George Moseley Murphy Collection of differential equations solved in Mathematica 11 and Maple 2016.1

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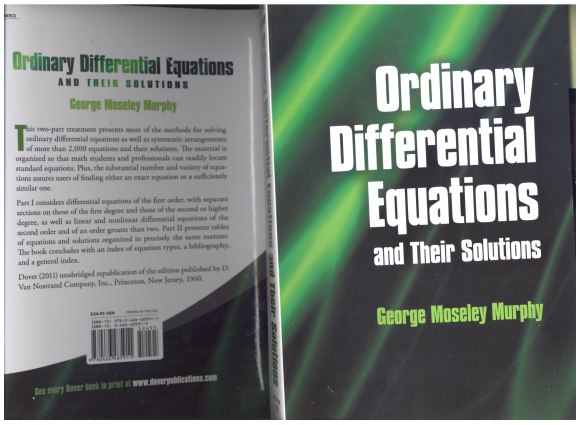
1 Introduction and summary of results

This report gives the result of solving all the 2,313 differential equations given in George Moseley Murphy 1960 book in Mathematica 11.01 and Maple 2016.1 on windows 7, 64 bit OS.



The PC used is an Intel i7-3930k running at 3.20 GHz with 16 GB memory.

The command `AboluteTiming[]` was used in Mathematica to obtain the CPU time. In Maple the following commands were used for this purpose

```
t0 := time[real]():
timeOut := 10*60;
result_of_solve := timelimit(timeOut,dsolve(ode[i]));
cpu_time := time[real]()-t0:
```

Both Maple and Mathematica had a CPU time limit of 10 minutes to complete each problem else the problem is considered not solved and marked as timed out.

When Mathematica returned `DifferentialRoot` as a solution to an ODE this was counted as not solved. Similarly, when Maple returned `DESol` this was also counted as not solved.

Table 1 below summarizes the performance of each CAS system

system	% solved	mean CPU time (sec)	mean leaf size of result	total CPU (minutes)	total leaf size
Mathematica	84.87	30.42	137.23	1172.83	317419
Maple	94.77	1.06	116.08	40.98	268492

Table 1: Summary of final results

The following summarizes which equations are solved by each system

Not solved by Mathematica 23, 41, 50, 51, 61, 63, 76, 78, 87, 89, 90, 93, 97, 98, 106, 112, 113, 116, 130, 143, 210, 306, 387, 391, 422, 425, 477, 518, 527, 534, 565, 566, 596, 721,

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Not solved by Maple 61, 63, 76, 87, 89, 90, 93, 97, 98, 106, 113, 128, 130, 142, 210, 391, 422, 425, 477, 527, 534, 596, 627, 682, 721, 739, 742, 775, 914, 969, 970, 987, 1013, 1019, 1020, 1042, 1073, 1110, 1116, 1120, 1174, 1216, 1375, 1415, 1513, 1518, 1534, 1588, 1643, 1706, 1732, 1736, 1738, 1739, 1744, 1758, 1774, 1775, 1778, 1779, 1780, 1781, 1787, 1791, 1794, 1795, 1798, 1799, 1801, 1805, 1859, 1865, 1871, 1885, 1886, 1891, 1904, 1909, 1913, 1914, 1946, 1948, 1949, 1951, 1952, 1953, 1968, 1972, 2005, 2015, 2016, 2020, 2021, 2028, 2036, 2037, 2044, 2047, 2048, 2049, 2068, 2077, 2108, 2151, 2171, 2233, 2237, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2307, 2308, 2309, 2310, 2311, 2312, 2313

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Solved by Maple but not by Mathematica 23, 41, 50, 51, 78, 112, 116, 143, 306, 387, 518, 565, 566, 722, 755, 758, 804, 807, 809, 834, 837, 840, 843, 860, 861, 867, 910, 926, 927, 949, 952, 961, 963, 977, 982, 988, 1005, 1012, 1014, 1018, 1030, 1032, 1033, 1034, 1035, 1036, 1037, 1040, 1041, 1043, 1044, 1045, 1046, 1047, 1049, 1050, 1052, 1053, 1059, 1060, 1061, 1063, 1064, 1067, 1068, 1069, 1070, 1071, 1074, 1075, 1076, 1077, 1078, 1079, 1080, 1083, 1084, 1085, 1086, 1087, 1088, 1089, 1090, 1091, 1096, 1097, 1099, 1100, 1101, 1111, 1121, 1123, 1132, 1133, 1140, 1142, 1143, 1149, 1214, 1218, 1219, 1222, 1306, 1314, 1317, 1321, 1333, 1334, 1343, 1344, 1400, 1419, 1541, 1557, 1616, 1641, 1642, 1645, 1656, 1663, 1695, 1697, 1698, 1705, 1715, 1727, 1731, 1733, 1735, 1737, 1753, 1762, 1769, 1783,

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Solved by both Maple and Mathematica 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 43, 44, 45, 46, 47, 48, 49, 52, 53, 54, 55, 56, 57, 58, 59, 60, 62, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 77, 79, 80, 81, 82, 83, 84, 85, 86, 88, 91, 92, 94, 95, 96, 99, 100, 101, 102, 103, 104, 105, 107, 108, 109, 110, 111, 114, 115, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 129, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 388, 389, 390, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 423, 424, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 519, 520, 521, 522, 523, 524, 525, 526, 528, 529, 530, 531, 532, 533, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662,

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Both systems unable to solve 61, 63, 76, 87, 89, 90, 93, 97, 98, 106, 113, 130, 210, 391, 422, 425, 477, 527, 534, 596, 721, 739, 742, 775, 914, 969, 970, 987, 1019, 1020, 1042, 1073, 1110, 1116, 1174, 1216, 1375, 1415, 1513, 1518, 1534, 1588, 1643, 1706, 1732, 1736, 1738, 1739, 1744, 1758, 1774, 1775, 1778, 1779, 1780, 1781, 1787, 1791, 1794, 1795, 1798, 1799, 1801, 1805, 1859, 1865, 1871, 1885, 1886, 1891, 1904, 1909, 1913, 1914, 1946, 1948, 1949, 1951, 1952, 1953, 1968, 1972, 2005, 2015, 2016, 2020, 2021, 2028, 2036, 2037, 2044, 2048, 2068, 2108, 2151, 2171, 2233, 2237, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2307, 2308, 2309, 2310, 2311, 2312, 2313

2 Quick lookup table and final result for each ODE

Final conclusion table for each equation is given by table 2 below. Clicking on the problem opens a new page that shows the result.

Table 2: Breakdown of results for each Murphy differential equation

	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1	✓	0.1	19	✓	0.54	12
ODE 2	✓	0.035	28	✓	0.122	21
ODE 3	✓	0.03	46	✓	0.079	43
ODE 4	✓	0.012	28	✓	0.05	31
ODE 5	✓	0.065	43	✓	0.022	40
ODE 6	✓	0.067	43	✓	0.013	40
ODE 7	✓	0.029	34	✓	0.019	30
ODE 8	✓	0.006	22	✓	0.031	17
ODE 9	✓	0.015	42	✓	0.009	30
ODE 10	✓	0.01	32	✓	0.01	29
ODE 11	✓	0.006	22	✓	0.093	19
ODE 12	✓	0.023	18	✓	0.021	15
ODE 13	✓	0.025	14	✓	0.005	11
ODE 14	✓	0.015	10	✓	0.025	8
ODE 15	✓	0.015	15	✓	0.007	15
ODE 16	✓	0.014	19	✓	0.017	16
ODE 17	✓	0.029	28	✓	0.14	39
ODE 18	✓	0.023	16	✓	0.023	16
ODE 19	✓	0.026	14	✓	0.006	11
ODE 20	✓	0.015	15	✓	0.029	21
ODE 21	✓	0.061	81	✓	1.581	99
ODE 22	✓	0.05	20	✓	0.101	32
ODE 23	✗	0	0	✓	0.71	114
ODE 24	✓	28.65	155	✓	1.476	125
ODE 25	✓	0.009	19	✓	0.006	11
ODE 26	✓	0.045	21	✓	0.01	15

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Table 2 – continued from previous page

	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 27	✓	0.012	10	✓	0.005	10
ODE 28	✓	0.02	21	✓	0.014	21
ODE 29	✓	0.029	12	✓	0.006	10
ODE 30	✓	0.02	13	✓	0.019	11
ODE 31	✓	0.019	19	✓	0.015	24
ODE 32	✓	0.019	15	✓	0.008	13
ODE 33	✓	0.018	19	✓	0.012	29
ODE 34	✓	0.044	20	✓	0.485	100
ODE 35	✓	0.026	24	✓	0.067	40
ODE 36	✓	0.015	17	✓	0.011	14
ODE 37	✓	0.019	33	✓	0.026	27
ODE 38	✓	0.008	18	✓	0.011	15
ODE 39	✓	0.486	44	✓	0.06	24
ODE 40	✓	0.007	117	✓	0.609	44
ODE 41	✗	0	0	✓	0.635	30
ODE 42	✓	0.024	49	✓	0.092	39
ODE 43	✓	0.01	30	✓	0.047	15
ODE 44	✓	0.009	22	✓	0.027	28
ODE 45	✓	0.018	18	✓	0.028	26
ODE 46	✓	0.772	48	✓	0.141	34
ODE 47	✓	0.007	17	✓	0.027	20
ODE 48	✓	0.019	25	✓	0.033	32
ODE 49	✓	6.562	57	✓	0.175	25
ODE 50	✗	0	0	✓	0.985	128
ODE 51	✗	0	0	✓	0.131	48
ODE 52	✓	0.016	28	✓	0.033	32
ODE 53	✓	0.017	34	✓	0.04	20
ODE 54	✓	0.025	123	✓	0.284	80
ODE 55	✓	0.02	32	✓	0.008	23
ODE 56	✓	0.006	189	✓	0.077	59

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Table 2 – continued from previous page

	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 57	✓	0.022	93	✓	0.107	85
ODE 58	✓	0.224	648	✓	0.473	363
ODE 59	✓	0.006	175	✓	0.092	71
ODE 60	✓	0.037	54	✓	0.012	41
ODE 61	✗	0	0	✗	0	0
ODE 62	✓	0.044	88	✓	0.201	50
ODE 63	✗	0	0	✗	0	0
ODE 64	✓	0.02	39	✓	0.013	18
ODE 65	✓	0.065	35	✓	0.136	56
ODE 66	✓	0.045	63	✓	0.341	51
ODE 67	✓	0.009	25	✓	0.063	23
ODE 68	✓	0.006	19	✓	0.004	17
ODE 69	✓	0.057	42	✓	0.007	33
ODE 70	✓	0.105	1067	✓	0.213	179
ODE 71	✓	0.049	57	✓	0.016	54
ODE 72	✓	0.064	28	✓	0.271	29
ODE 73	✓	0.057	24	✓	0.273	35
ODE 74	✓	0.052	50	✓	0.215	35
ODE 75	✓	0.038	35	✓	0.006	13
ODE 76	✗	0	0	✗	0	0
ODE 77	✓	0.067	62	✓	0.011	44
ODE 78	✗	0	0	✓	0.071	142
ODE 79	✓	0.877	73	✓	0.062	50
ODE 80	✓	0.375	161	✓	0.036	110
ODE 81	✓	0.034	77	✓	0.005	21
ODE 82	✓	0.039	54	✓	0.019	30
ODE 83	✓	0.006	39	✓	0.005	14
ODE 84	✓	0.013	45	✓	0.006	19
ODE 85	✓	0.145	94	✓	0.049	79
ODE 86	✓	9.148	376	✓	1.876	373

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 87	✗	0	0	✗	0	0
ODE 88	✓	0.033	101	✓	0.044	41
ODE 89	✗	0	0	✗	0	0
ODE 90	✗	0	0	✗	0	0
ODE 91	✓	0.032	43	✓	0.034	21
ODE 92	✓	0.026	44	✓	0.012	15
ODE 93	✗	0	0	✗	0	0
ODE 94	✓	0.045	98	✓	0.575	33
ODE 95	✓	172.366	109	✓	0.305	61
ODE 96	✓	0.493	64	✓	0.019	48
ODE 97	✗	0	0	✗	0	0
ODE 98	✗	0	0	✗	0	0
ODE 99	✓	95.624	283	✓	0.168	31
ODE 100	✓	42.334	352	✓	0.056	27
ODE 101	✓	0.222	116	✓	0.078	68
ODE 102	✓	0.074	25	✓	0.072	47
ODE 103	✓	0.019	16	✓	0.008	17
ODE 104	✓	0.056	43	✓	0.01	29
ODE 105	✓	0.031	27	✓	0.015	24
ODE 106	✗	0	0	✗	0	0
ODE 107	✓	0.004	17	✓	0.006	13
ODE 108	✓	0.106	41	✓	0.036	26
ODE 109	✓	0.051	23	✓	0.017	24
ODE 110	✓	0.428	28	✓	0.049	33
ODE 111	✓	0.628	102	✓	0.069	84
ODE 112	✗	0	0	✓	1.381	43
ODE 113	✗	0	0	✗	0	0
ODE 114	✓	0.089	47	✓	0.023	56
ODE 115	✓	0.26	55	✓	1.17	23
ODE 116	✗	0	0	✓	0.02	55
ODE 117	✓	0.051	29	✓	0.005	12

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Table 2 – continued from previous page

	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 118	✓	0.061	29	✓	0.006	14
ODE 119	✓	0.113	21	✓	0.042	15
ODE 120	✓	0.064	29	✓	0.005	14
ODE 121	✓	0.045	29	✓	0.005	12
ODE 122	✓	0.027	41	✓	0.015	14
ODE 123	✓	0.094	20	✓	0.929	18
ODE 124	✓	0.029	32	✓	0.01	18
ODE 125	✓	0.389	2959	✓	0.038	51
ODE 126	✓	0.23	52	✓	0.026	55
ODE 127	✓	0.781	94	✓	0.072	85
ODE 128	✓	0.553	53	✗	0	0
ODE 129	✓	0.184	15	✓	0.023	31
ODE 130	✗	0	0	✗	0	0
ODE 131	✓	0.115	31	✓	0.011	21
ODE 132	✓	0.055	40	✓	0.188	33
ODE 133	✓	0.009	18	✓	0.007	12
ODE 134	✓	0.022	24	✓	0.019	32
ODE 135	✓	0.017	19	✓	0.007	16
ODE 136	✓	221.018	191	✓	0.544	113
ODE 137	✓	0.065	25	✓	0.008	21
ODE 138	✓	11.421	126	✓	0.032	35
ODE 139	✓	0.09	31	✓	0.007	20
ODE 140	✓	2.761	54	✓	0.111	41
ODE 141	✓	0.477	48	✓	0.09	107
ODE 142	✓	0.361	61	✗	0	0
ODE 143	✗	0	0	✓	0.198	198
ODE 144	✓	0.144	547	✓	0.091	131
ODE 145	✓	0.029	46	✓	0.017	56
ODE 146	✓	0.003	17	✓	0.006	13
ODE 147	✓	0.003	13	✓	0.004	11

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 148	✓	0.003	19	✓	0.005	15
ODE 149	✓	0.004	18	✓	0.012	14
ODE 150	✓	0.007	19	✓	0.007	17
ODE 151	✓	0.012	19	✓	0.012	17
ODE 152	✓	0.01	14	✓	0.005	12
ODE 153	✓	0.021	29	✓	0.014	31
ODE 154	✓	0.011	19	✓	0.008	17
ODE 155	✓	0.003	11	✓	0.004	9
ODE 156	✓	0.015	26	✓	0.01	31
ODE 157	✓	0.008	22	✓	0.008	19
ODE 158	✓	0.009	24	✓	0.009	21
ODE 159	✓	0.028	31	✓	0.015	28
ODE 160	✓	0.009	25	✓	0.01	22
ODE 161	✓	0.012	37	✓	0.011	36
ODE 162	✓	0.006	19	✓	0.008	16
ODE 163	✓	0.008	21	✓	0.008	17
ODE 164	✓	0.009	30	✓	0.016	25
ODE 165	✓	0.037	70	✓	0.022	50
ODE 166	✓	0.013	30	✓	0.087	27
ODE 167	✓	0.011	12	✓	0.011	17
ODE 168	✓	0.011	84	✓	0.35	86
ODE 169	✓	0.021	33	✓	0.006	24
ODE 170	✓	0.02	33	✓	0.009	29
ODE 171	✓	0.019	103	✓	0.014	34
ODE 172	✓	0.015	229	✓	0.114	164
ODE 173	✓	0.227	589	✓	0.143	231
ODE 174	✓	0.007	133	✓	0.081	59
ODE 175	✓	0.007	17	✓	0.005	17
ODE 176	✓	0.007	18	✓	0.006	17
ODE 177	✓	0.007	18	✓	0.005	17

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 178	✓	0.05	76	✓	0.089	73
ODE 179	✓	0.012	27	✓	0.014	21
ODE 180	✓	0.007	18	✓	0.005	15
ODE 181	✓	0.015	43	✓	0.072	64
ODE 182	✓	0.181	301	✓	0.336	848
ODE 183	✓	0.048	101	✓	0.111	66
ODE 184	✓	0.037	40	✓	0.015	34
ODE 185	✓	0.026	31	✓	0.009	26
ODE 186	✓	0.259	1293	✓	0.239	174
ODE 187	✓	0.524	126	✓	0.104	50
ODE 188	✓	0.01	17	✓	0.008	20
ODE 189	✓	0.13	51	✓	0.011	20
ODE 190	✓	0.02	59	✓	0.005	15
ODE 191	✓	0.008	35	✓	0.004	17
ODE 192	✓	0.012	51	✓	0.013	25
ODE 193	✓	0.035	103	✓	0.011	34
ODE 194	✓	0.027	45	✓	0.025	34
ODE 195	✓	0.014	21	✓	0.006	15
ODE 196	✓	1.005	3935	✓	0.039	27
ODE 197	✓	0.02	13	✓	0.037	27
ODE 198	✓	0.032	17	✓	0.037	27
ODE 199	✓	0.018	12	✓	2.555	28
ODE 200	✓	0.115	81	✓	0.252	49
ODE 201	✓	0.046	39	✓	0.046	41
ODE 202	✓	0.067	19	✓	0.443	17
ODE 203	✓	0.026	16	✓	0.02	17
ODE 204	✓	0.025	17	✓	0.012	26
ODE 205	✓	0.038	35	✓	0.018	34
ODE 206	✓	89.672	48	✓	0.204	24
ODE 207	✓	0.062	19	✓	0.338	15

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Table 2 – continued from previous page

	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 208	✓	0.027	15	✓	0.01	16
ODE 209	✓	0.044	27	✓	0.02	35
ODE 210	✗	0	0	✗	0	0
ODE 211	✓	0.055	19	✓	0.011	29
ODE 212	✓	0.019	14	✓	0.006	11
ODE 213	✓	0.077	16	✓	0.081	59
ODE 214	✓	0.031	16	✓	0.012	17
ODE 215	✓	0.04	14	✓	0.112	17
ODE 216	✓	0.014	18	✓	0.01	18
ODE 217	✓	0.024	21	✓	0.022	31
ODE 218	✓	0.009	13	✓	0.006	13
ODE 219	✓	0.015	17	✓	0.02	17
ODE 220	✓	0.03	19	✓	0.02	17
ODE 221	✓	0.036	16	✓	0.042	45
ODE 222	✓	4.293	39	✓	0.272	32
ODE 223	✓	527.297	142	✓	0.107	39
ODE 224	✓	0.016	18	✓	0.013	14
ODE 225	✓	0.005	22	✓	0.005	18
ODE 226	✓	0.012	17	✓	0.007	14
ODE 227	✓	0.027	39	✓	0.01	37
ODE 228	✓	0.013	49	✓	0.007	23
ODE 229	✓	0.014	119	✓	0.007	34
ODE 230	✓	0.185	57	✓	0.097	81
ODE 231	✓	0.005	19	✓	0.007	17
ODE 232	✓	0.01	26	✓	0.013	22
ODE 233	✓	0.005	25	✓	0.005	24
ODE 234	✓	0.007	21	✓	0.007	19
ODE 235	✓	0.01	20	✓	0.01	18
ODE 236	✓	0.016	32	✓	0.01	28
ODE 237	✓	0.022	22	✓	0.006	22

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Table 2 – continued from previous page

	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 238	✓	0.019	77	✓	0.013	35
ODE 239	✓	0.005	21	✓	0.006	15
ODE 240	✓	0.105	124	✓	0.253	62
ODE 241	✓	0.019	63	✓	0.006	15
ODE 242	✓	0.018	53	✓	0.005	13
ODE 243	✓	0.011	60	✓	0.008	23
ODE 244	✓	2.022	357	✓	0.032	34
ODE 245	✓	0.013	22	✓	0.013	18
ODE 246	✓	0.015	20	✓	0.02	29
ODE 247	✓	0.012	32	✓	0.01	23
ODE 248	✓	0.014	64	✓	0.007	23
ODE 249	✓	0.012	61	✓	0.015	17
ODE 250	✓	0.009	84	✓	0.005	17
ODE 251	✓	0.01	115	✓	0.007	22
ODE 252	✓	0.006	15	✓	0.008	12
ODE 253	✓	0.009	26	✓	0.012	22
ODE 254	✓	0.007	26	✓	0.007	22
ODE 255	✓	0.007	19	✓	0.008	16
ODE 256	✓	0.009	22	✓	0.01	21
ODE 257	✓	0.006	19	✓	0.006	16
ODE 258	✓	0.032	32	✓	0.013	27
ODE 259	✓	0.014	24	✓	0.009	21
ODE 260	✓	0.011	24	✓	0.013	19
ODE 261	✓	0.067	32	✓	0.026	41
ODE 262	✓	0.022	39	✓	0.005	27
ODE 263	✓	0.008	17	✓	0.006	20
ODE 264	✓	0.016	31	✓	0.008	26
ODE 265	✓	0.063	66	✓	0.014	60
ODE 266	✓	0.135	1260	✓	0.099	196
ODE 267	✓	0.008	17	✓	0.016	25

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 268	✓	0.182	109	✓	0.089	52
ODE 269	✓	0.007	51	✓	0.012	37
ODE 270	✓	0.166	1577	✓	0.1	220
ODE 271	✓	0.033	64	✓	0.011	54
ODE 272	✓	3.172	268	✓	0.088	76
ODE 273	✓	0.013	42	✓	0.008	21
ODE 274	✓	0.009	46	✓	0.006	19
ODE 275	✓	0.618	239	✓	0.081	182
ODE 276	✓	0.872	279	✓	0.095	308
ODE 277	✓	0.031	144	✓	0.008	29
ODE 278	✓	0.013	21	✓	0.007	19
ODE 279	✓	0.151	23	✓	0.443	18
ODE 280	✓	0.024	52	✓	0.016	30
ODE 281	✓	0.011	30	✓	2.933	47
ODE 282	✓	0.013	21	✓	0.01	20
ODE 283	✓	0.012	23	✓	0.011	19
ODE 284	✓	0.013	22	✓	0.011	18
ODE 285	✓	0.01	32	✓	0.011	48
ODE 286	✓	0.008	19	✓	0.012	18
ODE 287	✓	0.019	42	✓	0.523	58
ODE 288	✓	0.013	43	✓	0.013	53
ODE 289	✓	0.009	27	✓	0.01	20
ODE 290	✓	0.011	22	✓	0.011	18
ODE 291	✓	0.005	13	✓	0.005	13
ODE 292	✓	0.006	25	✓	0.006	23
ODE 293	✓	0.006	17	✓	0.007	15
ODE 294	✓	0.012	18	✓	0.009	16
ODE 295	✓	0.023	21	✓	0.008	19
ODE 296	✓	0.006	30	✓	0.007	29
ODE 297	✓	0.013	21	✓	0.008	18

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Table 2 – continued from previous page

	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 298	✓	0.012	11	✓	0.006	12
ODE 299	✓	0.028	37	✓	0.006	12
ODE 300	✓	0.015	47	✓	0.107	14
ODE 301	✓	0.084	32	✓	2.865	231
ODE 302	✓	0.024	23	✓	0.009	19
ODE 303	✓	0.035	33	✓	0.011	22
ODE 304	✓	0.543	161	✓	0.962	85
ODE 305	✓	0.231	39	✓	0.784	31
ODE 306	✗	0	0	✓	0.33	27
ODE 307	✓	0.019	27	✓	0.024	24
ODE 308	✓	0.018	26	✓	0.011	22
ODE 309	✓	0.035	43	✓	0.018	40
ODE 310	✓	0.017	32	✓	0.009	25
ODE 311	✓	0.157	58	✓	0.367	280
ODE 312	✓	0.036	33	✓	0.011	21
ODE 313	✓	0.012	24	✓	0.021	23
ODE 314	✓	0.006	21	✓	0.01	19
ODE 315	✓	0.006	21	✓	0.007	19
ODE 316	✓	0.008	14	✓	0.013	12
ODE 317	✓	0.01	23	✓	0.017	19
ODE 318	✓	0.011	29	✓	0.02	25
ODE 319	✓	0.008	23	✓	0.016	21
ODE 320	✓	0.013	22	✓	0.02	19
ODE 321	✓	0.012	34	✓	0.018	27
ODE 322	✓	0.044	50	✓	0.022	33
ODE 323	✓	0.01	17	✓	0.007	15
ODE 324	✓	0.023	34	✓	0.037	57
ODE 325	✓	0.016	34	✓	0.02	37
ODE 326	✓	0.026	42	✓	0.018	44
ODE 327	✓	0.018	39	✓	0.015	42

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 328	✓	0.069	70	✓	0.011	56
ODE 329	✓	0.256	102	✓	0.202	58
ODE 330	✓	0.003	17	✓	0.006	12
ODE 331	✓	0.038	18	✓	0.057	16
ODE 332	✓	0.008	24	✓	0.009	16
ODE 333	✓	0.071	32	✓	0.018	23
ODE 334	✓	0.037	33	✓	0.013	25
ODE 335	✓	0.009	22	✓	0.009	18
ODE 336	✓	0.014	22	✓	0.02	27
ODE 337	✓	0.036	66	✓	0.017	37
ODE 338	✓	0.075	63	✓	0.203	97
ODE 339	✓	0.025	23	✓	0.013	19
ODE 340	✓	0.023	38	✓	0.016	23
ODE 341	✓	0.019	23	✓	0.012	24
ODE 342	✓	0.038	55	✓	0.012	37
ODE 343	✓	0.018	28	✓	0.012	27
ODE 344	✓	0.009	19	✓	0.016	17
ODE 345	✓	2.506	110	✓	0.047	153
ODE 346	✓	0.01	23	✓	0.009	21
ODE 347	✓	0.006	16	✓	0.011	14
ODE 348	✓	0.02	22	✓	0.014	24
ODE 349	✓	0.008	17	✓	0.006	19
ODE 350	✓	0.03	39	✓	0.008	19
ODE 351	✓	0.01	24	✓	0.005	21
ODE 352	✓	0.038	27	✓	0.02	31
ODE 353	✓	0.013	25	✓	0.021	32
ODE 354	✓	0.008	42	✓	0.007	17
ODE 355	✓	0.15	17	✓	0.45	17
ODE 356	✓	0.014	23	✓	0.011	19
ODE 357	✓	0.017	25	✓	0.024	51

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 358	✓	0.009	21	✓	0.01	18
ODE 359	✓	0.014	37	✓	0.011	25
ODE 360	✓	0.009	16	✓	0.013	14
ODE 361	✓	0.011	25	✓	0.02	17
ODE 362	✓	0.016	23	✓	0.026	20
ODE 363	✓	0.013	26	✓	0.011	23
ODE 364	✓	0.007	23	✓	0.01	21
ODE 365	✓	0.01	26	✓	0.013	22
ODE 366	✓	0.119	73	✓	0.553	30
ODE 367	✓	0.014	20	✓	0.012	22
ODE 368	✓	0.138	34	✓	0.005	17
ODE 369	✓	0.009	44	✓	0.005	19
ODE 370	✓	0.011	94	✓	0.008	22
ODE 371	✓	0.12	104	✓	0.01	50
ODE 372	✓	0.008	21	✓	0.007	19
ODE 373	✓	0.012	112	✓	0.079	34
ODE 374	✓	1.511	40	✓	0.405	23
ODE 375	✓	0.032	45	✓	0.022	28
ODE 376	✓	0.011	21	✓	0.006	21
ODE 377	✓	0.166	24	✓	0.683	18
ODE 378	✓	0.224	42	✓	0.029	67
ODE 379	✓	0.012	22	✓	0.013	18
ODE 380	✓	1.469	612	✓	0.383	490
ODE 381	✓	0.004	15	✓	0.005	15
ODE 382	✓	0.038	46	✓	0.013	36
ODE 383	✓	0.458	108	✓	0.065	63
ODE 384	✓	0.017	28	✓	0.011	26
ODE 385	✓	0.068	222	✓	0.084	52
ODE 386	✓	0.201	470	✓	0.64	218
ODE 387	✗	0	0	✓	0.43	498

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 388	✓	0.069	143	✓	0.02	72
ODE 389	✓	0.022	113	✓	0.013	38
ODE 390	✓	0.251	254	✓	0.095	962
ODE 391	✗	0	0	✗	0	0
ODE 392	✓	0.03	33	✓	0.013	34
ODE 393	✓	0.02	11	✓	0.01	12
ODE 394	✓	0.069	59	✓	0.017	39
ODE 395	✓	0.025	42	✓	0.015	36
ODE 396	✓	0.056	61	✓	0.014	33
ODE 397	✓	0.048	106	✓	0.018	37
ODE 398	✓	0.095	90	✓	0.036	74
ODE 399	✓	0.073	100	✓	0.039	86
ODE 400	✓	0.003	21	✓	0.006	15
ODE 401	✓	0.003	20	✓	0.005	14
ODE 402	✓	0.009	143	✓	0.111	119
ODE 403	✓	0.335	191	✓	0.013	28
ODE 404	✓	0.318	100	✓	0.021	38
ODE 405	✓	0.051	14	✓	0.013	32
ODE 406	✓	0.231	149	✓	0.016	34
ODE 407	✓	0.002	7	✓	0.003	5
ODE 408	✓	0.002	21	✓	0.005	15
ODE 409	✓	0.003	20	✓	0.005	14
ODE 410	✓	0.783	196	✓	0.062	33
ODE 411	✓	0.664	558	✓	0.105	36
ODE 412	✓	0.003	20	✓	0.008	14
ODE 413	✓	0.378	63	✓	1.013	87
ODE 414	✓	0.058	18	✓	0.06	18
ODE 415	✓	0.029	13	✓	0.038	10
ODE 416	✓	0.027	15	✓	0.053	13
ODE 417	✓	0.051	58	✓	0.06	52

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 418	✓	0.016	25	✓	0.01	21
ODE 419	✓	0.007	16	✓	0.006	14
ODE 420	✓	0.005	39	✓	0.004	14
ODE 421	✓	0.009	43	✓	0.006	15
ODE 422	✗	0	0	✗	0	0
ODE 423	✓	0.139	71	✓	0.016	67
ODE 424	✓	0.036	32	✓	0.009	24
ODE 425	✗	0	0	✗	0	0
ODE 426	✓	0.01	47	✓	0.009	20
ODE 427	✓	0.013	77	✓	0.008	28
ODE 428	✓	0.072	106	✓	0.036	51
ODE 429	✓	0.161	71	✓	0.01	62
ODE 430	✓	0.016	62	✓	0.007	22
ODE 431	✓	0.036	36	✓	0.022	20
ODE 432	✓	0.014	43	✓	0.009	18
ODE 433	✓	0.016	39	✓	0.012	29
ODE 434	✓	28.217	92	✓	0.125	30
ODE 435	✓	0.135	71	✓	0.021	66
ODE 436	✓	0.041	61	✓	0.008	19
ODE 437	✓	0.022	47	✓	0.033	16
ODE 438	✓	0.014	20	✓	0.018	16
ODE 439	✓	0.03	31	✓	0.013	35
ODE 440	✓	0.023	51	✓	0.011	33
ODE 441	✓	0.006	18	✓	0.007	15
ODE 442	✓	0.019	24	✓	0.012	25
ODE 443	✓	0.042	17	✓	0.011	24
ODE 444	✓	0.038	23	✓	0.033	26
ODE 445	✓	1.661	159	✓	0.025	64
ODE 446	✓	0.009	43	✓	0.02	22
ODE 447	✓	1.127	159	✓	0.023	61

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 448	✓	1.831	179	✓	0.024	71
ODE 449	✓	0.031	33	✓	0.012	35
ODE 450	✓	0.018	30	✓	0.026	26
ODE 451	✓	0.02	22	✓	0.025	18
ODE 452	✓	0.289	1601	✓	0.022	47
ODE 453	✓	0.01	53	✓	0.02	42
ODE 454	✓	0.357	4937	✓	0.03	55
ODE 455	✓	0.012	63	✓	0.02	44
ODE 456	✓	0.035	80	✓	0.022	35
ODE 457	✓	0.196	2563	✓	0.029	49
ODE 458	✓	0.074	925	✓	0.022	41
ODE 459	✓	0.056	49	✓	0.032	71
ODE 460	✓	0.017	29	✓	0.014	23
ODE 461	✓	0.096	232	✓	0.02	29
ODE 462	✓	0.05	85	✓	0.111	74
ODE 463	✓	0.01	47	✓	0.007	18
ODE 464	✓	0.012	57	✓	0.007	21
ODE 465	✓	0.018	26	✓	0.018	16
ODE 466	✓	0.029	29	✓	0.011	35
ODE 467	✓	0.023	55	✓	0.011	33
ODE 468	✓	0.01	67	✓	0.02	50
ODE 469	✓	0.016	30	✓	0.026	26
ODE 470	✓	0.219	2587	✓	0.031	45
ODE 471	✓	0.009	53	✓	0.012	19
ODE 472	✓	0.01	67	✓	0.02	50
ODE 473	✓	0.029	28	✓	0.026	26
ODE 474	✓	0.016	29	✓	0.025	26
ODE 475	✓	0.13	256	✓	0.031	45
ODE 476	✓	0.009	65	✓	0.013	20
ODE 477	✗	0	0	✗	0	0

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 478	✓	0.035	81	✓	0.049	26
ODE 479	✓	0.442	29	✓	0.028	64
ODE 480	✓	0.03	59	✓	0.008	19
ODE 481	✓	0.069	781	✓	0.024	55
ODE 482	✓	0.017	30	✓	0.027	26
ODE 483	✓	0.02	30	✓	0.028	22
ODE 484	✓	0.016	30	✓	0.024	22
ODE 485	✓	0.018	26	✓	0.025	26
ODE 486	✓	0.038	31	✓	0.013	35
ODE 487	✓	0.014	26	✓	0.031	26
ODE 488	✓	0.011	61	✓	0.023	24
ODE 489	✓	0.01	71	✓	0.02	50
ODE 490	✓	4.833	109	✓	0.023	59
ODE 491	✓	0.287	1677	✓	0.031	55
ODE 492	✓	0.355	4961	✓	0.03	47
ODE 493	✓	0.028	276	✓	0.021	35
ODE 494	✓	1.	3591	✓	0.049	99
ODE 495	✓	0.183	1177	✓	0.03	43
ODE 496	✓	0.018	28	✓	0.022	24
ODE 497	✓	1.948	7785	✓	0.023	47
ODE 498	✓	22.004	145	✓	0.025	72
ODE 499	✓	0.01	77	✓	0.023	36
ODE 500	✓	0.104	1673	✓	0.03	47
ODE 501	✓	2.633	7715	✓	0.03	47
ODE 502	✓	0.378	73	✓	0.017	67
ODE 503	✓	0.039	36	✓	0.023	23
ODE 504	✓	0.03	83	✓	0.013	36
ODE 505	✓	0.037	45	✓	0.016	50
ODE 506	✓	0.045	106	✓	0.037	126
ODE 507	✓	1.405	216	✓	0.043	228

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 508	✓	0.012	50	✓	0.006	15
ODE 509	✓	0.006	42	✓	0.007	17
ODE 510	✓	0.007	46	✓	0.006	19
ODE 511	✓	0.007	43	✓	0.006	17
ODE 512	✓	0.023	38	✓	0.008	22
ODE 513	✓	0.019	20	✓	0.01	26
ODE 514	✓	0.023	20	✓	0.01	31
ODE 515	✓	0.016	58	✓	0.008	21
ODE 516	✓	0.021	86	✓	0.008	31
ODE 517	✓	0.02	58	✓	0.01	21
ODE 518	✗	0	0	✓	0.302	24
ODE 519	✓	0.045	25	✓	0.012	32
ODE 520	✓	0.014	16	✓	0.02	17
ODE 521	✓	0.017	16	✓	0.007	15
ODE 522	✓	0.017	23	✓	0.008	15
ODE 523	✓	0.016	21	✓	0.007	17
ODE 524	✓	0.007	50	✓	0.007	23
ODE 525	✓	0.073	29	✓	0.044	29
ODE 526	✓	0.022	96	✓	0.033	74
ODE 527	✗	0	0	✗	0	0
ODE 528	✓	0.018	31	✓	0.01	22
ODE 529	✓	0.037	75	✓	0.021	33
ODE 530	✓	0.015	20	✓	0.011	26
ODE 531	✓	0.022	30	✓	0.011	31
ODE 532	✓	0.026	54	✓	0.013	33
ODE 533	✓	0.214	74	✓	0.041	42
ODE 534	✗	0	0	✗	0	0
ODE 535	✓	0.047	431	✓	0.022	37
ODE 536	✓	0.038	90	✓	0.013	37
ODE 537	✓	0.011	68	✓	0.02	33

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 538	✓	0.011	71	✓	0.021	31
ODE 539	✓	0.011	73	✓	0.02	33
ODE 540	✓	0.021	23	✓	0.009	17
ODE 541	✓	0.016	32	✓	0.019	33
ODE 542	✓	0.01	37	✓	0.012	18
ODE 543	✓	0.012	52	✓	0.005	15
ODE 544	✓	0.008	44	✓	0.006	18
ODE 545	✓	0.008	60	✓	0.005	19
ODE 546	✓	0.007	38	✓	0.005	14
ODE 547	✓	0.008	52	✓	0.007	22
ODE 548	✓	0.013	59	✓	0.013	25
ODE 549	✓	0.011	75	✓	0.014	22
ODE 550	✓	0.022	51	✓	0.011	23
ODE 551	✓	0.032	385	✓	0.021	33
ODE 552	✓	0.023	62	✓	0.013	27
ODE 553	✓	15.088	457	✓	0.054	74
ODE 554	✓	14.96	451	✓	0.032	76
ODE 555	✓	0.01	58	✓	0.011	28
ODE 556	✓	0.014	56	✓	0.009	26
ODE 557	✓	0.088	413	✓	0.019	31
ODE 558	✓	0.028	71	✓	0.013	35
ODE 559	✓	0.012	83	✓	0.014	25
ODE 560	✓	0.011	75	✓	0.014	24
ODE 561	✓	0.018	68	✓	0.009	28
ODE 562	✓	0.012	72	✓	0.008	27
ODE 563	✓	0.014	31	✓	0.008	24
ODE 564	✓	0.031	34	✓	0.023	51
ODE 565	✗	0	0	✓	0.285	509
ODE 566	✗	0	0	✓	0.847	3737
ODE 567	✓	2.35	77	✓	0.055	77

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 568	✓	0.01	57	✓	0.014	17
ODE 569	✓	15.013	738	✓	0.044	101
ODE 570	✓	0.982	30	✓	0.017	29
ODE 571	✓	0.014	62	✓	0.014	27
ODE 572	✓	0.016	81	✓	0.017	24
ODE 573	✓	4.953	30	✓	0.011	21
ODE 574	✓	0.017	21	✓	0.008	17
ODE 575	✓	0.018	25	✓	0.011	23
ODE 576	✓	0.016	47	✓	0.007	18
ODE 577	✓	0.032	93	✓	0.027	43
ODE 578	✓	0.011	43	✓	0.008	20
ODE 579	✓	0.88	32	✓	0.024	30
ODE 580	✓	0.013	69	✓	0.012	20
ODE 581	✓	0.013	74	✓	0.018	25
ODE 582	✓	0.066	101	✓	0.03	48
ODE 583	✓	0.017	58	✓	0.011	23
ODE 584	✓	0.008	47	✓	0.008	19
ODE 585	✓	0.037	42	✓	0.019	44
ODE 586	✓	14.689	326	✓	0.019	30
ODE 587	✓	0.008	44	✓	0.005	19
ODE 588	✓	0.012	71	✓	0.013	24
ODE 589	✓	1.417	1769	✓	0.021	29
ODE 590	✓	0.029	78	✓	0.024	41
ODE 591	✓	0.035	98	✓	0.02	38
ODE 592	✓	0.008	51	✓	0.007	19
ODE 593	✓	1.16	98	✓	0.055	96
ODE 594	✓	0.02	61	✓	0.019	20
ODE 595	✓	0.037	63	✓	0.013	17
ODE 596	✗	0	0	✗	0	0
ODE 597	✓	26.919	38	✓	0.008	27

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 598	✓	1.406	25	✓	0.008	17
ODE 599	✓	0.218	420	✓	0.014	25
ODE 600	✓	0.016	326	✓	0.013	20
ODE 601	✓	0.478	121	✓	0.02	37
ODE 602	✓	1.373	44	✓	0.015	29
ODE 603	✓	0.089	61	✓	0.012	33
ODE 604	✓	0.603	359	✓	0.013	35
ODE 605	✓	0.227	372	✓	0.013	35
ODE 606	✓	1.642	25	✓	0.037	29
ODE 607	✓	0.018	312	✓	0.015	23
ODE 608	✓	0.029	438	✓	0.021	33
ODE 609	✓	0.025	16	✓	0.046	31
ODE 610	✓	0.179	458	✓	0.025	40
ODE 611	✓	0.013	53	✓	0.027	46
ODE 612	✓	0.016	346	✓	0.008	27
ODE 613	✓	3.352	106	✓	0.183	25
ODE 614	✓	0.052	19	✓	0.016	17
ODE 615	✓	0.02	414	✓	0.013	21
ODE 616	✓	0.065	21	✓	0.014	25
ODE 617	✓	0.039	20	✓	0.026	22
ODE 618	✓	0.114	35	✓	0.033	33
ODE 619	✓	0.037	89	✓	0.016	40
ODE 620	✓	0.785	45	✓	0.026	42
ODE 621	✓	0.109	27	✓	0.027	28
ODE 622	✓	0.253	35	✓	0.02	68
ODE 623	✓	0.087	25	✓	0.028	47
ODE 624	✓	0.034	381	✓	0.016	35
ODE 625	✓	0.072	747	✓	0.027	44
ODE 626	✓	0.217	1089	✓	0.039	71
ODE 627	✓	0.177	69	✗	0	0

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 628	✓	0.038	111	✓	0.007	26
ODE 629	✓	0.016	307	✓	0.014	18
ODE 630	✓	0.031	66	✓	0.014	38
ODE 631	✓	0.049	501	✓	0.046	30
ODE 632	✓	0.032	382	✓	0.014	44
ODE 633	✓	0.177	3501	✓	0.042	75
ODE 634	✓	0.026	570	✓	0.018	27
ODE 635	✓	0.014	115	✓	0.017	27
ODE 636	✓	0.035	66	✓	0.016	32
ODE 637	✓	0.045	51	✓	0.023	56
ODE 638	✓	0.058	87	✓	0.021	39
ODE 639	✓	0.108	1105	✓	0.017	40
ODE 640	✓	0.071	744	✓	0.015	46
ODE 641	✓	0.027	57	✓	0.01	23
ODE 642	✓	0.092	661	✓	0.02	35
ODE 643	✓	0.02	44	✓	0.011	28
ODE 644	✓	0.066	83	✓	0.091	116
ODE 645	✓	0.029	65	✓	0.092	114
ODE 646	✓	0.038	56	✓	0.018	29
ODE 647	✓	0.088	48	✓	0.151	40
ODE 648	✓	0.057	32	✓	0.013	34
ODE 649	✓	0.036	26	✓	0.018	29
ODE 650	✓	0.134	30	✓	0.018	34
ODE 651	✓	0.082	37	✓	0.018	49
ODE 652	✓	0.505	1069	✓	0.019	33
ODE 653	✓	0.044	163	✓	0.019	33
ODE 654	✓	0.061	216	✓	0.021	37
ODE 655	✓	0.064	31	✓	0.013	37
ODE 656	✓	0.008	72	✓	0.006	17
ODE 657	✓	0.16	2348	✓	0.021	24

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 658	✓	0.019	328	✓	0.014	27
ODE 659	✓	0.024	362	✓	0.024	21
ODE 660	✓	0.398	27	✓	0.112	23
ODE 661	✓	0.008	99	✓	0.004	17
ODE 662	✓	0.035	64	✓	0.013	30
ODE 663	✓	0.037	67	✓	0.021	37
ODE 664	✓	0.049	288	✓	0.028	46
ODE 665	✓	0.01	111	✓	0.006	25
ODE 666	✓	0.022	55	✓	0.011	25
ODE 667	✓	0.039	29	✓	0.025	27
ODE 668	✓	0.017	60	✓	0.024	40
ODE 669	✓	0.058	75	✓	0.024	40
ODE 670	✓	0.065	30	✓	0.018	27
ODE 671	✓	0.053	83	✓	0.025	28
ODE 672	✓	0.072	30	✓	0.017	26
ODE 673	✓	0.027	424	✓	0.017	28
ODE 674	✓	0.034	660	✓	0.024	35
ODE 675	✓	0.011	41	✓	0.007	18
ODE 676	✓	0.066	24	✓	0.018	43
ODE 677	✓	0.018	117	✓	0.016	31
ODE 678	✓	0.095	1211	✓	0.013	21
ODE 679	✓	0.046	201	✓	0.019	37
ODE 680	✓	0.159	1430	✓	0.014	35
ODE 681	✓	0.116	1807	✓	0.016	29
ODE 682	✓	0.127	37	✗	0	0
ODE 683	✓	0.024	149	✓	0.016	37
ODE 684	✓	0.038	129	✓	0.016	35
ODE 685	✓	0.208	39	✓	0.191	47
ODE 686	✓	0.101	878	✓	0.023	45
ODE 687	✓	0.012	151	✓	0.009	23

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Table 2 – continued from previous page

	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 688	✓	0.065	209	✓	0.024	43
ODE 689	✓	0.042	159	✓	0.015	37
ODE 690	✓	0.044	364	✓	0.162	28
ODE 691	✓	0.178	2201	✓	0.017	51
ODE 692	✓	0.038	108	✓	0.015	32
ODE 693	✓	0.079	524	✓	0.199	36
ODE 694	✓	0.024	61	✓	0.01	29
ODE 695	✓	0.127	359	✓	0.021	33
ODE 696	✓	0.029	370	✓	0.017	27
ODE 697	✓	0.189	433	✓	0.026	47
ODE 698	✓	0.065	34	✓	0.014	36
ODE 699	✓	0.107	331	✓	0.025	49
ODE 700	✓	0.096	1139	✓	0.016	29
ODE 701	✓	0.505	23	✓	0.092	26
ODE 702	✓	0.021	302	✓	0.016	35
ODE 703	✓	0.031	358	✓	0.108	20
ODE 704	✓	0.28	42	✓	0.139	33
ODE 705	✓	0.2	2097	✓	0.021	27
ODE 706	✓	0.042	491	✓	0.114	27
ODE 707	✓	0.032	672	✓	0.119	21
ODE 708	✓	0.061	34	✓	0.021	51
ODE 709	✓	0.64	117	✓	0.017	31
ODE 710	✓	0.072	1021	✓	0.019	35
ODE 711	✓	0.153	239	✓	0.422	37
ODE 712	✓	0.013	123	✓	0.006	16
ODE 713	✓	0.15	2021	✓	0.016	27
ODE 714	✓	4.637	1	✓	0.045	81
ODE 715	✓	0.422	584	✓	0.118	22
ODE 716	✓	0.025	161	✓	0.035	61
ODE 717	✓	0.019	139	✓	0.019	31

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 718	✓	0.013	116	✓	0.02	35
ODE 719	✓	0.016	141	✓	0.02	37
ODE 720	✓	0.025	253	✓	0.172	25
ODE 721	✗	0	0	✗	0	0
ODE 722	✗	0	0	✓	0.123	40
ODE 723	✓	0.164	50	✓	0.085	37
ODE 724	✓	1.044	93	✓	0.035	70
ODE 725	✓	0.176	89	✓	0.013	67
ODE 726	✓	0.088	94	✓	0.02	75
ODE 727	✓	0.003	20	✓	0.005	14
ODE 728	✓	0.032	39	✓	0.024	19
ODE 729	✓	0.087	60	✓	0.071	50
ODE 730	✓	0.089	28	✓	0.034	18
ODE 731	✓	0.128	321	✓	0.015	28
ODE 732	✓	0.108	321	✓	0.01	28
ODE 733	✓	0.045	52	✓	0.062	18
ODE 734	✓	1.137	40	✓	0.283	27
ODE 735	✓	1.155	2949	✓	0.132	133
ODE 736	✓	1.227	429	✓	0.061	35
ODE 737	✓	3.754	35	✓	0.413	73
ODE 738	✓	0.127	27	✓	0.167	27
ODE 739	✗	0	0	✗	0	0
ODE 740	✓	0.143	32	✓	0.271	33
ODE 741	✓	0.419	26	✓	0.17	23
ODE 742	✗	0	0	✗	0	0
ODE 743	✓	0.058	17	✓	0.08	15
ODE 744	✓	0.071	21	✓	0.105	19
ODE 745	✓	0.122	27	✓	0.081	23
ODE 746	✓	0.084	14	✓	0.066	13
ODE 747	✓	0.074	27	✓	0.021	30

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 748	✓	0.069	33	✓	0.034	15
ODE 749	✓	0.026	23	✓	0.009	15
ODE 750	✓	0.057	17	✓	0.071	15
ODE 751	✓	0.085	27	✓	0.045	18
ODE 752	✓	0.03	57	✓	0.446	41
ODE 753	✓	0.015	31	✓	0.034	31
ODE 754	✓	0.204	46	✓	0.014	35
ODE 755	✗	0	0	✓	1.037	267
ODE 756	✓	0.674	158	✓	0.137	212
ODE 757	✓	0.741	1865	✓	0.137	418
ODE 758	✗	0	0	✓	0.249	280
ODE 759	✓	0.018	23	✓	0.037	31
ODE 760	✓	0.021	23	✓	0.036	31
ODE 761	✓	0.045	99	✓	0.047	61
ODE 762	✓	0.004	26	✓	0.007	20
ODE 763	✓	0.097	93	✓	0.036	72
ODE 764	✓	0.004	33	✓	0.007	23
ODE 765	✓	0.022	35	✓	0.035	37
ODE 766	✓	0.602	173	✓	0.159	90
ODE 767	✓	0.047	68	✓	0.035	51
ODE 768	✓	0.092	71	✓	0.143	50
ODE 769	✓	0.239	243	✓	0.396	212
ODE 770	✓	0.265	91	✓	0.149	110
ODE 771	✓	0.491	209	✓	0.195	158
ODE 772	✓	0.721	931	✓	0.247	382
ODE 773	✓	2.855	413	✓	0.242	190
ODE 774	✓	0.586	865	✓	0.154	195
ODE 775	✗	0	0	✗	0	0
ODE 776	✓	0.018	47	✓	0.022	35
ODE 777	✓	0.28	76	✓	0.024	39

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 778	✓	0.063	73	✓	0.029	85
ODE 779	✓	0.002	21	✓	0.006	17
ODE 780	✓	0.002	21	✓	0.008	17
ODE 781	✓	0.008	53	✓	0.02	43
ODE 782	✓	0.04	68	✓	0.021	49
ODE 783	✓	0.314	110	✓	0.043	141
ODE 784	✓	0.034	83	✓	0.029	63
ODE 785	✓	0.003	12	✓	0.016	17
ODE 786	✓	0.002	14	✓	0.018	19
ODE 787	✓	0.288	1493	✓	0.016	31
ODE 788	✓	0.601	122	✓	0.015	48
ODE 789	✓	0.002	15	✓	0.017	22
ODE 790	✓	0.002	15	✓	0.018	22
ODE 791	✓	0.003	17	✓	0.018	24
ODE 792	✓	0.003	13	✓	0.019	20
ODE 793	✓	0.03	82	✓	0.026	65
ODE 794	✓	0.003	29	✓	0.006	21
ODE 795	✓	0.404	1445	✓	0.014	33
ODE 796	✓	0.374	1445	✓	0.013	33
ODE 797	✓	0.306	123	✓	0.022	20
ODE 798	✓	0.027	62	✓	0.027	45
ODE 799	✓	1.323	287	✓	0.016	42
ODE 800	✓	0.282	771	✓	0.017	33
ODE 801	✓	0.145	21	✓	0.019	21
ODE 802	✓	0.015	59	✓	0.026	47
ODE 803	✓	0.774	167	✓	0.019	25
ODE 804	✗	0	0	✓	0.182	394
ODE 805	✓	1.781	101	✓	0.023	50
ODE 806	✓	0.004	26	✓	0.007	20
ODE 807	✗	0	0	✓	0.231	368

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 808	✓	0.219	56	✓	0.413	27
ODE 809	✗	0	0	✓	0.403	27
ODE 810	✓	1.093	217	✓	0.205	23
ODE 811	✓	0.017	25	✓	0.035	19
ODE 812	✓	0.005	32	✓	0.008	25
ODE 813	✓	0.196	137	✓	0.269	23
ODE 814	✓	0.003	27	✓	0.008	20
ODE 815	✓	0.718	41	✓	0.029	42
ODE 816	✓	0.116	1373	✓	0.061	143
ODE 817	✓	0.003	23	✓	0.006	18
ODE 818	✓	0.05	55	✓	0.048	49
ODE 819	✓	0.571	4913	✓	0.063	155
ODE 820	✓	0.347	226	✓	0.067	69
ODE 821	✓	1.469	45	✓	0.041	106
ODE 822	✓	1.132	43	✓	0.02	48
ODE 823	✓	0.005	29	✓	0.007	22
ODE 824	✓	0.242	25	✓	0.273	56
ODE 825	✓	0.003	21	✓	0.007	16
ODE 826	✓	0.051	59	✓	0.036	79
ODE 827	✓	0.007	29	✓	0.008	25
ODE 828	✓	0.196	47	✓	0.187	82
ODE 829	✓	0.588	136	✓	0.294	86
ODE 830	✓	0.008	55	✓	0.011	25
ODE 831	✓	0.774	199	✓	0.075	81
ODE 832	✓	0.032	31	✓	0.107	91
ODE 833	✓	0.972	175	✓	2.484	142
ODE 834	✗	0	0	✓	0.372	259
ODE 835	✓	0.469	102	✓	0.015	28
ODE 836	✓	0.003	15	✓	0.019	22
ODE 837	✗	0	0	✓	0.13	122

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 838	✓	0.057	69	✓	0.051	51
ODE 839	✓	0.328	1093	✓	0.016	30
ODE 840	✗	0	0	✓	0.125	138
ODE 841	✓	0.005	27	✓	0.023	19
ODE 842	✓	0.255	56	✓	0.733	83
ODE 843	✗	0	0	✓	0.303	164
ODE 844	✓	0.298	771	✓	0.018	32
ODE 845	✓	0.292	771	✓	0.016	33
ODE 846	✓	1.153	193	✓	0.452	60
ODE 847	✓	0.006	39	✓	0.025	25
ODE 848	✓	0.237	167	✓	0.025	46
ODE 849	✓	0.284	41	✓	0.018	29
ODE 850	✓	1.13	163	✓	0.021	44
ODE 851	✓	1.23	32	✓	0.018	39
ODE 852	✓	13.296	34	✓	0.017	42
ODE 853	✓	30.713	39	✓	0.016	42
ODE 854	✓	30.997	40	✓	0.019	43
ODE 855	✓	1.032	180	✓	0.021	29
ODE 856	✓	0.005	24	✓	0.006	18
ODE 857	✓	25.886	1	✓	0.02	39
ODE 858	✓	0.37	183	✓	0.022	26
ODE 859	✓	0.249	167	✓	0.028	36
ODE 860	✗	0	0	✓	0.178	269
ODE 861	✗	0	0	✓	0.183	269
ODE 862	✓	0.806	158	✓	0.027	40
ODE 863	✓	0.204	133	✓	0.072	57
ODE 864	✓	0.703	212	✓	0.027	37
ODE 865	✓	0.312	16	✓	0.03	38
ODE 866	✓	0.878	145	✓	0.038	39
ODE 867	✗	0	0	✓	0.043	29

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 868	✓	2.832	323	✓	0.034	196
ODE 869	✓	1.705	9391	✓	0.017	33
ODE 870	✓	1.466	6977	✓	0.029	37
ODE 871	✓	0.072	151	✓	0.023	32
ODE 872	✓	0.075	51	✓	0.032	47
ODE 873	✓	1.828	357	✓	0.096	61
ODE 874	✓	0.004	21	✓	0.008	17
ODE 875	✓	0.635	243	✓	0.023	106
ODE 876	✓	0.592	223	✓	0.044	96
ODE 877	✓	0.003	20	✓	0.007	15
ODE 878	✓	0.004	21	✓	0.007	16
ODE 879	✓	0.003	28	✓	0.008	21
ODE 880	✓	0.019	52	✓	0.02	40
ODE 881	✓	0.256	57	✓	0.033	37
ODE 882	✓	0.584	201	✓	0.026	34
ODE 883	✓	242.704	286	✓	0.131	2085
ODE 884	✓	2.705	2	✓	0.034	54
ODE 885	✓	0.073	53	✓	0.033	53
ODE 886	✓	0.387	150	✓	0.03	37
ODE 887	✓	2.594	65	✓	0.058	97
ODE 888	✓	0.013	37	✓	0.034	30
ODE 889	✓	0.081	58	✓	0.021	29
ODE 890	✓	1.158	613	✓	0.021	33
ODE 891	✓	20.423	1	✓	0.023	32
ODE 892	✓	0.194	123	✓	0.073	53
ODE 893	✓	0.009	31	✓	0.024	23
ODE 894	✓	0.262	263	✓	0.067	77
ODE 895	✓	0.003	24	✓	0.007	20
ODE 896	✓	0.004	19	✓	0.009	15
ODE 897	✓	0.21	147	✓	0.053	137

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 898	✓	0.005	30	✓	0.012	24
ODE 899	✓	0.041	103	✓	0.077	45
ODE 900	✓	0.005	21	✓	0.01	17
ODE 901	✓	1.748	54	✓	10.321	80
ODE 902	✓	0.033	55	✓	0.244	22
ODE 903	✓	0.032	26	✓	1.386	67
ODE 904	✓	0.499	101	✓	0.045	42
ODE 905	✓	0.274	47	✓	0.044	36
ODE 906	✓	0.108	85	✓	0.06	69
ODE 907	✓	0.498	22	✓	0.231	34
ODE 908	✓	0.889	154	✓	0.173	130
ODE 909	✓	0.005	21	✓	0.01	17
ODE 910	✗	0	0	✓	0.105	69
ODE 911	✓	0.005	19	✓	0.01	15
ODE 912	✓	0.072	59	✓	0.055	83
ODE 913	✓	0.004	21	✓	0.012	17
ODE 914	✗	0	0	✗	0	0
ODE 915	✓	0.131	64	✓	0.08	99
ODE 916	✓	0.132	73	✓	0.08	103
ODE 917	✓	0.007	49	✓	0.01	25
ODE 918	✓	0.082	88	✓	251.375	166
ODE 919	✓	0.35	24	✓	0.292	31
ODE 920	✓	0.018	48	✓	0.032	40
ODE 921	✓	0.02	52	✓	0.037	44
ODE 922	✓	0.023	52	✓	0.035	44
ODE 923	✓	0.009	43	✓	0.035	52
ODE 924	✓	0.416	26	✓	0.449	36
ODE 925	✓	0.008	27	✓	0.015	23
ODE 926	✗	0	0	✓	0.044	69
ODE 927	✗	0	0	✓	1.707	17

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 928	✓	0.008	42	✓	0.058	30
ODE 929	✓	0.143	113	✓	0.103	99
ODE 930	✓	0.688	369	✓	0.119	229
ODE 931	✓	0.006	39	✓	0.025	31
ODE 932	✓	1.398	2799	✓	0.068	161
ODE 933	✓	0.368	123	✓	0.138	66
ODE 934	✓	0.515	1921	✓	0.095	195
ODE 935	✓	0.112	61	✓	0.423	35
ODE 936	✓	0.955	297	✓	0.069	83
ODE 937	✓	1.057	406	✓	0.059	69
ODE 938	✓	0.631	49	✓	0.07	43
ODE 939	✓	0.208	50	✓	0.177	84
ODE 940	✓	0.053	139	✓	0.038	90
ODE 941	✓	0.249	166	✓	0.098	107
ODE 942	✓	0.707	121	✓	0.158	67
ODE 943	✓	0.386	120	✓	0.063	71
ODE 944	✓	0.415	120	✓	0.069	71
ODE 945	✓	0.014	54	✓	0.031	39
ODE 946	✓	0.017	46	✓	0.026	40
ODE 947	✓	0.015	47	✓	0.076	50
ODE 948	✓	0.087	109	✓	0.08	107
ODE 949	✗	0	0	✓	0.049	51
ODE 950	✓	0.467	245	✓	0.057	112
ODE 951	✓	0.316	146	✓	0.795	73
ODE 952	✗	0	0	✓	0.231	65
ODE 953	✓	0.006	47	✓	0.006	20
ODE 954	✓	0.895	201	✓	0.085	243
ODE 955	✓	0.005	52	✓	0.007	24
ODE 956	✓	0.006	49	✓	0.007	21
ODE 957	✓	0.104	101	✓	0.045	87

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 958	✓	0.176	121	✓	0.073	107
ODE 959	✓	0.371	137	✓	0.378	102
ODE 960	✓	0.225	135	✓	0.587	152
ODE 961	✗	0	0	✓	0.239	65
ODE 962	✓	0.091	110	✓	0.052	136
ODE 963	✗	0	0	✓	0.168	477
ODE 964	✓	6.314	305	✓	0.02	37
ODE 965	✓	0.006	53	✓	0.007	23
ODE 966	✓	0.007	49	✓	0.011	22
ODE 967	✓	0.007	47	✓	0.01	20
ODE 968	✓	0.007	45	✓	0.01	24
ODE 969	✗	0	0	✗	0	0
ODE 970	✗	0	0	✗	0	0
ODE 971	✓	0.008	49	✓	1.554	24
ODE 972	✓	0.279	69	✓	26.886	103
ODE 973	✓	0.137	79	✓	0.228	115
ODE 974	✓	0.008	85	✓	0.007	29
ODE 975	✓	0.021	89	✓	0.687	76
ODE 976	✓	0.167	177	✓	14.78	62
ODE 977	✗	0	0	✓	3.643	62
ODE 978	✓	0.345	85	✓	0.821	63
ODE 979	✓	0.008	72	✓	0.007	29
ODE 980	✓	0.006	39	✓	0.025	14
ODE 981	✓	0.461	41	✓	6.	522
ODE 982	✗	0	0	✓	0.536	105
ODE 983	✓	0.57	63	✓	0.41	108
ODE 984	✓	0.955	65	✓	1.638	126
ODE 985	✓	0.053	69	✓	0.449	53
ODE 986	✓	0.264	111	✓	0.497	122
ODE 987	✗	0	0	✗	0	0

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 988	✗	0	0	✓	0.652	160
ODE 989	✓	0.15	79	✓	0.322	74
ODE 990	✓	0.392	317	✓	0.544	137
ODE 991	✓	0.177	93	✓	0.545	78
ODE 992	✓	0.042	64	✓	0.189	29
ODE 993	✓	0.049	97	✓	0.033	48
ODE 994	✓	94.179	53	✓	0.415	137
ODE 995	✓	0.452	57	✓	0.256	106
ODE 996	✓	0.189	203	✓	0.705	197
ODE 997	✓	0.009	81	✓	0.011	29
ODE 998	✓	0.162	3017	✓	0.032	69
ODE 999	✓	0.149	180	✓	1.828	62
ODE 1000	✓	0.073	891	✓	0.043	42
ODE 1001	✓	2.024	763	✓	1.169	181
ODE 1002	✓	1.186	86	✓	0.922	139
ODE 1003	✓	1.546	71	✓	1.334	195
ODE 1004	✓	0.346	132	✓	1.575	161
ODE 1005	✗	0	0	✓	1.357	129
ODE 1006	✓	0.012	73	✓	0.013	34
ODE 1007	✓	0.286	133	✓	0.151	104
ODE 1008	✓	0.013	97	✓	0.015	32
ODE 1009	✓	0.797	146	✓	0.832	339
ODE 1010	✓	0.152	99	✓	1.243	60
ODE 1011	✓	0.043	156	✓	0.022	55
ODE 1012	✗	0	0	✓	24.846	28
ODE 1013	✓	0.135	46	✗	0	0
ODE 1014	✗	0	0	✓	2.323	32
ODE 1015	✓	0.189	987	✓	0.177	79
ODE 1016	✓	0.39	408	✓	0.146	99
ODE 1017	✓	0.494	307	✓	0.162	104

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1018	✗	0	0	✓	2.7	62
ODE 1019	✗	0	0	✗	0	0
ODE 1020	✗	0	0	✗	0	0
ODE 1021	✓	0.045	80	✓	0.063	68
ODE 1022	✓	0.014	95	✓	0.104	81
ODE 1023	✓	1.494	336	✓	0.016	43
ODE 1024	✓	1.804	473	✓	0.537	191
ODE 1025	✓	0.76	236	✓	0.187	133
ODE 1026	✓	0.892	274	✓	0.495	212
ODE 1027	✓	1.516	397	✓	0.567	275
ODE 1028	✓	11.26	1862	✓	0.065	268
ODE 1029	✓	223.943	3323	✓	0.689	245
ODE 1030	✗	0	0	✓	0.176	261
ODE 1031	✓	0.003	29	✓	0.009	23
ODE 1032	✗	0	0	✓	0.021	108
ODE 1033	✗	0	0	✓	0.014	33
ODE 1034	✗	0	0	✓	0.041	31
ODE 1035	✗	0	0	✓	0.053	231
ODE 1036	✗	0	0	✓	0.021	28
ODE 1037	✗	0	0	✓	0.093	45
ODE 1038	✓	185.849	1	✓	0.019	52
ODE 1039	✓	152.507	1	✓	0.024	63
ODE 1040	✗	0	0	✓	0.052	259
ODE 1041	✗	0	0	✓	1.507	38
ODE 1042	✗	0	0	✗	0	0
ODE 1043	✗	0	0	✓	0.88	42
ODE 1044	✗	0	0	✓	284.418	514
ODE 1045	✗	0	0	✓	0.994	42
ODE 1046	✗	0	0	✓	0.103	436
ODE 1047	✗	0	0	✓	0.056	429

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1048	✓	0.002	17	✓	0.039	40
ODE 1049	✗	0	0	✓	0.022	74
ODE 1050	✗	0	0	✓	0.158	831
ODE 1051	✓	53.024	1496	✓	0.021	50
ODE 1052	✗	0	0	✓	0.225	378
ODE 1053	✗	0	0	✓	0.086	370
ODE 1054	✓	0.074	45	✓	0.089	32
ODE 1055	✓	0.009	31	✓	0.008	26
ODE 1056	✓	0.012	43	✓	0.014	36
ODE 1057	✓	0.007	43	✓	0.009	33
ODE 1058	✓	0.011	105	✓	0.01	39
ODE 1059	✗	0	0	✓	0.016	25
ODE 1060	✗	0	0	✓	0.094	412
ODE 1061	✗	0	0	✓	0.361	37
ODE 1062	✓	2.683	828	✓	0.225	166
ODE 1063	✗	0	0	✓	0.021	32
ODE 1064	✗	0	0	✓	0.024	28
ODE 1065	✓	526.186	98	✓	0.282	124
ODE 1066	✓	0.004	31	✓	0.009	23
ODE 1067	✗	0	0	✓	0.656	97
ODE 1068	✗	0	0	✓	0.028	33
ODE 1069	✗	0	0	✓	0.087	63
ODE 1070	✗	0	0	✓	0.032	56
ODE 1071	✗	0	0	✓	0.05	37
ODE 1072	✓	0.031	64	✓	0.032	52
ODE 1073	✗	0	0	✗	0	0
ODE 1074	✗	0	0	✓	0.886	1532
ODE 1075	✗	0	0	✓	0.746	140
ODE 1076	✗	0	0	✓	6.289	400
ODE 1077	✗	0	0	✓	1.006	36

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1078	✗	0	0	✓	0.033	36
ODE 1079	✗	0	0	✓	0.056	517
ODE 1080	✗	0	0	✓	0.094	455
ODE 1081	✓	0.02	61	✓	0.031	54
ODE 1082	✓	0.023	75	✓	0.018	42
ODE 1083	✗	0	0	✓	0.631	42
ODE 1084	✗	0	0	✓	0.597	38
ODE 1085	✗	0	0	✓	0.612	40
ODE 1086	✗	0	0	✓	0.605	40
ODE 1087	✗	0	0	✓	1.536	37
ODE 1088	✗	0	0	✓	1.051	4164
ODE 1089	✗	0	0	✓	0.541	60
ODE 1090	✗	0	0	✓	0.647	176
ODE 1091	✗	0	0	✓	0.366	40
ODE 1092	✓	0.73	383	✓	0.175	144
ODE 1093	✓	0.987	415	✓	0.345	270
ODE 1094	✓	1.273	371	✓	0.443	262
ODE 1095	✓	1.938	535	✓	0.746	366
ODE 1096	✗	0	0	✓	0.019	31
ODE 1097	✗	0	0	✓	0.127	49
ODE 1098	✓	1.735	341	✓	0.311	118
ODE 1099	✗	0	0	✓	4.012	204
ODE 1100	✗	0	0	✓	0.14	50
ODE 1101	✗	0	0	✓	2.01	35
ODE 1102	✓	0.503	211	✓	0.109	40
ODE 1103	✓	317.903	1	✓	2.625	107
ODE 1104	✓	0.454	171	✓	0.174	50
ODE 1105	✓	0.999	569	✓	0.413	250
ODE 1106	✓	1.475	635	✓	0.606	434
ODE 1107	✓	1.548	641	✓	0.666	440

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1108	✓	1.797	1	✓	0.918	434
ODE 1109	✓	2.963	797	✓	2.018	578
ODE 1110	✗	0	0	✗	0	0
ODE 1111	✗	0	0	✓	0.063	25
ODE 1112	✓	0.515	79	✓	0.269	70
ODE 1113	✓	0.128	41	✓	0.058	38
ODE 1114	✓	0.532	164	✓	0.338	50
ODE 1115	✓	0.111	26	✓	0.051	18
ODE 1116	✗	0	0	✗	0	0
ODE 1117	✓	0.294	46	✓	0.046	33
ODE 1118	✓	0.016	14	✓	0.033	34
ODE 1119	✓	0.202	56	✓	0.052	37
ODE 1120	✓	0.069	39	✗	0	0
ODE 1121	✗	0	0	✓	0.063	5
ODE 1122	✓	0.114	44	✓	0.472	63
ODE 1123	✗	0	0	✓	0.08	5
ODE 1124	✓	91.465	93	✓	0.024	15
ODE 1125	✓	47.193	51	✓	0.023	37
ODE 1126	✓	0.037	49	✓	0.035	31
ODE 1127	✓	0.072	120	✓	0.079	117
ODE 1128	✓	0.239	273	✓	0.073	77
ODE 1129	✓	0.021	41	✓	0.04	33
ODE 1130	✓	96.745	407	✓	0.043	53
ODE 1131	✓	5.753	48	✓	0.033	57
ODE 1132	✗	0	0	✓	0.032	21
ODE 1133	✗	0	0	✓	0.209	178
ODE 1134	✓	0.005	22	✓	0.028	17
ODE 1135	✓	0.789	369	✓	0.032	55
ODE 1136	✓	0.306	148	✓	0.262	129
ODE 1137	✓	0.335	46	✓	0.435	45

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1138	✓	0.186	113	✓	0.384	176
ODE 1139	✓	0.004	22	✓	0.028	17
ODE 1140	✗	0	0	✓	0.029	18
ODE 1141	✓	0.01	13	✓	0.022	31
ODE 1142	✗	0	0	✓	0.028	18
ODE 1143	✗	0	0	✓	0.03	16
ODE 1144	✓	0.03	23	✓	0.063	32
ODE 1145	✓	0.048	27	✓	0.066	32
ODE 1146	✓	0.11	40	✓	0.042	56
ODE 1147	✓	0.038	59	✓	0.862	151
ODE 1148	✓	0.019	29	✓	0.084	39
ODE 1149	✗	0	0	✓	0.074	30
ODE 1150	✓	0.112	35	✓	0.03	31
ODE 1151	✓	0.015	22	✓	0.06	16
ODE 1152	✓	0.01	30	✓	0.056	24
ODE 1153	✓	0.041	22	✓	0.019	28
ODE 1154	✓	0.15	57	✓	0.012	88
ODE 1155	✓	0.114	34	✓	0.008	33
ODE 1156	✓	0.04	21	✓	0.034	36
ODE 1157	✓	0.054	22	✓	0.008	25
ODE 1158	✓	0.009	24	✓	0.153	17
ODE 1159	✓	0.002	16	✓	0.038	22
ODE 1160	✓	0.113	20	✓	0.076	23
ODE 1161	✓	0.074	38	✓	2.413	129
ODE 1162	✓	0.067	24	✓	0.082	33
ODE 1163	✓	0.332	15	✓	0.013	11
ODE 1164	✓	0.294	21	✓	0.009	12
ODE 1165	✓	0.017	42	✓	0.295	16
ODE 1166	✓	1.089	27	✓	0.012	28
ODE 1167	✓	0.005	13	✓	0.073	33

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1168	✓	0.233	87	✓	0.099	138
ODE 1169	✓	0.006	17	✓	0.158	63
ODE 1170	✓	1.124	28	✓	0.016	22
ODE 1171	✓	0.877	34	✓	0.033	30
ODE 1172	✓	0.099	42	✓	0.151	47
ODE 1173	✓	0.29	28	✓	0.021	20
ODE 1174	✗	0	0	✗	0	0
ODE 1175	✓	0.025	12	✓	0.003	9
ODE 1176	✓	0.022	23	✓	0.007	18
ODE 1177	✓	0.04	32	✓	0.029	29
ODE 1178	✓	0.007	19	✓	0.008	15
ODE 1179	✓	0.043	33	✓	0.012	28
ODE 1180	✓	0.021	16	✓	0.003	13
ODE 1181	✓	0.002	20	✓	0.009	15
ODE 1182	✓	0.003	19	✓	0.204	16
ODE 1183	✓	0.091	41	✓	0.185	27
ODE 1184	✓	0.034	30	✓	0.092	25
ODE 1185	✓	0.017	22	✓	0.038	24
ODE 1186	✓	0.084	41	✓	0.032	27
ODE 1187	✓	0.486	159	✓	0.121	82
ODE 1188	✓	0.021	27	✓	0.022	21
ODE 1189	✓	0.055	24	✓	0.079	20
ODE 1190	✓	0.084	50	✓	0.09	27
ODE 1191	✓	0.024	25	✓	0.021	19
ODE 1192	✓	0.094	27	✓	0.105	24
ODE 1193	✓	0.112	37	✓	0.074	28
ODE 1194	✓	0.039	36	✓	0.026	24
ODE 1195	✓	0.003	31	✓	0.004	22
ODE 1196	✓	0.088	36	✓	0.014	26
ODE 1197	✓	0.003	20	✓	0.004	17

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1198	✓	0.108	41	✓	0.083	37
ODE 1199	✓	0.024	28	✓	0.063	36
ODE 1200	✓	0.015	28	✓	0.02	36
ODE 1201	✓	0.148	31	✓	0.015	27
ODE 1202	✓	0.004	38	✓	0.019	29
ODE 1203	✓	0.004	36	✓	0.021	38
ODE 1204	✓	0.174	55	✓	0.063	33
ODE 1205	✓	0.036	46	✓	0.182	41
ODE 1206	✓	0.109	55	✓	0.044	33
ODE 1207	✓	0.018	28	✓	0.043	17
ODE 1208	✓	0.008	42	✓	0.115	31
ODE 1209	✓	0.007	46	✓	0.307	37
ODE 1210	✓	0.005	47	✓	0.125	29
ODE 1211	✓	0.005	47	✓	0.128	29
ODE 1212	✓	0.014	62	✓	0.143	45
ODE 1213	✓	0.026	110	✓	0.108	109
ODE 1214	✗	0	0	✓	0.294	109
ODE 1215	✓	0.07	112	✓	0.141	59
ODE 1216	✗	0	0	✗	0	0
ODE 1217	✓	0.026	28	✓	0.396	21
ODE 1218	✗	0	0	✓	0.446	82
ODE 1219	✗	0	0	✓	2.187	45
ODE 1220	✓	0.085	54	✓	0.248	50
ODE 1221	✓	0.081	61	✓	0.345	132
ODE 1222	✗	0	0	✓	0.37	80
ODE 1223	✓	0.89	146	✓	0.348	94
ODE 1224	✓	0.033	40	✓	0.302	29
ODE 1225	✓	0.154	54	✓	0.15	30
ODE 1226	✓	0.028	60	✓	0.074	35
ODE 1227	✓	0.028	46	✓	0.061	17

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1228	✓	0.657	136	✓	0.375	58
ODE 1229	✓	0.032	55	✓	0.129	39
ODE 1230	✓	0.033	53	✓	0.339	39
ODE 1231	✓	0.031	53	✓	0.599	39
ODE 1232	✓	0.015	40	✓	0.264	29
ODE 1233	✓	0.017	61	✓	1.219	47
ODE 1234	✓	0.016	50	✓	0.056	26
ODE 1235	✓	0.006	18	✓	0.007	14
ODE 1236	✓	0.005	26	✓	0.011	20
ODE 1237	✓	0.007	25	✓	0.012	19
ODE 1238	✓	0.01	36	✓	0.023	29
ODE 1239	✓	0.013	20	✓	0.013	16
ODE 1240	✓	0.032	41	✓	0.035	35
ODE 1241	✓	0.01	32	✓	0.02	28
ODE 1242	✓	0.031	41	✓	0.084	31
ODE 1243	✓	0.005	34	✓	0.005	26
ODE 1244	✓	0.016	22	✓	0.013	18
ODE 1245	✓	0.004	26	✓	0.005	22
ODE 1246	✓	0.029	37	✓	0.091	34
ODE 1247	✓	0.016	58	✓	0.08	99
ODE 1248	✓	0.241	250	✓	0.105	181
ODE 1249	✓	0.004	20	✓	0.009	17
ODE 1250	✓	0.024	54	✓	0.085	81
ODE 1251	✓	0.018	40	✓	0.051	30
ODE 1252	✓	0.018	43	✓	0.019	30
ODE 1253	✓	0.015	75	✓	0.024	59
ODE 1254	✓	0.005	22	✓	0.009	17
ODE 1255	✓	0.012	38	✓	0.028	29
ODE 1256	✓	0.004	18	✓	0.007	14
ODE 1257	✓	0.017	35	✓	0.026	28

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1258	✓	0.004	22	✓	0.005	18
ODE 1259	✓	0.016	38	✓	0.021	29
ODE 1260	✓	0.004	26	✓	0.003	22
ODE 1261	✓	0.004	20	✓	0.009	17
ODE 1262	✓	0.011	33	✓	0.02	29
ODE 1263	✓	0.021	54	✓	0.016	32
ODE 1264	✓	0.005	18	✓	0.007	14
ODE 1265	✓	0.038	33	✓	0.02	16
ODE 1266	✓	0.005	20	✓	0.008	17
ODE 1267	✓	0.005	30	✓	0.011	21
ODE 1268	✓	0.005	18	✓	0.007	14
ODE 1269	✓	0.037	35	✓	0.023	28
ODE 1270	✓	0.005	20	✓	0.009	17
ODE 1271	✓	0.02	40	✓	0.022	33
ODE 1272	✓	0.005	50	✓	0.014	44
ODE 1273	✓	0.374	103	✓	0.082	98
ODE 1274	✓	0.03	33	✓	0.017	28
ODE 1275	✓	0.007	62	✓	0.023	44
ODE 1276	✓	0.005	47	✓	0.011	41
ODE 1277	✓	0.756	150	✓	0.197	124
ODE 1278	✓	0.008	67	✓	0.053	49
ODE 1279	✓	0.026	117	✓	0.227	88
ODE 1280	✓	0.06	99	✓	0.068	53
ODE 1281	✓	0.035	78	✓	0.133	39
ODE 1282	✓	0.037	83	✓	0.089	53
ODE 1283	✓	0.019	41	✓	0.028	25
ODE 1284	✓	0.03	45	✓	0.078	33
ODE 1285	✓	0.043	55	✓	0.571	42
ODE 1286	✓	0.008	37	✓	0.085	35
ODE 1287	✓	0.007	39	✓	0.087	35

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1288	✓	0.02	39	✓	0.006	21
ODE 1289	✓	0.012	85	✓	0.243	27
ODE 1290	✓	0.006	36	✓	0.182	44
ODE 1291	✓	0.007	27	✓	0.106	31
ODE 1292	✓	0.014	24	✓	0.05	22
ODE 1293	✓	0.013	20	✓	0.12	16
ODE 1294	✓	0.016	29	✓	0.046	21
ODE 1295	✓	0.03	34	✓	0.017	27
ODE 1296	✓	0.041	63	✓	0.052	39
ODE 1297	✓	0.02	67	✓	0.096	58
ODE 1298	✓	0.028	81	✓	0.044	49
ODE 1299	✓	0.052	132	✓	0.074	98
ODE 1300	✓	0.142	303	✓	0.319	258
ODE 1301	✓	0.016	20	✓	0.077	16
ODE 1302	✓	0.055	51	✓	0.201	47
ODE 1303	✓	0.07	52	✓	0.038	49
ODE 1304	✓	1.423	87	✓	0.23	31
ODE 1305	✓	0.053	49	✓	0.107	56
ODE 1306	✗	0	0	✓	0.39	151
ODE 1307	✓	0.084	74	✓	0.054	216
ODE 1308	✓	0.048	90	✓	0.248	133
ODE 1309	✓	0.047	120	✓	0.211	105
ODE 1310	✓	0.115	45	✓	0.244	30
ODE 1311	✓	0.133	20	✓	0.26	45
ODE 1312	✓	0.058	51	✓	0.033	25
ODE 1313	✓	0.559	22	✓	0.236	19
ODE 1314	✗	0	0	✓	0.395	67
ODE 1315	✓	0.112	42	✓	0.051	22
ODE 1316	✓	0.1	56	✓	0.441	76
ODE 1317	✗	0	0	✓	0.383	77

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1318	✓	67.5	1	✓	0.632	398
ODE 1319	✓	0.239	64	✓	0.428	32
ODE 1320	✓	0.791	42	✓	0.276	35
ODE 1321	✗	0	0	✓	0.271	91
ODE 1322	✓	0.11	58	✓	0.089	24
ODE 1323	✓	0.088	43	✓	22.558	31
ODE 1324	✓	0.195	77	✓	1.181	274
ODE 1325	✓	0.826	146	✓	0.579	98
ODE 1326	✓	0.152	71	✓	0.829	74
ODE 1327	✓	0.273	30	✓	0.868	26
ODE 1328	✓	0.145	45	✓	11.259	59
ODE 1329	✓	25.372	55	✓	0.077	35
ODE 1330	✓	0.901	48	✓	0.232	45
ODE 1331	✓	0.04	30	✓	0.119	23
ODE 1332	✓	0.305	56	✓	0.171	37
ODE 1333	✗	0	0	✓	0.218	61
ODE 1334	✗	0	0	✓	0.327	32
ODE 1335	✓	0.145	36	✓	0.134	28
ODE 1336	✓	0.244	60	✓	0.649	114
ODE 1337	✓	0.104	33	✓	0.129	25
ODE 1338	✓	0.091	54	✓	0.065	34
ODE 1339	✓	0.076	48	✓	0.06	22
ODE 1340	✓	0.183	62	✓	0.253	148
ODE 1341	✓	0.306	129	✓	0.185	60
ODE 1342	✓	0.014	20	✓	0.076	25
ODE 1343	✗	0	0	✓	0.71	71
ODE 1344	✗	0	0	✓	1.084	71
ODE 1345	✓	0.072	54	✓	0.087	34
ODE 1346	✓	0.472	75	✓	0.202	54
ODE 1347	✓	0.552	31	✓	0.018	17

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1348	✓	0.035	120	✓	0.635	85
ODE 1349	✓	0.006	24	✓	0.008	17
ODE 1350	✓	0.02	36	✓	0.148	33
ODE 1351	✓	0.009	26	✓	0.126	37
ODE 1352	✓	0.006	22	✓	0.008	17
ODE 1353	✓	0.04	39	✓	0.01	27
ODE 1354	✓	0.123	53	✓	0.161	29
ODE 1355	✓	0.005	13	✓	0.007	10
ODE 1356	✓	0.195	24	✓	0.126	37
ODE 1357	✓	0.148	31	✓	0.009	23
ODE 1358	✓	0.084	19	✓	0.07	16
ODE 1359	✓	0.045	20	✓	0.007	17
ODE 1360	✓	0.01	33	✓	0.008	23
ODE 1361	✓	1.125	46	✓	0.076	25
ODE 1362	✓	0.011	15	✓	0.009	11
ODE 1363	✓	0.005	15	✓	0.009	11
ODE 1364	✓	0.03	37	✓	0.078	23
ODE 1365	✓	0.029	51	✓	0.048	29
ODE 1366	✓	0.011	36	✓	0.072	33
ODE 1367	✓	0.018	25	✓	0.009	15
ODE 1368	✓	0.062	50	✓	0.013	29
ODE 1369	✓	0.03	50	✓	0.012	29
ODE 1370	✓	0.032	58	✓	0.013	29
ODE 1371	✓	0.045	69	✓	0.014	39
ODE 1372	✓	0.053	77	✓	0.014	41
ODE 1373	✓	0.023	54	✓	0.043	39
ODE 1374	✓	0.082	85	✓	0.184	66
ODE 1375	✗	0	0	✗	0	0
ODE 1376	✓	0.055	165	✓	0.103	71
ODE 1377	✓	0.66	19	✓	0.027	13

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1378	✓	0.087	21	✓	0.093	21
ODE 1379	✓	0.041	24	✓	0.095	25
ODE 1380	✓	0.102	30	✓	0.045	22
ODE 1381	✓	0.057	72	✓	0.047	19
ODE 1382	✓	0.039	26	✓	0.031	22
ODE 1383	✓	0.017	29	✓	0.043	24
ODE 1384	✓	0.029	36	✓	0.079	30
ODE 1385	✓	0.023	24	✓	0.097	17
ODE 1386	✓	0.013	17	✓	0.045	13
ODE 1387	✓	0.013	23	✓	0.037	14
ODE 1388	✓	0.06	25	✓	0.016	16
ODE 1389	✓	0.036	48	✓	0.096	47
ODE 1390	✓	0.022	134	✓	0.253	109
ODE 1391	✓	0.025	117	✓	0.198	106
ODE 1392	✓	0.091	46	✓	0.124	39
ODE 1393	✓	0.008	21	✓	0.01	14
ODE 1394	✓	0.026	68	✓	0.055	46
ODE 1395	✓	0.012	29	✓	0.035	18
ODE 1396	✓	0.017	26	✓	0.031	21
ODE 1397	✓	0.03	38	✓	0.027	30
ODE 1398	✓	0.015	21	✓	0.056	17
ODE 1399	✓	0.019	30	✓	0.052	19
ODE 1400	✗	0	0	✓	0.28	32
ODE 1401	✓	0.017	17	✓	0.03	12
ODE 1402	✓	0.023	22	✓	0.017	16
ODE 1403	✓	0.028	42	✓	0.039	30
ODE 1404	✓	0.008	18	✓	0.01	15
ODE 1405	✓	0.039	239	✓	0.164	171
ODE 1406	✓	0.006	17	✓	0.01	11
ODE 1407	✓	0.01	46	✓	0.014	31

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1408	✓	0.01	49	✓	0.013	31
ODE 1409	✓	0.022	115	✓	0.21	84
ODE 1410	✓	0.027	55	✓	0.217	29
ODE 1411	✓	0.009	50	✓	0.14	37
ODE 1412	✓	0.045	78	✓	0.119	37
ODE 1413	✓	0.007	42	✓	0.003	28
ODE 1414	✓	0.006	38	✓	0.004	27
ODE 1415	✗	0	0	✗	0	0
ODE 1416	✓	0.015	96	✓	0.18	69
ODE 1417	✓	0.017	32	✓	0.01	25
ODE 1418	✓	0.127	307	✓	0.216	248
ODE 1419	✗	0	0	✓	2.069	92
ODE 1420	✓	0.009	26	✓	0.013	23
ODE 1421	✓	0.016	18	✓	0.009	15
ODE 1422	✓	0.018	18	✓	0.009	15
ODE 1423	✓	0.016	18	✓	0.009	15
ODE 1424	✓	0.01	42	✓	0.014	35
ODE 1425	✓	0.053	95	✓	0.016	45
ODE 1426	✓	0.008	42	✓	0.087	27
ODE 1427	✓	0.062	53	✓	0.051	30
ODE 1428	✓	0.017	67	✓	0.052	32
ODE 1429	✓	0.014	79	✓	0.244	53
ODE 1430	✓	0.029	42	✓	0.038	39
ODE 1431	✓	0.031	36	✓	0.05	27
ODE 1432	✓	0.018	88	✓	0.151	57
ODE 1433	✓	0.04	116	✓	0.047	67
ODE 1434	✓	0.062	147	✓	0.203	73
ODE 1435	✓	12.146	37	✓	0.334	178
ODE 1436	✓	0.009	18	✓	0.006	15
ODE 1437	✓	0.008	32	✓	0.011	15

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1438	✓	0.008	15	✓	0.006	12
ODE 1439	✓	0.014	41	✓	0.019	19
ODE 1440	✓	0.012	27	✓	0.016	22
ODE 1441	✓	0.01	23	✓	0.014	21
ODE 1442	✓	0.021	20	✓	0.023	17
ODE 1443	✓	0.012	20	✓	0.005	17
ODE 1444	✓	0.021	22	✓	0.014	19
ODE 1445	✓	0.026	18	✓	0.01	15
ODE 1446	✓	0.012	25	✓	0.009	17
ODE 1447	✓	0.05	80	✓	0.014	41
ODE 1448	✓	0.013	18	✓	0.029	15
ODE 1449	✓	0.009	26	✓	0.028	15
ODE 1450	✓	0.01	32	✓	0.082	29
ODE 1451	✓	0.01	22	✓	0.036	19
ODE 1452	✓	0.014	104	✓	0.195	45
ODE 1453	✓	0.131	93	✓	0.092	41
ODE 1454	✓	0.12	96	✓	0.114	47
ODE 1455	✓	0.027	63	✓	0.036	49
ODE 1456	✓	0.033	33	✓	0.015	19
ODE 1457	✓	0.011	14	✓	0.01	11
ODE 1458	✓	0.012	19	✓	0.019	18
ODE 1459	✓	0.017	18	✓	0.046	15
ODE 1460	✓	0.015	25	✓	0.022	22
ODE 1461	✓	0.015	32	✓	0.022	25
ODE 1462	✓	0.017	18	✓	0.009	15
ODE 1463	✓	0.019	26	✓	0.017	19
ODE 1464	✓	0.014	53	✓	0.035	19
ODE 1465	✓	0.021	22	✓	0.062	27
ODE 1466	✓	0.01	58	✓	0.06	43
ODE 1467	✓	0.048	145	✓	0.041	47

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1468	✓	0.007	17	✓	0.006	14
ODE 1469	✓	0.01	26	✓	0.014	20
ODE 1470	✓	0.014	33	✓	0.016	32
ODE 1471	✓	0.007	18	✓	0.007	14
ODE 1472	✓	0.011	20	✓	0.016	20
ODE 1473	✓	0.014	18	✓	0.009	15
ODE 1474	✓	0.02	27	✓	0.016	22
ODE 1475	✓	0.012	16	✓	0.01	13
ODE 1476	✓	0.015	19	✓	0.014	15
ODE 1477	✓	0.016	41	✓	0.016	37
ODE 1478	✓	0.013	16	✓	0.01	13
ODE 1479	✓	0.014	30	✓	0.031	25
ODE 1480	✓	0.01	28	✓	0.036	17
ODE 1481	✓	0.009	44	✓	0.059	29
ODE 1482	✓	0.011	26	✓	0.005	23
ODE 1483	✓	0.008	18	✓	0.009	14
ODE 1484	✓	0.02	57	✓	0.041	21
ODE 1485	✓	0.011	57	✓	0.014	53
ODE 1486	✓	0.072	131	✓	0.023	61
ODE 1487	✓	0.02	78	✓	0.042	59
ODE 1488	✓	0.056	169	✓	0.204	75
ODE 1489	✓	0.08	156	✓	0.039	65
ODE 1490	✓	0.092	136	✓	0.185	86
ODE 1491	✓	0.094	561	✓	0.036	75
ODE 1492	✓	0.073	243	✓	0.184	114
ODE 1493	✓	0.022	105	✓	0.01	17
ODE 1494	✓	0.271	302	✓	0.023	20
ODE 1495	✓	0.039	57	✓	0.016	21
ODE 1496	✓	0.063	123	✓	0.02	59
ODE 1497	✓	0.036	26	✓	0.036	21

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1498	✓	0.03	85	✓	0.068	57
ODE 1499	✓	8.95	34	✓	0.176	51
ODE 1500	✓	0.024	34	✓	0.06	31
ODE 1501	✓	0.011	16	✓	0.045	12
ODE 1502	✓	0.016	22	✓	0.021	15
ODE 1503	✓	0.021	41	✓	0.048	37
ODE 1504	✓	0.025	63	✓	0.144	93
ODE 1505	✓	0.013	21	✓	0.033	14
ODE 1506	✓	0.021	80	✓	0.02	28
ODE 1507	✓	0.09	41	✓	0.043	33
ODE 1508	✓	0.074	223	✓	0.266	110
ODE 1509	✓	0.034	49	✓	0.049	35
ODE 1510	✓	0.013	26	✓	0.098	18
ODE 1511	✓	0.027	60	✓	0.081	36
ODE 1512	✓	0.125	414	✓	0.222	148
ODE 1513	✗	0	0	✗	0	0
ODE 1514	✓	0.067	50	✓	0.032	39
ODE 1515	✓	0.134	29	✓	0.04	24
ODE 1516	✓	0.064	50	✓	0.017	39
ODE 1517	✓	0.158	29	✓	0.023	24
ODE 1518	✗	0	0	✗	0	0
ODE 1519	✓	0.023	30	✓	0.013	29
ODE 1520	✓	0.048	38	✓	0.029	28
ODE 1521	✓	0.023	43	✓	0.037	61
ODE 1522	✓	0.03	29	✓	0.038	23
ODE 1523	✓	0.031	39	✓	0.026	31
ODE 1524	✓	0.064	63	✓	0.01	20
ODE 1525	✓	0.024	38	✓	0.012	37
ODE 1526	✓	0.108	173	✓	0.053	49
ODE 1527	✓	0.056	75	✓	0.011	28

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1528	✓	0.019	25	✓	0.016	39
ODE 1529	✓	0.013	25	✓	0.008	39
ODE 1530	✓	0.029	45	✓	0.019	19
ODE 1531	✓	0.018	22	✓	0.014	19
ODE 1532	✓	0.028	45	✓	0.015	19
ODE 1533	✓	0.018	42	✓	0.178	31
ODE 1534	✗	0	0	✗	0	0
ODE 1535	✓	0.011	27	✓	0.009	20
ODE 1536	✓	0.079	36	✓	0.024	26
ODE 1537	✓	0.059	48	✓	0.026	14
ODE 1538	✓	0.447	21	✓	0.016	16
ODE 1539	✓	0.181	109	✓	0.03	20
ODE 1540	✓	0.022	18	✓	0.046	15
ODE 1541	✗	0	0	✓	0.168	119
ODE 1542	✓	0.016	26	✓	0.053	21
ODE 1543	✓	0.012	18	✓	0.049	15
ODE 1544	✓	0.022	42	✓	0.108	68
ODE 1545	✓	0.015	58	✓	0.105	53
ODE 1546	✓	0.046	33	✓	0.021	31
ODE 1547	✓	0.052	33	✓	0.02	21
ODE 1548	✓	0.027	41	✓	0.04	21
ODE 1549	✓	0.041	44	✓	0.012	26
ODE 1550	✓	0.248	69	✓	0.081	61
ODE 1551	✓	0.038	54	✓	0.089	39
ODE 1552	✓	0.145	69	✓	0.056	31
ODE 1553	✓	0.029	32	✓	0.057	27
ODE 1554	✓	0.201	87	✓	0.028	27
ODE 1555	✓	0.024	68	✓	0.156	36
ODE 1556	✓	0.025	86	✓	0.12	69
ODE 1557	✗	0	0	✓	0.254	134

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1558	✓	0.157	184	✓	0.087	134
ODE 1559	✓	0.031	74	✓	0.234	63
ODE 1560	✓	0.047	38	✓	0.03	41
ODE 1561	✓	0.146	73	✓	0.117	85
ODE 1562	✓	0.017	24	✓	0.02	17
ODE 1563	✓	0.053	90	✓	0.042	54
ODE 1564	✓	0.048	62	✓	0.044	62
ODE 1565	✓	0.031	30	✓	0.021	25
ODE 1566	✓	0.027	31	✓	0.021	23
ODE 1567	✓	0.035	51	✓	0.032	45
ODE 1568	✓	0.19	87	✓	0.025	42
ODE 1569	✓	0.034	23	✓	0.047	20
ODE 1570	✓	0.016	24	✓	0.01	17
ODE 1571	✓	0.04	38	✓	0.021	35
ODE 1572	✓	0.019	26	✓	0.019	22
ODE 1573	✓	0.012	56	✓	0.049	51
ODE 1574	✓	0.042	26	✓	0.125	51
ODE 1575	✓	0.081	53	✓	0.111	79
ODE 1576	✓	0.06	38	✓	0.013	20
ODE 1577	✓	0.062	28	✓	0.007	16
ODE 1578	✓	0.023	24	✓	0.008	20
ODE 1579	✓	0.032	52	✓	0.031	41
ODE 1580	✓	0.03	31	✓	0.016	22
ODE 1581	✓	0.027	41	✓	0.063	45
ODE 1582	✓	0.156	57	✓	0.063	51
ODE 1583	✓	0.154	131	✓	0.069	124
ODE 1584	✓	0.149	50	✓	0.059	44
ODE 1585	✓	0.143	67	✓	0.021	18
ODE 1586	✓	0.026	67	✓	0.011	18
ODE 1587	✓	0.139	142	✓	0.067	116

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1588	✗	0	0	✗	0	0
ODE 1589	✓	0.086	60	✓	0.085	42
ODE 1590	✓	0.013	37	✓	0.052	32
ODE 1591	✓	0.035	18	✓	0.034	14
ODE 1592	✓	0.023	20	✓	0.01	17
ODE 1593	✓	0.039	24	✓	0.025	19
ODE 1594	✓	0.654	20	✓	0.01	17
ODE 1595	✓	0.187	31	✓	0.02	27
ODE 1596	✓	32.612	45	✓	0.331	53
ODE 1597	✓	0.041	23	✓	0.03	19
ODE 1598	✓	0.057	23	✓	0.044	19
ODE 1599	✓	0.023	26	✓	0.006	23
ODE 1600	✓	0.041	22	✓	0.01	19
ODE 1601	✓	0.267	160	✓	0.15	249
ODE 1602	✓	0.476	179	✓	0.127	132
ODE 1603	✓	0.025	25	✓	0.018	18
ODE 1604	✓	0.024	20	✓	0.01	15
ODE 1605	✓	0.041	46	✓	0.108	33
ODE 1606	✓	0.059	76	✓	0.13	51
ODE 1607	✓	0.171	88	✓	0.085	61
ODE 1608	✓	0.029	55	✓	0.214	39
ODE 1609	✓	0.018	66	✓	0.066	49
ODE 1610	✓	0.912	37	✓	0.022	26
ODE 1611	✓	0.031	21	✓	0.019	14
ODE 1612	✓	0.052	54	✓	0.063	39
ODE 1613	✓	0.029	46	✓	0.039	69
ODE 1614	✓	0.08	49	✓	0.031	31
ODE 1615	✓	0.064	75	✓	0.118	66
ODE 1616	✗	0	0	✓	0.146	35
ODE 1617	✓	0.122	114	✓	0.106	86

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Table 2 – continued from previous page

	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1618	✓	0.041	39	✓	0.048	37
ODE 1619	✓	0.038	31	✓	0.02	33
ODE 1620	✓	0.041	22	✓	0.011	16
ODE 1621	✓	0.034	33	✓	0.029	27
ODE 1622	✓	0.012	24	✓	0.007	14
ODE 1623	✓	0.015	29	✓	0.022	22
ODE 1624	✓	0.016	20	✓	0.079	17
ODE 1625	✓	0.012	28	✓	0.032	23
ODE 1626	✓	0.12	38	✓	0.012	19
ODE 1627	✓	0.054	39	✓	0.068	24
ODE 1628	✓	0.341	26	✓	0.031	19
ODE 1629	✓	0.049	57	✓	0.117	23
ODE 1630	✓	0.015	20	✓	0.011	15
ODE 1631	✓	0.016	25	✓	0.069	16
ODE 1632	✓	0.019	21	✓	0.05	15
ODE 1633	✓	0.027	26	✓	0.008	18
ODE 1634	✓	0.022	28	✓	0.071	20
ODE 1635	✓	0.058	70	✓	0.069	42
ODE 1636	✓	0.012	31	✓	0.041	15
ODE 1637	✓	0.017	34	✓	0.101	25
ODE 1638	✓	0.072	57	✓	0.117	39
ODE 1639	✓	0.177	84	✓	0.031	27
ODE 1640	✓	0.062	78	✓	0.078	54
ODE 1641	✗	0	0	✓	0.142	35
ODE 1642	✗	0	0	✓	0.307	58
ODE 1643	✗	0	0	✗	0	0
ODE 1644	✓	0.127	130	✓	0.081	65
ODE 1645	✗	0	0	✓	0.198	66
ODE 1646	✓	0.041	26	✓	0.012	24
ODE 1647	✓	0.035	41	✓	0.023	41

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1648	✓	0.026	39	✓	0.01	24
ODE 1649	✓	0.035	43	✓	0.025	21
ODE 1650	✓	0.086	51	✓	0.088	33
ODE 1651	✓	0.033	44	✓	0.015	59
ODE 1652	✓	0.077	135	✓	0.123	124
ODE 1653	✓	0.018	19	✓	0.02	27
ODE 1654	✓	0.033	39	✓	0.054	31
ODE 1655	✓	0.035	30	✓	0.022	19
ODE 1656	✗	0	0	✓	0.245	507
ODE 1657	✓	0.033	95	✓	0.024	77
ODE 1658	✓	0.012	25	✓	0.013	20
ODE 1659	✓	0.022	18	✓	0.008	14
ODE 1660	✓	0.014	32	✓	0.033	26
ODE 1661	✓	0.262	47	✓	0.099	44
ODE 1662	✓	0.095	190	✓	0.219	96
ODE 1663	✗	0	0	✓	0.322	93
ODE 1664	✓	0.013	17	✓	0.008	14
ODE 1665	✓	0.013	27	✓	0.015	20
ODE 1666	✓	0.066	133	✓	0.026	65
ODE 1667	✓	0.103	283	✓	0.255	120
ODE 1668	✓	0.102	62	✓	0.163	57
ODE 1669	✓	0.111	261	✓	0.243	132
ODE 1670	✓	0.115	81	✓	0.018	66
ODE 1671	✓	0.015	23	✓	0.011	15
ODE 1672	✓	0.021	30	✓	0.041	23
ODE 1673	✓	0.028	47	✓	0.021	45
ODE 1674	✓	0.041	42	✓	0.026	33
ODE 1675	✓	0.036	32	✓	0.016	29
ODE 1676	✓	0.021	26	✓	0.021	19
ODE 1677	✓	0.041	48	✓	0.019	46

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1678	✓	0.314	145	✓	0.136	143
ODE 1679	✓	0.439	53	✓	0.21	39
ODE 1680	✓	0.259	106	✓	0.329	50
ODE 1681	✓	0.222	130	✓	0.126	73
ODE 1682	✓	0.244	158	✓	0.14	143
ODE 1683	✓	0.206	100	✓	0.123	31
ODE 1684	✓	0.066	21	✓	0.047	17
ODE 1685	✓	0.487	177	✓	0.192	184
ODE 1686	✓	0.028	25	✓	0.011	19
ODE 1687	✓	0.022	21	✓	0.021	17
ODE 1688	✓	0.026	17	✓	0.019	15
ODE 1689	✓	0.513	29	✓	0.02	17
ODE 1690	✓	0.027	24	✓	0.025	18
ODE 1691	✓	0.025	22	✓	0.021	18
ODE 1692	✓	0.523	317	✓	0.159	241
ODE 1693	✓	0.578	391	✓	0.251	347
ODE 1694	✓	0.022	33	✓	0.021	27
ODE 1695	✗	0	0	✓	0.361	83
ODE 1696	✓	0.026	32	✓	0.02	21
ODE 1697	✗	0	0	✓	0.778	393
ODE 1698	✗	0	0	✓	1.22	1123
ODE 1699	✓	0.969	19	✓	0.022	14
ODE 1700	✓	0.062	46	✓	0.033	35
ODE 1701	✓	0.044	41	✓	0.025	19
ODE 1702	✓	0.038	20	✓	0.021	17
ODE 1703	✓	0.025	21	✓	0.02	17
ODE 1704	✓	0.036	23	✓	0.032	20
ODE 1705	✗	0	0	✓	0.184	46
ODE 1706	✗	0	0	✗	0	0
ODE 1707	✓	0.067	57	✓	0.033	23

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1708	✓	0.042	47	✓	0.074	30
ODE 1709	✓	0.036	35	✓	0.061	27
ODE 1710	✓	0.57	100	✓	0.074	23
ODE 1711	✓	0.04	45	✓	0.069	25
ODE 1712	✓	0.021	20	✓	0.045	16
ODE 1713	✓	0.168	31	✓	0.016	19
ODE 1714	✓	0.027	24	✓	0.021	20
ODE 1715	✗	0	0	✓	0.319	81
ODE 1716	✓	0.139	73	✓	0.115	85
ODE 1717	✓	0.027	22	✓	0.059	16
ODE 1718	✓	0.012	25	✓	0.01	21
ODE 1719	✓	0.029	44	✓	0.112	24
ODE 1720	✓	0.016	51	✓	0.06	43
ODE 1721	✓	0.304	57	✓	0.151	30
ODE 1722	✓	0.089	65	✓	0.109	61
ODE 1723	✓	0.059	45	✓	0.041	20
ODE 1724	✓	0.218	227	✓	0.166	153
ODE 1725	✓	0.026	22	✓	0.009	17
ODE 1726	✓	0.017	22	✓	0.009	19
ODE 1727	✗	0	0	✓	0.325	54
ODE 1728	✓	0.037	20	✓	0.062	17
ODE 1729	✓	0.029	20	✓	0.056	17
ODE 1730	✓	0.024	48	✓	0.058	37
ODE 1731	✗	0	0	✓	0.265	83
ODE 1732	✗	0	0	✗	0	0
ODE 1733	✗	0	0	✓	0.344	101
ODE 1734	✓	57.26	1	✓	0.165	404
ODE 1735	✗	0	0	✓	0.494	253
ODE 1736	✗	0	0	✗	0	0
ODE 1737	✗	0	0	✓	0.306	144

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1738	✗	0	0	✗	0	0
ODE 1739	✗	0	0	✗	0	0
ODE 1740	✓	0.036	33	✓	0.027	28
ODE 1741	✓	9.73	1	✓	0.119	225
ODE 1742	✓	0.032	39	✓	0.012	29
ODE 1743	✓	170.067	1	✓	0.252	374
ODE 1744	✗	0	0	✗	0	0
ODE 1745	✓	0.32	121	✓	0.087	67
ODE 1746	✓	0.715	151	✓	0.132	108
ODE 1747	✓	0.1	156	✓	0.186	143
ODE 1748	✓	0.029	31	✓	0.009	25
ODE 1749	✓	0.063	35	✓	0.023	36
ODE 1750	✓	0.054	43	✓	0.029	41
ODE 1751	✓	0.03	36	✓	0.062	27
ODE 1752	✓	0.029	28	✓	0.054	21
ODE 1753	✗	0	0	✓	0.347	93
ODE 1754	✓	0.171	76	✓	0.08	39
ODE 1755	✓	1.461	199	✓	0.148	178
ODE 1756	✓	0.031	38	✓	0.085	27
ODE 1757	✓	0.03	22	✓	0.042	16
ODE 1758	✗	0	0	✗	0	0
ODE 1759	✓	0.059	56	✓	0.047	35
ODE 1760	✓	0.018	29	✓	0.008	21
ODE 1761	✓	0.014	52	✓	0.063	41
ODE 1762	✗	0	0	✓	21.024	10487
ODE 1763	✓	0.027	25	✓	0.049	19
ODE 1764	✓	0.029	23	✓	0.048	17
ODE 1765	✓	0.023	55	✓	0.012	43
ODE 1766	✓	0.033	29	✓	0.025	30
ODE 1767	✓	0.016	18	✓	0.031	14

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1768	✓	0.151	540	✓	0.392	391
ODE 1769	✗	0	0	✓	0.863	217
ODE 1770	✓	1.513	123	✓	0.294	92
ODE 1771	✓	0.017	12	✓	0.003	9
ODE 1772	✓	0.008	31	✓	0.011	22
ODE 1773	✓	0.033	14	✓	0.1	10
ODE 1774	✗	0	0	✗	0	0
ODE 1775	✗	0	0	✗	0	0
ODE 1776	✓	0.339	95	✓	0.027	17
ODE 1777	✓	1.445	570	✓	0.12	63
ODE 1778	✗	0	0	✗	0	0
ODE 1779	✗	0	0	✗	0	0
ODE 1780	✗	0	0	✗	0	0
ODE 1781	✗	0	0	✗	0	0
ODE 1782	✓	1.626	869	✓	0.087	89
ODE 1783	✗	0	0	✓	3.106	151
ODE 1784	✓	0.072	79	✓	0.107	49
ODE 1785	✓	0.079	35	✓	0.097	55
ODE 1786	✓	0.905	38	✓	0.083	51
ODE 1787	✗	0	0	✗	0	0
ODE 1788	✓	0.102	34	✓	0.07	24
ODE 1789	✗	0	0	✓	0.105	253
ODE 1790	✗	0	0	✓	1.344	1088
ODE 1791	✗	0	0	✗	0	0
ODE 1792	✗	0	0	✓	0.293	358
ODE 1793	✗	0	0	✓	0.783	442
ODE 1794	✗	0	0	✗	0	0
ODE 1795	✗	0	0	✗	0	0
ODE 1796	✗	0	0	✓	0.227	47
ODE 1797	✗	0	0	✓	0.631	72
ODE 1798	✗	0	0	✗	0	0

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1799	✗	0	0	✗	0	0
ODE 1800	✓	10.979	2742	✓	0.646	849
ODE 1801	✗	0	0	✗	0	0
ODE 1802	✗	0	0	✓	0.07	40
ODE 1803	✓	0.276	102	✓	0.189	58
ODE 1804	✗	0	0	✓	1.026	60
ODE 1805	✗	0	0	✗	0	0
ODE 1806	✓	0.015	24	✓	0.069	27
ODE 1807	✓	0.441	14	✓	0.044	24
ODE 1808	✓	0.028	20	✓	0.016	22
ODE 1809	✓	0.067	22	✓	0.053	29
ODE 1810	✗	0	0	✓	0.168	79
ODE 1811	✗	0	0	✓	0.173	115
ODE 1812	✗	0	0	✓	0.557	58
ODE 1813	✓	0.015	26	✓	0.098	24
ODE 1814	✓	9.933	62	✓	0.11	32
ODE 1815	✗	0	0	✓	0.167	70
ODE 1816	✓	90.464	144	✓	0.231	98
ODE 1817	✓	1.971	57	✓	0.029	29
ODE 1818	✓	45.286	81	✓	0.173	44
ODE 1819	✗	0	0	✓	0.559	59
ODE 1820	✓	0.063	69	✓	0.237	35
ODE 1821	✓	0.039	61	✓	0.111	57
ODE 1822	✗	0	0	✓	0.165	26
ODE 1823	✓	0.073	95	✓	0.245	49
ODE 1824	✓	0.022	50	✓	0.078	40
ODE 1825	✓	0.029	51	✓	0.078	37
ODE 1826	✓	1.877	154	✓	0.123	44
ODE 1827	✓	10.739	262	✓	0.148	94
ODE 1828	✓	58.909	59	✓	1.187	69

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1829	✓	25.633	80	✓	0.243	45
ODE 1830	✗	0	0	✓	2.429	206
ODE 1831	✓	0.033	19	✓	0.384	16
ODE 1832	✗	0	0	✓	0.314	41
ODE 1833	✓	0.064	75	✓	0.134	41
ODE 1834	✓	0.342	332	✓	0.164	38
ODE 1835	✓	0.826	350	✓	0.178	84
ODE 1836	✓	17.973	1391	✓	0.247	198
ODE 1837	✗	0	0	✓	0.695	271
ODE 1838	✓	0.363	33	✓	0.194	41
ODE 1839	✓	0.103	33	✓	0.041	22
ODE 1840	✗	0	0	✓	0.132	115
ODE 1841	✗	0	0	✓	0.081	60
ODE 1842	✗	0	0	✓	0.938	125
ODE 1843	✓	0.049	14	✓	0.175	10
ODE 1844	✓	0.391	189	✓	0.221	63
ODE 1845	✓	0.032	90	✓	0.239	51
ODE 1846	✓	1.262	190	✓	0.458	77
ODE 1847	✓	57.851	11689	✓	0.419	75
ODE 1848	✗	0	0	✓	1.078	125
ODE 1849	✗	0	0	✓	4.423	154
ODE 1850	✗	0	0	✓	4.763	155
ODE 1851	✗	0	0	✓	0.916	93
ODE 1852	✓	0.035	55	✓	0.079	43
ODE 1853	✓	0.072	46	✓	0.314	19
ODE 1854	✓	0.015	17	✓	0.214	15
ODE 1855	✓	0.015	19	✓	0.214	19
ODE 1856	✓	0.017	23	✓	0.214	19
ODE 1857	✓	124.833	74	✓	0.273	37
ODE 1858	✓	51.093	115	✓	0.813	70

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1859	✗	0	0	✗	0	0
ODE 1860	✓	0.042	67	✓	0.281	31
ODE 1861	✓	56.334	57	✓	0.32	47
ODE 1862	✓	0.036	59	✓	0.271	35
ODE 1863	✗	0	0	✓	1.322	67
ODE 1864	✗	0	0	✓	0.779	60
ODE 1865	✗	0	0	✗	0	0
ODE 1866	✓	0.015	27	✓	0.3	21
ODE 1867	✓	0.018	28	✓	0.297	22
ODE 1868	✓	0.017	17	✓	0.26	16
ODE 1869	✓	157.135	89	✓	0.32	39
ODE 1870	✓	49.745	117	✓	0.408	79
ODE 1871	✗	0	0	✗	0	0
ODE 1872	✗	0	0	✓	2.577	101
ODE 1873	✗	0	0	✓	0.289	60
ODE 1874	✗	0	0	✓	0.048	33
ODE 1875	✓	0.08	33	✓	0.224	27
ODE 1876	✗	0	0	✓	0.101	31
ODE 1877	✓	0.014	21	✓	0.022	16
ODE 1878	✗	0	0	✓	0.931	94
ODE 1879	✓	0.093	25	✓	0.041	23
ODE 1880	✗	0	0	✓	0.809	96
ODE 1881	✓	0.07	83	✓	0.058	26
ODE 1882	✓	297.41	89	✓	0.081	29
ODE 1883	✓	0.668	259	✓	0.151	47
ODE 1884	✗	0	0	✓	4.556	158
ODE 1885	✗	0	0	✗	0	0
ODE 1886	✗	0	0	✗	0	0
ODE 1887	✗	0	0	✓	0.661	99
ODE 1888	✗	0	0	✓	0.199	84
ODE 1889	✓	2.381	64	✓	0.115	43

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1890	✗	0	0	✓	0.319	68
ODE 1891	✗	0	0	✗	0	0
ODE 1892	✓	1.216	97	✓	0.129	76
ODE 1893	✗	0	0	✓	2.31	761
ODE 1894	✓	0.21	111	✓	0.389	54
ODE 1895	✓	0.035	14	✓	0.015	14
ODE 1896	✓	0.025	20	✓	0.013	17
ODE 1897	✓	0.183	88	✓	0.102	68
ODE 1898	✓	0.062	64	✓	0.048	23
ODE 1899	✓	0.118	25	✓	0.05	28
ODE 1900	✓	0.126	23	✓	0.064	26
ODE 1901	✓	4.94	2633	✓	0.125	83
ODE 1902	✗	0	0	✓	0.172	99
ODE 1903	✓	0.025	16	✓	0.092	15
ODE 1904	✗	0	0	✗	0	0
ODE 1905	✓	0.09	63	✓	0.025	19
ODE 1906	✓	0.168	30	✓	0.03	30
ODE 1907	✓	0.039	32	✓	0.065	20
ODE 1908	✓	0.027	21	✓	0.051	21
ODE 1909	✗	0	0	✗	0	0
ODE 1910	✓	0.027	21	✓	0.051	21
ODE 1911	✗	0	0	✓	0.707	97
ODE 1912	✗	0	0	✓	0.541	110
ODE 1913	✗	0	0	✗	0	0
ODE 1914	✗	0	0	✗	0	0
ODE 1915	✓	0.073	28	✓	0.038	27
ODE 1916	✗	0	0	✓	1.509	68
ODE 1917	✓	0.08	31	✓	0.067	25
ODE 1918	✓	9.987	57	✓	0.135	61
ODE 1919	✗	0	0	✓	0.319	53
ODE 1920	✓	0.079	13	✓	0.041	17

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1921	✓	0.11	34	✓	0.039	30
ODE 1922	✓	0.065	25	✓	0.039	20
ODE 1923	✓	0.035	26	✓	0.017	26
ODE 1924	✓	0.614	206	✓	0.162	64
ODE 1925	✓	2.178	264	✓	0.173	85
ODE 1926	✗	0	0	✓	0.19	313
ODE 1927	✓	0.346	51	✓	0.13	70
ODE 1928	✓	1.615	370	✓	1.279	75
ODE 1929	✗	0	0	✓	2.915	70
ODE 1930	✓	0.059	26	✓	0.197	26
ODE 1931	✓	0.066	32	✓	0.08	21
ODE 1932	✓	0.074	23	✓	0.119	24
ODE 1933	✓	0.039	27	✓	0.027	19
ODE 1934	✓	0.034	18	✓	0.028	16
ODE 1935	✓	0.139	75	✓	0.04	26
ODE 1936	✓	0.049	25	✓	0.018	27
ODE 1937	✓	0.823	227	✓	0.164	16
ODE 1938	✓	0.225	27	✓	1.368	63
ODE 1939	✓	0.353	59	✓	0.572	120
ODE 1940	✓	0.846	73	✓	0.152	42
ODE 1941	✓	0.008	24	✓	0.016	17
ODE 1942	✓	0.196	129	✓	0.108	87
ODE 1943	✓	0.009	29	✓	0.123	22
ODE 1944	✓	0.454	77	✓	0.072	53
ODE 1945	✓	1.183	359	✓	0.075	61
ODE 1946	✗	0	0	✗	0	0
ODE 1947	✓	1.746	443	✓	0.292	69
ODE 1948	✗	0	0	✗	0	0
ODE 1949	✗	0	0	✗	0	0
ODE 1950	✓	8.601	285	✓	0.075	49

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Table 2 – continued from previous page

	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1951	✗	0	0	✗	0	0
ODE 1952	✗	0	0	✗	0	0
ODE 1953	✗	0	0	✗	0	0
ODE 1954	✓	0.029	16	✓	0.016	17
ODE 1955	✓	0.093	17	✓	0.042	19
ODE 1956	✗	0	0	✓	0.202	60
ODE 1957	✓	1.276	217	✓	0.041	25
ODE 1958	✓	22.461	2761	✓	0.084	71
ODE 1959	✓	0.908	173	✓	0.078	87
ODE 1960	✓	0.072	27	✓	0.04	22
ODE 1961	✓	0.031	20	✓	0.016	17
ODE 1962	✓	0.1	43	✓	0.151	67
ODE 1963	✓	0.134	41	✓	0.284	30
ODE 1964	✓	4.467	2281	✓	0.53	87
ODE 1965	✓	0.03	20	✓	0.073	17
ODE 1966	✓	0.321	43	✓	0.305	147
ODE 1967	✓	0.036	17	✓	0.08	19
ODE 1968	✗	0	0	✗	0	0
ODE 1969	✓	0.046	19	✓	0.017	18
ODE 1970	✓	0.04	18	✓	0.015	18
ODE 1971	✓	0.033	12	✓	0.015	15
ODE 1972	✗	0	0	✗	0	0
ODE 1973	✓	0.045	24	✓	0.016	18
ODE 1974	✓	0.041	20	✓	0.017	18
ODE 1975	✓	320.582	104	✓	0.049	43
ODE 1976	✗	0	0	✓	1.152	107
ODE 1977	✗	0	0	✓	0.838	110
ODE 1978	✓	0.046	19	✓	0.017	18
ODE 1979	✓	0.045	17	✓	0.016	18
ODE 1980	✓	0.044	18	✓	0.016	18
ODE 1981	✓	0.066	37	✓	0.167	19

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 1982	✓	0.147	33	✓	0.021	21
ODE 1983	✓	0.138	24	✓	0.017	21
ODE 1984	✓	0.053	21	✓	0.018	18
ODE 1985	✓	0.151	22	✓	0.02	26
ODE 1986	✓	0.119	79	✓	1.314	26
ODE 1987	✓	0.048	18	✓	0.141	17
ODE 1988	✓	0.084	104	✓	0.044	28
ODE 1989	✓	0.038	23	✓	0.069	18
ODE 1990	✓	0.054	23	✓	0.036	18
ODE 1991	✓	0.245	21	✓	0.064	31
ODE 1992	✗	0	0	✓	0.381	79
ODE 1993	✓	0.793	22	✓	0.051	34
ODE 1994	✓	0.07	56	✓	0.039	21
ODE 1995	✓	0.093	19	✓	0.074	26
ODE 1996	✓	0.866	37	✓	0.078	38
ODE 1997	✓	0.058	9	✓	0.083	19
ODE 1998	✓	0.068	20	✓	0.045	21
ODE 1999	✓	0.089	58	✓	0.035	24
ODE 2000	✗	0	0	✓	1.267	168
ODE 2001	✗	0	0	✓	0.797	162
ODE 2002	✓	0.214	63	✓	0.087	52
ODE 2003	✓	0.075	53	✓	0.564	50
ODE 2004	✗	0	0	✓	0.897	79
ODE 2005	✗	0	0	✗	0	0
ODE 2006	✓	0.884	75	✓	0.145	135
ODE 2007	✗	0	0	✓	1.274	112
ODE 2008	✗	0	0	✓	0.494	158
ODE 2009	✓	0.088	14	✓	0.025	15
ODE 2010	✓	0.09	93	✓	0.019	22
ODE 2011	✗	0	0	✓	0.034	41

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 2012	✓	0.192	42	✓	0.469	56
ODE 2013	✓	0.089	441	✓	0.042	26
ODE 2014	✓	1.397	24	✓	0.154	23
ODE 2015	✗	0	0	✗	0	0
ODE 2016	✗	0	0	✗	0	0
ODE 2017	✓	0.248	37	✓	0.025	27
ODE 2018	✓	1.042	87	✓	0.053	37
ODE 2019	✓	0.113	32	✓	0.054	18
ODE 2020	✗	0	0	✗	0	0
ODE 2021	✗	0	0	✗	0	0
ODE 2022	✓	0.336	53	✓	0.191	41
ODE 2023	✓	0.319	53	✓	0.046	41
ODE 2024	✓	0.323	103	✓	0.268	209
ODE 2025	✓	60.167	72	✓	0.162	25
ODE 2026	✓	1.061	35	✓	0.067	36
ODE 2027	✓	0.322	65	✓	0.034	40
ODE 2028	✗	0	0	✗	0	0
ODE 2029	✗	0	0	✓	0.235	131
ODE 2030	✓	2.491	62	✓	2.174	56
ODE 2031	✓	0.618	78	✓	0.13	23
ODE 2032	✓	0.665	721	✓	0.084	57
ODE 2033	✗	0	0	✓	0.661	232
ODE 2034	✓	20.673	10112	✓	1.74	115637
ODE 2035	✗	0	0	✓	2.211	5
ODE 2036	✗	0	0	✗	0	0
ODE 2037	✗	0	0	✗	0	0
ODE 2038	✗	0	0	✓	5.438	532
ODE 2039	✗	0	0	✓	0.538	109
ODE 2040	✗	0	0	✓	1.051	334
ODE 2041	✗	0	0	✓	1.207	65
ODE 2042	✓	0.101	1881	✓	0.295	91

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 2043	✗	0	0	✓	7.823	257
ODE 2044	✗	0	0	✗	0	0
ODE 2045	✗	0	0	✓	3.671	818
ODE 2046	✗	0	0	✓	0.059	20
ODE 2047	✓	10.406	70	✗	0	0
ODE 2048	✗	0	0	✗	0	0
ODE 2049	✓	10.967	108	✗	0	0
ODE 2050	✓	0.054	116	✓	0.167	101
ODE 2051	✗	0	0	✓	1.967	46
ODE 2052	✗	0	0	✓	1.422	54
ODE 2053	✗	0	0	✓	0.173	38
ODE 2054	✗	0	0	✓	0.112	50
ODE 2055	✓	0.246	153	✓	0.085	87
ODE 2056	✗	0	0	✓	2.223	54
ODE 2057	✗	0	0	✓	0.14	330
ODE 2058	✓	1.103	369	✓	0.326	159
ODE 2059	✗	0	0	✓	0.358	285
ODE 2060	✓	0.86	157	✓	0.073	91
ODE 2061	✗	0	0	✓	6.507	51
ODE 2062	✓	0.851	119	✓	0.441	173
ODE 2063	✓	0.155	101	✓	0.293	92
ODE 2064	✓	0.008	21	✓	0.092	28
ODE 2065	✓	0.132	141	✓	0.191	78
ODE 2066	✓	0.352	261	✓	0.194	44
ODE 2067	✗	0	0	✓	0.173	63
ODE 2068	✗	0	0	✗	0	0
ODE 2069	✓	0.009	24	✓	0.241	41
ODE 2070	✓	0.03	24	✓	0.516	311
ODE 2071	✗	0	0	✓	2.148	148
ODE 2072	✓	0.235	80	✓	0.051	23

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 2073	✓	11.681	270	✓	1.691	129
ODE 2074	✗	0	0	✓	3.543	126
ODE 2075	✗	0	0	✓	0.466	82
ODE 2076	✗	0	0	✓	15.168	169
ODE 2077	✓	0.118	135	✗	0	0
ODE 2078	✓	0.015	22	✓	0.167	24
ODE 2079	✗	0	0	✓	0.259	17
ODE 2080	✗	0	0	✓	0.053	22
ODE 2081	✓	3.241	32	✓	0.015	17
ODE 2082	✓	8.751	42	✓	0.086	33
ODE 2083	✓	1.118	37	✓	0.091	24
ODE 2084	✗	0	0	✓	0.132	48
ODE 2085	✗	0	0	✓	0.152	53
ODE 2086	✓	0.014	17	✓	0.002	15
ODE 2087	✓	0.032	29	✓	0.01	24
ODE 2088	✓	0.015	21	✓	0.008	19
ODE 2089	✓	0.034	32	✓	0.253	25
ODE 2090	✓	0.015	52	✓	0.008	35
ODE 2091	✓	0.01	59	✓	0.121	40
ODE 2092	✓	1.449	98	✓	0.336	61
ODE 2093	✓	0.008	54	✓	0.01	53
ODE 2094	✓	0.037	78	✓	0.159	45
ODE 2095	✓	0.016	19	✓	0.006	14
ODE 2096	✓	0.017	23	✓	0.008	16
ODE 2097	✓	0.113	39	✓	0.063	36
ODE 2098	✓	0.008	30	✓	0.007	23
ODE 2099	✓	0.051	57	✓	0.087	35
ODE 2100	✓	0.008	25	✓	0.007	19
ODE 2101	✓	0.016	39	✓	0.017	26
ODE 2102	✓	0.021	51	✓	0.042	36

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 2103	✓	0.092	49	✓	0.041	35
ODE 2104	✓	0.009	28	✓	0.01	21
ODE 2105	✓	0.009	53	✓	0.01	47
ODE 2106	✓	0.012	59	✓	0.081	43
ODE 2107	✓	0.014	79	✓	0.037	55
ODE 2108	✗	0	0	✗	0	0
ODE 2109	✓	0.124	75	✓	0.006	32
ODE 2110	✓	0.008	81	✓	0.032	170
ODE 2111	✓	0.01	42	✓	0.006	33
ODE 2112	✓	0.017	28	✓	0.01	18
ODE 2113	✓	0.049	37	✓	0.025	27
ODE 2114	✓	0.01	28	✓	0.007	23
ODE 2115	✓	0.292	1185	✓	0.714	1277
ODE 2116	✓	0.01	30	✓	0.006	27
ODE 2117	✓	0.015	24	✓	0.008	16
ODE 2118	✓	0.031	41	✓	0.018	36
ODE 2119	✓	0.023	33	✓	0.02	28
ODE 2120	✓	0.039	48	✓	0.06	82
ODE 2121	✓	0.019	28	✓	0.01	18
ODE 2122	✓	0.26	58	✓	0.053	41
ODE 2123	✓	0.081	51	✓	0.036	40
ODE 2124	✓	0.009	87	✓	0.026	170
ODE 2125	✓	0.009	31	✓	0.01	24
ODE 2126	✓	0.094	52	✓	0.057	214
ODE 2127	✓	0.01	27	✓	0.007	21
ODE 2128	✓	0.01	28	✓	0.01	21
ODE 2129	✓	0.012	42	✓	0.013	30
ODE 2130	✓	0.048	47	✓	0.039	82
ODE 2131	✓	0.014	23	✓	0.006	19
ODE 2132	✓	0.023	34	✓	0.017	32

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 2133	✓	0.061	42	✓	0.02	32
ODE 2134	✓	0.03	41	✓	0.02	39
ODE 2135	✓	0.013	22	✓	0.006	17
ODE 2136	✓	0.118	40	✓	0.065	34
ODE 2137	✓	0.009	22	✓	0.008	19
ODE 2138	✓	0.011	35	✓	0.011	24
ODE 2139	✓	0.013	26	✓	0.007	23
ODE 2140	✓	0.022	30	✓	0.007	16
ODE 2141	✓	0.024	34	✓	0.017	36
ODE 2142	✓	0.012	23	✓	0.006	19
ODE 2143	✓	0.022	34	✓	0.015	27
ODE 2144	✓	0.016	23	✓	0.007	15
ODE 2145	✓	0.009	84	✓	0.02	542
ODE 2146	✓	0.102	57	✓	0.23	59
ODE 2147	✓	0.032	68	✓	0.023	43
ODE 2148	✓	0.167	90	✓	0.209	104
ODE 2149	✓	0.681	56	✓	28.87	276
ODE 2150	✗	0	0	✓	0.084	36
ODE 2151	✗	0	0	✗	0	0
ODE 2152	✗	0	0	✓	0.2	36
ODE 2153	✓	0.008	29	✓	0.008	21
ODE 2154	✓	0.009	30	✓	0.008	21
ODE 2155	✓	0.026	37	✓	0.014	23
ODE 2156	✓	0.009	28	✓	0.008	23
ODE 2157	✗	0	0	✓	0.635	121
ODE 2158	✓	0.07	21	✓	0.093	16
ODE 2159	✓	0.058	24	✓	0.087	18
ODE 2160	✓	0.081	28	✓	0.026	22
ODE 2161	✓	0.034	77	✓	0.093	45
ODE 2162	✓	0.137	111	✓	0.043	81

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 2163	✗	0	0	✓	0.117	45
ODE 2164	✓	0.554	97	✓	0.556	135
ODE 2165	✓	0.014	27	✓	0.026	23
ODE 2166	✓	6.796	872	✓	0.34	1033
ODE 2167	✓	0.033	43	✓	0.013	32
ODE 2168	✓	0.022	24	✓	0.01	16
ODE 2169	✓	0.271	58	✓	0.018	62
ODE 2170	✓	0.043	34	✓	0.009	20
ODE 2171	✗	0	0	✗	0	0
ODE 2172	✗	0	0	✓	0.162	80
ODE 2173	✓	0.115	41	✓	0.103	18
ODE 2174	✓	0.051	27	✓	0.078	17
ODE 2175	✓	0.054	40	✓	0.007	26
ODE 2176	✓	0.023	28	✓	0.008	16
ODE 2177	✗	0	0	✓	0.614	1221
ODE 2178	✓	0.008	24	✓	0.007	20
ODE 2179	✓	0.01	22	✓	0.006	18
ODE 2180	✓	0.016	33	✓	0.014	27
ODE 2181	✓	0.011	19	✓	0.008	15
ODE 2182	✓	0.02	39	✓	0.027	33
ODE 2183	✓	0.011	28	✓	0.008	24
ODE 2184	✓	0.016	36	✓	0.009	18
ODE 2185	✓	0.01	26	✓	0.01	26
ODE 2186	✓	0.01	22	✓	0.008	22
ODE 2187	✓	0.016	26	✓	0.018	20
ODE 2188	✓	0.01	22	✓	0.013	22
ODE 2189	✓	0.01	24	✓	0.007	20
ODE 2190	✓	0.042	29	✓	0.012	18
ODE 2191	✓	0.011	22	✓	0.01	20
ODE 2192	✓	0.043	23	✓	0.118	18

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 2193	✓	0.666	97	✓	0.371	134
ODE 2194	✗	0	0	✓	0.365	141
ODE 2195	✓	0.021	31	✓	0.011	30
ODE 2196	✓	0.253	96	✓	0.251	60
ODE 2197	✓	0.109	50	✓	0.043	47
ODE 2198	✓	0.031	21	✓	0.028	16
ODE 2199	✓	0.013	34	✓	0.007	30
ODE 2200	✗	0	0	✓	0.946	76
ODE 2201	✓	0.013	38	✓	0.007	30
ODE 2202	✓	0.013	50	✓	0.007	37
ODE 2203	✓	0.061	42	✓	0.161	143
ODE 2204	✓	0.017	33	✓	0.021	30
ODE 2205	✓	0.115	62	✓	0.18	67
ODE 2206	✓	0.066	29	✓	0.229	28
ODE 2207	✓	0.024	42	✓	0.029	34
ODE 2208	✓	0.122	46	✓	0.246	23
ODE 2209	✗	0	0	✓	0.437	437
ODE 2210	✗	0	0	✓	0.066	25
ODE 2211	✓	0.006	22	✓	0.006	21
ODE 2212	✓	0.035	32	✓	0.023	29
ODE 2213	✓	0.05	30	✓	0.023	28
ODE 2214	✓	0.041	40	✓	0.063	35
ODE 2215	✓	0.066	38	✓	0.096	31
ODE 2216	✓	0.008	76	✓	0.012	50
ODE 2217	✓	0.008	45	✓	0.026	38
ODE 2218	✓	0.009	56	✓	0.005	47
ODE 2219	✓	0.008	26	✓	0.004	21
ODE 2220	✓	0.008	35	✓	0.007	23
ODE 2221	✓	0.058	43	✓	0.164	33
ODE 2222	✓	0.098	42	✓	0.028	31

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 2223	✓	0.117	46	✓	0.151	41
ODE 2224	✓	0.053	55	✓	0.024	41
ODE 2225	✓	0.009	44	✓	0.009	33
ODE 2226	✓	0.009	34	✓	0.008	27
ODE 2227	✓	0.01	50	✓	0.005	37
ODE 2228	✓	0.01	47	✓	0.009	34
ODE 2229	✓	0.027	34	✓	0.013	21
ODE 2230	✓	0.008	30	✓	0.011	25
ODE 2231	✓	0.251	47	✓	0.496	51
ODE 2232	✓	0.009	34	✓	0.02	29
ODE 2233	✗	0	0	✗	0	0
ODE 2234	✓	0.009	32	✓	0.01	24
ODE 2235	✓	0.035	39	✓	0.018	33
ODE 2236	✗	0	0	✓	0.904	91
ODE 2237	✗	0	0	✗	0	0
ODE 2238	✓	0.009	32	✓	0.009	24
ODE 2239	✓	0.009	27	✓	0.007	21
ODE 2240	✓	0.01	52	✓	0.005	36
ODE 2241	✓	0.009	35	✓	0.008	23
ODE 2242	✓	0.039	143	✓	0.035	172
ODE 2243	✓	0.009	26	✓	0.006	22
ODE 2244	✓	0.011	42	✓	0.004	32
ODE 2245	✓	0.722	148	✓	0.046	84
ODE 2246	✓	0.909	173	✓	0.307	130
ODE 2247	✓	0.022	38	✓	0.012	22
ODE 2248	✓	0.009	25	✓	0.011	18
ODE 2249	✓	0.009	27	✓	0.011	19
ODE 2250	✓	0.061	62	✓	0.138	51
ODE 2251	✓	0.027	32	✓	0.01	19
ODE 2252	✓	0.025	29	✓	0.009	17

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	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 2253	✓	0.025	27	✓	0.01	18
ODE 2254	✓	0.025	27	✓	0.013	19
ODE 2255	✓	0.073	146	✓	0.092	61
ODE 2256	✓	0.02	50	✓	0.014	48
ODE 2257	✓	0.164	222	✓	0.078	67
ODE 2258	✓	0.839	310	✓	0.215	148
ODE 2259	✓	0.028	27	✓	0.01	18
ODE 2260	✓	0.209	146	✓	0.07	123
ODE 2261	✓	0.013	30	✓	0.01	25
ODE 2262	✓	0.012	30	✓	0.005	25
ODE 2263	✓	0.027	27	✓	0.012	19
ODE 2264	✓	0.015	116	✓	0.027	89
ODE 2265	✓	0.014	186	✓	0.018	51
ODE 2266	✓	0.135	860	✓	0.218	508
ODE 2267	✗	0	0	✓	0.017	28
ODE 2268	✓	0.136	53	✓	0.009	28
ODE 2269	✓	0.031	35	✓	0.007	22
ODE 2270	✓	0.673	80	✓	0.412	69
ODE 2271	✓	0.007	32	✓	0.012	33
ODE 2272	✓	0.008	98	✓	0.013	102
ODE 2273	✓	0.01	70	✓	0.007	49
ODE 2274	✓	0.01	105	✓	0.034	84
ODE 2275	✗	0	0	✗	0	0
ODE 2276	✗	0	0	✗	0	0
ODE 2277	✗	0	0	✗	0	0
ODE 2278	✗	0	0	✗	0	0
ODE 2279	✗	0	0	✗	0	0
ODE 2280	✗	0	0	✗	0	0
ODE 2281	✗	0	0	✗	0	0
ODE 2282	✗	0	0	✓	2.727	67
ODE 2283	✗	0	0	✓	1.373	65

Continued on next page

Table 2 – continued from previous page

	Mathematica			Maple		
#	solved	cpu	leaf	solved	cpu	leaf
ODE 2284	✗	0	0	✓	1.77	129
ODE 2285	✗	0	0	✓	0.755	60
ODE 2286	✓	0.182	282	✓	1.217	190
ODE 2287	✓	2.744	409	✓	0.309	77
ODE 2288	✓	0.198	83	✓	0.296	95
ODE 2289	✓	0.232	60	✓	0.128	24
ODE 2290	✓	0.31	457	✓	0.049	26
ODE 2291	✗	0	0	✓	0.195	27
ODE 2292	✗	0	0	✓	0.302	22
ODE 2293	✓	0.094	24	✓	0.453	53
ODE 2294	✗	0	0	✓	0.726	60
ODE 2295	✓	0.025	21	✓	0.114	18
ODE 2296	✓	0.121	95	✓	0.222	49
ODE 2297	✗	0	0	✓	1.585	789
ODE 2298	✓	1.888	131	✓	0.166	151
ODE 2299	✓	0.026	61	✓	0.105	31
ODE 2300	✓	0.531	415	✓	0.192	197
ODE 2301	✓	0.064	75	✓	0.119	45
ODE 2302	✗	0	0	✓	0.202	97
ODE 2303	✓	0.044	48	✓	0.202	41
ODE 2304	✓	0.032	28	✓	0.291	30
ODE 2305	✗	0	0	✓	0.854	142
ODE 2306	✗	0	0	✓	0.479	105
ODE 2307	✗	0	0	✗	0	0
ODE 2308	✗	0	0	✗	0	0
ODE 2309	✗	0	0	✗	0	0
ODE 2310	✗	0	0	✗	0	0
ODE 2311	✗	0	0	✗	0	0
ODE 2312	✗	0	0	✗	0	0
ODE 2313	✗	0	0	✗	0	0

3 Detailed lookup table and classification for each ODE

The following table 3 gives the classification of each ODE from Maple ODE advisor with a link to each ODE page as well. Clicking on the problem opens a new page that shows the result.

Table 3: ODE classification and performance for each differential equation

#	result
ODE 1	$y'(x) = af(x)$ [_quadrature] Solution method Separable ODE, Dependent variable missing Maple ✓ Mathematica ✓
ODE 2	$y'(x) = y(x) + x + \sin(x)$ [[_linear, `class A`]] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 3	$y'(x) = x^2 + 2y(x) + 3\cosh(x)$ [[_linear, `class A`]] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 4	$y'(x) = a + bx + cy(x)$ [[_linear, `class A`]] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 5	$y'(x) = a\cos(bx + c) + ky(x)$ [[_linear, `class A`]] Solution method Linear ODE Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 6	$y'(x) = a\sin(bx+c) + ky(x)$ [[_linear, `class A`]] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 7	$y'(x) = a + be^{kx} + cy(x)$ [[_linear, `class A`]] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 8	$y'(x) = x(x^2 - y(x))$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 9	$y'(x) = x\left(ay(x) + e^{-x^2}\right)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 10	$y'(x) = x^2(ax^3 + by(x))$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 11	$y'(x) = ax^n y(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 12	$y'(x) = y(x)\cos(x) + \sin(x)\cos(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 13	$y'(x) = y(x)\cos(x) + e^{\sin(x)}$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 14	$y'(x) = y(x)\cot(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 15	$y'(x) = 1 - y(x)\cot(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 16	$y'(x) = x\csc(x) - y(x)\cot(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 17	$y'(x) = y(x)(\cot(x) + 2\csc(2x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 18	$y'(x) = \sec(x) - y(x)\cot(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 19	$y'(x) = y(x)\cot(x) + e^x \sin(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 20	$y'(x) + 2y(x)\cot(x) + \csc(x) = 0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 21	$y'(x) = 4x\csc(x)\sec^2(x) - 2y(x)\cot(2x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 22	$y'(x) = 2\big(\cos(2x)\cot^2(x) - y(x)\csc(2x)\big)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 23	$y'(x) = 4x\csc(x)\left(y(x) + \sin^3(x)\right)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✗

Continued on next page

Table 3 – continued from previous page

#	result
ODE 24	$y'(x) = 4x \csc(x) \left(y(x) - \tan^2(x) + 1\right)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 25	$y'(x) = y(x) \sec(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 26	$y'(x) + \tan(x) = (1 - y(x)) \sec(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 27	$y'(x) = y(x) \tan(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 28	$y'(x) = y(x) \tan(x) + \cos(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 29	$y'(x) = \cos(x) - y(x) \tan(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 30	$y'(x) = \sec(x) - y(x)\tan(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 31	$y'(x) = y(x)\tan(x) + \sin(2x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 32	$y'(x) = \sin(2x) - y(x)\tan(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 33	$y'(x) = 2y(x)\tan(x) + \sin(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 34	$y'(x) = 2(y(x)\tan(2x) + \sec(2x) + 1)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 35	$y'(x) = 3y(x)\tan(x) + \csc(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 36	$y'(x) = y(x)(a + \sin(\log(x)) + \cos(\log(x)))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 37	$y'(x) = 6e^{2x} - y(x)\tanh(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 38	$y'(x) = y(x)f'(x) + f(x)f'(x)$ (ODEtools/info) missing specification of intermediate function Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 39	$y'(x) = f(x) + g(x)y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 40	$y'(x) = x^2 - y(x)^2$ [_Riccati] Solution method Series solution to $y'(x) = f(x, y(x))$, case $f(x, y)$ analytic Maple ✓ Mathematica ✓
ODE 41	$f(x)^2 + y'(x) = f'(x) + y(x)^2$ (ODEtools/info) missing specification of intermediate function Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✗

Continued on next page

Table 3 – continued from previous page

#	result
ODE 42	$y'(x) - x + 1 = y(x)(y(x) + x)$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 43	$y'(x) = (y(x) + x)^2$ [[_homogeneous, `class C`], _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 44	$y'(x) = (x - y(x))^2$ [[_homogeneous, `class C`], _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 45	$y'(x) = (x - y(x))^2 + 3(y(x) - x + 1)$ [[_homogeneous, `class C`], _Riccati] Solution method Equation linear in the variables, $y'(x) = f(a + bx + cy(x))$ Maple ✓ Mathematica ✓
ODE 46	$y'(x) = -\left(x^2 + 1\right) y(x) + y(x)^2 + 2x$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 47	$y'(x) = x\left(x^3 + 2\right) - \left(2x^2 - y(x)\right) y(x)$ [[_1st_order, _with_linear_symmetries], _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 48	$y'(x) = x\left(2 - x^3\right) + \left(2x^2 - y(x)\right) y(x) + 1$ [[_1st_order, _with_linear_symmetries], _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 49	$y'(x) = \cos(x) - y(x)(\sin(x) - y(x))$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 50	$y'(x) = y(x)(y(x) + \sin(2x)) + \cos(2x)$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✗
ODE 51	$y'(x) = xf(x)y(x) + f(x) + y(x)^2$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✗
ODE 52	$y'(x) = (-4y(x) + x + 3)^2$ [[_homogeneous, `class C`], _Riccati] Solution method Equation linear in the variables, $y'(x) = f(a + bx + cy(x))$ Maple ✓ Mathematica ✓
ODE 53	$y'(x) = (9y(x) + 4x + 1)^2$ [[_homogeneous, `class C`], _Riccati] Solution method Equation linear in the variables, $y'(x) = f(a + bx + cy(x))$ Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 54	$y'(x) = 3\left(a + by(x)^2 + bx\right)$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 55	$y'(x) = a + by(x)^2$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 56	$y'(x) = ax + by(x)^2$ [[_Riccati, _special]] Solution method Riccati ODE, Main form Maple ✓ Mathematica ✓
ODE 57	$y'(x) = a + bx + cy(x)^2$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 58	$y'(x) = ax^{n-1} + bx^{2n} + cy(x)^2$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 59	$y'(x) = ax^2 + by(x)^2$ [[_Riccati, _special]] Solution method Riccati ODE, Main form Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 60	$y'(x) = \mathrm{a0} + \mathrm{a1}y(x) + \mathrm{a2}y(x)^2$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 61	$y'(x) = ay(x) + by(x)^2 + f(x)$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✗ Mathematica ✗
ODE 62	$y'(x) = a(x - y(x))y(x) + 1$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 63	$y'(x) = ay(x)^2 + f(x) + g(x)y(x)$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✗ Mathematica ✗
ODE 64	$y'(x) = xy(x)(y(x) + 3)$ [_separable] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 65	$y'(x) = -x^3 + \left(2x^2 + 1\right) y(x) - xy(x)^2 - x + 1$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 66	$y'(x) = x\left(x^2 y(x) - y(x)^2 + 2\right)$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 67	$y'(x) = -(1-x)y(x)^2 + (1-2x)y(x) + x$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 68	$y'(x) = axy(x)^2$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 69	$y'(x) = x^n\left(a + by(x)^2\right)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 70	$y'(x) = ax^m + bx^n y(x)^2$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 71	$y'(x) = y(x)(a + by(x)\cos(kx))$ [_Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 72	$y'(x) = \sin(x)\left(2\sec^2(x) - y(x)\right)$ [_linear] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 73	$y'(x) + 4\csc(x) = y(x)^2\sin(x) + y(x)(3 - \cot(x))$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 74	$y'(x) = y(x)\sec(x) + (\sin(x) - 1)^2$ [_linear] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 75	$y'(x) + \left(1 - y(x)^2\right)\tan(x) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 76	$y'(x) = f(x) + g(x)y(x) + h(x)y(x)^2$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✗ Mathematica ✗
ODE 77	$y'(x) = f(x)\left(a + by(x) + cy(x)^2\right)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 78	$y(x)^2(ax+y(x))+y'(x)$ [_Abel] Solution method Abel ODE, First kind Maple ✓ Mathematica ✗
ODE 79	$y'(x)=y(x)^2\left(ae^x+y(x)\right)$ [_Abel] Solution method Abel ODE, First kind Maple ✓ Mathematica ✓
ODE 80	$3a(y(x)+2x)y(x)^2+y'(x)=0$ [_Abel] Solution method Abel ODE, First kind Maple ✓ Mathematica ✓
ODE 81	$y'(x)=y(x)\left(a+by(x)^2\right)$ [_quadrature] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 82	$y'(x)=\text{a0}+\text{a1}y(x)+\text{a2}y(x)^2+\text{a3}y(x)^3$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 83	$y'(x)=xy(x)^3$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 84	$y'(x)+y(x)\left(1-xy(x)^2\right)=0$ [_Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 85	$y'(x)=y(x)^2(a+bxy(x))$ [[_homogeneous, `class G`], _Abel] Solution method Abel ODE, First kind Maple ✓ Mathematica ✓
ODE 86	$y(x)^3\left(a+4b^2x+3bx^2\right)+y'(x)+3xy(x)^2=0$ [_Abel] Solution method Abel ODE, First kind Maple ✓ Mathematica ✓
ODE 87	$y'(x)=y(x)^2\left(x^3y(x)+1\right)$ [_Abel] Solution method Abel ODE, First kind Maple ✗ Mathematica ✗
ODE 88	$2xy(x)\left(axy(x)^2+1\right)+y'(x)=0$ [_Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 89	$y'(x)=y(x)^2-ax\left(1-x^{n-1}\right)y(x)^3$ [_Abel] Solution method Abel ODE, First kind Maple ✗ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 90	$y'(x) = ay(x)^2 + xy(x)^3 \left(b + cx^{n-1}\right)$ [_Abel] Solution method Abel ODE, First kind Maple ✗ Mathematica ✗
ODE 91	$y'(x) + y(x) \left(y(x)^2 \sec(x) + \tan(x)\right) = 0$ [_Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 92	$y'(x) + y(x)^3 \tan(x) \sec(x) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 93	$y'(x) = \mathrm{f0}(x) + \mathrm{f1}(x)y(x) + \mathrm{f2}(x)y(x)^2 + \mathrm{f3}(x)y(x)^3$ [_Abel] Solution method Abel ODE, First kind Maple ✗ Mathematica ✗
ODE 94	$y'(x) = y(x) \left(y(x)^3 \sec(x) + \tan(x)\right)$ [_Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 95	$y'(x) = ax^{\frac{n}{1-n}} + by(x)^n$ [[_homogeneous, `class G`], _Chini] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 96	$y'(x) = f(x)y(x) + g(x)y(x)^k$ [_Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 97	$y'(x) = f(x) + g(x)y(x) + h(x)y(x)^n$ [_Chini] Solution method Change of Variable, new dependent variable Maple ✗ Mathematica ✗
ODE 98	$y'(x) = f(x)y(x)^m + g(x)y(x)^n$ [NONE] Solution method Change of Variable, new dependent variable Maple ✗ Mathematica ✗
ODE 99	$y'(x) = \sqrt{\lvert y(x)\rvert}$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 100	$y'(x) = a + \sqrt{\mathrm{A0} + \mathrm{B0}y(x)} + by(x)$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 101	$y'(x) = ax + b\sqrt{y(x)}$ [[_homogeneous, `class G`], _Chini] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 102	$x^3 + y'(x) = x\sqrt{x^4 + 4y(x)}$ [[_1st_order, _with_linear_symmetries]] Solution method Homogeneous equation, isobaric equation Maple ✓ Mathematica ✓
ODE 103	$y'(x) + 2\left(1 - x\sqrt{y(x)}\right) y(x) = 0$ [_Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 104	$y'(x) = \sqrt{a + by(x)^2}$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 105	$y'(x) = y(x)\sqrt{a + by(x)}$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 106	$g(x)(f(x) - y(x))\sqrt{(y(x) - a)(y(x) - b)} + y'(x) = 0$ [`y=_G(x,y')`] Solution method Change of Variable, new dependent variable Maple ✗ Mathematica ✗
ODE 107	$y'(x) = \sqrt{XY}$ [_quadrature] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 108	$y'(x) = \mathrm{R1}\left(x, \sqrt{X}\right) \mathrm{R2}\left(y(x), \sqrt{Y}\right)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 109	$y'(x) = \cos^2(x) \cos(y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 110	$y'(x) = \sec^2(x) \mathrm{Cosy}(y(x)) \cot(y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 111	$y'(x) = a + b \cos(Ax + By(x))$ [[_homogeneous, `class C`], _dAlembert] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 112	$y'(x) = -(1 - f'(x)) \cos(y(x)) + f'(x) - f(x) \sin(y(x)) + 1$ (ODEtools/info) missing specification of intermediate function Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✗
ODE 113	$g(x) \sin(ay(x)) + h(x) \cos(ay(x)) + f(x) + y'(x) = 0$ [`y=_G(x,y')`] Solution method Change of Variable, new dependent variable Maple ✗ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 114	$y'(x) = a + b\cos(y(x))$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 115	$x\left(\sin(2y(x)) - x^2\cos^2(y(x))\right) + y'(x) = 0$ [`y=_G(x,y')`] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 116	$y'(x) + \tan(x)\sec(x)\cos^2(y(x)) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✗
ODE 117	$y'(x) = \cot(x)\cot(y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 118	$y'(x) + \cot(x)\cot(y(x)) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 119	$y'(x) = \sin(x)(\csc(y(x)) - \cot(y(x)))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 120	$y'(x) = \tan(x)\cot(y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 121	$y'(x) + \tan(x)\cot(y(x)) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 122	$y'(x) + \sin(2x)\csc(2y(x)) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 123	$y'(x) = \tan(x)(\tan(y(x)) + \sec(x)\sec(y(x)))$ [`y=_G(x,y')`] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 124	$y'(x) = \cos(x)\sec^2(y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 125	$y'(x) = \sec^2(x)\sec^3(y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 126	$y'(x) = a + b\sin(y(x))$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 127	$y'(x) = a + b\sin(Ax + By(x))$ [[_homogeneous, `class C`], _dAlembert] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 128	$y'(x) = \tan(y(x))(\cos(x)\sin(y(x)) + 1)$ [`y=_G(x,y')`] Solution method Change of Variable, new dependent variable Maple ✗ Mathematica ✓
ODE 129	$y'(x) + \csc(2x)\sin(2y(x)) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 130	$f(x) + g(x)\tan(y(x)) + y'(x) = 0$ [`y=_G(x,y')`] Solution method Change of Variable, new dependent variable Maple ✗ Mathematica ✗
ODE 131	$y'(x) = \sqrt{a + b\cos(y(x))}$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 132	$y'(x) = e^{y(x)} + x$ [[_1st_order , `_with_symmetry_[F(x),G(x)]`]] Solution method Series solution to $y'(x) = f(x, y(x))$, case $f(x, y)$ analytic Maple ✓ Mathematica ✓
ODE 133	$y'(x) = e^{y(x)+x}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 134	$y'(x) = e^x \left(a + be^{-y(x)}\right)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 135	$y'(x) + y(x) \log(x) \log(y(x)) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 136	$y'(x) = x^{m-1} y(x)^{1-n} f(ax^m + by(x)^n)$ [[_1st_order , `_with_symmetry_[F(x),G(y)]`]] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 137	$y'(x) = af(y(x))$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 138	$y'(x) = f(a + bx + cy(x))$ [[_homogeneous, `class C`], _dAlembert] Solution method Equation linear in the variables, $y'(x) = f(a + bx + cy(x))$ Maple ✓ Mathematica ✓
ODE 139	$y'(x) = f(x)g(y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 140	$y'(x) = \mathrm{Csx}(x)y(x)\sec(x) + \sec^2(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 141	$2y'(x) + 2\csc^2(x) = y(x)\csc(x)\sec(x) - y(x)^2\sec^2(x)$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 142	$2y'(x) = 2\sin^2(y(x))\tan(y(x)) - x\sin(2y(x))$ [`y=_G(x,y')`] Solution method Change of Variable, new dependent variable Maple ✗ Mathematica ✓
ODE 143	$ax + 2y'(x) = \sqrt{a^2x^2 - 4bx^2 - 4cy(x)}$ [[_homogeneous, `class G`]] Solution method Homogeneous equation, isobaric equation Maple ✓ Mathematica ✗

Continued on next page

Table 3 – continued from previous page

#	result
ODE 144	$3y'(x) = \sqrt{x^2 - 3y(x)} + x$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 145	$xy'(x) = \sqrt{a^2 - x^2}$ [_quadrature] Solution method Separable ODE, Dependent variable missing Maple ✓ Mathematica ✓
ODE 146	$xy'(x) + y(x) + x = 0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 147	$x^2 + xy'(x) - y(x) = 0$ [_linear] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 148	$xy'(x) = x^3 - y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 149	$xy'(x) = x^3 + y(x) + 1$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 150	$xy'(x) = x^m + y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 151	$xy'(x) = x \sin(x) - y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 152	$xy'(x) = x^2 \sin(x) + y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 153	$xy'(x) = x^n \log(x) - y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 154	$xy'(x) = \sin(x) - 2y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 155	$xy'(x) = ay(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 156	$xy'(x) = ay(x) + x + 1$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 157	$xy'(x) = ax + by(x)$ [_linear] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 158	$xy'(x) = ax^2 + by(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 159	$xy'(x) = a + bx^n + cy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 160	$xy'(x) + (3 - x)y(x) + 2 = 0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 161	$(ax + 2)y(x) + xy'(x) + x = 0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 162	$y(x)(a+bx)+xy'(x)=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 163	$xy'(x)=x^3+\left(1-2x^2\right)y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 164	$xy'(x)=ax-\left(1-bx^2\right)y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 165	$\left(2-ax^2\right)y(x)+xy'(x)+x=0$ [_linear] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 166	$x^2+xy'(x)+y(x)^2=0$ [_rational, _Riccati] Solution method Riccati ODE, Special cases Maple ✓ Mathematica ✓
ODE 167	$xy'(x)=x^2+y(x)(y(x)+1)$ [[_homogeneous, `class D`], _rational, _Riccati] Solution method Riccati ODE, Special cases Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 168	$xy'(x)+y(x)^2-y(x)=x^{2/3}$ [_rational, _Riccati] Solution method Riccati ODE, Special cases Maple ✓ Mathematica ✓
ODE 169	$xy'(x)=a+by(x)^2$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 170	$xy'(x)=ax^2+by(x)^2+y(x)$ [[_homogeneous, `class D`], _rational, _Riccati] Solution method Riccati ODE, Special cases Maple ✓ Mathematica ✓
ODE 171	$xy'(x)=ax^{2n}+y(x)(by(x)+n)$ [_rational, _Riccati] Solution method Riccati ODE, Special cases Maple ✓ Mathematica ✓
ODE 172	$xy'(x)=ax^n+by(x)+cy(x)^2$ [_rational, _Riccati] Solution method Riccati ODE, Special cases Maple ✓ Mathematica ✓
ODE 173	$xy'(x)=ax^n+by(x)+cy(x)^2+k$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 174	$a + xy'(x) + xy(x)^2 = 0$ [_rational, [_Riccati, _special]] Solution method Riccati ODE, Main form Maple ✓ Mathematica ✓
ODE 175	$xy'(x) + y(x)(1 - xy(x)) = 0$ [[_homogeneous, `class G`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 176	$xy'(x) = y(x)(1 - xy(x))$ [[_homogeneous, `class D`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 177	$xy'(x) = y(x)(xy(x) + 1)$ [[_homogeneous, `class D`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 178	$xy'(x) = ax^3y(x)(1 - xy(x))$ [_Bernoulli] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 179	$xy'(x) = x^3 + (2x^2 + 1)\, y(x) + xy(x)^2$ [[_homogeneous, `class D`], _rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 180	$xy'(x) = y(x)(2xy(x)+1)$ [[_homogeneous, `class D`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 181	$y(x)(axy(x)+2)+bx+xy'(x)=0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`], _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 182	$a0+a1x+y(x)(a2+a3xy(x))+xy'(x)=0$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 183	$ax^2y(x)^2+xy'(x)+2y(x)=b$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 184	$\frac{1}{2}(n-m)y(x)+x^m+x^ny(x)^2+xy'(x)=0$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 185	$y(x)\left(a+bx^ny(x)\right)+xy'(x)=0$ [[_homogeneous, `class G`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 186	$xy'(x) = ax^m - by(x) - cx^n y(x)^2$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 187	$xy'(x) = ax^n(x - y(x))^2 - y(x) + 2x$ [[_1st_order, _with_linear_symmetries], _rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 188	$y(x)(1 - ay(x)\log(x)) + xy'(x) = 0$ [_Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 189	$xy'(x) = f(x)\left(x^2 - y(x)^2\right) + y(x)$ [[_homogeneous, `class D`], _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 190	$xy'(x) = y(x)\left(y(x)^2 + 1\right)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 191	$xy'(x) + y(x)\left(1 - xy(x)^2\right) = 0$ [[_homogeneous, `class G`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 192	$xy'(x)+y(x)=a\left(x^2+1\right)y(x)^3$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 193	$xy'(x)=ay(x)+b\left(x^2+1\right)y(x)^3$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 194	$xy'(x)+2y(x)=ax^{2k}y(x)^k$ [[_homogeneous, `class G`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 195	$xy'(x)=4\left(y(x)-\sqrt{y(x)}\right)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 196	$xy'(x)+2y(x)=\sqrt{y(x)^2+1}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 197	$xy'(x)=\sqrt{x^2+y(x)^2}+y(x)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 198	$xy'(x) = \sqrt{x^2 - y(x)^2} + y(x)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 199	$xy'(x) = x\sqrt{x^2 + y(x)^2} + y(x)$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Homogeneous equation, $xy'(x) = xf(x)g(u) + y(x)$ Maple ✓ Mathematica ✓
ODE 200	$xy'(x) = y(x) - x(x - y(x))\sqrt{x^2 + y(x)^2}$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Homogeneous equation, $xy'(x) = xf(x)g(u) + y(x)$ Maple ✓ Mathematica ✓
ODE 201	$xy'(x) = a\sqrt{b^2x^2 + y(x)^2} + y(x)$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 202	$\cos(y(x))\left(\sin(y(x)) - 3x^2\cos(y(x))\right) + xy'(x) = 0$ [`y=_G(x,y')`] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 203	$xy'(x) - y(x) + x\cos\left(\frac{y(x)}{x}\right) + x = 0$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓

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#	result
ODE 204	$xy'(x) = y(x) - x\cos^2\left(\frac{y(x)}{x}\right)$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 205	$xy'(x) = \left(1 - 2x^2\right)\cot^2(y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 206	$xy'(x) = y(x) - \cot^2(y(x))$ [_separable] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 207	$xy'(x) + y(x) + 2x\sec(xy(x)) = 0$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 208	$xy'(x) - y(x) + x\sec\left(\frac{y(x)}{x}\right) = 0$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓

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#	result
ODE 209	$xy'(x) = y(x) + x \sec^2\left(\frac{y(x)}{x}\right)$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 210	$xy'(x) = \sin(x - y(x))$ [`y=_G(x,y')`] Solution method Change of Variable, new dependent variable Maple ✗ Mathematica ✗
ODE 211	$xy'(x) = y(x) + x \sin\left(\frac{y(x)}{x}\right)$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 212	$xy'(x) + \tan(y(x)) = 0$ [_separable] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 213	$xy'(x) + \tan(y(x) + x) + x = 0$ [[_1st_order, _with_linear_symmetries]] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 214	$xy'(x) = y(x) - x \tan\left(\frac{y(x)}{x}\right)$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 215	$xy'(x) = \left(y(x)^2 + 1\right)\left(x^2 + \tan^{-1}(y(x))\right)$ [`y=_G(x,y')`] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 216	$xy'(x) = xe^{\frac{y(x)}{x}} + y(x)$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 217	$xy'(x) = xe^{\frac{y(x)}{x}} + y(x) + x$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 218	$xy'(x) = y(x)\log(y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 219	$xy'(x) = y(x)(-\log(y(x)) + \log(x) + 1)$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 220	$xy'(x) + y(x)(-\log(y(x)) - \log(x) + 1) = 0$ [[_homogeneous, `class G`]] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 221	$xy'(x) = y(x) - 2x \tanh\left(\frac{y(x)}{x}\right)$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 222	$ny(x) + xy'(x) = f(x)g(x^n y(x))$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 223	$xy'(x) = y(x)f(x^m y(x)^n)$ [[_homogeneous, `class G`]] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 224	$(x+1)y'(x) = (3x+4)x^3 + y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 225	$(x+1)y'(x) = 2y(x) + (x+1)^4$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 226	$(x+1)y'(x) = ny(x) + e^x(x+1)^{n+1}$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 227	$(x+1)y'(x) = ay(x) + bxy(x)^2$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 228	$(x+1)y'(x) + (x+1)^4y(x)^3 + y(x) = 0$ [[_1st_order, _with_linear_symmetries], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 229	$(x+1)y'(x) = y(x)\left(1 - xy(x)^3\right)$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 230	$(x+1)y'(x) = (x+1)\sqrt{y(x)+1} + y(x) + 1$ [[_1st_order, _with_linear_symmetries]] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 231	$(a+x)y'(x)=bx$ [_quadrature] Solution method Separable ODE, Dependent variable missing Maple ✓ Mathematica ✓
ODE 232	$(a+x)y'(x)=bx+y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 233	$(a+x)y'(x)+bx^2+y(x)=0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 234	$(a+x)y'(x)=2(a+x)^5+3y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 235	$(a+x)y'(x)=b+cy(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 236	$(a+x)y'(x)=bx+cy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 237	$(a+x)y'(x) = y(x)(1-ay(x))$ [_separable] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 238	$(a-x)y'(x) = y(x)^3(b+cx)+y(x)$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 239	$2xy'(x) = 2x^3 - y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 240	$2xy'(x)+1 = y(x)^2+4ixy(x)$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 241	$2xy'(x) = y(x)\left(y(x)^2+1\right)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 242	$2xy'(x)+y(x)\left(y(x)^2+1\right) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 243	$2xy'(x) = y(x)\left(-6y(x)^2 + x + 1\right)$ [_rational , _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 244	$\sqrt{a^2 - 4b - 4cy(x)} + a + 2xy'(x) + 4y(x) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 245	$(1 - 2x)y'(x) = 2(-3y(x) + 16x + 8)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 246	$(2x + 1)y'(x) = 4e^{-y(x)} - 2$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 247	$2(1 - x)y'(x) = y(x) + 4\sqrt{1 - x}x$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 248	$2(x + 1)y'(x) + (x + 1)^4 y(x)^3 + 2y(x) = 0$ [[_1st_order , _with_linear_symmetries] , _rational , _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 249	$3xy'(x) = 3x^{2/3} + (1 - 3y(x))y(x)$ [_rational, _Riccati] Solution method Riccati ODE, Special cases Maple ✓ Mathematica ✓
ODE 250	$3xy'(x) = y(x)\left(xy(x)^3 + 2\right)$ [[_homogeneous, `class G`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 251	$3xy'(x) = y(x)\left(3xy(x)^3 \log(x) + 1\right)$ [_Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 252	$x^2y'(x) = a - y(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 253	$x^2y'(x) = a + bx + cx^2 + xy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 254	$x^2y'(x) = a + bx + cx^2 - xy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 255	$x^2y'(x)+(1-2x)y(x)=x^2$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 256	$x^2y'(x)=a+bxy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 257	$x^2y'(x)=y(x)(a+bx)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 258	$x^2y'(x)+(x+2)xy(x)=\left(1-e^{-2x}\right)x-2$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 259	$x^2y'(x)+2(1-x)xy(x)=e^x(2e^x-1)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 260	$x^2y'(x)+x^2+xy(x)+y(x)^2=0$ [[_homogeneous, `class A`], _rational, _Riccati] Solution method Homogeneous equation Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 261	$x^2y'(x) = (-y(x)+2x+1)^2$ [[_homogeneous, `class C`], _rational, _Riccati] Solution method Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 262	$x^2y'(x) = a+by(x)^2$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 263	$x^2y'(x) = y(x)(ay(x)+x)$ [[_homogeneous, `class A`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 264	$x^2y'(x) = y(x)(ax+by(x))$ [[_homogeneous, `class A`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 265	$ax^2+bxy(x)+cy(x)^2+x^2y'(x) = 0$ [[_homogeneous, `class A`], _rational, _Riccati] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 266	$x^2y'(x) = a+bx^n+x^2y(x)^2$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 267	$x^2y'(x)+xy(x)(xy(x)+4)+2=0$ [[_homogeneous, `class G`], _rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 268	$ax(1-xy(x))+x^2y'(x)+x^2\left(-y(x)^2\right)+2=0$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 269	$x^2y'(x)=a+bx^2y(x)^2$ [[_homogeneous, `class G`], _rational, [_Riccati, _special]] Solution method Riccati ODE, Main form Maple ✓ Mathematica ✓
ODE 270	$x^2y'(x)=a+bx^n+cx^2y(x)^2$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 271	$x^2y'(x)=a+bxy(x)+cx^2y(x)^2$ [[_homogeneous, `class G`], _rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 272	$x^2y'(x)=a+bxy(x)+cx^4y(x)^2$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 273	$x^2y'(x)+y(x)\left(x^2+y(x)^2-x\right)=0$ [[_homogeneous, `class D`], _rational, _Bernoulli] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 274	$x^2y'(x)=2y(x)\left(x-y(x)^2\right)$ [[_homogeneous, `class G`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 275	$x^2y'(x)=ax^2y(x)^2-ay(x)^3$ [_rational, _Abel] Solution method Abel ODE, Second kind Maple ✓ Mathematica ✓
ODE 276	$ay(x)^2+bx^2y(x)^3+x^2y'(x)=0$ [_rational, _Abel] Solution method Abel ODE, Second kind Maple ✓ Mathematica ✓
ODE 277	$x^2y'(x)=y(x)\left(ax+by(x)^3\right)$ [[_homogeneous, `class G`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 278	$x^2y'(x)+xy(x)+\sqrt{y(x)}=0$ [[_homogeneous, `class G`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 279	$x^2 y'(x) = 3x \tan(y(x)) + \sec(y(x))$ [`y=_G(x,y')`] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 280	$(1-x^2)\, y'(x) = -x^2 + y(x) + 1$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 281	$(1-x^2)\, y'(x) + 1 = xy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 282	$(1-x^2)\, y'(x) = 5 - xy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 283	$a + (x^2+1)\, y'(x) + xy(x) = 0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 284	$a + (x^2+1)\, y'(x) - xy(x) = 0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 285	$a + \left(1 - x^2\right) y'(x) - xy(x) = 0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 286	$\left(1 - x^2\right) y'(x) + xy(x) - x = 0$ [_separable] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 287	$\left(1 - x^2\right) y'(x) - x^2 + xy(x) = 0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 288	$\left(1 - x^2\right) y'(x) + x^2 + xy(x) = 0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 289	$\left(x^2 + 1\right) y'(x) = x\left(x^2 + 1\right) - xy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 290	$\left(x^2 + 1\right) y'(x) = x\left(3x^2 - y(x)\right)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 291	$\left(1-x^2\right) y'(x)+2xy(x)=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 292	$\left(x^2+1\right) y'(x)=2x(x-y(x))$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 293	$\left(x^2+1\right) y'(x)=2x\left(x^2+1\right)^2+2xy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 294	$\left(1-x^2\right) y'(x)+\cos(x)=2xy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 295	$\left(x^2+1\right) y'(x)=\tan(x)-2xy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 296	$\left(1-x^2\right) y'(x)=a+4xy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 297	$(x^2+1)\,y'(x) = y(x)(a+2bx)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 298	$(x^2+1)\,y'(x) = y(x)^2+1$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 299	$(1-x^2)\,y'(x) = 1-y(x)^2$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 300	$(1-x^2)\,y'(x) = 1-(2x-y(x))y(x)$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`], _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 301	$(1-x^2)\,y'(x) = n(y(x)^2-2xy(x)+1)$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 302	$(x^2+1)\,y'(x)+x(1-y(x))y(x) = 0$ [_separable] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 303	$(1-x^2)\,y'(x) = xy(x)(ay(x)+1)$ [_separable] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 304	$(x^2+1)\,y'(x) = y(x)^2 - 2x\left(y(x)^2+1\right)y(x) + 1$ [_rational, _Abel] Solution method Abel ODE, Second kind Maple ✓ Mathematica ✓
ODE 305	$(x^2+1)\,y'(x) + x\sin(y(x))\cos(y(x)) = x\left(x^2+1\right)\cos^2(y(x))$ [`y=_G(x,y')`] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 306	$(x^2+1)\,y'(x) = x^2 - y(x)\cot^{-1}(x) + 1$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✗
ODE 307	$(4-x^2)\,y'(x) + 4y(x) = (x+2)y(x)^2$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 308	$(a^2+x^2)\,y'(x) = b + xy(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 309	$\left(a^2+x^2\right) y'(x) = \left(\sqrt{a^2+x^2}+x\right)(b+y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 310	$\left(a^2+x^2\right) y'(x) + (x-y(x))y(x) = 0$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 311	$\left(a^2+x^2\right) y'(x) = a^2 - 2y(x)^2 + 3xy(x)$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 312	$\left(a^2+x^2\right) y'(x) + bxy(x)^2 + xy(x) = 0$ [_separable] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 313	$(1-x)xy'(x) = a + (x+1)y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 314	$(1-x)xy'(x) = 2(xy(x)+1)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 315	$(1-x)xy'(x)=2(xy(x)-1)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 316	$x(x+1)y'(x)=(1-2x)y(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 317	$(1-x)xy'(x)+(2x+1)y(x)=a$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 318	$(1-x)xy'(x)=a+2(2-x)y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 319	$(1-x)xy'(x)-3xy(x)+y(x)+2=0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 320	$x(x+1)y'(x)=\left(x^2+x-1\right)y(x)+(x+1)\left(x^2-1\right)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 321	$x^2 + (x-3)(x-2)y'(x) + 3xy(x) - 8y(x) = 0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 322	$x(a+x)y'(x) = y(x)(b+cy(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 323	$(a+x)^2y'(x) = 2(a+x)(b+y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 324	$k(-a+y(x)+x)^2 + (x-a)^2y'(x) + y(x)^2 = 0$ [[_homogeneous, `class C`], _rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 325	$(x-a)(x-b)y'(x) + ky(x) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 326	$(x-a)(x-b)y'(x) = y(x)(-a-b+2x) + (x-a)(x-b)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 327	$(x-a)(x-b)y'(x)=cy(x)^2$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 328	$k(y(x)-a)(y(x)-b)+(x-a)(x-b)y'(x)=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 329	$k(-a+y(x)+x)(-b+y(x)+x)+(x-a)(x-b)y'(x)+y(x)^2=0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`], _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 330	$2x^2y'(x)=y(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 331	$2x^2y'(x)+2x^2y(x)\cot(x)+x\cot(x)-1=0$ [_linear] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 332	$2x^2y'(x)+x^2\left(-y(x)^2\right)+2xy(x)+1=0$ [[_homogeneous, `class G`], _rational, _Riccati] Solution method Homogeneous equation, isobaric equation Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 333	$2x^2y'(x) = \left(x^2 - y(x)^2\right)(1 - x\cot(x)) + 2xy(x)$ [[_homogeneous, `class D`], _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 334	$2\left(1 - x^2\right)y'(x) = \sqrt{1 - x^2} + (x + 1)y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 335	$(1 - 2x)xy'(x) + (1 - 4x)y(x) + 1 = 0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 336	$(1 - 2x)xy'(x) = y(x)^2 - (4x + 1)y(x) + 4x$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`], _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 337	$2(1 - x)xy'(x) + (1 - 2x)y(x) + x = 0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 338	$2(1 - x)xy'(x) + (1 - x)y(x)^2 + x = 0$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 339	$2\left(x^2+x+1\right)y'(x)=8x^2-(2x+1)y(x)+1$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 340	$4\left(x^2+1\right)y'(x)-x^2-4xy(x)=0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 341	$ax^2y'(x)=axy(x)+b^2y(x)^2+x^2$ [[_homogeneous, `class A`], _rational, _Riccati] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 342	$\left(a+bx^2\right)y'(x)=A+By(x)^2$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 343	$\left(a+bx^2\right)y'(x)=cxy(x)\log(y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 344	$x(ax+1)y'(x)+a-y(x)=0$ [_separable] Solution method Linear ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 345	$(a+bx)^2 y'(x) + y(x)^3 (a+bx) + cy(x)^2 = 0$ [_rational, _Abel] Solution method Abel ODE, Second kind Maple ✓ Mathematica ✓
ODE 346	$x^3 y'(x) = a + bx^2 y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 347	$x^3 y'(x) = x^2 y(x) - x^2 + 3$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 348	$x^3 y'(x) = x^4 + y(x)^2$ [[_homogeneous, `class G`], _rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 349	$x^3 y'(x) = y(x) \left(x^2 + y(x)\right)$ [[_homogeneous, `class D`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 350	$x^3 y'(x) = x^2 (y(x) - 1) + y(x)^2$ [[_homogeneous, `class D`], _rational, _Riccati] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓

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#	result
ODE 351	$x^3y'(x) = (x+1)y(x)^2$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 352	$x^3y'(x) + x^2y(x)\left(1 - x^2y(x)\right) + 20 = 0$ [[_homogeneous, `class G`], _rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 353	$x^6\left(-y(x)^2\right) + x^3y'(x) + (3-2x)x^2y(x) + 3 = 0$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 354	$x^3y'(x) = y(x)\left(2x^2 + y(x)^2\right)$ [[_homogeneous, `class A`], _rational, _Bernoulli] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 355	$x^3y'(x) = \cos(y(x))\left(\cos(y(x)) - 2x^2\sin(y(x))\right)$ [`y=_G(x,y')`] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 356	$x\left(x^2+1\right)y'(x) = ax^2 + y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

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#	result
ODE 357	$x\left(1-x^2\right)y'(x)=ax^2+y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 358	$x\left(x^2+1\right)y'(x)=ax^3+y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 359	$x\left(x^2+1\right)y'(x)=a-x^2y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 360	$x\left(x^2+1\right)y'(x)=\left(1-x^2\right)y(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 361	$x\left(1-x^2\right)y'(x)=\left(x^2-x+1\right)y(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 362	$x\left(1-x^2\right)y'(x)=ax^3+\left(1-2x^2\right)y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

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#	result
ODE 363	$x\left(1-x^2\right)y'(x)=\left(1-2x^2\right)y(x)+\left(1-x^2\right)x^3$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 364	$x\left(x^2+1\right)y'(x)=2\left(1-2x^2y(x)\right)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 365	$x\left(x^2+1\right)y'(x)=x-\left(5x^2+3\right)y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 366	$\left(1-x^2\right)xy'(x)+\left(1-x^2\right)y(x)^2+x^2=0$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 367	$(1-x)x^2y'(x)=(2-x)xy(x)-y(x)^2$ [[_homogeneous, `class D`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 368	$2x^3y'(x)=y(x)\left(x^2-y(x)^2\right)$ [[_homogeneous, `class A`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 369	$2x^3y'(x) = y(x)\left(ay(x)^2 + 3x^2\right)$ [[_homogeneous, `class A`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 370	$6x^3y'(x) = 4x^2y(x) + (1-3x)y(x)^4$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 371	$xy'(x)\left(a+bx+cx^2\right) - y(x)\left(a+bx+cx^2\right) + x^2 = y(x)^2$ [[_homogeneous, `class D`], _rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 372	$x^4y'(x) = y(x)\left(x^3 + y(x)\right)$ [[_homogeneous, `class D`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 373	$a^2 + x^4y'(x) + x^4y(x)^2 = 0$ [_rational, [_Riccati, _special]] Solution method Riccati ODE, Main form Maple ✓ Mathematica ✓
ODE 374	$x^4y'(x) + x^3y(x) + \csc(xy(x)) = 0$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓

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#	result
ODE 375	$(1-x^4)\,y'(x) = 2x(1-y(x)^2)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 376	$x(1-x^3)\,y'(x) = 2x - (1-4x^3)\,y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 377	$x(1-x^3)\,y'(x) = x^2 + y(x)(1-2xy(x))$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 378	$x^2(1-x^2)\,y'(x) = y(x)\,(x-3x^3y(x))$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 379	$x(1-2x^3)\,y'(x) = 2(1-x^3)\,y(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 380	$(y'(x)+y(x)^2)\,(a+bx+cx^2)^2 + A = 0$ [_rational, _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓

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#	result
ODE 381	$x^5 y'(x) = 1 - 3x^4 y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 382	$x\left(1-x^4\right) y'(x) = \left(1-x^4\right) y(x) + 2x\left(x^2 - y(x)^2\right)$ [[_homogeneous, `class D`], _rational, _Riccati] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 383	$x^7 y'(x) + 5x^3 y(x)^2 + 2\left(x^2+1\right) y(x)^3 = 0$ [_rational, _Abel] Solution method Abel ODE, First kind Maple ✓ Mathematica ✓
ODE 384	$x^n y'(x) = a + bx^{n-1} y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 385	$x^n y'(x) = x^{2n-1} - y(x)^2$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 386	$y(x)\left(x^{n-1} + y(x)\right) + x^n y'(x) + x^2 = 0$ [_Riccati] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓

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#	result
ODE 387	$(1-n)x^{n-1}+x^{2n-2}+x^n y'(x)+y(x)^2=0$ [_Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✗
ODE 388	$x^n y'(x)=a^2x^{2n-2}+b^2y(x)^2$ [[_homogeneous, `class G`], _Riccati] Solution method Riccati ODE, Generalized ODE Maple ✓ Mathematica ✓
ODE 389	$x^n y'(x)=x^{n-1}\left(ax^{2n}-by(x)^2+ny(x)\right)$ [_rational, _Riccati] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 390	$x^{2n}y'(x)=-nx^{n-1}+x^n y(x)\left(x^{2n}y(x)^2-3x^n y(x)+1\right)+1$ [_Abel] Solution method Abel ODE, First kind Maple ✓ Mathematica ✓
ODE 391	$x^k y'(x)=ax^m+by(x)^n$ [_Chini] Solution method Change of Variable, new dependent variable Maple ✗ Mathematica ✗
ODE 392	$\sqrt{x^2+1}y'(x)=2x-y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓

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#	result
ODE 393	$\sqrt{1-x^2}y'(x) = y(x)^2+1$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 394	$\left(x-\sqrt{x^2+1}\right)y'(x) = y(x)+\sqrt{y(x)^2+1}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 395	$\sqrt{a^2+x^2}y'(x)+y(x)+x = \sqrt{a^2+x^2}$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 396	$\sqrt{b^2+x^2}y'(x) = \sqrt{a^2+y(x)^2}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 397	$\sqrt{b^2-x^2}y'(x) = \sqrt{a^2-y(x)^2}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 398	$x\sqrt{a^2+x^2}y'(x) = y(x)\sqrt{b^2+y(x)^2}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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#	result
ODE 399	$x\sqrt{x^2-a^2}y'(x)=y(x)\sqrt{y(x)^2-b^2}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 400	$\sqrt{X}y'(x)+\sqrt{Y}=0$ [_quadrature] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 401	$\sqrt{X}y'(x)=\sqrt{Y}$ [_quadrature] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 402	$x^{3/2}y'(x)=a+bx^{3/2}y(x)^2$ [_rational, [_Riccati, _special]] Solution method Abel ODE, First kind Maple ✓ Mathematica ✓
ODE 403	$\sqrt{x^3+1}y'(x)=\sqrt{y(x)^3+1}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 404	$\sqrt{(1-x)x(1-ax)}y'(x)=\sqrt{(1-y(x))y(x)(1-ay(x))}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 405	$\sqrt{1-x^4}y'(x) = \sqrt{1-y(x)^4}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 406	$\sqrt{x^4+x^2+1}y'(x) = \sqrt{y(x)^4+y(x)^2+1}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 407	$\sqrt{X}y'(x) = 0$ [_quadrature] Solution method Separable ODE, Dependent variable missing Maple ✓ Mathematica ✓
ODE 408	$\sqrt{X}y'(x) + \sqrt{Y} = 0$ [_quadrature] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 409	$\sqrt{X}y'(x) = \sqrt{Y}$ [_quadrature] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 410	$\left(x^3+1\right)^{2/3}y'(x) + \left(y(x)^3+1\right)^{2/3} = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 411	$\left(\mathrm{a0}+\mathrm{a1}x+4x^3\right)^{2/3}y'(x)+\left(\mathrm{a0}+\mathrm{a1}y(x)+4y(x)^3\right)^{2/3}=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 412	$X^{2/3}y'(x)=Y^{2/3}$ [_quadrature] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 413	$\left(a+\cos^2\left(\frac{x}{2}\right)\right)y'(x)=y(x)\tan\left(\frac{x}{2}\right)\left(a-y(x)+\cos^2\left(\frac{x}{2}\right)+1\right)$ [_Bernoulli] Solution method Change of Variable, Two new variables Maple ✓ Mathematica ✓
ODE 414	$\left(1-4\cos^2(x)\right)y'(x)=y(x)\left(4\cos^2(x)+1\right)\tan(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 415	$(1-\sin(x))y'(x)+y(x)\cos(x)=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 416	$y'(x)(\cos(x)-\sin(x))+y(x)(\sin(x)+\cos(x))=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 417	$y'(x)\left(\mathrm{a0}+\mathrm{a1}\sin^2(x)\right)+\mathrm{a2}x\left(\mathrm{a1}\sin^2(x)+\mathrm{a3}\right)+\mathrm{a1}y(x)\sin(2x)=0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 418	$(x-e^x)\,y'(x)+(1-e^x)\,y(x)+e^x x=0$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 419	$x\log(x)y'(x)=ax(\log(x)+1)-y(x)$ [_linear] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 420	$y(x)y'(x)+x=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 421	$e^{x^2}x+y(x)y'(x)=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 422	$x^3+y(x)y'(x)+y(x)=0$ [_rational, [_Abel, `2nd type`, `class A`]] Solution method Abel ODE, Second kind Maple ✗ Mathematica ✗

Continued on next page

Table 3 – continued from previous page

#	result
ODE 423	$ax + by(x) + y(x)y'(x) = 0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 424	$y(x)y'(x) + e^{-x}x(y(x) + 1) = 0$ [_separable] Solution method Linear ODE Maple ✓ Mathematica ✓
ODE 425	$f(x) + y(x)y'(x) = g(x)y(x)$ [[_Abel, `2nd type`, `class A`]] Solution method Exact equation, integrating factor Maple ✗ Mathematica ✗
ODE 426	$y(x)y'(x) + y(x)^2 + 4x(x + 1) = 0$ [[_homogeneous, `class D`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 427	$y(x)y'(x) = ax + by(x)^2$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 428	$y(x)y'(x) = ay(x)^2 + b\cos(c + x)$ [_Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 429	$y(x)y'(x) = \mathrm{a0} + \mathrm{a1}y(x) + \mathrm{a2}y(x)^2$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 430	$y(x)y'(x) = ax + bxy(x)^2$ [_separable] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 431	$y(x)y'(x) = \csc^2(x) - y(x)^2\cot(x)$ [_Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 432	$y(x)y'(x) = \sqrt{a^2 + y(x)^2}$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 433	$y(x)y'(x) = \sqrt{y(x)^2 - a^2}$ [_quadrature] Solution method Separable ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 434	$g(x)f\left(x^2 + y(x)^2\right) + y(x)y'(x) + x = 0$ [NONE] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 435	$(y(x)+1)y'(x)=y(x)+x$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 436	$(y(x)+1)y'(x)=x^2(1-y(x))$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 437	$(y(x)+x)y'(x)+y(x)=0$ [[_homogeneous, `class A`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 438	$(x-y(x))y'(x)=y(x)$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 439	$(y(x)+x)y'(x)-y(x)+x=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 440	$(y(x)+x)y'(x)=x-y(x)$ [[_homogeneous, `class A`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Homogeneous equation Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 441	$1-y'(x)=y(x)+x$ [[_linear, `class A`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 442	$(x-y(x))y'(x)=y(x)(2xy(x)+1)$ [[_homogeneous, `class D`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 443	$(y(x)+x)y'(x)+\tan(y(x))=0$ [[_1st_order, `_with_symmetry_[F(x)*G(y),0]`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 444	$(x-y(x))y'(x)=\left(e^{-\frac{x}{y(x)}}+1\right)y(x)$ [[_homogeneous, `class A`], _dAlembert] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 445	$(y(x)+x+1)y'(x)+3y(x)+4x+1=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 446	$(y(x)+x+2)y'(x)=-y(x)-x+1$ [[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 447	$(-y(x)-x+3)y'(x)=-3y(x)+x+1$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 448	$(y(x)-x+3)y'(x)=3y(x)-4x+11$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 449	$(y(x)+2x)y'(x)-2y(x)+x=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 450	$(-y(x)+2x+2)y'(x)+3(-y(x)+2x+1)=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓

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#	result
ODE 451	$(-y(x)+2x+3)y'(x)+2=0$ [[_homogeneous, `class C`], [_Abel, `2nd type`, `class C`], _dAlembert Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 452	$(-y(x)+2x+4)y'(x)-2y(x)+x+5=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 453	$(-y(x)-2x+5)y'(x)-2y(x)-x+4=0$ [[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 454	$(y(x)-3x+1)y'(x)=2(x-y(x))$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 455	$(y(x)-3x+2)y'(x)-3y(x)-2x+5=0$ [[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓

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#	result
ODE 456	$(4x - y(x))y'(x) - 5y(x) + 2x = 0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 457	$(-y(x) - 4x + 6)y'(x) = 2x - y(x)$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 458	$(-y(x) + 5x + 1)y'(x) - 5y(x) + x + 5 = 0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 459	$y'(x)(a + bx + y(x)) + a - bx - y(x) = 0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 460	$\left(x^2 - y(x)\right) y'(x) + x = 0$ [_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`], [_Abel, `2nd` Solution method Change of Variable, new independent variable Maple ✓ Mathematica ✓

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#	result
ODE 461	$\left(x^2 - y(x)\right) y'(x) = 4xy(x)$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 462	$y'(x)(y(x) - \cot(x)\csc(x)) + y(x)\csc(x)(y(x)\cos(x) + 1) = 0$ [[_Abel, `2nd type`, `class A`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 463	$x^2 + 2y(x)y'(x) + y(x)^2 + 2x = 0$ [[_homogeneous, `class D`], _rational, _Bernoulli] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 464	$2y(x)y'(x) = x^3 + xy(x)^2$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 465	$(x - 2y(x))y'(x) = y(x)$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 466	$(2y(x) + x)y'(x) - y(x) + 2x = 0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓

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#	result
ODE 467	$(x-2y(x))y'(x)+y(x)+2x=0$ [[_homogeneous, `class A`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Exact equation Maple ✓ Mathematica ✓
ODE 468	$(-2y(x)+x+1)y'(x)=-y(x)+2x+1$ [[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Exact equation Maple ✓ Mathematica ✓
ODE 469	$(2y(x)+x+1)y'(x)-2y(x)-x+1=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 470	$(2y(x)+x+1)y'(x)-4y(x)+x+7=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 471	$x^2+2(y(x)+x)y'(x)+2y(x)=0$ [_exact, _rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`], [_Abe Solution method Exact equation Maple ✓ Mathematica ✓

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#	result
ODE 472	$(-2y(x)+2x+3)y'(x)=-2y(x)+6x+1$ [[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 473	$(-2y(x)-4x+1)y'(x)+y(x)+2x=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 474	$(6x-2y(x))y'(x)=-y(x)+3x+2$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 475	$(2y(x)+9x+19)y'(x)-6y(x)-2x+18=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 476	$\left(x^3+2y(x)\right)y'(x)=3x(2-xy(x))$ [_exact, _rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`], [_Abe Solution method Exact equation Maple ✓ Mathematica ✓

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#	result
ODE 477	$y'(x)(\tan(x)\sec(x)-2y(x))+\sec(x)(2y(x)\sin(x)+1)=0$ [[_Abel, `2nd type`, `class A`]] Solution method Exact equation, integrating factor Maple ✗ Mathematica ✗
ODE 478	$(e^{-x}x-2y(x))\,y'(x)=2e^{-2x}x-(-2y(x)+e^{-x}x+e^{-x})\,y(x)$ [[_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 479	$3y(x)y'(x)+5\cot(x)\cos^2(y(x))\cot(y(x))=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 480	$3(2-y(x))y'(x)+xy(x)=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 481	$(x-3y(x))y'(x)-y(x)+3x+4=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 482	$(-3y(x)-x+4)y'(x)-3y(x)-x+3=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 483	$(3y(x)+2x+2)y'(x)=-3y(x)-2x+1$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 484	$(-3y(x)-2x+5)y'(x)-3y(x)-2x+1=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 485	$(-3y(x)+9x+1)y'(x)-y(x)+3x+2=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 486	$(4y(x)+x)y'(x)-y(x)+4x=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 487	$(4y(x)+2x+3)y'(x)=2y(x)+x+1$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 488	$(-4y(x)+2x+5)y'(x)=-2y(x)+x+3$ [[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 489	$(-4y(x)+3x+5)y'(x)=-3y(x)+7x+2$ [[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 490	$4(-y(x)-x+1)y'(x)-x+2=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class C`], Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 491	$(-4y(x)-11x+11)y'(x)=-25y(x)-8x+62$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓

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#	result
ODE 492	$(5y(x)+3x+6)y'(x)=7y(x)+x+2$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 493	$(5y(x)+7x)y'(x)+8y(x)+10x=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 494	$\left(4x^3+5y(x)+x\right)y'(x)+7x^3+3x^2y(x)+4y(x)=0$ [_rational, [_Abel, `2nd type`, `class A`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 495	$(6y(x)-x+5)y'(x)=4y(x)-x+3$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 496	$3(2y(x)+x)y'(x)=-2y(x)-x+1$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓

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#	result
ODE 497	$(7y(x)-3x+3)y'(x)+3y(x)-7x+7=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 498	$(9y(x)+x+1)y'(x)+5y(x)+x+1=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 499	$(-12y(x)+5x+8)y'(x)=-5y(x)+2x+3$ [[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 500	$(-16y(x)+7x+140)y'(x)+y(x)+8x+25=0$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 501	$(21y(x)+9x+3)y'(x)=-5y(x)+7x+45$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 502	$y'(x)(ax+by(x))+x=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class C`], Solution method Change of Variable, new independent variable Maple ✓ Mathematica ✓
ODE 503	$y'(x)(ax+by(x))+y(x)=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Change of Variable, new independent variable Maple ✓ Mathematica ✓
ODE 504	$y'(x)(ax+by(x))+ay(x)+bx=0$ [[_homogeneous, `class A`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Exact equation Maple ✓ Mathematica ✓
ODE 505	$y'(x)(ax+by(x))=ay(x)+bx$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 506	$\mathrm{a1}+y'(x)(\mathrm{a2}+bx+\mathrm{c2}y(x))+by(x)+\mathrm{b1}x=0$ [[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓

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#	result
ODE 507	$y'(x)(\mathrm{a2}+\mathrm{b2}y(x)+\mathrm{c2}y(x))=\mathrm{a1}+\mathrm{b1}x+\mathrm{c1}y(x)$ [[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 508	$xy(x)y'(x)+y(x)^2+1=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 509	$xy(x)y'(x)=y(x)^2+x$ [[_homogeneous, `class D`], _rational, _Bernoulli] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 510	$x^2+xy(x)y'(x)+y(x)^2=0$ [[_homogeneous, `class A`], _rational, _Bernoulli] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 511	$x^4+xy(x)y'(x)-y(x)^2=0$ [[_homogeneous, `class D`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 512	$xy(x)y'(x)=ax^3\cos(x)+y(x)^2$ [[_homogeneous, `class D`], _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 513	$xy(x)y'(x) = x^2 - xy(x) + y(x)^2$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 514	$2x^2 + xy(x)y'(x) - 2xy(x) - y(x)^2 = 0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 515	$xy(x)y'(x) = a + by(x)^2$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 516	$xy(x)y'(x) = ax^n + by(x)^2$ [[_homogeneous, `class G`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 517	$xy(x)y'(x) = (x^2 + 1)(1 - y(x)^2)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 518	$x^2 \cot^{-1}\left(\frac{y(x)}{x}\right) + xy(x)y'(x) - y(x)^2 = 0$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 519	$x^2 e^{-\frac{2y(x)}{x}} + xy(x)y'(x) - y(x)^2 = 0$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 520	$(xy(x)+1)y'(x) + y(x)^2 = 0$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 521	$x(y(x)+1)y'(x) - (1-x)y(x) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 522	$x(1-y(x))y'(x) + (x+1)y(x) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 523	$x(1-y(x))y'(x) + (1-x)y(x) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 524	$ax + x(y(x)+2)y'(x) = 0$ [_quadrature] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 525	$(x(-y(x))+3x+2)y'(x)+y(x)=0$ [_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`], [_Abel, `2nd Solution method Change of Variable, new independent variable Maple ✓ Mathematica ✓
ODE 526	$x(y(x)+4)y'(x)=y(x)^2+2y(x)+2x$ [_rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation, special Maple ✓ Mathematica ✓
ODE 527	$x(a+y(x))y'(x)+bx+cy(x)=0$ [_rational, [_Abel, `2nd type`, `class B`]] Solution method Change of Variable, new independent variable Maple ✗ Mathematica ✗
ODE 528	$x(a+y(x))y'(x)=y(x)(A+Bx)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 529	$x(y(x)+x)y'(x)+y(x)^2=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 530	$x(x-y(x))y'(x)+y(x)^2=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 531	$x(y(x)+x)y'(x)=x^2+y(x)^2$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 532	$2x^2+x(x-y(x))y'(x)+3xy(x)-y(x)^2=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 533	$x\sqrt{x^2-y(x)^2}+x(y(x)+x)y'(x)-y(x)(y(x)+x)=0$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 534	$(a+x(y(x)+x))y'(x)=by(x)(y(x)+x)$ [_rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation, special Maple ✗ Mathematica ✗
ODE 535	$x(y(x)+2x)y'(x)=x^2+xy(x)-y(x)^2$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 536	$4x^2+x(4x-y(x))y'(x)-6xy(x)-y(x)^2=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 537	$x\left(x^3+y(x)\right)y'(x)=\left(x^3-y(x)\right)y(x)$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 538	$x\left(2x^3+y(x)\right)y'(x)=\left(2x^3-y(x)\right)y(x)$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 539	$x\left(2x^3+y(x)\right)y'(x)=6y(x)^2$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Change of Variable, new independent variable Maple ✓ Mathematica ✓
ODE 540	$(1-x)y(x)y'(x)+x(1-y(x))=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 541	$(a+x)(b+x)y'(x)=xy(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 542	$-2x^3+2xy(x)y'(x)-y(x)^2+1=0$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 543	$a + 2xy(x)y'(x) + y(x)^2 = 0$ [_separable] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 544	$2xy(x)y'(x) = ax + y(x)^2$ [[_homogeneous, `class G`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 545	$x^2 + 2xy(x)y'(x) + y(x)^2 = 0$ [[_homogeneous, `class A`], _exact, _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 546	$2xy(x)y'(x) = x^2 + y(x)^2$ [[_homogeneous, `class A`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 547	$2xy(x)y'(x) = 4(2x + 1)x^2 + y(x)^2$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 548	$x^2(ax^3 + 1) + 2xy(x)y'(x) = 6y(x)^2$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 549	$3x^2+(2xy(x)-x+3)y'(x)+y(x)^2-y(x)=0$ [_exact, _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 550	$x(x-2y(x))y'(x)+y(x)^2=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 551	$x(2y(x)+x)y'(x)+(2x-y(x))y(x)=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 552	$x(x-2y(x))y'(x)+(2x-y(x))y(x)=0$ [[_homogeneous, `class A`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 553	$x(-2y(x)+x+1)y'(x)+y(x)(y(x)-2x+1)=0$ [_rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 554	$x(-2y(x)-x+1)y'(x)+y(x)(y(x)+2x+1)=0$ [_rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 555	$2x\left(2x^2+y(x)\right)y'(x)+y(x)\left(12x^2+y(x)\right)=0$ [[_homogeneous, `class G`], _exact, _rational, [_Abel, `2nd type`, `cl Solution method Exact equation Maple ✓ Mathematica ✓
ODE 556	$-3x^2+2(x+1)y(x)y'(x)+y(x)^2+2x=0$ [_exact, _rational, _Bernoulli] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 557	$x(3y(x)+2x)y'(x)=y(x)^2$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 558	$x(3y(x)+2x)y'(x)+3(y(x)+x)^2=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 559	$\left(x^2+6xy(x)+3\right)y'(x)+3y(x)^2+2xy(x)+2x=0$ [_exact, _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 560	$x^3+3x(2y(x)+x)y'(x)+3y(x)(y(x)+2x)=0$ [_exact, _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation Maple ✓ Mathematica ✓

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#	result
ODE 561	$axy(x)y'(x) = x^2 + y(x)^2$ [[_homogeneous, `class A`], _rational, _Bernoulli] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 562	$axy(x)y'(x) + x^2 - y(x)^2 = 0$ [[_homogeneous, `class A`], _rational, _Bernoulli] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 563	$xy'(x)(a + by(x)) = cy(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 564	$x(x - ay(x))y'(x) = y(x)(y(x) - ax)$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 565	$y'(x)(x(Ax + By(x)) + \text{a0} + \text{a1}x + \text{a2}y(x)) = y(x)(Ax + By(x)) + \text{b0} + \text{b1}x + \text{b2}y(x)$ [_rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation, Jacobi equation Maple ✓ Mathematica ✗

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#	result
ODE 566	$y'(x)(x(\mathrm{a1}+\mathrm{b2}x+\mathrm{c2}y(x))+\mathrm{a1}+\mathrm{b1}x+\mathrm{c1}y(x))=y(x)(\mathrm{a2}+\mathrm{b2}x+\mathrm{c2}y(x))+\mathrm{a3}+\mathrm{b3}x+\mathrm{c2}y(x)$ [_rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation, Jacobi equation Maple ✓ Mathematica ✗
ODE 567	$xy'(x)\left(ay(x)+x^n\right)+y(x)^2(b+cy(x))=0$ [_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`], [_Abel, `2nd Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 568	$\left(1-x^2y(x)\right)y'(x)-xy(x)^2+1=0$ [_exact, _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 569	$\left(1-x^2y(x)\right)y'(x)+xy(x)^2-1=0$ [_rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation, special Maple ✓ Mathematica ✓
ODE 570	$x(1-xy(x))y'(x)+y(x)(xy(x)+1)=0$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓

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#	result
ODE 571	$x(xy(x)+2)y'(x) = 2x^3 - xy(x)^2 - 2y(x) + 3$ [_exact, _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 572	$x(2-xy(x))y'(x) - x(xy(x)+1)y(x)^2 + 2y(x) = 0$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class C`]] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 573	$x(3-xy(x))y'(x) = y(x)(xy(x)-1)$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 574	$x^2(1-y(x))y'(x) + (1-x)y(x) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 575	$x^2(1-y(x))y'(x) + (x+1)y(x)^2 = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 576	$(x^2+1)\,y(x)y'(x) + x(1-y(x)^2) = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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#	result
ODE 577	$(1-x^2)\,y(x)y'(x)+2x^2+xy(x)^2=0$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 578	$2x^2y(x)y'(x)=x^2(2x+1)-y(x)^2$ [[_homogeneous, `class D`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 579	$x(1-2xy(x))y'(x)+y(x)(2xy(x)+1)=0$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Change of Variable, Two new variables Maple ✓ Mathematica ✓
ODE 580	$x(2xy(x)+1)y'(x)+y(x)(3xy(x)+2)=0$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Homogeneous equation, isobaric equation Maple ✓ Mathematica ✓
ODE 581	$y(x)\left(-x^2y(x)^2+2xy(x)+1\right)+x(2xy(x)+1)y'(x)=0$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class C`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 582	$x^2(x-2y(x))y'(x)=2x^3-4xy(x)^2+y(x)^3$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class C`]] Solution method Homogeneous equation Maple ✓ Mathematica ✓

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#	result
ODE 583	$2x(x+1)y(x)y'(x) = y(x)^2 + 1$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 584	$3x^2y(x)y'(x) + 2xy(x)^2 + 1 = 0$ [[_homogeneous, `class G`], _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 585	$x^2(4x - 3y(x))y'(x) = y(x)\left(6x^2 - 3xy(x) + 2y(x)^2\right)$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class C`], Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 586	$\left(1 - x^3y(x)\right)y'(x) = x^2y(x)^2$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 587	$a + 2x^3y(x)y'(x) + 3x^2y(x)^2 = 0$ [[_homogeneous, `class G`], _exact, _rational, _Bernoulli] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 588	$x\left(3 - 2x^2y(x)\right)y'(x) = 3x^2y(x)^2 - 3y(x) + 4x$ [_exact, _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation Maple ✓ Mathematica ✓

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#	result
ODE 589	$x\left(2x^2y(x)+3\right)y'(x)+y(x)\left(3x^2y(x)+4\right)=0$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 590	$3x^4+8x^3y(x)y'(x)-6x^2y(x)^2-y(x)^4=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 591	$xy(x)\left(a+bx^2\right)y'(x)=A+By(x)^2$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 592	$3x^4y(x)y'(x)=1-2x^3y(x)^2$ [[_homogeneous, `class G`], _rational, _Bernoulli] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 593	$x^7y(x)y'(x)=5x^3y(x)+2\left(x^2+1\right)$ [_rational, [_Abel, `2nd type`, `class B`]] Solution method Abel ODE, Second kind Maple ✓ Mathematica ✓
ODE 594	$\sqrt{x^2+1}y(x)y'(x)+x\sqrt{y(x)^2+1}=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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#	result
ODE 595	$\sqrt{x^2+1}(y(x)+1)y'(x)=y(x)^3$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 596	$y'(x)(\mathrm{g0}(x)+\mathrm{g1}(x)y(x))=\mathrm{f0}(x)+\mathrm{f1}(x)y(x)+\mathrm{f2}(x)y(x)^2+\mathrm{f3}(x)y(x)^3$ [[_Abel, `2nd type`, `class C`]] Solution method Abel ODE, Second kind Maple ✗ Mathematica ✗
ODE 597	$y(x)^2y'(x)+x(2-y(x))=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 598	$y(x)^2y'(x)=x(y(x)^2+1)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 599	$\left(y(x)^2+x\right)y'(x)+y(x)=a+bx$ [_exact, _rational] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 600	$\left(x-y(x)^2\right)y'(x)=x^2-y(x)$ [_exact, _rational] Solution method Exact equation Maple ✓ Mathematica ✓

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#	result
ODE 601	$\left(x^2+y(x)^2\right)y'(x)+xy(x)=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 602	$\left(x^2+y(x)^2\right)y'(x)=xy(x)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 603	$\left(x^2-y(x)^2\right)y'(x)=2xy(x)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 604	$\left(x^2-y(x)^2\right)y'(x)+x(2y(x)+x)=0$ [[_homogeneous, `class A`], _exact, _rational, _dAlembert] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 605	$\left(x^2+y(x)^2\right)y'(x)+2x(y(x)+2x)=0$ [[_homogeneous, `class A`], _exact, _rational, _dAlembert] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 606	$\left(-x^2+y(x)^2+1\right)y'(x)=x^2-y(x)^2+1$ [[_1st_order, _with_linear_symmetries], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓

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#	result
ODE 607	$\left(a^2+x^2+y(x)^2\right)y'(x)+2xy(x)=0$ [_exact , _rational , [_1st_order , `_with_symmetry_[F(x)*G(y) ,0] `]] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 608	$\left(a^2+x^2+y(x)^2\right)y'(x)+b^2+x^2+2xy(x)=0$ [_exact , _rational] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 609	$\left(x^2+y(x)^2+x\right)y'(x)=y(x)$ [_rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 610	$\left(3x^2-y(x)^2\right)y'(x)=2xy(x)$ [[_homogeneous , `class A`] , _rational , _dAlembert] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 611	$\left(x^4+y(x)^2\right)y'(x)=4x^3y(x)$ [[_homogeneous , `class G`] , _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 612	$y(x)(y(x)+1)y'(x)=x(x+1)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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#	result
ODE 613	$\left(y(x)^2+2y(x)+x\right)y'(x)+y(x)^2(y(x)+x)^2+y(x)(y(x)+1)=0$ [_rational] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 614	$\left(x^2+y(x)^2+2y(x)\right)y'(x)+2x=0$ [_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 615	$\left(x^3-y(x)^2+2y(x)\right)y'(x)+3x^2y(x)=0$ [_exact, _rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 616	$\left(y(x)^2+xy(x)+y(x)+1\right)y'(x)+y(x)+1=0$ [[_1st_order, _with_linear_symmetries], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 617	$(y(x)+x)^2y'(x)=a^2$ [[_homogeneous, `class C`], _dAlembert] Solution method Equation linear in the variables, $y'(x)=f(a+bx+cy(x))$ Maple ✓ Mathematica ✓
ODE 618	$(x-y(x))^2y'(x)=a^2$ [[_homogeneous, `class C`], _dAlembert] Solution method Equation linear in the variables, $y'(x)=f(a+bx+cy(x))$ Maple ✓ Mathematica ✓

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#	result
ODE 619	$\left(x^2+2xy(x)-y(x)^2\right)y'(x)+x^2-2xy(x)+y(x)^2=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 620	$(x-y(x))^2y'(x)=(-y(x)+x+1)^2$ [[_homogeneous, `class C`], _rational, _dAlembert] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 621	$(y(x)+x)^2y'(x)=(y(x)+x+2)^2$ [[_homogeneous, `class C`], _rational, _dAlembert] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 622	$(y(x)+x)^2y'(x)=x^2-2xy(x)+5y(x)^2$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 623	$y'(x)(a+b+y(x)+x)^2=2(a+y(x))^2$ [[_homogeneous, `class C`], _rational] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 624	$\left(2x^2+4xy(x)-y(x)^2\right)y'(x)=x^2-4xy(x)-2y(x)^2$ [[_homogeneous, `class A`], _exact, _rational, _dAlembert] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 625	$(y(x)+3x)^2y'(x)=4y(x)(2y(x)+3x)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 626	$(-y(x)-3x+1)^2y'(x)=(-4y(x)-6x+3)(1-2y(x))$ [[_homogeneous, `class C`], _rational] Solution method Change of Variable, Two new variables Maple ✓ Mathematica ✓
ODE 627	$y'(x)\left(\cot(x)-2y(x)^2\right)=y(x)^3\csc(x)\sec(x)$ [`y=_G(x,y')`] Solution method Change of Variable, new independent variable Maple ✗ Mathematica ✓
ODE 628	$3y(x)^2y'(x)=ay(x)^3+x+1$ [_rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 629	$\left(x^2-3y(x)^2\right)y'(x)+2xy(x)+1=0$ [_exact, _rational] Solution method Exact equation Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 630	$\left(2x^2+3y(x)^2\right)y'(x)+x(y(x)+3x)=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 631	$3\left(x^2-y(x)^2\right)y'(x)-2y(x)^3+6x(x+1)y(x)+3e^x=0$ [`y=_G(x,y')`] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 632	$\left(3x^2+2xy(x)+4y(x)^2\right)y'(x)+2x^2+6xy(x)+y(x)^2=0$ [[_homogeneous, `class A`], _exact, _rational, _dAlembert] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 633	$(2y(x)-3x+1)^2y'(x)=(-3y(x)+2x+4)^2$ [[_homogeneous, `class C`], _rational] Solution method Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$ Maple ✓ Mathematica ✓
ODE 634	$\left(-3x^2y(x)+6y(x)^2+1\right)y'(x)+x^2-3xy(x)^2=0$ [_exact, _rational] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 635	$a+(x-6y(x))^2y'(x)-6y(x)^2+2xy(x)=0$ [_exact, _rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`]] Solution method Exact equation Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 636	$\left(ay(x)^2+x^2\right)y'(x)=xy(x)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 637	$\left(ay(x)^2+x^2+xy(x)\right)y'(x)=ax^2+xy(x)+y(x)^2$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 638	$\left(ax^2-ay(x)^2+2xy(x)\right)y'(x)-2axy(x)+x^2-y(x)^2=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 639	$y'(x)\left(x^2(a+2b)+2x(2b+c)y(x)+3cy(x)^2\right)+2x(a+2b)y(x)+3ax^2+(2b+c)y(x)^2=0$ [[_homogeneous, `class A`], _exact, _rational, _dAlembert] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 640	$y'(x)\left(ax^2+2bxy(x)+cy(x)^2\right)+2axy(x)+by(x)^2+kx^2=0$ [[_homogeneous, `class A`], _exact, _rational, _dAlembert] Solution method Exact equation Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 641	$x\left(1-y(x)^2\right)y'(x)=\left(x^2+1\right)y(x)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 642	$x\left(3x-y(x)^2\right)y'(x)+y(x)\left(5x-2y(x)^2\right)=0$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 643	$x\left(x^2+y(x)^2\right)y'(x)=y(x)\left(x^4+x^2+y(x)^2\right)$ [[_homogeneous, `class D`], _rational] Solution method Homogeneous equation, $xy'(x)=xf(x)g(u)+y(x)$ Maple ✓ Mathematica ✓
ODE 644	$x\left(-x^2+y(x)^2+1\right)y'(x)+y(x)\left(x^2-y(x)^2+1\right)=0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Homogeneous equation, special Maple ✓ Mathematica ✓
ODE 645	$x\left(a-x^2-y(x)^2\right)y'(x)+y(x)\left(a+x^2+y(x)^2\right)=0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Homogeneous equation, special Maple ✓ Mathematica ✓
ODE 646	$x\left(2x^2+y(x)^2\right)y'(x)=y(x)\left(2x^2+3y(x)^2\right)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 647	$\left(x\left(a-x^2-y(x)^2\right)+y(x)\right)y'(x)-y(x)\left(a-x^2-y(x)^2\right)+x=0$ [[_1st_order, _with_linear_symmetries], _rational] Solution method Change of Variable, Two new variables Maple ✓ Mathematica ✓
ODE 648	$x(a+y(x))^2y'(x)=by(x)^2$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 649	$x\left(x^2-xy(x)+y(x)^2\right)y'(x)+y(x)\left(x^2+xy(x)+y(x)^2\right)=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 650	$x\left(x^2-xy(x)-y(x)^2\right)y'(x)=y(x)\left(x^2+xy(x)-y(x)^2\right)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 651	$x\left(axy(x)+x^2+y(x)^2\right)y'(x)=y(x)\left(bxy(x)+x^2+y(x)^2\right)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 652	$x\left(x^2-2y(x)^2\right)y'(x)=y(x)\left(2x^2-y(x)^2\right)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 653	$x\left(x^2+2y(x)^2\right)y'(x)=y(x)\left(2x^2+3y(x)^2\right)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 654	$2x\left(5x^2+y(x)^2\right)y'(x)=x^2y(x)-y(x)^3$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 655	$x\left(axy(x)+x^2+2y(x)^2\right)y'(x)=y(x)^2(ax+2y(x))$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 656	$3xy(x)^2y'(x)=2x-y(x)^3$ [[_homogeneous, `class G`], _exact, _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 657	$\left(3xy(x)^2-4x+1\right)y'(x)=y(x)\left(2-y(x)^2\right)$ [_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 658	$x\left(x-3y(x)^2\right)y'(x)+y(x)\left(2x-y(x)^2\right)=0$ [[_homogeneous, `class G`], _exact, _rational] Solution method Exact equation Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 659	$x^3+3x\left(y(x)^2+x\right)y'(x)-3xy(x)-2y(x)^3=0$ [_rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 660	$x\left(-3x^3y(x)+x^3+4y(x)^2\right)y'(x)=6y(x)^3$ [_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]] Solution method Change of Variable, new independent variable Maple ✓ Mathematica ✓
ODE 661	$6xy(x)^2y'(x)+2y(x)^3+x=0$ [[_homogeneous, `class G`], _exact, _rational, _Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 662	$x\left(6y(x)^2+x\right)y'(x)-3y(x)^3+xy(x)=0$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 663	$x\left(x^2-6y(x)^2\right)y'(x)=4y(x)\left(x^2+3y(x)^2\right)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 664	$x\left(3x-7y(x)^2\right)y'(x)+y(x)\left(5x-3y(x)^2\right)=0$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 665	$x^3 + x^2 y(x)^2 y'(x) - x + 1 = 0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 666	$\left(1 - x^2 y(x)^2\right) y'(x) = x y(x)^3$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 667	$\left(1 - x^2 y(x)^2\right) y'(x) = y(x)^2 (x y(x) + 1)$ [[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 668	$x\left(x y(x)^2 + 1\right) y'(x) + y(x) = 0$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 669	$x\left(x y(x)^2 + 1\right) y'(x) = y(x)\left(2 - 3x y(x)^2\right)$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 670	$x^2 (a + y(x))^2 y'(x) = \left(x^2 + 1\right)\left(a^2 + y(x)^2\right)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 671	$\left(x^2+1\right)\left(y(x)^2+1\right)y'(x)+2xy(x)\left(1-y(x)^2\right)=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 672	$\left(x^2+1\right)\left(y(x)^2+1\right)y'(x)+2xy(x)(1-y(x))^2=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 673	$\left(-x^3+6x^2y(x)^2+1\right)y'(x)=x\left(-4y(x)^3+3xy(x)+6\right)$ [_exact, _rational] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 674	$x\left(4x^2y(x)-12xy(x)^2+5x+3\right)y'(x)+y(x)\left(6x^2y(x)-8xy(x)^2+10x+3\right)=0$ [_exact, _rational] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 675	$x^3\left(y(x)^2+1\right)y'(x)+3x^2y(x)=0$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 676	$y(x)\left(x^2y(x)^2+1\right)+x(1-xy(x))^2y'(x)=0$ [[_homogeneous, `class G`], _rational] Solution method Homogeneous equation, isobaric equation Maple ✓ Mathematica ✓
ODE 677	$\left(1-x^4y(x)^2\right)y'(x)=x^3y(x)^3$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 678	$\left(3x-y(x)^3\right)y'(x)=x^2-3y(x)$ [_exact, _rational] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 679	$\left(x^3-y(x)^3\right)y'(x)+x^2y(x)=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 680	$x^2(ax+3y(x))+\left(x^3+y(x)^3\right)y'(x)=0$ [[_homogeneous, `class A`], _exact, _rational, _dAlembert] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 681	$\left(-x^2y(x)-y(x)^3+x\right)y'(x)=x^3+xy(x)^2-y(x)$ [_exact, _rational] Solution method Exact equation Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 682	$\left(a^2 x + y(x)\left(x^2 - y(x)^2\right)\right) y'(x) + x\left(x^2 - y(x)^2\right) = a^2 y(x)$ [_rational] Solution method Change of Variable, Two new variables Maple ✗ Mathematica ✓
ODE 683	$y(x)\left(a + x^2 + y(x)^2\right) y'(x) = x\left(a - x^2 - y(x)^2\right)$ [_exact, _rational] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 684	$y(x)\left(3x^2 + y(x)^2\right) y'(x) + x\left(x^2 + 3y(x)^2\right) = 0$ [[_homogeneous, `class A`], _exact, _rational, _dAlembert] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 685	$y(x)\left(a - 3x^2 - y(x)^2\right) y'(x) + x\left(a - x^2 + y(x)^2\right) = 0$ [_rational] Solution method Change of Variable, Two new variables Maple ✓ Mathematica ✓
ODE 686	$2y(x)^3 y'(x) = x^3 - x y(x)^2$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 687	$y(x)\left(2y(x)^2 + 1\right) y'(x) = x\left(2x^2 + 1\right)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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#	result
ODE 688	$x^3 + y(x)\left(3x^2 + 2y(x)^2\right) y'(x) = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 689	$y(x)\left(5x^2 + 2y(x)^2\right) y'(x) + x\left(x^2 + 5y(x)^2\right) = 0$ [[_homogeneous, `class A`], _exact, _rational, _dAlembert] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 690	$2x^3 + 3x^2y(x) + \left(-x^3 + x^2 + 3xy(x)^2 + 2y(x)^3\right) y'(x) - y(x)^3 + y(x)^2 = 0$ [_rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 691	$4x^3 + 9x^2y(x) + \left(3x^3 + 6x^2y(x) - 3xy(x)^2 + 20y(x)^3\right) y'(x) + 6xy(x)^2 - y(x)^3 = 0$ [[_homogeneous, `class A`], _exact, _rational, _dAlembert] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 692	$\left(ay(x)^3 + x^3\right) y'(x) = x^2y(x)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 693	$y'(x)\left(ax^2-bx^3+3cxy(x)^2+2cy(x)^3\right)+ay(x)^2+2bx^3+3bx^2y(x)-cy(x)^3=0$ [_rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 694	$xy(x)^3y'(x)=\left(1-x^2\right)\left(y(x)^2+1\right)$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 695	$x\left(x-y(x)^3\right)y'(x)=y(x)\left(y(x)^3+3x\right)$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 696	$x\left(2x^3+y(x)^3\right)y'(x)=y(x)\left(2x^3-x^2y(x)+y(x)^3\right)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 697	$x\left(2x^3-y(x)^3\right)y'(x)=y(x)\left(x^3-2y(x)^3\right)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓

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#	result
ODE 698	$x\left(x^3+3x^2y(x)+y(x)^3\right)y'(x)=y(x)^2\left(3x^2+y(x)^2\right)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 699	$x\left(x^3-2y(x)^3\right)y'(x)=y(x)\left(2x^3-y(x)^3\right)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 700	$x\left(x^4-2y(x)^3\right)y'(x)+y(x)\left(2x^4+y(x)^3\right)=0$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 701	$x\left(2y(x)^3+y(x)+x\right)y'(x)=(x-y(x))y(x)$ [_rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 702	$\left(-7xy(x)^3-y(x)+5x\right)y'(x)-y(x)^4+5y(x)=0$ [_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 703	$y(x)\left(1-2x^3y(x)\right)+x\left(1-2xy(x)^3\right)y'(x)=0$ [_rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓

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#	result
ODE 704	$x\left(-2xy(x)^3-xy(x)^2+2\right)y'(x)+2y(x)+1=0$ [_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]] Solution method Change of Variable, new independent variable Maple ✓ Mathematica ✓
ODE 705	$\left(-10x^2y(x)^3+3y(x)^2+2\right)y'(x)=x\left(5y(x)^4+1\right)$ [_exact, _rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 706	$xy'(x)\left(a+bxy(x)^3\right)+y(x)\left(a+cx^3y(x)\right)=0$ [_rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 707	$y(x)\left(1-2x^3y(x)^2\right)+x\left(1-2x^2y(x)^3\right)y'(x)=0$ [_rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 708	$x(1-xy(x))\left(1-x^2y(x)^2\right)y'(x)+y(x)(xy(x)+1)\left(x^2y(x)^2+1\right)=0$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 709	$\left(x^2-y(x)^4\right)y'(x)=xy(x)$ [[_homogeneous, `class G`], _rational] Solution method Change of Variable, new independent variable Maple ✓ Mathematica ✓

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#	result
ODE 710	$\left(x^3-y(x)^4\right)y'(x)=3x^2y(x)$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 711	$\left(a^2x^2+\left(x^2+y(x)^2\right)^2\right)y'(x)=a^2xy(x)$ [_rational] Solution method Change of Variable, Two new variables Maple ✓ Mathematica ✓
ODE 712	$2\left(x-y(x)^4\right)y'(x)=y(x)$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 713	$\left(-2y(x)^4-xy(x)^3+4x\right)y'(x)=y(x)\left(y(x)^3+2\right)$ [_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 714	$y(x)y'(x)\left((ax+by(x))^3+ax^3\right)+x\left((ax+by(x))^3+by(x)^3\right)=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 715	$\left(2x^2y(x)^3+xy(x)^4+2y(x)+x\right)y'(x)+y(x)\left(y(x)^4+1\right)=0$ [_rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓

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#	result
ODE 716	$2x\left(x^3+y(x)^4\right)y'(x)=y(x)\left(x^3+2y(x)^4\right)$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 717	$x\left(1-x^2y(x)^4\right)y'(x)+y(x)=0$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 718	$\left(x^2-y(x)^5\right)y'(x)=2xy(x)$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 719	$x\left(x^3+y(x)^5\right)y'(x)=y(x)\left(x^3-y(x)^5\right)$ [[_homogeneous, `class G`], _rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 720	$y(x)^3\left(3x^5y(x)^5-1\right)+x^3\left(5x^3y(x)^7+1\right)y'(x)=0$ [_rational] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 721	$y'(x)(\mathrm{f1}(x,y(x))+x\mathrm{f2}(x,y(x)))=y(x)\mathrm{f2}(x,y(x))+\mathrm{f3}(x,y(x))$ [NONE] Solution method Homogeneous equation, Darbooux type Maple ✗ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 722	$y'(x)(a(y(x)+x)+1)^n+a(y(x)+x)^n=0$ [[_homogeneous, `class C`], _dAlembert] Solution method Exact equation Maple ✓ Mathematica ✗
ODE 723	$xy'(x)\left(a+xy(x)^n\right)+by(x)=0$ [[_homogeneous, `class G`], _rational] Solution method Change of Variable, new independent variable Maple ✓ Mathematica ✓
ODE 724	$f(x)y(x)^m y'(x)+g(x)y(x)^{m+1}+h(x)y(x)^n=0$ [_Bernoulli] Solution method The Bernoulli ODE Maple ✓ Mathematica ✓
ODE 725	$\sqrt{b^2+y(x)^2}y'(x)=\sqrt{a^2+x^2}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 726	$\sqrt{b^2-y(x)^2}y'(x)=\sqrt{a^2-x^2}$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 727	$\sqrt{Y}y'(x)=\sqrt{X}$ [_quadrature] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 728	$\left(\sqrt{y(x)+x}+1\right)y'(x)+1=0$ [[_homogeneous, `class C`], _dAlembert] Solution method Change of Variable, new dependent variable Maple ✓ Mathematica ✓
ODE 729	$\sqrt{xy(x)}y'(x)-y(x)+x=\sqrt{xy(x)}$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 730	$\left(x-2\sqrt{xy(x)}\right)y'(x)=y(x)$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 731	$\left(x^2+1\right)^{3/2}\left(y(x)+\sqrt{y(x)^2+1}\right)y'(x)=y(x)^2+1$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓
ODE 732	$\left(x^2+1\right)^{3/2}\left(y(x)+\sqrt{y(x)^2+1}\right)y'(x)=y(x)^2+1$ [_separable] Solution method Separable ODE, Neither variable missing Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 733	$\left(x-\sqrt{x^2+y(x)^2}\right)y'(x)=y(x)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 734	$x\left(1-\sqrt{x^2-y(x)^2}\right)y'(x)=y(x)$ [`y=_G(x,y')`] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 735	$x\left(\sqrt{x^2+y(x)^2}+x\right)y'(x)+\sqrt{x^2+y(x)^2}y(x)=0$ [[_homogeneous, `class G`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 736	$xy(x)\left(\sqrt{x^2-y(x)^2}+x\right)y'(x)=xy(x)^2-\left(x^2-y(x)^2\right)^{3/2}$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 737	$\left(x-y(x)^2\sqrt{y(x)^2-x^2}\right)y'(x)=y(x)\left(x\sqrt{y(x)^2-x^2}+1\right)$ [NONE] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 738	$\left(x\sqrt{x^2+y(x)^2+1}-y(x)\left(x^2+y(x)^2\right)\right)y'(x) = \sqrt{x^2+y(x)^2+1}y(x) + x\left(x^2+y(x)^2\right)$ [[_1st_order, _with_linear_symmetries]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 739	$y'(x)\left(x^2\sec(x)\cos(y(x))+1\right)-y(x)\tan(x)+\sec(x)\sin(y(x))=0$ [NONE] Solution method Exact equation, integrating factor Maple ✗ Mathematica ✗
ODE 740	$y'(x)\cos(y(x))(\cos(y(x))-\sin(A)\sin(x))+\cos(x)(\cos(x)-\sin(A)\sin(y(x)))=0$ [_exact] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 741	$y'(x)(a\cos(ay(x)+bx)-b\sin(ax+by(x)))-a\sin(ax+by(x))+b\cos(ay(x)+bx)=0$ [_exact] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 742	$y'(x)(a\sin(xy(x))-\sin(y(x))+\cos(y(x)+x))+y(x)\sin(xy(x))+\cos(y(x)+x)+\cos(x)=0$ [NONE] Solution method Exact equation Maple ✗ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 743	$y'(x)(\cos(x)\sec(y(x))+x)+\tan(y(x))-y(x)\sin(x)\sec(y(x))=0$ [NONE] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 744	$y'(x)\left(x^2+2y(x)\sin(x)\sec(y(x))\right)+2x\tan(y(x))+y(x)^2\cos(x)\sec(y(x))=0$ [NONE] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 745	$y'(x)\left(x^2\sec^2(y(x))-6xy(x)+2\right)-3y(x)^2+2x\tan(y(x))=0$ [_exact] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 746	$y'(x)((y(x)+x)\tan(y(x))+1)+1=0$ [[_1st_order, _with_linear_symmetries]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 747	$xy'(x)\left(x-y(x)\tan\left(\frac{y(x)}{x}\right)\right)+y(x)\left(y(x)\tan\left(\frac{y(x)}{x}\right)+x\right)=0$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous equation Maple ✓ Mathematica ✓
ODE 748	$\left(xe^{y(x)}+e^x\right)y'(x)+e^xy(x)+e^{y(x)}=0$ [_exact] Solution method Exact equation Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 749	$y'(x)(-\log(y(x))-2x+1)+2y(x)=0$ [[_1st_order, _with_linear_symmetries]] Solution method Exact equation, integrating factor Maple ✓ Mathematica ✓
ODE 750	$y'(x)(x\cosh(y(x))+\sinh(x))+\sinh(y(x))+y(x)\cosh(x)=0$ [_exact] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 751	$(\sinh(x)+1)y'(x)\sinh(y(x))+\cosh(x)(\cosh(y(x))-1)=0$ [_separable] Solution method Exact equation Maple ✓ Mathematica ✓
ODE 752	$y'(x)^2=ax^n$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 753	$y'(x)^2=y(x)$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✓

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#	result
ODE 754	$y'(x)^2 = x - y(x)$ [[_homogeneous, `class C`], _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 755	$y'(x)^2 = x^2 + y(x)$ [[_homogeneous, `class G`]] Solution method Homogeneous ODE, The Isobaric equation Maple ✓ Mathematica ✗
ODE 756	$x^2 + y'(x)^2 = 4y(x)$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 757	$3x^2 + y'(x)^2 = 8y(x)$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 758	$ax^2 + by(x) + y'(x)^2 = 0$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✗

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#	result
ODE 759	$y'(x)^2 = y(x)^2 + 1$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 760	$y'(x)^2 = 1 - y(x)^2$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 761	$y'(x)^2 = a^2 - y(x)^2$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 762	$y'(x)^2 = a^2 y(x)^2$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 763	$y'(x)^2 = a + by(x)^2$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 764	$y'(x)^2 = x^2 y(x)^2$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 765	$y'(x)^2 = (y(x) - 1)y(x)^2$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 766	$y'(x)^2 = (y(x) - a)(y(x) - b)(y(x) - c)$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 767	$y'(x)^2 = a^2 y(x)^n$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 768	$y'(x)^2 = a^2 y(x)^2 \left(1 - \log^2(y(x))\right)$ [_quadrature] Solution method Change of variable Maple ✓ Mathematica ✓

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#	result
ODE 769	$f(x)(y(x)-a)(y(x)-b)+y'(x)^2=0$ [[_1st_order , `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m+F(x)G(y)=0$ Maple ✓ Mathematica ✓
ODE 770	$f(x)(y(x)-a)^2(y(x)-b)+y'(x)^2=0$ [[_1st_order , `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m+F(x)G(y)=0$ Maple ✓ Mathematica ✓
ODE 771	$f(x)(y(x)-a)(y(x)-b)(y(x)-c)+y'(x)^2=0$ [[_1st_order , `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m+F(x)G(y)=0$ Maple ✓ Mathematica ✓
ODE 772	$f(x)(y(x)-a)^2(y(x)-b)(y(x)-c)+y'(x)^2=0$ [[_1st_order , `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m+F(x)G(y)=0$ Maple ✓ Mathematica ✓
ODE 773	$f(x)(y(x)-\text{a1})(y(x)-\text{a2})(y(x)-\text{a3})(y(x)-\text{a4})+y'(x)^2=0$ [[_1st_order , `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m+F(x)G(y)=0$ Maple ✓ Mathematica ✓
ODE 774	$y'(x)^2=f(x)^2(y(x)-a)(y(x)-b)(y(x)-c)^2$ [_separable] Solution method Change of variable Maple ✓ Mathematica ✓

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#	result
ODE 775	$y'(x)^2 = f(x)^2(y(x)-a)(y(x)-b)(y(x)-u(x))^2$ [`y=_G(x,y')`] Solution method Change of variable Maple ✗ Mathematica ✗
ODE 776	$y'(x)^2 + 2y'(x) + x = 0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 777	$a(x-y(x)) + y'(x)^2 - 2y'(x) = 0$ [[_homogeneous, `class C`], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 778	$y'(x)^2 - 2y'(x) - y(x)^2 = 0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 779	$y'(x)^2 - 5y'(x) + 6 = 0$ [_quadrature] Solution method Missing Variables ODE, Both independent and dependent variable missing Maple ✓ Mathematica ✓

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#	result
ODE 780	$y'(x)^2 - 7y'(x) + 12 = 0$ [_quadrature] Solution method Missing Variables ODE, Both independent and dependent variable missing Maple ✓ Mathematica ✓
ODE 781	$ay'(x) + b + y'(x)^2 = 0$ [_quadrature] Solution method Missing Variables ODE, Both independent and dependent variable missing Maple ✓ Mathematica ✓
ODE 782	$ay'(x) + bx + y'(x)^2 = 0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for x Maple ✓ Mathematica ✓
ODE 783	$ay'(x) + by(x) + y'(x)^2 = 0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✓
ODE 784	$y'(x)^2 + xy'(x) + 1 = 0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for x Maple ✓ Mathematica ✓

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#	result
ODE 785	$y'(x)^2 + xy'(x) - y(x) = 0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 786	$y'(x)^2 - xy'(x) + y(x) = 0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 787	$y'(x)^2 - xy'(x) - y(x) = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 788	$y'(x)^2 + xy'(x) - y(x) + x = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 789	$y'(x)^2 + (1-x)y'(x) + y(x) = 0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓

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#	result
ODE 790	$y'(x)^2-(x+1)y'(x)+y(x)=0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 791	$y'(x)^2-(2-x)y'(x)-y(x)+1=0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 792	$(a+x)y'(x)+y'(x)^2-y(x)=0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 793	$y'(x)^2-2xy'(x)+1=0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for x Maple ✓ Mathematica ✓
ODE 794	$-3x^2+2xy'(x)+y'(x)^2=0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 795	$y'(x)^2+2xy'(x)-y(x)=0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 796	$y'(x)^2+2xy'(x)-y(x)=0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 797	$y'(x)^2-2xy'(x)+2y(x)=0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 798	$y'(x)^2-(2x+1)y'(x)-(1-x)x=0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 799	$y'(x)^2+2(1-x)y'(x)-2(x-y(x))=0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓

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#	result
ODE 800	$y'(x)^2+3xy'(x)-y(x)=0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 801	$y'(x)^2-4(x+1)y'(x)+4y(x)=0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, $f(y-xy',y')=0$ Maple ✓ Mathematica ✓
ODE 802	$axy'(x)+y'(x)^2=bcx^2$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 803	$-axy'(x)+ay(x)+y'(x)^2=0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 804	$axy'(x)+bx^2+cy(x)+y'(x)^2=0$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✗

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#	result
ODE 805	$(a+bx)y'(x)+c+y'(x)^2=by(x)$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 806	$-2x^2y'(x)+2xy'(x)+y'(x)^2=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 807	$ax^2y'(x)+bxy(x)+y'(x)^2=0$ [[_homogeneous, `class G`]] Solution method Homogeneous ODE, The Isobaric equation Maple ✓ Mathematica ✗
ODE 808	$ax^3y'(x)-2ax^2y(x)+y'(x)^2=0$ [[_1st_order, _with_linear_symmetries]] Solution method Homogeneous ODE, The Isobaric equation Maple ✓ Mathematica ✓
ODE 809	$-2ax^3y'(x)+4ax^2y(x)+y'(x)^2=0$ [[_1st_order, _with_linear_symmetries]] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 810	$4x^5y'(x)-12x^4y(x)+y'(x)^2=0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓

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#	result
ODE 811	$y'(x)^2 - 2\cosh(x)y'(x) + 1 = 0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 812	$y'(x)^2 + y(x)y'(x) = x(y(x) + x)$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 813	$y'(x)^2 - y(x)y'(x) + e^x = 0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 814	$y'(x)^2 + (y(x) + x)y'(x) + xy(x) = 0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 815	$y'(x)^2 - 2y(x)y'(x) - 2x = 0$ [_dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓

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#	result
ODE 816	$y'(x)^2+(2y(x)+1)y'(x)+(y(x)-1)y(x)=0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Use new variable Maple ✓ Mathematica ✓
ODE 817	$y'(x)^2-2(x-y(x))y'(x)-4xy(x)=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 818	$y'(x)^2-(4y(x)+1)y'(x)+y(x)(4y(x)+1)=0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 819	$y'(x)^2-2(1-3y(x))y'(x)-(4-9y(x))y(x)=0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 820	$y(x)(3a+b+9y(x))+(a+6y(x))y'(x)+y'(x)^2=0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 821	$ay(x)y'(x) - ax + y'(x)^2 = 0$ [_dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 822	$-ay(x)y'(x) - ax + y'(x)^2 = 0$ [_dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 823	$y'(x)(ax + by(x)) + abxy(x) + y'(x)^2 = 0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 824	$y(x)^2 \log(ay(x)) - xy(x)y'(x) + y'(x)^2 = 0$ [[_1st_order, `_with_symmetry_[F(x),G(y)]`]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 825	$y'(x)^2 - (2xy(x) + 1)y'(x) + 2xy(x) = 0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 826	$y'(x)^2 - \left(y(x)^2 + 4\right) y'(x) + y(x)^2 + 4 = 0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Use new variable Maple ✓ Mathematica ✓
ODE 827	$-(x - y(x))y(x)y'(x) + y'(x)^2 - xy(x)^3 = 0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 828	$xy(x)^2y'(x) + y'(x)^2 + y(x)^3 = 0$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 829	$-2x^3y(x)^2y'(x) - 4x^2y(x)^3 + y'(x)^2 = 0$ [[_1st_order, _with_linear_symmetries]] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 830	$x^4y(x)^4 - x\left(x^2 + y(x)^2\right) y(x)y'(x) + y'(x)^2 = 0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 831	$2xy(x)^3y'(x) + y'(x)^2 + y(x)^4 = 0$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 832	$y'(x)^2 + 2y(x)\cot(x)y'(x) - y(x)^2 = 0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 833	$y'(x)^2 - 3xy(x)^{2/3}y'(x) + 9y(x)^{5/3} = 0$ [[_1st_order, _with_linear_symmetries]] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 834	$y'(x)^2 = e^{4x-2y(x)}(y'(x) - 1)$ [[_homogeneous, `class C`], _dAlembert] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 835	$2y'(x)^2 + xy'(x) - 2y(x) = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓

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#	result
ODE 836	$2y'(x)^2-(1-x)y'(x)-y(x)=0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 837	$-2x^2y'(x)+2y'(x)^2+3xy(x)=0$ [[_homogeneous, `class G`]] Solution method Homogeneous ODE, The Isobaric equation Maple ✓ Mathematica ✗
ODE 838	$2y'(x)^2+2(6y(x)-1)y'(x)+3y(x)(6y(x)-1)=0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 839	$3y'(x)^2-2xy'(x)+y(x)=0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 840	$x^2+4xy'(x)+3y'(x)^2-y(x)=0$ [[_homogeneous, `class G`]] Solution method Change of variable Maple ✓ Mathematica ✗

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#	result
ODE 841	$4y'(x)^2 = 9x$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 842	$4y'(x)^2 + 2xe^{-2y(x)}y'(x) - e^{-2y(x)} = 0$ [[_1st_order, _with_linear_symmetries]] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 843	$4y'(x)^2 + 2e^{2x-2y(x)}y'(x) - e^{2x-2y(x)} = 0$ [[_homogeneous, `class C`], _dAlembert] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 844	$5y'(x)^2 + 3xy'(x) - y(x) = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 845	$5y'(x)^2 + 6xy'(x) - 2y(x) = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓

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#	result
ODE 846	$3xy(x)^4y'(x) + 9y'(x)^2 + y(x)^5 = 0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 847	$xy'(x)^2 = a$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 848	$xy'(x)^2 = a - x^2$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 849	$xy'(x)^2 = y(x)$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 850	$xy'(x)^2 - 2y(x) + x = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 851	$xy'(x)^2 + y'(x) = y(x)$ [_rational, _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 852	$xy'(x)^2 + 2y'(x) - y(x) = 0$ [_rational, _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 853	$xy'(x)^2 - 2y'(x) - y(x) = 0$ [_rational, _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 854	$xy'(x)^2 + 4y'(x) - 2y(x) = 0$ [_rational, _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 855	$xy'(x)^2 + xy'(x) - y(x) = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 856	$-\left(x^2+1\right)y'(x)+xy'(x)^2+x=0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 857	$a+xy'(x)^2+y(x)y'(x)=0$ [[_homogeneous, `class G`], _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 858	$a+xy'(x)^2-y(x)y'(x)=0$ [[_homogeneous, `class G`], _rational, _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 859	$ax+xy'(x)^2-y(x)y'(x)=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 860	$-x^2+xy'(x)^2+y(x)y'(x)=0$ [[_homogeneous, `class G`], _rational] Solution method Homogeneous ODE, The Isobaric equation Maple ✓ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 861	$x^3 + xy'(x)^2 + y(x)y'(x) = 0$ [[_homogeneous, `class G`], _rational] Solution method Homogeneous ODE, The Isobaric equation Maple ✓ Mathematica ✗
ODE 862	$ay(x) + xy'(x)^2 - y(x)y'(x) = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 863	$y(x)y'(x) + xy'(x)^2 - y(x)^4 = 0$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 864	$(a - y(x))y'(x) + b + xy'(x)^2 = 0$ [[_1st_order, _with_linear_symmetries], _rational, _Clairaut] Solution method Clairaut's equation and related types, $f(y - xy', y') = 0$ Maple ✓ Mathematica ✓
ODE 865	$xy'(x)^2 + (x - y(x))y'(x) - y(x) + 1 = 0$ [[_1st_order, _with_linear_symmetries], _rational, _dAlembert] Solution method Clairaut's equation and related types, $f(y - xy', y') = 0$ Maple ✓ Mathematica ✓
ODE 866	$(a - y(x) + x)y'(x) + xy'(x)^2 - y(x) = 0$ [[_1st_order, _with_linear_symmetries], _rational, _dAlembert] Solution method Clairaut's equation and related types, $f(y - xy', y') = 0$ Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 867	$xy'(x)^2 - (3x - y(x))y'(x) + y(x) = 0$ [[_homogeneous, `class A`], _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✗
ODE 868	$a - by(x) + bx + xy'(x)^2 - y(x) = 0$ [[_homogeneous, `class C`], _rational, _dAlembert] Solution method Clairaut's equation and related types, $f(y - xy', y') = 0$ Maple ✓ Mathematica ✓
ODE 869	$a + xy'(x)^2 - 2y(x)y'(x) = 0$ [[_homogeneous, `class G`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 870	$xy'(x)^2 + 2y(x)y'(x) - x = 0$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous ODE, $x^n f(\frac{y}{x}, y') = 0$, Solve for p Maple ✓ Mathematica ✓
ODE 871	$ax + xy'(x)^2 - 2y(x)y'(x) = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous ODE, $x^n f(\frac{y}{x}, y') = 0$, Solve for y Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 872	$xy'(x)^2 - 2y(x)y'(x) + 2y(x) + x = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 873	$9x^2 + xy'(x)^2 - 3y(x)y'(x) = 0$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 874	$xy'(x)^2 - (3y(x) + 2x)y'(x) + 6y(x) = 0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 875	$-ay(x)y'(x) + b + xy'(x)^2 = 0$ [[_homogeneous, `class G`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 876	$ay(x)y'(x) + bx + xy'(x)^2 = 0$ [[_homogeneous, `class A`], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 877	$xy'(x)^2 - (xy(x) + 1)y'(x) + y(x) = 0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 878	$(1-x)y(x)y'(x)+xy'(x)^2-y(x)^2=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 879	$\left(1-x^2y(x)\right)y'(x)+xy'(x)^2-xy(x)=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 880	$(x+1)y'(x)^2=y(x)$ [[_homogeneous, `class C`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 881	$(x+1)y'(x)^2-(y(x)+x)y'(x)+y(x)=0$ [[_1st_order, _with_linear_symmetries], _rational, _dAlembert] Solution method Clairaut's equation and related types, $f(y-xy',y')=0$ Maple ✓ Mathematica ✓
ODE 882	$(a-x)y'(x)^2-b+y(x)y'(x)=0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, $f(y-xy',y')=0$ Maple ✓ Mathematica ✓
ODE 883	$(a+x)y'(x)^2+y'(x)(\mathrm{a1}+\mathrm{b1}x+\mathrm{c1}y(x))+\mathrm{a2}+\mathrm{b2}x+\mathrm{c2}y(x)=0$ [_dAlembert] Solution method Change of variable Maple ✓ Mathematica ✓

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#	result
ODE 884	$2xy'(x)^2 + (2x - y(x))y'(x) - y(x) + 1 = 0$ [_rational, _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 885	$3xy'(x)^2 - 6y(x)y'(x) + 2y(x) + x = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 886	$(3x + 1)y'(x)^2 - 3(y(x) + 2)y'(x) + 9 = 0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, $f(y - xy', y') = 0$ Maple ✓ Mathematica ✓
ODE 887	$(3x + 5)y'(x)^2 - (3y(x) + 3)y'(x) + y(x) = 0$ [_rational, _dAlembert] Solution method Clairaut's equation and related types, $f(y - xy', y') = 0$ Maple ✓ Mathematica ✓
ODE 888	$4xy'(x)^2 = (a - 3x)^2$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 889	$4xy'(x)^2 + 2xy'(x) - y(x) = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 890	$4xy'(x)^2 - 3y(x)y'(x) + 3 = 0$ [[_homogeneous, `class G`], _rational, _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 891	$4xy'(x)^2 + 4y(x)y'(x) = 1$ [[_homogeneous, `class G`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 892	$4y(x)y'(x) + 4xy'(x)^2 - y(x)^4 = 0$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 893	$4(2-x)y'(x)^2 + 1 = 0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 894	$8y(x)y'(x) + 16xy'(x)^2 + y(x)^6 = 0$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 895	$x^2y'(x)^2 = a^2$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 896	$x^2y'(x)^2 = y(x)^2$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 897	$x^2y'(x)^2 + x^2 - y(x)^2 = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 898	$x^2y'(x)^2 = (x - y(x))^2$ [_linear] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 899	$x^2y'(x)^2 - y(x)^4 + y(x)^2 = 0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 900	$x^2y'(x)^2 - xy'(x) + (1 - y(x))y(x) = 0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 901	$a^2 + 2axy'(x) - 2ay(x) + x^2y'(x)^2 + x^2 = 0$ [_rational] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 902	$x^2y'(x)^2 - 2xy(x)y'(x) + y(x)(y(x) + 1) - x = 0$ [[_1st_order, _with_linear_symmetries], _rational] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 903	$-x^4 + x^2y'(x)^2 + (1 - x^2)\,y(x)^2 - 2xy(x)y'(x) = 0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 904	$x^2y'(x)^2 - (2xy(x) + 1)y'(x) + y(x)^2 + 1 = 0$ [[_1st_order, _with_linear_symmetries], _rational, _Clairaut] Solution method Clairaut's equation and related types, $f(y - xy', y') = 0$ Maple ✓ Mathematica ✓

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#	result
ODE 905	$-(a+2xy(x))y'(x)+x^2y'(x)^2+y(x)^2=0$ [[_homogeneous, `class G`], _rational, _Clairaut] Solution method Clairaut's equation and related types, $f(y-xy',y')=0$ Maple ✓ Mathematica ✓
ODE 906	$x^2y'(x)^2-x(x-2y(x))y'(x)+y(x)^2=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 907	$-4a+x^2y'(x)^2+2x(y(x)+2x)y'(x)+y(x)^2=0$ [[_1st_order, `_with_symmetry_[F(x),G(y)]`]] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 908	$x\left(x^3-2y(x)\right)y'(x)-\left(2x^3-y(x)\right)y(x)+x^2y'(x)^2=0$ [[_homogeneous, `class G`], _rational] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 909	$x^2y'(x)^2+3xy(x)y'(x)+2y(x)^2=0$ [_separable] Solution method Homogeneous ODE, $x^nf\left(\frac{y}{x},y'\right)=0$, Solve for p Maple ✓ Mathematica ✓
ODE 910	$x^3+x^2y'(x)^2-3xy(x)y'(x)+2y(x)^2=0$ [[_homogeneous, `class G`], _rational] Solution method Change of variable Maple ✓ Mathematica ✗

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#	result
ODE 911	$x^2y'(x)^2+4xy(x)y'(x)-5y(x)^2=0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 912	$x^2y'(x)^2-4x(y(x)+2)y'(x)+4y(x)(y(x)+2)=0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 913	$x^2y'(x)^2-5xy(x)y'(x)+6y(x)^2=0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 914	$x^2y'(x)^2+x\left(x^2+xy(x)-2y(x)\right)y'(x)+(1-x)\left(x^2-y(x)\right)y(x)=0$ [_rational] Solution method Change of variable Maple ✗ Mathematica ✗
ODE 915	$x^2y'(x)^2+(y(x)+2x)y(x)y'(x)+y(x)^2=0$ [[_homogeneous, `class A`], _dAlembert] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 916	$x^2y'(x)^2+(2x-y(x))y(x)y'(x)+y(x)^2=0$ [[_homogeneous, `class A`], _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓

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#	result
ODE 917	$y'(x)\left(a+bx^2y(x)^3\right)+aby(x)^3+x^2y'(x)^2=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 918	$\left(1-x^2\right)y'(x)^2=1-y(x)^2$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 919	$\left(1-x^2\right)y'(x)^2+4x^2+2xy(x)y'(x)=0$ [[_1st_order, `_with_symmetry_[F(x),G(y)]`]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 920	$\left(a^2+x^2\right)y'(x)^2=b^2$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 921	$\left(a^2-x^2\right)y'(x)^2+b^2=0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 922	$\left(a^2-x^2\right) y'(x)^2=b^2$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 923	$\left(a^2-x^2\right) y'(x)^2=x^2$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 924	$\left(a^2-x^2\right) y'(x)^2+x^2+2xy(x)y'(x)=0$ [[_1st_order, `_with_symmetry_[F(x),G(y)]`]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 925	$\left(a^2-x^2\right) y'(x)^2-2xy(x)y'(x)-y(x)^2=0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 926	$\left(a^2+x^2\right) y'(x)^2+b-2xy(x)y'(x)+y(x)^2=0$ [[_1st_order, _with_linear_symmetries], _rational, _Clairaut] Solution method Clairaut's equation and related types, $f(y-xy',y')=0$ Maple ✓ Mathematica ✗

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#	result
ODE 927	$\left(2x^2+1\right)y'(x)^2+\left(x^2+2xy(x)+y(x)^2+2\right)y'(x)+2y(x)^2+1=0$ [`y=_G(x,y')`] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 928	$4x^2y'(x)^2-4xy(x)y'(x)=8x^3-y(x)^2$ [_linear] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 929	$ax^2y'(x)^2+(1-a)ax^2-2axy(x)y'(x)+y(x)^2=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous ODE, $x^nf\left(\frac{y}{x},y'\right)=0$, Solve for p Maple ✓ Mathematica ✓
ODE 930	$\left(1-a^2\right)x^2y'(x)^2-a^2x^2-2xy(x)y'(x)+y(x)^2=0$ [[_homogeneous, `class A`], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 931	$x^3y'(x)^2=a$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 932	$x^3y'(x)^2+xy'(x)-y(x)=0$ [[_homogeneous, `class G`], _rational] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 933	$a+x^3y'(x)^2+x^2y(x)y'(x)=0$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 934	$x^3y'(x)^2-\left(2x^2y(x)+1\right)y'(x)+xy(x)^2=0$ [[_homogeneous, `class G`], _rational] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 935	$x\left(1-x^2\right)y'(x)^2-2\left(1-x^2\right)y(x)y'(x)+x\left(1-y(x)^2\right)=0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 936	$4x(a-x)(b-x)y'(x)^2=\left(-2x(a+b)+ab+2x^2\right)^2$ [_quadrature] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 937	$x^4y'(x)^2-xy'(x)-y(x)=0$ [[_homogeneous, `class G`], _rational] Solution method Homogeneous ODE, The Isobaric equation Maple ✓ Mathematica ✓

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#	result
ODE 938	$x^4y'(x)^2+2x^3y(x)y'(x)-4=0$ [[_homogeneous, `class G`], _rational] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 939	$x^4y'(x)^2+xy(x)^2y'(x)-y(x)^3=0$ [[_homogeneous, `class G`]] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 940	$x^2\left(a^2-x^2\right)y'(x)^2+1=0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 941	$3x^4y'(x)^2-xy(x)-y(x)=0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 942	$4x^5y'(x)^2+12x^4y(x)y'(x)+9=0$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓

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#	result
ODE 943	$x^6 y'(x)^2 - 2xy'(x) - 4y(x) = 0$ [[_homogeneous, `class G`], _rational] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 944	$x^8 y'(x)^2 + 3xy'(x) + 9y(x) = 0$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 945	$y(x)y'(x)^2 = a$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 946	$y(x)y'(x)^2 = a^2 x$ [[_homogeneous, `class A`], _dAlembert] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 947	$y(x)y'(x)^2 = e^{2x}$ [[_1st_order, _with_linear_symmetries]] Solution method Change of variable Maple ✓ Mathematica ✓

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#	result
ODE 948	$2axy'(x) - ay(x) + y(x)y'(x)^2 = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right) = 0$ Maple ✓ Mathematica ✓
ODE 949	$-4a^2xy'(x) + a^2y(x) + y(x)y'(x)^2 = 0$ [[_homogeneous, `class A`], _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✗
ODE 950	$axy'(x) + by(x) + y(x)y'(x)^2 = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 951	$-(a - 2bx)y'(x) - by(x) + y(x)y'(x)^2 = 0$ [[_homogeneous, `class C`], _rational, _dAlembert] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 952	$x^3y'(x) - x^2y(x) + y(x)y'(x)^2 = 0$ [[_1st_order, _with_linear_symmetries]] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 953	$y(x)y'(x)^2 + (x - y(x))y'(x) - x = 0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 954	$y(x)y'(x)^2-(y(x)+x)y'(x)+y(x)=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 955	$y(x)y'(x)^2-(xy(x)+1)y'(x)+x=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 956	$y(x)y'(x)^2+\left(x-y(x)^2\right)y'(x)-xy(x)=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 957	$y(x)y'(x)^2+y(x)=a$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Use new variable Maple ✓ Mathematica ✓
ODE 958	$(y(x)+x)y'(x)^2+2xy'(x)-y(x)=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓

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#	result
ODE 959	$(2x - y(x))y'(x)^2 - 2(1-x)y'(x) - y(x) + 2 = 0$ [[_homogeneous, `class C`], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 960	$2y(x)y'(x)^2 + (5-4x)y'(x) + 2y(x) = 0$ [[_homogeneous, `class C`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 961	$4x^3y'(x) - 4x^2y(x) + 9y(x)y'(x)^2 = 0$ [[_1st_order, _with_linear_symmetries]] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 962	$(1 - ay(x))y'(x)^2 = ay(x)$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Use new variable Maple ✓ Mathematica ✓
ODE 963	$y'(x)^2(\mathrm{a0} + \mathrm{b0}x + \mathrm{c0}y(x)) + y'(x)(\mathrm{a1} + \mathrm{b1}x + \mathrm{c1}y(x)) + \mathrm{a2} + \mathrm{b2}x + \mathrm{c2}y(x) = 0$ [_dAlembert] Solution method Change of variable Maple ✓ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 964	$\left(x^2 - ay(x)\right) y'(x)^2 - 2xy(x)y'(x) = 0$ [_quadrature] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 965	$xy(x)y'(x)^2 + (y(x) + x)y'(x) + 1 = 0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 966	$\left(x^2 + y(x)^2\right) y'(x) + xy(x)y'(x)^2 + xy(x) = 0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 967	$\left(x^2 - y(x)^2\right) y'(x) + xy(x)y'(x)^2 - xy(x) = 0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 968	$-\left(x^2 - y(x)^2\right) y'(x) + xy(x)y'(x)^2 - xy(x) = 0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 969	$\left(a + x^2 - y(x)^2\right) y'(x) + xy(x)y'(x)^2 - xy(x) = 0$ [_rational] Solution method Change of variable Maple ✗ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 970	$-y'(x)\left(a-bx^2+y(x)^2\right)-bxy(x)+xy(x)y'(x)^2=0$ [_rational] Solution method The method of Lagrange Maple ✗ Mathematica ✗
ODE 971	$\left(3x^2-2y(x)^2\right)y'(x)+xy(x)y'(x)^2-6xy(x)=0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 972	$-2xy(x)y'(x)+x(x-2y(x))y'(x)^2+y(x)^2-2xy(x)=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous ODE, $x^n f\left(\frac{y}{x},y'\right)=0$, Solve for p Maple ✓ Mathematica ✓
ODE 973	$6xy(x)y'(x)+x(x-2y(x))y'(x)^2+y(x)^2-2xy(x)=0$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous ODE, $x^n f\left(\frac{y}{x},y'\right)=0$ Maple ✓ Mathematica ✓
ODE 974	$y(x)^2y'(x)^2=a^2$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 975	$-a^2+y(x)^2y'(x)^2+y(x)^2=0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✓
ODE 976	$y(x)^2y'(x)^2-3xy'(x)+y(x)=0$ [[_1st_order, _with_linear_symmetries], _rational] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 977	$-6x^3y'(x)+4x^2y(x)+y(x)^2y'(x)^2=0$ [[_1st_order, _with_linear_symmetries]] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 978	$4a^2-4ay(x)y'(x)-4ax+y(x)^2y'(x)^2+y(x)^2=0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(y)]`]] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 979	$y(x)^2y'(x)^2-(x+1)y(x)y'(x)+x=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 980	$x^2+2xy(x)y'(x)+y(x)^2y'(x)^2=0$ [_separable] Solution method Homogeneous ODE, $x^n f(\frac{y}{x},y')=0$, Solve for p Maple ✓ Mathematica ✓
ODE 981	$a+y(x)^2y'(x)^2+2xy(x)y'(x)-y(x)^2=0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(y)]`]] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 982	$-x^2-2xy(x)y'(x)+y(x)^2y'(x)^2+2y(x)^2=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 983	$a-x^2-2xy(x)y'(x)+y(x)^2y'(x)^2+2y(x)^2=0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(y)]`]] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 984	$(a-1)b+ax^2+2axy(x)y'(x)+(1-a)y(x)^2+y(x)^2y'(x)^2=0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(y)]`]] Solution method Homogeneous ODE, $x^n f(\frac{y}{x},y')=0$, Solve for x Maple ✓ Mathematica ✓

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#	result
ODE 985	$\left(1-y(x)^2\right) y'(x)^2 = 1$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 986	$\left(a^2-y(x)^2\right) y'(x)^2 = y(x)^2$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 987	$\left(a^2-2axy(x)+y(x)^2\right) y'(x)^2 + 2ay(x)y'(x) + y(x)^2 = 0$ [`y=_G(x,y')`] Solution method No Missing Variables ODE, Solve for x Maple ✗ Mathematica ✗
ODE 988	$\left(a^2x^2-y(x)^2\right) y'(x)^2 + \left(a^2-1\right) x^2 - 2xy(x)y'(x) = 0$ [[_homogeneous, `class A`], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✗
ODE 989	$\left((1-a)x^2+y(x)^2\right) y'(x)^2 + 2axy(x)y'(x) + (1-a)y(x)^2 + x^2 = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right) = 0$, Solve for p Maple ✓ Mathematica ✓

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#	result
ODE 990	$\left(\left(1-4a^2\right)x^2+y(x)^2\right)y'(x)^2-8a^2xy(x)y'(x)+\left(1-4a^2\right)y(x)^2+x^2=0$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous ODE, $x^n f\left(\frac{y}{x},y'\right)=0$, Solve for p Maple ✓ Mathematica ✓
ODE 991	$\left(\left(1-a^2\right)x^2+y(x)^2\right)y'(x)^2+2a^2xy(x)y'(x)+\left(1-a^2\right)y(x)^2+x^2=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous ODE, $x^n f\left(\frac{y}{x},y'\right)=0$, Solve for p Maple ✓ Mathematica ✓
ODE 992	$(y(x)+x)^2y'(x)^2=y(x)^2$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 993	$-\left(x^2-xy(x)-2y(x)^2\right)y'(x)+(y(x)+x)^2y'(x)^2-(x-y(x))y(x)=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 994	$2a^2y'(x)+\left(a^2-(x-y(x))^2\right)y'(x)^2+a^2-(x-y(x))^2=0$ [[_homogeneous, `class C`], _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 995	$x^2+2xy(x)y'(x)+2y(x)^2y'(x)^2+y(x)^2-1=0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(y)]`]] Solution method Change of variable Maple ✓ Mathematica ✓

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#	result
ODE 996	$-x^2-2xy(x)y'(x)+3y(x)^2y'(x)^2+4y(x)^2=0$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous ODE, $x^n f\left(\frac{y}{x},y'\right)=0$, Solve for x Maple ✓ Mathematica ✓
ODE 997	$3x^3+2(3x+1)xy(x)y'(x)+4y(x)^2y'(x)^2=0$ [_separable] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 998	$\left(x^2-4y(x)^2\right)y'(x)^2-4x^2+6xy(x)y'(x)+y(x)^2=0$ [[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 999	$9y(x)^2y'(x)^2-3xy'(x)+y(x)=0$ [[_1st_order, _with_linear_symmetries], _rational] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 1000	$(2-3y(x))^2y'(x)^2=4(1-y(x))$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 1001	$a^2(-x^2) - 3a^2xy(x)y'(x) + (1-a^2)\,y(x)^2y'(x)^2 + y(x)^2 = 0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 1002	$(a-b)y(x)^2y'(x)^2 - ab + ay(x)^2 - bx^2 - 2bxy(x)y'(x) = 0$ [_rational, [_1st_order, `_with_symmetry_[F(x),G(y)]`]] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 1003	$a^2y'(x)^2\left(b^2-(cx-ay(x))^2\right) + c^2\left(b^2-(cx-ay(x))^2\right) + 2ab^2cy'(x) = 0$ [[_homogeneous, `class C`], _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 1004	$a^2x + y(x)^3\left(-y'(x)\right) + xy(x)^2y'(x)^2 = 0$ [[_homogeneous, `class G`], _rational] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 1005	$\left(a - x^3 - y(x)^3\right)y'(x) + x^2y(x) + xy(x)^2y'(x)^2 = 0$ [_rational] Solution method Change of variable Maple ✓ Mathematica ✗

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#	result
ODE 1006	$-x\left(x^2-2y(x)^2\right)-2y(x)^3y'(x)+xy(x)^2y'(x)^2=0$ [_separable] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 1007	$-a+y(x)^3\left(-y'(x)\right)+2xy(x)^2y'(x)^2=0$ [[_homogeneous, `class G`], _rational] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 1008	$4x^2y(x)^2y'(x)^2=\left(x^2+y(x)^2\right)^2$ [[_homogeneous, `class A`], _rational, _Bernoulli] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 1009	$-2x\left(x^3+2y(x)^2\right)y(x)y'(x)+\left(2x^3+y(x)^2\right)y(x)^2+4x^2y(x)^2y'(x)^2=0$ [[_homogeneous, `class G`], _rational, _dAlembert] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 1010	$4y(x)^3y'(x)^2-4xy'(x)+y(x)=0$ [[_1st_order, _with_linear_symmetries], _rational] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓

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#	result
ODE 1011	$xy(x)\left(x^2+y(x)^2\right)y'(x)^2 - xy(x)\left(x^2+y(x)^2\right) - \left(x^4+x^2y(x)^2+y(x)^4\right)y'(x)=0$ [[_homogeneous, `class A`], _rational, _Bernoulli] Solution method Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right)=0$, Solve for p Maple ✓ Mathematica ✓
ODE 1012	$x\left(a^2x+y(x)\left(x^2-y(x)^2\right)\right)y'(x)^2 + \left(2a^2xy(x)+\left(x^2-y(x)^2\right)^2\right)y'(x) + a^2y(x)^2 - x\left(x^2-y(x)^2\right)y(x)=0$ [`y=_G(x,y')`] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 1013	$x\left(a^2x+y(x)\left(x^2-y(x)^2\right)\right)y'(x)^2 - \left(2a^2xy(x)-\left(x^2-y(x)^2\right)^2\right)y'(x) + a^2y(x)^2 - x\left(x^2-y(x)^2\right)y(x)=0$ [_separable] Solution method Change of variable Maple ✗ Mathematica ✓
ODE 1014	$\left(x^2-y(x)^2\left(x^2+y(x)^2\right)\right)y'(x)^2-2xy(x)y'(x)+y(x)^2=0$ [`y=_G(x,y')`] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 1015	$-2x\left(x^2+2y(x)^2\right)y(x)y'(x)+\left(x^4+y(x)^2\left(x^2-y(x)^2\right)\right)y'(x)^2+y(x)^4=0$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right)=0$, Solve for p Maple ✓ Mathematica ✓

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#	result
ODE 1016	$y(x)^5 \left(-y'(x)\right) + 3xy(x)^4 y'(x)^2 + 1 = 0$ [[_homogeneous, `class G`], _rational] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 1017	$-a - 3y(x)^5 y'(x) + 9xy(x)^4 y'(x)^2 = 0$ [[_homogeneous, `class G`], _rational] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 1018	$9\left(1 - x^2\right) y(x)^4 y'(x)^2 + 4x^2 + 6xy(x)^5 y'(x) = 0$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 1019	$y'(x)^2 \left(a^2 r(x, y(x)) - x^2\right) + a^2 r(x, y(x)) + 2xy(x)y'(x) - y(x)^2 = 0$ [NONE] Solution method Change of variable, polar coordinates Maple ✗ Mathematica ✗
ODE 1020	$y'(x)^2 \left(ar(x, y(x)) - x^2\right) + ar(x, y(x)) + 2xy(x)y'(x) - y(x)^2 = 0$ [NONE] Solution method Change of variable, polar coordinates Maple ✗ Mathematica ✗

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#	result
ODE 1021	$y'(x)^3 = a + bx$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 1022	$y'(x)^3 = ax^n$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 1023	$y'(x)^3 - y(x) + x = 0$ [[_homogeneous, `class C`], _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 1024	$y'(x)^3 = f(x)\left(a + by(x) + cy(x)^2\right)$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 1025	$y'(x)^3 = (y(x) - a)^2(y(x) - b)^2$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 1026	$f(x)(y(x)-a)^2(y(x)-b)^2+y'(x)^3=0$ [[_1st_order , `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m+F(x)G(y)=0$ Maple ✓ Mathematica ✓
ODE 1027	$f(x)(y(x)-a)^2(y(x)-b)^2(y(x)-c)^2+y'(x)^3=0$ [[_1st_order , `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m+F(x)G(y)=0$ Maple ✓ Mathematica ✓
ODE 1028	$a-bx+y'(x)^3+y'(x)=0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for x Maple ✓ Mathematica ✓
ODE 1029	$y'(x)^3+y'(x)-y(x)=0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✓
ODE 1030	$y'(x)^3+y'(x)=e^{y(x)}$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✗

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#	result
ODE 1031	$y'(x)^3 - 7y'(x) + 6 = 0$ [_quadrature] Solution method Missing Variables ODE, Both independent and dependent variable missing Maple ✓ Mathematica ✓
ODE 1032	$ay(x) + y'(x)^3 - xy'(x) = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✗
ODE 1033	$y'(x)^3 + 2xy'(x) - y(x) = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✗
ODE 1034	$y'(x)^3 - 2xy'(x) - y(x) = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✗
ODE 1035	$-axy'(x) + x^3 + y'(x)^3 = 0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Use new variable Maple ✓ Mathematica ✗

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#	result
ODE 1036	$axy'(x) - ay(x) + y'(x)^3 = 0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✗
ODE 1037	$-(a+bx)y'(x) + by(x) + y'(x)^3 = 0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✗
ODE 1038	$y'(x)^3 - y(x)y'(x) - x = 0$ [_dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 1039	$y'(x)^3 - (y(x)+3)y'(x) + x = 0$ [_dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 1040	$y'(x)^3 - 2y(x)y'(x) + y(x)^2 = 0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✗

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#	result
ODE 1041	$-axy(x)y'(x)+2ay(x)^2+y'(x)^3=0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✗
ODE 1042	$-\left(x^3+xy(x)+y(x)^2\right)y'(x)+y'(x)^3+xy(x)(y(x)+x)=0$ [`y=_G(x,y')`] Solution method No Missing Variables ODE, Solve for y' Maple ✗ Mathematica ✗
ODE 1043	$-xy(x)^4y'(x)+y'(x)^3-y(x)^5=0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✗
ODE 1044	$y'(x)^3+e^{3x-2y(x)}(y'(x)-1)=0$ [[_homogeneous, `class C`], _dAlembert] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 1045	$y'(x)^3+\left(e^{2x}+e^{3x}\right)e^{-2y(x)}y'(x)-e^{3x-2y(x)}=0$ [`y=_G(x,y')`] Solution method Change of variable Maple ✓ Mathematica ✗

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#	result
ODE 1046	$y'(x)^3 + y'(x)^2 - y(x) = 0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✗
ODE 1047	$y'(x)^3 - y'(x)^2 + y(x)^2 = 0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Use new variable Maple ✓ Mathematica ✗
ODE 1048	$y'(x)^3 - y'(x)^2 + xy'(x) - y(x) = 0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 1049	$abx - ay'(x)^2 + by(x) + y'(x)^3 = 0$ [[_homogeneous, `class C`], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✗
ODE 1050	$a0y'(x)^2 + a1y'(x) + a2 + a3y(x) + y'(x)^3 = 0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✗

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#	result
ODE 1051	$y'(x)^3 + xy'(x)^2 - y(x) = 0$ [_dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 1052	$-x^3 - (1-3x)xy'(x) + y'(x)^3 + (1-3x)y'(x)^2 - 1 = 0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Use new variable Maple ✓ Mathematica ✗
ODE 1053	$y'(x)^3 - y(x)y'(x)^2 + y(x)^2 = 0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✗
ODE 1054	$y'(x)^3 + y'(x)^2(\cos(x)\cot(x) - y(x)) - y'(x)(y(x)\cos(x)\cot(x) + 1) + y(x) = 0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 1055	$y'(x)^3 + \left(2x - y(x)^2\right)y'(x)^2 - 2xy(x)^2y'(x) = 0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓

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#	result
ODE 1056	$\left(x^2+2xy(x)^2-y(x)^2\right)y'(x) - y(x)^2\left(x^2-y(x)^2\right) + y'(x)^3 - \left(y(x)^2+2x\right)y'(x)^2=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 1057	$-x^3y(x)^3+x\left(x^2+xy(x)+y(x)^2\right)y(x)y'(x)-\left(x^2+xy(x)+y(x)^2\right)y'(x)^2+y'(x)^3=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 1058	$-x^3y(x)^6 + x\left(x^2+y(x)^4+xy(x)^2\right)y(x)^2y'(x) - \left(x^2+y(x)^4+xy(x)^2\right)y'(x)^2+y'(x)^3=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 1059	$2y'(x)^3+xy'(x)-2y(x)=0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✗
ODE 1060	$2y'(x)^3+y'(x)^2-y(x)=0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✗

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#	result
ODE 1061	$x^4(-y'(x)) + 2x^3y(x) + 3y'(x)^3 = 0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✗
ODE 1062	$4y'(x)^3 + 4y'(x) = x$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for x Maple ✓ Mathematica ✓
ODE 1063	$8y'(x)^3 + 12y'(x)^2 = 27(y(x) + x)$ [[_homogeneous, `class C`], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✗
ODE 1064	$a + xy'(x)^3 - y(x)y'(x)^2 = 0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✗
ODE 1065	$xy'(x)^3 + (2x - y(x))y'(x)^2 + (2 - 2y(x))y'(x) - y(x) + 1 = 0$ [_dAlembert] Solution method Clairaut's equation and related types, $f(y - xy', y') = 0$ Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1066	$-\left(x^2+y(x)+x\right)y'(x)^2+\left(x^2+xy(x)+y(x)\right)y'(x)+xy'(x)^3-xy(x)=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 1067	$4x^2+xy'(x)^3-2y(x)y'(x)^2=0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✗
ODE 1068	$2xy'(x)^3-3y(x)y'(x)^2-x=0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✗
ODE 1069	$4xy'(x)^3-6y(x)y'(x)^2+3y(x)-x=0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✗
ODE 1070	$8xy'(x)^3-12y(x)y'(x)^2+9y(x)=0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 1071	$x^2y'(x)^3 - 2xy(x)y'(x)^2 + y(x)^2y'(x) + 1 = 0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, $f(y - xy', y') = 0$ Maple ✓ Mathematica ✗
ODE 1072	$bx\left(a^2 - x^2\right)y'(x)^2 + \left(a^2 - x^2\right)y'(x)^3 - bx - y'(x) = 0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 1073	$x\left(x^5 + 3y(x)^2\right)y'(x) - 2x^5y(x) - 3x^2y(x)y'(x)^2 + xy'(x)^3 - y(x)^3 = 0$ [`y=_G(x,y')`] Solution method Change of variable Maple ✗ Mathematica ✗
ODE 1074	$2x^3y'(x)^3 + 6x^2y(x)y'(x)^2 - (1 - 6xy(x))y(x)y'(x) + 2y(x)^3 = 0$ [[_homogeneous, `class G`]] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 1075	$8x^3y'(x)^3 + 12x^2y(x)y'(x)^2 - \left(1 - 6xy(x)^2\right)y'(x) + y(x)^3 = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 1076	$x^4y'(x)^3 - x^3y(x)y'(x)^2 - x^2y(x)^2y'(x) + xy(x)^3 = 1$ [[_1st_order, _with_linear_symmetries]] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 1077	$x^6y'(x)^3 - xy'(x) - y(x) = 0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✗
ODE 1078	$y(x)y'(x)^3 - 3xy'(x) + 3y(x) = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✗
ODE 1079	$2y(x)y'(x)^3 - 3xy'(x) + 2y(x) = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✗
ODE 1080	$2y(x)y'(x)^3 + 3y(x)y'(x) + x = 0$ [[_homogeneous, `class A`], _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✗
ODE 1081	$2y(x)y'(x)^3 - y(x)y'(x)^2 + 2xy'(x) - x = 0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1082	$(2y(x)+x)y'(x)^3+3(y(x)+x)y'(x)^2+(y(x)+2x)y'(x)=0$ [_quadrature] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 1083	$y(x)^2y'(x)^3-xy'(x)+y(x)=0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✗
ODE 1084	$y(x)^2y'(x)^3+2xy'(x)-y(x)=0$ [[_1st_order, _with_linear_symmetries]] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 1085	$4y(x)^2y'(x)^3-2xy'(x)+y(x)=0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✗
ODE 1086	$16y(x)^2y'(x)^3+2xy'(x)-y(x)=0$ [[_1st_order, _with_linear_symmetries]] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 1087	$x\left(x^2+1\right)y'(x)-x^2y(x)+y(x)^3\left(-y'(x)^2\right)+xy(x)^2y'(x)^3=0$ [`y=_G(x,y')`] Solution method Change of variable Maple ✓ Mathematica ✗

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#	result
ODE 1088	$x^7y(x)^2y'(x)^3+\left(1-3x^6y(x)^3\right)y'(x)^2+3x^5y(x)^4y'(x)-x^4y(x)^5=0$ [[_homogeneous, `class G`]] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 1089	$y(x)^3y'(x)^3-xy'(x)+y(x)=0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✗
ODE 1090	$x^3+3x^2y(x)y'(x)+y(x)^3y'(x)^3-(1-3x)y(x)^2y'(x)^2-y(x)^2=0$ [`y=_G(x,y')`] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 1091	$y(x)^4y'(x)^3-6xy'(x)+2y(x)=0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✗
ODE 1092	$y'(x)^4=(y(x)-a)^3(y(x)-b)^2$ [_quadrature] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 1093	$f(x)(y(x)-a)^3(y(x)-b)^2+y'(x)^4=0$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m+F(x)G(y)=0$ Maple ✓ Mathematica ✓

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#	result
ODE 1094	$f(x)(y(x)-a)^3(y(x)-b)^3+y'(x)^4=0$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m+F(x)G(y)=0$ Maple ✓ Mathematica ✓
ODE 1095	$f(x)(y(x)-a)^3(y(x)-b)^3(y(x)-c)^2+y'(x)^4=0$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m+F(x)G(y)=0$ Maple ✓ Mathematica ✓
ODE 1096	$y'(x)^4+xy'(x)-3y(x)=0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✗
ODE 1097	$y'(x)^4-3(1-x)y'(x)^2+3(1-2y(x))y'(x)+3x=0$ [_dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✗
ODE 1098	$-4x^2y(x)y'(x)^2+y'(x)^4+16xy(x)^2y'(x)-16y(x)^3=0$ [[_homogeneous, `class G`]] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓

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#	result
ODE 1099	$y'(x)^4+4y(x)y'(x)^3+6y(x)^2y'(x)^2-\left(1-4y(x)^3\right)y'(x)-y(x)\left(3-y(x)^3\right)=0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Use new variable Maple ✓ Mathematica ✗
ODE 1100	$2y'(x)^4-y(x)y'(x)-2=0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✗
ODE 1101	$12x^3+xy'(x)^4-2y(x)y'(x)^3=0$ [[_1st_order, _with_linear_symmetries]] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✗
ODE 1102	$ay'(x)^3+by'(x)^2+y'(x)^5=cy(x)$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✓
ODE 1103	$ay'(x)^4+by'(x)^3+cxy'(x)^2+y'(x)^5=cy(x)$ [_dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓

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#	result
ODE 1104	$3y'(x)^5 - y(x)y'(x) + 1 = 0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✓
ODE 1105	$y'(x)^6 = (y(x) - a)^4(y(x) - b)^3$ [_quadrature] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 1106	$f(x)(y(x) - a)^4(y(x) - b)^3 + y'(x)^6 = 0$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m + F(x)G(y) = 0$ Maple ✓ Mathematica ✓
ODE 1107	$f(x)(y(x) - a)^5(y(x) - b)^3 + y'(x)^6 = 0$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m + F(x)G(y) = 0$ Maple ✓ Mathematica ✓
ODE 1108	$f(x)(y(x) - a)^5(y(x) - b)^4 + y'(x)^6 = 0$ [[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m + F(x)G(y) = 0$ Maple ✓ Mathematica ✓

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#	result
ODE 1109	$f(x)(y(x)-a)^5(y(x)-b)^4(y(x)-c)^3+y'(x)^6=0$ [[_1st_order , `_with_symmetry_[F(x),G(x)*y+H(x)]`]] Solution method Binomial equation $(y')^m+F(x)G(y)=0$ Maple ✓ Mathematica ✓
ODE 1110	$x^2\left(y'(x)^6+3y(x)^4+3y(x)^2+1\right)=a^2$ [_rational] Solution method Missing Variables ODE, Dependent variable missing, Solve for x Maple ✗ Mathematica ✗
ODE 1111	$y'(x)^n=ax^r+by'(x)^s$ [_quadrature] Solution method Change of variable Maple ✓ Mathematica ✗
ODE 1112	$y'(x)^n=f(x)^n(y(x)-a)^{n+1}(y(x)-b)^{n-1}$ [_separable] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 1113	$y'(x)^n=f(x)(y(x)-a)^{n+1}$ [_separable] Solution method Binomial equation $(y')^m+F(x)G(y)=0$ Maple ✓ Mathematica ✓

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#	result
ODE 1114	$y'(x)^n = f(x)(y(x)-a)^{n-1}(y(x)-b)^{n-1}$ [_separable] Solution method Binomial equation $(y')^m + F(x)G(y) = 0$ Maple ✓ Mathematica ✓
ODE 1115	$f(x)g(x) + y'(x)^n = 0$ [_quadrature] Solution method Form $(y')^m + X(x,y) = 0$ Maple ✓ Mathematica ✓
ODE 1116	$f(x,y(x)) + y'(x)^n = 0$ [NONE] Solution method Form $(y')^m + X(x,y) = 0$ Maple ✗ Mathematica ✗
ODE 1117	$ay'(x) + y'(x)^n = by(x)$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✓
ODE 1118	$y'(x)^n + xy'(x) - y(x) = 0$ [_Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓

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#	result
ODE 1119	$ay'(x)^m + y'(x)^n = by(x)$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✓
ODE 1120	$\mathrm{Y1}(y(x))y'(x)^{n-1} + y'(x)^n = 0$ [_quadrature] Solution method Form $(y')^m + f_1(x,y)(y')^{m-1} \cdots + f_m(x,y) = 0$ Maple ✗ Mathematica ✓
ODE 1121	$\mathrm{X1}(x,y(x))y'(x)^{n-1} + y'(x)^n = 0$ [_quadrature] Solution method Form $(y')^m + f_1(x,y)(y')^{m-1} \cdots + f_m(x,y) = 0$ Maple ✓ Mathematica ✗
ODE 1122	$x^{n-1}y'(x)^n - nxy'(x) + y(x) = 0$ [`y=_G(x,y')`] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 1123	$\mathrm{X0}(x,y(x))y'(x)^n + \mathrm{X1}(x,y(x))y'(x)^{n-1} = 0$ [_quadrature] Solution method Form $X_0(x,y)(y')^m + X_1(x,y)(y')^{m-1} + \cdots + X_m(x,y) = 0$ Maple ✓ Mathematica ✗

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#	result
ODE 1124	$2\sqrt{ay'(x)}+xy'(x)-y(x)=0$ [[_homogeneous, `class G`], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 1125	$(x-y(x))\sqrt{y'(x)}=a(y'(x)+1)$ [[_homogeneous, `class C`], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 1126	$3xy'(x)+2(y(x)+1)^{3/2}-3y(x)=0$ [_separable] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 1127	$ay'(x)+\sqrt{y'(x)^2+1}=x$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for x Maple ✓ Mathematica ✓
ODE 1128	$ay'(x)+\sqrt{y'(x)^2+1}=y(x)$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✓

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#	result
ODE 1129	$\sqrt{y'(x)^2+1} = xy'(x)$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for y' Maple ✓ Mathematica ✓
ODE 1130	$-ay(x)y'(x) - ax + \sqrt{y'(x)^2+1} = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 1131	$-xy'(x)^2 + \sqrt{y'(x)^2+1} + y(x) = 0$ [_dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 1132	$\sqrt{a^2+b^2y'(x)^2} + xy'(x) - y(x) = 0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✗
ODE 1133	$\sqrt{ac-b^2}(xy'(x) - y(x)) + \sqrt{a+2by'(x)+cy'(x)^2} = 0$ [[_1st_order, _with_linear_symmetries], _rational, _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✗

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#	result
ODE 1134	$a\sqrt{y'(x)^2+1}+xy'(x)-y(x)=0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method No Missing Variables ODE, Solve for y' Maple ✓ Mathematica ✓
ODE 1135	$ax\sqrt{y'(x)^2+1}+xy'(x)-y(x)=0$ [[_homogeneous, `class A`], _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 1136	$-ay(x)y'(x)-ax+y(x)\sqrt{y'(x)^2+1}=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 1137	$y(x)\sqrt{y'(x)^2+1}=f(y(x)y'(x)+x)$ [`x=_G(y,y')`] Solution method The method of Lagrange Maple ✓ Mathematica ✓
ODE 1138	$\sqrt{(ax^2+y(x)^2)(y'(x)^2+1)}-ax-y(x)y'(x)=0$ [[_homogeneous, `class A`], _rational, _dAlembert] Solution method Homogeneous ODE, $x^n f\left(\frac{y}{x},y'\right)=0$, Solve for p Maple ✓ Mathematica ✓
ODE 1139	$a\sqrt[3]{y'(x)^3+1}+xy'(x)-y(x)=0$ [_Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓

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#	result
ODE 1140	$y'(x)\left(a+x\sqrt{y'(x)^2+1}\right)=y(x)\sqrt{y'(x)^2+1}$ [_Clairaut] Solution method Clairaut's equation and related types, $f(y-xy',y')=0$ Maple ✓ Mathematica ✗
ODE 1141	$xy'(x)+\cos(y'(x))=y(x)$ [_Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 1142	$a\cos(y'(x))+by'(x)+x=0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for x Maple ✓ Mathematica ✗
ODE 1143	$y'(x)+\sin(y'(x))=x$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for x Maple ✓ Mathematica ✗
ODE 1144	$y'(x)\sin(y'(x))+\cos(y'(x))=y(x)$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✓

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#	result
ODE 1145	$y'(x)^2 \sin(y'(x)) = y(x)$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✓
ODE 1146	$y'(x)^2 (\sin(y'(x)) + x) = y(x)$ [_dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 1147	$(y'(x)^2 + 1) \sin^2(y(x) - xy'(x)) = 1$ [_Clairaut] Solution method Clairaut's equation and related types, $f(y - xy', y') = 0$ Maple ✓ Mathematica ✓
ODE 1148	$-\sqrt{1 - y'(x)^2} + y'(x) (\cos^{-1}(y'(x)) - x) + y(x) = 0$ [_Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 1149	$(y'(x)^2 + 1) (ax + \tan^{-1}(y'(x))) + y'(x) = 0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for x Maple ✓ Mathematica ✗

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#	result
ODE 1150	$-y'(x)^2 + e^{y'(x)-y(x)} + 1 = 0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing, Solve for y Maple ✓ Mathematica ✓
ODE 1151	$y'(x) + \log(y'(x)) = x$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for x Maple ✓ Mathematica ✓
ODE 1152	$a + xy'(x) + \log(y'(x)) = 0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing, Solve for x Maple ✓ Mathematica ✓
ODE 1153	$a + xy'(x) + \log(y'(x)) = y(x)$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 1154	$a + by(x) + xy'(x) + \log(y'(x)) = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓

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#	result
ODE 1155	$4xy'(x) + \log(y'(x)) - 2y(x) = 0$ [[_1st_order, _with_linear_symmetries], _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 1156	$a(xy'(x) - y(x)) + \log(y'(x)) = 0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, $f(y - xy', y') = 0$ Maple ✓ Mathematica ✓
ODE 1157	$a(\log(y'(x)) - y'(x)) + y(x) - x = 0$ [[_homogeneous, `class C`], _dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 1158	$y'(x) + y(x)\log(y'(x)) - xy(x) - y(x)\log(y(x)) = 0$ [_separable] Solution method No Missing Variables ODE, Solve for x Maple ✓ Mathematica ✓
ODE 1159	$-(x+1)y'(x) + y'(x)\log(y'(x)) + y(x) = 0$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓

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#	result
ODE 1160	$\log\left(xy'(x)-y(x)\right)=y'(x)$ [[_1st_order, _with_linear_symmetries], _Clairaut] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 1161	$y'(x)\log\left(\sqrt{a+y'(x)^2}+y'(x)\right)-xy'(x)-\sqrt{y'(x)^2+1}+y(x)=0$ [_Clairaut] Solution method Clairaut's equation and related types, $f(y-xy',y')=0$ Maple ✓ Mathematica ✓
ODE 1162	$y'(x)\tan\left(y'(x)\right)+\log\left(\cos\left(y'(x)\right)\right)=y(x)$ [_dAlembert] Solution method No Missing Variables ODE, Solve for y Maple ✓ Mathematica ✓
ODE 1163	$f(y'(x))=0$ [_quadrature] Solution method Missing Variables ODE, Both independent and dependent variable missing Maple ✓ Mathematica ✓
ODE 1164	$f(x,y'(x))=0$ [_quadrature] Solution method Missing Variables ODE, Dependent variable missing Maple ✓ Mathematica ✓

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#	result
ODE 1165	$f\left(xy'(x)^2\right) = y(x) - 2xy'(x)$ [`y=_G(x,y')`] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 1166	$f(y(x), y'(x)) = 0$ [_quadrature] Solution method Missing Variables ODE, Independent variable missing Maple ✓ Mathematica ✓
ODE 1167	$f(y'(x)) + xy'(x) = y(x)$ [_Clairaut] Solution method Clairaut's equation and related types, main form Maple ✓ Mathematica ✓
ODE 1168	$f(y'(x)) + xg(y'(x)) = y(x)$ [_dAlembert] Solution method Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's) Maple ✓ Mathematica ✓
ODE 1169	$f(y'(x), y(x) - xy'(x)) = 0$ [_Clairaut] Solution method Clairaut's equation and related types, $f(y - xy', y') = 0$ Maple ✓ Mathematica ✓

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#	result
ODE 1170	$f(xy'(x), y(x)) = 0$ [_separable] Solution method Homogeneous ODE, The Isobaric equation Maple ✓ Mathematica ✓
ODE 1171	$x^n f\left(y'(x), \frac{y(x)}{x}\right) = 0$ [[_homogeneous, `class A`], _dAlembert] Solution method Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right) = 0$ Maple ✓ Mathematica ✓
ODE 1172	$f(y(x)y'(x) + x) = y(x)^2 \left(y'(x)^2 + 1\right)$ [`x=_G(y,y')`] Solution method Change of variable Maple ✓ Mathematica ✓
ODE 1173	$y(x) f\left(\frac{y'(x)}{y(x)}, x\right) = 0$ [_separable] Solution method Homogeneous ODE, equation of form $yf(x, \frac{y'}{y})$ Maple ✓ Mathematica ✓
ODE 1174	$f(x, y(x), y'(x)) = 0$ [NONE] Solution method No Missing Variables ODE Maple ✗ Mathematica ✗

Continued on next page

Table 3 – continued from previous page

#	result
ODE 1175	$y''(x) = 0$ [[_2nd_order , _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1176	$y''(x) = x + \sin(x)$ [[_2nd_order , _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1177	$y''(x) = \mathrm{c1}\cos(ax) + \mathrm{c2}\sin(bx)$ [[_2nd_order , _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1178	$y''(x) = e^x x$ [[_2nd_order , _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1179	$y''(x) = \mathrm{c1}e^{ax} + \mathrm{c2}e^{-bx}$ [[_2nd_order , _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1180	$y''(x) + y(x) = 0$ [[_2nd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1181	$y''(x) - y(x) = 0$ [[_2nd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1182	$y''(x) + y(x) = ax$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1183	$y''(x) + y(x) = a\cos(bx)$ [[_2nd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1184	$y''(x) + y(x) = 8\cos(x)\cos(2x)$ [[_2nd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1185	$y''(x) + y(x) = \sec(x)$ [[_2nd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1186	$y''(x) + y(x) = a\sin(bx)$ [[_2nd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1187	$y''(x)+y(x)=\sin(ax)\sin(bx)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1188	$y''(x)+y(x)=4x\sin(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1189	$y''(x)+y(x)=x(\cos(x)-x\sin(x))$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1190	$y''(x)+y(x)=\tan^2(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1191	$y''(x)+y(x)=e^{-x}$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1192	$y''(x)+y(x)=e^x\left(x^2-1\right)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1193	$y''(x)+y(x)=e^x\sin(2x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1194	$y''(x)+y(x)=e^{2x}\cos(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1195	$y''(x)-2y(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1196	$y''(x)-2y(x)=4e^{x^2}x^2$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1197	$y''(x)+4y(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1198	$y''(x)+4y(x)=x\sin^2(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1199	$y''(x) + 4y(x) = 2\tan(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1200	$y''(x) + 4y(x) = 2\tan(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1201	$y''(x) - a^2 y(x) = x + 1$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1202	$y''(x) = ax + by(x)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1203	$a^2 y(x) + y''(x) = x^2 + x + 1$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1204	$a^2 y(x) + y''(x) = \cos(bx)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1205	$a^2 y(x) + y''(x) = \cot(ax)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1206	$a^2 y(x) + y''(x) = \sin(bx)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1207	$y''(x) + xy(x) = 0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1208	$y(x)(a + bx) + y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1209	$(a + x^2) y(x) + y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1210	$(a - x^2) y(x) + y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1211	$y''(x) = (a + x^2)\, y(x)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1212	$y(x)\left(a + b^2x^2\right) + y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1213	$y(x)\left(a + bx + cx^2\right) + y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1214	$y(x)\left(\mathrm{a0} + \mathrm{a1}x^2 + x^4\right) + y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1215	$ax^k y(x) + y''(x) = 0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1216	$y(x)\left(\mathrm{a0} + \mathrm{a1}x + \mathrm{a2}x^2 + \mathrm{a3}x^3 + \mathrm{a4}x^4 + x^8\right) + y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 1217	$y(x)(a+b\cos(2x))+y''(x)=0$ [_ellipsoidal] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1218	$y(x)(a+b\cos(2x)+k\cos(4x))+y''(x)=0$ [_ellipsoidal] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1219	$y(x)\left(\sum_{n=0}^{m}a(n)\cos(2nx)\right)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1220	$y''(x)=2y(x)\csc^2(x)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1221	$ay(x)\csc^2(x)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1222	$y(x)\left(\mathrm{a0}+\mathrm{a1}\cos^2(x)+\mathrm{a2}\csc^2(x)\right)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
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Table 3 – continued from previous page

#	result
ODE 1223	$y''(x) = y(x)\left(a^2 + (p-1)p\csc^2(x) + (q-1)q\sec^2(x)\right)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1224	$y(x)\left(a + b\sin^2(x)\right) + y''(x) = 0$ [_ellipsoidal] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1225	$y''(x) = y(x)\left(2\tan^2(x) + 1\right)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1226	$y''(x) - y(x)\left(a^2 - be^x\right) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1227	$y''(x) - \left(a^2 - e^{2x}\right)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1228	$y(x)\left(a + be^x + ce^{2x}\right) + y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1229	$ae^{bx}y(x)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1230	$y(x)\left(a+b\cosh^2(x)\right)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1231	$y(x)\left(a+b\sinh^2(x)\right)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1232	$y(x)\left(a+b\sin^2(x)\right)+y''(x)=0$ [_ellipsoidal] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1233	$\frac{(a+b)y(x)}{x^2}+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1234	$y''(x)-y'(x)+xy(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1235	$y''(x)+2y'(x)+y(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1236	$y''(x)-2y'(x)+y(x)=(x-6)x^2$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1237	$y''(x)-2y'(x)+y(x)=e^x$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1238	$y''(x)-2y'(x)+y(x)=e^x\left(3x^2+2x+1\right)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1239	$y''(x)-2y'(x)+y(x)=e^x\sin(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1240	$y''(x)+2y'(x)+y(x)=x^2+3e^{2x}-\cos(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1241	$y''(x) - 2y'(x) + y(x) = 8e^{3x}x^2$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1242	$y''(x) - 2y'(x) + y(x) = 50\cos(x)\cosh(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1243	$y''(x) + 2y'(x) + 3y(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1244	$y''(x) + 2y'(x) + y(x) = e^{-x}\cos(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1245	$y''(x) + 2y'(x) + 5y(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1246	$y''(x) + 2y'(x) + 5y(x) = 8\sinh(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1247	$-2\tan(a)y'(x)+\csc^2(a)y(x)+y''(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1248	$-2\tan(a)y'(x)+\csc^2(a)y(x)+y''(x)=x^2e^{x\tan(a)}$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1249	$y''(x)+3y'(x)+2y(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1250	$y''(x)+3y'(x)+2y(x)=\cos(ax)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1251	$y''(x)+3y'(x)+2y(x)=e^x+\sin(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1252	$y''(x)-3y'(x)+2y(x)=x^2+2e^{-x}$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1253	$y''(x) - 3y'(x) + 2y(x) = xe^{ax}$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1254	$y''(x) - 3y'(x) - 4y(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1255	$y''(x) - 3y'(x) - 4y(x) = 10\cos(2x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1256	$y''(x) - 4y'(x) + 4y(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1257	$y''(x) - 4y'(x) + 4y(x) = e^{2x}\cos^2(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1258	$y''(x) + 4y'(x) + 5y(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1259	$y''(x)+4y'(x)+5y(x)=\sin(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1260	$y''(x)-4y'(x)+13y(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1261	$y''(x)-5y'(x)+6y(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1262	$y''(x)-5y'(x)+6y(x)=4e^{x}x^{2}$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1263	$y''(x)-5y'(x)+6y(x)=e^{ax}$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1264	$y''(x)+6y'(x)+9y(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1265	$y''(x)+6y'(x)+9y(x)=e^{-3x}\cosh(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1266	$y''(x)-7y'(x)+12y(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1267	$y''(x)-7y'(x)+12y(x)=x$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1268	$y''(x)+8y'(x)+16y(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1269	$y''(x)+8y'(x)+16y(x)=4e^{x}-e^{2x}$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1270	$y''(x)-9y'(x)+20y(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1271	$y''(x) - 9y'(x) + 20y(x) = e^{3x}x^2$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1272	$2ay'(x) + b^2y(x) + y''(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1273	$2ay'(x) + b^2y(x) + y''(x) = c\sin(kx)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1274	$a^2y(x) - 2ay'(x) + y''(x) = e^x$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1275	$\left(a^2 + b^2\right)^2 y(x) - 4aby'(x) + y''(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1276	$ay'(x) + by(x) + y''(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1277	$ay'(x)+by(x)+y''(x)=f(x)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1278	$ay'(x)+y(x)(b+cx)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1279	$ay'(x)+y(x)\left(b+cx^2\right)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1280	$ay'(x)+y(x)\left(b+ce^x\right)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1281	$be^{2ax}y(x)+ay'(x)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1282	$ay'(x)+be^{kx}y(x)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1283	$y''(x)+xy'(x)+y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1284	$y''(x)+xy'(x)-y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1285	$y''(x)-xy'(x)+2y(x)=0$ [_Hermite] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1286	$ny(x)+y''(x)-xy'(x)=0$ [_Hermite] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1287	$-ay(x)+y''(x)-xy'(x)=0$ [_Hermite] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1288	$y''(x)-xy'(x)-(1-x)y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1289	$y''(x) - 2xy'(x) + 6y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1290	$y''(x) + 2xy'(x) - 8y(x) = 0$ [_erf] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1291	$2ny(x) + y''(x) - 2xy'(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1292	$-\left(-x^2 - x + 1\right) y(x) + y''(x) - (2x + 1)y'(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1293	$2\left(2x^2 + 1\right) y(x) + y''(x) + 4xy'(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1294	$-\left(3 - 4x^2\right) y(x) + y''(x) - 4xy'(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1295	$-\left(3-4x^2\right)y(x)+y''(x)-4xy'(x)=e^{x^2}$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1296	$a^2x^2y(x)-2axy'(x)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1297	$axy'(x)+by(x)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1298	$(a+bx)y'(x)+cy(x)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1299	$(\mathrm{a0}+\mathrm{b0}x)y'(x)+y(x)(\mathrm{a1}+\mathrm{b1}x)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1300	$(\mathrm{a0}+\mathrm{b0}x)y'(x)+y(x)\left(\mathrm{a1}+\mathrm{b1}x+\mathrm{c1}x^2\right)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1301	$-2a\left(1-2ax^2\right)y(x)-4axy'(x)+y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1302	$x^2(-y'(x))+y''(x)+xy(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1303	$x^2(-y'(x))+y''(x)+xy(x)=x$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1304	$x^2y'(x)+y''(x)-4xy(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1305	$x^4y'(x)-x^3y(x)+y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1306	$a(k+1)x^{k-1}y(x)+ax^ky'(x)+y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 1307	$akx^{k-1}y(x)+ax^{k}y'(x)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1308	$-ax^{k-1}y(x)+ax^{k}y'(x)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1309	$ax^{k}y'(x)+bx^{k-1}y(x)+y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1310	$y''(x)-\cot(x)y'(x)+2y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1311	$k(k+1)y(x)+y''(x)+\cot(x)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1312	$y''(x)+\cot(x)y'(x)-y(x)\csc^{2}(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1313	$y(x)\left(p(p+1)-k^2\csc^2(x)\right)+y''(x)+\cot(x)y'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1314	$y(x)\left(\mathrm{a0}+4\mathrm{a1}\sin^2(x)-\mathrm{a2}\csc^2(x)\right)+y''(x)+\cot(x)y'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1315	$y''(x)+2\cot(x)y'(x)+3y(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1316	$y''(x)+2\cot(x)y'(x)+3y(x)=e^x\csc(x)$ [[_2nd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1317	$a\cot(x)y'(x)+y(x)\left(b+k^2\cos^2(x)\right)+y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1318	$y(x)\left(a\cot^2(x)+b\cot(x)\csc(x)+c\csc^2(x)\right)+k\cot(x)y'(x)+y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1319	$y''(x) - \cot(2x)y'(x) + 2y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1320	$ay(x)\tan^2(x) + y''(x) - 2\cot(2x)y'(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1321	$a\cot(bx)y'(x) + cy(x) + y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1322	$\left(b^2 - a^2\right)y(x) + 2a\cot(ax)y'(x) + y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1323	$ay(x)\tan^2\left(\frac{x}{2}\right) + y''(x) - \csc(x)y'(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1324	$y''(x) + y'(x)(\cot(x) + \csc(x)) = a\csc(x) + 1$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 1325	$y''(x) - \csc(2x)y'(x) + y(x)\left(\sin^2(x) + 2\right)\csc^2(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1326	$ay(x)\csc^2(x) + y''(x) + (\cos(x) + 2)\csc(x)y'(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1327	$y''(x) - (3\cos(x) + 2)\csc(x)y'(x) - 2y(x)(\cos(x) + 1)\sec(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1328	$y''(x) - y'(x)(\cot(x) - \sin(x)) + y(x)\sin^2(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1329	$y''(x) - \sin(x)y'(x) + y(x)(-\cos(x)) = a - x + x\log(x)$ [[_2nd_order , _exact , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1330	$-2\csc(2x)\left(1 - a\sin^2(x)\right)y'(x) + by(x)\tan^2(x) + y''(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1331	$ay(x)\cos^2(x)+y''(x)+\tan(x)y'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1332	$ay(x)\cot^2(x)+y''(x)+\tan(x)y'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1333	$-a(a+1)y(x)\csc^2(x)+y''(x)-\tan(x)y'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1334	$y(x)\left(a\cos^2(x)-\sec^2(x)\right)+y''(x)-\tan(x)y'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1335	$y''(x)+2\tan(x)y'(x)-y(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1336	$y''(x)+2\tan(x)y'(x)-y(x)=(x+1)\sec(x)$ [[_2nd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1337	$y''(x) + 2\tan(x)y'(x) + 3y(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1338	$by(x) + y''(x) - 2\tan(x)y'(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1339	$-\left(a^2+1\right)y(x) + y''(x) - 2\tan(x)y'(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1340	$-\left(a^2+1\right)y(x) + y''(x) - 2\tan(x)y'(x) = \sin(x)$ [[_2nd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1341	$a\tan(x)y'(x) + by(x) + y''(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1342	$y''(x) - \left(2e^x+1\right)y'(x) + e^{2x}y(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1343	$y(x)\left(\mathrm{a0}+4\mathrm{a1}\sinh^2(x)-\mathrm{a2csch}^2(x)\right)+y''(x)+\coth(x)y'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1344	$y(x)\left(\mathrm{a0}+4\mathrm{a1}\cosh^2(x)-\mathrm{a2sech}^2(x)\right)+y''(x)+\tanh(x)y'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1345	$by(x)+y''(x)+2\tanh(x)y'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1346	$a\tanh(x)y'(x)+by(x)+y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1347	$f(x)y'(x)+y''(x)=0$ [[_2nd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1348	$akx^{k-1}y(x)+2ax^k y'(x)+2y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1349	$3y''(x) - 10y'(x) + 3y(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1350	$4y''(x) = \left(a + x^2\right) y(x)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1351	$\left(4a - x^2 + 2\right) y(x) + 4y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1352	$4y''(x) - 8y'(x) + 3y(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1353	$xy''(x) + y(x) = 0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1354	$(a + x)y(x) + xy''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1355	$xy''(x)+y'(x)=0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1356	$xy''(x)+y'(x)=x^n$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1357	$xy''(x)+y'(x)-y(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1358	$xy''(x)+y'(x)-(x+1)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1359	$4x^3y(x)+xy''(x)-y'(x)=0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1360	$-a^2x^3y(x)+xy''(x)-y'(x)=0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1361	$x^3\left(e^{x^2}-k^2\right)y(x)+xy''(x)-y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1362	$xy''(x)+2y'(x)=0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1363	$xy''(x)+2y'(x)=0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1364	$xy''(x)+2y'(x)-xy(x)=e^x$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1365	$axy(x)+xy''(x)+2y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1366	$ax^2y(x)+xy''(x)+2y'(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1367	$ay'(x)+xy''(x)=0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1368	$(a+1)y'(x)+xy''(x)+y(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1369	$(1-a)y'(x)+xy''(x)+y(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1370	$(a+1)y'(x)+xy''(x)-y(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1371	$2ny'(x)+xy''(x)-y(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1372	$ay'(x)+by(x)+xy''(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1373	$ay'(x)+bxy(x)+xy''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1374	$ay'(x)+y(x)(\mathrm{b1}+\mathrm{b2}x)+xy''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1375	$ay'(x)+y(x)\left(\mathrm{a1}+\mathrm{b1}x+\mathrm{c1}x^2\right)+xy''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1376	$ay'(x)+bx^k y(x)+xy''(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1377	$xy''(x)-(x+1)y'(x)+y(x)=0$ [_Laguerre] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1378	$ny(x)+xy''(x)+(1-x)y'(x)=0$ [_Laguerre] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1379	$(k-x+1)y'(x)+ny(x)+xy''(x)=0$ [_Laguerre] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1380	$xy''(x)-(x+1)y'(x)+2(1-x)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1381	$xy''(x)-(2-x)y'(x)-y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1382	$xy''(x)-(x+3)y'(x)+y(x)=0$ [_Laguerre] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1383	$xy''(x)-(x+3)y'(x)+3y(x)=0$ [_Laguerre] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1384	$(a+x)y'(x)+by(x)+xy''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1385	$-ay(x)+(c-x)y'(x)+xy''(x)=0$ [_Laguerre] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1386	$xy''(x)+(1-2x)y'(x)-(1-x)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1387	$xy''(x)-(2x+1)y'(x)+(x+1)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1388	$xy''(x)-(2x+1)y'(x)+(x+1)y(x)=x^2-x-1$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1389	$(a+bx)y'(x)+cy(x)+xy''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1390	$(\mathrm{a1}+\mathrm{b1}x)y'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)+xy''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1391	$-2(a+bx)y'(x)+y(x)(2a+bx)+xy''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1392	$y'(x)(x(a+b)+m+n)+y(x)(abx+an+bm)+xy''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1393	$xy''(x)-\left(1-x^2\right)y'(x)=0$ [[_2nd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1394	$-\left(4-x^2\right)y'(x)+xy''(x)+2xy(x)=0$ [[_2nd_order , _exact , _linear , _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1395	$x^3y(x)-\left(2x^2+1\right)y'(x)+xy''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1396	$-8x^3y(x)-\left(2x^2+1\right)y'(x)+xy''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1397	$-8x^3y(x) - \left(2x^2+1\right)y'(x) + xy''(x) = 4e^{-x^2}x^3$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1398	$\left(4x^2+1\right)y'(x) + 4x\left(x^2+1\right)y(x) + xy''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1399	$-\left(1-2ax^3\right)y'(x) + ax^2\left(ax^3+1\right)y(x) + xy''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1400	$(xf(x)+2)y'(x) + f(x)y(x) + xy''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1401	$(1-x)y''(x) + xy'(x) - y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1402	$(1-x)y''(x) + xy'(x) - y(x) = (1-x)^2$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1403	$(3-x)y''(x)-(9-4x)y'(x)+3(2-x)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1404	$(a-x)y''(x)-2y'(x)=0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1405	$(a+x)y''(x)+(\mathrm{a1}+\mathrm{b1}x)y'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1406	$2xy''(x)+y'(x)=0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1407	$ay(x)+2xy''(x)+y'(x)=0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1408	$-ay(x)+2xy''(x)+y'(x)=0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1409	$y(x)(a+bx)+2xy''(x)+y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1410	$-\left(2x^2+1\right)y'(x)+2xy''(x)-xy(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1411	$(1-2x)y''(x)-(x+2)y'(x)-y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1412	$(1-2x)y''(x)-(4-3x)y'(x)+(3-x)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1413	$4y''(x)+2y'(x)+y(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1414	$4y''(x)-2y'(x)-y(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1415	$4xy''(x) + 4\coth(x)y'(x) + y(x) = 0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1416	$y(x)(a + bx) + 16xy''(x) + 8y'(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1417	$(a + bx)y''(x) + cy'(x) = 0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1418	$(\mathrm{a0} + \mathrm{b0}x)y''(x) + (\mathrm{a1} + \mathrm{b1}x)y'(x) + y(x)(\mathrm{a2} + \mathrm{b2}x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1419	$(1 - x\cot(x))y''(x) - xy'(x) + y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1420	$x^2y''(x) = a + bx$ [[_2nd_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1421	$x^2y''(x) = 2y(x)$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1422	$x^2y''(x) = 6y(x)$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1423	$x^2y''(x) = 12y(x)$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1424	$ay(x) + x^2y''(x) = 0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1425	$y(x)(a + bx) + x^2y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1426	$x^2y''(x) - (2 - x^2)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1427	$x^2y''(x) - \left(2 - x^2\right) y(x) = x^4$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1428	$x^2y''(x) - \left(a^2x^2 + 2\right) y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1429	$x^2y''(x) - \left(6 - a^2x^2\right) y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1430	$x^2y''(x) - y(x) \left(a^2x^2 + n(n+1)\right) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1431	$x^2y''(x) - y(x) \left((n-1)n - a^2x^2\right) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1432	$y(x) \left(a + bx + cx^2\right) + x^2y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1433	$x^2y''(x) - y(x)\left((a-1)a - bx^k\right) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1434	$x^k y(x)\left(a + bx^k\right) + x^2y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1435	$-by(x)\left(a + bx^2\right) + ay'(x) + x^2y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1436	$x^2y''(x) + xy'(x) + y(x) = 0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1437	$x^2y''(x) + xy'(x) - y(x) = 0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1438	$x^2y''(x) - xy'(x) + y(x) = 0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1439	$x^2y''(x)+xy'(x)-y(x)=ax^2$ [[_2nd_order, _exact, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1440	$x^2y''(x)-xy'(x)+y(x)=x^2(x+3)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1441	$x^2y''(x)-xy'(x)+y(x)=3x^3$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1442	$x^2y''(x)+xy'(x)+y(x)=\log(x)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1443	$x^2y''(x)-xy'(x)+2y(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1444	$x^2y''(x)-xy'(x)+2y(x)=x\log(x)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1445	$x^2y''(x) - xy'(x) - 3y(x) = 0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1446	$a^2(-y(x)) + x^2y''(x) + xy'(x) = 0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1447	$y(x)(a + bx) + x^2y''(x) + xy'(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1448	$-\left(p^2 - x^2\right) y(x) + x^2y''(x) + xy'(x) = 0$ [_Bessel] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1449	$-\left(p^2 + x^2\right) y(x) + x^2y''(x) + xy'(x) = 0$ [[_Bessel, _modified]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1450	$-\left(p^2 + ix^2\right) y(x) + x^2y''(x) + xy'(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 1451	$-y(x)\left(p^2-a^2x^2\right)+x^2y''(x)+xy'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1452	$-y(x)\left(a+bx+cx^2\right)+x^2y''(x)+xy'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1453	$-y(x)\left(4ax^2+n^2-x^4\right)+x^2y''(x)+xy'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1454	$-y(x)\left(a^2+b^2x^2+c^2x^4\right)+x^2y''(x)+xy'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1455	$(m+1)a(m)x^my(x)+x^2y''(x)+xy'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1456	$(a+x)y'(x)+x^2y''(x)-y(x)=0$ [[_2nd_order , _exact , _linear , _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 1457	$x^2y''(x) - 2xy'(x) + 2y(x) = 0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1458	$x^2y''(x) - 2xy'(x) + 2y(x) = 4x^3$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1459	$x^2y''(x) - 2xy'(x) + 2y(x) = x^3 \sin(x)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1460	$x^2y''(x) - 2xy'(x) + 2y(x) = 2x \log(x)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1461	$x^2y''(x) - 2xy'(x) + 2y(x) = x^5 \log(x)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1462	$x^2y''(x) + 2xy'(x) - 6y(x) = 0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1463	$x^2y''(x)+2xy'(x)-6y(x)=2-x$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1464	$\left(a^2x^2+2\right)y(x)+x^2y''(x)-2xy'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1465	$-y(x)\left(n(n+1)-a^2x^2\right)+x^2y''(x)+2xy'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1466	$y(x)\left(a+bx^2\right)+x^2y''(x)+2xy'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1467	$ay(x)+x^2y''(x)-2(1-x)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1468	$x^2y''(x)+3xy'(x)+y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1469	$x^2y''(x)+3xy'(x)+y(x)=x$ [[_2nd_order, _exact, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1470	$x^2y''(x)+3xy'(x)+y(x)=a-x+x\log(x)$ [[_2nd_order, _exact, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1471	$x^2y''(x)-3xy'(x)+4y(x)=0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1472	$x^2y''(x)-3xy'(x)+4y(x)=5x$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1473	$x^2y''(x)-3xy'(x)-5y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1474	$x^2y''(x)-3xy'(x)-5y(x)=x^2\log(x)$ [[_2nd_order, _exact, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1475	$x^2y''(x)+4xy'(x)+2y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1476	$x^2y''(x)+4xy'(x)+2y(x)=e^x$ [[_2nd_order, _exact, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1477	$x^2y''(x)+4xy'(x)+2y(x)=\log(x+1)$ [[_2nd_order, _exact, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1478	$x^2y''(x)-4xy'(x)+6y(x)=0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1479	$x^2y''(x)-4xy'(x)+6y(x)=x^2\left(x^2-1\right)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1480	$x^2y''(x)+\left(2-x^2\right)y(x)+4xy'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1481	$x^2y''(x)+\left(x^2+6\right)y(x)+4xy'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1482	$x^2y''(x)+5xy'(x)+13y(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1483	$x^2y''(x)-7xy'(x)+16y(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1484	$y(x)\left(a(a+1)+b^2x^2\right)-2axy'(x)+x^2y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1485	$\mathrm{a1}xy'(x)+\mathrm{a2}y(x)+x^2y''(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1486	$\mathrm{a1}xy'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)+x^2y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1487	$\mathrm{a1} x y'(x) + y(x)\left(\mathrm{a2} + \mathrm{b2} x^2\right) + x^2 y''(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1488	$\mathrm{a1} x y'(x) + y(x)\left(\mathrm{a2} + \mathrm{b2} x + \mathrm{c2} x^2\right) + x^2 y''(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1489	$a x y'(x) + y(x)\left(b + c x^3\right) + x^2 y''(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1490	$a x y'(x) + x^2 y(x)\left(\mathrm{a1} + \mathrm{b1} x^2\right) + x^2 y''(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1491	$a x y'(x) + y(x)\left(b + c x^{2k}\right) + x^2 y''(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1492	$(a + b x) y'(x) + c y(x) + x^2 y''(x) = 0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1493	$-2axy'(x)+a(a+1)y(x)+x^2y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1494	$-2axy'(x)+a(a+1)y(x)+x^2y''(x)=e^x x^{a+2}$ [[_2nd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1495	$y(x)\left(a(a+1)+b^2x^2\right)-2axy'(x)+x^2y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1496	$y(x)(a+bx)+2axy'(x)+x^2y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1497	$x^2y''(x)-x^2y'(x)-2x^2y(x)=2x^2\log(x)+x+1$ [[_2nd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1498	$y(x)\left(a+bx^2\right)+x^2y''(x)+x^2y'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1499	$x^2y''(x) - \left(1-x^2\right)y'(x) - y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1500	$x^2y''(x) + (1-x)xy'(x) - (1-x)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1501	$x^2y''(x) - (x+2)xy'(x) + (x+2)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1502	$x^2y''(x) - (x+2)xy'(x) + (x+2)y(x) = x^3$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1503	$x^2y''(x) + (2-x)xy'(x) - (3x+2)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1504	$x^2y''(x) + (x+3)xy'(x) - y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1505	$x^2y''(x) - 2(x+1)xy'(x) + 2(x+1)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1506	$ax^2y'(x) + x^2y''(x) - 2y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1507	$-x(ax+5)y'(x) + (3ax+5)y(x) + x^2y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1508	$x(\mathrm{a1}+\mathrm{b1}x)y'(x) + y(x)\left(\mathrm{a2}+\mathrm{b2}x+\mathrm{c2}x^2\right) + x^2y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1509	$x^3y'(x) + x^2y''(x) - \left(2-x^2\right)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1510	$x^2y''(x) + \left(1-x^2\right)xy'(x) - \left(x^2+1\right)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1511	$4x^3y'(x)+x^2y''(x)+\left(4x^4+2x^2+1\right)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1512	$xy'(x)\left(\mathrm{a0}+\mathrm{b0}x^k\right)+y(x)\left(\mathrm{a1}+\mathrm{b1}x^k+\mathrm{c1}x^{2k}\right)+x^2y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1513	$xy'(x)\left(\mathrm{a0}+\mathrm{a1}x^r+\mathrm{a2}x^s\right)+y(x)\left(\mathrm{b0}+\mathrm{b1}x^r+\mathrm{b2}x^{2r}+\mathrm{b3}x^s+\mathrm{b4}x^{2s}+\mathrm{b5}x^{r+s}\right)+x^2y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1514	$ay(x)+x^2y''(x)+2x^2\cot(x)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1515	$-y(x)(a-x\cot(x))+x^2y''(x)+x(2x\cot(x)+1)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1516	$ay(x)+x^2y''(x)-2x^2\tan(x)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1517	$-y(x)(a+x\tan(x))+x^2y''(x)+x(1-2x\tan(x))y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1518	$y(x)\left(f(x)\left(\text{a1}+\text{b1}x^k-1\right)+\text{a2}+\text{b2}x^k+\text{c2}x^{2k}+f'(x)+f(x)^2\right)+$ $xy'(x)\left(\text{a1}+\text{b1}x^k+2f(x)\right)+x^2y''(x)=0$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 1519	$\left(x^2+1\right)y''(x)-2y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1520	$a+\left(x^2+1\right)y''(x)-xy'(x)=0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1521	$(1-x^2)\,y''(x)+xy'(x)=x$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1522	$(x^2+1)\,y''(x)-xy'(x)+y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1523	$(1-x^2)\,y''(x)+xy'(x)-y(x)=0$ [_Gegenbauer] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1524	$(1-x^2)\,y''(x)-xy'(x)+y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1525	$(1-x^2)\,y''(x)-xy'(x)-y(x)=0$ [_Gegenbauer, [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1526	$(1-x^2)\,y''(x)+xy'(x)-y(x)=x\left(1-x^2\right)^{3/2}$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1527	$(1-x^2)\,y''(x)+xy'(x)+3y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1528	$(x^2+1)\,y''(x)+xy'(x)-4y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1529	$(x^2+1)\,y''(x)+xy'(x)-4y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1530	$n^2y(x)+(1-x^2)\,y''(x)-xy'(x)=0$ [_Gegenbauer, [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1531	$a^2y(x)+(x^2+1)\,y''(x)+xy'(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1532	$a^2y(x)+(1-x^2)\,y''(x)-xy'(x)=0$ [_Gegenbauer, [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1533	$y(x)\left(a+bx^2\right)+\left(1-x^2\right)y''(x)-xy'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1534	$y(x)\left(\sum_{m=0}^{n}a(m)x^{2m}\right)+\left(1-x^2\right)y''(x)-xy'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1535	$\left(1-x^2\right)y''(x)-2xy'(x)=0$ [[_2nd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1536	$a+\left(1-x^2\right)y''(x)-2xy'(x)=0$ [[_2nd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1537	$\left(x^2+1\right)y''(x)+2xy'(x)-2y(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1538	$\left(x^2+1\right)y''(x)-2xy'(x)+2y(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1539	$\left(1-x^2\right) y''(x)+2xy'(x)-2y(x)=\left(1-x^2\right)^2$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1540	$n(n+1)y(x)+\left(1-x^2\right) y''(x)-2xy'(x)=0$ [_Gegenbauer] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1541	$n(n+1)y(x)+\left(1-x^2\right) y''(x)-2xy'(x)=\frac{2((-n-1)xP_n(x)+(n+1)P_{n+1}(x))}{x^2-1}$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1542	$-p(p+1)y(x)+\left(x^2+1\right) y''(x)+2xy'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1543	$p(p+1)y(x)+\left(1-x^2\right) y''(x)-2xy'(x)=0$ [_Gegenbauer] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1544	$n(n+2)y(x)+\left(1-x^2\right) y''(x)-3xy'(x)=0$ [_Gegenbauer] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1545	$-ay(x)+\left(1-x^2\right)y''(x)-3xy'(x)=0$ [_Gegenbauer] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1546	$\left(x^2+1\right)y''(x)+4xy'(x)+2y(x)=2(\cos(x)-x)$ [[_2nd_order, _exact, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1547	$\left(x^2+1\right)y''(x)-4xy'(x)+6y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1548	$\left(1-x^2\right)y''(x)-\left(x^2+1\right)y(x)-4xy'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1549	$\left(1-x^2\right)y''(x)-6xy'(x)-4y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1550	$ny(x)(a+b+n+1)+(-x(a+b+2)-a+b)y'(x)+\left(1-x^2\right)y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1551	$p(2k+p)y(x)-(2k+1)xy'(x)+\left(1-x^2\right)y''(x)=0$ [_Gegenbauer] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1552	$ny(x)(a+b+n+1)+(-x(a+b+2)-a+b)y'(x)+\left(1-x^2\right)y''(x)=0$ [_Gegenbauer] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1553	$-(k-p)(k+p+1)y(x)-2(k+1)xy'(x)+\left(1-x^2\right)y''(x)=0$ [_Gegenbauer] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1554	$-2axy'(x)+(1-a)ay(x)+\left(1-x^2\right)y''(x)=0$ [_Gegenbauer] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1555	$axy'(x)-(2-a)y(x)+\left(x^2+1\right)y''(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1556	$axy'(x)+by(x)+\left(1-x^2\right)y''(x)=0$ [_Gegenbauer] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1557	$axy'(x)+y(x)\left(\mathrm{a0}+\mathrm{b0}x+\mathrm{c0}x^2\right)+\left(1-x^2\right)y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1558	$(a+bx)y'(x)+cy(x)+\left(1-x^2\right)y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1559	$\left(a^2-x^2\right)y''(x)+y(x)\left(b^2+c^2x^2\right)-xy'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1560	$\left(a^2-x^2\right)y''(x)-8xy'(x)-12y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1561	$(1-x)xy''(x)+2y'(x)+y(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1562	$(1-x)xy''(x)-2y'(x)+2y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1563	$(1-x)xy''(x)+2y'(x)+6y(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1564	$(1-x)xy''(x)-2y'(x)+6y(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1565	$(1-x)xy''(x)+3y'(x)+2y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1566	$(1-x)xy''(x)-3y'(x)+2y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1567	$(1-x)xy''(x)-3y'(x)+2y(x)=x\left(3x^3+1\right)$ [[_2nd_order, _exact, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1568	$-ay'(x)+(1-x)xy''(x)+2y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1569	$x(x+1)y''(x)+(1-x)y'(x)+y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1570	$(1-x)xy''(x)-(x+1)y'(x)+y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1571	$(1-x)xy''(x)-(x+4)y'(x)+4y(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1572	$(1-x)xy''(x)+2xy'(x)-2y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1573	$(1-x)xy''(x)+(1-2x)y'(x)+6y(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1574	$p(p+1)y(x)+(1-x)xy''(x)+(1-2x)y'(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1575	$(1-x)xy''(x)+(1-x)y'(x)+2y(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1576	$(1-x)xy''(x)-3xy'(x)-y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1577	$x(x+1)y''(x)+(3x+2)y'(x)+y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1578	$(1-x)xy''(x)+(1-4x)y'(x)-2y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1579	$(1-x)xy''(x)-2(2x+1)y'(x)-2y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1580	$(1-x)xy''(x)-2(1-2x)y'(x)-6y(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1581	$(p-k)(k+p+1)y(x)+(k+1)(1-2x)y'(x)+(1-x)xy''(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1582	$(c-(a+1)x)y'(x)+n(a+n)y(x)+(1-x)xy''(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1583	$(a+bx)y'(x)+cy(x)+x(x+1)y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1584	$y'(x)(c-x(a+b+1))-aby(x)+(1-x)xy''(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1585	$-(a-(2-a)x)y'(x)-ay(x)+x(x+1)y''(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1586	$-(a-(2-a)x)y'(x)-ay(x)+x(x+1)y''(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1587	$(a+bx)y'(x)+cy(x)+(1-x)xy''(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1588	$y(x)\left(\sum_{m=0}^{n}a(m)x^m\right)+a(1-2x)y'(x)+x(x+1)y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1589	$\left(-x^2-x+2\right)y''(x)+(1-x)xy'(x)+x(6x+7)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1590	$(2-x)xy''(x)+2(1-x)y'(x)+2y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1591	$-\left(2-x^2\right)y'(x)+(2-x)xy''(x)+2(1-x)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1592	$(1-x)^2y''(x)-4(1-x)y'(x)+2y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1593	$(1-x)^2y''(x)-4(1-x)y'(x)+2y(x)=\cos(x)$ [[_2nd_order, _exact, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1594	$(x+1)^2y''(x)-4(x+1)y'(x)+6y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1595	$(x+1)^2y''(x)-4(x+1)y'(x)+6y(x)=x$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1596	$-\left(-x^2-x+1\right)y'(x)+(x+1)^2y''(x)-(x+2)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1597	$(1-x)^2y''(x)-2(1-x)^2y'(x)+(1-x)^2y(x)=e^x$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1598	$\left(x^2+3x+4\right)y''(x)+\left(x^2+x+1\right)y'(x)-(2x+3)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1599	$(x+2)^2y''(x)-(x+2)y'(x)+2y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1600	$(2-x)^2y''(x)+(2-x)y'(x)-3y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1601	$x(\mathrm{a0}+x)y''(x)+(\mathrm{a1}+\mathrm{b1}x)y'(x)+\mathrm{a2}y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1602	$-4(a+x)y'(x)+(\mathrm{a0}+x)^2y''(x)+6y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1603	$2x^2y''(x)-xy'(x)+y(x)=x^2$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1604	$2x^2y''(x)+xy'(x)-3y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1605	$2x^2y''(x) - (2x+7)xy'(x) + 2(x+5)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1606	$2x^2y''(x) - (1-4x)xy'(x) - 2(1-3x)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1607	$2x^2y''(x) - (1-4x)xy'(x) - 2(1-3x)y(x) = x^3(x+1)$ [[_2nd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1608	$\left(2x^2+1\right)y''(x) + 3xy'(x) - 3y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1609	$2a^2y(x) + 2\left(1-x^2\right)y''(x) - xy'(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1610	$2x(x+1)y''(x) + y'(x) - 4y(x) = 0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1611	$2(1-x)xy''(x)+(x+1)y'(x)-y(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1612	$2(1-x)xy''(x)+(1-x)y'(x)+y(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1613	$2(1-x)xy''(x)+(1-2x)y'(x)-2y(x)=0$ [_Jacobi, [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1614	$2(1-x)xy''(x)+(1-2x)y'(x)+8y(x)=0$ [_Jacobi, [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1615	$ay(x)+2(1-x)xy''(x)-(1-2x)y'(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1616	$y(x)(a+bx)+2(1-x)xy''(x)+(1-2x)y'(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 1617	$2a(a+1)y(x)+2(1-x)xy''(x)-(3x+1)y'(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1618	$(1-2x)(1-x)y''(x)+2(1-2x)y'(x)+4y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1619	$(1-2x)(1-x)y''(x)+2(3-4x)y'(x)+12y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1620	$2(x+1)^2y''(x)-(x+1)y'(x)+y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1621	$2(x+1)^2y''(x)-(x+1)y'(x)+y(x)=x$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1622	$4x^2y''(x)+y(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1623	$4x^2y''(x)+y(x)=\sqrt{x}$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1624	$y(x)\left(4kx-4p^2-x^2+1\right)+4x^2y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1625	$\left(4a^2x^2+1\right)y(x)+4x^2y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1626	$-\left(a^2-x\right)y(x)+4x^2y''(x)+4xy'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1627	$4x^2y''(x)-\left(4x^2+1\right)y(x)+4xy'(x)=4e^xx^{3/2}$ [[_2nd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1628	$-\left((2n+1)^2-4x^2\right)y(x)+4x^2y''(x)+4xy'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1629	$-\left(a^2x^2+1\right)y(x)+4x^2y''(x)+4xy'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1630	$4x^2y''(x)-8xy'(x)+5y(x)=0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1631	$4x^2y''(x)-2(x+2)xy'(x)+(x+3)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1632	$4x^2y''(x)-\left(-4x^2+4x+1\right)y(x)+4(1-2x)xy'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1633	$4x^3y'(x)+4x^2y''(x)-\left(3-2x^2\right)y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1634	$4x^3y'(x)+4x^2y''(x)+\left(x^4+2x^2+1\right)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1635	$\left(a+x^4+2x^2\right) y(x)+4x^3y'(x)+4x^2y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1636	$4\left(1-x^2\right) y''(x)-8xy'(x)-y(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1637	$-\left(4p^2+1\right) y(x)+4\left(1-x^2\right) y''(x)-8xy'(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1638	$4\left(x^2+1\right) y''(x)=x^2+4xy'(x)$ [[_2nd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1639	$4axy'(x)-a(a+2)y(x)+4\left(1-x^2\right) y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1640	$4(1-x)xy''(x)+2(1-x)y'(x)+y(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1641	$y(x)(a+bx)+4(1-x)xy''(x)+2(1-2x)y'(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1642	$y(x)\left(a+bx+cx^2\right)+4(1-x)xy''(x)+2(1-2x)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1643	$y(x)\left(\sum_{m=0}^{n}a(m)x^m\right)+4(1-x)xy''(x)+2(1-2x)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1644	$-(k-p)(k+p+1)y(x)+2(1-(3-2k)x)y'(x)+4(1-x)xy''(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1645	$2(ax+1)y'(x)+y(x)\left(b+k^2x\right)+4(1-x)xy''(x)=0$ [_Jacobi] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1646	$(2x+1)^2y''(x)-2(2x+1)y'(x)-12y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1647	$(2x+1)^2y''(x)-2(2x+1)y'(x)-12y(x)=3x+1$ [[_2nd_order, _exact, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1648	$(1-3x)^2y''(x)-3(1-3x)y'(x)-9y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1649	$16x^2y''(x)+(4x+3)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1650	$16x^2y''(x)+32xy'(x)-(4x+5)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1651	$\left(ax^2+1\right)y''(x)+axy'(x)+b^2y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1652	$\left(ax^2+1\right)y''(x)+bxy'(x)+cy(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1653	$\left(1-a^2x^2\right)y''(x)-2a^2xy'(x)=0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1654	$\left(1-a^2x^2\right)y''(x)-2a^2xy'(x)+2a^2y(x)=0$ [_Gegenbauer] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1655	$x(a+bx)y''(x)+2ay'(x)-2by(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1656	$y''(x)\left(\mathrm{a0}+\mathrm{b0}x+\mathrm{c0}x^2\right)+(\mathrm{a1}+\mathrm{b1}x)y'(x)+2\mathrm{a2}y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1657	$\mathrm{a1}(a+bx)y'(x)+(a+bx)^2y''(x)+\mathrm{a2}y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1658	$x^3y''(x)=a+bx$ [[_2nd_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1659	$x^3y''(x)+xy'(x)-y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1660	$x^3y''(x)+xy'(x)-2y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1661	$x^3y''(x)+2xy'(x)-y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1662	$\mathrm{a1}xy'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)+x^3y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1663	$y(x)\left(a+bx+cx^2\right)+x^3y''(x)+x^2y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1664	$x^3y''(x)+3x^2y'(x)+xy(x)=0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
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#	result
ODE 1665	$x^3y''(x)+3x^2y'(x)+xy(x)=1$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1666	$ax^2y'(x)+y(x)(b+cx)+x^3y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1667	$(\mathrm{a1}+\mathrm{b1}x^2)\,y'(x)+\mathrm{a2}xy(x)+x^3y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1668	$x(\mathrm{a1}+\mathrm{b1}x)y'(x)+\mathrm{a2}y(x)+x^3y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1669	$x(\mathrm{a1}+\mathrm{b1}x)y'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)+x^3y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1670	$(1-x^3)\,y''(x)+6xy(x)=0$ [[_2nd_order , _exact , _linear , _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1671	$x(1-x^2)\,y''(x)-y'(x)=0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1672	$x^3+(1-x^2)\,xy''(x)-y'(x)=0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1673	$ax^3y(x)+(1-x^2)\,xy''(x)-y'(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1674	$x(1-x^2)\,y''(x)-(x^2+7)\,y'(x)+4xy(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1675	$x(x^2+1)\,y''(x)-2(x^2+1)\,y'(x)+2xy(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1676	$x(x^2+1)\,y''(x)-2(1-x^2)\,y'(x)-2xy(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1677	$x(1-x^2)\,y''(x)-2(1-x^2)\,y'(x)-2xy(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1678	$(a+bx^2)\,y'(x)+cxy(x)+x(x^2+1)\,y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1679	$(a+bx^2)\,y'(x)+(a-1)x(a+b)y(x)+x(1-x^2)\,y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1680	$(a+bx^2)\,y'(x)+2(1-b)xy(x)+x(1-x^2)\,y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1681	$(a-(a+1)x^2)\,y'(x)+cxy(x)+x(1-x^2)\,y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1682	$(a+bx^2)\,y'(x)+cxy(x)+x(1-x^2)\,y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1683	$x\left(x^2+2\right)y''(x)-y'(x)-6xy(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1684	$x\left(2-x^2\right)y''(x)-\left(x^2+4x+2\right)y(x)-\left(-x^3-3x^2+2x+2\right)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1685	$x\left(\mathrm{a0}+x^2\right)y''(x)+\left(\mathrm{a1}+\mathrm{b1}x^2\right)y'(x)+\mathrm{a2}xy(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1686	$x^2(x+1)y''(x)+xy'(x)+(x+1)^3(-y(x))=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1687	$(1-x)x^2y''(x)-(x+1)xy'(x)+y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1688	$(x+1)x^2y''(x)-(2x+1)xy'(x)+(2x+1)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1689	$(1-x)x^2y''(x)+2(2-x)xy'(x)+2(x+1)y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1690	$(1-x)x^2y''(x)-(4-5x)xy'(x)+(6-9x)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1691	$(x+1)x^2y''(x)+2(3x+2)xy'(x)+2(3x+1)y(x)=0$ [[_2nd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1692	$x(\mathrm{a1}+\mathrm{b1}x)y'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)+(1-x)x^2y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1693	$x^2(\mathrm{a0}+x)y''(x)+x(\mathrm{a1}+\mathrm{b1}x)y'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1694	$(1-x)^2xy''(x)-2y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1695	$x\left(x^2+1\right)y''(x)+x(x+1)y'(x)+y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1696	$x(2-x)^2y''(x)+2(2-x)y'(x)+2y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1697	$(1-x)x(a-x)y''(x)+y'(x)\left(x^2(\mathrm{a0}+\mathrm{a1}+1)+\mathrm{a0a2}-\mathrm{a0}+\mathrm{a1}+x(\mathrm{a2}+\mathrm{a3})-\mathrm{a3}+1\right)+\mathrm{a0a1}(x-k)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1698	$(\mathrm{a1}-x)(\mathrm{a2}-x)(\mathrm{a3}-x)y''(x)+y'(x)\left(\mathrm{b0}+\mathrm{b1}x+\mathrm{b2}x^2\right)+y(x)(\mathrm{c0}+\mathrm{c1}x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1699	$\left(1-2x^3\right)y''(x)+6x^2y'(x)-6xy(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 1700	$2(1-x)x^2y''(x)+(3-5x)xy'(x)-(x+1)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1701	$2(2-x)x^2y''(x)-(4-x)xy'(x)+(3-x)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1702	$x\left(3x^2+1\right)y''(x)+2y'(x)-6xy(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1703	$4(x+1)x^2y''(x)-4x^2y'(x)+(3x+1)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1704	$x^2(a+bx)y''(x)-2x(2a+bx)y'(x)+2y(x)(3a+bx)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1705	$y(x)(a+bx)+4(1-x)xy''(x)+2(1-3x)(1-x)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 1706	$4(1-x)x(1-ax)y''(x)+y'(x)\left(\mathrm{a0}+\mathrm{a1}x+\mathrm{a2}x^2\right)+y(x)\left(\mathrm{b0}+\mathrm{b1}x^2\right)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1707	$a^2y(x)+x^4y''(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1708	$x^4y''(x)+\left(1-2x^2\right)y(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1709	$x^4y''(x)-\left(2x^2+1\right)y(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1710	$\left(e^{2/x}-a^2\right)y(x)+x^4y''(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1711	$x^4y''(x)+xy'(x)-2y(x)=0$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1712	$x^4y''(x) - 2x^2y'(x) + (2x+1)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1713	$x^4y''(x) + x^3y'(x) + y(x) = 0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1714	$x^4y''(x) + x^3y'(x) - (x+1)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1715	$y(x)\left(a + bx^2 + cx^4\right) + x^4y''(x) + x^3y'(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1716	$x^4y''(x) + \left(x^2+1\right)xy'(x) + y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1717	$x^4y''(x) - \left(1-x^2\right)xy'(x) + \left(1-x^2\right)y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1718	$a^2y(x)+x^4y''(x)+2x^3y'(x)=0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1719	$x^4y''(x)+\left(2x^2+1\right)xy'(x)-y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1720	$2x^2(a+x)y'(x)+by(x)+x^4y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1721	$\left(x^3+1\right)xy''(x)-\left(1-x^3\right)y'(x)+x^2(-y(x))=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1722	$x^3(-y'(x))+\left(1-x^2\right)x^2y''(x)-2y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1723	$\left(1-x^2\right)x^2y''(x)-\left(2-x^2\right)xy'(x)+\left(2-x^2\right)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1724	$a(a+1)y(x)-2x^3y'(x)+\left(1-x^2\right)x^2y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1725	$\left(x^2+1\right)^2y''(x)+2x\left(x^2+1\right)y'(x)+y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1726	$\left(x^2+1\right)^2y''(x)+2x\left(x^2+1\right)y'(x)+4y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1727	$a^2(-y(x))+\left(x^2+1\right)^2y''(x)-2x\left(1-x^2\right)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1728	$-y(x)\left(m^2-n(n+1)\left(1-x^2\right)\right)+\left(1-x^2\right)^2y''(x)-2x\left(1-x^2\right)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1729	$-y(x)\left(k^2-p(p+1)\left(1-x^2\right)\right)+\left(1-x^2\right)^2y''(x)-2x\left(1-x^2\right)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1730	$-y(x)\left(a^2-k\left(1-x^2\right)\right)+\left(1-x^2\right)^2 y''(x)-2x\left(1-x^2\right)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1731	$y(x)\left(\mathrm{a0}+\mathrm{a2}x^2+\mathrm{a4}x^4\right)+\left(1-x^2\right)^2 y''(x)-2x\left(1-x^2\right)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1732	$y(x)\left(\sum_{m=0}^{n} a(m)x^m\right)+\left(1-x^2\right)^2 y''(x)-2x\left(1-x^2\right)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1733	$ax\left(1-x^2\right)y'(x)+by(x)+\left(x^2+1\right)^2 y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1734	$\mathrm{a1}x\left(1-x^2\right)y'(x)+y(x)\left(\mathrm{a2}+\mathrm{b2}x+\mathrm{c2}x^2\right)+\left(1-x^2\right)^2 y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1735	$x^2\left(a^2+x^2\right)^2 y''(x)+x\left(a^2+2x^2\right)y'(x)+b^2y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 1736	$\left(a^2+x^2\right)^2 y''(x)+2x\left(a^2+2x^2\right) y'(x)-y(x)\left(\mathrm{a0}+\mathrm{a2}x^2+\mathrm{a4}x^4\right)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1737	$\left(a^2-x^2\right)^2 y''(x)-2x\left(a^2-x^2\right) y'(x)+y(x)\left(\mathrm{a0}+\mathrm{a2}x^2+\mathrm{a4}x^4\right)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1738	$\left(a^2+x^2\right)^2\left(b^2+x^2\right) y''(x)+x\left(\mathrm{a0}+\mathrm{b0}x^2\right) y'(x)+y(x)\left(\mathrm{a1}+\mathrm{b1}x^2\right)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1739	$\left(a^2-x^2\right)^2\left(b^2-x^2\right) y''(x)+x\left(\mathrm{a0}+\mathrm{b0}x^2\right) y'(x)+y(x)\left(\mathrm{a1}+\mathrm{b1}x^2+\mathrm{c1}x^4\right)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1740	$(1-x)x(x+1)^2y''(x)+2(3-x)x(x+1)y'(x)-2(1-x)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1741	$y(x)\left(a+bx+cx^2\right)+(1-x)^2x^2y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1742	$(1-x)^2x^2y''(x)+(1-2x)(1-x)xy'(x)-y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1743	$(1-x)x(\mathrm{a1}+\mathrm{b2}x)y'(x)+y(x)\left(\mathrm{a2}+\mathrm{b2}x+\mathrm{c2}x^2\right)+(1-x)^2x^2y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1744	$y(x)\left(\sum_{m=0}^{n}a(m)x^m\right)+(1-x)^2x^2y''(x)+(1-2x)(1-x)xy'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1745	$x^2(a-x)^2y''(x)+by(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1746	$(a-x)^2(b-x)^2y''(x)=k^2y(x)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1747	$(a-x)(A+2x)(b-x)y'(x)+(a-x)^2(b-x)^2y''(x)+By(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1748	$(a-x)^4y''(x)-2(a-x)^3y'(x)-y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1749	$(1-2x)(1-x)x^2y''(x)+2(2-3x)xy'(x)+2(3x+1)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1750	$(1-2x)(1-x)x^2y''(x)+2(1-2x)(2-x)xy'(x)+2(1-x)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1751	$-y(x)\left(4k^2+\left(4p^2+1\right)\left(1-x^2\right)\right)+4\left(1-x^2\right)^2y''(x)-8x\left(1-x^2\right)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1752	$-y(x)\left(4k^2+\left(1-4p^2\right)\left(1-x^2\right)\right)+4\left(1-x^2\right)^2y''(x)-8x\left(1-x^2\right)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1753	$-y(x)\left(a(a+1)(1-x)+b^2x\right)+4\left(1-x^2\right)x^2y''(x)+2(1-3x)(1-x)xy'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1754	$(a+bx)^4y''(x)+y(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1755	$y''(x)\left(a+bx+cx^2\right)^2+Ay(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1756	$x^5y''(x)+xy'(x)-y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1757	$x^5y''(x)-\left(1-2x^3\right)xy'(x)+\left(1-2x^3\right)y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1758	$x\left(a^2-x^2\right)\left(b^2-x^2\right)y''(x)+\left(\mathrm{a0}+\mathrm{b0}x^4\right)y'(x)+x^3y(x)\left(\mathrm{a1}+\mathrm{b1}x^2+\mathrm{c1}x^4\right)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1759	$ay(x)+x^6y''(x)-x^5y'(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1760	$x^6y''(x)+3x^5y'(x)+y(x)=0$ [[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1761	$x^3\left(a+3x^2\right)y'(x)+x^6y''(x)+y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1762	$(a-x)(b-x)(c-x)y'(x)\left(\mathrm{a1}+\mathrm{b1}x+\mathrm{c1}x^2\right)+(a-x)^2(b-x)^2(c-x)^2y''(x)+y(x)\left(\mathrm{a2}+\mathrm{b2}x+\mathrm{c2}x^2\right)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 1763	$4x^6y''(x)+\left(1-2x^2\right)y(x)+4\left(2x^2+1\right)x^3y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1764	$4x^6y''(x)+\left(8x^4+10x^2+1\right)y(x)-4\left(2x^2+1\right)x^3y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1765	$\left(4b-a^2\right)y(x)+4x^6y''(x)+12x^5y'(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1766	$x^{2a}y''(x)+ax^{2a-1}y'(x)+(1-a)^2y(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_s Solution method TO DO Maple ✓ Mathematica ✓
ODE 1767	$a^2x^{a-1}y(x)+x^{a+1}y''(x)+(1-2a)x^ay'(x)=0$ [[_Emden, _Fowler]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1768	$x^2y''(x)\left(\mathrm{a0}+\mathrm{b0}x^k\right)+xy'(x)\left(\mathrm{a1}+\mathrm{b1}x^k\right)+y(x)\left(\mathrm{a2}+\mathrm{b2}x^k\right)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1769	$\left(1-a^2\cos^2(x)\right)y''(x)+a^2\sin(x)\cos(x)y'(x)+y(x)\left(\mathrm{a0}+\mathrm{a1}\cos^2(x)\right)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1770	$-y(x)\left(4k^2-\left(1-p^2\right)\sinh^2(x)\right)+4\sinh^2(x)y''(x)+4\sinh(x)\cosh(x)y'(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1771	$y''(x)=0$ [[_2nd_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1772	$y''(x)=ay(x)$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1773	$y''(x)=6y(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1774	$y''(x) = 6y(x)^2 + x$ [[_Painleve, `1st`]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1775	$y''(x) = a + bx + cy(x)^2$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1776	$y''(x) = 2y(x)^3$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1777	$y''(x) = a + by(x) + 2y(x)^3$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1778	$y''(x) = a + 2y(x)^3 + xy(x)$ [[_Painleve, `2nd`]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1779	$y''(x) = f(x) + g(x)y(x) + 2y(x)^3$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗

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#	result
ODE 1780	$y''(x) = -2abxy(x) + a + 2b^2y(x)^3$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1781	$y''(x) = \mathrm{a0} + \mathrm{a1}xy(x) + \mathrm{a2}y(x) + \mathrm{a3}y(x)^3$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1782	$y''(x) = \mathrm{a0} + \mathrm{a1}y(x) + \mathrm{a2}y(x)^2 + \mathrm{a3}y(x)^3$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1783	$ax^r y(x)^s + y''(x) = 0$ [[_Emden, _Fowler], [_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1784	$a\sin(y(x)) + y''(x) = 0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1785	$ae^{y(x)} + y''(x) = 0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1786	$y''(x) = f(y(x))$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1787	$y(x)\left(f'(x) + 2f(x)^2\right) + 3f(x)y'(x) + y''(x) = 2y(x)^3$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 1788	$y''(x) + y(x)y'(x) = 0$ [[_2nd_order, _missing_x], [_2nd_order, _exact, _nonlinear], _Lagerstr Solution method TO DO Maple ✓ Mathematica ✓
ODE 1789	$y''(x) + y(x)y'(x) = y(x)^3$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1790	$ay(x) + y''(x) + y(x)y'(x) = y(x)^3$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1791	$y''(x) + y(x)y'(x) = 12f'(x) - 12f(x)y(x) + y(x)^3$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
	Continued on next page

Table 3 – continued from previous page

#	result
ODE 1792	$2a^2y(x)+(3a+y(x))y'(x)+ay(x)^2+y''(x)=y(x)^3$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1793	$y''(x)=y(x)\left(f'(x)-2f(x)^2\right)+(3f(x)-y(x))y'(x)+f(x)y(x)^2+y(x)^3$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✓ Mathematica ✗
ODE 1794	$y''(x)=(3\mathrm{f1}(x)-y(x))y'(x)+\mathrm{f1}(x)y(x)^2+\mathrm{f2}(x)+\mathrm{f3}(x)y(x)+y(x)^3$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1795	$y''(x)=y'(x)(\mathrm{f0}(x)y(x)+\mathrm{f1}(x))+\mathrm{g0}(x)y(x)^3+\mathrm{g1}(x)y(x)^2+\mathrm{g2}(x)y(x)+\mathrm{g3}(x)$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1796	$y''(x)=y(x)f'(x)+(f(x)-2y(x))y'(x)$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✓ Mathematica ✗
ODE 1797	$y''(x)=(f(x)-2y(x))y'(x)+f(x)y(x)^2+g(x)$ [[_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✗

Continued on next page

Table 3 – continued from previous page

#	result
ODE 1798	$y''(x) = (\mathrm{f1}(x) - 2y(x))y'(x) + \mathrm{f2}(x)y(x)^2 + \mathrm{f3}(x)$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1799	$y''(x) = (\mathrm{f1}(x) - 2y(x))y'(x) + \mathrm{f2}(x)y(x)^2 + \mathrm{f3}(x)y(x) + \mathrm{f4}(x)$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1800	$y''(x) = a + 4b^2y(x) + 3by(x)^2 + 3y(x)y'(x)$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1], [_2nd_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1801	$y''(x) + 3y(x)y'(x) = f(x) + g(x)y(x) - y(x)^3$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1802	$y''(x) = (f(x) - 3y(x))y'(x) + f(x)y(x)^2 - y(x)^3$ [[_2nd_order, _with_potential_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1803	$y''(x) = a(2y(x)y'(x) + 1)$ [[_2nd_order, _missing_x], [_2nd_order, _exact, _nonlinear], [_2nd_or Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1804	$a\left(y(x)^2-1\right)y'(x)+by(x)+y''(x)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1805	$y'(x)f(x,y(x))+g(x,y(x))+y''(x)=0$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1806	$y''(x)=\left(x^2-y'(x)\right)^2+2x$ [[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1807	$y''(x)+2y'(x)^2\tan(y(x))+2\cot(x)y'(x)=0$ [_Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducib Solution method TO DO Maple ✓ Mathematica ✓
ODE 1808	$y''(x)=ay'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_xy Solution method TO DO Maple ✓ Mathematica ✓
ODE 1809	$y''(x)=a^2+b^2y'(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1810	$ay'(x)^2 + by(x) + y''(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1811	$ay'(x)^2 + b\sin(y(x)) + y''(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1812	$ay'(x)^2 + by'(x) + cy(x) + y''(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1813	$y''(x) = e^x y'(x)^2$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1814	$f(x)y'(x) + g(x)y'(x)^2 + y''(x) = 0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1815	$ay(x)y'(x)^2 + by(x) + y''(x) = 0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 1816	$f(y(x))y'(x)^2 + g(y(x)) + y''(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1817	$f(x)y'(x) + g(y(x))y'(x)^2 + y''(x) = 0$ [_Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducib Solution method TO DO Maple ✓ Mathematica ✓
ODE 1818	$f(y(x))y'(x) + g(y(x))y'(x)^2 + y''(x) = 0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1819	$f(y(x))y'(x) + g(y(x))y'(x)^2 + h(y(x)) + y''(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1820	$y''(x) + y'(x)^3 + y'(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1821	$y''(x) = (a - x)y'(x)^3$ [[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1822	$y''(x) + \left(e^{2y(x)} + x\right) y'(x)^3 = 0$ [[_2nd_order, _with_exponential_symmetries], [_2nd_order, _with_linear Solution method TO DO Maple ✓ Mathematica ✗
ODE 1823	$y''(x) + 4y'(x)^3 + 2y'(x) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1824	$ay'(x)^3 + y''(x) = 0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_y_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1825	$y''(x) = xy'(x)^3$ [[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1826	$y'(x)^3(ax + by(x)) + y''(x) = 0$ [[_2nd_order, _with_exponential_symmetries], [_2nd_order, _with_linear Solution method TO DO Maple ✓ Mathematica ✓
ODE 1827	$ay(x)\left(y'(x)^2 + 1\right)^2 + y''(x) = 0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1828	$y''(x) = a(xy'(x) - y(x))^k$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1829	$f(x)y'(x)^k + g(x)y'(x) + y''(x) = 0$ [[_2nd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1830	$y''(x) = Ax^a y(x)^b y'(x)^c$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1831	$y''(x) = a\sqrt{y'(x)^2 + 1}$ [[_2nd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1832	$y''(x) = a\sqrt{by(x)^2 + y'(x)^2}$ [[_2nd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1833	$y''(x) = a\left(y'(x)^2 + 1\right)^{3/2}$ [[_2nd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1834	$y''(x) = ax\left(y'(x)^2+1\right)^{3/2}$ [[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1835	$y''(x) = ay(x)\left(y'(x)^2+1\right)^{3/2}$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1836	$y''(x) = ay(x)\left(\left(b-y'(x)\right)^2+1\right)^{3/2}$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1837	$y''(x) = a\left(y'(x)^2+1\right)^{3/2}(b+cx+y(x))$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✗
ODE 1838	$y''(x)+y(x)^3y'(x) = y(x)y'(x)\sqrt{4y'(x)+y(x)^4}$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1839	$y''(x) = f(y'(x))$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1840	$y''(x) = f(ax + by(x), y'(x))$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1841	$y''(x) = y(x) f\left(x, \frac{y'(x)}{y(x)}\right)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1842	$y''(x) = x^{n-2} f\left(x^{-n} y(x), x^{1-n} y'(x)\right)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1843	$2y''(x) = 12y(x)^2 + 1$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1844	$2y''(x) = y(x)\left(a - y(x)^2\right)$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1845	$8y''(x)+9y'(x)^4=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1846	$axe^{y(x)}+xy''(x)+y'(x)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1847	$xy''(x)+2y'(x)+xy(x)^5=0$ [_Emden, [_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1848	$xy(x)^n+xy''(x)+2y'(x)=0$ [_Emden, [_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1849	$x^my(x)^n+xy''(x)+2y'(x)=0$ [[_Emden, _Fowler], [_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1850	$ax^my(x)^n+xy''(x)+2y'(x)=0$ [[_Emden, _Fowler], [_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 1851	$ay'(x) + bxe^{y(x)} + xy''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1852	$(2 - ax^2)\, y'(x) + xy''(x) = 0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1853	$xy''(x) = (1 - y(x))y'(x)$ [[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetrie Solution method TO DO Maple ✓ Mathematica ✓
ODE 1854	$xy''(x) + xy'(x)^2 = y'(x)$ [[_2nd_order, _missing_y], _Liouville, [_2nd_order, _reducible, _mu_xy Solution method TO DO Maple ✓ Mathematica ✓
ODE 1855	$xy''(x) = xy'(x)^2 + y'(x)$ [[_2nd_order, _missing_y], _Liouville, [_2nd_order, _reducible, _mu_xy Solution method TO DO Maple ✓ Mathematica ✓
ODE 1856	$xy''(x) + 2xy'(x)^2 - 2y'(x) = 0$ [[_2nd_order, _missing_y], _Liouville, [_2nd_order, _reducible, _mu_xy Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1857	$xy''(x) = x^2y'(x)^2 - 2y'(x) - y(x)^2$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1858	$ax^2y'(x)^2 + xy''(x) + 2y'(x) = b$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1859	$(axy'(x) - y(x))^2 + xy''(x) = b$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1860	$xy''(x) = y'(x)^3 + y'(x)$ [[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1861	$xy''(x) + 2y'(x) = ax^{2k}y'(x)^k$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1862	$2xy''(x) + y'(x)^3 + y'(x) = 0$ [[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1863	$ay(x)\left(1-y(x)^n\right)+x^2y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1864	$ae^{y(x)-1}+x^2y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1865	$(a+1)xy'(x)+x^2y''(x)=x^kf\left(x^ky(x),ky(x)+xy'(x)\right)$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1866	$x^2y''(x)+y'(x)^2=0$ [[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1867	$x^2y''(x)=(3x-2y'(x))\,y'(x)$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1868	$x^2y''(x)+x^2y'(x)^2+4xy'(x)+2=0$ [[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1869	$x^2y''(x) = x^4y'(x)^2 - 4x^2y(x)^2 + 6y(x)$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1870	$a(xy'(x) - y(x))^2 + x^2y''(x) = bx^2$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1871	$ax^4y'(x)^2 + x^2y''(x) + 2xy(x) = b$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1872	$ay(x)y'(x)^2 + bx + x^2y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1873	$x^2y''(x) = \sqrt{ax^2y'(x)^2 + by(x)^2}$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1874	$x^2y''(x) = y(x)f\left(\frac{xy'(x)}{y(x)}\right)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 1875	$(x^2+1)\,y''(x)+y'(x)^2+1=0$ [[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1876	$ay(x)^3+9x^2y''(x)+2y(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1877	$x^3y''(x)-x^2y'(x)=3-x^2$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1878	$x^3\left(y''(x)+y(x)y'(x)-y(x)^3\right)+12xy(x)+24=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1879	$x^3y''(x)=a(xy'(x)-y(x))^2$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_</br>Solution method TO DO Maple ✓ Mathematica ✓
ODE 1880	$2x^3y''(x)+x^2(2xy(x)+9)y'(x)+xy(x)\left(-2x^2y(x)^2+3xy(x)+12\right)-6=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 1881	$x^4 y''(x) = x\left(x^2 + 2y(x)\right) y'(x) - 4y(x)^2$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1882	$x^4 y''(x) = x^2 y'(x)\left(y'(x) + x\right) - 4y(x)^2$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1883	$x^4 y''(x) + \left(xy'(x) - y(x)\right)^3 = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1884	$x^a y''(x) + y(x)^b = 0$ [[_Emden, _Fowler], [_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1885	$\left(1 - 12x^2\right)\left(3y'(x) + y(x)^2\right) + 2x\left(1 - 4x^2\right)\left(y''(x) + y(x)y'(x) - y(x)^3\right) - 48xy(x) + 24 = 0$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗

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#	result
ODE 1886	$axy(x) + b - \left(kx^{k-1} - 12x^2\right)\left(3y'(x) + y(x)^2\right) + 2\left(x^k - 4x^3\right)\left(y''(x) + y(x)y'(x) - y(x)^3\right) = 0$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1887	$\sqrt{x}y''(x) = y(x)^{3/2}$ [[_Emden, _Fowler], [_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1888	$x^{3/2}y''(x) = f\left(\frac{y(x)}{\sqrt{x}}\right)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1889	$y''(x)\left(a + 2bx + cx^2\right)^{3/2} = f\left(\frac{x}{\sqrt{a+2bx+cx^2}}\right)$ [[_2nd_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1890	$f(x)f'(x)y'(x) + f(x)^2y''(x) = g(y(x), f(x)y'(x))$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 1891	$f(x)^2 y''(x) = y'(x)\left(3f(x)f'(x) - f(x)^2 y(x) + 3f(x)^3\right) - 24f(x)^4$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 1892	$f(x)^2 y''(x) = -af(x)^5 + 3f(x)f'(x) - f(x)^2 y(x) + 3f(x)^3$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✓ Mathematica ✓
ODE 1893	$2f(x)^2 y''(x) = f(x)y'(x)\left(3f'(x) - 2f(x)y(x)\right) + f(x)y(x)^2 f'(x) + y(x)\left(f(x)f''(x) - 2f'(x)^2 - 2f(x)^3\right) + 2f(x)^2 y(x)^3$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✓ Mathematica ✗
ODE 1894	$y(x)y''(x) = a$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1895	$y(x)y''(x) = y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1896	$y(x)y''(x)+y'(x)^2=0$ [[_2nd_order, _missing_x], [_2nd_order, _exact, _nonlinear], _Liouvill Solution method TO DO Maple ✓ Mathematica ✓
ODE 1897	$y(x)y''(x)=y'(x)^2-a^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1898	$y(x)y''(x)+y'(x)^2=a^2$ [[_2nd_order, _missing_x], [_2nd_order, _exact, _nonlinear], [_2nd_or Solution method TO DO Maple ✓ Mathematica ✓
ODE 1899	$y(x)y''(x)+y'(x)^2+y(x)^2=0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1900	$2a^2y(x)^2+y(x)y''(x)+y'(x)^2=0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1901	$y(x)y''(x)=\mathrm{a0}+\mathrm{a1}y(x)+y(x)^3(\mathrm{a2}+\mathrm{a3}y(x))+y'(x)^2$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1902	$y(x)y''(x) = \mathrm{a0} + \mathrm{a1}y(x) + \mathrm{a2}y(x)^2 + \mathrm{a3}y(x)^3 + \mathrm{a4}y(x)^4 + y'(x)^2$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1903	$y(x)y''(x) = y'(x)^2 + y(x)y'(x)$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 1904	$y(x)y''(x) = e^x y(x)\left(\mathrm{a0} + \mathrm{a1}y(x)^2\right) + e^{2x}\left(\mathrm{a2} + \mathrm{a3}y(x)^4\right) + y'(x)^2$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1905	$y(x)y''(x) = y'(x)^2 + y(x)^2\log(y(x))$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1906	$y(x)y''(x) = -x^2y(x)^2 + y'(x)^2 + y(x)^2\log(y(x))$ [[_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1907	$y(x)y''(x) + y'(x)^2 = y'(x)$ [[_2nd_order, _missing_x], [_2nd_order, _exact, _nonlinear], [_2nd_or Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1908	$y(x)y''(x) = y'(x)^2 - y'(x)$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1], [_2nd_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1909	$y(x)y''(x) = y(x)^2 (f(x)y(x) + g'(x)) + y'(x)^2 + y'(x)$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 1910	$y(x)y''(x) = y'(x)^2 - 2y'(x)$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1], [_2nd_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1911	$y(x)y''(x) + y'(x)^2 - xy'(x) + y(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1912	$axy'(x) + y(x)y''(x) + y'(x)^2 = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1913	$y(x)y''(x) = -y(x)f'(x) + f(x)y'(x) + y'(x)^2 + y(x)^3$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 1914	$y(x)y''(x) = y(x)f''(x) - f(x)y'(x) - f(x)y(x)^3 + y'(x)^2 + y(x)^4$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 1915	$y(x)y''(x) = -ay(x)y'(x) - by(x)^2 + y'(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1916	$y(x)y''(x) = ay(x)y'(x) + by(x)^2 + y'(x)^2 + y(x)^3$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1917	$y(x)y''(x) = y(x)^2y'(x) + y'(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _with_potential_symmetries], [Solution method TO DO Maple ✓ Mathematica ✓
ODE 1918	$y(x)y''(x) = f(x)y(x)y'(x) + g(x)y(x)^2 + y'(x)^2$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1919	$y(x)y''(x) = -y(x)\left(f'(x) - y(x)^2g'(x)\right) + y'(x)\left(f(x) + g(x)y(x)^2\right) + y'(x)^2$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✓ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 1920	$y(x)y''(x) = 2y'(x)^2 + y(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1921	$y(x)y''(x) = 2\left(y'(x)^2 - y(x)^2\right)$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1922	$y(x)y''(x) = -3y(x)y'(x) + 3y'(x)^2 + y(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1923	$y(x)y''(x) = ay'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 1924	$y(x)y''(x) = ay'(x)^2 + b$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1925	$y(x)y''(x) = ay'(x)^2 + by(x)^3$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1926	$y(x)y''(x) = ay'(x)^2 + \mathrm{a0} + \mathrm{a1}y(x) + \mathrm{a2}y(x)^2 + \mathrm{a3}y(x)^3 + \mathrm{a3}y(x)^2 + \mathrm{a4}y(x)^4$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1927	$y(x)y''(x) = ay'(x)^2 + by(x)y'(x) + cy(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1928	$y(x)y''(x) = \mathrm{a3}y(x)^{a+1} + ay'(x)^2 + \mathrm{a1}y(x)y'(x) + \mathrm{a2}y(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1929	$ay'(x)^2 + f(x)y(x)y'(x) + g(x)y(x)^2 + y(x)y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1930	$y(x)y''(x) + y'(x)^3 = 0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1], [_2nd_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1931	$y(x)y''(x) + y'(x)^3 - y'(x)^2 = 0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1], [_2nd_ Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1932	$y(x)y''(x) = y'(x)^2\left(y'(x)(-\sin(y(x))) - y(x)y'(x)\cos(y(x)) + 1\right)$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_y_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1933	$(1 - y(x))y''(x) + 2y'(x)^2 = 0$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 1934	$(a + y(x))y''(x) = y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 1935	$(a + y(x))y''(x) + y'(x)^2 = b$ [[_2nd_order, _missing_x], [_2nd_order, _exact, _nonlinear], [_2nd_or Solution method TO DO Maple ✓ Mathematica ✓
ODE 1936	$(a + y(x))y''(x) + by'(x)^2 = 0$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 1937	$(y(x) + x)y''(x) + y'(x)^2 - y'(x) = 0$ [[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetrie Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1938	$(x-y(x))y''(x)+2y'(x)\left(y'(x)+1\right)=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1939	$(x-y(x))y''(x)=\left(y'(x)+1\right)\left(y'(x)^2+1\right)$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1940	$(x-y(x))y''(x)=f(y'(x))$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1941	$2y(x)y''(x)=y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 1942	$2y(x)y''(x)+y'(x)^2+1=0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1943	$2y(x)y''(x)=a+y'(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1944	$2y(x)y''(x) = y'(x)^2 + 8y(x)^3$ [[_2nd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1945	$2y(x)y''(x) = y'(x)^2 + 8y(x)^3 + 4y(x)^2$ [[_2nd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1946	$2y(x)y''(x) = y'(x)^2 + 4(2y(x) + x)y(x)^2$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1947	$2y(x)y''(x) = y(x)^2(a + by(x)) + y'(x)^2$ [[_2nd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1948	$2y(x)y''(x) = ay(x)^3 + y'(x)^2 - 2xy(x)^2 - 1$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1949	$2y(x)y''(x) = y(x)^2(ax + by(x)) + y'(x)^2$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 1950	$2y(x)y''(x) = y'(x)^2 + 3y(x)^4$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1951	$2y(x)y''(x) = -a^2 - 4\left(b - x^2\right) y(x)^2 + y'(x)^2 + 3y(x)^4 + 8xy(x)^3$ [[_Painleve, `4th`]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1952	$2y(x)y''(x) = -2y(x)^2\left(f'(x) + f(x)^2\right) - 3f(x)y(x)y'(x) + y'(x)^2 + 8y(x)^3$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 1953	$2y(x)y''(x) = 2xf(x)y(x)^2 - 4y(x)^2y'(x) + y'(x)^2 - y(x)^4 - 1$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 1954	$2y(x)y''(x) = 3y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 1955	$2y(x)y''(x) = 3y'(x)^2 + 4y(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1956	$2y(x)y''(x) = f(x)y(x)^2 + 3y'(x)^2$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1957	$2y(x)y''(x) = 6y'(x)^2 + (1 - 3y(x)^2)\, y(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1958	$2y(x)y''(x) = 6y'(x)^2 - y(x)^2\,(ay(x)^3 + 1)$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1959	$2y(x)y''(x) = y'(x)^2\,(y'(x)^2 + 1)$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1960	$3y(x)y''(x) = 2y'(x)^2 + 36y(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1961	$3y(x)y''(x) = 5y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1962	$4y(x)y''(x) = 3y'(x)^2 - 4y(x)$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1963	$4y(x)y''(x) = 3y'(x)^2 + 12y(x)^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1964	$4y(x)y''(x) = ay(x) + by(x)^2 + cy(x)^3 + 3y'(x)^2$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1965	$5y(x)y''(x) = y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 1966	$12y(x)y''(x) = 15y'(x)^2 - 8y(x)^3$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1967	$ay(x)y''(x) = (a-1)y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1968	$a(a+2)^2y(x)y''(x) = a^2(a+2)y(x)^3f'(x) - a^2f(x)^2y(x)^4 + a(a+2)^2f(x)y(x)^2y'(x) + (a-1)(a+2)^2y'(x)^2$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 1969	$xy(x)y''(x) + xy'(x)^2 + y(x)y'(x) = 0$ [[_2nd_order, _exact, _nonlinear], _Liouville, [_2nd_order, _with_line Solution method TO DO Maple ✓ Mathematica ✓
ODE 1970	$xy(x)y''(x) + xy'(x)^2 = y(x)y'(x)$ [[_2nd_order, _exact, _nonlinear], _Liouville, [_2nd_order, _with_line Solution method TO DO Maple ✓ Mathematica ✓
ODE 1971	$xy(x)y''(x) = xy'(x)^2 - y(x)y'(x)$ [_Liouville, [_Painleve, `3rd`], [_2nd_order, _with_linear_symmetries] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1972	$xy(x)y''(x) = x(\mathrm{a0} + \mathrm{a1}y(x)^4) + y(x)(\mathrm{a2} + \mathrm{a3}y(x)^2) + xy'(x)^2 - y(x)y'(x)$ [[_Painleve, `3rd`]] Solution method TO DO Maple ✗ Mathematica ✗

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#	result
ODE 1973	$xy(x)y''(x)+xy'(x)^2+2y(x)y'(x)=0$ [[_2nd_order, _exact, _nonlinear], _Liouville, [_2nd_order, _with_line Solution method TO DO Maple ✓ Mathematica ✓
ODE 1974	$xy(x)y''(x)+xy'(x)^2=3y(x)y'(x)$ [[_2nd_order, _exact, _nonlinear], _Liouville, [_2nd_order, _with_line Solution method TO DO Maple ✓ Mathematica ✓
ODE 1975	$ay(x)y'(x)+f(x)+xy(x)y''(x)+xy'(x)^2=0$ [[_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1976	$xy(x)y''(x)=ay(x)y'(x)+xy'(x)^2+xy(x)^3$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1977	$xy(x)y''(x)=ay(x)y'(x)+b^2xy(x)^3+xy'(x)^2$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 1978	$xy(x)y''(x)+2xy'(x)^2+y(x)y'(x)=0$ [_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _red Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1979	$xy(x)y''(x) - 2xy'(x)^2 + y(x)y'(x) = 0$ [_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _red Solution method TO DO Maple ✓ Mathematica ✓
ODE 1980	$xy(x)y''(x) - 2xy'(x)^2 - y(x)y'(x) = 0$ [_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _red Solution method TO DO Maple ✓ Mathematica ✓
ODE 1981	$xy(x)y''(x) = 2xy'(x)^2 - (y(x)+1)y'(x)$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1982	$ay(x)y'(x) + xy(x)y''(x) + 2xy'(x)^2 = 0$ [_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _red Solution method TO DO Maple ✓ Mathematica ✓
ODE 1983	$ay(x)y'(x) + xy(x)y''(x) - 2xy'(x)^2 = 0$ [_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _red Solution method TO DO Maple ✓ Mathematica ✓
ODE 1984	$xy(x)y''(x) - 4xy'(x)^2 + 4y(x)y'(x) = 0$ [_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _red Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1985	$ay'(x)\left(xy'(x)-y(x)\right)+xy(x)y''(x)=0$ [_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _red Solution method TO DO Maple ✓ Mathematica ✓
ODE 1986	$x(y(x)+x)y''(x)+xy'(x)^2+(x-y(x))y'(x)=y(x)$ [[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetrie Solution method TO DO Maple ✓ Mathematica ✓
ODE 1987	$2xy(x)y''(x)=xy'(x)^2-y(x)y'(x)$ [_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _red Solution method TO DO Maple ✓ Mathematica ✓
ODE 1988	$x^2+x(2y(x)+x)y''(x)+2xy'(x)^2+4(y(x)+x)y'(x)+2y(x)=0$ [[_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 1989	$x^2y(x)y''(x)+\left(xy'(x)-y(x)\right)^2=0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1990	$x^2y(x)y''(x)+\left(xy'(x)-y(x)\right)^2=3y(x)^2$ [[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetrie Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 1991	$x^2 y(x) y''(x) = a x y(x) y'(x) + a y(x)^2 + 2 x^2 y'(x)^2$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1992	$a x^2 y'(x)^2 + b x y(x) y'(x) + c y(x)^2 + x^2 y(x) y''(x)$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✗
ODE 1993	$x^2 (1 - y(x)) y''(x) + 2 x^2 y'(x)^2 - 2 x (1 - y(x)) y'(x) + 2 (1 - y(x))^2 y(x) = 0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1994	$x^2 (x - y(x)) y''(x) = (x y'(x) - y(x))^2$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1995	$x^2 (x - y(x)) y''(x) + (x y'(x) - y(x))^2 = 0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1996	$x^2 (x - y(x)) y''(x) = a (x y'(x) - y(x))^2$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 1997	$2x^2y(x)y''(x) = x^2y'(x)^2 - y(x)^2$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1998	$2x^2y(x)y''(x) = x^2y'(x)^2 + 2xy(x)y'(x) - 4y(x)^2$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 1999	$x^3y(x)y''(x) + x^3y'(x)^2 + 6x^2y(x)y'(x) + 3xy(x)^2 = a$ [[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetrie Solution method TO DO Maple ✓ Mathematica ✓
ODE 2000	$x(x+1)^2y(x)y''(x) = a(x+2)y(x)^2 - 2\left(x^2+1\right)y(x)y'(x) + x(x+1)^2y'(x)^2$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✗
ODE 2001	$8\left(1-x^3\right)y(x)y''(x) + 4\left(1-x^3\right)y'(x)^2 - 12x^2y(x)y'(x) + 3xy(x)^2 = 0$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✗
ODE 2002	$\sqrt{a^2+x^2}\left(by'(x)^2 + y(x)y''(x)\right) = y(x)y'(x)$ [_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _red Solution method TO DO Maple ✓ Mathematica ✓
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Table 3 – continued from previous page

#	result
ODE 2003	$\sqrt{a^2-x^2}\left(xy(x)y''(x)-xy'(x)^2-y(x)y'(x)\right)=bxy'(x)^2$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2004	$\mathrm{f0}(x)y(x)y''(x)+\mathrm{f1}(x)y'(x)^2+\mathrm{f2}(x)y(x)y'(x)+\mathrm{f3}(x)y(x)^2=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2005	$4f(x)y(x)y''(x)=y'(x)\left(2f'(x)-6f(x)y(x)^2\right)+2y(x)^3f'(x)+3f(x)g(x)y(x)^2+3f(x)y'(x)^2-f(x)y(x)^4+4f(x)^2y(x)$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2006	$y(x)^2y''(x)=a$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2007	$ax+y(x)^2y''(x)+y(x)y'(x)^2=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 2008	$y(x)^2 y''(x) + y(x) y'(x)^2 = a + bx$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2009	$\left(y(x)^2 + 1\right) y''(x) + (1 - 2y(x)) y'(x)^2 = 0$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 2010	$\left(y(x)^2 + 1\right) y''(x) = 3y(x) y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 2011	$\left(y(x)^2 + 1\right) y''(x) = (a + 3y(x)) y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✗
ODE 2012	$\left(y(x)^2 + 1\right) y''(x) + y'(x) \left(y'(x)^2 + 1\right) = 0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2013	$\left(y(x)^2 + x\right) y''(x) + 2y(x) y'(x)^2 + 2y'(x) = a$ [[_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _mu_xy]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2014	$\left(y(x)^2+x\right)y''(x)=2\left(x-y(x)^2\right)y'(x)^3-y'(x)\left(4y(x)y'(x)+1\right)$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 2015	$\left(x^2+y(x)^2\right)y''(x)=\left(y(x)^2+1\right)\left(xy'(x)-y(x)\right)$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 2016	$\left(x^2+y(x)^2\right)y''(x)=2\left(y(x)^2+1\right)\left(xy'(x)-y(x)\right)$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 2017	$2(1-y(x))y(x)y''(x)=(1-2y(x))y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 2018	$2(1-y(x))y(x)y''(x)=f(x)(1-y(x))y(x)y'(x)+(1-2y(x))y'(x)^2$ [_Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducib Solution method TO DO Maple ✓ Mathematica ✓
ODE 2019	$2(1-y(x))y(x)y''(x)=(1-3y(x))y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2020	$2(1-y(x))y(x)y''(x) = 4y(x)y'(x)(f(x)+g(x)y(x)) + (1-3y(x))y'(x)^2$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 2021	$2(1-y(x))y(x)y''(x) = -4y(x)^2(1-y(x))\left(f'(x)+f(x)^2+g'(x)-g(x)^2\right) - 4y(x)y'(x)(f(x)+g(x)y(x)) + (1-y(x))^3\left(-\left(\text{F0}(x)^2-\text{G0}(x)^2y(x)^2\right)\right) + (1-3y(x))y'(x)^2$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2022	$3(1-y(x))y(x)y''(x) = 2(1-2y(x))y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 2023	$4(1-y(x))y(x)y''(x) = 3(1-2y(x))y'(x)^2$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x Solution method TO DO Maple ✓ Mathematica ✓
ODE 2024	$xy(x)^2y''(x) = a$ [[_Emden, _Fowler], [_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2025	$xy(x)^2y''(x) = \left(a - y(x)^2\right) y'(x) + xy(x)y'(x)^2$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 2026	$x^2y(x)^2y''(x) = \left(x^2 + y(x)^2\right)(xy'(x) - y(x))$ [[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 2027	$\left(a^2 - x^2\right)\left(a^2 - y(x)^2\right) y''(x) + \left(a^2 - x^2\right) y(x)y'(x)^2 = x\left(a^2 - y(x)^2\right) y'(x)$ [_Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducib Solution method TO DO Maple ✓ Mathematica ✓
ODE 2028	$(1-y(x))^3\left(\mathrm{a0} + \mathrm{a1}y(x)^2\right) + \mathrm{a2}x(1-y(x))y(x)^2 + \mathrm{a3}x^3y(x)^2(y(x)+1) + 2x^2(1-y(x))y(x)y''(x) - x^2(1-3y(x))y'(x)^2 + 2x(1-y(x))y(x)y'(x) = 0$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 2029	$x^3y(x)^2y''(x) + (y(x)+x)(xy'(x) - y(x))^3 = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 2030	$y(x)^3 y''(x) = a^2$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2031	$y(x)\left(y(x)^2+1\right)y''(x) + \left(1-3y(x)^2\right)y'(x)^2 = 0$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_ Solution method TO DO Maple ✓ Mathematica ✓
ODE 2032	$2y(x)^3 y''(x) + y(x)^2 y'(x)^2 = 2$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2033	$2(1-y(x))y(x)(a-y(x))y''(x) + (-(1-y(x))(a-y(x)) + y(x)(a-y(x)) + (1-y(x))y(x))y'(x)^2 = \mathrm{a0}y(x)^2\left(1-y(x)^2\right)(a-y(x))^2 + \mathrm{a2}y(x)^2(a-y(x))^2 + \mathrm{a3}(1-y(x))^2(a-y(x))^2 + \mathrm{a1}(1-y(x))^2 y(x)^2$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2034	$2(a-y(x))(b-y(x))(c-y(x))y''(x) + y'(x)^2((a-y(x))(b-y(x)) + (a-y(x))(c-y(x)) + (b-y(x))(c-y(x))) = \mathrm{a0}(a-y(x))^2(b-y(x))^2(c-y(x))^2 + 2\mathrm{a2}(a-y(x))^2(c-y(x))^2 + \mathrm{a3}(a-y(x))^2(b-y(x))^2 + \mathrm{a1}(b-y(x))^2(c-y(x))^2$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2035	$2(1-x)x(1-y(x))(x-y(x))y(x)y''(x) = 2(1-y(x))\left(x^2-2xy(x)+y(x)\right)y(x)y'(x) + (1-x)x\left(3y(x)^2-2xy(x)-2y(x)+x\right)y'(x)^2-\left(1-y(x)^2\right)y(x)^2$ [NONE] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2036	$2(1-x)x(1-y(x))(x-y(x))y(x)y''(x) = f(x)((1-y(x))(x-y(x))y(x))^{3/2} + 2(1-y(x))\left(x^2-2xy(x)+y(x)\right)y(x)y'(x) + (1-x)x\left(3y(x)^2-2xy(x)-2y(x)+x\right)y'(x)^2-\left(1-y(x)^2\right)y(x)^2$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2037	$2(1-x)^2x^2(1-y(x))(x-y(x))y(x)y''(x) = \mathrm{a0}x(x-y(x))^2(1-y(x))^2 + \mathrm{a1}(1-x)(x-y(x))^2y(x)^2 + (\mathrm{a2}-1)(1-x)xy(x)^2(1-y(x))^2 + \mathrm{a3}(x-y(x))^2y(x)^2(1-y(x))^2+2(1-x)xy(x)\left(x^2-2xy(x)+y(x)\right)(1-y(x))^2y'(x)+(1-x)^2x^2\left(3y(x)^2-2xy(x)-2y(x)+x\right)y'(x)^2$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 2038	$b\sqrt{\left(1-y(x)^2\right)\left(1-a^2y(x)^2\right)}y'(x)^2 + \left(1-y(x)^2\right)\left(1-a^2y(x)^2\right)y''(x) + y(x)\left(-2a^2y(x)^2+a^2+1\right)=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 2039	$a^2 y(x) + \left(x^2 + y(x)^2\right)^2 y''(x) = 0$ [NONE] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2040	$y''(x) \left(a + 2bx + cx^2 + y(x)^2\right)^2 + Ay(x) = 0$ [NONE] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2041	$\mathrm{f0}(y(x))y''(x) + \mathrm{f1}(y(x))y'(x)^2 + \mathrm{f2}(y(x))y'(x) + \mathrm{f3}(y(x)) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2042	$\sqrt{y(x)}y''(x) = a$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2043	$\sqrt{y(x)}y''(x) = 2(a + bx)$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2044	$y''(x)X(x, y(x))^3 = 1$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗

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#	result
ODE 2045	$y''(x)\left(\mathrm{a0}+\mathrm{a1}\sin^2(y(x))\right)+\mathrm{a2}y(x)\left(\mathrm{a1}\sin^2(y(x))+\mathrm{a3}\right)+\mathrm{a1}y'(x)^2+\mathrm{a1}y'(x)^2\sin(y(x))\cos(y(x))=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2046	$y(x)y''(x)(1-\log(y(x)))+y'(x)^2(\log(y(x))+1)=0$ [[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_
	Solution method TO DO Maple ✓ Mathematica ✗
ODE 2047	$f(y(x))y''(x)=y'(x)^2f'(y(x))-g(x)f(y(x))y'(x)-h(x)f(y(x))^2$ (ODEtools/info) missing specification of intermediate function
	Solution method TO DO Maple ✗ Mathematica ✓
ODE 2048	$f(y(x))y''(x)=f(y(x))^2\mathrm{F0}\left(x,\frac{y'(x)}{f(y(x))}\right)+y'(x)^2f'(y(x))$ (ODEtools/info) missing specification of intermediate function
	Solution method TO DO Maple ✗ Mathematica ✗
ODE 2049	$ay'(x)^2f'(y(x))+f(y(x))y''(x)+g(y(x))=0$ (ODEtools/info) missing specification of intermediate function
	Solution method TO DO Maple ✗ Mathematica ✓

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#	result
ODE 2050	$y'(x)y''(x) = a^2x$ [[_2nd_order, _missing_y], [_2nd_order, _exact, _nonlinear], [_2nd_or Solution method TO DO Maple ✓ Mathematica ✓
ODE 2051	$y'(x)y''(x) = x^2y(x)y'(x) + xy(x)^2$ [[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetrie Solution method TO DO Maple ✓ Mathematica ✗
ODE 2052	$(2x^2y'(x) + y(x)^2)\,y''(x) + 2(y(x) + x)y'(x)^2 + xy'(x) + y(x) = 0$ [[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetrie Solution method TO DO Maple ✓ Mathematica ✗
ODE 2053	$ay(x)^2 + x^3y'(x)y''(x) = 0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2054	$\mathrm{f1}y'(x)y''(x) + \mathrm{f2}y(x)y''(x) + \mathrm{f3}y'(x)^2 + \mathrm{f4}y(x)y'(x) + \mathrm{f5}y(x)^2 = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2055	$3y(x)y'(x)y''(x) = y'(x)^3 - 1$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2056	$\left(x^2+2y(x)^2y'(x)\right)y''(x)+2y(x)y'(x)^3+3xy'(x)+y(x)=0$ [[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetrie Solution method TO DO Maple ✓ Mathematica ✗
ODE 2057	$\left(x-y'(x)^2\right)y''(x)=x^2-y'(x)$ [[_2nd_order, _missing_y], [_2nd_order, _exact, _nonlinear], [_2nd_or Solution method TO DO Maple ✓ Mathematica ✗
ODE 2058	$\left(y'(x)^2+y(x)^2\right)y''(x)+y(x)^3=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2059	$y''(x)\left(a(xy'(x)-y(x))+y'(x)^2\right)=b$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2060	$4y(x)y'(x)^2y''(x)=y'(x)^4+3$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2061	$y''(x)f(y'(x))+g(y(x))y'(x)+h(x)=0$ [[_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _mu_x_y1], Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 2062	$y''(x)^2 = a + by(x)$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2063	$y''(x)^2 = a + by'(x)^2$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2064	$y''(x)^2 - xy''(x) + y'(x) = 0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2065	$a^2y''(x)^2 = \left(y'(x)^2 + 1\right)^3$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2066	$ax + xy''(x)^2 - 2y'(x)y''(x) = 0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2067	$(xy''(x) - y'(x))^2 = y''(x)^2 + 1$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 2068	$2\left(x^2+1\right)y''(x)^2+2(x-y'(x))\,y'(x)-x(4y'(x)+x)\,y''(x)=2y(x)$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 2069	$3x^2y''(x)^2+4y'(x)^2-2(3xy'(x)+y(x))\,y''(x)=0$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2070	$(2-9x)x^2y''(x)^2+6y(x)y''(x)-6(1-6x)xy'(x)y''(x)=36xy'(x)^2$ [[_2nd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2071	$\mathrm{f0}y''(x)^2+\mathrm{f1}y'(x)y''(x)+\mathrm{f2}y(x)y''(x)+\mathrm{g0}y'(x)^2+\mathrm{g1}y(x)y'(x)+hy(x)^2=0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2072	$y(x)y''(x)+4y(x)y'(x)^3-y'(x)^2=0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_y_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2073	$\left(y(x)y''(x)+y'(x)^2+1\right)^2=\left(y'(x)^2+1\right)^3$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2074	$y''(x)^2 \left(a^2 - b^2 y(x)^2\right) + y'(x)^2 \left(1 - b^2 y'(x)^2\right) + 2b^2 y(x) y'(x)^2 y''(x) = 0$ [[_2nd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2075	$\left(x^2 y(x) y''(x) + x^2 \left(-y'(x)^2\right) + y(x)^2\right)^2 = 4xy(x) \left(xy'(x) - y(x)\right)^3$ [[_2nd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2076	$y''(x)^3 = 12y'(x) \left(xy''(x) - 2y'(x)\right)$ [[_2nd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2077	$32y''(x) \left(xy''(x) - y'(x)\right)^3 + \left(2y(x)y''(x) - y'(x)^2\right)^3 = 0$ type_of_ode Solution method TO DO Maple ✗ Mathematica ✓
ODE 2078	$f(y''(x)) + xy''(x) = y'(x)$ [[_2nd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2079	$y'(x) f\left(\frac{y''(x)}{y'(x)}\right) = y'(x)^2 - y(x)y''(x)$ [[_2nd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 2080	$f\left(y''(x), y'(x) - xy''(x), \frac{1}{2}x^2y''(x) - xy'(x) + y(x)\right) = 0$ [NONE] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2081	$f(x, y''(x)) = 0$ [[_2nd_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2082	$f(y(x), y''(x)) = 0$ [[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2083	$f(y'(x), y''(x)) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2084	$f(x, y'(x), y''(x)) = 0$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2085	$f(y(x), y'(x), y''(x)) = 0$ [[_2nd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 2086	$y'''(x) = 0$ [[_3rd_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2087	$y'''(x) = \cos(x) + 1$ [[_3rd_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2088	$y'''(x) + \sin(x) = 0$ [[_3rd_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2089	$y'''(x) = \sin^3(x)$ [[_3rd_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2090	$y'''(x) = y(x)$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2091	$y'''(x) = x^2 + y(x)$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2092	$y'''(x) = y(x) + e^x x + \cos^2(x)$ [[_3rd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2093	$y'''(x) + ay(x) = 0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2094	$y'''(x) = xy(x)$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2095	$y'''(x) + y'(x) = 0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2096	$y'''(x) = y'(x)$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2097	$y'''(x) + y'(x) = x^3 + \cos(x)$ [[_3rd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2098	$y'''(x) - 2y'(x) + 4y(x) = 0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2099	$y'''(x) - 2y'(x) + 4y(x) = e^x \cos(x)$ [[_3rd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2100	$y'''(x) - 3y'(x) + 2y(x) = 0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2101	$y'''(x) - 3y'(x) + 2y(x) = 3e^x$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2102	$y'''(x) - 3y'(x) + 2y(x) = e^x x^2$ [[_3rd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2103	$y'''(x) - 4y'(x) = x^2 - 3e^{2x}$ [[_3rd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2104	$y'''(x) - 7y'(x) + 6y(x) = 0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2105	$y'''(x) = a^2 y(x)$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2106	$y'''(x) + 2xy'(x) + y(x) = 0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2107	$y'''(x) + 2axy'(x) + ay(x) = 0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2108	$y'''(x) + y(x)f'(x) + 2f(x)y'(x) = 0$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2109	$y'''(x) - y''(x) + y'(x) = 0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2110	$y'''(x) - y''(x) + y'(x) + y(x) = 0$ [[_3rd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2111	$y'''(x) + y''(x) + y'(x) - 3y(x) = 0$ [[_3rd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2112	$y'''(x) - y''(x) - 2y'(x) = 0$ [[_3rd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2113	$y'''(x) - y''(x) - 2y'(x) = e^{-x}$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2114	$y'''(x) + y''(x) + 4y'(x) + 4y(x) = 0$ [[_3rd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2115	$y'''(x) + y''(x) + 2y'(x) + 4y(x) = \sin(2x)$ [[_3rd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2116	$y'''(x)+y''(x)-7y'(x)-15y(x)=0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2117	$y'''(x)+2y''(x)+y'(x)=0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2118	$y'''(x)+2y''(x)+y'(x)=(x-1)x$ [[_3rd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2119	$y'''(x)-2y''(x)+y'(x)=e^x$ [[_3rd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2120	$y'''(x)-2y''(x)-y'(x)+2y(x)=\sinh(x)$ [[_3rd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2121	$y'''(x)-2y''(x)-3y'(x)=0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2122	$y'''(x) - 2y''(x) - 3y'(x) = 3x^2 + \sin(x)$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2123	$y'''(x) - 2y''(x) - 3y'(x) = 3x^2 + e^{-x}$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2124	$y'''(x) - 2y''(x) + 3y'(x) + 10y(x) = 0$ [[_3rd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2125	$y'''(x) - a^2y'(x) + 2a^2y(x) - 2y''(x) = 0$ [[_3rd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2126	$y'''(x) - a^2y'(x) + 2a^2y(x) - 2y''(x) = \sinh(x)$ [[_3rd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2127	$y'''(x) - 3y''(x) + 4y(x) = 0$ [[_3rd_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2128	$y'''(x)+3y''(x)-y'(x)-3y(x)=0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2129	$y'''(x)-3y''(x)-y'(x)+3y(x)=x^2$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2130	$y'''(x)+3y''(x)-y'(x)-3y(x)=\cosh(x)$ [[_3rd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2131	$y'''(x)+3y''(x)+3y'(x)+y(x)=0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2132	$y'''(x)+3y''(x)+3y'(x)+y(x)=e^{-x}x$ [[_3rd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2133	$y'''(x)-3y''(x)+3y'(x)-y(x)=x\left(1-e^{x}x^{2}\right)$ [[_3rd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2134	$y'''(x)+3y''(x)+3y'(x)+y(x)=e^{-x}\left(2-x^2\right)$ [[_3rd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2135	$y'''(x)-3y''(x)+4y'(x)-2y(x)=0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2136	$y'''(x)-3y''(x)+4y'(x)-2y(x)=e^x+\cos(x)$ [[_3rd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2137	$y'''(x)-4y''(x)+5y'(x)-2y(x)=0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2138	$y'''(x)-4y''(x)+5y'(x)-2y(x)=x$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2139	$y'''(x)-4y''(x)+6y'(x)-4y(x)=0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2140	$y'''(x) - 6y''(x) + 9y'(x) = 0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2141	$y'''(x) - 6y''(x) + 12y'(x) - 8y(x) = e^{2x}x^2$ [[_3rd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2142	$y'''(x) + a^3(-y(x)) + 3a^2y'(x) - 3ay''(x) = 0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2143	$y'''(x) + a^3(-y(x)) + 3a^2y'(x) - 3ay''(x) = e^{ax}$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2144	$y'''(x) = ay''(x)$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2145	$y'''(x) + \mathrm{a1}y''(x) + \mathrm{a2}y'(x) + \mathrm{a3}y(x) = 0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2146	$y'''(x) - 2\left(-2a - 4x^2 + 1\right) y'(x) - 8axy(x) - 6xy''(x) = 0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2147	$y'''(x) + a^3x^3y(x) + 3a^2x^2y'(x) + 3axy''(x) = 0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2148	$y'''(x) + x^2(-y''(x)) + 2xy'(x) - 2y(x) = 0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2149	$y'''(x) + y''(x)(2\cot(x) + \csc(x)) - y'(x) = \cot(x)$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2150	$y'''(x) - \sin(x)y''(x) - 2\cos(x)y'(x) + y(x)\sin(x) = \log(x)$ [[_3rd_order , _fully , _exact , _linear]] Solution method TO DO Maple ✓ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 2151	$y'''(x) + y'(x)\left(2f'(x)^2 + f'(x) + 4g(x)\right) + 2y(x)\left(2f(x)g(x) + g'(x)\right) + 3f(x)y''(x) = 0$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2152	$y'''(x) + f(x)y''(x) + f(x)y(x) + y'(x) = 0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2153	$4y'''(x) - 3y'(x) + y(x) = 0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2154	$4y'''(x) - 8y''(x) - 11y'(x) - 3y(x) = 0$ [[_3rd_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2155	$4y'''(x) - 8y''(x) - 11y'(x) - 3y(x) + 18e^x = 0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2156	$xy'''(x) = 2$ [[_3rd_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2157	$xy'''(x) + 3y'(x) + xy(x) = 0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2158	$xy'''(x) - y''(x) + xy'(x) - y(x) = 0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2159	$xy'''(x) - y''(x) - xy'(x) + y(x) = 0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2160	$xy'''(x) - y''(x) - xy'(x) + y(x) = 1 - x^2$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2161	$xy'''(x) + x^2(-y(x)) + 3y''(x) = 0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2162	$xy'''(x) - \left(3 - x^2\right) y''(x) + 4xy'(x) + 2y(x) = 0$ [[_3rd_order , _fully , _exact , _linear]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2163	$(1 - 2x)y'''(x) - (x + 4)y''(x) - 2y'(x) = 0$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2164	$x^2y'''(x) + ax^2y(x) - 6y'(x) = 0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2165	$x^2y'''(x) + 2xy''(x) = a$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2166	$x^2y'''(x) + \left(x^2 + 2\right) y'(x) + 4xy''(x) + 3xy(x) = f(x)$ [[_3rd_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2167	$x^2y'''(x) + 5xy''(x) + 4y'(x) = \log(x)$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2168	$x^2y'''(x)+6xy''(x)+6y'(x)=0$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2169	$x^2y'''(x)+ax^2y(x)+6xy''(x)+6y'(x)=0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2170	$x^2y'''(x)-2(n+1)xy''(x)+6ny'(x)=0$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2171	$x^2y'''(x)+\left(6-2x^3\right)y'(x)+2x^3y(x)+\left(6-x^2\right)xy''(x)=0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✗ Mathematica ✗
ODE 2172	$\left(x^2+1\right)y'''(x)+8xy'(x)+10y'(x)=0$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2173	$\left(x^2+2\right)y'''(x)+\left(x^2+2\right)y'(x)-2xy''(x)-2xy(x)=0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2174	$\left(x^2-2x+2\right)y'''(x)+x^2(-y''(x))+2xy'(x)-2y(x)=0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2175	$(x+2)^2y'''(x)+(x+2)y''(x)+y'(x)=0$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2176	$4x^2y'''(x)+8xy''(x)+y'(x)=0$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2177	$x(\mathrm{a0}+\mathrm{b0}x)y'''(x)+(\mathrm{a1}+\mathrm{b1}x)y''(x)+xy'(x)+y(x)=f(x)$ [[_3rd_order , _exact , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2178	$x^3y'''(x)=a$ [[_3rd_order , _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2179	$x^3y'''(x)+xy'(x)-y(x)=0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2180	$x^3y'''(x)+xy'(x)-y(x)=x\log(x)$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2181	$x^3y'''(x)-x^2y''(x)+2xy'(x)-2y(x)=0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2182	$x^3y'''(x)-x^2y''(x)+2xy'(x)-2y(x)=x\left(x^2+3\right)$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2183	$x^3y'''(x)+x^2y''(x)+3xy'(x)-8y(x)=0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2184	$x^3y'''(x)-x^2y''(x)+xy'(x)=0$ [[_3rd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2185	$x^3y'''(x)+2x^2y''(x)+2y(x)=0$ [[_3rd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2186	$x^3y'''(x)+2x^2y''(x)-xy'(x)+y(x)=0$ [[_3rd_order, _exact, _linear, _homogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2187	$x^3y'''(x)+3x^2y''(x)=a$ [[_3rd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2188	$x^3y'''(x)+3x^2y''(x)-2xy'(x)+2y(x)=0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2189	$x^3y'''(x)-3x^2y''(x)+7xy'(x)-8y(x)=0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2190	$x^3y'''(x)+\left(1-a^2\right)xy'(x)+3x^2y''(x)=0$ [[_3rd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2191	$x^3y'''(x)+4x^2y''(x)-8xy'(x)+8y(x)=0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2192	$x^3y'''(x)-4x^2y''(x)+\left(x^2+8\right)xy'(x)-2\left(x^2+4\right)y(x)=0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2193	$x^3y'''(x)-\left(12-ax^3\right)y(x)+6x^2y''(x)=0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2194	$x^3y'''(x)+x^2\log(x)y''(x)+2xy'(x)-y(x)=2x^3$ [[_3rd_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2195	$\left(x^3+1\right)y'''(x)+9x^2y''(x)+18xy'(x)+6y(x)=0$ [[_3rd_order, _fully, _exact, _linear]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2196	$x\left(x^2+1\right)y'''(x)+3\left(2x^2+1\right)y''(x)-12y(x)=0$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2197	$x\left(1-x^2\right)y'''(x)+\left(3-8x^2\right)y''(x)-14xy'(x)-4y(x)=0$ [[_3rd_order, _fully, _exact, _linear]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2198	$x\left(x^2-2x+2\right)y'''(x)+\left(-x^3+3x^2-6x+6\right)y''(x)=0$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2199	$(x+1)^3y'''(x)+(x+1)^2y''(x)+3(x+1)y'(x)-8y(x)=0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2200	$x^2(y(x)+3)y'''(x)-3(x+2)xy''(x)+6(x+1)y'(x)-6y(x)=0$ [NONE] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2201	$4x^3y'''(x)+xy'(x)-y(x)=0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2202	$(1-2x)^3y'''(x)+(1-2x)y'(x)+2y(x)=0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2203	$x^4y'''(x)+2x^3y''(x)+2xy(x)=10\left(x^2+1\right)$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2204	$x^4y'''(x)+2x^3y''(x)-x^2y'(x)+xy(x)=1$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2205	$\left(x^2+1\right)x^2y'''(x)+8x^3y''(x)+10x^2y'(x)=3x^2+2x^2\log(x)-1$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2206	$(x+1)x^3y'''(x)-2(2x+1)x^2y''(x)+2(5x+2)xy'(x)-4(3x+1)y(x)=0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2207	$4x^4y'''(x)-4x^3y''(x)+4x^2y'(x)=1$ [[_3rd_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2208	$\left(x^2+1\right)x^3y'''(x)-2\left(2x^2+1\right)x^2y''(x)+2\left(5x^2+2\right)xy'(x)-4\left(3x^2+1\right)y(x)=0$ [[_3rd_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2209	$(a-x)^3(b-x)^3y'''(x)=cy(x)$ [[_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2210	$(x+\sin(x))y'''(x)+3(\cos(x)+1)y''(x)-3\sin(x)y'(x)-y(x)\cos(x)+\sin(x)=0$ [[_3rd_order, _fully, _exact, _linear]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2211	$y''''(x)=0$ [[_high_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2212	$y''''(x)=x\cos(x)$ [[_high_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2213	$y''''(x)+4e^{-x}\cos(x)=0$ [[_high_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2214	$y''''(x)=y(x)+\cos(x)$ [[_high_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2215	$y''''(x) = y(x) + e^x \cos(x)$ [[_high_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2216	$y''''(x) + ay(x) = 0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2217	$y''''(x) = a^4 y(x) + x^3$ [[_high_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2218	$y''''(x) + y''(x) + y(x) = 0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2219	$y''''(x) + 2y''(x) + y(x) = 0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2220	$y''''(x) - 2y''(x) + y(x) = 0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2221	$y''''(x)+2y''(x)+y(x)=\cos(x)$ [[_high_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2222	$y''''(x)-2y''(x)+y(x)=\cos(x)$ [[_high_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2223	$y''''(x)+2y''(x)+y(x)=24x\sin(x)$ [[_high_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2224	$y''''(x)-2y''(x)+y(x)=e^x+4$ [[_high_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2225	$y''''(x)-2y''(x)-8y(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2226	$y''''(x)+3y''(x)-4y(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2227	$y''''(x)+5y''(x)+6y(x)=0$ [[_high_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2228	$y''''(x)-12y''(x)+27y(x)=0$ [[_high_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2229	$y''''(x)+a^2y''(x)=0$ [[_high_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2230	$y''''(x)+a^4y(x)+2a^2y''(x)=0$ [[_high_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2231	$y''''(x)+a^4y(x)+2a^2y''(x)=\cosh(ax)$ [[_high_order , _linear , _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2232	$y''''(x)+\left(a^2+b^2\right)y''(x)+a^2b^2y(x)=0$ [[_high_order , _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2233	$y''''(x)+3y(x)\left(f''(x)+3f(x)^2\right)+10f'(x)y'(x)+10f(x)y''(x)=0$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2234	$-y'''(x)+y''''(x)-3y''(x)+5y'(x)-2y(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2235	$-y'''(x)+y''''(x)-3y''(x)+5y'(x)-2y(x)=e^{3x}$ [[_high_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2236	$-2y'''(x)+y''''(x)+y(x)^2=0$ [[_high_order, _missing_x], [_high_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2237	$-2y'''(x)+y''''(x)+y(x)^2=x^3$ [NONE] Solution method TO DO Maple ✗ Mathematica ✗
ODE 2238	$2y'''(x)+y''''(x)-2y'(x)-y(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2239	$-2y'''(x)+y''''(x)+2y''(x)-2y'(x)+y(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2240	$2y'''(x)+y''''(x)+3y''(x)+2y'(x)+y(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2241	$2y'''(x)+y''''(x)-3y''(x)-4y'(x)+4y(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2242	$-3y'''(x)+y''''(x)+y''(x)-y'(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2243	$-4y'''(x)+y''''(x)+6y''(x)-4y'(x)+y(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2244	$-4y'''(x)+y''''(x)+12y''(x)-16y'(x)+16y(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 2245	$4axy'''(x)+y''''(x)+a^4x^4y(x)+4a^3x^3y'(x)+6a^2x^2y''(x)=0$ [[_high_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2246	$2\left(y''''(x)+\left(a^2+b^2\right)y''(x)+a^2b^2y(x)\right)=\cos(ax)+\cos(bx)$ [[_high_order, _linear, _nonhomogeneous]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2247	$-12y'''(x)+4y''''(x)+11y''(x)-3y'(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2248	$3y'''(x)+xy''''(x)=0$ [[_high_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2249	$5y'''(x)+xy''''(x)=0$ [[_high_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2250	$x^2y''''(x)=2y'''(x)$ [[_high_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 2251	$x^2y''''(x) = 2y''(x)$ [[_high_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2252	$x^2y''''(x) + 4xy'''(x) + 2y''(x) = 0$ [[_high_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2253	$x^2y''''(x) + 6xy'''(x) + 6y''(x) = 0$ [[_high_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2254	$x^2y''''(x) + 8xy'''(x) + 12y''(x) = 0$ [[_high_order , _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2255	$x^2y''''(x) + 8xy'''(x) + a^2(-y(x)) + 12y''(x) = 0$ [[_high_order , _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2256	$(a + x)^2y''''(x) = 1$ [[_high_order , _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2257	$32x(a-b+2)y'''(x)+16x^2y''''(x)+16(a-b+1)(a-b+2)y''(x)+c^4(-y(x))=0$ [[_high_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2258	$x^3y''''(x)+2x^2y'''(x)+a^4\left(-x^3\right)y(x)-xy''(x)=0$ [[_high_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2259	$x^3y''''(x)+6x^2y'''(x)+6xy''(x)=0$ [[_high_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2260	$x^2(a+b+c+3)y'''(x)+x^3y''''(x)+x(ab+ac+a+bc+b+c+1)y''(x)-y'(x)(x-abc)-ky(x)=0$ [[_high_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2261	$x^4y''''(x)+6x^3y'''(x)+4x^2y''(x)-2xy'(x)-4y(x)=0$ [[_high_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

Continued on next page

Table 3 – continued from previous page

#	result
ODE 2262	$x^4 y''''(x) + 6x^3 y'''(x) + 9x^2 y''(x) + 3xy'(x) + y(x) = 0$ [[_high_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2263	$x^4 y''''(x) + 8x^3 y'''(x) + 12x^2 y''(x) = 0$ [[_high_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2264	$x^4 y''''(x) + 8x^3 y'''(x) + ay(x) + 12x^2 y''(x) = 0$ [[_high_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2265	$\mathrm{A1}x^3 y'''(x) + x^4 y''''(x) + \mathrm{A2}x^2 y''(x) + \mathrm{A3}xy'(x) + \mathrm{A4}y(x) = 0$ [[_high_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2266	$16a^4x^4y''''(x) - 32(1-2a)a^2x^3y'''(x) + 16(1-2a)(1-a)a^2x^2y''(x) - b^4x^{2/a}y(x) = 0$ [[_high_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✓

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Table 3 – continued from previous page

#	result
ODE 2267	$4(e^x+2)\,y'''(x)+(2x+e^x)\,y''''(x)+6e^x y''(x)+4e^x y'(x)+e^x y(x)=0$ [[_high_order, _fully, _exact, _linear]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2268	$-y'''(x)+y''''(x)-2y''(x)+2y'(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2269	$2y'''(x)+y''''(x)+y'(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2270	$2y'''(x)+y''''(x)+y'(x)=ax+b\cos(x)+c\sin(x)$ [[_high_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2271	$y'''''(x)=0$ [[_high_order, _quadrature]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2272	$y'''''(x)+ay(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2273	$2y'''(x)+y'''''(x)+y(x)=0$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2274	$y'''''''(x)=y(x)$ [[_high_order, _missing_x]] Solution method TO DO Maple ✓ Mathematica ✓
ODE 2275	$y'''''''(x)-2y''''+y(x)=0$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2276	$y^{(2n)}(x)=a^{2n}y(x)$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2277	$x^n y^{(2n)}(x)=y(x)$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2278	$x^{n+\frac{1}{2}}y^{(2n+1)}(x)=y(x)$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗

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Table 3 – continued from previous page

#	result
ODE 2279	$y^{(n)}(x) = e^x x$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2280	$amx^{m-1}y(x) + ax^m y'(x) + y^{(n)}(x) = 0$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2281	$(a-x)^n(b-x)^n y^{(n)}(x) = cy(x)$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2282	$y'''(x) = y'(x)(y'(x)+1)$ [[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _wi Solution method TO DO Maple ✓ Mathematica ✗
ODE 2283	$y'''(x) + y'(x)^2 - y(x)y'(x) = 0$ [[_3rd_order, _missing_x], [_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2284	$y'''(x) + ay(x)y''(x) = 0$ [[_3rd_order, _missing_x], [_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗

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#	result
ODE 2285	$x^2y'''(x)+xy''(x)-(1-2xy(x))y'(x)+y(x)^2=f(x)$ [[_3rd_order, _exact, _nonlinear]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2286	$x^2y'''(x)-x(1-y(x))y''(x)+xy'(x)^2+(1-y(x))y'(x)=0$ [[_3rd_order, _exact, _nonlinear], [_3rd_order, _with_linear_symmetrie Solution method TO DO Maple ✓ Mathematica ✓
ODE 2287	$y(x)y'''(x)+y(x)^3y'(x)-y'(x)y''(x)=0$ [[_3rd_order, _missing_x], [_3rd_order, _exact, _nonlinear], [_3rd_orc Solution method TO DO Maple ✓ Mathematica ✓
ODE 2288	$(a+y(x))y'''(x)+3y'(x)y''(x)=0$ [[_3rd_order, _missing_x], [_3rd_order, _exact, _nonlinear], [_3rd_orc Solution method TO DO Maple ✓ Mathematica ✓
ODE 2289	$x^3y(x)y'''(x)+3x^3y'(x)y''(x)+9x^2y(x)y''(x)+9x^2y'(x)^2+18xy(x)y'(x)+3y(x)^2=0$ [[_3rd_order, _exact, _nonlinear], [_3rd_order, _with_linear_symmetrie Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2290	$\left(y(x)^2+x\right)y'''(x)+3y''(x)+2y'(x)^3+6y(x)y'(x)y''(x)=0$ [[_3rd_order, _exact, _nonlinear], [_3rd_order, _with_linear_symmetrie Solution method TO DO Maple ✓ Mathematica ✓
ODE 2291	$4y(x)^2y'''(x)+15y'(x)^3-18y(x)y'(x)y''(x)=0$ [[_3rd_order, _missing_x], [_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2292	$9y(x)^2y'''(x)+40y'(x)^3-45y(x)y'(x)y''(x)=0$ [[_3rd_order, _missing_x], [_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2293	$y'(x)y'''(x)+y'(x)^2=2y''(x)^2$ [[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _wi Solution method TO DO Maple ✓ Mathematica ✓
ODE 2294	$y'(x)y''(x)=axy'(x)^5+3y''(x)^2$ [[_2nd_order, _missing_y]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2295	$2y'(x)y'''(x)=2y''(x)^2$ [[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _wi Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2296	$\left(y'(x)^2+1\right) y'''(x) = 3y'(x)y''(x)^2$ [[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _wi Solution method TO DO Maple ✓ Mathematica ✓
ODE 2297	$\left(y'(x)^2+1\right) y'''(x) = y''(x)^2 \left(a+3y'(x)\right)$ [[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _wi Solution method TO DO Maple ✓ Mathematica ✗
ODE 2298	$y'(x)^3 y'''(x) = 1$ [[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _wi Solution method TO DO Maple ✓ Mathematica ✓
ODE 2299	$y''(x)y'''(x) = 2$ [[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _exa Solution method TO DO Maple ✓ Mathematica ✓
ODE 2300	$y''(x)y'''(x) = a\sqrt{b^2y''(x)^2+1}$ [[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _wi Solution method TO DO Maple ✓ Mathematica ✓
ODE 2301	$2xy''(x)y'''(x) = y''(x)^2 - a^2$ [[_3rd_order, _missing_y], [_3rd_order, _with_linear_symmetries], [_3 Solution method TO DO Maple ✓ Mathematica ✓

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#	result
ODE 2302	$\left(1-x^2\right)\left(y'''(x)\right)^2+2xy''(x)y'''(x)-y''(x)^2+1=0$ [[_3rd_order, _missing_y], [_3rd_order, _with_linear_symmetries]] Solution method TO DO Maple ✓ Mathematica ✗
ODE 2303	$\sqrt{y''(x)^2+1}(1-y'''(x))=y''(x)y'''(x)$ [[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _wi Solution method TO DO Maple ✓ Mathematica ✓
ODE 2304	$3y''(x)y''''(x)=5\left(y'''(x)\right)^2$ [[_high_order, _missing_x], [_high_order, _missing_y], [_high_order, Solution method TO DO Maple ✓ Mathematica ✓
ODE 2305	$-4y'(x)\left(y'''(x)\right)^2+3y'(x)y''(x)y''''(x)-3y''(x)^3=0$ [[_high_order, _missing_x], [_high_order, _missing_y], [_high_order, Solution method TO DO Maple ✓ Mathematica ✗
ODE 2306	$-45y''(x)y'''(x)y''''(x)+9y''(x)^2y'''''(x)+40\left(y'''(x)\right)^3=0$ [[_high_order, _missing_x], [_high_order, _missing_y], [_high_order, Solution method TO DO Maple ✓ Mathematica ✗
ODE 2307	$y^{(n)}(x)=f(x)$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗

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#	result
ODE 2308	$y^{(n)}(x) = f\left(y^{(n-2)}(x)\right)$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2309	$y^{(n)}(x) = f\left(y^{(n-1)}(x)\right)$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2310	$y^{(n-2)}(x)y^{(n)}(x) = y^{(n-1)}(x)^2$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2311	$f\left(x, y^{(n)}(x)\right) = 0$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2312	$f\left(x, y^{(n-1)}(x), y^{(n)}(x)\right) = 0$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗
ODE 2313	$f\left(y^{(n-2)}(x), y^{(n-1)}(x), y^{(n)}(x)\right) = 0$ (ODEtools/info) missing specification of intermediate function Solution method TO DO Maple ✗ Mathematica ✗

4 Listing of problems and solutions obtained by Mathematica and Maple

4.1 $y'(x) = af(x)$ . . . 549
4.2 $y'(x) = y(x) + x + \sin(x)$ . . . 550
4.3 $y'(x) = x^2 + 2y(x) + 3\cosh(x)$ . . . 551
4.4 $y'(x) = a + bx + cy(x)$ . . . 552
4.5 $y'(x) = a\cos(bx + c) + ky(x)$ . . . 553
4.6 $y'(x) = a\sin(bx + c) + ky(x)$ . . . 554
4.7 $y'(x) = a + be^{kx} + cy(x)$ . . . 555
4.8 $y'(x) = x\left(x^2 - y(x)\right)$ . . . 556
4.9 $y'(x) = x\left(ay(x) + e^{-x^2}\right)$ . . . 557
4.10 $y'(x) = x^2\left(ax^3 + by(x)\right)$ . . . 558
4.11 $y'(x) = ax^n y(x)$ . . . 559
4.12 $y'(x) = y(x)\cos(x) + \sin(x)\cos(x)$ . . . 560
4.13 $y'(x) = y(x)\cos(x) + e^{\sin(x)}$ . . . 561
4.14 $y'(x) = y(x)\cot(x)$ . . . 562
4.15 $y'(x) = 1 - y(x)\cot(x)$ . . . 563
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4.17 $y'(x) = y(x)(\cot(x) + 2\csc(2x))$ . . . 565
4.18 $y'(x) = \sec(x) - y(x)\cot(x)$ . . . 566
4.19 $y'(x) = y(x)\cot(x) + e^x\sin(x)$ . . . 567
4.20 $y'(x) + 2y(x)\cot(x) + \csc(x) = 0$ . . . 568
4.21 $y'(x) = 4x\csc(x)\sec^2(x) - 2y(x)\cot(2x)$ . . . 569
4.22 $y'(x) = 2\left(\cos(2x)\cot^2(x) - y(x)\csc(2x)\right)$ . . . 570
4.23 $y'(x) = 4x\csc(x)\left(y(x) + \sin^3(x)\right)$ . . . 571
4.24 $y'(x) = 4x\csc(x)\left(y(x) - \tan^2(x) + 1\right)$ . . . 572
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4.27 $y'(x) = y(x)\tan(x)$ . . . 575
4.28 $y'(x) = y(x)\tan(x) + \cos(x)$ . . . 576
4.29 $y'(x) = \cos(x) - y(x)\tan(x)$ . . . 577
4.30 $y'(x) = \sec(x) - y(x)\tan(x)$ . . . 578
4.31 $y'(x) = y(x)\tan(x) + \sin(2x)$ . . . 579
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4.33 $y'(x) = 2y(x)\tan(x) + \sin(x)$ . . . 581
4.34 $y'(x) = 2(y(x)\tan(2x) + \sec(2x) + 1)$ . . . 582
4.35 $y'(x) = 3y(x)\tan(x) + \csc(x)$ . . . 583
4.36 $y'(x) = y(x)(a + \sin(\log(x)) + \cos(\log(x)))$ . . . 584
4.37 $y'(x) = 6e^{2x} - y(x)\tanh(x)$ . . . 585
4.38 $y'(x) = y(x)f'(x) + f(x)f'(x)$ . . . 586

4.39 $y'(x) = f(x) + g(x)y(x)$ . . . 587
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4.50 $y'(x) = y(x)(y(x) + \sin(2x)) + \cos(2x)$ . . . 598
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4.52 $y'(x) = (-4y(x) + x + 3)^2$ . . . 600
4.53 $y'(x) = (9y(x) + 4x + 1)^2$ . . . 601
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4.55 $y'(x) = a + by(x)^2$ . . . 603
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4.59 $y'(x) = ax^2 + by(x)^2$ . . . 608
4.60 $y'(x) = \mathrm{a0} + \mathrm{a1}y(x) + \mathrm{a2}y(x)^2$ . . . 610
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4.62 $y'(x) = a(x - y(x))y(x) + 1$ . . . 612
4.63 $y'(x) = ay(x)^2 + f(x) + g(x)y(x)$ . . . 613
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4.201 $xy'(x)=a\sqrt{b^2x^2+y(x)^2}+y(x)$ 770
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4.257 $x^2y'(x)=y(x)(a+bx)$ 828
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4.277 $x^2y'(x)=y(x)\left(ax+by(x)^3\right)$ 853
4.278 $x^2y'(x)+xy(x)+\sqrt{y(x)}=0$ 854
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4.284 $a + \left(x^2+1\right) y'(x) - xy(x) = 0$ 860
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4.298 $\left(x^2+1\right) y'(x) = y(x)^2 + 1$ 874
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4.300 $\left(1-x^2\right) y'(x) = 1 - (2x - y(x))y(x)$ 876
4.301 $\left(1-x^2\right) y'(x) = n\left(y(x)^2 - 2xy(x) + 1\right)$ 877
4.302 $\left(x^2+1\right) y'(x) + x(1 - y(x))y(x) = 0$ 878
4.303 $\left(1-x^2\right) y'(x) = xy(x)(ay(x) + 1)$ 879
4.304 $\left(x^2+1\right) y'(x) = y(x)^2 - 2x\left(y(x)^2+1\right) y(x) + 1$ 880
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4.306 $\left(x^2+1\right) y'(x) = x^2 - y(x)\cot^{-1}(x) + 1$ 883
4.307 $\left(4-x^2\right) y'(x) + 4y(x) = (x+2)y(x)^2$ 884
4.308 $\left(a^2+x^2\right) y'(x) = b + xy(x)$ 885
4.309 $\left(a^2+x^2\right) y'(x) = \left(\sqrt{a^2+x^2} + x\right)(b + y(x))$ 886
4.310 $\left(a^2+x^2\right) y'(x) + (x - y(x))y(x) = 0$ 887
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4.313 $(1-x)xy'(x) = a + (x+1)y(x)$ 891
4.314 $(1-x)xy'(x) = 2(xy(x) + 1)$ 892
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4.318 $(1-x)xy'(x) = a + 2(2-x)y(x)$ 896
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4.320 $x(x+1)y'(x) = \left(x^2 + x - 1\right) y(x) + (x+1)\left(x^2-1\right)$ 898
4.321 $x^2 + (x-3)(x-2)y'(x) + 3xy(x) - 8y(x) = 0$ 899
4.322 $x(a+x)y'(x) = y(x)(b + cy(x))$ 900
4.323 $(a+x)^2 y'(x) = 2(a+x)(b+y(x))$ 901

4.324 $k(-a+y(x)+x)^2+(x-a)^2y'(x)+y(x)^2=0$ 902
4.325 $(x-a)(x-b)y'(x)+ky(x)=0$ 903
4.326 $(x-a)(x-b)y'(x)=y(x)(-a-b+2x)+(x-a)(x-b)$ 904
4.327 $(x-a)(x-b)y'(x)=cy(x)^2$ 905
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4.329 $k(-a+y(x)+x)(-b+y(x)+x)+(x-a)(x-b)y'(x)+y(x)^2=0$ 907
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4.331 $2x^2y'(x)+2x^2y(x)\cot(x)+x\cot(x)-1=0$ 909
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4.335 $(1-2x)xy'(x)+(1-4x)y(x)+1=0$ 913
4.336 $(1-2x)xy'(x)=y(x)^2-(4x+1)y(x)+4x$ 914
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4.340 $4\left(x^2+1\right)y'(x)-x^2-4xy(x)=0$ 919
4.341 $ax^2y'(x)=axy(x)+b^2y(x)^2+x^2$ 920
4.342 $\left(a+bx^2\right)y'(x)=A+By(x)^2$ 921
4.343 $\left(a+bx^2\right)y'(x)=cxy(x)\log(y(x))$ 922
4.344 $x(ax+1)y'(x)+a-y(x)=0$ 923
4.345 $(a+bx)^2y'(x)+y(x)^3(a+bx)+cy(x)^2=0$ 924
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4.347 $x^3y'(x)=x^2y(x)-x^2+3$ 926
4.348 $x^3y'(x)=x^4+y(x)^2$ 927
4.349 $x^3y'(x)=y(x)\left(x^2+y(x)\right)$ 928
4.350 $x^3y'(x)=x^2(y(x)-1)+y(x)^2$ 929
4.351 $x^3y'(x)=(x+1)y(x)^2$ 930
4.352 $x^3y'(x)+x^2y(x)\left(1-x^2y(x)\right)+20=0$ 931
4.353 $x^6\left(-y(x)^2\right)+x^3y'(x)+(3-2x)x^2y(x)+3=0$ 932
4.354 $x^3y'(x)=y(x)\left(2x^2+y(x)^2\right)$ 933
4.355 $x^3y'(x)=\cos(y(x))\left(\cos(y(x))-2x^2\sin(y(x))\right)$ 934
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4.777 $a(x - y(x)) + y'(x)^2 - 2y'(x) = 0$ 1485
4.778 $y'(x)^2 - 2y'(x) - y(x)^2 = 0$ 1486
4.779 $y'(x)^2 - 5y'(x) + 6 = 0$ 1487
4.780 $y'(x)^2 - 7y'(x) + 12 = 0$ 1488
4.781 $ay'(x) + b + y'(x)^2 = 0$ 1489
4.782 $ay'(x) + bx + y'(x)^2 = 0$ 1490
4.783 $ay'(x) + by(x) + y'(x)^2 = 0$ 1491
4.784 $y'(x)^2 + xy'(x) + 1 = 0$ 1492
4.785 $y'(x)^2 + xy'(x) - y(x) = 0$ 1493
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4.791 $y'(x)^2 - (2 - x)y'(x) - y(x) + 1 = 0$ 1500
4.792 $(a + x)y'(x) + y'(x)^2 - y(x) = 0$ 1501
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4.798 $y'(x)^2 - (2x + 1)y'(x) - (1 - x)x = 0$ 1509
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4.1003 $a^2y'(x)^2 \left(b^2 - (cx - ay(x))^2\right) + c^2\left(b^2 - (cx - ay(x))^2\right) + 2ab^2cy'(x) = 0$ 1766
4.1004 $a^2x + y(x)^3 \left(-y'(x)\right) + xy(x)^2y'(x)^2 = 0$ 1767
4.1005 $\left(a - x^3 - y(x)^3\right) y'(x) + x^2y(x) + xy(x)^2y'(x)^2 = 0$ 1769
4.1006 $-x\left(x^2 - 2y(x)^2\right) - 2y(x)^3y'(x) + xy(x)^2y'(x)^2 = 0$ 1770
4.1007 $-a + y(x)^3 \left(-y'(x)\right) + 2xy(x)^2y'(x)^2 = 0$ 1771
4.1008 $4x^2y(x)^2y'(x)^2 = \left(x^2 + y(x)^2\right)^2$ 1772
4.1009 $-2x\left(x^3 + 2y(x)^2\right) y(x)y'(x) + \left(2x^3 + y(x)^2\right) y(x)^2 + 4x^2y(x)^2y'(x)^2 = 0$ 1773
4.1010 $4y(x)^3y'(x)^2 - 4xy'(x) + y(x) = 0$ 1775
4.1011 $xy(x) \left(x^2 + y(x)^2\right) y'(x)^2 - xy(x) \left(x^2 + y(x)^2\right) - \left(x^4 + x^2y(x)^2 + y(x)^4\right) y'(x) = 0$ 1776
4.1012 $x\left(a^2x + y(x) \left(x^2 - y(x)^2\right)\right) y'(x)^2 + \left(2a^2xy(x) + \left(x^2 - y(x)^2\right)^2\right) y'(x) + a^2y(x)^2 -$
$x\left(x^2 - y(x)^2\right) y(x) = 0$ 1778

4.1013 $x\left(a^2x+y(x)\left(x^2-y(x)^2\right)\right)y'(x)^2-\left(2a^2xy(x)-\left(x^2-y(x)^2\right)^2\right)y'(x)+a^2y(x)^2-x\left(x^2-y(x)^2\right)y(x)=0$ 1779
4.1014 $\left(x^2-y(x)^2\left(x^2+y(x)^2\right)\right)y'(x)^2-2xy(x)y'(x)+y(x)^2=0$ 1780
4.1015 $-2x\left(x^2+2y(x)^2\right)y(x)y'(x)+\left(x^4+y(x)^2\left(x^2-y(x)^2\right)\right)y'(x)^2+y(x)^4=0$ . . 1781
4.1016 $y(x)^5\left(-y'(x)\right)+3xy(x)^4y'(x)^2+1=0$ 1783
4.1017 $-a-3y(x)^5y'(x)+9xy(x)^4y'(x)^2=0$ 1785
4.1018 $9\left(1-x^2\right)y(x)^4y'(x)^2+4x^2+6xy(x)^5y'(x)=0$ 1787
4.1019 $y'(x)^2\left(a^2r(x,y(x))-x^2\right)+a^2r(x,y(x))+2xy(x)y'(x)-y(x)^2=0$ 1788
4.1020 $y'(x)^2\left(ar(x,y(x))-x^2\right)+ar(x,y(x))+2xy(x)y'(x)-y(x)^2=0$ 1789
4.1021 $y'(x)^3=a+bx$ 1790
4.1022 $y'(x)^3=ax^n$ 1791
4.1023 $y'(x)^3-y(x)+x=0$ 1792
4.1024 $y'(x)^3=f(x)\left(a+by(x)+cy(x)^2\right)$ 1794
4.1025 $y'(x)^3=(y(x)-a)^2(y(x)-b)^2$ 1796
4.1026 $f(x)(y(x)-a)^2(y(x)-b)^2+y'(x)^3=0$ 1798
4.1027 $f(x)(y(x)-a)^2(y(x)-b)^2(y(x)-c)^2+y'(x)^3=0$ 1800
4.1028 $a-bx+y'(x)^3+y'(x)=0$ 1802
4.1029 $y'(x)^3+y'(x)-y(x)=0$ 1804
4.1030 $y'(x)^3+y'(x)=e^{y(x)}$ 1807
4.1031 $y'(x)^3-7y'(x)+6=0$ 1808
4.1032 $ay(x)+y'(x)^3-xy'(x)=0$ 1809
4.1033 $y'(x)^3+2xy'(x)-y(x)=0$ 1810
4.1034 $y'(x)^3-2xy'(x)-y(x)=0$ 1811
4.1035 $-axy'(x)+x^3+y'(x)^3=0$ 1812
4.1036 $axy'(x)-ay(x)+y'(x)^3=0$ 1813
4.1037 $-(a+bx)y'(x)+by(x)+y'(x)^3=0$ 1814
4.1038 $y'(x)^3-y(x)y'(x)-x=0$ 1815
4.1039 $y'(x)^3-(y(x)+3)y'(x)+x=0$ 1816
4.1040 $y'(x)^3-2y(x)y'(x)+y(x)^2=0$ 1817
4.1041 $-axy(x)y'(x)+2ay(x)^2+y'(x)^3=0$ 1818
4.1042 $-\left(x^3+xy(x)+y(x)^2\right)y'(x)+y'(x)^3+xy(x)(y(x)+x)=0$ 1819
4.1043 $-xy(x)^4y'(x)+y'(x)^3-y(x)^5=0$ 1820
4.1044 $y'(x)^3+e^{3x-2y(x)}(y'(x)-1)=0$ 1821
4.1045 $y'(x)^3+\left(e^{2x}+e^{3x}\right)e^{-2y(x)}y'(x)-e^{3x-2y(x)}=0$ 1823
4.1046 $y'(x)^3+y'(x)^2-y(x)=0$ 1824
4.1047 $y'(x)^3-y'(x)^2+y(x)^2=0$ 1826
4.1048 $y'(x)^3-y'(x)^2+xy'(x)-y(x)=0$ 1828
4.1049 $abx-ay'(x)^2+by(x)+y'(x)^3=0$ 1829
4.1050 $\mathrm{a0}y'(x)^2+\mathrm{a1}y'(x)+\mathrm{a2}+\mathrm{a3}y(x)+y'(x)^3=0$ 1830
4.1051 $y'(x)^3+xy'(x)^2-y(x)=0$ 1832
4.1052 $-x^3-(1-3x)xy'(x)+y'(x)^3+(1-3x)y'(x)^2-1=0$ 1834

4.1053 $y'(x)^3 - y(x)y'(x)^2 + y(x)^2 = 0$ . . . 1836
4.1054 $y'(x)^3 + y'(x)^2(\cos(x)\cot(x) - y(x)) - y'(x)(y(x)\cos(x)\cot(x) + 1) + y(x) = 0$ 1838
4.1055 $y'(x)^3 + \left(2x - y(x)^2\right) y'(x)^2 - 2xy(x)^2y'(x) = 0$ . . . 1839
4.1056 $\left(x^2 + 2xy(x)^2 - y(x)^2\right) y'(x) - y(x)^2 \left(x^2 - y(x)^2\right) + y'(x)^3 - \left(y(x)^2 + 2x\right) y'(x)^2 = 0$ . . . 1840
4.1057 $-x^3y(x)^3 + x\left(x^2 + xy(x) + y(x)^2\right) y(x)y'(x) - \left(x^2 + xy(x) + y(x)^2\right) y'(x)^2 + y'(x)^3 = 0$ . . . 1841
4.1058 $-x^3y(x)^6 + x\left(x^2 + y(x)^4 + xy(x)^2\right) y(x)^2y'(x) - \left(x^2 + y(x)^4 + xy(x)^2\right) y'(x)^2 + y'(x)^3 = 0$ . . . 1842
4.1059 $2y'(x)^3 + xy'(x) - 2y(x) = 0$ . . . 1843
4.1060 $2y'(x)^3 + y'(x)^2 - y(x) = 0$ . . . 1844
4.1061 $x^4(-y'(x)) + 2x^3y(x) + 3y'(x)^3 = 0$ . . . 1846
4.1062 $4y'(x)^3 + 4y'(x) = x$ . . . 1847
4.1063 $8y'(x)^3 + 12y'(x)^2 = 27(y(x) + x)$ . . . 1849
4.1064 $a + xy'(x)^3 - y(x)y'(x)^2 = 0$ . . . 1850
4.1065 $xy'(x)^3 + (2x - y(x))y'(x)^2 + (2 - 2y(x))y'(x) - y(x) + 1 = 0$ . . . 1851
4.1066 $-\left(x^2 + y(x) + x\right) y'(x)^2 + \left(x^2 + xy(x) + y(x)\right) y'(x) + xy'(x)^3 - xy(x) = 0$ . . . 1853
4.1067 $4x^2 + xy'(x)^3 - 2y(x)y'(x)^2 = 0$ . . . 1854
4.1068 $2xy'(x)^3 - 3y(x)y'(x)^2 - x = 0$ . . . 1855
4.1069 $4xy'(x)^3 - 6y(x)y'(x)^2 + 3y(x) - x = 0$ . . . 1856
4.1070 $8xy'(x)^3 - 12y(x)y'(x)^2 + 9y(x) = 0$ . . . 1857
4.1071 $x^2y'(x)^3 - 2xy(x)y'(x)^2 + y(x)^2y'(x) + 1 = 0$ . . . 1858
4.1072 $bx\left(a^2 - x^2\right) y'(x)^2 + \left(a^2 - x^2\right) y'(x)^3 - bx - y'(x) = 0$ . . . 1859
4.1073 $x\left(x^5 + 3y(x)^2\right) y'(x) - 2x^5y(x) - 3x^2y(x)y'(x)^2 + xy'(x)^3 - y(x)^3 = 0$ . . . 1860
4.1074 $2x^3y'(x)^3 + 6x^2y(x)y'(x)^2 - (1 - 6xy(x))y(x)y'(x) + 2y(x)^3 = 0$ . . . 1861
4.1075 $8x^3y'(x)^3 + 12x^2y(x)y'(x)^2 - \left(1 - 6xy(x)^2\right) y'(x) + y(x)^3 = 0$ . . . 1863
4.1076 $x^4y'(x)^3 - x^3y(x)y'(x)^2 - x^2y(x)^2y'(x) + xy(x)^3 = 1$ . . . 1864
4.1077 $x^6y'(x)^3 - xy'(x) - y(x) = 0$ . . . 1866
4.1078 $y(x)y'(x)^3 - 3xy'(x) + 3y(x) = 0$ . . . 1867
4.1079 $2y(x)y'(x)^3 - 3xy'(x) + 2y(x) = 0$ . . . 1868
4.1080 $2y(x)y'(x)^3 + 3y(x)y'(x) + x = 0$ . . . 1870
4.1081 $2y(x)y'(x)^3 - y(x)y'(x)^2 + 2xy'(x) - x = 0$ . . . 1872
4.1082 $(2y(x) + x)y'(x)^3 + 3(y(x) + x)y'(x)^2 + (y(x) + 2x)y'(x) = 0$ . . . 1873
4.1083 $y(x)^2y'(x)^3 - xy'(x) + y(x) = 0$ . . . 1874
4.1084 $y(x)^2y'(x)^3 + 2xy'(x) - y(x) = 0$ . . . 1875
4.1085 $4y(x)^2y'(x)^3 - 2xy'(x) + y(x) = 0$ . . . 1876
4.1086 $16y(x)^2y'(x)^3 + 2xy'(x) - y(x) = 0$ . . . 1877
4.1087 $x\left(x^2 + 1\right) y'(x) - x^2y(x) + y(x)^3 \left(-y'(x)^2\right) + xy(x)^2y'(x)^3 = 0$ . . . 1878
4.1088 $x^7y(x)^2y'(x)^3 + \left(1 - 3x^6y(x)^3\right) y'(x)^2 + 3x^5y(x)^4y'(x) - x^4y(x)^5 = 0$ . . . 1879
4.1089 $y(x)^3y'(x)^3 - xy'(x) + y(x) = 0$ . . . 1882
4.1090 $x^3 + 3x^2y(x)y'(x) + y(x)^3y'(x)^3 - (1 - 3x)y(x)^2y'(x)^2 - y(x)^2 = 0$ . . . 1883

4.1091 $y(x)^4 y'(x)^3 - 6xy'(x) + 2y(x) = 0$ 1884
4.1092 $y'(x)^4 = (y(x) - a)^3 (y(x) - b)^2$ 1885
4.1093 $f(x)(y(x) - a)^3 (y(x) - b)^2 + y'(x)^4 = 0$ 1887
4.1094 $f(x)(y(x) - a)^3 (y(x) - b)^3 + y'(x)^4 = 0$ 1889
4.1095 $f(x)(y(x) - a)^3 (y(x) - b)^3 (y(x) - c)^2 + y'(x)^4 = 0$ 1891
4.1096 $y'(x)^4 + xy'(x) - 3y(x) = 0$ 1893
4.1097 $y'(x)^4 - 3(1 - x)y'(x)^2 + 3(1 - 2y(x))y'(x) + 3x = 0$ 1894
4.1098 $-4x^2 y(x) y'(x)^2 + y'(x)^4 + 16xy(x)^2 y'(x) - 16y(x)^3 = 0$ 1895
4.1099 $y'(x)^4 + 4y(x)y'(x)^3 + 6y(x)^2 y'(x)^2 - \left(1 - 4y(x)^3\right) y'(x) - y(x)\left(3 - y(x)^3\right) = 0$ 1897
4.1100 $2y'(x)^4 - y(x)y'(x) - 2 = 0$ 1898
4.1101 $12x^3 + xy'(x)^4 - 2y(x)y'(x)^3 = 0$ 1899
4.1102 $ay'(x)^3 + by'(x)^2 + y'(x)^5 = cy(x)$ 1900
4.1103 $ay'(x)^4 + by'(x)^3 + cxy'(x)^2 + y'(x)^5 = cy(x)$ 1901
4.1104 $3y'(x)^5 - y(x)y'(x) + 1 = 0$ 1902
4.1105 $y'(x)^6 = (y(x) - a)^4 (y(x) - b)^3$ 1904
4.1106 $f(x)(y(x) - a)^4 (y(x) - b)^3 + y'(x)^6 = 0$ 1906
4.1107 $f(x)(y(x) - a)^5 (y(x) - b)^3 + y'(x)^6 = 0$ 1908
4.1108 $f(x)(y(x) - a)^5 (y(x) - b)^4 + y'(x)^6 = 0$ 1910
4.1109 $f(x)(y(x) - a)^5 (y(x) - b)^4 (y(x) - c)^3 + y'(x)^6 = 0$ 1912
4.1110 $x^2 \left(y'(x)^6 + 3y(x)^4 + 3y(x)^2 + 1\right) = a^2$ 1914
4.1111 $y'(x)^n = ax^r + by'(x)^s$ 1915
4.1112 $y'(x)^n = f(x)^n (y(x) - a)^{n+1} (y(x) - b)^{n-1}$ 1916
4.1113 $y'(x)^n = f(x)(y(x) - a)^{n+1}$ 1917
4.1114 $y'(x)^n = f(x)(y(x) - a)^{n-1} (y(x) - b)^{n-1}$ 1918
4.1115 $f(x)g(x) + y'(x)^n = 0$ 1919
4.1116 $f(x, y(x)) + y'(x)^n = 0$ 1920
4.1117 $ay'(x) + y'(x)^n = by(x)$ 1921
4.1118 $y'(x)^n + xy'(x) - y(x) = 0$ 1922
4.1119 $ay'(x)^m + y'(x)^n = by(x)$ 1923
4.1120 $\mathrm{Y1}(y(x))y'(x)^{n-1} + y'(x)^n = 0$ 1924
4.1121 $\mathrm{X1}(x, y(x))y'(x)^{n-1} + y'(x)^n = 0$ 1925
4.1122 $x^{n-1} y'(x)^n - nxy'(x) + y(x) = 0$ 1926
4.1123 $\mathrm{X0}(x, y(x))y'(x)^n + \mathrm{X1}(x, y(x))y'(x)^{n-1} = 0$ 1927
4.1124 $2\sqrt{ay'(x)} + xy'(x) - y(x) = 0$ 1928
4.1125 $(x - y(x))\sqrt{y'(x)} = a(y'(x) + 1)$ 1929
4.1126 $3xy'(x) + 2(y(x) + 1)^{3/2} - 3y(x) = 0$ 1930
4.1127 $ay'(x) + \sqrt{y'(x)^2 + 1} = x$ 1931
4.1128 $ay'(x) + \sqrt{y'(x)^2 + 1} = y(x)$ 1932
4.1129 $\sqrt{y'(x)^2 + 1} = xy'(x)$ 1934
4.1130 $-ay(x)y'(x) - ax + \sqrt{y'(x)^2 + 1} = 0$ 1935
4.1131 $-xy'(x)^2 + \sqrt{y'(x)^2 + 1} + y(x) = 0$ 1937

4.1132 $\sqrt{a^2+b^2y'(x)^2}+xy'(x)-y(x)=0$ . . . 1938
4.1133 $\sqrt{ac-b^2}(xy'(x)-y(x))+\sqrt{a+2by'(x)+cy'(x)^2}=0$ . . . 1939
4.1134 $a\sqrt{y'(x)^2+1}+xy'(x)-y(x)=0$ . . . 1940
4.1135 $ax\sqrt{y'(x)^2+1}+xy'(x)-y(x)=0$ . . . 1941
4.1136 $-ay(x)y'(x)-ax+y(x)\sqrt{y'(x)^2+1}=0$ . . . 1943
4.1137 $y(x)\sqrt{y'(x)^2+1}=f(y(x)y'(x)+x)$ . . . 1945
4.1138 $\sqrt{(ax^2+y(x)^2)\left(y'(x)^2+1\right)}-ax-y(x)y'(x)=0$ . . . 1946
4.1139 $a\sqrt[3]{y'(x)^3+1}+xy'(x)-y(x)=0$ . . . 1947
4.1140 $y'(x)\left(a+x\sqrt{y'(x)^2+1}\right)=y(x)\sqrt{y'(x)^2+1}$ . . . 1948
4.1141 $xy'(x)+\cos\left(y'(x)\right)=y(x)$ . . . 1949
4.1142 $a\cos\left(y'(x)\right)+by'(x)+x=0$ . . . 1950
4.1143 $y'(x)+\sin\left(y'(x)\right)=x$ . . . 1951
4.1144 $y'(x)\sin\left(y'(x)\right)+\cos\left(y'(x)\right)=y(x)$ . . . 1952
4.1145 $y'(x)^2\sin\left(y'(x)\right)=y(x)$ . . . 1953
4.1146 $y'(x)^2\left(\sin\left(y'(x)\right)+x\right)=y(x)$ . . . 1954
4.1147 $\left(y'(x)^2+1\right)\sin^2\left(y(x)-xy'(x)\right)=1$ . . . 1955
4.1148 $-\sqrt{1-y'(x)^2}+y'(x)\left(\cos^{-1}\left(y'(x)\right)-x\right)+y(x)=0$ . . . 1956
4.1149 $\left(y'(x)^2+1\right)\left(ax+\tan^{-1}\left(y'(x)\right)\right)+y'(x)=0$ . . . 1957
4.1150 $-y'(x)^2+e^{y'(x)-y(x)}+1=0$ . . . 1958
4.1151 $y'(x)+\log\left(y'(x)\right)=x$ . . . 1959
4.1152 $a+xy'(x)+\log\left(y'(x)\right)=0$ . . . 1960
4.1153 $a+xy'(x)+\log\left(y'(x)\right)=y(x)$ . . . 1961
4.1154 $a+by(x)+xy'(x)+\log\left(y'(x)\right)=0$ . . . 1962
4.1155 $4xy'(x)+\log\left(y'(x)\right)-2y(x)=0$ . . . 1963
4.1156 $a(xy'(x)-y(x))+\log\left(y'(x)\right)=0$ . . . 1964
4.1157 $a(\log\left(y'(x)\right)-y'(x))+y(x)-x=0$ . . . 1965
4.1158 $y'(x)+y(x)\log\left(y'(x)\right)-xy(x)-y(x)\log(y(x))=0$ . . . 1966
4.1159 $-(x+1)y'(x)+y'(x)\log\left(y'(x)\right)+y(x)=0$ . . . 1967
4.1160 $\log\left(xy'(x)-y(x)\right)=y'(x)$ . . . 1968
4.1161 $y'(x)\log\left(\sqrt{a+y'(x)^2}+y'(x)\right)-xy'(x)-\sqrt{y'(x)^2+1}+y(x)=0$ . . . 1969
4.1162 $y'(x)\tan\left(y'(x)\right)+\log\left(\cos\left(y'(x)\right)\right)=y(x)$ . . . 1970
4.1163 $f(y'(x))=0$ . . . 1971
4.1164 $f(x,y'(x))=0$ . . . 1972
4.1165 $f\left(xy'(x)^2\right)=y(x)-2xy'(x)$ . . . 1973
4.1166 $f(y(x),y'(x))=0$ . . . 1974
4.1167 $f(y'(x))+xy'(x)=y(x)$ . . . 1975
4.1168 $f(y'(x))+xg(y'(x))=y(x)$ . . . 1976
4.1169 $f(y'(x),y(x)-xy'(x))=0$ . . . 1978
4.1170 $f(xy'(x),y(x))=0$ . . . 1979
4.1171 $x^nf\left(y'(x),\frac{y(x)}{x}\right)=0$ . . . 1980
4.1172 $f(y(x)y'(x)+x)=y(x)^2\left(y'(x)^2+1\right)$ . . . 1981

4.1173 $y(x)f\left(\frac{y'(x)}{y(x)},x\right)=0$ 1982
4.1174 $f(x,y(x),y'(x))=0$ 1983
4.1175 $y''(x)=0$ 1984
4.1176 $y''(x)=x+\sin(x)$ 1985
4.1177 $y''(x)=\mathrm{c1}\cos(ax)+\mathrm{c2}\sin(bx)$ 1986
4.1178 $y''(x)=e^{x}x$ 1987
4.1179 $y''(x)=\mathrm{c1}e^{ax}+\mathrm{c2}e^{-bx}$ 1988
4.1180 $y''(x)+y(x)=0$ 1989
4.1181 $y''(x)-y(x)=0$ 1990
4.1182 $y''(x)+y(x)=ax$ 1991
4.1183 $y''(x)+y(x)=a\cos(bx)$ 1992
4.1184 $y''(x)+y(x)=8\cos(x)\cos(2x)$ 1993
4.1185 $y''(x)+y(x)=\sec(x)$ 1994
4.1186 $y''(x)+y(x)=a\sin(bx)$ 1995
4.1187 $y''(x)+y(x)=\sin(ax)\sin(bx)$ 1996
4.1188 $y''(x)+y(x)=4x\sin(x)$ 1997
4.1189 $y''(x)+y(x)=x(\cos(x)-x\sin(x))$ 1998
4.1190 $y''(x)+y(x)=\tan^{2}(x)$ 1999
4.1191 $y''(x)+y(x)=e^{-x}$ 2000
4.1192 $y''(x)+y(x)=e^{x}\left(x^{2}-1\right)$ 2001
4.1193 $y''(x)+y(x)=e^{x}\sin(2x)$ 2002
4.1194 $y''(x)+y(x)=e^{2x}\cos(x)$ 2003
4.1195 $y''(x)-2y(x)=0$ 2004
4.1196 $y''(x)-2y(x)=4e^{x^{2}}x^{2}$ 2005
4.1197 $y''(x)+4y(x)=0$ 2006
4.1198 $y''(x)+4y(x)=x\sin^{2}(x)$ 2007
4.1199 $y''(x)+4y(x)=2\tan(x)$ 2008
4.1200 $y''(x)+4y(x)=2\tan(x)$ 2009
4.1201 $y''(x)-a^{2}y(x)=x+1$ 2010
4.1202 $y''(x)=ax+by(x)$ 2011
4.1203 $a^{2}y(x)+y''(x)=x^{2}+x+1$ 2012
4.1204 $a^{2}y(x)+y''(x)=\cos(bx)$ 2013
4.1205 $a^{2}y(x)+y''(x)=\cot(ax)$ 2014
4.1206 $a^{2}y(x)+y''(x)=\sin(bx)$ 2015
4.1207 $y''(x)+xy(x)=0$ 2016
4.1208 $y(x)(a+bx)+y''(x)=0$ 2017
4.1209 $\left(a+x^{2}\right)y(x)+y''(x)=0$ 2018
4.1210 $\left(a-x^{2}\right)y(x)+y''(x)=0$ 2019
4.1211 $y''(x)=\left(a+x^{2}\right)y(x)$ 2020
4.1212 $y(x)\left(a+b^{2}x^{2}\right)+y''(x)=0$ 2021
4.1213 $y(x)\left(a+bx+cx^{2}\right)+y''(x)=0$ 2022

4.1214 $y(x) \left(\mathrm{a0} + \mathrm{a1} x^2 + x^4\right) + y''(x) = 0$ 2023
4.1215 $a x^k y(x) + y''(x) = 0$ 2024
4.1216 $y(x) \left(\mathrm{a0} + \mathrm{a1} x + \mathrm{a2} x^2 + \mathrm{a3} x^3 + \mathrm{a4} x^4 + x^8\right) + y''(x) = 0$ 2025
4.1217 $y(x)(a + b \cos(2x)) + y''(x) = 0$ 2026
4.1218 $y(x)(a + b \cos(2x) + k \cos(4x)) + y''(x) = 0$ 2027
4.1219 $y(x) \left(\sum_{n=0}^{m} a(n) \cos(2nx)\right) + y''(x) = 0$ 2028
4.1220 $y''(x) = 2y(x) \csc^2(x)$ 2029
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4.1832 $y''(x)=a\sqrt{by(x)^2+y'(x)^2}$ . . . 2690
4.1833 $y''(x)=a\left(y'(x)^2+1\right)^{3/2}$ . . . 2691
4.1834 $y''(x)=ax\left(y'(x)^2+1\right)^{3/2}$ . . . 2692
4.1835 $y''(x)=ay(x)\left(y'(x)^2+1\right)^{3/2}$ . . . 2694
4.1836 $y''(x)=ay(x)\left(\left(b-y'(x)\right)^2+1\right)^{3/2}$ . . . 2696
4.1837 $y''(x)=a\left(y'(x)^2+1\right)^{3/2}(b+cx+y(x))$ . . . 2698
4.1838 $y''(x)+y(x)^3y'(x)=y(x)y'(x)\sqrt{4y'(x)+y(x)^4}$ . . . 2699
4.1839 $y''(x)=f(y'(x))$ . . . 2700
4.1840 $y''(x)=f(ax+by(x),y'(x))$ . . . 2701
4.1841 $y''(x)=y(x)f\left(x,\frac{y'(x)}{y(x)}\right)$ . . . 2702
4.1842 $y''(x)=x^{n-2}f\left(x^{-n}y(x),x^{1-n}y'(x)\right)$ . . . 2703
4.1843 $2y''(x)=12y(x)^2+1$ . . . 2704
4.1844 $2y''(x)=y(x)\left(a-y(x)^2\right)$ . . . 2705
4.1845 $8y''(x)+9y'(x)^4=0$ . . . 2707
4.1846 $axe^{y(x)}+xy''(x)+y'(x)=0$ . . . 2708
4.1847 $xy''(x)+2y'(x)+xy(x)^5=0$ . . . 2710
4.1848 $xy(x)^n+xy''(x)+2y'(x)=0$ . . . 2718
4.1849 $x^my(x)^n+xy''(x)+2y'(x)=0$ . . . 2719
4.1850 $ax^my(x)^n+xy''(x)+2y'(x)=0$ . . . 2720
4.1851 $ay'(x)+bxe^{y(x)}+xy''(x)=0$ . . . 2721
4.1852 $\left(2-ax^2\right)y'(x)+xy''(x)=0$ . . . 2722
4.1853 $xy''(x)=(1-y(x))y'(x)$ . . . 2723
4.1854 $xy''(x)+xy'(x)^2=y'(x)$ . . . 2724
4.1855 $xy''(x)=xy'(x)^2+y'(x)$ . . . 2725
4.1856 $xy''(x)+2xy'(x)^2-2y'(x)=0$ . . . 2726
4.1857 $xy''(x)=x^2y'(x)^2-2y'(x)-y(x)^2$ . . . 2727
4.1858 $ax^2y'(x)^2+xy''(x)+2y'(x)=b$ . . . 2728
4.1859 $(axy'(x)-y(x))^2+xy''(x)=b$ . . . 2729
4.1860 $xy''(x)=y'(x)^3+y'(x)$ . . . 2730
4.1861 $xy''(x)+2y'(x)=ax^{2k}y'(x)^k$ . . . 2731
4.1862 $2xy''(x)+y'(x)^3+y'(x)=0$ . . . 2732
4.1863 $ay(x)\left(1-y(x)^n\right)+x^2y''(x)=0$ . . . 2733

4.1864 $ae^{y(x)-1}+x^2y''(x)=0$ 2734
4.1865 $(a+1)xy'(x)+x^2y''(x)=x^kf\left(x^ky(x),ky(x)+xy'(x)\right)$ 2735
4.1866 $x^2y''(x)+y'(x)^2=0$ 2736
4.1867 $x^2y''(x)=\left(3x-2y'(x)\right)y'(x)$ 2737
4.1868 $x^2y''(x)+x^2y'(x)^2+4xy'(x)+2=0$ 2738
4.1869 $x^2y''(x)=x^4y'(x)^2-4x^2y(x)^2+6y(x)$ 2739
4.1870 $a(xy'(x)-y(x))^2+x^2y''(x)=bx^2$ 2740
4.1871 $ax^4y'(x)^2+x^2y''(x)+2xy(x)=b$ 2741
4.1872 $ay(x)y'(x)^2+bx+x^2y''(x)=0$ 2742
4.1873 $x^2y''(x)=\sqrt{ax^2y'(x)^2+by(x)^2}$ 2743
4.1874 $x^2y''(x)=y(x)f\left(\frac{xy'(x)}{y(x)}\right)$ 2744
4.1875 $\left(x^2+1\right)y''(x)+y'(x)^2+1=0$ 2745
4.1876 $ay(x)^3+9x^2y''(x)+2y(x)=0$ 2746
4.1877 $x^3y''(x)-x^2y'(x)=3-x^2$ 2747
4.1878 $x^3\left(y''(x)+y(x)y'(x)-y(x)^3\right)+12xy(x)+24=0$ 2748
4.1879 $x^3y''(x)=a(xy'(x)-y(x))^2$ 2749
4.1880 $2x^3y''(x)+x^2(2xy(x)+9)y'(x)+xy(x)\left(-2x^2y(x)^2+3xy(x)+12\right)-6=0$. 2750
4.1881 $x^4y''(x)=x\left(x^2+2y(x)\right)y'(x)-4y(x)^2$ 2751
4.1882 $x^4y''(x)=x^2y'(x)\left(y'(x)+x\right)-4y(x)^2$ 2752
4.1883 $x^4y''(x)+(xy'(x)-y(x))^3=0$ 2753
4.1884 $x^ay''(x)+y(x)^b=0$ 2754
4.1885 $\left(1-12x^2\right)\left(3y'(x)+y(x)^2\right)+2x\left(1-4x^2\right)\left(y''(x)+y(x)y'(x)-y(x)^3\right)-48xy(x)+24=0$ 2755
4.1886 $axy(x)+b-\left(kx^{k-1}-12x^2\right)\left(3y'(x)+y(x)^2\right)+2\left(x^k-4x^3\right)\left(y''(x)+y(x)y'(x)-y(x)^3\right)=0$ 2756
4.1887 $\sqrt{x}y''(x)=y(x)^{3/2}$ 2757
4.1888 $x^{3/2}y''(x)=f\left(\frac{y(x)}{\sqrt{x}}\right)$ 2758
4.1889 $y''(x)\left(a+2bx+cx^2\right)^{3/2}=f\left(\frac{x}{\sqrt{a+2bx+cx^2}}\right)$ 2759
4.1890 $f(x)f'(x)y'(x)+f(x)^2y''(x)=g(y(x),f(x)y'(x))$ 2760
4.1891 $f(x)^2y''(x)=y'(x)\left(3f(x)f'(x)-f(x)^2y(x)+3f(x)^3\right)-24f(x)^4$ 2761
4.1892 $f(x)^2y''(x)=-af(x)^5+3f(x)f'(x)-f(x)^2y(x)+3f(x)^3$ 2762
4.1893 $2f(x)^2y''(x)=f(x)y'(x)\left(3f'(x)-2f(x)y(x)\right)+f(x)y(x)^2f'(x)+y(x)\left(f(x)f''(x)-2f'(x)^2-2f(x)^3\right)+2f(x)^2y(x)^3$ 2763
4.1894 $y(x)y''(x)=a$ 2765
4.1895 $y(x)y''(x)=y'(x)^2$ 2766
4.1896 $y(x)y''(x)+y'(x)^2=0$ 2767
4.1897 $y(x)y''(x)=y'(x)^2-a^2$ 2768
4.1898 $y(x)y''(x)+y'(x)^2=a^2$ 2769
4.1899 $y(x)y''(x)+y'(x)^2+y(x)^2=0$ 2770
4.1900 $2a^2y(x)^2+y(x)y''(x)+y'(x)^2=0$ 2771

4.1901 $y(x)y''(x) = \mathrm{a0} + \mathrm{a1}y(x) + y(x)^3(\mathrm{a2} + \mathrm{a3}y(x)) + y'(x)^2$ 2772
4.1902 $y(x)y''(x) = \mathrm{a0} + \mathrm{a1}y(x) + \mathrm{a2}y(x)^2 + \mathrm{a3}y(x)^3 + \mathrm{a4}y(x)^4 + y'(x)^2$ 2775
4.1903 $y(x)y''(x) = y'(x)^2 + y(x)y'(x)$ 2776
4.1904 $y(x)y''(x) = e^x y(x)\left(\mathrm{a0} + \mathrm{a1}y(x)^2\right) + e^{2x}\left(\mathrm{a2} + \mathrm{a3}y(x)^4\right) + y'(x)^2$ 2777
4.1905 $y(x)y''(x) = y'(x)^2 + y(x)^2\log(y(x))$ 2778
4.1906 $y(x)y''(x) = -x^2y(x)^2 + y'(x)^2 + y(x)^2\log(y(x))$ 2779
4.1907 $y(x)y''(x) + y'(x)^2 = y'(x)$ 2780
4.1908 $y(x)y''(x) = y'(x)^2 - y'(x)$ 2781
4.1909 $y(x)y''(x) = y(x)^2\left(f(x)y(x) + g'(x)\right) + y'(x)^2 + y'(x)$ 2782
4.1910 $y(x)y''(x) = y'(x)^2 - 2y'(x)$ 2783
4.1911 $y(x)y''(x) + y'(x)^2 - xy'(x) + y(x) = 0$ 2784
4.1912 $axy'(x) + y(x)y''(x) + y'(x)^2 = 0$ 2785
4.1913 $y(x)y''(x) = -y(x)f'(x) + f(x)y'(x) + y'(x)^2 + y(x)^3$ 2786
4.1914 $y(x)y''(x) = y(x)f''(x) - f(x)y'(x) - f(x)y(x)^3 + y'(x)^2 + y(x)^4$ 2787
4.1915 $y(x)y''(x) = -ay(x)y'(x) - by(x)^2 + y'(x)^2$ 2788
4.1916 $y(x)y''(x) = ay(x)y'(x) + by(x)^2 + y'(x)^2 + y(x)^3$ 2789
4.1917 $y(x)y''(x) = y(x)^2y'(x) + y'(x)^2$ 2790
4.1918 $y(x)y''(x) = f(x)y(x)y'(x) + g(x)y(x)^2 + y'(x)^2$ 2791
4.1919 $y(x)y''(x) = -y(x)\left(f'(x) - y(x)^2g'(x)\right) + y'(x)\left(f(x) + g(x)y(x)^2\right) + y'(x)^2$. 2792
4.1920 $y(x)y''(x) = 2y'(x)^2 + y(x)^2$ 2793
4.1921 $y(x)y''(x) = 2\left(y'(x)^2 - y(x)^2\right)$ 2794
4.1922 $y(x)y''(x) = -3y(x)y'(x) + 3y'(x)^2 + y(x)^2$ 2795
4.1923 $y(x)y''(x) = ay'(x)^2$ 2796
4.1924 $y(x)y''(x) = ay'(x)^2 + b$ 2797
4.1925 $y(x)y''(x) = ay'(x)^2 + by(x)^3$ 2799
4.1926 $y(x)y''(x) = ay'(x)^2 + \mathrm{a0} + \mathrm{a1}y(x) + \mathrm{a2}y(x)^2 + \mathrm{a3}y(x)^3 + \mathrm{a3}y(x)^2 + \mathrm{a4}y(x)^4$. 2801
4.1927 $y(x)y''(x) = ay'(x)^2 + by(x)y'(x) + cy(x)^2$ 2803
4.1928 $y(x)y''(x) = \mathrm{a3}y(x)^{a+1} + ay'(x)^2 + \mathrm{a1}y(x)y'(x) + \mathrm{a2}y(x)^2$ 2804
4.1929 $ay'(x)^2 + f(x)y(x)y'(x) + g(x)y(x)^2 + y(x)y''(x) = 0$ 2806
4.1930 $y(x)y''(x) + y'(x)^3 = 0$ 2807
4.1931 $y(x)y''(x) + y'(x)^3 - y'(x)^2 = 0$ 2808
4.1932 $y(x)y''(x) = y'(x)^2\left(y'(x)(-\sin(y(x))) - y(x)y'(x)\cos(y(x)) + 1\right)$ 2809
4.1933 $(1 - y(x))y''(x) + 2y'(x)^2 = 0$ 2810
4.1934 $(a + y(x))y''(x) = y'(x)^2$ 2811
4.1935 $(a + y(x))y''(x) + y'(x)^2 = b$ 2812
4.1936 $(a + y(x))y''(x) + by'(x)^2 = 0$ 2813
4.1937 $(y(x) + x)y''(x) + y'(x)^2 - y'(x) = 0$ 2814
4.1938 $(x - y(x))y''(x) + 2y'(x)\left(y'(x) + 1\right) = 0$ 2815
4.1939 $(x - y(x))y''(x) = \left(y'(x) + 1\right)\left(y'(x)^2 + 1\right)$ 2816
4.1940 $(x - y(x))y''(x) = f(y'(x))$ 2817
4.1941 $2y(x)y''(x) = y'(x)^2$ 2818

4.1942 $2y(x)y''(x)+y'(x)^2+1=0$ . . . 2819
4.1943 $2y(x)y''(x)=a+y'(x)^2$ . . . 2820
4.1944 $2y(x)y''(x)=y'(x)^2+8y(x)^3$ . . . 2821
4.1945 $2y(x)y''(x)=y'(x)^2+8y(x)^3+4y(x)^2$ . . . 2822
4.1946 $2y(x)y''(x)=y'(x)^2+4(2y(x)+x)y(x)^2$ . . . 2824
4.1947 $2y(x)y''(x)=y(x)^2(a+by(x))+y'(x)^2$ . . . 2825
4.1948 $2y(x)y''(x)=ay(x)^3+y'(x)^2-2xy(x)^2-1$ . . . 2827
4.1949 $2y(x)y''(x)=y(x)^2(ax+by(x))+y'(x)^2$ . . . 2828
4.1950 $2y(x)y''(x)=y'(x)^2+3y(x)^4$ . . . 2829
4.1951 $2y(x)y''(x)=-a^2-4\left(b-x^2\right)y(x)^2+y'(x)^2+3y(x)^4+8xy(x)^3$ . . . 2831
4.1952 $2y(x)y''(x)=-2y(x)^2\left(f'(x)+f(x)^2\right)-3f(x)y(x)y'(x)+y'(x)^2+8y(x)^3$ . . . 2832
4.1953 $2y(x)y''(x)=2xf(x)y(x)^2-4y(x)^2y'(x)+y'(x)^2-y(x)^4-1$ . . . 2833
4.1954 $2y(x)y''(x)=3y'(x)^2$ . . . 2834
4.1955 $2y(x)y''(x)=3y'(x)^2+4y(x)^2$ . . . 2835
4.1956 $2y(x)y''(x)=f(x)y(x)^2+3y'(x)^2$ . . . 2836
4.1957 $2y(x)y''(x)=6y'(x)^2+\left(1-3y(x)^2\right)y(x)^2$ . . . 2837
4.1958 $2y(x)y''(x)=6y'(x)^2-y(x)^2\left(ay(x)^3+1\right)$ . . . 2838
4.1959 $2y(x)y''(x)=y'(x)^2\left(y'(x)^2+1\right)$ . . . 2841
4.1960 $3y(x)y''(x)=2y'(x)^2+36y(x)^2$ . . . 2842
4.1961 $3y(x)y''(x)=5y'(x)^2$ . . . 2843
4.1962 $4y(x)y''(x)=3y'(x)^2-4y(x)$ . . . 2844
4.1963 $4y(x)y''(x)=3y'(x)^2+12y(x)^2$ . . . 2845
4.1964 $4y(x)y''(x)=ay(x)+by(x)^2+cy(x)^3+3y'(x)^2$ . . . 2846
4.1965 $5y(x)y''(x)=y'(x)^2$ . . . 2849
4.1966 $12y(x)y''(x)=15y'(x)^2-8y(x)^3$ . . . 2850
4.1967 $ay(x)y''(x)=(a-1)y'(x)^2$ . . . 2851
4.1968 $a(a+2)^2y(x)y''(x)=a^2(a+2)y(x)^3f'(x)-a^2f(x)^2y(x)^4+a(a+2)^2f(x)y(x)^2y'(x)+(a-1)(a+2)^2y'(x)^2$ . . . 2852
4.1969 $xy(x)y''(x)+xy'(x)^2+y(x)y'(x)=0$ . . . 2853
4.1970 $xy(x)y''(x)+xy'(x)^2=y(x)y'(x)$ . . . 2854
4.1971 $xy(x)y''(x)=xy'(x)^2-y(x)y'(x)$ . . . 2855
4.1972 $xy(x)y''(x)=x\left(\mathrm{a0}+\mathrm{a1}y(x)^4\right)+y(x)\left(\mathrm{a2}+\mathrm{a3}y(x)^2\right)+xy'(x)^2-y(x)y'(x)$ . . . 2856
4.1973 $xy(x)y''(x)+xy'(x)^2+2y(x)y'(x)=0$ . . . 2857
4.1974 $xy(x)y''(x)+xy'(x)^2=3y(x)y'(x)$ . . . 2858
4.1975 $ay(x)y'(x)+f(x)+xy(x)y''(x)+xy'(x)^2=0$ . . . 2859
4.1976 $xy(x)y''(x)=ay(x)y'(x)+xy'(x)^2+xy(x)^3$ . . . 2860
4.1977 $xy(x)y''(x)=ay(x)y'(x)+b^2xy(x)^3+xy'(x)^2$ . . . 2861
4.1978 $xy(x)y''(x)+2xy'(x)^2+y(x)y'(x)=0$ . . . 2862
4.1979 $xy(x)y''(x)-2xy'(x)^2+y(x)y'(x)=0$ . . . 2863
4.1980 $xy(x)y''(x)-2xy'(x)^2-y(x)y'(x)=0$ . . . 2864
4.1981 $xy(x)y''(x)=2xy'(x)^2-(y(x)+1)y'(x)$ . . . 2865

4.1982 $ay(x)y'(x)+xy(x)y''(x)+2xy'(x)^2=0$ 2866
4.1983 $ay(x)y'(x)+xy(x)y''(x)-2xy'(x)^2=0$ 2867
4.1984 $xy(x)y''(x)-4xy'(x)^2+4y(x)y'(x)=0$ 2868
4.1985 $ay'(x)\left(xy'(x)-y(x)\right)+xy(x)y''(x)=0$ 2869
4.1986 $x(y(x)+x)y''(x)+xy'(x)^2+(x-y(x))y'(x)=y(x)$ 2870
4.1987 $2xy(x)y''(x)=xy'(x)^2-y(x)y'(x)$ 2871
4.1988 $x^2+x(2y(x)+x)y''(x)+2xy'(x)^2+4(y(x)+x)y'(x)+2y(x)=0$ 2872
4.1989 $x^2y(x)y''(x)+\left(xy'(x)-y(x)\right)^2=0$ 2873
4.1990 $x^2y(x)y''(x)+\left(xy'(x)-y(x)\right)^2=3y(x)^2$ 2874
4.1991 $x^2y(x)y''(x)=axy(x)y'(x)+ay(x)^2+2x^2y'(x)^2$ 2875
4.1992 $ax^2y'(x)^2+bxy(x)y'(x)+cy(x)^2+x^2y(x)y''(x)$ 2876
4.1993 $x^2(1-y(x))y''(x)+2x^2y'(x)^2-2x(1-y(x))y'(x)+2(1-y(x))^2y(x)=0$ . . 2877
4.1994 $x^2(x-y(x))y''(x)=\left(xy'(x)-y(x)\right)^2$ 2878
4.1995 $x^2(x-y(x))y''(x)+\left(xy'(x)-y(x)\right)^2=0$ 2879
4.1996 $x^2(x-y(x))y''(x)=a\left(xy'(x)-y(x)\right)^2$ 2880
4.1997 $2x^2y(x)y''(x)=x^2y'(x)^2-y(x)^2$ 2881
4.1998 $2x^2y(x)y''(x)=x^2y'(x)^2+2xy(x)y'(x)-4y(x)^2$ 2882
4.1999 $x^3y(x)y''(x)+x^3y'(x)^2+6x^2y(x)y'(x)+3xy(x)^2=a$ 2883
4.2000 $x(x+1)^2y(x)y''(x)=a(x+2)y(x)^2-2\left(x^2+1\right)y(x)y'(x)+x(x+1)^2y'(x)^2$. 2884
4.2001 $8\left(1-x^3\right)y(x)y''(x)+4\left(1-x^3\right)y'(x)^2-12x^2y(x)y'(x)+3xy(x)^2=0$ 2885
4.2002 $\sqrt{a^2+x^2}\left(by'(x)^2+y(x)y''(x)\right)=y(x)y'(x)$ 2886
4.2003 $\sqrt{a^2-x^2}\left(xy(x)y''(x)-xy'(x)^2-y(x)y'(x)\right)=bxy'(x)^2$ 2887
4.2004 $\mathrm{f0}(x)y(x)y''(x)+\mathrm{f1}(x)y'(x)^2+\mathrm{f2}(x)y(x)y'(x)+\mathrm{f3}(x)y(x)^2=0$ 2888
4.2005 $4f(x)y(x)y''(x)=y'(x)\left(2f'(x)-6f(x)y(x)^2\right)+2y(x)^3f'(x)+3f(x)g(x)y(x)^2+$
$3f(x)y'(x)^2-f(x)y(x)^4+4f(x)^2y(x)$ 2889
4.2006 $y(x)^2y''(x)=a$ 2890
4.2007 $ax+y(x)^2y''(x)+y(x)y'(x)^2=0$ 2891
4.2008 $y(x)^2y''(x)+y(x)y'(x)^2=a+bx$ 2892
4.2009 $\left(y(x)^2+1\right)y''(x)+(1-2y(x))y'(x)^2=0$ 2893
4.2010 $\left(y(x)^2+1\right)y''(x)=3y(x)y'(x)^2$ 2894
4.2011 $\left(y(x)^2+1\right)y''(x)=(a+3y(x))y'(x)^2$ 2895
4.2012 $\left(y(x)^2+1\right)y''(x)+y'(x)\left(y'(x)^2+1\right)=0$ 2896
4.2013 $\left(y(x)^2+x\right)y''(x)+2y(x)y'(x)^2+2y'(x)=a$ 2897
4.2014 $\left(y(x)^2+x\right)y''(x)=2\left(x-y(x)^2\right)y'(x)^3-y'(x)\left(4y(x)y'(x)+1\right)$ 2899
4.2015 $\left(x^2+y(x)^2\right)y''(x)=\left(y(x)^2+1\right)\left(xy'(x)-y(x)\right)$ 2900
4.2016 $\left(x^2+y(x)^2\right)y''(x)=2\left(y(x)^2+1\right)\left(xy'(x)-y(x)\right)$ 2901
4.2017 $2(1-y(x))y(x)y''(x)=(1-2y(x))y'(x)^2$ 2902
4.2018 $2(1-y(x))y(x)y''(x)=f(x)(1-y(x))y(x)y'(x)+(1-2y(x))y'(x)^2$ 2903
4.2019 $2(1-y(x))y(x)y''(x)=(1-3y(x))y'(x)^2$ 2904
4.2020 $2(1-y(x))y(x)y''(x)=4y(x)y'(x)(f(x)+g(x)y(x))+(1-3y(x))y'(x)^2$ . . . 2905

4.2021 $2(1-y(x))y(x)y''(x) = -4y(x)^2(1-y(x))\left(f'(x)+f(x)^2+g'(x)-g(x)^2\right)-4y(x)y'(x)(f(x)+g(x)y(x))+(1-y(x))^3\left(-\left(\mathrm{F0}(x)^2-\mathrm{G0}(x)^2y(x)^2\right)\right)+(1-3y(x))y'(x)^2$ 2906
4.2022 $3(1-y(x))y(x)y''(x) = 2(1-2y(x))y'(x)^2$ . . . 2907
4.2023 $4(1-y(x))y(x)y''(x) = 3(1-2y(x))y'(x)^2$ . . . 2908
4.2024 $xy(x)^2y''(x) = a$ . . . 2909
4.2025 $xy(x)^2y''(x) = \left(a-y(x)^2\right)y'(x)+xy(x)y'(x)^2$ . . . 2911
4.2026 $x^2y(x)^2y''(x) = \left(x^2+y(x)^2\right)\left(xy'(x)-y(x)\right)$ . . . 2912
4.2027 $\left(a^2-x^2\right)\left(a^2-y(x)^2\right)y''(x)+\left(a^2-x^2\right)y(x)y'(x)^2 = x\left(a^2-y(x)^2\right)y'(x)$ . . . 2913
4.2028 $(1-y(x))^3\left(\mathrm{a0}+\mathrm{a1}y(x)^2\right)+\mathrm{a2}x(1-y(x))y(x)^2+\mathrm{a3}x^3y(x)^2(y(x)+1)+2x^2(1-y(x))y(x)y''(x)-x^2(1-3y(x))y'(x)^2+2x(1-y(x))y(x)y'(x) = 0$ . . . 2914
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4.2286 $x^2y'''(x)-x(1-y(x))y''(x)+xy'(x)^2+(1-y(x))y'(x)=0$ . . . 3243
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4.2293 $y'(x)y'''(x)+y'(x)^2=2y''(x)^2$ 3253
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4.2295 $2y'(x)y'''(x)=2y''(x)^2$ 3255
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4.2297 $\left(y'(x)^2+1\right)y'''(x)=y''(x)^2\left(a+3y'(x)\right)$ 3257
4.2298 $y'(x)^3y'''(x)=1$ 3259
4.2299 $y''(x)y'''(x)=2$ 3261
4.2300 $y''(x)y'''(x)=a\sqrt{b^2y''(x)^2+1}$ 3262
4.2301 $2xy''(x)y'''(x)=y''(x)^2-a^2$ 3264
4.2302 $\left(1-x^2\right)\left(y'''(x)\right)^2+2xy''(x)y'''(x)-y''(x)^2+1=0$ 3265
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4.2304 $3y''(x)y''''(x)=5\left(y'''(x)\right)^2$ 3267
4.2305 $-4y'(x)\left(y'''(x)\right)^2+3y'(x)y''(x)y''''(x)-3y''(x)^3=0$ 3268
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4.2308 $y^{(n)}(x)=f\left(y^{(n-2)}(x)\right)$ 3271
4.2309 $y^{(n)}(x)=f\left(y^{(n-1)}(x)\right)$ 3272
4.2310 $y^{(n-2)}(x)y^{(n)}(x)=y^{(n-1)}(x)^2$ 3273
4.2311 $f\left(x,y^{(n)}(x)\right)=0$ 3274
4.2312 $f\left(x,y^{(n-1)}(x),y^{(n)}(x)\right)=0$ 3275
4.2313 $f\left(y^{(n-2)}(x),y^{(n-1)}(x),y^{(n)}(x)\right)=0$ 3276

4.1 $y'(x) = af(x)$

ODE

$$y'(x) = af(x)$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Dependent variable missing

Mathematica ✓
cpu = 0.099971 (sec), leaf count = 19

$$\left\{\left\{y(x) \to \int_1^x af(K[1])\,dK[1] + c_1\right\}\right\}$$

Maple ✓
cpu = 0.54 (sec), leaf count = 12

$$\left\{y(x) = \int af(x)\ \mathrm{d}x + \_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a*f[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + Integrate[a*f[K[1]], {K[1], 1, x}]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a*f(x), y(x),'implicit')
```

Maple raw output

```
y(x) = Int(a*f(x),x)+_C1
```

4.2 $y'(x) = y(x) + x + \sin(x)$

ODE

$$y'(x) = y(x) + x + \sin(x)$$

ODE Classification

```
[[_linear, `class A`]]
```

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0345287 (sec), leaf count = 28

$$\left\{\left\{y(x) \to c_1 e^x - x - \frac{\sin(x)}{2} - \frac{\cos(x)}{2} - 1\right\}\right\}$$

Maple ✓
cpu = 0.122 (sec), leaf count = 21

$$\left\{y(x) = -\frac{\cos(x)}{2} - \frac{\sin(x)}{2} - x - 1 + e^x \_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x + Sin[x] + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 - x + E^x*C[1] - Cos[x]/2 - Sin[x]/2}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x+sin(x)+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2*cos(x)-1/2*sin(x)-x-1+exp(x)*_C1
```

4.3 $y'(x) = x^2 + 2y(x) + 3\cosh(x)$

ODE

$$y'(x) = x^2 + 2y(x) + 3\cosh(x)$$

ODE Classification

```
[[_linear, `class A`]]
```

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0297104 (sec), leaf count = 46

$$\left\{\left\{y(x) \to c_1 e^{2x} - \frac{1}{4}e^{-x}\left(e^x\left(2x^2+2x+1\right)+6e^{2x}+2\right)\right\}\right\}$$

Maple ✓
cpu = 0.079 (sec), leaf count = 43

$$\left\{y(x) = -\frac{\mathrm{e}^{2x}}{2}\left(\left(x^2+x+\frac{1}{2}\right)\mathrm{e}^{-2x} - 2\_C1 + 3\cosh(x) - 3\sinh(x) + \cosh(3x) - \sinh(3x)\right)\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x^2 + 3*Cosh[x] + 2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(2 + 6*E^(2*x) + E^x*(1 + 2*x + 2*x^2))/(4*E^x) + E^(2*x)*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x^2+3*cosh(x)+2*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2*((x^2+x+1/2)*exp(-2*x)-2*_C1+3*cosh(x)-3*sinh(x)+cosh(3*x)-sinh(3*x)
)*exp(2*x)
```

4.4 $y'(x) = a + bx + cy(x)$

ODE

$$y'(x) = a + bx + cy(x)$$

ODE Classification

```
[[_linear, `class A`]]
```

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.012023 (sec), leaf count = 28

$$\left\{\left\{y(x) \to c_1 e^{cx} - \frac{ac + bcx + b}{c^2}\right\}\right\}$$

Maple ✓
cpu = 0.05 (sec), leaf count = 31

$$\left\{y(x) = \frac{\mathrm{e}^{cx}\_C1\, c^2 + (-bx - a)\, c - b}{c^2}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a + b*x + c*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((b + a*c + b*c*x)/c^2) + E^(c*x)*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a+b*x+c*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (exp(c*x)*_C1*c^2+(-b*x-a)*c-b)/c^2
```

4.5 $y'(x) = a\cos(bx+c) + ky(x)$

ODE

$$y'(x) = a\cos(bx+c) + ky(x)$$

ODE Classification

```
[[_linear, `class A`]]
```

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0653687 (sec), leaf count = 43

$$\left\{\left\{y(x) \to \frac{a(b\sin(bx+c) - k\cos(bx+c))}{b^2+k^2} + c_1 e^{kx}\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 40

$$\left\{y(x) = \mathrm{e}^{kx}\_C1 + \frac{a(b\sin(bx+c) - \cos(bx+c)\,k)}{b^2+k^2}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a*Cos[c + b*x] + k*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(k*x)*C[1] + (a*(-(k*Cos[c + b*x]) + b*Sin[c + b*x]))/(b^2 + k^2)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a*cos(b*x+c)+k*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(k*x)*_C1+a*(b*sin(b*x+c)-cos(b*x+c)*k)/(b^2+k^2)
```

4.6 $y'(x) = a\sin(bx+c) + ky(x)$

ODE

$$y'(x) = a\sin(bx+c) + ky(x)$$

ODE Classification

```
[[_linear, `class A`]]
```

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0671456 (sec), leaf count = 43

$$\left\{\left\{y(x) \to c_1 e^{kx} - \frac{a(k\sin(bx+c) + b\cos(bx+c))}{b^2+k^2}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 40

$$\left\{y(x) = \mathrm{e}^{kx}\_C1 - \frac{a(b\cos(bx+c) + \sin(bx+c)\,k)}{b^2+k^2}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a*Sin[c + b*x] + k*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(k*x)*C[1] - (a*(b*Cos[c + b*x] + k*Sin[c + b*x]))/(b^2 + k^2)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a*sin(b*x+c)+k*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(k*x)*_C1-a*(b*cos(b*x+c)+sin(b*x+c)*k)/(b^2+k^2)
```

4.7 $y'(x) = a + be^{kx} + cy(x)$

ODE

$$y'(x) = a + be^{kx} + cy(x)$$

ODE Classification

```
[[_linear, `class A`]]
```

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.028643 (sec), leaf count = 34

$$\left\{\left\{y(x) \to -\frac{a}{c} + \frac{be^{kx}}{k-c} + c_1 e^{cx}\right\}\right\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 30

$$\left\{y(x) = -\frac{a}{c} + \frac{be^{kx}}{-c+k} + \mathrm{e}^{cx}\_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a + b*E^(k*x) + c*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(a/c) + (b*E^(k*x))/(-c + k) + E^(c*x)*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a+b*exp(k*x)+c*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -1/c*a+1/(-c+k)*b*exp(k*x)+exp(c*x)*_C1
```

4.8 $y'(x) = x(x^2 - y(x))$

ODE

$$y'(x) = x(x^2 - y(x))$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00635294 (sec), leaf count = 22

$$\left\{\left\{y(x) \to c_1 e^{-\frac{x^2}{2}} + x^2 - 2\right\}\right\}$$

Maple ✓
cpu = 0.031 (sec), leaf count = 17

$$\left\{y(x) = x^2 - 2 + \mathrm{e}^{-\frac{x^2}{2}} \_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x*(x^2 - y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2 + x^2 + C[1]/E^(x^2/2)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x*(x^2-y(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = x^2-2+exp(-1/2*x^2)*_C1
```

4.9 $y'(x) = x\left(ay(x) + e^{-x^2}\right)$

ODE

$$y'(x) = x\left(ay(x) + e^{-x^2}\right)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0151758 (sec), leaf count = 42

$$\left\{\left\{y(x) \to \frac{e^{\frac{ax^2}{2}}\left((a+2)c_1 - e^{-\frac{1}{2}(a+2)x^2}\right)}{a+2}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 30

$$\left\{y(x) = \left(-\frac{1}{a+2}\mathrm{e}^{-\frac{x^2(a+2)}{2}} + \_C1\right)\mathrm{e}^{\frac{ax^2}{2}}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x*(E^(-x^2) + a*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^((a*x^2)/2)*(-E^(-((2 + a)*x^2)/2) + (2 + a)*C[1]))/(2 + a)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x*(exp(-x^2)+a*y(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = (-1/(a+2)*exp(-1/2*x^2*(a+2))+_C1)*exp(1/2*a*x^2)
```

4.10 $y'(x) = x^2(ax^3 + by(x))$

ODE

$$y'(x) = x^2\left(ax^3 + by(x)\right)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0103166 (sec), leaf count = 32

$$\left\{\left\{y(x) \to c_1 e^{\frac{bx^3}{3}} - \frac{a\left(bx^3+3\right)}{b^2}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 29

$$\left\{y(x) = -\frac{ax^3}{b} - 3\,\frac{a}{b^2} + \mathrm{e}^{\frac{bx^3}{3}}\_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x^2*(a*x^3 + b*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a*(3 + b*x^3))/b^2) + E^((b*x^3)/3)*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x^2*(a*x^3+b*y(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = -1/b*x^3*a-3/b^2*a+exp(1/3*b*x^3)*_C1
```

4.11 $y'(x) = ax^n y(x)$

ODE

$$y'(x) = ax^n y(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00608288 (sec), leaf count = 22

$$\left\{\left\{y(x) \to c_1 e^{\frac{a x^{n+1}}{n+1}}\right\}\right\}$$

Maple ✓
cpu = 0.093 (sec), leaf count = 19

$$\left\{y(x) = \_C1 \, \mathrm{e}^{\frac{x^{n+1} a}{n+1}}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a*x^n*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^((a*x^(1 + n))/(1 + n))*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a*x^n*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(x^(n+1)/(n+1)*a)
```

4.12 $y'(x) = y(x)\cos(x) + \sin(x)\cos(x)$

ODE

$$y'(x) = y(x)\cos(x) + \sin(x)\cos(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0227268 (sec), leaf count = 18

$$\left\{\left\{y(x) \to c_1 e^{\sin(x)} - \sin(x) - 1\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 15

$$\left\{y(x) = -\sin(x) - 1 + \mathrm{e}^{\sin(x)}\_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Cos[x]*Sin[x] + Cos[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 + E^Sin[x]*C[1] - Sin[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = cos(x)*sin(x)+y(x)*cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -sin(x)-1+exp(sin(x))*_C1
```

4.13 $y'(x) = y(x)\cos(x) + e^{\sin(x)}$

ODE

$$y'(x) = y(x)\cos(x) + e^{\sin(x)}$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.025223 (sec), leaf count = 14

$$\left\{\left\{y(x) \to (c_1 + x)\, e^{\sin(x)}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 11

$$\left\{y(x) = (x + \_C1)\, \mathrm{e}^{\sin(x)}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == E^Sin[x] + Cos[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^Sin[x]*(x + C[1])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = exp(sin(x))+y(x)*cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (x+_C1)*exp(sin(x))
```

4.14 $y'(x) = y(x)\cot(x)$

ODE

$$y'(x) = y(x)\cot(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0151464 (sec), leaf count = 10

$$\{\{y(x) \to c_1 \sin(x)\}\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 8

$$\{y(x) = \_C1 \sin(x)\}$$

Mathematica raw input

```
DSolve[y'[x] == Cot[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Sin[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = y(x)*cot(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(x)
```

4.15 $y'(x) = 1 - y(x)\cot(x)$

ODE

$$y'(x) = 1 - y(x)\cot(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0148926 (sec), leaf count = 15

$$\{\{y(x) \to c_1 \csc(x) - \cot(x)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 15

$$\left\{y(x) = \frac{-\cos(x) + \_C1}{\sin(x)}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == 1 - Cot[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Cot[x] + C[1]*Csc[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = 1-y(x)*cot(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-cos(x)+_C1)/sin(x)
```

4.16 $y'(x) = x \csc(x) - y(x) \cot(x)$

ODE

$$y'(x) = x \csc(x) - y(x) \cot(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0136703 (sec), leaf count = 19

$$\left\{\left\{y(x) \to \frac{1}{2}\left(2c_1 + x^2\right) \csc(x)\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 16

$$\left\{y(x) = \frac{1}{\sin(x)}\left(\frac{x^2}{2} + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x*Csc[x] - Cot[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((x^2 + 2*C[1])*Csc[x])/2}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x*csc(x)-y(x)*cot(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (1/2*x^2+_C1)/sin(x)
```

4.17 $y'(x) = y(x)(\cot(x) + 2\csc(2x))$

ODE

$$y'(x) = y(x)(\cot(x) + 2\csc(2x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0285719 (sec), leaf count = 28

$$\left\{\left\{y(x) \to \frac{c_1 \sin^{\frac{3}{2}}(x)\sqrt{\sin(2x)}}{\cos^{\frac{3}{2}}(x)}\right\}\right\}$$

Maple ✓
cpu = 0.14 (sec), leaf count = 39

$$\left\{y(x) = \frac{\_C1 \cot(x)(\cos(x) - \cos(3x))}{(\cot(x))^2 \sin(2x) + 2\cot(x) - \sin(2x)}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == (Cot[x] + 2*Csc[2*x])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*Sin[x]^(3/2)*Sqrt[Sin[2*x]])/Cos[x]^(3/2)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (2*csc(2*x)+cot(x))*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*cot(x)*(cos(x)-cos(3*x))/(cot(x)^2*sin(2*x)+2*cot(x)-sin(2*x))
```

4.18 $y'(x) = \sec(x) - y(x)\cot(x)$

ODE

$$y'(x) = \sec(x) - y(x)\cot(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0225697 (sec), leaf count = 16

$$\{\{y(x) \to \csc(x)\,(c_1 - \log(\cos(x)))\}\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 16

$$\left\{y(x) = \frac{-\ln(\cos(x)) + \_C1}{\sin(x)}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Sec[x] - Cot[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> Csc[x]*(C[1] - Log[Cos[x]])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = sec(x)-y(x)*cot(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-ln(cos(x))+_C1)/sin(x)
```

4.19 $y'(x) = y(x)\cot(x) + e^x \sin(x)$

ODE

$$y'(x) = y(x)\cot(x) + e^x \sin(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0263516 (sec), leaf count = 14

$$\{\{y(x) \to (c_1 + e^x)\sin(x)\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 11

$$\{y(x) = \sin(x)\,(\mathrm{e}^x + \_C1)\}$$

Mathematica raw input

```
DSolve[y'[x] == E^x*Sin[x] + Cot[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x + C[1])*Sin[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = exp(x)*sin(x)+y(x)*cot(x), y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)*(exp(x)+_C1)
```

4.20 $y'(x) + 2y(x)\cot(x) + \csc(x) = 0$

ODE

$$y'(x) + 2y(x)\cot(x) + \csc(x) = 0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0147157 (sec), leaf count = 15

$$\{\{y(x) \to \csc^2(x)\,(c_1 + \cos(x))\}\}$$

Maple ✓
cpu = 0.029 (sec), leaf count = 21

$$\left\{y(x) = \frac{-2\cos(x) - 2\_C1}{-1 + \cos(2x)}\right\}$$

Mathematica raw input

```
DSolve[Csc[x] + 2*Cot[x]*y[x] + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + Cos[x])*Csc[x]^2}}
```

Maple raw input

```
dsolve(diff(y(x),x)+csc(x)+2*y(x)*cot(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-2*cos(x)-2*_C1)/(-1+cos(2*x))
```

4.21 $y'(x) = 4x\csc(x)\sec^2(x) - 2y(x)\cot(2x)$

ODE

$$y'(x) = 4x\csc(x)\sec^2(x) - 2y(x)\cot(2x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0606009 (sec), leaf count = 81

$$\{\{y(x) \to \csc(x)\sec(x)\left(c_1 + 4i\text{Li}_2\left(-ie^{ix}\right) - 4i\text{Li}_2\left(ie^{ix}\right) + 4x\log\left(1 - ie^{ix}\right) - 4x\log\left(1 + ie^{ix}\right)\right)\}\}$$

Maple ✓
cpu = 1.581 (sec), leaf count = 99

$$\left\{y(x) = -16\left(\sin(2x)\left(idilog\left(1 - ie^{ix}\right) - idilog\left(1 + ie^{ix}\right) - x\ln\left(1 - ie^{ix}\right) + x\ln\left(1 + ie^{ix}\right)\right)\sqrt{-\frac{e^{4ix}}{\left(e^{4ix} - 1\right)^2}} - \_C1/16\right)\right\}$$

Mathematica raw input

```
DSolve[y'[x] == 4*x*Csc[x]*Sec[x]^2 - 2*Cot[2*x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> Csc[x]*(C[1] + 4*x*Log[1 - I*E^(I*x)] - 4*x*Log[1 + I*E^(I*x)] + (4*I)
*PolyLog[2, (-I)*E^(I*x)] - (4*I)*PolyLog[2, I*E^(I*x)])*Sec[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = 4*csc(x)*x*sec(x)^2-2*y(x)*cot(2*x), y(x),'implicit')
```

Maple raw output

```
y(x) = -16*(sin(2*x)*(I*dilog(1-I*exp(I*x))-I*dilog(1+I*exp(I*x))-x*ln(1-I*exp(I
*x))+x*ln(1+I*exp(I*x)))*(-exp(4*I*x)/(exp(4*I*x)-1)^2)^(1/2)-1/16*_C1)*(cot(2*x
)^2+1)^(1/2)
```

4.22 $y'(x) = 2(\cos(2x)\cot^2(x) - y(x)\csc(2x))$

ODE

$$y'(x) = 2\big(\cos(2x)\cot^2(x) - y(x)\csc(2x)\big)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.049581 (sec), leaf count = 20

$$\{\{y(x) \to \cot(x)\,(c_1 + \cos(2x) + 2\log(\sin(x)))\}\}$$

Maple ✓
cpu = 0.101 (sec), leaf count = 32

$$\left\{y(x) = (\csc(2x) + \cot(2x))\left(2(\cos(x))^2 + \_C1 + \ln(1+\cos(x)) + \ln(\cos(x)-1)\right)\right\}$$

Mathematica raw input

```
DSolve[y'[x] == 2*(Cos[2*x]*Cot[x]^2 - Csc[2*x]*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> Cot[x]*(C[1] + Cos[2*x] + 2*Log[Sin[x]])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = 2*cot(x)^2*cos(2*x)-2*y(x)*csc(2*x), y(x),'implicit')
```

Maple raw output

```
y(x) = (csc(2*x)+cot(2*x))*(2*cos(x)^2+_C1+ln(1+cos(x))+ln(cos(x)-1))
```

4.23 $y'(x) = 4x \csc(x) \left(y(x) + \sin^3(x)\right)$

ODE

$$y'(x) = 4x \csc(x) \left(y(x) + \sin^3(x)\right)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✗
cpu = 599.993 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.71 (sec), leaf count = 114

$$\left\{y(x) = \mathrm{e}^{-4\,i\,(polylog(2,\mathrm{e}^{ix})-polylog(2,-\mathrm{e}^{ix}))}\left(1-\mathrm{e}^{ix}\right)^{4\,x}\left(1+\mathrm{e}^{ix}\right)^{-4\,x}\left(4\int -1/2\,x\left(1-\mathrm{e}^{ix}\right)^{-4\,x}\left(1+\mathrm{e}^{ix}\right)^{4\,x}\mathrm{e}^{4\,i\,(polylog(2,\mathrm{e}^{ix})-po}\right.\right.$$

Mathematica raw input

```
DSolve[y'[x] == 4*x*Csc[x]*(Sin[x]^3 + y[x]),y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x) = 4*csc(x)*x*(sin(x)^3+y(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-4*I*(polylog(2,exp(I*x))-polylog(2,-exp(I*x))))*(1-exp(I*x))^(4*x)*(
1+exp(I*x))^(-4*x)*(4*Int(-1/2*x*(1-exp(I*x))^(-4*x)*(1+exp(I*x))^(4*x)*exp(4*I*
(polylog(2,exp(I*x))-polylog(2,-exp(I*x))))*(-1+cos(2*x)),x)+_C1)
```

4.24 $y'(x) = 4x \csc(x) (y(x) - \tan^2(x) + 1)$

ODE

$$y'(x) = 4x \csc(x) (y(x) - \tan^2(x) + 1)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 28.6501 (sec), leaf count = 155

$$\left\{\left\{y(x) \to \exp\left(4i\text{Li}_2\left(-e^{ix}\right) - 4i\text{Li}_2\left(e^{ix}\right) + 4x\left(\log\left(1 - e^{ix}\right) - \log\left(1 + e^{ix}\right)\right)\right)\left(c_1 + \int_1^x 4K[1]\cos(2K[1])\csc(K[1])\sec^2(K\right.\right.$$

Maple ✓
cpu = 1.476 (sec), leaf count = 125

$$\left\{y(x) = \mathrm{e}^{-4\,i\left(polylog\left(2,\mathrm{e}^{ix}\right)-polylog\left(2,-\mathrm{e}^{ix}\right)\right)}\left(1-\mathrm{e}^{ix}\right)^{4x}\left(1+\mathrm{e}^{ix}\right)^{-4x}\left(4\int 4\,\frac{x\left(1-\mathrm{e}^{ix}\right)^{-4x}\left(1+\mathrm{e}^{ix}\right)^{4x}\mathrm{e}^{4\,i\left(polylog\left(2,\mathrm{e}^{ix}\right)-polylog\right.}}{-1+\cos\left(4x\right)}\right.$$

Mathematica raw input

```
DSolve[y'[x] == 4*x*Csc[x]*(1 - Tan[x]^2 + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(4*x*(Log[1 - E^(I*x)] - Log[1 + E^(I*x)]) + (4*I)*PolyLog[2, -E^(I*
x)] - (4*I)*PolyLog[2, E^(I*x)])*(C[1] + Integrate[4*E^(4*K[1]*(-Log[1 - E^(I*K[
1])] + Log[1 + E^(I*K[1])]) - (4*I)*PolyLog[2, -E^(I*K[1])] + (4*I)*PolyLog[2, E
^(I*K[1])])*Cos[2*K[1]]*Csc[K[1]]*K[1]*Sec[K[1]]^2, {K[1], 1, x}])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = 4*csc(x)*x*(1-tan(x)^2+y(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-4*I*(polylog(2,exp(I*x))-polylog(2,-exp(I*x))))*(1-exp(I*x))^(4*x)*(
1+exp(I*x))^(-4*x)*(4*Int(4*x*(1-exp(I*x))^(-4*x)*(1+exp(I*x))^(4*x)*exp(4*I*(po
lylog(2,exp(I*x))-polylog(2,-exp(I*x))))*(-sin(3*x)+sin(x))/(-1+cos(4*x)),x)+_C1
)
```

4.25 $y'(x) = y(x)\sec(x)$

ODE

$$y'(x) = y(x)\sec(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0093707 (sec), leaf count = 19

$$\left\{\left\{y(x) \to c_1 e^{2\tanh^{-1}\left(\tan\left(\frac{x}{2}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 11

$$\{y(x) = \_C1\,(\sec(x) + \tan(x))\}$$

Mathematica raw input

```
DSolve[y'[x] == Sec[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(2*ArcTanh[Tan[x/2]])*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = y(x)*sec(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(sec(x)+tan(x))
```

4.26 $y'(x) + \tan(x) = (1 - y(x)) \sec(x)$

ODE

$$y'(x) + \tan(x) = (1 - y(x)) \sec(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0450482 (sec), leaf count = 21

$$\left\{\left\{y(x) \to (c_1 + x)\, e^{-2 \tanh^{-1}\left(\tan\left(\frac{x}{2}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 15

$$\left\{y(x) = \frac{x + \_C1}{\sec(x) + \tan(x)}\right\}$$

Mathematica raw input

```
DSolve[Tan[x] + y'[x] == Sec[x]*(1 - y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x + C[1])/E^(2*ArcTanh[Tan[x/2]])}}
```

Maple raw input

```
dsolve(diff(y(x),x)+tan(x) = (1-y(x))*sec(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (x+_C1)/(sec(x)+tan(x))
```

4.27 $y'(x) = y(x)\tan(x)$

ODE

$$y'(x) = y(x)\tan(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0119539 (sec), leaf count = 10

$$\{\{y(x) \to c_1 \sec(x)\}\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 10

$$\left\{y(x) = \frac{\_C1}{\cos(x)}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Tan[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Sec[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = y(x)*tan(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1/cos(x)
```

4.28 $y'(x) = y(x)\tan(x) + \cos(x)$

ODE

$$y'(x) = y(x)\tan(x) + \cos(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0196748 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{1}{2}((2c_1 + x)\sec(x) + \sin(x))\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 21

$$\left\{y(x) = \frac{\sin(2x) + 2x + 4\_C1}{4\cos(x)}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Cos[x] + Tan[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((x + 2*C[1])*Sec[x] + Sin[x])/2}}
```

Maple raw input

```
dsolve(diff(y(x),x) = cos(x)+y(x)*tan(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(sin(2*x)+2*x+4*_C1)/cos(x)
```

4.29 $y'(x) = \cos(x) - y(x)\tan(x)$

ODE

$$y'(x) = \cos(x) - y(x)\tan(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0289665 (sec), leaf count = 12

$$\{\{y(x) \to (c_1 + x)\cos(x)\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 10

$$\{y(x) = (x + \_C1)\cos(x)\}$$

Mathematica raw input

```
DSolve[y'[x] == Cos[x] - Tan[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x + C[1])*Cos[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = cos(x)-y(x)*tan(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (x+_C1)*cos(x)
```

4.30 $y'(x) = \sec(x) - y(x)\tan(x)$

ODE

$$y'(x) = \sec(x) - y(x)\tan(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0202716 (sec), leaf count = 13

$$\{\{y(x) \to c_1 \cos(x) + \sin(x)\}\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 11

$$\{y(x) = \cos(x)(\tan(x) + \_C1)\}$$

Mathematica raw input

```
DSolve[y'[x] == Sec[x] - Tan[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[x] + Sin[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = sec(x)-y(x)*tan(x), y(x),'implicit')
```

Maple raw output

```
y(x) = cos(x)*(tan(x)+_C1)
```

4.31 $y'(x) = y(x)\tan(x) + \sin(2x)$

ODE

$$y'(x) = y(x)\tan(x) + \sin(2x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0185008 (sec), leaf count = 19

$$\left\{\left\{y(x) \to c_1 \sec(x) - \frac{2\cos^2(x)}{3}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 24

$$\left\{y(x) = \frac{-\cos(3x) - 3\cos(x) + 6\_C1}{6\cos(x)}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Sin[2*x] + Tan[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*Cos[x]^2)/3 + C[1]*Sec[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = sin(2*x)+y(x)*tan(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/6*(-cos(3*x)-3*cos(x)+6*_C1)/cos(x)
```

4.32 $y'(x) = \sin(2x) - y(x)\tan(x)$

ODE

$$y'(x) = \sin(2x) - y(x)\tan(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0193996 (sec), leaf count = 15

$$\{\{y(x) \to \cos(x)\,(c_1 - 2\cos(x))\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 13

$$\{y(x) = \cos(x)\,(-2\cos(x) + \_C1)\}$$

Mathematica raw input

```
DSolve[y'[x] == Sin[2*x] - Tan[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] - 2*Cos[x])*Cos[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = sin(2*x)-y(x)*tan(x), y(x),'implicit')
```

Maple raw output

```
y(x) = cos(x)*(-2*cos(x)+_C1)
```

4.33 $y'(x) = 2y(x)\tan(x) + \sin(x)$

ODE

$$y'(x) = 2y(x)\tan(x) + \sin(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0182083 (sec), leaf count = 19

$$\left\{\left\{y(x) \to c_1 \sec^2(x) - \frac{\cos(x)}{3}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 29

$$\left\{y(x) = \frac{-\cos(3x) - 3\cos(x) + 12\_C1}{6\cos(2x) + 6}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Sin[x] + 2*Tan[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Cos[x]/3 + C[1]*Sec[x]^2}}
```

Maple raw input

```
dsolve(diff(y(x),x) = sin(x)+2*y(x)*tan(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-cos(3*x)-3*cos(x)+12*_C1)/(6*cos(2*x)+6)
```

4.34 $y'(x) = 2(y(x)\tan(2x) + \sec(2x) + 1)$

ODE

$$y'(x) = 2(y(x)\tan(2x) + \sec(2x) + 1)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0442997 (sec), leaf count = 20

$$\{\{y(x) \to \sec(2x)\,(c_1 + 2x + \sin(2x))\}\}$$

Maple ✓
cpu = 0.485 (sec), leaf count = 100

$$\left\{y(x) = \frac{1}{\sin(2\,x)}\left(x\sin(4\,x)\sqrt{(\cos(4\,x)+1)^{-1}}\sqrt{2\,\cos(4\,x)+2}\sqrt{2+2\,(\tan(2\,x))^2} + \sqrt{1+(\tan(2\,x))^2}\left(\_C1\ \sin(2\,x)\sqrt{}\right.\right.$$

Mathematica raw input

```
DSolve[y'[x] == 2*(1 + Sec[2*x] + Tan[2*x]*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sec[2*x]*(2*x + C[1] + Sin[2*x])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = 2+2*sec(2*x)+2*y(x)*tan(2*x), y(x),'implicit')
```

Maple raw output

```
y(x) = (x*sin(4*x)*(1/(cos(4*x)+1))^(1/2)*(2*cos(4*x)+2)^(1/2)*(2+2*tan(2*x)^2)^
(1/2)+(1+tan(2*x)^2)^(1/2)*(_C1*sin(2*x)*(2*cos(4*x)+2)^(1/2)+1/2*cos(2*x)-1/2*c
os(6*x)))/(2*cos(4*x)+2)^(1/2)/sin(2*x)
```

4.35 $y'(x) = 3y(x)\tan(x) + \csc(x)$

ODE

$$y'(x) = 3y(x)\tan(x) + \csc(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0263951 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \sec^3(x)\left(c_1 + \frac{1}{4}\cos(2x) + \log(\sin(x))\right)\right\}\right\}$$

Maple ✓
cpu = 0.067 (sec), leaf count = 40

$$\left\{y(x) = \frac{2\left(\cos\left(x\right)\right)^2 + 2\,\ln\left(\cos\left(x\right) - 1\right) + 2\,\ln\left(1 + \cos\left(x\right)\right) + 4\,\_C1}{\cos\left(3\,x\right) + 3\,\cos\left(x\right)}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Csc[x] + 3*Tan[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + Cos[2*x]/4 + Log[Sin[x]])*Sec[x]^3}}
```

Maple raw input

```
dsolve(diff(y(x),x) = csc(x)+3*y(x)*tan(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (2*cos(x)^2+2*ln(cos(x)-1)+2*ln(1+cos(x))+4*_C1)/(cos(3*x)+3*cos(x))
```

4.36 $y'(x) = y(x)(a + \sin(\log(x)) + \cos(\log(x)))$

ODE

$$y'(x) = y(x)(a + \sin(\log(x)) + \cos(\log(x)))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0148363 (sec), leaf count = 17

$$\left\{\left\{y(x) \to c_1 e^{x(a+\sin(\log(x)))}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 14

$$\left\{y(x) = \_C1\ \mathrm{e}^{x(\sin(\ln(x))+a)}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == (a + Cos[Log[x]] + Sin[Log[x]])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x*(a + Sin[Log[x]]))*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (a+cos(ln(x))+sin(ln(x)))*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(x*(sin(ln(x))+a))
```

4.37 $y'(x) = 6e^{2x} - y(x)\tanh(x)$

ODE

$$y'(x) = 6e^{2x} - y(x)\tanh(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0194598 (sec), leaf count = 33

$$\left\{\left\{y(x) \to \frac{e^x\left(c_1 + 6e^x + 2e^{3x}\right)}{e^{2x}+1}\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 27

$$\left\{y(x) = \frac{\cosh(3x) + 3\cosh(x) + \sinh(3x) + 3\sinh(x) + \_C1}{\cosh(x)}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == 6*E^(2*x) - Tanh[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*(6*E^x + 2*E^(3*x) + C[1]))/(1 + E^(2*x))}}
```

Maple raw input

```
dsolve(diff(y(x),x) = 6*exp(2*x)-y(x)*tanh(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (cosh(3*x)+3*cosh(x)+sinh(3*x)+3*sinh(x)+_C1)/cosh(x)
```

4.38 $y'(x) = y(x)f'(x) + f(x)f'(x)$

ODE

$$y'(x) = y(x)f'(x) + f(x)f'(x)$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00774583 (sec), leaf count = 18

$$\left\{\left\{y(x) \to c_1 e^{f(x)} - f(x) - 1\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 15

$$\left\{y(x) = -f(x) - 1 + \mathrm{e}^{f(x)} \_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x] == f[x]*f'[x] + y[x]*f'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 + E^f[x]*C[1] - f[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = f(x)*diff(f(x),x)+diff(f(x),x)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -f(x)-1+exp(f(x))*_C1
```

4.39 $y'(x) = f(x) + g(x)y(x)$

ODE

$$y'(x) = f(x) + g(x)y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.486403 (sec), leaf count = 44

$$\left\{\left\{y(x) \to e^{\int_1^x g(K[1])\,dK[1]}\left(\int_1^x f(K[2])e^{-\int_1^{K[2]} g(K[1])\,dK[1]}\,dK[2] + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.06 (sec), leaf count = 24

$$\left\{y(x) = \left(\int f(x)\,\mathrm{e}^{-\int g(x)\,\mathrm{d}x}\,\mathrm{d}x + \_C1\right)\mathrm{e}^{\int g(x)\,\mathrm{d}x}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == f[x] + g[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^Integrate[g[K[1]], {K[1], 1, x}]*(C[1] + Integrate[f[K[2]]/E^Integra
te[g[K[1]], {K[1], 1, K[2]}], {K[2], 1, x}])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = f(x)+g(x)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (Int(f(x)*exp(-Int(g(x),x)),x)+_C1)*exp(Int(g(x),x))
```

4.40 $y'(x) = x^2 - y(x)^2$

ODE

$$y'(x) = x^2 - y(x)^2$$

ODE Classification

[_Riccati]

Book solution method
Series solution to $y'(x) = f(x, y(x))$, case $f(x, y)$ analytic

Mathematica ✓
cpu = 0.00687899 (sec), leaf count = 117

$$\left\{\left\{y(x) \to -\frac{-ix^2\left(c_1\left(J_{-\frac{5}{4}}\left(\frac{ix^2}{2}\right) - J_{\frac{3}{4}}\left(\frac{ix^2}{2}\right)\right) + 2J_{-\frac{3}{4}}\left(\frac{ix^2}{2}\right)\right) - c_1 J_{-\frac{1}{4}}\left(\frac{ix^2}{2}\right)}{2x\left(c_1 J_{-\frac{1}{4}}\left(\frac{ix^2}{2}\right) + J_{\frac{1}{4}}\left(\frac{ix^2}{2}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.609 (sec), leaf count = 44

$$\left\{y(x) = x\left(I_{-\frac{3}{4}}\left(\frac{x^2}{2}\right)\_C1 - K_{\frac{3}{4}}\left(\frac{x^2}{2}\right)\right)\left(\_C1\, I_{\frac{1}{4}}\left(\frac{x^2}{2}\right) + K_{\frac{1}{4}}\left(\frac{x^2}{2}\right)\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x^2 - y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(-(BesselJ[-1/4, (I/2)*x^2]*C[1]) - I*x^2*(2*BesselJ[-3/4, (I/2)*x^2]
 + (BesselJ[-5/4, (I/2)*x^2] - BesselJ[3/4, (I/2)*x^2])*C[1]))/(2*x*(BesselJ[1/4
, (I/2)*x^2] + BesselJ[-1/4, (I/2)*x^2]*C[1]))}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x^2-y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(BesselI(-3/4,1/2*x^2)*_C1-BesselK(3/4,1/2*x^2))/(_C1*BesselI(1/4,1/2*x
^2)+BesselK(1/4,1/2*x^2))
```

4.41 $f(x)^2 + y'(x) = f'(x) + y(x)^2$

ODE

$$f(x)^2 + y'(x) = f'(x) + y(x)^2$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✗
cpu = 13.5635 (sec), leaf count = 0 , could not solve

```
DSolve[f[x]^2 + Derivative[1][y][x] == y[x]^2 + Derivative[1][f][x], y[x], x]
```

Maple ✓
cpu = 0.635 (sec), leaf count = 30

$$\left\{ y(x) = f(x) + \frac{e^{\int 2 f(x)\,dx}}{\_C1 - \int e^{\int 2 f(x)\,dx}\,dx} \right\}$$

Mathematica raw input

```
DSolve[f[x]^2 + y'[x] == y[x]^2 + f'[x],y[x],x]
```

Mathematica raw output

```
DSolve[f[x]^2 + Derivative[1][y][x] == y[x]^2 + Derivative[1][f][x], y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)+f(x)^2 = diff(f(x),x)+y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = f(x)+exp(Int(2*f(x),x))/(_C1-Int(exp(Int(2*f(x),x)),x))
```

4.42 $y'(x) - x + 1 = y(x)(y(x) + x)$

ODE

$$y'(x) - x + 1 = y(x)(y(x) + x)$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0236493 (sec), leaf count = 49

$$\left\{\left\{y(x) \to \frac{2e^{\frac{1}{2}(x-2)^2}}{2e^2 c_1 - \sqrt{2\pi}\text{erfi}\left(\frac{x-2}{\sqrt{2}}\right)} - 1\right\}\right\}$$

Maple ✓
cpu = 0.092 (sec), leaf count = 39

$$\left\{y(x) = -1 + \frac{1}{\_C1 + \frac{i}{2}\sqrt{\pi}\text{e}^{-2}\sqrt{2}Erf\left(\frac{i}{2}\sqrt{2}\,(x-2)\right)}\text{e}^{\frac{x(x-4)}{2}}\right\}$$

Mathematica raw input

```
DSolve[1 - x + y'[x] == y[x]*(x + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 + (2*E^((-2 + x)^2/2))/(2*E^2*C[1] - Sqrt[2*Pi]*Erfi[(-2 + x)/Sqrt[
2]])}}
```

Maple raw input

```
dsolve(diff(y(x),x)+1-x = (x+y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -1+exp(1/2*x*(x-4))/(_C1+1/2*I*Pi^(1/2)*exp(-2)*2^(1/2)*erf(1/2*I*2^(1/2)
*(x-2)))
```

4.43 $y'(x) = (y(x) + x)^2$

ODE

$$y'(x) = (y(x) + x)^2$$

ODE Classification

[[_homogeneous, `class C`], _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.00951565 (sec), leaf count = 30

$$\left\{\left\{y(x) \to \frac{1}{c_1 e^{2ix} - \frac{i}{2}} - x - i\right\}\right\}$$

Maple ✓
cpu = 0.047 (sec), leaf count = 15

$$\{-\arctan(x + y(x)) + x - \_C1 = 0\}$$

Mathematica raw input

```
DSolve[y'[x] == (x + y[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -I - x + (-I/2 + E^((2*I)*x)*C[1])^(-1)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (x+y(x))^2, y(x),'implicit')
```

Maple raw output

```
-arctan(x+y(x))+x-_C1 = 0
```

4.44 $y'(x) = (x - y(x))^2$

ODE

$$y'(x) = (x - y(x))^2$$

ODE Classification

[[_homogeneous, `class C`], _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.00864402 (sec), leaf count = 22

$$\left\{\left\{y(x) \to \frac{1}{c_1 e^{2x} + \frac{1}{2}} + x - 1\right\}\right\}$$

Maple ✓
cpu = 0.027 (sec), leaf count = 28

$$\{-\ln(y(x) - x - 1) + \ln(y(x) - x + 1) + 2x - \_C1 = 0\}$$

Mathematica raw input

```
DSolve[y'[x] == (x - y[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 + x + (1/2 + E^(2*x)*C[1])^(-1)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (x-y(x))^2, y(x),'implicit')
```

Maple raw output

```
-ln(y(x)-x-1)+ln(y(x)-x+1)+2*x-_C1 = 0
```

4.45 $y'(x) = (x - y(x))^2 + 3(y(x) - x + 1)$

ODE

$$y'(x) = (x - y(x))^2 + 3(y(x) - x + 1)$$

ODE Classification

[[_homogeneous, `class C`], _Riccati]

Book solution method
Equation linear in the variables, $y'(x) = f(a + bx + cy(x))$

Mathematica ✓
cpu = 0.0180019 (sec), leaf count = 18

$$\left\{\left\{y(x) \to \frac{1}{c_1 e^x + 1} + x - 2\right\}\right\}$$

Maple ✓
cpu = 0.028 (sec), leaf count = 26

$$\{\ln(-x + y(x) + 2) - \ln(y(x) - x + 1) + x - \_C1 = 0\}$$

Mathematica raw input

```
DSolve[y'[x] == (x - y[x])^2 + 3*(1 - x + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2 + x + (1 + E^x*C[1])^(-1)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = 3-3*x+3*y(x)+(x-y(x))^2, y(x),'implicit')
```

Maple raw output

```
ln(-x+y(x)+2)-ln(y(x)-x+1)+x-_C1 = 0
```

4.46 $y'(x) = -(x^2+1)\,y(x) + y(x)^2 + 2x$

ODE

$$y'(x) = -(x^2+1)\,y(x) + y(x)^2 + 2x$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.772018 (sec), leaf count = 48

$$\left\{\left\{y(x) \to \frac{e^{\frac{x^3}{3}+x}}{c_1 - \int_1^x e^{\frac{K[1]^3}{3}+K[1]}\,dK[1]} + x^2 + 1\right\}\right\}$$

Maple ✓
cpu = 0.141 (sec), leaf count = 34

$$\left\{y(x) = x^2 + 1 + 1\mathrm{e}^{\frac{x^3}{3}+x}\left(\_C1 - \int \mathrm{e}^{\frac{x^3}{3}+x}\,\mathrm{d}x\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == 2*x - (1 + x^2)*y[x] + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1 + x^2 + E^(x + x^3/3)/(C[1] - Integrate[E^(K[1] + K[1]^3/3), {K[1],
1, x}])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = 2*x-(x^2+1)*y(x)+y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = x^2+1+exp(1/3*x^3+x)/(_C1-Int(exp(1/3*x^3+x),x))
```

4.47 $y'(x) = x(x^3+2) - (2x^2 - y(x))\, y(x)$

ODE

$$y'(x) = x(x^3+2) - (2x^2 - y(x))\, y(x)$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.00691611 (sec), leaf count = 17

$$\left\{\left\{y(x) \to \frac{1}{c_1 - x} + x^2\right\}\right\}$$

Maple ✓
cpu = 0.027 (sec), leaf count = 20

$$\left\{(x^2 - y(x))^{-1} - x - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x*(2 + x^3) - (2*x^2 - y[x])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2 + (-x + C[1])^(-1)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x*(x^3+2)-(2*x^2-y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
1/(x^2-y(x))-x-_C1 = 0
```

4.48 $y'(x) = x(2-x^3) + (2x^2 - y(x))\,y(x) + 1$

ODE

$$y'(x) = x\left(2-x^3\right) + \left(2x^2 - y(x)\right)y(x) + 1$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0186806 (sec), leaf count = 25

$$\left\{\left\{y(x) \to -\frac{2}{2c_1 e^{2x}+1} + x^2 + 1\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 32

$$\left\{-\ln\left(1-x^2+y(x)\right) + \ln\left(-x^2+y(x)-1\right) + 2x - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == 1 + x*(2 - x^3) + (2*x^2 - y[x])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1 + x^2 - 2/(1 + 2*E^(2*x)*C[1])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = 1+x*(-x^3+2)+(2*x^2-y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
-ln(1-x^2+y(x))+ln(-x^2+y(x)-1)+2*x-_C1 = 0
```

4.49 $y'(x) = \cos(x) - y(x)(\sin(x) - y(x))$

ODE

$$y'(x) = \cos(x) - y(x)(\sin(x) - y(x))$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 6.56183 (sec), leaf count = 57

$$\left\{\left\{y(x) \to \frac{c_1 \sin(x) \left(\int_1^x e^{-\cos(K[1])}\, dK[1]\right) + c_1\left(-e^{-\cos(x)}\right) + \sin(x)}{c_1 \int_1^x e^{-\cos(K[1])}\, dK[1] + 1}\right\}\right\}$$

Maple ✓
cpu = 0.175 (sec), leaf count = 25

$$\left\{y(x) = -\frac{\mathrm{e}^{-\cos(x)}}{\_C1 + \int \mathrm{e}^{-\cos(x)}\, \mathrm{d}x} + \sin(x)\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Cos[x] - (Sin[x] - y[x])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(C[1]/E^Cos[x]) + Sin[x] + C[1]*Integrate[E^(-Cos[K[1]]), {K[1], 1,
x}]*Sin[x])/(1 + C[1]*Integrate[E^(-Cos[K[1]]), {K[1], 1, x}])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = cos(x)-(sin(x)-y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -1/(_C1+Int(exp(-cos(x)),x))*exp(-cos(x))+sin(x)
```

4.50 $y'(x) = y(x)(y(x) + \sin(2x)) + \cos(2x)$

ODE

$$y'(x) = y(x)(y(x) + \sin(2x)) + \cos(2x)$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✗
cpu = 0 (sec), leaf count = 0 , crash

```
Kernel Crash
```

Maple ✓
cpu = 0.985 (sec), leaf count = 128

$$\left\{y(x) = 2\,\frac{\sin(2\,x)}{\sqrt{2\,\cos(2\,x)+2}}\left(\_C1\,(\cos(2\,x)+1)\,HeunCPrime\left(1,1/2,-1/2,-1,\frac{7}{8},1/2\,\cos(2\,x)+1/2\right)+HeunC\left(1,1/2,\right.\right.$$

Mathematica raw input

```
DSolve[y'[x] == Cos[2*x] + y[x]*(Sin[2*x] + y[x]),y[x],x]
```

Mathematica raw output

```
""
```

Maple raw input

```
dsolve(diff(y(x),x) = cos(2*x)+(sin(2*x)+y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 2*(_C1*(cos(2*x)+1)*HeunCPrime(1,1/2,-1/2,-1,7/8,1/2*cos(2*x)+1/2)+HeunC(
1,1/2,-1/2,-1,7/8,1/2*cos(2*x)+1/2)*_C1+1/2*HeunCPrime(1,-1/2,-1/2,-1,7/8,1/2*co
s(2*x)+1/2)*(2*cos(2*x)+2)^(1/2))*sin(2*x)/(2*cos(2*x)+2)^(1/2)/(_C1*HeunC(1,1/2
,-1/2,-1,7/8,1/2*cos(2*x)+1/2)*(2*cos(2*x)+2)^(1/2)+HeunC(1,-1/2,-1/2,-1,7/8,1/2
*cos(2*x)+1/2))
```

4.51 $y'(x) = xf(x)y(x) + f(x) + y(x)^2$

ODE

$$y'(x) = xf(x)y(x) + f(x) + y(x)^2$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✗
cpu = 20.7448 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x] == f[x] + x*f[x]*y[x] + y[x]^2, y[x], x]
```

Maple ✓
cpu = 0.131 (sec), leaf count = 48

$$\left\{y(x) + 1e^{\int \frac{f(x)x^2-2}{x}\,dx}\left(-\_C1 + \int e^{\int \frac{f(x)x^2-2}{x}\,dx}\,dx\right)^{-1} + x^{-1} = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == f[x] + x*f[x]*y[x] + y[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x] == f[x] + x*f[x]*y[x] + y[x]^2, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x) = f(x)+x*f(x)*y(x)+y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x)+exp(Int(1/x*(f(x)*x^2-2),x))/(-_C1+Int(exp(Int(1/x*(f(x)*x^2-2),x)),x))+1/x
 = 0
```

4.52 $y'(x) = (-4y(x) + x + 3)^2$

ODE

$$y'(x) = (-4y(x) + x + 3)^2$$

ODE Classification

[[_homogeneous, `class C`], _Riccati]

Book solution method
Equation linear in the variables, $y'(x) = f(a + bx + cy(x))$

Mathematica ✓
cpu = 0.0161134 (sec), leaf count = 28

$$\left\{\left\{y(x) \to \frac{1}{16}\left(\frac{1}{c_1 e^{4x} + \frac{1}{4}} + 4x + 10\right)\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 32

$$\{-\ln(-2x + 8y(x) - 7) + \ln(-2x + 8y(x) - 5) + 4x - \_C1 = 0\}$$

Mathematica raw input

```
DSolve[y'[x] == (3 + x - 4*y[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (10 + 4*x + (1/4 + E^(4*x)*C[1])^(-1))/16}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (3+x-4*y(x))^2, y(x),'implicit')
```

Maple raw output

```
-ln(-2*x+8*y(x)-7)+ln(-2*x+8*y(x)-5)+4*x-_C1 = 0
```

4.53 $y'(x) = (9y(x) + 4x + 1)^2$

ODE

$$y'(x) = (9y(x) + 4x + 1)^2$$

ODE Classification

[[_homogeneous, `class C`], _Riccati]

Book solution method
Equation linear in the variables, $y'(x) = f(a + bx + cy(x))$

Mathematica ✓
cpu = 0.0174784 (sec), leaf count = 34

$$\left\{\left\{y(x) \to \frac{1}{81}\left(\frac{1}{c_1 e^{12ix} - \frac{i}{12}} - 36x - (9 + 6i)\right)\right\}\right\}$$

Maple ✓
cpu = 0.04 (sec), leaf count = 20

$$\left\{-\frac{1}{6}\arctan\left(\frac{27\,y(x)}{2} + 6\,x + \frac{3}{2}\right) + x - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == (1 + 4*x + 9*y[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-9 - 6*I) - 36*x + (-I/12 + E^((12*I)*x)*C[1])^(-1))/81}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (1+4*x+9*y(x))^2, y(x),'implicit')
```

Maple raw output

```
-1/6*arctan(27/2*y(x)+6*x+3/2)+x-_C1 = 0
```

4.54 $y'(x) = 3(a + by(x)^2 + bx)$

ODE

$$y'(x) = 3\big(a + by(x)^2 + bx\big)$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0248185 (sec), leaf count = 123

$$\left\{\left\{y(x) \to \frac{b\left(c_1 \text{Ai}'\left(-\frac{3^{2/3}b(a+bx)}{(-b^2)^{2/3}}\right) + \text{Bi}'\left(-\frac{3^{2/3}b(a+bx)}{(-b^2)^{2/3}}\right)\right)}{\sqrt[3]{3}\,(-b^2)^{2/3}\left(c_1 \text{Ai}\left(-\frac{3^{2/3}b(a+bx)}{(-b^2)^{2/3}}\right) + \text{Bi}\left(-\frac{3^{2/3}b(a+bx)}{(-b^2)^{2/3}}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.284 (sec), leaf count = 80

$$\left\{y(x) = 3^{\frac{2}{3}}\left(\text{Ai}^{(1)}\left(-3^{\frac{2}{3}}(bx+a)\,\frac{1}{\sqrt[3]{b}}\right)\_C1 + \text{Bi}^{(1)}\left(-3^{\frac{2}{3}}(bx+a)\,\frac{1}{\sqrt[3]{b}}\right)\right)\frac{1}{\sqrt[3]{b}}\left(3\,\text{Ai}\left(-\frac{3^{2/3}(bx+a)}{\sqrt[3]{b}}\right)\_C1 + 3\,\text{Bi}\left(-\frac{3^{2/3}(bx\right.\right.\right.$$

Mathematica raw input

```
DSolve[y'[x] == 3*(a + b*x + b*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (b*(AiryBiPrime[-((3^(2/3)*b*(a + b*x))/(-b^2)^(2/3))] + AiryAiPrime[-
((3^(2/3)*b*(a + b*x))/(-b^2)^(2/3))]*C[1]))/(3^(1/3)*(-b^2)^(2/3)*(AiryBi[-((3^
(2/3)*b*(a + b*x))/(-b^2)^(2/3))] + AiryAi[-((3^(2/3)*b*(a + b*x))/(-b^2)^(2/3))
]*C[1]))}}
```

Maple raw input

```
dsolve(diff(y(x),x) = 3*a+3*b*x+3*b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = (AiryAi(1,-3^(2/3)*(b*x+a)/b^(1/3))*_C1+AiryBi(1,-3^(2/3)*(b*x+a)/b^(1/3)
))/b^(1/3)*3^(2/3)/(3*AiryAi(-3^(2/3)*(b*x+a)/b^(1/3))*_C1+3*AiryBi(-3^(2/3)*(b*
x+a)/b^(1/3)))
```

4.55 $y'(x) = a + by(x)^2$

ODE

$$y'(x) = a + by(x)^2$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 0.0198322 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \frac{\sqrt{a}\tan\left(\sqrt{a}\sqrt{b}(c_1 + x)\right)}{\sqrt{b}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 23

$$\left\{x - 1\arctan\left(by(x)\frac{1}{\sqrt{ab}}\right)\frac{1}{\sqrt{ab}} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a + b*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[a]*Tan[Sqrt[a]*Sqrt[b]*(x + C[1])])/Sqrt[b]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a+b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
x-1/(a*b)^(1/2)*arctan(y(x)*b/(a*b)^(1/2))+_C1 = 0
```

4.56 $y'(x) = ax + by(x)^2$

ODE

$$y'(x) = ax + by(x)^2$$

ODE Classification

[[_Riccati, _special]]

Book solution method
Riccati ODE, Main form

Mathematica ✓
cpu = 0.00577601 (sec), leaf count = 189

$$\left\{\left\{y(x) \to \frac{\sqrt{a}\sqrt{b}x^{3/2}\left(c_1\left(J_{\frac{2}{3}}\left(\frac{2}{3}\sqrt{a}\sqrt{b}x^{3/2}\right) - J_{-\frac{4}{3}}\left(\frac{2}{3}\sqrt{a}\sqrt{b}x^{3/2}\right)\right) - 2J_{-\frac{2}{3}}\left(\frac{2}{3}\sqrt{a}\sqrt{b}x^{3/2}\right)\right) - c_1 J_{-\frac{1}{3}}\left(\frac{2}{3}\sqrt{a}\sqrt{b}x^{3/2}\right)}{2bx\left(c_1 J_{-\frac{1}{3}}\left(\frac{2}{3}\sqrt{a}\sqrt{b}x^{3/2}\right) + J_{\frac{1}{3}}\left(\frac{2}{3}\sqrt{a}\sqrt{b}x^{3/2}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.077 (sec), leaf count = 59

$$\left\{y(x) = \frac{1}{b}\sqrt[3]{ab}\left(\mathrm{Ai}^{(1)}\left(-\sqrt[3]{ab}x\right)\_C1 + \mathrm{Bi}^{(1)}\left(-\sqrt[3]{ab}x\right)\right)\left(\_C1\,\mathrm{Ai}\left(-\sqrt[3]{ab}x\right) + \mathrm{Bi}\left(-\sqrt[3]{ab}x\right)\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a*x + b*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(BesselJ[-1/3, (2*Sqrt[a]*Sqrt[b]*x^(3/2))/3]*C[1]) + Sqrt[a]*Sqrt[b
]*x^(3/2)*(-2*BesselJ[-2/3, (2*Sqrt[a]*Sqrt[b]*x^(3/2))/3] + (-BesselJ[-4/3, (2*
Sqrt[a]*Sqrt[b]*x^(3/2))/3] + BesselJ[2/3, (2*Sqrt[a]*Sqrt[b]*x^(3/2))/3])*C[1])
)/(2*b*x*(BesselJ[1/3, (2*Sqrt[a]*Sqrt[b]*x^(3/2))/3] + BesselJ[-1/3, (2*Sqrt[a]
*Sqrt[b]*x^(3/2))/3]*C[1]))}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a*x+b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = (a*b)^(1/3)*(AiryAi(1,-(a*b)^(1/3)*x)*_C1+AiryBi(1,-(a*b)^(1/3)*x))/b/(_C
1*AiryAi(-(a*b)^(1/3)*x)+AiryBi(-(a*b)^(1/3)*x))
```

4.57 $y'(x) = a + bx + cy(x)^2$

ODE

$$y'(x) = a + bx + cy(x)^2$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0220407 (sec), leaf count = 93

$$\left\{\left\{y(x) \to \frac{b\left(c_1 \text{Ai}'\left(-\frac{c(a+bx)}{(-bc)^{2/3}}\right) + \text{Bi}'\left(-\frac{c(a+bx)}{(-bc)^{2/3}}\right)\right)}{(-bc)^{2/3}\left(c_1 \text{Ai}\left(-\frac{c(a+bx)}{(-bc)^{2/3}}\right) + \text{Bi}\left(-\frac{c(a+bx)}{(-bc)^{2/3}}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.107 (sec), leaf count = 85

$$\left\{y(x) = 1\sqrt[3]{b\frac{1}{\sqrt{c}}}\left(\text{Ai}^{(1)}\left(-(bx+a)\left(b\frac{1}{\sqrt{c}}\right)^{-\frac{2}{3}}\right)\_C1 + \text{Bi}^{(1)}\left(-(bx+a)\left(b\frac{1}{\sqrt{c}}\right)^{-\frac{2}{3}}\right)\right)\frac{1}{\sqrt{c}}\left(\text{Ai}\left(-(bx+a)\left(b\frac{1}{\sqrt{c}}\right)^{-\frac{2}{3}}\right)-\right.$$

Mathematica raw input

```
DSolve[y'[x] == a + b*x + c*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (b*(AiryBiPrime[-((c*(a + b*x))/(-(b*c))^(2/3))] + AiryAiPrime[-((c*(a
 + b*x))/(-(b*c))^(2/3))]*C[1]))/((-(b*c))^(2/3)*(AiryBi[-((c*(a + b*x))/(-(b*c)
)^(2/3))] + AiryAi[-((c*(a + b*x))/(-(b*c))^(2/3))]*C[1]))}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a+b*x+c*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = (b/c^(1/2))^(1/3)*(AiryAi(1,-(b*x+a)/(b/c^(1/2))^(2/3))*_C1+AiryBi(1,-(b*
x+a)/(b/c^(1/2))^(2/3)))/c^(1/2)/(AiryAi(-(b*x+a)/(b/c^(1/2))^(2/3))*_C1+AiryBi(
-(b*x+a)/(b/c^(1/2))^(2/3)))
```

4.58 $y'(x) = ax^{n-1} + bx^{2n} + cy(x)^2$

ODE

$$y'(x) = ax^{n-1} + bx^{2n} + cy(x)^2$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.224197 (sec), leaf count = 648

$$\left\{\left\{y(x) \to -\frac{x^n\left(\sqrt{b}c_1(n+1)\sqrt{-(n+1)^2}U\left(-\frac{(n+1)\left(\sqrt{b}\sqrt{-(n+1)^2}n+a\sqrt{c}(n+1)\right)}{2\sqrt{b}(-(n+1)^2)^{3/2}},\frac{n}{n+1},\frac{2\sqrt{b}\sqrt{c}x^{n+1}}{\sqrt{-(n+1)^2}}\right)+c_1\left(a\sqrt{c}(n+1)+\sqrt{b}\sqrt{}\right.\right.}{\sqrt{c}(n+1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.473 (sec), leaf count = 363

$$\left\{y(x) = -\frac{1}{2\,cx}\left(\left((2+n)\,b^{\frac{3}{2}} - i\sqrt{c}ab\right)M_{-\frac{1}{2\,n+2}\left((-2\,n-2)\sqrt{b}+i\sqrt{c}a\right)\frac{1}{\sqrt{b}},(2\,n+2)^{-1}}\left(\frac{2\,ix^{n+1}}{n+1}\sqrt{c}\sqrt{b}\right) - 2\,b^{3/2}\_C1\,(n+1)\,W_{-\frac{(-2}}\right.\right.$$

Mathematica raw input

```
DSolve[y'[x] == a*x^(-1 + n) + b*x^(2*n) + c*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x^n*(Sqrt[b]*(1 + n)*Sqrt[-(1 + n)^2]*C[1]*HypergeometricU[-((1 + n
)*(a*Sqrt[c]*(1 + n) + Sqrt[b]*n*Sqrt[-(1 + n)^2]))/(2*Sqrt[b]*(-(1 + n)^2)^(3/2
)), n/(1 + n), (2*Sqrt[b]*Sqrt[c]*x^(1 + n))/Sqrt[-(1 + n)^2]] + (a*Sqrt[c]*(1 +
 n) + Sqrt[b]*n*Sqrt[-(1 + n)^2])*C[1]*HypergeometricU[-((1 + n)*(a*Sqrt[c]*(1 +
 n) + Sqrt[b]*Sqrt[-(1 + n)^2]*(2 + 3*n)))/(2*Sqrt[b]*(-(1 + n)^2)^(3/2)), 1 + n
/(1 + n), (2*Sqrt[b]*Sqrt[c]*x^(1 + n))/Sqrt[-(1 + n)^2]] + Sqrt[b]*(1 + n)*Sqrt
[-(1 + n)^2]*(LaguerreL[-((1 + n)*(-(a*Sqrt[c]*(1 + n)) - Sqrt[b]*n*Sqrt[-(1 + n
)^2]))/(2*Sqrt[b]*(-(1 + n)^2)^(3/2)), -(1 + n)^(-1), (2*Sqrt[b]*Sqrt[c]*x^(1 +
```

```
n))/Sqrt[-(1 + n)^2]] + 2*LaguerreL[-((1 + n)*(-(a*Sqrt[c]*(1 + n)) - Sqrt[b]*Sq
rt[-(1 + n)^2]*(2 + 3*n)))/(2*Sqrt[b]*(-(1 + n)^2)^(3/2)), n/(1 + n), (2*Sqrt[b]
*Sqrt[c]*x^(1 + n))/Sqrt[-(1 + n)^2]]))/(Sqrt[c]*(1 + n)^2*(C[1]*Hypergeometric
U[-((1 + n)*(a*Sqrt[c]*(1 + n) + Sqrt[b]*n*Sqrt[-(1 + n)^2]))/(2*Sqrt[b]*(-(1 +
n)^2)^(3/2)), n/(1 + n), (2*Sqrt[b]*Sqrt[c]*x^(1 + n))/Sqrt[-(1 + n)^2]] + Lague
rreL[-((1 + n)*(-(a*Sqrt[c]*(1 + n)) - Sqrt[b]*n*Sqrt[-(1 + n)^2]))/(2*Sqrt[b]*(
-(1 + n)^2)^(3/2)), -(1 + n)^(-1), (2*Sqrt[b]*Sqrt[c]*x^(1 + n))/Sqrt[-(1 + n)^2
]]))}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a*x^(n-1)+b*x^(2*n)+c*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2*(((2+n)*b^(3/2)-I*c^(1/2)*a*b)*WhittakerM(-((-2*n-2)*b^(1/2)+I*c^(1/
2)*a)/b^(1/2)/(2*n+2),1/(2*n+2),2*I*c^(1/2)*b^(1/2)/(n+1)*x^(n+1))-2*b^(3/2)*_C1
*(n+1)*WhittakerW(-((-2*n-2)*b^(1/2)+I*c^(1/2)*a)/b^(1/2)/(2*n+2),1/(2*n+2),2*I*
c^(1/2)*b^(1/2)/(n+1)*x^(n+1))+(WhittakerW(-I*c^(1/2)/b^(1/2)*a/(2*n+2),1/(2*n+2
),2*I*c^(1/2)*b^(1/2)/(n+1)*x^(n+1))*_C1+WhittakerM(-I*c^(1/2)/b^(1/2)*a/(2*n+2)
,1/(2*n+2),2*I*c^(1/2)*b^(1/2)/(n+1)*x^(n+1)))*(-b^(3/2)*n+I*c^(1/2)*(2*b*x^(n+1
)+a)*b))/b^(3/2)/(WhittakerW(-I*c^(1/2)/b^(1/2)*a/(2*n+2),1/(2*n+2),2*I*c^(1/2)*
b^(1/2)/(n+1)*x^(n+1))*_C1+WhittakerM(-I*c^(1/2)/b^(1/2)*a/(2*n+2),1/(2*n+2),2*I
*c^(1/2)*b^(1/2)/(n+1)*x^(n+1)))/c/x
```

4.59 $y'(x) = ax^2 + by(x)^2$

ODE

$$y'(x) = ax^2 + by(x)^2$$

ODE Classification

[[_Riccati, _special]]

Book solution method
Riccati ODE, Main form

Mathematica ✓
cpu = 0.00597792 (sec), leaf count = 175

$$\left\{\left\{y(x) \to \frac{\sqrt{a}\sqrt{b}x^2\left(c_1\left(J_{\frac{3}{4}}\left(\frac{1}{2}\sqrt{a}\sqrt{b}x^2\right) - J_{-\frac{5}{4}}\left(\frac{1}{2}\sqrt{a}\sqrt{b}x^2\right)\right) - 2J_{-\frac{3}{4}}\left(\frac{1}{2}\sqrt{a}\sqrt{b}x^2\right)\right) - c_1 J_{-\frac{1}{4}}\left(\frac{1}{2}\sqrt{a}\sqrt{b}x^2\right)}{2bx\left(c_1 J_{-\frac{1}{4}}\left(\frac{1}{2}\sqrt{a}\sqrt{b}x^2\right) + J_{\frac{1}{4}}\left(\frac{1}{2}\sqrt{a}\sqrt{b}x^2\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.092 (sec), leaf count = 71

$$\left\{y(x) = -\frac{x}{b}\sqrt{ab}\left(J_{-\frac{3}{4}}\left(\frac{x^2}{2}\sqrt{ab}\right)\_C1 + Y_{-\frac{3}{4}}\left(\frac{x^2}{2}\sqrt{ab}\right)\right)\left(\_C1\, J_{\frac{1}{4}}\left(\frac{x^2}{2}\sqrt{ab}\right) + Y_{\frac{1}{4}}\left(\frac{x^2}{2}\sqrt{ab}\right)\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a*x^2 + b*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(BesselJ[-1/4, (Sqrt[a]*Sqrt[b]*x^2)/2]*C[1]) + Sqrt[a]*Sqrt[b]*x^2*
(-2*BesselJ[-3/4, (Sqrt[a]*Sqrt[b]*x^2)/2] + (-BesselJ[-5/4, (Sqrt[a]*Sqrt[b]*x^
2)/2] + BesselJ[3/4, (Sqrt[a]*Sqrt[b]*x^2)/2])*C[1]))/(2*b*x*(BesselJ[1/4, (Sqrt
[a]*Sqrt[b]*x^2)/2] + BesselJ[-1/4, (Sqrt[a]*Sqrt[b]*x^2)/2]*C[1]))}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a*x^2+b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = -(a*b)^(1/2)*x*(BesselJ(-3/4,1/2*(a*b)^(1/2)*x^2)*_C1+BesselY(-3/4,1/2*(a
*b)^(1/2)*x^2))/b/(_C1*BesselJ(1/4,1/2*(a*b)^(1/2)*x^2)+BesselY(1/4,1/2*(a*b)^(1
/2)*x^2))
```

4.60 $y'(x) = \mathbf{a0} + \mathbf{a1}y(x) + \mathbf{a2}y(x)^2$

ODE

$$y'(x) = \mathrm{a0} + \mathrm{a1}y(x) + \mathrm{a2}y(x)^2$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 0.0369065 (sec), leaf count = 54

$$\left\{\left\{y(x) \to \frac{\sqrt{4\mathrm{a0a2} - \mathrm{a1}^2}\tan\left(\frac{1}{2}(c_1 + x)\sqrt{4\mathrm{a0a2} - \mathrm{a1}^2}\right) - \mathrm{a1}}{2\mathrm{a2}}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 41

$$\left\{x - 2\frac{1}{\sqrt{4\,a0\,a2 - a1^2}}\arctan\left(\frac{2\,a2\,y(x) + a1}{\sqrt{4\,a0\,a2 - a1^2}}\right) + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a0 + a1*y[x] + a2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-a1 + Sqrt[-a1^2 + 4*a0*a2]*Tan[(Sqrt[-a1^2 + 4*a0*a2]*(x + C[1]))/2]
)/(2*a2)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a0+a1*y(x)+a2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
x-2/(4*a0*a2-a1^2)^(1/2)*arctan((2*a2*y(x)+a1)/(4*a0*a2-a1^2)^(1/2))+_C1 = 0
```

4.61 $y'(x) = ay(x) + by(x)^2 + f(x)$

ODE

$$y'(x) = ay(x) + by(x)^2 + f(x)$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✗
cpu = 9.75091 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x] == f[x] + a*y[x] + b*y[x]^2, y[x], x]
```

Maple ✗
cpu = 0.397 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x) = f(x)+a*y(x)+b*y(x)^2, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y'[x] == f[x] + a*y[x] + b*y[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x] == f[x] + a*y[x] + b*y[x]^2, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x) = f(x)+a*y(x)+b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x) = f(x)+a*y(x)+b*y(x)^2, y(x),'implicit')
```

4.62 $y'(x) = a(x - y(x))y(x) + 1$

ODE

$$y'(x) = a(x - y(x))y(x) + 1$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0442847 (sec), leaf count = 88

$$\left\{\left\{y(x) \to \frac{\sqrt{2\pi}c_1 x \text{erf}\left(\frac{\sqrt{a}x}{\sqrt{2}}\right) + \frac{2\left(c_1 e^{-\frac{ax^2}{2}} + ax\right)}{\sqrt{a}}}{\sqrt{2\pi}c_1 \text{erf}\left(\frac{\sqrt{a}x}{\sqrt{2}}\right) + 2\sqrt{a}}\right\}\right\}$$

Maple ✓
cpu = 0.201 (sec), leaf count = 50

$$\left\{-a(x - y(x))\left(e^{-\frac{ax^2}{2}}\right)^{-1} - 2\left(\frac{\sqrt{\pi}\sqrt{2}Erf\left(1/2\sqrt{2}\sqrt{a}x\right)}{\sqrt{a}} + 2\_C1\right)^{-1} = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == 1 + a*(x - y[x])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((2*(a*x + C[1]/E^((a*x^2)/2)))/Sqrt[a] + Sqrt[2*Pi]*x*C[1]*Erf[(Sqrt[
a]*x)/Sqrt[2]])/(2*Sqrt[a] + Sqrt[2*Pi]*C[1]*Erf[(Sqrt[a]*x)/Sqrt[2]])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = 1+a*(x-y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
-a*(x-y(x))/exp(-1/2*a*x^2)-2/(Pi^(1/2)*2^(1/2)/a^(1/2)*erf(1/2*2^(1/2)*a^(1/2)*
x)+2*_C1) = 0
```

4.63 $y'(x) = ay(x)^2 + f(x) + g(x)y(x)$

ODE

$$y'(x) = ay(x)^2 + f(x) + g(x)y(x)$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✗
cpu = 20.8632 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x] == f[x] + g[x]*y[x] + a*y[x]^2, y[x], x]
```

Maple ✗
cpu = 0.213 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x) = f(x)+g(x)*y(x)+a*y(x)^2, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y'[x] == f[x] + g[x]*y[x] + a*y[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x] == f[x] + g[x]*y[x] + a*y[x]^2, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x) = f(x)+g(x)*y(x)+a*y(x)^2, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x) = f(x)+g(x)*y(x)+a*y(x)^2, y(x),'implicit')
```

4.64 $y'(x) = xy(x)(y(x)+3)$

ODE

$$y'(x) = xy(x)(y(x)+3)$$

ODE Classification

[_separable]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0197666 (sec), leaf count = 39

$$\left\{\left\{y(x) \to -\frac{3e^{3c_1+\frac{3x^2}{2}}}{e^{3c_1+\frac{3x^2}{2}}-1}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 18

$$\left\{(y(x))^{-1} + \frac{1}{3} - \mathrm{e}^{-\frac{3x^2}{2}}\_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x*y[x]*(3 + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-3*E^((3*x^2)/2 + 3*C[1]))/(-1 + E^((3*x^2)/2 + 3*C[1]))}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x*y(x)*(3+y(x)), y(x),'implicit')
```

Maple raw output

```
1/y(x)+1/3-exp(-3/2*x^2)*_C1 = 0
```

4.65 $y'(x) = -x^3 + (2x^2+1)\,y(x) - xy(x)^2 - x + 1$

ODE

$$y'(x) = -x^3 + (2x^2+1)\,y(x) - xy(x)^2 - x + 1$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0645825 (sec), leaf count = 35

$$\left\{\left\{y(x) \to \frac{c_1 x + e^x\left(x^2 - x + 1\right)}{c_1 + e^x(x-1)}\right\}\right\}$$

Maple ✓
cpu = 0.136 (sec), leaf count = 56

$$\left\{y(x) = 1\left(\_C1\,\left(x^2 - x + 1\right)\mathrm{e}^{\frac{x\left(x^2+3\right)}{3}} + \mathrm{e}^{\frac{x^3}{3}}x\right)\left(\_C1\,\mathrm{e}^{\frac{x\left(x^2+3\right)}{3}}(-1+x) + \mathrm{e}^{\frac{x^3}{3}}\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == 1 - x - x^3 + (1 + 2*x^2)*y[x] - x*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*(1 - x + x^2) + x*C[1])/(E^x*(-1 + x) + C[1])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = 1-x-x^3+(2*x^2+1)*y(x)-x*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*(x^2-x+1)*exp(1/3*x*(x^2+3))+exp(1/3*x^3)*x)/(_C1*exp(1/3*x*(x^2+3))
*(-1+x)+exp(1/3*x^3))
```

4.66 $y'(x) = x(x^2y(x) - y(x)^2 + 2)$

ODE

$$y'(x) = x\left(x^2y(x) - y(x)^2 + 2\right)$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0453608 (sec), leaf count = 63

$$\left\{\left\{y(x) \to \frac{2c_1x^2 + \sqrt{\pi}x^2\text{erf}\left(\frac{x^2}{2}\right) + 2e^{-\frac{x^4}{4}}}{2c_1 + \sqrt{\pi}\text{erf}\left(\frac{x^2}{2}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.341 (sec), leaf count = 51

$$\left\{y(x) = \frac{1}{\sqrt{\pi}}\left(Erf\left(\frac{x^2}{2}\right)\sqrt{\pi}\_C1\,x^2 + x^2\sqrt{\pi} + 2\,\mathrm{e}^{-1/4\,x^4}\_C1\right)\left(Erf\left(\frac{x^2}{2}\right)\_C1 + 1\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x*(2 + x^2*y[x] - y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2/E^(x^4/4) + 2*x^2*C[1] + Sqrt[Pi]*x^2*Erf[x^2/2])/(2*C[1] + Sqrt[Pi
]*Erf[x^2/2])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x*(2+x^2*y(x)-y(x)^2), y(x),'implicit')
```

Maple raw output

```
y(x) = (erf(1/2*x^2)*Pi^(1/2)*_C1*x^2+x^2*Pi^(1/2)+2*exp(-1/4*x^4)*_C1)/Pi^(1/2)
/(erf(1/2*x^2)*_C1+1)
```

4.67 $y'(x) = -(1-x)y(x)^2 + (1-2x)y(x) + x$

ODE

$$y'(x) = -(1-x)y(x)^2 + (1-2x)y(x) + x$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.00933038 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{c_1 e^x + x + 1}{c_1 e^x + x}\right\}\right\}$$

Maple ✓
cpu = 0.063 (sec), leaf count = 23

$$\left\{y(x) = 1 - 2\,\frac{\mathrm{e}^{-x}}{\_C1 - 2\,x\mathrm{e}^{-x}}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x + (1 - 2*x)*y[x] - (1 - x)*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x + E^x*C[1])/(x + E^x*C[1])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x+(1-2*x)*y(x)-(1-x)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1-2*exp(-x)/(_C1-2*x*exp(-x))
```

4.68 $y'(x) = axy(x)^2$

ODE

$$y'(x) = axy(x)^2$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00574785 (sec), leaf count = 19

$$\left\{\left\{y(x) \to -\frac{2}{ax^2 + 2c_1}\right\}\right\}$$

Maple ✓
cpu = 0.004 (sec), leaf count = 17

$$\left\{(y(x))^{-1} + \frac{ax^2}{2} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a*x*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2/(a*x^2 + 2*C[1])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a*x*y(x)^2, y(x),'implicit')
```

Maple raw output

```
1/y(x)+1/2*a*x^2-_C1 = 0
```

4.69 $y'(x) = x^n(a + by(x)^2)$

ODE

$$y'(x) = x^n\left(a + by(x)^2\right)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0569839 (sec), leaf count = 42

$$\left\{\left\{y(x) \to \frac{\sqrt{a}\tan\left(\sqrt{a}\sqrt{b}\left(c_1 + \frac{x^{n+1}}{n+1}\right)\right)}{\sqrt{b}}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 33

$$\left\{\frac{x^{n+1}}{n+1} - 1\arctan\left(by(x)\frac{1}{\sqrt{ab}}\right)\frac{1}{\sqrt{ab}} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x^n*(a + b*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[a]*Tan[Sqrt[a]*Sqrt[b]*(x^(1 + n)/(1 + n) + C[1])])/Sqrt[b]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x^n*(a+b*y(x)^2), y(x),'implicit')
```

Maple raw output

```
x^(n+1)/(n+1)-1/(a*b)^(1/2)*arctan(y(x)*b/(a*b)^(1/2))+_C1 = 0
```

4.70 $y'(x) = ax^m + bx^n y(x)^2$

ODE

$$y'(x) = ax^m + bx^n y(x)^2$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.104942 (sec), leaf count = 1067

$$\left\{\left\{y(x) \to -\frac{a^{-\frac{n+1}{2(m+n+2)}} b^{-\frac{2m+3n+5}{2(m+n+2)}} (m+n+1)^{\frac{n+1}{m+n+2}} \left((m+n+1)^2\right)^{\frac{n+1}{m+n+2}-\frac{1}{2}} x^{-n-1} \left(x^{m+n+1}\right)^{-\frac{n+1}{2(m+n+1)}} \left(a^{\frac{n+1}{2(m+n+2)}} b^{\frac{n}{2(m+\right.\right.\right.$$

Maple ✓
cpu = 0.213 (sec), leaf count = 179

$$\left\{y(x) = \frac{x^{-n}}{bx}\left(Y_{\frac{m+1}{m+n+2}}\left(2\frac{\sqrt{ab}x^{m/2+n/2+1}}{m+n+2}\right)\_C1 + J_{\frac{m+1}{m+n+2}}\left(2\frac{\sqrt{ab}x^{m/2+n/2+1}}{m+n+2}\right)\right) x^{\frac{m}{2}+\frac{n}{2}+1}\sqrt{ab}\left(Y_{\frac{-n-1}{m+n+2}}\left(2\frac{\sqrt{ab}x^{m/2+n/}{m+n+}\right.\right.\right.$$

Mathematica raw input

```
DSolve[y'[x] == a*x^m + b*x^n*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((1 + m + n)^((1 + n)/(2 + m + n))*((1 + m + n)^2)^(-1/2 + (1 + n)/(2
  + m + n))*x^(-1 - n)*((a^((1 + n)/(2*(2 + m + n)))*b^((1 + n)/(2*(2 + m + n)))*
(2 + m + n)*(x^(1 + m + n))^((1 + n)/(2*(1 + m + n)))*(-(Sqrt[a]*Sqrt[b]*(1 + m
+ n)*(x^(1 + m + n))^((1 + (1 + m + n)^(-1))/2)*BesselJ[(1 + m)/(2 + m + n), (2*
Sqrt[a]*Sqrt[b]*(1 + m + n)*(x^(1 + m + n))^((1 + (1 + m + n)^(-1))/2))/(Sqrt[(1
  + m + n)^2]*(2 + m + n))]) + (1 + n)*Sqrt[(1 + m + n)^2]*BesselJ[-((1 + n)/(2 +
  m + n)), (2*Sqrt[a]*Sqrt[b]*(1 + m + n)*(x^(1 + m + n))^((1 + (1 + m + n)^(-1))
/2))/(Sqrt[(1 + m + n)^2]*(2 + m + n))] + Sqrt[a]*Sqrt[b]*(1 + m + n)*(x^(1 + m
+ n))^((1 + (1 + m + n)^(-1))/2)*BesselJ[-((3 + m + 2*n)/(2 + m + n)), (2*Sqrt[a
]*Sqrt[b]*(1 + m + n)*(x^(1 + m + n))^((1 + (1 + m + n)^(-1))/2))/(Sqrt[(1 + m +
  n)^2]*(2 + m + n))])*C[1]*Gamma[(1 + m)/(2 + m + n)])/(1 + m + n)^((1 + n)/(2 +
```

```
 m + n)) + a^((1 + n)/(2*(2 + m + n)))*b^((1 + n)/(2*(2 + m + n)))*(1 + n)^2*(1
+ m + n)^((1 + n)/(2 + m + n))*((1 + m + n)^2)^((m - n)/(2*(2 + m + n)))*(x^(1 +
 m + n))^((1 + n)/(2*(1 + m + n)))*BesselJ[(1 + n)/(2 + m + n), (2*Sqrt[a]*Sqrt[
b]*(1 + m + n)*(x^(1 + m + n))^((1 + (1 + m + n)^(-1))/2))/(Sqrt[(1 + m + n)^2]*
(2 + m + n))]*Gamma[(1 + n)/(2 + m + n)] + (a^((3 + m + 2*n)/(2*(2 + m + n)))*b^
((3 + m + 2*n)/(2*(2 + m + n)))*(1 + n)*(1 + m + n)^((3 + m + 2*n)/(2 + m + n))*
(x^(1 + m + n))^((3 + m + 2*n)/(2*(1 + m + n)))*(BesselJ[-((1 + m)/(2 + m + n)),
 (2*Sqrt[a]*Sqrt[b]*(1 + m + n)*(x^(1 + m + n))^((1 + (1 + m + n)^(-1))/2))/(Sqr
t[(1 + m + n)^2]*(2 + m + n))] - BesselJ[1 + (1 + n)/(2 + m + n), (2*Sqrt[a]*Sqr
t[b]*(1 + m + n)*(x^(1 + m + n))^((1 + (1 + m + n)^(-1))/2))/(Sqrt[(1 + m + n)^2
]*(2 + m + n))])*Gamma[(1 + n)/(2 + m + n)])/((1 + m + n)^2)^((1 + n)/(2 + m + n
))))/(2*a^((1 + n)/(2*(2 + m + n)))*b^((5 + 2*m + 3*n)/(2*(2 + m + n)))*(x^(1 +
m + n))^((1 + n)/(2*(1 + m + n)))*(((1 + m + n)^2)^((1 + n)/(2 + m + n))*(2 + m
+ n)*BesselJ[-((1 + n)/(2 + m + n)), (2*Sqrt[a]*Sqrt[b]*(1 + m + n)*(x^(1 + m +
n))^((1 + (1 + m + n)^(-1))/2))/(Sqrt[(1 + m + n)^2]*(2 + m + n))]*C[1]*Gamma[(1
 + m)/(2 + m + n)] + (1 + n)*(1 + m + n)^((2*(1 + n))/(2 + m + n))*BesselJ[(1 +
n)/(2 + m + n), (2*Sqrt[a]*Sqrt[b]*(1 + m + n)*(x^(1 + m + n))^((1 + (1 + m + n)
^(-1))/2))/(Sqrt[(1 + m + n)^2]*(2 + m + n))]*Gamma[(1 + n)/(2 + m + n)]))}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a*x^m+b*x^n*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = (BesselY((m+1)/(m+n+2),2*(a*b)^(1/2)*x^(1/2*m+1/2*n+1)/(m+n+2))*_C1+Besse
lJ((m+1)/(m+n+2),2*(a*b)^(1/2)*x^(1/2*m+1/2*n+1)/(m+n+2)))*x^(1/2*m+1/2*n+1)*(a*
b)^(1/2)/(BesselY((-n-1)/(m+n+2),2*(a*b)^(1/2)*x^(1/2*m+1/2*n+1)/(m+n+2))*_C1+Be
sselJ((-n-1)/(m+n+2),2*(a*b)^(1/2)*x^(1/2*m+1/2*n+1)/(m+n+2)))*x^(-n)/b/x
```

4.71 $y'(x) = y(x)(a + by(x)\cos(kx))$

ODE

$$y'(x) = y(x)(a + by(x)\cos(kx))$$

ODE Classification

[_Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0492755 (sec), leaf count = 57

$$\left\{\left\{y(x) \to -\frac{\left(a^2+k^2\right)e^{ax}}{c_1\left(-\left(a^2+k^2\right)\right)+bke^{ax}\sin(kx)+abe^{ax}\cos(kx)}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 54

$$\left\{(y(x))^{-1}+\frac{be^{ax}(\cos(kx)\,a+k\sin(kx))-\_C1\,\left(a^2+k^2\right)}{\left(a^2+k^2\right)\mathrm{e}^{ax}}=0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == y[x]*(a + b*Cos[k*x]*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((E^(a*x)*(a^2 + k^2))/(-((a^2 + k^2)*C[1]) + a*b*E^(a*x)*Cos[k*x] +
b*E^(a*x)*k*Sin[k*x]))}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (a+b*y(x)*cos(k*x))*y(x), y(x),'implicit')
```

Maple raw output

```
1/y(x)+(b*exp(a*x)*(cos(k*x)*a+k*sin(k*x))-_C1*(a^2+k^2))/(a^2+k^2)/exp(a*x) = 0
```

4.72 $y'(x) = \sin(x)\left(2\sec^2(x) - y(x)\right)$

ODE

$$y'(x) = \sin(x)\left(2\sec^2(x) - y(x)\right)$$

ODE Classification

[_linear]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.064027 (sec), leaf count = 28

$$\left\{\left\{y(x) \to c_1 e^{\cos(x)} + 2e^{\cos(x)}\text{Ei}(-\cos(x)) + 2\sec(x)\right\}\right\}$$

Maple ✓
cpu = 0.271 (sec), leaf count = 29

$$\left\{y(x) = \left(\int 4\,\frac{\sin(x)\,\mathrm{e}^{-\cos(x)}}{\cos(2x)+1}\,\mathrm{d}x + \_C1\right)\mathrm{e}^{\cos(x)}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Sin[x]*(2*Sec[x]^2 - y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^Cos[x]*C[1] + 2*E^Cos[x]*ExpIntegralEi[-Cos[x]] + 2*Sec[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = sin(x)*(2*sec(x)^2-y(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = (Int(4*sin(x)/(cos(2*x)+1)*exp(-cos(x)),x)+_C1)*exp(cos(x))
```

4.73 $y'(x) + 4\csc(x) = y(x)^2 \sin(x) + y(x)(3 - \cot(x))$

ODE

$$y'(x) + 4\csc(x) = y(x)^2 \sin(x) + y(x)(3 - \cot(x))$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0565983 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \left(\frac{1}{c_1 e^{5x} + \frac{1}{5}} - 4\right)\csc(x)\right\}\right\}$$

Maple ✓
cpu = 0.273 (sec), leaf count = 35

$$\left\{y(x) = \frac{\_C1\, \mathrm{e}^{-x} - 4\,\mathrm{e}^{4x}}{\sin(x)\,(\_C1\, \mathrm{e}^{-x} + \mathrm{e}^{4x})}\right\}$$

Mathematica raw input

```
DSolve[4*Csc[x] + y'[x] == (3 - Cot[x])*y[x] + Sin[x]*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-4 + (1/5 + E^(5*x)*C[1])^(-1))*Csc[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x)+4*csc(x) = (3-cot(x))*y(x)+y(x)^2*sin(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*exp(-x)-4*exp(4*x))/sin(x)/(_C1*exp(-x)+exp(4*x))
```

4.74 $y'(x) = y(x)\sec(x) + (\sin(x) - 1)^2$

ODE

$$y'(x) = y(x)\sec(x) + (\sin(x) - 1)^2$$

ODE Classification

[_linear]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0521092 (sec), leaf count = 50

$$\left\{\left\{y(x) \to -\frac{1}{4}e^{2\tanh^{-1}\left(\tan\left(\frac{x}{2}\right)\right)}\left(\cos(2x) - 4\left(c_1 - 3\sin(x) + 8\log\left(\sin\left(\frac{x}{2}\right) + \cos\left(\frac{x}{2}\right)\right)\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.215 (sec), leaf count = 35

$$\left\{y(x) = (\sec(x) + \tan(x))\left(-\frac{(\cos(x))^2}{2} + \_C1 - 3\sin(x) + 4\ln(\cos(x)) + 4\ln(\sec(x) + \tan(x))\right)\right\}$$

Mathematica raw input

```
DSolve[y'[x] == (-1 + Sin[x])^2 + Sec[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(E^(2*ArcTanh[Tan[x/2]])*(Cos[2*x] - 4*(C[1] + 8*Log[Cos[x/2] + Sin[x
/2]] - 3*Sin[x])))/4}}
```

Maple raw input

```
dsolve(diff(y(x),x) = y(x)*sec(x)+(sin(x)-1)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = (sec(x)+tan(x))*(-1/2*cos(x)^2+_C1-3*sin(x)+4*ln(cos(x))+4*ln(sec(x)+tan(
x)))
```

4.75 $y'(x) + (1 - y(x)^2)\tan(x) = 0$

ODE

$$y'(x) + (1 - y(x)^2)\tan(x) = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0377814 (sec), leaf count = 35

$$\left\{\left\{y(x) \to \frac{1 - e^{2c_1}\sec^2(x)}{e^{2c_1}\sec^2(x) + 1}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 13

$$\{-\ln(\cos(x)) + Artanh(y(x)) + \_C1 = 0\}$$

Mathematica raw input

```
DSolve[Tan[x]*(1 - y[x]^2) + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 - E^(2*C[1])*Sec[x]^2)/(1 + E^(2*C[1])*Sec[x]^2)}}
```

Maple raw input

```
dsolve(diff(y(x),x)+tan(x)*(1-y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
-ln(cos(x))+arctanh(y(x))+_C1 = 0
```

4.76 $y'(x) = f(x) + g(x)y(x) + h(x)y(x)^2$

ODE

$$y'(x) = f(x) + g(x)y(x) + h(x)y(x)^2$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✗
cpu = 20.8609 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x] == f[x] + g[x]*y[x] + h[x]*y[x]^2, y[x], x]
```

Maple ✗
cpu = 0.258 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x) = f(x)+g(x)*y(x)+h(x)*y(x)^2, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y'[x] == f[x] + g[x]*y[x] + h[x]*y[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x] == f[x] + g[x]*y[x] + h[x]*y[x]^2, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x) = f(x)+g(x)*y(x)+h(x)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x) = f(x)+g(x)*y(x)+h(x)*y(x)^2, y(x),'implicit')
```

4.77 $y'(x) = f(x)\left(a + by(x) + cy(x)^2\right)$

ODE

$$y'(x) = f(x)\left(a + by(x) + cy(x)^2\right)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.066664 (sec), leaf count = 62

$$\left\{\left\{y(x) \to \frac{\sqrt{4ac - b^2}\tan\left(\frac{1}{2}\sqrt{4ac - b^2}\left(\int_1^x f(K[1])\,dK[1] + c_1\right)\right) - b}{2c}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 44

$$\left\{\int f(x)\,\mathrm{d}x - 2\frac{1}{\sqrt{4\,ca - b^2}}\arctan\left(\frac{2\,cy(x) + b}{\sqrt{4\,ca - b^2}}\right) + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == f[x]*(a + b*y[x] + c*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-b + Sqrt[-b^2 + 4*a*c]*Tan[(Sqrt[-b^2 + 4*a*c]*(C[1] + Integrate[f[K
[1]], {K[1], 1, x}]))/2])/(2*c)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (a+b*y(x)+c*y(x)^2)*f(x), y(x),'implicit')
```

Maple raw output

```
Int(f(x),x)-2/(4*a*c-b^2)^(1/2)*arctan((2*c*y(x)+b)/(4*a*c-b^2)^(1/2))+_C1 = 0
```

4.78 $y(x)^2(ax+y(x))+y'(x)$

ODE

$$y(x)^2(ax+y(x))+y'(x)$$

ODE Classification

[_Abel]

Book solution method
Abel ODE, First kind

Mathematica ✗
cpu = 0.00569826 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]^2*(a*x + y[x]) + Derivative[1][y][x], y[x], x]
```

Maple ✓
cpu = 0.071 (sec), leaf count = 142

$$\left\{ \_C1 + 1\left(\sqrt[3]{-2\,a^2}x\mathrm{Ai}\left(\frac{x^2}{4}\left(-2\,a^2\right)^{\frac{2}{3}} + \frac{a}{y\left(x\right)}\frac{1}{\sqrt[3]{-2\,a^2}} \right) + 2\,\mathrm{Ai}^{(1)}\left(1/4\left(-2\,a^2\right)^{2/3}x^2 + \frac{a}{\sqrt[3]{-2\,a^2}y\left(x\right)} \right) \right)\left(\sqrt[3]{-2\,a^2}x\mathrm{Bi}\left(\frac{x}{4}\right.\right.\right.$$

Mathematica raw input

```
DSolve[y[x]^2*(a*x + y[x]) + y'[x],y[x],x]
```

Mathematica raw output

```
DSolve[y[x]^2*(a*x + y[x]) + Derivative[1][y][x], y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)+(a*x+y(x))*y(x)^2, y(x),'implicit')
```

Maple raw output

```
_C1+((-2*a^2)^(1/3)*x*AiryAi(1/4*(-2*a^2)^(2/3)*x^2+1/(-2*a^2)^(1/3)*a/y(x))+2*A
iryAi(1,1/4*(-2*a^2)^(2/3)*x^2+1/(-2*a^2)^(1/3)*a/y(x)))/((-2*a^2)^(1/3)*x*AiryB
i(1/4*(-2*a^2)^(2/3)*x^2+1/(-2*a^2)^(1/3)*a/y(x))+2*AiryBi(1,1/4*(-2*a^2)^(2/3)*
x^2+1/(-2*a^2)^(1/3)*a/y(x))) = 0
```

4.79 $y'(x) = y(x)^2 (ae^x + y(x))$

ODE

$$y'(x) = y(x)^2 (ae^x + y(x))$$

ODE Classification

[_Abel]

Book solution method
Abel ODE, First kind

Mathematica ✓
cpu = 0.876621 (sec), leaf count = 73

$$\text{Solve}\left[-iae^x = \frac{2e^{-\frac{(ae^x y(x)+1)^2}{2y(x)^2}}}{2c_1 - i\sqrt{2\pi}\,\text{erf}\left(\frac{ae^x y(x)+1}{\sqrt{2}y(x)}\right)}, y(x)\right]$$

Maple ✓
cpu = 0.062 (sec), leaf count = 50

$$\left\{ \_C1 + \frac{1}{ae^x}\mathrm{e}^{-\frac{\left(ae^x+(y(x))^{-1}\right)^2}{2}} + \frac{\sqrt{2}\sqrt{\pi}}{2} Erf\left(\frac{\left(ae^x+(y(x))^{-1}\right)\sqrt{2}}{2}\right) = 0 \right\}$$

Mathematica raw input

```
DSolve[y'[x] == y[x]^2*(a*E^x + y[x]),y[x],x]
```

Mathematica raw output

```
Solve[(-I)*a*E^x == 2/(E^((1 + a*E^x*y[x])^2/(2*y[x]^2))*(2*C[1] - I*Sqrt[2*Pi]*
Erf[(1 + a*E^x*y[x])/(Sqrt[2]*y[x])])), y[x]]
```

Maple raw input

```
dsolve(diff(y(x),x) = (a*exp(x)+y(x))*y(x)^2, y(x),'implicit')
```

Maple raw output

```
_C1+exp(-1/2*(a*exp(x)+1/y(x))^2)/a/exp(x)+1/2*erf(1/2*(a*exp(x)+1/y(x))*2^(1/2)
)*2^(1/2)*Pi^(1/2) = 0
```

4.80 $3a(y(x)+2x)y(x)^2+y'(x)=0$

ODE

$$3a(y(x)+2x)y(x)^2+y'(x)=0$$

ODE Classification

[_Abel]

Book solution method
Abel ODE, First kind

Mathematica ✓
cpu = 0.375106 (sec), leaf count = 161

$$\text{Solve}\left[\frac{\sqrt[3]{-3}\sqrt[3]{a}x\text{Ai}\left(\frac{(-1)^{2/3}(3ax^2y(x)-1)}{\sqrt[3]{3}\sqrt[3]{a}y(x)}\right)+\text{Ai}'\left(\frac{(-1)^{2/3}(3ax^2y(x)-1)}{\sqrt[3]{3}\sqrt[3]{a}y(x)}\right)}{\sqrt[3]{-3}\sqrt[3]{a}x\text{Bi}\left(\frac{(-1)^{2/3}(3ax^2y(x)-1)}{\sqrt[3]{3}\sqrt[3]{a}y(x)}\right)+\text{Bi}'\left(\frac{(-1)^{2/3}(3ax^2y(x)-1)}{\sqrt[3]{3}\sqrt[3]{a}y(x)}\right)}+c_1=0,y(x)\right]$$

Maple ✓
cpu = 0.036 (sec), leaf count = 110

$$\left\{\_C1+1\left(\sqrt[3]{-3\,a}x\text{Ai}\left(\left(-3\,a\right)^{\frac{2}{3}}x^2+\frac{1}{y\left(x\right)}\frac{1}{\sqrt[3]{-3\,a}}\right)+\text{Ai}^{(1)}\left(\left(-3\,a\right)^{\frac{2}{3}}x^2+\frac{1}{y\left(x\right)}\frac{1}{\sqrt[3]{-3\,a}}\right)\right)\left(\sqrt[3]{-3\,a}x\text{Bi}\left(\left(-3\,a\right)^{\frac{2}{3}}x^2+\frac{1}{y\left(x\right.}\right.\right.\right.$$

Mathematica raw input

```
DSolve[3*a*y[x]^2*(2*x + y[x]) + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[((-3)^(1/3)*a^(1/3)*x*AiryAi[((-1)^(2/3)*(-1 + 3*a*x^2*y[x]))/(3^(1/3)*a^(
1/3)*y[x])] + AiryAiPrime[((-1)^(2/3)*(-1 + 3*a*x^2*y[x]))/(3^(1/3)*a^(1/3)*y[x]
)])/((-3)^(1/3)*a^(1/3)*x*AiryBi[((-1)^(2/3)*(-1 + 3*a*x^2*y[x]))/(3^(1/3)*a^(1/
3)*y[x])] + AiryBiPrime[((-1)^(2/3)*(-1 + 3*a*x^2*y[x]))/(3^(1/3)*a^(1/3)*y[x])]
) + C[1] == 0, y[x]]
```

Maple raw input

```
dsolve(diff(y(x),x)+3*a*(2*x+y(x))*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
_C1+((-3*a)^(1/3)*x*AiryAi((-3*a)^(2/3)*x^2+1/(-3*a)^(1/3)/y(x))+AiryAi(1,(-3*a)
^(2/3)*x^2+1/(-3*a)^(1/3)/y(x)))/((-3*a)^(1/3)*x*AiryBi((-3*a)^(2/3)*x^2+1/(-3*a
)^(1/3)/y(x))+AiryBi(1,(-3*a)^(2/3)*x^2+1/(-3*a)^(1/3)/y(x))) = 0
```

4.81 $y'(x) = y(x)\left(a + by(x)^2\right)$

ODE

$$y'(x) = y(x)\left(a + by(x)^2\right)$$

ODE Classification

[_quadrature]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0339076 (sec), leaf count = 77

$$\left\{\left\{y(x) \to -\frac{i\sqrt{a}e^{a(c_1+x)}}{\sqrt{be^{2a(c_1+x)}-1}}\right\}, \left\{y(x) \to \frac{i\sqrt{a}e^{a(c_1+x)}}{\sqrt{be^{2a(c_1+x)}-1}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 21

$$\left\{\frac{b}{a} - \mathrm{e}^{-2\,ax}\_C1 + (y(x))^{-2} = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == y[x]*(a + b*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*Sqrt[a]*E^(a*(x + C[1])))/Sqrt[-1 + b*E^(2*a*(x + C[1]))]}, {y[x
] -> (I*Sqrt[a]*E^(a*(x + C[1])))/Sqrt[-1 + b*E^(2*a*(x + C[1]))]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = y(x)*(a+b*y(x)^2), y(x),'implicit')
```

Maple raw output

```
1/a*b-exp(-2*a*x)*_C1+1/y(x)^2 = 0
```

4.82 $y'(x) = \mathbf{a0} + \mathbf{a1}y(x) + \mathbf{a2}y(x)^2 + \mathbf{a3}y(x)^3$

ODE

$$y'(x) = \text{a0} + \text{a1}y(x) + \text{a2}y(x)^2 + \text{a3}y(x)^3$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 0.0391074 (sec), leaf count = 54

$$\text{Solve}\left[c_1 + x = \text{RootSum}\left[\#1^3\text{a3} + \#1^2\text{a2} + \#1\text{a1} + \text{a0}\&, \frac{\log(y(x) - \#1)}{3\#1^2\text{a3} + 2\#1\text{a2} + \text{a1}}\&\right], y(x)\right]$$

Maple ✓
cpu = 0.019 (sec), leaf count = 30

$$\left\{x - \int^{y(x)} \left(\_a^3 a3 + \_a^2 a2 + \_a\, a1 + a0\right)^{-1} d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a0 + a1*y[x] + a2*y[x]^2 + a3*y[x]^3,y[x],x]
```

Mathematica raw output

```
Solve[x + C[1] == RootSum[a0 + a1*#1 + a2*#1^2 + a3*#1^3 & , Log[-#1 + y[x]]/(a1
 + 2*a2*#1 + 3*a3*#1^2) & ], y[x]]
```

Maple raw input

```
dsolve(diff(y(x),x) = a0+a1*y(x)+a2*y(x)^2+a3*y(x)^3, y(x),'implicit')
```

Maple raw output

```
x-Intat(1/(_a^3*a3+_a^2*a2+_a*a1+a0),_a = y(x))+_C1 = 0
```

4.83 $y'(x) = xy(x)^3$

ODE

$$y'(x) = xy(x)^3$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00579969 (sec), leaf count = 39

$$\left\{\left\{y(x) \to -\frac{1}{\sqrt{-2c_1 - x^2}}\right\}, \left\{y(x) \to \frac{1}{\sqrt{-2c_1 - x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 14

$$\left\{(y(x))^{-2} + x^2 - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == x*y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1/Sqrt[-x^2 - 2*C[1]])}, {y[x] -> 1/Sqrt[-x^2 - 2*C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x*y(x)^3, y(x),'implicit')
```

Maple raw output

```
1/y(x)^2+x^2-_C1 = 0
```

4.84 $y'(x) + y(x)\left(1 - xy(x)^2\right) = 0$

ODE

$$y'(x) + y(x)\left(1 - xy(x)^2\right) = 0$$

ODE Classification

[_Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0129408 (sec), leaf count = 45

$$\left\{\left\{y(x) \to -\frac{1}{\sqrt{c_1 e^{2x} + x + \frac{1}{2}}}\right\}, \left\{y(x) \to \frac{1}{\sqrt{c_1 e^{2x} + x + \frac{1}{2}}}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 19

$$\left\{(y(x))^{-2} - x - \frac{1}{2} - \mathrm{e}^{2x}\_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 - x*y[x]^2) + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1/Sqrt[1/2 + x + E^(2*x)*C[1]])}, {y[x] -> 1/Sqrt[1/2 + x + E^(2*x)*
C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)+y(x)*(1-x*y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
1/y(x)^2-x-1/2-exp(2*x)*_C1 = 0
```

4.85 $y'(x) = y(x)^2(a + bxy(x))$

ODE

$$y'(x) = y(x)^2(a + bxy(x))$$

ODE Classification

[[_homogeneous, `class G`], _Abel]

Book solution method
Abel ODE, First kind

Mathematica ✓
cpu = 0.144999 (sec), leaf count = 94

$$\text{Solve}\left[\frac{a^2 \log\left(\frac{bxy(x)(a+bxy(x))+b}{b^2x^2y(x)^2}\right) + \frac{2a^2 \tan^{-1}\left(\frac{a+2bxy(x)}{a\sqrt{\frac{4b}{a^2}-1}}\right)}{\sqrt{\frac{4b}{a^2}-1}} + 2a^2\log(x) + 2bc_1}{b} = 0, y(x)\right]$$

Maple ✓
cpu = 0.049 (sec), leaf count = 79

$$\left\{-1\left(aArtanh\left((2\,bxy(x)+a)\frac{1}{\sqrt{a^2-4\,b}}\right) - \frac{\ln\left(bx^2(y(x))^2 + axy(x) + 1\right) - 2\_C1 + 2\ln(x) - 2\ln(xy(x))}{2}\sqrt{a^2-4\,b}\right)\right.$$

Mathematica raw input

```
DSolve[y'[x] == y[x]^2*(a + b*x*y[x]),y[x],x]
```

Mathematica raw output

```
Solve[((2*a^2*ArcTan[(a + 2*b*x*y[x])/(a*Sqrt[-1 + (4*b)/a^2])])/Sqrt[-1 + (4*b)
/a^2] + 2*b*C[1] + 2*a^2*Log[x] + a^2*Log[(b + b*x*y[x]*(a + b*x*y[x]))/(b^2*x^2
*y[x]^2)])/b == 0, y[x]]
```

Maple raw input

```
dsolve(diff(y(x),x) = (a+b*x*y(x))*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-(a*arctanh((2*b*x*y(x)+a)/(a^2-4*b)^(1/2))-1/2*(a^2-4*b)^(1/2)*(ln(b*x^2*y(x)^2
+a*x*y(x)+1)-2*_C1+2*ln(x)-2*ln(x*y(x))))/(a^2-4*b)^(1/2) = 0
```

4.86 $y(x)^3\left(a+4b^2x+3bx^2\right)+y'(x)+3xy(x)^2=0$

ODE

$$y(x)^3\left(a+4b^2x+3bx^2\right)+y'(x)+3xy(x)^2=0$$

ODE Classification

[_Abel]

Book solution method
Abel ODE, First kind

Mathematica ✓
cpu = 9.14762 (sec), leaf count = 376

$$\text{Solve}\left[c_1=\frac{\left(3x-b\left(\sqrt{4-\frac{3a}{b^3}}-2\right)\right)J_{\frac{1}{2}\sqrt{4-\frac{3a}{b^3}}}\left(-\frac{1}{2}i\sqrt{3}\sqrt{\frac{(a+bx(4b+3x))y(x)-2b}{b^3y(x)}}\right)-i\sqrt{3}b\sqrt{\frac{y(x)(a+bx(4b+3x))-2b}{b^3y(x)}}J_{\frac{1}{2}\left(\sqrt{4-\frac{3a}{b^3}}+2\right)}\right.$$
$$\left.\frac{}{i\sqrt{3}b\sqrt{\frac{y(x)(a+bx(4b+3x))-2b}{b^3y(x)}}Y_{\frac{1}{2}\left(\sqrt{4-\frac{3a}{b^3}}+2\right)}\left(-\frac{1}{2}i\sqrt{3}\sqrt{\frac{(a+bx(4b+3x))y(x)-2b}{b^3y(x)}}\right)+\left(b\left(\sqrt{4-\frac{3a}{b^3}}-2\right)-3x\right)Y_{\frac{1}{2}\sqrt{4-\frac{3a}{b^3}}}}\right.$$

Maple ✓
cpu = 1.876 (sec), leaf count = 373

$$\left\{\_C1+1\left(-K_{\frac{1}{2}\sqrt{\frac{4b^3-3a}{b^3}}+1}\left(-\frac{\sqrt{3}}{2}\sqrt{\frac{4b^2xy(x)+(3x^2y(x)-2)b+ay(x)}{b^3y(x)}}\right)\sqrt{3}\sqrt{\frac{4b^2xy(x)+(3x^2y(x)-2)b+ay(x)}{b^3y(x)}}b\right.\right.$$

Mathematica raw input

```
DSolve[3*x*y[x]^2 + (a + 4*b^2*x + 3*b*x^2)*y[x]^3 + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] == ((-((-2 + Sqrt[4 - (3*a)/b^3])*b) + 3*x)*BesselJ[Sqrt[4 - (3*a)/b^
3]/2, (-I/2)*Sqrt[3]*Sqrt[(-2*b + (a + b*x*(4*b + 3*x))*y[x])/(b^3*y[x])]] - I*S
qrt[3]*b*BesselJ[(2 + Sqrt[4 - (3*a)/b^3])/2, (-I/2)*Sqrt[3]*Sqrt[(-2*b + (a + b
*x*(4*b + 3*x))*y[x])/(b^3*y[x])]]*Sqrt[(-2*b + (a + b*x*(4*b + 3*x))*y[x])/(b^3
*y[x])])/(((-2 + Sqrt[4 - (3*a)/b^3])*b - 3*x)*BesselY[Sqrt[4 - (3*a)/b^3]/2, (-
I/2)*Sqrt[3]*Sqrt[(-2*b + (a + b*x*(4*b + 3*x))*y[x])/(b^3*y[x])]] + I*Sqrt[3]*b
*BesselY[(2 + Sqrt[4 - (3*a)/b^3])/2, (-I/2)*Sqrt[3]*Sqrt[(-2*b + (a + b*x*(4*b
+ 3*x))*y[x])/(b^3*y[x])]]*Sqrt[(-2*b + (a + b*x*(4*b + 3*x))*y[x])/(b^3*y[x])])
, y[x]]
```

Maple raw input

```
dsolve(diff(y(x),x)+3*x*y(x)^2+(4*b^2*x+3*b*x^2+a)*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
_C1+(-BesselK(1/2*((4*b^3-3*a)/b^3)^(1/2)+1,-1/2*3^(1/2)*((4*b^2*x*y(x)+(3*x^2*y
(x)-2)*b+a*y(x))/b^3/y(x))^(1/2))*3^(1/2)*((4*b^2*x*y(x)+(3*x^2*y(x)-2)*b+a*y(x)
)/b^3/y(x))^(1/2)*b-BesselK(1/2*((4*b^3-3*a)/b^3)^(1/2),-1/2*3^(1/2)*((4*b^2*x*y
(x)+(3*x^2*y(x)-2)*b+a*y(x))/b^3/y(x))^(1/2))*(b*((4*b^3-3*a)/b^3)^(1/2)-2*b-3*x
))/(BesselI(1/2*((4*b^3-3*a)/b^3)^(1/2)+1,-1/2*3^(1/2)*((4*b^2*x*y(x)+(3*x^2*y(x
)-2)*b+a*y(x))/b^3/y(x))^(1/2))*3^(1/2)*((4*b^2*x*y(x)+(3*x^2*y(x)-2)*b+a*y(x))/
b^3/y(x))^(1/2)*b-BesselI(1/2*((4*b^3-3*a)/b^3)^(1/2),-1/2*3^(1/2)*((4*b^2*x*y(x
)+(3*x^2*y(x)-2)*b+a*y(x))/b^3/y(x))^(1/2))*(b*((4*b^3-3*a)/b^3)^(1/2)-2*b-3*x))
 = 0
```

4.87 $y'(x) = y(x)^2 \left(x^3 y(x) + 1\right)$

ODE

$$y'(x) = y(x)^2 \left(x^3 y(x) + 1\right)$$

ODE Classification

[_Abel]

Book solution method
Abel ODE, First kind

Mathematica ✗
cpu = 22.8741 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x] == y[x]^2*(1 + x^3*y[x]), y[x], x]
```

Maple ✗
cpu = 3.194 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x) = (1+x^3*y(x))*y(x)^2, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y'[x] == y[x]^2*(1 + x^3*y[x]),y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x] == y[x]^2*(1 + x^3*y[x]), y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x) = (1+x^3*y(x))*y(x)^2, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x) = (1+x^3*y(x))*y(x)^2, y(x),'implicit')
```

4.88 $2xy(x)\left(axy(x)^2+1\right)+y'(x)=0$

ODE

$$2xy(x)\left(axy(x)^2+1\right)+y'(x)=0$$

ODE Classification

[_Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.033291 (sec), leaf count = 101

$$\left\{\left\{y(x)\to -\frac{2}{\sqrt{\sqrt{2\pi}ae^{2x^2}\text{erf}\left(\sqrt{2}x\right)-4ax+4c_1e^{2x^2}}}\right\},\left\{y(x)\to \frac{2}{\sqrt{\sqrt{2\pi}ae^{2x^2}\text{erf}\left(\sqrt{2}x\right)-4ax+4c_1e^{2x^2}}}\right\}\right\}$$

Maple ✓
cpu = 0.044 (sec), leaf count = 41

$$\left\{(y(x))^{-2}+ax-\frac{\mathrm{e}^{2x^2}a\sqrt{2}\sqrt{\pi}Erf\left(\sqrt{2}x\right)}{4}-\mathrm{e}^{2x^2}\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*x*y[x]*(1 + a*x*y[x]^2) + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2/Sqrt[-4*a*x + 4*E^(2*x^2)*C[1] + a*E^(2*x^2)*Sqrt[2*Pi]*Erf[Sqrt[2]
*x]]}, {y[x] -> 2/Sqrt[-4*a*x + 4*E^(2*x^2)*C[1] + a*E^(2*x^2)*Sqrt[2*Pi]*Erf[Sq
rt[2]*x]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)+2*x*y(x)*(1+a*x*y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
1/y(x)^2+a*x-1/4*exp(2*x^2)*a*2^(1/2)*Pi^(1/2)*erf(2^(1/2)*x)-exp(2*x^2)*_C1 = 0
```

4.89 $y'(x) = y(x)^2 - ax(1 - x^{n-1})\, y(x)^3$

ODE

$$y'(x) = y(x)^2 - ax\left(1 - x^{n-1}\right) y(x)^3$$

ODE Classification

[_Abel]

Book solution method
Abel ODE, First kind

Mathematica ✗
cpu = 32.8836 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x] == y[x]^2 - a*x*(1 - x^(-1 + n))*y[x]^3, y[x], x]
```

Maple ✗
cpu = 2.908 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x) = y(x)^2-a*x*(1-x^(n-1))*y(x)^3, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y'[x] == y[x]^2 - a*x*(1 - x^(-1 + n))*y[x]^3,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x] == y[x]^2 - a*x*(1 - x^(-1 + n))*y[x]^3, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x) = y(x)^2-a*x*(1-x^(n-1))*y(x)^3, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x) = y(x)^2-a*x*(1-x^(n-1))*y(x)^3, y(x),'implicit')
```

4.90 $y'(x) = ay(x)^2 + xy(x)^3 \left(b + cx^{n-1}\right)$

ODE

$$y'(x) = ay(x)^2 + xy(x)^3 \left(b + cx^{n-1}\right)$$

ODE Classification

[_Abel]

Book solution method
Abel ODE, First kind

Mathematica ✗
cpu = 36.5386 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x] == a*y[x]^2 + x*(b + c*x^(-1 + n))*y[x]^3, y[x], x]
```

Maple ✗
cpu = 2.416 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x) = a*y(x)^2+x*y(x)^3*(b+c*x^(n-1)), y(x),'implicit')
```

Mathematica raw input

```
DSolve[y'[x] == a*y[x]^2 + x*(b + c*x^(-1 + n))*y[x]^3,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x] == a*y[x]^2 + x*(b + c*x^(-1 + n))*y[x]^3, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x) = a*y(x)^2+x*y(x)^3*(b+c*x^(n-1)), y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x) = a*y(x)^2+x*y(x)^3*(b+c*x^(n-1)), y(x),'implicit')
```

4.91 $y'(x) + y(x)\left(y(x)^2 \sec(x) + \tan(x)\right) = 0$

ODE

$$y'(x) + y(x)\left(y(x)^2 \sec(x) + \tan(x)\right) = 0$$

ODE Classification

[_Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0322549 (sec), leaf count = 43

$$\left\{\left\{y(x) \to -\frac{1}{\sqrt{\sec^2(x)\left(c_1 + 2\sin(x)\right)}}\right\}, \left\{y(x) \to \frac{1}{\sqrt{\sec^2(x)\left(c_1 + 2\sin(x)\right)}}\right\}\right\}$$

Maple ✓
cpu = 0.034 (sec), leaf count = 21

$$\left\{(y(x))^{-2} + \frac{-\_C1 - 2\sin(x)}{(\cos(x))^2} = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(Tan[x] + Sec[x]*y[x]^2) + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1/Sqrt[Sec[x]^2*(C[1] + 2*Sin[x])])}, {y[x] -> 1/Sqrt[Sec[x]^2*(C[1]
 + 2*Sin[x])]}}
```

Maple raw input

```
dsolve(diff(y(x),x)+(tan(x)+y(x)^2*sec(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/y(x)^2+(-_C1-2*sin(x))/cos(x)^2 = 0
```

4.92 $y'(x) + y(x)^3 \tan(x) \sec(x) = 0$

ODE

$$y'(x) + y(x)^3 \tan(x) \sec(x) = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0261714 (sec), leaf count = 44

$$\left\{\left\{y(x) \to -\frac{1}{\sqrt{2}\sqrt{\sec(x) - c_1}}\right\}, \left\{y(x) \to \frac{1}{\sqrt{2}\sqrt{\sec(x) - c_1}}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 15

$$\left\{(y(x))^{-2} - 2\sec(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[Sec[x]*Tan[x]*y[x]^3 + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1/(Sqrt[2]*Sqrt[-C[1] + Sec[x]]))}, {y[x] -> 1/(Sqrt[2]*Sqrt[-C[1] +
  Sec[x]])}}
```

Maple raw input

```
dsolve(diff(y(x),x)+y(x)^3*sec(x)*tan(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/y(x)^2-2*sec(x)-_C1 = 0
```

4.93 $y'(x) = \mathbf{f0}(x) + \mathbf{f1}(x)y(x) + \mathbf{f2}(x)y(x)^2 + \mathbf{f3}(x)y(x)^3$

ODE

$$y'(x) = \mathrm{f0}(x) + \mathrm{f1}(x)y(x) + \mathrm{f2}(x)y(x)^2 + \mathrm{f3}(x)y(x)^3$$

ODE Classification

[_Abel]

Book solution method
Abel ODE, First kind

Mathematica ✗
cpu = 127.575 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x] == f0[x] + f1[x]*y[x] + f2[x]*y[x]^2 + f3[x]*y[x]^3, y[x], x]
```

Maple ✗
cpu = 0.458 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x) = f0(x)+f1(x)*y(x)+f2(x)*y(x)^2+f3(x)*y(x)^3, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y'[x] == f0[x] + f1[x]*y[x] + f2[x]*y[x]^2 + f3[x]*y[x]^3,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x] == f0[x] + f1[x]*y[x] + f2[x]*y[x]^2 + f3[x]*y[x]^3,
y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x) = f0(x)+f1(x)*y(x)+f2(x)*y(x)^2+f3(x)*y(x)^3, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x) = f0(x)+f1(x)*y(x)+f2(x)*y(x)^2+f3(x)*y(x)^3, y(x),'implicit
')
```

4.94 $y'(x) = y(x)\left(y(x)^3 \sec(x) + \tan(x)\right)$

ODE

$$y'(x) = y(x)\left(y(x)^3 \sec(x) + \tan(x)\right)$$

ODE Classification

[_Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0449442 (sec), leaf count = 98

$$\left\{\left\{y(x) \to \frac{1}{\sqrt[3]{c_1 \cos^3(x) - \sin(x) - 2\sin(x)\cos^2(x)}}\right\}, \left\{y(x) \to -\frac{\sqrt[3]{-1}}{\sqrt[3]{c_1 \cos^3(x) - \sin(x) - 2\sin(x)\cos^2(x)}}\right\}, \left\{y(x) \to \frac{}{\sqrt[3]{c}}\right.$$

Maple ✓
cpu = 0.575 (sec), leaf count = 33

$$\left\{\frac{1 + \left(-(\cos(x))^3 \_C1 + 2\sin(x)(\cos(x))^2 + \sin(x)\right)(y(x))^3}{(y(x))^3} = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == y[x]*(Tan[x] + Sec[x]*y[x]^3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*Cos[x]^3 - Sin[x] - 2*Cos[x]^2*Sin[x])^(-1/3)}, {y[x] -> -((-1)^
(1/3)/(C[1]*Cos[x]^3 - Sin[x] - 2*Cos[x]^2*Sin[x])^(1/3))}, {y[x] -> (-1)^(2/3)/
(C[1]*Cos[x]^3 - Sin[x] - 2*Cos[x]^2*Sin[x])^(1/3)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (tan(x)+y(x)^3*sec(x))*y(x), y(x),'implicit')
```

Maple raw output

```
(1+(-cos(x)^3*_C1+2*sin(x)*cos(x)^2+sin(x))*y(x)^3)/y(x)^3 = 0
```

4.95 $y'(x) = ax^{\frac{n}{1-n}} + by(x)^n$

ODE

$$y'(x) = ax^{\frac{n}{1-n}} + by(x)^n$$

ODE Classification

[[_homogeneous, `class G`], _Chini]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 172.366 (sec), leaf count = 109

$$\text{Solve}\left[\int_1^x aK[2]^{\frac{n}{1-n}}\left(\frac{bK[2]^{\frac{n}{n-1}}}{a}\right)^{\frac{1}{n}} dK[2] + c_1 = \int_1^{y(x)\left(\frac{bx^{\frac{n}{n-1}}}{a}\right)^{\frac{1}{n}}} \frac{1}{-K[1]\left(\frac{(-1)^n(n-1)^{-n}a^{1-n}}{b}\right)^{\frac{1}{n}} + K[1]^n + 1} dK[1], y(x)\right]$$

Maple ✓
cpu = 0.305 (sec), leaf count = 61

$$\left\{-\int_{\_b}^{y(x)} 1x^{\frac{n}{n-1}}\left(\left(bx(n-1)\_a^n + \_a\right)x^{\frac{n}{n-1}} + a(n-1)x\right)^{-1} \mathrm{d}\_a(n-1) + \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a*x^(n/(1 - n)) + b*y[x]^n,y[x],x]
```

Mathematica raw output

```
Solve[C[1] + Integrate[a*K[2]^(n/(1 - n))*((b*K[2]^(n/(-1 + n)))/a)^n^(-1), {K[2
], 1, x}] == Integrate[(1 - (((-1)^n*a^(1 - n))/(b*(-1 + n)^n))^n^(-1)*K[1] + K[
1]^n)^(-1), {K[1], 1, ((b*x^(n/(-1 + n)))/a)^n^(-1)*y[x]}], y[x]]
```

Maple raw input

```
dsolve(diff(y(x),x) = a*x^(n/(1-n))+b*y(x)^n, y(x),'implicit')
```

Maple raw output

```
-Int(1/((b*x*(n-1)*_a^n+_a)*x^(1/(n-1)*n)+a*(n-1)*x)*x^(1/(n-1)*n),_a = _b .. y(
x))*(n-1)+ln(x)-_C1 = 0
```

4.96 $y'(x) = f(x)y(x) + g(x)y(x)^k$

ODE

$$y'(x) = f(x)y(x) + g(x)y(x)^k$$

ODE Classification

[_Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.493421 (sec), leaf count = 64

$$\left\{\left\{y(x) \to \left(e^{-(k-1)\int_1^x f(K[1])\,dK[1]}\left(c_1 - (k-1)\int_1^x g(K[2])e^{(k-1)\int_1^{K[2]} f(K[1])\,dK[1]}\,dK[2]\right)\right)^{\frac{1}{1-k}}\right\}\right\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 48

$$\left\{(y(x))^{1-k} + \frac{-\int -\mathrm{e}^{\int f(x)(k-1)\,\mathrm{d}x} g(x)\,(k-1)\,\mathrm{d}x - \_C1}{\mathrm{e}^{\int f(x)(k-1)\,\mathrm{d}x}} = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == f[x]*y[x] + g[x]*y[x]^k,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((C[1] - (-1 + k)*Integrate[E^((-1 + k)*Integrate[f[K[1]], {K[1], 1, K
[2]}])*g[K[2]], {K[2], 1, x}])/E^((-1 + k)*Integrate[f[K[1]], {K[1], 1, x}]))^(1
 - k)^(-1)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = f(x)*y(x)+g(x)*y(x)^k, y(x),'implicit')
```

Maple raw output

```
y(x)^(1-k)+(-Int(-exp(Int(f(x)*(k-1),x))*g(x)*(k-1),x)-_C1)/exp(Int(f(x)*(k-1),x
)) = 0
```

4.97 $y'(x) = f(x) + g(x)y(x) + h(x)y(x)^n$

ODE

$$y'(x) = f(x) + g(x)y(x) + h(x)y(x)^n$$

ODE Classification

[_Chini]

Book solution method
Change of Variable, new dependent variable

Mathematica ✗
cpu = 3.99729 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x] == f[x] + g[x]*y[x] + h[x]*y[x]^n, y[x], x]
```

Maple ✗
cpu = 0.36 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x) = f(x)+g(x)*y(x)+h(x)*y(x)^n, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y'[x] == f[x] + g[x]*y[x] + h[x]*y[x]^n,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x] == f[x] + g[x]*y[x] + h[x]*y[x]^n, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x) = f(x)+g(x)*y(x)+h(x)*y(x)^n, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x) = f(x)+g(x)*y(x)+h(x)*y(x)^n, y(x),'implicit')
```

4.98 $y'(x) = f(x)y(x)^m + g(x)y(x)^n$

ODE

$$y'(x) = f(x)y(x)^m + g(x)y(x)^n$$

ODE Classification

[NONE]

Book solution method
Change of Variable, new dependent variable

Mathematica ✗
cpu = 2.26333 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x] == f[x]*y[x]^m + g[x]*y[x]^n, y[x], x]
```

Maple ✗
cpu = 0.308 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x) = f(x)*y(x)^m+g(x)*y(x)^n, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y'[x] == f[x]*y[x]^m + g[x]*y[x]^n,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x] == f[x]*y[x]^m + g[x]*y[x]^n, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x) = f(x)*y(x)^m+g(x)*y(x)^n, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x) = f(x)*y(x)^m+g(x)*y(x)^n, y(x),'implicit')
```

4.99 $y'(x) = \sqrt{|y(x)|}$

ODE

$$y'(x) = \sqrt{|y(x)|}$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 95.6243 (sec), leaf count = 283

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{2\ 2^{3/4}(1-\#1)\sqrt[4]{|\Im(\#1)|+i(1-\Re(\#1))}(i|\Im(\#1)|-\Re(\#1)+1)\ {}_2F_1\left(\frac{1}{4},\frac{3}{4};\frac{7}{4};\frac{2\left|\Im(\#1)\right|+i\left(7\right.}{4\left|\Im(7\right.}\right.}{3\sqrt[4]{|\Im(\#1)|}\left(\Im(\#1)^2+(1-\Re(\#1))^2\right)}\right.\right.$$

Maple ✓
cpu = 0.168 (sec), leaf count = 31

Mathematica raw input

```
DSolve[y'[x] == Sqrt[Abs[y[x]]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(-2*2^(3/4)*Hypergeometric2F1[1/4, 3/4, 7/4, (2*Abs[Im
[#1]] + I*(-2 + Conjugate[#1] + #1))/(4*Abs[Im[#1]])]*(Abs[Im[#1]] + I*(1 - Re[#
1]))^(1/4)*(1 + I*Abs[Im[#1]] - Re[#1])*(1 - #1))/(3*Abs[Im[#1]]^(1/4)*(Im[#1]^2
 + (1 - Re[#1])^2)) - (2*2^(3/4)*Hypergeometric2F1[1/4, 3/4, 7/4, (2*Abs[Im[#1]]
 + I*(2*Abs[#1]^2 - Conjugate[#1] - #1))/(4*Abs[Im[#1]])]*((-I)*Abs[Im[#1]] + Im
[#1]^2 - Re[#1] + Re[#1]^2)*((Abs[Im[#1]] + I*(-Im[#1]^2 + (1 - Re[#1])*Re[#1]))
/(Im[#1]^2 + Re[#1]^2))^(1/4)*(1 - #1))/(3*Abs[Im[#1]]^(1/4)*(Im[#1]^2 + (1 - Re
[#1])^2)) & ][x + C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = abs(y(x))^(1/2), y(x),'implicit')
```

Maple raw output

```
x-piecewise(y(x) <= 0,-2*(-y(x))^(1/2),0 < y(x),2*y(x)^(1/2))+_C1 = 0
```

4.100 $y'(x) = a + \sqrt{\mathbf{A0} + \mathbf{B0}y(x)} + by(x)$

ODE

$$y'(x) = a + \sqrt{\mathrm{A0} + \mathrm{B0}y(x)} + by(x)$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 42.3344 (sec), leaf count = 352

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{\log\left(\#1^2 b^2 + 2\#1 ab - \#1\mathrm{B0} + a^2 - \mathrm{A0}\right) - \frac{2\sqrt{2}\sqrt{\mathrm{B0}\left(-\sqrt{-4ab\mathrm{B0}+4\mathrm{A0}b^2+\mathrm{B0}^2}-2ab+\mathrm{B0}\right)+2\mathrm{A0}b^2}}{\sqrt{\mathrm{B0}(\mathrm{B0}-}}\right.\right.\right.$$

Maple ✓
cpu = 0.056 (sec), leaf count = 27

$$\left\{x - \int^{y(x)} \left(a + b\_a + \sqrt{B0\ \_a + A0}\right)^{-1} d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a + b*y[x] + Sqrt[A0 + B0*y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[((2*B0*ArcTan[(2*a*b - B0 + 2*b^2*#1)/Sqrt[-4*A0*b^2 +
  (4*a*b - B0)*B0]])/Sqrt[-4*A0*b^2 + (4*a*b - B0)*B0] - (2*Sqrt[2]*Sqrt[2*A0*b^2
 + B0*(-2*a*b + B0 - Sqrt[4*A0*b^2 - 4*a*b*B0 + B0^2])]*ArcTanh[(Sqrt[2]*b*Sqrt[
A0 + B0*#1])/Sqrt[2*A0*b^2 + B0*(-2*a*b + B0 - Sqrt[4*A0*b^2 - 4*a*b*B0 + B0^2])
]])/Sqrt[4*A0*b^2 + B0*(-4*a*b + B0)] + (2*Sqrt[2]*Sqrt[2*A0*b^2 + B0*(-2*a*b +
B0 + Sqrt[4*A0*b^2 - 4*a*b*B0 + B0^2])]*ArcTanh[(Sqrt[2]*b*Sqrt[A0 + B0*#1])/Sqr
t[2*A0*b^2 + B0*(-2*a*b + B0 + Sqrt[4*A0*b^2 - 4*a*b*B0 + B0^2])]])/Sqrt[4*A0*b^
2 + B0*(-4*a*b + B0)] + Log[a^2 - A0 + 2*a*b*#1 - B0*#1 + b^2*#1^2])/(2*b) & ][x
```

```
 + C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a+b*y(x)+(A0+B0*y(x))^(1/2), y(x),'implicit')
```

Maple raw output

```
x-Intat(1/(a+b*_a+(B0*_a+A0)^(1/2)),_a = y(x))+_C1 = 0
```

4.101 $y'(x) = ax + b\sqrt{y(x)}$

ODE

$$y'(x) = ax + b\sqrt{y(x)}$$

ODE Classification

[[_homogeneous, `class G`], _Chini]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.221863 (sec), leaf count = 116

$$\text{Solve}\left[\frac{b^2 \log\left(b^2\left(-\sqrt{\frac{b^2 y(x)}{a^2 x^2}} + \frac{2y(x)}{ax^2} - 1\right)\right) + \frac{2b^3 \tanh^{-1}\left(\frac{b^2 - 4a\sqrt{\frac{b^2 y(x)}{a^2 x^2}}}{b\sqrt{8a+b^2}}\right)}{\sqrt{8a+b^2}} + 2ac_1 + 2b^2 \log(x)}{a} = 0, y(x)\right]$$

Maple ✓
cpu = 0.078 (sec), leaf count = 68

$$\left\{-\frac{1}{2}\ln\left(\sqrt{y(x)}bx + ax^2 - 2y(x)\right) + b\sqrt{y(x)}\,Artanh\left(1\left(b\sqrt{y(x)} + 2ax\right)\frac{1}{\sqrt{y(x)\left(b^2+8a\right)}}\right)\frac{1}{\sqrt{y(x)\left(b^2+8a\right)}} + \_C1 =\right.$$

Mathematica raw input

```
DSolve[y'[x] == a*x + b*Sqrt[y[x]],y[x],x]
```

Mathematica raw output

```
Solve[((2*b^3*ArcTanh[(b^2 - 4*a*Sqrt[(b^2*y[x])/(a^2*x^2)])/(b*Sqrt[8*a + b^2])
])/Sqrt[8*a + b^2] + 2*a*C[1] + 2*b^2*Log[x] + b^2*Log[b^2*(-1 + (2*y[x])/(a*x^2
) - Sqrt[(b^2*y[x])/(a^2*x^2)])])/a == 0, y[x]]
```

Maple raw input

```
dsolve(diff(y(x),x) = a*x+b*y(x)^(1/2), y(x),'implicit')
```

Maple raw output

```
-1/2*ln(y(x)^(1/2)*b*x+a*x^2-2*y(x))+b*y(x)^(1/2)/(y(x)*(b^2+8*a))^(1/2)*arctanh
((b*y(x)^(1/2)+2*a*x)/(y(x)*(b^2+8*a))^(1/2))+_C1 = 0
```

4.102 $x^3 + y'(x) = x\sqrt{x^4 + 4y(x)}$

ODE

$$x^3 + y'(x) = x\sqrt{x^4 + 4y(x)}$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Homogeneous equation, isobaric equation

Mathematica ✓
cpu = 0.0737663 (sec), leaf count = 25

$$\{\{y(x) \to 2e^{2c_1}\left(2e^{2c_1} + x^2\right)\}\}$$

Maple ✓
cpu = 0.072 (sec), leaf count = 47

$$\left\{1\left(\left(-\_C1 + y(x)\right)\sqrt{x^4 + 4\,y\,(x)} - x^2(\_C1 + y(x))\right)\left(x^2 + \sqrt{x^4 + 4\,y\,(x)}\right)^{-1} = 0\right\}$$

Mathematica raw input

```
DSolve[x^3 + y'[x] == x*Sqrt[x^4 + 4*y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*E^(2*C[1])*(2*E^(2*C[1]) + x^2)}}
```

Maple raw input

```
dsolve(diff(y(x),x)+x^3 = x*(x^4+4*y(x))^(1/2), y(x),'implicit')
```

Maple raw output

```
((-_C1+y(x))*(x^4+4*y(x))^(1/2)-x^2*(_C1+y(x)))/(x^2+(x^4+4*y(x))^(1/2)) = 0
```

4.103 $y'(x) + 2\left(1 - x\sqrt{y(x)}\right) y(x) = 0$

ODE

$$y'(x) + 2\left(1 - x\sqrt{y(x)}\right) y(x) = 0$$

ODE Classification

[_Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.018551 (sec), leaf count = 16

$$\left\{\left\{y(x) \to \frac{1}{(c_1 e^x + x + 1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 17

$$\left\{\frac{1}{\sqrt{y(x)}} - x - 1 - \mathrm{e}^x \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[2*(1 - x*Sqrt[y[x]])*y[x] + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x + E^x*C[1])^(-2)}}
```

Maple raw input

```
dsolve(diff(y(x),x)+2*y(x)*(1-x*y(x)^(1/2)) = 0, y(x),'implicit')
```

Maple raw output

```
1/y(x)^(1/2)-x-1-exp(x)*_C1 = 0
```

4.104 $y'(x) = \sqrt{a + by(x)^2}$

ODE

$$y'(x) = \sqrt{a + by(x)^2}$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 0.0555641 (sec), leaf count = 43

$$\left\{\left\{y(x) \to \frac{e^{-\sqrt{b}(c_1+x)}\left(e^{2\sqrt{b}(c_1+x)} - ab\right)}{2b}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 29

$$\left\{x - 1\ln\left(\sqrt{b}y(x) + \sqrt{a + b\left(y\left(x\right)\right)^2}\right)\frac{1}{\sqrt{b}} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Sqrt[a + b*y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(a*b) + E^(2*Sqrt[b]*(x + C[1])))/(2*b*E^(Sqrt[b]*(x + C[1])))}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (a+b*y(x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
x-ln(b^(1/2)*y(x)+(a+b*y(x)^2)^(1/2))/b^(1/2)+_C1 = 0
```

4.105 $y'(x) = y(x)\sqrt{a + by(x)}$

ODE

$$y'(x) = y(x)\sqrt{a + by(x)}$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 0.0310508 (sec), leaf count = 27

$$\left\{\left\{y(x) \to -\frac{a\text{sech}^2\left(\frac{1}{2}\sqrt{a}(c_1 + x)\right)}{b}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 24

$$\left\{x + 2\,\frac{1}{\sqrt{a}}\,Artanh\left(\frac{\sqrt{a + by\,(x)}}{\sqrt{a}}\right) + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == y[x]*Sqrt[a + b*y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a*Sech[(Sqrt[a]*(x + C[1]))/2]^2)/b)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = y(x)*(a+b*y(x))^(1/2), y(x),'implicit')
```

Maple raw output

```
x+2/a^(1/2)*arctanh((a+b*y(x))^(1/2)/a^(1/2))+_C1 = 0
```

4.106 $g(x)(f(x)-y(x))\sqrt{(y(x)-a)(y(x)-b)}+y'(x)=0$

ODE

$$g(x)(f(x)-y(x))\sqrt{(y(x)-a)(y(x)-b)}+y'(x)=0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of Variable, new dependent variable

Mathematica ✗
cpu = 2.98454 (sec), leaf count = 0 , could not solve

```
DSolve[g[x]*(f[x] - y[x])*Sqrt[(-a + y[x])*(-b + y[x])] + Derivative[1][y][x] == 0, y[x], x]
```

Maple ✗
cpu = 0.755 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x)+(f(x)-y(x))*g(x)*((y(x)-a)*(y(x)-b))^(1/2) = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[g[x]*(f[x] - y[x])*Sqrt[(-a + y[x])*(-b + y[x])] + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[g[x]*(f[x] - y[x])*Sqrt[(-a + y[x])*(-b + y[x])] + Derivative[1][y][x] ==
 0, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)+(f(x)-y(x))*g(x)*((y(x)-a)*(y(x)-b))^(1/2) = 0, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x)+(f(x)-y(x))*g(x)*((y(x)-a)*(y(x)-b))^(1/2) = 0, y(x),'implic
it')
```

4.107 $y'(x) = \sqrt{XY}$

ODE

$$y'(x) = \sqrt{XY}$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00386379 (sec), leaf count = 17

$$\left\{\left\{y(x) \to c_1 + x\sqrt{XY}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 13

$$\left\{y(x) = \sqrt{XY}x + \_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Sqrt[X*Y],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*Sqrt[X*Y] + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (X*Y)^(1/2), y(x),'implicit')
```

Maple raw output

```
y(x) = (X*Y)^(1/2)*x+_C1
```

4.108 $y'(x) = \mathbf{R1}\left(x, \sqrt{X}\right) \mathbf{R2}\left(y(x), \sqrt{Y}\right)$

ODE

$$y'(x) = \mathrm{R1}\left(x, \sqrt{X}\right) \mathrm{R2}\left(y(x), \sqrt{Y}\right)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.10644 (sec), leaf count = 41

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{\mathrm{R2}\left(K[1], \sqrt{Y}\right)}\, dK[1]\&\right]\left[\int_1^x \mathrm{R1}\left(K[2], \sqrt{X}\right)\, dK[2] + c_1\right]\right\}\right\}$$

Maple ✓
cpu = 0.036 (sec), leaf count = 26

$$\left\{\int R1\left(x, \sqrt{X}\right)\, \mathrm{d}x - \int^{y(x)} \left(R2\left(\_a, \sqrt{Y}\right)\right)^{-1} d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == R1[x, Sqrt[X]]*R2[y[x], Sqrt[Y]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Integrate[R2[K[1], Sqrt[Y]]^(-1), {K[1], 1, #1}] & ][C
[1] + Integrate[R1[K[2], Sqrt[X]], {K[2], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = R1(x,X^(1/2))*R2(y(x),Y^(1/2)), y(x),'implicit')
```

Maple raw output

```
Int(R1(x,X^(1/2)),x)-Intat(1/R2(_a,Y^(1/2)),_a = y(x))+_C1 = 0
```

4.109 $y'(x) = \cos^2(x)\cos(y(x))$

ODE

$$y'(x) = \cos^2(x)\cos(y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.050805 (sec), leaf count = 23

$$\left\{\left\{y(x) \to 2\tan^{-1}\left(\tanh\left(\frac{1}{8}(c_1 + 2x + \sin(2x))\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 24

$$\left\{\frac{\sin(2x)}{4} + \frac{x}{2} - \ln(\sec(y(x)) + \tan(y(x))) + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Cos[x]^2*Cos[y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*ArcTan[Tanh[(2*x + C[1] + Sin[2*x])/8]]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = cos(x)^2*cos(y(x)), y(x),'implicit')
```

Maple raw output

```
1/4*sin(2*x)+1/2*x-ln(sec(y(x))+tan(y(x)))+_C1 = 0
```

4.110 $y'(x) = \sec^2(x)\mathbf{Cosy}(y(x))\cot(y(x))$

ODE

$$y'(x) = \sec^2(x)\text{Cosy}(y(x))\cot(y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.427983 (sec), leaf count = 28

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{\tan(K[1])}{\text{Cosy}(K[1])}\,dK[1]\&\right][c_1 + \tan(x)]\right\}\right\}$$

Maple ✓
cpu = 0.049 (sec), leaf count = 33

$$\left\{\frac{1}{\cos(x)}\left(-\int^{y(x)} \frac{1}{\cot(\_a)\ Cosy(\_a)}d\_a \cos(x) + \_C1\ \cos(x) + \sin(x)\right) = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Cosy[y[x]]*Cot[y[x]]*Sec[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Integrate[Tan[K[1]]/Cosy[K[1]], {K[1], 1, #1}] & ][C[1
] + Tan[x]]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = sec(x)^2*cot(y(x))*Cosy(y(x)), y(x),'implicit')
```

Maple raw output

```
(-Intat(1/cot(_a)/Cosy(_a),_a = y(x))*cos(x)+_C1*cos(x)+sin(x))/cos(x) = 0
```

4.111 $y'(x) = a + b\cos(Ax + By(x))$

ODE

$$y'(x) = a + b\cos(Ax + By(x))$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.627935 (sec), leaf count = 102

$$\left\{\left\{y(x) \to -\frac{2\tan^{-1}\left(\frac{(B(a+b)+A)\tanh\left(\frac{(x-c_1)\left(B^2\left(a^2-b^2\right)+2aAB+A^2\right)}{2\sqrt{-(B(a-b)+A)(B(a+b)+A)}}\right)}{\sqrt{-(B(a-b)+A)(B(a+b)+A)}}\right) + Ax}{B}\right\}\right\}$$

Maple ✓
cpu = 0.069 (sec), leaf count = 84

$$\left\{x - 2\,\frac{1}{\sqrt{B^2a^2 - B^2b^2 + 2\,ABa + A^2}}\arctan\left(\frac{(A + (a-b)\,B)\tan\left(1/2\,Ax + 1/2\,By(x)\right)}{\sqrt{B^2a^2 - B^2b^2 + 2\,ABa + A^2}}\right) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a + b*Cos[A*x + B*y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((A*x + 2*ArcTan[((A + (a + b)*B)*Tanh[((A^2 + 2*a*A*B + (a^2 - b^2)*
B^2)*(x - C[1]))/(2*Sqrt[-((A + (a - b)*B)*(A + (a + b)*B))])])/Sqrt[-((A + (a -
 b)*B)*(A + (a + b)*B))]])/B)}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a+b*cos(A*x+B*y(x)), y(x),'implicit')
```

Maple raw output

```
x-2/(B^2*a^2-B^2*b^2+2*A*B*a+A^2)^(1/2)*arctan((A+(a-b)*B)/(B^2*a^2-B^2*b^2+2*A*
B*a+A^2)^(1/2)*tan(1/2*A*x+1/2*B*y(x)))-_C1 = 0
```

4.112 $y'(x) = -(1 - f'(x))\cos(y(x)) + f'(x) - f(x)\sin(y(x)) + 1$

ODE

$$y'(x) = -(1 - f'(x))\cos(y(x)) + f'(x) - f(x)\sin(y(x)) + 1$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
Change of Variable, new dependent variable

Mathematica ✗
cpu = 23.7205 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x] == 1 - f[x]*Sin[y[x]] - Cos[y[x]]*(1 - Derivative[1][f][x]) + Derivative[1
```

Maple ✓
cpu = 1.381 (sec), leaf count = 43

$$\left\{ y(x) - 2\arctan\left(\frac{-\mathrm{e}^{\int f(x)\,\mathrm{d}x} + \int \mathrm{e}^{\int f(x)\,\mathrm{d}x}\,\mathrm{d}x f(x) + \_C1\, f(x)}{\_C1 + \int \mathrm{e}^{\int f(x)\,\mathrm{d}x}\,\mathrm{d}x} \right) = 0 \right\}$$

Mathematica raw input

```
DSolve[y'[x] == 1 - f[x]*Sin[y[x]] - Cos[y[x]]*(1 - f'[x]) + f'[x],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x] == 1 - f[x]*Sin[y[x]] - Cos[y[x]]*(1 - Derivative[1][
f][x]) + Derivative[1][f][x], y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x) = 1+diff(f(x),x)-f(x)*sin(y(x))-(1-diff(f(x),x))*cos(y(x)), y(x),'implicit')
```

Maple raw output

```
y(x)-2*arctan((-exp(Int(f(x),x))+Int(exp(Int(f(x),x)),x)*f(x)+_C1*f(x))/(_C1+Int
(exp(Int(f(x),x)),x))) = 0
```

4.113 $g(x)\sin(ay(x)) + h(x)\cos(ay(x)) + f(x) + y'(x) = 0$

ODE

$$g(x)\sin(ay(x)) + h(x)\cos(ay(x)) + f(x) + y'(x) = 0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of Variable, new dependent variable

Mathematica ✗
cpu = 25.1185 (sec), leaf count = 0 , could not solve

```
DSolve[f[x] + Cos[a*y[x]]*h[x] + g[x]*Sin[a*y[x]] + Derivative[1][y][x] == 0, y[x], x]
```

Maple ✗
cpu = 1.253 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x)+f(x)+g(x)*sin(a*y(x))+h(x)*cos(a*y(x)) = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[f[x] + Cos[a*y[x]]*h[x] + g[x]*Sin[a*y[x]] + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f[x] + Cos[a*y[x]]*h[x] + g[x]*Sin[a*y[x]] + Derivative[1][y][x] == 0, y[
x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)+f(x)+g(x)*sin(a*y(x))+h(x)*cos(a*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x)+f(x)+g(x)*sin(a*y(x))+h(x)*cos(a*y(x)) = 0, y(x),'implicit')
```

4.114 $y'(x) = a + b\cos(y(x))$

ODE

$$y'(x) = a + b\cos(y(x))$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 0.0887156 (sec), leaf count = 47

$$\left\{\left\{y(x) \to 2\tan^{-1}\left(\frac{(a+b)\tanh\left(\frac{1}{2}\sqrt{b^2-a^2}(c_1+x)\right)}{\sqrt{b^2-a^2}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 56

$$\left\{1\left(-2\arctan\left(\frac{(a-b)\tan(1/2\,y(x))}{\sqrt{a^2-b^2}}\right)+\sqrt{a^2-b^2}(x+\_C1)\right)\frac{1}{\sqrt{a^2-b^2}}=0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a + b*Cos[y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*ArcTan[((a + b)*Tanh[(Sqrt[-a^2 + b^2]*(x + C[1]))/2])/Sqrt[-a^2 + b
^2]]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a+b*cos(y(x)), y(x),'implicit')
```

Maple raw output

```
1/(a^2-b^2)^(1/2)*(-2*arctan((a-b)*tan(1/2*y(x))/(a^2-b^2)^(1/2))+(a^2-b^2)^(1/2
)*(x+_C1)) = 0
```

4.115 $x(\sin(2y(x)) - x^2\cos^2(y(x))) + y'(x) = 0$

ODE

$$x(\sin(2y(x)) - x^2\cos^2(y(x))) + y'(x) = 0$$

ODE Classification

[` y=_G(x,y') `]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.260147 (sec), leaf count = 55

$$\left\{\left\{y(x) \to \tan^{-1}\left(\frac{1}{2}\left(-8c_1e^{-x^2} + x^2 - 1\right)\right)\right\}, \left\{y(x) \to -\tan^{-1}\left(4c_1e^{-x^2} - \frac{x^2}{2} + \frac{1}{2}\right)\right\}\right\}$$

Maple ✓
cpu = 1.17 (sec), leaf count = 23

$$\{\ln\left(-x^2 + 2\tan\left(y(x)\right) + 1\right) + x^2 - \_C1 = 0\}$$

Mathematica raw input

```
DSolve[x*(-(x^2*Cos[y[x]]^2) + Sin[2*y[x]]) + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ArcTan[(-1 + x^2 - (8*C[1])/E^x^2)/2]}, {y[x] -> -ArcTan[1/2 - x^2/2 +
  (4*C[1])/E^x^2]}}
```

Maple raw input

```
dsolve(diff(y(x),x)+x*(sin(2*y(x))-x^2*cos(y(x))^2) = 0, y(x),'implicit')
```

Maple raw output

```
ln(-x^2+2*tan(y(x))+1)+x^2-_C1 = 0
```

4.116 $y'(x) + \tan(x)\sec(x)\cos^2(y(x)) = 0$

ODE

$$y'(x) + \tan(x)\sec(x)\cos^2(y(x)) = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✗
cpu = 0 (sec), leaf count = 0 , $Failed

$Failed

Maple ✓
cpu = 0.02 (sec), leaf count = 55

$$\left\{\frac{\_C1\ \cos(x-y(x)) + \_C1\ \cos(x+y(x)) + \sin(x+y(x)) - \sin(x-y(x)) + 2\cos(y(x))}{\cos(x-y(x)) + \cos(x+y(x))} = 0\right\}$$

Mathematica raw input

```
DSolve[Cos[y[x]]^2*Sec[x]*Tan[x] + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{}
```

Maple raw input

```
dsolve(diff(y(x),x)+tan(x)*sec(x)*cos(y(x))^2 = 0, y(x),'implicit')
```

Maple raw output

```
(_C1*cos(x-y(x))+_C1*cos(x+y(x))+sin(x+y(x))-sin(x-y(x))+2*cos(y(x)))/(cos(x-y(x
))+cos(x+y(x))) = 0
```

4.117 $y'(x) = \cot(x)\cot(y(x))$

ODE

$$y'(x) = \cot(x)\cot(y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0512485 (sec), leaf count = 29

$$\left\{\left\{y(x) \to -\cos^{-1}\left(-\frac{1}{2}c_1 \csc(x)\right)\right\}, \left\{y(x) \to \cos^{-1}\left(-\frac{1}{2}c_1 \csc(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 12

$$\{\ln(\sin(x)) + \ln(\cos(y(x))) + \_C1 = 0\}$$

Mathematica raw input

```
DSolve[y'[x] == Cot[x]*Cot[y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ArcCos[-(C[1]*Csc[x])/2]}, {y[x] -> ArcCos[-(C[1]*Csc[x])/2]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = cot(x)*cot(y(x)), y(x),'implicit')
```

Maple raw output

```
ln(sin(x))+ln(cos(y(x)))+_C1 = 0
```

4.118 $y'(x) + \cot(x)\cot(y(x)) = 0$

ODE

$$y'(x) + \cot(x)\cot(y(x)) = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0608963 (sec), leaf count = 29

$$\left\{\left\{y(x) \to -\cos^{-1}\left(-\frac{1}{2}c_1 \sin(x)\right)\right\}, \left\{y(x) \to \cos^{-1}\left(-\frac{1}{2}c_1 \sin(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 14

$$\{\ln(\sin(x)) - \ln(\cos(y(x))) + \_C1 = 0\}$$

Mathematica raw input

```
DSolve[Cot[x]*Cot[y[x]] + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ArcCos[-(C[1]*Sin[x])/2]}, {y[x] -> ArcCos[-(C[1]*Sin[x])/2]}}
```

Maple raw input

```
dsolve(diff(y(x),x)+cot(x)*cot(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
ln(sin(x))-ln(cos(y(x)))+_C1 = 0
```

4.119 $y'(x) = \sin(x)(\csc(y(x)) - \cot(y(x)))$

ODE

$$y'(x) = \sin(x)(\csc(y(x)) - \cot(y(x)))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.112868 (sec), leaf count = 21

$$\left\{\left\{y(x) \to 2\sin^{-1}\left(e^{\frac{1}{4}(c_1 - 2\cos(x))}\right)\right\}\right\}$$

Maple ✓
cpu = 0.042 (sec), leaf count = 15

$$\{\_C1 + \cos(x) + \ln(1 - \cos(y(x))) = 0\}$$

Mathematica raw input

```
DSolve[y'[x] == (-Cot[y[x]] + Csc[y[x]])*Sin[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*ArcSin[E^((C[1] - 2*Cos[x])/4)]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = sin(x)*(csc(y(x))-cot(y(x))), y(x),'implicit')
```

Maple raw output

```
_C1+cos(x)+ln(1-cos(y(x))) = 0
```

4.120 $y'(x) = \tan(x)\cot(y(x))$

ODE

$$y'(x) = \tan(x)\cot(y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0635995 (sec), leaf count = 29

$$\left\{\left\{y(x) \to -\cos^{-1}\left(\frac{1}{2}c_1\cos(x)\right)\right\}, \left\{y(x) \to \cos^{-1}\left(\frac{1}{2}c_1\cos(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 14

$$\{-\ln(\cos(x)) + \ln(\cos(y(x))) + \_C1 = 0\}$$

Mathematica raw input

```
DSolve[y'[x] == Cot[y[x]]*Tan[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ArcCos[(C[1]*Cos[x])/2]}, {y[x] -> ArcCos[(C[1]*Cos[x])/2]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = tan(x)*cot(y(x)), y(x),'implicit')
```

Maple raw output

```
-ln(cos(x))+ln(cos(y(x)))+_C1 = 0
```

4.121 $y'(x) + \tan(x)\cot(y(x)) = 0$

ODE

$$y'(x) + \tan(x)\cot(y(x)) = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0450254 (sec), leaf count = 29

$$\left\{\left\{y(x) \to -\cos^{-1}\left(\frac{1}{2}c_1 \sec(x)\right)\right\}, \left\{y(x) \to \cos^{-1}\left(\frac{1}{2}c_1 \sec(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 12

$$\{\_C1 + \ln(\cos(x)) + \ln(\cos(y(x))) = 0\}$$

Mathematica raw input

```
DSolve[Cot[y[x]]*Tan[x] + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ArcCos[(C[1]*Sec[x])/2]}, {y[x] -> ArcCos[(C[1]*Sec[x])/2]}}
```

Maple raw input

```
dsolve(diff(y(x),x)+tan(x)*cot(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
_C1+ln(cos(x))+ln(cos(y(x))) = 0
```

4.122 $y'(x) + \sin(2x)\csc(2y(x)) = 0$

ODE

$$y'(x) + \sin(2x)\csc(2y(x)) = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0273169 (sec), leaf count = 41

$$\left\{\left\{y(x) \to -\frac{1}{2}\cos^{-1}\left(-2c_1 - \cos(2x)\right)\right\}, \left\{y(x) \to \frac{1}{2}\cos^{-1}\left(-2c_1 - \cos(2x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 14

$$\{\_C1 + \cos(2x) + \cos(2y(x)) = 0\}$$

Mathematica raw input

```
DSolve[Csc[2*y[x]]*Sin[2*x] + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ArcCos[-2*C[1] - Cos[2*x]]/2}, {y[x] -> ArcCos[-2*C[1] - Cos[2*x]]/2}
}
```

Maple raw input

```
dsolve(diff(y(x),x)+sin(2*x)*csc(2*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
_C1+cos(2*x)+cos(2*y(x)) = 0
```

4.123 $y'(x) = \tan(x)(\tan(y(x)) + \sec(x)\sec(y(x)))$

ODE

$$y'(x) = \tan(x)(\tan(y(x)) + \sec(x)\sec(y(x)))$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0938504 (sec), leaf count = 20

$$\left\{\left\{y(x) \to \sin^{-1}\left(\frac{1}{4}\sec(x)\left(c_1 - 4\log(\cos(x))\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.929 (sec), leaf count = 18

$$\left\{\frac{\sin(y(x))}{\sec(x)} + \ln(\cos(x)) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Tan[x]*(Sec[x]*Sec[y[x]] + Tan[y[x]]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> ArcSin[((C[1] - 4*Log[Cos[x]])*Sec[x])/4]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = tan(x)*(tan(y(x))+sec(x)*sec(y(x))), y(x),'implicit')
```

Maple raw output

```
1/sec(x)*sin(y(x))+ln(cos(x))-_C1 = 0
```

4.124 $y'(x) = \cos(x)\sec^2(y(x))$

ODE

$$y'(x) = \cos(x)\sec^2(y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0290052 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[2\left(\frac{\#1}{2} + \frac{1}{4}\sin(2\#1)\right)\&\right][c_1 + 2\sin(x)]\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 18

$$\left\{\sin(x) - \frac{\sin(2\,y(x))}{4} - \frac{y(x)}{2} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Cos[x]*Sec[y[x]]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[2*(Sin[2*#1]/4 + #1/2) & ][C[1] + 2*Sin[x]]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = cos(x)*sec(y(x))^2, y(x),'implicit')
```

Maple raw output

```
sin(x)-1/4*sin(2*y(x))-1/2*y(x)+_C1 = 0
```

4.125 $y'(x) = \sec^2(x)\sec^3(y(x))$

ODE

$$y'(x) = \sec^2(x)\sec^3(y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.389479 (sec), leaf count = 2959

$$\left\{\left\{y(x) \to -\cos^{-1}\left(-\frac{\sqrt{2^{2/3}\sqrt[3]{-9c_1^2 - 18\tan(x)c_1 - 9\tan^2(x) + 3\sqrt{(c_1+\tan(x))^2\left(9c_1^2 + 18\tan(x)c_1 + 9\tan^2(x) - 4\right)}} +}\right.\right.\right.$$

Maple ✓
cpu = 0.038 (sec), leaf count = 51

$$\left\{\frac{24\_C1\cos(x) + 24\sin(x) - 9\sin(x+y(x)) + 9\sin(x-y(x)) - \sin(3y(x)+x) + \sin(x-3y(x))}{24\cos(x)} = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Sec[x]^2*Sec[y[x]]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ArcCos[-(Sqrt[-2 + (2*2^(1/3))/(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan
[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])
^(1/3) + 2^(2/3)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Ta
n[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3)]/Sqrt[2])]}, {y[x]
 -> ArcCos[-(Sqrt[-2 + (2*2^(1/3))/(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 +
 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3)
+ 2^(2/3)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2
*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3)]/Sqrt[2])]}, {y[x] -> -Ar
cCos[Sqrt[-2 + (2*2^(1/3))/(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[
(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3) + 2^(2/3
```

```
)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9
*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3)]/Sqrt[2]]}, {y[x] -> ArcCos[Sqrt[
-2 + (2*2^(1/3))/(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Ta
n[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3) + 2^(2/3)*(2 - 9*C
[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 +
18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3)]/Sqrt[2]]}, {y[x] -> -ArcCos[-Sqrt[((-I)*((
-2*I)*2^(1/3) - 2*2^(1/3)*Sqrt[3] - (4*I)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan
[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])
^(1/3) - I*2^(2/3)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] +
Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(2/3) + 2^(2/3)*Sqrt[3
]*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9
*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(2/3)))/(2 - 9*C[1]^2 - 18*C[1]*Tan[x]
- 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[
x]^2)])^(1/3)]/2]}, {y[x] -> ArcCos[-Sqrt[((-I)*((-2*I)*2^(1/3) - 2*2^(1/3)*Sqrt
[3] - (4*I)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])
^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3) - I*2^(2/3)*(2 - 9*C[1]
^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*
C[1]*Tan[x] + 9*Tan[x]^2)])^(2/3) + 2^(2/3)*Sqrt[3]*(2 - 9*C[1]^2 - 18*C[1]*Tan[
x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*T
an[x]^2)])^(2/3)))/(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] +
Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3)]/2]}, {y[x] -> -
ArcCos[Sqrt[((-I)*((-2*I)*2^(1/3) - 2*2^(1/3)*Sqrt[3] - (4*I)*(2 - 9*C[1]^2 - 18
*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Ta
n[x] + 9*Tan[x]^2)])^(1/3) - I*2^(2/3)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]
^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(2
/3) + 2^(2/3)*Sqrt[3]*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1]
 + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(2/3)))/(2 - 9*C[1]
^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*
C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3)]/2]}, {y[x] -> ArcCos[Sqrt[((-I)*((-2*I)*2^(1/
3) - 2*2^(1/3)*Sqrt[3] - (4*I)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*S
qrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3) - I*
2^(2/3)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(
-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(2/3) + 2^(2/3)*Sqrt[3]*(2 - 9*C[
1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 1
8*C[1]*Tan[x] + 9*Tan[x]^2)])^(2/3)))/(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^
2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/
3)]/2]}, {y[x] -> -ArcCos[-Sqrt[(I*((2*I)*2^(1/3) - 2*2^(1/3)*Sqrt[3] + (4*I)*(2
 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1
]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3) + I*2^(2/3)*(2 - 9*C[1]^2 - 18*C[1]*T
an[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] +
9*Tan[x]^2)])^(2/3) + 2^(2/3)*Sqrt[3]*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^
2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(2/
3)))/(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4
+ 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3)]/2]}, {y[x] -> ArcCos[-Sqrt[(I
*((2*I)*2^(1/3) - 2*2^(1/3)*Sqrt[3] + (4*I)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*T
an[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)
])^(1/3) + I*2^(2/3)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1]
```

```
+ Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(2/3) + 2^(2/3)*Sqrt
[3]*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 +
 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(2/3)))/(2 - 9*C[1]^2 - 18*C[1]*Tan[x
] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Ta
n[x]^2)])^(1/3)]/2]}, {y[x] -> -ArcCos[Sqrt[(I*((2*I)*2^(1/3) - 2*2^(1/3)*Sqrt[3
] + (4*I)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2
*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3) + I*2^(2/3)*(2 - 9*C[1]^2
 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[
1]*Tan[x] + 9*Tan[x]^2)])^(2/3) + 2^(2/3)*Sqrt[3]*(2 - 9*C[1]^2 - 18*C[1]*Tan[x]
 - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan
[x]^2)])^(2/3)))/(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Ta
n[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(1/3)]/2]}, {y[x] -> Arc
Cos[Sqrt[(I*((2*I)*2^(1/3) - 2*2^(1/3)*Sqrt[3] + (4*I)*(2 - 9*C[1]^2 - 18*C[1]*T
an[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] +
9*Tan[x]^2)])^(1/3) + I*2^(2/3)*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*
Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(2/3) + 2
^(2/3)*Sqrt[3]*(2 - 9*C[1]^2 - 18*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[
x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Tan[x] + 9*Tan[x]^2)])^(2/3)))/(2 - 9*C[1]^2 - 18
*C[1]*Tan[x] - 9*Tan[x]^2 + 3*Sqrt[(C[1] + Tan[x])^2*(-4 + 9*C[1]^2 + 18*C[1]*Ta
n[x] + 9*Tan[x]^2)])^(1/3)]/2]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = sec(x)^2*sec(y(x))^3, y(x),'implicit')
```

Maple raw output

```
1/24*(24*_C1*cos(x)+24*sin(x)-9*sin(x+y(x))+9*sin(x-y(x))-sin(3*y(x)+x)+sin(x-3*
y(x)))/cos(x) = 0
```

4.126 $y'(x) = a + b\sin(y(x))$

ODE

$$y'(x) = a + b\sin(y(x))$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 0.230122 (sec), leaf count = 52

$$\left\{\left\{y(x) \to 2\tan^{-1}\left(\frac{\sqrt{a^2-b^2}\tan\left(\frac{1}{2}\sqrt{a^2-b^2}(c_1+x)\right)-b}{a}\right)\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 55

$$\left\{1\left(-2\arctan\left(\frac{\tan(1/2\,y(x))\,a+b}{\sqrt{a^2-b^2}}\right)+\sqrt{a^2-b^2}(x+\_C1)\right)\frac{1}{\sqrt{a^2-b^2}}=0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a + b*Sin[y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*ArcTan[(-b + Sqrt[a^2 - b^2]*Tan[(Sqrt[a^2 - b^2]*(x + C[1]))/2])/a]
}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a+b*sin(y(x)), y(x),'implicit')
```

Maple raw output

```
1/(a^2-b^2)^(1/2)*(-2*arctan((tan(1/2*y(x))*a+b)/(a^2-b^2)^(1/2))+(a^2-b^2)^(1/2
)*(x+_C1)) = 0
```

4.127 $y'(x) = a + b\sin(Ax + By(x))$

ODE

$$y'(x) = a + b\sin(Ax + By(x))$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.780987 (sec), leaf count = 94

$$\left\{\left\{y(x) \to \frac{2\tan^{-1}\left(\frac{\sqrt{B^2(a^2-b^2)+2aAB+A^2}\tan\left(\frac{1}{2}(x-c_1)\sqrt{B^2(a^2-b^2)+2aAB+A^2}\right)-bB}{aB+A}\right)-Ax}{B}\right\}\right\}$$

Maple ✓
cpu = 0.072 (sec), leaf count = 85

$$\left\{x - 2\frac{1}{\sqrt{B^2a^2-b^2B^2+2ABa+A^2}}\arctan\left(\frac{(aB+A)\tan(1/2\,Ax+1/2\,By(x))+bB}{\sqrt{B^2a^2-b^2B^2+2ABa+A^2}}\right) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a + b*Sin[A*x + B*y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(A*x) + 2*ArcTan[(-(b*B) + Sqrt[A^2 + 2*a*A*B + (a^2 - b^2)*B^2]*Tan
[(Sqrt[A^2 + 2*a*A*B + (a^2 - b^2)*B^2]*(x - C[1]))/2])/(A + a*B)])/B}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a+b*sin(A*x+B*y(x)), y(x),'implicit')
```

Maple raw output

```
x-2/(B^2*a^2-B^2*b^2+2*A*B*a+A^2)^(1/2)*arctan(1/(B^2*a^2-B^2*b^2+2*A*B*a+A^2)^(
1/2)*((B*a+A)*tan(1/2*A*x+1/2*B*y(x))+b*B))-_C1 = 0
```

4.128 $y'(x) = \tan(y(x))(\cos(x)\sin(y(x)) + 1)$

ODE

$$y'(x) = \tan(y(x))(\cos(x)\sin(y(x)) + 1)$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.552714 (sec), leaf count = 53

$$\left\{\left\{y(x) \to \csc^{-1}\left(\frac{1}{2}\left(-2c_1e^{-x} - \sin(x) - \cos(x)\right)\right)\right\}, \left\{y(x) \to -\csc^{-1}\left(\frac{1}{2}\left(2c_1e^{-x} + \sin(x) + \cos(x)\right)\right)\right\}\right\}$$

Maple ✗
cpu = 4.932 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x) = (1+cos(x)*sin(y(x)))*tan(y(x)), y(x),'implicit')
```

Mathematica raw input

```
DSolve[y'[x] == (1 + Cos[x]*Sin[y[x]])*Tan[y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ArcCsc[((-2*C[1])/E^x - Cos[x] - Sin[x])/2]}, {y[x] -> -ArcCsc[((2*C[1
])/E^x + Cos[x] + Sin[x])/2]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (1+cos(x)*sin(y(x)))*tan(y(x)), y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x) = (1+cos(x)*sin(y(x)))*tan(y(x)), y(x),'implicit')
```

4.129 $y'(x) + \csc(2x)\sin(2y(x)) = 0$

ODE

$$y'(x) + \csc(2x)\sin(2y(x)) = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.183718 (sec), leaf count = 15

$$\{\{y(x) \to \cot^{-1}\left(e^{-2c_1}\tan(x)\right)\}\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 31

$$\{\ln(\csc(2x) - \cot(2x)) + \ln(\csc(2y(x)) - \cot(2y(x))) + \_C1 = 0\}$$

Mathematica raw input

```
DSolve[Csc[2*x]*Sin[2*y[x]] + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ArcCot[Tan[x]/E^(2*C[1])]}}
```

Maple raw input

```
dsolve(diff(y(x),x)+csc(2*x)*sin(2*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
ln(csc(2*x)-cot(2*x))+ln(csc(2*y(x))-cot(2*y(x)))+_C1 = 0
```

4.130 $f(x) + g(x)\tan(y(x)) + y'(x) = 0$

ODE

$$f(x) + g(x)\tan(y(x)) + y'(x) = 0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of Variable, new dependent variable

Mathematica ✗
cpu = 22.5539 (sec), leaf count = 0 , could not solve

```
DSolve[f[x] + g[x]*Tan[y[x]] + Derivative[1][y][x] == 0, y[x], x]
```

Maple ✗
cpu = 0.748 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x)+f(x)+g(x)*tan(y(x)) = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[f[x] + g[x]*Tan[y[x]] + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f[x] + g[x]*Tan[y[x]] + Derivative[1][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)+f(x)+g(x)*tan(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x)+f(x)+g(x)*tan(y(x)) = 0, y(x),'implicit')
```

4.131 $y'(x) = \sqrt{a + b\cos(y(x))}$

ODE

$$y'(x) = \sqrt{a + b\cos(y(x))}$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 0.115207 (sec), leaf count = 31

$$\left\{\left\{y(x) \to 2\text{am}\left(\frac{1}{2}\sqrt{a+b}(x+c_1)\,|\,\frac{2b}{a+b}\right)\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 21

$$\left\{x - \int^{y(x)} \frac{1}{\sqrt{a + b\cos\left(\_a\right)}} d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Sqrt[a + b*Cos[y[x]]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*JacobiAmplitude[(Sqrt[a + b]*(x + C[1]))/2, (2*b)/(a + b)]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = (a+b*cos(y(x)))^(1/2), y(x),'implicit')
```

Maple raw output

```
x-Intat(1/(a+b*cos(_a))^(1/2),_a = y(x))+_C1 = 0
```

4.132 $y'(x) = e^{y(x)} + x$

ODE

$$y'(x) = e^{y(x)} + x$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)]`]]

Book solution method
Series solution to $y'(x) = f(x, y(x))$, case $f(x, y)$ analytic

Mathematica ✓
cpu = 0.0545513 (sec), leaf count = 40

$$\left\{\left\{y(x) \to \frac{1}{2}\left(x^2 - 2\log\left(-c_1 - \sqrt{\frac{\pi}{2}}\text{erfi}\left(\frac{x}{\sqrt{2}}\right)\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.188 (sec), leaf count = 33

$$\left\{\_C1 - \frac{i}{2}\sqrt{\pi}\sqrt{2}Erf\left(\frac{i}{2}\sqrt{2}x\right) + \mathrm{e}^{-y(x)+\frac{x^2}{2}} = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == E^y[x] + x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2 - 2*Log[-C[1] - Sqrt[Pi/2]*Erfi[x/Sqrt[2]]])/2}}
```

Maple raw input

```
dsolve(diff(y(x),x) = x+exp(y(x)), y(x),'implicit')
```

Maple raw output

```
_C1-1/2*I*Pi^(1/2)*2^(1/2)*erf(1/2*I*2^(1/2)*x)+exp(-y(x)+1/2*x^2) = 0
```

4.133 $y'(x) = e^{y(x)+x}$

ODE

$$y'(x) = e^{y(x)+x}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00883313 (sec), leaf count = 18

$$\{\{y(x) \to -\log(-c_1 - e^x)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 12

$$\left\{e^x + e^{-y(x)} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == E^(x + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Log[-E^x - C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = exp(x+y(x)), y(x),'implicit')
```

Maple raw output

```
exp(x)+exp(-y(x))+_C1 = 0
```

4.134 $y'(x) = e^x\left(a + be^{-y(x)}\right)$

ODE

$$y'(x) = e^x\left(a + be^{-y(x)}\right)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0220513 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \log\left(\frac{e^{a(c_1+e^x)} - b}{a}\right)\right\}\right\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 32

$$\left\{e^x + \frac{\ln\left(e^{-y(x)}\right)}{a} - \frac{\ln\left(a + be^{-y(x)}\right)}{a} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == E^x*(a + b/E^y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> Log[(-b + E^(a*(E^x + C[1])))/a]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = exp(x)*(a+b*exp(-y(x))), y(x),'implicit')
```

Maple raw output

```
exp(x)+1/a*ln(exp(-y(x)))-1/a*ln(a+b*exp(-y(x)))+_C1 = 0
```

4.135 $y'(x) + y(x)\log(x)\log(y(x)) = 0$

ODE

$$y'(x) + y(x)\log(x)\log(y(x)) = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0168001 (sec), leaf count = 19

$$\left\{\left\{y(x) \to e^{x^{-x}e^{c_1+x}}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 16

$$\{x\ln(x) - x + \ln(\ln(y(x))) + \_C1 = 0\}$$

Mathematica raw input

```
DSolve[Log[x]*Log[y[x]]*y[x] + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(E^(x + C[1])/x^x)}}
```

Maple raw input

```
dsolve(diff(y(x),x)+y(x)*ln(x)*ln(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
x*ln(x)-x+ln(ln(y(x)))+_C1 = 0
```

4.136 $y'(x) = x^{m-1} y(x)^{1-n} f(ax^m + by(x)^n)$

ODE

$$y'(x) = x^{m-1} y(x)^{1-n} f(ax^m + by(x)^n)$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(y)]`]]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 221.018 (sec), leaf count = 191

$$\text{Solve}\left[c_1 = \int_1^{y(x)} -\frac{K[2]\left(bnf(bK[2]^n + ax^m) + am\right)\left(\int_1^x \frac{a^2 bm^2 nK[1]^{m-1} K[2]^{n-1} f'(aK[1]^m + bK[2]^n)}{(bnf(aK[1]^m + bK[2]^n) + am)^2}\, dK[1]\right) + amK[2]^n}{K[2]\left(bnf\left(bK[2]^n + ax^m\right) + am\right)}\, dK[2] -\right.$$

Maple ✓
cpu = 0.544 (sec), leaf count = 113

$$\left\{\frac{1}{m}\left(\int^{\frac{ax^m}{b}+(y(x))^n}\left(\left(\sqrt[n]{\frac{\_a\,b - am}{b}}\right)^{-n} n\left(\sqrt[m]{m}\right)^m (-\_a\,b + am)\, f\left(a\left(\sqrt[m]{m}\right)^m + b\left(\sqrt[n]{\frac{\_a\,b - am}{b}}\right)^n\right) - am^2\right)^{-1} d\_ab\right.\right.$$

Mathematica raw input

```
DSolve[y'[x] == x^(-1 + m)*f[a*x^m + b*y[x]^n]*y[x]^(1 - n),y[x],x]
```

Mathematica raw output

```
Solve[C[1] == Integrate[(a*m*f[a*K[1]^m + b*y[x]^n]*K[1]^(-1 + m))/(a*m + b*n*f[
a*K[1]^m + b*y[x]^n]), {K[1], 1, x}] + Integrate[-(((a*m + b*n*f[a*x^m + b*K[2]^
n])*Integrate[(a^2*b*m^2*n*K[1]^(-1 + m)*K[2]^(-1 + n)*Derivative[1][f][a*K[1]^m
 + b*K[2]^n])/(a*m + b*n*f[a*K[1]^m + b*K[2]^n])^2, {K[1], 1, x}]*K[2] + a*m*K[2
]^n)/((a*m + b*n*f[a*x^m + b*K[2]^n])*K[2])), {K[2], 1, y[x]}], y[x]]
```

Maple raw input

```
dsolve(diff(y(x),x) = x^(m-1)*y(x)^(1-n)*f(a*x^m+b*y(x)^n), y(x),'implicit')
```

Maple raw output

```
(Intat(1/((((_a*b-a*m)/b)^(1/n))^(-n)*n*(m^(1/m))^m*(-_a*b+a*m)*f(a*(m^(1/m))^m+
b*(((_a*b-a*m)/b)^(1/n))^n)-a*m^2),_a = 1/b*a*x^m+y(x)^n)*b*m^2-_C1*m+x^m)/m = 0
```

4.137 $y'(x) = af(y(x))$

ODE

$$y'(x) = af(y(x))$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 0.0654202 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{f(K[1])}\, dK[1]\&\right][ax + c_1]\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 21

$$\left\{x - \int^{y(x)} \frac{1}{af\left(\_a\right)} d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == a*f[y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Integrate[f[K[1]]^(-1), {K[1], 1, #1}] & ][a*x + C[1]]
}}
```

Maple raw input

```
dsolve(diff(y(x),x) = a*f(y(x)), y(x),'implicit')
```

Maple raw output

```
x-Intat(1/a/f(_a),_a = y(x))+_C1 = 0
```

4.138 $y'(x) = f(a + bx + cy(x))$

ODE

$$y'(x) = f(a + bx + cy(x))$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
Equation linear in the variables, $y'(x) = f(a + bx + cy(x))$

Mathematica ✓
cpu = 11.4208 (sec), leaf count = 126

$$\text{Solve}\left[c_1 = \int_1^{y(x)} -\frac{(cf(cK[2]+a+bx)+b)\int_1^x \frac{bc^2 f'(bK[1]+cK[2]+a)}{(cf(bK[1]+cK[2]+a)+b)^2}\,dK[1]+c}{cf(cK[2]+a+bx)+b}\,dK[2] + \int_1^x \frac{cf(bK[1]+a+cy(x))}{cf(bK[1]+a+cy(x))+b}\,dK\right.$$

Maple ✓
cpu = 0.032 (sec), leaf count = 35

$$\left\{-\int^{y(x)+\frac{bx}{c}} (f(\_a\,c+a)\,c+b)^{-1}\,d\_ac + x - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == f[a + b*x + c*y[x]],y[x],x]
```

Mathematica raw output

```
Solve[C[1] == Integrate[(c*f[a + b*K[1] + c*y[x]])/(b + c*f[a + b*K[1] + c*y[x]]
), {K[1], 1, x}] + Integrate[-((c + (b + c*f[a + b*x + c*K[2]])*Integrate[(b*c^2
*Derivative[1][f][a + b*K[1] + c*K[2]])/(b + c*f[a + b*K[1] + c*K[2]])^2, {K[1],
 1, x}])/(b + c*f[a + b*x + c*K[2]])), {K[2], 1, y[x]}], y[x]]
```

Maple raw input

```
dsolve(diff(y(x),x) = f(a+b*x+c*y(x)), y(x),'implicit')
```

Maple raw output

```
-Intat(1/(f(_a*c+a)*c+b),_a = y(x)+b/c*x)*c+x-_C1 = 0
```

4.139 $y'(x) = f(x)g(y(x))$

ODE

$$y'(x) = f(x)g(y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0899802 (sec), leaf count = 31

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{g(K[1])}\, dK[1]\&\right]\left[\int_1^x f(K[2])\, dK[2] + c_1\right]\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 20

$$\left\{\int f(x)\, \mathrm{d}x - \int^{y(x)} (g(\_a))^{-1}\, d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x] == f[x]*g[y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Integrate[g[K[1]]^(-1), {K[1], 1, #1}] & ][C[1] + Inte
grate[f[K[2]], {K[2], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x) = f(x)*g(y(x)), y(x),'implicit')
```

Maple raw output

```
Int(f(x),x)-Intat(1/g(_a),_a = y(x))+_C1 = 0
```

4.140 $y'(x) = \mathbf{Csx}(x) y(x) \sec(x) + \sec^2(x)$

ODE

$$y'(x) = \mathrm{Csx}(x) y(x) \sec(x) + \sec^2(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 2.76097 (sec), leaf count = 54

$$\left\{\left\{y(x) \to e^{\int_1^x \mathrm{Csx}(K[1]) \sec(K[1])\, dK[1]} \left(\int_1^x \sec^2(K[2]) e^{-\int_1^{K[2]} \mathrm{Csx}(K[1]) \sec(K[1])\, dK[1]}\, dK[2] + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.111 (sec), leaf count = 41

$$\left\{y(x) = \left(\int 2 \frac{1}{\cos(2x) + 1} \mathrm{e}^{-\int \frac{Csx(x)}{\cos(x)} \mathrm{d}x} \mathrm{d}x + \_C1\right) \mathrm{e}^{\int \frac{Csx(x)}{\cos(x)} \mathrm{d}x}\right\}$$

Mathematica raw input

```
DSolve[y'[x] == Sec[x]^2 + Csx[x]*Sec[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^Integrate[Csx[K[1]]*Sec[K[1]], {K[1], 1, x}]*(C[1] + Integrate[Sec[K
[2]]^2/E^Integrate[Csx[K[1]]*Sec[K[1]], {K[1], 1, K[2]}], {K[2], 1, x}])}}
```

Maple raw input

```
dsolve(diff(y(x),x) = sec(x)^2+y(x)*sec(x)*Csx(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (Int(2/(cos(2*x)+1)*exp(-Int(Csx(x)/cos(x),x)),x)+_C1)*exp(Int(Csx(x)/cos
(x),x))
```

4.141 $2y'(x) + 2\csc^2(x) = y(x)\csc(x)\sec(x) - y(x)^2\sec^2(x)$

ODE

$$2y'(x) + 2\csc^2(x) = y(x)\csc(x)\sec(x) - y(x)^2\sec^2(x)$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.476711 (sec), leaf count = 48

$$\left\{\left\{y(x) \to \frac{\cot(x)\left(c_1\sqrt{\cos(x)} + 2\sqrt[4]{\sin^2(x)}\right)}{c_1\sqrt{\cos(x)} + \sqrt[4]{\sin^2(x)}}\right\}\right\}$$

Maple ✓
cpu = 0.09 (sec), leaf count = 107

$$\left\{\int^{\frac{(\csc(x)\sec(x)+2\cot(x)+2\tan(x))y(x)}{2(\csc(x))^2}} (\csc(x)\sec(x) + 2\cot(x) + 2\tan(x))^2\left(2\left(\_a^2 - \_a/2 + 1/2\right)(\sec(x))^2(\csc(x))^2 - 4\sec\right.\right.$$

Mathematica raw input

```
DSolve[2*Csc[x]^2 + 2*y'[x] == Csc[x]*Sec[x]*y[x] - Sec[x]^2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Cot[x]*(C[1]*Sqrt[Cos[x]] + 2*(Sin[x]^2)^(1/4)))/(C[1]*Sqrt[Cos[x]] +
  (Sin[x]^2)^(1/4))}}
```

Maple raw input

```
dsolve(2*diff(y(x),x)+2*csc(x)^2 = y(x)*csc(x)*sec(x)-y(x)^2*sec(x)^2, y(x),'implicit')
```

Maple raw output

```
Intat((csc(x)*sec(x)+2*cot(x)+2*tan(x))^2/(2*(_a^2-1/2*_a+1/2)*sec(x)^2*csc(x)^2
-4*sec(x)*(cot(x)+tan(x))*(_a-1)*csc(x)-4*(cot(x)+tan(x))^2*(_a-1)),_a = 1/2/csc
(x)^2*(csc(x)*sec(x)+2*cot(x)+2*tan(x))*y(x))+1/2*ln(tan(x))+ln(sin(x))-ln(cos(x
))+_C1 = 0
```

4.142 $2y'(x) = 2\sin^2(y(x))\tan(y(x)) - x\sin(2y(x))$

ODE

$$2y'(x) = 2\sin^2(y(x))\tan(y(x)) - x\sin(2y(x))$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.361296 (sec), leaf count = 61

$$\left\{\left\{y(x) \to -\cot^{-1}\left(\sqrt{e^{x^2}\left(4c_1 - \sqrt{\pi}\text{erf}(x)\right)}\right)\right\}, \left\{y(x) \to \cot^{-1}\left(\sqrt{e^{x^2}\left(4c_1 - \sqrt{\pi}\text{erf}(x)\right)}\right)\right\}\right\}$$

Maple ✗
cpu = 39.009 (sec), leaf count = 0 , could not solve

```
dsolve(2*diff(y(x),x) = 2*sin(y(x))^2*tan(y(x))-x*sin(2*y(x)), y(x),'implicit')
```

Mathematica raw input

```
DSolve[2*y'[x] == -(x*Sin[2*y[x]]) + 2*Sin[y[x]]^2*Tan[y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ArcCot[Sqrt[E^x^2*(4*C[1] - Sqrt[Pi]*Erf[x])]]}, {y[x] -> ArcCot[Sqrt
[E^x^2*(4*C[1] - Sqrt[Pi]*Erf[x])]]}}
```

Maple raw input

```
dsolve(2*diff(y(x),x) = 2*sin(y(x))^2*tan(y(x))-x*sin(2*y(x)), y(x),'implicit')
```

Maple raw output

```
dsolve(2*diff(y(x),x) = 2*sin(y(x))^2*tan(y(x))-x*sin(2*y(x)), y(x),'implicit')
```

4.143 $ax + 2y'(x) = \sqrt{a^2x^2 - 4bx^2 - 4cy(x)}$

ODE

$$ax + 2y'(x) = \sqrt{a^2x^2 - 4bx^2 - 4cy(x)}$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
Homogeneous equation, isobaric equation

Mathematica ✗
cpu = 599.993 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.198 (sec), leaf count = 198

$$\left\{ \int_{\_b}^{x} 1 \left(-\_a + \sqrt{-4\,cy\,(x) + (a^2 - 4\,b)\,\_a^2} \right) \left(a\_a^2 - \_a \sqrt{-4\,cy\,(x) + (a^2 - 4\,b)\,\_a^2} + 4\,y(x) \right)^{-1} d\_a + \int^{y(x)} 2 \left(-ax^2 \right.$$

Mathematica raw input

```
DSolve[a*x + 2*y'[x] == Sqrt[a^2*x^2 - 4*b*x^2 - 4*c*y[x]],y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(2*diff(y(x),x)+a*x = (a^2*x^2-4*b*x^2-4*c*y(x))^(1/2), y(x),'implicit')
```

Maple raw output

```
Int((-a*_a+(-4*c*y(x)+(a^2-4*b)*_a^2)^(1/2))/(a*_a^2-_a*(-4*c*y(x)+(a^2-4*b)*_a^
2)^(1/2)+4*y(x)),_a = _b .. x)+Intat(2/(-a*x^2+x*((a^2-4*b)*x^2-4*_f*c)^(1/2)-4*
_f)-Int((-8*c*_f/((a^2-4*b)*_a^2-4*_f*c)^(1/2)+4*a*_a-4*((a^2-4*b)*_a^2-4*_f*c)^
(1/2))/(a*_a^2-_a*((a^2-4*b)*_a^2-4*_f*c)^(1/2)+4*_f)^2,_a = _b .. x),_f = y(x))
+_C1 = 0
```

4.144 $3y'(x) = \sqrt{x^2 - 3y(x)} + x$

ODE

$$3y'(x) = \sqrt{x^2 - 3y(x)} + x$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.144187 (sec), leaf count = 547

$$\{\{y(x) \to \text{Root}\left[3888\#1^6 - 1944\#1^5 x^2 + 243\#1^4 x^4 + 216\#1^3 e^{6c_1} - 378\#1^2 e^{6c_1} x^2 + 144\#1 e^{6c_1} x^4 - 16 e^{6c_1} x^6 + 3e^{12c_1} \&, 1$$

Maple ✓
cpu = 0.091 (sec), leaf count = 131

$$\left\{ -\frac{1}{y(x)} \left(\left(x - \sqrt{x^2 - 3y(x)} \right) \sqrt{2\sqrt{x^2 - 3y(x)} + x} + \sqrt{2\sqrt{x^2 - 3y(x)} - x} \sqrt{-x^2 + 4y(x)} y(x) \_C1 \left(x + \sqrt{x^2 - 3y(x)} \right. \right. \right.$$

Mathematica raw input

```
DSolve[3*y'[x] == x + Sqrt[x^2 - 3*y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[3*E^(12*C[1]) - 16*E^(6*C[1])*x^6 + 144*E^(6*C[1])*x^4*#1 - 378*E
^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 243*x^4*#1^4 - 1944*x^2*#1^5 + 3888*#
1^6 & , 1]}, {y[x] -> Root[3*E^(12*C[1]) - 16*E^(6*C[1])*x^6 + 144*E^(6*C[1])*x^
4*#1 - 378*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 243*x^4*#1^4 - 1944*x^2*#
1^5 + 3888*#1^6 & , 2]}, {y[x] -> Root[3*E^(12*C[1]) - 16*E^(6*C[1])*x^6 + 144*E
^(6*C[1])*x^4*#1 - 378*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 243*x^4*#1^4
- 1944*x^2*#1^5 + 3888*#1^6 & , 3]}, {y[x] -> Root[3*E^(12*C[1]) - 16*E^(6*C[1])
*x^6 + 144*E^(6*C[1])*x^4*#1 - 378*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 2
43*x^4*#1^4 - 1944*x^2*#1^5 + 3888*#1^6 & , 4]}, {y[x] -> Root[3*E^(12*C[1]) - 1
6*E^(6*C[1])*x^6 + 144*E^(6*C[1])*x^4*#1 - 378*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[
1])*#1^3 + 243*x^4*#1^4 - 1944*x^2*#1^5 + 3888*#1^6 & , 5]}, {y[x] -> Root[3*E^(
12*C[1]) - 16*E^(6*C[1])*x^6 + 144*E^(6*C[1])*x^4*#1 - 378*E^(6*C[1])*x^2*#1^2 +
 216*E^(6*C[1])*#1^3 + 243*x^4*#1^4 - 1944*x^2*#1^5 + 3888*#1^6 & , 6]}}
```

Maple raw input

```
dsolve(3*diff(y(x),x) = x+(x^2-3*y(x))^(1/2), y(x),'implicit')
```

Maple raw output

```
-1/(2*(x^2-3*y(x))^(1/2)-x)^(1/2)/(-x^2+4*y(x))^(1/2)*((x-(x^2-3*y(x))^(1/2))*(2
*(x^2-3*y(x))^(1/2)+x)^(1/2)+(2*(x^2-3*y(x))^(1/2)-x)^(1/2)*(-x^2+4*y(x))^(1/2)*
y(x)*_C1*(x+(x^2-3*y(x))^(1/2)))/(x+(x^2-3*y(x))^(1/2))/y(x) = 0
```

4.145 $xy'(x) = \sqrt{a^2 - x^2}$

ODE

$$xy'(x) = \sqrt{a^2 - x^2}$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Dependent variable missing

Mathematica ✓
cpu = 0.0293514 (sec), leaf count = 46

$$\left\{\left\{y(x) \to \sqrt{a^2 - x^2} - a \log\left(a\left(\sqrt{a^2 - x^2} + a\right)\right) + a \log(x) + c_1\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 56

$$\left\{y(x) = \sqrt{a^2 - x^2} - a^2 \ln\left(\frac{1}{x}\left(2\,a^2 + 2\sqrt{a^2}\sqrt{a^2 - x^2}\right)\right)\frac{1}{\sqrt{a^2}} + \_C1\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == Sqrt[a^2 - x^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[a^2 - x^2] + C[1] + a*Log[x] - a*Log[a*(a + Sqrt[a^2 - x^2])]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = (a^2-x^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
y(x) = (a^2-x^2)^(1/2)-a^2/(a^2)^(1/2)*ln((2*a^2+2*(a^2)^(1/2)*(a^2-x^2)^(1/2))/
x)+_C1
```

4.146 $xy'(x) + y(x) + x = 0$

ODE

$$xy'(x) + y(x) + x = 0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00348525 (sec), leaf count = 17

$$\left\{\left\{y(x) \to \frac{c_1}{x} - \frac{x}{2}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 13

$$\left\{y(x) = -\frac{x}{2} + \frac{\_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[x + y[x] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x/2 + C[1]/x}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+x+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2*x+1/x*_C1
```

4.147 $x^2 + xy'(x) - y(x) = 0$

ODE

$$x^2 + xy'(x) - y(x) = 0$$

ODE Classification

[_linear]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.00314319 (sec), leaf count = 13

$$\{\{y(x) \to x(c_1 - x)\}\}$$

Maple ✓
cpu = 0.004 (sec), leaf count = 11

$$\{y(x) = (-x + \_C1)\, x\}$$

Mathematica raw input

```
DSolve[x^2 - y[x] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(-x + C[1])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+x^2-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-x+_C1)*x
```

4.148 $xy'(x) = x^3 - y(x)$

ODE

$$xy'(x) = x^3 - y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00347406 (sec), leaf count = 19

$$\left\{\left\{y(x) \to \frac{c_1}{x} + \frac{x^3}{4}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 15

$$\left\{y(x) = \frac{1}{x}\left(\frac{x^4}{4} + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == x^3 - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^3/4 + C[1]/x}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = x^3-y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (1/4*x^4+_C1)/x
```

4.149 $xy'(x) = x^3 + y(x) + 1$

ODE

$$xy'(x) = x^3 + y(x) + 1$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00428841 (sec), leaf count = 18

$$\left\{\left\{y(x) \to c_1 x + \frac{x^3}{2} - 1\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 14

$$\left\{y(x) = \frac{x^3}{2} - 1 + x\_C1\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == 1 + x^3 + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 + x^3/2 + x*C[1]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = 1+x^3+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x^3-1+x*_C1
```

4.150 $xy'(x) = x^m + y(x)$

ODE

$$xy'(x) = x^m + y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0074508 (sec), leaf count = 19

$$\left\{\left\{y(x) \to c_1 x + \frac{x^m}{m-1}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 17

$$\left\{y(x) = \frac{x^m}{m-1} + x\_C1\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == x^m + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^m/(-1 + m) + x*C[1]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = x^m+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/(m-1)*x^m+x*_C1
```

4.151 $xy'(x) = x\sin(x) - y(x)$

ODE

$$xy'(x) = x\sin(x) - y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0119053 (sec), leaf count = 19

$$\left\{\left\{y(x) \to \frac{c_1 + \sin(x) - x\cos(x)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 17

$$\left\{y(x) = \frac{\sin(x) - x\cos(x) + \_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == x*Sin[x] - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] - x*Cos[x] + Sin[x])/x}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = x*sin(x)-y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (sin(x)-x*cos(x)+_C1)/x
```

4.152 $xy'(x) = x^2 \sin(x) + y(x)$

ODE

$$xy'(x) = x^2 \sin(x) + y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0101323 (sec), leaf count = 14

$$\{\{y(x) \to x(c_1 - \cos(x))\}\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 12

$$\{y(x) = x(-\cos(x) + \_C1)\}$$

Mathematica raw input

```
DSolve[x*y'[x] == x^2*Sin[x] + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[1] - Cos[x])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = x^2*sin(x)+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = x*(-cos(x)+_C1)
```

4.153 $xy'(x) = x^n \log(x) - y(x)$

ODE

$$xy'(x) = x^n \log(x) - y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0206706 (sec), leaf count = 29

$$\left\{\left\{y(x) \to \frac{c_1}{x} + \frac{x^n((n+1)\log(x) - 1)}{(n+1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 31

$$\left\{y(x) = \frac{x^n \ln(x)}{n+1} - \frac{x^n}{(n+1)^2} + \frac{\_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == x^n*Log[x] - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/x + (x^n*(-1 + (1 + n)*Log[x]))/(1 + n)^2}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = x^n*ln(x)-y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/(n+1)*ln(x)*x^n-x^n/(n+1)^2+1/x*_C1
```

4.154 $xy'(x) = \sin(x) - 2y(x)$

ODE

$$xy'(x) = \sin(x) - 2y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0106506 (sec), leaf count = 19

$$\left\{\left\{y(x) \to \frac{c_1 + \sin(x) - x\cos(x)}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 17

$$\left\{y(x) = \frac{\sin(x) - x\cos(x) + \_C1}{x^2}\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == Sin[x] - 2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] - x*Cos[x] + Sin[x])/x^2}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = sin(x)-2*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (sin(x)-x*cos(x)+_C1)/x^2
```

4.155 $xy'(x) = ay(x)$

ODE

$$xy'(x) = ay(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00302576 (sec), leaf count = 11

$$\{\{y(x) \to c_1 x^a\}\}$$

Maple ✓
cpu = 0.004 (sec), leaf count = 9

$$\{y(x) = \_C1\, x^a\}$$

Mathematica raw input

```
DSolve[x*y'[x] == a*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^a*C[1]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = a*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^a
```

4.156 $xy'(x) = ay(x) + x + 1$

ODE

$$xy'(x) = ay(x) + x + 1$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0149854 (sec), leaf count = 26

$$\left\{\left\{y(x) \to c_1 x^a + \frac{x}{1-a} - \frac{1}{a}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 31

$$\left\{y(x) = \left(-\frac{x^{-a}(ax+a-1)}{a\,(a-1)} + \_C1\right) x^a\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == 1 + x + a*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -a^(-1) + x/(1 - a) + x^a*C[1]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = 1+x+a*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-x^(-a)*(a*x+a-1)/a/(a-1)+_C1)*x^a
```

4.157 $xy'(x) = ax + by(x)$

ODE

$$xy'(x) = ax + by(x)$$

ODE Classification

[_linear]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.00769079 (sec), leaf count = 22

$$\left\{\left\{y(x) \to \frac{ax}{1-b} + c_1 x^b\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 19

$$\left\{y(x) = -\frac{ax}{-1+b} + x^b\_C1\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == a*x + b*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a*x)/(1 - b) + x^b*C[1]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = a*x+b*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -a/(-1+b)*x+x^b*_C1
```

4.158 $xy'(x) = ax^2 + by(x)$

ODE

$$xy'(x) = ax^2 + by(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00881329 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \frac{ax^2}{2-b} + c_1 x^b\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 21

$$\left\{y(x) = -\frac{ax^2}{-2+b} + x^b \_C1\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == a*x^2 + b*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a*x^2)/(2 - b) + x^b*C[1]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = a*x^2+b*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -1/(-2+b)*a*x^2+x^b*_C1
```

4.159 $xy'(x) = a + bx^n + cy(x)$

ODE

$$xy'(x) = a + bx^n + cy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0281479 (sec), leaf count = 31

$$\left\{\left\{y(x) \to -\frac{a}{c} - \frac{bx^n}{c-n} + c_1 x^c\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 28

$$\left\{y(x) = \frac{bx^n}{-c+n} - \frac{a}{c} + x^c\_C1\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == a + b*x^n + c*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(a/c) - (b*x^n)/(c - n) + x^c*C[1]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = a+b*x^n+c*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = b/(-c+n)*x^n-1/c*a+x^c*_C1
```

4.160 $xy'(x) + (3 - x)y(x) + 2 = 0$

ODE

$$xy'(x) + (3 - x)y(x) + 2 = 0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00871058 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{c_1 e^x + 2x^2 + 4x + 4}{x^3}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 22

$$\left\{y(x) = \frac{e^x\_C1 + 2\,x^2 + 4\,x + 4}{x^3}\right\}$$

Mathematica raw input

```
DSolve[2 + (3 - x)*y[x] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (4 + 4*x + 2*x^2 + E^x*C[1])/x^3}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+2+(3-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (exp(x)*_C1+2*x^2+4*x+4)/x^3
```

4.161 $(ax+2)y(x)+xy'(x)+x=0$

ODE

$$(ax+2)y(x)+xy'(x)+x=0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0121552 (sec), leaf count = 37

$$\left\{\left\{y(x)\to \frac{c_1 e^{-ax}-\frac{a^2x^2-2ax+2}{a^3}}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 36

$$\left\{y(x)=-a^{-1}+2\,\frac{1}{a^2x}-2\,\frac{1}{a^3x^2}+\frac{\mathrm{e}^{-ax}\_C1}{x^2}\right\}$$

Mathematica raw input

```
DSolve[x + (2 + a*x)*y[x] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-((2 - 2*a*x + a^2*x^2)/a^3) + C[1]/E^(a*x))/x^2}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+x+(a*x+2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/a+2/a^2/x-2/a^3/x^2+exp(-a*x)/x^2*_C1
```

4.162 $y(x)(a+bx)+xy'(x)=0$

ODE

$$y(x)(a+bx)+xy'(x)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00612063 (sec), leaf count = 19

$$\{\{y(x)\to c_1 x^{-a}e^{-bx}\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 16

$$\{y(x)=\_C1\,\mathrm{e}^{-bx}x^{-a}\}$$

Mathematica raw input

```
DSolve[(a + b*x)*y[x] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/(E^(b*x)*x^a)}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+(b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-b*x)*x^(-a)
```

4.163 $xy'(x) = x^3 + (1 - 2x^2)\, y(x)$

ODE

$$xy'(x) = x^3 + (1 - 2x^2)\, y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00817173 (sec), leaf count = 21

$$\left\{\left\{y(x) \to x\left(c_1 e^{-x^2} + \frac{1}{2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 17

$$\left\{y(x) = \frac{x}{2} + \mathrm{e}^{-x^2} x\_C1\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == x^3 + (1 - 2*x^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(1/2 + C[1]/E^x^2)}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = x^3+(-2*x^2+1)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x+exp(-x^2)*x*_C1
```

4.164 $xy'(x) = ax - (1 - bx^2)\, y(x)$

ODE

$$xy'(x) = ax - (1 - bx^2)\, y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0093403 (sec), leaf count = 30

$$\left\{\left\{y(x) \to \frac{bc_1 e^{\frac{bx^2}{2}} - a}{bx}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 25

$$\left\{y(x) = \frac{1}{bx}\left(\mathrm{e}^{\frac{bx^2}{2}} \_C1\, b - a\right)\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == a*x - (1 - b*x^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-a + b*E^((b*x^2)/2)*C[1])/(b*x)}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = a*x-(-b*x^2+1)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (exp(1/2*b*x^2)*_C1*b-a)/b/x
```

4.165 $(2-ax^2)\,y(x)+xy'(x)+x=0$

ODE

$$(2-ax^2)\,y(x)+xy'(x)+x=0$$

ODE Classification

[_linear]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0365667 (sec), leaf count = 70

$$\left\{\left\{y(x)\to \frac{-\frac{\sqrt{2\pi}e^{\frac{ax^2}{2}}\operatorname{erf}\left(\frac{\sqrt{a}x}{\sqrt{2}}\right)}{a^{3/2}}+2c_1e^{\frac{ax^2}{2}}+\frac{2x}{a}}{2x^2}\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 50

$$\left\{y(x)=\frac{1}{x^2}\left(\frac{x}{a}\mathrm{e}^{-\frac{ax^2}{2}}-\frac{\sqrt{\pi}\sqrt{2}}{2}Erf\left(\frac{\sqrt{2}x}{2}\sqrt{a}\right)a^{-\frac{3}{2}}+\_C1\right)\mathrm{e}^{\frac{ax^2}{2}}\right\}$$

Mathematica raw input

```
DSolve[x + (2 - a*x^2)*y[x] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((2*x)/a + 2*E^((a*x^2)/2)*C[1] - (E^((a*x^2)/2)*Sqrt[2*Pi]*Erf[(Sqrt[
a]*x)/Sqrt[2]])/a^(3/2))/(2*x^2)}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+x+(-a*x^2+2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (exp(-1/2*a*x^2)*x/a-1/2/a^(3/2)*Pi^(1/2)*2^(1/2)*erf(1/2*2^(1/2)*a^(1/2)
*x)+_C1)*exp(1/2*a*x^2)/x^2
```

4.166 $x^2 + xy'(x) + y(x)^2 = 0$

ODE

$$x^2 + xy'(x) + y(x)^2 = 0$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Special cases

Mathematica ✓
cpu = 0.013271 (sec), leaf count = 30

$$\left\{\left\{y(x) \to -\frac{x(c_1 J_1(x) + Y_1(x))}{c_1 J_0(x) + Y_0(x)}\right\}\right\}$$

Maple ✓
cpu = 0.087 (sec), leaf count = 27

$$\left\{y(x) = -\frac{(\_C1\, Y_1(x) + J_1(x))\, x}{\_C1\, Y_0(x) + J_0(x)}\right\}$$

Mathematica raw input

```
DSolve[x^2 + y[x]^2 + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x*(BesselY[1, x] + BesselJ[1, x]*C[1]))/(BesselY[0, x] + BesselJ[0,
  x]*C[1]))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+x^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -(_C1*BesselY(1,x)+BesselJ(1,x))*x/(_C1*BesselY(0,x)+BesselJ(0,x))
```

4.167 $xy'(x) = x^2 + y(x)(y(x) + 1)$

ODE

$$xy'(x) = x^2 + y(x)(y(x) + 1)$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Riccati]

Book solution method
Riccati ODE, Special cases

Mathematica ✓
cpu = 0.010818 (sec), leaf count = 12

$$\{\{y(x) \to x \tan(c_1 + x)\}\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 17

$$\left\{\arctan\left(\frac{y(x)}{x}\right) - x - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == x^2 + y[x]*(1 + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*Tan[x + C[1]]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = x^2+y(x)*(1+y(x)), y(x),'implicit')
```

Maple raw output

```
arctan(y(x)/x)-x-_C1 = 0
```

4.168 $xy'(x) + y(x)^2 - y(x) = x^{2/3}$

ODE

$$xy'(x) + y(x)^2 - y(x) = x^{2/3}$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Special cases

Mathematica ✓
cpu = 0.01117 (sec), leaf count = 84

$$\left\{\left\{y(x) \to \frac{3x^{2/3}\left(c_1 \cosh\left(3\sqrt[3]{x}\right) - i \sinh\left(3\sqrt[3]{x}\right)\right)}{\left(3c_1\sqrt[3]{x} + i\right)\sinh\left(3\sqrt[3]{x}\right) + \left(-c_1 - 3i\sqrt[3]{x}\right)\cosh\left(3\sqrt[3]{x}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.35 (sec), leaf count = 86

$$\left\{y(x) = 1\left(\_C1\, \mathrm{e}^{3\,\sqrt[3]{x}}\left|3\sqrt[3]{x} - 1\right| + \_C1\, \mathrm{e}^{3\,\sqrt[3]{x}}|1| - 3\,\mathrm{e}^{-3\,\sqrt[3]{x}}\sqrt[3]{x}\right)\sqrt[3]{x}\left(\_C1\, \mathrm{e}^{3\,\sqrt[3]{x}}\left|3\sqrt[3]{x} - 1\right| + \mathrm{e}^{-3\,\sqrt[3]{x}}\left(3\sqrt[3]{x} + 1\right)\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[-y[x] + y[x]^2 + x*y'[x] == x^(2/3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*x^(2/3)*(C[1]*Cosh[3*x^(1/3)] - I*Sinh[3*x^(1/3)]))/(((-3*I)*x^(1/3
) - C[1])*Cosh[3*x^(1/3)] + (I + 3*x^(1/3)*C[1])*Sinh[3*x^(1/3)])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)-y(x)+y(x)^2 = x^(2/3), y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*exp(3*x^(1/3))*abs(3*x^(1/3)-1)+_C1*exp(3*x^(1/3))*abs(1,3*x^(1/3)-1
)-3*exp(-3*x^(1/3))*x^(1/3))*x^(1/3)/(_C1*exp(3*x^(1/3))*abs(3*x^(1/3)-1)+exp(-3
*x^(1/3))*(3*x^(1/3)+1))
```

4.169 $xy'(x) = a + by(x)^2$

ODE

$$xy'(x) = a + by(x)^2$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0210846 (sec), leaf count = 33

$$\left\{\left\{y(x) \to \frac{\sqrt{a}\tan\left(\sqrt{a}\sqrt{b}(c_1 + \log(x))\right)}{\sqrt{b}}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 24

$$\left\{\ln(x) - 1\arctan\left(by(x)\frac{1}{\sqrt{ab}}\right)\frac{1}{\sqrt{ab}} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == a + b*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[a]*Tan[Sqrt[a]*Sqrt[b]*(C[1] + Log[x])])/Sqrt[b]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = a+b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-1/(a*b)^(1/2)*arctan(y(x)*b/(a*b)^(1/2))+_C1 = 0
```

4.170 $xy'(x) = ax^2 + by(x)^2 + y(x)$

ODE

$$xy'(x) = ax^2 + by(x)^2 + y(x)$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Riccati]

Book solution method
Riccati ODE, Special cases

Mathematica ✓
cpu = 0.0197641 (sec), leaf count = 33

$$\left\{\left\{y(x) \to \frac{\sqrt{a}x \tan\left(\sqrt{a}\sqrt{b}(c_1 + x)\right)}{\sqrt{b}}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 29

$$\left\{1 \arctan\left(\frac{by(x)}{x}\frac{1}{\sqrt{ab}}\right)\frac{1}{\sqrt{ab}} - x - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == a*x^2 + y[x] + b*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[a]*x*Tan[Sqrt[a]*Sqrt[b]*(x + C[1])])/Sqrt[b]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = a*x^2+y(x)+b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
1/(a*b)^(1/2)*arctan(1/x*y(x)*b/(a*b)^(1/2))-x-_C1 = 0
```

4.171 $xy'(x) = ax^{2n} + y(x)(by(x) + n)$

ODE

$$xy'(x) = ax^{2n} + y(x)(by(x) + n)$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Special cases

Mathematica ✓
cpu = 0.0190239 (sec), leaf count = 103

$$\left\{\left\{y(x) \to \frac{\sqrt{a}x^n\left(c_1 \sin\left(\frac{\sqrt{a}\sqrt{b}x^n}{n}\right) - \cos\left(\frac{\sqrt{a}\sqrt{b}x^n}{n}\right)\right)}{\sqrt{b}\left(c_1 \cos\left(\frac{\sqrt{a}\sqrt{b}x^n}{n}\right) + \sin\left(\frac{\sqrt{a}\sqrt{b}x^n}{n}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 34

$$\left\{\arctan\left(x^{-n}y(x)\sqrt{b}\frac{1}{\sqrt{a}}\right) - \frac{x^n}{n}\sqrt{b}\sqrt{a} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == a*x^(2*n) + y[x]*(n + b*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[a]*x^n*(-Cos[(Sqrt[a]*Sqrt[b]*x^n)/n] + C[1]*Sin[(Sqrt[a]*Sqrt[b
]*x^n)/n]))/(Sqrt[b]*(C[1]*Cos[(Sqrt[a]*Sqrt[b]*x^n)/n] + Sin[(Sqrt[a]*Sqrt[b]*x
^n)/n]))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = a*x^(2*n)+(n+b*y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
arctan(b^(1/2)/a^(1/2)*x^(-n)*y(x))-x^n/n*b^(1/2)*a^(1/2)+_C1 = 0
```

4.172 $xy'(x) = ax^n + by(x) + cy(x)^2$

ODE

$$xy'(x) = ax^n + by(x) + cy(x)^2$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Special cases

Mathematica ✓
cpu = 0.0147045 (sec), leaf count = 229

$$\left\{\left\{y(x) \to \frac{\sqrt{a}\sqrt{c}x^{n/2}\left(c_1\left(J_{1-\frac{b}{n}}\left(\frac{2\sqrt{a}\sqrt{c}x^{n/2}}{n}\right) - J_{-\frac{b+n}{n}}\left(\frac{2\sqrt{a}\sqrt{c}x^{n/2}}{n}\right)\right) - 2J_{\frac{b}{n}-1}\left(\frac{2\sqrt{a}\sqrt{c}x^{n/2}}{n}\right)\right) - bc_1 J_{-\frac{b}{n}}\left(\frac{2\sqrt{a}\sqrt{c}x^{n/2}}{n}\right)}{2c\left(J_{\frac{b}{n}}\left(\frac{2\sqrt{a}\sqrt{c}x^{n/2}}{n}\right) + c_1 J_{-\frac{b}{n}}\left(\frac{2\sqrt{a}\sqrt{c}x^{n/2}}{n}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.114 (sec), leaf count = 164

$$\left\{y(x) = \frac{1}{c}\left(\sqrt{ca}\left(Y_{\frac{b+n}{n}}\left(2\frac{\sqrt{ca}x^{n/2}}{n}\right)\_C1 + J_{\frac{b+n}{n}}\left(2\frac{\sqrt{ca}x^{n/2}}{n}\right)\right)x^{\frac{n}{2}} - b\left(Y_{\frac{b}{n}}\left(2\frac{\sqrt{ca}x^{n/2}}{n}\right)\_C1 + J_{\frac{b}{n}}\left(2\frac{\sqrt{ca}x^{n/2}}{n}\right)\right)\right)\left(\right.$$

Mathematica raw input

```
DSolve[x*y'[x] == a*x^n + b*y[x] + c*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(b*BesselJ[-(b/n), (2*Sqrt[a]*Sqrt[c]*x^(n/2))/n]*C[1]) + Sqrt[a]*Sq
rt[c]*x^(n/2)*(-2*BesselJ[-1 + b/n, (2*Sqrt[a]*Sqrt[c]*x^(n/2))/n] + (BesselJ[1
- b/n, (2*Sqrt[a]*Sqrt[c]*x^(n/2))/n] - BesselJ[-((b + n)/n), (2*Sqrt[a]*Sqrt[c]
*x^(n/2))/n])*C[1]))/(2*c*(BesselJ[b/n, (2*Sqrt[a]*Sqrt[c]*x^(n/2))/n] + BesselJ
[-(b/n), (2*Sqrt[a]*Sqrt[c]*x^(n/2))/n]*C[1]))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = a*x^n+b*y(x)+c*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = ((c*a)^(1/2)*(BesselY((b+n)/n,2*(c*a)^(1/2)*x^(1/2*n)/n)*_C1+BesselJ((b+n
)/n,2*(c*a)^(1/2)*x^(1/2*n)/n))*x^(1/2*n)-b*(BesselY(b/n,2*(c*a)^(1/2)*x^(1/2*n)
/n)*_C1+BesselJ(b/n,2*(c*a)^(1/2)*x^(1/2*n)/n)))/c/(BesselY(b/n,2*(c*a)^(1/2)*x^
(1/2*n)/n)*_C1+BesselJ(b/n,2*(c*a)^(1/2)*x^(1/2*n)/n))
```

4.173 $xy'(x) = ax^n + by(x) + cy(x)^2 + k$

ODE

$$xy'(x) = ax^n + by(x) + cy(x)^2 + k$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.227298 (sec), leaf count = 589

$$\left\{\left\{y(x) \to -\frac{-\sqrt{a}\sqrt{c}c_1 x^n \Gamma\left(1-\frac{\sqrt{b^2-4ck}}{n}\right) J_{1-\frac{\sqrt{b^2-4ck}}{n}}\left(\frac{2\sqrt{a}\sqrt{c}\sqrt{x^n}}{n}\right) + \sqrt{a}\sqrt{c}c_1 x^n \Gamma\left(1-\frac{\sqrt{b^2-4ck}}{n}\right) J_{-\frac{n+\sqrt{b^2-4ck}}{n}}\left(\frac{2\sqrt{a}\sqrt{c}\sqrt{x^n}}{n}\right)}{2c\right.\right.$$

Maple ✓
cpu = 0.143 (sec), leaf count = 231

$$\left\{y(x) = \frac{1}{2c}\left(2\sqrt{ca}\left(Y_{\frac{\sqrt{b^2-4ck}+n}{n}}\left(2\frac{\sqrt{ca}x^{n/2}}{n}\right)\_C1 + J_{\frac{\sqrt{b^2-4ck}+n}{n}}\left(2\frac{\sqrt{ca}x^{n/2}}{n}\right)\right)x^{n/2} - \left(Y_{\frac{1}{n}\sqrt{b^2-4ck}}\left(2\frac{\sqrt{ca}x^{n/2}}{n}\right)\_C1 +\right.\right.$$

Mathematica raw input

```
DSolve[x*y'[x] == k + a*x^n + b*y[x] + c*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(-(Sqrt[a]*Sqrt[c]*x^n*BesselJ[1 - Sqrt[b^2 - 4*c*k]/n, (2*Sqrt[a]*Sq
rt[c]*Sqrt[x^n])/n]*C[1]*Gamma[1 - Sqrt[b^2 - 4*c*k]/n]) + b*Sqrt[x^n]*BesselJ[-
(Sqrt[b^2 - 4*c*k]/n), (2*Sqrt[a]*Sqrt[c]*Sqrt[x^n])/n]*C[1]*Gamma[1 - Sqrt[b^2
- 4*c*k]/n] + Sqrt[a]*Sqrt[c]*x^n*BesselJ[-((Sqrt[b^2 - 4*c*k] + n)/n), (2*Sqrt[
a]*Sqrt[c]*Sqrt[x^n])/n]*C[1]*Gamma[1 - Sqrt[b^2 - 4*c*k]/n] + Sqrt[a]*Sqrt[c]*x
^n*BesselJ[-1 + Sqrt[b^2 - 4*c*k]/n, (2*Sqrt[a]*Sqrt[c]*Sqrt[x^n])/n]*Gamma[(Sqr
t[b^2 - 4*c*k] + n)/n] + b*Sqrt[x^n]*BesselJ[Sqrt[b^2 - 4*c*k]/n, (2*Sqrt[a]*Sqr
t[c]*Sqrt[x^n])/n]*Gamma[(Sqrt[b^2 - 4*c*k] + n)/n] - Sqrt[a]*Sqrt[c]*x^n*Bessel
J[(Sqrt[b^2 - 4*c*k] + n)/n, (2*Sqrt[a]*Sqrt[c]*Sqrt[x^n])/n]*Gamma[(Sqrt[b^2 -
4*c*k] + n)/n])/(2*c*Sqrt[x^n]*(BesselJ[-(Sqrt[b^2 - 4*c*k]/n), (2*Sqrt[a]*Sqrt[
c]*Sqrt[x^n])/n]*C[1]*Gamma[1 - Sqrt[b^2 - 4*c*k]/n] + BesselJ[Sqrt[b^2 - 4*c*k]
/n, (2*Sqrt[a]*Sqrt[c]*Sqrt[x^n])/n]*Gamma[(Sqrt[b^2 - 4*c*k] + n)/n]))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = k+a*x^n+b*y(x)+c*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*(2*(c*a)^(1/2)*(BesselY(((b^2-4*c*k)^(1/2)+n)/n,2*(c*a)^(1/2)*x^(1/2*
n)/n)*_C1+BesselJ(((b^2-4*c*k)^(1/2)+n)/n,2*(c*a)^(1/2)*x^(1/2*n)/n))*x^(1/2*n)-
(BesselY((b^2-4*c*k)^(1/2)/n,2*(c*a)^(1/2)*x^(1/2*n)/n)*_C1+BesselJ((b^2-4*c*k)^
(1/2)/n,2*(c*a)^(1/2)*x^(1/2*n)/n))*((b^2-4*c*k)^(1/2)+b))/c/(BesselY((b^2-4*c*k
)^(1/2)/n,2*(c*a)^(1/2)*x^(1/2*n)/n)*_C1+BesselJ((b^2-4*c*k)^(1/2)/n,2*(c*a)^(1/
2)*x^(1/2*n)/n))
```

4.174 $a + xy'(x) + xy(x)^2 = 0$

ODE

$$a + xy'(x) + xy(x)^2 = 0$$

ODE Classification

[_rational, [_Riccati, _special]]

Book solution method
Riccati ODE, Main form

Mathematica ✓
cpu = 0.00663421 (sec), leaf count = 133

$$\left\{\left\{y(x) \to \frac{i\sqrt{-a}(c_1-2)\sqrt{x}J_0\left(2i\sqrt{-a}\sqrt{x}\right) + c_1\left(J_1\left(2i\sqrt{-a}\sqrt{x}\right) - i\sqrt{-a}\sqrt{x}J_2\left(2i\sqrt{-a}\sqrt{x}\right)\right)}{2\left(c_1-1\right)xJ_1\left(2i\sqrt{-a}\sqrt{x}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.081 (sec), leaf count = 59

$$\left\{y(x) = 1\sqrt{a}\left(J_0\left(2\sqrt{a}\sqrt{x}\right)\_C1 + Y_0\left(2\sqrt{a}\sqrt{x}\right)\right)\frac{1}{\sqrt{x}}\left(\_C1\,J_1\left(2\sqrt{a}\sqrt{x}\right) + Y_1\left(2\sqrt{a}\sqrt{x}\right)\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[a + x*y[x]^2 + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (I*Sqrt[-a]*Sqrt[x]*BesselJ[0, (2*I)*Sqrt[-a]*Sqrt[x]]*(-2 + C[1]) + (
BesselJ[1, (2*I)*Sqrt[-a]*Sqrt[x]] - I*Sqrt[-a]*Sqrt[x]*BesselJ[2, (2*I)*Sqrt[-a
]*Sqrt[x]])*C[1])/(2*x*BesselJ[1, (2*I)*Sqrt[-a]*Sqrt[x]]*(-1 + C[1]))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+a+x*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = a^(1/2)*(BesselJ(0,2*a^(1/2)*x^(1/2))*_C1+BesselY(0,2*a^(1/2)*x^(1/2)))/x
^(1/2)/(_C1*BesselJ(1,2*a^(1/2)*x^(1/2))+BesselY(1,2*a^(1/2)*x^(1/2)))
```

4.175 $xy'(x) + y(x)(1 - xy(x)) = 0$

ODE

$$xy'(x) + y(x)(1 - xy(x)) = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00701563 (sec), leaf count = 17

$$\left\{\left\{y(x) \to \frac{1}{c_1 x - x \log(x)}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 17

$$\left\{(y(x))^{-1} - (-\ln(x) + \_C1)\, x = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 - x*y[x]) + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*C[1] - x*Log[x])^(-1)}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+(1-x*y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/y(x)-(-ln(x)+_C1)*x = 0
```

4.176 $xy'(x) = y(x)(1 - xy(x))$

ODE

$$xy'(x) = y(x)(1 - xy(x))$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00669308 (sec), leaf count = 18

$$\left\{\left\{y(x) \to \frac{2x}{2c_1 + x^2}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 17

$$\left\{(y(x))^{-1} - \frac{x}{2} - \frac{\_C1}{x} = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == y[x]*(1 - x*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x)/(x^2 + 2*C[1])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = (1-x*y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
1/y(x)-1/2*x-1/x*_C1 = 0
```

4.177 $xy'(x) = y(x)(xy(x)+1)$

ODE

$$xy'(x) = y(x)(xy(x)+1)$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00687323 (sec), leaf count = 18

$$\left\{\left\{y(x) \to -\frac{2x}{x^2 - 2c_1}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 17

$$\left\{(y(x))^{-1} + \frac{x}{2} - \frac{\_C1}{x} = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == y[x]*(1 + x*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*x)/(x^2 - 2*C[1])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = (1+x*y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
1/y(x)+1/2*x-1/x*_C1 = 0
```

4.178 $xy'(x) = ax^3 y(x)(1 - xy(x))$

ODE

$$xy'(x) = ax^3 y(x)(1 - xy(x))$$

ODE Classification

[_Bernoulli]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0495087 (sec), leaf count = 76

$$\left\{\left\{y(x) \to \frac{3e^{\frac{ax^3}{3}} \sqrt[3]{-ax^3}}{3\sqrt[3]{-ax^3}\left(xe^{\frac{ax^3}{3}} + c_1\right) + \sqrt[3]{3}x\Gamma\left(\frac{1}{3}, -\frac{ax^3}{3}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.089 (sec), leaf count = 73

$$\left\{(y(x))^{-1} + \frac{2\,3^{5/6}x\pi}{9\,\Gamma(2/3)}\mathrm{e}^{-\frac{ax^3}{3}}\frac{1}{\sqrt[3]{-ax^3}} - x - x\mathrm{e}^{-\frac{ax^3}{3}}\Gamma\left(\frac{1}{3}, -\frac{ax^3}{3}\right)\frac{1}{\sqrt[3]{-9\,ax^3}} - \mathrm{e}^{-\frac{ax^3}{3}}\_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == a*x^3*y[x]*(1 - x*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*E^((a*x^3)/3)*(-(a*x^3))^(1/3))/(3*(-(a*x^3))^(1/3)*(E^((a*x^3)/3)*
x + C[1]) + 3^(1/3)*x*Gamma[1/3, -(a*x^3)/3])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = a*x^3*(1-x*y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
1/y(x)+2/9*exp(-1/3*a*x^3)*3^(5/6)*x*Pi/GAMMA(2/3)/(-a*x^3)^(1/3)-x-exp(-1/3*a*x
^3)*x*GAMMA(1/3,-1/3*a*x^3)/(-9*a*x^3)^(1/3)-exp(-1/3*a*x^3)*_C1 = 0
```

4.179 $xy'(x) = x^3 + (2x^2+1)\,y(x) + xy(x)^2$

ODE

$$xy'(x) = x^3 + (2x^2+1)\,y(x) + xy(x)^2$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0119542 (sec), leaf count = 27

$$\left\{\left\{y(x) \to -\frac{x\left(2c_1 + x^2 + 2\right)}{2c_1 + x^2}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 21

$$\left\{-\frac{x}{x + y\left(x\right)} - \frac{x^2}{2} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == x^3 + (1 + 2*x^2)*y[x] + x*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x*(2 + x^2 + 2*C[1]))/(x^2 + 2*C[1]))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = x^3+(2*x^2+1)*y(x)+x*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-x/(x+y(x))-1/2*x^2-_C1 = 0
```

4.180 $xy'(x) = y(x)(2xy(x)+1)$

ODE

$$xy'(x) = y(x)(2xy(x)+1)$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00724698 (sec), leaf count = 18

$$\left\{\left\{y(x) \to -\frac{x}{x^2 - c_1}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 15

$$\left\{x - \frac{-C1}{x} + (y(x))^{-1} = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == y[x]*(1 + 2*x*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x/(x^2 - C[1]))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)*(1+2*x*y(x)), y(x),'implicit')
```

Maple raw output

```
x-1/x*_C1+1/y(x) = 0
```

4.181 $y(x)(axy(x)+2)+bx+xy'(x)=0$

ODE

$$y(x)(axy(x)+2)+bx+xy'(x)=0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`], _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0148677 (sec), leaf count = 43

$$\left\{\left\{y(x)\to -\sqrt{\frac{b}{a}}\tan\left(ax\sqrt{\frac{b}{a}}-c_1\right)-\frac{1}{ax}\right\}\right\}$$

Maple ✓
cpu = 0.072 (sec), leaf count = 64

$$\left\{-ay(x)+\frac{1}{x}\left(i\sqrt{a}\sqrt{b}x-1\right)+2\,\mathrm{e}^{-2\,ix\sqrt{a}\sqrt{b}}\left(\frac{i\mathrm{e}^{-2\,ix\sqrt{a}\sqrt{b}}}{\sqrt{a}\sqrt{b}}-2\_C1\right)^{-1}=0\right\}$$

Mathematica raw input

```
DSolve[b*x + y[x]*(2 + a*x*y[x]) + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1/(a*x)) - Sqrt[b/a]*Tan[a*Sqrt[b/a]*x - C[1]]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+b*x+(2+a*x*y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-a*y(x)+(I*a^(1/2)*b^(1/2)*x-1)/x+2*exp(-2*I*x*a^(1/2)*b^(1/2))/(I/a^(1/2)/b^(1/
2)*exp(-2*I*x*a^(1/2)*b^(1/2))-2*_C1) = 0
```

4.182 $\mathbf{a0} + \mathbf{a1}x + y(x)(\mathbf{a2} + \mathbf{a3}xy(x)) + xy'(x) = 0$

ODE

$$\mathrm{a0} + \mathrm{a1}x + y(x)(\mathrm{a2} + \mathrm{a3}xy(x)) + xy'(x) = 0$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.180795 (sec), leaf count = 301

$$\left\{\left\{y(x) \to -\frac{i\left(\sqrt{\mathrm{a1}}c_1 U\left(\frac{1}{2}\left(\frac{i\sqrt{\mathrm{a3}}\mathrm{a0}}{\sqrt{\mathrm{a1}}} + \mathrm{a2}\right), \mathrm{a2}, 2i\sqrt{\mathrm{a1}}\sqrt{\mathrm{a3}}x\right) + c_1\left(\sqrt{\mathrm{a1}}\mathrm{a2} + i\mathrm{a0}\sqrt{\mathrm{a3}}\right) U\left(\frac{1}{2}\left(\frac{i\sqrt{\mathrm{a3}}\mathrm{a0}}{\sqrt{\mathrm{a1}}} + \mathrm{a2} + 2\right), \mathrm{a2} + 1, 2i\sqrt{\right.\right.\right.}}{\sqrt{\mathrm{a3}}\left(c_1 U\left(\frac{1}{2}\left(\frac{i\sqrt{\mathrm{a3}}\mathrm{a0}}{\sqrt{\mathrm{a1}}} + \mathrm{a2}\right), \mathrm{a2}, 2i\sqrt{\mathrm{a1}}\sqrt{\mathrm{a3}}x\right) + L^{\mathrm{a}}_{-}\right.}$$

Maple ✓
cpu = 0.336 (sec), leaf count = 848

$$\left\{y(x) = 4\,a1^2\left(-1/4\_C1\left(a0^2 a1^2 a3^3 + a1^3 a2^2 a3^2 - 2\left(-a1\,a3\right)^{3/2} a0\,a1\,a2\,a3 - 2\left(-a1\,a3\right)^{5/2} a0\,a2\right) U\left(1/2\,\frac{(-a1\,a}{}\right.\right.\right.$$

Mathematica raw input

```
DSolve[a0 + a1*x + y[x]*(a2 + a3*x*y[x]) + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*(Sqrt[a1]*C[1]*HypergeometricU[(a2 + (I*a0*Sqrt[a3])/Sqrt[a1])/2
, a2, (2*I)*Sqrt[a1]*Sqrt[a3]*x] + (Sqrt[a1]*a2 + I*a0*Sqrt[a3])*C[1]*Hypergeome
tricU[(2 + a2 + (I*a0*Sqrt[a3])/Sqrt[a1])/2, 1 + a2, (2*I)*Sqrt[a1]*Sqrt[a3]*x]
+ Sqrt[a1]*(2*LaguerreL[-1 - a2/2 - ((I/2)*a0*Sqrt[a3])/Sqrt[a1], a2, (2*I)*Sqrt
[a1]*Sqrt[a3]*x] + LaguerreL[-a2/2 - ((I/2)*a0*Sqrt[a3])/Sqrt[a1], -1 + a2, (2*I
)*Sqrt[a1]*Sqrt[a3]*x])))/(Sqrt[a3]*(C[1]*HypergeometricU[(a2 + (I*a0*Sqrt[a3])/
Sqrt[a1])/2, a2, (2*I)*Sqrt[a1]*Sqrt[a3]*x] + LaguerreL[-a2/2 - ((I/2)*a0*Sqrt[a
3])/Sqrt[a1], -1 + a2, (2*I)*Sqrt[a1]*Sqrt[a3]*x]))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+a0+a1*x+(a2+a3*x*y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 4*a1^2*(-1/4*_C1*(a0^2*a1^2*a3^3+a1^3*a2^2*a3^2-2*(-a1*a3)^(3/2)*a0*a1*a2
*a3-2*(-a1*a3)^(5/2)*a0*a2)*KummerU(1/2*((-a1*a3)^(3/2)*a0+2*a3*((-a1*a3)^(1/2)*
a0+1/2*a1*(a2+2))*a1)/a1^2/a3,((-a1*a3)^(3/2)*a0+a3*((-a1*a3)^(1/2)*a0+a1*(1+a2)
)*a1)/a1^2/a3,2*x*(-a1*a3)^(1/2))+a3^2*(a1^3*a3*(a3*a0-a2*(-a1*a3)^(1/2))*Kummer
M(1/2*((-a1*a3)^(3/2)*a0+2*a3*((-a1*a3)^(1/2)*a0+1/2*a1*(a2+2))*a1)/a1^2/a3,((-a
1*a3)^(3/2)*a0+a3*((-a1*a3)^(1/2)*a0+a1*(1+a2))*a1)/a1^2/a3,2*x*(-a1*a3)^(1/2))+
a1^3*a3*(a2*(-a1*a3)^(1/2)+a3*a0)*KummerM(1/2/a1^2/a3*((-a1*a3)^(3/2)*a0+2*a0*a3
*a1*(-a1*a3)^(1/2)+a1^2*a2*a3),((-a1*a3)^(3/2)*a0+a3*((-a1*a3)^(1/2)*a0+a1*(1+a2
))*a1)/a1^2/a3,2*x*(-a1*a3)^(1/2))+1/2*KummerU(1/2/a1^2/a3*((-a1*a3)^(3/2)*a0+2*
a0*a3*a1*(-a1*a3)^(1/2)+a1^2*a2*a3),((-a1*a3)^(3/2)*a0+a3*((-a1*a3)^(1/2)*a0+a1*
(1+a2))*a1)/a1^2/a3,2*x*(-a1*a3)^(1/2))*_C1*((-a1*a3)^(1/2)*a0-a1*a2))*a1^2)/(_C
1*(a1^4*a2^2*a3^2*(-a1*a3)^(1/2)+2*a0^2*a1*a3*(-a1*a3)^(5/2)+(-a1*a3)^(7/2)*a0^2
)*KummerU(1/2*((-a1*a3)^(3/2)*a0+2*a3*((-a1*a3)^(1/2)*a0+1/2*a1*(a2+2))*a1)/a1^2
/a3,((-a1*a3)^(3/2)*a0+a3*((-a1*a3)^(1/2)*a0+a1*(1+a2))*a1)/a1^2/a3,2*x*(-a1*a3)
^(1/2))+4*(-a1^2*a3^2*((-a1*a3)^(1/2)*a0+a1*a2)*KummerM(1/2*((-a1*a3)^(3/2)*a0+2
*a3*((-a1*a3)^(1/2)*a0+1/2*a1*(a2+2))*a1)/a1^2/a3,((-a1*a3)^(3/2)*a0+a3*((-a1*a3
)^(1/2)*a0+a1*(1+a2))*a1)/a1^2/a3,2*x*(-a1*a3)^(1/2))+a1^2*a3^2*((-a1*a3)^(1/2)*
a0-a1*a2)*KummerM(1/2/a1^2/a3*((-a1*a3)^(3/2)*a0+2*a0*a3*a1*(-a1*a3)^(1/2)+a1^2*
a2*a3),((-a1*a3)^(3/2)*a0+a3*((-a1*a3)^(1/2)*a0+a1*(1+a2))*a1)/a1^2/a3,2*x*(-a1*
a3)^(1/2))-1/2*KummerU(1/2/a1^2/a3*((-a1*a3)^(3/2)*a0+2*a0*a3*a1*(-a1*a3)^(1/2)+
a1^2*a2*a3),((-a1*a3)^(3/2)*a0+a3*((-a1*a3)^(1/2)*a0+a1*(1+a2))*a1)/a1^2/a3,2*x*
(-a1*a3)^(1/2))*_C1*(a2*(-a1*a3)^(1/2)+a3*a0))*a3^2*a1^4)
```

4.183 $ax^2y(x)^2 + xy'(x) + 2y(x) = b$

ODE

$$ax^2y(x)^2 + xy'(x) + 2y(x) = b$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0478848 (sec), leaf count = 101

$$\left\{\left\{y(x) \to \frac{i\sqrt{b}\left(Y_1\left(-i\sqrt{a}\sqrt{b}x\right) - c_1 J_1\left(i\sqrt{a}\sqrt{b}x\right)\right)}{\sqrt{a}x\left(c_1 J_0\left(i\sqrt{a}\sqrt{b}x\right) + Y_0\left(-i\sqrt{a}\sqrt{b}x\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.111 (sec), leaf count = 66

$$\left\{y(x) = -\frac{1}{ax}\sqrt{-ab}\left(Y_1\left(\sqrt{-ab}x\right)\_C1 + J_1\left(\sqrt{-ab}x\right)\right)\left(\_C1\, Y_0\left(\sqrt{-ab}x\right) + J_0\left(\sqrt{-ab}x\right)\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + a*x^2*y[x]^2 + x*y'[x] == b,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (I*Sqrt[b]*(BesselY[1, (-I)*Sqrt[a]*Sqrt[b]*x] - BesselJ[1, I*Sqrt[a]*
Sqrt[b]*x]*C[1]))/(Sqrt[a]*x*(BesselY[0, (-I)*Sqrt[a]*Sqrt[b]*x] + BesselJ[0, I*
Sqrt[a]*Sqrt[b]*x]*C[1]))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+a*x^2*y(x)^2+2*y(x) = b, y(x),'implicit')
```

Maple raw output

```
y(x) = -(-a*b)^(1/2)*(BesselY(1,(-a*b)^(1/2)*x)*_C1+BesselJ(1,(-a*b)^(1/2)*x))/a
/x/(_C1*BesselY(0,(-a*b)^(1/2)*x)+BesselJ(0,(-a*b)^(1/2)*x))
```

4.184 $\frac{1}{2}(n-m)y(x)+x^m+x^n y(x)^2+xy'(x)=0$

ODE

$$\frac{1}{2}(n-m)y(x)+x^m+x^n y(x)^2+xy'(x)=0$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0366563 (sec), leaf count = 40

$$\left\{\left\{y(x)\to -x^{\frac{m-n}{2}}\tan\left(\frac{2x^{\frac{m+n}{2}}}{m+n}-c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 34

$$\left\{\arctan\left(x^{\frac{n}{2}-\frac{m}{2}}y(x)\right)+2\,\frac{x^{n/2+m/2}}{n+m}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x^m + ((-m + n)*y[x])/2 + x^n*y[x]^2 + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x^((m - n)/2)*Tan[(2*x^((m + n)/2))/(m + n) - C[1]])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+x^m+1/2*(n-m)*y(x)+x^n*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
arctan(x^(1/2*n-1/2*m)*y(x))+2*x^(1/2*n+1/2*m)/(n+m)+_C1 = 0
```

4.185 $y(x)\left(a+bx^n y(x)\right)+xy'(x)=0$

ODE

$$y(x)\left(a+bx^n y(x)\right)+xy'(x)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0261589 (sec), leaf count = 31

$$\left\{\left\{y(x)\to \frac{a-n}{c_1(a-n)x^a-bx^n}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 26

$$\left\{\frac{bx^n}{a-n}-x^a\_C1+(y(x))^{-1}=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(a + b*x^n*y[x]) + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a - n)/(-(b*x^n) + (a - n)*x^a*C[1])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+(a+b*x^n*y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/(a-n)*x^n*b-x^a*_C1+1/y(x) = 0
```

4.186 $xy'(x) = ax^m - by(x) - cx^n y(x)^2$

ODE

$$xy'(x) = ax^m - by(x) - cx^n y(x)^2$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.259203 (sec), leaf count = 1293

$$\left\{\left\{y(x) \to \frac{x^{-n}\left((-1)^{\frac{n}{m+n}}\sqrt{a}\sqrt{c}m(m+n)^{\frac{2n}{m+n}}x^{m+n}I_{-\frac{b+m}{m+n}}\left(\frac{2\sqrt{a}\sqrt{c}\sqrt{x^{m+n}}}{\sqrt{(m+n)^2}}\right)\Gamma\left(\frac{-b+m+2n}{m+n}\right)\left((m+n)^2\right)^{\frac{b}{m+n}} + (-1)^{\frac{n}{m+n}}\sqrt{a}\sqrt{\right.\right.\right.$$

Maple ✓
cpu = 0.239 (sec), leaf count = 174

$$\left\{y(x) = -\frac{x^{1-n}}{cx}\left(Y_{\frac{b+m}{n+m}}\left(2\frac{\sqrt{-ca}x^{n/2+m/2}}{n+m}\right)\_C1 + J_{\frac{b+m}{n+m}}\left(2\frac{\sqrt{-ca}x^{n/2+m/2}}{n+m}\right)\right)x^{\frac{n}{2}+\frac{m}{2}}\sqrt{-ca}\left(Y_{\frac{b-n}{n+m}}\left(2\frac{\sqrt{-ca}x^{n/2+m/2}}{n+m}\right)\right.\right.$$

Mathematica raw input

```
DSolve[x*y'[x] == a*x^m - b*y[x] - c*x^n*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-1)^(b/(m + n))*Sqrt[a]*Sqrt[c]*(m + n)^(1 + (2*b)/(m + n))*((m + n)
^2)^(n/(m + n))*x^(m + n)*BesselI[(b + m)/(m + n), (2*Sqrt[a]*Sqrt[c]*Sqrt[x^(m
 + n)])/Sqrt[(m + n)^2]]*C[1]*Gamma[(b + m)/(m + n)] + (-1)^(b/(m + n))*(-b + n)*
(m + n)^((2*b)/(m + n))*((m + n)^2)^(1/2 + n/(m + n))*Sqrt[x^(m + n)]*BesselI[(b
  - n)/(m + n), (2*Sqrt[a]*Sqrt[c]*Sqrt[x^(m + n)])/Sqrt[(m + n)^2]]*C[1]*Gamma[(
b + m)/(m + n)] + (-1)^(b/(m + n))*Sqrt[a]*Sqrt[c]*m*(m + n)^((2*b)/(m + n))*((m
  + n)^2)^(n/(m + n))*x^(m + n)*BesselI[-1 + (b - n)/(m + n), (2*Sqrt[a]*Sqrt[c]*
Sqrt[x^(m + n)])/Sqrt[(m + n)^2]]*C[1]*Gamma[(b + m)/(m + n)] + (-1)^(b/(m + n))
*Sqrt[a]*Sqrt[c]*n*(m + n)^((2*b)/(m + n))*((m + n)^2)^(n/(m + n))*x^(m + n)*Bes
selI[-1 + (b - n)/(m + n), (2*Sqrt[a]*Sqrt[c]*Sqrt[x^(m + n)])/Sqrt[(m + n)^2]]*
C[1]*Gamma[(b + m)/(m + n)] + (-1)^(n/(m + n))*Sqrt[a]*Sqrt[c]*m*(m + n)^((2*n)/
(m + n))*((m + n)^2)^(b/(m + n))*x^(m + n)*BesselI[-((b + m)/(m + n)), (2*Sqrt[a
]*Sqrt[c]*Sqrt[x^(m + n)])/Sqrt[(m + n)^2]]*Gamma[(-b + m + 2*n)/(m + n)] + (-1)
```

```
^(n/(m + n))*Sqrt[a]*Sqrt[c]*n*(m + n)^((2*n)/(m + n))*((m + n)^2)^(b/(m + n))*x
^(m + n)*BesselI[-((b + m)/(m + n)), (2*Sqrt[a]*Sqrt[c]*Sqrt[x^(m + n)])/Sqrt[(m
 + n)^2]]*Gamma[(-b + m + 2*n)/(m + n)] + (-1)^(1 + n/(m + n))*b*(m + n)^((2*n)/
(m + n))*((m + n)^2)^(1/2 + b/(m + n))*Sqrt[x^(m + n)]*BesselI[(-b + n)/(m + n),
 (2*Sqrt[a]*Sqrt[c]*Sqrt[x^(m + n)])/Sqrt[(m + n)^2]]*Gamma[(-b + m + 2*n)/(m +
n)] + (-1)^(n/(m + n))*n*(m + n)^((2*n)/(m + n))*((m + n)^2)^(1/2 + b/(m + n))*S
qrt[x^(m + n)]*BesselI[(-b + n)/(m + n), (2*Sqrt[a]*Sqrt[c]*Sqrt[x^(m + n)])/Sqr
t[(m + n)^2]]*Gamma[(-b + m + 2*n)/(m + n)] + (-1)^(n/(m + n))*Sqrt[a]*Sqrt[c]*m
*(m + n)^((2*n)/(m + n))*((m + n)^2)^(b/(m + n))*x^(m + n)*BesselI[1 + (-b + n)/
(m + n), (2*Sqrt[a]*Sqrt[c]*Sqrt[x^(m + n)])/Sqrt[(m + n)^2]]*Gamma[(-b + m + 2*
n)/(m + n)] + (-1)^(n/(m + n))*Sqrt[a]*Sqrt[c]*n*(m + n)^((2*n)/(m + n))*((m + n
)^2)^(b/(m + n))*x^(m + n)*BesselI[1 + (-b + n)/(m + n), (2*Sqrt[a]*Sqrt[c]*Sqrt
[x^(m + n)])/Sqrt[(m + n)^2]]*Gamma[(-b + m + 2*n)/(m + n)])/(2*c*Sqrt[(m + n)^2
]*x^n*Sqrt[x^(m + n)]*((-1)^(b/(m + n))*(m + n)^((2*b)/(m + n))*((m + n)^2)^(n/(
m + n))*BesselI[(b - n)/(m + n), (2*Sqrt[a]*Sqrt[c]*Sqrt[x^(m + n)])/Sqrt[(m + n
)^2]]*C[1]*Gamma[(b + m)/(m + n)] + (-1)^(n/(m + n))*(m + n)^((2*n)/(m + n))*((m
 + n)^2)^(b/(m + n))*BesselI[(-b + n)/(m + n), (2*Sqrt[a]*Sqrt[c]*Sqrt[x^(m + n)
])/Sqrt[(m + n)^2]]*Gamma[(-b + m + 2*n)/(m + n)]))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = a*x^m-b*y(x)-c*x^n*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = -(BesselY((b+m)/(n+m),2*(-c*a)^(1/2)*x^(1/2*n+1/2*m)/(n+m))*_C1+BesselJ((
b+m)/(n+m),2*(-c*a)^(1/2)*x^(1/2*n+1/2*m)/(n+m)))*x^(1/2*n+1/2*m)*(-c*a)^(1/2)/(
BesselY((b-n)/(n+m),2*(-c*a)^(1/2)*x^(1/2*n+1/2*m)/(n+m))*_C1+BesselJ((b-n)/(n+m
),2*(-c*a)^(1/2)*x^(1/2*n+1/2*m)/(n+m)))*x^(1-n)/c/x
```

4.187 $xy'(x) = ax^n(x - y(x))^2 - y(x) + 2x$

ODE

$$xy'(x) = ax^n(x - y(x))^2 - y(x) + 2x$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.523851 (sec), leaf count = 126

$$\left\{\left\{y(x) \to \frac{x^{-n}\left(2ac_1\sqrt{(n-1)^2}x^{n+1} + 2ax^{n+\sqrt{(n-1)^2}+1} - c_1\left(-n+\sqrt{(n-1)^2}+1\right)(n-1) - \left(n+\sqrt{(n-1)^2}-1\right)x^{\sqrt{(n}\right.\right.}{2a\left(c_1\sqrt{(n-1)^2} + x^{\sqrt{(n-1)^2}}\right)}$$

Maple ✓
cpu = 0.104 (sec), leaf count = 50

$$\left\{\frac{-a\_C1\,(x - y(x))\,x^n + xy(x) + (n-1)\,\_C1 - x^2}{a\,(x - y\,(x))\,x^n - n + 1} = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == 2*x + a*x^n*(x - y[x])^2 - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-((-1 + Sqrt[(-1 + n)^2] + n)*x^Sqrt[(-1 + n)^2]) + 2*a*x^(1 + Sqrt[(
-1 + n)^2] + n) - (1 + Sqrt[(-1 + n)^2] - n)*(-1 + n)*C[1] + 2*a*Sqrt[(-1 + n)^2
]*x^(1 + n)*C[1])/(2*a*x^n*(x^Sqrt[(-1 + n)^2] + Sqrt[(-1 + n)^2]*C[1]))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = 2*x-y(x)+a*x^n*(x-y(x))^2, y(x),'implicit')
```

Maple raw output

```
(-a*_C1*(x-y(x))*x^n+x*y(x)+(n-1)*_C1-x^2)/(a*(x-y(x))*x^n-n+1) = 0
```

4.188 $y(x)(1-ay(x)\log(x))+xy'(x)=0$

ODE

$$y(x)(1-ay(x)\log(x))+xy'(x)=0$$

ODE Classification

[_Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00976524 (sec), leaf count = 17

$$\left\{\left\{y(x)\to \frac{1}{a\log(x)+a+c_1 x}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 20

$$\left\{-a\ln(x)-a-\_C1\,x+(y(x))^{-1}=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 - a*Log[x]*y[x]) + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a + x*C[1] + a*Log[x])^(-1)}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+(1-a*y(x)*ln(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-a*ln(x)-a-_C1*x+1/y(x) = 0
```

4.189 $xy'(x) = f(x)\left(x^2 - y(x)^2\right) + y(x)$

ODE

$$xy'(x) = f(x)\left(x^2 - y(x)^2\right) + y(x)$$

ODE Classification

[[_homogeneous, `class D`], _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.130127 (sec), leaf count = 51

$$\left\{\left\{y(x) \to \frac{x - xe^{2\left(\int_1^x -f(K[1])\,dK[1]+c_1\right)}}{e^{2\left(\int_1^x -f(K[1])\,dK[1]+c_1\right)}+1}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 20

$$\left\{Artanh\left(\frac{y(x)}{x}\right) - \int f(x)\,\mathrm{d}x - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == y[x] + f[x]*(x^2 - y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - E^(2*(C[1] + Integrate[-f[K[1]], {K[1], 1, x}]))*x)/(1 + E^(2*(C[
1] + Integrate[-f[K[1]], {K[1], 1, x}])))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)+(x^2-y(x)^2)*f(x), y(x),'implicit')
```

Maple raw output

```
arctanh(y(x)/x)-Int(f(x),x)-_C1 = 0
```

4.190 $xy'(x) = y(x)\left(y(x)^2+1\right)$

ODE

$$xy'(x) = y(x)\left(y(x)^2+1\right)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0197654 (sec), leaf count = 59

$$\left\{\left\{y(x) \to -\frac{ie^{c_1}x}{\sqrt{e^{2c_1}x^2-1}}\right\}, \left\{y(x) \to \frac{ie^{c_1}x}{\sqrt{e^{2c_1}x^2-1}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 15

$$\left\{1 - \frac{\_C1}{x^2} + (y(x))^{-2} = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == y[x]*(1 + y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*E^C[1]*x)/Sqrt[-1 + E^(2*C[1])*x^2]}, {y[x] -> (I*E^C[1]*x)/Sqrt
[-1 + E^(2*C[1])*x^2]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)*(1+y(x)^2), y(x),'implicit')
```

Maple raw output

```
1-1/x^2*_C1+1/y(x)^2 = 0
```

4.191 $xy'(x) + y(x)\left(1 - xy(x)^2\right) = 0$

ODE

$$xy'(x) + y(x)\left(1 - xy(x)^2\right) = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00785942 (sec), leaf count = 35

$$\left\{\left\{y(x) \to -\frac{1}{\sqrt{x\left(c_1 x + 2\right)}}\right\}, \left\{y(x) \to \frac{1}{\sqrt{x\left(c_1 x + 2\right)}}\right\}\right\}$$

Maple ✓
cpu = 0.004 (sec), leaf count = 17

$$\left\{-2\,x - x^2\_C1 + (y(x))^{-2} = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 - x*y[x]^2) + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1/Sqrt[x*(2 + x*C[1])])}, {y[x] -> 1/Sqrt[x*(2 + x*C[1])]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+y(x)*(1-x*y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
-2*x-x^2*_C1+1/y(x)^2 = 0
```

4.192 $xy'(x) + y(x) = a(x^2+1)\,y(x)^3$

ODE

$$xy'(x) + y(x) = a\left(x^2+1\right)y(x)^3$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0119158 (sec), leaf count = 51

$$\left\{\left\{y(x) \to -\frac{1}{\sqrt{-2ax^2\log(x) + a + c_1x^2}}\right\}, \left\{y(x) \to \frac{1}{\sqrt{-2ax^2\log(x) + a + c_1x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 25

$$\left\{-a + 2\,x^2\ln(x)\,a - x^2\_C1 + (y(x))^{-2} = 0\right\}$$

Mathematica raw input

```
DSolve[y[x] + x*y'[x] == a*(1 + x^2)*y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1/Sqrt[a + x^2*C[1] - 2*a*x^2*Log[x]])}, {y[x] -> 1/Sqrt[a + x^2*C[1
] - 2*a*x^2*Log[x]]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+y(x) = a*(x^2+1)*y(x)^3, y(x),'implicit')
```

Maple raw output

```
-a+2*x^2*ln(x)*a-x^2*_C1+1/y(x)^2 = 0
```

4.193 $xy'(x) = ay(x) + b(x^2+1)\,y(x)^3$

ODE

$$xy'(x) = ay(x) + b(x^2+1)\,y(x)^3$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0348685 (sec), leaf count = 103

$$\left\{\left\{y(x) \to -\frac{i\sqrt{a}\sqrt{a+1}x^a}{\sqrt{bx^{2a}\left(ax^2+a+1\right)-a(a+1)c_1}}\right\},\left\{y(x) \to \frac{i\sqrt{a}\sqrt{a+1}x^a}{\sqrt{bx^{2a}\left(ax^2+a+1\right)-a(a+1)c_1}}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 34

$$\left\{-\frac{\_C1}{\left(x^a\right)^2}+\left(y(x)\right)^{-2}+\frac{b\left(ax^2+a+1\right)}{a\left(1+a\right)}=0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == a*y[x] + b*(1 + x^2)*y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*Sqrt[a]*Sqrt[1 + a]*x^a)/Sqrt[b*x^(2*a)*(1 + a + a*x^2) - a*(1 +
  a)*C[1]]}, {y[x] -> (I*Sqrt[a]*Sqrt[1 + a]*x^a)/Sqrt[b*x^(2*a)*(1 + a + a*x^2)
- a*(1 + a)*C[1]]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = a*y(x)+b*(x^2+1)*y(x)^3, y(x),'implicit')
```

Maple raw output

```
-1/(x^a)^2*_C1+1/y(x)^2+b*(a*x^2+a+1)/a/(1+a) = 0
```

4.194 $xy'(x) + 2y(x) = ax^{2k}y(x)^k$

ODE

$$xy'(x) + 2y(x) = ax^{2k}y(x)^k$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0265826 (sec), leaf count = 45

$$\left\{\left\{y(x) \to \left(\frac{1}{2}ax^{2k} - \frac{1}{2}akx^{2k} + c_1x^{2k-2}\right)^{\frac{1}{1-k}}\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 34

$$\left\{-\frac{\left(x^k\right)^2\_C1}{x^2} + (y(x))^{1-k} + \frac{x^{2\,k}a(k-1)}{2} = 0\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + x*y'[x] == a*x^(2*k)*y[x]^k,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((a*x^(2*k))/2 - (a*k*x^(2*k))/2 + x^(-2 + 2*k)*C[1])^(1 - k)^(-1)}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+2*y(x) = a*x^(2*k)*y(x)^k, y(x),'implicit')
```

Maple raw output

```
-(x^k)^2/x^2*_C1+y(x)^(1-k)+1/2*x^(2*k)*a*(k-1) = 0
```

4.195 $xy'(x) = 4\left(y(x) - \sqrt{y(x)}\right)$

ODE

$$xy'(x) = 4\left(y(x) - \sqrt{y(x)}\right)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0140277 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \left(e^{\frac{c_1}{2}} x^2 + 1\right)^2\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 15

$$\left\{-x^2 \_C1 + \sqrt{y(x)} - 1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == 4*(-Sqrt[y[x]] + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + E^(C[1]/2)*x^2)^2}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = 4*y(x)-4*y(x)^(1/2), y(x),'implicit')
```

Maple raw output

```
-x^2*_C1+y(x)^(1/2)-1 = 0
```

4.196 $xy'(x) + 2y(x) = \sqrt{y(x)^2 + 1}$

ODE

$$xy'(x) + 2y(x) = \sqrt{y(x)^2 + 1}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 1.00548 (sec), leaf count = 3935

$$\left\{\left\{y(x) \to -\frac{\sqrt{\frac{\cosh(6c_1)}{x^6} - \frac{\sinh(6c_1)}{x^6} + \frac{9\sqrt[3]{2}\sqrt[3]{32x^{18} + 40\cosh(6c_1)x^{12} - 40\sinh(6c_1)x^{12} - \cosh(12c_1)x^6 + \sinh(12c_1)x^6}}{x^6}}}{\sqrt{2}}\right.\right.$$

Maple ✓
cpu = 0.039 (sec), leaf count = 27

$$\left\{\ln(x) + \int^{y(x)} \left(2\_a - \sqrt{\_a^2 + 1}\right)^{-1} d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + x*y'[x] == Sqrt[1 + y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Cosh[3*C[1]] - Sinh[3*C[1]] + x^3*Sqrt[36 + Cosh[6*C[1]]/x^6 - Sinh[
6*C[1]]/x^6 + (36*2^(2/3)*(Cosh[3*C[1]] - Sinh[3*C[1]])*((-1 + 2*x^6)*Cosh[3*C[1
]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^18 + 40*x^12*Cosh[6*C[1]] - x^6*Cosh[12*C[
1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[18*C[1]] - Sinh[18*C[1]])
*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C
[1]] + Sinh[21*C[1]])])^(1/3) + (9*2^(1/3)*(32*x^18 + 40*x^12*Cosh[6*C[1]] - x^6
*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[18*C[1]] - Sin
```

```
h[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3
*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^6] + x^3*Sqrt[72 + (2*Cosh[6*C[1]])/
x^6 - (2*Sinh[6*C[1]])/x^6 + (36*2^(2/3)*(-Cosh[3*C[1]] + Sinh[3*C[1]])*((-1 + 2
*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^18 + 40*x^12*Cosh[6*C[1]]
- x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[18*C[1]]
- Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1
]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) - (9*2^(1/3)*(32*x^18 + 40*x^12*Co
sh[6*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cos
h[18*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)
*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^6 - (2*(432*x^6*Cosh
[3*C[1]] - Cosh[9*C[1]] - 432*x^6*Sinh[3*C[1]] + Sinh[9*C[1]]))/(x^9*Sqrt[36 + C
osh[6*C[1]]/x^6 - Sinh[6*C[1]]/x^6 + (36*2^(2/3)*(Cosh[3*C[1]] - Sinh[3*C[1]])*(
(-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^18 + 40*x^12*Cosh[6
*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[18
*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sin
h[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) + (9*2^(1/3)*(32*x^18 + 40*
x^12*Cosh[6*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]]
 + (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 +
16*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^6])])/(18*x^3
)}, {y[x] -> (-Cosh[3*C[1]] + Sinh[3*C[1]] - x^3*Sqrt[36 + Cosh[6*C[1]]/x^6 - Si
nh[6*C[1]]/x^6 + (36*2^(2/3)*(Cosh[3*C[1]] - Sinh[3*C[1]])*((-1 + 2*x^6)*Cosh[3*
C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^18 + 40*x^12*Cosh[6*C[1]] - x^6*Cosh[12
*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[18*C[1]] - Sinh[18*C[1
]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[2
1*C[1]] + Sinh[21*C[1]])])^(1/3) + (9*2^(1/3)*(32*x^18 + 40*x^12*Cosh[6*C[1]] -
x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[18*C[1]] -
Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]]
)^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^6] + x^3*Sqrt[72 + (2*Cosh[6*C[1]
])/x^6 - (2*Sinh[6*C[1]])/x^6 + (36*2^(2/3)*(-Cosh[3*C[1]] + Sinh[3*C[1]])*((-1
+ 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^18 + 40*x^12*Cosh[6*C[1
]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[18*C[1
]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*
C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) - (9*2^(1/3)*(32*x^18 + 40*x^12
*Cosh[6*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (
Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x
^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^6 - (2*(432*x^6*C
osh[3*C[1]] - Cosh[9*C[1]] - 432*x^6*Sinh[3*C[1]] + Sinh[9*C[1]]))/(x^9*Sqrt[36
+ Cosh[6*C[1]]/x^6 - Sinh[6*C[1]]/x^6 + (36*2^(2/3)*(Cosh[3*C[1]] - Sinh[3*C[1]]
)*((-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^18 + 40*x^12*Cos
h[6*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh
[18*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*
Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) + (9*2^(1/3)*(32*x^18 +
40*x^12*Cosh[6*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[
1]] + (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1
 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^6])])/(18*
x^3)}, {y[x] -> (-Cosh[3*C[1]] + Sinh[3*C[1]] + x^3*Sqrt[36 + Cosh[6*C[1]]/x^6 -
 Sinh[6*C[1]]/x^6 + (36*2^(2/3)*(Cosh[3*C[1]] - Sinh[3*C[1]])*((-1 + 2*x^6)*Cosh
```

```
[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^18 + 40*x^12*Cosh[6*C[1]] - x^6*Cosh
[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[18*C[1]] - Sinh[18*
C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cos
h[21*C[1]] + Sinh[21*C[1]])])^(1/3) + (9*2^(1/3)*(32*x^18 + 40*x^12*Cosh[6*C[1]]
 - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[18*C[1]]
 - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[
1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^6] - x^3*Sqrt[72 + (2*Cosh[6*C
[1]])/x^6 - (2*Sinh[6*C[1]])/x^6 + (36*2^(2/3)*(-Cosh[3*C[1]] + Sinh[3*C[1]])*((
-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^18 + 40*x^12*Cosh[6*
C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[18*
C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh
[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) - (9*2^(1/3)*(32*x^18 + 40*x
^12*Cosh[6*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]]
+ (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 1
6*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^6 + (2*(432*x^
6*Cosh[3*C[1]] - Cosh[9*C[1]] - 432*x^6*Sinh[3*C[1]] + Sinh[9*C[1]]))/(x^9*Sqrt[
36 + Cosh[6*C[1]]/x^6 - Sinh[6*C[1]]/x^6 + (36*2^(2/3)*(Cosh[3*C[1]] - Sinh[3*C[
1]])*((-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^18 + 40*x^12*
Cosh[6*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (C
osh[18*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^
6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) + (9*2^(1/3)*(32*x^18
 + 40*x^12*Cosh[6*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12
*C[1]] + (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] +
(-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^6])])/(
18*x^3)}, {y[x] -> (-Cosh[3*C[1]] + Sinh[3*C[1]] + x^3*Sqrt[36 + Cosh[6*C[1]]/x^
6 - Sinh[6*C[1]]/x^6 + (36*2^(2/3)*(Cosh[3*C[1]] - Sinh[3*C[1]])*((-1 + 2*x^6)*C
osh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^18 + 40*x^12*Cosh[6*C[1]] - x^6*C
osh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[18*C[1]] - Sinh[
18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(
Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) + (9*2^(1/3)*(32*x^18 + 40*x^12*Cosh[6*C[
1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[18*C[
1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3
*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^6] + x^3*Sqrt[72 + (2*Cosh[
6*C[1]])/x^6 - (2*Sinh[6*C[1]])/x^6 + (36*2^(2/3)*(-Cosh[3*C[1]] + Sinh[3*C[1]])
*((-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^18 + 40*x^12*Cosh
[6*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] + (Cosh[
18*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*S
inh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) - (9*2^(1/3)*(32*x^18 + 4
0*x^12*Cosh[6*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1
]] + (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1
+ 16*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^6 + (2*(432
*x^6*Cosh[3*C[1]] - Cosh[9*C[1]] - 432*x^6*Sinh[3*C[1]] + Sinh[9*C[1]]))/(x^9*Sq
rt[36 + Cosh[6*C[1]]/x^6 - Sinh[6*C[1]]/x^6 + (36*2^(2/3)*(Cosh[3*C[1]] - Sinh[3
*C[1]])*((-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^18 + 40*x^
12*Cosh[6*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh[12*C[1]] +
 (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16
*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) + (9*2^(1/3)*(32*x
```

```
^18 + 40*x^12*Cosh[6*C[1]] - x^6*Cosh[12*C[1]] - 40*x^12*Sinh[6*C[1]] + x^6*Sinh
[12*C[1]] + (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[x^12*((1 + 16*x^6)*Cosh[3*C[1]]
 + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^6])]
)/(18*x^3)}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+2*y(x) = (1+y(x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
ln(x)+Intat(1/(2*_a-(_a^2+1)^(1/2)),_a = y(x))+_C1 = 0
```

4.197 $xy'(x) = \sqrt{x^2 + y(x)^2} + y(x)$

ODE

$$xy'(x) = \sqrt{x^2 + y(x)^2} + y(x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0195762 (sec), leaf count = 13

$$\{\{y(x) \to x \sinh(c_1 + \log(x))\}\}$$

Maple ✓
cpu = 0.037 (sec), leaf count = 27

$$\left\{\frac{y(x)}{x^2} + \frac{1}{x^2}\sqrt{x^2 + (y(x))^2} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == y[x] + Sqrt[x^2 + y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*Sinh[C[1] + Log[x]]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)+(x^2+y(x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
1/x^2*y(x)+1/x^2*(x^2+y(x)^2)^(1/2)-_C1 = 0
```

4.198 $xy'(x) = \sqrt{x^2 - y(x)^2} + y(x)$

ODE

$$xy'(x) = \sqrt{x^2 - y(x)^2} + y(x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0316742 (sec), leaf count = 17

$$\{\{y(x) \to x \cosh(c_1 + i \log(x))\}\}$$

Maple ✓
cpu = 0.037 (sec), leaf count = 27

$$\left\{ -\arctan\left(y(x) \frac{1}{\sqrt{x^2 - (y(x))^2}} \right) + \ln(x) - \_C1 = 0 \right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == y[x] + Sqrt[x^2 - y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*Cosh[C[1] + I*Log[x]]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)+(x^2-y(x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
-arctan(1/(x^2-y(x)^2)^(1/2)*y(x))+ln(x)-_C1 = 0
```

4.199 $xy'(x) = x\sqrt{x^2 + y(x)^2} + y(x)$

ODE

$$xy'(x) = x\sqrt{x^2 + y(x)^2} + y(x)$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Homogeneous equation, $xy'(x) = xf(x)g(u) + y(x)$

Mathematica ✓
cpu = 0.0184963 (sec), leaf count = 12

$$\{\{y(x) \to x \sinh(c_1 + x)\}\}$$

Maple ✓
cpu = 2.555 (sec), leaf count = 28

$$\left\{\ln\left(y(x) + \sqrt{x^2 + (y(x))^2}\right) - x - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == y[x] + x*Sqrt[x^2 + y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*Sinh[x + C[1]]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)+x*(x^2+y(x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
ln(y(x)+(x^2+y(x)^2)^(1/2))-x-ln(x)-_C1 = 0
```

4.200 $xy'(x) = y(x) - x(x - y(x))\sqrt{x^2 + y(x)^2}$

ODE

$$xy'(x) = y(x) - x(x - y(x))\sqrt{x^2 + y(x)^2}$$

ODE Classification

[[_1st_order , `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Homogeneous equation, $xy'(x) = xf(x)g(u) + y(x)$

Mathematica ✓
cpu = 0.115472 (sec), leaf count = 81

$$\left\{\left\{y(x) \to \frac{x\left(-2e^{\frac{2c_1+x^2}{\sqrt{2}}} + e^{\sqrt{2}(2c_1+x^2)} - 1\right)}{2e^{\frac{2c_1+x^2}{\sqrt{2}}} + e^{\sqrt{2}(2c_1+x^2)} - 1}\right\}\right\}$$

Maple ✓
cpu = 0.252 (sec), leaf count = 49

$$\left\{\ln\left(2\frac{x\left(\sqrt{2\,x^2 + 2\,(y(x))^2} + y(x) + x\right)}{y(x) - x}\right) + \frac{\sqrt{2}x^2}{2} - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == y[x] - x*(x - y[x])*Sqrt[x^2 + y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-1 - 2*E^((x^2 + 2*C[1])/Sqrt[2]) + E^(Sqrt[2]*(x^2 + 2*C[1])))*x)/(
-1 + 2*E^((x^2 + 2*C[1])/Sqrt[2]) + E^(Sqrt[2]*(x^2 + 2*C[1])))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)-x*(x-y(x))*(x^2+y(x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
ln(2*x*((2*x^2+2*y(x)^2)^(1/2)+y(x)+x)/(y(x)-x))+1/2*2^(1/2)*x^2-ln(x)-_C1 = 0
```

4.201 $xy'(x) = a\sqrt{b^2x^2 + y(x)^2} + y(x)$

ODE

$$xy'(x) = a\sqrt{b^2x^2 + y(x)^2} + y(x)$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.045988 (sec), leaf count = 39

$$\left\{\left\{y(x) \to \frac{1}{2}e^{c_1}x^{a+1} - \frac{1}{2}b^2e^{-c_1}x^{1-a}\right\}\right\}$$

Maple ✓
cpu = 0.046 (sec), leaf count = 41

$$\left\{\frac{y(x)}{x^a x} + \frac{1}{x^a x}\sqrt{(y(x))^2 + b^2x^2} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == y[x] + a*Sqrt[b^2*x^2 + y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(b^2*x^(1 - a))/(2*E^C[1]) + (E^C[1]*x^(1 + a))/2}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)+a*(y(x)^2+b^2*x^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
1/(x^a)/x*y(x)+1/(x^a)/x*(y(x)^2+b^2*x^2)^(1/2)-_C1 = 0
```

4.202 $\cos(y(x))\left(\sin(y(x))-3x^2\cos(y(x))\right)+xy'(x)=0$

ODE

$$\cos(y(x))\left(\sin(y(x))-3x^2\cos(y(x))\right)+xy'(x)=0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0673996 (sec), leaf count = 19

$$\left\{\left\{y(x)\to \tan^{-1}\left(\frac{c_1}{2x}+x^2\right)\right\}\right\}$$

Maple ✓
cpu = 0.443 (sec), leaf count = 17

$$\{-\_C1+x\tan(y(x))-x^3=0\}$$

Mathematica raw input

```
DSolve[Cos[y[x]]*(-3*x^2*Cos[y[x]] + Sin[y[x]]) + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ArcTan[x^2 + C[1]/(2*x)]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+(sin(y(x))-3*x^2*cos(y(x)))*cos(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
-_C1+x*tan(y(x))-x^3 = 0
```

4.203 $xy'(x) - y(x) + x\cos\left(\frac{y(x)}{x}\right) + x = 0$

ODE

$$xy'(x) - y(x) + x\cos\left(\frac{y(x)}{x}\right) + x = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0256671 (sec), leaf count = 16

$$\{\{y(x) \to 2x\tan^{-1}(c_1 - \log(x))\}\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 17

$$\left\{-\_C1 + \tan\left(\frac{y(x)}{2x}\right) + \ln(x) = 0\right\}$$

Mathematica raw input

```
DSolve[x + x*Cos[y[x]/x] - y[x] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*x*ArcTan[C[1] - Log[x]]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+x-y(x)+x*cos(y(x)/x) = 0, y(x),'implicit')
```

Maple raw output

```
-_C1+tan(1/2*y(x)/x)+ln(x) = 0
```

4.204 $xy'(x) = y(x) - x\cos^2\left(\frac{y(x)}{x}\right)$

ODE

$$xy'(x) = y(x) - x\cos^2\left(\frac{y(x)}{x}\right)$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0245053 (sec), leaf count = 17

$$\{\{y(x) \to x\tan^{-1}(2c_1 - \log(x))\}\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 26

$$\left\{-\_C1 + 1\sin\left(\frac{y(x)}{x}\right)\left(\cos\left(\frac{y(x)}{x}\right)\right)^{-1} + \ln(x) = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == -(x*Cos[y[x]/x]^2) + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*ArcTan[2*C[1] - Log[x]]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)-x*cos(y(x)/x)^2, y(x),'implicit')
```

Maple raw output

```
-_C1+1/cos(y(x)/x)*sin(y(x)/x)+ln(x) = 0
```

4.205 $xy'(x) = (1 - 2x^2)\cot^2(y(x))$

ODE

$$xy'(x) = (1 - 2x^2)\cot^2(y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0379573 (sec), leaf count = 35

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{1}{2}(\tan(\#1) - \#1)\&\right]\left[c_1 - \frac{x^2}{2} + \frac{\log(x)}{2}\right]\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 34

$$\left\{\frac{2 + \left(2x^2 + \pi + 2\_C1 - 2y(x) - 2\ln(x)\right)\cot(y(x))}{2\cot(y(x))} = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == (1 - 2*x^2)*Cot[y[x]]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(-#1 + Tan[#1])/2 & ][-x^2/2 + C[1] + Log[x]/2]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = (-2*x^2+1)*cot(y(x))^2, y(x),'implicit')
```

Maple raw output

```
1/2*(2+(2*x^2+Pi+2*_C1-2*y(x)-2*ln(x))*cot(y(x)))/cot(y(x)) = 0
```

4.206 $xy'(x) = y(x) - \cot^2(y(x))$

ODE

$$xy'(x) = y(x) - \cot^2(y(x))$$

ODE Classification

[_separable]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 89.6717 (sec), leaf count = 48

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{\cos(2K[1]) - 1}{-K[1] + K[1]\cos(2K[1]) + \cos(2K[1]) + 1}\, dK[1]\&\right][c_1 + \log(x)]\right\}\right\}$$

Maple ✓
cpu = 0.204 (sec), leaf count = 24

$$\left\{\ln(x) - \int^{y(x)} \left(-(\cot(\_a))^2 + \_a\right)^{-1} d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == -Cot[y[x]]^2 + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Integrate[(-1 + Cos[2*K[1]])/(1 + Cos[2*K[1]] - K[1] +
  Cos[2*K[1]]*K[1]), {K[1], 1, #1}] & ][C[1] + Log[x]]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)-cot(y(x))^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-Intat(1/(-cot(_a)^2+_a),_a = y(x))+_C1 = 0
```

4.207 $xy'(x) + y(x) + 2x \sec(xy(x)) = 0$

ODE

$$xy'(x) + y(x) + 2x \sec(xy(x)) = 0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0620316 (sec), leaf count = 19

$$\left\{\left\{y(x) \to -\frac{\sin^{-1}\left(x^2 - c_1\right)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.338 (sec), leaf count = 15

$$\{\sin(xy(x)) + x^2 - \_C1 = 0\}$$

Mathematica raw input

```
DSolve[2*x*Sec[x*y[x]] + y[x] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(ArcSin[x^2 - C[1]]/x)}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+y(x)+2*x*sec(x*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
sin(x*y(x))+x^2-_C1 = 0
```

4.208 $xy'(x) - y(x) + x \sec\left(\frac{y(x)}{x}\right) = 0$

ODE

$$xy'(x) - y(x) + x \sec\left(\frac{y(x)}{x}\right) = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0267887 (sec), leaf count = 15

$$\{\{y(x) \to x \sin^{-1}(c_1 - \log(x))\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 16

$$\left\{-\_C1 + \sin\left(\frac{y(x)}{x}\right) + \ln(x) = 0\right\}$$

Mathematica raw input

```
DSolve[x*Sec[y[x]/x] - y[x] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*ArcSin[C[1] - Log[x]]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)-y(x)+x*sec(y(x)/x) = 0, y(x),'implicit')
```

Maple raw output

```
-_C1+sin(y(x)/x)+ln(x) = 0
```

4.209 $xy'(x) = y(x) + x\sec^2\left(\frac{y(x)}{x}\right)$

ODE

$$xy'(x) = y(x) + x\sec^2\left(\frac{y(x)}{x}\right)$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0441468 (sec), leaf count = 27

$$\text{Solve}\left[4(c_1 + \log(x)) = \frac{2y(x)}{x} + \sin\left(\frac{2y(x)}{x}\right), y(x)\right]$$

Maple ✓
cpu = 0.02 (sec), leaf count = 35

$$\left\{\frac{1}{2x}\left(\cos\left(\frac{y(x)}{x}\right)\sin\left(\frac{y(x)}{x}\right)x + y(x)\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == x*Sec[y[x]/x]^2 + y[x],y[x],x]
```

Mathematica raw output

```
Solve[4*(C[1] + Log[x]) == Sin[(2*y[x])/x] + (2*y[x])/x, y[x]]
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)+x*sec(y(x)/x)^2, y(x),'implicit')
```

Maple raw output

```
1/2*(cos(y(x)/x)*sin(y(x)/x)*x+y(x))/x-ln(x)-_C1 = 0
```

4.210 $xy'(x) = \sin(x - y(x))$

ODE

$$xy'(x) = \sin(x - y(x))$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of Variable, new dependent variable

Mathematica ✗
cpu = 2.94972 (sec), leaf count = 0 , could not solve

```
DSolve[x*Derivative[1][y][x] == Sin[x - y[x]], y[x], x]
```

Maple ✗
cpu = 1.532 (sec), leaf count = 0 , could not solve

```
dsolve(x*diff(y(x),x) = sin(x-y(x)), y(x),'implicit')
```

Mathematica raw input

```
DSolve[x*y'[x] == Sin[x - y[x]],y[x],x]
```

Mathematica raw output

```
DSolve[x*Derivative[1][y][x] == Sin[x - y[x]], y[x], x]
```

Maple raw input

```
dsolve(x*diff(y(x),x) = sin(x-y(x)), y(x),'implicit')
```

Maple raw output

```
dsolve(x*diff(y(x),x) = sin(x-y(x)), y(x),'implicit')
```

4.211 $xy'(x) = y(x) + x \sin\left(\frac{y(x)}{x}\right)$

ODE

$$xy'(x) = y(x) + x \sin\left(\frac{y(x)}{x}\right)$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0554972 (sec), leaf count = 19

$$\left\{\left\{y(x) \to 2x \cot^{-1}\left(\frac{e^{-c_1}}{x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 29

$$\left\{\ln\left(\csc\left(\frac{y(x)}{x}\right) - \cot\left(\frac{y(x)}{x}\right)\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == x*Sin[y[x]/x] + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*x*ArcCot[1/(E^C[1]*x)]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)+x*sin(y(x)/x), y(x),'implicit')
```

Maple raw output

```
ln(csc(y(x)/x)-cot(y(x)/x))-ln(x)-_C1 = 0
```

4.212 $xy'(x) + \tan(y(x)) = 0$

ODE

$$xy'(x) + \tan(y(x)) = 0$$

ODE Classification

[_separable]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0193132 (sec), leaf count = 14

$$\left\{\left\{y(x) \to \sin^{-1}\left(\frac{e^{c_1}}{x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 11

$$\{\ln(x) + \ln(\sin(y(x))) + \_C1 = 0\}$$

Mathematica raw input

```
DSolve[Tan[y[x]] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ArcSin[E^C[1]/x]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+tan(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)+ln(sin(y(x)))+_C1 = 0
```

4.213 $xy'(x) + \tan(y(x) + x) + x = 0$

ODE

$$xy'(x) + \tan(y(x) + x) + x = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.0768081 (sec), leaf count = 16

$$\left\{\left\{y(x) \to \sin^{-1}\left(\frac{c_1}{x}\right) - x\right\}\right\}$$

Maple ✓
cpu = 0.081 (sec), leaf count = 59

$$\left\{\frac{\left(-\_C1\,x^2 + (\tan(x))^2 + 1\right)(\tan(y(x)))^2 - 2\tan(x)\tan(y(x))\,\_C1\,x^2 + 1 + \left(-\_C1\,x^2 + 1\right)(\tan(x))^2}{(\tan(x) + \tan(y(x)))^2\,x^2} = 0\right\}$$

Mathematica raw input

```
DSolve[x + Tan[x + y[x]] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x + ArcSin[C[1]/x]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+x+tan(x+y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
((-_C1*x^2+tan(x)^2+1)*tan(y(x))^2-2*tan(x)*tan(y(x))*_C1*x^2+1+(-_C1*x^2+1)*tan
(x)^2)/(tan(x)+tan(y(x)))^2/x^2 = 0
```

4.214 $xy'(x) = y(x) - x \tan\left(\frac{y(x)}{x}\right)$

ODE

$$xy'(x) = y(x) - x \tan\left(\frac{y(x)}{x}\right)$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0314434 (sec), leaf count = 16

$$\left\{\left\{y(x) \to x \sin^{-1}\left(\frac{e^{c_1}}{x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 17

$$\left\{-\_C1 + \ln\left(\sin\left(\frac{y(x)}{x}\right)\right) + \ln(x) = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == -(x*Tan[y[x]/x]) + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*ArcSin[E^C[1]/x]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)-x*tan(y(x)/x), y(x),'implicit')
```

Maple raw output

```
-_C1+ln(sin(y(x)/x))+ln(x) = 0
```

4.215 $xy'(x) = (y(x)^2 + 1)\left(x^2 + \tan^{-1}(y(x))\right)$

ODE

$$xy'(x) = (y(x)^2 + 1)\left(x^2 + \tan^{-1}(y(x))\right)$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.0399848 (sec), leaf count = 14

$$\{\{y(x) \to \tan(x(2c_1 + x))\}\}$$

Maple ✓
cpu = 0.112 (sec), leaf count = 17

$$\left\{\frac{\arctan(y(x))}{x} - x - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == (x^2 + ArcTan[y[x]])*(1 + y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> Tan[x*(x + 2*C[1])]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = (1+y(x)^2)*(x^2+arctan(y(x))), y(x),'implicit')
```

Maple raw output

```
1/x*arctan(y(x))-x-_C1 = 0
```

4.216 $xy'(x) = xe^{\frac{y(x)}{x}} + y(x)$

ODE

$$xy'(x) = xe^{\frac{y(x)}{x}} + y(x)$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0135442 (sec), leaf count = 18

$$\{\{y(x) \to -x \log(-c_1 - \log(x))\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 18

$$\left\{-\_C1 + \left(e^{\frac{y(x)}{x}}\right)^{-1} + \ln(x) = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == E^(y[x]/x)*x + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x*Log[-C[1] - Log[x]])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)+x*exp(y(x)/x), y(x),'implicit')
```

Maple raw output

```
-_C1+1/exp(y(x)/x)+ln(x) = 0
```

4.217 $xy'(x) = xe^{\frac{y(x)}{x}} + y(x) + x$

ODE

$$xy'(x) = xe^{\frac{y(x)}{x}} + y(x) + x$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0242288 (sec), leaf count = 21

$$\left\{\left\{y(x) \to -x \log\left(\frac{e^{-c_1}}{x} - 1\right)\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 31

$$\left\{-\ln\left(e^{\frac{y(x)}{x}} + 1\right) + \ln\left(e^{\frac{y(x)}{x}}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == x + E^(y[x]/x)*x + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x*Log[-1 + 1/(E^C[1]*x)])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = x+y(x)+x*exp(y(x)/x), y(x),'implicit')
```

Maple raw output

```
-ln(exp(y(x)/x)+1)+ln(exp(y(x)/x))-ln(x)-_C1 = 0
```

4.218 $xy'(x) = y(x)\log(y(x))$

ODE

$$xy'(x) = y(x)\log(y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00943726 (sec), leaf count = 13

$$\left\{\left\{y(x) \to e^{e^{c_1} x}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 13

$$\{\ln(x) - \ln(\ln(y(x))) + \_C1 = 0\}$$

Mathematica raw input

```
DSolve[x*y'[x] == Log[y[x]]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(E^C[1]*x)}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)*ln(y(x)), y(x),'implicit')
```

Maple raw output

```
ln(x)-ln(ln(y(x)))+_C1 = 0
```

4.219 $xy'(x) = y(x)(-\log(y(x)) + \log(x) + 1)$

ODE

$$xy'(x) = y(x)(-\log(y(x)) + \log(x) + 1)$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.014644 (sec), leaf count = 17

$$\left\{\left\{y(x) \to xe^{\frac{e^{c_1}}{x}}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 17

$$\{x \ln(x) - x \ln(y(x)) - \_C1 = 0\}$$

Mathematica raw input

```
DSolve[x*y'[x] == (1 + Log[x] - Log[y[x]])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(E^C[1]/x)*x}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = (1+ln(x)-ln(y(x)))*y(x), y(x),'implicit')
```

Maple raw output

```
x*ln(x)-x*ln(y(x))-_C1 = 0
```

4.220 $xy'(x) + y(x)(-\log(y(x)) - \log(x) + 1) = 0$

ODE

$$xy'(x) + y(x)(-\log(y(x)) - \log(x) + 1) = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.0297898 (sec), leaf count = 19

$$\left\{\left\{y(x) \to \frac{e^{e^{-c_1} x}}{x}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 17

$$\left\{\frac{-\_C1\, x + \ln(x) + \ln(y(x))}{x} = 0\right\}$$

Mathematica raw input

```
DSolve[(1 - Log[x] - Log[y[x]])*y[x] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x/E^C[1])/x}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)+(1-ln(x)-ln(y(x)))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
(-_C1*x+ln(x)+ln(y(x)))/x = 0
```

4.221 $xy'(x) = y(x) - 2x \tanh\left(\frac{y(x)}{x}\right)$

ODE

$$xy'(x) = y(x) - 2x \tanh\left(\frac{y(x)}{x}\right)$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.035833 (sec), leaf count = 16

$$\left\{\left\{y(x) \to x \sinh^{-1}\left(\frac{e^{c_1}}{x^2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.042 (sec), leaf count = 45

$$\left\{\frac{1}{4}\ln\left(\tanh\left(\frac{y(x)}{x}\right)-1\right)+\frac{1}{4}\ln\left(\tanh\left(\frac{y(x)}{x}\right)+1\right)-\frac{1}{2}\ln\left(\tanh\left(\frac{y(x)}{x}\right)\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == -2*x*Tanh[y[x]/x] + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*ArcSinh[E^C[1]/x^2]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)-2*x*tanh(y(x)/x), y(x),'implicit')
```

Maple raw output

```
1/4*ln(tanh(y(x)/x)-1)+1/4*ln(tanh(y(x)/x)+1)-1/2*ln(tanh(y(x)/x))-ln(x)-_C1 = 0
```

4.222 $ny(x) + xy'(x) = f(x)g(x^n y(x))$

ODE

$$ny(x) + xy'(x) = f(x)g(x^n y(x))$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 4.29333 (sec), leaf count = 39

$$\text{Solve}\left[\int_1^x f(K[2])K[2]^{n-1}\,dK[2] + c_1 = \int_1^{x^n y(x)} \frac{1}{g(K[1])}\,dK[1], y(x)\right]$$

Maple ✓
cpu = 0.272 (sec), leaf count = 32

$$\left\{\int f(x)\,x^{n-1}\,\mathrm{d}x - \int^{x^n y(x)} (g(\_a))^{-1}\,d\_a - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[n*y[x] + x*y'[x] == f[x]*g[x^n*y[x]],y[x],x]
```

Mathematica raw output

```
Solve[C[1] + Integrate[f[K[2]]*K[2]^(-1 + n), {K[2], 1, x}] == Integrate[g[K[1]]
^(-1), {K[1], 1, x^n*y[x]}], y[x]]
```

Maple raw input

```
dsolve(x*diff(y(x),x)+n*y(x) = f(x)*g(x^n*y(x)), y(x),'implicit')
```

Maple raw output

```
Int(f(x)*x^(n-1),x)-Intat(1/g(_a),_a = x^n*y(x))-_C1 = 0
```

4.223 $xy'(x) = y(x)f(x^m y(x)^n)$

ODE

$$xy'(x) = y(x)f(x^m y(x)^n)$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 527.297 (sec), leaf count = 142

$$\text{Solve}\left[c_1 = \int_1^{y(x)} -\frac{K[2]\left(nf(x^m K[2]^n)+m\right)\left(\int_1^x \frac{mn^2 K[1]^{m-1}K[2]^{n-1}f'(K[1]^m K[2]^n)}{(nf(K[1]^m K[2]^n)+m)^2}\,dK[1]\right)+n}{K[2]\left(nf\left(x^m K[2]^n\right)+m\right)}\,dK[2] + \int_1^x \frac{nf(y(x)^n}{K[1]\left(nf\left(y(x)^n\right.\right.}\right.$$

Maple ✓
cpu = 0.107 (sec), leaf count = 39

$$\left\{\int_{\_b}^{y(x)} \frac{1}{\left(f\left(x^m \_a^n\right)n+m\right)\_a}\,\mathrm{d}\_a - \frac{\ln(x)}{n} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x] == f[x^m*y[x]^n]*y[x],y[x],x]
```

Mathematica raw output

```
Solve[C[1] == Integrate[(n*f[K[1]^m*y[x]^n])/((m + n*f[K[1]^m*y[x]^n])*K[1]), {K
[1], 1, x}] + Integrate[-((n + (m + n*f[x^m*K[2]^n])*Integrate[(m*n^2*K[1]^(-1 +
 m)*K[2]^(-1 + n)*Derivative[1][f][K[1]^m*K[2]^n])/(m + n*f[K[1]^m*K[2]^n])^2, {
K[1], 1, x}]*K[2])/((m + n*f[x^m*K[2]^n])*K[2])), {K[2], 1, y[x]}], y[x]]
```

Maple raw input

```
dsolve(x*diff(y(x),x) = y(x)*f(x^m*y(x)^n), y(x),'implicit')
```

Maple raw output

```
Int(1/(f(x^m*_a^n)*n+m)/_a,_a = _b .. y(x))-ln(x)/n-_C1 = 0
```

4.224 $(x+1)y'(x) = (3x+4)x^3 + y(x)$

ODE

$$(x+1)y'(x) = (3x+4)x^3 + y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0164465 (sec), leaf count = 18

$$\{\{y(x) \to (c_1+4)\,x + c_1 + x^4 + 4\}\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 14

$$\{y(x) = x^4 + \_C1\,x + \_C1 + x + 1\}$$

Mathematica raw input

```
DSolve[(1 + x)*y'[x] == x^3*(4 + 3*x) + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 4 + x^4 + C[1] + x*(4 + C[1])}}
```

Maple raw input

```
dsolve((1+x)*diff(y(x),x) = x^3*(4+3*x)+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = x^4+_C1*x+_C1+x+1
```

4.225 $(x+1)y'(x) = 2y(x) + (x+1)^4$

ODE

$$(x+1)y'(x) = 2y(x) + (x+1)^4$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00532228 (sec), leaf count = 22

$$\left\{\left\{y(x) \to (x+1)^2\left(c_1 + \frac{x^2}{2} + x\right)\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 18

$$\left\{y(x) = \left(x + \frac{x^2}{2} + \_C1\right)(1+x)^2\right\}$$

Mathematica raw input

```
DSolve[(1 + x)*y'[x] == (1 + x)^4 + 2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x)^2*(x + x^2/2 + C[1])}}
```

Maple raw input

```
dsolve((1+x)*diff(y(x),x) = (1+x)^4+2*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (x+1/2*x^2+_C1)*(1+x)^2
```

4.226 $(x+1)y'(x) = ny(x) + e^x(x+1)^{n+1}$

ODE

$$(x+1)y'(x) = ny(x) + e^x(x+1)^{n+1}$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.012048 (sec), leaf count = 17

$$\{\{y(x) \to (c_1 + e^x)(x+1)^n\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 14

$$\{y(x) = (\mathrm{e}^x + \_C1)(1+x)^n\}$$

Mathematica raw input

```
DSolve[(1 + x)*y'[x] == E^x*(1 + x)^(1 + n) + n*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x)^n*(E^x + C[1])}}
```

Maple raw input

```
dsolve((1+x)*diff(y(x),x) = exp(x)*(1+x)^(n+1)+n*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (exp(x)+_C1)*(1+x)^n
```

4.227 $(x+1)y'(x) = ay(x) + bxy(x)^2$

ODE

$$(x+1)y'(x) = ay(x) + bxy(x)^2$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0265106 (sec), leaf count = 39

$$\left\{\left\{y(x) \to -\frac{a(a+1)(x+1)^a}{b(x+1)^a(ax-1) - a(a+1)c_1}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 37

$$\left\{\frac{bx}{1+a} - \frac{b}{a\,(1+a)} - (1+x)^{-a}\,\_C1 + (y(x))^{-1} = 0\right\}$$

Mathematica raw input

```
DSolve[(1 + x)*y'[x] == a*y[x] + b*x*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a*(1 + a)*(1 + x)^a)/(b*(1 + x)^a*(-1 + a*x) - a*(1 + a)*C[1]))}}
```

Maple raw input

```
dsolve((1+x)*diff(y(x),x) = a*y(x)+b*x*y(x)^2, y(x),'implicit')
```

Maple raw output

```
1/(1+a)*b*x-1/a/(1+a)*b-(1+x)^(-a)*_C1+1/y(x) = 0
```

4.228 $(x+1)y'(x)+(x+1)^4y(x)^3+y(x)=0$

ODE

$$(x+1)y'(x)+(x+1)^4y(x)^3+y(x)=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0129206 (sec), leaf count = 49

$$\left\{\left\{y(x)\to -\frac{1}{\sqrt{(x+1)^2\left(c_1+x^2+2x\right)}}\right\},\left\{y(x)\to \frac{1}{\sqrt{(x+1)^2\left(c_1+x^2+2x\right)}}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 23

$$\left\{(y(x))^{-2}-\left(x^2+\_C1+2\,x\right)(1+x)^2=0\right\}$$

Mathematica raw input

```
DSolve[y[x] + (1 + x)^4*y[x]^3 + (1 + x)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1/Sqrt[(1 + x)^2*(2*x + x^2 + C[1])])}, {y[x] -> 1/Sqrt[(1 + x)^2*(2
*x + x^2 + C[1])]}}
```

Maple raw input

```
dsolve((1+x)*diff(y(x),x)+y(x)+(1+x)^4*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
1/y(x)^2-(x^2+_C1+2*x)*(1+x)^2 = 0
```

4.229 $(x+1)y'(x) = y(x)\left(1 - xy(x)^3\right)$

ODE

$$(x+1)y'(x) = y(x)\left(1 - xy(x)^3\right)$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0139653 (sec), leaf count = 119

$$\left\{\left\{y(x) \to -\frac{(-2)^{2/3}(x+1)}{\sqrt[3]{-4c_1 - 3x^4 - 8x^3 - 6x^2}}\right\}, \left\{y(x) \to -\frac{2^{2/3}(x+1)}{\sqrt[3]{-4c_1 - 3x^4 - 8x^3 - 6x^2}}\right\}, \left\{y(x) \to \frac{\sqrt[3]{-1}2^{2/3}(x+1)}{\sqrt[3]{-4c_1 - 3x^4 - 8x^3 - 6x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 34

$$\left\{(y(x))^{-3} + \frac{-3\,x^4 - 8\,x^3 - 6\,x^2 - 4\_C1}{4\,(1+x)^3} = 0\right\}$$

Mathematica raw input

```
DSolve[(1 + x)*y'[x] == y[x]*(1 - x*y[x]^3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(((-2)^(2/3)*(1 + x))/(-6*x^2 - 8*x^3 - 3*x^4 - 4*C[1])^(1/3))}, {y[x
] -> -((2^(2/3)*(1 + x))/(-6*x^2 - 8*x^3 - 3*x^4 - 4*C[1])^(1/3))}, {y[x] -> ((-
1)^(1/3)*2^(2/3)*(1 + x))/(-6*x^2 - 8*x^3 - 3*x^4 - 4*C[1])^(1/3)}}
```

Maple raw input

```
dsolve((1+x)*diff(y(x),x) = (1-x*y(x)^3)*y(x), y(x),'implicit')
```

Maple raw output

```
1/y(x)^3+1/4*(-3*x^4-8*x^3-6*x^2-4*_C1)/(1+x)^3 = 0
```

4.230 $(x+1)y'(x) = (x+1)\sqrt{y(x)+1} + y(x) + 1$

ODE

$$(x+1)y'(x) = (x+1)\sqrt{y(x)+1} + y(x) + 1$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.185196 (sec), leaf count = 57

$$\text{Solve}\left[c_1 + \log(x+1) = \log(y(x) - x(x+2)) + \frac{2\sqrt{y(x)+1}\tan^{-1}\left(\frac{x+1}{\sqrt{-y(x)-1}}\right)}{\sqrt{-y(x)-1}}, y(x)\right]$$

Maple ✓
cpu = 0.097 (sec), leaf count = 81

$$\left\{\frac{1}{x^2+2x-y(x)}\left(\left(-y(x)\_C1+1+\_C1\,x^2+(2\_C1+1)x\right)\sqrt{1+y(x)}-(1+x)\left(-y(x)\_C1-1+\_C1\,x^2+(2\_C1\right.\right.$$

Mathematica raw input

```
DSolve[(1 + x)*y'[x] == 1 + y[x] + (1 + x)*Sqrt[1 + y[x]],y[x],x]
```

Mathematica raw output

```
Solve[C[1] + Log[1 + x] == Log[-(x*(2 + x)) + y[x]] + (2*ArcTan[(1 + x)/Sqrt[-1
- y[x]]]*Sqrt[1 + y[x]])/Sqrt[-1 - y[x]], y[x]]
```

Maple raw input

```
dsolve((1+x)*diff(y(x),x) = 1+y(x)+(1+x)*(1+y(x))^(1/2), y(x),'implicit')
```

Maple raw output

```
((-y(x)*_C1+1+_C1*x^2+(2*_C1+1)*x)*(1+y(x))^(1/2)-(1+x)*(-y(x)*_C1-1+_C1*x^2+(2*
_C1-1)*x))/(-(1+y(x))^(1/2)+x+1)/(x^2+2*x-y(x)) = 0
```

4.231 $(a+x)y'(x) = bx$

ODE

$$(a+x)y'(x) = bx$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Dependent variable missing

Mathematica ✓
cpu = 0.00477031 (sec), leaf count = 19

$$\{\{y(x) \to -ab\log(a+x) + bx + c_1\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 17

$$\{y(x) = -\ln(a+x)\,ab + bx + \_C1\}$$

Mathematica raw input

```
DSolve[(a + x)*y'[x] == b*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> b*x + C[1] - a*b*Log[a + x]}}
```

Maple raw input

```
dsolve((a+x)*diff(y(x),x) = b*x, y(x),'implicit')
```

Maple raw output

```
y(x) = -ln(a+x)*a*b+b*x+_C1
```

4.232 $(a+x)y'(x) = bx + y(x)$

ODE

$$(a+x)y'(x) = bx + y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00989323 (sec), leaf count = 26

$$\left\{\left\{y(x) \to (a+x)\left(\frac{ab}{a+x} + b\log(a+x) + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 22

$$\{y(x) = b(a+x)\ln(a+x) + (b + \_C1)\,a + \_C1\,x\}$$

Mathematica raw input

```
DSolve[(a + x)*y'[x] == b*x + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a + x)*((a*b)/(a + x) + C[1] + b*Log[a + x])}}
```

Maple raw input

```
dsolve((a+x)*diff(y(x),x) = b*x+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = b*(a+x)*ln(a+x)+(b+_C1)*a+_C1*x
```

4.233 $(a+x)y'(x)+bx^2+y(x)=0$

ODE

$$(a+x)y'(x)+bx^2+y(x)=0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00539683 (sec), leaf count = 25

$$\left\{\left\{y(x)\to \frac{3c_1-bx^3}{3(a+x)}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 24

$$\left\{y(x)=\frac{-bx^3+3\_C1}{3\,a+3\,x}\right\}$$

Mathematica raw input

```
DSolve[b*x^2 + y[x] + (a + x)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(b*x^3) + 3*C[1])/(3*(a + x))}}
```

Maple raw input

```
dsolve((a+x)*diff(y(x),x)+b*x^2+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-b*x^3+3*_C1)/(3*a+3*x)
```

4.234 $(a+x)y'(x) = 2(a+x)^5 + 3y(x)$

ODE

$$(a+x)y'(x) = 2(a+x)^5 + 3y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00712026 (sec), leaf count = 21

$$\{\{y(x) \to (a+x)^3 \left(2ax + c_1 + x^2\right)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 19

$$\left\{y(x) = \left(2\,ax + x^2 + \_C1\right)(a+x)^3\right\}$$

Mathematica raw input

```
DSolve[(a + x)*y'[x] == 2*(a + x)^5 + 3*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a + x)^3*(2*a*x + x^2 + C[1])}}
```

Maple raw input

```
dsolve((a+x)*diff(y(x),x) = 2*(a+x)^5+3*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (2*a*x+x^2+_C1)*(a+x)^3
```

4.235 $(a+x)y'(x) = b + cy(x)$

ODE

$$(a+x)y'(x) = b + cy(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0104212 (sec), leaf count = 20

$$\left\{\left\{y(x) \to c_1(a+x)^c - \frac{b}{c}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 18

$$\left\{y(x) = -\frac{b}{c} + (a+x)^c \_C1\right\}$$

Mathematica raw input

```
DSolve[(a + x)*y'[x] == b + c*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(b/c) + (a + x)^c*C[1]}}
```

Maple raw input

```
dsolve((a+x)*diff(y(x),x) = b+c*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -b/c+(a+x)^c*_C1
```

4.236 $(a+x)y'(x) = bx + cy(x)$

ODE

$$(a+x)y'(x) = bx + cy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0163371 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \frac{ab+bcx}{c-c^2} + c_1(a+x)^c\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 28

$$\left\{y(x) = (a+x)^c\_C1 - \frac{b(cx+a)}{c(c-1)}\right\}$$

Mathematica raw input

```
DSolve[(a + x)*y'[x] == b*x + c*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a*b + b*c*x)/(c - c^2) + (a + x)^c*C[1]}}
```

Maple raw input

```
dsolve((a+x)*diff(y(x),x) = b*x+c*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (a+x)^c*_C1-b*(c*x+a)/c/(c-1)
```

4.237 $(a+x)y'(x) = y(x)(1-ay(x))$

ODE

$$(a+x)y'(x) = y(x)(1-ay(x))$$

ODE Classification

[_separable]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0224721 (sec), leaf count = 22

$$\left\{\left\{y(x) \to \frac{a+x}{a^2+ax+e^{c_1}}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 22

$$\left\{(y(x))^{-1} + \frac{-ax - \_C1}{a+x} = 0\right\}$$

Mathematica raw input

```
DSolve[(a + x)*y'[x] == y[x]*(1 - a*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a + x)/(a^2 + E^C[1] + a*x)}}
```

Maple raw input

```
dsolve((a+x)*diff(y(x),x) = y(x)*(1-a*y(x)), y(x),'implicit')
```

Maple raw output

```
1/y(x)+(-a*x-_C1)/(a+x) = 0
```

4.238 $(a-x)y'(x) = y(x)^3(b+cx)+y(x)$

ODE

$$(a-x)y'(x) = y(x)^3(b+cx)+y(x)$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0185469 (sec), leaf count = 77

$$\left\{\left\{y(x)\to -\frac{1}{\sqrt{a^2c_1+a\left(c-2c_1x\right)-b+x\left(c_1x-2c\right)}}\right\},\left\{y(x)\to \frac{1}{\sqrt{a^2c_1+a\left(c-2c_1x\right)-b+x\left(c_1x-2c\right)}}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 35

$$\left\{\frac{1+\left(-(a-x)^2\_C1-ca+2cx+b\right)(y(x))^2}{(y(x))^2}=0\right\}$$

Mathematica raw input

```
DSolve[(a - x)*y'[x] == y[x] + (b + c*x)*y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1/Sqrt[-b + a^2*C[1] + a*(c - 2*x*C[1]) + x*(-2*c + x*C[1])])}, {y[x
] -> 1/Sqrt[-b + a^2*C[1] + a*(c - 2*x*C[1]) + x*(-2*c + x*C[1])]}}
```

Maple raw input

```
dsolve((a-x)*diff(y(x),x) = y(x)+(c*x+b)*y(x)^3, y(x),'implicit')
```

Maple raw output

```
(1+(-(a-x)^2*_C1-c*a+2*c*x+b)*y(x)^2)/y(x)^2 = 0
```

4.239 $2xy'(x) = 2x^3 - y(x)$

ODE

$$2xy'(x) = 2x^3 - y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00453928 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{c_1}{\sqrt{x}} + \frac{2x^3}{7}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 15

$$\left\{y(x) = \frac{2\,x^3}{7} + \_C1\,\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[2*x*y'[x] == 2*x^3 - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x^3)/7 + C[1]/Sqrt[x]}}
```

Maple raw input

```
dsolve(2*x*diff(y(x),x) = 2*x^3-y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 2/7*x^3+1/x^(1/2)*_C1
```

4.240 $2xy'(x) + 1 = y(x)^2 + 4ixy(x)$

ODE

$$2xy'(x) + 1 = y(x)^2 + 4ixy(x)$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.104555 (sec), leaf count = 124

$$\left\{\left\{y(x) \to \frac{(1-i)\sqrt{x}\left((2-2i)\sqrt{x}G^{2,0}_{1,2}\left(-2ix \middle| \begin{matrix} -1 \\ -\frac{3}{2}, -\frac{1}{2} \end{matrix}\right) + c_1 e^{ix}((x-i)J_0(x) - J_1(x) + xJ_2(x))\right)}{G^{2,0}_{1,2}\left(-2ix \middle| \begin{matrix} 1 \\ -\frac{1}{2}, \frac{1}{2} \end{matrix}\right) + (1+i)c_1 e^{ix}\sqrt{x}(J_0(x) - iJ_1(x))}\right\}\right\}$$

Maple ✓
cpu = 0.253 (sec), leaf count = 62

$$\left\{y(x) = \frac{-K_0(ix)\_C1 + iJ_1(x) + K_1(ix)\_C1 + J_0(x)}{K_0(ix)\_C1 + iJ_1(x) + K_1(ix)\_C1 - J_0(x)}\right\}$$

Mathematica raw input

```
DSolve[1 + 2*x*y'[x] == (4*I)*x*y[x] + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((1 - I)*Sqrt[x]*(E^(I*x)*((-I + x)*BesselJ[0, x] - BesselJ[1, x] + x*
BesselJ[2, x])*C[1] + (2 - 2*I)*Sqrt[x]*MeijerG[{{}, {-1}}, {{-3/2, -1/2}, {}},
(-2*I)*x]))/((1 + I)*E^(I*x)*Sqrt[x]*(BesselJ[0, x] - I*BesselJ[1, x])*C[1] + Me
ijerG[{{}, {1}}, {{-1/2, 1/2}, {}}, (-2*I)*x])}}
```

Maple raw input

```
dsolve(2*x*diff(y(x),x)+1 = 4*I*x*y(x)+y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = (-BesselK(0,I*x)*_C1+I*BesselJ(1,x)+BesselK(1,I*x)*_C1+BesselJ(0,x))/(Bes
selK(0,I*x)*_C1+I*BesselJ(1,x)+BesselK(1,I*x)*_C1-BesselJ(0,x))
```

4.241 $2xy'(x) = y(x)\left(y(x)^2+1\right)$

ODE

$$2xy'(x) = y(x)\left(y(x)^2+1\right)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0194105 (sec), leaf count = 63

$$\left\{\left\{y(x) \to -\frac{ie^{c_1}\sqrt{x}}{\sqrt{e^{2c_1}x-1}}\right\}, \left\{y(x) \to \frac{ie^{c_1}\sqrt{x}}{\sqrt{e^{2c_1}x-1}}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 15

$$\left\{-\frac{\_C1}{x}+1+(y(x))^{-2}=0\right\}$$

Mathematica raw input

```
DSolve[2*x*y'[x] == y[x]*(1 + y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*E^C[1]*Sqrt[x])/Sqrt[-1 + E^(2*C[1])*x]}, {y[x] -> (I*E^C[1]*Sqr
t[x])/Sqrt[-1 + E^(2*C[1])*x]}}
```

Maple raw input

```
dsolve(2*x*diff(y(x),x) = y(x)*(1+y(x)^2), y(x),'implicit')
```

Maple raw output

```
-1/x*_C1+1+1/y(x)^2 = 0
```

4.242 $2xy'(x) + y(x)\left(y(x)^2+1\right) = 0$

ODE

$$2xy'(x) + y(x)\left(y(x)^2+1\right) = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0176471 (sec), leaf count = 53

$$\left\{\left\{y(x) \to -\frac{ie^{c_1}}{\sqrt{e^{2c_1}-x}}\right\}, \left\{y(x) \to \frac{ie^{c_1}}{\sqrt{e^{2c_1}-x}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 13

$$\left\{1 - \_C1\, x + (y(x))^{-2} = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 + y[x]^2) + 2*x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*E^C[1])/Sqrt[E^(2*C[1]) - x]}, {y[x] -> (I*E^C[1])/Sqrt[E^(2*C[1
]) - x]}}
```

Maple raw input

```
dsolve(2*x*diff(y(x),x)+y(x)*(1+y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
1-_C1*x+1/y(x)^2 = 0
```

4.243 $2xy'(x) = y(x)\left(-6y(x)^2 + x + 1\right)$

ODE

$$2xy'(x) = y(x)\left(-6y(x)^2 + x + 1\right)$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0109751 (sec), leaf count = 60

$$\left\{\left\{y(x) \to -\frac{e^{x/2}\sqrt{x}}{\sqrt{c_1 + 6e^x}}\right\}, \left\{y(x) \to \frac{e^{x/2}\sqrt{x}}{\sqrt{c_1 + 6e^x}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 23

$$\left\{-6\,x^{-1} - \frac{\mathrm{e}^{-x}\_C1}{x} + (y(x))^{-2} = 0\right\}$$

Mathematica raw input

```
DSolve[2*x*y'[x] == y[x]*(1 + x - 6*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((E^(x/2)*Sqrt[x])/Sqrt[6*E^x + C[1]])}, {y[x] -> (E^(x/2)*Sqrt[x])/S
qrt[6*E^x + C[1]]}}
```

Maple raw input

```
dsolve(2*x*diff(y(x),x) = (1+x-6*y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
-6/x-1/x*exp(-x)*_C1+1/y(x)^2 = 0
```

4.244 $\sqrt{a^2-4b-4cy(x)}+a+2xy'(x)+4y(x)=0$

ODE

$$\sqrt{a^2-4b-4cy(x)}+a+2xy'(x)+4y(x)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 2.02221 (sec), leaf count = 357

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{1}{8}\left(-\frac{2c\tan^{-1}\left(\frac{8\#1+2a+c}{\sqrt{-4a^2-4ac+16b-c^2}}\right)}{\sqrt{-4a^2-4ac+16b-c^2}}-\frac{2\sqrt{c\left(\sqrt{4a^2+4ac-16b+c^2}+c\right)+2a^2+2ac-8b}\,\text{ta}}{\sqrt{2a^2+2ac-8}}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.032 (sec), leaf count = 34

$$\left\{\ln(x)+\int^{y(x)}2\left(4\_a+a+\sqrt{-4\_a\,c+a^2-4\,b}\right)^{-1}d\_a+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[a + 4*y[x] + Sqrt[a^2 - 4*b - 4*c*y[x]] + 2*x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[((-2*c*ArcTan[(2*a + c + 8*#1)/Sqrt[-4*a^2 + 16*b - 4*
a*c - c^2]])/Sqrt[-4*a^2 + 16*b - 4*a*c - c^2] - (2*Sqrt[2*a^2 - 8*b + 2*a*c + c
*(c + Sqrt[4*a^2 - 16*b + 4*a*c + c^2])]*ArcTanh[(Sqrt[2]*Sqrt[a^2 - 4*(b + c*#1
)])/Sqrt[2*a^2 - 8*b + 2*a*c + c*(c + Sqrt[4*a^2 - 16*b + 4*a*c + c^2])]])/Sqrt[
2*a^2 - 8*b + 2*a*c + c^2/2] + (2*Sqrt[2*a^2 - 8*b + 2*a*c + c^2 - c*Sqrt[4*a^2
- 16*b + 4*a*c + c^2]]*ArcTanh[Sqrt[a^2 - 4*(b + c*#1)]/Sqrt[a^2 + a*c + (-8*b +
  c*(c - Sqrt[4*a^2 - 16*b + 4*a*c + c^2]))/2]])/Sqrt[2*a^2 - 8*b + 2*a*c + c^2/2
] + Log[b + #1*(2*a + c + 4*#1)])/8 & ][C[1] - Log[x]/2]}}
```

Maple raw input

```
dsolve(2*x*diff(y(x),x)+4*y(x)+a+(a^2-4*b-4*c*y(x))^(1/2) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)+Intat(2/(4*_a+a+(-4*_a*c+a^2-4*b)^(1/2)),_a = y(x))+_C1 = 0
```

4.245 $(1-2x)y'(x) = 2(-3y(x)+16x+8)$

ODE

$$(1-2x)y'(x) = 2(-3y(x)+16x+8)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0125542 (sec), leaf count = 22

$$\left\{\left\{y(x) \to c_1(2x-1)^3 + 8x + \frac{4}{3}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 18

$$\left\{y(x) = \frac{4}{3} + 8\,x + (-1+2\,x)^3\,\_C1\right\}$$

Mathematica raw input

```
DSolve[(1 - 2*x)*y'[x] == 2*(8 + 16*x - 3*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> 4/3 + 8*x + (-1 + 2*x)^3*C[1]}}
```

Maple raw input

```
dsolve((1-2*x)*diff(y(x),x) = 16+32*x-6*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 4/3+8*x+(-1+2*x)^3*_C1
```

4.246 $(2x+1)y'(x) = 4e^{-y(x)} - 2$

ODE

$$(2x+1)y'(x) = 4e^{-y(x)} - 2$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.015125 (sec), leaf count = 20

$$\left\{\left\{y(x) \to \log\left(\frac{e^{c_1}}{2x+1} + 2\right)\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 29

$$\left\{\_C1 + \ln(1+2x) + \ln\left(2\,\mathrm{e}^{-y(x)} - 1\right) - \ln\left(\mathrm{e}^{-y(x)}\right) = 0\right\}$$

Mathematica raw input

```
DSolve[(1 + 2*x)*y'[x] == -2 + 4/E^y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> Log[2 + E^C[1]/(1 + 2*x)]}}
```

Maple raw input

```
dsolve((1+2*x)*diff(y(x),x) = 4*exp(-y(x))-2, y(x),'implicit')
```

Maple raw output

```
_C1+ln(1+2*x)+ln(2*exp(-y(x))-1)-ln(exp(-y(x))) = 0
```

4.247 $2(1-x)y'(x) = y(x) + 4\sqrt{1-x}x$

ODE

$$2(1-x)y'(x) = y(x) + 4\sqrt{1-x}x$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0116151 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \frac{\sqrt{2}c_1 + 2x^2}{2\sqrt{1-x}}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 23

$$\left\{y(x) = x^2 \frac{1}{\sqrt{1-x}} + \_C1 \frac{1}{\sqrt{-1+x}}\right\}$$

Mathematica raw input

```
DSolve[2*(1 - x)*y'[x] == 4*Sqrt[1 - x]*x + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x^2 + Sqrt[2]*C[1])/(2*Sqrt[1 - x])}}
```

Maple raw input

```
dsolve(2*(1-x)*diff(y(x),x) = 4*x*(1-x)^(1/2)+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = x^2/(1-x)^(1/2)+1/(-1+x)^(1/2)*_C1
```

4.248 $2(x+1)y'(x)+(x+1)^4y(x)^3+2y(x)=0$

ODE

$$2(x+1)y'(x)+(x+1)^4y(x)^3+2y(x)=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0139986 (sec), leaf count = 64

$$\left\{\left\{y(x)\to -\frac{\sqrt{2}}{\sqrt{(x+1)^2\left(2c_1+x^2+2x\right)}}\right\},\left\{y(x)\to \frac{\sqrt{2}}{\sqrt{(x+1)^2\left(2c_1+x^2+2x\right)}}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 23

$$\left\{(y(x))^{-2}-\left(\frac{x^2}{2}+x+\_C1\right)(1+x)^2=0\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + (1 + x)^4*y[x]^3 + 2*(1 + x)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2]/Sqrt[(1 + x)^2*(2*x + x^2 + 2*C[1])])}, {y[x] -> Sqrt[2]/Sqr
t[(1 + x)^2*(2*x + x^2 + 2*C[1])]}}
```

Maple raw input

```
dsolve(2*(1+x)*diff(y(x),x)+2*y(x)+(1+x)^4*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
1/y(x)^2-(1/2*x^2+x+_C1)*(1+x)^2 = 0
```

4.249 $3xy'(x) = 3x^{2/3} + (1 - 3y(x))y(x)$

ODE

$$3xy'(x) = 3x^{2/3} + (1 - 3y(x))y(x)$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Special cases

Mathematica ✓
cpu = 0.0118605 (sec), leaf count = 61

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{x}\left(c_1 \sinh\left(3\sqrt[3]{x}\right) + i\cosh\left(3\sqrt[3]{x}\right)\right)}{c_1 \cosh\left(3\sqrt[3]{x}\right) + i\sinh\left(3\sqrt[3]{x}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 17

$$\left\{\_C1 + Artanh\left(y(x)\frac{1}{\sqrt[3]{x}}\right) - 3\sqrt[3]{x} = 0\right\}$$

Mathematica raw input

```
DSolve[3*x*y'[x] == 3*x^(2/3) + (1 - 3*y[x])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(1/3)*(I*Cosh[3*x^(1/3)] + C[1]*Sinh[3*x^(1/3)]))/(C[1]*Cosh[3*x^(1
/3)] + I*Sinh[3*x^(1/3)])}}
```

Maple raw input

```
dsolve(3*x*diff(y(x),x) = 3*x^(2/3)+(1-3*y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
_C1+arctanh(1/x^(1/3)*y(x))-3*x^(1/3) = 0
```

4.250 $3xy'(x) = y(x)\left(xy(x)^3 + 2\right)$

ODE

$$3xy'(x) = y(x)\left(xy(x)^3 + 2\right)$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00875218 (sec), leaf count = 84

$$\left\{\left\{y(x) \to -\frac{\sqrt[3]{-3}x^{2/3}}{\sqrt[3]{3c_1 - x^3}}\right\}, \left\{y(x) \to \frac{x^{2/3}}{\sqrt[3]{c_1 - \frac{x^3}{3}}}\right\}, \left\{y(x) \to \frac{(-1)^{2/3}x^{2/3}}{\sqrt[3]{c_1 - \frac{x^3}{3}}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 17

$$\left\{(y(x))^{-3} + \frac{x}{3} - \frac{\_C1}{x^2} = 0\right\}$$

Mathematica raw input

```
DSolve[3*x*y'[x] == y[x]*(2 + x*y[x]^3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(((-3)^(1/3)*x^(2/3))/(-x^3 + 3*C[1])^(1/3))}, {y[x] -> x^(2/3)/(-x^3
/3 + C[1])^(1/3)}, {y[x] -> ((-1)^(2/3)*x^(2/3))/(-x^3/3 + C[1])^(1/3)}}
```

Maple raw input

```
dsolve(3*x*diff(y(x),x) = (2+x*y(x)^3)*y(x), y(x),'implicit')
```

Maple raw output

```
1/y(x)^3+1/3*x-1/x^2*_C1 = 0
```

4.251 $3xy'(x) = y(x)\left(3xy(x)^3\log(x)+1\right)$

ODE

$$3xy'(x) = y(x)\left(3xy(x)^3\log(x)+1\right)$$

ODE Classification

[_Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0102411 (sec), leaf count = 115

$$\left\{\left\{y(x)\to \frac{(-2)^{2/3}\sqrt[3]{x}}{\sqrt[3]{4c_1+3x^2-6x^2\log(x)}}\right\},\left\{y(x)\to \frac{2^{2/3}\sqrt[3]{x}}{\sqrt[3]{4c_1+3x^2-6x^2\log(x)}}\right\},\left\{y(x)\to -\frac{\sqrt[3]{-1}2^{2/3}\sqrt[3]{x}}{\sqrt[3]{4c_1+3x^2-6x^2\log(x)}}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 22

$$\left\{(y(x))^{-3}+\frac{3\,x\ln(x)}{2}-\frac{3\,x}{4}-\frac{\_C1}{x}=0\right\}$$

Mathematica raw input

```
DSolve[3*x*y'[x] == y[x]*(1 + 3*x*Log[x]*y[x]^3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-2)^(2/3)*x^(1/3))/(3*x^2 + 4*C[1] - 6*x^2*Log[x])^(1/3)}, {y[x] ->
(2^(2/3)*x^(1/3))/(3*x^2 + 4*C[1] - 6*x^2*Log[x])^(1/3)}, {y[x] -> -(((-1)^(1/3)
*2^(2/3)*x^(1/3))/(3*x^2 + 4*C[1] - 6*x^2*Log[x])^(1/3))}}
```

Maple raw input

```
dsolve(3*x*diff(y(x),x) = (1+3*x*y(x)^3*ln(x))*y(x), y(x),'implicit')
```

Maple raw output

```
1/y(x)^3+3/2*x*ln(x)-3/4*x-1/x*_C1 = 0
```

4.252 $x^2y'(x) = a - y(x)$

ODE

$$x^2y'(x) = a - y(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0059408 (sec), leaf count = 15

$$\left\{\left\{y(x) \to a + c_1 e^{\frac{1}{x}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 12

$$\left\{y(x) = a + \mathrm{e}^{x^{-1}} \_C1\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == a - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> a + E^x^(-1)*C[1]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = a-y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = a+exp(1/x)*_C1
```

4.253 $x^2y'(x) = a + bx + cx^2 + xy(x)$

ODE

$$x^2y'(x) = a + bx + cx^2 + xy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00906 (sec), leaf count = 26

$$\left\{\left\{y(x) \to -\frac{a}{2x} - b + c_1 x + cx\log(x)\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 22

$$\left\{y(x) = -b + xc\ln(x) - \frac{a}{2x} + \_C1\ x\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == a + b*x + c*x^2 + x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -b - a/(2*x) + x*C[1] + c*x*Log[x]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = a+b*x+c*x^2+x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -b+x*c*ln(x)-1/2/x*a+_C1*x
```

4.254 $x^2y'(x) = a + bx + cx^2 - xy(x)$

ODE

$$x^2y'(x) = a + bx + cx^2 - xy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00691771 (sec), leaf count = 26

$$\left\{\left\{y(x) \to \frac{a\log(x)}{x} + b + \frac{cx}{2} + \frac{c_1}{x}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 22

$$\left\{y(x) = \frac{cx}{2} + b + \frac{a\ln(x)}{x} + \frac{\_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == a + b*x + c*x^2 - x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> b + (c*x)/2 + C[1]/x + (a*Log[x])/x}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = a+b*x+c*x^2-x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*c*x+b+1/x*ln(x)*a+1/x*_C1
```

4.255 $x^2y'(x) + (1-2x)y(x) = x^2$

ODE

$$x^2y'(x) + (1-2x)y(x) = x^2$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00676732 (sec), leaf count = 19

$$\left\{\left\{y(x) \to x^2\left(c_1 e^{\frac{1}{x}} + 1\right)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 16

$$\left\{y(x) = x^2\left(\mathrm{e}^{x^{-1}}\_C1 + 1\right)\right\}$$

Mathematica raw input

```
DSolve[(1 - 2*x)*y[x] + x^2*y'[x] == x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2*(1 + E^x^(-1)*C[1])}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)+(1-2*x)*y(x) = x^2, y(x),'implicit')
```

Maple raw output

```
y(x) = x^2*(exp(1/x)*_C1+1)
```

4.256 $x^2y'(x) = a + bxy(x)$

ODE

$$x^2y'(x) = a + bxy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00891025 (sec), leaf count = 22

$$\left\{\left\{y(x) \to c_1 x^b - \frac{a}{bx + x}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 21

$$\left\{y(x) = -\frac{a}{(b+1)\,x} + x^b\_C1\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == a + b*x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(a/(x + b*x)) + x^b*C[1]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = a+b*x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -1/(b+1)*a/x+x^b*_C1
```

4.257 $x^2y'(x) = y(x)(a+bx)$

ODE

$$x^2y'(x) = y(x)(a+bx)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00621471 (sec), leaf count = 19

$$\{\{y(x) \to c_1 e^{-\frac{a}{x}} x^b\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 16

$$\{y(x) = \_C1\, x^b \mathrm{e}^{-\frac{a}{x}}\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == (a + b*x)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^b*C[1])/E^(a/x)}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = (b*x+a)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^b*exp(-1/x*a)
```

4.258 $x^2y'(x) + (x+2)xy(x) = (1-e^{-2x})\,x - 2$

ODE

$$x^2y'(x) + (x+2)xy(x) = (1-e^{-2x})\,x - 2$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0318917 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \frac{e^{-2x}\left(c_1e^x + e^{2x}(x-3) + x + 1\right)}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 27

$$\left\{y(x) = \frac{\mathrm{e}^{-x}\_C1 + x\mathrm{e}^{-2\,x} + \mathrm{e}^{-2\,x} + x - 3}{x^2}\right\}$$

Mathematica raw input

```
DSolve[x*(2 + x)*y[x] + x^2*y'[x] == -2 + (1 - E^(-2*x))*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + E^(2*x)*(-3 + x) + x + E^x*C[1])/(E^(2*x)*x^2)}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)+x*(2+x)*y(x) = x*(1-exp(-2*x))-2, y(x),'implicit')
```

Maple raw output

```
y(x) = (exp(-x)*_C1+x*exp(-2*x)+exp(-2*x)+x-3)/x^2
```

4.259 $x^2y'(x) + 2(1-x)xy(x) = e^x(2e^x - 1)$

ODE

$$x^2y'(x) + 2(1-x)xy(x) = e^x(2e^x - 1)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0136623 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \frac{e^x(e^x(c_1 + 2x) + 1)}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 21

$$\left\{y(x) = \frac{(\mathrm{e}^{-x} + 2\,x + \_C1)\,\mathrm{e}^{2\,x}}{x^2}\right\}$$

Mathematica raw input

```
DSolve[2*(1 - x)*x*y[x] + x^2*y'[x] == E^x*(-1 + 2*E^x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*(1 + E^x*(2*x + C[1])))/x^2}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)+2*x*(1-x)*y(x) = exp(x)*(2*exp(x)-1), y(x),'implicit')
```

Maple raw output

```
y(x) = (exp(-x)+2*x+_C1)/x^2*exp(2*x)
```

4.260 $x^2y'(x) + x^2 + xy(x) + y(x)^2 = 0$

ODE

$$x^2y'(x) + x^2 + xy(x) + y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Riccati]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0108986 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \frac{x(-c_1 + \log(x) - 1)}{c_1 - \log(x)}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 19

$$\left\{\frac{x}{x + y(x)} - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2 + x*y[x] + y[x]^2 + x^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(-1 - C[1] + Log[x]))/(C[1] - Log[x])}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)+x^2+x*y(x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x/(x+y(x))-ln(x)-_C1 = 0
```

4.261 $x^2y'(x) = (-y(x) + 2x + 1)^2$

ODE

$$x^2y'(x) = (-y(x) + 2x + 1)^2$$

ODE Classification

[[_homogeneous, `class C`], _rational, _Riccati]

Book solution method
Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0672451 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \frac{12c_1x + 3c_1 + x^4 + x^3}{3c_1 + x^3}\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 41

$$\left\{-\frac{1}{3}\ln\left(\frac{1 + x - y(x)}{x}\right) + \frac{1}{3}\ln\left(\frac{1 - y(x) + 4x}{x}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == (1 + 2*x - y[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^3 + x^4 + 3*C[1] + 12*x*C[1])/(x^3 + 3*C[1])}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = (1+2*x-y(x))^2, y(x),'implicit')
```

Maple raw output

```
-1/3*ln((1+x-y(x))/x)+1/3*ln((1-y(x)+4*x)/x)-ln(x)-_C1 = 0
```

4.262 $x^2y'(x) = a + by(x)^2$

ODE

$$x^2y'(x) = a + by(x)^2$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0220567 (sec), leaf count = 39

$$\left\{\left\{y(x) \to -\frac{\sqrt{a}\tan\left(\frac{\sqrt{a}\sqrt{b}(1-c_1x)}{x}\right)}{\sqrt{b}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 27

$$\left\{-x^{-1} - 1\arctan\left(by(x)\frac{1}{\sqrt{ab}}\right)\frac{1}{\sqrt{ab}} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == a + b*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((Sqrt[a]*Tan[(Sqrt[a]*Sqrt[b]*(1 - x*C[1]))/x])/Sqrt[b])}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = a+b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-1/x-1/(a*b)^(1/2)*arctan(y(x)*b/(a*b)^(1/2))+_C1 = 0
```

4.263 $x^2y'(x) = y(x)(ay(x) + x)$

ODE

$$x^2y'(x) = y(x)(ay(x) + x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00770743 (sec), leaf count = 17

$$\left\{\left\{y(x) \to \frac{x}{c_1 - a\log(x)}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 20

$$\left\{(y(x))^{-1} + \frac{a\ln(x) - \_C1}{x} = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == y[x]*(x + a*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> x/(C[1] - a*Log[x])}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = (x+a*y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
1/y(x)+(a*ln(x)-_C1)/x = 0
```

4.264 $x^2y'(x) = y(x)(ax + by(x))$

ODE

$$x^2y'(x) = y(x)(ax + by(x))$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0163454 (sec), leaf count = 31

$$\left\{\left\{y(x) \to -\frac{(a-1)x^{a+1}}{bx^a - (a-1)c_1 x}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 26

$$\left\{\frac{b}{x\,(a-1)} - x^{-a}\_C1 + (y(x))^{-1} = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == y[x]*(a*x + b*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(((-1 + a)*x^(1 + a))/(b*x^a - (-1 + a)*x*C[1]))}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = (a*x+b*y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
1/x/(a-1)*b-x^(-a)*_C1+1/y(x) = 0
```

4.265 $ax^2 + bxy(x) + cy(x)^2 + x^2 y'(x) = 0$

ODE

$$ax^2 + bxy(x) + cy(x)^2 + x^2 y'(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Riccati]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0634027 (sec), leaf count = 66

$$\left\{\left\{y(x) \to -\frac{x\left(-\sqrt{4ac-b^2-2b-1}\tan\left(\frac{1}{2}\sqrt{4ac-b^2-2b-1}(c_1-\log(x))\right)+b+1\right)}{2c}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 60

$$\left\{-2\frac{1}{\sqrt{4\,ca-b^2-2\,b-1}}\arctan\left(\frac{bx+2\,cy(x)+x}{x\sqrt{4\,ca-b^2-2\,b-1}}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[a*x^2 + b*x*y[x] + c*y[x]^2 + x^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x*(1 + b - Sqrt[-1 - 2*b - b^2 + 4*a*c]*Tan[(Sqrt[-1 - 2*b - b^2 + 4
*a*c]*(C[1] - Log[x]))/2]))/(2*c)}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)+a*x^2+b*x*y(x)+c*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-2/(4*a*c-b^2-2*b-1)^(1/2)*arctan((b*x+2*c*y(x)+x)/x/(4*a*c-b^2-2*b-1)^(1/2))-ln
(x)-_C1 = 0
```

4.266 $x^2y'(x) = a + bx^n + x^2y(x)^2$

ODE

$$x^2y'(x) = a + bx^n + x^2y(x)^2$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.135075 (sec), leaf count = 1260

$$\left\{\left\{y(x) \to \frac{-n^{\frac{2\sqrt{(1-4a)n^2}}{n^2}+1}(x^n)^{\frac{i\sqrt{4a-1}}{n}+1} J_{\frac{\sqrt{(1-4a)n^2}}{n^2}-1}\left(\frac{2\sqrt{b}\sqrt{x^n}}{n}\right)\Gamma\left(\frac{n+\sqrt{1-4a}}{n}\right) b^{\frac{i\sqrt{4a-1}}{n}+\frac{1}{2}} + n^{\frac{2\sqrt{(1-4a)n^2}}{n^2}+1}(x^n)^{\frac{i\sqrt{4a-1}}{n}+1} J_{\frac{\sqrt{(1-\right.}$$

Maple ✓
cpu = 0.099 (sec), leaf count = 196

$$\left\{y(x) = \frac{1}{2x}\left(2\sqrt{b}\left(Y_{\frac{\sqrt{1-4a}+n}{n}}\left(2\frac{\sqrt{b}x^{n/2}}{n}\right)\_C1 + J_{\frac{\sqrt{1-4a}+n}{n}}\left(2\frac{\sqrt{b}x^{n/2}}{n}\right)\right)x^{n/2} - (\sqrt{1-4a}+1)\left(Y_{\frac{1}{n}\sqrt{1-4a}}\left(2\frac{\sqrt{b}x^{n/2}}{n}\right)\right.\right.$$

Mathematica raw input

```
DSolve[x^2*y'[x] == a + b*x^n + x^2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(b^(Sqrt[(1 - 4*a)*n^2]/n^2)*n^(((2*I)*Sqrt[-1 + 4*a])/n)*(n - I*Sqr
t[-1 + 4*a]*n + Sqrt[(1 - 4*a)*n^2])*(x^n)^(1/2 + Sqrt[(1 - 4*a)*n^2]/n^2)*Besse
lJ[-(Sqrt[(1 - 4*a)*n^2]/n^2), (2*Sqrt[b]*Sqrt[x^n])/n]*C[1]*Gamma[1 - Sqrt[1 -
4*a]/n]) - b^(1/2 + Sqrt[(1 - 4*a)*n^2]/n^2)*n^(1 + ((2*I)*Sqrt[-1 + 4*a])/n)*(x
^n)^(1 + Sqrt[(1 - 4*a)*n^2]/n^2)*BesselJ[-1 - Sqrt[(1 - 4*a)*n^2]/n^2, (2*Sqrt[
b]*Sqrt[x^n])/n]*C[1]*Gamma[1 - Sqrt[1 - 4*a]/n] + b^(1/2 + Sqrt[(1 - 4*a)*n^2]/
n^2)*n^(1 + ((2*I)*Sqrt[-1 + 4*a])/n)*(x^n)^(1 + Sqrt[(1 - 4*a)*n^2]/n^2)*Bessel
J[1 - Sqrt[(1 - 4*a)*n^2]/n^2, (2*Sqrt[b]*Sqrt[x^n])/n]*C[1]*Gamma[1 - Sqrt[1 -
4*a]/n] - b^((I*Sqrt[-1 + 4*a])/n)*n^(1 + (2*Sqrt[(1 - 4*a)*n^2])/n^2)*(x^n)^(1/
2 + (I*Sqrt[-1 + 4*a])/n)*BesselJ[Sqrt[(1 - 4*a)*n^2]/n^2, (2*Sqrt[b]*Sqrt[x^n])
/n]*Gamma[(Sqrt[1 - 4*a] + n)/n] - I*Sqrt[-1 + 4*a]*b^((I*Sqrt[-1 + 4*a])/n)*n^(
```

```
1 + (2*Sqrt[(1 - 4*a)*n^2])/n^2)*(x^n)^(1/2 + (I*Sqrt[-1 + 4*a])/n)*BesselJ[Sqrt
[(1 - 4*a)*n^2]/n^2, (2*Sqrt[b]*Sqrt[x^n])/n]*Gamma[(Sqrt[1 - 4*a] + n)/n] + b^(
(I*Sqrt[-1 + 4*a])/n)*n^((2*Sqrt[(1 - 4*a)*n^2])/n^2)*Sqrt[(1 - 4*a)*n^2]*(x^n)^
(1/2 + (I*Sqrt[-1 + 4*a])/n)*BesselJ[Sqrt[(1 - 4*a)*n^2]/n^2, (2*Sqrt[b]*Sqrt[x^
n])/n]*Gamma[(Sqrt[1 - 4*a] + n)/n] - b^(1/2 + (I*Sqrt[-1 + 4*a])/n)*n^(1 + (2*S
qrt[(1 - 4*a)*n^2])/n^2)*(x^n)^(1 + (I*Sqrt[-1 + 4*a])/n)*BesselJ[-1 + Sqrt[(1 -
 4*a)*n^2]/n^2, (2*Sqrt[b]*Sqrt[x^n])/n]*Gamma[(Sqrt[1 - 4*a] + n)/n] + b^(1/2 +
 (I*Sqrt[-1 + 4*a])/n)*n^(1 + (2*Sqrt[(1 - 4*a)*n^2])/n^2)*(x^n)^(1 + (I*Sqrt[-1
 + 4*a])/n)*BesselJ[1 + Sqrt[(1 - 4*a)*n^2]/n^2, (2*Sqrt[b]*Sqrt[x^n])/n]*Gamma[
(Sqrt[1 - 4*a] + n)/n])/(2*n*x*Sqrt[x^n]*(b^(Sqrt[(1 - 4*a)*n^2]/n^2)*n^(((2*I)*
Sqrt[-1 + 4*a])/n)*(x^n)^(Sqrt[(1 - 4*a)*n^2]/n^2)*BesselJ[-(Sqrt[(1 - 4*a)*n^2]
/n^2), (2*Sqrt[b]*Sqrt[x^n])/n]*C[1]*Gamma[1 - Sqrt[1 - 4*a]/n] + b^((I*Sqrt[-1
+ 4*a])/n)*n^((2*Sqrt[(1 - 4*a)*n^2])/n^2)*(x^n)^((I*Sqrt[-1 + 4*a])/n)*BesselJ[
Sqrt[(1 - 4*a)*n^2]/n^2, (2*Sqrt[b]*Sqrt[x^n])/n]*Gamma[(Sqrt[1 - 4*a] + n)/n]))
}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = a+b*x^n+x^2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*(2*b^(1/2)*(BesselY(((1-4*a)^(1/2)+n)/n,2*b^(1/2)/n*x^(1/2*n))*_C1+Be
sselJ(((1-4*a)^(1/2)+n)/n,2*b^(1/2)/n*x^(1/2*n)))*x^(1/2*n)-((1-4*a)^(1/2)+1)*(B
esselY((1-4*a)^(1/2)/n,2*b^(1/2)/n*x^(1/2*n))*_C1+BesselJ((1-4*a)^(1/2)/n,2*b^(1
/2)/n*x^(1/2*n))))/x/(BesselY((1-4*a)^(1/2)/n,2*b^(1/2)/n*x^(1/2*n))*_C1+BesselJ
((1-4*a)^(1/2)/n,2*b^(1/2)/n*x^(1/2*n)))
```

4.267 $x^2y'(x) + xy(x)(xy(x) + 4) + 2 = 0$

ODE

$$x^2y'(x) + xy(x)(xy(x) + 4) + 2 = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.00801237 (sec), leaf count = 17

$$\left\{\left\{y(x) \to \frac{1}{c_1 + x} - \frac{2}{x}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 25

$$\{\ln(x) - \_C1 - \ln(2 + xy(x)) + \ln(1 + xy(x)) = 0\}$$

Mathematica raw input

```
DSolve[2 + x*y[x]*(4 + x*y[x]) + x^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2/x + (x + C[1])^(-1)}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)+2+x*y(x)*(4+x*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-ln(2+x*y(x))+ln(1+x*y(x)) = 0
```

4.268 $ax(1-xy(x))+x^2y'(x)+x^2(-y(x)^2)+2=0$

ODE

$$ax(1-xy(x))+x^2y'(x)+x^2\left(-y(x)^2\right)+2=0$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.181816 (sec), leaf count = 109

$$\left\{\left\{y(x)\to \frac{a^6c_1x^3e^{ax}-a^5c_1x^2e^{ax}+2a^4c_1xe^{ax}-2a^3c_1e^{ax}+1}{a^5c_1x^3\left(-e^{ax}\right)+2a^4c_1x^2e^{ax}-2a^3c_1xe^{ax}+x}\right\}\right\}$$

Maple ✓
cpu = 0.089 (sec), leaf count = 52

$$\left\{y(x)=\frac{-(ax-1)\left(a^2x^2+2\right)\mathrm{e}^{ax}+\_C1}{\left(\left(a^2x^2-2\,ax+2\right)\mathrm{e}^{ax}+\_C1\right)x}\right\}$$

Mathematica raw input

```
DSolve[2 - x^2*y[x]^2 + a*x*(1 - x*y[x]) + x^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 - 2*a^3*E^(a*x)*C[1] + 2*a^4*E^(a*x)*x*C[1] - a^5*E^(a*x)*x^2*C[1]
+ a^6*E^(a*x)*x^3*C[1])/(x - 2*a^3*E^(a*x)*x*C[1] + 2*a^4*E^(a*x)*x^2*C[1] - a^5
*E^(a*x)*x^3*C[1])}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)+2+a*x*(1-x*y(x))-x^2*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-(a*x-1)*(a^2*x^2+2)*exp(a*x)+_C1)/((a^2*x^2-2*a*x+2)*exp(a*x)+_C1)/x
```

4.269 $x^2y'(x) = a + bx^2y(x)^2$

ODE

$$x^2y'(x) = a + bx^2y(x)^2$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Riccati, _special]]

Book solution method
Riccati ODE, Main form

Mathematica ✓
cpu = 0.00671612 (sec), leaf count = 51

$$\left\{\left\{y(x) \to \frac{\sqrt{1-4ab}\left(\frac{2c_1}{x^{\sqrt{1-4ab}}+c_1}-1\right)-1}{2bx}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 37

$$\left\{\ln(x) - \_C1 - 2\frac{1}{\sqrt{4ab-1}}\arctan\left(\frac{2bxy(x)+1}{\sqrt{4ab-1}}\right) = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == a + b*x^2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + Sqrt[1 - 4*a*b]*(-1 + (2*C[1])/(x^Sqrt[1 - 4*a*b] + C[1])))/(2*b
*x)}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = a+b*x^2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-2/(4*a*b-1)^(1/2)*arctan((2*b*x*y(x)+1)/(4*a*b-1)^(1/2)) = 0
```

4.270 $x^2y'(x) = a + bx^n + cx^2y(x)^2$

ODE

$$x^2y'(x) = a + bx^n + cx^2y(x)^2$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.16589 (sec), leaf count = 1577

$$\left\{\left\{y(x) \to \frac{-b^{\frac{i\sqrt{4ac-1}}{n}+\frac{1}{2}} n^{\frac{2\sqrt{(1-4ac)n^2}}{n^2}+1} (x^n)^{\frac{i\sqrt{4ac-1}}{n}+1} J_{\frac{\sqrt{(1-4ac)n^2}}{n^2}-1}\left(\frac{2\sqrt{b}\sqrt{c}\sqrt{x^n}}{n}\right)\Gamma\left(\frac{n+\sqrt{1-4ac}}{n}\right) c^{\frac{i\sqrt{4ac-1}}{n}+\frac{1}{2}} + b^{\frac{i\sqrt{4ac-1}}{n}+\frac{1}{2}} n^{\frac{2\sqrt{}}{}}}{}\right.\right.$$

Maple ✓
cpu = 0.1 (sec), leaf count = 220

$$\left\{y(x) = \frac{1}{2cx}\left(2\sqrt{cb}\left(Y_{\frac{\sqrt{-4ca+1}+n}{n}}\left(2\frac{\sqrt{cb}x^{n/2}}{n}\right)\_C1 + J_{\frac{\sqrt{-4ca+1}+n}{n}}\left(2\frac{\sqrt{cb}x^{n/2}}{n}\right)\right)x^{n/2} - \left(\sqrt{-4ca+1}+1\right)\left(Y_{\frac{1}{n}\sqrt{-4ca+1}}\right.\right.\right.$$

Mathematica raw input

```
DSolve[x^2*y'[x] == a + b*x^n + c*x^2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(b^(Sqrt[(1 - 4*a*c)*n^2]/n^2)*c^(Sqrt[(1 - 4*a*c)*n^2]/n^2)*n^(((2*
I)*Sqrt[-1 + 4*a*c])/n)*(n - I*Sqrt[-1 + 4*a*c]*n + Sqrt[(1 - 4*a*c)*n^2])*(x^n)
^(1/2 + Sqrt[(1 - 4*a*c)*n^2]/n^2)*BesselJ[-(Sqrt[(1 - 4*a*c)*n^2]/n^2), (2*Sqrt
[b]*Sqrt[c]*Sqrt[x^n])/n]*C[1]*Gamma[1 - Sqrt[1 - 4*a*c]/n]) - b^(1/2 + Sqrt[(1
- 4*a*c)*n^2]/n^2)*c^(1/2 + Sqrt[(1 - 4*a*c)*n^2]/n^2)*n^(1 + ((2*I)*Sqrt[-1 + 4
*a*c])/n)*(x^n)^(1 + Sqrt[(1 - 4*a*c)*n^2]/n^2)*BesselJ[-1 - Sqrt[(1 - 4*a*c)*n^
2]/n^2, (2*Sqrt[b]*Sqrt[c]*Sqrt[x^n])/n]*C[1]*Gamma[1 - Sqrt[1 - 4*a*c]/n] + b^(
1/2 + Sqrt[(1 - 4*a*c)*n^2]/n^2)*c^(1/2 + Sqrt[(1 - 4*a*c)*n^2]/n^2)*n^(1 + ((2*
I)*Sqrt[-1 + 4*a*c])/n)*(x^n)^(1 + Sqrt[(1 - 4*a*c)*n^2]/n^2)*BesselJ[1 - Sqrt[(
1 - 4*a*c)*n^2]/n^2, (2*Sqrt[b]*Sqrt[c]*Sqrt[x^n])/n]*C[1]*Gamma[1 - Sqrt[1 - 4*
a*c]/n] - b^((I*Sqrt[-1 + 4*a*c])/n)*c^((I*Sqrt[-1 + 4*a*c])/n)*n^(1 + (2*Sqrt[(
```

```
1 - 4*a*c)*n^2])/n^2)*(x^n)^(1/2 + (I*Sqrt[-1 + 4*a*c])/n)*BesselJ[Sqrt[(1 - 4*a
*c)*n^2]/n^2, (2*Sqrt[b]*Sqrt[c]*Sqrt[x^n])/n]*Gamma[(Sqrt[1 - 4*a*c] + n)/n] -
I*b^((I*Sqrt[-1 + 4*a*c])/n)*c^((I*Sqrt[-1 + 4*a*c])/n)*Sqrt[-1 + 4*a*c]*n^(1 +
(2*Sqrt[(1 - 4*a*c)*n^2])/n^2)*(x^n)^(1/2 + (I*Sqrt[-1 + 4*a*c])/n)*BesselJ[Sqrt
[(1 - 4*a*c)*n^2]/n^2, (2*Sqrt[b]*Sqrt[c]*Sqrt[x^n])/n]*Gamma[(Sqrt[1 - 4*a*c] +
 n)/n] + b^((I*Sqrt[-1 + 4*a*c])/n)*c^((I*Sqrt[-1 + 4*a*c])/n)*n^((2*Sqrt[(1 - 4
*a*c)*n^2])/n^2)*Sqrt[(1 - 4*a*c)*n^2]*(x^n)^(1/2 + (I*Sqrt[-1 + 4*a*c])/n)*Bess
elJ[Sqrt[(1 - 4*a*c)*n^2]/n^2, (2*Sqrt[b]*Sqrt[c]*Sqrt[x^n])/n]*Gamma[(Sqrt[1 -
4*a*c] + n)/n] - b^(1/2 + (I*Sqrt[-1 + 4*a*c])/n)*c^(1/2 + (I*Sqrt[-1 + 4*a*c])/
n)*n^(1 + (2*Sqrt[(1 - 4*a*c)*n^2])/n^2)*(x^n)^(1 + (I*Sqrt[-1 + 4*a*c])/n)*Bess
elJ[-1 + Sqrt[(1 - 4*a*c)*n^2]/n^2, (2*Sqrt[b]*Sqrt[c]*Sqrt[x^n])/n]*Gamma[(Sqrt
[1 - 4*a*c] + n)/n] + b^(1/2 + (I*Sqrt[-1 + 4*a*c])/n)*c^(1/2 + (I*Sqrt[-1 + 4*a
*c])/n)*n^(1 + (2*Sqrt[(1 - 4*a*c)*n^2])/n^2)*(x^n)^(1 + (I*Sqrt[-1 + 4*a*c])/n)
*BesselJ[1 + Sqrt[(1 - 4*a*c)*n^2]/n^2, (2*Sqrt[b]*Sqrt[c]*Sqrt[x^n])/n]*Gamma[(
Sqrt[1 - 4*a*c] + n)/n])/(2*c*n*x*Sqrt[x^n]*(b^(Sqrt[(1 - 4*a*c)*n^2]/n^2)*c^(Sq
rt[(1 - 4*a*c)*n^2]/n^2)*n^(((2*I)*Sqrt[-1 + 4*a*c])/n)*(x^n)^(Sqrt[(1 - 4*a*c)*
n^2]/n^2)*BesselJ[-(Sqrt[(1 - 4*a*c)*n^2]/n^2), (2*Sqrt[b]*Sqrt[c]*Sqrt[x^n])/n]
*C[1]*Gamma[1 - Sqrt[1 - 4*a*c]/n] + b^((I*Sqrt[-1 + 4*a*c])/n)*c^((I*Sqrt[-1 +
4*a*c])/n)*n^((2*Sqrt[(1 - 4*a*c)*n^2])/n^2)*(x^n)^((I*Sqrt[-1 + 4*a*c])/n)*Bess
elJ[Sqrt[(1 - 4*a*c)*n^2]/n^2, (2*Sqrt[b]*Sqrt[c]*Sqrt[x^n])/n]*Gamma[(Sqrt[1 -
4*a*c] + n)/n]))}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = a+b*x^n+c*x^2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*(2*(c*b)^(1/2)*(BesselY(((-4*a*c+1)^(1/2)+n)/n,2*(c*b)^(1/2)*x^(1/2*n
)/n)*_C1+BesselJ(((-4*a*c+1)^(1/2)+n)/n,2*(c*b)^(1/2)*x^(1/2*n)/n))*x^(1/2*n)-((
-4*a*c+1)^(1/2)+1)*(BesselY((-4*a*c+1)^(1/2)/n,2*(c*b)^(1/2)*x^(1/2*n)/n)*_C1+Be
sselJ((-4*a*c+1)^(1/2)/n,2*(c*b)^(1/2)*x^(1/2*n)/n)))/x/c/(BesselY((-4*a*c+1)^(1
/2)/n,2*(c*b)^(1/2)*x^(1/2*n)/n)*_C1+BesselJ((-4*a*c+1)^(1/2)/n,2*(c*b)^(1/2)*x^
(1/2*n)/n))
```

4.271 $x^2y'(x) = a + bxy(x) + cx^2y(x)^2$

ODE

$$x^2y'(x) = a + bxy(x) + cx^2y(x)^2$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0331989 (sec), leaf count = 64

$$\left\{\left\{y(x) \to -\frac{\sqrt{-4ac+b^2+2b+1}\left(1-\frac{2c_1}{x^{\sqrt{-4ac+b^2+2b+1}}+c_1}\right)+b+1}{2cx}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 54

$$\left\{\ln(x) - \_C1 - 2\frac{1}{\sqrt{4ca-b^2-2b-1}}\arctan\left(\frac{2cxy(x)+b+1}{\sqrt{4ca-b^2-2b-1}}\right) = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == a + b*x*y[x] + c*x^2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1 + b + Sqrt[1 + 2*b + b^2 - 4*a*c]*(1 - (2*C[1])/(x^Sqrt[1 + 2*b +
b^2 - 4*a*c] + C[1])))/(2*c*x)}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = a+b*x*y(x)+c*x^2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-2/(4*a*c-b^2-2*b-1)^(1/2)*arctan((2*c*x*y(x)+b+1)/(4*a*c-b^2-2*b-1)^(1
/2)) = 0
```

4.272 $x^2y'(x) = a + bxy(x) + cx^4y(x)^2$

ODE

$$x^2y'(x) = a + bxy(x) + cx^4y(x)^2$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 3.17175 (sec), leaf count = 268

$$\left\{\left\{y(x) \to -\frac{\sqrt{a}\sqrt{c}c_1 x J_{\frac{b+1}{2}}\left(\sqrt{a}\sqrt{c}x\right) + bc_1 J_{\frac{b+3}{2}}\left(\sqrt{a}\sqrt{c}x\right) + 3c_1 J_{\frac{b+3}{2}}\left(\sqrt{a}\sqrt{c}x\right) - \sqrt{a}\sqrt{c}c_1 x J_{\frac{b+5}{2}}\left(\sqrt{a}\sqrt{c}x\right) + \sqrt{a}\sqrt{c}xY_{\frac{b+1}{2}}\left(\sqrt{}\right.}{2cx^3\left(c_1 J_{\frac{b+3}{2}}\left(\sqrt{a}\sqrt{c}x\right) + Y_{\frac{b+3}{2}}\left(\sqrt{a}\sqrt{c}x\right)\right)}\right.\right.$$

Maple ✓
cpu = 0.088 (sec), leaf count = 76

$$\left\{y(x) = \frac{1}{cx^2}\sqrt{ca}\left(Y_{-\frac{1}{2}-\frac{b}{2}}\left(\sqrt{ca}x\right)\_C1 + J_{-\frac{1}{2}-\frac{b}{2}}\left(\sqrt{ca}x\right)\right)\left(Y_{-\frac{3}{2}-\frac{b}{2}}\left(\sqrt{ca}x\right)\_C1 + J_{-\frac{3}{2}-\frac{b}{2}}\left(\sqrt{ca}x\right)\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == a + b*x*y[x] + c*x^4*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[a]*Sqrt[c]*x*BesselY[(1 + b)/2, Sqrt[a]*Sqrt[c]*x] + (3 + b)*Be
sselY[(3 + b)/2, Sqrt[a]*Sqrt[c]*x] - Sqrt[a]*Sqrt[c]*x*BesselY[(5 + b)/2, Sqrt[
a]*Sqrt[c]*x] + Sqrt[a]*Sqrt[c]*x*BesselJ[(1 + b)/2, Sqrt[a]*Sqrt[c]*x]*C[1] + 3
*BesselJ[(3 + b)/2, Sqrt[a]*Sqrt[c]*x]*C[1] + b*BesselJ[(3 + b)/2, Sqrt[a]*Sqrt[
c]*x]*C[1] - Sqrt[a]*Sqrt[c]*x*BesselJ[(5 + b)/2, Sqrt[a]*Sqrt[c]*x]*C[1])/(2*c*
x^3*(BesselY[(3 + b)/2, Sqrt[a]*Sqrt[c]*x] + BesselJ[(3 + b)/2, Sqrt[a]*Sqrt[c]*
x]*C[1]))}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = a+b*x*y(x)+c*x^4*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = (c*a)^(1/2)/x^2*(BesselY(-1/2-1/2*b,(c*a)^(1/2)*x)*_C1+BesselJ(-1/2-1/2*b
,(c*a)^(1/2)*x))/c/(BesselY(-3/2-1/2*b,(c*a)^(1/2)*x)*_C1+BesselJ(-3/2-1/2*b,(c*
a)^(1/2)*x))
```

4.273 $x^2y'(x) + y(x)\left(x^2 + y(x)^2 - x\right) = 0$

ODE

$$x^2y'(x) + y(x)\left(x^2 + y(x)^2 - x\right) = 0$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Bernoulli]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0130531 (sec), leaf count = 42

$$\left\{\left\{y(x) \to -\frac{x}{\sqrt{c_1 e^{2x} - 1}}\right\}, \left\{y(x) \to \frac{x}{\sqrt{c_1 e^{2x} - 1}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 21

$$\left\{x^{-2} - \frac{\mathrm{e}^{2x}\_C1}{x^2} + (y(x))^{-2} = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(-x + x^2 + y[x]^2) + x^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x/Sqrt[-1 + E^(2*x)*C[1]])}, {y[x] -> x/Sqrt[-1 + E^(2*x)*C[1]]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)+(x^2+y(x)^2-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/x^2-1/x^2*exp(2*x)*_C1+1/y(x)^2 = 0
```

4.274 $x^2y'(x) = 2y(x)\left(x - y(x)^2\right)$

ODE

$$x^2y'(x) = 2y(x)\left(x - y(x)^2\right)$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00889937 (sec), leaf count = 46

$$\left\{\left\{y(x) \to -\frac{x^2}{\sqrt{c_1 + \frac{4x^3}{3}}}\right\}, \left\{y(x) \to \frac{x^2}{\sqrt{c_1 + \frac{4x^3}{3}}}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 19

$$\left\{(y(x))^{-2} - \frac{4}{3x} - \frac{\_C1}{x^4} = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == 2*y[x]*(x - y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x^2/Sqrt[(4*x^3)/3 + C[1]])}, {y[x] -> x^2/Sqrt[(4*x^3)/3 + C[1]]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = 2*y(x)*(x-y(x)^2), y(x),'implicit')
```

Maple raw output

```
1/y(x)^2-4/3/x-1/x^4*_C1 = 0
```

4.275 $x^2y'(x) = ax^2y(x)^2 - ay(x)^3$

ODE

$$x^2y'(x) = ax^2y(x)^2 - ay(x)^3$$

ODE Classification

[_rational , _Abel]

Book solution method
Abel ODE, Second kind

Mathematica ✓
cpu = 0.617778 (sec), leaf count = 239

$$\text{Solve}\left[\frac{\text{Ai}'\left(\frac{2ay(x)x^2+x+a\left(ax^3+2\right)y(x)^2}{2\sqrt[3]{2}a^{4/3}xy(x)^2}\right)-\frac{(axy(x)+1)\text{Ai}\left(\frac{2ay(x)x^2+x+a\left(ax^3+2\right)y(x)^2}{2\sqrt[3]{2}a^{4/3}xy(x)^2}\right)}{2^{2/3}a^{2/3}y(x)}}{\text{Bi}'\left(\frac{2ay(x)x^2+x+a\left(ax^3+2\right)y(x)^2}{2\sqrt[3]{2}a^{4/3}xy(x)^2}\right)-\frac{(axy(x)+1)\text{Bi}\left(\frac{2ay(x)x^2+x+a\left(ax^3+2\right)y(x)^2}{2\sqrt[3]{2}a^{4/3}xy(x)^2}\right)}{2^{2/3}a^{2/3}y(x)}}+c_1=0,y(x)\right]$$

Maple ✓
cpu = 0.081 (sec), leaf count = 182

$$\left\{\_C1+1\left((-axy(x)-1)\,\text{Ai}\left(\left(\frac{x}{2}\sqrt[3]{-2\,a}-\frac{1}{y(x)}(-2\,a)^{-\frac{2}{3}}\right)^2-\frac{1}{x}\frac{1}{\sqrt[3]{-2\,a}}\right)+\text{Ai}^{(1)}\left(\left(\frac{x}{2}\sqrt[3]{-2\,a}-\frac{1}{y(x)}(-2\,a)^{-\frac{2}{3}}\right)^2-\frac{1}{x}\frac{1}{\sqrt[3]{}}\right.\right.$$

Mathematica raw input

```
DSolve[x^2*y'[x] == a*x^2*y[x]^2 - a*y[x]^3,y[x],x]
```

Mathematica raw output

```
Solve[C[1] + (AiryAiPrime[(x + 2*a*x^2*y[x] + a*(2 + a*x^3)*y[x]^2)/(2*2^(1/3)*a
^(4/3)*x*y[x]^2)] - (AiryAi[(x + 2*a*x^2*y[x] + a*(2 + a*x^3)*y[x]^2)/(2*2^(1/3)
*a^(4/3)*x*y[x]^2)]*(1 + a*x*y[x]))/(2^(2/3)*a^(2/3)*y[x]))/(AiryBiPrime[(x + 2*
a*x^2*y[x] + a*(2 + a*x^3)*y[x]^2)/(2*2^(1/3)*a^(4/3)*x*y[x]^2)] - (AiryBi[(x +
2*a*x^2*y[x] + a*(2 + a*x^3)*y[x]^2)/(2*2^(1/3)*a^(4/3)*x*y[x]^2)]*(1 + a*x*y[x]
))/(2^(2/3)*a^(2/3)*y[x])) == 0, y[x]]
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = a*x^2*y(x)^2-a*y(x)^3, y(x),'implicit')
```

Maple raw output

```
_C1+((-a*x*y(x)-1)*AiryAi((1/2*(-2*a)^(1/3)*x-1/(-2*a)^(2/3)/y(x))^2-1/(-2*a)^(1
/3)/x)+AiryAi(1,(1/2*(-2*a)^(1/3)*x-1/(-2*a)^(2/3)/y(x))^2-1/(-2*a)^(1/3)/x)*(-2
*a)^(2/3)*y(x))/((-a*x*y(x)-1)*AiryBi((1/2*(-2*a)^(1/3)*x-1/(-2*a)^(2/3)/y(x))^2
-1/(-2*a)^(1/3)/x)+AiryBi(1,(1/2*(-2*a)^(1/3)*x-1/(-2*a)^(2/3)/y(x))^2-1/(-2*a)^
(1/3)/x)*(-2*a)^(2/3)*y(x)) = 0
```

4.276 $ay(x)^2 + bx^2y(x)^3 + x^2y'(x) = 0$

ODE

$$ay(x)^2 + bx^2y(x)^3 + x^2y'(x) = 0$$

ODE Classification

[_rational , _Abel]

Book solution method
Abel ODE, Second kind

Mathematica ✓
cpu = 0.871592 (sec), leaf count = 279

$$\text{Solve}\left[\frac{\frac{(ay(x)+x)\text{Ai}\left(\frac{x^2+2ay(x)x+\left(a^2-2bx^3\right)y(x)^2}{2\sqrt[3]{2}a^{2/3}b^{2/3}x^2y(x)^2}\right)}{2^{2/3}\sqrt[3]{a}\sqrt[3]{b}xy(x)}+\text{Ai}'\left(\frac{x^2+2ay(x)x+\left(a^2-2bx^3\right)y(x)^2}{2\sqrt[3]{2}a^{2/3}b^{2/3}x^2y(x)^2}\right)}{\frac{(ay(x)+x)\text{Bi}\left(\frac{x^2+2ay(x)x+\left(a^2-2bx^3\right)y(x)^2}{2\sqrt[3]{2}a^{2/3}b^{2/3}x^2y(x)^2}\right)}{2^{2/3}\sqrt[3]{a}\sqrt[3]{b}xy(x)}+\text{Bi}'\left(\frac{x^2+2ay(x)x+\left(a^2-2bx^3\right)y(x)^2}{2\sqrt[3]{2}a^{2/3}b^{2/3}x^2y(x)^2}\right)}+c_1=0,y(x)\right]$$

Maple ✓
cpu = 0.095 (sec), leaf count = 308

$$\left\{\_C1+1\left(a\text{Ai}\left(\left(\frac{\sqrt[3]{2}}{2bx}\sqrt[3]{a^2b^2}+\frac{ab\sqrt[3]{2}}{2y\left(x\right)}\left(a^2b^2\right)^{-\frac{2}{3}}\right)^2-\frac{b2^{\frac{2}{3}}x}{2}\frac{1}{\sqrt[3]{a^2b^2}}\right)b\sqrt[3]{2}(x+ay(x))+2\left(a^2b^2\right)^{2/3}\text{Ai}^{(1)}\left(\left(1/2\,\frac{\sqrt[3]{2}\sqrt[3]{a^2b^2}}{bx}\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[a*y[x]^2 + b*x^2*y[x]^3 + x^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] + (AiryAiPrime[(x^2 + 2*a*x*y[x] + (a^2 - 2*b*x^3)*y[x]^2)/(2*2^(1/3)
*a^(2/3)*b^(2/3)*x^2*y[x]^2)] + (AiryAi[(x^2 + 2*a*x*y[x] + (a^2 - 2*b*x^3)*y[x]
^2)/(2*2^(1/3)*a^(2/3)*b^(2/3)*x^2*y[x]^2)]*(x + a*y[x]))/(2^(2/3)*a^(1/3)*b^(1/
3)*x*y[x]))/(AiryBiPrime[(x^2 + 2*a*x*y[x] + (a^2 - 2*b*x^3)*y[x]^2)/(2*2^(1/3)*
a^(2/3)*b^(2/3)*x^2*y[x]^2)] + (AiryBi[(x^2 + 2*a*x*y[x] + (a^2 - 2*b*x^3)*y[x]^
2)/(2*2^(1/3)*a^(2/3)*b^(2/3)*x^2*y[x]^2)]*(x + a*y[x]))/(2^(2/3)*a^(1/3)*b^(1/3
)*x*y[x])) == 0, y[x]]
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)+a*y(x)^2+b*x^2*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
_C1+(a*AiryAi((1/2/b*2^(1/3)*(a^2*b^2)^(1/3)/x+1/2/(a^2*b^2)^(2/3)*2^(1/3)*a*b/y
(x))^2-1/2*b*2^(2/3)/(a^2*b^2)^(1/3)*x)*b*2^(1/3)*(x+a*y(x))+2*(a^2*b^2)^(2/3)*A
iryAi(1,(1/2/b*2^(1/3)*(a^2*b^2)^(1/3)/x+1/2/(a^2*b^2)^(2/3)*2^(1/3)*a*b/y(x))^2
-1/2*b*2^(2/3)/(a^2*b^2)^(1/3)*x)*x*y(x))/(a*AiryBi((1/2/b*2^(1/3)*(a^2*b^2)^(1/
3)/x+1/2/(a^2*b^2)^(2/3)*2^(1/3)*a*b/y(x))^2-1/2*b*2^(2/3)/(a^2*b^2)^(1/3)*x)*b*
2^(1/3)*(x+a*y(x))+2*(a^2*b^2)^(2/3)*AiryBi(1,(1/2/b*2^(1/3)*(a^2*b^2)^(1/3)/x+1
/2/(a^2*b^2)^(2/3)*2^(1/3)*a*b/y(x))^2-1/2*b*2^(2/3)/(a^2*b^2)^(1/3)*x)*x*y(x))
= 0
```

4.277 $x^2y'(x) = y(x)\left(ax + by(x)^3\right)$

ODE

$$x^2y'(x) = y(x)\left(ax + by(x)^3\right)$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.031254 (sec), leaf count = 144

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{(1-3a)x^{3a+1}}}{\sqrt[3]{3bx^{3a}+(1-3a)c_1x}}\right\}, \left\{y(x) \to -\frac{\sqrt[3]{-1}\sqrt[3]{(1-3a)x^{3a+1}}}{\sqrt[3]{3bx^{3a}+(1-3a)c_1x}}\right\}, \left\{y(x) \to \frac{(-1)^{2/3}\sqrt[3]{(1-3a)x^{3a+1}}}{\sqrt[3]{3bx^{3a}+(1-3a)c_1x}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 29

$$\left\{3\,\frac{b}{x\left(3\,a-1\right)} - x^{-3\,a}\_C1 + \left(y(x)\right)^{-3} = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == y[x]*(a*x + b*y[x]^3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((1 - 3*a)*x^(1 + 3*a))^(1/3)/(3*b*x^(3*a) + (1 - 3*a)*x*C[1])^(1/3)},
 {y[x] -> -(((-1)^(1/3)*((1 - 3*a)*x^(1 + 3*a))^(1/3))/(3*b*x^(3*a) + (1 - 3*a)*
x*C[1])^(1/3))}, {y[x] -> ((-1)^(2/3)*((1 - 3*a)*x^(1 + 3*a))^(1/3))/(3*b*x^(3*a
) + (1 - 3*a)*x*C[1])^(1/3)}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = (a*x+b*y(x)^3)*y(x), y(x),'implicit')
```

Maple raw output

```
3/x/(3*a-1)*b-x^(-3*a)*_C1+1/y(x)^3 = 0
```

4.278 $x^2y'(x) + xy(x) + \sqrt{y(x)} = 0$

ODE

$$x^2y'(x) + xy(x) + \sqrt{y(x)} = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0128784 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{\left(c_1\sqrt{x}+1\right)^2}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 19

$$\left\{\sqrt{y(x)} - x^{-1} - \_C1\frac{1}{\sqrt{x}} = 0\right\}$$

Mathematica raw input

```
DSolve[Sqrt[y[x]] + x*y[x] + x^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + Sqrt[x]*C[1])^2/x^2}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)+x*y(x)+y(x)^(1/2) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^(1/2)-1/x-1/x^(1/2)*_C1 = 0
```

4.279 $x^2y'(x) = 3x\tan(y(x)) + \sec(y(x))$

ODE

$$x^2y'(x) = 3x\tan(y(x)) + \sec(y(x))$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.15135 (sec), leaf count = 23

$$\left\{\left\{y(x) \to -\sin^{-1}\left(3c_1x^3 + \frac{1}{4x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.443 (sec), leaf count = 18

$$\left\{4\frac{\sin(y(x))}{x^3} + x^{-4} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x] == Sec[y[x]] + 3*x*Tan[y[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ArcSin[1/(4*x) + 3*x^3*C[1]]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x) = sec(y(x))+3*x*tan(y(x)), y(x),'implicit')
```

Maple raw output

```
4/x^3*sin(y(x))+1/x^4-_C1 = 0
```

4.280 $(1-x^2)\,y'(x) = -x^2 + y(x) + 1$

ODE

$$(1-x^2)\,y'(x) = -x^2 + y(x) + 1$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0243267 (sec), leaf count = 52

$$\left\{\left\{y(x) \to \frac{\sqrt{x+1}\left(c_1 + \sqrt{1-x^2} + 2\sin^{-1}\left(\frac{\sqrt{x+1}}{\sqrt{2}}\right)\right)}{\sqrt{1-x}}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 30

$$\left\{y(x) = (1+x)\left(\sqrt{-x^2+1} + \arcsin(x) + \_C1\right)\frac{1}{\sqrt{-x^2+1}}\right\}$$

Mathematica raw input

```
DSolve[(1 - x^2)*y'[x] == 1 - x^2 + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[1 + x]*(Sqrt[1 - x^2] + 2*ArcSin[Sqrt[1 + x]/Sqrt[2]] + C[1]))/S
qrt[1 - x]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x) = 1-x^2+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = ((-x^2+1)^(1/2)+arcsin(x)+_C1)*(1+x)/(-x^2+1)^(1/2)
```

4.281 $(1-x^2)\,y'(x)+1=xy(x)$

ODE

$$(1-x^2)\,y'(x)+1=xy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0111911 (sec), leaf count = 30

$$\left\{\left\{y(x)\to \frac{c_1+\log\left(\sqrt{x^2-1}+x\right)}{\sqrt{x^2-1}}\right\}\right\}$$

Maple ✓
cpu = 2.933 (sec), leaf count = 47

$$\left\{y(x)=\frac{1}{(-1+x)(1+x)}\sqrt{(-1+x)(1+x)}\ln\left(x+\sqrt{x^2-1}\right)+\_C1\frac{1}{\sqrt{-1+x}}\frac{1}{\sqrt{1+x}}\right\}$$

Mathematica raw input

```
DSolve[1 + (1 - x^2)*y'[x] == x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + Log[x + Sqrt[-1 + x^2]])/Sqrt[-1 + x^2]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x)+1 = x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/(-1+x)/(1+x)*((-1+x)*(1+x))^(1/2)*ln(x+(x^2-1)^(1/2))+1/(-1+x)^(1/2)/(1
+x)^(1/2)*_C1
```

4.282 $(1-x^2)\,y'(x) = 5 - xy(x)$

ODE

$$(1-x^2)\,y'(x) = 5 - xy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0125513 (sec), leaf count = 21

$$\left\{\left\{y(x) \to c_1\sqrt{x^2-1} + 5x\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 20

$$\left\{y(x) = \sqrt{-1+x}\sqrt{1+x}\_C1 + 5\,x\right\}$$

Mathematica raw input

```
DSolve[(1 - x^2)*y'[x] == 5 - x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 5*x + Sqrt[-1 + x^2]*C[1]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x) = 5-x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-1+x)^(1/2)*(1+x)^(1/2)*_C1+5*x
```

4.283 $a + (x^2+1)\,y'(x) + xy(x) = 0$

ODE

$$a + (x^2+1)\,y'(x) + xy(x) = 0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0118314 (sec), leaf count = 23

$$\left\{\left\{y(x) \to \frac{c_1 - a\sinh^{-1}(x)}{\sqrt{x^2+1}}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 19

$$\left\{y(x) = (-a\,Arcsinh(x) + \_C1)\frac{1}{\sqrt{x^2+1}}\right\}$$

Mathematica raw input

```
DSolve[a + x*y[x] + (1 + x^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(a*ArcSinh[x]) + C[1])/Sqrt[1 + x^2]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x)+a+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-a*arcsinh(x)+_C1)/(x^2+1)^(1/2)
```

4.284 $a + (x^2+1)\,y'(x) - xy(x) = 0$

ODE

$$a + (x^2+1)\,y'(x) - xy(x) = 0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.012744 (sec), leaf count = 22

$$\left\{\left\{y(x) \to c_1\sqrt{x^2+1} - ax\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 18

$$\left\{y(x) = \sqrt{x^2+1}\_C1 - ax\right\}$$

Mathematica raw input

```
DSolve[a - x*y[x] + (1 + x^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(a*x) + Sqrt[1 + x^2]*C[1]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x)+a-x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2+1)^(1/2)*_C1-a*x
```

4.285 $a + (1 - x^2)\, y'(x) - xy(x) = 0$

ODE

$$a + (1 - x^2)\, y'(x) - xy(x) = 0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0103287 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \frac{a \log\left(\sqrt{x^2-1}+x\right) + c_1}{\sqrt{x^2-1}}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 48

$$\left\{y(x) = \frac{a}{(-1+x)(1+x)}\sqrt{(-1+x)(1+x)}\ln\left(x+\sqrt{x^2-1}\right) + \_C1\frac{1}{\sqrt{-1+x}}\frac{1}{\sqrt{1+x}}\right\}$$

Mathematica raw input

```
DSolve[a - x*y[x] + (1 - x^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + a*Log[x + Sqrt[-1 + x^2]])/Sqrt[-1 + x^2]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x)+a-x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/(-1+x)/(1+x)*a*((-1+x)*(1+x))^(1/2)*ln(x+(x^2-1)^(1/2))+1/(-1+x)^(1/2)/
(1+x)^(1/2)*_C1
```

4.286 $(1-x^2)\,y'(x)+xy(x)-x=0$

ODE

$$(1-x^2)\,y'(x)+xy(x)-x=0$$

ODE Classification

[_separable]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00769271 (sec), leaf count = 19

$$\left\{\left\{y(x)\to c_1\sqrt{x^2-1}+1\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 18

$$\left\{y(x)=\sqrt{-1+x}\sqrt{1+x}\_C1+1\right\}$$

Mathematica raw input

```
DSolve[-x + x*y[x] + (1 - x^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1 + Sqrt[-1 + x^2]*C[1]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x)-x+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-1+x)^(1/2)*(1+x)^(1/2)*_C1+1
```

4.287 $(1-x^2)\,y'(x)-x^2+xy(x)=0$

ODE

$$(1-x^2)\,y'(x)-x^2+xy(x)=0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0193686 (sec), leaf count = 42

$$\left\{\left\{y(x)\to c_1\sqrt{x^2-1}-\sqrt{x^2-1}\log\left(\sqrt{x^2-1}+x\right)+x\right\}\right\}$$

Maple ✓
cpu = 0.523 (sec), leaf count = 58

$$\left\{y(x)=-x^2\ln\left(x+\sqrt{x^2-1}\right)\frac{1}{\sqrt{x^2-1}}+x+1\ln\left(x+\sqrt{x^2-1}\right)\frac{1}{\sqrt{x^2-1}}+\sqrt{-1+x}\sqrt{1+x}\_C1\right\}$$

Mathematica raw input

```
DSolve[-x^2 + x*y[x] + (1 - x^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x + Sqrt[-1 + x^2]*C[1] - Sqrt[-1 + x^2]*Log[x + Sqrt[-1 + x^2]]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x)-x^2+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/(x^2-1)^(1/2)*ln(x+(x^2-1)^(1/2))*x^2+x+1/(x^2-1)^(1/2)*ln(x+(x^2-1)^(
1/2))+(-1+x)^(1/2)*(1+x)^(1/2)*_C1
```

4.288 $(1-x^2)\,y'(x)+x^2+xy(x)=0$

ODE

$$(1-x^2)\,y'(x)+x^2+xy(x)=0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0132908 (sec), leaf count = 43

$$\left\{\left\{y(x)\to c_1\sqrt{x^2-1}+\sqrt{x^2-1}\log\left(\sqrt{x^2-1}+x\right)-x\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 53

$$\left\{y(x)=1\left(\left(x^2-1\right)\ln\left(x+\sqrt{x^2-1}\right)-\sqrt{x^2-1}\left(-\sqrt{-1+x}\sqrt{1+x}\_C1+x\right)\right)\frac{1}{\sqrt{x^2-1}}\right\}$$

Mathematica raw input

```
DSolve[x^2 + x*y[x] + (1 - x^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x + Sqrt[-1 + x^2]*C[1] + Sqrt[-1 + x^2]*Log[x + Sqrt[-1 + x^2]]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x)+x^2+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ((x^2-1)*ln(x+(x^2-1)^(1/2))-(x^2-1)^(1/2)*(-(-1+x)^(1/2)*(1+x)^(1/2)*_C1
+x))/(x^2-1)^(1/2)
```

4.289 $(x^2+1)\,y'(x) = x(x^2+1) - xy(x)$

ODE

$$(x^2+1)\,y'(x) = x(x^2+1) - xy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00913295 (sec), leaf count = 27

$$\left\{\left\{y(x) \to \frac{c_1}{\sqrt{x^2+1}} + \frac{1}{3}\left(x^2+1\right)\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 20

$$\left\{y(x) = \frac{x^2}{3} + \frac{1}{3} + \_C1\,\frac{1}{\sqrt{x^2+1}}\right\}$$

Mathematica raw input

```
DSolve[(1 + x^2)*y'[x] == x*(1 + x^2) - x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x^2)/3 + C[1]/Sqrt[1 + x^2]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x) = x*(x^2+1)-x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/3*x^2+1/3+1/(x^2+1)^(1/2)*_C1
```

4.290 $(x^2+1)\,y'(x) = x(3x^2 - y(x))$

ODE

$$(x^2+1)\,y'(x) = x(3x^2 - y(x))$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0114468 (sec), leaf count = 22

$$\left\{\left\{y(x) \to \frac{c_1}{\sqrt{x^2+1}} + x^2 - 2\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 18

$$\left\{y(x) = x^2 - 2 + \_C1\,\frac{1}{\sqrt{x^2+1}}\right\}$$

Mathematica raw input

```
DSolve[(1 + x^2)*y'[x] == x*(3*x^2 - y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2 + x^2 + C[1]/Sqrt[1 + x^2]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x) = x*(3*x^2-y(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = x^2-2+1/(x^2+1)^(1/2)*_C1
```

4.291 $(1-x^2)\,y'(x)+2xy(x)=0$

ODE

$$(1-x^2)\,y'(x)+2xy(x)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00505317 (sec), leaf count = 13

$$\{\{y(x)\to c_1(x^2-1)\}\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 13

$$\{y(x)=\_C1\,x^2-\_C1\}$$

Mathematica raw input

```
DSolve[2*x*y[x] + (1 - x^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + x^2)*C[1]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x)+2*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^2-_C1
```

4.292 $(x^2+1)\,y'(x) = 2x(x-y(x))$

ODE

$$(x^2+1)\,y'(x) = 2x(x-y(x))$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00589057 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{3c_1+2x^3}{3x^2+3}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 23

$$\left\{y(x) = \frac{2\,x^3+3\,\_C1}{3\,x^2+3}\right\}$$

Mathematica raw input

```
DSolve[(1 + x^2)*y'[x] == 2*x*(x - y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x^3 + 3*C[1])/(3 + 3*x^2)}}
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x) = 2*x*(x-y(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = (2*x^3+3*_C1)/(3*x^2+3)
```

4.293 $(x^2+1)\,y'(x) = 2x(x^2+1)^2 + 2xy(x)$

ODE

$$(x^2+1)\,y'(x) = 2x(x^2+1)^2 + 2xy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00624031 (sec), leaf count = 17

$$\{\{y(x) \to (x^2+1)\,(c_1 + x^2)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 15

$$\{y(x) = (x^2 + \_C1)\,(x^2+1)\}$$

Mathematica raw input

```
DSolve[(1 + x^2)*y'[x] == 2*x*(1 + x^2)^2 + 2*x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x^2)*(x^2 + C[1])}}
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x) = 2*x*(x^2+1)^2+2*x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2+_C1)*(x^2+1)
```

4.294 $(1-x^2)\,y'(x)+\cos(x)=2xy(x)$

ODE

$$(1-x^2)\,y'(x)+\cos(x)=2xy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0115811 (sec), leaf count = 18

$$\left\{\left\{y(x)\to \frac{c_1+\sin(x)}{x^2-1}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 16

$$\left\{y(x)=\frac{\sin(x)+\_C1}{x^2-1}\right\}$$

Mathematica raw input

```
DSolve[Cos[x] + (1 - x^2)*y'[x] == 2*x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + Sin[x])/(-1 + x^2)}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x)+cos(x) = 2*x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (sin(x)+_C1)/(x^2-1)
```

4.295 $(x^2+1)\,y'(x) = \tan(x) - 2xy(x)$

ODE

$$(x^2+1)\,y'(x) = \tan(x) - 2xy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0228375 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{c_1 - \log(\cos(x))}{x^2+1}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 19

$$\left\{y(x) = \frac{-\ln(\cos(x)) + \_C1}{x^2+1}\right\}$$

Mathematica raw input

```
DSolve[(1 + x^2)*y'[x] == Tan[x] - 2*x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] - Log[Cos[x]])/(1 + x^2)}}
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x) = tan(x)-2*x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-ln(cos(x))+_C1)/(x^2+1)
```

4.296 $(1-x^2)\,y'(x) = a + 4xy(x)$

ODE

$$(1-x^2)\,y'(x) = a + 4xy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00616223 (sec), leaf count = 30

$$\left\{\left\{y(x) \to \frac{3c_1 - ax\left(x^2-3\right)}{3\left(x^2-1\right)^2}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 29

$$\left\{y(x) = \frac{1}{(-1+x)^2(1+x)^2}\left(-a\left(\frac{x^3}{3} - x\right) + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(1 - x^2)*y'[x] == a + 4*x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(a*x*(-3 + x^2)) + 3*C[1])/(3*(-1 + x^2)^2)}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x) = a+4*x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-a*(1/3*x^3-x)+_C1)/(-1+x)^2/(1+x)^2
```

4.297 $(x^2+1)\,y'(x) = y(x)(a+2bx)$

ODE

$$(x^2+1)\,y'(x) = y(x)(a+2bx)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0130476 (sec), leaf count = 21

$$\left\{\left\{y(x) \to c_1 \left(x^2+1\right)^b e^{a \tan^{-1}(x)}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 18

$$\left\{y(x) = \_C1 \left(x^2+1\right)^b \mathrm{e}^{a \arctan(x)}\right\}$$

Mathematica raw input

```
DSolve[(1 + x^2)*y'[x] == (a + 2*b*x)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(a*ArcTan[x])*(1 + x^2)^b*C[1]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x) = (2*b*x+a)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(x^2+1)^b*exp(a*arctan(x))
```

4.298 $(x^2+1)\,y'(x) = y(x)^2+1$

ODE

$$(x^2+1)\,y'(x) = y(x)^2+1$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0116723 (sec), leaf count = 11

$$\{\{y(x) \to \tan\left(c_1 + \tan^{-1}(x)\right)\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 12

$$\{\arctan(x) - \arctan(y(x)) + \_C1 = 0\}$$

Mathematica raw input

```
DSolve[(1 + x^2)*y'[x] == 1 + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Tan[ArcTan[x] + C[1]]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x) = 1+y(x)^2, y(x),'implicit')
```

Maple raw output

```
arctan(x)-arctan(y(x))+_C1 = 0
```

4.299 $(1-x^2)\,y'(x) = 1 - y(x)^2$

ODE

$$(1-x^2)\,y'(x) = 1 - y(x)^2$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0275774 (sec), leaf count = 37

$$\left\{\left\{y(x) \to -\frac{e^{2c_1}(x-1)+x+1}{e^{2c_1}(x-1)-x-1}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 12

$$\{-Artanh(x) + Artanh(y(x)) + \_C1 = 0\}$$

Mathematica raw input

```
DSolve[(1 - x^2)*y'[x] == 1 - y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((1 + E^(2*C[1])*(-1 + x) + x)/(-1 + E^(2*C[1])*(-1 + x) - x))}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x) = 1-y(x)^2, y(x),'implicit')
```

Maple raw output

```
-arctanh(x)+arctanh(y(x))+_C1 = 0
```

4.300 $(1-x^2)\,y'(x) = 1-(2x-y(x))y(x)$

ODE

$$(1-x^2)\,y'(x) = 1-(2x-y(x))y(x)$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`], _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0152203 (sec), leaf count = 47

$$\left\{\left\{y(x)\to \frac{2c_1 x+x\log(1-x)-x\log(x+1)+2}{2c_1+\log(1-x)-\log(x+1)}\right\}\right\}$$

Maple ✓
cpu = 0.107 (sec), leaf count = 14

$$\left\{y(x) = x+(\_C1-Artanh(x))^{-1}\right\}$$

Mathematica raw input

```
DSolve[(1 - x^2)*y'[x] == 1 - (2*x - y[x])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2 + 2*x*C[1] + x*Log[1 - x] - x*Log[1 + x])/(2*C[1] + Log[1 - x] - Lo
g[1 + x])}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x) = 1-(2*x-y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = x+1/(_C1-arctanh(x))
```

4.301 $(1-x^2)\,y'(x) = n(y(x)^2 - 2xy(x) + 1)$

ODE

$$(1-x^2)\,y'(x) = n(y(x)^2 - 2xy(x) + 1)$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0838893 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \frac{c_1 P_n(x) + Q_n(x)}{c_1 P_{n-1}(x) + Q_{n-1}(x)}\right\}\right\}$$

Maple ✓
cpu = 2.865 (sec), leaf count = 231

$$\left\{y(x) = \frac{1}{4\,n\,(1+x)}\left(8\,((n-1/2)\,x + 1/2 - n/2)\,\_C1\,(1+x)\,HeunC\left(0, -2\,n+1, 0, 0, n^2 - n + 1/2, 2\,(1+x)^{-1}\right) - n\left(-\right.\right.\right.$$

Mathematica raw input

```
DSolve[(1 - x^2)*y'[x] == n*(1 - 2*x*y[x] + y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*LegendreP[n, x] + LegendreQ[n, x])/(C[1]*LegendreP[-1 + n, x] +
LegendreQ[-1 + n, x])}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x) = n*(1-2*x*y(x)+y(x)^2), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(8*((n-1/2)*x+1/2-1/2*n)*_C1*(1+x)*HeunC(0,-2*n+1,0,0,n^2-n+1/2,2/(1+
x))-n*(-1/2-1/2*x)^(-2*n+1)*(1+x)*HeunC(0,2*n-1,0,0,n^2-n+1/2,2/(1+x))-8*(-1+x)*
(HeunCPrime(0,-2*n+1,0,0,n^2-n+1/2,2/(1+x))*_C1-1/4*(-1/2-1/2*x)^(-2*n+1)*HeunCP
rime(0,2*n-1,0,0,n^2-n+1/2,2/(1+x))))/n/(1+x)/(HeunC(0,-2*n+1,0,0,n^2-n+1/2,2/(1
+x))*_C1-1/4*(-1/2-1/2*x)^(-2*n+1)*HeunC(0,2*n-1,0,0,n^2-n+1/2,2/(1+x)))
```

4.302 $(x^2+1)\,y'(x)+x(1-y(x))y(x)=0$

ODE

$$(x^2+1)\,y'(x)+x(1-y(x))y(x)=0$$

ODE Classification

[_separable]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0236234 (sec), leaf count = 23

$$\left\{\left\{y(x)\to \frac{1}{e^{c_1}\sqrt{x^2+1}+1}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 19

$$\left\{-\sqrt{x^2+1}\_C1+(y(x))^{-1}-1=0\right\}$$

Mathematica raw input

```
DSolve[x*(1 - y[x])*y[x] + (1 + x^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + E^C[1]*Sqrt[1 + x^2])^(-1)}}
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x)+x*y(x)*(1-y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
-(x^2+1)^(1/2)*_C1+1/y(x)-1 = 0
```

4.303 $(1-x^2)\,y'(x) = xy(x)(ay(x)+1)$

ODE

$$(1-x^2)\,y'(x) = xy(x)(ay(x)+1)$$

ODE Classification

[_separable]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0350801 (sec), leaf count = 33

$$\left\{\left\{y(x) \to -\frac{e^{c_1}}{ae^{c_1} - \sqrt{1-x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 22

$$\left\{-\sqrt{-1+x}\sqrt{1+x}\_C1 + (y(x))^{-1} + a = 0\right\}$$

Mathematica raw input

```
DSolve[(1 - x^2)*y'[x] == x*y[x]*(1 + a*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(E^C[1]/(a*E^C[1] - Sqrt[1 - x^2]))}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x) = x*y(x)*(1+a*y(x)), y(x),'implicit')
```

Maple raw output

```
-(-1+x)^(1/2)*(1+x)^(1/2)*_C1+1/y(x)+a = 0
```

4.304 $(x^2+1)\,y'(x) = y(x)^2 - 2x(y(x)^2+1)\,y(x) + 1$

ODE

$$(x^2+1)\,y'(x) = y(x)^2 - 2x(y(x)^2+1)\,y(x) + 1$$

ODE Classification

[_rational , _Abel]

Book solution method
Abel ODE, Second kind

Mathematica ✓
cpu = 0.542792 (sec), leaf count = 161

$$\text{Solve}\left[c_1 = \frac{i\left(x\left(\sqrt[4]{\frac{(x^2+1)\,(y(x)^2+1)}{(xy(x)-1)^2}}\,{}_2F_1\left(\frac{1}{2},\frac{5}{4};\frac{3}{2};-\frac{(x+y(x))^2}{(xy(x)-1)^2}\right)-2\right)+y(x)\left(\sqrt[4]{\frac{(x^2+1)\,(y(x)^2+1)}{(xy(x)-1)^2}}\,{}_2F_1\left(\frac{1}{2},\frac{5}{4};\frac{3}{2};-\frac{(x-}{(xy}\right.\right.}{2(xy(x)-1)\sqrt[4]{-\frac{(x^2+1)\,(y(x)^2+1)}{(xy(x)-1)^2}}}\right]$$

Maple ✓
cpu = 0.962 (sec), leaf count = 85

$$\left\{ \_C1 + x\frac{1}{\sqrt[4]{\left(x^{-1}+x^2\left(\frac{x^4 y(x)}{x^2+1}-\frac{x^3}{x^2+1}\right)^{-1}\right)^2+1}} + \frac{x+y(x)}{2\,xy(x)-2}\,{}_2\mathrm{F}_1\left(\frac{1}{2},\frac{5}{4};\frac{3}{2};-\frac{(x+y(x))^2}{(xy(x)-1)^2}\right) = 0 \right\}$$

Mathematica raw input

```
DSolve[(1 + x^2)*y'[x] == 1 + y[x]^2 - 2*x*y[x]*(1 + y[x]^2),y[x],x]
```

Mathematica raw output

```
Solve[C[1] == ((I/2)*(x*(-2 + Hypergeometric2F1[1/2, 5/4, 3/2, -((x + y[x])^2/(-
1 + x*y[x])^2)]*(((1 + x^2)*(1 + y[x]^2))/(-1 + x*y[x])^2)^(1/4)) + y[x]*(2*x^2
+ Hypergeometric2F1[1/2, 5/4, 3/2, -((x + y[x])^2/(-1 + x*y[x])^2)]*(((1 + x^2)*
(1 + y[x]^2))/(-1 + x*y[x])^2)^(1/4))))/((-1 + x*y[x])*(-(((1 + x^2)*(1 + y[x]^2
))/(-1 + x*y[x])^2))^(1/4)), y[x]]
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x) = 1+y(x)^2-2*x*y(x)*(1+y(x)^2), y(x),'implicit')
```

Maple raw output

```
_C1+x/((1/x+x^2/(x^4/(x^2+1)*y(x)-x^3/(x^2+1)))^2+1)^(1/4)+(x+y(x))*hypergeom([1
/2, 5/4],[3/2],-(x+y(x))^2/(x*y(x)-1)^2)/(2*x*y(x)-2) = 0
```

4.305 $(x^2+1)\,y'(x)+x\sin(y(x))\cos(y(x))=x(x^2+1)\cos^2(y(x))$

ODE

$$(x^2+1)\,y'(x)+x\sin(y(x))\cos(y(x))=x(x^2+1)\cos^2(y(x))$$

ODE Classification

[` y=_G(x,y') `]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.23079 (sec), leaf count = 39

$$\left\{\left\{y(x)\to \tan^{-1}\left(\frac{-6c_1\sqrt{x^2+1}+x^4+2x^2+1}{3x^2+3}\right)\right\}\right\}$$

Maple ✓
cpu = 0.784 (sec), leaf count = 31

$$\left\{\_C1+\frac{1}{3}\left(x^2+1\right)^{\frac{3}{2}}-\frac{\sin\left(y\left(x\right)\right)}{\cos\left(y\left(x\right)\right)}\sqrt{x^2+1}=0\right\}$$

Mathematica raw input

```
DSolve[x*Cos[y[x]]*Sin[y[x]] + (1 + x^2)*y'[x] == x*(1 + x^2)*Cos[y[x]]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ArcTan[(1 + 2*x^2 + x^4 - 6*Sqrt[1 + x^2]*C[1])/(3 + 3*x^2)]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x)+x*sin(y(x))*cos(y(x)) = x*(x^2+1)*cos(y(x))^2, y(x),'implicit')
```

Maple raw output

```
_C1+1/3*(x^2+1)^(3/2)-1/cos(y(x))*sin(y(x))*(x^2+1)^(1/2) = 0
```

4.306 $(x^2+1)\,y'(x) = x^2 - y(x)\cot^{-1}(x) + 1$

ODE

$$(x^2+1)\,y'(x) = x^2 - y(x)\cot^{-1}(x) + 1$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✗
cpu = 599.991 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.33 (sec), leaf count = 27

$$\left\{y(x) = \left(\int \mathrm{e}^{-\frac{(\pi - 2\arctan(x))^2}{8}}\,\mathrm{d}x + \_C1\right)\mathrm{e}^{\frac{(\operatorname{arccot}(x))^2}{2}}\right\}$$

Mathematica raw input

```
DSolve[(1 + x^2)*y'[x] == 1 + x^2 - ArcCot[x]*y[x],y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((x^2+1)*diff(y(x),x) = 1+x^2-y(x)*arccot(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (Int(exp(-1/8*(Pi-2*arctan(x))^2),x)+_C1)*exp(1/2*arccot(x)^2)
```

4.307 $(4-x^2)\,y'(x)+4y(x)=(x+2)y(x)^2$

ODE

$$(4-x^2)\,y'(x)+4y(x)=(x+2)y(x)^2$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0187497 (sec), leaf count = 27

$$\left\{\left\{y(x)\to \frac{2-x}{(x+2)\,(c_1-\log(x+2))}\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 24

$$\left\{(y(x))^{-1}-\frac{(\ln(2+x)+\_C1)\,(2+x)}{x-2}=0\right\}$$

Mathematica raw input

```
DSolve[4*y[x] + (4 - x^2)*y'[x] == (2 + x)*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2 - x)/((2 + x)*(C[1] - Log[2 + x]))}}
```

Maple raw input

```
dsolve((-x^2+4)*diff(y(x),x)+4*y(x) = (2+x)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
1/y(x)-(ln(2+x)+_C1)*(2+x)/(x-2) = 0
```

4.308 $(a^2+x^2)\,y'(x) = b + xy(x)$

ODE

$$(a^2+x^2)\,y'(x) = b + xy(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.017577 (sec), leaf count = 26

$$\left\{\left\{y(x) \to \frac{bx}{a^2} + c_1\sqrt{a^2+x^2}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 22

$$\left\{y(x) = \frac{bx}{a^2} + \sqrt{a^2+x^2}\_C1\right\}$$

Mathematica raw input

```
DSolve[(a^2 + x^2)*y'[x] == b + x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (b*x)/a^2 + Sqrt[a^2 + x^2]*C[1]}}
```

Maple raw input

```
dsolve((a^2+x^2)*diff(y(x),x) = b+x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/a^2*x*b+(a^2+x^2)^(1/2)*_C1
```

4.309 $(a^2+x^2)\,y'(x) = \left(\sqrt{a^2+x^2}+x\right)(b+y(x))$

ODE

$$(a^2+x^2)\,y'(x) = \left(\sqrt{a^2+x^2}+x\right)(b+y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0345841 (sec), leaf count = 43

$$\left\{\left\{y(x) \to \frac{\left(\sqrt{a^2+x^2}+x\right)\left(a^2 c_1 \sqrt{a^2+x^2}+bx\right)}{a^2}\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 40

$$\left\{y(x) = \left(\frac{bx}{a^2}\frac{1}{\sqrt{a^2+x^2}}+\_C1\right)\left(x\sqrt{a^2+x^2}+a^2+x^2\right)\right\}$$

Mathematica raw input

```
DSolve[(a^2 + x^2)*y'[x] == (x + Sqrt[a^2 + x^2])*(b + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((x + Sqrt[a^2 + x^2])*(b*x + a^2*Sqrt[a^2 + x^2]*C[1]))/a^2}}
```

Maple raw input

```
dsolve((a^2+x^2)*diff(y(x),x) = (b+y(x))*(x+(a^2+x^2)^(1/2)), y(x),'implicit')
```

Maple raw output

```
y(x) = (1/(a^2+x^2)^(1/2)/a^2*x*b+_C1)*(x*(a^2+x^2)^(1/2)+a^2+x^2)
```

4.310 $(a^2+x^2)\,y'(x)+(x-y(x))y(x)=0$

ODE

$$(a^2+x^2)\,y'(x)+(x-y(x))y(x)=0$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0168714 (sec), leaf count = 32

$$\left\{\left\{y(x)\to \frac{a^2}{a^2c_1\sqrt{a^2+x^2}-x}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 25

$$\left\{\frac{x}{a^2}-\sqrt{a^2+x^2}\_C1+(y(x))^{-1}=0\right\}$$

Mathematica raw input

```
DSolve[(x - y[x])*y[x] + (a^2 + x^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> a^2/(-x + a^2*Sqrt[a^2 + x^2]*C[1])}}
```

Maple raw input

```
dsolve((a^2+x^2)*diff(y(x),x)+(x-y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/a^2*x-(a^2+x^2)^(1/2)*_C1+1/y(x) = 0
```

4.311 $(a^2+x^2)\,y'(x) = a^2 - 2y(x)^2 + 3xy(x)$

ODE

$$(a^2+x^2)\,y'(x) = a^2 - 2y(x)^2 + 3xy(x)$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.156724 (sec), leaf count = 58

$$\left\{\left\{y(x) \to \frac{a^2 c_1 (-x)\sqrt{a^2+x^2} + a^2 + 2x^2}{2x - a^2 c_1 \sqrt{a^2+x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.367 (sec), leaf count = 280

$$\left\{y(x) = -\frac{a}{ia+x}\left(-\frac{\sqrt{2}(ix-a)\_C1}{2}\sqrt{\frac{ix-a}{a}}\,HeunC\left(0,-\frac{1}{2},2,0,\frac{5}{4},\frac{a+ix}{ix-a}\right) + (ix-a)\sqrt{\frac{a+ix}{a}}\,HeunC\left(0,\frac{1}{2},2,0,\frac{5}{4},\frac{a}{ix}\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a^2 + x^2)*y'[x] == a^2 + 3*x*y[x] - 2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a^2 + 2*x^2 - a^2*x*Sqrt[a^2 + x^2]*C[1])/(2*x - a^2*Sqrt[a^2 + x^2]*
C[1])}}
```

Maple raw input

```
dsolve((a^2+x^2)*diff(y(x),x) = a^2+3*x*y(x)-2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = -a*(-1/2*((I*x-a)/a)^(1/2)*2^(1/2)*(I*x-a)*_C1*HeunC(0,-1/2,2,0,5/4,(a+I*
x)/(I*x-a))+(I*x-a)*((a+I*x)/a)^(1/2)*HeunC(0,1/2,2,0,5/4,(a+I*x)/(I*x-a))+(-_C1
*2^(1/2)*((I*x-a)/a)^(1/2)*HeunCPrime(0,-1/2,2,0,5/4,(a+I*x)/(I*x-a))+HeunCPrime
```

```
(0,1/2,2,0,5/4,(a+I*x)/(I*x-a))*((a+I*x)/a)^(1/2))*(a+I*x))/(2^(1/2)*((I*x-a)/a)
^(1/2)*HeunC(0,-1/2,2,0,5/4,(a+I*x)/(I*x-a))*_C1-HeunC(0,1/2,2,0,5/4,(a+I*x)/(I*
x-a))*((a+I*x)/a)^(1/2))/(I*a+x)
```

4.312 $(a^2+x^2)\,y'(x)+bxy(x)^2+xy(x)=0$

ODE

$$(a^2+x^2)\,y'(x)+bxy(x)^2+xy(x)=0$$

ODE Classification

[_separable]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0363504 (sec), leaf count = 33

$$\left\{\left\{y(x)\to -\frac{e^{c_1}}{be^{c_1}-\sqrt{a^2+x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 21

$$\left\{-\sqrt{a^2+x^2}\_C1+(y(x))^{-1}+b=0\right\}$$

Mathematica raw input

```
DSolve[x*y[x] + b*x*y[x]^2 + (a^2 + x^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(E^C[1]/(b*E^C[1] - Sqrt[a^2 + x^2]))}}
```

Maple raw input

```
dsolve((a^2+x^2)*diff(y(x),x)+x*y(x)+b*x*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-(a^2+x^2)^(1/2)*_C1+1/y(x)+b = 0
```

4.313 $(1-x)xy'(x) = a + (x+1)y(x)$

ODE

$$(1-x)xy'(x) = a + (x+1)y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0123901 (sec), leaf count = 24

$$\left\{\left\{y(x) \to -\frac{ax\log(x) + a - c_1 x}{(x-1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 23

$$\left\{y(x) = \frac{-a\ln(x)\,x + \_C1\,x - a}{(-1+x)^2}\right\}$$

Mathematica raw input

```
DSolve[(1 - x)*x*y'[x] == a + (1 + x)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a - x*C[1] + a*x*Log[x])/(-1 + x)^2)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(y(x),x) = a+(1+x)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-a*ln(x)*x+_C1*x-a)/(-1+x)^2
```

4.314 $(1-x)xy'(x) = 2(xy(x)+1)$

ODE

$$(1-x)xy'(x) = 2(xy(x)+1)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00624863 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{c_1 - 2x + 2\log(x)}{(x-1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 19

$$\left\{y(x) = \frac{-2\,x + 2\,\ln(x) + \_C1}{(-1+x)^2}\right\}$$

Mathematica raw input

```
DSolve[(1 - x)*x*y'[x] == 2*(1 + x*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*x + C[1] + 2*Log[x])/(-1 + x)^2}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(y(x),x) = 2+2*x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-2*x+2*ln(x)+_C1)/(-1+x)^2
```

4.315 $(1-x)xy'(x) = 2(xy(x)-1)$

ODE

$$(1-x)xy'(x) = 2(xy(x)-1)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00563554 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{c_1 + 2x - 2\log(x)}{(x-1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 19

$$\left\{y(x) = \frac{-2\ln(x) + 2x + \_C1}{(-1+x)^2}\right\}$$

Mathematica raw input

```
DSolve[(1 - x)*x*y'[x] == 2*(-1 + x*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x + C[1] - 2*Log[x])/(-1 + x)^2}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(y(x),x) = 2*x*y(x)-2, y(x),'implicit')
```

Maple raw output

```
y(x) = (-2*ln(x)+2*x+_C1)/(-1+x)^2
```

4.316 $x(x+1)y'(x) = (1-2x)y(x)$

ODE

$$x(x+1)y'(x) = (1-2x)y(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00784502 (sec), leaf count = 14

$$\left\{\left\{y(x) \to \frac{c_1 x}{(x+1)^3}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 12

$$\left\{y(x) = \frac{\_C1\, x}{(1+x)^3}\right\}$$

Mathematica raw input

```
DSolve[x*(1 + x)*y'[x] == (1 - 2*x)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*C[1])/(1 + x)^3}}
```

Maple raw input

```
dsolve(x*(1+x)*diff(y(x),x) = (1-2*x)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1/(1+x)^3*x
```

4.317 $(1-x)xy'(x)+(2x+1)y(x)=a$

ODE

$$(1-x)xy'(x)+(2x+1)y(x)=a$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00982764 (sec), leaf count = 23

$$\left\{\left\{y(x)\to \frac{a-3c_1(x-1)^3}{3x}\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 19

$$\left\{y(x)=\frac{3\left(-1+x\right)^3\_C1+a}{3\,x}\right\}$$

Mathematica raw input

```
DSolve[(1 + 2*x)*y[x] + (1 - x)*x*y'[x] == a,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a - 3*(-1 + x)^3*C[1])/(3*x)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(y(x),x)+(1+2*x)*y(x) = a, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/3*(3*(-1+x)^3*_C1+a)/x
```

4.318 $(1-x)xy'(x) = a + 2(2-x)y(x)$

ODE

$$(1-x)xy'(x) = a + 2(2-x)y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0109021 (sec), leaf count = 29

$$\left\{\left\{y(x) \to \frac{a(4x-3)+12c_1x^4}{12(x-1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 25

$$\left\{y(x) = \frac{12\_C1\,x^4 + 4\,ax - 3\,a}{12\,(-1+x)^2}\right\}$$

Mathematica raw input

```
DSolve[(1 - x)*x*y'[x] == a + 2*(2 - x)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a*(-3 + 4*x) + 12*x^4*C[1])/(12*(-1 + x)^2)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(y(x),x) = a+2*(2-x)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/12*(12*_C1*x^4+4*a*x-3*a)/(-1+x)^2
```

4.319 $(1-x)xy'(x)-3xy(x)+y(x)+2=0$

ODE

$$(1-x)xy'(x)-3xy(x)+y(x)+2=0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00756792 (sec), leaf count = 23

$$\left\{\left\{y(x)\to \frac{c_1+x^2-2x}{(x-1)^2x}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 21

$$\left\{y(x)=\frac{x^2+\_C1-2\,x}{\left(-1+x\right)^2x}\right\}$$

Mathematica raw input

```
DSolve[2 + y[x] - 3*x*y[x] + (1 - x)*x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*x + x^2 + C[1])/((-1 + x)^2*x)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(y(x),x)+2-3*x*y(x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2+_C1-2*x)/(-1+x)^2/x
```

4.320 $x(x+1)y'(x) = (x^2+x-1)\,y(x) + (x+1)\,(x^2-1)$

ODE

$$x(x+1)y'(x) = (x^2+x-1)\,y(x) + (x+1)\,(x^2-1)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0126451 (sec), leaf count = 22

$$\left\{\left\{y(x) \to -\frac{(x+1)\,(x-c_1 e^x)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 19

$$\left\{y(x) = -\frac{(1+x)\,(-\mathrm{e}^x\_C1+x)}{x}\right\}$$

Mathematica raw input

```
DSolve[x*(1 + x)*y'[x] == (1 + x)*(-1 + x^2) + (-1 + x + x^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(((1 + x)*(x - E^x*C[1]))/x)}}
```

Maple raw input

```
dsolve(x*(1+x)*diff(y(x),x) = (1+x)*(x^2-1)+(x^2+x-1)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -(1+x)*(-exp(x)*_C1+x)/x
```

4.321 $x^2 + (x-3)(x-2)y'(x) + 3xy(x) - 8y(x) = 0$

ODE

$$x^2 + (x-3)(x-2)y'(x) + 3xy(x) - 8y(x) = 0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0123187 (sec), leaf count = 34

$$\left\{\left\{y(x) \to \frac{-12c_1 - 3x^4 + 8x^3}{12(x-3)(x-2)^2}\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 27

$$\left\{y(x) = \frac{1}{(x-3)(x-2)^2}\left(-\frac{x^4}{4} + \frac{2x^3}{3} + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[x^2 - 8*y[x] + 3*x*y[x] + (-3 + x)*(-2 + x)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (8*x^3 - 3*x^4 - 12*C[1])/(12*(-3 + x)*(-2 + x)^2)}}
```

Maple raw input

```
dsolve((x-2)*(x-3)*diff(y(x),x)+x^2-8*y(x)+3*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-1/4*x^4+2/3*x^3+_C1)/(x-3)/(x-2)^2
```

4.322 $x(a+x)y'(x) = y(x)(b+cy(x))$

ODE

$$x(a+x)y'(x) = y(x)(b+cy(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.043622 (sec), leaf count = 50

$$\left\{\left\{y(x) \to -\frac{be^{bc_1}x^{\frac{b}{a}}}{ce^{bc_1}x^{\frac{b}{a}} - (a+x)^{\frac{b}{a}}}\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 33

$$\left\{\frac{c}{b} - (a+x)^{\frac{b}{a}}\, x^{-\frac{b}{a}} \_C1 + (y(x))^{-1} = 0\right\}$$

Mathematica raw input

```
DSolve[x*(a + x)*y'[x] == y[x]*(b + c*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((b*E^(b*C[1])*x^(b/a))/(c*E^(b*C[1])*x^(b/a) - (a + x)^(b/a)))}}
```

Maple raw input

```
dsolve(x*(a+x)*diff(y(x),x) = (b+c*y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
1/b*c-(a+x)^(b/a)*x^(-b/a)*_C1+1/y(x) = 0
```

4.323 $(a+x)^2 y'(x) = 2(a+x)(b+y(x))$

ODE

$$(a+x)^2 y'(x) = 2(a+x)(b+y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00965325 (sec), leaf count = 17

$$\{\{y(x) \to c_1 (a+x)^2 - b\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 15

$$\left\{y(x) = -b + (a+x)^2 \_C1\right\}$$

Mathematica raw input

```
DSolve[(a + x)^2*y'[x] == 2*(a + x)*(b + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -b + (a + x)^2*C[1]}}
```

Maple raw input

```
dsolve((a+x)^2*diff(y(x),x) = 2*(a+x)*(b+y(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = -b+(a+x)^2*_C1
```

4.324 $k(-a+y(x)+x)^2+(x-a)^2y'(x)+y(x)^2=0$

ODE

$$k(-a+y(x)+x)^2+(x-a)^2y'(x)+y(x)^2=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0226401 (sec), leaf count = 34

$$\left\{\left\{y(x)\to \frac{1}{\frac{k+1}{a-x}+c_1}+\frac{k(a-x)}{k+1}\right\}\right\}$$

Maple ✓
cpu = 0.037 (sec), leaf count = 57

$$\left\{\ln\left(\frac{x+y(x)-a}{a-x}\right)-\ln\left(\frac{(k+1)\,y(x)-k(a-x)}{a-x}\right)-\ln(a-x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x]^2 + k*(-a + x + y[x])^2 + (-a + x)^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (k*(a - x))/(1 + k) + ((1 + k)/(a - x) + C[1])^(-1)}}
```

Maple raw input

```
dsolve((x-a)^2*diff(y(x),x)+k*(x+y(x)-a)^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
ln((x+y(x)-a)/(a-x))-ln(((k+1)*y(x)-k*(a-x))/(a-x))-ln(a-x)-_C1 = 0
```

4.325 $(x-a)(x-b)y'(x)+ky(x)=0$

ODE

$$(x-a)(x-b)y'(x)+ky(x)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0161387 (sec), leaf count = 34

$$\left\{\left\{y(x)\to c_1 e^{\frac{k(\log(x-b)-\log(x-a))}{a-b}}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 37

$$\left\{y(x)=\_C1\,(x-b)^{\frac{k}{a-b}}\,(x-a)^{-\frac{k}{a-b}}\right\}$$

Mathematica raw input

```
DSolve[k*y[x] + (-a + x)*(-b + x)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^((k*(-Log[-a + x] + Log[-b + x]))/(a - b))*C[1]}}
```

Maple raw input

```
dsolve((x-a)*(x-b)*diff(y(x),x)+k*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(x-b)^(k/(a-b))*(x-a)^(-k/(a-b))
```

4.326 $(x-a)(x-b)y'(x) = y(x)(-a-b+2x) + (x-a)(x-b)$

ODE

$$(x-a)(x-b)y'(x) = y(x)(-a-b+2x) + (x-a)(x-b)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0257433 (sec), leaf count = 42

$$\left\{\left\{y(x) \to (x-a)(x-b)\left(\frac{\log(x-a)-\log(x-b)}{a-b}+c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 44

$$\left\{y(x) = \frac{(b-x)\left(\ln(x-a)-\ln(x-b)+\_C1\,(a-b)\right)(a-x)}{a-b}\right\}$$

Mathematica raw input

```
DSolve[(-a + x)*(-b + x)*y'[x] == (-a + x)*(-b + x) + (-a - b + 2*x)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-a + x)*(-b + x)*(C[1] + (Log[-a + x] - Log[-b + x])/(a - b))}}
```

Maple raw input

```
dsolve((x-a)*(x-b)*diff(y(x),x) = (x-a)*(x-b)+(2*x-a-b)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (b-x)*(ln(x-a)-ln(x-b)+_C1*(a-b))*(a-x)/(a-b)
```

4.327 $(x-a)(x-b)y'(x) = cy(x)^2$

ODE

$$(x-a)(x-b)y'(x) = cy(x)^2$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0184464 (sec), leaf count = 39

$$\left\{\left\{y(x) \to \frac{b-a}{c_1(a-b) + c\log(x-a) - c\log(x-b)}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 42

$$\left\{(y(x))^{-1} - \frac{c\ln(x-b)}{a-b} + \frac{c\ln(x-a)}{a-b} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(-a + x)*(-b + x)*y'[x] == c*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-a + b)/((a - b)*C[1] + c*Log[-a + x] - c*Log[-b + x])}}
```

Maple raw input

```
dsolve((x-a)*(x-b)*diff(y(x),x) = c*y(x)^2, y(x),'implicit')
```

Maple raw output

```
1/y(x)-c/(a-b)*ln(x-b)+c/(a-b)*ln(x-a)-_C1 = 0
```

4.328 $k(y(x)-a)(y(x)-b)+(x-a)(x-b)y'(x)=0$

ODE

$$k(y(x)-a)(y(x)-b)+(x-a)(x-b)y'(x)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0689227 (sec), leaf count = 70

$$\left\{\left\{y(x)\to \frac{ae^{bc_1}(x-a)^k-be^{ac_1}(x-b)^k}{e^{bc_1}(x-a)^k-e^{ac_1}(x-b)^k}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 56

$$\left\{\frac{\ln\left(y(x)-a\right)-\ln\left(y(x)-b\right)+\ln\left(x-a\right)k-\ln\left(x-b\right)k+\_C1\,k(a-b)}{k\left(a-b\right)}=0\right\}$$

Mathematica raw input

```
DSolve[k*(-a + y[x])*(-b + y[x]) + (-a + x)*(-b + x)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a*E^(b*C[1])*(-a + x)^k - b*E^(a*C[1])*(-b + x)^k)/(E^(b*C[1])*(-a +
x)^k - E^(a*C[1])*(-b + x)^k)}}
```

Maple raw input

```
dsolve((x-a)*(x-b)*diff(y(x),x)+k*(y(x)-a)*(y(x)-b) = 0, y(x),'implicit')
```

Maple raw output

```
(ln(y(x)-a)-ln(y(x)-b)+ln(x-a)*k-ln(x-b)*k+_C1*k*(a-b))/k/(a-b) = 0
```

4.329 $k(-a+y(x)+x)(-b+y(x)+x)+(x-a)(x-b)y'(x)+y(x)^2=0$

ODE

$$k(-a+y(x)+x)(-b+y(x)+x)+(x-a)(x-b)y'(x)+y(x)^2=0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`], _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.256415 (sec), leaf count = 102

$$\left\{\left\{y(x)\to \frac{(k+1)\sqrt{-\frac{k^2(a-b)^2}{(k+1)^2}}\tan\left(\frac{(k+1)\sqrt{-\frac{k^2(a-b)^2}{(k+1)^2}}(\log(x-b)-\log(x-a))}{2(a-b)}+c_1\right)+k(a+b-2x)}{2(k+1)}\right\}\right\}$$

Maple ✓
cpu = 0.202 (sec), leaf count = 58

$$\left\{y(x)=\frac{\left(\_C1\,(a-x)\,(a-x)^k+(b-x)^k\,(b-x)\right)k}{(k+1)\left(\_C1\,(a-x)^k+(b-x)^k\right)}\right\}$$

Mathematica raw input

```
DSolve[y[x]^2 + k*(-a + x + y[x])*(-b + x + y[x]) + (-a + x)*(-b + x)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (k*(a + b - 2*x) + Sqrt[-(((a - b)^2*k^2)/(1 + k)^2)]*(1 + k)*Tan[C[1]
 + (Sqrt[-(((a - b)^2*k^2)/(1 + k)^2)]*(1 + k)*(-Log[-a + x] + Log[-b + x]))/(2*
(a - b))])/(2*(1 + k))}}
```

Maple raw input

```
dsolve((x-a)*(x-b)*diff(y(x),x)+k*(x+y(x)-a)*(x+y(x)-b)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*(a-x)*(a-x)^k+(b-x)^k*(b-x))*k/(k+1)/(_C1*(a-x)^k+(b-x)^k)
```

4.330 $2x^2y'(x) = y(x)$

ODE

$$2x^2y'(x) = y(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00324911 (sec), leaf count = 17

$$\left\{\left\{y(x) \to c_1 e^{-\frac{1}{2}/x}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 12

$$\left\{y(x) = \_C1\, \mathrm{e}^{-\frac{1}{2x}}\right\}$$

Mathematica raw input

```
DSolve[2*x^2*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(1/(2*x))}}
```

Maple raw input

```
dsolve(2*x^2*diff(y(x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-1/2/x)
```

4.331 $2x^2y'(x) + 2x^2y(x)\cot(x) + x\cot(x) - 1 = 0$

ODE

$$2x^2y'(x) + 2x^2y(x)\cot(x) + x\cot(x) - 1 = 0$$

ODE Classification

[_linear]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0381775 (sec), leaf count = 18

$$\left\{\left\{y(x) \to c_1 \csc(x) - \frac{1}{2x}\right\}\right\}$$

Maple ✓
cpu = 0.057 (sec), leaf count = 16

$$\left\{y(x) = -\frac{1}{2\,x} + \frac{\_C1}{\sin(x)}\right\}$$

Mathematica raw input

```
DSolve[-1 + x*Cot[x] + 2*x^2*Cot[x]*y[x] + 2*x^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1/(2*x) + C[1]*Csc[x]}}
```

Maple raw input

```
dsolve(2*x^2*diff(y(x),x)+x*cot(x)-1+2*x^2*y(x)*cot(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2/x+1/sin(x)*_C1
```

4.332 $2x^2y'(x) + x^2(-y(x)^2) + 2xy(x) + 1 = 0$

ODE

$$2x^2y'(x) + x^2\left(-y(x)^2\right) + 2xy(x) + 1 = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Riccati]

Book solution method
Homogeneous equation, isobaric equation

Mathematica ✓
cpu = 0.00824596 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \frac{i\tan\left(c_1 + \frac{1}{2}i\log(x)\right)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 16

$$\{\ln(x) - \_C1 + 2\,Artanh(xy(x)) = 0\}$$

Mathematica raw input

```
DSolve[1 + 2*x*y[x] - x^2*y[x]^2 + 2*x^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (I*Tan[C[1] + (I/2)*Log[x]])/x}}
```

Maple raw input

```
dsolve(2*x^2*diff(y(x),x)+1+2*x*y(x)-x^2*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+2*arctanh(x*y(x)) = 0
```

4.333 $2x^2y'(x) = (x^2 - y(x)^2)(1 - x\cot(x)) + 2xy(x)$

ODE

$$2x^2y'(x) = (x^2 - y(x)^2)(1 - x\cot(x)) + 2xy(x)$$

ODE Classification

[[_homogeneous, `class D`], _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0711245 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \frac{x(x - e^{2c_1}\sin(x))}{e^{2c_1}\sin(x) + x}\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 23

$$\left\{-2\,Artanh\left(\frac{y(x)}{x}\right) - \ln(\sin(x)) + \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[2*x^2*y'[x] == 2*x*y[x] + (1 - x*Cot[x])*(x^2 - y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(x - E^(2*C[1])*Sin[x]))/(x + E^(2*C[1])*Sin[x])}}
```

Maple raw input

```
dsolve(2*x^2*diff(y(x),x) = 2*x*y(x)+(1-x*cot(x))*(x^2-y(x)^2), y(x),'implicit')
```

Maple raw output

```
-2*arctanh(y(x)/x)-ln(sin(x))+ln(x)-_C1 = 0
```

4.334 $2(1-x^2)\,y'(x) = \sqrt{1-x^2} + (x+1)y(x)$

ODE

$$2(1-x^2)\,y'(x) = \sqrt{1-x^2} + (x+1)y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.036943 (sec), leaf count = 33

$$\left\{\left\{y(x) \to \frac{c_1}{\sqrt{2-2x}} + \frac{x+1}{\sqrt{1-x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 25

$$\left\{y(x) = \_C1\frac{1}{\sqrt{-1+x}} + (1+x)\frac{1}{\sqrt{-x^2+1}}\right\}$$

Mathematica raw input

```
DSolve[2*(1 - x^2)*y'[x] == Sqrt[1 - x^2] + (1 + x)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x)/Sqrt[1 - x^2] + C[1]/Sqrt[2 - 2*x]}}
```

Maple raw input

```
dsolve(2*(-x^2+1)*diff(y(x),x) = (-x^2+1)^(1/2)+(1+x)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/(-1+x)^(1/2)*_C1+(1+x)/(-x^2+1)^(1/2)
```

4.335 $(1-2x)xy'(x)+(1-4x)y(x)+1=0$

ODE

$$(1-2x)xy'(x)+(1-4x)y(x)+1=0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0089752 (sec), leaf count = 22

$$\left\{\left\{y(x)\to -\frac{x-c_1}{x-2x^2}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 18

$$\left\{y(x)=\frac{x+\_C1}{x\left(-1+2\,x\right)}\right\}$$

Mathematica raw input

```
DSolve[1 + (1 - 4*x)*y[x] + (1 - 2*x)*x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x - C[1])/(x - 2*x^2))}}
```

Maple raw input

```
dsolve(x*(1-2*x)*diff(y(x),x)+1+(1-4*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x+_C1)/x/(-1+2*x)
```

4.336 $(1-2x)xy'(x) = y(x)^2 - (4x+1)y(x) + 4x$

ODE

$$(1-2x)xy'(x) = y(x)^2 - (4x+1)y(x) + 4x$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`], _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0137807 (sec), leaf count = 22

$$\left\{\left\{y(x) \to \frac{x(2x-1)}{x-c_1} + 1\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 27

$$\left\{\frac{(-x+\_C1)\,y(x) + 2\,x^2 - \_C1}{y(x) - 1} = 0\right\}$$

Mathematica raw input

```
DSolve[(1 - 2*x)*x*y'[x] == 4*x - (1 + 4*x)*y[x] + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1 + (x*(-1 + 2*x))/(x - C[1])}}
```

Maple raw input

```
dsolve(x*(1-2*x)*diff(y(x),x) = 4*x-(1+4*x)*y(x)+y(x)^2, y(x),'implicit')
```

Maple raw output

```
((-x+_C1)*y(x)+2*x^2-_C1)/(y(x)-1) = 0
```

4.337 $2(1-x)xy'(x)+(1-2x)y(x)+x=0$

ODE

$$2(1-x)xy'(x)+(1-2x)y(x)+x=0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.035545 (sec), leaf count = 66

$$\left\{\left\{y(x)\to \frac{2c_1\sqrt{-(x-1)x}-x^2+x-\sqrt{x-1}\sqrt{x}\log\left(\sqrt{x-1}+\sqrt{x}\right)}{2x-2x^2}\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 37

$$\left\{y(x)=\frac{1}{4}\left(2\sqrt{x\left(-1+x\right)}+\ln\left(-\frac{1}{2}+x+\sqrt{x\left(-1+x\right)}\right)+4\_C1\right)\frac{1}{\sqrt{x\left(-1+x\right)}}\right\}$$

Mathematica raw input

```
DSolve[x + (1 - 2*x)*y[x] + 2*(1 - x)*x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - x^2 + 2*Sqrt[-((-1 + x)*x)]*C[1] - Sqrt[-1 + x]*Sqrt[x]*Log[Sqrt[
-1 + x] + Sqrt[x]])/(2*x - 2*x^2)}}
```

Maple raw input

```
dsolve(2*x*(1-x)*diff(y(x),x)+x+(1-2*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(2*(x*(-1+x))^(1/2)+ln(-1/2+x+(x*(-1+x))^(1/2))+4*_C1)/(x*(-1+x))^(1/
2)
```

4.338 $2(1-x)xy'(x)+(1-x)y(x)^2+x=0$

ODE

$$2(1-x)xy'(x)+(1-x)y(x)^2+x=0$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0746079 (sec), leaf count = 63

$$\left\{\left\{y(x)\to -\frac{2\left(\pi G^{2,0}_{2,2}\left(x\left|\begin{array}{c}\frac{1}{2},\frac{3}{2}\\0,1\end{array}\right.\right)+c_1(K(x)-E(x))\right)}{\pi G^{2,0}_{2,2}\left(x\left|\begin{array}{c}\frac{1}{2},\frac{3}{2}\\0,0\end{array}\right.\right)+2c_1E(x)}\right\}\right\}$$

Maple ✓
cpu = 0.203 (sec), leaf count = 97

$$\left\{y(x)=\frac{x}{-2+2x}\left(LegendreQ\left(-\frac{1}{2},1,\frac{2-x}{x}\right)\_C1-LegendreQ\left(\frac{1}{2},1,\frac{2-x}{x}\right)\_C1+LegendreP\left(-\frac{1}{2},1,\frac{2-x}{x}\right)-Lege\right.\right.$$

Mathematica raw input

```
DSolve[x + (1 - x)*y[x]^2 + 2*(1 - x)*x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*(C[1]*(-EllipticE[x] + EllipticK[x]) + Pi*MeijerG[{{}, {1/2, 3/2}}
, {{0, 1}, {}}, x]))/(2*C[1]*EllipticE[x] + Pi*MeijerG[{{}, {1/2, 3/2}}, {{0, 0}
, {}}, x])}}
```

Maple raw input

```
dsolve(2*x*(1-x)*diff(y(x),x)+x+(1-x)*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x*(LegendreQ(-1/2,1,(2-x)/x)*_C1-LegendreQ(1/2,1,(2-x)/x)*_C1+Legendr
eP(-1/2,1,(2-x)/x)-LegendreP(1/2,1,(2-x)/x))/(LegendreQ(-1/2,1,(2-x)/x)*_C1+Lege
ndreP(-1/2,1,(2-x)/x))/(-1+x)
```

4.339 $2(x^2+x+1)\,y'(x) = 8x^2-(2x+1)y(x)+1$

ODE

$$2(x^2+x+1)\,y'(x) = 8x^2-(2x+1)y(x)+1$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.024688 (sec), leaf count = 23

$$\left\{\left\{y(x)\to \frac{c_1}{\sqrt{x^2+x+1}}+2x-3\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 19

$$\left\{y(x) = 2\,x-3+\_C1\,\frac{1}{\sqrt{x^2+x+1}}\right\}$$

Mathematica raw input

```
DSolve[2*(1 + x + x^2)*y'[x] == 1 + 8*x^2 - (1 + 2*x)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -3 + 2*x + C[1]/Sqrt[1 + x + x^2]}}
```

Maple raw input

```
dsolve(2*(x^2+x+1)*diff(y(x),x) = 1+8*x^2-(1+2*x)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 2*x-3+1/(x^2+x+1)^(1/2)*_C1
```

4.340 $4(x^2+1)\,y'(x) - x^2 - 4xy(x) = 0$

ODE

$$4(x^2+1)\,y'(x) - x^2 - 4xy(x) = 0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0230519 (sec), leaf count = 38

$$\left\{\left\{y(x) \to \frac{1}{4}\left(4c_1\sqrt{x^2+1} + \sqrt{x^2+1}\sinh^{-1}(x) - x\right)\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 23

$$\left\{y(x) = \frac{4\_C1 + Arcsinh(x)}{4}\sqrt{x^2+1} - \frac{x}{4}\right\}$$

Mathematica raw input

```
DSolve[-x^2 - 4*x*y[x] + 4*(1 + x^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-x + Sqrt[1 + x^2]*ArcSinh[x] + 4*Sqrt[1 + x^2]*C[1])/4}}
```

Maple raw input

```
dsolve(4*(x^2+1)*diff(y(x),x)-4*x*y(x)-x^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(4*_C1+arcsinh(x))*(x^2+1)^(1/2)-1/4*x
```

4.341 $ax^2y'(x) = axy(x) + b^2y(x)^2 + x^2$

ODE

$$ax^2y'(x) = axy(x) + b^2y(x)^2 + x^2$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Riccati]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0190003 (sec), leaf count = 23

$$\left\{\left\{y(x) \to \frac{x \tan\left(\frac{b(ac_1+\log(x))}{a}\right)}{b}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 24

$$\left\{\frac{a}{b}\arctan\left(\frac{by(x)}{x}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[a*x^2*y'[x] == x^2 + a*x*y[x] + b^2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*Tan[(b*(a*C[1] + Log[x]))/a])/b}}
```

Maple raw input

```
dsolve(a*x^2*diff(y(x),x) = x^2+a*x*y(x)+b^2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
a/b*arctan(b/x*y(x))-ln(x)-_C1 = 0
```

4.342 $(a+bx^2)\,y'(x) = A + By(x)^2$

ODE

$$(a+bx^2)\,y'(x) = A + By(x)^2$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0384604 (sec), leaf count = 55

$$\left\{\left\{y(x) \to \frac{\sqrt{A}\tan\left(\sqrt{A}\sqrt{B}\left(\frac{\tan^{-1}\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)}{\sqrt{a}\sqrt{b}} + c_1\right)\right)}{\sqrt{B}}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 37

$$\left\{1\arctan\left(bx\frac{1}{\sqrt{ab}}\right)\frac{1}{\sqrt{ab}} - 1\arctan\left(By(x)\frac{1}{\sqrt{AB}}\right)\frac{1}{\sqrt{AB}} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(a + b*x^2)*y'[x] == A + B*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[A]*Tan[Sqrt[A]*Sqrt[B]*(ArcTan[(Sqrt[b]*x)/Sqrt[a]]/(Sqrt[a]*Sqr
t[b]) + C[1])])/Sqrt[B]}}
```

Maple raw input

```
dsolve((b*x^2+a)*diff(y(x),x) = A+B*y(x)^2, y(x),'implicit')
```

Maple raw output

```
1/(a*b)^(1/2)*arctan(x*b/(a*b)^(1/2))-1/(A*B)^(1/2)*arctan(y(x)*B/(A*B)^(1/2))+_
C1 = 0
```

4.343 $(a+bx^2)\,y'(x) = cxy(x)\log(y(x))$

ODE

$$(a+bx^2)\,y'(x) = cxy(x)\log(y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0180848 (sec), leaf count = 28

$$\left\{\left\{y(x) \to e^{e^{c_1}(a+bx^2)^{\frac{c}{2b}}}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 27

$$\left\{\frac{\ln\left(bx^2+a\right)}{2\,b} - \frac{\ln\left(\ln\left(y(x)\right)\right)}{c} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(a + b*x^2)*y'[x] == c*x*Log[y[x]]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(E^C[1]*(a + b*x^2)^(c/(2*b)))}}
```

Maple raw input

```
dsolve((b*x^2+a)*diff(y(x),x) = c*x*y(x)*ln(y(x)), y(x),'implicit')
```

Maple raw output

```
1/2/b*ln(b*x^2+a)-1/c*ln(ln(y(x)))+_C1 = 0
```

4.344 $x(ax+1)y'(x)+a-y(x)=0$

ODE

$$x(ax+1)y'(x)+a-y(x)=0$$

ODE Classification

[_separable]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0086965 (sec), leaf count = 19

$$\left\{\left\{y(x)\to \frac{a+c_1 x}{ax+1}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 17

$$\left\{y(x)=\frac{\_C1\,x+a}{ax+1}\right\}$$

Mathematica raw input

```
DSolve[a - y[x] + x*(1 + a*x)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a + x*C[1])/(1 + a*x)}}
```

Maple raw input

```
dsolve(x*(a*x+1)*diff(y(x),x)+a-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x+a)/(a*x+1)
```

4.345 $(a+bx)^2 y'(x) + y(x)^3(a+bx) + cy(x)^2 = 0$

ODE

$$(a+bx)^2 y'(x) + y(x)^3(a+bx) + cy(x)^2 = 0$$

ODE Classification

[_rational, _Abel]

Book solution method
Abel ODE, Second kind

Mathematica ✓
cpu = 2.50611 (sec), leaf count = 110

$$\text{Solve}\left[-\frac{c}{\sqrt{-b(a+bx)^2}} = \frac{2\exp\left(-\frac{(b(a+bx)+cy(x))^2}{2by(x)^2(a+bx)^2}\right)}{2c_1 - \sqrt{2\pi}\,\text{erfi}\left(\frac{b(a+bx)+cy(x)}{\sqrt{2}y(x)\sqrt{-b(a+bx)^2}}\right)}, y(x)\right]$$

Maple ✓
cpu = 0.047 (sec), leaf count = 153

$$\left\{\frac{1}{2}\left(\left(Erf\left(\frac{\sqrt{2}(cy(x)+b(bx+a))}{2\,(bx+a)\,y\,(x)}\frac{1}{\sqrt{b}}\right)e^{\frac{(cy(x)+b(bx+a))^2}{2\,(y(x))^2(bx+a)^2 b}}\sqrt{\pi}\sqrt{2}bc + 2\,(bx+a)\,b^{3/2}\right)e^{-\frac{((-bx-a+c)y(x)+b(bx+a))((bx+a+c)y(x)+b(bx+a)}{2\,(y(x))^2(bx+a)^2 b}}\right.$$

Mathematica raw input

```
DSolve[c*y[x]^2 + (a + b*x)*y[x]^3 + (a + b*x)^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[-(c/Sqrt[-(b*(a + b*x)^2)]) == 2/(E^((b*(a + b*x) + c*y[x])^2/(2*b*(a + b*
x)^2*y[x]^2))*(2*C[1] - Sqrt[2*Pi]*Erfi[(b*(a + b*x) + c*y[x])/(Sqrt[2]*Sqrt[-(b
*(a + b*x)^2)]*y[x])])), y[x]]
```

Maple raw input

```
dsolve((b*x+a)^2*diff(y(x),x)+c*y(x)^2+(b*x+a)*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
1/2*((erf(1/2*2^(1/2)*(c*y(x)+b*(b*x+a))/b^(1/2)/y(x)/(b*x+a))*exp(1/2*(c*y(x)+b
*(b*x+a))^2/y(x)^2/(b*x+a)^2/b)*Pi^(1/2)*2^(1/2)*b*c+2*(b*x+a)*b^(3/2))*exp(-1/2
*((-b*x-a+c)*y(x)+b*(b*x+a))*((b*x+a+c)*y(x)+b*(b*x+a))/y(x)^2/(b*x+a)^2/b)+2*_C
1*b^(5/2))/b^(5/2) = 0
```

4.346 $x^3y'(x) = a + bx^2y(x)$

ODE

$$x^3y'(x) = a + bx^2y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00990763 (sec), leaf count = 23

$$\left\{\left\{y(x) \to c_1x^b - \frac{a}{(b+2)x^2}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 21

$$\left\{y(x) = -\frac{a}{(2+b)\,x^2} + x^b\_C1\right\}$$

Mathematica raw input

```
DSolve[x^3*y'[x] == a + b*x^2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(a/((2 + b)*x^2)) + x^b*C[1]}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x) = a+b*x^2*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -1/(2+b)*a/x^2+x^b*_C1
```

4.347 $x^3y'(x) = x^2y(x) - x^2 + 3$

ODE

$$x^3y'(x) = x^2y(x) - x^2 + 3$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.006048 (sec), leaf count = 16

$$\left\{\left\{y(x) \to c_1 x - \frac{1}{x^2} + 1\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 14

$$\{y(x) = -x^{-2} + 1 + \_C1\, x\}$$

Mathematica raw input

```
DSolve[x^3*y'[x] == 3 - x^2 + x^2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1 - x^(-2) + x*C[1]}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x) = 3-x^2+x^2*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -1/x^2+1+_C1*x
```

4.348 $x^3y'(x) = x^4 + y(x)^2$

ODE

$$x^3y'(x) = x^4 + y(x)^2$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0201781 (sec), leaf count = 22

$$\left\{\left\{y(x) \to \frac{x^2(c_1 + \log(x) - 1)}{c_1 + \log(x)}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 24

$$\left\{\ln(x) - \_C1 - \frac{x^2}{x^2 - y(x)} = 0\right\}$$

Mathematica raw input

```
DSolve[x^3*y'[x] == x^4 + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2*(-1 + C[1] + Log[x]))/(C[1] + Log[x])}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x) = x^4+y(x)^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-x^2/(x^2-y(x)) = 0
```

4.349 $x^3 y'(x) = y(x)\left(x^2 + y(x)\right)$

ODE

$$x^3 y'(x) = y(x)\left(x^2 + y(x)\right)$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00778647 (sec), leaf count = 17

$$\left\{\left\{y(x) \to \frac{x^2}{c_1 x + 1}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 19

$$\left\{-x^{-2} - \frac{\_C1}{x} + (y(x))^{-1} = 0\right\}$$

Mathematica raw input

```
DSolve[x^3*y'[x] == y[x]*(x^2 + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2/(1 + x*C[1])}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x) = y(x)*(x^2+y(x)), y(x),'implicit')
```

Maple raw output

```
-1/x^2-1/x*_C1+1/y(x) = 0
```

4.350 $x^3y'(x) = x^2(y(x)-1)+y(x)^2$

ODE

$$x^3y'(x) = x^2(y(x)-1)+y(x)^2$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Riccati]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.0298685 (sec), leaf count = 39

$$\left\{\left\{y(x)\to \frac{x\left(e^{2/x}-e^{2c_1}\right)}{e^{2c_1}+e^{2/x}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 19

$$\left\{-Artanh\left(\frac{y(x)}{x}\right)+x^{-1}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x^3*y'[x] == x^2*(-1 + y[x]) + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((E^(2/x) - E^(2*C[1]))*x)/(E^(2/x) + E^(2*C[1]))}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x) = x^2*(y(x)-1)+y(x)^2, y(x),'implicit')
```

Maple raw output

```
-arctanh(y(x)/x)+1/x-_C1 = 0
```

4.351 $x^3y'(x) = (x+1)y(x)^2$

ODE

$$x^3y'(x) = (x+1)y(x)^2$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00951533 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \frac{2x^2}{-2c_1x^2+2x+1}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 21

$$\left\{(y(x))^{-1} - \frac{1}{2\,x^2} - x^{-1} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^3*y'[x] == (1 + x)*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x^2)/(1 + 2*x - 2*x^2*C[1])}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x) = (1+x)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
1/y(x)-1/2/x^2-1/x-_C1 = 0
```

4.352 $x^3y'(x) + x^2y(x)\left(1 - x^2y(x)\right) + 20 = 0$

ODE

$$x^3y'(x) + x^2y(x)\left(1 - x^2y(x)\right) + 20 = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0378869 (sec), leaf count = 27

$$\left\{\left\{y(x) \to \frac{4 - 5c_1x^9}{c_1x^{11} + x^2}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 31

$$\left\{\ln(x) - \_C1 + \frac{\ln\left(x^2y(x) + 5\right)}{9} - \frac{\ln\left(x^2y(x) - 4\right)}{9} = 0\right\}$$

Mathematica raw input

```
DSolve[20 + x^2*y[x]*(1 - x^2*y[x]) + x^3*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (4 - 5*x^9*C[1])/(x^2 + x^11*C[1])}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x)+20+x^2*y(x)*(1-x^2*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+1/9*ln(x^2*y(x)+5)-1/9*ln(x^2*y(x)-4) = 0
```

4.353 $x^6(-y(x)^2) + x^3 y'(x) + (3-2x)x^2 y(x) + 3 = 0$

ODE

$$x^6(-y(x)^2) + x^3 y'(x) + (3-2x)x^2 y(x) + 3 = 0$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0132444 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{\frac{1}{c_1 e^{4x}+\frac{1}{4}} - 3}{x^3}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 32

$$\left\{\frac{1}{2}\ln\left(\frac{2x^3 y(x)}{3}+2\right) - \frac{\ln\left(2x^3 y(x)-2\right)}{2} + 2x + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[3 + (3 - 2*x)*x^2*y[x] - x^6*y[x]^2 + x^3*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-3 + (1/4 + E^(4*x)*C[1])^(-1))/x^3}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x)+3+(3-2*x)*x^2*y(x)-x^6*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
1/2*ln(2/3*x^3*y(x)+2)-1/2*ln(2*x^3*y(x)-2)+2*x+_C1 = 0
```

4.354 $x^3 y'(x) = y(x)\left(2x^2 + y(x)^2\right)$

ODE

$$x^3 y'(x) = y(x)\left(2x^2 + y(x)^2\right)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Bernoulli]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.00845715 (sec), leaf count = 42

$$\left\{\left\{y(x) \to -\frac{x^2}{\sqrt{c_1 - x^2}}\right\}, \left\{y(x) \to \frac{x^2}{\sqrt{c_1 - x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 17

$$\left\{x^{-2} - \frac{\_C1}{x^4} + (y(x))^{-2} = 0\right\}$$

Mathematica raw input

```
DSolve[x^3*y'[x] == y[x]*(2*x^2 + y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x^2/Sqrt[-x^2 + C[1]])}, {y[x] -> x^2/Sqrt[-x^2 + C[1]]}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x) = (2*x^2+y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
1/x^2-1/x^4*_C1+1/y(x)^2 = 0
```

4.355 $x^3 y'(x) = \cos(y(x)) (\cos(y(x)) - 2x^2 \sin(y(x)))$

ODE

$$x^3 y'(x) = \cos(y(x)) (\cos(y(x)) - 2x^2 \sin(y(x)))$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.1503 (sec), leaf count = 17

$$\left\{\left\{y(x) \to \tan^{-1}\left(\frac{4c_1 + \log(x)}{x^2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.45 (sec), leaf count = 17

$$\{-x^2 \tan(y(x)) + \ln(x) - \_C1 = 0\}$$

Mathematica raw input

```
DSolve[x^3*y'[x] == Cos[y[x]]*(Cos[y[x]] - 2*x^2*Sin[y[x]]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> ArcTan[(4*C[1] + Log[x])/x^2]}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x) = cos(y(x))*(cos(y(x))-2*x^2*sin(y(x))), y(x),'implicit')
```

Maple raw output

```
-x^2*tan(y(x))+ln(x)-_C1 = 0
```

4.356 $x(x^2+1)\,y'(x) = ax^2 + y(x)$

ODE

$$x(x^2+1)\,y'(x) = ax^2 + y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0136889 (sec), leaf count = 23

$$\left\{\left\{y(x) \to \frac{x\left(a\sinh^{-1}(x) + c_1\right)}{\sqrt{x^2+1}}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 19

$$\left\{y(x) = (aArcsinh(x) + \_C1)\,x\frac{1}{\sqrt{x^2+1}}\right\}$$

Mathematica raw input

```
DSolve[x*(1 + x^2)*y'[x] == a*x^2 + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(a*ArcSinh[x] + C[1]))/Sqrt[1 + x^2]}}
```

Maple raw input

```
dsolve(x*(x^2+1)*diff(y(x),x) = a*x^2+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (a*arcsinh(x)+_C1)*x/(x^2+1)^(1/2)
```

4.357 $x(1-x^2)\,y'(x) = ax^2 + y(x)$

ODE

$$x(1-x^2)\,y'(x) = ax^2 + y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0169882 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{x\left(a\sin^{-1}(x) + c_1\right)}{\sqrt{1-x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 51

$$\left\{y(x) = -\frac{ax}{(-1+x)(1+x)}\sqrt{(-1+x)(1+x)}\ln\left(x+\sqrt{x^2-1}\right) + \_C1\,x\frac{1}{\sqrt{-1+x}}\frac{1}{\sqrt{1+x}}\right\}$$

Mathematica raw input

```
DSolve[x*(1 - x^2)*y'[x] == a*x^2 + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(a*ArcSin[x] + C[1]))/Sqrt[1 - x^2]}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(y(x),x) = a*x^2+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -1/(-1+x)/(1+x)*x*a*((-1+x)*(1+x))^(1/2)*ln(x+(x^2-1)^(1/2))+1/(-1+x)^(1/
2)/(1+x)^(1/2)*x*_C1
```

4.358 $x(x^2+1)\,y'(x) = ax^3 + y(x)$

ODE

$$x(x^2+1)\,y'(x) = ax^3 + y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00928271 (sec), leaf count = 21

$$\left\{\left\{y(x) \to x\left(a + \frac{c_1}{\sqrt{x^2+1}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 18

$$\left\{y(x) = ax + \_C1\, x\frac{1}{\sqrt{x^2+1}}\right\}$$

Mathematica raw input

```
DSolve[x*(1 + x^2)*y'[x] == a*x^3 + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(a + C[1]/Sqrt[1 + x^2])}}
```

Maple raw input

```
dsolve(x*(x^2+1)*diff(y(x),x) = a*x^3+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = a*x+x/(x^2+1)^(1/2)*_C1
```

4.359 $x(x^2+1)\,y'(x) = a - x^2 y(x)$

ODE

$$x(x^2+1)\,y'(x) = a - x^2 y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0135174 (sec), leaf count = 37

$$\left\{\left\{y(x) \to \frac{-a\log\left(\sqrt{x^2+1}+1\right) + a\log(x) + c_1}{\sqrt{x^2+1}}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 25

$$\left\{y(x) = 1\left(-a\,Artanh\left(\frac{1}{\sqrt{x^2+1}}\right) + \_C1\right)\frac{1}{\sqrt{x^2+1}}\right\}$$

Mathematica raw input

```
DSolve[x*(1 + x^2)*y'[x] == a - x^2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + a*Log[x] - a*Log[1 + Sqrt[1 + x^2]])/Sqrt[1 + x^2]}}
```

Maple raw input

```
dsolve(x*(x^2+1)*diff(y(x),x) = a-x^2*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-a*arctanh(1/(x^2+1)^(1/2))+_C1)/(x^2+1)^(1/2)
```

4.360 $x(x^2+1)\,y'(x) = (1-x^2)\,y(x)$

ODE

$$x(x^2+1)\,y'(x) = (1-x^2)\,y(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00857106 (sec), leaf count = 16

$$\left\{\left\{y(x) \to \frac{c_1 x}{x^2+1}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 14

$$\left\{y(x) = \frac{\_C1\, x}{x^2+1}\right\}$$

Mathematica raw input

```
DSolve[x*(1 + x^2)*y'[x] == (1 - x^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*C[1])/(1 + x^2)}}
```

Maple raw input

```
dsolve(x*(x^2+1)*diff(y(x),x) = (-x^2+1)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x/(x^2+1)
```

4.361 $x(1-x^2)\,y'(x) = (x^2-x+1)\,y(x)$

ODE

$$x(1-x^2)\,y'(x) = (x^2-x+1)\,y(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.011488 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{c_1 x}{(x+1)\sqrt{1-x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 17

$$\left\{y(x) = \_C1\, x \frac{1}{\sqrt{-1+x}}(1+x)^{-\frac{3}{2}}\right\}$$

Mathematica raw input

```
DSolve[x*(1 - x^2)*y'[x] == (1 - x + x^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*C[1])/((1 + x)*Sqrt[1 - x^2])}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(y(x),x) = (x^2-x+1)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1/(-1+x)^(1/2)/(1+x)^(3/2)*x
```

4.362 $x(1-x^2)\,y'(x) = ax^3 + (1-2x^2)\,y(x)$

ODE

$$x(1-x^2)\,y'(x) = ax^3 + (1-2x^2)\,y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0161483 (sec), leaf count = 23

$$\left\{\left\{y(x) \to x\left(a + c_1\sqrt{1-x^2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 20

$$\left\{y(x) = x\left(\sqrt{-1+x}\sqrt{1+x}\_C1 + a\right)\right\}$$

Mathematica raw input

```
DSolve[x*(1 - x^2)*y'[x] == a*x^3 + (1 - 2*x^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(a + Sqrt[1 - x^2]*C[1])}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(y(x),x) = a*x^3+(-2*x^2+1)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = x*((-1+x)^(1/2)*(1+x)^(1/2)*_C1+a)
```

4.363 $x(1-x^2)\,y'(x) = (1-2x^2)\,y(x) + (1-x^2)\,x^3$

ODE

$$x(1-x^2)\,y'(x) = (1-2x^2)\,y(x) + (1-x^2)\,x^3$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0128339 (sec), leaf count = 26

$$\left\{\left\{y(x) \to x\left(c_1\sqrt{1-x^2} + x^2 - 1\right)\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 23

$$\left\{y(x) = x\left(\sqrt{-1+x}\sqrt{1+x}\_C1 + x^2 - 1\right)\right\}$$

Mathematica raw input

```
DSolve[x*(1 - x^2)*y'[x] == x^3*(1 - x^2) + (1 - 2*x^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(-1 + x^2 + Sqrt[1 - x^2]*C[1])}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(y(x),x) = x^3*(-x^2+1)+(-2*x^2+1)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = x*((-1+x)^(1/2)*(1+x)^(1/2)*_C1+x^2-1)
```

4.364 $x(x^2+1)\,y'(x) = 2(1-2x^2y(x))$

ODE

$$x(x^2+1)\,y'(x) = 2(1-2x^2y(x))$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00718074 (sec), leaf count = 23

$$\left\{\left\{y(x)\to \frac{c_1+x^2+2\log(x)}{(x^2+1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 21

$$\left\{y(x) = \frac{x^2+2\ln(x)+\_C1}{(x^2+1)^2}\right\}$$

Mathematica raw input

```
DSolve[x*(1 + x^2)*y'[x] == 2*(1 - 2*x^2*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2 + C[1] + 2*Log[x])/(1 + x^2)^2}}
```

Maple raw input

```
dsolve(x*(x^2+1)*diff(y(x),x) = 2-4*x^2*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2+2*ln(x)+_C1)/(x^2+1)^2
```

4.365 $x(x^2+1)\,y'(x) = x - (5x^2+3)\,y(x)$

ODE

$$x(x^2+1)\,y'(x) = x - (5x^2+3)\,y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0102446 (sec), leaf count = 26

$$\left\{\left\{y(x) \to \frac{4c_1 + x^4}{4\,(x^5+x^3)}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 22

$$\left\{y(x) = \frac{1}{(x^2+1)\,x^3}\left(\frac{x^4}{4} + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[x*(1 + x^2)*y'[x] == x - (3 + 5*x^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^4 + 4*C[1])/(4*(x^3 + x^5))}}
```

Maple raw input

```
dsolve(x*(x^2+1)*diff(y(x),x) = x-(5*x^2+3)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (1/4*x^4+_C1)/(x^2+1)/x^3
```

4.366 $(1-x^2)\,xy'(x)+(1-x^2)\,y(x)^2+x^2=0$

ODE

$$(1-x^2)\,xy'(x)+(1-x^2)\,y(x)^2+x^2=0$$

ODE Classification

[_rational , _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.119322 (sec), leaf count = 73

$$\left\{\left\{y(x)\to -\frac{2\left(\pi G^{2,0}_{2,2}\left(x^2\middle|\begin{matrix}\frac{1}{2},\frac{3}{2}\\ 0,1\end{matrix}\right)+c_1\left(K\left(x^2\right)-E\left(x^2\right)\right)\right)}{\pi G^{2,0}_{2,2}\left(x^2\middle|\begin{matrix}\frac{1}{2},\frac{3}{2}\\ 0,0\end{matrix}\right)+2c_1E\left(x^2\right)}\right\}\right\}$$

Maple ✓
cpu = 0.553 (sec), leaf count = 30

$$\left\{y(x)=\frac{\_C1\ EllipticCE(x)+EllipticE(x)-EllipticK(x)}{\_C1\ EllipticCE\left(x\right)-\_C1\ EllipticCK\left(x\right)+EllipticE\left(x\right)}\right\}$$

Mathematica raw input

```
DSolve[x^2 + (1 - x^2)*y[x]^2 + x*(1 - x^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*(C[1]*(-EllipticE[x^2] + EllipticK[x^2]) + Pi*MeijerG[{{}, {1/2, 3
/2}}, {{0, 1}, {}}, x^2]))/(2*C[1]*EllipticE[x^2] + Pi*MeijerG[{{}, {1/2, 3/2}},
 {{0, 0}, {}}, x^2])}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(y(x),x)+x^2+(-x^2+1)*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*EllipticCE(x)+EllipticE(x)-EllipticK(x))/(_C1*EllipticCE(x)-_C1*Elli
pticCK(x)+EllipticE(x))
```

4.367 $(1-x)x^2y'(x) = (2-x)xy(x) - y(x)^2$

ODE

$$(1-x)x^2y'(x) = (2-x)xy(x) - y(x)^2$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0139954 (sec), leaf count = 20

$$\left\{\left\{y(x) \to \frac{x^2}{c_1(-x)+c_1+1}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 22

$$\left\{-\frac{(-1+x)\_C1}{x^2} + (y(x))^{-1} - x^{-2} = 0\right\}$$

Mathematica raw input

```
DSolve[(1 - x)*x^2*y'[x] == (2 - x)*x*y[x] - y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2/(1 + C[1] - x*C[1])}}
```

Maple raw input

```
dsolve(x^2*(1-x)*diff(y(x),x) = (2-x)*x*y(x)-y(x)^2, y(x),'implicit')
```

Maple raw output

```
-1/x^2*(-1+x)*_C1+1/y(x)-1/x^2 = 0
```

4.368 $2x^3y'(x) = y(x)\left(x^2 - y(x)^2\right)$

ODE

$$2x^3y'(x) = y(x)\left(x^2 - y(x)^2\right)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.137588 (sec), leaf count = 34

$$\left\{\left\{y(x) \to -\frac{x}{\sqrt{c_1 x - 1}}\right\}, \left\{y(x) \to \frac{x}{\sqrt{c_1 x - 1}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 17

$$\left\{x^{-2} - \frac{-C1}{x} + (y(x))^{-2} = 0\right\}$$

Mathematica raw input

```
DSolve[2*x^3*y'[x] == y[x]*(x^2 - y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x/Sqrt[-1 + x*C[1]])}, {y[x] -> x/Sqrt[-1 + x*C[1]]}}
```

Maple raw input

```
dsolve(2*x^3*diff(y(x),x) = (x^2-y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
1/x^2-1/x*_C1+1/y(x)^2 = 0
```

4.369 $2x^3y'(x) = y(x)\left(ay(x)^2 + 3x^2\right)$

ODE

$$2x^3y'(x) = y(x)\left(ay(x)^2 + 3x^2\right)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00902352 (sec), leaf count = 44

$$\left\{\left\{y(x) \to -\frac{x^{3/2}}{\sqrt{c_1 - ax}}\right\}, \left\{y(x) \to \frac{x^{3/2}}{\sqrt{c_1 - ax}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 19

$$\left\{\frac{a}{x^2} - \frac{\_C1}{x^3} + (y(x))^{-2} = 0\right\}$$

Mathematica raw input

```
DSolve[2*x^3*y'[x] == y[x]*(3*x^2 + a*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x^(3/2)/Sqrt[-(a*x) + C[1]])}, {y[x] -> x^(3/2)/Sqrt[-(a*x) + C[1]]}
}
```

Maple raw input

```
dsolve(2*x^3*diff(y(x),x) = (3*x^2+a*y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
a/x^2-1/x^3*_C1+1/y(x)^2 = 0
```

4.370 $6x^3y'(x) = 4x^2y(x) + (1-3x)y(x)^4$

ODE

$$6x^3y'(x) = 4x^2y(x) + (1-3x)y(x)^4$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0111069 (sec), leaf count = 94

$$\left\{\left\{y(x) \to -\frac{\sqrt[3]{-2}x^{2/3}}{\sqrt[3]{2c_1+3x-\log(x)}}\right\}, \left\{y(x) \to \frac{x^{2/3}}{\sqrt[3]{c_1+\frac{3x}{2}-\frac{\log(x)}{2}}}\right\}, \left\{y(x) \to \frac{(-1)^{2/3}x^{2/3}}{\sqrt[3]{c_1+\frac{3x}{2}-\frac{\log(x)}{2}}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 22

$$\left\{(y(x))^{-3} + \frac{-3\,x - 2\,\_C1 + \ln(x)}{2\,x^2} = 0\right\}$$

Mathematica raw input

```
DSolve[6*x^3*y'[x] == 4*x^2*y[x] + (1 - 3*x)*y[x]^4,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(((-2)^(1/3)*x^(2/3))/(3*x + 2*C[1] - Log[x])^(1/3))}, {y[x] -> x^(2/
3)/((3*x)/2 + C[1] - Log[x]/2)^(1/3)}, {y[x] -> ((-1)^(2/3)*x^(2/3))/((3*x)/2 +
C[1] - Log[x]/2)^(1/3)}}
```

Maple raw input

```
dsolve(6*x^3*diff(y(x),x) = 4*x^2*y(x)+(1-3*x)*y(x)^4, y(x),'implicit')
```

Maple raw output

```
1/y(x)^3+1/2*(-3*x-2*_C1+ln(x))/x^2 = 0
```

4.371 $xy'(x)\left(a+bx+cx^2\right)-y(x)\left(a+bx+cx^2\right)+x^2=y(x)^2$

ODE

$$xy'(x)\left(a+bx+cx^2\right)-y(x)\left(a+bx+cx^2\right)+x^2=y(x)^2$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.119629 (sec), leaf count = 104

$$\left\{\left\{y(x)\to -\frac{x\left(\exp\left(\frac{4\tan^{-1}\left(\frac{b+2cx}{\sqrt{4ac-b^2}}\right)}{\sqrt{4ac-b^2}}+2c_1\right)-1\right)}{\exp\left(\frac{4\tan^{-1}\left(\frac{b+2cx}{\sqrt{4ac-b^2}}\right)}{\sqrt{4ac-b^2}}+2c_1\right)+1}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 50

$$\left\{-Artanh\left(\frac{y(x)}{x}\right)-2\frac{1}{\sqrt{4\,ca-b^2}}\arctan\left(\frac{2\,cx+b}{\sqrt{4\,ca-b^2}}\right)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x^2 - (a + b*x + c*x^2)*y[x] + x*(a + b*x + c*x^2)*y'[x] == y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(((-1 + E^((4*ArcTan[(b + 2*c*x)/Sqrt[-b^2 + 4*a*c]])/Sqrt[-b^2 + 4*a
*c] + 2*C[1]))*x)/(1 + E^((4*ArcTan[(b + 2*c*x)/Sqrt[-b^2 + 4*a*c]])/Sqrt[-b^2 +
 4*a*c] + 2*C[1])))}}
```

Maple raw input

```
dsolve(x*(c*x^2+b*x+a)*diff(y(x),x)+x^2-(c*x^2+b*x+a)*y(x) = y(x)^2, y(x),'implicit')
```

Maple raw output

```
-arctanh(y(x)/x)-2/(4*a*c-b^2)^(1/2)*arctan((2*c*x+b)/(4*a*c-b^2)^(1/2))-_C1 = 0
```

4.372 $x^4 y'(x) = y(x)\left(x^3 + y(x)\right)$

ODE

$$x^4 y'(x) = y(x)\left(x^3 + y(x)\right)$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00798134 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{2x^3}{2c_1 x^2 + 1}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 19

$$\left\{(y(x))^{-1} - \frac{1}{2\,x^3} - \frac{\_C1}{x} = 0\right\}$$

Mathematica raw input

```
DSolve[x^4*y'[x] == y[x]*(x^3 + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x^3)/(1 + 2*x^2*C[1])}}
```

Maple raw input

```
dsolve(x^4*diff(y(x),x) = (x^3+y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
1/y(x)-1/2/x^3-1/x*_C1 = 0
```

4.373 $a^2 + x^4 y'(x) + x^4 y(x)^2 = 0$

ODE

$$a^2 + x^4 y'(x) + x^4 y(x)^2 = 0$$

ODE Classification

[_rational, [_Riccati, _special]]

Book solution method
Riccati ODE, Main form

Mathematica ✓
cpu = 0.0116087 (sec), leaf count = 112

$$\left\{\left\{y(x) \to \frac{\left(x + i\sqrt{-a^2}c_1\right)\cosh\left(\frac{\sqrt{-a^2}}{x}\right) - \left(\sqrt{-a^2} + ic_1 x\right)\sinh\left(\frac{\sqrt{-a^2}}{x}\right)}{x^2\left(\cosh\left(\frac{\sqrt{-a^2}}{x}\right) - ic_1\sinh\left(\frac{\sqrt{-a^2}}{x}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.079 (sec), leaf count = 34

$$\left\{-x^2 y(x) - \tan\left(\frac{\_C1\, x - 1}{x}\sqrt{a^2}\right)\sqrt{a^2} + x = 0\right\}$$

Mathematica raw input

```
DSolve[a^2 + x^4*y[x]^2 + x^4*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((x + I*Sqrt[-a^2]*C[1])*Cosh[Sqrt[-a^2]/x] - (Sqrt[-a^2] + I*x*C[1])*
Sinh[Sqrt[-a^2]/x])/(x^2*(Cosh[Sqrt[-a^2]/x] - I*C[1]*Sinh[Sqrt[-a^2]/x]))}}
```

Maple raw input

```
dsolve(x^4*diff(y(x),x)+a^2+x^4*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-x^2*y(x)-tan((a^2)^(1/2)*(_C1*x-1)/x)*(a^2)^(1/2)+x = 0
```

4.374 $x^4 y'(x) + x^3 y(x) + \csc(xy(x)) = 0$

ODE

$$x^4 y'(x) + x^3 y(x) + \csc(xy(x)) = 0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 1.51103 (sec), leaf count = 40

$$\left\{\left\{y(x) \to -\frac{\cos^{-1}\left(c_1 - \frac{1}{2x^2}\right)}{x}\right\}, \left\{y(x) \to \frac{\cos^{-1}\left(c_1 - \frac{1}{2x^2}\right)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.405 (sec), leaf count = 23

$$\left\{-\_C1 + \frac{-2\cos(xy(x))x^2 - 1}{x^2} = 0\right\}$$

Mathematica raw input

```
DSolve[Csc[x*y[x]] + x^3*y[x] + x^4*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(ArcCos[-1/(2*x^2) + C[1]]/x)}, {y[x] -> ArcCos[-1/(2*x^2) + C[1]]/x}
}
```

Maple raw input

```
dsolve(x^4*diff(y(x),x)+x^3*y(x)+csc(x*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
-_C1+(-2*cos(x*y(x))*x^2-1)/x^2 = 0
```

4.375 $(1-x^4)\,y'(x) = 2x(1-y(x)^2)$

ODE

$$(1-x^4)\,y'(x) = 2x(1-y(x)^2)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.032486 (sec), leaf count = 45

$$\left\{\left\{y(x) \to -\frac{e^{2c_1}\left(x^2-1\right)+x^2+1}{e^{2c_1}\left(x^2-1\right)-x^2-1}\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 28

$$\left\{\_C1 + \frac{\ln(-1+x)}{2} + \frac{\ln(1+x)}{2} - \frac{\ln\left(x^2+1\right)}{2} + \mathit{Artanh}(y(x)) = 0\right\}$$

Mathematica raw input

```
DSolve[(1 - x^4)*y'[x] == 2*x*(1 - y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((1 + x^2 + E^(2*C[1])*(-1 + x^2))/(-1 - x^2 + E^(2*C[1])*(-1 + x^2))
)}}
```

Maple raw input

```
dsolve((-x^4+1)*diff(y(x),x) = 2*x*(1-y(x)^2), y(x),'implicit')
```

Maple raw output

```
_C1+1/2*ln(-1+x)+1/2*ln(1+x)-1/2*ln(x^2+1)+arctanh(y(x)) = 0
```

4.376 $x(1-x^3)\,y'(x) = 2x - (1-4x^3)\,y(x)$

ODE

$$x\left(1-x^3\right)y'(x) = 2x - \left(1-4x^3\right)y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.010793 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{c_1 + x^2}{x - x^4}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 21

$$\left\{y(x) = \frac{-x^2 + \_C1}{x^4 - x}\right\}$$

Mathematica raw input

```
DSolve[x*(1 - x^3)*y'[x] == 2*x - (1 - 4*x^3)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2 + C[1])/(x - x^4)}}
```

Maple raw input

```
dsolve(x*(-x^3+1)*diff(y(x),x) = 2*x-(-4*x^3+1)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-x^2+_C1)/(x^4-x)
```

4.377 $x(1-x^3)\,y'(x) = x^2 + y(x)(1-2xy(x))$

ODE

$$x\left(1-x^3\right)y'(x) = x^2 + y(x)(1-2xy(x))$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.166011 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \frac{x(2c_1x+1)}{2c_1+x^2}\right\}\right\}$$

Maple ✓
cpu = 0.683 (sec), leaf count = 18

$$\left\{y(x) = \frac{x(\_C1+x)}{\_C1\,x^2+1}\right\}$$

Mathematica raw input

```
DSolve[x*(1 - x^3)*y'[x] == x^2 + y[x]*(1 - 2*x*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(1 + 2*x*C[1]))/(x^2 + 2*C[1])}}
```

Maple raw input

```
dsolve(x*(-x^3+1)*diff(y(x),x) = x^2+(1-2*x*y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = x*(_C1+x)/(_C1*x^2+1)
```

4.378 $x^2(1-x^2)\,y'(x) = y(x)\,(x-3x^3y(x))$

ODE

$$x^2(1-x^2)\,y'(x) = y(x)\,(x-3x^3y(x))$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.224418 (sec), leaf count = 42

$$\left\{\left\{y(x)\to \frac{x}{c_1\sqrt{1-x^2}-3\sqrt{1-x^2}\sin^{-1}(x)+3x}\right\}\right\}$$

Maple ✓
cpu = 0.029 (sec), leaf count = 67

$$\left\{(y(x))^{-1}+3\,\frac{x\ln\left(x+\sqrt{x^2-1}\right)}{\sqrt{x^2-1}}-3-3\,\frac{\ln\left(x+\sqrt{x^2-1}\right)}{\sqrt{x^2-1}x}-\frac{\_C1}{x}\sqrt{-1+x}\sqrt{1+x}=0\right\}$$

Mathematica raw input

```
DSolve[x^2*(1 - x^2)*y'[x] == y[x]*(x - 3*x^3*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> x/(3*x - 3*Sqrt[1 - x^2]*ArcSin[x] + Sqrt[1 - x^2]*C[1])}}
```

Maple raw input

```
dsolve(x^2*(-x^2+1)*diff(y(x),x) = (x-3*x^3*y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
1/y(x)+3*x/(x^2-1)^(1/2)*ln(x+(x^2-1)^(1/2))-3-3/x/(x^2-1)^(1/2)*ln(x+(x^2-1)^(1
/2))-(-1+x)^(1/2)*(1+x)^(1/2)/x*_C1 = 0
```

4.379 $x(1-2x^3)\,y'(x) = 2(1-x^3)\,y(x)$

ODE

$$x(1-2x^3)\,y'(x) = 2(1-x^3)\,y(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0124854 (sec), leaf count = 22

$$\left\{\left\{y(x) \to \frac{c_1 x^2}{\sqrt[3]{1-2x^3}}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 18

$$\left\{y(x) = \_C1\, x^2 \frac{1}{\sqrt[3]{2\,x^3-1}}\right\}$$

Mathematica raw input

```
DSolve[x*(1 - 2*x^3)*y'[x] == 2*(1 - x^3)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2*C[1])/(1 - 2*x^3)^(1/3)}}
```

Maple raw input

```
dsolve(x*(-2*x^3+1)*diff(y(x),x) = 2*(-x^3+1)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^2/(2*x^3-1)^(1/3)
```

4.380 $(y'(x)+y(x)^2)\left(a+bx+cx^2\right)^2+A=0$

ODE

$$(y'(x)+y(x)^2)\left(a+bx+cx^2\right)^2+A=0$$

ODE Classification

[_rational, _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 1.46923 (sec), leaf count = 612

$$\left\{\left\{y(x)\to \frac{b^2c_1\left(-\exp\left(\frac{2\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\tan^{-1}\left(\frac{b+2cx}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)\right)+bc_1\sqrt{b^2-4ac}\sqrt{1-\frac{4A}{b^2-4ac}}\exp\left(\frac{2\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\tan\right.\right.}{\sqrt{b^2-4ac}}\right.$$

Maple ✓
cpu = 0.383 (sec), leaf count = 490

$$\left\{y(x)=2\frac{c}{\sqrt{-4\,ca+b^2}\left(2\,cx+b+i\sqrt{4\,ca-b^2}\right)\left(i\sqrt{4\,ca-b^2}-2\,cx-b\right)}\left(\left(i\sqrt{\frac{-4\,ca+b^2-4\,A}{c^2}}c\sqrt{4\,ca-b^2}-\sqrt{-4\,ca+\right.\right.\right.$$

Mathematica raw input

```
DSolve[A + (a + b*x + c*x^2)^2*(y[x]^2 + y'[x]) == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (b + Sqrt[b^2 - 4*a*c]*Sqrt[1 - (4*A)/(b^2 - 4*a*c)] + 2*c*x + 4*A*E^(
(2*Sqrt[-b^2 + 4*a*c]*Sqrt[1 - (4*A)/(b^2 - 4*a*c)]*ArcTan[(b + 2*c*x)/Sqrt[-b^2
 + 4*a*c]])/Sqrt[b^2 - 4*a*c])*C[1] - b^2*E^((2*Sqrt[-b^2 + 4*a*c]*Sqrt[1 - (4*A
)/(b^2 - 4*a*c)]*ArcTan[(b + 2*c*x)/Sqrt[-b^2 + 4*a*c]])/Sqrt[b^2 - 4*a*c])*C[1]
 + 4*a*c*E^((2*Sqrt[-b^2 + 4*a*c]*Sqrt[1 - (4*A)/(b^2 - 4*a*c)]*ArcTan[(b + 2*c*
x)/Sqrt[-b^2 + 4*a*c]])/Sqrt[b^2 - 4*a*c])*C[1] + b*Sqrt[b^2 - 4*a*c]*Sqrt[1 - (
4*A)/(b^2 - 4*a*c)]*E^((2*Sqrt[-b^2 + 4*a*c]*Sqrt[1 - (4*A)/(b^2 - 4*a*c)]*ArcTa
n[(b + 2*c*x)/Sqrt[-b^2 + 4*a*c]])/Sqrt[b^2 - 4*a*c])*C[1] + 2*c*Sqrt[b^2 - 4*a*
```

```
c]*Sqrt[1 - (4*A)/(b^2 - 4*a*c)]*E^((2*Sqrt[-b^2 + 4*a*c]*Sqrt[1 - (4*A)/(b^2 -
4*a*c)]*ArcTan[(b + 2*c*x)/Sqrt[-b^2 + 4*a*c]])/Sqrt[b^2 - 4*a*c])*x*C[1])/(2*(a
 + x*(b + c*x))*(1 + Sqrt[b^2 - 4*a*c]*Sqrt[1 - (4*A)/(b^2 - 4*a*c)]*E^((2*Sqrt[
-b^2 + 4*a*c]*Sqrt[1 - (4*A)/(b^2 - 4*a*c)]*ArcTan[(b + 2*c*x)/Sqrt[-b^2 + 4*a*c
]])/Sqrt[b^2 - 4*a*c])*C[1]))}}
```

Maple raw input

```
dsolve((c*x^2+b*x+a)^2*(diff(y(x),x)+y(x)^2)+A = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 2*((I*((-4*a*c+b^2-4*A)/c^2)^(1/2)*c*(4*a*c-b^2)^(1/2)-(-4*a*c+b^2)^(1/2)
*(2*c*x+b))*_C1*((I*(4*a*c-b^2)^(1/2)-2*c*x-b)/(2*c*x+b+I*(4*a*c-b^2)^(1/2)))^(-
1/2*c/(-4*a*c+b^2)^(1/2)*((-4*a*c+b^2-4*A)/c^2)^(1/2))-((I*(4*a*c-b^2)^(1/2)-2*c
*x-b)/(2*c*x+b+I*(4*a*c-b^2)^(1/2)))^(1/2*c/(-4*a*c+b^2)^(1/2)*((-4*a*c+b^2-4*A)
/c^2)^(1/2))*(I*((-4*a*c+b^2-4*A)/c^2)^(1/2)*c*(4*a*c-b^2)^(1/2)+(-4*a*c+b^2)^(1
/2)*(2*c*x+b)))*c/(-4*a*c+b^2)^(1/2)/(2*c*x+b+I*(4*a*c-b^2)^(1/2))/(I*(4*a*c-b^2
)^(1/2)-2*c*x-b)/(_C1*((I*(4*a*c-b^2)^(1/2)-2*c*x-b)/(2*c*x+b+I*(4*a*c-b^2)^(1/2
)))^(-1/2*c/(-4*a*c+b^2)^(1/2)*((-4*a*c+b^2-4*A)/c^2)^(1/2))+((I*(4*a*c-b^2)^(1/
2)-2*c*x-b)/(2*c*x+b+I*(4*a*c-b^2)^(1/2)))^(1/2*c/(-4*a*c+b^2)^(1/2)*((-4*a*c+b^
2-4*A)/c^2)^(1/2)))
```

4.381 $x^5 y'(x) = 1 - 3x^4 y(x)$

ODE

$$x^5 y'(x) = 1 - 3x^4 y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00370956 (sec), leaf count = 15

$$\left\{\left\{y(x) \to \frac{c_1 x - 1}{x^4}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 15

$$\left\{y(x) = \frac{1}{x^3}\left(-x^{-1} + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[x^5*y'[x] == 1 - 3*x^4*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + x*C[1])/x^4}}
```

Maple raw input

```
dsolve(x^5*diff(y(x),x) = 1-3*x^4*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-1/x+_C1)/x^3
```

4.382 $x(1-x^4)\,y'(x) = (1-x^4)\,y(x) + 2x(x^2 - y(x)^2)$

ODE

$$x(1-x^4)\,y'(x) = (1-x^4)\,y(x) + 2x(x^2 - y(x)^2)$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Riccati]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.0376377 (sec), leaf count = 46

$$\left\{\left\{y(x) \to -\frac{x\left(e^{2c_1}\left(x^2-1\right)+x^2+1\right)}{e^{2c_1}\left(x^2-1\right)-x^2-1}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 36

$$\left\{-\_C1 - Artanh\left(\frac{y(x)}{x}\right) - \frac{\ln(-1+x)}{2} - \frac{\ln(1+x)}{2} + \frac{\ln\left(x^2+1\right)}{2} = 0\right\}$$

Mathematica raw input

```
DSolve[x*(1 - x^4)*y'[x] == (1 - x^4)*y[x] + 2*x*(x^2 - y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x*(1 + x^2 + E^(2*C[1])*(-1 + x^2)))/(-1 - x^2 + E^(2*C[1])*(-1 + x
^2)))}}
```

Maple raw input

```
dsolve(x*(-x^4+1)*diff(y(x),x) = 2*x*(x^2-y(x)^2)+(-x^4+1)*y(x), y(x),'implicit')
```

Maple raw output

```
-_C1-arctanh(y(x)/x)-1/2*ln(-1+x)-1/2*ln(1+x)+1/2*ln(x^2+1) = 0
```

4.383 $x^7 y'(x) + 5x^3 y(x)^2 + 2(x^2+1)\, y(x)^3 = 0$

ODE

$$x^7 y'(x) + 5x^3 y(x)^2 + 2(x^2+1)\, y(x)^3 = 0$$

ODE Classification

[_rational, _Abel]

Book solution method
Abel ODE, First kind

Mathematica ✓
cpu = 0.457795 (sec), leaf count = 108

$$\text{Solve}\left[c_1 = \frac{i\left(\sqrt[4]{\frac{x^4}{y(x)^2}+\frac{1}{x^2}+\frac{2x}{y(x)}+1}\,(x^3+y(x))\;{}_2F_1\left(\frac{1}{2},\frac{5}{4};\frac{3}{2};-\frac{(x^3+y(x))^2}{x^2y(x)^2}\right)+2x^2y(x)\right)}{2xy(x)\sqrt[4]{-\frac{(x^3+y(x))^2}{x^2y(x)^2}-1}},\, y(x)\right]$$

Maple ✓
cpu = 0.065 (sec), leaf count = 63

$$\left\{ \_C1 + x\frac{1}{\sqrt[4]{\left(x^{-1}+\frac{x^2}{y(x)}\right)^2+1}} + \frac{x^3+y(x)}{2xy(x)}\,{}_2\mathrm{F}_1\left(\frac{1}{2},\frac{5}{4};\frac{3}{2};-\frac{(x^3+y(x))^2}{x^2(y(x))^2}\right) = 0 \right\}$$

Mathematica raw input

```
DSolve[5*x^3*y[x]^2 + 2*(1 + x^2)*y[x]^3 + x^7*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] == ((I/2)*(2*x^2*y[x] + Hypergeometric2F1[1/2, 5/4, 3/2, -((x^3 + y[x
])^2/(x^2*y[x]^2))]*(1 + x^(-2) + x^4/y[x]^2 + (2*x)/y[x])^(1/4)*(x^3 + y[x])))/
(x*y[x]*(-1 - (x^3 + y[x])^2/(x^2*y[x]^2))^(1/4)), y[x]]
```

Maple raw input

```
dsolve(x^7*diff(y(x),x)+5*x^3*y(x)^2+2*(x^2+1)*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
_C1+x/((1/x+x^2/y(x))^2+1)^(1/4)+1/2*(x^3+y(x))*hypergeom([1/2, 5/4],[3/2],-(x^3
+y(x))^2/x^2/y(x)^2)/x/y(x) = 0
```

4.384 $x^n y'(x) = a + b x^{n-1} y(x)$

ODE

$$x^n y'(x) = a + b x^{n-1} y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0169469 (sec), leaf count = 28

$$\left\{\left\{y(x) \to c_1 x^b - \frac{a x^{1-n}}{b+n-1}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 26

$$\left\{y(x) = -\frac{a x^{1-n}}{n+b-1} + x^b \_C1\right\}$$

Mathematica raw input

```
DSolve[x^n*y'[x] == a + b*x^(-1 + n)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a*x^(1 - n))/(-1 + b + n)) + x^b*C[1]}}
```

Maple raw input

```
dsolve(x^n*diff(y(x),x) = a+b*x^(n-1)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -a*x^(1-n)/(n+b-1)+x^b*_C1
```

4.385 $x^n y'(x) = x^{2n-1} - y(x)^2$

ODE

$$x^n y'(x) = x^{2n-1} - y(x)^2$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0675225 (sec), leaf count = 222

$$\left\{\left\{y(x) \to \frac{x^{n-1}\left(c_1(-1)^{n+1}\sqrt{x}\Gamma(n)I_{n-2}\left(2\sqrt{x}\right) + c_1(-1)^{n+1}\Gamma(n)I_{n-1}\left(2\sqrt{x}\right) + c_1(-1)^n n\Gamma(n)I_{n-1}\left(2\sqrt{x}\right) + c_1(-1)^{n+1}\sqrt{x}\Gamma\right.}{2\left(c_1(-1)^{n+1}\Gamma(n)I_{n-1}\left(2\sqrt{x}\right) + \Gamma(\right.}\right\}$$

Maple ✓
cpu = 0.084 (sec), leaf count = 52

$$\left\{y(x) = x^n\left(-K_n\left(2\sqrt{x}\right)\_C1 + I_n\left(2\sqrt{x}\right)\right)\frac{1}{\sqrt{x}}\left(K_{n-1}\left(2\sqrt{x}\right)\_C1 + I_{n-1}\left(2\sqrt{x}\right)\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[x^n*y'[x] == x^(-1 + 2*n) - y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(-1 + n)*(-((-1 + n)*BesselI[1 - n, 2*Sqrt[x]]*Gamma[2 - n]) + Sqrt
[x]*BesselI[2 - n, 2*Sqrt[x]]*Gamma[2 - n] + Sqrt[x]*BesselI[-n, 2*Sqrt[x]]*Gamm
a[2 - n] + (-1)^(1 + n)*Sqrt[x]*BesselI[-2 + n, 2*Sqrt[x]]*C[1]*Gamma[n] + (-1)^
(1 + n)*BesselI[-1 + n, 2*Sqrt[x]]*C[1]*Gamma[n] + (-1)^n*n*BesselI[-1 + n, 2*Sq
rt[x]]*C[1]*Gamma[n] + (-1)^(1 + n)*Sqrt[x]*BesselI[n, 2*Sqrt[x]]*C[1]*Gamma[n])
)/(2*(BesselI[1 - n, 2*Sqrt[x]]*Gamma[2 - n] + (-1)^(1 + n)*BesselI[-1 + n, 2*Sq
rt[x]]*C[1]*Gamma[n]))}}
```

Maple raw input

```
dsolve(x^n*diff(y(x),x) = x^(2*n-1)-y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/x^(1/2)*(-BesselK(n,2*x^(1/2))*_C1+BesselI(n,2*x^(1/2)))*x^n/(BesselK(n
-1,2*x^(1/2))*_C1+BesselI(n-1,2*x^(1/2)))
```

4.386 $y(x)\left(x^{n-1}+y(x)\right)+x^n y'(x)+x^2=0$

ODE

$$y(x)\left(x^{n-1}+y(x)\right)+x^n y'(x)+x^2=0$$

ODE Classification

[_Riccati]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.201479 (sec), leaf count = 470

$$\left\{\left\{y(x)\to -\frac{x^{n-1}\left(c_1\left(x^{2n}\right)^{\frac{1}{n}}\Gamma\left(\frac{4-3n}{4-2n}\right)\left(-J_{\frac{n}{2(n-2)}-1}\left(\frac{\left(x^{2n}\right)^{\frac{1}{n}-\frac{1}{2}}}{2-n}\right)\right)+c_1\left(x^{2n}\right)^{\frac{1}{n}}\Gamma\left(\frac{4-3n}{4-2n}\right)J_{\frac{n}{2(n-2)}+1}\left(\frac{\left(x^{2n}\right)^{\frac{1}{n}-\frac{1}{2}}}{2-n}\right)+c_1 n\sqrt{x^{2n}}\right.\right.\right.$$
$$\left.\left.\left.2\sqrt{x^{2n}}\left(c_1\Gamma\right.\right.\right.$$

Maple ✓
cpu = 0.64 (sec), leaf count = 218

$$\left\{y(x)=\frac{x^n}{x\left(n-4\right)}\left(\frac{x^{-3n+4}\_C1\left(n-4\right)}{3}{}_0\mathrm{F}_1\left(\ ;\ \frac{5n-8}{2n-4};-\frac{x^{-2n+4}}{4\left(n-2\right)^2}\right)+\left(n-\frac{4}{3}\right)\left(-{}_0\mathrm{F}_1\left(\ ;\ \frac{3n-4}{2n-4};-\frac{x^{-2n+4}}{4\left(n-2\right)^2}\right)n(n-\right.\right.\right.$$

Mathematica raw input

```
DSolve[x^2 + y[x]*(x^(-1 + n) + y[x]) + x^n*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x^(-1 + n)*(n*Sqrt[x^(2*n)]*BesselJ[n/(2*(-2 + n)), (x^(2*n))^(-1/2
+ n^(-1))/(2 - n)]*C[1]*Gamma[(4 - 3*n)/(4 - 2*n)] - (x^(2*n))^n^(-1)*BesselJ[-1
 + n/(2*(-2 + n)), (x^(2*n))^(-1/2 + n^(-1))/(2 - n)]*C[1]*Gamma[(4 - 3*n)/(4 -
2*n)] + (x^(2*n))^n^(-1)*BesselJ[1 + n/(2*(-2 + n)), (x^(2*n))^(-1/2 + n^(-1))/(
2 - n)]*C[1]*Gamma[(4 - 3*n)/(4 - 2*n)] + (x^(2*n))^n^(-1)*BesselJ[(-4 + n)/(2*(
-2 + n)), (x^(2*n))^(-1/2 + n^(-1))/(2 - n)]*Gamma[(-4 + n)/(2*(-2 + n))] + n*Sq
rt[x^(2*n)]*BesselJ[n/(4 - 2*n), (x^(2*n))^(-1/2 + n^(-1))/(2 - n)]*Gamma[(-4 +
n)/(2*(-2 + n))] - (x^(2*n))^n^(-1)*BesselJ[-1 + n/(4 - 2*n), (x^(2*n))^(-1/2 +
n^(-1))/(2 - n)]*Gamma[(-4 + n)/(2*(-2 + n))]))/(2*Sqrt[x^(2*n)]*(BesselJ[n/(2*(
-2 + n)), (x^(2*n))^(-1/2 + n^(-1))/(2 - n)]*C[1]*Gamma[(4 - 3*n)/(4 - 2*n)] + B
esselJ[n/(4 - 2*n), (x^(2*n))^(-1/2 + n^(-1))/(2 - n)]*Gamma[(-4 + n)/(2*(-2 + n
```

```
))]))}}
```

Maple raw input

```
dsolve(x^n*diff(y(x),x)+x^2+(x^(n-1)+y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (1/3*x^(-3*n+4)*_C1*hypergeom([],[(5*n-8)/(2*n-4)],-1/4/(n-2)^2*x^(-2*n+4
))*(n-4)+(n-4/3)*(-hypergeom([],[(3*n-4)/(2*n-4)],-1/4/(n-2)^2*x^(-2*n+4))*n*(n-
4)*_C1*x^(-n)+x^(-2*n+4)*hypergeom([],[(3*n-8)/(2*n-4)],-1/4/(n-2)^2*x^(-2*n+4))
))*x^n/(n-4/3)/(n-4)/(_C1*x^(-n)*hypergeom([],[(3*n-4)/(2*n-4)],-1/4/(n-2)^2*x^(
-2*n+4))+hypergeom([],[(n-4)/(2*n-4)],-1/4/(n-2)^2*x^(-2*n+4)))/x
```

4.387 $(1-n)x^{n-1}+x^{2n-2}+x^n y'(x)+y(x)^2=0$

ODE

$$(1-n)x^{n-1}+x^{2n-2}+x^n y'(x)+y(x)^2=0$$

ODE Classification

[_Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✗
cpu = 22.0608 (sec), leaf count = 0 , could not solve

```
DSolve[(1 - n)*x^(-1 + n) + x^(-2 + 2*n) + y[x]^2 + x^n*Derivative[1][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.43 (sec), leaf count = 498

$$\left\{y(x)=-\frac{x^n}{x}\left(x^{\frac{3}{2}-\frac{3n}{2}+\frac{1}{2}\sqrt{n-3}\sqrt{n+1}}\_C1\,(n-1)\left(n-1+\sqrt{n-3}\sqrt{n+1}\right){}_0\mathrm{F}_1\left(\,;\,\frac{1}{n-1}\left(-\sqrt{n-3}\sqrt{n+1}+2n-2\right);\,\frac{x^{1-r}}{n-1}\right.\right.$$

Mathematica raw input

```
DSolve[(1 - n)*x^(-1 + n) + x^(-2 + 2*n) + y[x]^2 + x^n*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[(1 - n)*x^(-1 + n) + x^(-2 + 2*n) + y[x]^2 + x^n*Derivative[1][y][x] == 0
, y[x], x]
```

Maple raw input

```
dsolve(x^n*diff(y(x),x)+x^(2*n-2)+y(x)^2+(1-n)*x^(n-1) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -x^n*(x^(3/2-3/2*n+1/2*(n-3)^(1/2)*(n+1)^(1/2))*_C1*(n-1)*(n-1+(n-3)^(1/2
)*(n+1)^(1/2))*hypergeom([],[(-(n-3)^(1/2)*(n+1)^(1/2)+2*n-2)/(n-1)],1/(n-1)*x^(
1-n))+x^(3/2-3/2*n-1/2*(n-3)^(1/2)*(n+1)^(1/2))*(n-1)*(n-1-(n-3)^(1/2)*(n+1)^(1/
2))*hypergeom([],[((n-3)^(1/2)*(n+1)^(1/2)+2*n-2)/(n-1)],1/(n-1)*x^(1-n))-1/2*x^
(1/2*(n-3)^(1/2)*(n+1)^(1/2)-1/2*n+1/2)*_C1*(-(n-3)^(3/2)*(n+1)^(3/2)+(n-1)*(-4+
(n+1)^(1/2)*(n-1)*(n-3)^(1/2)))*hypergeom([],[(n-1-(n-3)^(1/2)*(n+1)^(1/2))/(n-1
```

```
)],1/(n-1)*x^(1-n))+1/2*hypergeom([],[1/(n-1)*(n-1+(n-3)^(1/2)*(n+1)^(1/2))],1/(
n-1)*x^(1-n))*(-(n-3)^(3/2)*(n+1)^(3/2)+(n-1)*(4+(n+1)^(1/2)*(n-1)*(n-3)^(1/2)))
*x^(-1/2*(n-3)^(1/2)*(n+1)^(1/2)-1/2*n+1/2))/x/(n-1+(n-3)^(1/2)*(n+1)^(1/2))/(n-
1-(n-3)^(1/2)*(n+1)^(1/2))/(_C1*x^(1/2*(n-3)^(1/2)*(n+1)^(1/2)-1/2*n+1/2)*hyperg
eom([],[(n-1-(n-3)^(1/2)*(n+1)^(1/2))/(n-1)],1/(n-1)*x^(1-n))+x^(-1/2*(n-3)^(1/2
)*(n+1)^(1/2)-1/2*n+1/2)*hypergeom([],[1/(n-1)*(n-1+(n-3)^(1/2)*(n+1)^(1/2))],1/
(n-1)*x^(1-n)))
```

4.388 $x^n y'(x) = a^2 x^{2n-2} + b^2 y(x)^2$

ODE

$$x^n y'(x) = a^2 x^{2n-2} + b^2 y(x)^2$$

ODE Classification

[[_homogeneous, `class G`], _Riccati]

Book solution method
Riccati ODE, Generalized ODE

Mathematica ✓
cpu = 0.0685813 (sec), leaf count = 143

$$\left\{\left\{y(x) \to \frac{x^{n-1}\left(c_1\left(ab\sqrt{\frac{(n-1)^2-4a^2b^2}{a^2b^2}}+n-1\right)+\left(-ab\sqrt{\frac{(n-1)^2-4a^2b^2}{a^2b^2}}+n-1\right)x^{ab\sqrt{\frac{(n-1)^2-4a^2b^2}{a^2b^2}}}\right)}{2b^2\left(x^{ab\sqrt{\frac{(n-1)^2}{a^2b^2}-4}}+c_1\right)}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 72

$$\left\{\ln(x) - \_C1 - 2\frac{1}{\sqrt{4a^2b^2-n^2+2n-1}}\arctan\left(\frac{2b^2y(x)x^{1-n}-n+1}{\sqrt{4a^2b^2-n^2+2n-1}}\right) = 0\right\}$$

Mathematica raw input

```
DSolve[x^n*y'[x] == a^2*x^(-2 + 2*n) + b^2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(-1 + n)*((-1 - a*b*Sqrt[(-4*a^2*b^2 + (-1 + n)^2)/(a^2*b^2)] + n)*
x^(a*b*Sqrt[(-4*a^2*b^2 + (-1 + n)^2)/(a^2*b^2)]) + (-1 + a*b*Sqrt[(-4*a^2*b^2 +
  (-1 + n)^2)/(a^2*b^2)] + n)*C[1]))/(2*b^2*(x^(a*b*Sqrt[-4 + (-1 + n)^2/(a^2*b^2
)]) + C[1]))}}
```

Maple raw input

```
dsolve(x^n*diff(y(x),x) = a^2*x^(2*n-2)+b^2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-2/(4*a^2*b^2-n^2+2*n-1)^(1/2)*arctan((2*b^2*y(x)*x^(1-n)-n+1)/(4*a^2*b
^2-n^2+2*n-1)^(1/2)) = 0
```

4.389 $x^n y'(x) = x^{n-1}(ax^{2n} - by(x)^2 + ny(x))$

ODE

$$x^n y'(x) = x^{n-1}\left(ax^{2n} - by(x)^2 + ny(x)\right)$$

ODE Classification

[_rational, _Riccati]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.0217505 (sec), leaf count = 113

$$\left\{\left\{y(x) \to \frac{\sqrt{a}x^n\left(c_1 \sin\left(\frac{\sqrt{a}\sqrt{-b}x^n}{n}\right) - \cos\left(\frac{\sqrt{a}\sqrt{-b}x^n}{n}\right)\right)}{\sqrt{-b}\left(c_1 \cos\left(\frac{\sqrt{a}\sqrt{-b}x^n}{n}\right) + \sin\left(\frac{\sqrt{a}\sqrt{-b}x^n}{n}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 38

$$\left\{i Artanh\left(x^{-n} y(x)\sqrt{b}\frac{1}{\sqrt{a}}\right) - \frac{ix^n}{n}\sqrt{b}\sqrt{a} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^n*y'[x] == x^(-1 + n)*(a*x^(2*n) + n*y[x] - b*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[a]*x^n*(-Cos[(Sqrt[a]*Sqrt[-b]*x^n)/n] + C[1]*Sin[(Sqrt[a]*Sqrt[
-b]*x^n)/n]))/(Sqrt[-b]*(C[1]*Cos[(Sqrt[a]*Sqrt[-b]*x^n)/n] + Sin[(Sqrt[a]*Sqrt[
-b]*x^n)/n]))}}
```

Maple raw input

```
dsolve(x^n*diff(y(x),x) = x^(n-1)*(a*x^(2*n)+n*y(x)-b*y(x)^2), y(x),'implicit')
```

Maple raw output

```
I*arctanh(b^(1/2)/a^(1/2)*x^(-n)*y(x))-I*x^n/n*b^(1/2)*a^(1/2)+_C1 = 0
```

4.390 $x^{2n}y'(x) = -nx^{n-1} + x^n y(x)\left(x^{2n}y(x)^2 - 3x^n y(x) + 1\right) + 1$

ODE

$$x^{2n}y'(x) = -nx^{n-1} + x^n y(x)\left(x^{2n}y(x)^2 - 3x^n y(x) + 1\right) + 1$$

ODE Classification

[_Abel]

Book solution method
Abel ODE, First kind

Mathematica ✓
cpu = 0.250927 (sec), leaf count = 254

$$\left\{\left\{y(x) \to x^{-n} - \frac{e^{\frac{2x^{1-n}}{n-1}}}{\sqrt{c_1 - \frac{2x\left(\frac{4^{\frac{n+1}{n-1}} x\left(\frac{x^{1-n}}{1-n}\right)^{\frac{2}{n-1}} \Gamma\left(-\frac{2}{n-1}, -\frac{4x^{1-n}}{n-1}\right)}{n-1} + e^{\frac{4x^{1-n}}{n-1}} x^n\right)}{n+1}}}\right\}, \left\{y(x) \to \frac{e^{\frac{2x^{1-n}}{n-1}}}{\sqrt{c_1 - \frac{2x\left(\frac{4^{\frac{n+1}{n-1}} x\left(\frac{x^{1-n}}{1-n}\right)^{\frac{2}{n-1}} \Gamma\left(-\frac{2}{n-1},\right.}{n-1}\right.}{n+1}}}\right.$$

Maple ✓
cpu = 0.095 (sec), leaf count = 962

$$\left\{y(x) - 1e^{2\frac{x}{(n-1)x^n}} \frac{}{\sqrt{\_C1 - 2\frac{1}{1-n}2^{-2\frac{n}{1-n}-2(1-n)^{-1}}\left((1-n)^{-1}\right)^{-\frac{n}{1-n}-(1-n)^{-1}}\left(-\frac{(n-1)(1-n)}{(n+1)(n-3)}2^{-3+2\frac{n}{1-n}+2(1-n)^{-1}+2(n-1)^{-}\right.}\right.}}\right.$$

Mathematica raw input

```
DSolve[x^(2*n)*y'[x] == 1 - n*x^(-1 + n) + x^n*y[x]*(1 - 3*x^n*y[x] + x^(2*n)*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^(-n) - E^((2*x^(1 - n))/(-1 + n))/Sqrt[C[1] - (2*x*(E^((4*x^(1 - n))
/(-1 + n))*x^n + (4^((1 + n)/(-1 + n))*x*(x^(1 - n)/(1 - n))^(2/(-1 + n))*Gamma[
-2/(-1 + n), (-4*x^(1 - n))/(-1 + n)])/(-1 + n)))/(1 + n)]}, {y[x] -> x^(-n) + E
^((2*x^(1 - n))/(-1 + n))/Sqrt[C[1] - (2*x*(E^((4*x^(1 - n))/(-1 + n))*x^n + (4^
((1 + n)/(-1 + n))*x*(x^(1 - n)/(1 - n))^(2/(-1 + n))*Gamma[-2/(-1 + n), (-4*x^(
1 - n))/(-1 + n)])/(-1 + n)))/(1 + n)]}}
```

Maple raw input

```
dsolve(x^(2*n)*diff(y(x),x) = 1-n*x^(n-1)+x^n*y(x)*(1-3*x^n*y(x)+x^(2*n)*y(x)^2), y(x),'implicit')
```

Maple raw output

```
y(x)+exp(2*x/(n-1)/(x^n))/(_C1-2*2^(-2*n/(1-n)-2/(1-n))*(1/(1-n))^(-n/(1-n)-1/(1
-n))/(1-n)*(-2^(-3+2*n/(1-n)+2/(1-n)+2/(n-1))*(n-1)/(n+1)*x^(-n^2/(1-n)+1/(1-n)-
1+n)*(1/(1-n))^(n/(1-n)+1/(1-n))*(-4*x^(1-n)/(1-n)*n^2+8*n*x^(1-n)/(1-n)-4*x^(1-
n)/(1-n)+2*n-2)/(n-3)*(1-n)*(x^(1-n)/(1-n))^(1/(n-1))*exp(2*x^(1-n)/(n-1))*Whitt
akerM(-1/(n-1)*n,-1/(n-1)+1/2,-4*x^(1-n)/(n-1))+2^(-1+2*n/(1-n)+2/(1-n)+2/(n-1))
*(n-1)/(n+1)*x^(-n^2/(1-n)+1/(1-n)-1+n)*(1/(1-n))^(n/(1-n)+1/(1-n))/(n-3)*(1-n)*
(x^(1-n)/(1-n))^(1/(n-1))*exp(2*x^(1-n)/(n-1))*WhittakerM(-1/(n-1),-1/(n-1)+1/2,
-4*x^(1-n)/(n-1))))^(1/2)-1/(x^n) = 0, y(x)-exp(2*x/(n-1)/(x^n))/(_C1-2*2^(-2*n/
(1-n)-2/(1-n))*(1/(1-n))^(-n/(1-n)-1/(1-n))/(1-n)*(-2^(-3+2*n/(1-n)+2/(1-n)+2/(n
-1))*(n-1)/(n+1)*x^(-n^2/(1-n)+1/(1-n)-1+n)*(1/(1-n))^(n/(1-n)+1/(1-n))*(-4*x^(1
-n)/(1-n)*n^2+8*n*x^(1-n)/(1-n)-4*x^(1-n)/(1-n)+2*n-2)/(n-3)*(1-n)*(x^(1-n)/(1-n
))^(1/(n-1))*exp(2*x^(1-n)/(n-1))*WhittakerM(-1/(n-1)*n,-1/(n-1)+1/2,-4*x^(1-n)/
(n-1))+2^(-1+2*n/(1-n)+2/(1-n)+2/(n-1))*(n-1)/(n+1)*x^(-n^2/(1-n)+1/(1-n)-1+n)*(
1/(1-n))^(n/(1-n)+1/(1-n))/(n-3)*(1-n)*(x^(1-n)/(1-n))^(1/(n-1))*exp(2*x^(1-n)/(
n-1))*WhittakerM(-1/(n-1),-1/(n-1)+1/2,-4*x^(1-n)/(n-1))))^(1/2)-1/(x^n) = 0
```

4.391 $x^k y'(x) = ax^m + by(x)^n$

ODE

$$x^k y'(x) = ax^m + by(x)^n$$

ODE Classification

[_Chini]

Book solution method
Change of Variable, new dependent variable

Mathematica ✗
cpu = 20.8832 (sec), leaf count = 0 , could not solve

```
DSolve[x^k*Derivative[1][y][x] == a*x^m + b*y[x]^n, y[x], x]
```

Maple ✗
cpu = 0.284 (sec), leaf count = 0 , could not solve

```
dsolve(x^k*diff(y(x),x) = a*x^m+b*y(x)^n, y(x),'implicit')
```

Mathematica raw input

```
DSolve[x^k*y'[x] == a*x^m + b*y[x]^n,y[x],x]
```

Mathematica raw output

```
DSolve[x^k*Derivative[1][y][x] == a*x^m + b*y[x]^n, y[x], x]
```

Maple raw input

```
dsolve(x^k*diff(y(x),x) = a*x^m+b*y(x)^n, y(x),'implicit')
```

Maple raw output

```
dsolve(x^k*diff(y(x),x) = a*x^m+b*y(x)^n, y(x),'implicit')
```

4.392 $\sqrt{x^2+1}y'(x) = 2x - y(x)$

ODE

$$\sqrt{x^2+1}y'(x) = 2x - y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0303187 (sec), leaf count = 33

$$\left\{\left\{y(x) \to e^{-\sinh^{-1}(x)}\left(c_1 + x^2 + \sqrt{x^2+1}x - \sinh^{-1}(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 34

$$\left\{y(x) = 1\left(x^2 + x\sqrt{x^2+1} - Arcsinh(x) + \_C1\right)\left(x + \sqrt{x^2+1}\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[Sqrt[1 + x^2]*y'[x] == 2*x - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2 + x*Sqrt[1 + x^2] - ArcSinh[x] + C[1])/E^ArcSinh[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(x^2+1)^(1/2) = 2*x-y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2+x*(x^2+1)^(1/2)-arcsinh(x)+_C1)/(x+(x^2+1)^(1/2))
```

4.393 $\sqrt{1-x^2}y'(x) = y(x)^2+1$

ODE

$$\sqrt{1-x^2}y'(x) = y(x)^2+1$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0197276 (sec), leaf count = 11

$$\{\{y(x) \to \tan\left(c_1 + \sin^{-1}(x)\right)\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 12

$$\{\arcsin(x) - \arctan(y(x)) + \_C1 = 0\}$$

Mathematica raw input

```
DSolve[Sqrt[1 - x^2]*y'[x] == 1 + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Tan[ArcSin[x] + C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(-x^2+1)^(1/2) = 1+y(x)^2, y(x),'implicit')
```

Maple raw output

```
arcsin(x)-arctan(y(x))+_C1 = 0
```

4.394 $\left(x-\sqrt{x^2+1}\right) y'(x)=y(x)+\sqrt{y(x)^2+1}$

ODE

$$\left(x-\sqrt{x^2+1}\right) y'(x)=y(x)+\sqrt{y(x)^2+1}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0692613 (sec), leaf count = 59

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{1}{2}\left(\#1\left(\sqrt{\#1^2+1}-\#1\right)+\sinh^{-1}(\#1)\right)\&\right]\left[c_1+\frac{1}{2}\left(-x\left(\sqrt{x^2+1}+x\right)-\sinh^{-1}(x)\right)\right]\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 39

$$\left\{\_C1+x^2+x\sqrt{x^2+1}+Arcsinh(x)-(y(x))^2+y(x)\sqrt{1+(y(x))^2}+Arcsinh(y(x))=0\right\}$$

Mathematica raw input

```
DSolve[(x - Sqrt[1 + x^2])*y'[x] == y[x] + Sqrt[1 + y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(ArcSinh[#1] + #1*(-#1 + Sqrt[1 + #1^2]))/2 & ][(-(x*(
x + Sqrt[1 + x^2])) - ArcSinh[x])/2 + C[1]]}}
```

Maple raw input

```
dsolve((x-(x^2+1)^(1/2))*diff(y(x),x) = y(x)+(1+y(x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
_C1+x^2+x*(x^2+1)^(1/2)+arcsinh(x)-y(x)^2+y(x)*(1+y(x)^2)^(1/2)+arcsinh(y(x)) =
0
```

4.395 $\sqrt{a^2+x^2}y'(x)+y(x)+x=\sqrt{a^2+x^2}$

ODE

$$\sqrt{a^2+x^2}y'(x)+y(x)+x=\sqrt{a^2+x^2}$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.025351 (sec), leaf count = 42

$$\left\{\left\{y(x)\to \frac{a^2\log\left(\sqrt{a^2+x^2}+x\right)+c_1}{\sqrt{a^2+x^2}+x}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 36

$$\left\{y(x)=1\left(a^2\ln\left(x+\sqrt{a^2+x^2}\right)+\_C1\right)\left(x+\sqrt{a^2+x^2}\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[x + y[x] + Sqrt[a^2 + x^2]*y'[x] == Sqrt[a^2 + x^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + a^2*Log[x + Sqrt[a^2 + x^2]])/(x + Sqrt[a^2 + x^2])}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(a^2+x^2)^(1/2)+x+y(x) = (a^2+x^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
y(x) = (a^2*ln(x+(a^2+x^2)^(1/2))+_C1)/(x+(a^2+x^2)^(1/2))
```

4.396 $\sqrt{b^2+x^2}y'(x) = \sqrt{a^2+y(x)^2}$

ODE

$$\sqrt{b^2+x^2}y'(x) = \sqrt{a^2+y(x)^2}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0556873 (sec), leaf count = 61

$$\left\{\left\{y(x) \to \frac{e^{-c_1}\left(a^2\left(x-\sqrt{b^2+x^2}\right)+b^2e^{2c_1}\left(\sqrt{b^2+x^2}+x\right)\right)}{2b^2}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 33

$$\left\{\ln\left(x+\sqrt{b^2+x^2}\right)-\ln\left(y(x)+\sqrt{(y(x))^2+a^2}\right)+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[Sqrt[b^2 + x^2]*y'[x] == Sqrt[a^2 + y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a^2*(x - Sqrt[b^2 + x^2]) + b^2*E^(2*C[1])*(x + Sqrt[b^2 + x^2]))/(2*
b^2*E^C[1])}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(b^2+x^2)^(1/2) = (y(x)^2+a^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
ln(x+(b^2+x^2)^(1/2))-ln(y(x)+(y(x)^2+a^2)^(1/2))+_C1 = 0
```

4.397 $\sqrt{b^2-x^2}y'(x)=\sqrt{a^2-y(x)^2}$

ODE

$$\sqrt{b^2-x^2}y'(x)=\sqrt{a^2-y(x)^2}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.048327 (sec), leaf count = 106

$$\left\{\left\{y(x)\to \frac{a\tan\left(\tan^{-1}\left(\frac{x}{\sqrt{b^2-x^2}}\right)+c_1\right)}{\sqrt{\sec^2\left(\tan^{-1}\left(\frac{x}{\sqrt{b^2-x^2}}\right)+c_1\right)}}\right\},\left\{y(x)\to -\frac{a\tan\left(\tan^{-1}\left(\frac{x}{\sqrt{b^2-x^2}}\right)+c_1\right)}{\sqrt{\sec^2\left(\tan^{-1}\left(\frac{x}{\sqrt{b^2-x^2}}\right)+c_1\right)}}\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 37

$$\left\{\arctan\left(x\frac{1}{\sqrt{b^2-x^2}}\right)-\arctan\left(y(x)\frac{1}{\sqrt{a^2-\left(y\left(x\right)\right)^2}}\right)+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[Sqrt[b^2 - x^2]*y'[x] == Sqrt[a^2 - y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a*Tan[ArcTan[x/Sqrt[b^2 - x^2]] + C[1]])/Sqrt[Sec[ArcTan[x/Sqrt[b^2 -
  x^2]] + C[1]]^2]}, {y[x] -> -((a*Tan[ArcTan[x/Sqrt[b^2 - x^2]] + C[1]])/Sqrt[Se
c[ArcTan[x/Sqrt[b^2 - x^2]] + C[1]]^2])}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(b^2-x^2)^(1/2) = (a^2-y(x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
arctan(x/(b^2-x^2)^(1/2))-arctan(y(x)/(a^2-y(x)^2)^(1/2))+_C1 = 0
```

4.398 $x\sqrt{a^2+x^2}y'(x) = y(x)\sqrt{b^2+y(x)^2}$

ODE

$$x\sqrt{a^2+x^2}y'(x) = y(x)\sqrt{b^2+y(x)^2}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0949498 (sec), leaf count = 90

$$\left\{\left\{y(x) \to -\frac{2b^2 e^{bc_1} x^{\frac{b}{a}} \left(a\left(\sqrt{a^2+x^2}+a\right)\right)^{\frac{b}{a}}}{b^2 e^{2bc_1} x^{\frac{2b}{a}} - \left(a\left(\sqrt{a^2+x^2}+a\right)\right)^{\frac{2b}{a}}}\right\}\right\}$$

Maple ✓
cpu = 0.036 (sec), leaf count = 74

$$\left\{-1\ln\left(\frac{1}{x}\left(2a^2+2\sqrt{a^2}\sqrt{a^2+x^2}\right)\right)\frac{1}{\sqrt{a^2}}+1\ln\left(\frac{1}{y(x)}\left(2b^2+2\sqrt{b^2}\sqrt{b^2+(y(x))^2}\right)\right)\frac{1}{\sqrt{b^2}}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*Sqrt[a^2 + x^2]*y'[x] == y[x]*Sqrt[b^2 + y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*b^2*E^(b*C[1])*x^(b/a)*(a*(a + Sqrt[a^2 + x^2]))^(b/a))/(b^2*E^(2*
b*C[1])*x^((2*b)/a) - (a*(a + Sqrt[a^2 + x^2]))^((2*b)/a))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)*(a^2+x^2)^(1/2) = y(x)*(b^2+y(x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
-1/(a^2)^(1/2)*ln((2*a^2+2*(a^2)^(1/2)*(a^2+x^2)^(1/2))/x)+1/(b^2)^(1/2)*ln((2*b
^2+2*(b^2)^(1/2)*(b^2+y(x)^2)^(1/2))/y(x))+_C1 = 0
```

4.399 $x\sqrt{x^2-a^2}y'(x) = y(x)\sqrt{y(x)^2-b^2}$

ODE

$$x\sqrt{x^2-a^2}y'(x) = y(x)\sqrt{y(x)^2-b^2}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0734998 (sec), leaf count = 100

$$\left\{\left\{y(x) \to -\frac{4ibe^{ibc_1}\left(\frac{2\sqrt{x^2-a^2}}{x}-\frac{2ia}{x}\right)^{\frac{b}{a}}}{-4+e^{2ibc_1}\left(\frac{2\sqrt{x^2-a^2}}{x}-\frac{2ia}{x}\right)^{\frac{2b}{a}}}\right\}\right\}$$

Maple ✓
cpu = 0.039 (sec), leaf count = 86

$$\left\{-1\ln\left(\frac{1}{x}\left(-2a^2+2\sqrt{-a^2}\sqrt{-a^2+x^2}\right)\right)\frac{1}{\sqrt{-a^2}}+1\ln\left(\frac{1}{y(x)}\left(-2b^2+2\sqrt{-b^2}\sqrt{(y(x))^2-b^2}\right)\right)\frac{1}{\sqrt{-b^2}}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*Sqrt[-a^2 + x^2]*y'[x] == y[x]*Sqrt[-b^2 + y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-4*I)*b*E^(I*b*C[1])*(((-2*I)*a)/x + (2*Sqrt[-a^2 + x^2])/x)^(b/a))/
(-4 + E^((2*I)*b*C[1])*(((-2*I)*a)/x + (2*Sqrt[-a^2 + x^2])/x)^((2*b)/a))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)*(-a^2+x^2)^(1/2) = y(x)*(y(x)^2-b^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
-1/(-a^2)^(1/2)*ln((-2*a^2+2*(-a^2)^(1/2)*(-a^2+x^2)^(1/2))/x)+1/(-b^2)^(1/2)*ln
((-2*b^2+2*(-b^2)^(1/2)*(y(x)^2-b^2)^(1/2))/y(x))+_C1 = 0
```

4.400 $\sqrt{X}y'(x)+\sqrt{Y}=0$

ODE

$$\sqrt{X}y'(x)+\sqrt{Y}=0$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0029912 (sec), leaf count = 21

$$\left\{\left\{y(x)\to c_1-\frac{x\sqrt{Y}}{\sqrt{X}}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 15

$$\left\{y(x)=-x\sqrt{Y}\frac{1}{\sqrt{X}}+\_C1\right\}$$

Mathematica raw input

```
DSolve[Sqrt[Y] + Sqrt[X]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x*Sqrt[Y])/Sqrt[X]) + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*X^(1/2)+Y^(1/2) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -Y^(1/2)/X^(1/2)*x+_C1
```

4.401 $\sqrt{X}y'(x) = \sqrt{Y}$

ODE

$$\sqrt{X}y'(x) = \sqrt{Y}$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00303792 (sec), leaf count = 20

$$\left\{\left\{y(x) \to c_1 + \frac{x\sqrt{Y}}{\sqrt{X}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 14

$$\left\{y(x) = x\sqrt{Y}\frac{1}{\sqrt{X}} + \_C1\right\}$$

Mathematica raw input

```
DSolve[Sqrt[X]*y'[x] == Sqrt[Y],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*Sqrt[Y])/Sqrt[X] + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*X^(1/2) = Y^(1/2), y(x),'implicit')
```

Maple raw output

```
y(x) = Y^(1/2)/X^(1/2)*x+_C1
```

4.402 $x^{3/2}y'(x) = a + bx^{3/2}y(x)^2$

ODE

$$x^{3/2}y'(x) = a + bx^{3/2}y(x)^2$$

ODE Classification

[_rational, [_Riccati, _special]]

Book solution method
Abel ODE, First kind

Mathematica ✓
cpu = 0.00910832 (sec), leaf count = 143

$$\left\{\left\{y(x) \to \frac{c_1\left(\sqrt{a}\sqrt{b}\sqrt[4]{x}J_3\left(4\sqrt{a}\sqrt{b}\sqrt[4]{x}\right) - J_2\left(4\sqrt{a}\sqrt{b}\sqrt[4]{x}\right)\right) - \sqrt{a}\sqrt{b}(c_1+2)\sqrt[4]{x}J_1\left(4\sqrt{a}\sqrt{b}\sqrt[4]{x}\right)}{2b\left(c_1+1\right)xJ_2\left(4\sqrt{a}\sqrt{b}\sqrt[4]{x}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.111 (sec), leaf count = 119

$$\left\{y(x) = -2\frac{a\left(J_1\left(4\sqrt{a}\sqrt{b}\sqrt[4]{x}\right)\_C1 + Y_1\left(4\sqrt{a}\sqrt{b}\sqrt[4]{x}\right)\right)}{\sqrt{x}\left(-2J_0\left(4\sqrt{a}\sqrt{b}\sqrt[4]{x}\right)\sqrt{a}\sqrt[4]{x}\sqrt{b}\_C1 - 2Y_0\left(4\sqrt{a}\sqrt{b}\sqrt[4]{x}\right)\sqrt{a}\sqrt{b}\sqrt[4]{x} + J_1\left(4\sqrt{a}\sqrt{b}\sqrt[4]{x}\right)\_C1 + Y_1\left(4\sqrt{a}\sqrt{b}\right.\right.\right.}$$

Mathematica raw input

```
DSolve[x^(3/2)*y'[x] == a + b*x^(3/2)*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-BesselJ[2, 4*Sqrt[a]*Sqrt[b]*x^(1/4)] + Sqrt[a]*Sqrt[b]*x^(1/4)*Bes
selJ[3, 4*Sqrt[a]*Sqrt[b]*x^(1/4)])*C[1] - Sqrt[a]*Sqrt[b]*x^(1/4)*BesselJ[1, 4*
Sqrt[a]*Sqrt[b]*x^(1/4)]*(2 + C[1]))/(2*b*x*BesselJ[2, 4*Sqrt[a]*Sqrt[b]*x^(1/4)
]*(1 + C[1]))}}
```

Maple raw input

```
dsolve(x^(3/2)*diff(y(x),x) = a+b*x^(3/2)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = -2*a/x^(1/2)*(BesselJ(1,4*a^(1/2)*b^(1/2)*x^(1/4))*_C1+BesselY(1,4*a^(1/2
)*b^(1/2)*x^(1/4)))/(-2*BesselJ(0,4*a^(1/2)*b^(1/2)*x^(1/4))*a^(1/2)*x^(1/4)*b^(
1/2)*_C1-2*BesselY(0,4*a^(1/2)*b^(1/2)*x^(1/4))*a^(1/2)*b^(1/2)*x^(1/4)+BesselJ(
1,4*a^(1/2)*b^(1/2)*x^(1/4))*_C1+BesselY(1,4*a^(1/2)*b^(1/2)*x^(1/4)))
```

4.403 $\sqrt{x^3+1}y'(x) = \sqrt{y(x)^3+1}$

ODE

$$\sqrt{x^3+1}y'(x) = \sqrt{y(x)^3+1}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.334943 (sec), leaf count = 191

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{2\sqrt[6]{-1}\sqrt{-\sqrt[6]{-1}\left(\#1+(-1)^{2/3}\right)}\sqrt{(-1)^{2/3}\#1^2+\sqrt[3]{-1}\#1+1}F\left(\sin^{-1}\left(\frac{\sqrt{-(-1)^{5/6}(\#1+1)}}{\sqrt[4]{3}}\right)|\right.\right.\right.\right.$$
$$\left.\left.\left.\left.\frac{}{\sqrt[4]{3}\sqrt{\#1^3+1}}\right]\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 28

$$\left\{\int \frac{1}{\sqrt{x^3+1}}\,\mathrm{d}x - \int^{y(x)} \frac{1}{\sqrt{\_a^3+1}}d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[Sqrt[1 + x^3]*y'[x] == Sqrt[1 + y[x]^3],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(2*(-1)^(1/6)*EllipticF[ArcSin[Sqrt[-((-1)^(5/6)*(1 +
#1))]/3^(1/4)], (-1)^(1/3)]*Sqrt[-((-1)^(1/6)*((-1)^(2/3) + #1))]*Sqrt[1 + (-1)^
(1/3)*#1 + (-1)^(2/3)*#1^2])/(3^(1/4)*Sqrt[1 + #1^3]) & ][C[1] + (2*(-1)^(1/6)*S
qrt[-((-1)^(1/6)*((-1)^(2/3) + x))]*Sqrt[1 + (-1)^(1/3)*x + (-1)^(2/3)*x^2]*Elli
pticF[ArcSin[Sqrt[-((-1)^(5/6)*(1 + x))]/3^(1/4)], (-1)^(1/3)])/(3^(1/4)*Sqrt[1
+ x^3])]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(x^3+1)^(1/2) = (1+y(x)^3)^(1/2), y(x),'implicit')
```

Maple raw output

```
Int(1/(x^3+1)^(1/2),x)-Intat(1/(_a^3+1)^(1/2),_a = y(x))+_C1 = 0
```

4.404 $\sqrt{(1-x)x(1-ax)}y'(x) = \sqrt{(1-y(x))y(x)(1-ay(x))}$

ODE

$$\sqrt{(1-x)x(1-ax)}y'(x) = \sqrt{(1-y(x))y(x)(1-ay(x))}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.317921 (sec), leaf count = 100

$$\left\{\left\{y(x) \to \text{ns}\left(\frac{1}{2}i\sqrt{a}c_1 - F\left(i\sinh^{-1}\left(\frac{1}{\sqrt{x-1}}\right)|\frac{a-1}{a}\right)|\frac{a-1}{a}\right)^2\left(-1+\text{sn}\left(\frac{1}{2}i\sqrt{a}c_1 - F\left(i\sinh^{-1}\left(\frac{1}{\sqrt{x-1}}\right)|\frac{a-1}{a}\right)\right.\right.\right.$$

Maple ✓
cpu = 0.021 (sec), leaf count = 38

$$\left\{\int \frac{1}{\sqrt{x\,(-1+x)\,(ax-1)}}\,\mathrm{d}x - \int^{y(x)} \frac{1}{\sqrt{\_a\,(\_a-1)\,(\_a\,a-1)}}d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[Sqrt[(1 - x)*x*(1 - a*x)]*y'[x] == Sqrt[(1 - y[x])*y[x]*(1 - a*y[x])],y[x],x]
```

Mathematica raw output

```
{{y[x] -> JacobiNS[(I/2)*Sqrt[a]*C[1] - EllipticF[I*ArcSinh[1/Sqrt[-1 + x]], (-1
 + a)/a], (-1 + a)/a]^2*(-1 + JacobiSN[(I/2)*Sqrt[a]*C[1] - EllipticF[I*ArcSinh[
1/Sqrt[-1 + x]], (-1 + a)/a], (-1 + a)/a]^2)}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(x*(1-x)*(-a*x+1))^(1/2) = (y(x)*(1-y(x))*(1-a*y(x)))^(1/2), y(x),'implicit')
```

Maple raw output

```
Int(1/(x*(-1+x)*(a*x-1))^(1/2),x)-Intat(1/(_a*(_a-1)*(_a*a-1))^(1/2),_a = y(x))+
_C1 = 0
```

4.405 $\sqrt{1-x^4}y'(x) = \sqrt{1-y(x)^4}$

ODE

$$\sqrt{1-x^4}y'(x) = \sqrt{1-y(x)^4}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0508674 (sec), leaf count = 14

$$\{\{y(x) \to \text{sn}\left(c_1 + F\left(\sin^{-1}(x)\middle|-1\right)\middle|-1\right)\}\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 32

$$\left\{\int \frac{1}{\sqrt{-x^4+1}}\,\mathrm{d}x - \int^{y(x)} \frac{1}{\sqrt{-\_a^4+1}}d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[Sqrt[1 - x^4]*y'[x] == Sqrt[1 - y[x]^4],y[x],x]
```

Mathematica raw output

```
{{y[x] -> JacobiSN[C[1] + EllipticF[ArcSin[x], -1], -1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(-x^4+1)^(1/2) = (1-y(x)^4)^(1/2), y(x),'implicit')
```

Maple raw output

```
Int(1/(-x^4+1)^(1/2),x)-Intat(1/(-_a^4+1)^(1/2),_a = y(x))+_C1 = 0
```

4.406 $\sqrt{x^4+x^2+1}y'(x)=\sqrt{y(x)^4+y(x)^2+1}$

ODE

$$\sqrt{x^4+x^2+1}y'(x)=\sqrt{y(x)^4+y(x)^2+1}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.231231 (sec), leaf count = 149

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{(-1)^{2/3}\sqrt{\sqrt[3]{-1}\#1^2+1}\sqrt{1-(-1)^{2/3}\#1^2}F\left(i\sinh^{-1}\left((-1)^{5/6}\#1\right)|(-1)^{2/3}\right)}{\sqrt{\#1^4+\#1^2+1}}\&\right]\left[c_1+\frac{(-1)^{2/3}}{}\right.\right.\right.$$

Maple ✓
cpu = 0.016 (sec), leaf count = 34

$$\left\{\int\frac{1}{\sqrt{x^4+x^2+1}}\,\mathrm{d}x-\int^{y(x)}\frac{1}{\sqrt{\_a^4+\_a^2+1}}d\_a+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[Sqrt[1 + x^2 + x^4]*y'[x] == Sqrt[1 + y[x]^2 + y[x]^4],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[((-1)^(2/3)*EllipticF[I*ArcSinh[(-1)^(5/6)*#1], (-1)^(
2/3)]*Sqrt[1 + (-1)^(1/3)*#1^2]*Sqrt[1 - (-1)^(2/3)*#1^2])/Sqrt[1 + #1^2 + #1^4]
 & ][C[1] + ((-1)^(2/3)*Sqrt[1 + (-1)^(1/3)*x^2]*Sqrt[1 - (-1)^(2/3)*x^2]*Ellipt
icF[I*ArcSinh[(-1)^(5/6)*x], (-1)^(2/3)])/Sqrt[1 + x^2 + x^4]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(x^4+x^2+1)^(1/2) = (1+y(x)^2+y(x)^4)^(1/2), y(x),'implicit')
```

Maple raw output

```
Int(1/(x^4+x^2+1)^(1/2),x)-Intat(1/(_a^4+_a^2+1)^(1/2),_a = y(x))+_C1 = 0
```

4.407 $\sqrt{X}y'(x) = 0$

ODE

$$\sqrt{X}y'(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Dependent variable missing

Mathematica ✓
cpu = 0.00191894 (sec), leaf count = 7

$$\{\{y(x) \to c_1\}\}$$

Maple ✓
cpu = 0.003 (sec), leaf count = 5

$$\{y(x) = \_C1\}$$

Mathematica raw input

```
DSolve[Sqrt[X]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*X^(1/2) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1
```

4.408 $\sqrt{X}y'(x)+\sqrt{Y}=0$

ODE

$$\sqrt{X}y'(x)+\sqrt{Y}=0$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00221268 (sec), leaf count = 21

$$\left\{\left\{y(x)\to c_1-\frac{x\sqrt{Y}}{\sqrt{X}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 15

$$\left\{y(x)=-x\sqrt{Y}\frac{1}{\sqrt{X}}+\_C1\right\}$$

Mathematica raw input

```
DSolve[Sqrt[Y] + Sqrt[X]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x*Sqrt[Y])/Sqrt[X]) + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*X^(1/2)+Y^(1/2) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -Y^(1/2)/X^(1/2)*x+_C1
```

4.409 $\sqrt{X}y'(x) = \sqrt{Y}$

ODE

$$\sqrt{X}y'(x) = \sqrt{Y}$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00275729 (sec), leaf count = 20

$$\left\{\left\{y(x) \to c_1 + \frac{x\sqrt{Y}}{\sqrt{X}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 14

$$\left\{y(x) = x\sqrt{Y}\frac{1}{\sqrt{X}} + \_C1\right\}$$

Mathematica raw input

```
DSolve[Sqrt[X]*y'[x] == Sqrt[Y],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*Sqrt[Y])/Sqrt[X] + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*X^(1/2) = Y^(1/2), y(x),'implicit')
```

Maple raw output

```
y(x) = Y^(1/2)/X^(1/2)*x+_C1
```

4.410 $(x^3+1)^{2/3} y'(x) + (y(x)^3+1)^{2/3} = 0$

ODE

$$(x^3+1)^{2/3} y'(x) + (y(x)^3+1)^{2/3} = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.782776 (sec), leaf count = 196

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{3\sqrt[3]{\frac{\sqrt[3]{-1}-\#1}{1+\sqrt[3]{-1}}}(\#1+1)\left(\frac{\#1+(-1)^{2/3}}{(-1)^{2/3}-1}\right)^{2/3}\,{}_2F_1\left(\frac{1}{3},\frac{2}{3};\frac{4}{3};\frac{\sqrt[3]{-1}(\#1+1)}{\left(-1+\sqrt[3]{-1}\right)\#1+1}\right)}{(\#1^3+1)^{2/3}}\&\right]\left[c_1 - \frac{3\sqrt[3]{\frac{\sqrt[3]{-1}}{1+}}\right.\right.\right.$$

Maple ✓
cpu = 0.062 (sec), leaf count = 33

$$\left\{x\,{}_2\mathrm{F}_1\left(\frac{1}{3},\frac{2}{3};\frac{4}{3};-x^3\right) + y(x)\,{}_2\mathrm{F}_1\left(\frac{1}{3},\frac{2}{3};\frac{4}{3};-(y(x))^3\right) + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(1 + y[x]^3)^(2/3) + (1 + x^3)^(2/3)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(3*Hypergeometric2F1[1/3, 2/3, 4/3, ((-1)^(1/3)*(1 + #
1))/(1 + (-1 + (-1)^(1/3))*#1)]*(((-1)^(1/3) - #1)/(1 + (-1)^(1/3)))^(1/3)*(1 +
#1)*(((-1)^(2/3) + #1)/(-1 + (-1)^(2/3)))^(2/3))/(1 + #1^3)^(2/3) & ][C[1] - (3*
(((-1)^(1/3) - x)/(1 + (-1)^(1/3)))^(1/3)*(1 + x)*(((-1)^(2/3) + x)/(-1 + (-1)^(
2/3)))^(2/3)*Hypergeometric2F1[1/3, 2/3, 4/3, ((-1)^(1/3)*(1 + x))/(1 + (-1 + (-
1)^(1/3))*x)])/(1 + x^3)^(2/3)]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(x^3+1)^(2/3)+(1+y(x)^3)^(2/3) = 0, y(x),'implicit')
```

Maple raw output

```
x*hypergeom([1/3, 2/3],[4/3],-x^3)+y(x)*hypergeom([1/3, 2/3],[4/3],-y(x)^3)+_C1
= 0
```

4.411 $(\mathbf{a0}+\mathbf{a1}x+4x^3)^{2/3}y'(x)+(\mathbf{a0}+\mathbf{a1}y(x)+4y(x)^3)^{2/3}=0$

ODE

$$(\mathrm{a0}+\mathrm{a1}x+4x^3)^{2/3}y'(x)+(\mathrm{a0}+\mathrm{a1}y(x)+4y(x)^3)^{2/3}=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.663591 (sec), leaf count = 558

$$\text{Solve}\left[\frac{3\left(\frac{x-\text{Root}\left[4\#1^3+\#1\text{a1}+\text{a0}\&,2\right]}{\text{Root}\left[4\#1^3+\#1\text{a1}+\text{a0}\&,1\right]-\text{Root}\left[4\#1^3+\#1\text{a1}+\text{a0}\&,2\right]}\right)^{2/3}\sqrt[3]{\frac{x-\text{Root}\left[4\#1^3+\#1\text{a1}+\text{a0}\&,3\right]}{\text{Root}\left[4\#1^3+\#1\text{a1}+\text{a0}\&,1\right]-\text{Root}\left[4\#1^3+\#1\text{a1}\right.}}\right.$$

Maple ✓
cpu = 0.105 (sec), leaf count = 36

$$\left\{\int (4x^3+a1\,x+a0)^{-\frac{2}{3}}\,dx+\int^{y(x)}(4\_a^3+\_a\,a1+a0)^{-\frac{2}{3}}\,d\_a+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(a0 + a1*y[x] + 4*y[x]^3)^(2/3) + (a0 + a1*x + 4*x^3)^(2/3)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[(3*Hypergeometric2F1[1/3, 2/3, 4/3, ((x - Root[a0 + a1*#1 + 4*#1^3 & , 1])
*(-Root[a0 + a1*#1 + 4*#1^3 & , 2] + Root[a0 + a1*#1 + 4*#1^3 & , 3]))/((Root[a0
 + a1*#1 + 4*#1^3 & , 1] - Root[a0 + a1*#1 + 4*#1^3 & , 2])*(x - Root[a0 + a1*#1
 + 4*#1^3 & , 3]))]*(x - Root[a0 + a1*#1 + 4*#1^3 & , 1])*((x - Root[a0 + a1*#1
+ 4*#1^3 & , 2])/(Root[a0 + a1*#1 + 4*#1^3 & , 1] - Root[a0 + a1*#1 + 4*#1^3 & ,
 2]))^(2/3)*((x - Root[a0 + a1*#1 + 4*#1^3 & , 3])/(Root[a0 + a1*#1 + 4*#1^3 & ,
 1] - Root[a0 + a1*#1 + 4*#1^3 & , 3]))^(1/3))/(a0 + a1*x + 4*x^3)^(2/3) + (3*Hy
pergeometric2F1[1/3, 2/3, 4/3, ((-Root[a0 + a1*#1 + 4*#1^3 & , 2] + Root[a0 + a1
*#1 + 4*#1^3 & , 3])*(-Root[a0 + a1*#1 + 4*#1^3 & , 1] + y[x]))/((Root[a0 + a1*#
1 + 4*#1^3 & , 1] - Root[a0 + a1*#1 + 4*#1^3 & , 2])*(-Root[a0 + a1*#1 + 4*#1^3
& , 3] + y[x]))]*(-Root[a0 + a1*#1 + 4*#1^3 & , 1] + y[x])*((-Root[a0 + a1*#1 +
4*#1^3 & , 2] + y[x])/(Root[a0 + a1*#1 + 4*#1^3 & , 1] - Root[a0 + a1*#1 + 4*#1^
```

```
3 & , 2]))^(2/3)*((-Root[a0 + a1*#1 + 4*#1^3 & , 3] + y[x])/(Root[a0 + a1*#1 + 4
*#1^3 & , 1] - Root[a0 + a1*#1 + 4*#1^3 & , 3]))^(1/3))/(a0 + a1*y[x] + 4*y[x]^3
)^(2/3) == C[1], y[x]]
```

Maple raw input

```
dsolve(diff(y(x),x)*(4*x^3+a1*x+a0)^(2/3)+(a0+a1*y(x)+4*y(x)^3)^(2/3) = 0, y(x),'implicit')
```

Maple raw output

```
Int(1/(4*x^3+a1*x+a0)^(2/3),x)+Intat(1/(4*_a^3+_a*a1+a0)^(2/3),_a = y(x))+_C1 =
0
```

4.412 $X^{2/3}y'(x) = Y^{2/3}$

ODE

$$X^{2/3}y'(x) = Y^{2/3}$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00294672 (sec), leaf count = 20

$$\left\{\left\{y(x) \to c_1 + \frac{xY^{2/3}}{X^{2/3}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 14

$$\left\{y(x) = xY^{\frac{2}{3}}X^{-\frac{2}{3}} + \_C1\right\}$$

Mathematica raw input

```
DSolve[X^(2/3)*y'[x] == Y^(2/3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*Y^(2/3))/X^(2/3) + C[1]}}
```

Maple raw input

```
dsolve(X^(2/3)*diff(y(x),x) = Y^(2/3), y(x),'implicit')
```

Maple raw output

```
y(x) = Y^(2/3)/X^(2/3)*x+_C1
```

4.413 $\left(a+\cos^2\left(\frac{x}{2}\right)\right)y'(x)=y(x)\tan\left(\frac{x}{2}\right)\left(a-y(x)+\cos^2\left(\frac{x}{2}\right)+1\right)$

ODE

$$\left(a+\cos^2\left(\frac{x}{2}\right)\right)y'(x)=y(x)\tan\left(\frac{x}{2}\right)\left(a-y(x)+\cos^2\left(\frac{x}{2}\right)+1\right)$$

ODE Classification

[_Bernoulli]

Book solution method
Change of Variable, Two new variables

Mathematica ✓
cpu = 0.377655 (sec), leaf count = 63

$$\left\{\left\{y(x)\to\frac{(a+1)(2a+\cos(x)+1)^{\frac{1}{a}}}{(a+1)c_1\cos^{\frac{2}{a}+2}\left(\frac{x}{2}\right)+\sin^2\left(\frac{x}{2}\right)(2a+\cos(x)+1)^{\frac{1}{a}}}\right\}\right\}$$

Maple ✓
cpu = 1.013 (sec), leaf count = 87

$$\left\{(y(x))^{-1}-1\left(\int 1\sqrt[a]{a+\left(\cos\left(\frac{x}{2}\right)\right)^2}\tan\left(\frac{x}{2}\right)\left(\sqrt[a]{\cos\left(\frac{x}{2}\right)}\right)^{-2}\left(\cos\left(\frac{x}{2}\right)\right)^{-2}\left(a+\left(\cos\left(\frac{x}{2}\right)\right)^2\right)^{-1}dx+\_C1\right)\left(\sqrt[a]{\cos(\right.\right.$$

Mathematica raw input

```
DSolve[(a + Cos[x/2]^2)*y'[x] == Tan[x/2]*(1 + a + Cos[x/2]^2 - y[x])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((1 + a)*(1 + 2*a + Cos[x])^a^(-1))/((1 + a)*C[1]*Cos[x/2]^(2 + 2/a) +
  (1 + 2*a + Cos[x])^a^(-1)*Sin[x/2]^2)}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(a+cos(1/2*x)^2) = y(x)*tan(1/2*x)*(1+a+cos(1/2*x)^2-y(x)), y(x),'implicit')
```

Maple raw output

```
1/y(x)-(Int(1/(cos(1/2*x)^(1/a))^2/cos(1/2*x)^2*(a+cos(1/2*x)^2)^(1/a)/(a+cos(1/
2*x)^2)*tan(1/2*x),x)+_C1)*(cos(1/2*x)^(1/a))^2*cos(1/2*x)^2/((a+cos(1/2*x)^2)^(
1/a)) = 0
```

4.414 $(1-4\cos^2(x))\,y'(x) = y(x)\,(4\cos^2(x)+1)\tan(x)$

ODE

$$(1-4\cos^2(x))\,y'(x) = y(x)\,(4\cos^2(x)+1)\tan(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0583134 (sec), leaf count = 18

$$\{\{y(x)\to c_1(2\cos(2x)+1)\sec(x)\}\}$$

Maple ✓
cpu = 0.06 (sec), leaf count = 18

$$\left\{y(x) = \frac{2\_C1\,\cos(2x)+\_C1}{\cos(x)}\right\}$$

Mathematica raw input

```
DSolve[(1 - 4*Cos[x]^2)*y'[x] == (1 + 4*Cos[x]^2)*Tan[x]*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*(1 + 2*Cos[2*x])*Sec[x]}}
```

Maple raw input

```
dsolve((1-4*cos(x)^2)*diff(y(x),x) = tan(x)*(1+4*cos(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (2*_C1*cos(2*x)+_C1)/cos(x)
```

4.415 $(1-\sin(x))y'(x)+y(x)\cos(x)=0$

ODE

$$(1-\sin(x))y'(x)+y(x)\cos(x)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0288154 (sec), leaf count = 13

$$\{\{y(x)\to -c_1(\sin(x)-1)\}\}$$

Maple ✓
cpu = 0.038 (sec), leaf count = 10

$$\{y(x)=\_C1\,(\sin(x)-1)\}$$

Mathematica raw input

```
DSolve[Cos[x]*y[x] + (1 - Sin[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(C[1]*(-1 + Sin[x]))}}
```

Maple raw input

```
dsolve((1-sin(x))*diff(y(x),x)+y(x)*cos(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(sin(x)-1)
```

4.416 $y'(x)(\cos(x)-\sin(x))+y(x)(\sin(x)+\cos(x))=0$

ODE

$$y'(x)(\cos(x)-\sin(x))+y(x)(\sin(x)+\cos(x))=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0266965 (sec), leaf count = 15

$$\{\{y(x)\to c_1(\cos(x)-\sin(x))\}\}$$

Maple ✓
cpu = 0.053 (sec), leaf count = 13

$$\{y(x)=\_C1\,(-\cos(x)+\sin(x))\}$$

Mathematica raw input

```
DSolve[(Cos[x] + Sin[x])*y[x] + (Cos[x] - Sin[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*(Cos[x] - Sin[x])}}
```

Maple raw input

```
dsolve((cos(x)-sin(x))*diff(y(x),x)+y(x)*(cos(x)+sin(x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(-cos(x)+sin(x))
```

4.417 $y'(x)\left(\mathbf{a0}+\mathbf{a1}\sin^2(x)\right)+\mathbf{a2}x(\mathbf{a1}\sin^2(x)+\mathbf{a3})+\mathbf{a1}y(x)\sin(2x)=0$

ODE

$$y'(x)\left(\mathrm{a0}+\mathrm{a1}\sin^2(x)\right)+\mathrm{a2}x\left(\mathrm{a1}\sin^2(x)+\mathrm{a3}\right)+\mathrm{a1}y(x)\sin(2x)=0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.051036 (sec), leaf count = 58

$$\left\{\left\{y(x)\to\frac{-2\mathrm{a1a2}x^2+2\mathrm{a1a2}x\sin(2x)+\mathrm{a1a2}\cos(2x)-4\mathrm{a2a3}x^2+4c_1}{4(2\mathrm{a0}-\mathrm{a1}\cos(2x)+\mathrm{a1})}\right\}\right\}$$

Maple ✓
cpu = 0.06 (sec), leaf count = 52

$$\left\{y(x)=\frac{\cos(2\,x)\,a1\,a2+2\,\sin(2\,x)\,a1\,a2\,x-2\,x^2(a1+2\,a3)\,a2+8\,\_C1}{-4\,a1\,\cos(2\,x)+8\,a0+4\,a1}\right\}$$

Mathematica raw input

```
DSolve[a2*x*(a3 + a1*Sin[x]^2) + a1*Sin[2*x]*y[x] + (a0 + a1*Sin[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*a1*a2*x^2 - 4*a2*a3*x^2 + 4*C[1] + a1*a2*Cos[2*x] + 2*a1*a2*x*Sin[
2*x])/(4*(2*a0 + a1 - a1*Cos[2*x]))}}
```

Maple raw input

```
dsolve((a0+a1*sin(x)^2)*diff(y(x),x)+a2*x*(a3+a1*sin(x)^2)+a1*y(x)*sin(2*x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (cos(2*x)*a1*a2+2*sin(2*x)*a1*a2*x-2*x^2*(a1+2*a3)*a2+8*_C1)/(-4*a1*cos(2
*x)+8*a0+4*a1)
```

4.418 $(x - e^x)\, y'(x) + (1 - e^x)\, y(x) + e^x x = 0$

ODE

$$(x - e^x)\, y'(x) + (1 - e^x)\, y(x) + e^x x = 0$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0159076 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{c_1 + e^x(x-1)}{e^x - x}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 21

$$\left\{y(x) = \frac{(-1+x)\,\mathrm{e}^x + \_C1}{-x + \mathrm{e}^x}\right\}$$

Mathematica raw input

```
DSolve[E^x*x + (1 - E^x)*y[x] + (-E^x + x)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*(-1 + x) + C[1])/(E^x - x)}}
```

Maple raw input

```
dsolve((x-exp(x))*diff(y(x),x)+x*exp(x)+(1-exp(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ((-1+x)*exp(x)+_C1)/(-x+exp(x))
```

4.419 $x \log(x) y'(x) = ax(\log(x)+1) - y(x)$

ODE

$$x \log(x) y'(x) = ax(\log(x)+1) - y(x)$$

ODE Classification

[_linear]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.00652861 (sec), leaf count = 16

$$\left\{\left\{y(x) \to ax + \frac{c_1}{\log(x)}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 14

$$\left\{y(x) = ax + \frac{\_C1}{\ln(x)}\right\}$$

Mathematica raw input

```
DSolve[x*Log[x]*y'[x] == a*x*(1 + Log[x]) - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> a*x + C[1]/Log[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*x*ln(x) = a*x*(1+ln(x))-y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = a*x+1/ln(x)*_C1
```

4.420 $y(x)y'(x) + x = 0$

ODE

$$y(x)y'(x) + x = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00544579 (sec), leaf count = 39

$$\left\{\left\{y(x) \to -\sqrt{2c_1 - x^2}\right\}, \left\{y(x) \to \sqrt{2c_1 - x^2}\right\}\right\}$$

Maple ✓
cpu = 0.004 (sec), leaf count = 14

$$\left\{x^2 + (y(x))^2 - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x + y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-x^2 + 2*C[1]]}, {y[x] -> Sqrt[-x^2 + 2*C[1]]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)+x = 0, y(x),'implicit')
```

Maple raw output

```
x^2+y(x)^2-_C1 = 0
```

4.421 $e^{x^2}x + y(x)y'(x) = 0$

ODE

$$e^{x^2}x + y(x)y'(x) = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00882513 (sec), leaf count = 43

$$\left\{\left\{y(x) \to -\sqrt{2c_1 - e^{x^2}}\right\}, \left\{y(x) \to \sqrt{2c_1 - e^{x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 15

$$\left\{(y(x))^2 + \mathrm{e}^{x^2} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[E^x^2*x + y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-E^x^2 + 2*C[1]]}, {y[x] -> Sqrt[-E^x^2 + 2*C[1]]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)+x*exp(x^2) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+exp(x^2)-_C1 = 0
```

4.422 $x^3 + y(x)y'(x) + y(x) = 0$

ODE

$$x^3 + y(x)y'(x) + y(x) = 0$$

ODE Classification

[_rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Abel ODE, Second kind

Mathematica ✗
cpu = 3.33664 (sec), leaf count = 0 , could not solve

```
DSolve[x^3 + y[x] + y[x]*Derivative[1][y][x] == 0, y[x], x]
```

Maple ✗
cpu = 1.775 (sec), leaf count = 0 , could not solve

```
dsolve(y(x)*diff(y(x),x)+x^3+y(x) = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[x^3 + y[x] + y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[x^3 + y[x] + y[x]*Derivative[1][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)+x^3+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
dsolve(y(x)*diff(y(x),x)+x^3+y(x) = 0, y(x),'implicit')
```

4.423 $ax + by(x) + y(x)y'(x) = 0$

ODE

$$ax + by(x) + y(x)y'(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.138588 (sec), leaf count = 71

$$\text{Solve}\left[\frac{1}{2}\log\left(a + \frac{by(x)}{x} + \frac{y(x)^2}{x^2}\right) + \log(x) = \frac{b\tan^{-1}\left(\frac{b+\frac{2y(x)}{x}}{\sqrt{4a-b^2}}\right)}{\sqrt{4a-b^2}} + c_1, y(x)\right]$$

Maple ✓
cpu = 0.016 (sec), leaf count = 67

$$\left\{-\frac{1}{2}\ln\left(\frac{ax^2 + bxy(x) + (y(x))^2}{x^2}\right) - bArtanh\left(\frac{bx + 2\,y(x)}{x}\frac{1}{\sqrt{b^2 - 4\,a}}\right)\frac{1}{\sqrt{b^2 - 4\,a}} - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[a*x + b*y[x] + y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[Log[x] + Log[a + (b*y[x])/x + y[x]^2/x^2]/2 == (b*ArcTan[(b + (2*y[x])/x)/
Sqrt[4*a - b^2]])/Sqrt[4*a - b^2] + C[1], y[x]]
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)+a*x+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln((a*x^2+b*x*y(x)+y(x)^2)/x^2)-b/(b^2-4*a)^(1/2)*arctanh((b*x+2*y(x))/x/(b
^2-4*a)^(1/2))-ln(x)-_C1 = 0
```

4.424 $y(x)y'(x) + e^{-x}x(y(x)+1) = 0$

ODE

$$y(x)y'(x) + e^{-x}x(y(x)+1) = 0$$

ODE Classification

[_separable]

Book solution method
Linear ODE

Mathematica ✓
cpu = 0.0358439 (sec), leaf count = 32

$$\left\{\left\{y(x) \to -W\left(-e^{-e^{-x}((c_1+1)e^x+x+1)}\right) - 1\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 24

$$\left\{-\ln(1+y(x)) + (-x-1)\,\mathrm{e}^{-x} + \_C1 + y(x) = 0\right\}$$

Mathematica raw input

```
DSolve[(x*(1 + y[x]))/E^x + y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 - ProductLog[-E^(-((1 + x + E^x*(1 + C[1]))/E^x))]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)+x*exp(-x)*(1+y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
-ln(1+y(x))+(-x-1)*exp(-x)+_C1+y(x) = 0
```

4.425 $f(x) + y(x)y'(x) = g(x)y(x)$

ODE

$$f(x) + y(x)y'(x) = g(x)y(x)$$

ODE Classification

[[_Abel, `2nd type`, `class A`]]

Book solution method
Exact equation, integrating factor

Mathematica ✗
cpu = 9.65825 (sec), leaf count = 0 , could not solve

```
DSolve[f[x] + y[x]*Derivative[1][y][x] == g[x]*y[x], y[x], x]
```

Maple ✗
cpu = 0.24 (sec), leaf count = 0 , could not solve

```
dsolve(y(x)*diff(y(x),x)+f(x) = g(x)*y(x), y(x),'implicit')
```

Mathematica raw input

```
DSolve[f[x] + y[x]*y'[x] == g[x]*y[x],y[x],x]
```

Mathematica raw output

```
DSolve[f[x] + y[x]*Derivative[1][y][x] == g[x]*y[x], y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)+f(x) = g(x)*y(x), y(x),'implicit')
```

Maple raw output

```
dsolve(y(x)*diff(y(x),x)+f(x) = g(x)*y(x), y(x),'implicit')
```

4.426 $y(x)y'(x) + y(x)^2 + 4x(x+1) = 0$

ODE

$$y(x)y'(x) + y(x)^2 + 4x(x+1) = 0$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0104468 (sec), leaf count = 47

$$\left\{\left\{y(x) \to -\sqrt{c_1 e^{-2x} - 4x^2}\right\}, \left\{y(x) \to \sqrt{c_1 e^{-2x} - 4x^2}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 20

$$\left\{4x^2 - \mathrm{e}^{-2x} \_C1 + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[4*x*(1 + x) + y[x]^2 + y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-4*x^2 + C[1]/E^(2*x)]}, {y[x] -> Sqrt[-4*x^2 + C[1]/E^(2*x)]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)+4*(1+x)*x+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
4*x^2-exp(-2*x)*_C1+y(x)^2 = 0
```

4.427 $y(x)y'(x) = ax + by(x)^2$

ODE

$$y(x)y'(x) = ax + by(x)^2$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0132547 (sec), leaf count = 77

$$\left\{\left\{y(x) \to -\frac{i\sqrt{a\left(bx+\frac{1}{2}\right)-b^2c_1e^{2bx}}}{b}\right\}, \left\{y(x) \to \frac{i\sqrt{a\left(bx+\frac{1}{2}\right)-b^2c_1e^{2bx}}}{b}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 28

$$\left\{(y(x))^2 + \frac{ax}{b} + \frac{a}{2b^2} - \mathrm{e}^{2bx}\_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x] == a*x + b*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*Sqrt[a*(1/2 + b*x) - b^2*E^(2*b*x)*C[1]])/b}, {y[x] -> (I*Sqrt[a
*(1/2 + b*x) - b^2*E^(2*b*x)*C[1]])/b}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x) = a*x+b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x)^2+1/b*a*x+1/2*a/b^2-exp(2*b*x)*_C1 = 0
```

4.428 $y(x)y'(x) = ay(x)^2 + b\cos(c+x)$

ODE

$$y(x)y'(x) = ay(x)^2 + b\cos(c+x)$$

ODE Classification

[_Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0723789 (sec), leaf count = 106

$$\left\{\left\{y(x) \to -\frac{\sqrt{(4a^2+1)\,c_1 e^{2ax} - 4ab\cos(c+x) + 2b\sin(c+x)}}{\sqrt{4a^2+1}}\right\}, \left\{y(x) \to \frac{\sqrt{(4a^2+1)\,c_1 e^{2ax} - 4ab\cos(c+x) + 2b\sin(c}}{\sqrt{4a^2+1}}\right.\right.$$

Maple ✓
cpu = 0.036 (sec), leaf count = 51

$$\left\{-4\,\mathrm{e}^{2\,ax}\_C1\,a^2 + 4\,a^2(y(x))^2 + 4\,\cos(x+c)\,ab - \mathrm{e}^{2\,ax}\_C1 - 2\,\sin(x+c)\,b + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x] == b*Cos[c + x] + a*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[(1 + 4*a^2)*E^(2*a*x)*C[1] - 4*a*b*Cos[c + x] + 2*b*Sin[c + x]]
/Sqrt[1 + 4*a^2])}, {y[x] -> Sqrt[(1 + 4*a^2)*E^(2*a*x)*C[1] - 4*a*b*Cos[c + x]
+ 2*b*Sin[c + x]]/Sqrt[1 + 4*a^2]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x) = b*cos(x+c)+a*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-4*exp(2*a*x)*_C1*a^2+4*a^2*y(x)^2+4*cos(x+c)*a*b-exp(2*a*x)*_C1-2*sin(x+c)*b+y(
x)^2 = 0
```

4.429 $y(x)y'(x) = \mathbf{a0} + \mathbf{a1}y(x) + \mathbf{a2}y(x)^2$

ODE

$$y(x)y'(x) = \text{a0} + \text{a1}y(x) + \text{a2}y(x)^2$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 0.161276 (sec), leaf count = 71

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{\log(\#1(\#1\text{a2} + \text{a1}) + \text{a0}) - \frac{2\text{a1}\tan^{-1}\left(\frac{2\#1\text{a2}+\text{a1}}{\sqrt{4\text{a0a2}-\text{a1}^2}}\right)}{\sqrt{4\text{a0a2}-\text{a1}^2}}}{2\text{a2}}\&\right][c_1 + x]\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 62

$$\left\{x - \frac{\ln\left(a0 + a1\,y(x) + a2\,(y(x))^2\right)}{2\,a2} + \frac{a1}{a2}\arctan\left((2\,a2\,y(x) + a1)\frac{1}{\sqrt{4\,a0\,a2 - a1^2}}\right)\frac{1}{\sqrt{4\,a0\,a2 - a1^2}} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x] == a0 + a1*y[x] + a2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[((-2*a1*ArcTan[(a1 + 2*a2*#1)/Sqrt[-a1^2 + 4*a0*a2]])/
Sqrt[-a1^2 + 4*a0*a2] + Log[a0 + #1*(a1 + a2*#1)])/(2*a2) & ][x + C[1]]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x) = a0+a1*y(x)+a2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
x-1/2/a2*ln(a0+a1*y(x)+a2*y(x)^2)+a1/a2/(4*a0*a2-a1^2)^(1/2)*arctan((2*a2*y(x)+a
1)/(4*a0*a2-a1^2)^(1/2))+_C1 = 0
```

4.430 $y(x)y'(x) = ax + bxy(x)^2$

ODE

$$y(x)y'(x) = ax + bxy(x)^2$$

ODE Classification

[_separable]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0156785 (sec), leaf count = 62

$$\left\{\left\{y(x) \to -\frac{\sqrt{e^{b(2c_1+x^2)} - a}}{\sqrt{b}}\right\}, \left\{y(x) \to \frac{\sqrt{e^{b(2c_1+x^2)} - a}}{\sqrt{b}}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 22

$$\left\{\frac{a}{b} - \mathrm{e}^{bx^2}\_C1 + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x] == a*x + b*x*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-a + E^(b*(x^2 + 2*C[1]))]/Sqrt[b])}, {y[x] -> Sqrt[-a + E^(b*(
x^2 + 2*C[1]))]/Sqrt[b]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x) = a*x+b*x*y(x)^2, y(x),'implicit')
```

Maple raw output

```
a/b-exp(b*x^2)*_C1+y(x)^2 = 0
```

4.431 $y(x)y'(x) = \csc^2(x) - y(x)^2\cot(x)$

ODE

$$y(x)y'(x) = \csc^2(x) - y(x)^2\cot(x)$$

ODE Classification

[_Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0364509 (sec), leaf count = 36

$$\left\{\left\{y(x) \to -\sqrt{c_1 + 2x}\csc(x)\right\}, \left\{y(x) \to \sqrt{c_1 + 2x}\csc(x)\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 20

$$\left\{(y(x))^2 + \frac{-2x - \_C1}{(\sin(x))^2} = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x] == Csc[x]^2 - Cot[x]*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2*x + C[1]]*Csc[x])}, {y[x] -> Sqrt[2*x + C[1]]*Csc[x]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x) = csc(x)^2-y(x)^2*cot(x), y(x),'implicit')
```

Maple raw output

```
y(x)^2+(-2*x-_C1)/sin(x)^2 = 0
```

4.432 $y(x)y'(x) = \sqrt{a^2 + y(x)^2}$

ODE

$$y(x)y'(x) = \sqrt{a^2 + y(x)^2}$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 0.0143621 (sec), leaf count = 43

$$\left\{\left\{y(x) \to -\sqrt{(c_1 + x)^2 - a^2}\right\}, \left\{y(x) \to \sqrt{(c_1 + x)^2 - a^2}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 18

$$\left\{x - \sqrt{(y(x))^2 + a^2} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x] == Sqrt[a^2 + y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-a^2 + (x + C[1])^2]}, {y[x] -> Sqrt[-a^2 + (x + C[1])^2]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x) = (y(x)^2+a^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
x-(y(x)^2+a^2)^(1/2)+_C1 = 0
```

4.433 $y(x)y'(x) = \sqrt{y(x)^2 - a^2}$

ODE

$$y(x)y'(x) = \sqrt{y(x)^2 - a^2}$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Independent variable missing

Mathematica ✓
cpu = 0.0161185 (sec), leaf count = 39

$$\left\{\left\{y(x) \to -\sqrt{a^2 + (c_1 + x)^2}\right\}, \left\{y(x) \to \sqrt{a^2 + (c_1 + x)^2}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 29

$$\left\{x + (a - y(x))(a + y(x))\frac{1}{\sqrt{(y(x))^2 - a^2}} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x] == Sqrt[-a^2 + y[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[a^2 + (x + C[1])^2]}, {y[x] -> Sqrt[a^2 + (x + C[1])^2]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x) = (y(x)^2-a^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
x+(a-y(x))*(a+y(x))/(y(x)^2-a^2)^(1/2)+_C1 = 0
```

4.434 $g(x)f(x^2+y(x)^2)+y(x)y'(x)+x=0$

ODE

$$g(x)f\left(x^2+y(x)^2\right)+y(x)y'(x)+x=0$$

ODE Classification

[NONE]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 28.2166 (sec), leaf count = 92

$$\text{Solve}\left[c_1=\int_1^{y(x)}\left(\frac{K[2]}{f\left(K[2]^2+x^2\right)}-\int_1^x-\frac{2K[1]K[2]f'\left(K[1]^2+K[2]^2\right)}{f\left(K[1]^2+K[2]^2\right)^2}\,dK[1]\right)dK[2]+\int_1^x\left(\frac{K[1]}{f\left(K[1]^2+y(x)^2\right)}+g(K[1\right.\right.$$

Maple ✓
cpu = 0.125 (sec), leaf count = 30

$$\left\{\int_{\_b}^{y(x)}\frac{\_a}{f\left(\_a^2+x^2\right)}\,\mathrm{d}\_a+\int g(x)\,\mathrm{d}x-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x + f[x^2 + y[x]^2]*g[x] + y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] == Integrate[g[K[1]] + K[1]/f[K[1]^2 + y[x]^2], {K[1], 1, x}] + Integ
rate[-Integrate[(-2*K[1]*K[2]*Derivative[1][f][K[1]^2 + K[2]^2])/f[K[1]^2 + K[2]
^2]^2, {K[1], 1, x}] + K[2]/f[x^2 + K[2]^2], {K[2], 1, y[x]}], y[x]]
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)+x+f(x^2+y(x)^2)*g(x) = 0, y(x),'implicit')
```

Maple raw output

```
Int(1/f(_a^2+x^2)*_a,_a = _b .. y(x))+Int(g(x),x)-_C1 = 0
```

4.435 $(y(x)+1)y'(x) = y(x)+x$

ODE

$$(y(x)+1)y'(x) = y(x)+x$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.134524 (sec), leaf count = 71

$$\text{Solve}\left[\frac{1}{2}\log\left(\frac{x^2-y(x)^2+(x-3)y(x)-x-1}{(x-1)^2}\right)+\log(1-x) = c_1+\frac{\tanh^{-1}\left(\frac{y(x)+2x-1}{\sqrt{5}(y(x)+1)}\right)}{\sqrt{5}}, y(x)\right]$$

Maple ✓
cpu = 0.021 (sec), leaf count = 66

$$\left\{-\frac{1}{2}\ln\left(\frac{(y(x))^2+(3-x)\,y(x)-x^2+x+1}{(-1+x)^2}\right)-\frac{\sqrt{5}}{5}Artanh\left(\frac{(-3+x-2\,y(x))\sqrt{5}}{5\,x-5}\right)-\ln(-1+x)-\_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(1 + y[x])*y'[x] == x + y[x],y[x],x]
```

Mathematica raw output

```
Solve[Log[1 - x] + Log[(-1 - x + x^2 + (-3 + x)*y[x] - y[x]^2)/(-1 + x)^2]/2 ==
ArcTanh[(-1 + 2*x + y[x])/(Sqrt[5]*(1 + y[x]))]/Sqrt[5] + C[1], y[x]]
```

Maple raw input

```
dsolve((1+y(x))*diff(y(x),x) = x+y(x), y(x),'implicit')
```

Maple raw output

```
-1/2*ln((y(x)^2+(3-x)*y(x)-x^2+x+1)/(-1+x)^2)-1/5*5^(1/2)*arctanh((-3+x-2*y(x))*
5^(1/2)/(5*x-5))-ln(-1+x)-_C1 = 0
```

4.436 $(y(x)+1)y'(x) = x^2(1-y(x))$

ODE

$$(y(x)+1)y'(x) = x^2(1-y(x))$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0409178 (sec), leaf count = 61

$$\left\{\left\{y(x) \to 2W\left(-\frac{1}{2}\sqrt{e^{c_1-\frac{x^3}{3}-1}}\right)+1\right\}, \left\{y(x) \to 2W\left(\frac{1}{2}\sqrt{e^{c_1-\frac{x^3}{3}-1}}\right)+1\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 19

$$\left\{\frac{x^3}{3}+y(x)+2\ln(y(x)-1)+\_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(1 + y[x])*y'[x] == x^2*(1 - y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1 + 2*ProductLog[-Sqrt[E^(-1 - x^3/3 + C[1])]/2]}, {y[x] -> 1 + 2*Prod
uctLog[Sqrt[E^(-1 - x^3/3 + C[1])]/2]}}
```

Maple raw input

```
dsolve((1+y(x))*diff(y(x),x) = x^2*(1-y(x)), y(x),'implicit')
```

Maple raw output

```
1/3*x^3+y(x)+2*ln(y(x)-1)+_C1 = 0
```

4.437 $(y(x)+x)y'(x)+y(x)=0$

ODE

$$(y(x)+x)y'(x)+y(x)=0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0217192 (sec), leaf count = 47

$$\left\{\left\{y(x)\to -\sqrt{e^{2c_1}+x^2}-x\right\},\left\{y(x)\to \sqrt{e^{2c_1}+x^2}-x\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 16

$$\left\{x+\frac{y(x)}{2}-\frac{\_C1}{y(x)}=0\right\}$$

Mathematica raw input

```
DSolve[y[x] + (x + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x - Sqrt[E^(2*C[1]) + x^2]}, {y[x] -> -x + Sqrt[E^(2*C[1]) + x^2]}}
```

Maple raw input

```
dsolve((x+y(x))*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x+1/2*y(x)-1/y(x)*_C1 = 0
```

4.438 $(x - y(x))y'(x) = y(x)$

ODE

$$(x - y(x))y'(x) = y(x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0144344 (sec), leaf count = 20

$$\left\{\left\{y(x) \to -\frac{x}{W\left(-e^{-c_1}x\right)}\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 16

$$\{x - (-\ln(y(x)) + \_C1)\, y(x) = 0\}$$

Mathematica raw input

```
DSolve[(x - y[x])*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x/ProductLog[-(x/E^C[1])])}}
```

Maple raw input

```
dsolve((x-y(x))*diff(y(x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
x-(-ln(y(x))+_C1)*y(x) = 0
```

4.439 $(y(x)+x)y'(x)-y(x)+x=0$

ODE

$$(y(x)+x)y'(x)-y(x)+x=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0301354 (sec), leaf count = 31

$$\text{Solve}\left[\frac{1}{2}\log\left(\frac{y(x)^2}{x^2}+1\right)+\tan^{-1}\left(\frac{y(x)}{x}\right)+\log(x)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.013 (sec), leaf count = 35

$$\left\{-\frac{1}{2}\ln\left(\frac{x^2+(y(x))^2}{x^2}\right)-\arctan\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x - y[x] + (x + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[ArcTan[y[x]/x] + Log[x] + Log[1 + y[x]^2/x^2]/2 == C[1], y[x]]
```

Maple raw input

```
dsolve((x+y(x))*diff(y(x),x)+x-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln((x^2+y(x)^2)/x^2)-arctan(y(x)/x)-ln(x)-_C1 = 0
```

4.440 $(y(x)+x)y'(x)=x-y(x)$

ODE

$$(y(x)+x)y'(x)=x-y(x)$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0226282 (sec), leaf count = 51

$$\left\{\left\{y(x)\to -\sqrt{e^{2c_1}+2x^2}-x\right\},\left\{y(x)\to \sqrt{e^{2c_1}+2x^2}-x\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 33

$$\left\{-\frac{1}{2}\ln\left(\frac{-x^2+2\,xy(x)+(y(x))^2}{x^2}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(x + y[x])*y'[x] == x - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x - Sqrt[E^(2*C[1]) + 2*x^2]}, {y[x] -> -x + Sqrt[E^(2*C[1]) + 2*x^2]
}}
```

Maple raw input

```
dsolve((x+y(x))*diff(y(x),x) = x-y(x), y(x),'implicit')
```

Maple raw output

```
-1/2*ln((-x^2+2*x*y(x)+y(x)^2)/x^2)-ln(x)-_C1 = 0
```

4.441 $1 - y'(x) = y(x) + x$

ODE

$$1 - y'(x) = y(x) + x$$

ODE Classification

```
[[_linear, `class A`]]
```

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.00627231 (sec), leaf count = 18

$$\{\{y(x) \to c_1 e^{-x} - x + 2\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 15

$$\{y(x) = -x + 2 + \mathrm{e}^{-x}\_C1\}$$

Mathematica raw input

```
DSolve[1 - y'[x] == x + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2 - x + C[1]/E^x}}
```

Maple raw input

```
dsolve(1-diff(y(x),x) = x+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -x+2+exp(-x)*_C1
```

4.442 $(x - y(x))y'(x) = y(x)(2xy(x) + 1)$

ODE

$$(x - y(x))y'(x) = y(x)(2xy(x) + 1)$$

ODE Classification

[[_homogeneous, `class D`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0192396 (sec), leaf count = 24

$$\left\{\left\{y(x) \to -\frac{x}{W\left(x\left(-e^{x^2-c_1}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 25

$$\left\{-\_C1 + \ln\left(\frac{y(x)}{x}\right) + \frac{x}{y(x)} + x^2 + \ln(x) = 0\right\}$$

Mathematica raw input

```
DSolve[(x - y[x])*y'[x] == y[x]*(1 + 2*x*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x/ProductLog[-(E^(x^2 - C[1])*x)])}}
```

Maple raw input

```
dsolve((x-y(x))*diff(y(x),x) = y(x)*(1+2*x*y(x)), y(x),'implicit')
```

Maple raw output

```
-_C1+ln(y(x)/x)+x/y(x)+x^2+ln(x) = 0
```

4.443 $(y(x)+x)y'(x)+\tan(y(x))=0$

ODE

$$(y(x)+x)y'(x)+\tan(y(x))=0$$

ODE Classification

```
[[_1st_order, `_with_symmetry_[F(x)*G(y),0]`]]
```

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0423392 (sec), leaf count = 17

$$\text{Solve}[y(x)+\cot(y(x))+x=c_1\csc(y(x)),y(x)]$$

Maple ✓
cpu = 0.011 (sec), leaf count = 24

$$\left\{\frac{(x+y(x))\sin(y(x))-\_C1+\cos(y(x))}{\sin(y(x))}=0\right\}$$

Mathematica raw input

```
DSolve[Tan[y[x]] + (x + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[x + Cot[y[x]] + y[x] == C[1]*Csc[y[x]], y[x]]
```

Maple raw input

```
dsolve((x+y(x))*diff(y(x),x)+tan(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
((x+y(x))*sin(y(x))-_C1+cos(y(x)))/sin(y(x)) = 0
```

4.444 $(x-y(x))y'(x) = \left(e^{-\frac{x}{y(x)}}+1\right)y(x)$

ODE

$$(x-y(x))y'(x) = \left(e^{-\frac{x}{y(x)}}+1\right)y(x)$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0376383 (sec), leaf count = 23

$$\left\{\left\{y(x) \to -\frac{x}{W\left(\frac{x}{x-e^{c_1}}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 26

$$\left\{-\_C1 + \ln\left(\frac{1}{x}\left(y(x)\,\mathrm{e}^{\frac{x}{y(x)}}+x\right)\right) + \ln(x) = 0\right\}$$

Mathematica raw input

```
DSolve[(x - y[x])*y'[x] == (1 + E^(-(x/y[x])))*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x/ProductLog[x/(-E^C[1] + x)])}}
```

Maple raw input

```
dsolve((x-y(x))*diff(y(x),x) = (exp(-x/y(x))+1)*y(x), y(x),'implicit')
```

Maple raw output

```
-_C1+ln((y(x)*exp(x/y(x))+x)/x)+ln(x) = 0
```

4.445 $(y(x)+x+1)y'(x)+3y(x)+4x+1=0$

ODE

$$(y(x)+x+1)y'(x)+3y(x)+4x+1=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method

Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓

cpu = 1.66141 (sec), leaf count = 159

$$\text{Solve}\left[\frac{(-2)^{2/3}\left(-2x\log\left(\frac{3(-2)^{2/3}(y(x)+2x-1)}{y(x)+x+1}\right)+(2x-1)\log\left(-\frac{3(-2)^{2/3}(x-2)}{y(x)+x+1}\right)+\log\left(\frac{3(-2)^{2/3}(y(x)+2x-1)}{y(x)+x+1}\right)+y(x)\left(\log\left(-\frac{3}{9(y(x)+2x-1)}\right.\right.\right.\right.$$

Maple ✓

cpu = 0.025 (sec), leaf count = 64

$$\left\{\frac{1}{-1+y(x)+2x}\left((-1+y(x)+2x)\ln\left(\frac{1-y(x)-2x}{x-2}\right)+(-1+y(x)+2x)\ln(x-2)-\_C1\,y(x)+(-2\_C1+1)x+\right.\right.$$

Mathematica raw input

```
DSolve[1 + 4*x + 3*y[x] + (1 + x + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[((-2)^(2/3)*(1 + x + (-1 + 2*x)*Log[(-3*(-2)^(2/3)*(-2 + x))/(1 + x + y[x]
)] + Log[(3*(-2)^(2/3)*(-1 + 2*x + y[x]))/(1 + x + y[x])] - 2*x*Log[(3*(-2)^(2/3
)*(-1 + 2*x + y[x]))/(1 + x + y[x])] + (1 + Log[(-3*(-2)^(2/3)*(-2 + x))/(1 + x
+ y[x])] - Log[(3*(-2)^(2/3)*(-1 + 2*x + y[x]))/(1 + x + y[x])])*y[x]))/(9*(-1 +
 2*x + y[x])) == C[1] + ((-2)^(2/3)*Log[-2 + x])/9, y[x]]
```

Maple raw input

```
dsolve((1+x+y(x))*diff(y(x),x)+1+4*x+3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
((-1+y(x)+2*x)*ln((1-y(x)-2*x)/(x-2))+(-1+y(x)+2*x)*ln(x-2)-_C1*y(x)+(-2*_C1+1)*
x+_C1-2)/(-1+y(x)+2*x) = 0
```

4.446 $(y(x)+x+2)y'(x)=-y(x)-x+1$

ODE

$$(y(x)+x+2)y'(x)=-y(x)-x+1$$

ODE Classification

[[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.00913103 (sec), leaf count = 43

$$\left\{\left\{y(x)\to -\sqrt{c_1+6x+4}-x-2\right\},\left\{y(x)\to \sqrt{c_1+6x+4}-x-2\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 22

$$\left\{\frac{x}{3}-\frac{2\,y(x)}{3}-\frac{(x+y(x))^2}{6}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(2 + x + y[x])*y'[x] == 1 - x - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2 - x - Sqrt[4 + 6*x + C[1]]}, {y[x] -> -2 - x + Sqrt[4 + 6*x + C[1]]
}}
```

Maple raw input

```
dsolve((2+x+y(x))*diff(y(x),x) = 1-x-y(x), y(x),'implicit')
```

Maple raw output

```
1/3*x-2/3*y(x)-1/6*(x+y(x))^2-_C1 = 0
```

4.447 $(-y(x)-x+3)y'(x)=-3y(x)+x+1$

ODE

$$(-y(x)-x+3)y'(x)=-3y(x)+x+1$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method

Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓

cpu = 1.12665 (sec), leaf count = 159

$$\text{Solve}\left[\frac{2^{2/3}\left(x\left(-\log\left(-\frac{3\ 2^{2/3}(-y(x)+x-1)}{y(x)+x-3}\right)\right)+(x-1)\log\left(\frac{6\ 2^{2/3}(x-2)}{y(x)+x-3}\right)+\log\left(-\frac{3\ 2^{2/3}(-y(x)+x-1)}{y(x)+x-3}\right)+y(x)\left(-\log\left(\frac{6\ 2^{2/3}(x-\right.\right.\right.}{9(-y(x)+x-1)}\right.$$

Maple ✓

cpu = 0.023 (sec), leaf count = 61

$$\left\{\frac{1}{x-y\left(x\right)-1}\left(\left(x-y(x)-1\right)\ln\left(\frac{x-y(x)-1}{x-2}\right)+\left(x-y(x)-1\right)\ln\left(x-2\right)+\_C1\,y(x)+\left(-\_C1+2\right)x+\_C1-4\right)=\right.$$

Mathematica raw input

```
DSolve[(3 - x - y[x])*y'[x] == 1 + x - 3*y[x],y[x],x]
```

Mathematica raw output

```
Solve[(2^(2/3)*(3 - x + (-1 + x)*Log[(6*2^(2/3)*(-2 + x))/(-3 + x + y[x])] + Log
[(-3*2^(2/3)*(-1 + x - y[x]))/(-3 + x + y[x])] - x*Log[(-3*2^(2/3)*(-1 + x - y[x
]))/(-3 + x + y[x])] + (-1 - Log[(6*2^(2/3)*(-2 + x))/(-3 + x + y[x])] + Log[(-3
*2^(2/3)*(-1 + x - y[x]))/(-3 + x + y[x])])*y[x]))/(9*(-1 + x - y[x])) == C[1] +
 (2^(2/3)*Log[-2 + x])/9, y[x]]
```

Maple raw input

```
dsolve((3-x-y(x))*diff(y(x),x) = 1+x-3*y(x), y(x),'implicit')
```

Maple raw output

```
((x-y(x)-1)*ln((x-y(x)-1)/(x-2))+(x-y(x)-1)*ln(x-2)+_C1*y(x)+(-_C1+2)*x+_C1-4)/(
x-y(x)-1) = 0
```

4.448 $(y(x)-x+3)y'(x)=3y(x)-4x+11$

ODE

$$(y(x)-x+3)y'(x)=3y(x)-4x+11$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method

Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓

cpu = 1.83105 (sec), leaf count = 179

$$\text{Solve}\left[\frac{(-2)^{2/3}\left(-2x\log\left(\frac{3(-2)^{2/3}(-y(x)+2x-5)}{-y(x)+x-3}\right)+(2x-5)\log\left(-\frac{3(-2)^{2/3}(x-2)}{-y(x)+x-3}\right)+5\log\left(\frac{3(-2)^{2/3}(-y(x)+2x-5)}{-y(x)+x-3}\right)+y(x)\left(-\text{lo}\right.\right.}{9(-y(x)+2x-5)}$$

Maple ✓

cpu = 0.024 (sec), leaf count = 71

$$\left\{\frac{1}{-5-y(x)+2x}\left((-5-y(x)+2x)\ln\left(\frac{-5-y(x)+2x}{x-2}\right)+(-5-y(x)+2x)\ln(x-2)+\_C1\,y(x)+(-2\_C1+1)x\right.\right.$$

Mathematica raw input

```
DSolve[(3 - x + y[x])*y'[x] == 11 - 4*x + 3*y[x],y[x],x]
```

Mathematica raw output

```
Solve[((-2)^(2/3)*(-3 + x + (-5 + 2*x)*Log[(-3*(-2)^(2/3)*(-2 + x))/(-3 + x - y[
x])] + 5*Log[(3*(-2)^(2/3)*(-5 + 2*x - y[x]))/(-3 + x - y[x])] - 2*x*Log[(3*(-2)
^(2/3)*(-5 + 2*x - y[x]))/(-3 + x - y[x])] + (-1 - Log[(-3*(-2)^(2/3)*(-2 + x))/
(-3 + x - y[x])] + Log[(3*(-2)^(2/3)*(-5 + 2*x - y[x]))/(-3 + x - y[x])])*y[x]))
/(9*(-5 + 2*x - y[x])) == C[1] + ((-2)^(2/3)*Log[-2 + x])/9, y[x]]
```

Maple raw input

```
dsolve((3-x+y(x))*diff(y(x),x) = 11-4*x+3*y(x), y(x),'implicit')
```

Maple raw output

```
((-5-y(x)+2*x)*ln((-5-y(x)+2*x)/(x-2))+(-5-y(x)+2*x)*ln(x-2)+_C1*y(x)+(-2*_C1+1)
*x+5*_C1-2)/(-5-y(x)+2*x) = 0
```

4.449 $(y(x)+2x)y'(x)-2y(x)+x=0$

ODE

$$(y(x)+2x)y'(x)-2y(x)+x=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0310198 (sec), leaf count = 33

$$\text{Solve}\left[\log\left(\frac{y(x)^2}{x^2}+1\right)+4\tan^{-1}\left(\frac{y(x)}{x}\right)+2\log(x)=2c_1,y(x)\right]$$

Maple ✓
cpu = 0.012 (sec), leaf count = 35

$$\left\{-\frac{1}{2}\ln\left(\frac{x^2+(y(x))^2}{x^2}\right)-2\arctan\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x - 2*y[x] + (2*x + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[4*ArcTan[y[x]/x] + 2*Log[x] + Log[1 + y[x]^2/x^2] == 2*C[1], y[x]]
```

Maple raw input

```
dsolve((2*x+y(x))*diff(y(x),x)+x-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln((x^2+y(x)^2)/x^2)-2*arctan(y(x)/x)-ln(x)-_C1 = 0
```

4.450 $(-y(x)+2x+2)y'(x)+3(-y(x)+2x+1)=0$

ODE

$$(-y(x)+2x+2)y'(x)+3(-y(x)+2x+1)=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0177299 (sec), leaf count = 30

$$\left\{\left\{y(x)\to -\frac{3}{5}W\left(-e^{c_1+\frac{25x}{3}-1}\right)+2x+\frac{7}{5}\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 26

$$\left\{\frac{3x}{5}-\frac{3\ln(5y(x)-10x-7)}{25}+\frac{y(x)}{5}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[3*(1 + 2*x - y[x]) + (2 + 2*x - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 7/5 + 2*x - (3*ProductLog[-E^(-1 + (25*x)/3 + C[1])])/5}}
```

Maple raw input

```
dsolve((2+2*x-y(x))*diff(y(x),x)+3+6*x-3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
3/5*x-3/25*ln(5*y(x)-10*x-7)+1/5*y(x)-_C1 = 0
```

4.451 $(-y(x)+2x+3)y'(x)+2=0$

ODE

$$(-y(x)+2x+3)y'(x)+2=0$$

ODE Classification

[[_homogeneous, `class C`], [_Abel, `2nd type`, `class C`], _dAlembert]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0198444 (sec), leaf count = 22

$$\left\{\left\{y(x)\to W\left(-2c_1e^{-2(x+2)}\right)+2x+4\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 18

$$\left\{x-\frac{y(x)}{2}+2-\mathrm{e}^{-y(x)}\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2 + (3 + 2*x - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 4 + 2*x + ProductLog[(-2*C[1])/E^(2*(2 + x))]}}
```

Maple raw input

```
dsolve((3+2*x-y(x))*diff(y(x),x)+2 = 0, y(x),'implicit')
```

Maple raw output

```
x-1/2*y(x)+2-exp(-y(x))*_C1 = 0
```

4.452 $(-y(x)+2x+4)y'(x)-2y(x)+x+5=0$

ODE

$$(-y(x)+2x+4)y'(x)-2y(x)+x+5=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.289026 (sec), leaf count = 1601

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{-\cosh\left(\frac{3c_1}{4}\right)x^4-\sinh\left(\frac{3c_1}{4}\right)x^4-4\cosh\left(\frac{3c_1}{4}\right)x^3-4\sinh\left(\frac{3c_1}{4}\right)x^3+2\cosh\left(\frac{3c_1}{8}\right)x^2-6\cosh\left(\frac{3c_1}{4}\right.\right.}\right.$$

Maple ✓
cpu = 0.022 (sec), leaf count = 47

$$\left\{-\frac{3}{2}\ln\left(\frac{1-x-y(x)}{1+x}\right)+\frac{1}{2}\ln\left(\frac{-y(x)+3+x}{1+x}\right)-\ln(1+x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[5 + x - 2*y[x] + (4 + 2*x - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*(2 + x) + (3*(1 + x))/(-1 + (-1 + 2*Cosh[(3*C[1])/8] + 4*x*Cosh[(3*C
[1])/8] + 2*x^2*Cosh[(3*C[1])/8] - Cosh[(3*C[1])/4] - 4*x*Cosh[(3*C[1])/4] - 6*x
^2*Cosh[(3*C[1])/4] - 4*x^3*Cosh[(3*C[1])/4] - x^4*Cosh[(3*C[1])/4] + 2*Sinh[(3*
C[1])/8] + 4*x*Sinh[(3*C[1])/8] + 2*x^2*Sinh[(3*C[1])/8] - Sinh[(3*C[1])/4] - 4*
x*Sinh[(3*C[1])/4] - 6*x^2*Sinh[(3*C[1])/4] - 4*x^3*Sinh[(3*C[1])/4] - x^4*Sinh[
(3*C[1])/4] + Sqrt[(1 + x)^2*(x*(2 + x)*Cosh[(3*C[1])/16] + (2 + 2*x + x^2)*Sinh
```

```
[(3*C[1])/16])^3*(Cosh[(15*C[1])/16] + Sinh[(15*C[1])/16])])^(-1/3) - (-1 + 2*Co
sh[(3*C[1])/8] + 4*x*Cosh[(3*C[1])/8] + 2*x^2*Cosh[(3*C[1])/8] - Cosh[(3*C[1])/4
] - 4*x*Cosh[(3*C[1])/4] - 6*x^2*Cosh[(3*C[1])/4] - 4*x^3*Cosh[(3*C[1])/4] - x^4
*Cosh[(3*C[1])/4] + 2*Sinh[(3*C[1])/8] + 4*x*Sinh[(3*C[1])/8] + 2*x^2*Sinh[(3*C[
1])/8] - Sinh[(3*C[1])/4] - 4*x*Sinh[(3*C[1])/4] - 6*x^2*Sinh[(3*C[1])/4] - 4*x^
3*Sinh[(3*C[1])/4] - x^4*Sinh[(3*C[1])/4] + Sqrt[(1 + x)^2*(x*(2 + x)*Cosh[(3*C[
1])/16] + (2 + 2*x + x^2)*Sinh[(3*C[1])/16])^3*(Cosh[(15*C[1])/16] + Sinh[(15*C[
1])/16])])^(1/3)/(-1 + (1 + x)^2*Cosh[(3*C[1])/8] + (1 + x)^2*Sinh[(3*C[1])/8]))
}, {y[x] -> 2*(2 + x + (3*(1 + x))/(-2 + (-1 - I*Sqrt[3])/(-1 + 2*Cosh[(3*C[1])/
8] + 4*x*Cosh[(3*C[1])/8] + 2*x^2*Cosh[(3*C[1])/8] - Cosh[(3*C[1])/4] - 4*x*Cosh
[(3*C[1])/4] - 6*x^2*Cosh[(3*C[1])/4] - 4*x^3*Cosh[(3*C[1])/4] - x^4*Cosh[(3*C[1
])/4] + 2*Sinh[(3*C[1])/8] + 4*x*Sinh[(3*C[1])/8] + 2*x^2*Sinh[(3*C[1])/8] - Sin
h[(3*C[1])/4] - 4*x*Sinh[(3*C[1])/4] - 6*x^2*Sinh[(3*C[1])/4] - 4*x^3*Sinh[(3*C[
1])/4] - x^4*Sinh[(3*C[1])/4] + Sqrt[(1 + x)^2*(x*(2 + x)*Cosh[(3*C[1])/16] + (2
 + 2*x + x^2)*Sinh[(3*C[1])/16])^3*(Cosh[(15*C[1])/16] + Sinh[(15*C[1])/16])])^(
1/3) + ((1 - I*Sqrt[3])*(-1 + 2*Cosh[(3*C[1])/8] + 4*x*Cosh[(3*C[1])/8] + 2*x^2*
Cosh[(3*C[1])/8] - Cosh[(3*C[1])/4] - 4*x*Cosh[(3*C[1])/4] - 6*x^2*Cosh[(3*C[1])
/4] - 4*x^3*Cosh[(3*C[1])/4] - x^4*Cosh[(3*C[1])/4] + 2*Sinh[(3*C[1])/8] + 4*x*S
inh[(3*C[1])/8] + 2*x^2*Sinh[(3*C[1])/8] - Sinh[(3*C[1])/4] - 4*x*Sinh[(3*C[1])/
4] - 6*x^2*Sinh[(3*C[1])/4] - 4*x^3*Sinh[(3*C[1])/4] - x^4*Sinh[(3*C[1])/4] + Sq
rt[(1 + x)^2*(x*(2 + x)*Cosh[(3*C[1])/16] + (2 + 2*x + x^2)*Sinh[(3*C[1])/16])^3
*(Cosh[(15*C[1])/16] + Sinh[(15*C[1])/16])])^(1/3))/(-1 + (1 + x)^2*Cosh[(3*C[1]
)/8] + (1 + x)^2*Sinh[(3*C[1])/8]))}, {y[x] -> 2*(2 + x + (3*(1 + x))/(-2 + (I*
(I + Sqrt[3]))/(-1 + 2*Cosh[(3*C[1])/8] + 4*x*Cosh[(3*C[1])/8] + 2*x^2*Cosh[(3*C
[1])/8] - Cosh[(3*C[1])/4] - 4*x*Cosh[(3*C[1])/4] - 6*x^2*Cosh[(3*C[1])/4] - 4*x
^3*Cosh[(3*C[1])/4] - x^4*Cosh[(3*C[1])/4] + 2*Sinh[(3*C[1])/8] + 4*x*Sinh[(3*C[
1])/8] + 2*x^2*Sinh[(3*C[1])/8] - Sinh[(3*C[1])/4] - 4*x*Sinh[(3*C[1])/4] - 6*x^
2*Sinh[(3*C[1])/4] - 4*x^3*Sinh[(3*C[1])/4] - x^4*Sinh[(3*C[1])/4] + Sqrt[(1 + x
)^2*(x*(2 + x)*Cosh[(3*C[1])/16] + (2 + 2*x + x^2)*Sinh[(3*C[1])/16])^3*(Cosh[(1
5*C[1])/16] + Sinh[(15*C[1])/16])])^(1/3) + ((1 + I*Sqrt[3])*(-1 + 2*Cosh[(3*C[1
])/8] + 4*x*Cosh[(3*C[1])/8] + 2*x^2*Cosh[(3*C[1])/8] - Cosh[(3*C[1])/4] - 4*x*C
osh[(3*C[1])/4] - 6*x^2*Cosh[(3*C[1])/4] - 4*x^3*Cosh[(3*C[1])/4] - x^4*Cosh[(3*
C[1])/4] + 2*Sinh[(3*C[1])/8] + 4*x*Sinh[(3*C[1])/8] + 2*x^2*Sinh[(3*C[1])/8] -
Sinh[(3*C[1])/4] - 4*x*Sinh[(3*C[1])/4] - 6*x^2*Sinh[(3*C[1])/4] - 4*x^3*Sinh[(3
*C[1])/4] - x^4*Sinh[(3*C[1])/4] + Sqrt[(1 + x)^2*(x*(2 + x)*Cosh[(3*C[1])/16] +
 (2 + 2*x + x^2)*Sinh[(3*C[1])/16])^3*(Cosh[(15*C[1])/16] + Sinh[(15*C[1])/16])]
)^(1/3))/(-1 + (1 + x)^2*Cosh[(3*C[1])/8] + (1 + x)^2*Sinh[(3*C[1])/8]))))}}
```

Maple raw input

```
dsolve((4+2*x-y(x))*diff(y(x),x)+5+x-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-3/2*ln((1-x-y(x))/(1+x))+1/2*ln((-y(x)+3+x)/(1+x))-ln(1+x)-_C1 = 0
```

4.453 $(-y(x)-2x+5)y'(x)-2y(x)-x+4=0$

ODE

$$(-y(x)-2x+5)y'(x)-2y(x)-x+4=0$$

ODE Classification

[[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.00993643 (sec), leaf count = 53

$$\left\{\left\{y(x)\to -\sqrt{c_1+3x^2-12x+25}-2x+5\right\},\left\{y(x)\to \sqrt{c_1+3x^2-12x+25}-2x+5\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 42

$$\left\{-\frac{1}{2}\ln\left(\frac{(y(x))^2+(-10+4x)y(x)+x^2-8x+13}{(x-2)^2}\right)-\ln(x-2)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[4 - x - 2*y[x] + (5 - 2*x - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 5 - 2*x - Sqrt[25 - 12*x + 3*x^2 + C[1]]}, {y[x] -> 5 - 2*x + Sqrt[25
- 12*x + 3*x^2 + C[1]]}}
```

Maple raw input

```
dsolve((5-2*x-y(x))*diff(y(x),x)+4-x-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln((y(x)^2+(-10+4*x)*y(x)+x^2-8*x+13)/(x-2)^2)-ln(x-2)-_C1 = 0
```

4.454 $(y(x)-3x+1)y'(x)=2(x-y(x))$

ODE

$$(y(x)-3x+1)y'(x)=2(x-y(x))$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.35677 (sec), leaf count = 4937

$$\left\{\left\{y(x)\to 3x-\frac{}{\text{Root}\left[\left(65536e^{\frac{24c_1}{25}}x^8-262144e^{\frac{24c_1}{25}}x^7+458752e^{\frac{24c_1}{25}}x^6-458752e^{\frac{24c_1}{25}}x^5+286720e^{\frac{24c_1}{25}}x^4-114688e^{\frac{24c_1}{25}}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.03 (sec), leaf count = 55

$$\left\{\frac{1}{3}\ln\left(\frac{-2\,y(x)+4\,x-1}{-1+2\,x}\right)-\frac{4}{3}\ln\left(\frac{2-2\,y(x)-2\,x}{-1+2\,x}\right)-\ln\left(-1+2\,x\right)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(1 - 3*x + y[x])*y'[x] == 2*(x - y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 + 3*x - Root[E^((24*C[1])/25) + (16*E^((24*C[1])/25) - 32*E^((24*C[
1])/25)*x)*#1 + (112*E^((24*C[1])/25) - 448*E^((24*C[1])/25)*x + 448*E^((24*C[1]
)/25)*x^2)*#1^2 + (448*E^((24*C[1])/25) - 2688*E^((24*C[1])/25)*x + 5376*E^((24*
C[1])/25)*x^2 - 3584*E^((24*C[1])/25)*x^3)*#1^3 + (1120*E^((24*C[1])/25) - 8960*
E^((24*C[1])/25)*x + 26880*E^((24*C[1])/25)*x^2 - 35840*E^((24*C[1])/25)*x^3 + 1
7920*E^((24*C[1])/25)*x^4)*#1^4 + (1792*E^((24*C[1])/25) - 17920*E^((24*C[1])/25
)*x + 71680*E^((24*C[1])/25)*x^2 - 143360*E^((24*C[1])/25)*x^3 + 143360*E^((24*C
[1])/25)*x^4 - 57344*E^((24*C[1])/25)*x^5)*#1^5 + (16 + 1792*E^((24*C[1])/25) -
21504*E^((24*C[1])/25)*x + 107520*E^((24*C[1])/25)*x^2 - 286720*E^((24*C[1])/25)
*x^3 + 430080*E^((24*C[1])/25)*x^4 - 344064*E^((24*C[1])/25)*x^5 + 114688*E^((24
*C[1])/25)*x^6)*#1^6 + (16 + 1024*E^((24*C[1])/25) - 32*x - 14336*E^((24*C[1])/2
5)*x + 86016*E^((24*C[1])/25)*x^2 - 286720*E^((24*C[1])/25)*x^3 + 573440*E^((24*
C[1])/25)*x^4 - 688128*E^((24*C[1])/25)*x^5 + 458752*E^((24*C[1])/25)*x^6 - 1310
72*E^((24*C[1])/25)*x^7)*#1^7 + (4 + 256*E^((24*C[1])/25) - 16*x - 4096*E^((24*C
```

```
[1])/25)*x + 16*x^2 + 28672*E^((24*C[1])/25)*x^2 - 114688*E^((24*C[1])/25)*x^3 +
 286720*E^((24*C[1])/25)*x^4 - 458752*E^((24*C[1])/25)*x^5 + 458752*E^((24*C[1])
/25)*x^6 - 262144*E^((24*C[1])/25)*x^7 + 65536*E^((24*C[1])/25)*x^8)*#1^8 & , 1]
^(-1)}, {y[x] -> -1 + 3*x - Root[E^((24*C[1])/25) + (16*E^((24*C[1])/25) - 32*E^
((24*C[1])/25)*x)*#1 + (112*E^((24*C[1])/25) - 448*E^((24*C[1])/25)*x + 448*E^((
24*C[1])/25)*x^2)*#1^2 + (448*E^((24*C[1])/25) - 2688*E^((24*C[1])/25)*x + 5376*
E^((24*C[1])/25)*x^2 - 3584*E^((24*C[1])/25)*x^3)*#1^3 + (1120*E^((24*C[1])/25)
- 8960*E^((24*C[1])/25)*x + 26880*E^((24*C[1])/25)*x^2 - 35840*E^((24*C[1])/25)*
x^3 + 17920*E^((24*C[1])/25)*x^4)*#1^4 + (1792*E^((24*C[1])/25) - 17920*E^((24*C
[1])/25)*x + 71680*E^((24*C[1])/25)*x^2 - 143360*E^((24*C[1])/25)*x^3 + 143360*E
^((24*C[1])/25)*x^4 - 57344*E^((24*C[1])/25)*x^5)*#1^5 + (16 + 1792*E^((24*C[1])
/25) - 21504*E^((24*C[1])/25)*x + 107520*E^((24*C[1])/25)*x^2 - 286720*E^((24*C[
1])/25)*x^3 + 430080*E^((24*C[1])/25)*x^4 - 344064*E^((24*C[1])/25)*x^5 + 114688
*E^((24*C[1])/25)*x^6)*#1^6 + (16 + 1024*E^((24*C[1])/25) - 32*x - 14336*E^((24*
C[1])/25)*x + 86016*E^((24*C[1])/25)*x^2 - 286720*E^((24*C[1])/25)*x^3 + 573440*
E^((24*C[1])/25)*x^4 - 688128*E^((24*C[1])/25)*x^5 + 458752*E^((24*C[1])/25)*x^6
 - 131072*E^((24*C[1])/25)*x^7)*#1^7 + (4 + 256*E^((24*C[1])/25) - 16*x - 4096*E
^((24*C[1])/25)*x + 16*x^2 + 28672*E^((24*C[1])/25)*x^2 - 114688*E^((24*C[1])/25
)*x^3 + 286720*E^((24*C[1])/25)*x^4 - 458752*E^((24*C[1])/25)*x^5 + 458752*E^((2
4*C[1])/25)*x^6 - 262144*E^((24*C[1])/25)*x^7 + 65536*E^((24*C[1])/25)*x^8)*#1^8
 & , 2]^(-1)}, {y[x] -> -1 + 3*x - Root[E^((24*C[1])/25) + (16*E^((24*C[1])/25)
- 32*E^((24*C[1])/25)*x)*#1 + (112*E^((24*C[1])/25) - 448*E^((24*C[1])/25)*x + 4
48*E^((24*C[1])/25)*x^2)*#1^2 + (448*E^((24*C[1])/25) - 2688*E^((24*C[1])/25)*x
+ 5376*E^((24*C[1])/25)*x^2 - 3584*E^((24*C[1])/25)*x^3)*#1^3 + (1120*E^((24*C[1
])/25) - 8960*E^((24*C[1])/25)*x + 26880*E^((24*C[1])/25)*x^2 - 35840*E^((24*C[1
])/25)*x^3 + 17920*E^((24*C[1])/25)*x^4)*#1^4 + (1792*E^((24*C[1])/25) - 17920*E
^((24*C[1])/25)*x + 71680*E^((24*C[1])/25)*x^2 - 143360*E^((24*C[1])/25)*x^3 + 1
43360*E^((24*C[1])/25)*x^4 - 57344*E^((24*C[1])/25)*x^5)*#1^5 + (16 + 1792*E^((2
4*C[1])/25) - 21504*E^((24*C[1])/25)*x + 107520*E^((24*C[1])/25)*x^2 - 286720*E^
((24*C[1])/25)*x^3 + 430080*E^((24*C[1])/25)*x^4 - 344064*E^((24*C[1])/25)*x^5 +
 114688*E^((24*C[1])/25)*x^6)*#1^6 + (16 + 1024*E^((24*C[1])/25) - 32*x - 14336*
E^((24*C[1])/25)*x + 86016*E^((24*C[1])/25)*x^2 - 286720*E^((24*C[1])/25)*x^3 +
573440*E^((24*C[1])/25)*x^4 - 688128*E^((24*C[1])/25)*x^5 + 458752*E^((24*C[1])/
25)*x^6 - 131072*E^((24*C[1])/25)*x^7)*#1^7 + (4 + 256*E^((24*C[1])/25) - 16*x -
 4096*E^((24*C[1])/25)*x + 16*x^2 + 28672*E^((24*C[1])/25)*x^2 - 114688*E^((24*C
[1])/25)*x^3 + 286720*E^((24*C[1])/25)*x^4 - 458752*E^((24*C[1])/25)*x^5 + 45875
2*E^((24*C[1])/25)*x^6 - 262144*E^((24*C[1])/25)*x^7 + 65536*E^((24*C[1])/25)*x^
8)*#1^8 & , 3]^(-1)}, {y[x] -> -1 + 3*x - Root[E^((24*C[1])/25) + (16*E^((24*C[1
])/25) - 32*E^((24*C[1])/25)*x)*#1 + (112*E^((24*C[1])/25) - 448*E^((24*C[1])/25
)*x + 448*E^((24*C[1])/25)*x^2)*#1^2 + (448*E^((24*C[1])/25) - 2688*E^((24*C[1])
/25)*x + 5376*E^((24*C[1])/25)*x^2 - 3584*E^((24*C[1])/25)*x^3)*#1^3 + (1120*E^(
(24*C[1])/25) - 8960*E^((24*C[1])/25)*x + 26880*E^((24*C[1])/25)*x^2 - 35840*E^(
(24*C[1])/25)*x^3 + 17920*E^((24*C[1])/25)*x^4)*#1^4 + (1792*E^((24*C[1])/25) -
17920*E^((24*C[1])/25)*x + 71680*E^((24*C[1])/25)*x^2 - 143360*E^((24*C[1])/25)*
x^3 + 143360*E^((24*C[1])/25)*x^4 - 57344*E^((24*C[1])/25)*x^5)*#1^5 + (16 + 179
2*E^((24*C[1])/25) - 21504*E^((24*C[1])/25)*x + 107520*E^((24*C[1])/25)*x^2 - 28
6720*E^((24*C[1])/25)*x^3 + 430080*E^((24*C[1])/25)*x^4 - 344064*E^((24*C[1])/25
```

```
)*x^5 + 114688*E^((24*C[1])/25)*x^6)*#1^6 + (16 + 1024*E^((24*C[1])/25) - 32*x -
 14336*E^((24*C[1])/25)*x + 86016*E^((24*C[1])/25)*x^2 - 286720*E^((24*C[1])/25)
*x^3 + 573440*E^((24*C[1])/25)*x^4 - 688128*E^((24*C[1])/25)*x^5 + 458752*E^((24
*C[1])/25)*x^6 - 131072*E^((24*C[1])/25)*x^7)*#1^7 + (4 + 256*E^((24*C[1])/25) -
 16*x - 4096*E^((24*C[1])/25)*x + 16*x^2 + 28672*E^((24*C[1])/25)*x^2 - 114688*E
^((24*C[1])/25)*x^3 + 286720*E^((24*C[1])/25)*x^4 - 458752*E^((24*C[1])/25)*x^5
+ 458752*E^((24*C[1])/25)*x^6 - 262144*E^((24*C[1])/25)*x^7 + 65536*E^((24*C[1])
/25)*x^8)*#1^8 & , 4]^(-1)}, {y[x] -> -1 + 3*x - Root[E^((24*C[1])/25) + (16*E^(
(24*C[1])/25) - 32*E^((24*C[1])/25)*x)*#1 + (112*E^((24*C[1])/25) - 448*E^((24*C
[1])/25)*x + 448*E^((24*C[1])/25)*x^2)*#1^2 + (448*E^((24*C[1])/25) - 2688*E^((2
4*C[1])/25)*x + 5376*E^((24*C[1])/25)*x^2 - 3584*E^((24*C[1])/25)*x^3)*#1^3 + (1
120*E^((24*C[1])/25) - 8960*E^((24*C[1])/25)*x + 26880*E^((24*C[1])/25)*x^2 - 35
840*E^((24*C[1])/25)*x^3 + 17920*E^((24*C[1])/25)*x^4)*#1^4 + (1792*E^((24*C[1])
/25) - 17920*E^((24*C[1])/25)*x + 71680*E^((24*C[1])/25)*x^2 - 143360*E^((24*C[1
])/25)*x^3 + 143360*E^((24*C[1])/25)*x^4 - 57344*E^((24*C[1])/25)*x^5)*#1^5 + (1
6 + 1792*E^((24*C[1])/25) - 21504*E^((24*C[1])/25)*x + 107520*E^((24*C[1])/25)*x
^2 - 286720*E^((24*C[1])/25)*x^3 + 430080*E^((24*C[1])/25)*x^4 - 344064*E^((24*C
[1])/25)*x^5 + 114688*E^((24*C[1])/25)*x^6)*#1^6 + (16 + 1024*E^((24*C[1])/25) -
 32*x - 14336*E^((24*C[1])/25)*x + 86016*E^((24*C[1])/25)*x^2 - 286720*E^((24*C[
1])/25)*x^3 + 573440*E^((24*C[1])/25)*x^4 - 688128*E^((24*C[1])/25)*x^5 + 458752
*E^((24*C[1])/25)*x^6 - 131072*E^((24*C[1])/25)*x^7)*#1^7 + (4 + 256*E^((24*C[1]
)/25) - 16*x - 4096*E^((24*C[1])/25)*x + 16*x^2 + 28672*E^((24*C[1])/25)*x^2 - 1
14688*E^((24*C[1])/25)*x^3 + 286720*E^((24*C[1])/25)*x^4 - 458752*E^((24*C[1])/2
5)*x^5 + 458752*E^((24*C[1])/25)*x^6 - 262144*E^((24*C[1])/25)*x^7 + 65536*E^((2
4*C[1])/25)*x^8)*#1^8 & , 5]^(-1)}, {y[x] -> -1 + 3*x - Root[E^((24*C[1])/25) +
(16*E^((24*C[1])/25) - 32*E^((24*C[1])/25)*x)*#1 + (112*E^((24*C[1])/25) - 448*E
^((24*C[1])/25)*x + 448*E^((24*C[1])/25)*x^2)*#1^2 + (448*E^((24*C[1])/25) - 268
8*E^((24*C[1])/25)*x + 5376*E^((24*C[1])/25)*x^2 - 3584*E^((24*C[1])/25)*x^3)*#1
^3 + (1120*E^((24*C[1])/25) - 8960*E^((24*C[1])/25)*x + 26880*E^((24*C[1])/25)*x
^2 - 35840*E^((24*C[1])/25)*x^3 + 17920*E^((24*C[1])/25)*x^4)*#1^4 + (1792*E^((2
4*C[1])/25) - 17920*E^((24*C[1])/25)*x + 71680*E^((24*C[1])/25)*x^2 - 143360*E^(
(24*C[1])/25)*x^3 + 143360*E^((24*C[1])/25)*x^4 - 57344*E^((24*C[1])/25)*x^5)*#1
^5 + (16 + 1792*E^((24*C[1])/25) - 21504*E^((24*C[1])/25)*x + 107520*E^((24*C[1]
)/25)*x^2 - 286720*E^((24*C[1])/25)*x^3 + 430080*E^((24*C[1])/25)*x^4 - 344064*E
^((24*C[1])/25)*x^5 + 114688*E^((24*C[1])/25)*x^6)*#1^6 + (16 + 1024*E^((24*C[1]
)/25) - 32*x - 14336*E^((24*C[1])/25)*x + 86016*E^((24*C[1])/25)*x^2 - 286720*E^
((24*C[1])/25)*x^3 + 573440*E^((24*C[1])/25)*x^4 - 688128*E^((24*C[1])/25)*x^5 +
 458752*E^((24*C[1])/25)*x^6 - 131072*E^((24*C[1])/25)*x^7)*#1^7 + (4 + 256*E^((
24*C[1])/25) - 16*x - 4096*E^((24*C[1])/25)*x + 16*x^2 + 28672*E^((24*C[1])/25)*
x^2 - 114688*E^((24*C[1])/25)*x^3 + 286720*E^((24*C[1])/25)*x^4 - 458752*E^((24*
C[1])/25)*x^5 + 458752*E^((24*C[1])/25)*x^6 - 262144*E^((24*C[1])/25)*x^7 + 6553
6*E^((24*C[1])/25)*x^8)*#1^8 & , 6]^(-1)}, {y[x] -> -1 + 3*x - Root[E^((24*C[1])
/25) + (16*E^((24*C[1])/25) - 32*E^((24*C[1])/25)*x)*#1 + (112*E^((24*C[1])/25)
- 448*E^((24*C[1])/25)*x + 448*E^((24*C[1])/25)*x^2)*#1^2 + (448*E^((24*C[1])/25
) - 2688*E^((24*C[1])/25)*x + 5376*E^((24*C[1])/25)*x^2 - 3584*E^((24*C[1])/25)*
x^3)*#1^3 + (1120*E^((24*C[1])/25) - 8960*E^((24*C[1])/25)*x + 26880*E^((24*C[1]
)/25)*x^2 - 35840*E^((24*C[1])/25)*x^3 + 17920*E^((24*C[1])/25)*x^4)*#1^4 + (179
```

```
2*E^((24*C[1])/25) - 17920*E^((24*C[1])/25)*x + 71680*E^((24*C[1])/25)*x^2 - 143
360*E^((24*C[1])/25)*x^3 + 143360*E^((24*C[1])/25)*x^4 - 57344*E^((24*C[1])/25)*
x^5)*#1^5 + (16 + 1792*E^((24*C[1])/25) - 21504*E^((24*C[1])/25)*x + 107520*E^((
24*C[1])/25)*x^2 - 286720*E^((24*C[1])/25)*x^3 + 430080*E^((24*C[1])/25)*x^4 - 3
44064*E^((24*C[1])/25)*x^5 + 114688*E^((24*C[1])/25)*x^6)*#1^6 + (16 + 1024*E^((
24*C[1])/25) - 32*x - 14336*E^((24*C[1])/25)*x + 86016*E^((24*C[1])/25)*x^2 - 28
6720*E^((24*C[1])/25)*x^3 + 573440*E^((24*C[1])/25)*x^4 - 688128*E^((24*C[1])/25
)*x^5 + 458752*E^((24*C[1])/25)*x^6 - 131072*E^((24*C[1])/25)*x^7)*#1^7 + (4 + 2
56*E^((24*C[1])/25) - 16*x - 4096*E^((24*C[1])/25)*x + 16*x^2 + 28672*E^((24*C[1
])/25)*x^2 - 114688*E^((24*C[1])/25)*x^3 + 286720*E^((24*C[1])/25)*x^4 - 458752*
E^((24*C[1])/25)*x^5 + 458752*E^((24*C[1])/25)*x^6 - 262144*E^((24*C[1])/25)*x^7
 + 65536*E^((24*C[1])/25)*x^8)*#1^8 & , 7]^(-1)}, {y[x] -> -1 + 3*x - Root[E^((2
4*C[1])/25) + (16*E^((24*C[1])/25) - 32*E^((24*C[1])/25)*x)*#1 + (112*E^((24*C[1
])/25) - 448*E^((24*C[1])/25)*x + 448*E^((24*C[1])/25)*x^2)*#1^2 + (448*E^((24*C
[1])/25) - 2688*E^((24*C[1])/25)*x + 5376*E^((24*C[1])/25)*x^2 - 3584*E^((24*C[1
])/25)*x^3)*#1^3 + (1120*E^((24*C[1])/25) - 8960*E^((24*C[1])/25)*x + 26880*E^((
24*C[1])/25)*x^2 - 35840*E^((24*C[1])/25)*x^3 + 17920*E^((24*C[1])/25)*x^4)*#1^4
 + (1792*E^((24*C[1])/25) - 17920*E^((24*C[1])/25)*x + 71680*E^((24*C[1])/25)*x^
2 - 143360*E^((24*C[1])/25)*x^3 + 143360*E^((24*C[1])/25)*x^4 - 57344*E^((24*C[1
])/25)*x^5)*#1^5 + (16 + 1792*E^((24*C[1])/25) - 21504*E^((24*C[1])/25)*x + 1075
20*E^((24*C[1])/25)*x^2 - 286720*E^((24*C[1])/25)*x^3 + 430080*E^((24*C[1])/25)*
x^4 - 344064*E^((24*C[1])/25)*x^5 + 114688*E^((24*C[1])/25)*x^6)*#1^6 + (16 + 10
24*E^((24*C[1])/25) - 32*x - 14336*E^((24*C[1])/25)*x + 86016*E^((24*C[1])/25)*x
^2 - 286720*E^((24*C[1])/25)*x^3 + 573440*E^((24*C[1])/25)*x^4 - 688128*E^((24*C
[1])/25)*x^5 + 458752*E^((24*C[1])/25)*x^6 - 131072*E^((24*C[1])/25)*x^7)*#1^7 +
 (4 + 256*E^((24*C[1])/25) - 16*x - 4096*E^((24*C[1])/25)*x + 16*x^2 + 28672*E^(
(24*C[1])/25)*x^2 - 114688*E^((24*C[1])/25)*x^3 + 286720*E^((24*C[1])/25)*x^4 -
458752*E^((24*C[1])/25)*x^5 + 458752*E^((24*C[1])/25)*x^6 - 262144*E^((24*C[1])/
25)*x^7 + 65536*E^((24*C[1])/25)*x^8)*#1^8 & , 8]^(-1)}}
```

Maple raw input

```
dsolve((1-3*x+y(x))*diff(y(x),x) = 2*x-2*y(x), y(x),'implicit')
```

Maple raw output

```
1/3*ln((-2*y(x)+4*x-1)/(-1+2*x))-4/3*ln((2-2*y(x)-2*x)/(-1+2*x))-ln(-1+2*x)-_C1
= 0
```

4.455 $(y(x)-3x+2)y'(x)-3y(x)-2x+5=0$

ODE

$$(y(x)-3x+2)y'(x)-3y(x)-2x+5=0$$

ODE Classification

[[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0118295 (sec), leaf count = 63

$$\left\{\left\{y(x)\to -i\sqrt{-c_1-11x^2+22x-4}+3x-2\right\},\left\{y(x)\to i\sqrt{-c_1-11x^2+22x-4}+3x-2\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 44

$$\left\{-\frac{1}{2}\ln\left(\frac{(y(x))^2+(-6x+4)y(x)-2x^2+10x-7}{(-1+x)^2}\right)-\ln(-1+x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[5 - 2*x - 3*y[x] + (2 - 3*x + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2 + 3*x - I*Sqrt[-4 + 22*x - 11*x^2 - C[1]]}, {y[x] -> -2 + 3*x + I*S
qrt[-4 + 22*x - 11*x^2 - C[1]]}}
```

Maple raw input

```
dsolve((2-3*x+y(x))*diff(y(x),x)+5-2*x-3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln((y(x)^2+(-6*x+4)*y(x)-2*x^2+10*x-7)/(-1+x)^2)-ln(-1+x)-_C1 = 0
```

4.456 $(4x - y(x))y'(x) - 5y(x) + 2x = 0$

ODE

$$(4x - y(x))y'(x) - 5y(x) + 2x = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0349802 (sec), leaf count = 80

$$\left\{\left\{y(x) \to \frac{1}{2}\left(-e^{\frac{c_1}{2}}\sqrt{e^{c_1} + 12x} - e^{c_1} - 4x\right)\right\}, \left\{y(x) \to \frac{1}{2}\left(e^{\frac{c_1}{2}}\sqrt{e^{c_1} + 12x} - e^{c_1} - 4x\right)\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 35

$$\left\{-2\ln\left(\frac{2x + y(x)}{x}\right) + \ln\left(\frac{y(x) - x}{x}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[2*x - 5*y[x] + (4*x - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-E^C[1] - 4*x - E^(C[1]/2)*Sqrt[E^C[1] + 12*x])/2}, {y[x] -> (-E^C[1]
 - 4*x + E^(C[1]/2)*Sqrt[E^C[1] + 12*x])/2}}
```

Maple raw input

```
dsolve((4*x-y(x))*diff(y(x),x)+2*x-5*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-2*ln((2*x+y(x))/x)+ln((y(x)-x)/x)-ln(x)-_C1 = 0
```

4.457 $(-y(x)-4x+6)y'(x)=2x-y(x)$

ODE

$$(-y(x)-4x+6)y'(x)=2x-y(x)$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.19625 (sec), leaf count = 2563

$$\left\{\left\{y(x)\to -4x+\frac{}{\text{Root}\left[\left(11664e^{\frac{12c_1}{25}}x^6-69984e^{\frac{12c_1}{25}}x^5+174960e^{\frac{12c_1}{25}}x^4+11664x^4-233280e^{\frac{12c_1}{25}}x^3-46656x^3+174960\right.\right.\right.\right.$$

Maple ✓
cpu = 0.029 (sec), leaf count = 49

$$\left\{-3\ln\left(\frac{3-x-y(x)}{-1+x}\right)+2\ln\left(\frac{-y(x)+4-2x}{-1+x}\right)-\ln(-1+x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(6 - 4*x - y[x])*y'[x] == 2*x - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 6 - 4*x + Root[16*E^((12*C[1])/25) + (288*E^((12*C[1])/25) - 288*E^((1
2*C[1])/25)*x)*#1 + (729 + 2160*E^((12*C[1])/25) - 4320*E^((12*C[1])/25)*x + 216
0*E^((12*C[1])/25)*x^2)*#1^2 + (5832 + 8640*E^((12*C[1])/25) - 5832*x - 25920*E^
((12*C[1])/25)*x + 25920*E^((12*C[1])/25)*x^2 - 8640*E^((12*C[1])/25)*x^3)*#1^3
+ (17496 + 19440*E^((12*C[1])/25) - 34992*x - 77760*E^((12*C[1])/25)*x + 17496*x
^2 + 116640*E^((12*C[1])/25)*x^2 - 77760*E^((12*C[1])/25)*x^3 + 19440*E^((12*C[1
])/25)*x^4)*#1^4 + (23328 + 23328*E^((12*C[1])/25) - 69984*x - 116640*E^((12*C[1
])/25)*x + 69984*x^2 + 233280*E^((12*C[1])/25)*x^2 - 23328*x^3 - 233280*E^((12*C
[1])/25)*x^3 + 116640*E^((12*C[1])/25)*x^4 - 23328*E^((12*C[1])/25)*x^5)*#1^5 +
(11664 + 11664*E^((12*C[1])/25) - 46656*x - 69984*E^((12*C[1])/25)*x + 69984*x^2
 + 174960*E^((12*C[1])/25)*x^2 - 46656*x^3 - 233280*E^((12*C[1])/25)*x^3 + 11664
*x^4 + 174960*E^((12*C[1])/25)*x^4 - 69984*E^((12*C[1])/25)*x^5 + 11664*E^((12*C
[1])/25)*x^6)*#1^6 & , 1]^(-1)}, {y[x] -> 6 - 4*x + Root[16*E^((12*C[1])/25) + (
288*E^((12*C[1])/25) - 288*E^((12*C[1])/25)*x)*#1 + (729 + 2160*E^((12*C[1])/25)
```

```
 - 4320*E^((12*C[1])/25)*x + 2160*E^((12*C[1])/25)*x^2)*#1^2 + (5832 + 8640*E^((
12*C[1])/25) - 5832*x - 25920*E^((12*C[1])/25)*x + 25920*E^((12*C[1])/25)*x^2 -
8640*E^((12*C[1])/25)*x^3)*#1^3 + (17496 + 19440*E^((12*C[1])/25) - 34992*x - 77
760*E^((12*C[1])/25)*x + 17496*x^2 + 116640*E^((12*C[1])/25)*x^2 - 77760*E^((12*
C[1])/25)*x^3 + 19440*E^((12*C[1])/25)*x^4)*#1^4 + (23328 + 23328*E^((12*C[1])/2
5) - 69984*x - 116640*E^((12*C[1])/25)*x + 69984*x^2 + 233280*E^((12*C[1])/25)*x
^2 - 23328*x^3 - 233280*E^((12*C[1])/25)*x^3 + 116640*E^((12*C[1])/25)*x^4 - 233
28*E^((12*C[1])/25)*x^5)*#1^5 + (11664 + 11664*E^((12*C[1])/25) - 46656*x - 6998
4*E^((12*C[1])/25)*x + 69984*x^2 + 174960*E^((12*C[1])/25)*x^2 - 46656*x^3 - 233
280*E^((12*C[1])/25)*x^3 + 11664*x^4 + 174960*E^((12*C[1])/25)*x^4 - 69984*E^((1
2*C[1])/25)*x^5 + 11664*E^((12*C[1])/25)*x^6)*#1^6 & , 2]^(-1)}, {y[x] -> 6 - 4*
x + Root[16*E^((12*C[1])/25) + (288*E^((12*C[1])/25) - 288*E^((12*C[1])/25)*x)*#
1 + (729 + 2160*E^((12*C[1])/25) - 4320*E^((12*C[1])/25)*x + 2160*E^((12*C[1])/2
5)*x^2)*#1^2 + (5832 + 8640*E^((12*C[1])/25) - 5832*x - 25920*E^((12*C[1])/25)*x
 + 25920*E^((12*C[1])/25)*x^2 - 8640*E^((12*C[1])/25)*x^3)*#1^3 + (17496 + 19440
*E^((12*C[1])/25) - 34992*x - 77760*E^((12*C[1])/25)*x + 17496*x^2 + 116640*E^((
12*C[1])/25)*x^2 - 77760*E^((12*C[1])/25)*x^3 + 19440*E^((12*C[1])/25)*x^4)*#1^4
 + (23328 + 23328*E^((12*C[1])/25) - 69984*x - 116640*E^((12*C[1])/25)*x + 69984
*x^2 + 233280*E^((12*C[1])/25)*x^2 - 23328*x^3 - 233280*E^((12*C[1])/25)*x^3 + 1
16640*E^((12*C[1])/25)*x^4 - 23328*E^((12*C[1])/25)*x^5)*#1^5 + (11664 + 11664*E
^((12*C[1])/25) - 46656*x - 69984*E^((12*C[1])/25)*x + 69984*x^2 + 174960*E^((12
*C[1])/25)*x^2 - 46656*x^3 - 233280*E^((12*C[1])/25)*x^3 + 11664*x^4 + 174960*E^
((12*C[1])/25)*x^4 - 69984*E^((12*C[1])/25)*x^5 + 11664*E^((12*C[1])/25)*x^6)*#1
^6 & , 3]^(-1)}, {y[x] -> 6 - 4*x + Root[16*E^((12*C[1])/25) + (288*E^((12*C[1])
/25) - 288*E^((12*C[1])/25)*x)*#1 + (729 + 2160*E^((12*C[1])/25) - 4320*E^((12*C
[1])/25)*x + 2160*E^((12*C[1])/25)*x^2)*#1^2 + (5832 + 8640*E^((12*C[1])/25) - 5
832*x - 25920*E^((12*C[1])/25)*x + 25920*E^((12*C[1])/25)*x^2 - 8640*E^((12*C[1]
])/25)*x^3)*#1^3 + (17496 + 19440*E^((12*C[1])/25) - 34992*x - 77760*E^((12*C[1])
/25)*x + 17496*x^2 + 116640*E^((12*C[1])/25)*x^2 - 77760*E^((12*C[1])/25)*x^3 +
19440*E^((12*C[1])/25)*x^4)*#1^4 + (23328 + 23328*E^((12*C[1])/25) - 69984*x - 1
16640*E^((12*C[1])/25)*x + 69984*x^2 + 233280*E^((12*C[1])/25)*x^2 - 23328*x^3 -
 233280*E^((12*C[1])/25)*x^3 + 116640*E^((12*C[1])/25)*x^4 - 23328*E^((12*C[1])/
25)*x^5)*#1^5 + (11664 + 11664*E^((12*C[1])/25) - 46656*x - 69984*E^((12*C[1])/2
5)*x + 69984*x^2 + 174960*E^((12*C[1])/25)*x^2 - 46656*x^3 - 233280*E^((12*C[1])
/25)*x^3 + 11664*x^4 + 174960*E^((12*C[1])/25)*x^4 - 69984*E^((12*C[1])/25)*x^5
+ 11664*E^((12*C[1])/25)*x^6)*#1^6 & , 4]^(-1)}, {y[x] -> 6 - 4*x + Root[16*E^((
12*C[1])/25) + (288*E^((12*C[1])/25) - 288*E^((12*C[1])/25)*x)*#1 + (729 + 2160*
E^((12*C[1])/25) - 4320*E^((12*C[1])/25)*x + 2160*E^((12*C[1])/25)*x^2)*#1^2 + (
5832 + 8640*E^((12*C[1])/25) - 5832*x - 25920*E^((12*C[1])/25)*x + 25920*E^((12*
C[1])/25)*x^2 - 8640*E^((12*C[1])/25)*x^3)*#1^3 + (17496 + 19440*E^((12*C[1])/25
) - 34992*x - 77760*E^((12*C[1])/25)*x + 17496*x^2 + 116640*E^((12*C[1])/25)*x^2
 - 77760*E^((12*C[1])/25)*x^3 + 19440*E^((12*C[1])/25)*x^4)*#1^4 + (23328 + 2332
8*E^((12*C[1])/25) - 69984*x - 116640*E^((12*C[1])/25)*x + 69984*x^2 + 233280*E^
((12*C[1])/25)*x^2 - 23328*x^3 - 233280*E^((12*C[1])/25)*x^3 + 116640*E^((12*C[1
])/25)*x^4 - 23328*E^((12*C[1])/25)*x^5)*#1^5 + (11664 + 11664*E^((12*C[1])/25)
- 46656*x - 69984*E^((12*C[1])/25)*x + 69984*x^2 + 174960*E^((12*C[1])/25)*x^2 -
 46656*x^3 - 233280*E^((12*C[1])/25)*x^3 + 11664*x^4 + 174960*E^((12*C[1])/25)*x
```

```
^4 - 69984*E^((12*C[1])/25)*x^5 + 11664*E^((12*C[1])/25)*x^6)*#1^6 & , 5]^(-1)},
 {y[x] -> 6 - 4*x + Root[16*E^((12*C[1])/25) + (288*E^((12*C[1])/25) - 288*E^((1
2*C[1])/25)*x)*#1 + (729 + 2160*E^((12*C[1])/25) - 4320*E^((12*C[1])/25)*x + 216
0*E^((12*C[1])/25)*x^2)*#1^2 + (5832 + 8640*E^((12*C[1])/25) - 5832*x - 25920*E^
((12*C[1])/25)*x + 25920*E^((12*C[1])/25)*x^2 - 8640*E^((12*C[1])/25)*x^3)*#1^3
+ (17496 + 19440*E^((12*C[1])/25) - 34992*x - 77760*E^((12*C[1])/25)*x + 17496*x
^2 + 116640*E^((12*C[1])/25)*x^2 - 77760*E^((12*C[1])/25)*x^3 + 19440*E^((12*C[1
])/25)*x^4)*#1^4 + (23328 + 23328*E^((12*C[1])/25) - 69984*x - 116640*E^((12*C[1
])/25)*x + 69984*x^2 + 233280*E^((12*C[1])/25)*x^2 - 23328*x^3 - 233280*E^((12*C
[1])/25)*x^3 + 116640*E^((12*C[1])/25)*x^4 - 23328*E^((12*C[1])/25)*x^5)*#1^5 +
(11664 + 11664*E^((12*C[1])/25) - 46656*x - 69984*E^((12*C[1])/25)*x + 69984*x^2
 + 174960*E^((12*C[1])/25)*x^2 - 46656*x^3 - 233280*E^((12*C[1])/25)*x^3 + 11664
*x^4 + 174960*E^((12*C[1])/25)*x^4 - 69984*E^((12*C[1])/25)*x^5 + 11664*E^((12*C
[1])/25)*x^6)*#1^6 & , 6]^(-1)}}
```

Maple raw input

```
dsolve((6-4*x-y(x))*diff(y(x),x) = 2*x-y(x), y(x),'implicit')
```

Maple raw output

```
-3*ln((3-x-y(x))/(-1+x))+2*ln((-y(x)+4-2*x)/(-1+x))-ln(-1+x)-_C1 = 0
```

4.458 $(-y(x)+5x+1)y'(x)-5y(x)+x+5=0$

ODE

$$(-y(x)+5x+1)y'(x)-5y(x)+x+5=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0742956 (sec), leaf count = 925

$$\left\{\left\{y(x)\to 5x-\frac{1}{\text{Root}\left[\left(186624e^{\frac{12c_1}{25}}x^6+186624x^4\right)\#1^6+\left(-186624e^{\frac{12c_1}{25}}x^5-186624x^3\right)\#1^5+\left(77760e^{\frac{12c_1}{25}}x^4+69984\right.\right.\right.$$

Maple ✓
cpu = 0.022 (sec), leaf count = 41

$$\left\{-3\ln\left(\frac{1-x-y(x)}{x}\right)+2\ln\left(\frac{1+x-y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[5 + x - 5*y[x] + (1 + 5*x - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1 + 5*x - Root[4*E^((12*C[1])/25) - 144*E^((12*C[1])/25)*x*#1 + (729 +
  2160*E^((12*C[1])/25)*x^2)*#1^2 + (-11664*x - 17280*E^((12*C[1])/25)*x^3)*#1^3
+ (69984*x^2 + 77760*E^((12*C[1])/25)*x^4)*#1^4 + (-186624*x^3 - 186624*E^((12*C
[1])/25)*x^5)*#1^5 + (186624*x^4 + 186624*E^((12*C[1])/25)*x^6)*#1^6 & , 1]^(-1)
}, {y[x] -> 1 + 5*x - Root[4*E^((12*C[1])/25) - 144*E^((12*C[1])/25)*x*#1 + (729
  + 2160*E^((12*C[1])/25)*x^2)*#1^2 + (-11664*x - 17280*E^((12*C[1])/25)*x^3)*#1^
3 + (69984*x^2 + 77760*E^((12*C[1])/25)*x^4)*#1^4 + (-186624*x^3 - 186624*E^((12
*C[1])/25)*x^5)*#1^5 + (186624*x^4 + 186624*E^((12*C[1])/25)*x^6)*#1^6 & , 2]^(-
1)}, {y[x] -> 1 + 5*x - Root[4*E^((12*C[1])/25) - 144*E^((12*C[1])/25)*x*#1 + (7
29 + 2160*E^((12*C[1])/25)*x^2)*#1^2 + (-11664*x - 17280*E^((12*C[1])/25)*x^3)*#
1^3 + (69984*x^2 + 77760*E^((12*C[1])/25)*x^4)*#1^4 + (-186624*x^3 - 186624*E^((
12*C[1])/25)*x^5)*#1^5 + (186624*x^4 + 186624*E^((12*C[1])/25)*x^6)*#1^6 & , 3]^
(-1)}, {y[x] -> 1 + 5*x - Root[4*E^((12*C[1])/25) - 144*E^((12*C[1])/25)*x*#1 +
(729 + 2160*E^((12*C[1])/25)*x^2)*#1^2 + (-11664*x - 17280*E^((12*C[1])/25)*x^3)
```

```
*#1^3 + (69984*x^2 + 77760*E^((12*C[1])/25)*x^4)*#1^4 + (-186624*x^3 - 186624*E^
((12*C[1])/25)*x^5)*#1^5 + (186624*x^4 + 186624*E^((12*C[1])/25)*x^6)*#1^6 & , 4
]^(-1)}, {y[x] -> 1 + 5*x - Root[4*E^((12*C[1])/25) - 144*E^((12*C[1])/25)*x*#1
+ (729 + 2160*E^((12*C[1])/25)*x^2)*#1^2 + (-11664*x - 17280*E^((12*C[1])/25)*x^
3)*#1^3 + (69984*x^2 + 77760*E^((12*C[1])/25)*x^4)*#1^4 + (-186624*x^3 - 186624*
E^((12*C[1])/25)*x^5)*#1^5 + (186624*x^4 + 186624*E^((12*C[1])/25)*x^6)*#1^6 & ,
 5]^(-1)}, {y[x] -> 1 + 5*x - Root[4*E^((12*C[1])/25) - 144*E^((12*C[1])/25)*x*#
1 + (729 + 2160*E^((12*C[1])/25)*x^2)*#1^2 + (-11664*x - 17280*E^((12*C[1])/25)*
x^3)*#1^3 + (69984*x^2 + 77760*E^((12*C[1])/25)*x^4)*#1^4 + (-186624*x^3 - 18662
4*E^((12*C[1])/25)*x^5)*#1^5 + (186624*x^4 + 186624*E^((12*C[1])/25)*x^6)*#1^6 &
 , 6]^(-1)}}
```

Maple raw input

```
dsolve((1+5*x-y(x))*diff(y(x),x)+5+x-5*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-3*ln((1-x-y(x))/x)+2*ln((1+x-y(x))/x)-ln(x)-_C1 = 0
```

4.459 $y'(x)(a+bx+y(x))+a-bx-y(x)=0$

ODE

$$y'(x)(a+bx+y(x))+a-bx-y(x)=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0559698 (sec), leaf count = 49

$$\left\{\left\{y(x)\to \frac{2aW\left(-e^{\frac{(b+1)^2x}{2a}+c_1-1}\right)+a(-b)+a-b(b+1)x}{b+1}\right\}\right\}$$

Maple ✓
cpu = 0.032 (sec), leaf count = 71

$$\left\{\frac{a(-1+b)\ln\left((b+1)y(x)+b^2x+(a+x)b-a\right)-(b+1)\left(a\ln\left((b+1)(bx+y(x))+ab-a\right)+\_C1\,b-x+\_C1+y(x)\right.}{(b+1)^2}\right.$$

Mathematica raw input

```
DSolve[a - b*x - y[x] + (a + b*x + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a - a*b - b*(1 + b)*x + 2*a*ProductLog[-E^(-1 + ((1 + b)^2*x)/(2*a) +
  C[1])])/(1 + b)}}
```

Maple raw input

```
dsolve((a+b*x+y(x))*diff(y(x),x)+a-b*x-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
(a*(-1+b)*ln((b+1)*y(x)+b^2*x+(a+x)*b-a)-(b+1)*(a*ln((b+1)*(b*x+y(x))+a*b-a)+_C1
*b-x+_C1+y(x)))/(b+1)^2 = 0
```

4.460 $(x^2 - y(x))\, y'(x) + x = 0$

ODE

$$(x^2 - y(x))\, y'(x) + x = 0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`], [_Abel, `2nd type`, `class C`]]

Book solution method
Change of Variable, new independent variable

Mathematica ✓
cpu = 0.0171213 (sec), leaf count = 29

$$\left\{\left\{y(x) \to \frac{1}{2}\left(W\left(-e^{c_1-2x^2-1}\right)+1\right)+x^2\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 23

$$\left\{\frac{\left(2x^2-2y(x)+1\right)e^{2y(x)}}{2}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x + (x^2 - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2 + (1 + ProductLog[-E^(-1 - 2*x^2 + C[1])])/2}}
```

Maple raw input

```
dsolve((x^2-y(x))*diff(y(x),x)+x = 0, y(x),'implicit')
```

Maple raw output

```
1/2*(2*x^2-2*y(x)+1)*exp(2*y(x))+_C1 = 0
```

4.461 $(x^2 - y(x))\, y'(x) = 4xy(x)$

ODE

$$(x^2 - y(x))\, y'(x) = 4xy(x)$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.0963027 (sec), leaf count = 232

$$\left\{\left\{y(x)\to x^2\left(1+\frac{2-2i}{\frac{i\sqrt{2}}{\sqrt{x^2\sinh\left(\frac{2c_1}{9}\right)+x^2\cosh\left(\frac{2c_1}{9}\right)-i}}-(1-i)}\right)\right\},\left\{y(x)\to x^2\left(1+\frac{2-2i}{(-1+i)-\frac{i\sqrt{2}}{\sqrt{x^2\sinh\left(\frac{2c_1}{9}\right)+x^2\cosh\left(\frac{2c_1}{9}\right)-i}}}\right.\right.$$

Maple ✓
cpu = 0.02 (sec), leaf count = 29

$$\left\{\ln(x)-\_C1+\ln\left(\frac{x^2+y(x)}{x^2}\right)-\frac{1}{2}\ln\left(\frac{y(x)}{x^2}\right)=0\right\}$$

Mathematica raw input

```
DSolve[(x^2 - y[x])*y'[x] == 4*x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2*(1 + (2 - 2*I)/((-1 + I) + (I*Sqrt[2])/Sqrt[-I + x^2*Cosh[(2*C[1])
/9] + x^2*Sinh[(2*C[1])/9]]))}, {y[x] -> x^2*(1 + (2 - 2*I)/((-1 + I) - (I*Sqrt[
2])/Sqrt[-I + x^2*Cosh[(2*C[1])/9] + x^2*Sinh[(2*C[1])/9]]))}, {y[x] -> x^2*(1 +
  (2 - 2*I)/((-1 + I) - Sqrt[2]/Sqrt[I + x^2*Cosh[(2*C[1])/9] + x^2*Sinh[(2*C[1])
/9]]))}, {y[x] -> x^2*(1 + (2 - 2*I)/((-1 + I) + Sqrt[2]/Sqrt[I + x^2*Cosh[(2*C[
1])/9] + x^2*Sinh[(2*C[1])/9]]))}}
```

Maple raw input

```
dsolve((x^2-y(x))*diff(y(x),x) = 4*x*y(x), y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+ln((x^2+y(x))/x^2)-1/2*ln(y(x)/x^2) = 0
```

4.462 $y'(x)(y(x) - \cot(x)\csc(x)) + y(x)\csc(x)(y(x)\cos(x) + 1) = 0$

ODE

$$y'(x)(y(x) - \cot(x)\csc(x)) + y(x)\csc(x)(y(x)\cos(x) + 1) = 0$$

ODE Classification

```
[[_Abel, `2nd type`, `class A`]]
```

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0502895 (sec), leaf count = 85

$$\left\{\left\{y(x) \to \cot(x)\csc(x) - \frac{i\csc^2(x)\sqrt{(c_1-1)\cos(2x) - c_1 - 1}}{\sqrt{2}}\right\}, \left\{y(x) \to \cot(x)\csc(x) + \frac{i\csc^2(x)\sqrt{(c_1-1)\cos(2x) - c_1}}{\sqrt{2}}\right.\right.$$

Maple ✓
cpu = 0.111 (sec), leaf count = 74

$$\left\{-\frac{(\sin(x))^2}{(\cos(x))^2 y(x) + \cos(x) - y(x)} - \sin(x)\frac{1}{\sqrt{\_C1 + (\sin(x))^{-2}}} = 0, -\frac{(\sin(x))^2}{(\cos(x))^2 y(x) + \cos(x) - y(x)} + \sin(x)\right.$$

Mathematica raw input

```
DSolve[Csc[x]*y[x]*(1 + Cos[x]*y[x]) + (-(Cot[x]*Csc[x]) + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Cot[x]*Csc[x] - (I*Sqrt[-1 - C[1] + (-1 + C[1])*Cos[2*x]]*Csc[x]^2)/Sq
rt[2]}, {y[x] -> Cot[x]*Csc[x] + (I*Sqrt[-1 - C[1] + (-1 + C[1])*Cos[2*x]]*Csc[x
]^2)/Sqrt[2]}}
```

Maple raw input

```
dsolve((y(x)-cot(x)*csc(x))*diff(y(x),x)+csc(x)*(1+y(x)*cos(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-sin(x)^2/(cos(x)^2*y(x)+cos(x)-y(x))+sin(x)/(_C1+1/sin(x)^2)^(1/2) = 0, -sin(x)
^2/(cos(x)^2*y(x)+cos(x)-y(x))-sin(x)/(_C1+1/sin(x)^2)^(1/2) = 0
```

4.463 $x^2 + 2y(x)y'(x) + y(x)^2 + 2x = 0$

ODE

$$x^2 + 2y(x)y'(x) + y(x)^2 + 2x = 0$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Bernoulli]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0101089 (sec), leaf count = 47

$$\left\{\left\{y(x) \to -\sqrt{c_1 e^{-x} - x^2}\right\}, \left\{y(x) \to \sqrt{c_1 e^{-x} - x^2}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 18

$$\left\{x^2 - \mathrm{e}^{-x}\_C1 + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[2*x + x^2 + y[x]^2 + 2*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-x^2 + C[1]/E^x]}, {y[x] -> Sqrt[-x^2 + C[1]/E^x]}}
```

Maple raw input

```
dsolve(2*y(x)*diff(y(x),x)+2*x+x^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x^2-exp(-x)*_C1+y(x)^2 = 0
```

4.464 $2y(x)y'(x) = x^3 + xy(x)^2$

ODE

$$2y(x)y'(x) = x^3 + xy(x)^2$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0115853 (sec), leaf count = 57

$$\left\{\left\{y(x) \to -\sqrt{c_1 e^{\frac{x^2}{2}} - x^2 - 2}\right\}, \left\{y(x) \to \sqrt{c_1 e^{\frac{x^2}{2}} - x^2 - 2}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 21

$$\left\{x^2 + 2 - \mathrm{e}^{\frac{x^2}{2}} \_C1 + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[2*y[x]*y'[x] == x^3 + x*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-2 - x^2 + E^(x^2/2)*C[1]]}, {y[x] -> Sqrt[-2 - x^2 + E^(x^2/2)*
C[1]]}}
```

Maple raw input

```
dsolve(2*y(x)*diff(y(x),x) = x*y(x)^2+x^3, y(x),'implicit')
```

Maple raw output

```
x^2+2-exp(1/2*x^2)*_C1+y(x)^2 = 0
```

4.465 $(x-2y(x))y'(x)=y(x)$

ODE

$$(x-2y(x))y'(x)=y(x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0178371 (sec), leaf count = 26

$$\left\{\left\{y(x)\to -\frac{x}{2W\left(-\frac{1}{2}e^{-\frac{c_1}{2}}x\right)}\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 16

$$\{x-(-2\ln(y(x))+\_C1)\,y(x)=0\}$$

Mathematica raw input

```
DSolve[(x - 2*y[x])*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x/(2*ProductLog[-x/(2*E^(C[1]/2))])}}
```

Maple raw input

```
dsolve((x-2*y(x))*diff(y(x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
x-(-2*ln(y(x))+_C1)*y(x) = 0
```

4.466 $(2y(x)+x)y'(x)-y(x)+2x=0$

ODE

$$(2y(x)+x)y'(x)-y(x)+2x=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0294058 (sec), leaf count = 29

$$\text{Solve}\left[\log\left(\frac{y(x)^2}{x^2}+1\right)+\tan^{-1}\left(\frac{y(x)}{x}\right)+2\log(x)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.011 (sec), leaf count = 35

$$\left\{-\frac{1}{2}\ln\left(\frac{x^2+(y(x))^2}{x^2}\right)-\frac{1}{2}\arctan\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*x - y[x] + (x + 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[ArcTan[y[x]/x] + 2*Log[x] + Log[1 + y[x]^2/x^2] == C[1], y[x]]
```

Maple raw input

```
dsolve((x+2*y(x))*diff(y(x),x)+2*x-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln((x^2+y(x)^2)/x^2)-1/2*arctan(y(x)/x)-ln(x)-_C1 = 0
```

4.467 $(x-2y(x))y'(x)+y(x)+2x=0$

ODE

$$(x-2y(x))y'(x)+y(x)+2x=0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.023377 (sec), leaf count = 55

$$\left\{\left\{y(x)\to \frac{1}{2}\left(x-\sqrt{5x^2-4e^{c_1}}\right)\right\},\left\{y(x)\to \frac{1}{2}\left(\sqrt{5x^2-4e^{c_1}}+x\right)\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 33

$$\left\{-\frac{1}{2}\ln\left(\frac{-x^2-xy(x)+(y(x))^2}{x^2}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*x + y[x] + (x - 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - Sqrt[-4*E^C[1] + 5*x^2])/2}, {y[x] -> (x + Sqrt[-4*E^C[1] + 5*x^2
])/2}}
```

Maple raw input

```
dsolve((x-2*y(x))*diff(y(x),x)+2*x+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln((-x^2-x*y(x)+y(x)^2)/x^2)-ln(x)-_C1 = 0
```

4.468 $(-2y(x)+x+1)y'(x) = -y(x)+2x+1$

ODE

$$(-2y(x)+x+1)y'(x) = -y(x)+2x+1$$

ODE Classification

[[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0101588 (sec), leaf count = 67

$$\left\{\left\{y(x)\to \frac{1}{2}\left(-i\sqrt{-4c_1+3x^2+2x-1}+x+1\right)\right\},\left\{y(x)\to \frac{1}{2}\left(i\sqrt{-4c_1+3x^2+2x-1}+x+1\right)\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 50

$$\left\{-\frac{1}{2}\ln\left(\frac{9\left(y(x)\right)^2+(-9x-9)y(x)+9x^2+9x+3}{(1+3x)^2}\right)-\ln(1+3x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(1 + x - 2*y[x])*y'[x] == 1 + 2*x - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x - I*Sqrt[-1 + 2*x + 3*x^2 - 4*C[1]])/2}, {y[x] -> (1 + x + I*Sq
rt[-1 + 2*x + 3*x^2 - 4*C[1]])/2}}
```

Maple raw input

```
dsolve((1+x-2*y(x))*diff(y(x),x) = 1+2*x-y(x), y(x),'implicit')
```

Maple raw output

```
-1/2*ln((9*y(x)^2+(-9*x-9)*y(x)+9*x^2+9*x+3)/(1+3*x)^2)-ln(1+3*x)-_C1 = 0
```

4.469 $(2y(x)+x+1)y'(x)-2y(x)-x+1=0$

ODE

$$(2y(x)+x+1)y'(x)-2y(x)-x+1=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0163198 (sec), leaf count = 30

$$\left\{\left\{y(x)\to\frac{1}{6}\left(4W\left(-e^{c_1+\frac{9x}{4}-1}\right)-3x+1\right)\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 26

$$\left\{\frac{2x}{3}-\frac{4\ln(-1+3x+6y(x))}{9}-\frac{2y(x)}{3}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[1 - x - 2*y[x] + (1 + x + 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 - 3*x + 4*ProductLog[-E^(-1 + (9*x)/4 + C[1])])/6}}
```

Maple raw input

```
dsolve((1+x+2*y(x))*diff(y(x),x)+1-x-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
2/3*x-4/9*ln(-1+3*x+6*y(x))-2/3*y(x)-_C1 = 0
```

4.470 $(2y(x)+x+1)y'(x)-4y(x)+x+7=0$

ODE

$$(2y(x)+x+1)y'(x)-4y(x)+x+7=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.218651 (sec), leaf count = 2587

$$\left\{\left\{y(x)\to\frac{1}{2}\left(-x+\frac{}{\text{Root}\left[\left(11664e^{\frac{12c_1}{25}}x^6+209952e^{\frac{12c_1}{25}}x^5+1574640e^{\frac{12c_1}{25}}x^4+11664x^4+6298560e^{\frac{12c_1}{25}}x^3+139968x^3+\right.\right.\right.\right.$$

Maple ✓
cpu = 0.031 (sec), leaf count = 45

$$\left\{-3\ln\left(\frac{4-y(x)+x}{3+x}\right)+2\ln\left(\frac{5+x-2\,y(x)}{3+x}\right)-\ln(3+x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[7 + x - 4*y[x] + (1 + x + 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 - x + Root[16*E^((12*C[1])/25) + (-864*E^((12*C[1])/25) - 288*E^((
12*C[1])/25)*x)*#1 + (729 + 19440*E^((12*C[1])/25) + 12960*E^((12*C[1])/25)*x +
2160*E^((12*C[1])/25)*x^2)*#1^2 + (-17496 - 233280*E^((12*C[1])/25) - 5832*x - 2
33280*E^((12*C[1])/25)*x - 77760*E^((12*C[1])/25)*x^2 - 8640*E^((12*C[1])/25)*x^
3)*#1^3 + (157464 + 1574640*E^((12*C[1])/25) + 104976*x + 2099520*E^((12*C[1])/2
5)*x + 17496*x^2 + 1049760*E^((12*C[1])/25)*x^2 + 233280*E^((12*C[1])/25)*x^3 +
19440*E^((12*C[1])/25)*x^4)*#1^4 + (-629856 - 5668704*E^((12*C[1])/25) - 629856*
x - 9447840*E^((12*C[1])/25)*x - 209952*x^2 - 6298560*E^((12*C[1])/25)*x^2 - 233
28*x^3 - 2099520*E^((12*C[1])/25)*x^3 - 349920*E^((12*C[1])/25)*x^4 - 23328*E^((
12*C[1])/25)*x^5)*#1^5 + (944784 + 8503056*E^((12*C[1])/25) + 1259712*x + 170061
12*E^((12*C[1])/25)*x + 629856*x^2 + 14171760*E^((12*C[1])/25)*x^2 + 139968*x^3
+ 6298560*E^((12*C[1])/25)*x^3 + 11664*x^4 + 1574640*E^((12*C[1])/25)*x^4 + 2099
52*E^((12*C[1])/25)*x^5 + 11664*E^((12*C[1])/25)*x^6)*#1^6 & , 1]^(-1))/2}, {y[x
] -> (-1 - x + Root[16*E^((12*C[1])/25) + (-864*E^((12*C[1])/25) - 288*E^((12*C[
```

```
1])/25)*x)*#1 + (729 + 19440*E^((12*C[1])/25) + 12960*E^((12*C[1])/25)*x + 2160*
E^((12*C[1])/25)*x^2)*#1^2 + (-17496 - 233280*E^((12*C[1])/25) - 5832*x - 233280
*E^((12*C[1])/25)*x - 77760*E^((12*C[1])/25)*x^2 - 8640*E^((12*C[1])/25)*x^3)*#1
^3 + (157464 + 1574640*E^((12*C[1])/25) + 104976*x + 2099520*E^((12*C[1])/25)*x
+ 17496*x^2 + 1049760*E^((12*C[1])/25)*x^2 + 233280*E^((12*C[1])/25)*x^3 + 19440
*E^((12*C[1])/25)*x^4)*#1^4 + (-629856 - 5668704*E^((12*C[1])/25) - 629856*x - 9
447840*E^((12*C[1])/25)*x - 209952*x^2 - 6298560*E^((12*C[1])/25)*x^2 - 23328*x^
3 - 2099520*E^((12*C[1])/25)*x^3 - 349920*E^((12*C[1])/25)*x^4 - 23328*E^((12*C[
1])/25)*x^5)*#1^5 + (944784 + 8503056*E^((12*C[1])/25) + 1259712*x + 17006112*E^
((12*C[1])/25)*x + 629856*x^2 + 14171760*E^((12*C[1])/25)*x^2 + 139968*x^3 + 629
8560*E^((12*C[1])/25)*x^3 + 11664*x^4 + 1574640*E^((12*C[1])/25)*x^4 + 209952*E^
((12*C[1])/25)*x^5 + 11664*E^((12*C[1])/25)*x^6)*#1^6 & , 2]^(-1))/2}, {y[x] ->
(-1 - x + Root[16*E^((12*C[1])/25) + (-864*E^((12*C[1])/25) - 288*E^((12*C[1])/2
5)*x)*#1 + (729 + 19440*E^((12*C[1])/25) + 12960*E^((12*C[1])/25)*x + 2160*E^((1
2*C[1])/25)*x^2)*#1^2 + (-17496 - 233280*E^((12*C[1])/25) - 5832*x - 233280*E^((
12*C[1])/25)*x - 77760*E^((12*C[1])/25)*x^2 - 8640*E^((12*C[1])/25)*x^3)*#1^3 +
(157464 + 1574640*E^((12*C[1])/25) + 104976*x + 2099520*E^((12*C[1])/25)*x + 174
96*x^2 + 1049760*E^((12*C[1])/25)*x^2 + 233280*E^((12*C[1])/25)*x^3 + 19440*E^((
12*C[1])/25)*x^4)*#1^4 + (-629856 - 5668704*E^((12*C[1])/25) - 629856*x - 944784
0*E^((12*C[1])/25)*x - 209952*x^2 - 6298560*E^((12*C[1])/25)*x^2 - 23328*x^3 - 2
099520*E^((12*C[1])/25)*x^3 - 349920*E^((12*C[1])/25)*x^4 - 23328*E^((12*C[1])/2
5)*x^5)*#1^5 + (944784 + 8503056*E^((12*C[1])/25) + 1259712*x + 17006112*E^((12*
C[1])/25)*x + 629856*x^2 + 14171760*E^((12*C[1])/25)*x^2 + 139968*x^3 + 6298560*
E^((12*C[1])/25)*x^3 + 11664*x^4 + 1574640*E^((12*C[1])/25)*x^4 + 209952*E^((12*
C[1])/25)*x^5 + 11664*E^((12*C[1])/25)*x^6)*#1^6 & , 3]^(-1))/2}, {y[x] -> (-1 -
 x + Root[16*E^((12*C[1])/25) + (-864*E^((12*C[1])/25) - 288*E^((12*C[1])/25)*x)
*#1 + (729 + 19440*E^((12*C[1])/25) + 12960*E^((12*C[1])/25)*x + 2160*E^((12*C[1
])/25)*x^2)*#1^2 + (-17496 - 233280*E^((12*C[1])/25) - 5832*x - 233280*E^((12*C[
1])/25)*x - 77760*E^((12*C[1])/25)*x^2 - 8640*E^((12*C[1])/25)*x^3)*#1^3 + (1574
64 + 1574640*E^((12*C[1])/25) + 104976*x + 2099520*E^((12*C[1])/25)*x + 17496*x^
2 + 1049760*E^((12*C[1])/25)*x^2 + 233280*E^((12*C[1])/25)*x^3 + 19440*E^((12*C[
1])/25)*x^4)*#1^4 + (-629856 - 5668704*E^((12*C[1])/25) - 629856*x - 9447840*E^(
(12*C[1])/25)*x - 209952*x^2 - 6298560*E^((12*C[1])/25)*x^2 - 23328*x^3 - 209952
0*E^((12*C[1])/25)*x^3 - 349920*E^((12*C[1])/25)*x^4 - 23328*E^((12*C[1])/25)*x^
5)*#1^5 + (944784 + 8503056*E^((12*C[1])/25) + 1259712*x + 17006112*E^((12*C[1])
/25)*x + 629856*x^2 + 14171760*E^((12*C[1])/25)*x^2 + 139968*x^3 + 6298560*E^((1
2*C[1])/25)*x^3 + 11664*x^4 + 1574640*E^((12*C[1])/25)*x^4 + 209952*E^((12*C[1])
/25)*x^5 + 11664*E^((12*C[1])/25)*x^6)*#1^6 & , 4]^(-1))/2}, {y[x] -> (-1 - x +
Root[16*E^((12*C[1])/25) + (-864*E^((12*C[1])/25) - 288*E^((12*C[1])/25)*x)*#1 +
 (729 + 19440*E^((12*C[1])/25) + 12960*E^((12*C[1])/25)*x + 2160*E^((12*C[1])/25
)*x^2)*#1^2 + (-17496 - 233280*E^((12*C[1])/25) - 5832*x - 233280*E^((12*C[1])/2
5)*x - 77760*E^((12*C[1])/25)*x^2 - 8640*E^((12*C[1])/25)*x^3)*#1^3 + (157464 +
1574640*E^((12*C[1])/25) + 104976*x + 2099520*E^((12*C[1])/25)*x + 17496*x^2 + 1
049760*E^((12*C[1])/25)*x^2 + 233280*E^((12*C[1])/25)*x^3 + 19440*E^((12*C[1])/2
5)*x^4)*#1^4 + (-629856 - 5668704*E^((12*C[1])/25) - 629856*x - 9447840*E^((12*C
[1])/25)*x - 209952*x^2 - 6298560*E^((12*C[1])/25)*x^2 - 23328*x^3 - 2099520*E^(
(12*C[1])/25)*x^3 - 349920*E^((12*C[1])/25)*x^4 - 23328*E^((12*C[1])/25)*x^5)*#1
```

```
^5 + (944784 + 8503056*E^((12*C[1])/25) + 1259712*x + 17006112*E^((12*C[1])/25)*
x + 629856*x^2 + 14171760*E^((12*C[1])/25)*x^2 + 139968*x^3 + 6298560*E^((12*C[1
])/25)*x^3 + 11664*x^4 + 1574640*E^((12*C[1])/25)*x^4 + 209952*E^((12*C[1])/25)*
x^5 + 11664*E^((12*C[1])/25)*x^6)*#1^6 & , 5]^(-1))/2}, {y[x] -> (-1 - x + Root[
16*E^((12*C[1])/25) + (-864*E^((12*C[1])/25) - 288*E^((12*C[1])/25)*x)*#1 + (729
 + 19440*E^((12*C[1])/25) + 12960*E^((12*C[1])/25)*x + 2160*E^((12*C[1])/25)*x^2
)*#1^2 + (-17496 - 233280*E^((12*C[1])/25) - 5832*x - 233280*E^((12*C[1])/25)*x
- 77760*E^((12*C[1])/25)*x^2 - 8640*E^((12*C[1])/25)*x^3)*#1^3 + (157464 + 15746
40*E^((12*C[1])/25) + 104976*x + 2099520*E^((12*C[1])/25)*x + 17496*x^2 + 104976
0*E^((12*C[1])/25)*x^2 + 233280*E^((12*C[1])/25)*x^3 + 19440*E^((12*C[1])/25)*x^
4)*#1^4 + (-629856 - 5668704*E^((12*C[1])/25) - 629856*x - 9447840*E^((12*C[1])/
25)*x - 209952*x^2 - 6298560*E^((12*C[1])/25)*x^2 - 23328*x^3 - 2099520*E^((12*C
[1])/25)*x^3 - 349920*E^((12*C[1])/25)*x^4 - 23328*E^((12*C[1])/25)*x^5)*#1^5 +
(944784 + 8503056*E^((12*C[1])/25) + 1259712*x + 17006112*E^((12*C[1])/25)*x + 6
29856*x^2 + 14171760*E^((12*C[1])/25)*x^2 + 139968*x^3 + 6298560*E^((12*C[1])/25
)*x^3 + 11664*x^4 + 1574640*E^((12*C[1])/25)*x^4 + 209952*E^((12*C[1])/25)*x^5 +
 11664*E^((12*C[1])/25)*x^6)*#1^6 & , 6]^(-1))/2}}
```

Maple raw input

```
dsolve((1+x+2*y(x))*diff(y(x),x)+7+x-4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-3*ln((4-y(x)+x)/(3+x))+2*ln((5+x-2*y(x))/(3+x))-ln(3+x)-_C1 = 0
```

4.471 $x^2 + 2(y(x) + x)y'(x) + 2y(x) = 0$

ODE

$$x^2 + 2(y(x) + x)y'(x) + 2y(x) = 0$$

ODE Classification

[_exact, _rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`], [_Abel, `2nd type`, `cla

Book solution method
Exact equation

Mathematica ✓
cpu = 0.00919663 (sec), leaf count = 53

$$\left\{\left\{y(x) \to -\sqrt{c_1 - \frac{x^3}{3} + x^2} - x\right\}, \left\{y(x) \to \sqrt{c_1 - \frac{x^3}{3} + x^2} - x\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 19

$$\left\{\frac{x^3}{3} + 2\,xy(x) + (y(x))^2 + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2 + 2*y[x] + 2*(x + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x - Sqrt[x^2 - x^3/3 + C[1]]}, {y[x] -> -x + Sqrt[x^2 - x^3/3 + C[1]]
}}
```

Maple raw input

```
dsolve(2*(x+y(x))*diff(y(x),x)+x^2+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/3*x^3+2*x*y(x)+y(x)^2+_C1 = 0
```

4.472 $(-2y(x)+2x+3)y'(x)=-2y(x)+6x+1$

ODE

$$(-2y(x)+2x+3)y'(x)=-2y(x)+6x+1$$

ODE Classification

[[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.00981036 (sec), leaf count = 67

$$\left\{\left\{y(x)\to -\frac{1}{2}i\sqrt{-4c_1+8x^2-8x-9}+x+\frac{3}{2}\right\},\left\{y(x)\to \frac{1}{2}i\sqrt{-4c_1+8x^2-8x-9}+x+\frac{3}{2}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 50

$$\left\{-\frac{1}{2}\ln\left(\frac{4\left(y(x)\right)^2+(-8x-12)\,y(x)+12x^2+4x+11}{(-1+2x)^2}\right)-\ln(-1+2x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(3 + 2*x - 2*y[x])*y'[x] == 1 + 6*x - 2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 3/2 + x - (I/2)*Sqrt[-9 - 8*x + 8*x^2 - 4*C[1]]}, {y[x] -> 3/2 + x + (
I/2)*Sqrt[-9 - 8*x + 8*x^2 - 4*C[1]]}}
```

Maple raw input

```
dsolve((3+2*x-2*y(x))*diff(y(x),x) = 1+6*x-2*y(x), y(x),'implicit')
```

Maple raw output

```
-1/2*ln((4*y(x)^2+(-8*x-12)*y(x)+12*x^2+4*x+11)/(-1+2*x)^2)-ln(-1+2*x)-_C1 = 0
```

4.473 $(-2y(x)-4x+1)y'(x)+y(x)+2x=0$

ODE

$$(-2y(x)-4x+1)y'(x)+y(x)+2x=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0291591 (sec), leaf count = 28

$$\left\{\left\{y(x)\to -\frac{1}{10}W\left(-e^{c_1-25x-1}\right)-2x+\frac{2}{5}\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 26

$$\left\{\frac{x}{5}+\frac{\ln\left(-2+10\,x+5\,y(x)\right)}{25}-\frac{2\,y(x)}{5}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*x + y[x] + (1 - 4*x - 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2/5 - 2*x - ProductLog[-E^(-1 - 25*x + C[1])]/10}}
```

Maple raw input

```
dsolve((1-4*x-2*y(x))*diff(y(x),x)+2*x+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/5*x+1/25*ln(-2+10*x+5*y(x))-2/5*y(x)-_C1 = 0
```

4.474 $(6x - 2y(x))y'(x) = -y(x) + 3x + 2$

ODE

$$(6x - 2y(x))y'(x) = -y(x) + 3x + 2$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0160503 (sec), leaf count = 29

$$\left\{\left\{y(x) \to 3x - \frac{2}{5}\left(W\left(-e^{c_1 + \frac{25x}{4} - 1}\right) + 1\right)\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 26

$$\left\{-\frac{x}{5} + \frac{2\,y(x)}{5} - \frac{4\,\ln(5\,y(x) - 15\,x + 2)}{25} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(6*x - 2*y[x])*y'[x] == 2 + 3*x - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 3*x - (2*(1 + ProductLog[-E^(-1 + (25*x)/4 + C[1])]))/5}}
```

Maple raw input

```
dsolve((6*x-2*y(x))*diff(y(x),x) = 2+3*x-y(x), y(x),'implicit')
```

Maple raw output

```
-1/5*x+2/5*y(x)-4/25*ln(5*y(x)-15*x+2)-_C1 = 0
```

4.475 $(2y(x)+9x+19)y'(x)-6y(x)-2x+18=0$

ODE

$$(2y(x)+9x+19)y'(x)-6y(x)-2x+18=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.129511 (sec), leaf count = 256

$$\left\{\left\{y(x)\to\frac{1}{2}\left(\frac{(10-10i)(x+3)}{\frac{i\sqrt{2}}{\sqrt{(x+3)\sinh\left(\frac{2c_1}{9}\right)+(x+3)\cosh\left(\frac{2c_1}{9}\right)-i}}+(1-i)}-9x-19\right)\right\},\left\{y(x)\to\frac{1}{2}\left(\frac{(10-10i)(x+3)}{(1-i)-\frac{i\sqrt{2}}{\sqrt{(x+3)\sinh\left(\frac{2c_1}{9}\right)+(x+3)\cosh\left(\frac{2c_1}{9}\right)-i}}}\right.\right.$$

Maple ✓
cpu = 0.031 (sec), leaf count = 45

$$\left\{\ln\left(\frac{-y(x)-2-2x}{3+x}\right)-2\ln\left(\frac{11+x-2y(x)}{3+x}\right)-\ln(3+x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[18 - 2*x - 6*y[x] + (19 + 9*x + 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-19 - 9*x + ((10 - 10*I)*(3 + x))/((1 - I) + (I*Sqrt[2])/Sqrt[-I + (3
 + x)*Cosh[(2*C[1])/9] + (3 + x)*Sinh[(2*C[1])/9]]))/2}, {y[x] -> (-19 - 9*x + (
(10 - 10*I)*(3 + x))/((1 - I) - (I*Sqrt[2])/Sqrt[-I + (3 + x)*Cosh[(2*C[1])/9] +
 (3 + x)*Sinh[(2*C[1])/9]]))/2}, {y[x] -> (-19 - 9*x + ((10 - 10*I)*(3 + x))/((1
 - I) - Sqrt[2]/Sqrt[I + (3 + x)*Cosh[(2*C[1])/9] + (3 + x)*Sinh[(2*C[1])/9]]))/
2}, {y[x] -> (-19 - 9*x + ((10 - 10*I)*(3 + x))/((1 - I) + Sqrt[2]/Sqrt[I + (3 +
 x)*Cosh[(2*C[1])/9] + (3 + x)*Sinh[(2*C[1])/9]]))/2}}
```

Maple raw input

```
dsolve((19+9*x+2*y(x))*diff(y(x),x)+18-2*x-6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln((-y(x)-2-2*x)/(3+x))-2*ln((11+x-2*y(x))/(3+x))-ln(3+x)-_C1 = 0
```

4.476 $(x^3+2y(x))\,y'(x)=3x(2-xy(x))$

ODE

$$(x^3+2y(x))\,y'(x)=3x(2-xy(x))$$

ODE Classification

[_exact, _rational, [_1st_order, `_with_symmetry_[F(x),G(x)]`], [_Abel, `2nd type`, `cla

Book solution method
Exact equation

Mathematica ✓
cpu = 0.00941262 (sec), leaf count = 65

$$\left\{\left\{y(x)\to \frac{1}{2}\left(-\sqrt{4c_1+x^6+12x^2}-x^3\right)\right\},\left\{y(x)\to \frac{1}{2}\left(\sqrt{4c_1+x^6+12x^2}-x^3\right)\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 20

$$\left\{x^3y(x)-3\,x^2+(y(x))^2+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(x^3 + 2*y[x])*y'[x] == 3*x*(2 - x*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-x^3 - Sqrt[12*x^2 + x^6 + 4*C[1]])/2}, {y[x] -> (-x^3 + Sqrt[12*x^2
+ x^6 + 4*C[1]])/2}}
```

Maple raw input

```
dsolve((x^3+2*y(x))*diff(y(x),x) = 3*x*(2-x*y(x)), y(x),'implicit')
```

Maple raw output

```
x^3*y(x)-3*x^2+y(x)^2+_C1 = 0
```

4.477 $y'(x)(\tan(x)\sec(x)-2y(x))+\sec(x)(2y(x)\sin(x)+1)=0$

ODE

$$y'(x)(\tan(x)\sec(x)-2y(x))+\sec(x)(2y(x)\sin(x)+1)=0$$

ODE Classification

```
[[_Abel, `2nd type`, `class A`]]
```

Book solution method
Exact equation, integrating factor

Mathematica ✗
cpu = 64.6074 (sec), leaf count = 0 , could not solve

```
DSolve[Sec[x]*(1 + 2*Sin[x]*y[x]) + (Sec[x]*Tan[x] - 2*y[x])*Derivative[1][y][x] == 0, y[x], x]
```

Maple ✗
cpu = 37.955 (sec), leaf count = 0 , could not solve

```
dsolve((tan(x)*sec(x)-2*y(x))*diff(y(x),x)+sec(x)*(1+2*y(x)*sin(x)) = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[Sec[x]*(1 + 2*Sin[x]*y[x]) + (Sec[x]*Tan[x] - 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[Sec[x]*(1 + 2*Sin[x]*y[x]) + (Sec[x]*Tan[x] - 2*y[x])*Derivative[1][y][x]
 == 0, y[x], x]
```

Maple raw input

```
dsolve((tan(x)*sec(x)-2*y(x))*diff(y(x),x)+sec(x)*(1+2*y(x)*sin(x)) = 0, y(x),'implicit')
```

Maple raw output

```
dsolve((tan(x)*sec(x)-2*y(x))*diff(y(x),x)+sec(x)*(1+2*y(x)*sin(x)) = 0, y(x),'i
mplicit')
```

4.478 $\left(e^{-x}x-2y(x)\right)y'(x)=2e^{-2x}x-\left(-2y(x)+e^{-x}x+e^{-x}\right)y(x)$

ODE

$$\left(e^{-x}x-2y(x)\right)y'(x)=2e^{-2x}x-\left(-2y(x)+e^{-x}x+e^{-x}\right)y(x)$$

ODE Classification

[[_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0353197 (sec), leaf count = 81

$$\left\{\left\{y(x)\to\frac{1}{2}e^{-2x}\left(e^{x}x-\sqrt{e^{2x}\left(4c_1-3x^2\right)}\right)\right\},\left\{y(x)\to\frac{1}{2}e^{-2x}\left(\sqrt{e^{2x}\left(4c_1-3x^2\right)}+e^{x}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.049 (sec), leaf count = 26

$$\left\{-\left(y(x)\right)^2\mathrm{e}^{2x}+xy(x)\,\mathrm{e}^{x}-x^2+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(x/E^x - 2*y[x])*y'[x] == (2*x)/E^(2*x) - (E^(-x) + x/E^x - 2*y[x])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*x - Sqrt[E^(2*x)*(-3*x^2 + 4*C[1])])/(2*E^(2*x))}, {y[x] -> (E^x*
x + Sqrt[E^(2*x)*(-3*x^2 + 4*C[1])])/(2*E^(2*x))}}
```

Maple raw input

```
dsolve((x*exp(-x)-2*y(x))*diff(y(x),x) = 2*x*exp(-2*x)-(exp(-x)+x*exp(-x)-2*y(x))*y(x), y(x),'implici
```

Maple raw output

```
-y(x)^2*exp(2*x)+x*y(x)*exp(x)-x^2+_C1 = 0
```

4.479 $3y(x)y'(x) + 5\cot(x)\cos^2(y(x))\cot(y(x)) = 0$

ODE

$$3y(x)y'(x) + 5\cot(x)\cos^2(y(x))\cot(y(x)) = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.442068 (sec), leaf count = 29

$$\text{Solve}\left[c_1 = 40\sin(x)e^{-\frac{3}{10}(\tan(y(x))-y(x)\sec^2(y(x)))}, y(x)\right]$$

Maple ✓
cpu = 0.028 (sec), leaf count = 64

$$\left\{\frac{(10\_C1 + 10\ln(\sin(x)))\cos(3y(x)) - 3\sin(3y(x)) + (30\_C1 + 12y(x) + 30\ln(\sin(x)))\cos(y(x)) - 3\sin(y(x))}{10\cos(3y(x)) + 30\cos(y(x))} = 0\right.$$

Mathematica raw input

```
DSolve[5*Cos[y[x]]^2*Cot[x]*Cot[y[x]] + 3*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] == (40*Sin[x])/E^((3*(Tan[y[x]] - Sec[y[x]]^2*y[x]))/10), y[x]]
```

Maple raw input

```
dsolve(3*y(x)*diff(y(x),x)+5*cot(x)*cot(y(x))*cos(y(x))^2 = 0, y(x),'implicit')
```

Maple raw output

```
((10*_C1+10*ln(sin(x)))*cos(3*y(x))-3*sin(3*y(x))+(30*_C1+12*y(x)+30*ln(sin(x)))
*cos(y(x))-3*sin(y(x)))/(10*cos(3*y(x))+30*cos(y(x))) = 0
```

4.480 $3(2-y(x))y'(x)+xy(x)=0$

ODE

$$3(2-y(x))y'(x)+xy(x)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0301078 (sec), leaf count = 59

$$\left\{\left\{y(x)\to -2W\left(-\frac{1}{2}\sqrt{e^{-c_1-\frac{x^2}{6}}}\right)\right\},\left\{y(x)\to -2W\left(\frac{1}{2}\sqrt{e^{-c_1-\frac{x^2}{6}}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 19

$$\left\{\frac{x^2}{2}-3\,y(x)+6\,\ln\left(y(x)\right)+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*y[x] + 3*(2 - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2*ProductLog[-Sqrt[E^(-x^2/6 - C[1])]/2]}, {y[x] -> -2*ProductLog[Sqr
t[E^(-x^2/6 - C[1])]/2]}}
```

Maple raw input

```
dsolve(3*(2-y(x))*diff(y(x),x)+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/2*x^2-3*y(x)+6*ln(y(x))+_C1 = 0
```

4.481 $(x-3y(x))y'(x)-y(x)+3x+4=0$

ODE

$$(x-3y(x))y'(x)-y(x)+3x+4=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0688683 (sec), leaf count = 781

$$\left\{\left\{y(x)\to\frac{1}{3}\left(x-\frac{}{\text{Root}\left[\#1^6\left(16e^{12c_1}+1024x^6+9216x^5+34560x^4+69120x^3+77760x^2+46656x+11664\right)+\#1^4\left(-38\right.\right.\right.\right.$$

Maple ✓
cpu = 0.024 (sec), leaf count = 55

$$\left\{-\frac{2}{3}\ln\left(\frac{-2\,y(x)-4-2\,x}{3+2\,x}\right)-\frac{1}{3}\ln\left(\frac{-2\,y(x)+2+2\,x}{3+2\,x}\right)-\ln\left(3+2\,x\right)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[4 + 3*x - y[x] + (x - 3*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - Root[1 + (-18 - 12*x)*#1 + (81 + 108*x + 36*x^2)*#1^2 + (216 + 43
2*x + 288*x^2 + 64*x^3)*#1^3 + (-1944 - 5184*x - 5184*x^2 - 2304*x^3 - 384*x^4)*
#1^4 + (11664 + 16*E^(12*C[1]) + 46656*x + 77760*x^2 + 69120*x^3 + 34560*x^4 + 9
216*x^5 + 1024*x^6)*#1^6 & , 1]^(-1))/3}, {y[x] -> (x - Root[1 + (-18 - 12*x)*#1
 + (81 + 108*x + 36*x^2)*#1^2 + (216 + 432*x + 288*x^2 + 64*x^3)*#1^3 + (-1944 -
 5184*x - 5184*x^2 - 2304*x^3 - 384*x^4)*#1^4 + (11664 + 16*E^(12*C[1]) + 46656*
x + 77760*x^2 + 69120*x^3 + 34560*x^4 + 9216*x^5 + 1024*x^6)*#1^6 & , 2]^(-1))/3
}, {y[x] -> (x - Root[1 + (-18 - 12*x)*#1 + (81 + 108*x + 36*x^2)*#1^2 + (216 +
432*x + 288*x^2 + 64*x^3)*#1^3 + (-1944 - 5184*x - 5184*x^2 - 2304*x^3 - 384*x^4
)*#1^4 + (11664 + 16*E^(12*C[1]) + 46656*x + 77760*x^2 + 69120*x^3 + 34560*x^4 +
 9216*x^5 + 1024*x^6)*#1^6 & , 3]^(-1))/3}, {y[x] -> (x - Root[1 + (-18 - 12*x)*
#1 + (81 + 108*x + 36*x^2)*#1^2 + (216 + 432*x + 288*x^2 + 64*x^3)*#1^3 + (-1944
 - 5184*x - 5184*x^2 - 2304*x^3 - 384*x^4)*#1^4 + (11664 + 16*E^(12*C[1]) + 4665
6*x + 77760*x^2 + 69120*x^3 + 34560*x^4 + 9216*x^5 + 1024*x^6)*#1^6 & , 4]^(-1))
/3}, {y[x] -> (x - Root[1 + (-18 - 12*x)*#1 + (81 + 108*x + 36*x^2)*#1^2 + (216
```

```
+ 432*x + 288*x^2 + 64*x^3)*#1^3 + (-1944 - 5184*x - 5184*x^2 - 2304*x^3 - 384*x
^4)*#1^4 + (11664 + 16*E^(12*C[1]) + 46656*x + 77760*x^2 + 69120*x^3 + 34560*x^4
 + 9216*x^5 + 1024*x^6)*#1^6 & , 5]^(-1))/3}, {y[x] -> (x - Root[1 + (-18 - 12*x
)*#1 + (81 + 108*x + 36*x^2)*#1^2 + (216 + 432*x + 288*x^2 + 64*x^3)*#1^3 + (-19
44 - 5184*x - 5184*x^2 - 2304*x^3 - 384*x^4)*#1^4 + (11664 + 16*E^(12*C[1]) + 46
656*x + 77760*x^2 + 69120*x^3 + 34560*x^4 + 9216*x^5 + 1024*x^6)*#1^6 & , 6]^(-1
))/3}}
```

Maple raw input

```
dsolve((x-3*y(x))*diff(y(x),x)+4+3*x-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-2/3*ln((-2*y(x)-4-2*x)/(3+2*x))-1/3*ln((-2*y(x)+2+2*x)/(3+2*x))-ln(3+2*x)-_C1 =
 0
```

4.482 $(-3y(x)-x+4)y'(x)-3y(x)-x+3=0$

ODE

$$(-3y(x)-x+4)y'(x)-3y(x)-x+3=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0166686 (sec), leaf count = 30

$$\left\{\left\{y(x)\to\frac{1}{6}\left(-3W\left(-e^{c_1+\frac{4x}{3}-1}\right)-2x+5\right)\right\}\right\}$$

Maple ✓
cpu = 0.027 (sec), leaf count = 26

$$\left\{\frac{3x}{2}-\frac{3\ln(6y(x)+2x-5)}{4}+\frac{3y(x)}{2}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[3 - x - 3*y[x] + (4 - x - 3*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (5 - 2*x - 3*ProductLog[-E^(-1 + (4*x)/3 + C[1])])/6}}
```

Maple raw input

```
dsolve((4-x-3*y(x))*diff(y(x),x)+3-x-3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
3/2*x-3/4*ln(6*y(x)+2*x-5)+3/2*y(x)-_C1 = 0
```

4.483 $(3y(x)+2x+2)y'(x)=-3y(x)-2x+1$

ODE

$$(3y(x)+2x+2)y'(x)=-3y(x)-2x+1$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0197388 (sec), leaf count = 30

$$\left\{\left\{y(x)\to\frac{1}{3}\left(9W\left(-e^{c_1-\frac{x}{9}-1}\right)-2x+7\right)\right\}\right\}$$

Maple ✓
cpu = 0.028 (sec), leaf count = 22

$$\{-\_C1+x+3\ln(3y(x)+2x-7)+y(x)=0\}$$

Mathematica raw input

```
DSolve[(2 + 2*x + 3*y[x])*y'[x] == 1 - 2*x - 3*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (7 - 2*x + 9*ProductLog[-E^(-1 - x/9 + C[1])])/3}}
```

Maple raw input

```
dsolve((2+2*x+3*y(x))*diff(y(x),x) = 1-2*x-3*y(x), y(x),'implicit')
```

Maple raw output

```
-_C1+x+3*ln(3*y(x)+2*x-7)+y(x) = 0
```

4.484 $(-3y(x)-2x+5)y'(x)-3y(x)-2x+1=0$

ODE

$$(-3y(x)-2x+5)y'(x)-3y(x)-2x+1=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0161991 (sec), leaf count = 30

$$\left\{\left\{y(x)\to -4W\left(-e^{c_1+\frac{x}{12}-1}\right)-\frac{2x}{3}-\frac{7}{3}\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 22

$$\{-\_C1+x-4\ln(3\,y(x)+2\,x+7)+y(x)=0\}$$

Mathematica raw input

```
DSolve[1 - 2*x - 3*y[x] + (5 - 2*x - 3*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -7/3 - (2*x)/3 - 4*ProductLog[-E^(-1 + x/12 + C[1])]}}
```

Maple raw input

```
dsolve((5-2*x-3*y(x))*diff(y(x),x)+1-2*x-3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-_C1+x-4*ln(3*y(x)+2*x+7)+y(x) = 0
```

4.485 $(-3y(x)+9x+1)y'(x)-y(x)+3x+2=0$

ODE

$$(-3y(x)+9x+1)y'(x)-y(x)+3x+2=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0179894 (sec), leaf count = 26

$$\left\{\left\{y(x)\to\frac{1}{6}\left(W\left(-e^{c_1-20x-1}\right)+18x+3\right)\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 26

$$\left\{\frac{x}{10}+\frac{\ln(2\,y(x)-6\,x-1)}{20}+\frac{3\,y(x)}{10}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2 + 3*x - y[x] + (1 + 9*x - 3*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3 + 18*x + ProductLog[-E^(-1 - 20*x + C[1])])/6}}
```

Maple raw input

```
dsolve((1+9*x-3*y(x))*diff(y(x),x)+2+3*x-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/10*x+1/20*ln(2*y(x)-6*x-1)+3/10*y(x)-_C1 = 0
```

4.486 $(4y(x)+x)y'(x)-y(x)+4x=0$

ODE

$$(4y(x)+x)y'(x)-y(x)+4x=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0375279 (sec), leaf count = 31

$$\text{Solve}\left[2\log\left(\frac{y(x)^2}{x^2}+1\right)+\tan^{-1}\left(\frac{y(x)}{x}\right)+4\log(x)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.013 (sec), leaf count = 35

$$\left\{-\frac{1}{2}\ln\left(\frac{x^2+(y(x))^2}{x^2}\right)-\frac{1}{4}\arctan\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[4*x - y[x] + (x + 4*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[ArcTan[y[x]/x] + 4*Log[x] + 2*Log[1 + y[x]^2/x^2] == C[1], y[x]]
```

Maple raw input

```
dsolve((x+4*y(x))*diff(y(x),x)+4*x-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln((x^2+y(x)^2)/x^2)-1/4*arctan(y(x)/x)-ln(x)-_C1 = 0
```

4.487 $(4y(x)+2x+3)y'(x)=2y(x)+x+1$

ODE

$$(4y(x)+2x+3)y'(x)=2y(x)+x+1$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0141727 (sec), leaf count = 26

$$\left\{\left\{y(x)\to\frac{1}{8}\left(W\left(-e^{c_1+8x-1}\right)-4x-5\right)\right\}\right\}$$

Maple ✓
cpu = 0.031 (sec), leaf count = 26

$$\left\{\frac{x}{2}-\frac{\ln\left(5+4x+8y(x)\right)}{8}-y(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(3 + 2*x + 4*y[x])*y'[x] == 1 + x + 2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-5 - 4*x + ProductLog[-E^(-1 + 8*x + C[1])])/8}}
```

Maple raw input

```
dsolve((3+2*x+4*y(x))*diff(y(x),x) = 1+x+2*y(x), y(x),'implicit')
```

Maple raw output

```
1/2*x-1/8*ln(5+4*x+8*y(x))-y(x)-_C1 = 0
```

4.488 $(-4y(x)+2x+5)y'(x)=-2y(x)+x+3$

ODE

$$(-4y(x)+2x+5)y'(x)=-2y(x)+x+3$$

ODE Classification

[[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0106401 (sec), leaf count = 61

$$\left\{\left\{y(x)\to\frac{1}{4}\left(-i\sqrt{-16c_1+4x-25}+2x+5\right)\right\},\left\{y(x)\to\frac{1}{4}\left(i\sqrt{-16c_1+4x-25}+2x+5\right)\right\}\right\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 24

$$\left\{-\_C1+2\left(-x/2+y(x)\right)^2+3x-5y(x)=0\right\}$$

Mathematica raw input

```
DSolve[(5 + 2*x - 4*y[x])*y'[x] == 3 + x - 2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (5 + 2*x - I*Sqrt[-25 + 4*x - 16*C[1]])/4}, {y[x] -> (5 + 2*x + I*Sqrt
[-25 + 4*x - 16*C[1]])/4}}
```

Maple raw input

```
dsolve((5+2*x-4*y(x))*diff(y(x),x) = 3+x-2*y(x), y(x),'implicit')
```

Maple raw output

```
-_C1+2*(-1/2*x+y(x))^2+3*x-5*y(x) = 0
```

4.489 $(-4y(x)+3x+5)y'(x)=-3y(x)+7x+2$

ODE

$$(-4y(x)+3x+5)y'(x)=-3y(x)+7x+2$$

ODE Classification

[[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.010106 (sec), leaf count = 71

$$\left\{\left\{y(x)\to\frac{1}{4}\left(-i\sqrt{-16c_1+19x^2-14x-25}+3x+5\right)\right\},\left\{y(x)\to\frac{1}{4}\left(i\sqrt{-16c_1+19x^2-14x-25}+3x+5\right)\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 50

$$\left\{-\frac{1}{2}\ln\left(\frac{1444\left(y(x)\right)^2+\left(-2166\,x-3610\right)y(x)+2527\,x^2+1444\,x+2489}{\left(-7+19\,x\right)^2}\right)-\ln\left(-7+19\,x\right)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(5 + 3*x - 4*y[x])*y'[x] == 2 + 7*x - 3*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (5 + 3*x - I*Sqrt[-25 - 14*x + 19*x^2 - 16*C[1]])/4}, {y[x] -> (5 + 3*
x + I*Sqrt[-25 - 14*x + 19*x^2 - 16*C[1]])/4}}
```

Maple raw input

```
dsolve((5+3*x-4*y(x))*diff(y(x),x) = 2+7*x-3*y(x), y(x),'implicit')
```

Maple raw output

```
-1/2*ln((1444*y(x)^2+(-2166*x-3610)*y(x)+2527*x^2+1444*x+2489)/(-7+19*x)^2)-ln(-
7+19*x)-_C1 = 0
```

4.490 $4(-y(x)-x+1)y'(x)-x+2=0$

ODE

$$4(-y(x)-x+1)y'(x)-x+2=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class C`], _dAlembert]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 4.83265 (sec), leaf count = 109

$$\text{Solve}\left[\frac{2^{2/3}\left(x\log\left(\frac{x-2}{y(x)+x-1}\right)-x\log\left(\frac{2y(x)+x}{y(x)+x-1}\right)+2y(x)\left(\log\left(\frac{x-2}{y(x)+x-1}\right)-\log\left(\frac{2y(x)+x}{y(x)+x-1}\right)+1\right)+2x-2\right)}{9(2y(x)+x)}=c_1+\frac{1}{9}2^{2/3}\right]$$

Maple ✓
cpu = 0.023 (sec), leaf count = 59

$$\left\{\frac{1}{x+2\,y\left(x\right)}\left(\left(x+2\,y(x)\right)\ln\left(\frac{-x-2\,y(x)}{x-2}\right)+\left(x+2\,y(x)\right)\ln\left(x-2\right)-2\,\_C1\,y(x)+2+\left(-\_C1-1\right)x\right)=0\right\}$$

Mathematica raw input

```
DSolve[2 - x + 4*(1 - x - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[(2^(2/3)*(-2 + 2*x + x*Log[(-2 + x)/(-1 + x + y[x])] - x*Log[(x + 2*y[x])/
(-1 + x + y[x])] + 2*(1 + Log[(-2 + x)/(-1 + x + y[x])] - Log[(x + 2*y[x])/(-1 +
 x + y[x])])*y[x]))/(9*(x + 2*y[x])) == C[1] + (2^(2/3)*Log[-2 + x])/9, y[x]]
```

Maple raw input

```
dsolve(4*(1-x-y(x))*diff(y(x),x)+2-x = 0, y(x),'implicit')
```

Maple raw output

```
((x+2*y(x))*ln((-x-2*y(x))/(x-2))+(x+2*y(x))*ln(x-2)-2*_C1*y(x)+2+(-_C1-1)*x)/(x
+2*y(x)) = 0
```

4.491 $(-4y(x)-11x+11)y'(x)=-25y(x)-8x+62$

ODE

$$(-4y(x)-11x+11)y'(x)=-25y(x)-8x+62$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.286912 (sec), leaf count = 1677

$$\left\{\left\{y(x)\to\frac{1}{4}\left(\frac{}{\sqrt[3]{-6561\cosh\left(\frac{3c_1}{4}\right)x^4-6561\sinh\left(\frac{3c_1}{4}\right)x^4+2916\cosh\left(\frac{3c_1}{4}\right)x^3+2916\sinh\left(\frac{3c_1}{4}\right)x^3+162\cosh\left(\frac{3}{}\right.\right.}\right.\right.$$

Maple ✓
cpu = 0.031 (sec), leaf count = 55

$$\left\{\frac{1}{2}\ln\left(\frac{45-18\,y(x)-9\,x}{-1+9\,x}\right)-\frac{3}{2}\ln\left(\frac{18-9\,y(x)+36\,x}{-1+9\,x}\right)-\ln\left(-1+9\,x\right)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(11 - 11*x - 4*y[x])*y'[x] == 62 - 8*x - 25*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-11*(-1 + x) + (3*(-1 + 9*x))/(1 - (-1 + 2*Cosh[(3*C[1])/8] - 36*x*Co
sh[(3*C[1])/8] + 162*x^2*Cosh[(3*C[1])/8] - Cosh[(3*C[1])/4] + 36*x*Cosh[(3*C[1]
)/4] - 486*x^2*Cosh[(3*C[1])/4] + 2916*x^3*Cosh[(3*C[1])/4] - 6561*x^4*Cosh[(3*C
[1])/4] + 2*Sinh[(3*C[1])/8] - 36*x*Sinh[(3*C[1])/8] + 162*x^2*Sinh[(3*C[1])/8]
- Sinh[(3*C[1])/4] + 36*x*Sinh[(3*C[1])/4] - 486*x^2*Sinh[(3*C[1])/4] + 2916*x^3
*Sinh[(3*C[1])/4] - 6561*x^4*Sinh[(3*C[1])/4] + Sqrt[(1 - 9*x)^2*(9*x*(-2 + 9*x)
```

```
*Cosh[(3*C[1])/16] + (2 - 18*x + 81*x^2)*Sinh[(3*C[1])/16])^3*(Cosh[(15*C[1])/16
] + Sinh[(15*C[1])/16])])^(-1/3) + (-1 + 2*Cosh[(3*C[1])/8] - 36*x*Cosh[(3*C[1])
/8] + 162*x^2*Cosh[(3*C[1])/8] - Cosh[(3*C[1])/4] + 36*x*Cosh[(3*C[1])/4] - 486*
x^2*Cosh[(3*C[1])/4] + 2916*x^3*Cosh[(3*C[1])/4] - 6561*x^4*Cosh[(3*C[1])/4] + 2
*Sinh[(3*C[1])/8] - 36*x*Sinh[(3*C[1])/8] + 162*x^2*Sinh[(3*C[1])/8] - Sinh[(3*C
[1])/4] + 36*x*Sinh[(3*C[1])/4] - 486*x^2*Sinh[(3*C[1])/4] + 2916*x^3*Sinh[(3*C[
1])/4] - 6561*x^4*Sinh[(3*C[1])/4] + Sqrt[(1 - 9*x)^2*(9*x*(-2 + 9*x)*Cosh[(3*C[
1])/16] + (2 - 18*x + 81*x^2)*Sinh[(3*C[1])/16])^3*(Cosh[(15*C[1])/16] + Sinh[(1
5*C[1])/16])])^(1/3)/(-1 + (1 - 9*x)^2*Cosh[(3*C[1])/8] + (1 - 9*x)^2*Sinh[(3*C[
1])/8]))))/4}, {y[x] -> (-11*(-1 + x) + (6*(-1 + 9*x))/(2 + (1 + I*Sqrt[3])/(-1 +
 2*Cosh[(3*C[1])/8] - 36*x*Cosh[(3*C[1])/8] + 162*x^2*Cosh[(3*C[1])/8] - Cosh[(3
*C[1])/4] + 36*x*Cosh[(3*C[1])/4] - 486*x^2*Cosh[(3*C[1])/4] + 2916*x^3*Cosh[(3*
C[1])/4] - 6561*x^4*Cosh[(3*C[1])/4] + 2*Sinh[(3*C[1])/8] - 36*x*Sinh[(3*C[1])/8
] + 162*x^2*Sinh[(3*C[1])/8] - Sinh[(3*C[1])/4] + 36*x*Sinh[(3*C[1])/4] - 486*x^
2*Sinh[(3*C[1])/4] + 2916*x^3*Sinh[(3*C[1])/4] - 6561*x^4*Sinh[(3*C[1])/4] + Sqr
t[(1 - 9*x)^2*(9*x*(-2 + 9*x)*Cosh[(3*C[1])/16] + (2 - 18*x + 81*x^2)*Sinh[(3*C[
1])/16])^3*(Cosh[(15*C[1])/16] + Sinh[(15*C[1])/16])])^(1/3) + (I*(I + Sqrt[3])*
(-1 + 2*Cosh[(3*C[1])/8] - 36*x*Cosh[(3*C[1])/8] + 162*x^2*Cosh[(3*C[1])/8] - Co
sh[(3*C[1])/4] + 36*x*Cosh[(3*C[1])/4] - 486*x^2*Cosh[(3*C[1])/4] + 2916*x^3*Cos
h[(3*C[1])/4] - 6561*x^4*Cosh[(3*C[1])/4] + 2*Sinh[(3*C[1])/8] - 36*x*Sinh[(3*C[
1])/8] + 162*x^2*Sinh[(3*C[1])/8] - Sinh[(3*C[1])/4] + 36*x*Sinh[(3*C[1])/4] - 4
86*x^2*Sinh[(3*C[1])/4] + 2916*x^3*Sinh[(3*C[1])/4] - 6561*x^4*Sinh[(3*C[1])/4]
+ Sqrt[(1 - 9*x)^2*(9*x*(-2 + 9*x)*Cosh[(3*C[1])/16] + (2 - 18*x + 81*x^2)*Sinh[
(3*C[1])/16])^3*(Cosh[(15*C[1])/16] + Sinh[(15*C[1])/16])])^(1/3))/(-1 + (1 - 9*
x)^2*Cosh[(3*C[1])/8] + (1 - 9*x)^2*Sinh[(3*C[1])/8]))))/4}, {y[x] -> (-11*(-1 +
x) + (6*(-1 + 9*x))/(2 + (1 - I*Sqrt[3])/(-1 + 2*Cosh[(3*C[1])/8] - 36*x*Cosh[(3
*C[1])/8] + 162*x^2*Cosh[(3*C[1])/8] - Cosh[(3*C[1])/4] + 36*x*Cosh[(3*C[1])/4]
- 486*x^2*Cosh[(3*C[1])/4] + 2916*x^3*Cosh[(3*C[1])/4] - 6561*x^4*Cosh[(3*C[1])/
4] + 2*Sinh[(3*C[1])/8] - 36*x*Sinh[(3*C[1])/8] + 162*x^2*Sinh[(3*C[1])/8] - Sin
h[(3*C[1])/4] + 36*x*Sinh[(3*C[1])/4] - 486*x^2*Sinh[(3*C[1])/4] + 2916*x^3*Sinh
[(3*C[1])/4] - 6561*x^4*Sinh[(3*C[1])/4] + Sqrt[(1 - 9*x)^2*(9*x*(-2 + 9*x)*Cosh
[(3*C[1])/16] + (2 - 18*x + 81*x^2)*Sinh[(3*C[1])/16])^3*(Cosh[(15*C[1])/16] + S
inh[(15*C[1])/16])])^(1/3) - (I*(-I + Sqrt[3])*(-1 + 2*Cosh[(3*C[1])/8] - 36*x*C
osh[(3*C[1])/8] + 162*x^2*Cosh[(3*C[1])/8] - Cosh[(3*C[1])/4] + 36*x*Cosh[(3*C[1
])/4] - 486*x^2*Cosh[(3*C[1])/4] + 2916*x^3*Cosh[(3*C[1])/4] - 6561*x^4*Cosh[(3*
C[1])/4] + 2*Sinh[(3*C[1])/8] - 36*x*Sinh[(3*C[1])/8] + 162*x^2*Sinh[(3*C[1])/8]
 - Sinh[(3*C[1])/4] + 36*x*Sinh[(3*C[1])/4] - 486*x^2*Sinh[(3*C[1])/4] + 2916*x^
3*Sinh[(3*C[1])/4] - 6561*x^4*Sinh[(3*C[1])/4] + Sqrt[(1 - 9*x)^2*(9*x*(-2 + 9*x
)*Cosh[(3*C[1])/16] + (2 - 18*x + 81*x^2)*Sinh[(3*C[1])/16])^3*(Cosh[(15*C[1])/1
6] + Sinh[(15*C[1])/16])])^(1/3))/(-1 + (1 - 9*x)^2*Cosh[(3*C[1])/8] + (1 - 9*x)
^2*Sinh[(3*C[1])/8]))))/4}}
```

Maple raw input

```
dsolve((11-11*x-4*y(x))*diff(y(x),x) = 62-8*x-25*y(x), y(x),'implicit')
```

Maple raw output

```
1/2*ln((45-18*y(x)-9*x)/(-1+9*x))-3/2*ln((18-9*y(x)+36*x)/(-1+9*x))-ln(-1+9*x)-_
C1 = 0
```

4.492 $(5y(x)+3x+6)y'(x)=7y(x)+x+2$

ODE

$$(5y(x)+3x+6)y'(x)=7y(x)+x+2$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.355231 (sec), leaf count = 4961

Maple ✓
cpu = 0.03 (sec), leaf count = 47

$$\left\{-\frac{4}{3}\ln\left(\frac{-y(x)+2+x}{2+x}\right)+\frac{1}{3}\ln\left(\frac{-5\,y(x)-2-x}{2+x}\right)-\ln(2+x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(6 + 3*x + 5*y[x])*y'[x] == 2 + x + 7*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-3*(2 + x) + Root[E^((24*C[1])/25) + (-128*E^((24*C[1])/25) - 64*E^((
24*C[1])/25)*x)*#1 + (7168*E^((24*C[1])/25) + 7168*E^((24*C[1])/25)*x + 1792*E^(
(24*C[1])/25)*x^2)*#1^2 + (-229376*E^((24*C[1])/25) - 344064*E^((24*C[1])/25)*x
- 172032*E^((24*C[1])/25)*x^2 - 28672*E^((24*C[1])/25)*x^3)*#1^3 + (4587520*E^((
24*C[1])/25) + 9175040*E^((24*C[1])/25)*x + 6881280*E^((24*C[1])/25)*x^2 + 22937
60*E^((24*C[1])/25)*x^3 + 286720*E^((24*C[1])/25)*x^4)*#1^4 + (-58720256*E^((24*
C[1])/25) - 146800640*E^((24*C[1])/25)*x - 146800640*E^((24*C[1])/25)*x^2 - 7340
0320*E^((24*C[1])/25)*x^3 - 18350080*E^((24*C[1])/25)*x^4 - 1835008*E^((24*C[1])
/25)*x^5)*#1^5 + (4194304 + 469762048*E^((24*C[1])/25) + 1409286144*E^((24*C[1])
/25)*x + 1761607680*E^((24*C[1])/25)*x^2 + 1174405120*E^((24*C[1])/25)*x^3 + 440
401920*E^((24*C[1])/25)*x^4 + 88080384*E^((24*C[1])/25)*x^5 + 7340032*E^((24*C[1
])/25)*x^6)*#1^6 + (-33554432 - 2147483648*E^((24*C[1])/25) - 16777216*x - 75161
92768*E^((24*C[1])/25)*x - 11274289152*E^((24*C[1])/25)*x^2 - 9395240960*E^((24*
C[1])/25)*x^3 - 4697620480*E^((24*C[1])/25)*x^4 - 1409286144*E^((24*C[1])/25)*x^
5 - 234881024*E^((24*C[1])/25)*x^6 - 16777216*E^((24*C[1])/25)*x^7)*#1^7 + (6710
```

```
8864 + 4294967296*E^((24*C[1])/25) + 67108864*x + 17179869184*E^((24*C[1])/25)*x
 + 16777216*x^2 + 30064771072*E^((24*C[1])/25)*x^2 + 30064771072*E^((24*C[1])/25
)*x^3 + 18790481920*E^((24*C[1])/25)*x^4 + 7516192768*E^((24*C[1])/25)*x^5 + 187
9048192*E^((24*C[1])/25)*x^6 + 268435456*E^((24*C[1])/25)*x^7 + 16777216*E^((24*
C[1])/25)*x^8)*#1^8 & , 1]^(-1))/5}, {y[x] -> (-3*(2 + x) + Root[E^((24*C[1])/25
) + (-128*E^((24*C[1])/25) - 64*E^((24*C[1])/25)*x)*#1 + (7168*E^((24*C[1])/25)
+ 7168*E^((24*C[1])/25)*x + 1792*E^((24*C[1])/25)*x^2)*#1^2 + (-229376*E^((24*C[
1])/25) - 344064*E^((24*C[1])/25)*x - 172032*E^((24*C[1])/25)*x^2 - 28672*E^((24
*C[1])/25)*x^3)*#1^3 + (4587520*E^((24*C[1])/25) + 9175040*E^((24*C[1])/25)*x +
6881280*E^((24*C[1])/25)*x^2 + 2293760*E^((24*C[1])/25)*x^3 + 286720*E^((24*C[1]
)/25)*x^4)*#1^4 + (-58720256*E^((24*C[1])/25) - 146800640*E^((24*C[1])/25)*x - 1
46800640*E^((24*C[1])/25)*x^2 - 73400320*E^((24*C[1])/25)*x^3 - 18350080*E^((24*
C[1])/25)*x^4 - 1835008*E^((24*C[1])/25)*x^5)*#1^5 + (4194304 + 469762048*E^((24
*C[1])/25) + 1409286144*E^((24*C[1])/25)*x + 1761607680*E^((24*C[1])/25)*x^2 + 1
174405120*E^((24*C[1])/25)*x^3 + 440401920*E^((24*C[1])/25)*x^4 + 88080384*E^((2
4*C[1])/25)*x^5 + 7340032*E^((24*C[1])/25)*x^6)*#1^6 + (-33554432 - 2147483648*E
^((24*C[1])/25) - 16777216*x - 7516192768*E^((24*C[1])/25)*x - 11274289152*E^((2
4*C[1])/25)*x^2 - 9395240960*E^((24*C[1])/25)*x^3 - 4697620480*E^((24*C[1])/25)*
x^4 - 1409286144*E^((24*C[1])/25)*x^5 - 234881024*E^((24*C[1])/25)*x^6 - 1677721
6*E^((24*C[1])/25)*x^7)*#1^7 + (67108864 + 4294967296*E^((24*C[1])/25) + 6710886
4*x + 17179869184*E^((24*C[1])/25)*x + 16777216*x^2 + 30064771072*E^((24*C[1])/2
5)*x^2 + 30064771072*E^((24*C[1])/25)*x^3 + 18790481920*E^((24*C[1])/25)*x^4 + 7
516192768*E^((24*C[1])/25)*x^5 + 1879048192*E^((24*C[1])/25)*x^6 + 268435456*E^(
(24*C[1])/25)*x^7 + 16777216*E^((24*C[1])/25)*x^8)*#1^8 & , 2]^(-1))/5}, {y[x] -
> (-3*(2 + x) + Root[E^((24*C[1])/25) + (-128*E^((24*C[1])/25) - 64*E^((24*C[1])
/25)*x)*#1 + (7168*E^((24*C[1])/25) + 7168*E^((24*C[1])/25)*x + 1792*E^((24*C[1]
)/25)*x^2)*#1^2 + (-229376*E^((24*C[1])/25) - 344064*E^((24*C[1])/25)*x - 172032
*E^((24*C[1])/25)*x^2 - 28672*E^((24*C[1])/25)*x^3)*#1^3 + (4587520*E^((24*C[1])
/25) + 9175040*E^((24*C[1])/25)*x + 6881280*E^((24*C[1])/25)*x^2 + 2293760*E^((2
4*C[1])/25)*x^3 + 286720*E^((24*C[1])/25)*x^4)*#1^4 + (-58720256*E^((24*C[1])/25
) - 146800640*E^((24*C[1])/25)*x - 146800640*E^((24*C[1])/25)*x^2 - 73400320*E^(
(24*C[1])/25)*x^3 - 18350080*E^((24*C[1])/25)*x^4 - 1835008*E^((24*C[1])/25)*x^5
)*#1^5 + (4194304 + 469762048*E^((24*C[1])/25) + 1409286144*E^((24*C[1])/25)*x +
 1761607680*E^((24*C[1])/25)*x^2 + 1174405120*E^((24*C[1])/25)*x^3 + 440401920*E
^((24*C[1])/25)*x^4 + 88080384*E^((24*C[1])/25)*x^5 + 7340032*E^((24*C[1])/25)*x
^6)*#1^6 + (-33554432 - 2147483648*E^((24*C[1])/25) - 16777216*x - 7516192768*E^
((24*C[1])/25)*x - 11274289152*E^((24*C[1])/25)*x^2 - 9395240960*E^((24*C[1])/25
)*x^3 - 4697620480*E^((24*C[1])/25)*x^4 - 1409286144*E^((24*C[1])/25)*x^5 - 2348
81024*E^((24*C[1])/25)*x^6 - 16777216*E^((24*C[1])/25)*x^7)*#1^7 + (67108864 + 4
294967296*E^((24*C[1])/25) + 67108864*x + 17179869184*E^((24*C[1])/25)*x + 16777
216*x^2 + 30064771072*E^((24*C[1])/25)*x^2 + 30064771072*E^((24*C[1])/25)*x^3 +
18790481920*E^((24*C[1])/25)*x^4 + 7516192768*E^((24*C[1])/25)*x^5 + 1879048192*
E^((24*C[1])/25)*x^6 + 268435456*E^((24*C[1])/25)*x^7 + 16777216*E^((24*C[1])/25
)*x^8)*#1^8 & , 3]^(-1))/5}, {y[x] -> (-3*(2 + x) + Root[E^((24*C[1])/25) + (-12
8*E^((24*C[1])/25) - 64*E^((24*C[1])/25)*x)*#1 + (7168*E^((24*C[1])/25) + 7168*E
^((24*C[1])/25)*x + 1792*E^((24*C[1])/25)*x^2)*#1^2 + (-229376*E^((24*C[1])/25)
- 344064*E^((24*C[1])/25)*x - 172032*E^((24*C[1])/25)*x^2 - 28672*E^((24*C[1])/2
```

```
5)*x^3)*#1^3 + (4587520*E^((24*C[1])/25) + 9175040*E^((24*C[1])/25)*x + 6881280*
E^((24*C[1])/25)*x^2 + 2293760*E^((24*C[1])/25)*x^3 + 286720*E^((24*C[1])/25)*x^
4)*#1^4 + (-58720256*E^((24*C[1])/25) - 146800640*E^((24*C[1])/25)*x - 146800640
*E^((24*C[1])/25)*x^2 - 73400320*E^((24*C[1])/25)*x^3 - 18350080*E^((24*C[1])/25
)*x^4 - 1835008*E^((24*C[1])/25)*x^5)*#1^5 + (4194304 + 469762048*E^((24*C[1])/2
5) + 1409286144*E^((24*C[1])/25)*x + 1761607680*E^((24*C[1])/25)*x^2 + 117440512
0*E^((24*C[1])/25)*x^3 + 440401920*E^((24*C[1])/25)*x^4 + 88080384*E^((24*C[1])/
25)*x^5 + 7340032*E^((24*C[1])/25)*x^6)*#1^6 + (-33554432 - 2147483648*E^((24*C[
1])/25) - 16777216*x - 7516192768*E^((24*C[1])/25)*x - 11274289152*E^((24*C[1])/
25)*x^2 - 9395240960*E^((24*C[1])/25)*x^3 - 4697620480*E^((24*C[1])/25)*x^4 - 14
09286144*E^((24*C[1])/25)*x^5 - 234881024*E^((24*C[1])/25)*x^6 - 16777216*E^((24
*C[1])/25)*x^7)*#1^7 + (67108864 + 4294967296*E^((24*C[1])/25) + 67108864*x + 17
179869184*E^((24*C[1])/25)*x + 16777216*x^2 + 30064771072*E^((24*C[1])/25)*x^2 +
 30064771072*E^((24*C[1])/25)*x^3 + 18790481920*E^((24*C[1])/25)*x^4 + 751619276
8*E^((24*C[1])/25)*x^5 + 1879048192*E^((24*C[1])/25)*x^6 + 268435456*E^((24*C[1]
)/25)*x^7 + 16777216*E^((24*C[1])/25)*x^8)*#1^8 & , 4]^(-1))/5}, {y[x] -> (-3*(2
 + x) + Root[E^((24*C[1])/25) + (-128*E^((24*C[1])/25) - 64*E^((24*C[1])/25)*x)*
#1 + (7168*E^((24*C[1])/25) + 7168*E^((24*C[1])/25)*x + 1792*E^((24*C[1])/25)*x^
2)*#1^2 + (-229376*E^((24*C[1])/25) - 344064*E^((24*C[1])/25)*x - 172032*E^((24*
C[1])/25)*x^2 - 28672*E^((24*C[1])/25)*x^3)*#1^3 + (4587520*E^((24*C[1])/25) + 9
175040*E^((24*C[1])/25)*x + 6881280*E^((24*C[1])/25)*x^2 + 2293760*E^((24*C[1])/
25)*x^3 + 286720*E^((24*C[1])/25)*x^4)*#1^4 + (-58720256*E^((24*C[1])/25) - 1468
00640*E^((24*C[1])/25)*x - 146800640*E^((24*C[1])/25)*x^2 - 73400320*E^((24*C[1]
)/25)*x^3 - 18350080*E^((24*C[1])/25)*x^4 - 1835008*E^((24*C[1])/25)*x^5)*#1^5 +
 (4194304 + 469762048*E^((24*C[1])/25) + 1409286144*E^((24*C[1])/25)*x + 1761607
680*E^((24*C[1])/25)*x^2 + 1174405120*E^((24*C[1])/25)*x^3 + 440401920*E^((24*C[
1])/25)*x^4 + 88080384*E^((24*C[1])/25)*x^5 + 7340032*E^((24*C[1])/25)*x^6)*#1^6
 + (-33554432 - 2147483648*E^((24*C[1])/25) - 16777216*x - 7516192768*E^((24*C[1
])/25)*x - 11274289152*E^((24*C[1])/25)*x^2 - 9395240960*E^((24*C[1])/25)*x^3 -
4697620480*E^((24*C[1])/25)*x^4 - 1409286144*E^((24*C[1])/25)*x^5 - 234881024*E^
((24*C[1])/25)*x^6 - 16777216*E^((24*C[1])/25)*x^7)*#1^7 + (67108864 + 429496729
6*E^((24*C[1])/25) + 67108864*x + 17179869184*E^((24*C[1])/25)*x + 16777216*x^2
+ 30064771072*E^((24*C[1])/25)*x^2 + 30064771072*E^((24*C[1])/25)*x^3 + 18790481
920*E^((24*C[1])/25)*x^4 + 7516192768*E^((24*C[1])/25)*x^5 + 1879048192*E^((24*C
[1])/25)*x^6 + 268435456*E^((24*C[1])/25)*x^7 + 16777216*E^((24*C[1])/25)*x^8)*#
1^8 & , 5]^(-1))/5}, {y[x] -> (-3*(2 + x) + Root[E^((24*C[1])/25) + (-128*E^((24
*C[1])/25) - 64*E^((24*C[1])/25)*x)*#1 + (7168*E^((24*C[1])/25) + 7168*E^((24*C[
1])/25)*x + 1792*E^((24*C[1])/25)*x^2)*#1^2 + (-229376*E^((24*C[1])/25) - 344064
*E^((24*C[1])/25)*x - 172032*E^((24*C[1])/25)*x^2 - 28672*E^((24*C[1])/25)*x^3)*
#1^3 + (4587520*E^((24*C[1])/25) + 9175040*E^((24*C[1])/25)*x + 6881280*E^((24*C
[1])/25)*x^2 + 2293760*E^((24*C[1])/25)*x^3 + 286720*E^((24*C[1])/25)*x^4)*#1^4
+ (-58720256*E^((24*C[1])/25) - 146800640*E^((24*C[1])/25)*x - 146800640*E^((24*
C[1])/25)*x^2 - 73400320*E^((24*C[1])/25)*x^3 - 18350080*E^((24*C[1])/25)*x^4 -
1835008*E^((24*C[1])/25)*x^5)*#1^5 + (4194304 + 469762048*E^((24*C[1])/25) + 140
9286144*E^((24*C[1])/25)*x + 1761607680*E^((24*C[1])/25)*x^2 + 1174405120*E^((24
*C[1])/25)*x^3 + 440401920*E^((24*C[1])/25)*x^4 + 88080384*E^((24*C[1])/25)*x^5
+ 7340032*E^((24*C[1])/25)*x^6)*#1^6 + (-33554432 - 2147483648*E^((24*C[1])/25)
```

```
- 16777216*x - 7516192768*E^((24*C[1])/25)*x - 11274289152*E^((24*C[1])/25)*x^2
- 9395240960*E^((24*C[1])/25)*x^3 - 4697620480*E^((24*C[1])/25)*x^4 - 1409286144
*E^((24*C[1])/25)*x^5 - 234881024*E^((24*C[1])/25)*x^6 - 16777216*E^((24*C[1])/2
5)*x^7)*#1^7 + (67108864 + 4294967296*E^((24*C[1])/25) + 67108864*x + 1717986918
4*E^((24*C[1])/25)*x + 16777216*x^2 + 30064771072*E^((24*C[1])/25)*x^2 + 3006477
1072*E^((24*C[1])/25)*x^3 + 18790481920*E^((24*C[1])/25)*x^4 + 7516192768*E^((24
*C[1])/25)*x^5 + 1879048192*E^((24*C[1])/25)*x^6 + 268435456*E^((24*C[1])/25)*x^
7 + 16777216*E^((24*C[1])/25)*x^8)*#1^8 & , 6]^(-1))/5}, {y[x] -> (-3*(2 + x) +
Root[E^((24*C[1])/25) + (-128*E^((24*C[1])/25) - 64*E^((24*C[1])/25)*x)*#1 + (71
68*E^((24*C[1])/25) + 7168*E^((24*C[1])/25)*x + 1792*E^((24*C[1])/25)*x^2)*#1^2
+ (-229376*E^((24*C[1])/25) - 344064*E^((24*C[1])/25)*x - 172032*E^((24*C[1])/25
)*x^2 - 28672*E^((24*C[1])/25)*x^3)*#1^3 + (4587520*E^((24*C[1])/25) + 9175040*E
^((24*C[1])/25)*x + 6881280*E^((24*C[1])/25)*x^2 + 2293760*E^((24*C[1])/25)*x^3
+ 286720*E^((24*C[1])/25)*x^4)*#1^4 + (-58720256*E^((24*C[1])/25) - 146800640*E^
((24*C[1])/25)*x - 146800640*E^((24*C[1])/25)*x^2 - 73400320*E^((24*C[1])/25)*x^
3 - 18350080*E^((24*C[1])/25)*x^4 - 1835008*E^((24*C[1])/25)*x^5)*#1^5 + (419430
4 + 469762048*E^((24*C[1])/25) + 1409286144*E^((24*C[1])/25)*x + 1761607680*E^((
24*C[1])/25)*x^2 + 1174405120*E^((24*C[1])/25)*x^3 + 440401920*E^((24*C[1])/25)*
x^4 + 88080384*E^((24*C[1])/25)*x^5 + 7340032*E^((24*C[1])/25)*x^6)*#1^6 + (-335
54432 - 2147483648*E^((24*C[1])/25) - 16777216*x - 7516192768*E^((24*C[1])/25)*x
 - 11274289152*E^((24*C[1])/25)*x^2 - 9395240960*E^((24*C[1])/25)*x^3 - 46976204
80*E^((24*C[1])/25)*x^4 - 1409286144*E^((24*C[1])/25)*x^5 - 234881024*E^((24*C[1
])/25)*x^6 - 16777216*E^((24*C[1])/25)*x^7)*#1^7 + (67108864 + 4294967296*E^((24
*C[1])/25) + 67108864*x + 17179869184*E^((24*C[1])/25)*x + 16777216*x^2 + 300647
71072*E^((24*C[1])/25)*x^2 + 30064771072*E^((24*C[1])/25)*x^3 + 18790481920*E^((
24*C[1])/25)*x^4 + 7516192768*E^((24*C[1])/25)*x^5 + 1879048192*E^((24*C[1])/25)
*x^6 + 268435456*E^((24*C[1])/25)*x^7 + 16777216*E^((24*C[1])/25)*x^8)*#1^8 & ,
7]^(-1))/5}, {y[x] -> (-3*(2 + x) + Root[E^((24*C[1])/25) + (-128*E^((24*C[1])/2
5) - 64*E^((24*C[1])/25)*x)*#1 + (7168*E^((24*C[1])/25) + 7168*E^((24*C[1])/25)*
x + 1792*E^((24*C[1])/25)*x^2)*#1^2 + (-229376*E^((24*C[1])/25) - 344064*E^((24*
C[1])/25)*x - 172032*E^((24*C[1])/25)*x^2 - 28672*E^((24*C[1])/25)*x^3)*#1^3 + (
4587520*E^((24*C[1])/25) + 9175040*E^((24*C[1])/25)*x + 6881280*E^((24*C[1])/25)
*x^2 + 2293760*E^((24*C[1])/25)*x^3 + 286720*E^((24*C[1])/25)*x^4)*#1^4 + (-5872
0256*E^((24*C[1])/25) - 146800640*E^((24*C[1])/25)*x - 146800640*E^((24*C[1])/25
)*x^2 - 73400320*E^((24*C[1])/25)*x^3 - 18350080*E^((24*C[1])/25)*x^4 - 1835008*
E^((24*C[1])/25)*x^5)*#1^5 + (4194304 + 469762048*E^((24*C[1])/25) + 1409286144*
E^((24*C[1])/25)*x + 1761607680*E^((24*C[1])/25)*x^2 + 1174405120*E^((24*C[1])/2
5)*x^3 + 440401920*E^((24*C[1])/25)*x^4 + 88080384*E^((24*C[1])/25)*x^5 + 734003
2*E^((24*C[1])/25)*x^6)*#1^6 + (-33554432 - 2147483648*E^((24*C[1])/25) - 167772
16*x - 7516192768*E^((24*C[1])/25)*x - 11274289152*E^((24*C[1])/25)*x^2 - 939524
0960*E^((24*C[1])/25)*x^3 - 4697620480*E^((24*C[1])/25)*x^4 - 1409286144*E^((24*
C[1])/25)*x^5 - 234881024*E^((24*C[1])/25)*x^6 - 16777216*E^((24*C[1])/25)*x^7)*
#1^7 + (67108864 + 4294967296*E^((24*C[1])/25) + 67108864*x + 17179869184*E^((24
*C[1])/25)*x + 16777216*x^2 + 30064771072*E^((24*C[1])/25)*x^2 + 30064771072*E^(
(24*C[1])/25)*x^3 + 18790481920*E^((24*C[1])/25)*x^4 + 7516192768*E^((24*C[1])/2
5)*x^5 + 1879048192*E^((24*C[1])/25)*x^6 + 268435456*E^((24*C[1])/25)*x^7 + 1677
7216*E^((24*C[1])/25)*x^8)*#1^8 & , 8]^(-1))/5}}
```

Maple raw input

```
dsolve((6+3*x+5*y(x))*diff(y(x),x) = 2+x+7*y(x), y(x),'implicit')
```

Maple raw output

```
-4/3*ln((-y(x)+2+x)/(2+x))+1/3*ln((-5*y(x)-2-x)/(2+x))-ln(2+x)-_C1 = 0
```

4.493 $(5y(x)+7x)y'(x)+8y(x)+10x=0$

ODE

$$(5y(x)+7x)y'(x)+8y(x)+10x=0$$

ODE Classification

```
[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]
```

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0284206 (sec), leaf count = 276

$$\left\{\left\{y(x)\to \text{Root}\left[\#1^5+8\#1^4x+25\#1^3x^2+38\#1^2x^3+28\#1x^4-e^{c_1}+8x^5\&,1\right]\right\},\left\{y(x)\to \text{Root}\left[\#1^5+8\#1^4x+25\#1^3\right.\right.\right.$$

Maple ✓
cpu = 0.021 (sec), leaf count = 35

$$\left\{-\frac{3}{5}\ln\left(\frac{2x+y(x)}{x}\right)-\frac{2}{5}\ln\left(\frac{x+y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[10*x + 8*y[x] + (7*x + 5*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[-E^C[1] + 8*x^5 + 28*x^4*#1 + 38*x^3*#1^2 + 25*x^2*#1^3 + 8*x*#1^
4 + #1^5 & , 1]}, {y[x] -> Root[-E^C[1] + 8*x^5 + 28*x^4*#1 + 38*x^3*#1^2 + 25*x
^2*#1^3 + 8*x*#1^4 + #1^5 & , 2]}, {y[x] -> Root[-E^C[1] + 8*x^5 + 28*x^4*#1 + 3
8*x^3*#1^2 + 25*x^2*#1^3 + 8*x*#1^4 + #1^5 & , 3]}, {y[x] -> Root[-E^C[1] + 8*x^
5 + 28*x^4*#1 + 38*x^3*#1^2 + 25*x^2*#1^3 + 8*x*#1^4 + #1^5 & , 4]}, {y[x] -> Ro
ot[-E^C[1] + 8*x^5 + 28*x^4*#1 + 38*x^3*#1^2 + 25*x^2*#1^3 + 8*x*#1^4 + #1^5 & ,
 5]}}
```

Maple raw input

```
dsolve((7*x+5*y(x))*diff(y(x),x)+10*x+8*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-3/5*ln((2*x+y(x))/x)-2/5*ln((x+y(x))/x)-ln(x)-_C1 = 0
```

4.494 $(4x^3+5y(x)+x)\,y'(x)+7x^3+3x^2y(x)+4y(x)=0$

ODE

$$(4x^3+5y(x)+x)\,y'(x)+7x^3+3x^2y(x)+4y(x)=0$$

ODE Classification

```
[_rational, [_Abel, `2nd type`, `class A`]]
```

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 1.0001 (sec), leaf count = 3591

Maple ✓
cpu = 0.049 (sec), leaf count = 99

$$\left\{\frac{7}{5}\ln\left(\frac{-35\,x-35\,y(x)}{8\,x^3+2\,x+10\,y\,(x)}\right)+\frac{7}{20}\ln\left(\frac{140\,x^3+140\,y(x)}{12\,x^3+3\,x+15\,y\,(x)}\right)-\frac{7}{4}\ln\left(\frac{28\,x^3-28\,x}{x+4\,x^3+5\,y\,(x)}\right)+\frac{7\ln\left(x^3-x\right)}{4}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[7*x^3 + 4*y[x] + 3*x^2*y[x] + (x + 4*x^3 + 5*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-x - 4*x^3 + Root[1 + (30*x - 30*x^3)*#1 + (385*x^2 - 770*x^4 + 385*x
^6)*#1^2 + (2720*x^3 - 8160*x^5 + 8160*x^7 - 2720*x^9)*#1^3 + (11200*x^4 - 44800
*x^6 + 67200*x^8 - 44800*x^10 + 11200*x^12)*#1^4 + (25088*x^5 - 125440*x^7 + 250
880*x^9 - 250880*x^11 + 125440*x^13 - 25088*x^15)*#1^5 + (17920*x^6 - 107520*x^8
 + 268800*x^10 - 358400*x^12 + 268800*x^14 - 107520*x^16 + 17920*x^18)*#1^6 + (-
40960*x^7 + 286720*x^9 - 860160*x^11 + 1433600*x^13 - 1433600*x^15 + 860160*x^17
 - 286720*x^19 + 40960*x^21)*#1^7 + (-81920*x^8 + 655360*x^10 - 2293760*x^12 + 4
587520*x^14 - 5734400*x^16 + 4587520*x^18 - 2293760*x^20 + 655360*x^22 - 81920*x
^24)*#1^8 + (65536*E^((40*C[1])/9) + 65536*x^10 - 655360*x^12 + 2949120*x^14 - 7
864320*x^16 + 13762560*x^18 - 16515072*x^20 + 13762560*x^22 - 7864320*x^24 + 294
9120*x^26 - 655360*x^28 + 65536*x^30)*#1^10 & , 1]^(-1))/5}, {y[x] -> (-x - 4*x^
3 + Root[1 + (30*x - 30*x^3)*#1 + (385*x^2 - 770*x^4 + 385*x^6)*#1^2 + (2720*x^3
 - 8160*x^5 + 8160*x^7 - 2720*x^9)*#1^3 + (11200*x^4 - 44800*x^6 + 67200*x^8 - 4
4800*x^10 + 11200*x^12)*#1^4 + (25088*x^5 - 125440*x^7 + 250880*x^9 - 250880*x^1
```

```
1 + 125440*x^13 - 25088*x^15)*#1^5 + (17920*x^6 - 107520*x^8 + 268800*x^10 - 358
400*x^12 + 268800*x^14 - 107520*x^16 + 17920*x^18)*#1^6 + (-40960*x^7 + 286720*x
^9 - 860160*x^11 + 1433600*x^13 - 1433600*x^15 + 860160*x^17 - 286720*x^19 + 409
60*x^21)*#1^7 + (-81920*x^8 + 655360*x^10 - 2293760*x^12 + 4587520*x^14 - 573440
0*x^16 + 4587520*x^18 - 2293760*x^20 + 655360*x^22 - 81920*x^24)*#1^8 + (65536*E
^((40*C[1])/9) + 65536*x^10 - 655360*x^12 + 2949120*x^14 - 7864320*x^16 + 137625
60*x^18 - 16515072*x^20 + 13762560*x^22 - 7864320*x^24 + 2949120*x^26 - 655360*x
^28 + 65536*x^30)*#1^10 & , 2]^(-1))/5}, {y[x] -> (-x - 4*x^3 + Root[1 + (30*x -
 30*x^3)*#1 + (385*x^2 - 770*x^4 + 385*x^6)*#1^2 + (2720*x^3 - 8160*x^5 + 8160*x
^7 - 2720*x^9)*#1^3 + (11200*x^4 - 44800*x^6 + 67200*x^8 - 44800*x^10 + 11200*x^
12)*#1^4 + (25088*x^5 - 125440*x^7 + 250880*x^9 - 250880*x^11 + 125440*x^13 - 25
088*x^15)*#1^5 + (17920*x^6 - 107520*x^8 + 268800*x^10 - 358400*x^12 + 268800*x^
14 - 107520*x^16 + 17920*x^18)*#1^6 + (-40960*x^7 + 286720*x^9 - 860160*x^11 + 1
433600*x^13 - 1433600*x^15 + 860160*x^17 - 286720*x^19 + 40960*x^21)*#1^7 + (-81
920*x^8 + 655360*x^10 - 2293760*x^12 + 4587520*x^14 - 5734400*x^16 + 4587520*x^1
8 - 2293760*x^20 + 655360*x^22 - 81920*x^24)*#1^8 + (65536*E^((40*C[1])/9) + 655
36*x^10 - 655360*x^12 + 2949120*x^14 - 7864320*x^16 + 13762560*x^18 - 16515072*x
^20 + 13762560*x^22 - 7864320*x^24 + 2949120*x^26 - 655360*x^28 + 65536*x^30)*#1
^10 & , 3]^(-1))/5}, {y[x] -> (-x - 4*x^3 + Root[1 + (30*x - 30*x^3)*#1 + (385*x
^2 - 770*x^4 + 385*x^6)*#1^2 + (2720*x^3 - 8160*x^5 + 8160*x^7 - 2720*x^9)*#1^3
+ (11200*x^4 - 44800*x^6 + 67200*x^8 - 44800*x^10 + 11200*x^12)*#1^4 + (25088*x^
5 - 125440*x^7 + 250880*x^9 - 250880*x^11 + 125440*x^13 - 25088*x^15)*#1^5 + (17
920*x^6 - 107520*x^8 + 268800*x^10 - 358400*x^12 + 268800*x^14 - 107520*x^16 + 1
7920*x^18)*#1^6 + (-40960*x^7 + 286720*x^9 - 860160*x^11 + 1433600*x^13 - 143360
0*x^15 + 860160*x^17 - 286720*x^19 + 40960*x^21)*#1^7 + (-81920*x^8 + 655360*x^1
0 - 2293760*x^12 + 4587520*x^14 - 5734400*x^16 + 4587520*x^18 - 2293760*x^20 + 6
55360*x^22 - 81920*x^24)*#1^8 + (65536*E^((40*C[1])/9) + 65536*x^10 - 655360*x^1
2 + 2949120*x^14 - 7864320*x^16 + 13762560*x^18 - 16515072*x^20 + 13762560*x^22
- 7864320*x^24 + 2949120*x^26 - 655360*x^28 + 65536*x^30)*#1^10 & , 4]^(-1))/5},
 {y[x] -> (-x - 4*x^3 + Root[1 + (30*x - 30*x^3)*#1 + (385*x^2 - 770*x^4 + 385*x
^6)*#1^2 + (2720*x^3 - 8160*x^5 + 8160*x^7 - 2720*x^9)*#1^3 + (11200*x^4 - 44800
*x^6 + 67200*x^8 - 44800*x^10 + 11200*x^12)*#1^4 + (25088*x^5 - 125440*x^7 + 250
880*x^9 - 250880*x^11 + 125440*x^13 - 25088*x^15)*#1^5 + (17920*x^6 - 107520*x^8
 + 268800*x^10 - 358400*x^12 + 268800*x^14 - 107520*x^16 + 17920*x^18)*#1^6 + (-
40960*x^7 + 286720*x^9 - 860160*x^11 + 1433600*x^13 - 1433600*x^15 + 860160*x^17
 - 286720*x^19 + 40960*x^21)*#1^7 + (-81920*x^8 + 655360*x^10 - 2293760*x^12 + 4
587520*x^14 - 5734400*x^16 + 4587520*x^18 - 2293760*x^20 + 655360*x^22 - 81920*x
^24)*#1^8 + (65536*E^((40*C[1])/9) + 65536*x^10 - 655360*x^12 + 2949120*x^14 - 7
864320*x^16 + 13762560*x^18 - 16515072*x^20 + 13762560*x^22 - 7864320*x^24 + 294
9120*x^26 - 655360*x^28 + 65536*x^30)*#1^10 & , 5]^(-1))/5}, {y[x] -> (-x - 4*x^
3 + Root[1 + (30*x - 30*x^3)*#1 + (385*x^2 - 770*x^4 + 385*x^6)*#1^2 + (2720*x^3
 - 8160*x^5 + 8160*x^7 - 2720*x^9)*#1^3 + (11200*x^4 - 44800*x^6 + 67200*x^8 - 4
4800*x^10 + 11200*x^12)*#1^4 + (25088*x^5 - 125440*x^7 + 250880*x^9 - 250880*x^1
1 + 125440*x^13 - 25088*x^15)*#1^5 + (17920*x^6 - 107520*x^8 + 268800*x^10 - 358
400*x^12 + 268800*x^14 - 107520*x^16 + 17920*x^18)*#1^6 + (-40960*x^7 + 286720*x
^9 - 860160*x^11 + 1433600*x^13 - 1433600*x^15 + 860160*x^17 - 286720*x^19 + 409
60*x^21)*#1^7 + (-81920*x^8 + 655360*x^10 - 2293760*x^12 + 4587520*x^14 - 573440
```

```
0*x^16 + 4587520*x^18 - 2293760*x^20 + 655360*x^22 - 81920*x^24)*#1^8 + (65536*E
^((40*C[1])/9) + 65536*x^10 - 655360*x^12 + 2949120*x^14 - 7864320*x^16 + 137625
60*x^18 - 16515072*x^20 + 13762560*x^22 - 7864320*x^24 + 2949120*x^26 - 655360*x
^28 + 65536*x^30)*#1^10 & , 6]^(-1))/5}, {y[x] -> (-x - 4*x^3 + Root[1 + (30*x -
 30*x^3)*#1 + (385*x^2 - 770*x^4 + 385*x^6)*#1^2 + (2720*x^3 - 8160*x^5 + 8160*x
^7 - 2720*x^9)*#1^3 + (11200*x^4 - 44800*x^6 + 67200*x^8 - 44800*x^10 + 11200*x^
12)*#1^4 + (25088*x^5 - 125440*x^7 + 250880*x^9 - 250880*x^11 + 125440*x^13 - 25
088*x^15)*#1^5 + (17920*x^6 - 107520*x^8 + 268800*x^10 - 358400*x^12 + 268800*x^
14 - 107520*x^16 + 17920*x^18)*#1^6 + (-40960*x^7 + 286720*x^9 - 860160*x^11 + 1
433600*x^13 - 1433600*x^15 + 860160*x^17 - 286720*x^19 + 40960*x^21)*#1^7 + (-81
920*x^8 + 655360*x^10 - 2293760*x^12 + 4587520*x^14 - 5734400*x^16 + 4587520*x^1
8 - 2293760*x^20 + 655360*x^22 - 81920*x^24)*#1^8 + (65536*E^((40*C[1])/9) + 655
36*x^10 - 655360*x^12 + 2949120*x^14 - 7864320*x^16 + 13762560*x^18 - 16515072*x
^20 + 13762560*x^22 - 7864320*x^24 + 2949120*x^26 - 655360*x^28 + 65536*x^30)*#1
^10 & , 7]^(-1))/5}, {y[x] -> (-x - 4*x^3 + Root[1 + (30*x - 30*x^3)*#1 + (385*x
^2 - 770*x^4 + 385*x^6)*#1^2 + (2720*x^3 - 8160*x^5 + 8160*x^7 - 2720*x^9)*#1^3
+ (11200*x^4 - 44800*x^6 + 67200*x^8 - 44800*x^10 + 11200*x^12)*#1^4 + (25088*x^
5 - 125440*x^7 + 250880*x^9 - 250880*x^11 + 125440*x^13 - 25088*x^15)*#1^5 + (17
920*x^6 - 107520*x^8 + 268800*x^10 - 358400*x^12 + 268800*x^14 - 107520*x^16 + 1
7920*x^18)*#1^6 + (-40960*x^7 + 286720*x^9 - 860160*x^11 + 1433600*x^13 - 143360
0*x^15 + 860160*x^17 - 286720*x^19 + 40960*x^21)*#1^7 + (-81920*x^8 + 655360*x^1
0 - 2293760*x^12 + 4587520*x^14 - 5734400*x^16 + 4587520*x^18 - 2293760*x^20 + 6
55360*x^22 - 81920*x^24)*#1^8 + (65536*E^((40*C[1])/9) + 65536*x^10 - 655360*x^1
2 + 2949120*x^14 - 7864320*x^16 + 13762560*x^18 - 16515072*x^20 + 13762560*x^22
- 7864320*x^24 + 2949120*x^26 - 655360*x^28 + 65536*x^30)*#1^10 & , 8]^(-1))/5},
 {y[x] -> (-x - 4*x^3 + Root[1 + (30*x - 30*x^3)*#1 + (385*x^2 - 770*x^4 + 385*x
^6)*#1^2 + (2720*x^3 - 8160*x^5 + 8160*x^7 - 2720*x^9)*#1^3 + (11200*x^4 - 44800
*x^6 + 67200*x^8 - 44800*x^10 + 11200*x^12)*#1^4 + (25088*x^5 - 125440*x^7 + 250
880*x^9 - 250880*x^11 + 125440*x^13 - 25088*x^15)*#1^5 + (17920*x^6 - 107520*x^8
 + 268800*x^10 - 358400*x^12 + 268800*x^14 - 107520*x^16 + 17920*x^18)*#1^6 + (-
40960*x^7 + 286720*x^9 - 860160*x^11 + 1433600*x^13 - 1433600*x^15 + 860160*x^17
 - 286720*x^19 + 40960*x^21)*#1^7 + (-81920*x^8 + 655360*x^10 - 2293760*x^12 + 4
587520*x^14 - 5734400*x^16 + 4587520*x^18 - 2293760*x^20 + 655360*x^22 - 81920*x
^24)*#1^8 + (65536*E^((40*C[1])/9) + 65536*x^10 - 655360*x^12 + 2949120*x^14 - 7
864320*x^16 + 13762560*x^18 - 16515072*x^20 + 13762560*x^22 - 7864320*x^24 + 294
9120*x^26 - 655360*x^28 + 65536*x^30)*#1^10 & , 9]^(-1))/5}, {y[x] -> (-x - 4*x^
3 + Root[1 + (30*x - 30*x^3)*#1 + (385*x^2 - 770*x^4 + 385*x^6)*#1^2 + (2720*x^3
 - 8160*x^5 + 8160*x^7 - 2720*x^9)*#1^3 + (11200*x^4 - 44800*x^6 + 67200*x^8 - 4
4800*x^10 + 11200*x^12)*#1^4 + (25088*x^5 - 125440*x^7 + 250880*x^9 - 250880*x^1
1 + 125440*x^13 - 25088*x^15)*#1^5 + (17920*x^6 - 107520*x^8 + 268800*x^10 - 358
400*x^12 + 268800*x^14 - 107520*x^16 + 17920*x^18)*#1^6 + (-40960*x^7 + 286720*x
^9 - 860160*x^11 + 1433600*x^13 - 1433600*x^15 + 860160*x^17 - 286720*x^19 + 409
60*x^21)*#1^7 + (-81920*x^8 + 655360*x^10 - 2293760*x^12 + 4587520*x^14 - 573440
0*x^16 + 4587520*x^18 - 2293760*x^20 + 655360*x^22 - 81920*x^24)*#1^8 + (65536*E
^((40*C[1])/9) + 65536*x^10 - 655360*x^12 + 2949120*x^14 - 7864320*x^16 + 137625
60*x^18 - 16515072*x^20 + 13762560*x^22 - 7864320*x^24 + 2949120*x^26 - 655360*x
^28 + 65536*x^30)*#1^10 & , 10]^(-1))/5}}
```

Maple raw input

```
dsolve((x+4*x^3+5*y(x))*diff(y(x),x)+7*x^3+3*x^2*y(x)+4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
7/5*ln((-35*x-35*y(x))/(8*x^3+2*x+10*y(x)))+7/20*ln((140*x^3+140*y(x))/(12*x^3+3
*x+15*y(x)))-7/4*ln((28*x^3-28*x)/(x+4*x^3+5*y(x)))+7/4*ln(x^3-x)-_C1 = 0
```

4.495 $(6y(x)-x+5)y'(x)=4y(x)-x+3$

ODE

$$(6y(x)-x+5)y'(x)=4y(x)-x+3$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.18332 (sec), leaf count = 1177

$$\left\{\left\{y(x)\to\frac{1}{6}\left(x+\frac{}{\sqrt{-\frac{3\cosh\left(\frac{4c_1}{9}\right)(x+1)^2+3\sinh\left(\frac{4c_1}{9}\right)(x+1)^2+2}{(x+1)^2\left(\cosh\left(\frac{4c_1}{9}\right)(x+1)^2+\sinh\left(\frac{4c_1}{9}\right)(x+1)^2+1\right)}}-\sqrt{-\frac{\cosh\left(\frac{4c_1}{9}\right)+\sinh\left(\frac{4c_1}{9}\right)}{(x+1)^2\left(\cosh\left(\frac{4c_1}{9}\right)(x+1)^2+\sinh\left(\frac{4c_1}{9}\right)(x+1)^2+1\right)^2}}+\frac{3}{(x+1)}\right.\right.\right.$$

Maple ✓
cpu = 0.03 (sec), leaf count = 43

$$\left\{\ln\left(\frac{-3\,y(x)-2+x}{1+x}\right)-2\ln\left(\frac{-1+x-2\,y(x)}{1+x}\right)-\ln(1+x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(5 - x + 6*y[x])*y'[x] == 3 - x + 4*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-5 + x + (2*(1 + x))/(1 + Sqrt[3/(1 + x)^2 - Sqrt[-((Cosh[(4*C[1])/9]
  + Sinh[(4*C[1])/9])/((1 + x)^2*(1 + (1 + x)^2*Cosh[(4*C[1])/9] + (1 + x)^2*Sinh
[(4*C[1])/9])^2))] - (2 + 3*(1 + x)^2*Cosh[(4*C[1])/9] + 3*(1 + x)^2*Sinh[(4*C[1
])/9])/((1 + x)^2*(1 + (1 + x)^2*Cosh[(4*C[1])/9] + (1 + x)^2*Sinh[(4*C[1])/9]))
] + x*Sqrt[3/(1 + x)^2 - Sqrt[-((Cosh[(4*C[1])/9] + Sinh[(4*C[1])/9])/((1 + x)^2
*(1 + (1 + x)^2*Cosh[(4*C[1])/9] + (1 + x)^2*Sinh[(4*C[1])/9])^2))] - (2 + 3*(1
 + x)^2*Cosh[(4*C[1])/9] + 3*(1 + x)^2*Sinh[(4*C[1])/9])/((1 + x)^2*(1 + (1 + x)^
2*Cosh[(4*C[1])/9] + (1 + x)^2*Sinh[(4*C[1])/9]))]))/6}, {y[x] -> (-5 + x - (2*(
1 + x))/(-1 + Sqrt[3/(1 + x)^2 - Sqrt[-((Cosh[(4*C[1])/9] + Sinh[(4*C[1])/9])/((
1 + x)^2*(1 + (1 + x)^2*Cosh[(4*C[1])/9] + (1 + x)^2*Sinh[(4*C[1])/9])^2))] - (2
 + 3*(1 + x)^2*Cosh[(4*C[1])/9] + 3*(1 + x)^2*Sinh[(4*C[1])/9])/((1 + x)^2*(1 +
```

```
(1 + x)^2*Cosh[(4*C[1])/9] + (1 + x)^2*Sinh[(4*C[1])/9]))] + x*Sqrt[3/(1 + x)^2
- Sqrt[-((Cosh[(4*C[1])/9] + Sinh[(4*C[1])/9])/((1 + x)^2*(1 + (1 + x)^2*Cosh[(4
*C[1])/9] + (1 + x)^2*Sinh[(4*C[1])/9])^2))] - (2 + 3*(1 + x)^2*Cosh[(4*C[1])/9]
 + 3*(1 + x)^2*Sinh[(4*C[1])/9])/((1 + x)^2*(1 + (1 + x)^2*Cosh[(4*C[1])/9] + (1
 + x)^2*Sinh[(4*C[1])/9]))]))/6}, {y[x] -> (-5 + x + (2*(1 + x))/(1 + Sqrt[3/(1
+ x)^2 + Sqrt[-((Cosh[(4*C[1])/9] + Sinh[(4*C[1])/9])/((1 + x)^2*(1 + (1 + x)^2*
Cosh[(4*C[1])/9] + (1 + x)^2*Sinh[(4*C[1])/9])^2))] - (2 + 3*(1 + x)^2*Cosh[(4*C
[1])/9] + 3*(1 + x)^2*Sinh[(4*C[1])/9])/((1 + x)^2*(1 + (1 + x)^2*Cosh[(4*C[1])/
9] + (1 + x)^2*Sinh[(4*C[1])/9]))] + x*Sqrt[3/(1 + x)^2 + Sqrt[-((Cosh[(4*C[1])/
9] + Sinh[(4*C[1])/9])/((1 + x)^2*(1 + (1 + x)^2*Cosh[(4*C[1])/9] + (1 + x)^2*Si
nh[(4*C[1])/9])^2))] - (2 + 3*(1 + x)^2*Cosh[(4*C[1])/9] + 3*(1 + x)^2*Sinh[(4*C
[1])/9])/((1 + x)^2*(1 + (1 + x)^2*Cosh[(4*C[1])/9] + (1 + x)^2*Sinh[(4*C[1])/9]
))]))/6}, {y[x] -> (-5 + x - (2*(1 + x))/(-1 + Sqrt[3/(1 + x)^2 + Sqrt[-((Cosh[(
4*C[1])/9] + Sinh[(4*C[1])/9])/((1 + x)^2*(1 + (1 + x)^2*Cosh[(4*C[1])/9] + (1 +
 x)^2*Sinh[(4*C[1])/9])^2))] - (2 + 3*(1 + x)^2*Cosh[(4*C[1])/9] + 3*(1 + x)^2*S
inh[(4*C[1])/9])/((1 + x)^2*(1 + (1 + x)^2*Cosh[(4*C[1])/9] + (1 + x)^2*Sinh[(4*
C[1])/9]))] + x*Sqrt[3/(1 + x)^2 + Sqrt[-((Cosh[(4*C[1])/9] + Sinh[(4*C[1])/9])/
((1 + x)^2*(1 + (1 + x)^2*Cosh[(4*C[1])/9] + (1 + x)^2*Sinh[(4*C[1])/9])^2))] -
(2 + 3*(1 + x)^2*Cosh[(4*C[1])/9] + 3*(1 + x)^2*Sinh[(4*C[1])/9])/((1 + x)^2*(1
+ (1 + x)^2*Cosh[(4*C[1])/9] + (1 + x)^2*Sinh[(4*C[1])/9]))]))/6}}
```

Maple raw input

```
dsolve((5-x+6*y(x))*diff(y(x),x) = 3-x+4*y(x), y(x),'implicit')
```

Maple raw output

```
ln((-3*y(x)-2+x)/(1+x))-2*ln((-1+x-2*y(x))/(1+x))-ln(1+x)-_C1 = 0
```

4.496 $3(2y(x)+x)y'(x) = -2y(x) - x + 1$

ODE

$$3(2y(x)+x)y'(x) = -2y(x) - x + 1$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0184854 (sec), leaf count = 28

$$\left\{\left\{y(x) \to -W\left(-e^{c_1 - \frac{x}{6} - 1}\right) - \frac{x}{2} - 1\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 24

$$\{-\_C1 - x - 3\,y(x) + 3\,\ln(1 + x/2 + y(x)) = 0\}$$

Mathematica raw input

```
DSolve[3*(x + 2*y[x])*y'[x] == 1 - x - 2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 - x/2 - ProductLog[-E^(-1 - x/6 + C[1])]}}
```

Maple raw input

```
dsolve(3*(x+2*y(x))*diff(y(x),x) = 1-x-2*y(x), y(x),'implicit')
```

Maple raw output

```
-_C1-x-3*y(x)+3*ln(1+1/2*x+y(x)) = 0
```

4.497 $(7y(x) - 3x + 3)y'(x) + 3y(x) - 7x + 7 = 0$

ODE

$$(7y(x) - 3x + 3)y'(x) + 3y(x) - 7x + 7 = 0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 1.94773 (sec), leaf count = 7785

Maple ✓
cpu = 0.023 (sec), leaf count = 47

$$\left\{-\frac{5}{7}\ln\left(\frac{1-x-y(x)}{-1+x}\right) - \frac{2}{7}\ln\left(\frac{x-y(x)-1}{-1+x}\right) - \ln(-1+x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[7 - 7*x + 3*y[x] + (3 - 3*x + 7*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*(-1 + x))/7 - 1/(7*Root[1 + (84 - 84*x)*#1 + (2996 - 5992*x + 2996*
x^2)*#1^2 + (57344 - 172032*x + 172032*x^2 - 57344*x^3)*#1^3 + (586656 - 2346624
*x + 3519936*x^2 - 2346624*x^3 + 586656*x^4)*#1^4 + (1993600 - 9968000*x + 19936
000*x^2 - 19936000*x^3 + 9968000*x^4 - 1993600*x^5)*#1^5 + (-21168000 + 12700800
0*x - 317520000*x^2 + 423360000*x^3 - 317520000*x^4 + 127008000*x^5 - 21168000*x
^6)*#1^6 + (-247680000 + 1733760000*x - 5201280000*x^2 + 8668800000*x^3 - 866880
0000*x^4 + 5201280000*x^5 - 1733760000*x^6 + 247680000*x^7)*#1^7 + (-453600000 +
 3628800000*x - 12700800000*x^2 + 25401600000*x^3 - 31752000000*x^4 + 2540160000
0*x^5 - 12700800000*x^6 + 3628800000*x^7 - 453600000*x^8)*#1^8 + (5891200000 - 5
3020800000*x + 212083200000*x^2 - 494860800000*x^3 + 742291200000*x^4 - 74229120
0000*x^5 + 494860800000*x^6 - 212083200000*x^7 + 53020800000*x^8 - 5891200000*x^
9)*#1^9 + (28560000000 - 285600000000*x + 1285200000000*x^2 - 3427200000000*x^3
+ 5997600000000*x^4 - 7197120000000*x^5 + 5997600000000*x^6 - 3427200000000*x^7
+ 1285200000000*x^8 - 285600000000*x^9 + 28560000000*x^10)*#1^10 + (-44800000000
 + 492800000000*x - 2464000000000*x^2 + 7392000000000*x^3 - 14784000000000*x^4 +
```

```
 20697600000000*x^5 - 20697600000000*x^6 + 14784000000000*x^7 - 7392000000000*x^
8 + 2464000000000*x^9 - 492800000000*x^10 + 44800000000*x^11)*#1^11 + (-44800000
0000 + 5376000000000*x - 29568000000000*x^2 + 98560000000000*x^3 - 2217600000000
00*x^4 + 354816000000000*x^5 - 413952000000000*x^6 + 354816000000000*x^7 - 22176
0000000000*x^8 + 98560000000000*x^9 - 29568000000000*x^10 + 5376000000000*x^11 -
 448000000000*x^12)*#1^12 + (2560000000000 + 2560000000000*E^((140*C[1])/9) - 35
840000000000*x + 232960000000000*x^2 - 931840000000000*x^3 + 2562560000000000*x^
4 - 5125120000000000*x^5 + 7687680000000000*x^6 - 8785920000000000*x^7 + 7687680
000000000*x^8 - 5125120000000000*x^9 + 2562560000000000*x^10 - 931840000000000*x
^11 + 232960000000000*x^12 - 35840000000000*x^13 + 2560000000000*x^14)*#1^14 & ,
 1])}, {y[x] -> (3*(-1 + x))/7 - 1/(7*Root[1 + (84 - 84*x)*#1 + (2996 - 5992*x +
 2996*x^2)*#1^2 + (57344 - 172032*x + 172032*x^2 - 57344*x^3)*#1^3 + (586656 - 2
346624*x + 3519936*x^2 - 2346624*x^3 + 586656*x^4)*#1^4 + (1993600 - 9968000*x +
 19936000*x^2 - 19936000*x^3 + 9968000*x^4 - 1993600*x^5)*#1^5 + (-21168000 + 12
7008000*x - 317520000*x^2 + 423360000*x^3 - 317520000*x^4 + 127008000*x^5 - 2116
8000*x^6)*#1^6 + (-247680000 + 1733760000*x - 5201280000*x^2 + 8668800000*x^3 -
8668800000*x^4 + 5201280000*x^5 - 1733760000*x^6 + 247680000*x^7)*#1^7 + (-45360
0000 + 3628800000*x - 12700800000*x^2 + 25401600000*x^3 - 31752000000*x^4 + 2540
1600000*x^5 - 12700800000*x^6 + 3628800000*x^7 - 453600000*x^8)*#1^8 + (58912000
00 - 53020800000*x + 212083200000*x^2 - 494860800000*x^3 + 742291200000*x^4 - 74
2291200000*x^5 + 494860800000*x^6 - 212083200000*x^7 + 53020800000*x^8 - 5891200
000*x^9)*#1^9 + (28560000000 - 285600000000*x + 1285200000000*x^2 - 342720000000
0*x^3 + 5997600000000*x^4 - 7197120000000*x^5 + 5997600000000*x^6 - 342720000000
0*x^7 + 1285200000000*x^8 - 285600000000*x^9 + 28560000000*x^10)*#1^10 + (-44800
000000 + 492800000000*x - 2464000000000*x^2 + 7392000000000*x^3 - 14784000000000
*x^4 + 20697600000000*x^5 - 20697600000000*x^6 + 14784000000000*x^7 - 7392000000
000*x^8 + 2464000000000*x^9 - 492800000000*x^10 + 44800000000*x^11)*#1^11 + (-44
8000000000 + 5376000000000*x - 29568000000000*x^2 + 98560000000000*x^3 - 2217600
00000000*x^4 + 354816000000000*x^5 - 413952000000000*x^6 + 354816000000000*x^7 -
 221760000000000*x^8 + 98560000000000*x^9 - 29568000000000*x^10 + 5376000000000*
x^11 - 448000000000*x^12)*#1^12 + (2560000000000 + 2560000000000*E^((140*C[1])/9
) - 35840000000000*x + 232960000000000*x^2 - 931840000000000*x^3 + 2562560000000
000*x^4 - 5125120000000000*x^5 + 7687680000000000*x^6 - 8785920000000000*x^7 + 7
687680000000000*x^8 - 5125120000000000*x^9 + 2562560000000000*x^10 - 93184000000
0000*x^11 + 232960000000000*x^12 - 35840000000000*x^13 + 2560000000000*x^14)*#1^
14 & , 2])}, {y[x] -> (3*(-1 + x))/7 - 1/(7*Root[1 + (84 - 84*x)*#1 + (2996 - 59
92*x + 2996*x^2)*#1^2 + (57344 - 172032*x + 172032*x^2 - 57344*x^3)*#1^3 + (5866
56 - 2346624*x + 3519936*x^2 - 2346624*x^3 + 586656*x^4)*#1^4 + (1993600 - 99680
00*x + 19936000*x^2 - 19936000*x^3 + 9968000*x^4 - 1993600*x^5)*#1^5 + (-2116800
0 + 127008000*x - 317520000*x^2 + 423360000*x^3 - 317520000*x^4 + 127008000*x^5
- 21168000*x^6)*#1^6 + (-247680000 + 1733760000*x - 5201280000*x^2 + 8668800000*
x^3 - 8668800000*x^4 + 5201280000*x^5 - 1733760000*x^6 + 247680000*x^7)*#1^7 + (
-453600000 + 3628800000*x - 12700800000*x^2 + 25401600000*x^3 - 31752000000*x^4
+ 25401600000*x^5 - 12700800000*x^6 + 3628800000*x^7 - 453600000*x^8)*#1^8 + (58
91200000 - 53020800000*x + 212083200000*x^2 - 494860800000*x^3 + 742291200000*x^
4 - 742291200000*x^5 + 494860800000*x^6 - 212083200000*x^7 + 53020800000*x^8 - 5
891200000*x^9)*#1^9 + (28560000000 - 285600000000*x + 1285200000000*x^2 - 342720
```

```
0000000*x^3 + 5997600000000*x^4 - 7197120000000*x^5 + 5997600000000*x^6 - 342720
0000000*x^7 + 1285200000000*x^8 - 285600000000*x^9 + 28560000000*x^10)*#1^10 + (
-44800000000 + 492800000000*x - 2464000000000*x^2 + 7392000000000*x^3 - 14784000
000000*x^4 + 20697600000000*x^5 - 20697600000000*x^6 + 14784000000000*x^7 - 7392
000000000*x^8 + 2464000000000*x^9 - 492800000000*x^10 + 44800000000*x^11)*#1^11
+ (-448000000000 + 5376000000000*x - 29568000000000*x^2 + 98560000000000*x^3 - 2
21760000000000*x^4 + 354816000000000*x^5 - 413952000000000*x^6 + 354816000000000
*x^7 - 221760000000000*x^8 + 98560000000000*x^9 - 29568000000000*x^10 + 53760000
00000*x^11 - 448000000000*x^12)*#1^12 + (2560000000000 + 2560000000000*E^((140*C
[1])/9) - 35840000000000*x + 232960000000000*x^2 - 931840000000000*x^3 + 2562560
000000000*x^4 - 5125120000000000*x^5 + 7687680000000000*x^6 - 8785920000000000*x
^7 + 7687680000000000*x^8 - 5125120000000000*x^9 + 2562560000000000*x^10 - 93184
0000000000*x^11 + 232960000000000*x^12 - 35840000000000*x^13 + 2560000000000*x^1
4)*#1^14 & , 3])}, {y[x] -> (3*(-1 + x))/7 - 1/(7*Root[1 + (84 - 84*x)*#1 + (299
6 - 5992*x + 2996*x^2)*#1^2 + (57344 - 172032*x + 172032*x^2 - 57344*x^3)*#1^3 +
 (586656 - 2346624*x + 3519936*x^2 - 2346624*x^3 + 586656*x^4)*#1^4 + (1993600 -
 9968000*x + 19936000*x^2 - 19936000*x^3 + 9968000*x^4 - 1993600*x^5)*#1^5 + (-2
1168000 + 127008000*x - 317520000*x^2 + 423360000*x^3 - 317520000*x^4 + 12700800
0*x^5 - 21168000*x^6)*#1^6 + (-247680000 + 1733760000*x - 5201280000*x^2 + 86688
00000*x^3 - 8668800000*x^4 + 5201280000*x^5 - 1733760000*x^6 + 247680000*x^7)*#1
^7 + (-453600000 + 3628800000*x - 12700800000*x^2 + 25401600000*x^3 - 3175200000
0*x^4 + 25401600000*x^5 - 12700800000*x^6 + 3628800000*x^7 - 453600000*x^8)*#1^8
 + (5891200000 - 53020800000*x + 212083200000*x^2 - 494860800000*x^3 + 742291200
000*x^4 - 742291200000*x^5 + 494860800000*x^6 - 212083200000*x^7 + 53020800000*x
^8 - 5891200000*x^9)*#1^9 + (28560000000 - 285600000000*x + 1285200000000*x^2 -
3427200000000*x^3 + 5997600000000*x^4 - 7197120000000*x^5 + 5997600000000*x^6 -
3427200000000*x^7 + 1285200000000*x^8 - 285600000000*x^9 + 28560000000*x^10)*#1^
10 + (-44800000000 + 492800000000*x - 2464000000000*x^2 + 7392000000000*x^3 - 14
784000000000*x^4 + 20697600000000*x^5 - 20697600000000*x^6 + 14784000000000*x^7
- 7392000000000*x^8 + 2464000000000*x^9 - 492800000000*x^10 + 44800000000*x^11)*
#1^11 + (-448000000000 + 5376000000000*x - 29568000000000*x^2 + 98560000000000*x
^3 - 221760000000000*x^4 + 354816000000000*x^5 - 413952000000000*x^6 + 354816000
000000*x^7 - 221760000000000*x^8 + 98560000000000*x^9 - 29568000000000*x^10 + 53
76000000000*x^11 - 448000000000*x^12)*#1^12 + (2560000000000 + 2560000000000*E^(
(140*C[1])/9) - 35840000000000*x + 232960000000000*x^2 - 931840000000000*x^3 + 2
562560000000000*x^4 - 5125120000000000*x^5 + 7687680000000000*x^6 - 878592000000
0000*x^7 + 7687680000000000*x^8 - 5125120000000000*x^9 + 2562560000000000*x^10 -
 931840000000000*x^11 + 232960000000000*x^12 - 35840000000000*x^13 + 25600000000
00*x^14)*#1^14 & , 4])}, {y[x] -> (3*(-1 + x))/7 - 1/(7*Root[1 + (84 - 84*x)*#1
+ (2996 - 5992*x + 2996*x^2)*#1^2 + (57344 - 172032*x + 172032*x^2 - 57344*x^3)*
#1^3 + (586656 - 2346624*x + 3519936*x^2 - 2346624*x^3 + 586656*x^4)*#1^4 + (199
3600 - 9968000*x + 19936000*x^2 - 19936000*x^3 + 9968000*x^4 - 1993600*x^5)*#1^5
 + (-21168000 + 127008000*x - 317520000*x^2 + 423360000*x^3 - 317520000*x^4 + 12
7008000*x^5 - 21168000*x^6)*#1^6 + (-247680000 + 1733760000*x - 5201280000*x^2 +
 8668800000*x^3 - 8668800000*x^4 + 5201280000*x^5 - 1733760000*x^6 + 247680000*x
^7)*#1^7 + (-453600000 + 3628800000*x - 12700800000*x^2 + 25401600000*x^3 - 3175
2000000*x^4 + 25401600000*x^5 - 12700800000*x^6 + 3628800000*x^7 - 453600000*x^8
```

```
)*#1^8 + (5891200000 - 53020800000*x + 212083200000*x^2 - 494860800000*x^3 + 742
291200000*x^4 - 742291200000*x^5 + 494860800000*x^6 - 212083200000*x^7 + 5302080
0000*x^8 - 5891200000*x^9)*#1^9 + (28560000000 - 285600000000*x + 1285200000000*
x^2 - 3427200000000*x^3 + 5997600000000*x^4 - 7197120000000*x^5 + 5997600000000*
x^6 - 3427200000000*x^7 + 1285200000000*x^8 - 285600000000*x^9 + 28560000000*x^1
0)*#1^10 + (-44800000000 + 492800000000*x - 2464000000000*x^2 + 7392000000000*x^
3 - 14784000000000*x^4 + 20697600000000*x^5 - 20697600000000*x^6 + 1478400000000
0*x^7 - 7392000000000*x^8 + 2464000000000*x^9 - 492800000000*x^10 + 44800000000*
x^11)*#1^11 + (-448000000000 + 5376000000000*x - 29568000000000*x^2 + 9856000000
0000*x^3 - 221760000000000*x^4 + 354816000000000*x^5 - 413952000000000*x^6 + 354
816000000000*x^7 - 221760000000000*x^8 + 98560000000000*x^9 - 29568000000000*x^1
0 + 5376000000000*x^11 - 448000000000*x^12)*#1^12 + (2560000000000 + 25600000000
00*E^((140*C[1])/9) - 35840000000000*x + 232960000000000*x^2 - 931840000000000*x
^3 + 2562560000000000*x^4 - 5125120000000000*x^5 + 7687680000000000*x^6 - 878592
0000000000*x^7 + 7687680000000000*x^8 - 5125120000000000*x^9 + 2562560000000000*
x^10 - 931840000000000*x^11 + 232960000000000*x^12 - 35840000000000*x^13 + 25600
00000000*x^14)*#1^14 & , 5])}, {y[x] -> (3*(-1 + x))/7 - 1/(7*Root[1 + (84 - 84*
x)*#1 + (2996 - 5992*x + 2996*x^2)*#1^2 + (57344 - 172032*x + 172032*x^2 - 57344
*x^3)*#1^3 + (586656 - 2346624*x + 3519936*x^2 - 2346624*x^3 + 586656*x^4)*#1^4
+ (1993600 - 9968000*x + 19936000*x^2 - 19936000*x^3 + 9968000*x^4 - 1993600*x^5
)*#1^5 + (-21168000 + 127008000*x - 317520000*x^2 + 423360000*x^3 - 317520000*x^
4 + 127008000*x^5 - 21168000*x^6)*#1^6 + (-247680000 + 1733760000*x - 5201280000
*x^2 + 8668800000*x^3 - 8668800000*x^4 + 5201280000*x^5 - 1733760000*x^6 + 24768
0000*x^7)*#1^7 + (-453600000 + 3628800000*x - 12700800000*x^2 + 25401600000*x^3
- 31752000000*x^4 + 25401600000*x^5 - 12700800000*x^6 + 3628800000*x^7 - 4536000
00*x^8)*#1^8 + (5891200000 - 53020800000*x + 212083200000*x^2 - 494860800000*x^3
 + 742291200000*x^4 - 742291200000*x^5 + 494860800000*x^6 - 212083200000*x^7 + 5
3020800000*x^8 - 5891200000*x^9)*#1^9 + (28560000000 - 285600000000*x + 12852000
00000*x^2 - 3427200000000*x^3 + 5997600000000*x^4 - 7197120000000*x^5 + 59976000
00000*x^6 - 3427200000000*x^7 + 1285200000000*x^8 - 285600000000*x^9 + 285600000
00*x^10)*#1^10 + (-44800000000 + 492800000000*x - 2464000000000*x^2 + 7392000000
000*x^3 - 14784000000000*x^4 + 20697600000000*x^5 - 20697600000000*x^6 + 1478400
0000000*x^7 - 7392000000000*x^8 + 2464000000000*x^9 - 492800000000*x^10 + 448000
00000*x^11)*#1^11 + (-448000000000 + 5376000000000*x - 29568000000000*x^2 + 9856
0000000000*x^3 - 221760000000000*x^4 + 354816000000000*x^5 - 413952000000000*x^6
 + 354816000000000*x^7 - 221760000000000*x^8 + 98560000000000*x^9 - 295680000000
00*x^10 + 5376000000000*x^11 - 448000000000*x^12)*#1^12 + (2560000000000 + 25600
00000000*E^((140*C[1])/9) - 35840000000000*x + 232960000000000*x^2 - 93184000000
0000*x^3 + 2562560000000000*x^4 - 5125120000000000*x^5 + 7687680000000000*x^6 -
8785920000000000*x^7 + 7687680000000000*x^8 - 5125120000000000*x^9 + 25625600000
00000*x^10 - 931840000000000*x^11 + 232960000000000*x^12 - 35840000000000*x^13 +
 2560000000000*x^14)*#1^14 & , 6])}, {y[x] -> (3*(-1 + x))/7 - 1/(7*Root[1 + (84
 - 84*x)*#1 + (2996 - 5992*x + 2996*x^2)*#1^2 + (57344 - 172032*x + 172032*x^2 -
 57344*x^3)*#1^3 + (586656 - 2346624*x + 3519936*x^2 - 2346624*x^3 + 586656*x^4)
*#1^4 + (1993600 - 9968000*x + 19936000*x^2 - 19936000*x^3 + 9968000*x^4 - 19936
00*x^5)*#1^5 + (-21168000 + 127008000*x - 317520000*x^2 + 423360000*x^3 - 317520
000*x^4 + 127008000*x^5 - 21168000*x^6)*#1^6 + (-247680000 + 1733760000*x - 5201
```

```
280000*x^2 + 8668800000*x^3 - 8668800000*x^4 + 5201280000*x^5 - 1733760000*x^6 +
 247680000*x^7)*#1^7 + (-453600000 + 3628800000*x - 12700800000*x^2 + 2540160000
0*x^3 - 31752000000*x^4 + 25401600000*x^5 - 12700800000*x^6 + 3628800000*x^7 - 4
53600000*x^8)*#1^8 + (5891200000 - 53020800000*x + 212083200000*x^2 - 4948608000
00*x^3 + 742291200000*x^4 - 742291200000*x^5 + 494860800000*x^6 - 212083200000*x
^7 + 53020800000*x^8 - 5891200000*x^9)*#1^9 + (28560000000 - 285600000000*x + 12
85200000000*x^2 - 3427200000000*x^3 + 5997600000000*x^4 - 7197120000000*x^5 + 59
97600000000*x^6 - 3427200000000*x^7 + 1285200000000*x^8 - 285600000000*x^9 + 285
60000000*x^10)*#1^10 + (-44800000000 + 492800000000*x - 2464000000000*x^2 + 7392
000000000*x^3 - 14784000000000*x^4 + 20697600000000*x^5 - 20697600000000*x^6 + 1
4784000000000*x^7 - 7392000000000*x^8 + 2464000000000*x^9 - 492800000000*x^10 +
44800000000*x^11)*#1^11 + (-448000000000 + 5376000000000*x - 29568000000000*x^2
+ 98560000000000*x^3 - 221760000000000*x^4 + 354816000000000*x^5 - 4139520000000
00*x^6 + 354816000000000*x^7 - 221760000000000*x^8 + 98560000000000*x^9 - 295680
00000000*x^10 + 5376000000000*x^11 - 448000000000*x^12)*#1^12 + (2560000000000 +
 2560000000000*E^((140*C[1])/9) - 35840000000000*x + 232960000000000*x^2 - 93184
0000000000*x^3 + 2562560000000000*x^4 - 5125120000000000*x^5 + 7687680000000000*
x^6 - 8785920000000000*x^7 + 7687680000000000*x^8 - 5125120000000000*x^9 + 25625
60000000000*x^10 - 931840000000000*x^11 + 232960000000000*x^12 - 35840000000000*
x^13 + 2560000000000*x^14)*#1^14 & , 7])}, {y[x] -> (3*(-1 + x))/7 - 1/(7*Root[1
 + (84 - 84*x)*#1 + (2996 - 5992*x + 2996*x^2)*#1^2 + (57344 - 172032*x + 172032
*x^2 - 57344*x^3)*#1^3 + (586656 - 2346624*x + 3519936*x^2 - 2346624*x^3 + 58665
6*x^4)*#1^4 + (1993600 - 9968000*x + 19936000*x^2 - 19936000*x^3 + 9968000*x^4 -
 1993600*x^5)*#1^5 + (-21168000 + 127008000*x - 317520000*x^2 + 423360000*x^3 -
317520000*x^4 + 127008000*x^5 - 21168000*x^6)*#1^6 + (-247680000 + 1733760000*x
- 5201280000*x^2 + 8668800000*x^3 - 8668800000*x^4 + 5201280000*x^5 - 1733760000
*x^6 + 247680000*x^7)*#1^7 + (-453600000 + 3628800000*x - 12700800000*x^2 + 2540
1600000*x^3 - 31752000000*x^4 + 25401600000*x^5 - 12700800000*x^6 + 3628800000*x
^7 - 453600000*x^8)*#1^8 + (5891200000 - 53020800000*x + 212083200000*x^2 - 4948
60800000*x^3 + 742291200000*x^4 - 742291200000*x^5 + 494860800000*x^6 - 21208320
0000*x^7 + 53020800000*x^8 - 5891200000*x^9)*#1^9 + (28560000000 - 285600000000*
x + 1285200000000*x^2 - 3427200000000*x^3 + 5997600000000*x^4 - 7197120000000*x^
5 + 5997600000000*x^6 - 3427200000000*x^7 + 1285200000000*x^8 - 285600000000*x^9
 + 28560000000*x^10)*#1^10 + (-44800000000 + 492800000000*x - 2464000000000*x^2
+ 7392000000000*x^3 - 14784000000000*x^4 + 20697600000000*x^5 - 20697600000000*x
^6 + 14784000000000*x^7 - 7392000000000*x^8 + 2464000000000*x^9 - 492800000000*x
^10 + 44800000000*x^11)*#1^11 + (-448000000000 + 5376000000000*x - 2956800000000
0*x^2 + 98560000000000*x^3 - 221760000000000*x^4 + 354816000000000*x^5 - 4139520
00000000*x^6 + 354816000000000*x^7 - 221760000000000*x^8 + 98560000000000*x^9 -
29568000000000*x^10 + 5376000000000*x^11 - 448000000000*x^12)*#1^12 + (256000000
0000 + 2560000000000*E^((140*C[1])/9) - 35840000000000*x + 232960000000000*x^2 -
 931840000000000*x^3 + 2562560000000000*x^4 - 5125120000000000*x^5 + 76876800000
00000*x^6 - 8785920000000000*x^7 + 7687680000000000*x^8 - 5125120000000000*x^9 +
 2562560000000000*x^10 - 931840000000000*x^11 + 232960000000000*x^12 - 358400000
00000*x^13 + 2560000000000*x^14)*#1^14 & , 8])}, {y[x] -> (3*(-1 + x))/7 - 1/(7*
Root[1 + (84 - 84*x)*#1 + (2996 - 5992*x + 2996*x^2)*#1^2 + (57344 - 172032*x +
172032*x^2 - 57344*x^3)*#1^3 + (586656 - 2346624*x + 3519936*x^2 - 2346624*x^3 +
```

```
 586656*x^4)*#1^4 + (1993600 - 9968000*x + 19936000*x^2 - 19936000*x^3 + 9968000
*x^4 - 1993600*x^5)*#1^5 + (-21168000 + 127008000*x - 317520000*x^2 + 423360000*
x^3 - 317520000*x^4 + 127008000*x^5 - 21168000*x^6)*#1^6 + (-247680000 + 1733760
000*x - 5201280000*x^2 + 8668800000*x^3 - 8668800000*x^4 + 5201280000*x^5 - 1733
760000*x^6 + 247680000*x^7)*#1^7 + (-453600000 + 3628800000*x - 12700800000*x^2
+ 25401600000*x^3 - 31752000000*x^4 + 25401600000*x^5 - 12700800000*x^6 + 362880
0000*x^7 - 453600000*x^8)*#1^8 + (5891200000 - 53020800000*x + 212083200000*x^2
- 494860800000*x^3 + 742291200000*x^4 - 742291200000*x^5 + 494860800000*x^6 - 21
2083200000*x^7 + 53020800000*x^8 - 5891200000*x^9)*#1^9 + (28560000000 - 2856000
00000*x + 1285200000000*x^2 - 3427200000000*x^3 + 5997600000000*x^4 - 7197120000
000*x^5 + 5997600000000*x^6 - 3427200000000*x^7 + 1285200000000*x^8 - 2856000000
00*x^9 + 28560000000*x^10)*#1^10 + (-44800000000 + 492800000000*x - 246400000000
0*x^2 + 7392000000000*x^3 - 14784000000000*x^4 + 20697600000000*x^5 - 2069760000
0000*x^6 + 14784000000000*x^7 - 7392000000000*x^8 + 2464000000000*x^9 - 49280000
0000*x^10 + 44800000000*x^11)*#1^11 + (-448000000000 + 5376000000000*x - 2956800
0000000*x^2 + 98560000000000*x^3 - 221760000000000*x^4 + 354816000000000*x^5 - 4
13952000000000*x^6 + 354816000000000*x^7 - 221760000000000*x^8 + 98560000000000*
x^9 - 29568000000000*x^10 + 5376000000000*x^11 - 448000000000*x^12)*#1^12 + (256
0000000000 + 2560000000000*E^((140*C[1])/9) - 35840000000000*x + 232960000000000
*x^2 - 931840000000000*x^3 + 2562560000000000*x^4 - 5125120000000000*x^5 + 76876
80000000000*x^6 - 8785920000000000*x^7 + 7687680000000000*x^8 - 5125120000000000
*x^9 + 2562560000000000*x^10 - 931840000000000*x^11 + 232960000000000*x^12 - 358
40000000000*x^13 + 2560000000000*x^14)*#1^14 & , 9])}, {y[x] -> (3*(-1 + x))/7 -
 1/(7*Root[1 + (84 - 84*x)*#1 + (2996 - 5992*x + 2996*x^2)*#1^2 + (57344 - 17203
2*x + 172032*x^2 - 57344*x^3)*#1^3 + (586656 - 2346624*x + 3519936*x^2 - 2346624
*x^3 + 586656*x^4)*#1^4 + (1993600 - 9968000*x + 19936000*x^2 - 19936000*x^3 + 9
968000*x^4 - 1993600*x^5)*#1^5 + (-21168000 + 127008000*x - 317520000*x^2 + 4233
60000*x^3 - 317520000*x^4 + 127008000*x^5 - 21168000*x^6)*#1^6 + (-247680000 + 1
733760000*x - 5201280000*x^2 + 8668800000*x^3 - 8668800000*x^4 + 5201280000*x^5
- 1733760000*x^6 + 247680000*x^7)*#1^7 + (-453600000 + 3628800000*x - 1270080000
0*x^2 + 25401600000*x^3 - 31752000000*x^4 + 25401600000*x^5 - 12700800000*x^6 +
3628800000*x^7 - 453600000*x^8)*#1^8 + (5891200000 - 53020800000*x + 21208320000
0*x^2 - 494860800000*x^3 + 742291200000*x^4 - 742291200000*x^5 + 494860800000*x^
6 - 212083200000*x^7 + 53020800000*x^8 - 5891200000*x^9)*#1^9 + (28560000000 - 2
85600000000*x + 1285200000000*x^2 - 3427200000000*x^3 + 5997600000000*x^4 - 7197
120000000*x^5 + 5997600000000*x^6 - 3427200000000*x^7 + 1285200000000*x^8 - 2856
00000000*x^9 + 28560000000*x^10)*#1^10 + (-44800000000 + 492800000000*x - 246400
0000000*x^2 + 7392000000000*x^3 - 14784000000000*x^4 + 20697600000000*x^5 - 2069
7600000000*x^6 + 14784000000000*x^7 - 7392000000000*x^8 + 2464000000000*x^9 - 49
2800000000*x^10 + 44800000000*x^11)*#1^11 + (-448000000000 + 5376000000000*x - 2
9568000000000*x^2 + 98560000000000*x^3 - 221760000000000*x^4 + 354816000000000*x
^5 - 413952000000000*x^6 + 354816000000000*x^7 - 221760000000000*x^8 + 985600000
00000*x^9 - 29568000000000*x^10 + 5376000000000*x^11 - 448000000000*x^12)*#1^12
+ (2560000000000 + 2560000000000*E^((140*C[1])/9) - 35840000000000*x + 232960000
000000*x^2 - 931840000000000*x^3 + 2562560000000000*x^4 - 5125120000000000*x^5 +
 7687680000000000*x^6 - 8785920000000000*x^7 + 7687680000000000*x^8 - 5125120000
000000*x^9 + 2562560000000000*x^10 - 931840000000000*x^11 + 232960000000000*x^12
```

```
 - 35840000000000*x^13 + 2560000000000*x^14)*#1^14 & , 10])}, {y[x] -> (3*(-1 +
x))/7 - 1/(7*Root[1 + (84 - 84*x)*#1 + (2996 - 5992*x + 2996*x^2)*#1^2 + (57344
- 172032*x + 172032*x^2 - 57344*x^3)*#1^3 + (586656 - 2346624*x + 3519936*x^2 -
2346624*x^3 + 586656*x^4)*#1^4 + (1993600 - 9968000*x + 19936000*x^2 - 19936000*
x^3 + 9968000*x^4 - 1993600*x^5)*#1^5 + (-21168000 + 127008000*x - 317520000*x^2
 + 423360000*x^3 - 317520000*x^4 + 127008000*x^5 - 21168000*x^6)*#1^6 + (-247680
000 + 1733760000*x - 5201280000*x^2 + 8668800000*x^3 - 8668800000*x^4 + 52012800
00*x^5 - 1733760000*x^6 + 247680000*x^7)*#1^7 + (-453600000 + 3628800000*x - 127
00800000*x^2 + 25401600000*x^3 - 31752000000*x^4 + 25401600000*x^5 - 12700800000
*x^6 + 3628800000*x^7 - 453600000*x^8)*#1^8 + (5891200000 - 53020800000*x + 2120
83200000*x^2 - 494860800000*x^3 + 742291200000*x^4 - 742291200000*x^5 + 49486080
0000*x^6 - 212083200000*x^7 + 53020800000*x^8 - 5891200000*x^9)*#1^9 + (28560000
000 - 285600000000*x + 1285200000000*x^2 - 3427200000000*x^3 + 5997600000000*x^4
 - 7197120000000*x^5 + 5997600000000*x^6 - 3427200000000*x^7 + 1285200000000*x^8
 - 285600000000*x^9 + 28560000000*x^10)*#1^10 + (-44800000000 + 492800000000*x -
 2464000000000*x^2 + 7392000000000*x^3 - 14784000000000*x^4 + 20697600000000*x^5
 - 20697600000000*x^6 + 14784000000000*x^7 - 7392000000000*x^8 + 2464000000000*x
^9 - 492800000000*x^10 + 44800000000*x^11)*#1^11 + (-448000000000 + 537600000000
0*x - 29568000000000*x^2 + 98560000000000*x^3 - 221760000000000*x^4 + 3548160000
00000*x^5 - 413952000000000*x^6 + 354816000000000*x^7 - 221760000000000*x^8 + 98
560000000000*x^9 - 29568000000000*x^10 + 5376000000000*x^11 - 448000000000*x^12)
*#1^12 + (2560000000000 + 2560000000000*E^((140*C[1])/9) - 35840000000000*x + 23
2960000000000*x^2 - 931840000000000*x^3 + 2562560000000000*x^4 - 512512000000000
0*x^5 + 7687680000000000*x^6 - 8785920000000000*x^7 + 7687680000000000*x^8 - 512
5120000000000*x^9 + 2562560000000000*x^10 - 931840000000000*x^11 + 2329600000000
00*x^12 - 35840000000000*x^13 + 2560000000000*x^14)*#1^14 & , 11])}, {y[x] -> (3
*(-1 + x))/7 - 1/(7*Root[1 + (84 - 84*x)*#1 + (2996 - 5992*x + 2996*x^2)*#1^2 +
(57344 - 172032*x + 172032*x^2 - 57344*x^3)*#1^3 + (586656 - 2346624*x + 3519936
*x^2 - 2346624*x^3 + 586656*x^4)*#1^4 + (1993600 - 9968000*x + 19936000*x^2 - 19
936000*x^3 + 9968000*x^4 - 1993600*x^5)*#1^5 + (-21168000 + 127008000*x - 317520
000*x^2 + 423360000*x^3 - 317520000*x^4 + 127008000*x^5 - 21168000*x^6)*#1^6 + (
-247680000 + 1733760000*x - 5201280000*x^2 + 8668800000*x^3 - 8668800000*x^4 + 5
201280000*x^5 - 1733760000*x^6 + 247680000*x^7)*#1^7 + (-453600000 + 3628800000*
x - 12700800000*x^2 + 25401600000*x^3 - 31752000000*x^4 + 25401600000*x^5 - 1270
0800000*x^6 + 3628800000*x^7 - 453600000*x^8)*#1^8 + (5891200000 - 53020800000*x
 + 212083200000*x^2 - 494860800000*x^3 + 742291200000*x^4 - 742291200000*x^5 + 4
94860800000*x^6 - 212083200000*x^7 + 53020800000*x^8 - 5891200000*x^9)*#1^9 + (2
8560000000 - 285600000000*x + 1285200000000*x^2 - 3427200000000*x^3 + 5997600000
000*x^4 - 7197120000000*x^5 + 5997600000000*x^6 - 3427200000000*x^7 + 1285200000
000*x^8 - 285600000000*x^9 + 28560000000*x^10)*#1^10 + (-44800000000 + 492800000
000*x - 2464000000000*x^2 + 7392000000000*x^3 - 14784000000000*x^4 + 20697600000
000*x^5 - 20697600000000*x^6 + 14784000000000*x^7 - 7392000000000*x^8 + 24640000
00000*x^9 - 492800000000*x^10 + 44800000000*x^11)*#1^11 + (-448000000000 + 53760
00000000*x - 29568000000000*x^2 + 98560000000000*x^3 - 221760000000000*x^4 + 354
816000000000*x^5 - 413952000000000*x^6 + 354816000000000*x^7 - 221760000000000*x
^8 + 98560000000000*x^9 - 29568000000000*x^10 + 5376000000000*x^11 - 44800000000
0*x^12)*#1^12 + (2560000000000 + 2560000000000*E^((140*C[1])/9) - 35840000000000
```

```
*x + 232960000000000*x^2 - 931840000000000*x^3 + 2562560000000000*x^4 - 51251200
00000000*x^5 + 7687680000000000*x^6 - 8785920000000000*x^7 + 7687680000000000*x^
8 - 5125120000000000*x^9 + 2562560000000000*x^10 - 931840000000000*x^11 + 232960
000000000*x^12 - 35840000000000*x^13 + 2560000000000*x^14)*#1^14 & , 12])}, {y[x
] -> (3*(-1 + x))/7 - 1/(7*Root[1 + (84 - 84*x)*#1 + (2996 - 5992*x + 2996*x^2)*
#1^2 + (57344 - 172032*x + 172032*x^2 - 57344*x^3)*#1^3 + (586656 - 2346624*x +
3519936*x^2 - 2346624*x^3 + 586656*x^4)*#1^4 + (1993600 - 9968000*x + 19936000*x
^2 - 19936000*x^3 + 9968000*x^4 - 1993600*x^5)*#1^5 + (-21168000 + 127008000*x -
 317520000*x^2 + 423360000*x^3 - 317520000*x^4 + 127008000*x^5 - 21168000*x^6)*#
1^6 + (-247680000 + 1733760000*x - 5201280000*x^2 + 8668800000*x^3 - 8668800000*
x^4 + 5201280000*x^5 - 1733760000*x^6 + 247680000*x^7)*#1^7 + (-453600000 + 3628
800000*x - 12700800000*x^2 + 25401600000*x^3 - 31752000000*x^4 + 25401600000*x^5
 - 12700800000*x^6 + 3628800000*x^7 - 453600000*x^8)*#1^8 + (5891200000 - 530208
00000*x + 212083200000*x^2 - 494860800000*x^3 + 742291200000*x^4 - 742291200000*
x^5 + 494860800000*x^6 - 212083200000*x^7 + 53020800000*x^8 - 5891200000*x^9)*#1
^9 + (28560000000 - 285600000000*x + 1285200000000*x^2 - 3427200000000*x^3 + 599
7600000000*x^4 - 7197120000000*x^5 + 5997600000000*x^6 - 3427200000000*x^7 + 128
5200000000*x^8 - 285600000000*x^9 + 28560000000*x^10)*#1^10 + (-44800000000 + 49
2800000000*x - 2464000000000*x^2 + 7392000000000*x^3 - 14784000000000*x^4 + 2069
7600000000*x^5 - 20697600000000*x^6 + 14784000000000*x^7 - 7392000000000*x^8 + 2
464000000000*x^9 - 492800000000*x^10 + 44800000000*x^11)*#1^11 + (-448000000000
 + 5376000000000*x - 29568000000000*x^2 + 98560000000000*x^3 - 221760000000000*x^
4 + 354816000000000*x^5 - 413952000000000*x^6 + 354816000000000*x^7 - 2217600000
00000*x^8 + 98560000000000*x^9 - 29568000000000*x^10 + 5376000000000*x^11 - 4480
00000000*x^12)*#1^12 + (2560000000000 + 2560000000000*E^((140*C[1])/9) - 3584000
0000000*x + 232960000000000*x^2 - 931840000000000*x^3 + 2562560000000000*x^4 - 5
125120000000000*x^5 + 7687680000000000*x^6 - 8785920000000000*x^7 + 768768000000
0000*x^8 - 5125120000000000*x^9 + 2562560000000000*x^10 - 931840000000000*x^11 +
 232960000000000*x^12 - 35840000000000*x^13 + 2560000000000*x^14)*#1^14 & , 13])
}, {y[x] -> (3*(-1 + x))/7 - 1/(7*Root[1 + (84 - 84*x)*#1 + (2996 - 5992*x + 299
6*x^2)*#1^2 + (57344 - 172032*x + 172032*x^2 - 57344*x^3)*#1^3 + (586656 - 23466
24*x + 3519936*x^2 - 2346624*x^3 + 586656*x^4)*#1^4 + (1993600 - 9968000*x + 199
36000*x^2 - 19936000*x^3 + 9968000*x^4 - 1993600*x^5)*#1^5 + (-21168000 + 127008
000*x - 317520000*x^2 + 423360000*x^3 - 317520000*x^4 + 127008000*x^5 - 21168000
*x^6)*#1^6 + (-247680000 + 1733760000*x - 5201280000*x^2 + 8668800000*x^3 - 8668
800000*x^4 + 5201280000*x^5 - 1733760000*x^6 + 247680000*x^7)*#1^7 + (-453600000
 + 3628800000*x - 12700800000*x^2 + 25401600000*x^3 - 31752000000*x^4 + 25401600
000*x^5 - 12700800000*x^6 + 3628800000*x^7 - 453600000*x^8)*#1^8 + (5891200000 -
 53020800000*x + 212083200000*x^2 - 494860800000*x^3 + 742291200000*x^4 - 742291
200000*x^5 + 494860800000*x^6 - 212083200000*x^7 + 53020800000*x^8 - 5891200000*
x^9)*#1^9 + (28560000000 - 285600000000*x + 1285200000000*x^2 - 3427200000000*x^
3 + 5997600000000*x^4 - 7197120000000*x^5 + 5997600000000*x^6 - 3427200000000*x^
7 + 1285200000000*x^8 - 285600000000*x^9 + 28560000000*x^10)*#1^10 + (-448000000
00 + 492800000000*x - 2464000000000*x^2 + 7392000000000*x^3 - 14784000000000*x^4
 + 20697600000000*x^5 - 20697600000000*x^6 + 14784000000000*x^7 - 7392000000000*
x^8 + 2464000000000*x^9 - 492800000000*x^10 + 44800000000*x^11)*#1^11 + (-448000
000000 + 5376000000000*x - 29568000000000*x^2 + 98560000000000*x^3 - 22176000000
```

```
0000*x^4 + 354816000000000*x^5 - 413952000000000*x^6 + 354816000000000*x^7 - 221
760000000000*x^8 + 98560000000000*x^9 - 29568000000000*x^10 + 5376000000000*x^11
 - 448000000000*x^12)*#1^12 + (2560000000000 + 2560000000000*E^((140*C[1])/9) -
35840000000000*x + 232960000000000*x^2 - 931840000000000*x^3 + 2562560000000000*
x^4 - 5125120000000000*x^5 + 7687680000000000*x^6 - 8785920000000000*x^7 + 76876
80000000000*x^8 - 5125120000000000*x^9 + 2562560000000000*x^10 - 931840000000000
*x^11 + 232960000000000*x^12 - 35840000000000*x^13 + 2560000000000*x^14)*#1^14 &
 , 14])}}
```

Maple raw input

```
dsolve((3-3*x+7*y(x))*diff(y(x),x)+7-7*x+3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-5/7*ln((1-x-y(x))/(-1+x))-2/7*ln((x-y(x)-1)/(-1+x))-ln(-1+x)-_C1 = 0
```

4.498 $(9y(x)+x+1)y'(x)+5y(x)+x+1=0$

ODE

$$(9y(x)+x+1)y'(x)+5y(x)+x+1=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method

Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓

cpu = 22.0036 (sec), leaf count = 145

$$\text{Solve}\left[\frac{(-2)^{2/3}\left((x+1)\left(3\log\left(-\frac{6(-2)^{2/3}(x+1)}{9y(x)+x+1}\right)-3\log\left(\frac{9(-2)^{2/3}(3y(x)+x+1)}{9y(x)+x+1}\right)+1\right)+9y(x)\left(\log\left(-\frac{6(-2)^{2/3}(x+1)}{9y(x)+x+1}\right)-\log\left(\frac{9(-2)^{2/3}(3y(x)+x+1)}{9y(x)+x+1}\right)+1\right)\right)}{27(3y(x)+x+1)}\right.$$

Maple ✓

cpu = 0.025 (sec), leaf count = 72

$$\left\{\frac{1}{9\,y\left(x\right)+3+3\,x}\left(\left(-3\,x-9\,y(x)-3\right)\ln\left(\frac{-3\,y(x)-1-x}{1+x}\right)+\left(-3\,x-9\,y(x)-3\right)\ln\left(1+x\right)-9\,\_C1\,y(x)+(-3\,\_C1-\right.\right.$$

Mathematica raw input

```
DSolve[1 + x + 5*y[x] + (1 + x + 9*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[((-2)^(2/3)*((1 + x)*(1 + 3*Log[(-6*(-2)^(2/3)*(1 + x))/(1 + x + 9*y[x])]
- 3*Log[(9*(-2)^(2/3)*(1 + x + 3*y[x]))/(1 + x + 9*y[x])]) + 9*(1 + Log[(-6*(-2)
^(2/3)*(1 + x))/(1 + x + 9*y[x])] - Log[(9*(-2)^(2/3)*(1 + x + 3*y[x]))/(1 + x +
 9*y[x])])*y[x]))/(27*(1 + x + 3*y[x])) == C[1] + ((-2)^(2/3)*Log[1 + x])/9, y[x
]]
```

Maple raw input

```
dsolve((1+x+9*y(x))*diff(y(x),x)+1+x+5*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
((-3*x-9*y(x)-3)*ln((-3*y(x)-1-x)/(1+x))+(-3*x-9*y(x)-3)*ln(1+x)-9*_C1*y(x)+(-3*
_C1-2)*x-3*_C1-2)/(9*y(x)+3+3*x) = 0
```

4.499 $(-12y(x)+5x+8)y'(x)=-5y(x)+2x+3$

ODE

$$(-12y(x)+5x+8)y'(x)=-5y(x)+2x+3$$

ODE Classification

[[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.010099 (sec), leaf count = 77

$$\left\{\left\{y(x)\to\frac{1}{12}\left(-i\sqrt{-16\left(9c_1+4\right)-x^2-8x}+5x+8\right)\right\},\left\{y(x)\to\frac{1}{12}\left(i\sqrt{-16\left(9c_1+4\right)-x^2-8x}+5x+8\right)\right\}\right\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 36

$$\left\{-\frac{1}{2}\ln\left(\frac{(x-2\,y(x)+2)\,(1+x-3\,y(x))}{(4+x)^2}\right)-\ln(4+x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(8 + 5*x - 12*y[x])*y'[x] == 3 + 2*x - 5*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (8 + 5*x - I*Sqrt[-8*x - x^2 - 16*(4 + 9*C[1])])/12}, {y[x] -> (8 + 5*
x + I*Sqrt[-8*x - x^2 - 16*(4 + 9*C[1])])/12}}
```

Maple raw input

```
dsolve((8+5*x-12*y(x))*diff(y(x),x) = 3+2*x-5*y(x), y(x),'implicit')
```

Maple raw output

```
-1/2*ln((x-2*y(x)+2)*(1+x-3*y(x))/(4+x)^2)-ln(4+x)-_C1 = 0
```

4.500 $(-16y(x)+7x+140)y'(x)+y(x)+8x+25=0$

ODE

$$(-16y(x)+7x+140)y'(x)+y(x)+8x+25=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.10437 (sec), leaf count = 1673

$$\left\{\left\{y(x)\to\frac{1}{16}\left(7(x+20)-\frac{}{\text{Root}\left[(553584375x^8+17714700000x^7+248005800000x^6+1984046400000x^5+99202320000\right.\right.\right.$$

Maple ✓
cpu = 0.03 (sec), leaf count = 47

$$\left\{-\frac{5}{8}\ln\left(\frac{10-2\,y(x)-x}{4+x}\right)-\frac{3}{8}\ln\left(\frac{11-y(x)+x}{4+x}\right)-\ln(4+x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[25 + 8*x + y[x] + (140 + 7*x - 16*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (7*(20 + x) - Root[-1 + (192 + 48*x)*#1 + (-7488 - 3744*x - 468*x^2)*#
1^2 + (-608256 - 456192*x - 114048*x^2 - 9504*x^3)*#1^3 + (42508800 + 42508800*x
 + 15940800*x^2 + 2656800*x^3 + 166050*x^4)*#1^4 + (497664000 + 622080000*x + 31
1040000*x^2 + 77760000*x^3 + 9720000*x^4 + 486000*x^5)*#1^5 + (-67184640000 - 10
0776960000*x - 62985600000*x^2 - 20995200000*x^3 - 3936600000*x^4 - 393660000*x^
5 - 16402500*x^6)*#1^6 + (36279705600000 + 553584375*E^(30*C[1]) + 7255941120000
0*x + 63489484800000*x^2 + 31744742400000*x^3 + 9920232000000*x^4 + 198404640000
0*x^5 + 248005800000*x^6 + 17714700000*x^7 + 553584375*x^8)*#1^8 & , 1]^(-1))/16
}, {y[x] -> (7*(20 + x) - Root[-1 + (192 + 48*x)*#1 + (-7488 - 3744*x - 468*x^2)
*#1^2 + (-608256 - 456192*x - 114048*x^2 - 9504*x^3)*#1^3 + (42508800 + 42508800
*x + 15940800*x^2 + 2656800*x^3 + 166050*x^4)*#1^4 + (497664000 + 622080000*x +
311040000*x^2 + 77760000*x^3 + 9720000*x^4 + 486000*x^5)*#1^5 + (-67184640000 -
100776960000*x - 62985600000*x^2 - 20995200000*x^3 - 3936600000*x^4 - 393660000*
x^5 - 16402500*x^6)*#1^6 + (36279705600000 + 553584375*E^(30*C[1]) + 72559411200
000*x + 63489484800000*x^2 + 31744742400000*x^3 + 9920232000000*x^4 + 1984046400
```

```
000*x^5 + 248005800000*x^6 + 17714700000*x^7 + 553584375*x^8)*#1^8 & , 2]^(-1))/
16}, {y[x] -> (7*(20 + x) - Root[-1 + (192 + 48*x)*#1 + (-7488 - 3744*x - 468*x^
2)*#1^2 + (-608256 - 456192*x - 114048*x^2 - 9504*x^3)*#1^3 + (42508800 + 425088
00*x + 15940800*x^2 + 2656800*x^3 + 166050*x^4)*#1^4 + (497664000 + 622080000*x
+ 311040000*x^2 + 77760000*x^3 + 9720000*x^4 + 486000*x^5)*#1^5 + (-67184640000
- 100776960000*x - 62985600000*x^2 - 20995200000*x^3 - 3936600000*x^4 - 39366000
0*x^5 - 16402500*x^6)*#1^6 + (36279705600000 + 553584375*E^(30*C[1]) + 725594112
00000*x + 63489484800000*x^2 + 31744742400000*x^3 + 9920232000000*x^4 + 19840464
00000*x^5 + 248005800000*x^6 + 17714700000*x^7 + 553584375*x^8)*#1^8 & , 3]^(-1)
)/16}, {y[x] -> (7*(20 + x) - Root[-1 + (192 + 48*x)*#1 + (-7488 - 3744*x - 468*
x^2)*#1^2 + (-608256 - 456192*x - 114048*x^2 - 9504*x^3)*#1^3 + (42508800 + 4250
8800*x + 15940800*x^2 + 2656800*x^3 + 166050*x^4)*#1^4 + (497664000 + 622080000*
x + 311040000*x^2 + 77760000*x^3 + 9720000*x^4 + 486000*x^5)*#1^5 + (-6718464000
0 - 100776960000*x - 62985600000*x^2 - 20995200000*x^3 - 3936600000*x^4 - 393660
000*x^5 - 16402500*x^6)*#1^6 + (36279705600000 + 553584375*E^(30*C[1]) + 7255941
1200000*x + 63489484800000*x^2 + 31744742400000*x^3 + 9920232000000*x^4 + 198404
6400000*x^5 + 248005800000*x^6 + 17714700000*x^7 + 553584375*x^8)*#1^8 & , 4]^(-
1))/16}, {y[x] -> (7*(20 + x) - Root[-1 + (192 + 48*x)*#1 + (-7488 - 3744*x - 46
8*x^2)*#1^2 + (-608256 - 456192*x - 114048*x^2 - 9504*x^3)*#1^3 + (42508800 + 42
508800*x + 15940800*x^2 + 2656800*x^3 + 166050*x^4)*#1^4 + (497664000 + 62208000
0*x + 311040000*x^2 + 77760000*x^3 + 9720000*x^4 + 486000*x^5)*#1^5 + (-67184640
000 - 100776960000*x - 62985600000*x^2 - 20995200000*x^3 - 3936600000*x^4 - 3936
60000*x^5 - 16402500*x^6)*#1^6 + (36279705600000 + 553584375*E^(30*C[1]) + 72559
411200000*x + 63489484800000*x^2 + 31744742400000*x^3 + 9920232000000*x^4 + 1984
046400000*x^5 + 248005800000*x^6 + 17714700000*x^7 + 553584375*x^8)*#1^8 & , 5]^
(-1))/16}, {y[x] -> (7*(20 + x) - Root[-1 + (192 + 48*x)*#1 + (-7488 - 3744*x -
468*x^2)*#1^2 + (-608256 - 456192*x - 114048*x^2 - 9504*x^3)*#1^3 + (42508800 +
42508800*x + 15940800*x^2 + 2656800*x^3 + 166050*x^4)*#1^4 + (497664000 + 622080
000*x + 311040000*x^2 + 77760000*x^3 + 9720000*x^4 + 486000*x^5)*#1^5 + (-671846
40000 - 100776960000*x - 62985600000*x^2 - 20995200000*x^3 - 3936600000*x^4 - 39
3660000*x^5 - 16402500*x^6)*#1^6 + (36279705600000 + 553584375*E^(30*C[1]) + 725
59411200000*x + 63489484800000*x^2 + 31744742400000*x^3 + 9920232000000*x^4 + 19
84046400000*x^5 + 248005800000*x^6 + 17714700000*x^7 + 553584375*x^8)*#1^8 & , 6
]^(-1))/16}, {y[x] -> (7*(20 + x) - Root[-1 + (192 + 48*x)*#1 + (-7488 - 3744*x
- 468*x^2)*#1^2 + (-608256 - 456192*x - 114048*x^2 - 9504*x^3)*#1^3 + (42508800
+ 42508800*x + 15940800*x^2 + 2656800*x^3 + 166050*x^4)*#1^4 + (497664000 + 6220
80000*x + 311040000*x^2 + 77760000*x^3 + 9720000*x^4 + 486000*x^5)*#1^5 + (-6718
4640000 - 100776960000*x - 62985600000*x^2 - 20995200000*x^3 - 3936600000*x^4 -
393660000*x^5 - 16402500*x^6)*#1^6 + (36279705600000 + 553584375*E^(30*C[1]) + 7
2559411200000*x + 63489484800000*x^2 + 31744742400000*x^3 + 9920232000000*x^4 +
1984046400000*x^5 + 248005800000*x^6 + 17714700000*x^7 + 553584375*x^8)*#1^8 & ,
 7]^(-1))/16}, {y[x] -> (7*(20 + x) - Root[-1 + (192 + 48*x)*#1 + (-7488 - 3744*
x - 468*x^2)*#1^2 + (-608256 - 456192*x - 114048*x^2 - 9504*x^3)*#1^3 + (4250880
0 + 42508800*x + 15940800*x^2 + 2656800*x^3 + 166050*x^4)*#1^4 + (497664000 + 62
2080000*x + 311040000*x^2 + 77760000*x^3 + 9720000*x^4 + 486000*x^5)*#1^5 + (-67
184640000 - 100776960000*x - 62985600000*x^2 - 20995200000*x^3 - 3936600000*x^4
- 393660000*x^5 - 16402500*x^6)*#1^6 + (36279705600000 + 553584375*E^(30*C[1]) +
```

```
 72559411200000*x + 63489484800000*x^2 + 31744742400000*x^3 + 9920232000000*x^4
+ 1984046400000*x^5 + 248005800000*x^6 + 17714700000*x^7 + 553584375*x^8)*#1^8 &
 , 8]^(-1))/16}}
```

Maple raw input

```
dsolve((140+7*x-16*y(x))*diff(y(x),x)+25+8*x+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-5/8*ln((10-2*y(x)-x)/(4+x))-3/8*ln((11-y(x)+x)/(4+x))-ln(4+x)-_C1 = 0
```

4.501 $(21y(x)+9x+3)y'(x)=-5y(x)+7x+45$

ODE

$$(21y(x)+9x+3)y'(x)=-5y(x)+7x+45$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 2.63321 (sec), leaf count = 7715

$$\left\{\left\{y(x)\to \frac{1}{21}\left(-9x+\frac{}{\text{Root}\left[(12824703626379264x^{14}+897729253846548480x^{13}+29176200750012825600x^{12}+58352401\right.\right.\right.$$

Maple ✓
cpu = 0.03 (sec), leaf count = 47

$$\left\{-\frac{3}{7}\ln\left(\frac{-y(x)-3-x}{5+x}\right)-\frac{4}{7}\ln\left(\frac{-3\,y(x)+11+x}{5+x}\right)-\ln(5+x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(3 + 9*x + 21*y[x])*y'[x] == 45 + 7*x - 5*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-3 - 9*x + Root[1 + (-280 - 56*x)*#1 + (2800 + 1120*x + 112*x^2)*#1^2
  + (5600000 + 3360000*x + 672000*x^2 + 44800*x^3)*#1^3 + (-348320000 - 278656000
*x - 83596800*x^2 - 11146240*x^3 - 557312*x^4)*#1^4 + (-45203200000 - 4520320000
0*x - 18081280000*x^2 - 3616256000*x^3 - 361625600*x^4 - 14465024*x^5)*#1^5 + (4
142656000000 + 4971187200000*x + 2485593600000*x^2 + 662824960000*x^3 + 99423744
000*x^4 + 7953899520*x^5 + 265129984*x^6)*#1^6 + (184279040000000 + 257990656000
000*x + 154794393600000*x^2 + 51598131200000*x^3 + 10319626240000*x^4 + 12383551
48800*x^5 + 82557009920*x^6 + 2358771712*x^7)*#1^7 + (-23109632000000000 - 36975
411200000000*x - 25882787840000000*x^2 - 10353115136000000*x^3 - 258827878400000
0*x^4 - 414124605440000*x^5 - 41412460544000*x^6 - 2366426316800*x^7 - 591606579
20*x^8)*#1^8 + (-379846656000000000 - 683723980800000000*x - 546979184640000000*
x^2 - 255256952832000000*x^3 - 76577085849600000*x^4 - 15315417169920000*x^5 - 2
042055622656000*x^6 - 175033339084800*x^7 - 8751666954240*x^8 - 194481487872*x^9
)*#1^9 + (70354206720000000000 + 140708413440000000000*x + 126637572096000000000
*x^2 + 67540038451200000000*x^3 + 23639013457920000000*x^4 + 5673363229900800000
```

```
*x^5 + 945560538316800000*x^6 + 108064061521920000*x^7 + 8104804614144000*x^8 +
360213538406400*x^9 + 7204270768128*x^10)*#1^10 + (31708938240000000000 + 69759
6641280000000000*x + 697596641280000000000*x^2 + 418557984768000000000*x^3 + 167
423193907200000000*x^4 + 46878494294016000000*x^5 + 9375698858803200000*x^6 + 13
3938551257600000*x^7 + 133938555125760000*x^8 + 8929237008384000*x^9 + 35716948
0335360*x^10 + 6493990551552*x^11)*#1^11 + (-114152177664000000000000 - 27396522
6393600000000000*x - 3013617490329600000000000*x^2 - 2009078326886400000000000*x^3
 - 904085247098880000000000*x^4 - 289307279071641600000000*x^5 - 67505031783383040
00000*x^6 - 11572291162865664000000*x^7 - 1446536395358208000000*x^8 - 12858101292
072960000*x^9 - 771486077524377600*x^10 - 28054039182704640*x^11 - 4675673197117
44*x^12)*#1^12 + (78275778969600000000000000 + 12824703626379264*E^(168*C[1]) +
219172181114880000000000000*x + 28492383544934400000000000000*x^2 + 22793906835947
5200000000000*x^3 + 12536648759771136000000000000*x^4 + 501465950390845440000000000
*x^5 + 150439785117253632000000000*x^6 + 34386236598229401600000000*x^7 + 60175914
0469014528000000*x^8 + 8023455206253527040000*x^9 + 8023455206253527040000*x^10
 + 583524015000256512000*x^11 + 291762007500128256000*x^12 + 897729253846548480*x
^13 + 12824703626379264*x^14)*#1^14 & , 1]^(-1))/21}, {y[x] -> (-3 - 9*x + Root[
1 + (-280 - 56*x)*#1 + (2800 + 1120*x + 112*x^2)*#1^2 + (5600000 + 3360000*x + 6
72000*x^2 + 44800*x^3)*#1^3 + (-348320000 - 278656000*x - 83596800*x^2 - 1114624
0*x^3 - 557312*x^4)*#1^4 + (-45203200000 - 45203200000*x - 18081280000*x^2 - 361
6256000*x^3 - 361625600*x^4 - 14465024*x^5)*#1^5 + (4142656000000 + 497118720000
0*x + 2485593600000*x^2 + 662824960000*x^3 + 99423744000*x^4 + 7953899520*x^5 +
265129984*x^6)*#1^6 + (184279040000000 + 257990656000000*x + 154794393600000*x^2
 + 51598131200000*x^3 + 10319626240000*x^4 + 1238355148800*x^5 + 82557009920*x^6
 + 2358771712*x^7)*#1^7 + (-23109632000000000 - 3697541120000000*x - 2588278784
0000000*x^2 - 1035311513600000*x^3 - 258827878400000*x^4 - 41412460544000*x^5
 - 4141246054400*x^6 - 236642631680*x^7 - 59160657920*x^8)*#1^8 + (-3798466560
00000000 - 683723980800000000*x - 54697918464000000*x^2 - 2552569528320000*x^
3 - 76577085849600000*x^4 - 1531541716992000*x^5 - 204205562265600*x^6 - 17503
3339084800*x^7 - 8751666954240*x^8 - 194481487872*x^9)*#1^9 + (70354206720000000
000 + 14070841344000000000*x + 1266375720960000000000*x^2 + 67540038451200000000
*x^3 + 23639013457920000000*x^4 + 5673363229900800000*x^5 + 945560538316800000*x
^6 + 108064061521920000*x^7 + 8104804614144000*x^8 + 360213538406400*x^9 + 72042
70768128*x^10)*#1^10 + (317089382400000000000 + 697596641280000000000*x + 697596
641280000000000*x^2 + 418557984768000000000*x^3 + 167423193907200000000*x^4 + 46
878494294016000000*x^5 + 9375698858803200000*x^6 + 133938555125760000*x^7 + 133
938555125760000*x^8 + 8929237008384000*x^9 + 357169480335360*x^10 + 649399055155
2*x^11)*#1^11 + (-114152177664000000000000 - 27396522639360000000000000*x - 301361
749032960000000000*x^2 - 2009078326886400000000000*x^3 - 904085247098880000000000*
x^4 - 289307279071641600000000*x^5 - 675050317833830400000000*x^6 - 115722911628656
6400000*x^7 - 1446536395358208000000*x^8 - 12858101292072960000*x^9 - 77148607752
4377600*x^10 - 28054039182704640*x^11 - 467567319711744*x^12)*#1^12 + (782757789
69600000000000000 + 12824703626379264*E^(168*C[1]) + 219172181114880000000000000
*x + 28492383544934400000000000000*x^2 + 22793906835947520000000000000*x^3 + 1253664
875977113600000000000*x^4 + 501465950390845440000000000*x^5 + 150439785117253632000
000000*x^6 + 34386236598229401600000000*x^7 + 60175914046901452800000*x^8 + 8023
455206253527040000*x^9 + 802345520625352704000000*x^10 + 583524015000256512000*x^
```

```
11 + 2917620075001282560 0*x^12 + 897729253846548480*x^13 + 12824703626379264*x^1
4)*#1^14 & , 2]^(-1))/21}, {y[x] -> (-3 - 9*x + Root[1 + (-280 - 56*x)*#1 + (280
0 + 1120*x + 112*x^2)*#1^2 + (5600000 + 3360000*x + 672000*x^2 + 44800*x^3)*#1^3
 + (-348320000 - 278656000*x - 83596800*x^2 - 11146240*x^3 - 557312*x^4)*#1^4 +
(-45203200000 - 45203200000*x - 18081280000*x^2 - 3616256000*x^3 - 361625600*x^4
 - 14465024*x^5)*#1^5 + (4142656000000 + 4971187200000*x + 2485593600000*x^2 + 6
62824960000*x^3 + 99423744000*x^4 + 7953899520*x^5 + 265129984*x^6)*#1^6 + (1842
79040000000 + 257990656000000*x + 154794393600000*x^2 + 51598131200000*x^3 + 103
19626240000*x^4 + 1238355148800*x^5 + 82557009920*x^6 + 2358771712*x^7)*#1^7 + (
-23109632000000000 - 36975411200000000*x - 25882787840000000*x^2 - 1035311513600
0000*x^3 - 2588278784000000*x^4 - 414124605440000*x^5 - 41412460544000*x^6 - 236
6426316800*x^7 - 59160657920*x^8)*#1^8 + (-379846656000000000 - 6837239808000000
00*x - 546979184640000000*x^2 - 255256952832000000*x^3 - 76577085849600000*x^4 -
 15315417169920000*x^5 - 2042055622656000*x^6 - 175033339084800*x^7 - 8751666954
240*x^8 - 194481487872*x^9)*#1^9 + (70354206720000000000 + 140708413440000000000
*x + 126637572096000000000*x^2 + 67540038451200000000*x^3 + 23639013457920000000
*x^4 + 5673363229900800000*x^5 + 945560538316800000*x^6 + 108064061521920000*x^7
 + 8104804614144000*x^8 + 360213538406400*x^9 + 7204270768128*x^10)*#1^10 + (317
089382400000000000 + 6975966412800000000000*x + 6975966412800000000000*x^2 + 41855
7984768000000000*x^3 + 16742319390720000000 0*x^4 + 4687849429401600000 0*x^5 + 93
75698858803200000*x^6 + 1339385551257600000*x^7 + 133938555125760000*x^8 + 89292
37008384000*x^9 + 357169480335360*x^10 + 6493990551552*x^11)*#1^11 + (-114152177
664000000000000 - 2739652263936000000000000*x - 3013617490329600000000000*x^2 - 20
090783268864000000000*x^3 - 9040852470988800000000*x^4 - 289307279071641600000
00*x^5 - 675050317833830400000 0*x^6 - 1157229116286566400000*x^7 - 1446536395358
20800000*x^8 - 1285810129207296000 0*x^9 - 771486077524377600*x^10 - 280540391827
04640*x^11 - 467567319711744*x^12)*#1^12 + (78275778969600000000000000 + 1282470
3626379264*E^(168*C[1]) + 219172181114880000000000000*x + 284923835449344000000
00000*x^2 + 22793906835947520000000000000*x^3 + 12536648759771136000000000000*x^4 +
501465950390845440000000000*x^5 + 150439785117253632000000000*x^6 + 34386236598229
40160000000*x^7 + 60175914046901452800000 0*x^8 + 80234552062535270400000 0*x^9 + 8
02345520625352704000 0*x^10 + 583524015000256512000*x^11 + 2917620075001282560 0*x
^12 + 897729253846548480*x^13 + 12824703626379264*x^14)*#1^14 & , 3]^(-1))/21},
{y[x] -> (-3 - 9*x + Root[1 + (-280 - 56*x)*#1 + (2800 + 1120*x + 112*x^2)*#1^2
+ (5600000 + 3360000*x + 672000*x^2 + 44800*x^3)*#1^3 + (-348320000 - 278656000*
x - 83596800*x^2 - 11146240*x^3 - 557312*x^4)*#1^4 + (-45203200000 - 45203200000
*x - 18081280000*x^2 - 3616256000*x^3 - 361625600*x^4 - 14465024*x^5)*#1^5 + (41
42656000000 + 4971187200000*x + 2485593600000*x^2 + 662824960000*x^3 + 994237440
00*x^4 + 7953899520*x^5 + 265129984*x^6)*#1^6 + (184279040000000 + 2579906560000
00*x + 154794393600000*x^2 + 51598131200000*x^3 + 10319626240000*x^4 + 123835514
8800*x^5 + 82557009920*x^6 + 2358771712*x^7)*#1^7 + (-23109632000000000 - 369754
11200000000*x - 25882787840000000*x^2 - 1035311513600000 0*x^3 - 2588278784000000
*x^4 - 414124605440000*x^5 - 41412460544000*x^6 - 2366426316800*x^7 - 5916065792
0*x^8)*#1^8 + (-379846656000000000 - 68372398080000000 0*x - 546979184640000000*x
^2 - 255256952832000000*x^3 - 76577085849600000*x^4 - 15315417169920000*x^5 - 20
42055622656000*x^6 - 175033339084800*x^7 - 8751666954240*x^8 - 194481487872*x^9)
*#1^9 + (70354206720000000000 + 140708413440000000000*x + 126637572096000000000*
```

```
x^2 + 6754003845120000000*x^3 + 2363901345792000000*x^4 + 5673363229900800000*
x^5 + 945560538316800000*x^6 + 108064061521920000*x^7 + 8104804614144000*x^8 + 3
60213538406400*x^9 + 7204270768128*x^10)*#1^10 + (317089382400000000000 + 697596
641280000000000*x + 6975966412800000000000*x^2 + 418557984768000000000*x^3 + 1674
2319390720000000*x^4 + 468784942940160000000*x^5 + 93756988588032000000*x^6 + 133
9385551257600000*x^7 + 133938555125760000*x^8 + 8929237008384000*x^9 + 357169480
335360*x^10 + 6493990551552*x^11)*#1^11 + (-114152177664000000000000 - 273965226
393600000000000*x - 3013617490329600000000000*x^2 - 2009078326886400000000000*x^3
- 904085247098880000000000*x^4 - 289307279071641600000000*x^5 - 675050317833830400
0000*x^6 - 115722911628656640000*x^7 - 144653639535820800000*x^8 - 128581012920
72960000*x^9 - 77148607752437760*x^10 - 28054039182704640*x^11 - 46756731971174
4*x^12)*#1^12 + (782757789696000000000000000 + 12824703626379264*E^(168*C[1]) + 2
191721811148800000000000000*x + 284923835449344000000000000*x^2 + 227939068359475
200000000000*x^3 + 125366487597711360000000000*x^4 + 501465950390845440000000000*
x^5 + 150439785117253632000000000*x^6 + 343862365982294016000000000*x^7 + 601759140
469014528000000*x^8 + 802345520625352704000000*x^9 + 802345520625352704000000*x^10
+ 583524015000256512000*x^11 + 291762007500128256000*x^12 + 897729253846548480*x^
13 + 12824703626379264*x^14)*#1^14 & , 4]^(-1))/21}, {y[x] -> (-3 - 9*x + Root[1
 + (-280 - 56*x)*#1 + (2800 + 1120*x + 112*x^2)*#1^2 + (5600000 + 3360000*x + 67
2000*x^2 + 44800*x^3)*#1^3 + (-348320000 - 278656000*x - 83596800*x^2 - 11146240
*x^3 - 557312*x^4)*#1^4 + (-45203200000 - 45203200000*x - 18081280000*x^2 - 3616
256000*x^3 - 361625600*x^4 - 14465024*x^5)*#1^5 + (4142656000000 + 4971187200000
*x + 2485593600000*x^2 + 662824960000*x^3 + 99423744000*x^4 + 7953899520*x^5 + 2
65129984*x^6)*#1^6 + (184279040000000 + 257990656000000*x + 154794393600000*x^2
+ 51598131200000*x^3 + 10319626240000*x^4 + 1238355148800*x^5 + 82557009920*x^6
+ 2358771712*x^7)*#1^7 + (-23109632000000000 - 36975411200000000*x - 25882787840
000000*x^2 - 10353115136000000*x^3 - 2588278784000000*x^4 - 414124605440000*x^5
- 41412460544000*x^6 - 2366426316800*x^7 - 59160657920*x^8)*#1^8 + (-37984665600
0000000 - 683723980800000000*x - 546979184640000000*x^2 - 255256952832000000*x^3
 - 76577085849600000*x^4 - 15315417169920000*x^5 - 2042055622656000*x^6 - 175033
339084800*x^7 - 8751666954240*x^8 - 194481487872*x^9)*#1^9 + (703542067200000000
00 + 1407084134400000000000*x + 1266375720960000000000*x^2 + 675400384512000000000*
x^3 + 236390134579200000000*x^4 + 56733632299008000000*x^5 + 945560538316800000*x^
6 + 108064061521920000*x^7 + 8104804614144000*x^8 + 360213538406400*x^9 + 720427
0768128*x^10)*#1^10 + (317089382400000000000 + 697596641280000000000*x + 6975966
41280000000000*x^2 + 418557984768000000000*x^3 + 167423193907200000000*x^4 + 468
78494294016000000*x^5 + 937569885880320000*x^6 + 133938555125760000*x^7 + 1339
38555125760000*x^8 + 8929237008384000*x^9 + 357169480335360*x^10 + 6493990551552
*x^11)*#1^11 + (-114152177664000000000000 - 273965226393600000000000*x - 3013617
490329600000000000*x^2 - 2009078326886400000000000*x^3 - 904085247098880000000000*x
^4 - 289307279071641600000000*x^5 - 675050317833830400000000*x^6 - 1157229116286566
400000*x^7 - 144653639535820800000*x^8 - 128581012920729600000*x^9 - 771486077524
377600*x^10 - 28054039182704640*x^11 - 467567319711744*x^12)*#1^12 + (7827577896
9600000000000000 + 12824703626379264*E^(168*C[1]) + 2191721811148800000000000000*
x + 284923835449344000000000000*x^2 + 227939068359475200000000000*x^3 + 12536648
759771136000000000*x^4 + 501465950390845440000000000*x^5 + 150439785117253632000
00000*x^6 + 343862365982294016000000000*x^7 + 601759140469014528000000*x^8 + 80234
```

```
552062535270400000*x^9 + 8023455206253527040000*x^10 + 583524015000256512000*x^1
1 + 2917620075001282560 0*x^12 + 897729253846548480*x^13 + 12824703626379264*x^14
)*#1^14 & , 5]^(-1))/21}, {y[x] -> (-3 - 9*x + Root[1 + (-280 - 56*x)*#1 + (2800
 + 1120*x + 112*x^2)*#1^2 + (5600000 + 3360000*x + 672000*x^2 + 44800*x^3)*#1^3
+ (-348320000 - 278656000*x - 83596800*x^2 - 11146240*x^3 - 557312*x^4)*#1^4 + (
-45203200000 - 45203200000*x - 18081280000*x^2 - 3616256000*x^3 - 361625600*x^4
- 14465024*x^5)*#1^5 + (4142656000000 + 4971187200000*x + 2485593600000*x^2 + 66
2824960000*x^3 + 99423744000*x^4 + 7953899520*x^5 + 265129984*x^6)*#1^6 + (18427
9040000000 + 257990656000000*x + 154794393600000*x^2 + 51598131200000*x^3 + 1031
9626240000*x^4 + 1238355148800*x^5 + 82557009920*x^6 + 2358771712*x^7)*#1^7 + (-
23109632000000000 - 3697541120000000 0*x - 2588278784000000 0*x^2 - 10353115136000
000*x^3 - 2588278784000000*x^4 - 414124605440000*x^5 - 41412460544000*x^6 - 2366
426316800*x^7 - 59160657920*x^8)*#1^8 + (-379846656000000000 - 68372398080000000
0*x - 546979184640000000*x^2 - 255256952832000000*x^3 - 76577085849600000*x^4 -
15315417169920000*x^5 - 2042055622656000*x^6 - 175033339084800*x^7 - 87516669542
40*x^8 - 194481487872*x^9)*#1^9 + (70354206720000000000 + 140708413440000000000*
x + 126637572096000000000*x^2 + 67540038451200000000*x^3 + 23639013457920000000*
x^4 + 5673363229900800000*x^5 + 945560538316800000*x^6 + 108064061521920000*x^7
+ 8104804614144000*x^8 + 360213538406400*x^9 + 7204270768128*x^10)*#1^10 + (3170
89382400000000000 + 6975966412800000000000*x + 6975966412800000000000*x^2 + 418557
984768000000000*x^3 + 167423193907200000000*x^4 + 46878494294016000000*x^5 + 937
5698858803200000*x^6 + 133938555125760000*x^7 + 13393855512576000 0*x^8 + 892923
7008384000*x^9 + 357169480335360*x^10 + 6493990551552*x^11)*#1^11 + (-1141521776
64000000000000 - 2739652263936000000000000*x - 3013617490329600000000000*x^2 - 200
907832688640000000000*x^3 - 904085247098880000000000*x^4 - 289307279071641600000 0
*x^5 - 675050317833830400000 0*x^6 - 115722911628656640000 0*x^7 - 144653639535820
800000*x^8 - 12858101292072960000*x^9 - 771486077524377600*x^10 - 2805403918270
4640*x^11 - 467567319711744*x^12)*#1^12 + (782757789696000000000000000 + 12824703
626379264*E^(168*C[1]) + 219172181114880000000000000000*x + 284923835449344000000000
0000*x^2 + 227939068359475200000000000000*x^3 + 125366487597711360000000000*x^4 + 5
014659503908454400000000000*x^5 + 150439785117253632000000000*x^6 + 343862365982294
0160000000*x^7 + 601759140469014528000000*x^8 + 802345520625352704000 00*x^9 + 80
234552062535270400000*x^10 + 583524015000256512000*x^11 + 291762007500128256 00*x^
12 + 897729253846548480*x^13 + 12824703626379264*x^14)*#1^14 & , 6]^(-1))/21}, {
y[x] -> (-3 - 9*x + Root[1 + (-280 - 56*x)*#1 + (2800 + 1120*x + 112*x^2)*#1^2 +
 (5600000 + 3360000*x + 672000*x^2 + 44800*x^3)*#1^3 + (-348320000 - 278656000*x
 - 83596800*x^2 - 11146240*x^3 - 557312*x^4)*#1^4 + (-45203200000 - 45203200000*
x - 18081280000*x^2 - 3616256000*x^3 - 361625600*x^4 - 14465024*x^5)*#1^5 + (414
2656000000 + 4971187200000*x + 2485593600000*x^2 + 662824960000*x^3 + 9942374400
0*x^4 + 7953899520*x^5 + 265129984*x^6)*#1^6 + (184279040000000 + 25799065600000
0*x + 154794393600000*x^2 + 51598131200000*x^3 + 10319626240000*x^4 + 1238355148
800*x^5 + 82557009920*x^6 + 2358771712*x^7)*#1^7 + (-23109632000000000 - 3697541
1200000000*x - 2588278784000000*x^2 - 1035311513600000 0*x^3 - 2588278784000000*
x^4 - 414124605440000*x^5 - 41412460544000*x^6 - 2366426316800*x^7 - 59160657920
*x^8)*#1^8 + (-379846656000000000 - 683723980800000000*x - 546979184640000000*x^
2 - 255256952832000000*x^3 - 76577085849600000*x^4 - 15315417169920000*x^5 - 204
2055622656000*x^6 - 175033339084800*x^7 - 8751666954240*x^8 - 194481487872*x^9)*
```

```
#1^9 + (70354206720000000000 + 1407084134400000000000*x + 126637572096000000000*x
^2 + 67540038451200000000*x^3 + 23639013457920000000*x^4 + 5673363229900800000*x
^5 + 945560538316800000*x^6 + 108064061521920000*x^7 + 8104804614144000*x^8 + 36
0213538406400*x^9 + 7204270768128*x^10)*#1^10 + (317089382400000000000 + 6975966
41280000000000*x + 69759664128000000000*x^2 + 418557984768000000000*x^3 + 16742
3193907200000000*x^4 + 46878494294016000000*x^5 + 9375698858803200000*x^6 + 1339
385551257600000*x^7 + 133938555125760000*x^8 + 8929237008384000*x^9 + 3571694803
35360*x^10 + 6493990551552*x^11)*#1^11 + (-114152177664000000000000 - 2739652263
93600000000000*x - 30136174903296000000000*x^2 - 20090783268864000000000000*x^3 -
 90408524709888000000000*x^4 - 28930727907164160000000*x^5 - 6750503178338304000
000*x^6 - 1157229116286566400000*x^7 - 144653639535820800000*x^8 - 1285810129207
2960000*x^9 - 771486077524377600*x^10 - 28054039182704640*x^11 - 467567319711744
*x^12)*#1^12 + (78275778969600000000000000 + 12824703626379264*E^(168*C[1]) + 21
917218111488000000000000*x + 284923835449344000000000000*x^2 + 2279390683594752
00000000000*x^3 + 12536648759771136000000000*x^4 + 501465950390845440000000000*x
^5 + 150439785117253632000000000*x^6 + 34386236598229401600000000*x^7 + 6017591404
69014528000000*x^8 + 802345520625352704000000*x^9 + 8023455206253527040000*x^10 +
 583524015000256512000*x^11 + 291762007500128256000*x^12 + 897729253846548480*x^1
3 + 12824703626379264*x^14)*#1^14 & , 7]^(-1))/21}, {y[x] -> (-3 - 9*x + Root[1
+ (-280 - 56*x)*#1 + (2800 + 1120*x + 112*x^2)*#1^2 + (5600000 + 3360000*x + 672
000*x^2 + 44800*x^3)*#1^3 + (-348320000 - 278656000*x - 83596800*x^2 - 11146240*
x^3 - 557312*x^4)*#1^4 + (-45203200000 - 45203200000*x - 18081280000*x^2 - 36162
56000*x^3 - 361625600*x^4 - 14465024*x^5)*#1^5 + (4142656000000 + 4971187200000*
x + 2485593600000*x^2 + 662824960000*x^3 + 99423744000*x^4 + 7953899520*x^5 + 26
5129984*x^6)*#1^6 + (184279040000000 + 257990656000000*x + 154794393600000*x^2 +
 51598131200000*x^3 + 10319626240000*x^4 + 1238355148800*x^5 + 82557009920*x^6 +
 2358771712*x^7)*#1^7 + (-23109632000000000 - 3697541120000000*x - 258827878400
00000*x^2 - 10353115136000000*x^3 - 2588278784000000*x^4 - 414124605440000*x^5 -
 41412460544000*x^6 - 2366426316800*x^7 - 59160657920*x^8)*#1^8 + (-379846656000
000000 - 68372398080000000*x - 546979184640000000*x^2 - 25525695283200000*x^3
- 7657708584960000*x^4 - 1531541716992000*x^5 - 204205562265600*x^6 - 1750333
39084800*x^7 - 8751666954240*x^8 - 194481487872*x^9)*#1^9 + (7035420672000000000
0 + 1407084134400000000000*x + 126637572096000000000*x^2 + 67540038451200000000*x
^3 + 23639013457920000000*x^4 + 5673363229900800000*x^5 + 945560538316800000*x^6
 + 108064061521920000*x^7 + 8104804614144000*x^8 + 360213538406400*x^9 + 7204270
768128*x^10)*#1^10 + (317089382400000000000 + 6975966412800000000000*x + 69759664
1280000000000*x^2 + 418557984768000000000*x^3 + 167423193907200000000*x^4 + 4687
8494294016000000*x^5 + 9375698858803200000*x^6 + 1339385551257600000*x^7 + 13393
8555125760000*x^8 + 8929237008384000*x^9 + 357169480335360*x^10 + 6493990551552*
x^11)*#1^11 + (-114152177664000000000000 - 2739652263936000000000000*x - 30136174
9032960000000000*x^2 - 20090783268864000000000000*x^3 - 90408524709888000000000*x^
4 - 28930727907164160000000*x^5 - 6750503178338304000000*x^6 - 11572291162865664
00000*x^7 - 144653639535820800000*x^8 - 12858101292072960000*x^9 - 7714860775243
77600*x^10 - 28054039182704640*x^11 - 467567319711744*x^12)*#1^12 + (78275778969
600000000000000 + 12824703626379264*E^(168*C[1]) + 21917218111488000000000000*x
 + 284923835449344000000000000*x^2 + 227939068359475200000000000*x^3 + 125366487
597711360000000000*x^4 + 501465950390845440000000000*x^5 + 150439785117253632000
```

```
0000*x^6 + 34386236598229401600000000*x^7 + 60175914046901452800000*x^8 + 802345
52062535270400000*x^9 + 80234552062535270400000*x^10 + 583524015000256512000*x^11
 + 291762007500128256000*x^12 + 897729253846548480*x^13 + 12824703626379264*x^14)
*#1^14 & , 8]^(-1))/21}, {y[x] -> (-3 - 9*x + Root[1 + (-280 - 56*x)*#1 + (2800
+ 1120*x + 112*x^2)*#1^2 + (5600000 + 3360000*x + 672000*x^2 + 44800*x^3)*#1^3 +
 (-348320000 - 278656000*x - 83596800*x^2 - 11146240*x^3 - 557312*x^4)*#1^4 + (-
45203200000 - 45203200000*x - 18081280000*x^2 - 3616256000*x^3 - 361625600*x^4 -
 14465024*x^5)*#1^5 + (4142656000000 + 4971187200000*x + 2485593600000*x^2 + 662
824960000*x^3 + 99423744000*x^4 + 7953899520*x^5 + 265129984*x^6)*#1^6 + (184279
040000000 + 257990656000000*x + 154794393600000*x^2 + 51598131200000*x^3 + 10319
626240000*x^4 + 1238355148800*x^5 + 82557009920*x^6 + 2358771712*x^7)*#1^7 + (-2
3109632000000000 - 36975411200000000*x - 25882787840000000*x^2 - 103531151360000
00*x^3 - 2588278784000000*x^4 - 414124605440000*x^5 - 41412460544000*x^6 - 23664
26316800*x^7 - 59160657920*x^8)*#1^8 + (-379846656000000000 - 683723980800000000
*x - 546979184640000000*x^2 - 255256952832000000*x^3 - 76577085849600000*x^4 - 1
5315417169920000*x^5 - 2042055622656000*x^6 - 175033339084800*x^7 - 875166695424
0*x^8 - 194481487872*x^9)*#1^9 + (70354206720000000000 + 14070841344000000000*x
 + 1266375720960000000000*x^2 + 675400384512000000000*x^3 + 236390134579200000000*x
^4 + 56733632299008000000*x^5 + 9455605383168000000*x^6 + 1080640615219200000*x^7 +
 81048046141440000*x^8 + 3602135384064000*x^9 + 72042707681280*x^10)*#1^10 + (31708
9382400000000000 + 6975966412800000000000*x + 6975966412800000000000*x^2 + 4185579
84768000000000000*x^3 + 167423193907200000000*x^4 + 46878494294016000000*x^5 + 9375
698858803200000*x^6 + 1339385551257600000*x^7 + 133938555125760000*x^8 + 8929237
008384000*x^9 + 357169480335360*x^10 + 6493990551552*x^11)*#1^11 + (-11415217766
4000000000000 - 27396522639360000000000000*x - 30136174903296000000000000*x^2 - 2009
07832688640000000000*x^3 - 904085247098880000000000*x^4 - 28930727907164160000000
*x^5 - 675050317833830400000*x^6 - 11572291162865664000000*x^7 - 144653639535820
800000*x^8 - 1285810129207296000*x^9 - 771486077524377600*x^10 - 28054039182704
640*x^11 - 467567319711744*x^12)*#1^12 + (78275778969600000000000000000 + 128247036
26379264*E^(168*C[1]) + 21917218111488000000000000000*x + 284923835449344000000000
000*x^2 + 22793906835947520000000000000*x^3 + 12536648759771136000000000000*x^4 + 50
14659503908454400000000000*x^5 + 15043978511725363200000000*x^6 + 3438623659822940
160000000*x^7 + 601759140469014528000000*x^8 + 80234552062535270400000*x^9 + 802
34552062535270400000*x^10 + 583524015000256512000*x^11 + 291762007500128256000*x^1
2 + 897729253846548480*x^13 + 12824703626379264*x^14)*#1^14 & , 9]^(-1))/21}, {y
[x] -> (-3 - 9*x + Root[1 + (-280 - 56*x)*#1 + (2800 + 1120*x + 112*x^2)*#1^2 +
(5600000 + 3360000*x + 672000*x^2 + 44800*x^3)*#1^3 + (-348320000 - 278656000*x
- 83596800*x^2 - 11146240*x^3 - 557312*x^4)*#1^4 + (-45203200000 - 45203200000*x
 - 18081280000*x^2 - 3616256000*x^3 - 361625600*x^4 - 14465024*x^5)*#1^5 + (4142
656000000 + 4971187200000*x + 2485593600000*x^2 + 662824960000*x^3 + 99423744000
*x^4 + 7953899520*x^5 + 265129984*x^6)*#1^6 + (184279040000000 + 257990656000000
*x + 154794393600000*x^2 + 51598131200000*x^3 + 10319626240000*x^4 + 12383551488
00*x^5 + 82557009920*x^6 + 2358771712*x^7)*#1^7 + (-23109632000000000 - 36975411
200000000*x - 25882787840000000*x^2 - 10353115136000000*x^3 - 2588278784000000*x
^4 - 414124605440000*x^5 - 41412460544000*x^6 - 2366426316800*x^7 - 59160657920*
x^8)*#1^8 + (-379846656000000000 - 683723980800000000*x - 546979184640000000*x^2
 - 255256952832000000*x^3 - 76577085849600000*x^4 - 15315417169920000*x^5 - 2042
```

```
055622656000*x^6 - 175033339084800*x^7 - 8751666954240*x^8 - 194481487872*x^9)*#
1^9 + (70354206720000000000 + 1407084134400000000000*x + 126637572096000000000*x^
2 + 67540038451200000000*x^3 + 23639013457920000000*x^4 + 5673363229900800000*x^
5 + 945560538316800000*x^6 + 108064061521920000*x^7 + 8104804614144000*x^8 + 360
213538406400*x^9 + 7204270768128*x^10)*#1^10 + (317089382400000000000 + 69759664
1280000000000*x + 697596641280000000000*x^2 + 418557984768000000000*x^3 + 167423
193907200000000*x^4 + 46878494294016000000*x^5 + 9375698858803200000*x^6 + 13393
85551257600000*x^7 + 133938555125760000*x^8 + 8929237008384000*x^9 + 35716948033
5360*x^10 + 6493990551552*x^11)*#1^11 + (-114152177664000000000000 - 27396522639
3600000000000*x - 30136174903296000000000000*x^2 - 20090783268864000000000000*x^3 -
904085247098880000000000*x^4 - 289307279071641600000000*x^5 - 67505031783383040000
00*x^6 - 11572291162865664000000*x^7 - 1446536395358208000000*x^8 - 12858101292072
960000*x^9 - 771486077524377600*x^10 - 28054039182704640*x^11 - 467567319711744*
x^12)*#1^12 + (78275778969600000000000000 + 12824703626379264*E^(168*C[1]) + 219
172181114880000000000000*x + 284923835449344000000000000*x^2 + 22793906835947520
0000000000*x^3 + 12536648759771136000000000*x^4 + 501465950390845440000000000*x^
5 + 150439785117253632000000000*x^6 + 34386236598229401600000000*x^7 + 60175914046
9014528000000*x^8 + 80234552062535270400000*x^9 + 80234552062535270400000*x^10 +
583524015000256512000*x^11 + 291762007500128256000*x^12 + 897729253846548480*x^13
 + 12824703626379264*x^14)*#1^14 & , 10]^(-1))/21}, {y[x] -> (-3 - 9*x + Root[1
+ (-280 - 56*x)*#1 + (2800 + 1120*x + 112*x^2)*#1^2 + (5600000 + 3360000*x + 672
000*x^2 + 44800*x^3)*#1^3 + (-348320000 - 278656000*x - 83596800*x^2 - 11146240*
x^3 - 557312*x^4)*#1^4 + (-45203200000 - 45203200000*x - 18081280000*x^2 - 36162
56000*x^3 - 361625600*x^4 - 14465024*x^5)*#1^5 + (4142656000000 + 4971187200000*
x + 2485593600000*x^2 + 662824960000*x^3 + 99423744000*x^4 + 7953899520*x^5 + 26
5129984*x^6)*#1^6 + (184279040000000 + 257990656000000*x + 154794393600000*x^2 +
 51598131200000*x^3 + 10319626240000*x^4 + 1238355148800*x^5 + 82557009920*x^6 +
 2358771712*x^7)*#1^7 + (-23109632000000000 - 3697541120000000*x - 258827878400
00000*x^2 - 10353115136000000*x^3 - 2588278784000000*x^4 - 414124605440000*x^5 -
 41412460544000*x^6 - 2366426316800*x^7 - 59160657920*x^8)*#1^8 + (-379846656000
000000 - 683723980800000000*x - 546979184640000000*x^2 - 255256952832000000*x^3
- 76577085849600000*x^4 - 15315417169920000*x^5 - 2042055622656000*x^6 - 1750333
39084800*x^7 - 8751666954240*x^8 - 194481487872*x^9)*#1^9 + (7035420672000000000
0 + 1407084134400000000000*x + 126637572096000000000*x^2 + 67540038451200000000*x
^3 + 23639013457920000000*x^4 + 5673363229900800000*x^5 + 945560538316800000*x^6
 + 108064061521920000*x^7 + 8104804614144000*x^8 + 360213538406400*x^9 + 7204270
768128*x^10)*#1^10 + (317089382400000000000 + 697596641280000000000*x + 69759664
1280000000000*x^2 + 418557984768000000000*x^3 + 167423193907200000000*x^4 + 4687
8494294016000000*x^5 + 9375698858803200000*x^6 + 133938555125760000*x^7 + 13393
8555125760000*x^8 + 8929237008384000*x^9 + 357169480335360*x^10 + 6493990551552*
x^11)*#1^11 + (-114152177664000000000000 - 27396522639360000000000000*x - 30136174
9032960000000000*x^2 - 20090783268864000000000000*x^3 - 90408524709888000000000*x^
4 - 289307279071641600000000*x^5 - 67505031783383040000000*x^6 - 11572291162865664
00000*x^7 - 1446536395358208000000*x^8 - 12858101292072960000*x^9 - 7714860775243
77600*x^10 - 28054039182704640*x^11 - 467567319711744*x^12)*#1^12 + (78275778969
600000000000000 + 12824703626379264*E^(168*C[1]) + 219172181114880000000000000*x
 + 284923835449344000000000000*x^2 + 227939068359475200000000000*x^3 + 125366487
```

```
597711360000000000*x^4 + 501465950390845440000000000*x^5 + 150439785117253632000000000*x^6 + 34386236598229401600000000*x^7 + 6017591404690145280000000*x^8 + 802345520625352704000000*x^9 + 80234552062535270400000*x^10 + 5835240150002565120000*x^11 + 2917620075001282560000*x^12 + 897729253846548480*x^13 + 128247036263792640*x^14)*#1^14 & , 11]^(-1))/21}, {y[x] -> (-3 - 9*x + Root[1 + (-280 - 56*x)*#1 + (2800 + 1120*x + 112*x^2)*#1^2 + (5600000 + 3360000*x + 672000*x^2 + 44800*x^3)*#1^3 + (-348320000 - 278656000*x - 83596800*x^2 - 11146240*x^3 - 557312*x^4)*#1^4 + (-45203200000 - 45203200000*x - 18081280000*x^2 - 3616256000*x^3 - 361625600*x^4 - 14465024*x^5)*#1^5 + (4142656000000 + 4971187200000*x + 2485593600000*x^2 + 662824960000*x^3 + 99423744000*x^4 + 7953899520*x^5 + 265129984*x^6)*#1^6 + (184279040000000 + 257990656000000*x + 154794393600000*x^2 + 51598131200000*x^3 + 10319626240000*x^4 + 1238355148800*x^5 + 82557009920*x^6 + 2358771712*x^7)*#1^7 + (-23109632000000000 - 3697541120000000*x - 2588278784000000*x^2 - 1035311513600000*x^3 - 258827878400000*x^4 - 41412460544000*x^5 - 4141246054400*x^6 - 236642631680*x^7 - 59160657920*x^8)*#1^8 + (-379846656000000000 - 68372398080000000*x - 5469791846400000000*x^2 - 255256952832000000*x^3 - 76577085849600000*x^4 - 15315417169920000*x^5 - 2042055622656000*x^6 - 175033339084800*x^7 - 8751666954240*x^8 - 194481487872*x^9)*#1^9 + (70354206720000000000 + 14070841344000000000*x + 1266375720960000000000*x^2 + 67540038451200000000*x^3 + 2363901345792000000*x^4 + 56733632290080000*x^5 + 945560538316800000*x^6 + 108064061521920000*x^7 + 8104804614144000*x^8 + 360213538406400*x^9 + 7204270768128*x^10)*#1^10 + (317089382400000000000 + 69759664128000000000*x + 69759664128000000000*x^2 + 41855798476800000000*x^3 + 16742319390720000000*x^4 + 4687849429401600000*x^5 + 937569885880320000*x^6 + 133938555125760000*x^7 + 13393855512576000*x^8 + 8929237008384000*x^9 + 357169480335360*x^10 + 6493990551552*x^11)*#1^11 + (-114152177664000000000000 - 27396522639360000000000*x - 3013617490329600000000000*x^2 - 2009078326886400000000000*x^3 - 904085247098880000000000*x^4 - 289307279071641600000000*x^5 - 67505031783383040000000*x^6 - 11572291162865664000000*x^7 - 1446536395358208000000*x^8 - 128581012920729600000*x^9 - 7714860775243776000*x^10 - 280540391827046400*x^11 - 46756731971174400*x^12)*#1^12 + (78275778969600000000000000 + 1282470362637926400000000000*x + 284923835449344000000000000*x^2 + 22793906835947520000000000000*x^3 + 1253664875977113600000000000*x^4 + 50146595039084544000000000*x^5 + 1504397851172536320000000000*x^6 + 34386236598229401600000000*x^7 + 6017591404690145280000000*x^8 + 802345520625352704000000*x^9 + 80234552062535270400000*x^10 + 5835240150002565120000*x^11 + 2917620075001282560000*x^12 + 897729253846548480*x^13 + 128247036263792640*x^14)*#1^14 & , 12]^(-1))/21}, {y[x] -> (-3 - 9*x + Root[1 + (-280 - 56*x)*#1 + (2800 + 1120*x + 112*x^2)*#1^2 + (5600000 + 3360000*x + 672000*x^2 + 44800*x^3)*#1^3 + (-348320000 - 278656000*x - 83596800*x^2 - 11146240*x^3 - 557312*x^4)*#1^4 + (-45203200000 - 45203200000*x - 18081280000*x^2 - 3616256000*x^3 - 361625600*x^4 - 14465024*x^5)*#1^5 + (4142656000000 + 4971187200000*x + 2485593600000*x^2 + 662824960000*x^3 + 99423744000*x^4 + 7953899520*x^5 + 265129984*x^6)*#1^6 + (184279040000000 + 257990656000000*x + 154794393600000*x^2 + 51598131200000*x^3 + 10319626240000*x^4 + 1238355148800*x^5 + 82557009920*x^6 + 2358771712*x^7)*#1^7 + (-23109632000000000 - 3697541120000000*x - 2588278784000000*x^2 - 1035311513600000*x^3 - 258827878400000*x^4 - 41412460544000*x^5 - 4141246054400*x^6 - 236642631680*x^7 - 59160657920*x^8)*#1^8 + (-379846656000000000 - 68372398080000000*x - 5469791846400000000*x
```

```
^2 - 25525695283200000*x^3 - 76577085849600000*x^4 - 15315417169920000*x^5 - 20
42055622656000*x^6 - 175033339084800*x^7 - 8751666954240*x^8 - 194481487872*x^9)
*#1^9 + (70354206720000000000 + 140708413440000000000*x + 126637572096000000000*
x^2 + 67540038451200000000*x^3 + 23639013457920000000*x^4 + 5673363229900800000*
x^5 + 945560538316800000*x^6 + 108064061521920000*x^7 + 8104804614144000*x^8 + 3
60213538406400*x^9 + 7204270768128*x^10)*#1^10 + (317089382400000000000 + 697596
641280000000000*x + 6975966412800000000000*x^2 + 418557984768000000000*x^3 + 1674
2319390720000000*x^4 + 4687849429401600000*x^5 + 9375698858803200000*x^6 + 133
9385551257600000*x^7 + 133938555125760000*x^8 + 8929237008384000*x^9 + 357169480
335360*x^10 + 6493990551552*x^11)*#1^11 + (-11415217766400000000000 - 273965226
393600000000000*x - 3013617490329600000000000*x^2 - 2009078326886400000000000*x^3
 - 904085247098880000000000*x^4 - 289307279071641600000000*x^5 - 675050317833830400
0000*x^6 - 115722911628656640000*x^7 - 14465363953582080000*x^8 - 128581012920
72960000*x^9 - 771486077524377600*x^10 - 28054039182704640*x^11 - 46756731971174
4*x^12)*#1^12 + (78275778969600000000000000 + 12824703626379264*E^(168*C[1]) + 2
191721811148800000000000000*x + 284923835449344000000000000*x^2 + 227939068359475
200000000000*x^3 + 125366487597711360000000000*x^4 + 501465950390845440000000000*
x^5 + 150439785117253632000000000*x^6 + 34386236598229401600000000*x^7 + 601759140
469014528000000*x^8 + 80234552062535270400000*x^9 + 802345520625352704000*x^10
 + 583524015000256512000*x^11 + 291762007500128256000*x^12 + 897729253846548480*x^
13 + 12824703626379264*x^14)*#1^14 & , 13]^(-1))/21}, {y[x] -> (-3 - 9*x + Root[
1 + (-280 - 56*x)*#1 + (2800 + 1120*x + 112*x^2)*#1^2 + (5600000 + 3360000*x + 6
72000*x^2 + 44800*x^3)*#1^3 + (-348320000 - 278656000*x - 83596800*x^2 - 1114624
0*x^3 - 557312*x^4)*#1^4 + (-45203200000 - 45203200000*x - 18081280000*x^2 - 361
6256000*x^3 - 361625600*x^4 - 14465024*x^5)*#1^5 + (4142656000000 + 497118720000
0*x + 2485593600000*x^2 + 662824960000*x^3 + 99423744000*x^4 + 7953899520*x^5 +
 265129984*x^6)*#1^6 + (184279040000000 + 257990656000000*x + 154794393600000*x^2
  + 51598131200000*x^3 + 10319626240000*x^4 + 1238355148800*x^5 + 82557009920*x^6
  + 2358771712*x^7)*#1^7 + (-23109632000000000 - 3697541120000000*x - 2588278784
0000000*x^2 - 1035311513600000*x^3 - 258827878400000*x^4 - 41412460544000*x^5
  - 4141246054400*x^6 - 236642631680*x^7 - 59160657920*x^8)*#1^8 + (-3798466560
00000000 - 683723980800000000*x - 54679718464000000*x^2 - 2552569528320000*x^
3 - 76577085849600000*x^4 - 1531541716992000*x^5 - 204205562265600*x^6 - 17503
3339084800*x^7 - 8751666954240*x^8 - 194481487872*x^9)*#1^9 + (70354206720000000
000 + 140708413440000000000*x + 126637572096000000000*x^2 + 67540038451200000000
*x^3 + 23639013457920000000*x^4 + 5673363229900800000*x^5 + 945560538316800000*x
^6 + 108064061521920000*x^7 + 8104804614144000*x^8 + 360213538406400*x^9 + 72042
70768128*x^10)*#1^10 + (317089382400000000000 + 6975966412800000000000*x + 697596
641280000000000*x^2 + 418557984768000000000*x^3 + 167423193907200000000*x^4 + 46
878494294016000000*x^5 + 9375698858803200000*x^6 + 1339385551257600000*x^7 + 133
9385551257600000*x^8 + 8929237008384000*x^9 + 357169480335360*x^10 + 649399055155
2*x^11)*#1^11 + (-11415217766400000000000 - 2739652263936000000000000*x - 301361
749032960000000000*x^2 - 2009078326886400000000000*x^3 - 904085247098880000000000*
x^4 - 289307279071641600000000*x^5 - 675050317833830400000000*x^6 - 115722911628656
6400000*x^7 - 14465363953582080000*x^8 - 1285810129207296000*x^9 - 77148607752
4377600*x^10 - 28054039182704640*x^11 - 467567319711744*x^12)*#1^12 + (782757789
69600000000000000 + 12824703626379264*E^(168*C[1]) + 219172181114880000000000000
```

```
*x + 284923835449344000000000000*x^2 + 22793906835947520000000000*x^3 + 1253664
875977113600000000*x^4 + 501465950390845440000000*x^5 + 15043978511725363200
000000*x^6 + 34386236598229401600000000*x^7 + 60175914046901452800000*x^8 + 8023
455206253527040000*x^9 + 802345520625352704000*x^10 + 583524015000256512000*x^
11 + 291762007500128256000*x^12 + 89772925384654848*x^13 + 12824703626379264*x^1
4)*#1^14 & , 14]^(-1))/21}}
```

Maple raw input

```
dsolve((3+9*x+21*y(x))*diff(y(x),x) = 45+7*x-5*y(x), y(x),'implicit')
```

Maple raw output

```
-3/7*ln((-y(x)-3-x)/(5+x))-4/7*ln((-3*y(x)+11+x)/(5+x))-ln(5+x)-_C1 = 0
```

4.502 $y'(x)(ax+by(x))+x=0$

ODE

$$y'(x)(ax+by(x))+x=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class C`], _dAlembert]

Book solution method
Change of Variable, new independent variable

Mathematica ✓
cpu = 0.377994 (sec), leaf count = 73

$$\text{Solve}\left[\frac{a\tan^{-1}\left(\frac{a+\frac{2by(x)}{x}}{\sqrt{4b-a^2}}\right)}{\sqrt{4b-a^2}}+\frac{1}{2}\log\left(\frac{axy(x)+by(x)^2+x^2}{x^2}\right)+\log(x)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.017 (sec), leaf count = 67

$$\left\{-\frac{1}{2}\ln\left(\frac{axy(x)+b(y(x))^2+x^2}{x^2}\right)+aArtanh\left(\frac{ax+2\,by(x)}{x}\frac{1}{\sqrt{a^2-4\,b}}\right)\frac{1}{\sqrt{a^2-4\,b}}-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x + (a*x + b*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[(a*ArcTan[(a + (2*b*y[x])/x)/Sqrt[-a^2 + 4*b]])/Sqrt[-a^2 + 4*b] + Log[x]
+ Log[(x^2 + a*x*y[x] + b*y[x]^2)/x^2]/2 == C[1], y[x]]
```

Maple raw input

```
dsolve((a*x+b*y(x))*diff(y(x),x)+x = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln((a*x*y(x)+b*y(x)^2+x^2)/x^2)+a/(a^2-4*b)^(1/2)*arctanh((a*x+2*b*y(x))/x/
(a^2-4*b)^(1/2))-ln(x)-_C1 = 0
```

4.503 $y'(x)(ax+by(x))+y(x)=0$

ODE

$$y'(x)(ax+by(x))+y(x)=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Change of Variable, new independent variable

Mathematica ✓
cpu = 0.0389605 (sec), leaf count = 36

$$\text{Solve}\left[\frac{\log\left(a+\frac{by(x)}{x}+1\right)+a\log\left(\frac{y(x)}{x}\right)}{a+1}+\log(x)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.023 (sec), leaf count = 23

$$\left\{x+\frac{by(x)}{1+a}-(y(x))^{-a}\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x] + (a*x + b*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[Log[x] + (a*Log[y[x]/x] + Log[1 + a + (b*y[x])/x])/(1 + a) == C[1], y[x]]
```

Maple raw input

```
dsolve((a*x+b*y(x))*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x+b/(1+a)*y(x)-y(x)^(-a)*_C1 = 0
```

4.504 $y'(x)(ax+by(x))+ay(x)+bx=0$

ODE

$$y'(x)(ax+by(x))+ay(x)+bx=0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0298682 (sec), leaf count = 83

$$\left\{\left\{y(x)\to -\frac{\sqrt{a^2x^2-b^2x^2+be^{2c_1}}+ax}{b}\right\},\left\{y(x)\to \frac{\sqrt{a^2x^2-b^2x^2+be^{2c_1}}-ax}{b}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 36

$$\left\{-\frac{1}{2}\ln\left(\frac{2\,axy(x)+bx^2+b(y(x))^2}{x^2}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[b*x + a*y[x] + (a*x + b*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a*x + Sqrt[b*E^(2*C[1]) + a^2*x^2 - b^2*x^2])/b)}, {y[x] -> (-(a*x)
 + Sqrt[b*E^(2*C[1]) + a^2*x^2 - b^2*x^2])/b}}
```

Maple raw input

```
dsolve((a*x+b*y(x))*diff(y(x),x)+b*x+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln((2*a*x*y(x)+b*x^2+b*y(x)^2)/x^2)-ln(x)-_C1 = 0
```

4.505 $y'(x)(ax+by(x))=ay(x)+bx$

ODE

$$y'(x)(ax+by(x))=ay(x)+bx$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0368521 (sec), leaf count = 45

$$\text{Solve}\left[\frac{1}{2}\left((b-a)\log\left(\frac{y(x)+x}{x}\right)+(a+b)\log\left(1-\frac{y(x)}{x}\right)\right)+b\log(x)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.016 (sec), leaf count = 50

$$\left\{\frac{1}{2b}\left((-a-b)\ln\left(\frac{y(x)-x}{x}\right)+(a-b)\ln\left(\frac{x+y(x)}{x}\right)-2b(\_C1+\ln(x))\right)=0\right\}$$

Mathematica raw input

```
DSolve[(a*x + b*y[x])*y'[x] == b*x + a*y[x],y[x],x]
```

Mathematica raw output

```
Solve[b*Log[x] + ((-a + b)*Log[(x + y[x])/x] + (a + b)*Log[1 - y[x]/x])/2 == C[1
], y[x]]
```

Maple raw input

```
dsolve((a*x+b*y(x))*diff(y(x),x) = b*x+a*y(x), y(x),'implicit')
```

Maple raw output

```
1/2*((-a-b)*ln((y(x)-x)/x)+(a-b)*ln((x+y(x))/x)-2*b*(_C1+ln(x)))/b = 0
```

4.506 $\mathbf{a1} + y'(x)(\mathbf{a2} + bx + \mathbf{c2}y(x)) + by(x) + \mathbf{b1}x = 0$

ODE

$$\mathrm{a1} + y'(x)(\mathrm{a2} + bx + \mathrm{c2}y(x)) + by(x) + \mathrm{b1}x = 0$$

ODE Classification

[[_homogeneous, `class C`], _exact, _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0450018 (sec), leaf count = 106

$$\left\{\left\{y(x) \to -\frac{\frac{\sqrt{-x(2\mathrm{a1}+\mathrm{b1}x)+\frac{(\mathrm{a2}+bx)^2}{\mathrm{c2}}+c_1\mathrm{c2}}}{\sqrt{\frac{1}{\mathrm{c2}}}}+\mathrm{a2}+bx}{\mathrm{c2}}\right\},\left\{y(x) \to \sqrt{\frac{1}{\mathrm{c2}}}\sqrt{-x(2\mathrm{a1}+\mathrm{b1}x)+\frac{(\mathrm{a2}+bx)^2}{\mathrm{c2}}+c_1\mathrm{c2}}-\frac{\mathrm{a2}+bx}{\mathrm{c2}}\right\}\right.$$

Maple ✓
cpu = 0.037 (sec), leaf count = 126

$$\left\{-\frac{1}{2}\ln\left(2\,\frac{\left(b^2-b1\,c2\right)\left(1/2\,c2\left(b^2-b1\,c2\right)(y(x))^2+\left(b^2-b1\,c2\right)(bx+a2)\,y(x)+\left(1/2\,x^2b1+a1\,x\right)b^2+a1\,a2\,b-1/2\right.\right.}{\left(b^2x+a2\,b-(b1\,x+a1)\,c2\right)^2}\right.$$

Mathematica raw input

```
DSolve[a1 + b1*x + b*y[x] + (a2 + b*x + c2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a2 + b*x + Sqrt[(a2 + b*x)^2/c2 - x*(2*a1 + b1*x) + c2*C[1]]/Sqrt[c
2^(-1)])/c2)}, {y[x] -> -((a2 + b*x)/c2) + Sqrt[c2^(-1)]*Sqrt[(a2 + b*x)^2/c2 -
x*(2*a1 + b1*x) + c2*C[1]]}}
```

Maple raw input

```
dsolve((a2+b*x+c2*y(x))*diff(y(x),x)+a1+b1*x+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln(2*(b^2-b1*c2)*(1/2*c2*(b^2-b1*c2)*y(x)^2+(b^2-b1*c2)*(b*x+a2)*y(x)+(1/2*
x^2*b1+a1*x)*b^2+a1*a2*b-1/2*(b1*x+a1)^2*c2-1/2*a2^2*b1)/(b^2*x+a2*b-(b1*x+a1)*c
2)^2)-ln((b1*x+a1)*c2-b^2*x-a2*b)-_C1 = 0
```

4.507 $y'(x)(\mathbf{a2}+\mathbf{b2}y(x)+\mathbf{c2}y(x))=\mathbf{a1}+\mathbf{b1}x+\mathbf{c1}y(x)$

ODE

$$y'(x)(\mathrm{a2}+\mathrm{b2}y(x)+\mathrm{c2}y(x))=\mathrm{a1}+\mathrm{b1}x+\mathrm{c1}y(x)$$

ODE Classification

[[_homogeneous, `class C`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 1.4045 (sec), leaf count = 216

$$\text{Solve}\left[\frac{\mathrm{c1}^2\log\left(\frac{(\mathrm{a2}+(\mathrm{b2}+\mathrm{c2})y(x))^2\left(\frac{(\mathrm{b2}+\mathrm{c2})(\mathrm{a1}+\mathrm{b1}x+\mathrm{c1}y(x))(\mathrm{a1}(\mathrm{b2}+\mathrm{c2})-\mathrm{a2c1}+\mathrm{b1}x(\mathrm{b2}+\mathrm{c2}))}{(\mathrm{a2}+(\mathrm{b2}+\mathrm{c2})y(x))^2}-\mathrm{b1b2}-\mathrm{b1c2}\right)}{(\mathrm{a1}(\mathrm{b2}+\mathrm{c2})-\mathrm{a2c1}+\mathrm{b1}x(\mathrm{b2}+\mathrm{c2}))^2}\right)-\frac{2\mathrm{c1}^2\tan^{-1}\left(\frac{-2\mathrm{a1}(\mathrm{b2}}{\mathrm{c}}\right.}{2\mathrm{b1}(\mathrm{b2}+\mathrm{c}}\right.$$

Maple ✓
cpu = 0.043 (sec), leaf count = 228

$$\left\{-\frac{1}{2}\ln\left(-\frac{b1\,(b2+c2)\left(-b1\,(b2+c2)^2\,(y(x))^2+((b2+c2)\,(xc1-2\,a2)\,b1+c1\,(a1\,b2+a1\,c2-a2\,c1))\,y(x)+x^2(b\right.}{((b2+c2)\,a1+x\,(b2+c2)\,b1}\right.\right.$$

Mathematica raw input

```
DSolve[(a2 + b2*y[x] + c2*y[x])*y'[x] == a1 + b1*x + c1*y[x],y[x],x]
```

Mathematica raw output

```
Solve[((-2*c1^2*ArcTan[(a2*c1 - 2*a1*(b2 + c2) - 2*b1*b2*x - 2*b1*c2*x - c1*(b2
+ c2)*y[x])/(c1*Sqrt[-((c1^2 + 4*b1*(b2 + c2))/c1^2)]*(a2 + (b2 + c2)*y[x]))])/S
qrt[-((c1^2 + 4*b1*(b2 + c2))/c1^2)] - 2*b1*(b2 + c2)*C[1] + 2*c1^2*Log[-(a2*c1)
 + a1*(b2 + c2) + b1*(b2 + c2)*x] + c1^2*Log[((a2 + (b2 + c2)*y[x])^2*(-(b1*b2)
- b1*c2 + ((b2 + c2)*(-(a2*c1) + a1*(b2 + c2) + b1*(b2 + c2)*x)*(a1 + b1*x + c1*
y[x]))/(a2 + (b2 + c2)*y[x])^2))/(-(a2*c1) + a1*(b2 + c2) + b1*(b2 + c2)*x)^2])/
```

```
(2*b1*(b2 + c2)) == 0, y[x]]
```

Maple raw input

```
dsolve((a2+b2*y(x)+c2*y(x))*diff(y(x),x) = a1+b1*x+c1*y(x), y(x),'implicit')
```

Maple raw output

```
-1/2*ln(-(b2+c2)*b1*(-b1*(b2+c2)^2*y(x)^2+((b2+c2)*(c1*x-2*a2)*b1+c1*(a1*b2+a1*c
2-a2*c1))*y(x)+x^2*(b2+c2)*b1^2+(2*a1*b2*x+2*a1*c2*x-a2*c1*x-a2^2)*b1+a1*(a1*b2+
a1*c2-a2*c1))/((b2+c2)*a1+x*(b2+c2)*b1-a2*c1)^2)-1/(4*b1*b2+4*b1*c2+c1^2)^(1/2)*
arctanh((-2*b1*(b2+c2)^2*y(x)+(b2+c2)*(c1*x-2*a2)*b1+c1*(a1*b2+a1*c2-a2*c1))/(4*
b1*b2+4*b1*c2+c1^2)^(1/2)/((b2+c2)*a1+x*(b2+c2)*b1-a2*c1))*c1-ln((b2+c2)*a1+x*(b
2+c2)*b1-a2*c1)-_C1 = 0
```

4.508 $xy(x)y'(x) + y(x)^2 + 1 = 0$

ODE

$$xy(x)y'(x) + y(x)^2 + 1 = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0117978 (sec), leaf count = 50

$$\left\{\left\{y(x) \to -\frac{\sqrt{e^{2c_1} - x^2}}{x}\right\}, \left\{y(x) \to \frac{\sqrt{e^{2c_1} - x^2}}{x}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 15

$$\left\{1 - \frac{\_C1}{x^2} + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[1 + y[x]^2 + x*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[E^(2*C[1]) - x^2]/x)}, {y[x] -> Sqrt[E^(2*C[1]) - x^2]/x}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)+1+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
1-1/x^2*_C1+y(x)^2 = 0
```

4.509 $xy(x)y'(x) = y(x)^2 + x$

ODE

$$xy(x)y'(x) = y(x)^2 + x$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Bernoulli]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.00641502 (sec), leaf count = 42

$$\left\{\left\{y(x) \to -\sqrt{x}\sqrt{c_1 x - 2}\right\}, \left\{y(x) \to \sqrt{x}\sqrt{c_1 x - 2}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 17

$$\left\{-x^2\_C1 + (y(x))^2 + 2x = 0\right\}$$

Mathematica raw input

```
DSolve[x*y[x]*y'[x] == x + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[x]*Sqrt[-2 + x*C[1]])}, {y[x] -> Sqrt[x]*Sqrt[-2 + x*C[1]]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x) = x+y(x)^2, y(x),'implicit')
```

Maple raw output

```
-x^2*_C1+y(x)^2+2*x = 0
```

4.510 $x^2 + xy(x)y'(x) + y(x)^2 = 0$

ODE

$$x^2 + xy(x)y'(x) + y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Bernoulli]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.00717274 (sec), leaf count = 46

$$\left\{\left\{y(x) \to -\frac{\sqrt{c_1 - \frac{x^4}{2}}}{x}\right\}, \left\{y(x) \to \frac{\sqrt{c_1 - \frac{x^4}{2}}}{x}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 19

$$\left\{(y(x))^2 + \frac{x^2}{2} - \frac{\_C1}{x^2} = 0\right\}$$

Mathematica raw input

```
DSolve[x^2 + y[x]^2 + x*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-x^4/2 + C[1]]/x)}, {y[x] -> Sqrt[-x^4/2 + C[1]]/x}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)+x^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+1/2*x^2-1/x^2*_C1 = 0
```

4.511 $x^4 + xy(x)y'(x) - y(x)^2 = 0$

ODE

$$x^4 + xy(x)y'(x) - y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00717754 (sec), leaf count = 43

$$\left\{\left\{y(x) \to -\sqrt{c_1 x^2 - x^4}\right\}, \left\{y(x) \to \sqrt{c_1 x^2 - x^4}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 17

$$\left\{x^4 - x^2 \_C1 + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[x^4 - y[x]^2 + x*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-x^4 + x^2*C[1]]}, {y[x] -> Sqrt[-x^4 + x^2*C[1]]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)+x^4-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x^4-x^2*_C1+y(x)^2 = 0
```

4.512 $xy(x)y'(x) = ax^3\cos(x) + y(x)^2$

ODE

$$xy(x)y'(x) = ax^3\cos(x) + y(x)^2$$

ODE Classification

[[_homogeneous, `class D`], _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0227668 (sec), leaf count = 38

$$\left\{\left\{y(x) \to -x\sqrt{2a\sin(x) + c_1}\right\}, \left\{y(x) \to x\sqrt{2a\sin(x) + c_1}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 22

$$\left\{-2\sin(x)x^2a - x^2\_C1 + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y[x]*y'[x] == a*x^3*Cos[x] + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x*Sqrt[C[1] + 2*a*Sin[x]])}, {y[x] -> x*Sqrt[C[1] + 2*a*Sin[x]]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x) = a*x^3*cos(x)+y(x)^2, y(x),'implicit')
```

Maple raw output

```
-2*sin(x)*x^2*a-x^2*_C1+y(x)^2 = 0
```

4.513 $xy(x)y'(x) = x^2 - xy(x) + y(x)^2$

ODE

$$xy(x)y'(x) = x^2 - xy(x) + y(x)^2$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0185526 (sec), leaf count = 20

$$\left\{\left\{y(x) \to x\left(W\left(\frac{e^{c_1-1}}{x}\right)+1\right)\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 26

$$\left\{-\_C1 + \ln\left(\frac{y(x)-x}{x}\right) + \frac{y(x)}{x} + \ln(x) = 0\right\}$$

Mathematica raw input

```
DSolve[x*y[x]*y'[x] == x^2 - x*y[x] + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(1 + ProductLog[E^(-1 + C[1])/x])}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x) = x^2-x*y(x)+y(x)^2, y(x),'implicit')
```

Maple raw output

```
-_C1+ln((y(x)-x)/x)+y(x)/x+ln(x) = 0
```

4.514 $2x^2 + xy(x)y'(x) - 2xy(x) - y(x)^2 = 0$

ODE

$$2x^2 + xy(x)y'(x) - 2xy(x) - y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0230852 (sec), leaf count = 20

$$\{\{y(x) \to x(W(e^{c_1-1}x^2)+1)\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 31

$$\left\{\frac{1}{2}\ln\left(\frac{y(x)-x}{x}\right) + \frac{y(x)}{2x} - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[2*x^2 - 2*x*y[x] - y[x]^2 + x*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(1 + ProductLog[E^(-1 + C[1])*x^2])}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)+2*x^2-2*x*y(x)-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
1/2*ln((y(x)-x)/x)+1/2*y(x)/x-ln(x)-_C1 = 0
```

4.515 $xy(x)y'(x) = a + by(x)^2$

ODE

$$xy(x)y'(x) = a + by(x)^2$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0156619 (sec), leaf count = 58

$$\left\{\left\{y(x) \to -\frac{\sqrt{e^{2b(c_1+\log(x))} - a}}{\sqrt{b}}\right\}, \left\{y(x) \to \frac{\sqrt{e^{2b(c_1+\log(x))} - a}}{\sqrt{b}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 21

$$\left\{\frac{a}{b} - x^{2\,b}\_C1 + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y[x]*y'[x] == a + b*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-a + E^(2*b*(C[1] + Log[x]))]/Sqrt[b])}, {y[x] -> Sqrt[-a + E^(
2*b*(C[1] + Log[x]))]/Sqrt[b]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x) = a+b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
a/b-x^(2*b)*_C1+y(x)^2 = 0
```

4.516 $xy(x)y'(x) = ax^n + by(x)^2$

ODE

$$xy(x)y'(x) = ax^n + by(x)^2$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0209403 (sec), leaf count = 86

$$\left\{\left\{y(x) \to -\frac{\sqrt{c_1(2b-n)x^{2b} - 2ax^n}}{\sqrt{2b-n}}\right\}, \left\{y(x) \to \frac{\sqrt{c_1(2b-n)x^{2b} - 2ax^n}}{\sqrt{2b-n}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 31

$$\left\{2\frac{ax^n}{2b-n} - x^{2b}\_C1 + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y[x]*y'[x] == a*x^n + b*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-2*a*x^n + (2*b - n)*x^(2*b)*C[1]]/Sqrt[2*b - n])}, {y[x] -> Sq
rt[-2*a*x^n + (2*b - n)*x^(2*b)*C[1]]/Sqrt[2*b - n]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x) = a*x^n+b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
2/(2*b-n)*x^n*a-x^(2*b)*_C1+y(x)^2 = 0
```

4.517 $xy(x)y'(x) = (x^2+1)(1-y(x)^2)$

ODE

$$xy(x)y'(x) = (x^2+1)(1-y(x)^2)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0201164 (sec), leaf count = 58

$$\left\{\left\{y(x) \to -\frac{\sqrt{e^{2c_1-x^2}+x^2}}{x}\right\}, \left\{y(x) \to \frac{\sqrt{e^{2c_1-x^2}+x^2}}{x}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 21

$$\left\{-1-\frac{\mathrm{e}^{-x^2}\_C1}{x^2}+(y(x))^2=0\right\}$$

Mathematica raw input

```
DSolve[x*y[x]*y'[x] == (1 + x^2)*(1 - y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[E^(-x^2 + 2*C[1]) + x^2]/x)}, {y[x] -> Sqrt[E^(-x^2 + 2*C[1]) +
  x^2]/x}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x) = (x^2+1)*(1-y(x)^2), y(x),'implicit')
```

Maple raw output

```
-1-1/x^2*exp(-x^2)*_C1+y(x)^2 = 0
```

4.518 $x^2 \cot^{-1}\left(\frac{y(x)}{x}\right) + xy(x)y'(x) - y(x)^2 = 0$

ODE

$$x^2 \cot^{-1}\left(\frac{y(x)}{x}\right) + xy(x)y'(x) - y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✗
cpu = 599.993 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.302 (sec), leaf count = 24

$$\left\{-\_C1 + \int^{\frac{y(x)}{x}} \frac{\_a}{\operatorname{arccot}(\_a)} d\_a + \ln(x) = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*ArcCot[y[x]/x] - y[x]^2 + x*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)+x^2*arccot(y(x)/x)-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-_C1+Intat(1/arccot(_a)*_a,_a = y(x)/x)+ln(x) = 0
```

4.519 $x^2 e^{-\frac{2y(x)}{x}} + xy(x)y'(x) - y(x)^2 = 0$

ODE

$$x^2 e^{-\frac{2y(x)}{x}} + xy(x)y'(x) - y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0454222 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{1}{2}x\left(W\left(\frac{4(c_1 - \log(x))}{e}\right) + 1\right)\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 32

$$\left\{\frac{x - 2y(x)}{4x}\left(\mathrm{e}^{-2\frac{y(x)}{x}}\right)^{-1} - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2/E^((2*y[x])/x) - y[x]^2 + x*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(1 + ProductLog[(4*(C[1] - Log[x]))/E]))/2}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)+x^2*exp(-2*y(x)/x)-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
1/4*(x-2*y(x))/x/exp(-2*y(x)/x)-ln(x)-_C1 = 0
```

4.520 $(xy(x)+1)y'(x)+y(x)^2=0$

ODE

$$(xy(x)+1)y'(x)+y(x)^2=0$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0142415 (sec), leaf count = 16

$$\left\{\left\{y(x)\to \frac{W(e^{c_1}x)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 17

$$\left\{x+\frac{\ln(y(x))-\_C1}{y(x)}=0\right\}$$

Mathematica raw input

```
DSolve[y[x]^2 + (1 + x*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ProductLog[E^C[1]*x]/x}}
```

Maple raw input

```
dsolve((1+x*y(x))*diff(y(x),x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x+(ln(y(x))-_C1)/y(x) = 0
```

4.521 $x(y(x)+1)y'(x)-(1-x)y(x)=0$

ODE

$$x(y(x)+1)y'(x)-(1-x)y(x)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0173367 (sec), leaf count = 16

$$\{\{y(x)\to W\left(xe^{c_1-x}\right)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 15

$$\{x-\ln(x)+y(x)+\ln(y(x))+\_C1=0\}$$

Mathematica raw input

```
DSolve[-((1 - x)*y[x]) + x*(1 + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ProductLog[E^(-x + C[1])*x]}}
```

Maple raw input

```
dsolve(x*(1+y(x))*diff(y(x),x)-(1-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x-ln(x)+y(x)+ln(y(x))+_C1 = 0
```

4.522 $x(1-y(x))y'(x)+(x+1)y(x)=0$

ODE

$$x(1-y(x))y'(x)+(x+1)y(x)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0170666 (sec), leaf count = 23

$$\left\{\left\{y(x)\to -W\left(-\frac{e^{-c_1-x}}{x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 15

$$\{x+\ln(x)-y(x)+\ln(y(x))+\_C1=0\}$$

Mathematica raw input

```
DSolve[(1 + x)*y[x] + x*(1 - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ProductLog[-(E^(-x - C[1])/x)]}}
```

Maple raw input

```
dsolve(x*(1-y(x))*diff(y(x),x)+(1+x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x+ln(x)-y(x)+ln(y(x))+_C1 = 0
```

4.523 $x(1-y(x))y'(x)+(1-x)y(x)=0$

ODE

$$x(1-y(x))y'(x)+(1-x)y(x)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0157774 (sec), leaf count = 21

$$\left\{\left\{y(x)\to -W\left(-\frac{e^{x-c_1}}{x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 17

$$\{x-\ln(x)+y(x)-\ln(y(x))+\_C1=0\}$$

Mathematica raw input

```
DSolve[(1 - x)*y[x] + x*(1 - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ProductLog[-(E^(x - C[1])/x)]}}
```

Maple raw input

```
dsolve(x*(1-y(x))*diff(y(x),x)+(1-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x-ln(x)+y(x)-ln(y(x))+_C1 = 0
```

4.524 $ax + x(y(x) + 2)y'(x) = 0$

ODE

$$ax + x(y(x) + 2)y'(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0068614 (sec), leaf count = 50

$$\left\{\left\{y(x) \to -\sqrt{2}\sqrt{-ax + c_1 + 2} - 2\right\}, \left\{y(x) \to \sqrt{2}\sqrt{-ax + c_1 + 2} - 2\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 23

$$\left\{\frac{(y(x))^2 + 4\,y(x) + 2\,a(x + \_C1)}{2\,a} = 0\right\}$$

Mathematica raw input

```
DSolve[a*x + x*(2 + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2 - Sqrt[2]*Sqrt[2 - a*x + C[1]]}, {y[x] -> -2 + Sqrt[2]*Sqrt[2 - a*x
 + C[1]]}}
```

Maple raw input

```
dsolve(x*(2+y(x))*diff(y(x),x)+a*x = 0, y(x),'implicit')
```

Maple raw output

```
1/2*(y(x)^2+4*y(x)+2*a*(x+_C1))/a = 0
```

4.525 $(x(-y(x))+3x+2)y'(x)+y(x)=0$

ODE

$$(x(-y(x))+3x+2)y'(x)+y(x)=0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`], [_Abel, `2nd type`, `class B`]]

Book solution method
Change of Variable, new independent variable

Mathematica ✓
cpu = 0.0730179 (sec), leaf count = 29

$$\text{Solve}\left[x=\frac{c_1 e^{y(x)}+2y(x)^2+4y(x)+4}{y(x)^3},y(x)\right]$$

Maple ✓
cpu = 0.044 (sec), leaf count = 29

$$\left\{\_C1+\frac{\mathrm{e}^{y(x)}}{x\left(y\left(x\right)\right)^3-2\left(y\left(x\right)\right)^2-4y\left(x\right)-4}=0\right\}$$

Mathematica raw input

```
DSolve[y[x] + (2 + 3*x - x*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[x == (4 + E^y[x]*C[1] + 4*y[x] + 2*y[x]^2)/y[x]^3, y[x]]
```

Maple raw input

```
dsolve((2+3*x-x*y(x))*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
_C1+exp(y(x))/(x*y(x)^3-2*y(x)^2-4*y(x)-4) = 0
```

4.526 $x(y(x)+4)y'(x) = y(x)^2 + 2y(x) + 2x$

ODE

$$x(y(x)+4)y'(x) = y(x)^2 + 2y(x) + 2x$$

ODE Classification

[_rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation, special

Mathematica ✓
cpu = 0.0220779 (sec), leaf count = 96

$$\left\{\left\{y(x) \to \frac{1}{\frac{1}{x+4} - \frac{\left(\frac{x}{x+4}\right)^{3/2}}{x\sqrt{\frac{c_1(x+4)-4}{x+4}}}} - 4\right\}, \left\{y(x) \to \frac{1}{\frac{1}{x+4} + \frac{\left(\frac{x}{x+4}\right)^{3/2}}{x\sqrt{\frac{c_1(x+4)-4}{x+4}}}} - 4\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 74

$$\left\{(4+y(x))^{-1} - 1\sqrt{x}(4+x)^{-\frac{3}{2}} \frac{1}{\sqrt{\_C1 - 4\,(4+x)^{-1}}} - (4+x)^{-1} = 0, (4+y(x))^{-1} + 1\sqrt{x}(4+x)^{-\frac{3}{2}} \frac{1}{\sqrt{\_C1 - 4\,(4+x)}}\right.$$

Mathematica raw input

```
DSolve[x*(4 + y[x])*y'[x] == 2*x + 2*y[x] + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -4 + ((4 + x)^(-1) - (x/(4 + x))^(3/2)/(x*Sqrt[(-4 + (4 + x)*C[1])/(4
+ x)]))^(-1)}, {y[x] -> -4 + ((4 + x)^(-1) + (x/(4 + x))^(3/2)/(x*Sqrt[(-4 + (4
+ x)*C[1])/(4 + x)]))^(-1)}}
```

Maple raw input

```
dsolve(x*(4+y(x))*diff(y(x),x) = 2*x+2*y(x)+y(x)^2, y(x),'implicit')
```

Maple raw output

```
1/(4+y(x))+x^(1/2)/(4+x)^(3/2)/(_C1-4/(4+x))^(1/2)-1/(4+x) = 0, 1/(4+y(x))-x^(1/
2)/(4+x)^(3/2)/(_C1-4/(4+x))^(1/2)-1/(4+x) = 0
```

4.527 $x(a+y(x))y'(x)+bx+cy(x)=0$

ODE

$$x(a+y(x))y'(x)+bx+cy(x)=0$$

ODE Classification

[_rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Change of Variable, new independent variable

Mathematica ✗
cpu = 7.59793 (sec), leaf count = 0 , could not solve

```
DSolve[b*x + c*y[x] + x*(a + y[x])*Derivative[1][y][x] == 0, y[x], x]
```

Maple ✗
cpu = 2.755 (sec), leaf count = 0 , could not solve

```
dsolve(x*(a+y(x))*diff(y(x),x)+b*x+c*y(x) = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[b*x + c*y[x] + x*(a + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[b*x + c*y[x] + x*(a + y[x])*Derivative[1][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x*(a+y(x))*diff(y(x),x)+b*x+c*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
dsolve(x*(a+y(x))*diff(y(x),x)+b*x+c*y(x) = 0, y(x),'implicit')
```

4.528 $x(a+y(x))y'(x) = y(x)(A+Bx)$

ODE

$$x(a+y(x))y'(x) = y(x)(A+Bx)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0177155 (sec), leaf count = 31

$$\left\{\left\{y(x) \to aW\left(\frac{x^{\frac{A}{a}} e^{\frac{Bx+c_1}{a}}}{a}\right)\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 22

$$\{Bx + A\ln(x) - y(x) - a\ln(y(x)) + \_C1 = 0\}$$

Mathematica raw input

```
DSolve[x*(a + y[x])*y'[x] == (A + B*x)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> a*ProductLog[(E^((B*x + C[1])/a)*x^(A/a))/a]}}
```

Maple raw input

```
dsolve(x*(a+y(x))*diff(y(x),x) = y(x)*(B*x+A), y(x),'implicit')
```

Maple raw output

```
B*x+A*ln(x)-y(x)-a*ln(y(x))+_C1 = 0
```

4.529 $x(y(x)+x)y'(x)+y(x)^2=0$

ODE

$$x(y(x)+x)y'(x)+y(x)^2=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0367497 (sec), leaf count = 75

$$\left\{\left\{y(x)\to \frac{e^{2c_1}-\sqrt{e^{2c_1}\left(e^{2c_1}+x^2\right)}}{x}\right\},\left\{y(x)\to \frac{\sqrt{e^{2c_1}\left(e^{2c_1}+x^2\right)}+e^{2c_1}}{x}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 33

$$\left\{-\ln\left(\frac{y(x)}{x}\right)+\frac{1}{2}\ln\left(\frac{x+2\,y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x]^2 + x*(x + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(2*C[1]) - Sqrt[E^(2*C[1])*(E^(2*C[1]) + x^2)])/x}, {y[x] -> (E^(2*
C[1]) + Sqrt[E^(2*C[1])*(E^(2*C[1]) + x^2)])/x}}
```

Maple raw input

```
dsolve(x*(x+y(x))*diff(y(x),x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-ln(y(x)/x)+1/2*ln((x+2*y(x))/x)-ln(x)-_C1 = 0
```

4.530 $x(x-y(x))y'(x)+y(x)^2=0$

ODE

$$x(x-y(x))y'(x)+y(x)^2=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.014677 (sec), leaf count = 20

$$\left\{\left\{y(x)\to -xW\left(-\frac{e^{-c_1}}{x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 26

$$\left\{-\ln\left(\frac{y(x)}{x}\right)+\frac{y(x)}{x}-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x]^2 + x*(x - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x*ProductLog[-(1/(E^C[1]*x))])}}
```

Maple raw input

```
dsolve(x*(x-y(x))*diff(y(x),x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-ln(y(x)/x)+y(x)/x-ln(x)-_C1 = 0
```

4.531 $x(y(x)+x)y'(x) = x^2 + y(x)^2$

ODE

$$x(y(x)+x)y'(x) = x^2 + y(x)^2$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0218283 (sec), leaf count = 30

$$\left\{\left\{y(x) \to 2xW\left(\frac{e^{\frac{1}{2}(c_1-1)}}{2\sqrt{x}}\right)+x\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 31

$$\left\{-2\ln\left(\frac{y(x)-x}{x}\right)-\frac{y(x)}{x}-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(x + y[x])*y'[x] == x^2 + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x + 2*x*ProductLog[E^((-1 + C[1])/2)/(2*Sqrt[x])]}}
```

Maple raw input

```
dsolve(x*(x+y(x))*diff(y(x),x) = x^2+y(x)^2, y(x),'implicit')
```

Maple raw output

```
-2*ln((y(x)-x)/x)-y(x)/x-ln(x)-_C1 = 0
```

4.532 $2x^2 + x(x - y(x))y'(x) + 3xy(x) - y(x)^2 = 0$

ODE

$$2x^2 + x(x - y(x))y'(x) + 3xy(x) - y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.02603 (sec), leaf count = 54

$$\left\{\left\{y(x) \to x - \frac{\sqrt{e^{2c_1} + 2x^4}}{x}\right\}, \left\{y(x) \to \frac{\sqrt{e^{2c_1} + 2x^4}}{x} + x\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 33

$$\left\{-\frac{1}{4}\ln\left(\frac{-x^2 - 2\,xy(x) + (y(x))^2}{x^2}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[2*x^2 + 3*x*y[x] - y[x]^2 + x*(x - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x - Sqrt[E^(2*C[1]) + 2*x^4]/x}, {y[x] -> x + Sqrt[E^(2*C[1]) + 2*x^4]
/x}}
```

Maple raw input

```
dsolve(x*(x-y(x))*diff(y(x),x)+2*x^2+3*x*y(x)-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-1/4*ln((-x^2-2*x*y(x)+y(x)^2)/x^2)-ln(x)-_C1 = 0
```

4.533 $x\sqrt{x^2-y(x)^2}+x(y(x)+x)y'(x)-y(x)(y(x)+x)=0$

ODE

$$x\sqrt{x^2-y(x)^2}+x(y(x)+x)y'(x)-y(x)(y(x)+x)=0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.214498 (sec), leaf count = 74

$$\text{Solve}\left[\frac{y(x)\sqrt{\frac{y(x)-x}{y(x)+x}}}{x}+\sqrt{\frac{y(x)-x}{y(x)+x}}+2\sinh^{-1}\left(\frac{\sqrt{\frac{y(x)}{x}-1}}{\sqrt{2}}\right)+i\log(x)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.041 (sec), leaf count = 42

$$\left\{\arctan\left(y(x)\frac{1}{\sqrt{x^2-(y(x))^2}}\right)-\frac{1}{x}\sqrt{x^2-(y(x))^2}+\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[-(y[x]*(x + y[x])) + x*Sqrt[x^2 - y[x]^2] + x*(x + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[2*ArcSinh[Sqrt[-1 + y[x]/x]/Sqrt[2]] + I*Log[x] + Sqrt[(-x + y[x])/(x + y[
x])] + (y[x]*Sqrt[(-x + y[x])/(x + y[x])])/x == C[1], y[x]]
```

Maple raw input

```
dsolve(x*(x+y(x))*diff(y(x),x)-(x+y(x))*y(x)+x*(x^2-y(x)^2)^(1/2) = 0, y(x),'implicit')
```

Maple raw output

```
arctan(1/(x^2-y(x)^2)^(1/2)*y(x))-1/x*(x^2-y(x)^2)^(1/2)+ln(x)-_C1 = 0
```

4.534 $(a + x(y(x) + x))y'(x) = by(x)(y(x) + x)$

ODE

$$(a + x(y(x) + x))y'(x) = by(x)(y(x) + x)$$

ODE Classification

```
[_rational, [_Abel, `2nd type`, `class B`]]
```

Book solution method
Homogeneous equation, special

Mathematica ✗
cpu = 74.1937 (sec), leaf count = 0 , could not solve

```
DSolve[(a + x*(x + y[x]))*Derivative[1][y][x] == b*y[x]*(x + y[x]), y[x], x]
```

Maple ✗
cpu = 5.767 (sec), leaf count = 0 , could not solve

```
dsolve((a+x*(x+y(x)))*diff(y(x),x) = b*(x+y(x))*y(x), y(x),'implicit')
```

Mathematica raw input

```
DSolve[(a + x*(x + y[x]))*y'[x] == b*y[x]*(x + y[x]),y[x],x]
```

Mathematica raw output

```
DSolve[(a + x*(x + y[x]))*Derivative[1][y][x] == b*y[x]*(x + y[x]), y[x], x]
```

Maple raw input

```
dsolve((a+x*(x+y(x)))*diff(y(x),x) = b*(x+y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
dsolve((a+x*(x+y(x)))*diff(y(x),x) = b*(x+y(x))*y(x), y(x),'implicit')
```

4.535 $x(y(x)+2x)y'(x) = x^2+xy(x)-y(x)^2$

ODE

$$x(y(x)+2x)y'(x) = x^2+xy(x)-y(x)^2$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.046785 (sec), leaf count = 431

$$\left\{\left\{y(x)\to \text{Root}\left[32\#1^5-80\#1^4x+80\#1^3x^2+\#1^2\left(\frac{e^{6c_1}}{x^3}-40x^3\right)+\#1\left(\frac{2e^{6c_1}}{x^2}+10x^4\right)+\frac{e^{6c_1}}{x}-x^5\&,1\right]\right\},\left\{y(x)\to \text{R}\right.\right.$$

Maple ✓
cpu = 0.022 (sec), leaf count = 37

$$\left\{-\frac{5}{6}\ln\left(\frac{-x+2\,y(x)}{x}\right)+\frac{1}{3}\ln\left(\frac{x+y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(2*x + y[x])*y'[x] == x^2 + x*y[x] - y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[E^(6*C[1])/x - x^5 + ((2*E^(6*C[1]))/x^2 + 10*x^4)*#1 + (E^(6*C[1
])/x^3 - 40*x^3)*#1^2 + 80*x^2*#1^3 - 80*x*#1^4 + 32*#1^5 & , 1]}, {y[x] -> Root
[E^(6*C[1])/x - x^5 + ((2*E^(6*C[1]))/x^2 + 10*x^4)*#1 + (E^(6*C[1])/x^3 - 40*x^
3)*#1^2 + 80*x^2*#1^3 - 80*x*#1^4 + 32*#1^5 & , 2]}, {y[x] -> Root[E^(6*C[1])/x
- x^5 + ((2*E^(6*C[1]))/x^2 + 10*x^4)*#1 + (E^(6*C[1])/x^3 - 40*x^3)*#1^2 + 80*x
^2*#1^3 - 80*x*#1^4 + 32*#1^5 & , 3]}, {y[x] -> Root[E^(6*C[1])/x - x^5 + ((2*E^
(6*C[1]))/x^2 + 10*x^4)*#1 + (E^(6*C[1])/x^3 - 40*x^3)*#1^2 + 80*x^2*#1^3 - 80*x
*#1^4 + 32*#1^5 & , 4]}, {y[x] -> Root[E^(6*C[1])/x - x^5 + ((2*E^(6*C[1]))/x^2
+ 10*x^4)*#1 + (E^(6*C[1])/x^3 - 40*x^3)*#1^2 + 80*x^2*#1^3 - 80*x*#1^4 + 32*#1^
5 & , 5]}}
```

Maple raw input

```
dsolve(x*(2*x+y(x))*diff(y(x),x) = x^2+x*y(x)-y(x)^2, y(x),'implicit')
```

Maple raw output

```
-5/6*ln((-x+2*y(x))/x)+1/3*ln((x+y(x))/x)-ln(x)-_C1 = 0
```

4.536 $4x^2 + x(4x - y(x))y'(x) - 6xy(x) - y(x)^2 = 0$

ODE

$$4x^2 + x(4x - y(x))y'(x) - 6xy(x) - y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.037646 (sec), leaf count = 90

$$\left\{\left\{y(x) \to -\frac{e^{\frac{c_1}{2}}\sqrt{e^{c_1} + 12x^2} + e^{c_1} + 4x^2}{2x}\right\}, \left\{y(x) \to -\frac{-e^{\frac{c_1}{2}}\sqrt{e^{c_1} + 12x^2} + e^{c_1} + 4x^2}{2x}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 37

$$\left\{-\ln\left(\frac{2x + y(x)}{x}\right) + \frac{1}{2}\ln\left(\frac{y(x) - x}{x}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[4*x^2 - 6*x*y[x] - y[x]^2 + x*(4*x - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(E^C[1] + 4*x^2 + E^(C[1]/2)*Sqrt[E^C[1] + 12*x^2])/(2*x)}, {y[x] ->
-(E^C[1] + 4*x^2 - E^(C[1]/2)*Sqrt[E^C[1] + 12*x^2])/(2*x)}}
```

Maple raw input

```
dsolve(x*(4*x-y(x))*diff(y(x),x)+4*x^2-6*x*y(x)-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-ln((2*x+y(x))/x)+1/2*ln((y(x)-x)/x)-ln(x)-_C1 = 0
```

4.537 $x(x^3+y(x))\,y'(x)=(x^3-y(x))\,y(x)$

ODE

$$x(x^3+y(x))\,y'(x)=(x^3-y(x))\,y(x)$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0108369 (sec), leaf count = 68

$$\left\{\left\{y(x)\to \frac{x^4}{\frac{\sqrt{c_1 x^4+1}}{\sqrt{\frac{1}{x^2}}}-x}\right\},\left\{y(x)\to -\frac{x^4}{\frac{\sqrt{c_1 x^4+1}}{\sqrt{\frac{1}{x^2}}}+x}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 33

$$\left\{\ln(x)-\_C1+\frac{1}{2}\ln\left(\frac{y(x)}{x^3}\right)-\frac{1}{4}\ln\left(\frac{x^3+2\,y(x)}{x^3}\right)=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^3 + y[x])*y'[x] == (x^3 - y[x])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^4/(-x + Sqrt[1 + x^4*C[1]]/Sqrt[x^(-2)])}, {y[x] -> -(x^4/(x + Sqrt[
1 + x^4*C[1]]/Sqrt[x^(-2)]))}}
```

Maple raw input

```
dsolve(x*(x^3+y(x))*diff(y(x),x) = (x^3-y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+1/2*ln(y(x)/x^3)-1/4*ln((x^3+2*y(x))/x^3) = 0
```

4.538 $x(2x^3+y(x))\,y'(x)=(2x^3-y(x))\,y(x)$

ODE

$$x(2x^3+y(x))\,y'(x)=(2x^3-y(x))\,y(x)$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0111322 (sec), leaf count = 71

$$\left\{\left\{y(x)\to \frac{2x^4}{\frac{\sqrt{4c_1x^4+1}}{\sqrt{\frac{1}{x^2}}}-x}\right\},\left\{y(x)\to -\frac{2x^4}{\frac{\sqrt{4c_1x^4+1}}{\sqrt{\frac{1}{x^2}}}+x}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 31

$$\left\{\ln(x)-\_C1-\frac{1}{4}\ln\left(\frac{x^3+y(x)}{x^3}\right)+\frac{1}{2}\ln\left(\frac{y(x)}{x^3}\right)=0\right\}$$

Mathematica raw input

```
DSolve[x*(2*x^3 + y[x])*y'[x] == (2*x^3 - y[x])*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x^4)/(-x + Sqrt[1 + 4*x^4*C[1]]/Sqrt[x^(-2)])}, {y[x] -> (-2*x^4)/(
x + Sqrt[1 + 4*x^4*C[1]]/Sqrt[x^(-2)])}}
```

Maple raw input

```
dsolve(x*(2*x^3+y(x))*diff(y(x),x) = (2*x^3-y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-1/4*ln((x^3+y(x))/x^3)+1/2*ln(y(x)/x^3) = 0
```

4.539 $x(2x^3+y(x))\,y'(x)=6y(x)^2$

ODE

$$x(2x^3+y(x))\,y'(x)=6y(x)^2$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Change of Variable, new independent variable

Mathematica ✓
cpu = 0.0106324 (sec), leaf count = 73

$$\left\{\left\{y(x)\to 2x^3\left(\frac{2}{1-\frac{4x^{3/2}}{\sqrt{c_1+16x^3}}}-1\right)\right\},\left\{y(x)\to 2x^3\left(\frac{2}{\frac{4x^{3/2}}{\sqrt{c_1+16x^3}}+1}-1\right)\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 33

$$\left\{\ln(x)-\_C1-\frac{2}{3}\ln\left(\frac{-2\,x^3+y(x)}{x^3}\right)+\frac{1}{3}\ln\left(\frac{y(x)}{x^3}\right)=0\right\}$$

Mathematica raw input

```
DSolve[x*(2*x^3 + y[x])*y'[x] == 6*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*x^3*(-1 + 2/(1 - (4*x^(3/2))/Sqrt[16*x^3 + C[1]]))}, {y[x] -> 2*x^3*
(-1 + 2/(1 + (4*x^(3/2))/Sqrt[16*x^3 + C[1]]))}}
```

Maple raw input

```
dsolve(x*(2*x^3+y(x))*diff(y(x),x) = 6*y(x)^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-2/3*ln((-2*x^3+y(x))/x^3)+1/3*ln(y(x)/x^3) = 0
```

4.540 $(1-x)y(x)y'(x)+x(1-y(x))=0$

ODE

$$(1-x)y(x)y'(x)+x(1-y(x))=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0207448 (sec), leaf count = 23

$$\left\{\left\{y(x)\to W\left(\frac{e^{c_1-x-1}}{x-1}\right)+1\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 17

$$\{x+\ln(-1+x)+y(x)+\ln(y(x)-1)+\_C1=0\}$$

Mathematica raw input

```
DSolve[x*(1 - y[x]) + (1 - x)*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1 + ProductLog[E^(-1 - x + C[1])/(-1 + x)]}}
```

Maple raw input

```
dsolve(y(x)*(1-x)*diff(y(x),x)+x*(1-y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
x+ln(-1+x)+y(x)+ln(y(x)-1)+_C1 = 0
```

4.541 $(a+x)(b+x)y'(x) = xy(x)$

ODE

$$(a+x)(b+x)y'(x) = xy(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0162494 (sec), leaf count = 32

$$\left\{\left\{y(x) \to c_1 e^{\frac{a\log(a+x)-b\log(b+x)}{a-b}}\right\}\right\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 33

$$\left\{y(x) = \_C1\,(a+x)^{\frac{a}{a-b}}\,(b+x)^{-\frac{b}{a-b}}\right\}$$

Mathematica raw input

```
DSolve[(a + x)*(b + x)*y'[x] == x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^((a*Log[a + x] - b*Log[b + x])/(a - b))*C[1]}}
```

Maple raw input

```
dsolve((a+x)*(b+x)*diff(y(x),x) = x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(a+x)^(a/(a-b))*(b+x)^(-b/(a-b))
```

4.542 $-2x^3+2xy(x)y'(x)-y(x)^2+1=0$

ODE

$$-2x^3+2xy(x)y'(x)-y(x)^2+1=0$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00970668 (sec), leaf count = 37

$$\left\{\left\{y(x)\to -\sqrt{c_1x+x^3+1}\right\},\left\{y(x)\to \sqrt{c_1x+x^3+1}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 18

$$\left\{-x^3-\_C1\,x+(y(x))^2-1=0\right\}$$

Mathematica raw input

```
DSolve[1 - 2*x^3 - y[x]^2 + 2*x*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[1 + x^3 + x*C[1]]}, {y[x] -> Sqrt[1 + x^3 + x*C[1]]}}
```

Maple raw input

```
dsolve(2*x*y(x)*diff(y(x),x)+1-2*x^3-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-x^3-_C1*x+y(x)^2-1 = 0
```

4.543 $a + 2xy(x)y'(x) + y(x)^2 = 0$

ODE

$$a + 2xy(x)y'(x) + y(x)^2 = 0$$

ODE Classification

[_separable]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0124835 (sec), leaf count = 52

$$\left\{\left\{y(x) \to -\frac{\sqrt{e^{2c_1} - ax}}{\sqrt{x}}\right\}, \left\{y(x) \to \frac{\sqrt{e^{2c_1} - ax}}{\sqrt{x}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 15

$$\left\{a - \frac{\_C1}{x} + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[a + y[x]^2 + 2*x*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[E^(2*C[1]) - a*x]/Sqrt[x])}, {y[x] -> Sqrt[E^(2*C[1]) - a*x]/Sq
rt[x]}}
```

Maple raw input

```
dsolve(2*x*y(x)*diff(y(x),x)+a+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
a-1/x*_C1+y(x)^2 = 0
```

4.544 $2xy(x)y'(x) = ax + y(x)^2$

ODE

$$2xy(x)y'(x) = ax + y(x)^2$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00788918 (sec), leaf count = 44

$$\left\{\left\{y(x) \to -\sqrt{x}\sqrt{a\log(x) + c_1}\right\}, \left\{y(x) \to \sqrt{x}\sqrt{a\log(x) + c_1}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 18

$$\left\{-\ln(x)\,ax + (y(x))^2 - \_C1\,x = 0\right\}$$

Mathematica raw input

```
DSolve[2*x*y[x]*y'[x] == a*x + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[x]*Sqrt[C[1] + a*Log[x]])}, {y[x] -> Sqrt[x]*Sqrt[C[1] + a*Log[
x]]}}
```

Maple raw input

```
dsolve(2*x*y(x)*diff(y(x),x) = a*x+y(x)^2, y(x),'implicit')
```

Maple raw output

```
-ln(x)*a*x+y(x)^2-_C1*x = 0
```

4.545 $x^2 + 2xy(x)y'(x) + y(x)^2 = 0$

ODE

$$x^2 + 2xy(x)y'(x) + y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00833812 (sec), leaf count = 60

$$\left\{\left\{y(x) \to -\frac{\sqrt{3c_1 - x^3}}{\sqrt{3}\sqrt{x}}\right\}, \left\{y(x) \to \frac{\sqrt{3c_1 - x^3}}{\sqrt{3}\sqrt{x}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 19

$$\left\{(y(x))^2 + \frac{x^2}{3} - \frac{\_C1}{x} = 0\right\}$$

Mathematica raw input

```
DSolve[x^2 + y[x]^2 + 2*x*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-x^3 + 3*C[1]]/(Sqrt[3]*Sqrt[x]))}, {y[x] -> Sqrt[-x^3 + 3*C[1]
]/(Sqrt[3]*Sqrt[x])}}
```

Maple raw input

```
dsolve(2*x*y(x)*diff(y(x),x)+x^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+1/3*x^2-1/x*_C1 = 0
```

4.546 $2xy(x)y'(x) = x^2 + y(x)^2$

ODE

$$2xy(x)y'(x) = x^2 + y(x)^2$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00717018 (sec), leaf count = 38

$$\left\{\left\{y(x) \to -\sqrt{x}\sqrt{c_1 + x}\right\}, \left\{y(x) \to \sqrt{x}\sqrt{c_1 + x}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 14

$$\left\{(y(x))^2 - (x + \_C1)\, x = 0\right\}$$

Mathematica raw input

```
DSolve[2*x*y[x]*y'[x] == x^2 + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[x]*Sqrt[x + C[1]])}, {y[x] -> Sqrt[x]*Sqrt[x + C[1]]}}
```

Maple raw input

```
dsolve(2*x*y(x)*diff(y(x),x) = x^2+y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x)^2-(x+_C1)*x = 0
```

4.547 $2xy(x)y'(x) = 4(2x+1)x^2 + y(x)^2$

ODE

$$2xy(x)y'(x) = 4(2x+1)x^2 + y(x)^2$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00829588 (sec), leaf count = 52

$$\left\{\left\{y(x) \to -\sqrt{x}\sqrt{c_1 + 4x^2 + 4x}\right\}, \left\{y(x) \to \sqrt{x}\sqrt{c_1 + 4x^2 + 4x}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 22

$$\left\{-4\,x^3 + (y(x))^2 - \_C1\,x - 4\,x^2 = 0\right\}$$

Mathematica raw input

```
DSolve[2*x*y[x]*y'[x] == 4*x^2*(1 + 2*x) + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[x]*Sqrt[4*x + 4*x^2 + C[1]])}, {y[x] -> Sqrt[x]*Sqrt[4*x + 4*x^
2 + C[1]]}}
```

Maple raw input

```
dsolve(2*x*y(x)*diff(y(x),x) = 4*x^2*(1+2*x)+y(x)^2, y(x),'implicit')
```

Maple raw output

```
-4*x^3+y(x)^2-_C1*x-4*x^2 = 0
```

4.548 $x^2(ax^3+1)+2xy(x)y'(x)=6y(x)^2$

ODE

$$x^2(ax^3+1)+2xy(x)y'(x)=6y(x)^2$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0127939 (sec), leaf count = 59

$$\left\{\left\{y(x)\to -\frac{1}{2}\sqrt{4ax^5+4c_1x^6+x^2}\right\},\left\{y(x)\to \frac{1}{2}\sqrt{4ax^5+4c_1x^6+x^2}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 25

$$\left\{(y(x))^2-\frac{x^2}{4}-ax^5-x^6\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x^2*(1 + a*x^3) + 2*x*y[x]*y'[x] == 6*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[x^2 + 4*a*x^5 + 4*x^6*C[1]]/2}, {y[x] -> Sqrt[x^2 + 4*a*x^5 + 4*
x^6*C[1]]/2}}
```

Maple raw input

```
dsolve(2*x*y(x)*diff(y(x),x)+x^2*(a*x^3+1) = 6*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x)^2-1/4*x^2-a*x^5-x^6*_C1 = 0
```

4.549 $3x^2 + (2xy(x) - x + 3)y'(x) + y(x)^2 - y(x) = 0$

ODE

$$3x^2 + (2xy(x) - x + 3)y'(x) + y(x)^2 - y(x) = 0$$

ODE Classification

[_exact, _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0111792 (sec), leaf count = 75

$$\left\{\left\{y(x) \to -\frac{\sqrt{4c_1 x - 4x^4 + x^2 - 6x + 9} - x + 3}{2x}\right\}, \left\{y(x) \to \frac{\sqrt{(4c_1 - 6)\,x - 4x^4 + x^2 + 9} + x - 3}{2x}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 22

$$\left\{x(y(x))^2 + (3 - x)\,y(x) + x^3 + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[3*x^2 - y[x] + y[x]^2 + (3 - x + 2*x*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(3 - x + Sqrt[9 - 6*x + x^2 - 4*x^4 + 4*x*C[1]])/(2*x)}, {y[x] -> (-3
 + x + Sqrt[9 + x^2 - 4*x^4 + x*(-6 + 4*C[1])])/(2*x)}}
```

Maple raw input

```
dsolve((3-x+2*x*y(x))*diff(y(x),x)+3*x^2-y(x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x*y(x)^2+(3-x)*y(x)+x^3+_C1 = 0
```

4.550 $x(x-2y(x))y'(x)+y(x)^2=0$

ODE

$$x(x-2y(x))y'(x)+y(x)^2=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0221595 (sec), leaf count = 51

$$\left\{\left\{y(x)\to\frac{1}{2}\left(x-\sqrt{x\left(x-4e^{c_1}\right)}\right)\right\},\left\{y(x)\to\frac{1}{2}\left(\sqrt{x\left(x-4e^{c_1}\right)}+x\right)\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 23

$$\left\{-\_C1+\ln\left(-\frac{(x-y(x))\,y(x)}{x^2}\right)+\ln(x)=0\right\}$$

Mathematica raw input

```
DSolve[y[x]^2 + x*(x - 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - Sqrt[x*(-4*E^C[1] + x)])/2}, {y[x] -> (x + Sqrt[x*(-4*E^C[1] + x)
])/2}}
```

Maple raw input

```
dsolve(x*(x-2*y(x))*diff(y(x),x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-_C1+ln(-y(x)*(x-y(x))/x^2)+ln(x) = 0
```

4.551 $x(2y(x)+x)y'(x)+(2x-y(x))y(x)=0$

ODE

$$x(2y(x)+x)y'(x)+(2x-y(x))y(x)=0$$

ODE Classification

```
[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]
```

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0315004 (sec), leaf count = 385

$$\{\{y(x)\to \text{Root}[\#1^6+15\#1^5x+90\#1^4x^2+270\#1^3x^3+405\#1^2x^4+243\#1x^5-e^{3c_1}x^3\&,1]\},\{y(x)\to \text{Root}[\#1^6+15\#$$

Maple ✓
cpu = 0.021 (sec), leaf count = 33

$$\left\{-\frac{5}{3}\ln\left(\frac{3\,x+y(x)}{x}\right)-\frac{1}{3}\ln\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(2*x - y[x])*y[x] + x*(x + 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[-(E^(3*C[1])*x^3) + 243*x^5*#1 + 405*x^4*#1^2 + 270*x^3*#1^3 + 90
*x^2*#1^4 + 15*x*#1^5 + #1^6 & , 1]}, {y[x] -> Root[-(E^(3*C[1])*x^3) + 243*x^5*
#1 + 405*x^4*#1^2 + 270*x^3*#1^3 + 90*x^2*#1^4 + 15*x*#1^5 + #1^6 & , 2]}, {y[x]
 -> Root[-(E^(3*C[1])*x^3) + 243*x^5*#1 + 405*x^4*#1^2 + 270*x^3*#1^3 + 90*x^2*#
1^4 + 15*x*#1^5 + #1^6 & , 3]}, {y[x] -> Root[-(E^(3*C[1])*x^3) + 243*x^5*#1 + 4
05*x^4*#1^2 + 270*x^3*#1^3 + 90*x^2*#1^4 + 15*x*#1^5 + #1^6 & , 4]}, {y[x] -> Ro
ot[-(E^(3*C[1])*x^3) + 243*x^5*#1 + 405*x^4*#1^2 + 270*x^3*#1^3 + 90*x^2*#1^4 +
15*x*#1^5 + #1^6 & , 5]}, {y[x] -> Root[-(E^(3*C[1])*x^3) + 243*x^5*#1 + 405*x^4
*#1^2 + 270*x^3*#1^3 + 90*x^2*#1^4 + 15*x*#1^5 + #1^6 & , 6]}}
```

Maple raw input

```
dsolve(x*(x+2*y(x))*diff(y(x),x)+(2*x-y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-5/3*ln((3*x+y(x))/x)-1/3*ln(y(x)/x)-ln(x)-_C1 = 0
```

4.552 $x(x-2y(x))y'(x)+(2x-y(x))y(x)=0$

ODE

$$x(x-2y(x))y'(x)+(2x-y(x))y(x)=0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0228071 (sec), leaf count = 62

$$\left\{\left\{y(x)\to \frac{1}{2}\left(x-\frac{\sqrt{x^3-4e^{c_1}}}{\sqrt{x}}\right)\right\},\left\{y(x)\to \frac{1}{2}\left(\frac{\sqrt{x^3-4e^{c_1}}}{\sqrt{x}}+x\right)\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 27

$$\left\{-\frac{1}{3}\ln\left(-\frac{(x-y(x))\,y(x)}{x^2}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(2*x - y[x])*y[x] + x*(x - 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - Sqrt[-4*E^C[1] + x^3]/Sqrt[x])/2}, {y[x] -> (x + Sqrt[-4*E^C[1] +
  x^3]/Sqrt[x])/2}}
```

Maple raw input

```
dsolve(x*(x-2*y(x))*diff(y(x),x)+(2*x-y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/3*ln(-y(x)*(x-y(x))/x^2)-ln(x)-_C1 = 0
```

4.553 $x(-2y(x)+x+1)y'(x)+y(x)(y(x)-2x+1)=0$

ODE

$$x(-2y(x)+x+1)y'(x)+y(x)(y(x)-2x+1)=0$$

ODE Classification

[_rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 15.0879 (sec), leaf count = 457

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{2}x}{\sqrt[3]{27c_1^2x^2+\sqrt{\left(27c_1^2x^2+27c_1^2x\right)^2-108c_1^3x^3}+27c_1^2x}}-\frac{\sqrt[3]{27c_1^2x^2+\sqrt{\left(27c_1^2x^2+27c_1^2x\right)^2-108c_1^3x^3}+27c_1^2x}}{3\sqrt[3]{2}c_1}\right.\right.$$

Maple ✓
cpu = 0.054 (sec), leaf count = 74

$$\left\{\frac{7}{9}\ln\left(\frac{-189-189x}{4+4x-8y(x)}\right)-\frac{7}{6}\ln\left(-126\frac{1+x+y(x)}{1+x-2y(x)}\right)+\frac{7}{18}\ln\left(-378\frac{y(x)}{5+5x-10y(x)}\right)-\frac{7\ln(1+x)}{9}+\frac{7\ln(x)}{18}-\right.$$

Mathematica raw input

```
DSolve[y[x]*(1 - 2*x + y[x]) + x*(1 + x - 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 - x - (2^(1/3)*x)/(27*x*C[1]^2 + 27*x^2*C[1]^2 + Sqrt[-108*x^3*C[1]
^3 + (27*x*C[1]^2 + 27*x^2*C[1]^2)^2])^(1/3) - (27*x*C[1]^2 + 27*x^2*C[1]^2 + Sq
rt[-108*x^3*C[1]^3 + (27*x*C[1]^2 + 27*x^2*C[1]^2)^2])^(1/3)/(3*2^(1/3)*C[1])},
{y[x] -> -1 - x + ((1 + I*Sqrt[3])*x)/(2^(2/3)*(27*x*C[1]^2 + 27*x^2*C[1]^2 + Sq
rt[-108*x^3*C[1]^3 + (27*x*C[1]^2 + 27*x^2*C[1]^2)^2])^(1/3)) + ((1 - I*Sqrt[3])
*(27*x*C[1]^2 + 27*x^2*C[1]^2 + Sqrt[-108*x^3*C[1]^3 + (27*x*C[1]^2 + 27*x^2*C[1
]^2)^2])^(1/3))/(6*2^(1/3)*C[1])}, {y[x] -> -1 - x + ((1 - I*Sqrt[3])*x)/(2^(2/3
)*(27*x*C[1]^2 + 27*x^2*C[1]^2 + Sqrt[-108*x^3*C[1]^3 + (27*x*C[1]^2 + 27*x^2*C[
1]^2)^2])^(1/3)) + ((1 + I*Sqrt[3])*(27*x*C[1]^2 + 27*x^2*C[1]^2 + Sqrt[-108*x^3
*C[1]^3 + (27*x*C[1]^2 + 27*x^2*C[1]^2)^2])^(1/3))/(6*2^(1/3)*C[1])}}
```

Maple raw input

```
dsolve(x*(1+x-2*y(x))*diff(y(x),x)+(1-2*x+y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
7/9*ln((-189-189*x)/(4+4*x-8*y(x)))-7/6*ln(-126*(1+x+y(x))/(1+x-2*y(x)))+7/18*ln
(-378*y(x)/(5+5*x-10*y(x)))-7/9*ln(1+x)+7/18*ln(x)-_C1 = 0
```

4.554 $x(-2y(x)-x+1)y'(x)+y(x)(y(x)+2x+1)=0$

ODE

$$x(-2y(x)-x+1)y'(x)+y(x)(y(x)+2x+1)=0$$

ODE Classification

```
[_rational, [_Abel, `2nd type`, `class B`]]
```

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 14.9599 (sec), leaf count = 451

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{2}x}{\sqrt[3]{-27c_1^2x^2+\sqrt{108c_1^3x^3+\left(27c_1^2x-27c_1^2x^2\right)^2}+27c_1^2x}}+\frac{\sqrt[3]{-27c_1^2x^2+\sqrt{108c_1^3x^3+\left(27c_1^2x-27c_1^2x^2\right)^2}+27c}}{3\sqrt[3]{2}c_1}\right.\right.$$

Maple ✓
cpu = 0.032 (sec), leaf count = 76

$$\left\{\frac{7}{9}\ln\left(\frac{189-189\,x}{-4+4\,x+8\,y\left(x\right)}\right)-\frac{7}{6}\ln\left(-126\,\frac{x-y(x)-1}{-1+x+2\,y\left(x\right)}\right)+\frac{7}{18}\ln\left(378\,\frac{y(x)}{-5+5\,x+10\,y\left(x\right)}\right)-\frac{7\ln\left(-1+x\right)}{9}+\frac{7\ln\left(x\right.}{18}\right.$$

Mathematica raw input

```
DSolve[y[x]*(1 + 2*x + y[x]) + x*(1 - x - 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 + x - (2^(1/3)*x)/(27*x*C[1]^2 - 27*x^2*C[1]^2 + Sqrt[108*x^3*C[1]^
3 + (27*x*C[1]^2 - 27*x^2*C[1]^2)^2])^(1/3) + (27*x*C[1]^2 - 27*x^2*C[1]^2 + Sqr
t[108*x^3*C[1]^3 + (27*x*C[1]^2 - 27*x^2*C[1]^2)^2])^(1/3)/(3*2^(1/3)*C[1])}, {y
[x] -> -1 + x + ((1 + I*Sqrt[3])*x)/(2^(2/3)*(27*x*C[1]^2 - 27*x^2*C[1]^2 + Sqrt
[108*x^3*C[1]^3 + (27*x*C[1]^2 - 27*x^2*C[1]^2)^2])^(1/3)) - ((1 - I*Sqrt[3])*(2
7*x*C[1]^2 - 27*x^2*C[1]^2 + Sqrt[108*x^3*C[1]^3 + (27*x*C[1]^2 - 27*x^2*C[1]^2)
^2])^(1/3))/(6*2^(1/3)*C[1])}, {y[x] -> -1 + x + ((1 - I*Sqrt[3])*x)/(2^(2/3)*(2
7*x*C[1]^2 - 27*x^2*C[1]^2 + Sqrt[108*x^3*C[1]^3 + (27*x*C[1]^2 - 27*x^2*C[1]^2)
^2])^(1/3)) - ((1 + I*Sqrt[3])*(27*x*C[1]^2 - 27*x^2*C[1]^2 + Sqrt[108*x^3*C[1]^
3 + (27*x*C[1]^2 - 27*x^2*C[1]^2)^2])^(1/3))/(6*2^(1/3)*C[1])}}
```

Maple raw input

```
dsolve(x*(1-x-2*y(x))*diff(y(x),x)+(1+2*x+y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
7/9*ln((189-189*x)/(-4+4*x+8*y(x)))-7/6*ln(-126*(x-y(x)-1)/(-1+x+2*y(x)))+7/18*l
n(378*y(x)/(-5+5*x+10*y(x)))-7/9*ln(-1+x)+7/18*ln(x)-_C1 = 0
```

4.555 $2x(2x^2+y(x))\,y'(x)+y(x)\,(12x^2+y(x))=0$

ODE

$$2x(2x^2+y(x))\,y'(x)+y(x)\,(12x^2+y(x))=0$$

ODE Classification

[[_homogeneous, `class G`], _exact, _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0102903 (sec), leaf count = 58

$$\left\{\left\{y(x)\to -\frac{\sqrt{x\,(c_1+4x^5)}+2x^3}{x}\right\},\left\{y(x)\to \frac{\sqrt{x\,(c_1+4x^5)}-2x^3}{x}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 28

$$\left\{\ln(x)-\_C1+\frac{1}{5}\ln\left(\frac{4x^2y(x)+(y(x))^2}{x^4}\right)=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(12*x^2 + y[x]) + 2*x*(2*x^2 + y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((2*x^3 + Sqrt[x*(4*x^5 + C[1])])/x)}, {y[x] -> (-2*x^3 + Sqrt[x*(4*x
^5 + C[1])])/x}}
```

Maple raw input

```
dsolve(2*x*(2*x^2+y(x))*diff(y(x),x)+(12*x^2+y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+1/5*ln((4*x^2*y(x)+y(x)^2)/x^4) = 0
```

4.556 $-3x^2+2(x+1)y(x)y'(x)+y(x)^2+2x=0$

ODE

$$-3x^2+2(x+1)y(x)y'(x)+y(x)^2+2x=0$$

ODE Classification

[_exact, _rational, _Bernoulli]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0136598 (sec), leaf count = 56

$$\left\{\left\{y(x)\to -\frac{\sqrt{c_1+x^3-x^2}}{\sqrt{x+1}}\right\},\left\{y(x)\to \frac{\sqrt{c_1+x^3-x^2}}{\sqrt{x+1}}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 26

$$\left\{(y(x))^2+\frac{-x^3+x^2-\_C1}{1+x}=0\right\}$$

Mathematica raw input

```
DSolve[2*x - 3*x^2 + y[x]^2 + 2*(1 + x)*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-x^2 + x^3 + C[1]]/Sqrt[1 + x])}, {y[x] -> Sqrt[-x^2 + x^3 + C[
1]]/Sqrt[1 + x]}}
```

Maple raw input

```
dsolve(2*(1+x)*y(x)*diff(y(x),x)+2*x-3*x^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+(-x^3+x^2-_C1)/(1+x) = 0
```

4.557 $x(3y(x)+2x)y'(x)=y(x)^2$

ODE

$$x(3y(x)+2x)y'(x)=y(x)^2$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0881313 (sec), leaf count = 413

$$\left\{\left\{y(x)\to\frac{1}{3}\left(\frac{x^2}{\sqrt[3]{\frac{3}{2}\sqrt{3}\sqrt{e^{c_1}x^2\left(27e^{c_1}-4x^2\right)}+\frac{27e^{c_1}x}{2}-x^3}}+\sqrt[3]{\frac{3}{2}\sqrt{3}\sqrt{e^{c_1}x^2\left(27e^{c_1}-4x^2\right)}+\frac{27e^{c_1}x}{2}-x^3}-x\right)\right\},\left\{y(x)\right.\right.$$

Maple ✓
cpu = 0.019 (sec), leaf count = 31

$$\left\{-\frac{1}{2}\ln\left(\frac{x+y(x)}{x}\right)-\ln\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(2*x + 3*y[x])*y'[x] == y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-x + x^2/((27*E^C[1]*x)/2 - x^3 + (3*Sqrt[3]*Sqrt[E^C[1]*x^2*(27*E^C[
1] - 4*x^2)])/2)^(1/3) + ((27*E^C[1]*x)/2 - x^3 + (3*Sqrt[3]*Sqrt[E^C[1]*x^2*(27
*E^C[1] - 4*x^2)])/2)^(1/3))/3}, {y[x] -> (-4*x - (2*(1 + I*Sqrt[3])*x^2)/((27*E
^C[1]*x)/2 - x^3 + (3*Sqrt[3]*Sqrt[E^C[1]*x^2*(27*E^C[1] - 4*x^2)])/2)^(1/3) + I
*2^(2/3)*(I + Sqrt[3])*(27*E^C[1]*x - 2*x^3 + 3*Sqrt[3]*Sqrt[E^C[1]*x^2*(27*E^C[
1] - 4*x^2)])^(1/3))/12}, {y[x] -> (-4*x + ((2*I)*(I + Sqrt[3])*x^2)/((27*E^C[1]
*x)/2 - x^3 + (3*Sqrt[3]*Sqrt[E^C[1]*x^2*(27*E^C[1] - 4*x^2)])/2)^(1/3) - 2^(2/3
)*(1 + I*Sqrt[3])*(27*E^C[1]*x - 2*x^3 + 3*Sqrt[3]*Sqrt[E^C[1]*x^2*(27*E^C[1] -
4*x^2)])^(1/3))/12}}
```

Maple raw input

```
dsolve(x*(2*x+3*y(x))*diff(y(x),x) = y(x)^2, y(x),'implicit')
```

Maple raw output

```
-1/2*ln((x+y(x))/x)-ln(y(x)/x)-ln(x)-_C1 = 0
```

4.558 $x(3y(x)+2x)y'(x)+3(y(x)+x)^2=0$

ODE

$$x(3y(x)+2x)y'(x)+3(y(x)+x)^2=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0279902 (sec), leaf count = 71

$$\left\{\left\{y(x)\to -\frac{\sqrt{6e^{4c_1}-2x^4}+4x^2}{6x}\right\},\left\{y(x)\to \frac{\sqrt{6e^{4c_1}-2x^4}-4x^2}{6x}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 35

$$\left\{-\frac{1}{4}\ln\left(\frac{3x^2+8xy(x)+6(y(x))^2}{x^2}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[3*(x + y[x])^2 + x*(2*x + 3*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(4*x^2 + Sqrt[6*E^(4*C[1]) - 2*x^4])/(6*x)}, {y[x] -> (-4*x^2 + Sqrt[
6*E^(4*C[1]) - 2*x^4])/(6*x)}}
```

Maple raw input

```
dsolve(x*(2*x+3*y(x))*diff(y(x),x)+3*(x+y(x))^2 = 0, y(x),'implicit')
```

Maple raw output

```
-1/4*ln((3*x^2+8*x*y(x)+6*y(x)^2)/x^2)-ln(x)-_C1 = 0
```

4.559 $(x^2+6xy(x)+3)\,y'(x)+3y(x)^2+2xy(x)+2x=0$

ODE

$$(x^2+6xy(x)+3)\,y'(x)+3y(x)^2+2xy(x)+2x=0$$

ODE Classification

[_exact, _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.011937 (sec), leaf count = 83

$$\left\{\left\{y(x)\to -\frac{\sqrt{36c_1x+x^4-12x^3+6x^2+9}+x^2+3}{6x}\right\},\left\{y(x)\to -\frac{-\sqrt{36c_1x+x^4-12x^3+6x^2+9}+x^2+3}{6x}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 25

$$\left\{x^2y(x)+3\,x(y(x))^2+x^2+\_C1+3\,y(x)=0\right\}$$

Mathematica raw input

```
DSolve[2*x + 2*x*y[x] + 3*y[x]^2 + (3 + x^2 + 6*x*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(3 + x^2 + Sqrt[9 + 6*x^2 - 12*x^3 + x^4 + 36*x*C[1]])/(6*x)}, {y[x]
-> -(3 + x^2 - Sqrt[9 + 6*x^2 - 12*x^3 + x^4 + 36*x*C[1]])/(6*x)}}
```

Maple raw input

```
dsolve((3+6*x*y(x)+x^2)*diff(y(x),x)+2*x+2*x*y(x)+3*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x^2*y(x)+3*x*y(x)^2+x^2+_C1+3*y(x) = 0
```

4.560 $x^3 + 3x(2y(x) + x)y'(x) + 3y(x)(y(x) + 2x) = 0$

ODE

$$x^3 + 3x(2y(x) + x)y'(x) + 3y(x)(y(x) + 2x) = 0$$

ODE Classification

[_exact, _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0110045 (sec), leaf count = 75

$$\left\{\left\{y(x) \to -\frac{\sqrt{36c_1x - 3x^5 + 9x^4} + 3x^2}{6x}\right\}, \left\{y(x) \to \frac{\sqrt{36c_1x - 3x^5 + 9x^4} - 3x^2}{6x}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 24

$$\left\{\frac{x^4}{4} + 3\,x^2y(x) + 3\,x(y(x))^2 + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^3 + 3*y[x]*(2*x + y[x]) + 3*x*(x + 2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(3*x^2 + Sqrt[9*x^4 - 3*x^5 + 36*x*C[1]])/(6*x)}, {y[x] -> (-3*x^2 +
Sqrt[9*x^4 - 3*x^5 + 36*x*C[1]])/(6*x)}}
```

Maple raw input

```
dsolve(3*x*(x+2*y(x))*diff(y(x),x)+x^3+3*y(x)*(2*x+y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
1/4*x^4+3*x^2*y(x)+3*x*y(x)^2+_C1 = 0
```

4.561 $axy(x)y'(x) = x^2 + y(x)^2$

ODE

$$axy(x)y'(x) = x^2 + y(x)^2$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Bernoulli]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0176333 (sec), leaf count = 68

$$\left\{\left\{y(x) \to -\frac{\sqrt{(a-1)c_1 x^{2/a} + x^2}}{\sqrt{a-1}}\right\}, \left\{y(x) \to \frac{\sqrt{(a-1)c_1 x^{2/a} + x^2}}{\sqrt{a-1}}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 28

$$\left\{-\frac{x^2}{a-1} - x^{2\,a^{-1}} \_C1 + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[a*x*y[x]*y'[x] == x^2 + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[x^2 + (-1 + a)*x^(2/a)*C[1]]/Sqrt[-1 + a])}, {y[x] -> Sqrt[x^2
+ (-1 + a)*x^(2/a)*C[1]]/Sqrt[-1 + a]}}
```

Maple raw input

```
dsolve(a*x*y(x)*diff(y(x),x) = x^2+y(x)^2, y(x),'implicit')
```

Maple raw output

```
-x^2/(a-1)-x^(2/a)*_C1+y(x)^2 = 0
```

4.562 $axy(x)y'(x) + x^2 - y(x)^2 = 0$

ODE

$$axy(x)y'(x) + x^2 - y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Bernoulli]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.011585 (sec), leaf count = 72

$$\left\{\left\{y(x) \to -\frac{\sqrt{(a-1)c_1 x^{2/a} - x^2}}{\sqrt{a-1}}\right\}, \left\{y(x) \to \frac{\sqrt{(a-1)c_1 x^{2/a} - x^2}}{\sqrt{a-1}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 27

$$\left\{\frac{x^2}{a-1} - x^{2\,a^{-1}} \_C1 + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2 - y[x]^2 + a*x*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-x^2 + (-1 + a)*x^(2/a)*C[1]]/Sqrt[-1 + a])}, {y[x] -> Sqrt[-x^
2 + (-1 + a)*x^(2/a)*C[1]]/Sqrt[-1 + a]}}
```

Maple raw input

```
dsolve(a*x*y(x)*diff(y(x),x)+x^2-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x^2/(a-1)-x^(2/a)*_C1+y(x)^2 = 0
```

4.563 $xy'(x)(a+by(x)) = cy(x)$

ODE

$$xy'(x)(a+by(x)) = cy(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0140668 (sec), leaf count = 31

$$\left\{\left\{y(x) \to \frac{aW\left(\frac{be^{\frac{c_1}{a}} x^{\frac{c}{a}}}{a}\right)}{b}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 24

$$\left\{\ln(x) - \frac{a\ln(y(x))}{c} - \frac{by(x)}{c} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*(a + b*y[x])*y'[x] == c*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a*ProductLog[(b*E^(C[1]/a)*x^(c/a))/a])/b}}
```

Maple raw input

```
dsolve(x*(a+b*y(x))*diff(y(x),x) = c*y(x), y(x),'implicit')
```

Maple raw output

```
ln(x)-1/c*a*ln(y(x))-b/c*y(x)+_C1 = 0
```

4.564 $x(x-ay(x))y'(x) = y(x)(y(x)-ax)$

ODE

$$x(x-ay(x))y'(x) = y(x)(y(x)-ax)$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0312607 (sec), leaf count = 34

$$\text{Solve}\left[(a-1)\log\left(1-\frac{y(x)}{x}\right)+(a+1)\log(x)+\log\left(\frac{y(x)}{x}\right)=c_1, y(x)\right]$$

Maple ✓
cpu = 0.023 (sec), leaf count = 51

$$\left\{\frac{1}{1+a}\left((1-a)\ln\left(\frac{y(x)-x}{x}\right)-\ln\left(\frac{y(x)}{x}\right)+(-a-1)\ln(x)-\_C1\,a-\_C1\right)=0\right\}$$

Mathematica raw input

```
DSolve[x*(x - a*y[x])*y'[x] == y[x]*(-(a*x) + y[x]),y[x],x]
```

Mathematica raw output

```
Solve[(1 + a)*Log[x] + Log[y[x]/x] + (-1 + a)*Log[1 - y[x]/x] == C[1], y[x]]
```

Maple raw input

```
dsolve(x*(x-a*y(x))*diff(y(x),x) = y(x)*(y(x)-a*x), y(x),'implicit')
```

Maple raw output

```
((1-a)*ln((y(x)-x)/x)-ln(y(x)/x)+(-a-1)*ln(x)-_C1*a-_C1)/(1+a) = 0
```

4.565 $y'(x)(x(Ax+By(x))+\mathbf{a0}+\mathbf{a1}x+\mathbf{a2}y(x))=y(x)(Ax+By(x))+\mathbf{b0}+\mathbf{b1}x+\mathbf{b2}y(x)$

ODE

$$y'(x)(x(Ax+By(x))+\mathrm{a0}+\mathrm{a1}x+\mathrm{a2}y(x))=y(x)(Ax+By(x))+\mathrm{b0}+\mathrm{b1}x+\mathrm{b2}y(x)$$

ODE Classification

```
[_rational, [_Abel, `2nd type`, `class B`]]
```

Book solution method
Homogeneous equation, Jacobi equation

Mathematica ✗
cpu = 227.898 (sec), leaf count = 0 , could not solve

```
DSolve[(a0 + a1*x + a2*y[x] + x*(A*x + B*y[x]))*Derivative[1][y][x] == b0 + b1*x + b2*y[x] + y[x]*(A*
```

Maple ✓
cpu = 0.285 (sec), leaf count = 509

$$\left\{-27\int^{3}\frac{\left(a0\,A+Bb0-1/3\,a1^{2}+1/3\,a1\,b2-a2\,b1-1/3\,b2^{2}\right)\left(((-2/3\,xB+a2/3)a1+(1/3\,xB+a2/3)b2+Aa2\,x-Ba0)y(x)+1/3\,xa1^{2}+\left(1/3\,Ax^{2}-2/3\,b2\,x+a0/3\right)a1+\left(-2/3\,Ax^{2}\right.\right.}{\left(-2/9\,a1^{3}+1/3\,a1^{2}b2+\left(a0\,A-2\,Bb0-a2\,b1+1/3\,b2^{2}\right)a1-2/9\,b2^{3}+(-2\,a0\,A+Bb0-a2\,b1)b2+3\,Aa2\,b0+3\,Ba0\,b1\right)\left((xB+a2)y(x)+Ax^{2}+a1\right.}$$

Mathematica raw input

```
DSolve[(a0 + a1*x + a2*y[x] + x*(A*x + B*y[x]))*y'[x] == b0 + b1*x + b2*y[x] + y[x]*(A*x + B*y[x]),y[
```

Mathematica raw output

```
DSolve[(a0 + a1*x + a2*y[x] + x*(A*x + B*y[x]))*Derivative[1][y][x] == b0 + b1*x
 + b2*y[x] + y[x]*(A*x + B*y[x]), y[x], x]
```

Maple raw input

```
dsolve((a0+a1*x+a2*y(x)+x*(A*x+B*y(x)))*diff(y(x),x) = b0+b1*x+b2*y(x)+y(x)*(A*x+B*y(x)), y(x),'impli
```

Maple raw output

```
-27*Intat(1/(81*(-2/9*a1^3+1/3*a1^2*b2+(a0*A-2*B*b0-a2*b1+1/3*b2^2)*a1-2/9*b2^3+
(-2*A*a0+B*b0-a2*b1)*b2+3*A*a2*b0+3*B*a0*b1)^2*_a^3+729*(a0*A+B*b0-1/3*a1^2+1/3*
a1*b2-a2*b1-1/3*b2^2)^3*_a-729*(a0*A+B*b0-1/3*a1^2+1/3*a1*b2-a2*b1-1/3*b2^2)^3)*
(3*A*a0+3*B*b0-a1^2+a1*b2-3*a2*b1-b2^2)^3,_a = 3*(a0*A+B*b0-1/3*a1^2+1/3*a1*b2-a
2*b1-1/3*b2^2)*(((-2/3*x*B+1/3*a2)*a1+(1/3*x*B+1/3*a2)*b2+A*a2*x-B*a0)*y(x)+1/3*
```

```
x*a1^2+(1/3*A*x^2-2/3*b2*x+1/3*a0)*a1+(-2/3*A*x^2-2/3*a0)*b2+(b1*x+b0)*(B*x+a2))
/(-2/9*a1^3+1/3*a1^2*b2+(a0*A-2*B*b0-a2*b1+1/3*b2^2)*a1-2/9*b2^3+(-2*A*a0+B*b0-a
2*b1)*b2+3*A*a2*b0+3*B*a0*b1)/((B*x+a2)*y(x)+A*x^2+a1*x+a0))-Int(-(B*x+a2)*(3*A*
a0+3*B*b0-a1^2+a1*b2-3*a2*b1-b2^2)/((-3*B^2*b1-3*A*(a1-b2)*B+3*A^2*a2)*x^3+(-3*B
^2*b0+(-6*a2*b1-3*a0*A-3*a1*(a1-b2))*B+3*A*a2*(a1+b2))*x^2+((-6*a2*b0-6*(a1-1/2*
b2)*a0)*B+3*a2*(A*a0+a1*b2-a2*b1))*x-3*B*a0^2+3*a0*a2*b2-3*a2^2*b0),x)-_C1 = 0
```

4.566 $y'(x)(x(\mathbf{a1}+\mathbf{b2}x+\mathbf{c2}y(x))+\mathbf{a1}+\mathbf{b1}x+\mathbf{c1}y(x))=y(x)(\mathbf{a2}+\mathbf{b2}x+\mathbf{c2}y(x))+\mathbf{a3}+\mathbf{b3}x+\mathbf{c2}y(x)$

ODE

$$y'(x)(x(\mathrm{a1}+\mathrm{b2}x+\mathrm{c2}y(x))+\mathrm{a1}+\mathrm{b1}x+\mathrm{c1}y(x))=y(x)(\mathrm{a2}+\mathrm{b2}x+\mathrm{c2}y(x))+\mathrm{a3}+\mathrm{b3}x+\mathrm{c2}y(x)$$

ODE Classification

```
[_rational, [_Abel, `2nd type`, `class B`]]
```

Book solution method
Homogeneous equation, Jacobi equation

Mathematica ✗
cpu = 273.829 (sec), leaf count = 0 , could not solve

```
DSolve[(a1 + b1*x + c1*y[x] + x*(a1 + b2*x + c2*y[x]))*Derivative[1][y][x] == a3 + b3*x + c2*y[x] + y
```

Maple ✓
cpu = 0.847 (sec), leaf count = 3737

Too large to display

Mathematica raw input

```
DSolve[(a1 + b1*x + c1*y[x] + x*(a1 + b2*x + c2*y[x]))*y'[x] == a3 + b3*x + c2*y[x] + y[x]*(a2 + b2*x
```

Mathematica raw output

```
DSolve[(a1 + b1*x + c1*y[x] + x*(a1 + b2*x + c2*y[x]))*Derivative[1][y][x] == a3
 + b3*x + c2*y[x] + y[x]*(a2 + b2*x + c2*y[x]), y[x], x]
```

Maple raw input

```
dsolve((a1+b1*x+c1*y(x)+x*(a1+b2*x+c2*y(x)))*diff(y(x),x) = a3+b3*x+c2*y(x)+y(x)*(a2+b2*x+c2*y(x)), y
```

Maple raw output

```
27*Intat((a1^2+(-a2+2*b1-3*b2-c2)*a1+c2^2+(2*a2-3*a3-b1)*c2+a2^2-a2*b1+b1^2+3*b3
*c1)^3/((4*_a^3-27*_a+27)*a1^6-12*(3+_a)*(a2-2*b1+3*b2+c2)*(_a-3/2)^2*a1^5+((-3*
_a^3-162*_a+162)*c2^2+((-6*a2+72*a3-60*b1+126*b2-108*b3)*_a^3+(-324*a2+243*a3+40
5*b1-486*b2)*_a+324*a2-243*a3-405*b1+486*b2)*c2+(-3*a2^2+(-60*b1+126*b2)*a2+60*b
1^2-144*b1*b2+81*b2^2+36*b3*c1)*_a^3+(-162*a2^2+(405*b1-486*b2)*a2-405*b1^2+972*
b1*b2-729*b2^2-243*b3*c1)*_a+162*a2^2+(-405*b1+486*b2)*a2+405*b1^2-972*b1*b2+729
*b2^2+243*b3*c1)*a1^4+((26*_a^3+189*_a-189)*c2^3+((78*a2-144*a3-12*b1-54*b2+162*
b3)*_a^3+(567*a2-486*a3-648*b1+729*b2)*_a-567*a2+486*a3+648*b1-729*b2)*c2^2+((78
```

```
*a2^2+(-144*a3-24*b1-108*b2+162*b3)*a2-120*b1^2+(288*a3+378*b2-324*b3)*b1-324*a3
*b2-324*b2^2+486*b2*b3-18*b3*c1)*_a^3+(567*a2^2+(-486*a3-1296*b1+1458*b2)*a2+810
*b1^2+(972*a3-1458*b2)*b1-1458*a3*b2+729*b2^2+486*b3*c1)*_a-567*a2^2+(486*a3+129
6*b1-1458*b2)*a2-810*b1^2+(-972*a3+1458*b2)*b1+1458*a3*b2-729*b2^2-486*b3*c1)*c2
+(26*a2^3+(-12*b1-54*b2)*a2^2+(-120*b1^2+378*b1*b2-324*b2^2-18*b3*c1)*a2+80*b1^3
-216*b2*b1^2+(162*b2^2+144*b3*c1)*b1-108*b2*c1*(a3+3/2*b3))*_a^3+189*(a2^2+(-10/
7*b1+6/7*b2)*a2+10/7*b1^2-12/7*b1*b2+9/7*b2^2+18/7*b3*c1)*(a2-2*b1+3*b2)*_a-189*
(a2^2+(-10/7*b1+6/7*b2)*a2+10/7*b1^2-12/7*b1*b2+9/7*b2^2+18/7*b3*c1)*(a2-2*b1+3*
b2))*a1^3+((-3*_a^3-162*_a+162)*c2^4+((-12*a2-54*a3+78*b1-144*b2+162*b3)*_a^3+(-
648*a2+729*a3+567*b1-486*b2)*_a+648*a2-729*a3-567*b1+486*b2)*c2^3+((-18*a2^2+(-1
08*a3+234*b1-432*b2+324*b3)*a2-18*b1^2+(-432*a3-108*b2+324*b3)*b1+324*a3^2+(810*
b2-972*b3)*a3+324*b2^2-972*b2*b3+729*b3*(b3-4/27*c1))*_a^3+(-972*a2^2+(1458*a3+1
701*b1-1458*b2)*a2-972*b1^2+(-1458*a3+1458*b2)*b1-729*a3^2+1458*a3*b2-729*b2^2-7
29*b3*c1)*_a+972*a2^2+(-1458*a3-1701*b1+1458*b2)*a2+972*b1^2+(1458*a3-1458*b2)*b
1+729*a3^2-1458*a3*b2+729*b2^2+729*b3*c1)*c2^2+((-12*a2^3+(-54*a3+234*b1-432*b2+
162*b3)*a2^2+(-36*b1^2+(-432*a3-216*b2+324*b3)*b1+810*a3*b2+648*b2^2-972*b2*b3-2
16*b3*c1)*a2-120*b1^3+(432*a3+378*b2-324*b3)*b1^2+(-648*a3*b2-324*b2^2+486*b2*b3
-54*b3*c1)*b1+162*c1*((b2+2*b3)*a3+b3*(b2-3*b3)))*_a^3+(-648*a2^3+(729*a3+1701*b
1-1458*b2)*a2^2+(-1944*b1^2+(-1458*a3+2916*b2)*b1+1458*a3*b2-1458*b2^2-1458*b3*c
1)*a2+810*b1^3+(1458*a3-1458*b2)*b1^2+(-2916*a3*b2+729*b2^2+1458*b3*c1)*b1+(2187
*b2^2+1458*b3*c1)*a3-1458*b2*b3*c1)*_a+648*a2^3+(-729*a3-1701*b1+1458*b2)*a2^2+(
1944*b1^2+(1458*a3-2916*b2)*b1-1458*a3*b2+1458*b2^2+1458*b3*c1)*a2-810*b1^3+(-14
58*a3+1458*b2)*b1^2+(2916*a3*b2-729*b2^2-1458*b3*c1)*b1+(-2187*b2^2-1458*b3*c1)*
a3+1458*b2*b3*c1)*c2+(-3*a2^4+(78*b1-144*b2)*a2^3+(-18*b1^2-108*b1*b2+324*b2^2-1
08*b3*c1)*a2^2+(-120*b1^3+378*b2*b1^2+(-324*b2^2-54*b3*c1)*b1+162*b2*c1*(a3+b3))
*a2+60*b1^4-144*b2*b1^3+(81*b2^2+216*b3*c1)*b1^2-324*b2*c1*(a3+b3)*b1+486*a3*b2^
2*c1+81*b3^2*c1^2)*_a^3-162*(a2^2+(-5/2*b1+3*b2)*a2+5/2*b1^2-6*b1*b2+9/2*b2^2+3/
2*b3*c1)*(a2^2-a2*b1+b1^2+3*b3*c1)*_a+162*(a2^2+(-5/2*b1+3*b2)*a2+5/2*b1^2-6*b1*
b2+9/2*b2^2+3/2*b3*c1)*(a2^2-a2*b1+b1^2+3*b3*c1))*a1^2+((-12*_a^3+81*_a-81)*c2^5
+((-60*a2+126*a3-6*b1+72*b2-108*b3)*_a^3+(405*a2-486*a3-324*b1+243*b2)*_a-405*a2
+486*a3+324*b1-243*b2)*c2^4+((-120*a2^2+(378*a3-24*b1+288*b2-324*b3)*a2+78*b1^2+
(-108*a3-144*b2+162*b3)*b1-324*a3^2+(-324*b2+486*b3)*a3-18*b3*c1)*_a^3+(810*a2^2
+(-1458*a3-1296*b1+972*b2)*a2+567*b1^2+(1458*a3-486*b2)*b1+729*a3^2-1458*a3*b2+4
86*b3*c1)*_a-810*a2^2+(1458*a3+1296*b1-972*b2)*a2-567*b1^2+(-1458*a3+486*b2)*b1-
729*a3^2+1458*a3*b2-486*b3*c1)*c2^3+((-120*a2^3+(378*a3-36*b1+432*b2-324*b3)*a2^
2+(234*b1^2+(-216*a3-432*b2+324*b3)*b1-324*a3^2+(-648*b2+486*b3)*a3-54*b3*c1)*a2
-12*b1^3+(-432*a3-54*b2+162*b3)*b1^2+(648*a3^2+(810*b2-972*b3)*a3-216*b3*c1)*b1+
162*c1*((b2+b3)*a3+2*b2*b3-3*b3^2))*_a^3+(810*a2^3+(-1458*a3-1944*b1+1458*b2)*a2
^2+(1701*b1^2+(2916*a3-1458*b2)*b1+729*a3^2-2916*a3*b2+1458*b3*c1)*a2-648*b1^3+(
-1458*a3+729*b2)*b1^2+(-1458*a3^2+1458*a3*b2-1458*b3*c1)*b1+2187*a3^2*b2-1458*a3
*b3*c1+1458*b2*b3*c1)*_a-810*a2^3+(1458*a3+1944*b1-1458*b2)*a2^2+(-1701*b1^2+(-2
916*a3+1458*b2)*b1-729*a3^2+2916*a3*b2-1458*b3*c1)*a2+648*b1^3+(1458*a3-729*b2)*
b1^2+(1458*a3^2-1458*a3*b2+1458*b3*c1)*b1-2187*a3^2*b2+1458*a3*b3*c1-1458*b2*b3*
c1)*c2^2+((-60*a2^4+(126*a3-24*b1+288*b2-108*b3)*a2^3+(234*b1^2+(-108*a3-432*b2+
162*b3)*b1-324*a3*b2-54*b3*c1)*a2^2+(-24*b1^3+(-432*a3-108*b2+162*b3)*b1^2+(810*
a3*b2-432*b3*c1)*b1+324*((b2+1/2*b3)*a3+2*(b2-3/4*b3)*b3)*c1)*a2-60*b1^4+(288*a3
+126*b2-108*b3)*b1^3+(-324*a3*b2-54*b3*c1)*b1^2+324*((b2+2*b3)*a3+1/2*b3*(b2-3*b
```

```
3))*c1*b1-972*c1*(a3^2*b2+b2*(b2-3/2*b3)*a3-1/6*b3^2*c1))*_a^3+405*(a2^2-a2*b1+b
1^2+3*b3*c1)*(a2^2+(-6/5*a3-11/5*b1+12/5*b2)*a2+b1^2+(12/5*a3-6/5*b2)*b1-18/5*a3
*b2+3/5*b3*c1)*_a-405*(a2^2-a2*b1+b1^2+3*b3*c1)*(a2^2+(-6/5*a3-11/5*b1+12/5*b2)*
a2+b1^2+(12/5*a3-6/5*b2)*b1-18/5*a3*b2+3/5*b3*c1))*c2-12*(a2^2+(2*b1-6*b2)*a2-2*
b1^2+3*b1*b2-3*b3*c1)*(a2^3-3/2*a2^2*b1+(-3/2*b1^2+9/2*b3*c1)*a2-27/2*a3*c1*b2+b
1^3+9/2*b1*b3*c1)*_a^3+81*(a2^2-a2*b1+b1^2+3*b3*c1)^2*(a2-2*b1+3*b2)*_a-81*(a2^2
-a2*b1+b1^2+3*b3*c1)^2*(a2-2*b1+3*b2))*a1+(4*_a^3-27*_a+27)*c2^6+24*(a2-3/2*a3-1
/2*b1)*(3+_a)*(_a-3/2)^2*c2^5+((60*a2^2+(-144*a3-60*b1)*a2+81*a3^2+126*a3*b1-3*b
1^2+36*b3*c1)*_a^3+(-405*a2^2+(972*a3+405*b1)*a2-729*a3^2-486*a3*b1-162*b1^2-243
*b3*c1)*_a+405*a2^2+(-972*a3-405*b1)*a2+729*a3^2+486*a3*b1+162*b1^2+243*b3*c1)*c
2^4+((80*a2^3+(-216*a3-120*b1)*a2^2+(162*a3^2+378*a3*b1-12*b1^2+144*b3*c1)*a2+26
*b1^3-54*a3*b1^2+(-324*a3^2-18*b3*c1)*b1-108*a3*c1*(b2+3/2*b3))*_a^3-540*(a2^2+(
-6/5*a3-b1)*a2+9/10*a3^2+3/5*a3*b1+7/10*b1^2+9/5*b3*c1)*(a2-3/2*a3-1/2*b1)*_a+54
0*(a2^2+(-6/5*a3-b1)*a2+9/10*a3^2+3/5*a3*b1+7/10*b1^2+9/5*b3*c1)*(a2-3/2*a3-1/2*
b1))*c2^3+((60*a2^4+(-144*a3-120*b1)*a2^3+(81*a3^2+378*a3*b1-18*b1^2+216*b3*c1)*
a2^2+(78*b1^3-108*a3*b1^2+(-324*a3^2-54*b3*c1)*b1-324*a3*c1*(b2+b3))*a2-3*b1^4-1
44*a3*b1^3+(324*a3^2-108*b3*c1)*b1^2+162*a3*c1*(b2+b3)*b1+486*a3^2*b2*c1+81*b3^2
*c1^2)*_a^3-405*(a2^2+(-12/5*a3-b1)*a2+9/5*a3^2+6/5*a3*b1+2/5*b1^2+3/5*b3*c1)*(a
2^2-a2*b1+b1^2+3*b3*c1)*_a+405*(a2^2+(-12/5*a3-b1)*a2+9/5*a3^2+6/5*a3*b1+2/5*b1^
2+3/5*b3*c1)*(a2^2-a2*b1+b1^2+3*b3*c1))*c2^2+(24*(a2^2+(-3/2*a3-b1)*a2+3*a3*b1-1
/2*b1^2+3/2*b3*c1)*(a2^3-3/2*a2^2*b1+(-3/2*b1^2+9/2*b3*c1)*a2-27/2*a3*c1*b2+b1^3
+9/2*b1*b3*c1)*_a^3-162*(a2-3/2*a3-1/2*b1)*(a2^2-a2*b1+b1^2+3*b3*c1)^2*_a+162*(a
2-3/2*a3-1/2*b1)*(a2^2-a2*b1+b1^2+3*b3*c1)^2)*c2+4*(a2^3-3/2*a2^2*b1+(-3/2*b1^2+
9/2*b3*c1)*a2-27/2*a3*c1*b2+b1^3+9/2*b1*b3*c1)^2*_a^3-27*(a2^2-a2*b1+b1^2+3*b3*c
1)^3*_a+27*(a2^2-a2*b1+b1^2+3*b3*c1)^3),_a = 3/2*((c2^2*x+((-2*x-3)*a1+(a2-2*b1)
*x+c1)*c2+3*(b2*x+1/3*a1+1/3*a2+1/3*b1)*c1)*y(x)+((-2*x-2)*a1-2*x*((b2-3/2*b3)*x
-3/2*a3+b1))*c2+(1+x)*a1^2+(b2*x^2+(-2*a2+2*b1)*x-2*a2+b1)*a1-2*b2*(a2-1/2*b1)*x
^2+(-2*a2*b1+b1^2+3*b3*c1)*x+3*a3*c1)*(c2^2+(-a1+2*a2-3*a3-b1)*c2+3*b3*c1+a1^2+(
-a2+2*b1-3*b2)*a1+a2^2-a2*b1+b1^2)/((c2*x+c1)*y(x)+b2*x^2+a1*x+b1*x+a1)/(c2^3+(-
3/2*a1-9/2*a3-3/2*b1+3*a2)*c2^2+(-3/2*a1^2+(-3*b1+9*b2-3*a2-27/2*b3+9*a3)*a1-3/2
*b1^2+(-3*a2+9*a3)*b1+3*a2^2-9/2*a2*a3+9/2*b3*c1)*c2+a1^3+(-3/2*a2-9/2*b2+3*b1)*
a1^2+(3*b1^2+(-3*a2-9/2*b2)*b1-3/2*a2^2+9*b2*a2+9/2*b3*c1)*a1+b1^3-3/2*a2*b1^2+(
-3/2*a2^2+9/2*b3*c1)*b1+a2^3+9/2*a2*b3*c1-27/2*a3*c1*b2))-Int(-(c2*x+c1)*(c2^2+(
-a1+2*a2-3*a3-b1)*c2+3*b3*c1+a1^2+(-a2+2*b1-3*b2)*a1+a2^2-a2*b1+b1^2)/(((-3*b2+3
*b3)*c2^2+3*b2*(a1-a2+b1)*c2-3*b2^2*c1)*x^3+((-3*a1+3*a3-3*b1)*c2^2+((-3*b2+6*b3
)*c1+3*a1^2+(-3*a2+6*b1+3*b2)*a1-3*b1*(a2-b1))*c2-3*b2*c1*(a1+a2+b1))*x^2+(-3*a1
*c2^2+((-3*a1+6*a3-3*b1)*c1+6*(a1-1/2*a2+b1)*a1)*c2-3*c1*(-b3*c1+(a2+b2)*a1+a2*b
1))*x+3*a1*(a1-c1)*c2-3*a1*a2*c1+3*a3*c1^2),x)-_C1 = 0
```

4.567 $xy'(x)\left(ay(x)+x^n\right)+y(x)^2(b+cy(x))=0$

ODE

$$xy'(x)\left(ay(x)+x^n\right)+y(x)^2(b+cy(x))=0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`], [_Abel, `2nd type`, `class C`]]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 2.35039 (sec), leaf count = 77

$$\text{Solve}\left[-\frac{x^{-n}y(x)^{-\frac{an+b}{b}}(b+cy(x))^{\frac{an}{b}}\left(y(x)\left(a^2n+ab-cx^n\right)+anx^n\right)}{a^2n^2(an+b)}=c_1,y(x)\right]$$

Maple ✓
cpu = 0.055 (sec), leaf count = 77

$$\left\{\_C1+\frac{c-x^{-n}ab}{an}\left(\frac{b+cy(x)}{by(x)}\right)^{\frac{an}{b}}-\frac{b}{an+b}\left(\frac{b+cy(x)}{by(x)}\right)^{\frac{an}{b}+1}=0\right\}$$

Mathematica raw input

```
DSolve[y[x]^2*(b + c*y[x]) + x*(x^n + a*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[-(((b + c*y[x])^((a*n)/b)*(a*n*x^n + (a*b + a^2*n - c*x^n)*y[x]))/(a^2*n^2
*(b + a*n)*x^n*y[x]^((b + a*n)/b))) == C[1], y[x]]
```

Maple raw input

```
dsolve(x*(x^n+a*y(x))*diff(y(x),x)+(b+c*y(x))*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
_C1+((b+c*y(x))/y(x)/b)^(a/b*n)/a/n*(c-x^(-n)*a*b)-((b+c*y(x))/y(x)/b)^(a/b*n+1)
*b/(a*n+b) = 0
```

4.568 $(1-x^2y(x))\,y'(x)-xy(x)^2+1=0$

ODE

$$(1-x^2y(x))\,y'(x)-xy(x)^2+1=0$$

ODE Classification

[_exact, _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0104906 (sec), leaf count = 57

$$\left\{\left\{y(x)\to\frac{1-\sqrt{c_1x^2+2x^3+1}}{x^2}\right\},\left\{y(x)\to\frac{\sqrt{c_1x^2+2x^3+1}+1}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 17

$$\left\{-\frac{x^2(y(x))^2}{2}+x+y(x)+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[1 - x*y[x]^2 + (1 - x^2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 - Sqrt[1 + 2*x^3 + x^2*C[1]])/x^2}, {y[x] -> (1 + Sqrt[1 + 2*x^3 +
x^2*C[1]])/x^2}}
```

Maple raw input

```
dsolve((1-x^2*y(x))*diff(y(x),x)+1-x*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*x^2*y(x)^2+x+y(x)+_C1 = 0
```

4.569 $(1-x^2y(x))\,y'(x)+xy(x)^2-1=0$

ODE

$$(1-x^2y(x))\,y'(x)+xy(x)^2-1=0$$

ODE Classification

```
[_rational, [_Abel, `2nd type`, `class B`]]
```

Book solution method
Homogeneous equation, special

Mathematica ✓
cpu = 15.0125 (sec), leaf count = 738

$$\left\{\left\{y(x)\to \frac{(1-6c_1)\,x^2+(6c_1-1)\,x\sqrt[3]{-(1-6c_1)^2x^3+\sqrt{(6c_1-1)^3\left(6c_1x^6+(2-12c_1)\,x^3+6c_1-1\right)}+36c_1^2-12c_1+1}}{(6c_1-1)\sqrt[3]{-(1-6c_1)^2x^3+\sqrt{(6c_1-1)^3\left(6c_1x^6+(2-\right.}}\right.$$

Maple ✓
cpu = 0.044 (sec), leaf count = 101

$$\left\{\frac{7}{9}\ln\left(\frac{-63\,x^3+63}{4\,x^2y\,(x)-4}\right)-\frac{7}{6}\ln\left(-63\,\frac{x^2(x-y(x))}{x^2y\,(x)-1}\right)+\frac{7}{18}\ln\left(\frac{-63\,x^3+189\,x^2y(x)-126}{5\,x^2y\,(x)-5}\right)-\frac{7\ln(-1+x)}{9}-\frac{7\ln\left(x^2+x\right.}{9}\right.$$

Mathematica raw input

```
DSolve[-1 + x*y[x]^2 + (1 - x^2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2*(1 - 6*C[1]) + x*(-1 + 6*C[1])*(1 - x^3*(1 - 6*C[1])^2 - 12*C[1]
+ 36*C[1]^2 + Sqrt[(-1 + 6*C[1])^3*(-1 + x^3*(2 - 12*C[1]) + 6*C[1] + 6*x^6*C[1]
)])^(1/3) + (1 - x^3*(1 - 6*C[1])^2 - 12*C[1] + 36*C[1]^2 + Sqrt[(-1 + 6*C[1])^3
*(-1 + x^3*(2 - 12*C[1]) + 6*C[1] + 6*x^6*C[1])])^(2/3))/((-1 + 6*C[1])*(1 - x^3
*(1 - 6*C[1])^2 - 12*C[1] + 36*C[1]^2 + Sqrt[(-1 + 6*C[1])^3*(-1 + x^3*(2 - 12*C
[1]) + 6*C[1] + 6*x^6*C[1])])^(1/3))}, {y[x] -> ((1 + I*Sqrt[3])*x^2*(-1 + 6*C[1
]) + 2*x*(-1 + 6*C[1])*(1 - x^3*(1 - 6*C[1])^2 - 12*C[1] + 36*C[1]^2 + Sqrt[(-1
+ 6*C[1])^3*(-1 + x^3*(2 - 12*C[1]) + 6*C[1] + 6*x^6*C[1])])^(1/3) + I*(I + Sqrt
[3])*(1 - x^3*(1 - 6*C[1])^2 - 12*C[1] + 36*C[1]^2 + Sqrt[(-1 + 6*C[1])^3*(-1 +
x^3*(2 - 12*C[1]) + 6*C[1] + 6*x^6*C[1])])^(2/3))/(2*(-1 + 6*C[1])*(1 - x^3*(1 -
 6*C[1])^2 - 12*C[1] + 36*C[1]^2 + Sqrt[(-1 + 6*C[1])^3*(-1 + x^3*(2 - 12*C[1])
+ 6*C[1] + 6*x^6*C[1])])^(1/3))}, {y[x] -> ((1 - I*Sqrt[3])*x^2*(-1 + 6*C[1]) +
2*x*(-1 + 6*C[1])*(1 - x^3*(1 - 6*C[1])^2 - 12*C[1] + 36*C[1]^2 + Sqrt[(-1 + 6*C
```

```
[1])^3*(-1 + x^3*(2 - 12*C[1]) + 6*C[1] + 6*x^6*C[1])])^(1/3) - I*(-I + Sqrt[3])
*(1 - x^3*(1 - 6*C[1])^2 - 12*C[1] + 36*C[1]^2 + Sqrt[(-1 + 6*C[1])^3*(-1 + x^3*
(2 - 12*C[1]) + 6*C[1] + 6*x^6*C[1])])^(2/3))/(2*(-1 + 6*C[1])*(1 - x^3*(1 - 6*C
[1])^2 - 12*C[1] + 36*C[1]^2 + Sqrt[(-1 + 6*C[1])^3*(-1 + x^3*(2 - 12*C[1]) + 6*
C[1] + 6*x^6*C[1])])^(1/3))}}
```

Maple raw input

```
dsolve((1-x^2*y(x))*diff(y(x),x)-1+x*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
7/9*ln((-63*x^3+63)/(4*x^2*y(x)-4))-7/6*ln(-63*x^2*(x-y(x))/(x^2*y(x)-1))+7/18*l
n((-63*x^3+189*x^2*y(x)-126)/(5*x^2*y(x)-5))-7/9*ln(-1+x)-7/9*ln(x^2+x+1)+7/3*ln
(x)-_C1 = 0
```

4.570 $x(1-xy(x))y'(x)+y(x)(xy(x)+1)=0$

ODE

$$x(1-xy(x))y'(x)+y(x)(xy(x)+1)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.98151 (sec), leaf count = 30

$$\left\{\left\{y(x)\to -\frac{1}{xW\left(\frac{e^{\frac{9c_1}{2^{2/3}}-1}}{x^2}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 29

$$\left\{\ln(x)-\_C1-\frac{\ln(xy(x))\,xy(x)+1}{2\,xy(x)}=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 + x*y[x]) + x*(1 - x*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1/(x*ProductLog[E^(-1 + (9*C[1])/2^(2/3))/x^2]))}}
```

Maple raw input

```
dsolve(x*(1-x*y(x))*diff(y(x),x)+(1+x*y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-1/2*(ln(x*y(x))*x*y(x)+1)/x/y(x) = 0
```

4.571 $x(xy(x)+2)y'(x) = 2x^3 - xy(x)^2 - 2y(x) + 3$

ODE

$$x(xy(x)+2)y'(x) = 2x^3 - xy(x)^2 - 2y(x) + 3$$

ODE Classification

[_exact, _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0138217 (sec), leaf count = 62

$$\left\{\left\{y(x) \to -\frac{\sqrt{x^2\left(c_1+x^4+6x+4\right)}+2x}{x^2}\right\}, \left\{y(x) \to \frac{\sqrt{x^2\left(c_1+x^4+6x+4\right)}-2x}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 27

$$\left\{-\frac{x^4}{2}+\frac{x^2(y(x))^2}{2}+2\,xy(x)-3\,x+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(2 + x*y[x])*y'[x] == 3 + 2*x^3 - 2*y[x] - x*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((2*x + Sqrt[x^2*(4 + 6*x + x^4 + C[1])])/x^2)}, {y[x] -> (-2*x + Sqr
t[x^2*(4 + 6*x + x^4 + C[1])])/x^2}}
```

Maple raw input

```
dsolve(x*(2+x*y(x))*diff(y(x),x) = 3+2*x^3-2*y(x)-x*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-1/2*x^4+1/2*x^2*y(x)^2+2*x*y(x)-3*x+_C1 = 0
```

4.572 $x(2-xy(x))y'(x)-x(xy(x)+1)y(x)^2+2y(x)=0$

ODE

$$x(2-xy(x))y'(x)-x(xy(x)+1)y(x)^2+2y(x)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class C`]]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.0164487 (sec), leaf count = 81

$$\left\{\left\{y(x)\to \frac{2}{\sqrt{-\frac{1}{x^3}}x^2\sqrt{-x\left(4c_1-4\log(x)+1\right)+x}}\right\},\left\{y(x)\to \frac{2}{\left(-\frac{1}{x^3}\right)^{3/2}x^5\sqrt{-x\left(4c_1-4\log(x)+1\right)+x}}\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 24

$$\left\{\ln(x)-\_C1+\frac{1-xy(x)}{x^2\left(y(x)\right)^2}=0\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - x*y[x]^2*(1 + x*y[x]) + x*(2 - x*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2/(x + Sqrt[-x^(-3)]*x^2*Sqrt[-(x*(1 + 4*C[1] - 4*Log[x]))])}, {y[x] -
> 2/(x + (-x^(-3))^(3/2)*x^5*Sqrt[-(x*(1 + 4*C[1] - 4*Log[x]))])}}
```

Maple raw input

```
dsolve(x*(2-x*y(x))*diff(y(x),x)+2*y(x)-x*y(x)^2*(1+x*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+(1-x*y(x))/x^2/y(x)^2 = 0
```

4.573 $x(3-xy(x))y'(x)=y(x)(xy(x)-1)$

ODE

$$x(3-xy(x))y'(x)=y(x)(xy(x)-1)$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 4.95322 (sec), leaf count = 30

$$\left\{\left\{y(x)\to -\frac{3W\left(e^{\frac{9c_1}{2^{2/3}}-1}x^{2/3}\right)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 21

$$\left\{\ln(x)-\_C1+\frac{xy(x)}{2}-\frac{3\ln(xy(x))}{2}=0\right\}$$

Mathematica raw input

```
DSolve[x*(3 - x*y[x])*y'[x] == y[x]*(-1 + x*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-3*ProductLog[E^(-1 + (9*C[1])/2^(2/3))*x^(2/3)])/x}}
```

Maple raw input

```
dsolve(x*(3-x*y(x))*diff(y(x),x) = y(x)*(x*y(x)-1), y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+1/2*x*y(x)-3/2*ln(x*y(x)) = 0
```

4.574 $x^2(1-y(x))y'(x)+(1-x)y(x)=0$

ODE

$$x^2(1-y(x))y'(x)+(1-x)y(x)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0167342 (sec), leaf count = 21

$$\left\{\left\{y(x)\to -W\left(x\left(-e^{\frac{1}{x}-c_1}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 17

$$\left\{x^{-1}+\ln(x)+y(x)-\ln(y(x))+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(1 - x)*y[x] + x^2*(1 - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ProductLog[-(E^(x^(-1) - C[1])*x)]}}
```

Maple raw input

```
dsolve(x^2*(1-y(x))*diff(y(x),x)+(1-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/x+ln(x)+y(x)-ln(y(x))+_C1 = 0
```

4.575 $x^2(1-y(x))y'(x)+(x+1)y(x)^2=0$

ODE

$$x^2(1-y(x))y'(x)+(x+1)y(x)^2=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0184982 (sec), leaf count = 25

$$\left\{\left\{y(x)\to -\frac{1}{W\left(-\frac{e^{\frac{1}{x}-c_1}}{x}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 23

$$\left\{-x^{-1}+\ln(x)-(y(x))^{-1}-\ln(y(x))+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(1 + x)*y[x]^2 + x^2*(1 - y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ProductLog[-(E^(x^(-1) - C[1])/x)]^(-1)}}
```

Maple raw input

```
dsolve(x^2*(1-y(x))*diff(y(x),x)+(1+x)*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-1/x+ln(x)-1/y(x)-ln(y(x))+_C1 = 0
```

4.576 $(x^2+1)\,y(x)y'(x)+x(1-y(x)^2)=0$

ODE

$$(x^2+1)\,y(x)y'(x)+x(1-y(x)^2)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0160068 (sec), leaf count = 47

$$\left\{\left\{y(x)\to -\sqrt{e^{2c_1}\left(x^2+1\right)+1}\right\},\left\{y(x)\to \sqrt{e^{2c_1}\left(x^2+1\right)+1}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 18

$$\left\{-\_C1\,x^2+(y(x))^2-\_C1-1=0\right\}$$

Mathematica raw input

```
DSolve[x*(1 - y[x]^2) + (1 + x^2)*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[1 + E^(2*C[1])*(1 + x^2)]}, {y[x] -> Sqrt[1 + E^(2*C[1])*(1 + x^
2)]}}
```

Maple raw input

```
dsolve((x^2+1)*y(x)*diff(y(x),x)+x*(1-y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
-_C1*x^2+y(x)^2-_C1-1 = 0
```

4.577 $(1-x^2)\,y(x)y'(x)+2x^2+xy(x)^2=0$

ODE

$$(1-x^2)\,y(x)y'(x)+2x^2+xy(x)^2=0$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0318261 (sec), leaf count = 93

$$\left\{\left\{y(x)\to -\sqrt{c_1x^2-c_1+(x^2-1)\log(1-x)-(x^2-1)\log(x+1)-2x}\right\},\left\{y(x)\to \sqrt{c_1x^2-c_1+(x^2-1)\log(1-x)-(\right.\right.$$

Maple ✓
cpu = 0.027 (sec), leaf count = 43

$$\left\{(y(x))^2-\left(x^2-1\right)\ln\left(-1+x\right)-\_C1\,x^2+\ln\left(1+x\right)x^2+2\,x+\_C1-\ln\left(1+x\right)=0\right\}$$

Mathematica raw input

```
DSolve[2*x^2 + x*y[x]^2 + (1 - x^2)*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-2*x - C[1] + x^2*C[1] + (-1 + x^2)*Log[1 - x] - (-1 + x^2)*Log[
1 + x]]}, {y[x] -> Sqrt[-2*x - C[1] + x^2*C[1] + (-1 + x^2)*Log[1 - x] - (-1 + x
^2)*Log[1 + x]]}}
```

Maple raw input

```
dsolve((-x^2+1)*y(x)*diff(y(x),x)+2*x^2+x*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-(x^2-1)*ln(-1+x)-_C1*x^2+ln(1+x)*x^2+2*x+_C1-ln(1+x) = 0
```

4.578 $2x^2y(x)y'(x) = x^2(2x+1) - y(x)^2$

ODE

$$2x^2y(x)y'(x) = x^2(2x+1) - y(x)^2$$

ODE Classification

[[_homogeneous, `class D`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0110721 (sec), leaf count = 43

$$\left\{\left\{y(x) \to -\sqrt{c_1 e^{\frac{1}{x}} + x^2}\right\}, \left\{y(x) \to \sqrt{c_1 e^{\frac{1}{x}} + x^2}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 20

$$\left\{-x^2 - \mathrm{e}^{x^{-1}} \_C1 + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[2*x^2*y[x]*y'[x] == x^2*(1 + 2*x) - y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[x^2 + E^x^(-1)*C[1]]}, {y[x] -> Sqrt[x^2 + E^x^(-1)*C[1]]}}
```

Maple raw input

```
dsolve(2*x^2*y(x)*diff(y(x),x) = x^2*(1+2*x)-y(x)^2, y(x),'implicit')
```

Maple raw output

```
-x^2-exp(1/x)*_C1+y(x)^2 = 0
```

4.579 $x(1-2xy(x))y'(x)+y(x)(2xy(x)+1)=0$

ODE

$$x(1-2xy(x))y'(x)+y(x)(2xy(x)+1)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Change of Variable, Two new variables

Mathematica ✓
cpu = 0.88013 (sec), leaf count = 32

$$\left\{\left\{y(x)\to -\frac{1}{2xW\left(\frac{e^{\frac{9c_1}{2^{2/3}}-1}}{x^2}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 30

$$\left\{\ln(x)-\_C1-\frac{2\ln(xy(x))\,xy(x)+1}{4\,xy(x)}=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 + 2*x*y[x]) + x*(1 - 2*x*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1/(2*x*ProductLog[E^(-1 + (9*C[1])/2^(2/3))/x^2])}}
```

Maple raw input

```
dsolve(x*(1-2*x*y(x))*diff(y(x),x)+y(x)*(1+2*x*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-1/4*(2*ln(x*y(x))*x*y(x)+1)/x/y(x) = 0
```

4.580 $x(2xy(x)+1)y'(x)+y(x)(3xy(x)+2)=0$

ODE

$$x(2xy(x)+1)y'(x)+y(x)(3xy(x)+2)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Homogeneous equation, isobaric equation

Mathematica ✓
cpu = 0.0131273 (sec), leaf count = 69

$$\left\{\left\{y(x)\to -\frac{\sqrt{x^2\left(4c_1+x\right)}+x^{3/2}}{2x^{5/2}}\right\},\left\{y(x)\to \frac{\sqrt{x^2\left(4c_1+x\right)}-x^{3/2}}{2x^{5/2}}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 20

$$\{\ln(x)-\_C1+\ln\left(xy(x)\left(1+xy(x)\right)\right)=0\}$$

Mathematica raw input

```
DSolve[y[x]*(2 + 3*x*y[x]) + x*(1 + 2*x*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x^(3/2) + Sqrt[x^2*(x + 4*C[1])])/(2*x^(5/2))}, {y[x] -> (-x^(3/2) +
  Sqrt[x^2*(x + 4*C[1])])/(2*x^(5/2))}}
```

Maple raw input

```
dsolve(x*(1+2*x*y(x))*diff(y(x),x)+(2+3*x*y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+ln(x*y(x)*(1+x*y(x))) = 0
```

4.581 $y(x)\left(-x^2y(x)^2+2xy(x)+1\right)+x(2xy(x)+1)y'(x)=0$

ODE

$$y(x)\left(-x^2y(x)^2+2xy(x)+1\right)+x(2xy(x)+1)y'(x)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class C`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0130467 (sec), leaf count = 74

$$\left\{\left\{y(x)\to \frac{x}{\frac{\sqrt{x(c_1-2\log(x)+4)}}{\sqrt{\frac{1}{x^3}}}-2x^2}\right\},\left\{y(x)\to -\frac{x}{\frac{\sqrt{x(c_1-2\log(x)+4)}}{\sqrt{\frac{1}{x^3}}}+2x^2}\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 25

$$\left\{\ln(x)-\_C1+\frac{4\,xy(x)+1}{2\,x^2\left(y(x)\right)^2}=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 + 2*x*y[x] - x^2*y[x]^2) + x*(1 + 2*x*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x/(-2*x^2 + Sqrt[x*(4 + C[1] - 2*Log[x])]/Sqrt[x^(-3)])}, {y[x] -> -(x
/(2*x^2 + Sqrt[x*(4 + C[1] - 2*Log[x])]/Sqrt[x^(-3)]))}}
```

Maple raw input

```
dsolve(x*(1+2*x*y(x))*diff(y(x),x)+(1+2*x*y(x)-x^2*y(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+1/2*(4*x*y(x)+1)/x^2/y(x)^2 = 0
```

4.582 $x^2(x-2y(x))y'(x) = 2x^3 - 4xy(x)^2 + y(x)^3$

ODE

$$x^2(x-2y(x))y'(x) = 2x^3 - 4xy(x)^2 + y(x)^3$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class C`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0656077 (sec), leaf count = 101

$$\left\{\left\{y(x) \to \frac{2x^3 - \sqrt{e^{2c_1}x^2\left(e^{2c_1} - 3x^2\right)}}{e^{2c_1} + x^2}\right\}, \left\{y(x) \to \frac{\sqrt{e^{2c_1}x^2\left(e^{2c_1} - 3x^2\right)} + 2x^3}{e^{2c_1} + x^2}\right\}\right\}$$

Maple ✓
cpu = 0.03 (sec), leaf count = 48

$$\left\{\frac{1}{2}\ln\left(\frac{y(x)-x}{x}\right) - \ln\left(\frac{y(x)-2x}{x}\right) + \frac{1}{2}\ln\left(\frac{x+y(x)}{x}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*(x - 2*y[x])*y'[x] == 2*x^3 - 4*x*y[x]^2 + y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x^3 - Sqrt[E^(2*C[1])*x^2*(E^(2*C[1]) - 3*x^2)])/(E^(2*C[1]) + x^2)
}, {y[x] -> (2*x^3 + Sqrt[E^(2*C[1])*x^2*(E^(2*C[1]) - 3*x^2)])/(E^(2*C[1]) + x^
2)}}
```

Maple raw input

```
dsolve(x^2*(x-2*y(x))*diff(y(x),x) = 2*x^3-4*x*y(x)^2+y(x)^3, y(x),'implicit')
```

Maple raw output

```
1/2*ln((y(x)-x)/x)-ln((y(x)-2*x)/x)+1/2*ln((x+y(x))/x)-ln(x)-_C1 = 0
```

4.583 $2x(x+1)y(x)y'(x) = y(x)^2 + 1$

ODE

$$2x(x+1)y(x)y'(x) = y(x)^2 + 1$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0174176 (sec), leaf count = 58

$$\left\{\left\{y(x) \to -\frac{\sqrt{(e^{2c_1}-1)\,x-1}}{\sqrt{x+1}}\right\}, \left\{y(x) \to \frac{\sqrt{(e^{2c_1}-1)\,x-1}}{\sqrt{x+1}}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 23

$$\left\{\frac{(1+x)\,(y(x))^2 - \_C1\,x + 1}{1+x} = 0\right\}$$

Mathematica raw input

```
DSolve[2*x*(1 + x)*y[x]*y'[x] == 1 + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-1 + (-1 + E^(2*C[1]))*x]/Sqrt[1 + x])}, {y[x] -> Sqrt[-1 + (-1
 + E^(2*C[1]))*x]/Sqrt[1 + x]}}
```

Maple raw input

```
dsolve(2*(1+x)*x*y(x)*diff(y(x),x) = 1+y(x)^2, y(x),'implicit')
```

Maple raw output

```
((1+x)*y(x)^2-_C1*x+1)/(1+x) = 0
```

4.584 $3x^2y(x)y'(x) + 2xy(x)^2 + 1 = 0$

ODE

$$3x^2y(x)y'(x) + 2xy(x)^2 + 1 = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00776119 (sec), leaf count = 47

$$\left\{\left\{y(x) \to -\sqrt{\frac{c_1}{x^{4/3}} - \frac{2}{x}}\right\}, \left\{y(x) \to \sqrt{\frac{c_1}{x^{4/3}} - \frac{2}{x}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 19

$$\left\{(y(x))^2 + 2\,x^{-1} - \_C1\,x^{-\frac{4}{3}} = 0\right\}$$

Mathematica raw input

```
DSolve[1 + 2*x*y[x]^2 + 3*x^2*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-2/x + C[1]/x^(4/3)]}, {y[x] -> Sqrt[-2/x + C[1]/x^(4/3)]}}
```

Maple raw input

```
dsolve(3*x^2*y(x)*diff(y(x),x)+1+2*x*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+2/x-1/x^(4/3)*_C1 = 0
```

4.585 $x^2(4x-3y(x))y'(x)=y(x)\left(6x^2-3xy(x)+2y(x)^2\right)$

ODE

$$x^2(4x-3y(x))y'(x)=y(x)\left(6x^2-3xy(x)+2y(x)^2\right)$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class C`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0374147 (sec), leaf count = 42

$$\text{Solve}\left[2\left(\log\left(\frac{y(x)^2}{x^2}+1\right)+\log(x)\right)+3\tan^{-1}\left(\frac{y(x)}{x}\right)=c_1+4\log\left(\frac{y(x)}{x}\right),y(x)\right]$$

Maple ✓
cpu = 0.019 (sec), leaf count = 44

$$\left\{-\ln\left(\frac{x^2+(y(x))^2}{x^2}\right)-\frac{3}{2}\arctan\left(\frac{y(x)}{x}\right)+2\ln\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x^2*(4*x - 3*y[x])*y'[x] == y[x]*(6*x^2 - 3*x*y[x] + 2*y[x]^2),y[x],x]
```

Mathematica raw output

```
Solve[3*ArcTan[y[x]/x] + 2*(Log[x] + Log[1 + y[x]^2/x^2]) == C[1] + 4*Log[y[x]/x
], y[x]]
```

Maple raw input

```
dsolve(x^2*(4*x-3*y(x))*diff(y(x),x) = (6*x^2-3*x*y(x)+2*y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
-ln((x^2+y(x)^2)/x^2)-3/2*arctan(y(x)/x)+2*ln(y(x)/x)-ln(x)-_C1 = 0
```

4.586 $(1-x^3y(x))\,y'(x)=x^2y(x)^2$

ODE

$$(1-x^3y(x))\,y'(x)=x^2y(x)^2$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 14.689 (sec), leaf count = 326

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{12c_1x^6+2\sqrt{6}\sqrt{c_1x^6\left(6c_1x^6+1\right)}+1}+\frac{1}{\sqrt[3]{12c_1x^6+2\sqrt{6}\sqrt{c_1x^6\left(6c_1x^6+1\right)}+1}}+1}{2x^3}\right\},\left\{y(x)\to \frac{2i\left(\sqrt{3}+i\right)}{}\right.$$

Maple ✓
cpu = 0.019 (sec), leaf count = 30

$$\left\{\ln(x)-\_C1-\frac{\ln\left(2x^3y(x)-3\right)}{6}-\frac{\ln\left(x^3y(x)\right)}{3}=0\right\}$$

Mathematica raw input

```
DSolve[(1 - x^3*y[x])*y'[x] == x^2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + (1 + 12*x^6*C[1] + 2*Sqrt[6]*Sqrt[x^6*C[1]*(1 + 6*x^6*C[1])])^(-1
/3) + (1 + 12*x^6*C[1] + 2*Sqrt[6]*Sqrt[x^6*C[1]*(1 + 6*x^6*C[1])])^(1/3))/(2*x^
3)}, {y[x] -> (4 - (2*(1 + I*Sqrt[3]))/(1 + 12*x^6*C[1] + 2*Sqrt[6]*Sqrt[x^6*C[1
]*(1 + 6*x^6*C[1])])^(1/3) + (2*I)*(I + Sqrt[3])*(1 + 12*x^6*C[1] + 2*Sqrt[6]*Sq
rt[x^6*C[1]*(1 + 6*x^6*C[1])])^(1/3))/(8*x^3)}, {y[x] -> (4 + ((2*I)*(I + Sqrt[3
]))/(1 + 12*x^6*C[1] + 2*Sqrt[6]*Sqrt[x^6*C[1]*(1 + 6*x^6*C[1])])^(1/3) - 2*(1 +
 I*Sqrt[3])*(1 + 12*x^6*C[1] + 2*Sqrt[6]*Sqrt[x^6*C[1]*(1 + 6*x^6*C[1])])^(1/3))
/(8*x^3)}}
```

Maple raw input

```
dsolve((1-x^3*y(x))*diff(y(x),x) = x^2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-1/6*ln(2*x^3*y(x)-3)-1/3*ln(x^3*y(x)) = 0
```

4.587 $a + 2x^3 y(x) y'(x) + 3x^2 y(x)^2 = 0$

ODE

$$a + 2x^3 y(x) y'(x) + 3x^2 y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class G`], _exact, _rational, _Bernoulli]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.00846131 (sec), leaf count = 44

$$\left\{\left\{y(x) \to -\frac{\sqrt{c_1 - ax}}{x^{3/2}}\right\}, \left\{y(x) \to \frac{\sqrt{c_1 - ax}}{x^{3/2}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 19

$$\left\{\frac{a}{x^2} - \frac{\_C1}{x^3} + (y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[a + 3*x^2*y[x]^2 + 2*x^3*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-(a*x) + C[1]]/x^(3/2))}, {y[x] -> Sqrt[-(a*x) + C[1]]/x^(3/2)}
}
```

Maple raw input

```
dsolve(2*x^3*y(x)*diff(y(x),x)+a+3*x^2*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
1/x^2*a-1/x^3*_C1+y(x)^2 = 0
```

4.588 $x(3-2x^2y(x))\,y'(x) = 3x^2y(x)^2 - 3y(x) + 4x$

ODE

$$x(3-2x^2y(x))\,y'(x) = 3x^2y(x)^2 - 3y(x) + 4x$$

ODE Classification

[_exact, _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0122077 (sec), leaf count = 71

$$\left\{\left\{y(x) \to -\frac{\sqrt{x^2\left(4c_1x - 8x^3 + 9\right)} - 3x}{2x^3}\right\}, \left\{y(x) \to \frac{\sqrt{x^2\left(4c_1x - 8x^3 + 9\right)} + 3x}{2x^3}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 24

$$\left\{-x^3(y(x))^2 - 2\,x^2 + 3\,xy(x) + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*(3 - 2*x^2*y[x])*y'[x] == 4*x - 3*y[x] + 3*x^2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(-3*x + Sqrt[x^2*(9 - 8*x^3 + 4*x*C[1])])/(2*x^3)}, {y[x] -> (3*x + S
qrt[x^2*(9 - 8*x^3 + 4*x*C[1])])/(2*x^3)}}
```

Maple raw input

```
dsolve(x*(3-2*x^2*y(x))*diff(y(x),x) = 4*x-3*y(x)+3*x^2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-x^3*y(x)^2-2*x^2+3*x*y(x)+_C1 = 0
```

4.589 $x(2x^2y(x)+3)\,y'(x)+y(x)\,(3x^2y(x)+4)=0$

ODE

$$x\left(2x^2y(x)+3\right)y'(x)+y(x)\left(3x^2y(x)+4\right)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 1.41743 (sec), leaf count = 1769

$$\left\{\left\{y(x)\to \frac{\sqrt{\frac{\sqrt[3]{6}\sqrt[3]{e^{-6c_1}\left(\sqrt{48e^{6c_1}x^{18}+81e^{8c_1}x^{16}}-9e^{4c_1}x^8\right)}}{x^6}+\frac{3}{x^4}-\frac{2\,6^{2/3}e^{-2c_1}}{\sqrt[3]{e^{-6c_1}\left(\sqrt{48e^{6c_1}x^{18}+81e^{8c_1}x^{16}}-9e^{4c_1}x^8\right)}}}}{2\sqrt{3}}-\frac{1}{2}\right.\right.$$

Maple ✓
cpu = 0.021 (sec), leaf count = 29

$$\left\{\ln(x)-\_C1-\frac{\ln\left(x^2y(x)+2\right)}{2}-\frac{3\ln\left(x^2y(x)\right)}{2}=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(4 + 3*x^2*y[x]) + x*(3 + 2*x^2*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1/(2*x^2) + Sqrt[3/x^4 - (2*6^(2/3))/(E^(2*C[1])*((-9*E^(4*C[1])*x^8
+ Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3)) + (6^(1/3)*(
(-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^
(1/3))/x^6]/(2*Sqrt[3]) - Sqrt[2/x^4 + (2*2^(2/3))/(3^(1/3)*E^(2*C[1])*((-9*E^(4
*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3)) -
  (2^(1/3)*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E
^(6*C[1]))^(1/3))/(3^(2/3)*x^6) - (2*Sqrt[3])/(x^6*Sqrt[3/x^4 - (2*6^(2/3))/(E^(
2*C[1])*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(
```

```
6*C[1]))^(1/3)) + (6^(1/3)*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^
(6*C[1])*x^18])/E^(6*C[1]))^(1/3))/x^6])]/2}, {y[x] -> -1/(2*x^2) + Sqrt[3/x^4 -
 (2*6^(2/3))/(E^(2*C[1])*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6
*C[1])*x^18])/E^(6*C[1]))^(1/3)) + (6^(1/3)*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C
[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3))/x^6]/(2*Sqrt[3]) + Sqrt[2/x^
4 + (2*2^(2/3))/(3^(1/3)*E^(2*C[1])*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^1
6 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3)) - (2^(1/3)*((-9*E^(4*C[1])*x^8 + Sqr
t[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3))/(3^(2/3)*x^6) - (
2*Sqrt[3])/(x^6*Sqrt[3/x^4 - (2*6^(2/3))/(E^(2*C[1])*((-9*E^(4*C[1])*x^8 + Sqrt[
81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3)) + (6^(1/3)*((-9*E^(
4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3))/
x^6])]/2}, {y[x] -> -1/(2*x^2) - Sqrt[3/x^4 - (2*6^(2/3))/(E^(2*C[1])*((-9*E^(4*
C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3)) +
(6^(1/3)*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^
(6*C[1]))^(1/3))/x^6]/(2*Sqrt[3]) - Sqrt[2/x^4 + (2*2^(2/3))/(3^(1/3)*E^(2*C[1])
*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1])
)^(1/3)) - (2^(1/3)*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1]
)*x^18])/E^(6*C[1]))^(1/3))/(3^(2/3)*x^6) + (2*Sqrt[3])/(x^6*Sqrt[3/x^4 - (2*6^(
2/3))/(E^(2*C[1])*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*
x^18])/E^(6*C[1]))^(1/3)) + (6^(1/3)*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^
16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3))/x^6])]/2}, {y[x] -> -1/(2*x^2) - Sq
rt[3/x^4 - (2*6^(2/3))/(E^(2*C[1])*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16
 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3)) + (6^(1/3)*((-9*E^(4*C[1])*x^8 + Sqrt
[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3))/x^6]/(2*Sqrt[3]) +
 Sqrt[2/x^4 + (2*2^(2/3))/(3^(1/3)*E^(2*C[1])*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8
*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3)) - (2^(1/3)*((-9*E^(4*C[1])
*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3))/(3^(2/3
)*x^6) + (2*Sqrt[3])/(x^6*Sqrt[3/x^4 - (2*6^(2/3))/(E^(2*C[1])*((-9*E^(4*C[1])*x
^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]))^(1/3)) + (6^(1/3
)*((-9*E^(4*C[1])*x^8 + Sqrt[81*E^(8*C[1])*x^16 + 48*E^(6*C[1])*x^18])/E^(6*C[1]
))^(1/3))/x^6])]/2}}
```

Maple raw input

```
dsolve(x*(3+2*x^2*y(x))*diff(y(x),x)+(4+3*x^2*y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-1/2*ln(x^2*y(x)+2)-3/2*ln(x^2*y(x)) = 0
```

4.590 $3x^4 + 8x^3 y(x) y'(x) - 6x^2 y(x)^2 - y(x)^4 = 0$

ODE

$$3x^4 + 8x^3 y(x) y'(x) - 6x^2 y(x)^2 - y(x)^4 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0286494 (sec), leaf count = 78

$$\left\{\left\{y(x) \to -\frac{\sqrt{-x^2\left(e^{8c_1}x+3\right)}}{\sqrt{e^{8c_1}x-1}}\right\}, \left\{y(x) \to \frac{\sqrt{-x^2\left(e^{8c_1}x+3\right)}}{\sqrt{e^{8c_1}x-1}}\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 41

$$\left\{\ln\left(\frac{-3\,x^2+(y(x))^2}{x^2}\right) - \ln\left(\frac{x^2+(y(x))^2}{x^2}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[3*x^4 - 6*x^2*y[x]^2 - y[x]^4 + 8*x^3*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-(x^2*(3 + E^(8*C[1])*x))]/Sqrt[-1 + E^(8*C[1])*x])}, {y[x] ->
Sqrt[-(x^2*(3 + E^(8*C[1])*x))]/Sqrt[-1 + E^(8*C[1])*x]}}
```

Maple raw input

```
dsolve(8*x^3*y(x)*diff(y(x),x)+3*x^4-6*x^2*y(x)^2-y(x)^4 = 0, y(x),'implicit')
```

Maple raw output

```
ln((-3*x^2+y(x)^2)/x^2)-ln((x^2+y(x)^2)/x^2)-ln(x)-_C1 = 0
```

4.591 $xy(x)\left(a+bx^2\right)y'(x)=A+By(x)^2$

ODE

$$xy(x)\left(a+bx^2\right)y'(x)=A+By(x)^2$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0349639 (sec), leaf count = 98

$$\left\{\left\{y(x)\to -\frac{\sqrt{e^{2Bc_1}x^{\frac{2B}{a}}\left(a+bx^2\right)^{-\frac{B}{a}}-A}}{\sqrt{B}}\right\},\left\{y(x)\to \frac{\sqrt{e^{2Bc_1}x^{\frac{2B}{a}}\left(a+bx^2\right)^{-\frac{B}{a}}-A}}{\sqrt{B}}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 38

$$\left\{\frac{A}{B}-x^{2\frac{B}{a}}\left(bx^2+a\right)^{-\frac{B}{a}}\_C1+(y(x))^2=0\right\}$$

Mathematica raw input

```
DSolve[x*(a + b*x^2)*y[x]*y'[x] == A + B*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-A + (E^(2*B*C[1])*x^((2*B)/a))/(a + b*x^2)^(B/a)]/Sqrt[B])}, {
y[x] -> Sqrt[-A + (E^(2*B*C[1])*x^((2*B)/a))/(a + b*x^2)^(B/a)]/Sqrt[B]}}
```

Maple raw input

```
dsolve(x*y(x)*(b*x^2+a)*diff(y(x),x) = A+B*y(x)^2, y(x),'implicit')
```

Maple raw output

```
A/B-x^(2*B/a)*(b*x^2+a)^(-B/a)*_C1+y(x)^2 = 0
```

4.592 $3x^4y(x)y'(x) = 1 - 2x^3y(x)^2$

ODE

$$3x^4y(x)y'(x) = 1 - 2x^3y(x)^2$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Bernoulli]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.00777399 (sec), leaf count = 51

$$\left\{\left\{y(x) \to -\sqrt{\frac{c_1}{x^{4/3}} - \frac{2}{5x^3}}\right\}, \left\{y(x) \to \sqrt{\frac{c_1}{x^{4/3}} - \frac{2}{5x^3}}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 19

$$\left\{(y(x))^2 + \frac{2}{5\,x^3} - \_C1\,x^{-\frac{4}{3}} = 0\right\}$$

Mathematica raw input

```
DSolve[3*x^4*y[x]*y'[x] == 1 - 2*x^3*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-2/(5*x^3) + C[1]/x^(4/3)]}, {y[x] -> Sqrt[-2/(5*x^3) + C[1]/x^(
4/3)]}}
```

Maple raw input

```
dsolve(3*x^4*y(x)*diff(y(x),x) = 1-2*x^3*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x)^2+2/5/x^3-1/x^(4/3)*_C1 = 0
```

4.593 $x^7 y(x) y'(x) = 5x^3 y(x) + 2(x^2+1)$

ODE

$$x^7 y(x) y'(x) = 5x^3 y(x) + 2(x^2+1)$$

ODE Classification

[_rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Abel ODE, Second kind

Mathematica ✓
cpu = 1.16006 (sec), leaf count = 98

$$\text{Solve}\left[c_1 = \frac{i\left(\left(x^3 y(x)+1\right)\sqrt[4]{x^4 y(x)^2 + \frac{1}{x^2} + 2xy(x) + 1}\,{}_2F_1\left(\frac{1}{2}, \frac{5}{4}; \frac{3}{2}; -\frac{\left(y(x)x^3+1\right)^2}{x^2}\right) + 2x^2\right)}{2x\sqrt[4]{-\frac{\left(x^3 y(x)+1\right)^2}{x^2} - 1}}, y(x)\right]$$

Maple ✓
cpu = 0.055 (sec), leaf count = 96

$$\left\{ \_C1 + 1\left(-\frac{1+x^3 y(x)}{x}\,{}_2\mathrm{F}_1\left(\frac{1}{2}, \frac{5}{4}; \frac{3}{2}; -\frac{\left(1+x^3 y(x)\right)^2}{x^2}\right)\sqrt[4]{\frac{x^6 \left(y\left(x\right)\right)^2 + 2x^3 y\left(x\right) + x^2 + 1}{x^2}} - 2x\right) \frac{1}{\sqrt[4]{\frac{x^6 \left(y\left(x\right)\right)^2 + 2x^3 y\left(x\right) + x^2 + 1}{x^2}}} \right.$$

Mathematica raw input

```
DSolve[x^7*y[x]*y'[x] == 2*(1 + x^2) + 5*x^3*y[x],y[x],x]
```

Mathematica raw output

```
Solve[C[1] == ((I/2)*(2*x^2 + Hypergeometric2F1[1/2, 5/4, 3/2, -((1 + x^3*y[x])^
2/x^2)]*(1 + x^3*y[x])*(1 + x^(-2) + 2*x*y[x] + x^4*y[x]^2)^(1/4)))/(x*(-1 - (1
+ x^3*y[x])^2/x^2)^(1/4)), y[x]]
```

Maple raw input

```
dsolve(x^7*y(x)*diff(y(x),x) = 2*x^2+2+5*x^3*y(x), y(x),'implicit')
```

Maple raw output

```
_C1+(-(1+x^3*y(x))/x*hypergeom([1/2, 5/4],[3/2],-(1+x^3*y(x))^2/x^2)*((x^6*y(x)^
2+2*x^3*y(x)+x^2+1)/x^2)^(1/4)-2*x)/((x^6*y(x)^2+2*x^3*y(x)+x^2+1)/x^2)^(1/4) =
0
```

4.594 $\sqrt{x^2+1}y(x)y'(x)+x\sqrt{y(x)^2+1}=0$

ODE

$$\sqrt{x^2+1}y(x)y'(x)+x\sqrt{y(x)^2+1}=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.019607 (sec), leaf count = 61

$$\left\{\left\{y(x)\to -\sqrt{c_1\left(c_1-2\sqrt{x^2+1}\right)+x^2}\right\},\left\{y(x)\to \sqrt{c_1\left(c_1-2\sqrt{x^2+1}\right)+x^2}\right\}\right\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 20

$$\left\{\sqrt{x^2+1}+\sqrt{1+(y(x))^2}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*Sqrt[1 + y[x]^2] + Sqrt[1 + x^2]*y[x]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[x^2 + C[1]*(-2*Sqrt[1 + x^2] + C[1])]}, {y[x] -> Sqrt[x^2 + C[1]
*(-2*Sqrt[1 + x^2] + C[1])]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)*(x^2+1)^(1/2)+x*(1+y(x)^2)^(1/2) = 0, y(x),'implicit')
```

Maple raw output

```
(x^2+1)^(1/2)+(1+y(x)^2)^(1/2)+_C1 = 0
```

4.595 $\sqrt{x^2+1}(y(x)+1)y'(x) = y(x)^3$

ODE

$$\sqrt{x^2+1}(y(x)+1)y'(x) = y(x)^3$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0374284 (sec), leaf count = 63

$$\left\{\left\{y(x) \to -\frac{\sqrt{-2c_1 - 2\sinh^{-1}(x)+1}+1}{2\left(c_1+\sinh^{-1}(x)\right)}\right\}, \left\{y(x) \to \frac{\sqrt{-2c_1 - 2\sinh^{-1}(x)+1}-1}{2\left(c_1+\sinh^{-1}(x)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 17

$$\left\{Arcsinh(x) + (y(x))^{-1} + \frac{1}{2\left(y\left(x\right)\right)^2} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[Sqrt[1 + x^2]*(1 + y[x])*y'[x] == y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1 + Sqrt[1 - 2*ArcSinh[x] - 2*C[1]])/(2*(ArcSinh[x] + C[1]))}, {y[x]
  -> (-1 + Sqrt[1 - 2*ArcSinh[x] - 2*C[1]])/(2*(ArcSinh[x] + C[1]))}}
```

Maple raw input

```
dsolve((1+y(x))*diff(y(x),x)*(x^2+1)^(1/2) = y(x)^3, y(x),'implicit')
```

Maple raw output

```
arcsinh(x)+1/y(x)+1/2/y(x)^2+_C1 = 0
```

4.596 $y'(x)(\mathbf{g0}(x)+\mathbf{g1}(x)y(x))=\mathbf{f0}(x)+\mathbf{f1}(x)y(x)+\mathbf{f2}(x)y(x)^2+\mathbf{f3}(x)y(x)^3$

ODE

$$y'(x)(\text{g0}(x)+\text{g1}(x)y(x))=\text{f0}(x)+\text{f1}(x)y(x)+\text{f2}(x)y(x)^2+\text{f3}(x)y(x)^3$$

ODE Classification

```
[[_Abel, `2nd type`, `class C`]]
```

Book solution method
Abel ODE, Second kind

Mathematica ✗
cpu = 911.677 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✗
cpu = 4.27 (sec), leaf count = 0 , could not solve

```
dsolve((g0(x)+y(x)*g1(x))*diff(y(x),x) = f0(x)+f1(x)*y(x)+f2(x)*y(x)^2+f3(x)*y(x)^3, y(x),'implicit')
```

Mathematica raw input

```
DSolve[(g0[x] + g1[x]*y[x])*y'[x] == f0[x] + f1[x]*y[x] + f2[x]*y[x]^2 + f3[x]*y[x]^3,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((g0(x)+y(x)*g1(x))*diff(y(x),x) = f0(x)+f1(x)*y(x)+f2(x)*y(x)^2+f3(x)*y(x)^3, y(x),'implicit')
```

Maple raw output

```
dsolve((g0(x)+y(x)*g1(x))*diff(y(x),x) = f0(x)+f1(x)*y(x)+f2(x)*y(x)^2+f3(x)*y(x
)^3, y(x),'implicit')
```

4.597 $y(x)^2 y'(x) + x(2 - y(x)) = 0$

ODE

$$y(x)^2 y'(x) + x(2 - y(x)) = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 26.9186 (sec), leaf count = 38

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{\#1^2}{2} + 2\#1 + 4\log(\#1 - 2) - 6\&\right]\left[c_1 + \frac{x^2}{2}\right]\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 27

$$\left\{\frac{x^2}{2} - \frac{(y(x))^2}{2} - 2\,y(x) - 4\,\ln(y(x) - 2) + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*(2 - y[x]) + y[x]^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-6 + 4*Log[-2 + #1] + 2*#1 + #1^2/2 & ][x^2/2 + C[1]]}
}
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)+x*(2-y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
1/2*x^2-1/2*y(x)^2-2*y(x)-4*ln(y(x)-2)+_C1 = 0
```

4.598 $y(x)^2 y'(x) = x(y(x)^2 + 1)$

ODE

$$y(x)^2 y'(x) = x\left(y(x)^2 + 1\right)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 1.40645 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\#1 - \tan^{-1}(\#1)\&\right]\left[c_1 + \frac{x^2}{2}\right]\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 17

$$\left\{\frac{x^2}{2} - y(x) + \arctan\left(y(x)\right) + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]^2*y'[x] == x*(1 + y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-ArcTan[#1] + #1 & ][x^2/2 + C[1]]}}
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x) = x*(1+y(x)^2), y(x),'implicit')
```

Maple raw output

```
1/2*x^2-y(x)+arctan(y(x))+_C1 = 0
```

4.599 $(y(x)^2+x)\,y'(x)+y(x)=a+bx$

ODE

$$(y(x)^2+x)\,y'(x)+y(x)=a+bx$$

ODE Classification

[_exact, _rational]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.218048 (sec), leaf count = 420

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{2}\left(\sqrt{9\left(2ax+bx^2+2c_1\right)^2+16x^3}+6ax+3bx^2+6c_1\right)^{2/3}-2\,2^{2/3}x}{2\sqrt[3]{\sqrt{9\left(2ax+bx^2+2c_1\right)^2+16x^3}+6ax+3bx^2+6c_1}}\right\},\left\{y(x)\to \frac{i(\sqrt{3}+i)\left(\sqrt{36a^2x^2+36}\right.\right.\right.$$

Maple ✓
cpu = 0.014 (sec), leaf count = 25

$$\left\{-\frac{bx^2}{2}-ax+xy(x)+\frac{(y(x))^3}{3}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x] + (x + y[x]^2)*y'[x] == a + b*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*2^(2/3)*x + 2^(1/3)*(6*a*x + 3*b*x^2 + 6*C[1] + Sqrt[16*x^3 + 9*(2
*a*x + b*x^2 + 2*C[1])^2])^(2/3))/(2*(6*a*x + 3*b*x^2 + 6*C[1] + Sqrt[16*x^3 + 9
*(2*a*x + b*x^2 + 2*C[1])^2])^(1/3))}, {y[x] -> (2*2^(1/3)*(1 + I*Sqrt[3])*x + I
*(I + Sqrt[3])*(6*a*x + 3*b*x^2 + 6*C[1] + Sqrt[36*a^2*x^2 + 16*x^3 + 36*a*b*x^3
 + 9*b^2*x^4 + 72*a*x*C[1] + 36*b*x^2*C[1] + 36*C[1]^2])^(2/3))/(2*2^(2/3)*(6*a*
x + 3*b*x^2 + 6*C[1] + Sqrt[16*x^3 + 9*(2*a*x + b*x^2 + 2*C[1])^2])^(1/3))}, {y[
x] -> (x - I*Sqrt[3]*x)/(2^(1/3)*(6*a*x + 3*b*x^2 + 6*C[1] + Sqrt[16*x^3 + 9*(2*
a*x + b*x^2 + 2*C[1])^2])^(1/3)) - ((I/2)*(-I + Sqrt[3])*(6*a*x + 3*b*x^2 + 6*C[
1] + Sqrt[16*x^3 + 9*(2*a*x + b*x^2 + 2*C[1])^2])^(1/3))/2^(2/3)}}
```

Maple raw input

```
dsolve((x+y(x)^2)*diff(y(x),x)+y(x) = b*x+a, y(x),'implicit')
```

Maple raw output

```
-1/2*b*x^2-a*x+x*y(x)+1/3*y(x)^3+_C1 = 0
```

4.600 $(x - y(x)^2)\, y'(x) = x^2 - y(x)$

ODE

$$(x - y(x)^2)\, y'(x) = x^2 - y(x)$$

ODE Classification

[_exact, _rational]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0164503 (sec), leaf count = 326

$$\left\{\left\{y(x) \to -\frac{\sqrt[3]{2}\left(\sqrt{(6c_1-4)\,x^3+9c_1^2+x^6}+3c_1+x^3\right)^{2/3}+2x}{2^{2/3}\sqrt[3]{\sqrt{(6c_1-4)\,x^3+9c_1^2+x^6}+3c_1+x^3}}\right\},\left\{y(x) \to \frac{\sqrt[3]{2}(1-i\sqrt{3})\left(\sqrt{(6c_1-4)\,x^3+9c_1^2+x^6}+\right.}{2\,2^{2/3}\sqrt[3]{\sqrt{(6c_1-4)\,x^3+9c_1^2}}}\right.$$

Maple ✓
cpu = 0.013 (sec), leaf count = 20

$$\left\{-\frac{x^3}{3}+xy(x)-\frac{(y(x))^3}{3}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(x - y[x]^2)*y'[x] == x^2 - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((2*x + 2^(1/3)*(x^3 + 3*C[1] + Sqrt[x^6 + 9*C[1]^2 + x^3*(-4 + 6*C[1
])])^(2/3))/(2^(2/3)*(x^3 + 3*C[1] + Sqrt[x^6 + 9*C[1]^2 + x^3*(-4 + 6*C[1])])^(
1/3)))}, {y[x] -> ((2 + (2*I)*Sqrt[3])*x + 2^(1/3)*(1 - I*Sqrt[3])*(x^3 + 3*C[1]
 + Sqrt[x^6 + 9*C[1]^2 + x^3*(-4 + 6*C[1])])^(2/3))/(2*2^(2/3)*(x^3 + 3*C[1] + S
qrt[x^6 + 9*C[1]^2 + x^3*(-4 + 6*C[1])])^(1/3))}, {y[x] -> ((2 - (2*I)*Sqrt[3])*
x + 2^(1/3)*(1 + I*Sqrt[3])*(x^3 + 3*C[1] + Sqrt[x^6 + 9*C[1]^2 + x^3*(-4 + 6*C[
1])])^(2/3))/(2*2^(2/3)*(x^3 + 3*C[1] + Sqrt[x^6 + 9*C[1]^2 + x^3*(-4 + 6*C[1])]
)^(1/3))}}
```

Maple raw input

```
dsolve((x-y(x)^2)*diff(y(x),x) = x^2-y(x), y(x),'implicit')
```

Maple raw output

```
-1/3*x^3+x*y(x)-1/3*y(x)^3+_C1 = 0
```

4.601 $(x^2+y(x)^2)\,y'(x)+xy(x)=0$

ODE

$$(x^2+y(x)^2)\,y'(x)+xy(x)=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.477636 (sec), leaf count = 121

$$\left\{\left\{y(x)\to -\sqrt{-\sqrt{e^{4c_1}+x^4}-x^2}\right\},\left\{y(x)\to \sqrt{-\sqrt{e^{4c_1}+x^4}-x^2}\right\},\left\{y(x)\to -\sqrt{\sqrt{e^{4c_1}+x^4}-x^2}\right\},\left\{y(x)\to \sqrt{\sqrt{e^{4c_1}}\right.\right.$$

Maple ✓
cpu = 0.02 (sec), leaf count = 37

$$\left\{-\frac{1}{4}\ln\left(\frac{2x^2+(y(x))^2}{x^2}\right)-\frac{1}{2}\ln\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*y[x] + (x^2 + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-x^2 - Sqrt[E^(4*C[1]) + x^4]]}, {y[x] -> Sqrt[-x^2 - Sqrt[E^(4*
C[1]) + x^4]]}, {y[x] -> -Sqrt[-x^2 + Sqrt[E^(4*C[1]) + x^4]]}, {y[x] -> Sqrt[-x
^2 + Sqrt[E^(4*C[1]) + x^4]]}}
```

Maple raw input

```
dsolve((x^2+y(x)^2)*diff(y(x),x)+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/4*ln((2*x^2+y(x)^2)/x^2)-1/2*ln(y(x)/x)-ln(x)-_C1 = 0
```

4.602 $(x^2 + y(x)^2)\, y'(x) = xy(x)$

ODE

$$(x^2 + y(x)^2)\, y'(x) = xy(x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 1.37322 (sec), leaf count = 44

$$\left\{\left\{y(x) \to -\frac{x}{\sqrt{W\left(e^{-2c_1}x^2\right)}}\right\}, \left\{y(x) \to \frac{x}{\sqrt{W\left(e^{-2c_1}x^2\right)}}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 29

$$\left\{-\ln\left(\frac{y(x)}{x}\right) + \frac{x^2}{2\left(y\left(x\right)\right)^2} - \ln\left(x\right) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(x^2 + y[x]^2)*y'[x] == x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x/Sqrt[ProductLog[x^2/E^(2*C[1])]])}, {y[x] -> x/Sqrt[ProductLog[x^2
/E^(2*C[1])]]}}
```

Maple raw input

```
dsolve((x^2+y(x)^2)*diff(y(x),x) = x*y(x), y(x),'implicit')
```

Maple raw output

```
-ln(y(x)/x)+1/2*x^2/y(x)^2-ln(x)-_C1 = 0
```

4.603 $(x^2 - y(x)^2)\, y'(x) = 2xy(x)$

ODE

$$(x^2 - y(x)^2)\, y'(x) = 2xy(x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0892305 (sec), leaf count = 61

$$\left\{\left\{y(x) \to \frac{1}{2}\left(e^{c_1} - \sqrt{e^{2c_1} - 4x^2}\right)\right\}, \left\{y(x) \to \frac{1}{2}\left(\sqrt{e^{2c_1} - 4x^2} + e^{c_1}\right)\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 33

$$\left\{-\ln\left(\frac{x^2 + (y(x))^2}{x^2}\right) + \ln\left(\frac{y(x)}{x}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(x^2 - y[x]^2)*y'[x] == 2*x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^C[1] - Sqrt[E^(2*C[1]) - 4*x^2])/2}, {y[x] -> (E^C[1] + Sqrt[E^(2*C
[1]) - 4*x^2])/2}}
```

Maple raw input

```
dsolve((x^2-y(x)^2)*diff(y(x),x) = 2*x*y(x), y(x),'implicit')
```

Maple raw output

```
-ln((x^2+y(x)^2)/x^2)+ln(y(x)/x)-ln(x)-_C1 = 0
```

4.604 $(x^2 - y(x)^2)\,y'(x) + x(2y(x) + x) = 0$

ODE

$$(x^2 - y(x)^2)\,y'(x) + x(2y(x) + x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, _dAlembert]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.602625 (sec), leaf count = 359

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{\sqrt{2e^{3c_1}x^3 + e^{6c_1} - 3x^6} + e^{3c_1} + x^3}}{\sqrt[3]{2}} + \frac{\sqrt[3]{2}x^2}{\sqrt[3]{\sqrt{2e^{3c_1}x^3 + e^{6c_1} - 3x^6} + e^{3c_1} + x^3}}\right\}, \left\{y(x) \to \frac{i\left(\sqrt[3]{2}(\sqrt{3}+i)\left(\sqrt{\right.\right.\right.}\right.$$

Maple ✓
cpu = 0.013 (sec), leaf count = 35

$$\left\{-\frac{1}{3}\ln\left(\frac{-x^3 - 3\,x^2 y(x) + (y(x))^3}{x^3}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*(x + 2*y[x]) + (x^2 - y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2^(1/3)*x^2)/(E^(3*C[1]) + x^3 + Sqrt[E^(6*C[1]) + 2*E^(3*C[1])*x^3 -
  3*x^6])^(1/3) + (E^(3*C[1]) + x^3 + Sqrt[E^(6*C[1]) + 2*E^(3*C[1])*x^3 - 3*x^6]
)^(1/3)/2^(1/3)}, {y[x] -> ((I/2)*(-2*(-I + Sqrt[3])*x^2 + 2^(1/3)*(I + Sqrt[3])
*(E^(3*C[1]) + x^3 + Sqrt[E^(6*C[1]) + 2*E^(3*C[1])*x^3 - 3*x^6])^(2/3)))/(2^(2/
3)*(E^(3*C[1]) + x^3 + Sqrt[E^(6*C[1]) + 2*E^(3*C[1])*x^3 - 3*x^6])^(1/3))}, {y[
x] -> ((2*I)*(I + Sqrt[3])*x^2 + 2^(1/3)*(-1 - I*Sqrt[3])*(E^(3*C[1]) + x^3 + Sq
rt[E^(6*C[1]) + 2*E^(3*C[1])*x^3 - 3*x^6])^(2/3))/(2*2^(2/3)*(E^(3*C[1]) + x^3 +
  Sqrt[E^(6*C[1]) + 2*E^(3*C[1])*x^3 - 3*x^6])^(1/3))}}
```

Maple raw input

```
dsolve((x^2-y(x)^2)*diff(y(x),x)+x*(x+2*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
-1/3*ln((-x^3-3*x^2*y(x)+y(x)^3)/x^3)-ln(x)-_C1 = 0
```

4.605 $(x^2+y(x)^2)\,y'(x)+2x(y(x)+2x)=0$

ODE

$$(x^2+y(x)^2)\,y'(x)+2x(y(x)+2x)=0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, _dAlembert]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.226608 (sec), leaf count = 372

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{\sqrt{-8e^{3c_1}x^3+e^{6c_1}+20x^6}+e^{3c_1}-4x^3}}{\sqrt[3]{2}}-\frac{\sqrt[3]{2}x^2}{\sqrt[3]{\sqrt{-8e^{3c_1}x^3+e^{6c_1}+20x^6}+e^{3c_1}-4x^3}}\right\},\left\{y(x)\to \frac{i\sqrt[3]{2}(\sqrt{3}+\right.$$

Maple ✓
cpu = 0.013 (sec), leaf count = 35

$$\left\{-\frac{1}{3}\ln\left(\frac{4x^3+3x^2y(x)+(y(x))^3}{x^3}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*x*(2*x + y[x]) + (x^2 + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((2^(1/3)*x^2)/(E^(3*C[1]) - 4*x^3 + Sqrt[E^(6*C[1]) - 8*E^(3*C[1])*x
^3 + 20*x^6])^(1/3)) + (E^(3*C[1]) - 4*x^3 + Sqrt[E^(6*C[1]) - 8*E^(3*C[1])*x^3
 + 20*x^6])^(1/3)/2^(1/3)}, {y[x] -> ((2 + (2*I)*Sqrt[3])*x^2 + I*2^(1/3)*(I + Sq
rt[3])*(E^(3*C[1]) - 4*x^3 + Sqrt[E^(6*C[1]) - 8*E^(3*C[1])*x^3 + 20*x^6])^(2/3)
)/(2*2^(2/3)*(E^(3*C[1]) - 4*x^3 + Sqrt[E^(6*C[1]) - 8*E^(3*C[1])*x^3 + 20*x^6])
^(1/3))}, {y[x] -> ((1 - I*Sqrt[3])*x^2)/(2^(2/3)*(E^(3*C[1]) - 4*x^3 + Sqrt[E^(
6*C[1]) - 8*E^(3*C[1])*x^3 + 20*x^6])^(1/3)) - ((1 + I*Sqrt[3])*(E^(3*C[1]) - 4*
x^3 + Sqrt[E^(6*C[1]) - 8*E^(3*C[1])*x^3 + 20*x^6])^(1/3))/(2*2^(1/3))}}
```

Maple raw input

```
dsolve((x^2+y(x)^2)*diff(y(x),x)+2*x*(2*x+y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
-1/3*ln((4*x^3+3*x^2*y(x)+y(x)^3)/x^3)-ln(x)-_C1 = 0
```

4.606 $(-x^2+y(x)^2+1)\,y'(x)=x^2-y(x)^2+1$

ODE

$$(-x^2+y(x)^2+1)\,y'(x)=x^2-y(x)^2+1$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 1.64239 (sec), leaf count = 25

$$\text{Solve}\left[e^{\frac{1}{2}(y(x)+x)^2}(x-y(x))=c_1,y(x)\right]$$

Maple ✓
cpu = 0.037 (sec), leaf count = 29

$$\left\{\frac{(y(x))^2}{2}+xy(x)+\ln(y(x)-x)+\frac{x^2}{2}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(1 - x^2 + y[x]^2)*y'[x] == 1 + x^2 - y[x]^2,y[x],x]
```

Mathematica raw output

```
Solve[E^((x + y[x])^2/2)*(x - y[x]) == C[1], y[x]]
```

Maple raw input

```
dsolve((1-x^2+y(x)^2)*diff(y(x),x) = 1+x^2-y(x)^2, y(x),'implicit')
```

Maple raw output

```
1/2*y(x)^2+x*y(x)+ln(y(x)-x)+1/2*x^2-_C1 = 0
```

4.607 $(a^2+x^2+y(x)^2)\,y'(x)+2xy(x)=0$

ODE

$$(a^2+x^2+y(x)^2)\,y'(x)+2xy(x)=0$$

ODE Classification

[_exact, _rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0178541 (sec), leaf count = 312

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{2}\left(\sqrt{4\left(a^2+x^2\right)^3+9c_1^2}+3c_1\right)^{2/3}-2a^2-2x^2}{2^{2/3}\sqrt[3]{\sqrt{4\left(a^2+x^2\right)^3+9c_1^2}+3c_1}}\right\},\left\{y(x)\to \frac{\left(1+i\sqrt{3}\right)\left(a^2+x^2\right)}{2^{2/3}\sqrt[3]{\sqrt{4\left(a^2+x^2\right)^3+9c_1^2}+3c_1}}+\frac{i(\sqrt{3}+i)\sqrt[3]{}}{}\right.$$

Maple ✓
cpu = 0.015 (sec), leaf count = 23

$$\left\{x^2y(x)+a^2y(x)+\frac{(y(x))^3}{3}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*x*y[x] + (a^2 + x^2 + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*a^2 - 2*x^2 + 2^(1/3)*(3*C[1] + Sqrt[4*(a^2 + x^2)^3 + 9*C[1]^2])^
(2/3))/(2^(2/3)*(3*C[1] + Sqrt[4*(a^2 + x^2)^3 + 9*C[1]^2])^(1/3))}, {y[x] -> ((
1 + I*Sqrt[3])*(a^2 + x^2))/(2^(2/3)*(3*C[1] + Sqrt[4*(a^2 + x^2)^3 + 9*C[1]^2])
^(1/3)) + ((I/2)*(I + Sqrt[3])*(3*C[1] + Sqrt[4*(a^2 + x^2)^3 + 9*C[1]^2])^(1/3)
)/2^(1/3)}, {y[x] -> ((1 - I*Sqrt[3])*(a^2 + x^2))/(2^(2/3)*(3*C[1] + Sqrt[4*(a^
2 + x^2)^3 + 9*C[1]^2])^(1/3)) - ((I/2)*(-I + Sqrt[3])*(3*C[1] + Sqrt[4*(a^2 + x
^2)^3 + 9*C[1]^2])^(1/3))/2^(1/3)}}
```

Maple raw input

```
dsolve((a^2+x^2+y(x)^2)*diff(y(x),x)+2*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x^2*y(x)+a^2*y(x)+1/3*y(x)^3+_C1 = 0
```

4.608 $\left(a^2+x^2+y(x)^2\right)y'(x)+b^2+x^2+2xy(x)=0$

ODE

$$\left(a^2+x^2+y(x)^2\right)y'(x)+b^2+x^2+2xy(x)=0$$

ODE Classification

[_exact, _rational]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0293924 (sec), leaf count = 438

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{2}\left(\sqrt{4\left(a^2+x^2\right)^3+\left(3b^2x-3c_1+x^3\right)^2}-3b^2x+3c_1-x^3\right)^{2/3}-2a^2-2x^2}{2^{2/3}\sqrt[3]{\sqrt{4\left(a^2+x^2\right)^3+\left(3b^2x-3c_1+x^3\right)^2}-3b^2x+3c_1-x^3}}\right\},\left\{y(x)\to \frac{}{2^{2/3}\sqrt[3]{\sqrt{4\left(a^2+x^2\right.}}\right.$$

Maple ✓
cpu = 0.021 (sec), leaf count = 33

$$\left\{b^2x+\frac{x^3}{3}+x^2y(x)+a^2y(x)+\frac{(y(x))^3}{3}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[b^2 + x^2 + 2*x*y[x] + (a^2 + x^2 + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*a^2 - 2*x^2 + 2^(1/3)*(-3*b^2*x - x^3 + Sqrt[4*(a^2 + x^2)^3 + (3*
b^2*x + x^3 - 3*C[1])^2] + 3*C[1])^(2/3))/(2^(2/3)*(-3*b^2*x - x^3 + Sqrt[4*(a^2
 + x^2)^3 + (3*b^2*x + x^3 - 3*C[1])^2] + 3*C[1])^(1/3))}, {y[x] -> ((1 + I*Sqrt
[3])*(a^2 + x^2))/(2^(2/3)*(-3*b^2*x - x^3 + Sqrt[4*(a^2 + x^2)^3 + (3*b^2*x + x
^3 - 3*C[1])^2] + 3*C[1])^(1/3)) + ((I/2)*(I + Sqrt[3])*(-3*b^2*x - x^3 + Sqrt[4
*(a^2 + x^2)^3 + (3*b^2*x + x^3 - 3*C[1])^2] + 3*C[1])^(1/3))/2^(1/3)}, {y[x] ->
  ((1 - I*Sqrt[3])*(a^2 + x^2))/(2^(2/3)*(-3*b^2*x - x^3 + Sqrt[4*(a^2 + x^2)^3 +
  (3*b^2*x + x^3 - 3*C[1])^2] + 3*C[1])^(1/3)) - ((I/2)*(-I + Sqrt[3])*(-3*b^2*x
- x^3 + Sqrt[4*(a^2 + x^2)^3 + (3*b^2*x + x^3 - 3*C[1])^2] + 3*C[1])^(1/3))/2^(1
/3)}}
```

Maple raw input

```
dsolve((a^2+x^2+y(x)^2)*diff(y(x),x)+b^2+x^2+2*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
b^2*x+1/3*x^3+x^2*y(x)+a^2*y(x)+1/3*y(x)^3+_C1 = 0
```

4.609 $(x^2+y(x)^2+x)\,y'(x)=y(x)$

ODE

$$(x^2+y(x)^2+x)\,y'(x)=y(x)$$

ODE Classification

[_rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0252563 (sec), leaf count = 16

$$\text{Solve}\left[c_1+\tan^{-1}\left(\frac{x}{y(x)}\right)=y(x),y(x)\right]$$

Maple ✓
cpu = 0.046 (sec), leaf count = 31

$$\left\{\_C1-\frac{\mathrm{e}^{-2\,iy(x)}(ix+y(x))}{2\,iy\,(x)+2\,x}=0\right\}$$

Mathematica raw input

```
DSolve[(x + x^2 + y[x]^2)*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
Solve[ArcTan[x/y[x]] + C[1] == y[x], y[x]]
```

Maple raw input

```
dsolve((x+x^2+y(x)^2)*diff(y(x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
_C1-exp(-2*I*y(x))*(I*x+y(x))/(2*I*y(x)+2*x) = 0
```

4.610 $(3x^2 - y(x)^2)\, y'(x) = 2xy(x)$

ODE

$$(3x^2 - y(x)^2)\, y'(x) = 2xy(x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.178843 (sec), leaf count = 458

$$\left\{\left\{y(x) \to \frac{1}{3}\left(\frac{\sqrt[3]{27e^{c_1}x^2 + 3\sqrt{81e^{2c_1}x^4 - 12e^{4c_1}x^2} - 2e^{3c_1}}}{\sqrt[3]{2}} + \frac{\sqrt[3]{2}e^{2c_1}}{\sqrt[3]{27e^{c_1}x^2 + 3\sqrt{81e^{2c_1}x^4 - 12e^{4c_1}x^2} - 2e^{3c_1}}} - e^{c_1}\right)\right\}, \left\{y\right.$$

Maple ✓
cpu = 0.025 (sec), leaf count = 40

$$\left\{\ln\left(\frac{y(x) - x}{x}\right) + \ln\left(\frac{x + y(x)}{x}\right) - 3\ln\left(\frac{y(x)}{x}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(3*x^2 - y[x]^2)*y'[x] == 2*x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-E^C[1] + (2^(1/3)*E^(2*C[1]))/(-2*E^(3*C[1]) + 27*E^C[1]*x^2 + 3*Sqr
t[-12*E^(4*C[1])*x^2 + 81*E^(2*C[1])*x^4])^(1/3) + (-2*E^(3*C[1]) + 27*E^C[1]*x^
2 + 3*Sqrt[-12*E^(4*C[1])*x^2 + 81*E^(2*C[1])*x^4])^(1/3)/2^(1/3))/3}, {y[x] ->
-E^C[1]/3 - ((I/3)*(-I + Sqrt[3])*E^(2*C[1]))/(2^(2/3)*(-2*E^(3*C[1]) + 27*E^C[1
]*x^2 + 3*Sqrt[-12*E^(4*C[1])*x^2 + 81*E^(2*C[1])*x^4])^(1/3)) + ((I/6)*(I + Sqr
t[3])*(-2*E^(3*C[1]) + 27*E^C[1]*x^2 + 3*Sqrt[-12*E^(4*C[1])*x^2 + 81*E^(2*C[1])
*x^4])^(1/3))/2^(1/3)}, {y[x] -> -E^C[1]/3 + ((I/3)*(I + Sqrt[3])*E^(2*C[1]))/(2
^(2/3)*(-2*E^(3*C[1]) + 27*E^C[1]*x^2 + 3*Sqrt[-12*E^(4*C[1])*x^2 + 81*E^(2*C[1]
)*x^4])^(1/3)) - ((I/6)*(-I + Sqrt[3])*(-2*E^(3*C[1]) + 27*E^C[1]*x^2 + 3*Sqrt[-
12*E^(4*C[1])*x^2 + 81*E^(2*C[1])*x^4])^(1/3))/2^(1/3)}}
```

Maple raw input

```
dsolve((3*x^2-y(x)^2)*diff(y(x),x) = 2*x*y(x), y(x),'implicit')
```

Maple raw output

```
ln((y(x)-x)/x)+ln((x+y(x))/x)-3*ln(y(x)/x)-ln(x)-_C1 = 0
```

4.611 $(x^4 + y(x)^2)\, y'(x) = 4x^3 y(x)$

ODE

$$(x^4 + y(x)^2)\, y'(x) = 4x^3 y(x)$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0127836 (sec), leaf count = 53

$$\left\{\left\{y(x) \to \frac{1}{2}\left(c_1 - \sqrt{c_1^2 + 4x^4}\right)\right\}, \left\{y(x) \to \frac{1}{2}\left(\sqrt{c_1^2 + 4x^4} + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.027 (sec), leaf count = 46

$$\left\{\ln(x) - \_C1 + \frac{1}{2}\ln\left(\frac{-x^2 + y(x)}{x^2}\right) + \frac{1}{2}\ln\left(\frac{x^2 + y(x)}{x^2}\right) - \frac{1}{2}\ln\left(\frac{y(x)}{x^2}\right) = 0\right\}$$

Mathematica raw input

```
DSolve[(x^4 + y[x]^2)*y'[x] == 4*x^3*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] - Sqrt[4*x^4 + C[1]^2])/2}, {y[x] -> (C[1] + Sqrt[4*x^4 + C[1]^2
])/2}}
```

Maple raw input

```
dsolve((x^4+y(x)^2)*diff(y(x),x) = 4*x^3*y(x), y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+1/2*ln((-x^2+y(x))/x^2)+1/2*ln((x^2+y(x))/x^2)-1/2*ln(y(x)/x^2) = 0
```

4.612 $y(x)(y(x)+1)y'(x) = x(x+1)$

ODE

$$y(x)(y(x)+1)y'(x) = x(x+1)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0157604 (sec), leaf count = 346

$$\left\{\left\{y(x) \to \frac{1}{2}\left(\sqrt[3]{\sqrt{(12c_1+4x^3+6x^2-1)^2-1}+12c_1+4x^3+6x^2-1}+\frac{1}{\sqrt[3]{\sqrt{(12c_1+4x^3+6x^2-1)^2-1}+12c_1+4x^3}}\right.\right.$$

Maple ✓
cpu = 0.008 (sec), leaf count = 27

$$\left\{\frac{x^3}{3}+\frac{x^2}{2}-\frac{(y(x))^3}{3}-\frac{(y(x))^2}{2}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 + y[x])*y'[x] == x*(1 + x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + (-1 + 6*x^2 + 4*x^3 + 12*C[1] + Sqrt[-1 + (-1 + 6*x^2 + 4*x^3 +
12*C[1])^2])^(-1/3) + (-1 + 6*x^2 + 4*x^3 + 12*C[1] + Sqrt[-1 + (-1 + 6*x^2 + 4*
x^3 + 12*C[1])^2])^(1/3))/2}, {y[x] -> (-4 + (-2 - (2*I)*Sqrt[3])/(-1 + 6*x^2 +
4*x^3 + 12*C[1] + Sqrt[-1 + (-1 + 6*x^2 + 4*x^3 + 12*C[1])^2])^(1/3) + (2*I)*(I
+ Sqrt[3])*(-1 + 6*x^2 + 4*x^3 + 12*C[1] + Sqrt[-1 + (-1 + 6*x^2 + 4*x^3 + 12*C[
1])^2])^(1/3))/8}, {y[x] -> (-4 + ((2*I)*(I + Sqrt[3]))/(-1 + 6*x^2 + 4*x^3 + 12
*C[1] + Sqrt[-1 + (-1 + 6*x^2 + 4*x^3 + 12*C[1])^2])^(1/3) - 2*(1 + I*Sqrt[3])*(
-1 + 6*x^2 + 4*x^3 + 12*C[1] + Sqrt[-1 + (-1 + 6*x^2 + 4*x^3 + 12*C[1])^2])^(1/3
))/8}}
```

Maple raw input

```
dsolve(y(x)*(1+y(x))*diff(y(x),x) = (1+x)*x, y(x),'implicit')
```

Maple raw output

```
1/3*x^3+1/2*x^2-1/3*y(x)^3-1/2*y(x)^2+_C1 = 0
```

4.613 $(y(x)^2+2y(x)+x)\,y'(x)+y(x)^2(y(x)+x)^2+y(x)(y(x)+1)=0$

ODE

$$(y(x)^2+2y(x)+x)\,y'(x)+y(x)^2(y(x)+x)^2+y(x)(y(x)+1)=0$$

ODE Classification

[_rational]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 3.35184 (sec), leaf count = 106

$$\left\{\left\{y(x)\to -\frac{\sqrt{(c_1x-x^2+1)^2+4(x-c_1)}-c_1x+x^2-1}{2(x-c_1)}\right\},\left\{y(x)\to \frac{\sqrt{(c_1x-x^2+1)^2+4(x-c_1)}+c_1x-x^2+1}{2(x-c_1)}\right\}\right\}$$

Maple ✓
cpu = 0.183 (sec), leaf count = 25

$$\left\{\_C1+(x+y(x))^{-1}-x+\frac{1}{(x+y(x))\,y(x)}=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 + y[x]) + y[x]^2*(x + y[x])^2 + (x + 2*y[x] + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(-1 + x^2 - x*C[1] + Sqrt[4*(x - C[1]) + (1 - x^2 + x*C[1])^2])/(2*(x
 - C[1]))}, {y[x] -> (1 - x^2 + x*C[1] + Sqrt[4*(x - C[1]) + (1 - x^2 + x*C[1])^
2])/(2*(x - C[1]))}}
```

Maple raw input

```
dsolve((x+2*y(x)+y(x)^2)*diff(y(x),x)+y(x)*(1+y(x))+(x+y(x))^2*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
_C1+1/(x+y(x))-x+1/y(x)/(x+y(x)) = 0
```

4.614 $(x^2+y(x)^2+2y(x))\,y'(x)+2x=0$

ODE

$$(x^2+y(x)^2+2y(x))\,y'(x)+2x=0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0522379 (sec), leaf count = 19

$$\text{Solve}\left[e^{y(x)}\left(x^2+y(x)^2\right)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.016 (sec), leaf count = 17

$$\left\{\left(x^2+(y(x))^2\right)\mathrm{e}^{y(x)}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*x + (x^2 + 2*y[x] + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[E^y[x]*(x^2 + y[x]^2) == C[1], y[x]]
```

Maple raw input

```
dsolve((x^2+2*y(x)+y(x)^2)*diff(y(x),x)+2*x = 0, y(x),'implicit')
```

Maple raw output

```
(x^2+y(x)^2)*exp(y(x))+_C1 = 0
```

4.615 $(x^3 - y(x)^2 + 2y(x))\,y'(x) + 3x^2 y(x) = 0$

ODE

$$(x^3 - y(x)^2 + 2y(x))\,y'(x) + 3x^2 y(x) = 0$$

ODE Classification

[_exact , _rational , [_1st_order , `_with_symmetry_[F(x)*G(y) ,0] `]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0197385 (sec), leaf count = 414

$$\left\{\left\{y(x) \to \frac{1}{18}\left(-\frac{18\sqrt[3]{2}(x^3+1)}{\sqrt[3]{\sqrt{-18c_1x^3+3c_1\,(3c_1-4)-4x^9-3x^6+3c_1-3x^3-2}}} - 9\ 2^{2/3}\sqrt[3]{\sqrt{-18c_1x^3+3c_1\,(3c_1-4)-4x^9}\right.\right.\right.$$

Maple ✓
cpu = 0.013 (sec), leaf count = 21

$$\left\{x^3 y(x) - \frac{(y(x))^3}{3} + (y(x))^2 + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[3*x^2*y[x] + (x^3 + 2*y[x] - y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (18 - (18*2^(1/3)*(1 + x^3))/(-2 - 3*x^3 + 3*C[1] + Sqrt[-3*x^6 - 4*x^
9 - 18*x^3*C[1] + 3*C[1]*(-4 + 3*C[1])])^(1/3) - 9*2^(2/3)*(-2 - 3*x^3 + 3*C[1]
+ Sqrt[-3*x^6 - 4*x^9 - 18*x^3*C[1] + 3*C[1]*(-4 + 3*C[1])])^(1/3))/18}, {y[x] -
> (36 + (18*2^(1/3)*(1 + I*Sqrt[3])*(1 + x^3))/(-2 - 3*x^3 + 3*C[1] + Sqrt[-3*x^
6 - 4*x^9 - 18*x^3*C[1] + 3*C[1]*(-4 + 3*C[1])])^(1/3) + 9*2^(2/3)*(1 - I*Sqrt[3
])*(-2 - 3*x^3 + 3*C[1] + Sqrt[-3*x^6 - 4*x^9 - 18*x^3*C[1] + 3*C[1]*(-4 + 3*C[1
])])^(1/3))/36}, {y[x] -> (36 + (18*2^(1/3)*(1 - I*Sqrt[3])*(1 + x^3))/(-2 - 3*x
^3 + 3*C[1] + Sqrt[-3*x^6 - 4*x^9 - 18*x^3*C[1] + 3*C[1]*(-4 + 3*C[1])])^(1/3) +
 9*2^(2/3)*(1 + I*Sqrt[3])*(-2 - 3*x^3 + 3*C[1] + Sqrt[-3*x^6 - 4*x^9 - 18*x^3*C
[1] + 3*C[1]*(-4 + 3*C[1])])^(1/3))/36}}
```

Maple raw input

```
dsolve((x^3+2*y(x)-y(x)^2)*diff(y(x),x)+3*x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x^3*y(x)-1/3*y(x)^3+y(x)^2+_C1 = 0
```

4.616 $(y(x)^2 + xy(x) + y(x) + 1)\, y'(x) + y(x) + 1 = 0$

ODE

$$(y(x)^2 + xy(x) + y(x) + 1)\, y'(x) + y(x) + 1 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0654704 (sec), leaf count = 21

$$\text{Solve}\left[y(x) + x = c_1 e^{-y(x)}(y(x) + 1), y(x)\right]$$

Maple ✓
cpu = 0.014 (sec), leaf count = 25

$$\left\{\left(y(x)\, \mathrm{e}^{y(x)} - \_C1\, (1 + y(x))\right) \mathrm{e}^{-y(x)} + x = 0\right\}$$

Mathematica raw input

```
DSolve[1 + y[x] + (1 + y[x] + x*y[x] + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[x + y[x] == (C[1]*(1 + y[x]))/E^y[x], y[x]]
```

Maple raw input

```
dsolve((1+y(x)+x*y(x)+y(x)^2)*diff(y(x),x)+1+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
(y(x)*exp(y(x))-_C1*(1+y(x)))*exp(-y(x))+x = 0
```

4.617 $(y(x)+x)^2 y'(x) = a^2$

ODE

$$(y(x)+x)^2 y'(x) = a^2$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
Equation linear in the variables, $y'(x) = f(a+bx+cy(x))$

Mathematica ✓
cpu = 0.038709 (sec), leaf count = 20

$$\text{Solve}\left[a \tan^{-1}\left(\frac{y(x)+x}{a}\right) + c_1 = y(x), y(x)\right]$$

Maple ✓
cpu = 0.026 (sec), leaf count = 22

$$\left\{a \arctan\left(\frac{x+y(x)}{a}\right) - y(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(x + y[x])^2*y'[x] == a^2,y[x],x]
```

Mathematica raw output

```
Solve[a*ArcTan[(x + y[x])/a] + C[1] == y[x], y[x]]
```

Maple raw input

```
dsolve((x+y(x))^2*diff(y(x),x) = a^2, y(x),'implicit')
```

Maple raw output

```
a*arctan((x+y(x))/a)-y(x)-_C1 = 0
```

4.618 $(x - y(x))^2 y'(x) = a^2$

ODE

$$(x - y(x))^2 y'(x) = a^2$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
Equation linear in the variables, $y'(x) = f(a + bx + cy(x))$

Mathematica ✓
cpu = 0.113989 (sec), leaf count = 35

$$\text{Solve}[a \log(a - y(x) + x) + 2c_1 + 2y(x) = a \log(-a - y(x) + x), y(x)]$$

Maple ✓
cpu = 0.033 (sec), leaf count = 33

$$\left\{ y(x) - \frac{a \ln(y(x) - x + a)}{2} + \frac{a \ln(y(x) - x - a)}{2} - \_C1 = 0 \right\}$$

Mathematica raw input

```
DSolve[(x - y[x])^2*y'[x] == a^2,y[x],x]
```

Mathematica raw output

```
Solve[2*C[1] + a*Log[a + x - y[x]] + 2*y[x] == a*Log[-a + x - y[x]], y[x]]
```

Maple raw input

```
dsolve((x-y(x))^2*diff(y(x),x) = a^2, y(x),'implicit')
```

Maple raw output

```
y(x)-1/2*a*ln(y(x)-x+a)+1/2*a*ln(y(x)-x-a)-_C1 = 0
```

4.619 $(x^2+2xy(x)-y(x)^2)\,y'(x)+x^2-2xy(x)+y(x)^2=0$

ODE

$$(x^2+2xy(x)-y(x)^2)\,y'(x)+x^2-2xy(x)+y(x)^2=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0366941 (sec), leaf count = 89

$$\text{Solve}\left[c_1=\text{RootSum}\left[\#1^3-3\#1^2+\#1-1\&,\frac{\#1^2\log\left(\frac{y(x)}{x}-\#1\right)-2\#1\log\left(\frac{y(x)}{x}-\#1\right)-\log\left(\frac{y(x)}{x}-\#1\right)}{3\#1^2-6\#1+1}\&\right]+\log(x\right.$$

Maple ✓
cpu = 0.016 (sec), leaf count = 40

$$\left\{-\_C1+\int^{\frac{y(x)}{x}}\frac{\_a^2-2\_a-1}{\_a^3-3\_a^2+\_a-1}d\_a+\ln(x)=0\right\}$$

Mathematica raw input

```
DSolve[x^2 - 2*x*y[x] + y[x]^2 + (x^2 + 2*x*y[x] - y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] == Log[x] + RootSum[-1 + #1 - 3*#1^2 + #1^3 & , (-Log[-#1 + y[x]/x] -
 2*Log[-#1 + y[x]/x]*#1 + Log[-#1 + y[x]/x]*#1^2)/(1 - 6*#1 + 3*#1^2) & ], y[x]]
```

Maple raw input

```
dsolve((x^2+2*x*y(x)-y(x)^2)*diff(y(x),x)+x^2-2*x*y(x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-_C1+Intat(1/(_a^3-3*_a^2+_a-1)*(_a^2-2*_a-1),_a = y(x)/x)+ln(x) = 0
```

4.620 $(x-y(x))^2 y'(x) = (-y(x)+x+1)^2$

ODE

$$(x-y(x))^2 y'(x) = (-y(x)+x+1)^2$$

ODE Classification

[[_homogeneous, `class C`], _rational, _dAlembert]

Book solution method
Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.785482 (sec), leaf count = 45

$$\text{Solve}\left[16c_1 + 4x^2 + 4y(x)^2 + 4y(x) + 2\log(-2y(x)+2x+1) + 12x + 5 = 8xy(x), y(x)\right]$$

Maple ✓
cpu = 0.026 (sec), leaf count = 42

$$\left\{\frac{\ln(2y(x)-2x-1)}{8} + \frac{(y(x))^2}{4} + \frac{(-4x+2)y(x)}{8} + \frac{x^2}{4} + \frac{3x}{4} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(x - y[x])^2*y'[x] == (1 + x - y[x])^2,y[x],x]
```

Mathematica raw output

```
Solve[5 + 12*x + 4*x^2 + 16*C[1] + 2*Log[1 + 2*x - 2*y[x]] + 4*y[x] + 4*y[x]^2 =
= 8*x*y[x], y[x]]
```

Maple raw input

```
dsolve((x-y(x))^2*diff(y(x),x) = (1+x-y(x))^2, y(x),'implicit')
```

Maple raw output

```
1/8*ln(2*y(x)-2*x-1)+1/4*y(x)^2+1/8*(-4*x+2)*y(x)+1/4*x^2+3/4*x-_C1 = 0
```

4.621 $(y(x)+x)^2 y'(x) = (y(x)+x+2)^2$

ODE

$$(y(x)+x)^2 y'(x) = (y(x)+x+2)^2$$

ODE Classification

[[_homogeneous, `class C`], _rational, _dAlembert]

Book solution method
Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.10943 (sec), leaf count = 27

$$\text{Solve}\left[c_1 + \log\left((y(x)+x+2)^2 - 2(y(x)+x+2)+2\right) + x = y(x), y(x)\right]$$

Maple ✓
cpu = 0.027 (sec), leaf count = 28

$$\left\{-\_C1 + x - y(x) + \ln\left((x+y(x))^2 + 2x + 2y(x) + 2\right) = 0\right\}$$

Mathematica raw input

```
DSolve[(x + y[x])^2*y'[x] == (2 + x + y[x])^2,y[x],x]
```

Mathematica raw output

```
Solve[x + C[1] + Log[2 - 2*(2 + x + y[x]) + (2 + x + y[x])^2] == y[x], y[x]]
```

Maple raw input

```
dsolve((x+y(x))^2*diff(y(x),x) = (2+x+y(x))^2, y(x),'implicit')
```

Maple raw output

```
-_C1+x-y(x)+ln((x+y(x))^2+2*x+2*y(x)+2) = 0
```

4.622 $(y(x)+x)^2 y'(x) = x^2 - 2xy(x) + 5y(x)^2$

ODE

$$(y(x)+x)^2 y'(x) = x^2 - 2xy(x) + 5y(x)^2$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.252843 (sec), leaf count = 35

$$\text{Solve}\left[\frac{2x(x-2y(x))}{(x-y(x))^2} + \log\left(\frac{y(x)}{x} - 1\right) + \log(x) = c_1, y(x)\right]$$

Maple ✓
cpu = 0.02 (sec), leaf count = 68

$$\left\{\frac{1}{(x-y(x))^2}\left((x-y(x))^2 \ln\left(\frac{y(x)-x}{x}\right) + (-\_C1 + \ln(x))(y(x))^2 + 2x(\_C1 - \ln(x) - 2)y(x) - x^2(\_C1 - \ln(x) - 2\right.\right.$$

Mathematica raw input

```
DSolve[(x + y[x])^2*y'[x] == x^2 - 2*x*y[x] + 5*y[x]^2,y[x],x]
```

Mathematica raw output

```
Solve[Log[x] + Log[-1 + y[x]/x] + (2*x*(x - 2*y[x]))/(x - y[x])^2 == C[1], y[x]]
```

Maple raw input

```
dsolve((x+y(x))^2*diff(y(x),x) = x^2-2*x*y(x)+5*y(x)^2, y(x),'implicit')
```

Maple raw output

```
((x-y(x))^2*ln((y(x)-x)/x)+(-_C1+ln(x))*y(x)^2+2*x*(_C1-ln(x)-2)*y(x)-x^2*(_C1-l
n(x)-2))/(x-y(x))^2 = 0
```

4.623 $y'(x)(a+b+y(x)+x)^2 = 2(a+y(x))^2$

ODE

$$y'(x)(a+b+y(x)+x)^2 = 2(a+y(x))^2$$

ODE Classification

[[_homogeneous, `class C`], _rational]

Book solution method
Equation linear in the variables, $y'(x) = f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.0873864 (sec), leaf count = 25

$$\text{Solve}\left[2\tan^{-1}\left(\frac{b+x}{a+y(x)}\right) + c_1 = \log(a+y(x)), y(x)\right]$$

Maple ✓
cpu = 0.028 (sec), leaf count = 47

$$\left\{2\arctan\left(\frac{-a-y(x)}{b+x}\right) - \ln\left(\frac{-a-y(x)}{b+x}\right) - \ln(b+x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(a + b + x + y[x])^2*y'[x] == 2*(a + y[x])^2,y[x],x]
```

Mathematica raw output

```
Solve[2*ArcTan[(b + x)/(a + y[x])] + C[1] == Log[a + y[x]], y[x]]
```

Maple raw input

```
dsolve((a+b+x+y(x))^2*diff(y(x),x) = 2*(a+y(x))^2, y(x),'implicit')
```

Maple raw output

```
2*arctan((-a-y(x))/(b+x))-ln((-a-y(x))/(b+x))-ln(b+x)-_C1 = 0
```

4.624 $(2x^2+4xy(x)-y(x)^2)\,y'(x)=x^2-4xy(x)-2y(x)^2$

ODE

$$(2x^2+4xy(x)-y(x)^2)\,y'(x)=x^2-4xy(x)-2y(x)^2$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, _dAlembert]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0341975 (sec), leaf count = 381

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{\sqrt{54e^{3c_1}x^3+e^{6c_1}-135x^6}+e^{3c_1}+27x^3}}{\sqrt[3]{2}}+\frac{6\sqrt[3]{2}x^2}{\sqrt[3]{\sqrt{54e^{3c_1}x^3+e^{6c_1}-135x^6}+e^{3c_1}+27x^3}}+2x\right\},\left\{y(x)\to \frac{i(\right.\right.$$

Maple ✓
cpu = 0.016 (sec), leaf count = 35

$$\left\{-\frac{1}{3}\ln\left(\frac{(x+y(x))\left(x^2-7xy(x)+(y(x))^2\right)}{x^3}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(2*x^2 + 4*x*y[x] - y[x]^2)*y'[x] == x^2 - 4*x*y[x] - 2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*x + (6*2^(1/3)*x^2)/(E^(3*C[1]) + 27*x^3 + Sqrt[E^(6*C[1]) + 54*E^(3
*C[1])*x^3 - 135*x^6])^(1/3) + (E^(3*C[1]) + 27*x^3 + Sqrt[E^(6*C[1]) + 54*E^(3*
C[1])*x^3 - 135*x^6])^(1/3)/2^(1/3)}, {y[x] -> 2*x - (3*2^(1/3)*(1 + I*Sqrt[3])*
x^2)/(E^(3*C[1]) + 27*x^3 + Sqrt[E^(6*C[1]) + 54*E^(3*C[1])*x^3 - 135*x^6])^(1/3
) + ((I/2)*(I + Sqrt[3])*(E^(3*C[1]) + 27*x^3 + Sqrt[E^(6*C[1]) + 54*E^(3*C[1])*
x^3 - 135*x^6])^(1/3))/2^(1/3)}, {y[x] -> 2*x + ((3*I)*2^(1/3)*(I + Sqrt[3])*x^2
)/(E^(3*C[1]) + 27*x^3 + Sqrt[E^(6*C[1]) + 54*E^(3*C[1])*x^3 - 135*x^6])^(1/3) -
 ((1 + I*Sqrt[3])*(E^(3*C[1]) + 27*x^3 + Sqrt[E^(6*C[1]) + 54*E^(3*C[1])*x^3 - 1
35*x^6])^(1/3))/(2*2^(1/3))}}
```

Maple raw input

```
dsolve((2*x^2+4*x*y(x)-y(x)^2)*diff(y(x),x) = x^2-4*x*y(x)-2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-1/3*ln((x+y(x))*(x^2-7*x*y(x)+y(x)^2)/x^3)-ln(x)-_C1 = 0
```

4.625 $(y(x)+3x)^2y'(x)=4y(x)(2y(x)+3x)$

ODE

$$(y(x)+3x)^2y'(x)=4y(x)(2y(x)+3x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0719511 (sec), leaf count = 747

$$\left\{\left\{y(x)\to\frac{1}{4}\left(-\sqrt{12\sqrt[3]{-e^{c_1}x^4\left(e^{c_1}-16x\right)}-16e^{c_1}x+e^{2c_1}+16x^2}-\sqrt{2}\sqrt{-6\sqrt[3]{-e^{c_1}x^4\left(e^{c_1}-16x\right)}+\frac{(e^{c_1}-8x)}{\sqrt{12\sqrt[3]{-e^{c_1}x^4\left(e^{c_1}-\right.}}}}\right.\right.$$

Maple ✓
cpu = 0.027 (sec), leaf count = 44

$$\left\{-3\ln\left(\frac{y(x)-3x}{x}\right)-\ln\left(\frac{x+y(x)}{x}\right)+3\ln\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(3*x + y[x])^2*y'[x] == 4*y[x]*(3*x + 2*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-E^C[1] + 8*x - Sqrt[E^(2*C[1]) - 16*E^C[1]*x + 16*x^2 + 12*(-(E^C[1]
*(E^C[1] - 16*x)*x^4))^(1/3)] - Sqrt[2]*Sqrt[(E^C[1] - 8*x)^2 - 48*x^2 - 6*(-(E^
C[1]*(E^C[1] - 16*x)*x^4))^(1/3) + ((E^C[1] - 8*x)^3 - 72*(E^C[1] - 8*x)*x^2)/Sq
rt[E^(2*C[1]) - 16*E^C[1]*x + 16*x^2 + 12*(-(E^C[1]*(E^C[1] - 16*x)*x^4))^(1/3)]
])/4}, {y[x] -> (-E^C[1] + 8*x - Sqrt[E^(2*C[1]) - 16*E^C[1]*x + 16*x^2 + 12*(-(
E^C[1]*(E^C[1] - 16*x)*x^4))^(1/3)] + Sqrt[2]*Sqrt[(E^C[1] - 8*x)^2 - 48*x^2 - 6
*(-(E^C[1]*(E^C[1] - 16*x)*x^4))^(1/3) + ((E^C[1] - 8*x)^3 - 72*(E^C[1] - 8*x)*x
^2)/Sqrt[E^(2*C[1]) - 16*E^C[1]*x + 16*x^2 + 12*(-(E^C[1]*(E^C[1] - 16*x)*x^4))^
(1/3)]])/4}, {y[x] -> (-E^C[1] + 8*x + Sqrt[E^(2*C[1]) - 16*E^C[1]*x + 16*x^2 +
12*(-(E^C[1]*(E^C[1] - 16*x)*x^4))^(1/3)] - Sqrt[2]*Sqrt[(E^C[1] - 8*x)^2 - 48*x
^2 - 6*(-(E^C[1]*(E^C[1] - 16*x)*x^4))^(1/3) + (-(E^C[1] - 8*x)^3 + 72*(E^C[1] -
 8*x)*x^2)/Sqrt[E^(2*C[1]) - 16*E^C[1]*x + 16*x^2 + 12*(-(E^C[1]*(E^C[1] - 16*x)
*x^4))^(1/3)]])/4}, {y[x] -> (-E^C[1] + 8*x + Sqrt[E^(2*C[1]) - 16*E^C[1]*x + 16
*x^2 + 12*(-(E^C[1]*(E^C[1] - 16*x)*x^4))^(1/3)] + Sqrt[2]*Sqrt[(E^C[1] - 8*x)^2
```

```
 - 48*x^2 - 6*(-(E^C[1]*(E^C[1] - 16*x)*x^4))^(1/3) + (-(E^C[1] - 8*x)^3 + 72*(E
^C[1] - 8*x)*x^2)/Sqrt[E^(2*C[1]) - 16*E^C[1]*x + 16*x^2 + 12*(-(E^C[1]*(E^C[1]
- 16*x)*x^4))^(1/3)]])/4}}
```

Maple raw input

```
dsolve((3*x+y(x))^2*diff(y(x),x) = 4*(3*x+2*y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
-3*ln((y(x)-3*x)/x)-ln((x+y(x))/x)+3*ln(y(x)/x)-ln(x)-_C1 = 0
```

4.626 $(-y(x)-3x+1)^2y'(x)=(-4y(x)-6x+3)(1-2y(x))$

ODE

$$(-y(x)-3x+1)^2y'(x)=(-4y(x)-6x+3)(1-2y(x))$$

ODE Classification

[[_homogeneous, `class C`], _rational]

Book solution method
Change of Variable, Two new variables

Mathematica ✓
cpu = 0.217348 (sec), leaf count = 1089

$$\left\{\left\{y(x)\to \frac{1}{6}\left(12x+4e^{c_1}-\sqrt{36x^2-12x+16e^{2c_1}+16e^{c_1}(6x-1)+3\ 2^{2/3}\sqrt[3]{-e^{c_1}(6x-1)^4\left(6x+e^{c_1}-1\right)}+1}-\frac{1}{2}\sqrt{8\,(1\right.\right.\right.$$

Maple ✓
cpu = 0.039 (sec), leaf count = 71

$$\left\{-\ln\left(\frac{4-6\,y(x)-6\,x}{6\,x-1}\right)-3\,\ln\left(\frac{18\,x-6\,y(x)}{6\,x-1}\right)+3\,\ln\left(\frac{3-6\,y(x)}{6\,x-1}\right)-\ln\left(6\,x-1\right)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(1 - 3*x - y[x])^2*y'[x] == (3 - 6*x - 4*y[x])*(1 - 2*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + 4*E^C[1] + 12*x - Sqrt[1 + 16*E^(2*C[1]) - 12*x + 36*x^2 + 16*E^C
[1]*(-1 + 6*x) + 3*2^(2/3)*(-(E^C[1]*(-1 + 6*x)^4*(-1 + E^C[1] + 6*x)))^(1/3)] -
  Sqrt[-12*2^(2/3)*(-(E^C[1]*(-1 + 6*x)^4*(-1 + E^C[1] + 6*x)))^(1/3) + 8*(1 + 4*
E^C[1] + 12*x)^2 - 96*(2*E^C[1] + 3*x*(1 + 3*x)) - (8*(64*E^(3*C[1]) + 30*E^C[1]
*(1 - 6*x)^2 + 96*E^(2*C[1])*(-1 + 6*x) - (-1 + 6*x)^3))/Sqrt[1 + 16*E^(2*C[1])
- 12*x + 36*x^2 + 16*E^C[1]*(-1 + 6*x) + 3*2^(2/3)*(-(E^C[1]*(-1 + 6*x)^4*(-1 +
E^C[1] + 6*x)))^(1/3)]]/2)/6}, {y[x] -> (1 + 4*E^C[1] + 12*x - Sqrt[1 + 16*E^(2*
C[1]) - 12*x + 36*x^2 + 16*E^C[1]*(-1 + 6*x) + 3*2^(2/3)*(-(E^C[1]*(-1 + 6*x)^4*
(-1 + E^C[1] + 6*x)))^(1/3)] + Sqrt[-12*2^(2/3)*(-(E^C[1]*(-1 + 6*x)^4*(-1 + E^C
[1] + 6*x)))^(1/3) + 8*(1 + 4*E^C[1] + 12*x)^2 - 96*(2*E^C[1] + 3*x*(1 + 3*x)) -
  (8*(64*E^(3*C[1]) + 30*E^C[1]*(1 - 6*x)^2 + 96*E^(2*C[1])*(-1 + 6*x) - (-1 + 6*
x)^3))/Sqrt[1 + 16*E^(2*C[1]) - 12*x + 36*x^2 + 16*E^C[1]*(-1 + 6*x) + 3*2^(2/3)
*(-(E^C[1]*(-1 + 6*x)^4*(-1 + E^C[1] + 6*x)))^(1/3)]]/2)/6}, {y[x] -> (1 + 4*E^C
```

```
[1] + 12*x + Sqrt[1 + 16*E^(2*C[1]) - 12*x + 36*x^2 + 16*E^C[1]*(-1 + 6*x) + 3*2
^(2/3)*(-(E^C[1]*(-1 + 6*x)^4*(-1 + E^C[1] + 6*x)))^(1/3)] - Sqrt[-12*2^(2/3)*(-
(E^C[1]*(-1 + 6*x)^4*(-1 + E^C[1] + 6*x)))^(1/3) + 8*(1 + 4*E^C[1] + 12*x)^2 - 9
6*(2*E^C[1] + 3*x*(1 + 3*x)) + (8*(64*E^(3*C[1]) + 30*E^C[1]*(1 - 6*x)^2 + 96*E^
(2*C[1])*(-1 + 6*x) - (-1 + 6*x)^3))/Sqrt[1 + 16*E^(2*C[1]) - 12*x + 36*x^2 + 16
*E^C[1]*(-1 + 6*x) + 3*2^(2/3)*(-(E^C[1]*(-1 + 6*x)^4*(-1 + E^C[1] + 6*x)))^(1/3
)]]/2)/6}, {y[x] -> (1 + 4*E^C[1] + 12*x + Sqrt[1 + 16*E^(2*C[1]) - 12*x + 36*x^
2 + 16*E^C[1]*(-1 + 6*x) + 3*2^(2/3)*(-(E^C[1]*(-1 + 6*x)^4*(-1 + E^C[1] + 6*x))
)^(1/3)] + Sqrt[-12*2^(2/3)*(-(E^C[1]*(-1 + 6*x)^4*(-1 + E^C[1] + 6*x)))^(1/3) +
 8*(1 + 4*E^C[1] + 12*x)^2 - 96*(2*E^C[1] + 3*x*(1 + 3*x)) + (8*(64*E^(3*C[1]) +
 30*E^C[1]*(1 - 6*x)^2 + 96*E^(2*C[1])*(-1 + 6*x) - (-1 + 6*x)^3))/Sqrt[1 + 16*E
^(2*C[1]) - 12*x + 36*x^2 + 16*E^C[1]*(-1 + 6*x) + 3*2^(2/3)*(-(E^C[1]*(-1 + 6*x
)^4*(-1 + E^C[1] + 6*x)))^(1/3)]]/2)/6}}
```

Maple raw input

```
dsolve((1-3*x-y(x))^2*diff(y(x),x) = (1-2*y(x))*(3-6*x-4*y(x)), y(x),'implicit')
```

Maple raw output

```
-ln((4-6*y(x)-6*x)/(6*x-1))-3*ln((18*x-6*y(x))/(6*x-1))+3*ln((3-6*y(x))/(6*x-1))
-ln(6*x-1)-_C1 = 0
```

4.627 $y'(x)\left(\cot(x)-2y(x)^2\right)=y(x)^3\csc(x)\sec(x)$

ODE

$$y'(x)\left(\cot(x)-2y(x)^2\right)=y(x)^3\csc(x)\sec(x)$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of Variable, new independent variable

Mathematica ✓
cpu = 0.177224 (sec), leaf count = 69

$$\left\{\left\{y(x)\to -\frac{i\sqrt{\cot(x)}\sqrt{W\left(-2e^{-8c_1}\tan(x)\right)}}{\sqrt{2}}\right\},\left\{y(x)\to \frac{i\sqrt{\cot(x)}\sqrt{W\left(-2e^{-8c_1}\tan(x)\right)}}{\sqrt{2}}\right\}\right\}$$

Maple ✗
cpu = 111.19 (sec), leaf count = 0 , could not solve

```
dsolve((cot(x)-2*y(x)^2)*diff(y(x),x) = y(x)^3*csc(x)*sec(x), y(x),'implicit')
```

Mathematica raw input

```
DSolve[(Cot[x] - 2*y[x]^2)*y'[x] == Csc[x]*Sec[x]*y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*Sqrt[Cot[x]]*Sqrt[ProductLog[(-2*Tan[x])/E^(8*C[1])]])/Sqrt[2]},
 {y[x] -> (I*Sqrt[Cot[x]]*Sqrt[ProductLog[(-2*Tan[x])/E^(8*C[1])]])/Sqrt[2]}}
```

Maple raw input

```
dsolve((cot(x)-2*y(x)^2)*diff(y(x),x) = y(x)^3*csc(x)*sec(x), y(x),'implicit')
```

Maple raw output

```
dsolve((cot(x)-2*y(x)^2)*diff(y(x),x) = y(x)^3*csc(x)*sec(x), y(x),'implicit')
```

4.628 $3y(x)^2y'(x) = ay(x)^3 + x + 1$

ODE

$$3y(x)^2y'(x) = ay(x)^3 + x + 1$$

ODE Classification

[_rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.0378441 (sec), leaf count = 111

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{a^2c_1e^{ax} - a(x+1) - 1}}{a^{2/3}}\right\}, \left\{y(x) \to -\frac{\sqrt[3]{-1}\sqrt[3]{a^2c_1e^{ax} - a(x+1) - 1}}{a^{2/3}}\right\}, \left\{y(x) \to \frac{(-1)^{2/3}\sqrt[3]{a^2c_1e^{ax} - a(x+\right.\right.$$

Maple ✓
cpu = 0.007 (sec), leaf count = 26

$$\left\{\frac{x}{a} + a^{-1} + a^{-2} - \mathrm{e}^{ax}\_C1 + (y(x))^3 = 0\right\}$$

Mathematica raw input

```
DSolve[3*y[x]^2*y'[x] == 1 + x + a*y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 - a*(1 + x) + a^2*E^(a*x)*C[1])^(1/3)/a^(2/3)}, {y[x] -> -(((-1)^(
1/3)*(-1 - a*(1 + x) + a^2*E^(a*x)*C[1])^(1/3))/a^(2/3))}, {y[x] -> ((-1)^(2/3)*
(-1 - a*(1 + x) + a^2*E^(a*x)*C[1])^(1/3))/a^(2/3)}}
```

Maple raw input

```
dsolve(3*y(x)^2*diff(y(x),x) = 1+x+a*y(x)^3, y(x),'implicit')
```

Maple raw output

```
1/a*x+1/a+1/a^2-exp(a*x)*_C1+y(x)^3 = 0
```

4.629 $\left(x^2-3y(x)^2\right)y'(x)+2xy(x)+1=0$

ODE

$$\left(x^2-3y(x)^2\right)y'(x)+2xy(x)+1=0$$

ODE Classification

[_exact, _rational]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0162062 (sec), leaf count = 307

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{\sqrt{729\left(x-c_1\right){}^2-108x^6}+27c_1-27x}}{3\sqrt[3]{2}}-\frac{\sqrt[3]{2}x^2}{\sqrt[3]{\sqrt{729\left(x-c_1\right){}^2-108x^6}+27c_1-27x}}\right\},\left\{y(x)\to \frac{(1-i\sqrt{3})}{}\right.\right.$$

Maple ✓
cpu = 0.014 (sec), leaf count = 18

$$\left\{x^2y(x)-(y(x))^3+\_C1+x=0\right\}$$

Mathematica raw input

```
DSolve[1 + 2*x*y[x] + (x^2 - 3*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((2^(1/3)*x^2)/(-27*x + Sqrt[-108*x^6 + 729*(x - C[1])^2] + 27*C[1])^
(1/3)) - (-27*x + Sqrt[-108*x^6 + 729*(x - C[1])^2] + 27*C[1])^(1/3)/(3*2^(1/3))
}, {y[x] -> ((1 + I*Sqrt[3])*x^2)/(2^(2/3)*(-27*x + Sqrt[-108*x^6 + 729*(x - C[1
])^2] + 27*C[1])^(1/3)) + ((1 - I*Sqrt[3])*(-27*x + Sqrt[-108*x^6 + 729*(x - C[1
])^2] + 27*C[1])^(1/3))/(6*2^(1/3))}, {y[x] -> ((1 - I*Sqrt[3])*x^2)/(2^(2/3)*(-
27*x + Sqrt[-108*x^6 + 729*(x - C[1])^2] + 27*C[1])^(1/3)) + ((1 + I*Sqrt[3])*(-
27*x + Sqrt[-108*x^6 + 729*(x - C[1])^2] + 27*C[1])^(1/3))/(6*2^(1/3))}}
```

Maple raw input

```
dsolve((x^2-3*y(x)^2)*diff(y(x),x)+1+2*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x^2*y(x)-y(x)^3+_C1+x = 0
```

4.630 $\left(2x^2+3y(x)^2\right)y'(x)+x(y(x)+3x)=0$

ODE

$$\left(2x^2+3y(x)^2\right)y'(x)+x(y(x)+3x)=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0305008 (sec), leaf count = 66

$$\text{Solve}\left[c_1=\text{RootSum}\left[\#1^3+\#1+1\&,\frac{3\#1^2\log\left(\frac{y(x)}{x}-\#1\right)+2\log\left(\frac{y(x)}{x}-\#1\right)}{3\#1^2+1}\&\right]+3\log(x),y(x)\right]$$

Maple ✓
cpu = 0.014 (sec), leaf count = 38

$$\left\{-\frac{1}{3}\int^{\frac{y(x)}{x}}\frac{3\_a^2+2}{\_a^3+\_a+1}d\_a-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(3*x + y[x]) + (2*x^2 + 3*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] == 3*Log[x] + RootSum[1 + #1 + #1^3 & , (2*Log[-#1 + y[x]/x] + 3*Log[
-#1 + y[x]/x]*#1^2)/(1 + 3*#1^2) & ], y[x]]
```

Maple raw input

```
dsolve((2*x^2+3*y(x)^2)*diff(y(x),x)+x*(3*x+y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
-1/3*Intat(1/(_a^3+_a+1)*(3*_a^2+2),_a = y(x)/x)-ln(x)-_C1 = 0
```

4.631 $3(x^2 - y(x)^2)\,y'(x) - 2y(x)^3 + 6x(x+1)y(x) + 3e^x = 0$

ODE

$$3(x^2 - y(x)^2)\,y'(x) - 2y(x)^3 + 6x(x+1)y(x) + 3e^x = 0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.0490614 (sec), leaf count = 501

$$\left\{\left\{y(x) \to -\frac{e^{-2x}\sqrt[3]{\sqrt{e^{8x}\left(-2c_1e^{3x} + c_1^2 - 4e^{4x}x^6 + e^{6x}\right)} + c_1e^{4x} - e^{7x}}}{\sqrt[3]{2}} - \frac{\sqrt[3]{2}e^{2x}x^2}{\sqrt[3]{\sqrt{e^{8x}\left(-2c_1e^{3x} + c_1^2 - 4e^{4x}x^6 + e^{6x}\right)} + c_1e^{4x}}}\right.\right.$$

Maple ✓
cpu = 0.046 (sec), leaf count = 30

$$\left\{3\,\mathrm{e}^{2\,x}x^2y(x) - \mathrm{e}^{2\,x}(y(x))^3 + \mathrm{e}^{3\,x} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[3*E^x + 6*x*(1 + x)*y[x] - 2*y[x]^3 + 3*(x^2 - y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((2^(1/3)*E^(2*x)*x^2)/(-E^(7*x) + E^(4*x)*C[1] + Sqrt[E^(8*x)*(E^(6*
x) - 4*E^(4*x)*x^6 - 2*E^(3*x)*C[1] + C[1]^2)])^(1/3)) - (-E^(7*x) + E^(4*x)*C[1
] + Sqrt[E^(8*x)*(E^(6*x) - 4*E^(4*x)*x^6 - 2*E^(3*x)*C[1] + C[1]^2)])^(1/3)/(2^
(1/3)*E^(2*x))}, {y[x] -> (2*(1 + I*Sqrt[3])*E^(4*x)*x^2 + 2^(1/3)*(1 - I*Sqrt[3
])*(-E^(7*x) + E^(4*x)*C[1] + Sqrt[E^(8*x)*(E^(6*x) - 4*E^(4*x)*x^6 - 2*E^(3*x)*
C[1] + C[1]^2)])^(2/3))/(2*2^(2/3)*E^(2*x)*(-E^(7*x) + E^(4*x)*C[1] + Sqrt[E^(8*
x)*(E^(6*x) - 4*E^(4*x)*x^6 - 2*E^(3*x)*C[1] + C[1]^2)])^(1/3))}, {y[x] -> (2*(1
 - I*Sqrt[3])*E^(4*x)*x^2 + 2^(1/3)*(1 + I*Sqrt[3])*(-E^(7*x) + E^(4*x)*C[1] + S
qrt[E^(8*x)*(E^(6*x) - 4*E^(4*x)*x^6 - 2*E^(3*x)*C[1] + C[1]^2)])^(2/3))/(2*2^(2
/3)*E^(2*x)*(-E^(7*x) + E^(4*x)*C[1] + Sqrt[E^(8*x)*(E^(6*x) - 4*E^(4*x)*x^6 - 2
*E^(3*x)*C[1] + C[1]^2)])^(1/3))}}
```

Maple raw input

```
dsolve(3*(x^2-y(x)^2)*diff(y(x),x)+3*exp(x)+6*x*y(x)*(1+x)-2*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
3*exp(2*x)*x^2*y(x)-exp(2*x)*y(x)^3+exp(3*x)+_C1 = 0
```

4.632 $(3x^2+2xy(x)+4y(x)^2)\,y'(x)+2x^2+6xy(x)+y(x)^2=0$

ODE

$$(3x^2+2xy(x)+4y(x)^2)\,y'(x)+2x^2+6xy(x)+y(x)^2=0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, _dAlembert]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0315862 (sec), leaf count = 382

$$\left\{\left\{y(x)\to\frac{1}{4}\left(\sqrt[3]{2\sqrt{4e^{3c_1}x^3+16e^{6c_1}+333x^6}+8e^{3c_1}+x^3}-\frac{11x^2}{\sqrt[3]{2\sqrt{4e^{3c_1}x^3+16e^{6c_1}+333x^6}+8e^{3c_1}+x^3}}-x\right)\right\},\left\{y(x\right.\right.$$

Maple ✓
cpu = 0.014 (sec), leaf count = 44

$$\left\{-\frac{1}{3}\ln\left(\frac{2\,x^3+9\,x^2y(x)+3\,x(y(x))^2+4\,(y(x))^3}{x^3}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*x^2 + 6*x*y[x] + y[x]^2 + (3*x^2 + 2*x*y[x] + 4*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-x - (11*x^2)/(8*E^(3*C[1]) + x^3 + 2*Sqrt[16*E^(6*C[1]) + 4*E^(3*C[1
])*x^3 + 333*x^6])^(1/3) + (8*E^(3*C[1]) + x^3 + 2*Sqrt[16*E^(6*C[1]) + 4*E^(3*C
[1])*x^3 + 333*x^6])^(1/3))/4}, {y[x] -> (-4*x + (22*(1 + I*Sqrt[3])*x^2)/(8*E^(
3*C[1]) + x^3 + 2*Sqrt[16*E^(6*C[1]) + 4*E^(3*C[1])*x^3 + 333*x^6])^(1/3) + (2*I
)*(I + Sqrt[3])*(8*E^(3*C[1]) + x^3 + 2*Sqrt[16*E^(6*C[1]) + 4*E^(3*C[1])*x^3 +
333*x^6])^(1/3))/16}, {y[x] -> (-4*x + (22*(1 - I*Sqrt[3])*x^2)/(8*E^(3*C[1]) +
x^3 + 2*Sqrt[16*E^(6*C[1]) + 4*E^(3*C[1])*x^3 + 333*x^6])^(1/3) - 2*(1 + I*Sqrt[
3])*(8*E^(3*C[1]) + x^3 + 2*Sqrt[16*E^(6*C[1]) + 4*E^(3*C[1])*x^3 + 333*x^6])^(1
/3))/16}}
```

Maple raw input

```
dsolve((3*x^2+2*x*y(x)+4*y(x)^2)*diff(y(x),x)+2*x^2+6*x*y(x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-1/3*ln((2*x^3+9*x^2*y(x)+3*x*y(x)^2+4*y(x)^3)/x^3)-ln(x)-_C1 = 0
```

4.633 $(2y(x)-3x+1)^2y'(x)=(-3y(x)+2x+4)^2$

ODE

$$(2y(x)-3x+1)^2y'(x)=(-3y(x)+2x+4)^2$$

ODE Classification

[[_homogeneous, `class C`], _rational]

Book solution method
Equation linear in the variables, $y'(x)=f\left(\frac{X_1}{X_2}\right)$

Mathematica ✓
cpu = 0.177474 (sec), leaf count = 3501

Maple ✓
cpu = 0.042 (sec), leaf count = 75

$$\left\{-\frac{5}{9}\ln\left(\frac{45-20\,y(x)+5\,x}{-11+5\,x}\right)+\frac{1}{9}\ln\left(\frac{3-5\,y(x)+5\,x}{-11+5\,x}\right)-\frac{5}{9}\ln\left(\frac{-30-5\,y(x)+20\,x}{-11+5\,x}\right)-\ln\left(-11+5\,x\right)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(1 - 3*x + 2*y[x])^2*y'[x] == (4 + 2*x - 3*y[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[-459165024 + 1275458400*x - 1247114880*x^2 + 409406400*x^3 + 7103
3760*x^4 - 50349600*x^5 - 5261760*x^6 + 2246400*x^7 + 506880*x^8 + 38400*x^9 + 1
024*x^10 + 177147*C[1]^5 + 295245*x*C[1]^5 + (637729200 - 2139935760*x + 2598156
000*x^2 - 1246764960*x^3 + 45586800*x^4 + 114715440*x^5 - 4838400*x^6 - 5592960*
x^7 - 633600*x^8 - 21760*x^9 - 295245*C[1]^5)*#1 + (-184232880 + 1015642800*x -
1778293440*x^2 + 1264183200*x^3 - 266036400*x^4 - 70534800*x^5 + 17972640*x^6 +
3988800*x^7 + 190080*x^8)*#1^2 + (-90541800 + 85118040*x + 276922800*x^2 - 47378
5200*x^3 + 219051000*x^4 - 3051720*x^5 - 11592000*x^6 - 873120*x^7)*#1^3 + (3986
9010 - 154390050*x + 155568600*x^2 - 2902500*x^3 - 55677150*x^4 + 14206950*x^5 +
 2235540*x^6)*#1^4 + (7174575 + 6246315*x - 43079850*x^2 + 35619030*x^3 - 320872
5*x^4 - 3122577*x^5)*#1^5 + (-2953260 + 9795600*x - 6300360*x^2 - 2559600*x^3 +
2235540*x^4)*#1^6 + (-496800 - 84960*x + 1504800*x^2 - 873120*x^3)*#1^7 + (74880
 - 288000*x + 190080*x^2)*#1^8 + (19200 - 21760*x)*#1^9 + 1024*#1^10 & , 1]}, {y
[x] -> Root[-459165024 + 1275458400*x - 1247114880*x^2 + 409406400*x^3 + 7103376
0*x^4 - 50349600*x^5 - 5261760*x^6 + 2246400*x^7 + 506880*x^8 + 38400*x^9 + 1024
*x^10 + 177147*C[1]^5 + 295245*x*C[1]^5 + (637729200 - 2139935760*x + 2598156000
```

```
*x^2 - 1246764960*x^3 + 45586800*x^4 + 114715440*x^5 - 4838400*x^6 - 5592960*x^7
 - 633600*x^8 - 21760*x^9 - 295245*C[1]^5)*#1 + (-184232880 + 1015642800*x - 177
8293440*x^2 + 1264183200*x^3 - 266036400*x^4 - 70534800*x^5 + 17972640*x^6 + 398
8800*x^7 + 190080*x^8)*#1^2 + (-90541800 + 85118040*x + 276922800*x^2 - 47378520
0*x^3 + 219051000*x^4 - 3051720*x^5 - 11592000*x^6 - 873120*x^7)*#1^3 + (3986901
0 - 154390050*x + 155568600*x^2 - 2902500*x^3 - 55677150*x^4 + 14206950*x^5 + 22
35540*x^6)*#1^4 + (7174575 + 6246315*x - 43079850*x^2 + 35619030*x^3 - 3208725*x
^4 - 3122577*x^5)*#1^5 + (-2953260 + 9795600*x - 6300360*x^2 - 2559600*x^3 + 223
5540*x^4)*#1^6 + (-496800 - 84960*x + 1504800*x^2 - 873120*x^3)*#1^7 + (74880 -
288000*x + 190080*x^2)*#1^8 + (19200 - 21760*x)*#1^9 + 1024*#1^10 & , 2]}, {y[x]
 -> Root[-459165024 + 1275458400*x - 1247114880*x^2 + 409406400*x^3 + 71033760*x
^4 - 50349600*x^5 - 5261760*x^6 + 2246400*x^7 + 506880*x^8 + 38400*x^9 + 1024*x^
10 + 177147*C[1]^5 + 295245*x*C[1]^5 + (637729200 - 2139935760*x + 2598156000*x^
2 - 1246764960*x^3 + 45586800*x^4 + 114715440*x^5 - 4838400*x^6 - 5592960*x^7 -
633600*x^8 - 21760*x^9 - 295245*C[1]^5)*#1 + (-184232880 + 1015642800*x - 177829
3440*x^2 + 1264183200*x^3 - 266036400*x^4 - 70534800*x^5 + 17972640*x^6 + 398880
0*x^7 + 190080*x^8)*#1^2 + (-90541800 + 85118040*x + 276922800*x^2 - 473785200*x
^3 + 219051000*x^4 - 3051720*x^5 - 11592000*x^6 - 873120*x^7)*#1^3 + (39869010 -
 154390050*x + 155568600*x^2 - 2902500*x^3 - 55677150*x^4 + 14206950*x^5 + 22355
40*x^6)*#1^4 + (7174575 + 6246315*x - 43079850*x^2 + 35619030*x^3 - 3208725*x^4
- 3122577*x^5)*#1^5 + (-2953260 + 9795600*x - 6300360*x^2 - 2559600*x^3 + 223554
0*x^4)*#1^6 + (-496800 - 84960*x + 1504800*x^2 - 873120*x^3)*#1^7 + (74880 - 288
000*x + 190080*x^2)*#1^8 + (19200 - 21760*x)*#1^9 + 1024*#1^10 & , 3]}, {y[x] ->
 Root[-459165024 + 1275458400*x - 1247114880*x^2 + 409406400*x^3 + 71033760*x^4
- 50349600*x^5 - 5261760*x^6 + 2246400*x^7 + 506880*x^8 + 38400*x^9 + 1024*x^10
+ 177147*C[1]^5 + 295245*x*C[1]^5 + (637729200 - 2139935760*x + 2598156000*x^2 -
 1246764960*x^3 + 45586800*x^4 + 114715440*x^5 - 4838400*x^6 - 5592960*x^7 - 633
600*x^8 - 21760*x^9 - 295245*C[1]^5)*#1 + (-184232880 + 1015642800*x - 177829344
0*x^2 + 1264183200*x^3 - 266036400*x^4 - 70534800*x^5 + 17972640*x^6 + 3988800*x
^7 + 190080*x^8)*#1^2 + (-90541800 + 85118040*x + 276922800*x^2 - 473785200*x^3
+ 219051000*x^4 - 3051720*x^5 - 11592000*x^6 - 873120*x^7)*#1^3 + (39869010 - 15
4390050*x + 155568600*x^2 - 2902500*x^3 - 55677150*x^4 + 14206950*x^5 + 2235540*
x^6)*#1^4 + (7174575 + 6246315*x - 43079850*x^2 + 35619030*x^3 - 3208725*x^4 - 3
122577*x^5)*#1^5 + (-2953260 + 9795600*x - 6300360*x^2 - 2559600*x^3 + 2235540*x
^4)*#1^6 + (-496800 - 84960*x + 1504800*x^2 - 873120*x^3)*#1^7 + (74880 - 288000
*x + 190080*x^2)*#1^8 + (19200 - 21760*x)*#1^9 + 1024*#1^10 & , 4]}, {y[x] -> Ro
ot[-459165024 + 1275458400*x - 1247114880*x^2 + 409406400*x^3 + 71033760*x^4 - 5
0349600*x^5 - 5261760*x^6 + 2246400*x^7 + 506880*x^8 + 38400*x^9 + 1024*x^10 + 1
77147*C[1]^5 + 295245*x*C[1]^5 + (637729200 - 2139935760*x + 2598156000*x^2 - 12
46764960*x^3 + 45586800*x^4 + 114715440*x^5 - 4838400*x^6 - 5592960*x^7 - 633600
*x^8 - 21760*x^9 - 295245*C[1]^5)*#1 + (-184232880 + 1015642800*x - 1778293440*x
^2 + 1264183200*x^3 - 266036400*x^4 - 70534800*x^5 + 17972640*x^6 + 3988800*x^7
+ 190080*x^8)*#1^2 + (-90541800 + 85118040*x + 276922800*x^2 - 473785200*x^3 + 2
19051000*x^4 - 3051720*x^5 - 11592000*x^6 - 873120*x^7)*#1^3 + (39869010 - 15439
0050*x + 155568600*x^2 - 2902500*x^3 - 55677150*x^4 + 14206950*x^5 + 2235540*x^6
)*#1^4 + (7174575 + 6246315*x - 43079850*x^2 + 35619030*x^3 - 3208725*x^4 - 3122
577*x^5)*#1^5 + (-2953260 + 9795600*x - 6300360*x^2 - 2559600*x^3 + 2235540*x^4)
```

```
*#1^6 + (-496800 - 84960*x + 1504800*x^2 - 873120*x^3)*#1^7 + (74880 - 288000*x
+ 190080*x^2)*#1^8 + (19200 - 21760*x)*#1^9 + 1024*#1^10 & , 5]}, {y[x] -> Root[
-459165024 + 1275458400*x - 1247114880*x^2 + 409406400*x^3 + 71033760*x^4 - 5034
9600*x^5 - 5261760*x^6 + 2246400*x^7 + 506880*x^8 + 38400*x^9 + 1024*x^10 + 1771
47*C[1]^5 + 295245*x*C[1]^5 + (637729200 - 2139935760*x + 2598156000*x^2 - 12467
64960*x^3 + 45586800*x^4 + 114715440*x^5 - 4838400*x^6 - 5592960*x^7 - 633600*x^
8 - 21760*x^9 - 295245*C[1]^5)*#1 + (-184232880 + 1015642800*x - 1778293440*x^2
+ 1264183200*x^3 - 266036400*x^4 - 70534800*x^5 + 17972640*x^6 + 3988800*x^7 + 1
90080*x^8)*#1^2 + (-90541800 + 85118040*x + 276922800*x^2 - 473785200*x^3 + 2190
51000*x^4 - 3051720*x^5 - 11592000*x^6 - 873120*x^7)*#1^3 + (39869010 - 15439005
0*x + 155568600*x^2 - 2902500*x^3 - 55677150*x^4 + 14206950*x^5 + 2235540*x^6)*#
1^4 + (7174575 + 6246315*x - 43079850*x^2 + 35619030*x^3 - 3208725*x^4 - 3122577
*x^5)*#1^5 + (-2953260 + 9795600*x - 6300360*x^2 - 2559600*x^3 + 2235540*x^4)*#1
^6 + (-496800 - 84960*x + 1504800*x^2 - 873120*x^3)*#1^7 + (74880 - 288000*x + 1
90080*x^2)*#1^8 + (19200 - 21760*x)*#1^9 + 1024*#1^10 & , 6]}, {y[x] -> Root[-45
9165024 + 1275458400*x - 1247114880*x^2 + 409406400*x^3 + 71033760*x^4 - 5034960
0*x^5 - 5261760*x^6 + 2246400*x^7 + 506880*x^8 + 38400*x^9 + 1024*x^10 + 177147*
C[1]^5 + 295245*x*C[1]^5 + (637729200 - 2139935760*x + 2598156000*x^2 - 12467649
60*x^3 + 45586800*x^4 + 114715440*x^5 - 4838400*x^6 - 5592960*x^7 - 633600*x^8 -
 21760*x^9 - 295245*C[1]^5)*#1 + (-184232880 + 1015642800*x - 1778293440*x^2 + 1
264183200*x^3 - 266036400*x^4 - 70534800*x^5 + 17972640*x^6 + 3988800*x^7 + 1900
80*x^8)*#1^2 + (-90541800 + 85118040*x + 276922800*x^2 - 473785200*x^3 + 2190510
00*x^4 - 3051720*x^5 - 11592000*x^6 - 873120*x^7)*#1^3 + (39869010 - 154390050*x
 + 155568600*x^2 - 2902500*x^3 - 55677150*x^4 + 14206950*x^5 + 2235540*x^6)*#1^4
 + (7174575 + 6246315*x - 43079850*x^2 + 35619030*x^3 - 3208725*x^4 - 3122577*x^
5)*#1^5 + (-2953260 + 9795600*x - 6300360*x^2 - 2559600*x^3 + 2235540*x^4)*#1^6
+ (-496800 - 84960*x + 1504800*x^2 - 873120*x^3)*#1^7 + (74880 - 288000*x + 1900
80*x^2)*#1^8 + (19200 - 21760*x)*#1^9 + 1024*#1^10 & , 7]}, {y[x] -> Root[-45916
5024 + 1275458400*x - 1247114880*x^2 + 409406400*x^3 + 71033760*x^4 - 50349600*x
^5 - 5261760*x^6 + 2246400*x^7 + 506880*x^8 + 38400*x^9 + 1024*x^10 + 177147*C[1
]^5 + 295245*x*C[1]^5 + (637729200 - 2139935760*x + 2598156000*x^2 - 1246764960*
x^3 + 45586800*x^4 + 114715440*x^5 - 4838400*x^6 - 5592960*x^7 - 633600*x^8 - 21
760*x^9 - 295245*C[1]^5)*#1 + (-184232880 + 1015642800*x - 1778293440*x^2 + 1264
183200*x^3 - 266036400*x^4 - 70534800*x^5 + 17972640*x^6 + 3988800*x^7 + 190080*
x^8)*#1^2 + (-90541800 + 85118040*x + 276922800*x^2 - 473785200*x^3 + 219051000*
x^4 - 3051720*x^5 - 11592000*x^6 - 873120*x^7)*#1^3 + (39869010 - 154390050*x +
155568600*x^2 - 2902500*x^3 - 55677150*x^4 + 14206950*x^5 + 2235540*x^6)*#1^4 +
(7174575 + 6246315*x - 43079850*x^2 + 35619030*x^3 - 3208725*x^4 - 3122577*x^5)*
#1^5 + (-2953260 + 9795600*x - 6300360*x^2 - 2559600*x^3 + 2235540*x^4)*#1^6 + (
-496800 - 84960*x + 1504800*x^2 - 873120*x^3)*#1^7 + (74880 - 288000*x + 190080*
x^2)*#1^8 + (19200 - 21760*x)*#1^9 + 1024*#1^10 & , 8]}, {y[x] -> Root[-45916502
4 + 1275458400*x - 1247114880*x^2 + 409406400*x^3 + 71033760*x^4 - 50349600*x^5
- 5261760*x^6 + 2246400*x^7 + 506880*x^8 + 38400*x^9 + 1024*x^10 + 177147*C[1]^5
 + 295245*x*C[1]^5 + (637729200 - 2139935760*x + 2598156000*x^2 - 1246764960*x^3
 + 45586800*x^4 + 114715440*x^5 - 4838400*x^6 - 5592960*x^7 - 633600*x^8 - 21760
*x^9 - 295245*C[1]^5)*#1 + (-184232880 + 1015642800*x - 1778293440*x^2 + 1264183
200*x^3 - 266036400*x^4 - 70534800*x^5 + 17972640*x^6 + 3988800*x^7 + 190080*x^8
```

```
)*#1^2 + (-90541800 + 85118040*x + 276922800*x^2 - 473785200*x^3 + 219051000*x^4
 - 3051720*x^5 - 11592000*x^6 - 873120*x^7)*#1^3 + (39869010 - 154390050*x + 155
568600*x^2 - 2902500*x^3 - 55677150*x^4 + 14206950*x^5 + 2235540*x^6)*#1^4 + (71
74575 + 6246315*x - 43079850*x^2 + 35619030*x^3 - 3208725*x^4 - 3122577*x^5)*#1^
5 + (-2953260 + 9795600*x - 6300360*x^2 - 2559600*x^3 + 2235540*x^4)*#1^6 + (-49
6800 - 84960*x + 1504800*x^2 - 873120*x^3)*#1^7 + (74880 - 288000*x + 190080*x^2
)*#1^8 + (19200 - 21760*x)*#1^9 + 1024*#1^10 & , 9]}, {y[x] -> Root[-459165024 +
 1275458400*x - 1247114880*x^2 + 409406400*x^3 + 71033760*x^4 - 50349600*x^5 - 5
261760*x^6 + 2246400*x^7 + 506880*x^8 + 38400*x^9 + 1024*x^10 + 177147*C[1]^5 +
295245*x*C[1]^5 + (637729200 - 2139935760*x + 2598156000*x^2 - 1246764960*x^3 +
45586800*x^4 + 114715440*x^5 - 4838400*x^6 - 5592960*x^7 - 633600*x^8 - 21760*x^
9 - 295245*C[1]^5)*#1 + (-184232880 + 1015642800*x - 1778293440*x^2 + 1264183200
*x^3 - 266036400*x^4 - 70534800*x^5 + 17972640*x^6 + 3988800*x^7 + 190080*x^8)*#
1^2 + (-90541800 + 85118040*x + 276922800*x^2 - 473785200*x^3 + 219051000*x^4 -
3051720*x^5 - 11592000*x^6 - 873120*x^7)*#1^3 + (39869010 - 154390050*x + 155568
600*x^2 - 2902500*x^3 - 55677150*x^4 + 14206950*x^5 + 2235540*x^6)*#1^4 + (71745
75 + 6246315*x - 43079850*x^2 + 35619030*x^3 - 3208725*x^4 - 3122577*x^5)*#1^5 +
 (-2953260 + 9795600*x - 6300360*x^2 - 2559600*x^3 + 2235540*x^4)*#1^6 + (-49680
0 - 84960*x + 1504800*x^2 - 873120*x^3)*#1^7 + (74880 - 288000*x + 190080*x^2)*#
1^8 + (19200 - 21760*x)*#1^9 + 1024*#1^10 & , 10]}}
```

Maple raw input

```
dsolve((1-3*x+2*y(x))^2*diff(y(x),x) = (4+2*x-3*y(x))^2, y(x),'implicit')
```

Maple raw output

```
-5/9*ln((45-20*y(x)+5*x)/(-11+5*x))+1/9*ln((3-5*y(x)+5*x)/(-11+5*x))-5/9*ln((-30
-5*y(x)+20*x)/(-11+5*x))-ln(-11+5*x)-_C1 = 0
```

4.634 $\left(-3x^2y(x)+6y(x)^2+1\right)y'(x)+x^2-3xy(x)^2=0$

ODE

$$\left(-3x^2y(x)+6y(x)^2+1\right)y'(x)+x^2-3xy(x)^2=0$$

ODE Classification

[_exact, _rational]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0259497 (sec), leaf count = 570

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{\sqrt{\left(108c_1-\frac{27x^6}{4}+36x^3+27x^2\right)^2+4\left(6-\frac{9x^4}{4}\right)^3}+108c_1-\frac{27x^6}{4}+36x^3+27x^2}}{6\sqrt[3]{2}}+\frac{}{3\,2^{2/3}\sqrt[3]{\sqrt{\left(108c_1\right.}}}\right.\right.$$

Maple ✓
cpu = 0.018 (sec), leaf count = 27

$$\left\{-\frac{3\,x^2(y(x))^2}{2}+\frac{x^3}{3}+2\,(y(x))^3+y(x)+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x^2 - 3*x*y[x]^2 + (1 - 3*x^2*y[x] + 6*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2/4 + (6 - (9*x^4)/4)/(3*2^(2/3)*(27*x^2 + 36*x^3 - (27*x^6)/4 + 108
*C[1] + Sqrt[4*(6 - (9*x^4)/4)^3 + (27*x^2 + 36*x^3 - (27*x^6)/4 + 108*C[1])^2])
^(1/3)) - (27*x^2 + 36*x^3 - (27*x^6)/4 + 108*C[1] + Sqrt[4*(6 - (9*x^4)/4)^3 +
(27*x^2 + 36*x^3 - (27*x^6)/4 + 108*C[1])^2])^(1/3)/(6*2^(1/3))}, {y[x] -> x^2/4
 - ((1 + I*Sqrt[3])*(6 - (9*x^4)/4))/(6*2^(2/3)*(27*x^2 + 36*x^3 - (27*x^6)/4 +
108*C[1] + Sqrt[4*(6 - (9*x^4)/4)^3 + (27*x^2 + 36*x^3 - (27*x^6)/4 + 108*C[1])^
2])^(1/3)) + ((1 - I*Sqrt[3])*(27*x^2 + 36*x^3 - (27*x^6)/4 + 108*C[1] + Sqrt[4*
(6 - (9*x^4)/4)^3 + (27*x^2 + 36*x^3 - (27*x^6)/4 + 108*C[1])^2])^(1/3))/(12*2^(
1/3))}, {y[x] -> x^2/4 - ((1 - I*Sqrt[3])*(6 - (9*x^4)/4))/(6*2^(2/3)*(27*x^2 +
36*x^3 - (27*x^6)/4 + 108*C[1] + Sqrt[4*(6 - (9*x^4)/4)^3 + (27*x^2 + 36*x^3 - (
27*x^6)/4 + 108*C[1])^2])^(1/3)) + ((1 + I*Sqrt[3])*(27*x^2 + 36*x^3 - (27*x^6)/
```

```
4 + 108*C[1] + Sqrt[4*(6 - (9*x^4)/4)^3 + (27*x^2 + 36*x^3 - (27*x^6)/4 + 108*C[
1])^2])^(1/3))/(12*2^(1/3))}}
```

Maple raw input

```
dsolve((1-3*x^2*y(x)+6*y(x)^2)*diff(y(x),x)+x^2-3*x*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-3/2*x^2*y(x)^2+1/3*x^3+2*y(x)^3+y(x)+_C1 = 0
```

4.635 $a + (x - 6y(x))^2 y'(x) - 6y(x)^2 + 2xy(x) = 0$

ODE

$$a + (x - 6y(x))^2 y'(x) - 6y(x)^2 + 2xy(x) = 0$$

ODE Classification

[_exact , _rational , [_1st_order , `_with_symmetry_[F(x),G(x)]`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0139813 (sec), leaf count = 115

$$\left\{\left\{y(x) \to \frac{1}{6}\left(\sqrt[3]{-18ax + 18c_1 - x^3} + x\right)\right\}, \left\{y(x) \to \frac{x}{6} + \frac{1}{12}i\left(\sqrt{3} + i\right)\sqrt[3]{-18ax + 18c_1 - x^3}\right\}, \left\{y(x) \to \frac{x}{6} - \frac{1}{12}\left(1 + i\sqrt\right.\right.$$

Maple ✓
cpu = 0.017 (sec), leaf count = 27

$$\left\{x^2 y(x) - 6\,x(y(x))^2 + 12\,(y(x))^3 + ax + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[a + 2*x*y[x] - 6*y[x]^2 + (x - 6*y[x])^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x + (-18*a*x - x^3 + 18*C[1])^(1/3))/6}, {y[x] -> x/6 + (I/12)*(I + S
qrt[3])*(-18*a*x - x^3 + 18*C[1])^(1/3)}, {y[x] -> x/6 - ((1 + I*Sqrt[3])*(-18*a
*x - x^3 + 18*C[1])^(1/3))/12}}
```

Maple raw input

```
dsolve((x-6*y(x))^2*diff(y(x),x)+a+2*x*y(x)-6*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x^2*y(x)-6*x*y(x)^2+12*y(x)^3+a*x+_C1 = 0
```

4.636 $\left(ay(x)^2+x^2\right)y'(x)=xy(x)$

ODE

$$\left(ay(x)^2+x^2\right)y'(x)=xy(x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0353911 (sec), leaf count = 66

$$\left\{\left\{y(x)\to -\frac{x}{\sqrt{a}\sqrt{W\left(\frac{x^2e^{-\frac{2c_1}{a}}}{a}\right)}}\right\},\left\{y(x)\to \frac{x}{\sqrt{a}\sqrt{W\left(\frac{x^2e^{-\frac{2c_1}{a}}}{a}\right)}}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 32

$$\left\{-\ln\left(\frac{y(x)}{x}\right)+\frac{x^2}{2\,a\,(y\,(x))^2}-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(x^2 + a*y[x]^2)*y'[x] == x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x/(Sqrt[a]*Sqrt[ProductLog[x^2/(a*E^((2*C[1])/a))]]))}, {y[x] -> x/(
Sqrt[a]*Sqrt[ProductLog[x^2/(a*E^((2*C[1])/a))]])}}
```

Maple raw input

```
dsolve((x^2+a*y(x)^2)*diff(y(x),x) = x*y(x), y(x),'implicit')
```

Maple raw output

```
-ln(y(x)/x)+1/2/a*x^2/y(x)^2-ln(x)-_C1 = 0
```

4.637 $(ay(x)^2 + x^2 + xy(x))\, y'(x) = ax^2 + xy(x) + y(x)^2$

ODE

$$(ay(x)^2 + x^2 + xy(x))\, y'(x) = ax^2 + xy(x) + y(x)^2$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0451534 (sec), leaf count = 51

$$\text{Solve}\left[\frac{1}{3}\left((a-1)\log\left(\frac{x^2 + xy(x) + y(x)^2}{x^2}\right) + (a+2)\log\left(1 - \frac{y(x)}{x}\right)\right) + a\log(x) = c_1, y(x)\right]$$

Maple ✓
cpu = 0.023 (sec), leaf count = 56

$$\left\{\frac{1}{3\,a}\left((1-a)\ln\left(\frac{x^2 + xy(x) + (y(x))^2}{x^2}\right) + (-a-2)\ln\left(\frac{y(x)-x}{x}\right) - 3\,a(\_C1 + \ln(x))\right) = 0\right\}$$

Mathematica raw input

```
DSolve[(x^2 + x*y[x] + a*y[x]^2)*y'[x] == a*x^2 + x*y[x] + y[x]^2,y[x],x]
```

Mathematica raw output

```
Solve[a*Log[x] + ((2 + a)*Log[1 - y[x]/x] + (-1 + a)*Log[(x^2 + x*y[x] + y[x]^2)
/x^2])/3 == C[1], y[x]]
```

Maple raw input

```
dsolve((x^2+x*y(x)+a*y(x)^2)*diff(y(x),x) = a*x^2+x*y(x)+y(x)^2, y(x),'implicit')
```

Maple raw output

```
1/3*((1-a)*ln((x^2+x*y(x)+y(x)^2)/x^2)+(-a-2)*ln((y(x)-x)/x)-3*a*(_C1+ln(x)))/a
= 0
```

4.638 $(ax^2 - ay(x)^2 + 2xy(x))\,y'(x) - 2axy(x) + x^2 - y(x)^2 = 0$

ODE

$$(ax^2 - ay(x)^2 + 2xy(x))\,y'(x) - 2axy(x) + x^2 - y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0575669 (sec), leaf count = 87

$$\left\{\left\{y(x) \to \frac{1}{2}\left(a(-e^{c_1}) - \sqrt{a^2e^{2c_1} + 4x\left(e^{c_1} - x\right)}\right)\right\}, \left\{y(x) \to \frac{1}{2}\left(\sqrt{a^2e^{2c_1} + 4x\left(e^{c_1} - x\right)} - ae^{c_1}\right)\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 39

$$\left\{\ln\left(\frac{ay(x) - x}{x}\right) - \ln\left(\frac{x^2 + (y(x))^2}{x^2}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2 - 2*a*x*y[x] - y[x]^2 + (a*x^2 + 2*x*y[x] - a*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(a*E^C[1]) - Sqrt[a^2*E^(2*C[1]) + 4*(E^C[1] - x)*x])/2}, {y[x] -> (
-(a*E^C[1]) + Sqrt[a^2*E^(2*C[1]) + 4*(E^C[1] - x)*x])/2}}
```

Maple raw input

```
dsolve((a*x^2+2*x*y(x)-a*y(x)^2)*diff(y(x),x)+x^2-2*a*x*y(x)-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
ln((a*y(x)-x)/x)-ln((x^2+y(x)^2)/x^2)-ln(x)-_C1 = 0
```

4.639 $y'(x)\left(x^2(a+2b)+2x(2b+c)y(x)+3cy(x)^2\right)+2x(a+2b)y(x)+3ax^2+(2b+c)y(x)^2=0$

ODE

$$y'(x)\left(x^2(a+2b)+2x(2b+c)y(x)+3cy(x)^2\right)+2x(a+2b)y(x)+3ax^2+(2b+c)y(x)^2=0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, _dAlembert]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.107888 (sec), leaf count = 1105

$$\left\{\left\{y(x)\to \frac{2\sqrt[3]{2}(4b^2-2cb+c(c-3a))x^2}{\sqrt[3]{-16b^3x^3-2c^3x^3-18ac^2x^3+6bc^2x^3+12b^2cx^3+18abcx^3+27c^2e^{c_1}+\sqrt{4\left(3(a+2b)c-(2b+c)^2\right)^3x^6+(1}}}\right.\right.$$

Maple ✓
cpu = 0.017 (sec), leaf count = 40

$$\left\{-\frac{1}{3}\ln\left(\frac{(x+y(x))\left(ax^2+2bxy(x)+c(y(x))^2\right)}{x^3}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[3*a*x^2 + 2*(a + 2*b)*x*y[x] + (2*b + c)*y[x]^2 + ((a + 2*b)*x^2 + 2*(2*b + c)*x*y[x] + 3*c*y[
```

Mathematica raw output

```
{{y[x] -> (-2*(2*b + c)*x + (2*2^(1/3)*(4*b^2 - 2*b*c + c*(-3*a + c))*x^2)/(27*c
^2*E^C[1] - 16*b^3*x^3 + 18*a*b*c*x^3 + 12*b^2*c*x^3 - 18*a*c^2*x^3 + 6*b*c^2*x^
3 - 2*c^3*x^3 + Sqrt[4*(3*(a + 2*b)*c - (2*b + c)^2)^3*x^6 + (16*b^3*x^3 - 6*b*(
3*a + 2*b)*c*x^3 + 2*c^3*x^3 - 3*c^2*(9*E^C[1] + 2*(-3*a + b)*x^3))^2])^(1/3) +
2^(2/3)*(27*c^2*E^C[1] - 16*b^3*x^3 + 18*a*b*c*x^3 + 12*b^2*c*x^3 - 18*a*c^2*x^3
 + 6*b*c^2*x^3 - 2*c^3*x^3 + Sqrt[4*(3*(a + 2*b)*c - (2*b + c)^2)^3*x^6 + (16*b^
3*x^3 - 6*b*(3*a + 2*b)*c*x^3 + 2*c^3*x^3 - 3*c^2*(9*E^C[1] + 2*(-3*a + b)*x^3))
^2])^(1/3))/(6*c)}, {y[x] -> (-4*(2*b + c)*x - ((2*I)*2^(1/3)*(-I + Sqrt[3])*(4*
b^2 - 2*b*c + c*(-3*a + c))*x^2)/(27*c^2*E^C[1] - 16*b^3*x^3 + 18*a*b*c*x^3 + 12
```

```
*b^2*c*x^3 - 18*a*c^2*x^3 + 6*b*c^2*x^3 - 2*c^3*x^3 + Sqrt[4*(3*(a + 2*b)*c - (2
*b + c)^2)^3*x^6 + (16*b^3*x^3 - 6*b*(3*a + 2*b)*c*x^3 + 2*c^3*x^3 - 3*c^2*(9*E^
C[1] + 2*(-3*a + b)*x^3))^2])^(1/3) + I*2^(2/3)*(I + Sqrt[3])*(27*c^2*E^C[1] - 1
6*b^3*x^3 + 18*a*b*c*x^3 + 12*b^2*c*x^3 - 18*a*c^2*x^3 + 6*b*c^2*x^3 - 2*c^3*x^3
 + Sqrt[4*(3*(a + 2*b)*c - (2*b + c)^2)^3*x^6 + (16*b^3*x^3 - 6*b*(3*a + 2*b)*c*
x^3 + 2*c^3*x^3 - 3*c^2*(9*E^C[1] + 2*(-3*a + b)*x^3))^2])^(1/3))/(12*c)}, {y[x]
 -> -(4*(2*b + c)*x + (2*2^(1/3)*(1 - I*Sqrt[3])*(4*b^2 - 2*b*c + c*(-3*a + c))*
x^2)/(27*c^2*E^C[1] - 16*b^3*x^3 + 18*a*b*c*x^3 + 12*b^2*c*x^3 - 18*a*c^2*x^3 +
6*b*c^2*x^3 - 2*c^3*x^3 + Sqrt[4*(3*(a + 2*b)*c - (2*b + c)^2)^3*x^6 + (16*b^3*x
^3 - 6*b*(3*a + 2*b)*c*x^3 + 2*c^3*x^3 - 3*c^2*(9*E^C[1] + 2*(-3*a + b)*x^3))^2]
)^(1/3) + 2^(2/3)*(1 + I*Sqrt[3])*(27*c^2*E^C[1] - 16*b^3*x^3 + 18*a*b*c*x^3 + 1
2*b^2*c*x^3 - 18*a*c^2*x^3 + 6*b*c^2*x^3 - 2*c^3*x^3 + Sqrt[4*(3*(a + 2*b)*c - (
2*b + c)^2)^3*x^6 + (16*b^3*x^3 - 6*b*(3*a + 2*b)*c*x^3 + 2*c^3*x^3 - 3*c^2*(9*E
^C[1] + 2*(-3*a + b)*x^3))^2])^(1/3))/(12*c)}}
```

Maple raw input

```
dsolve(((a+2*b)*x^2+2*(c+2*b)*x*y(x)+3*c*y(x)^2)*diff(y(x),x)+3*a*x^2+2*(a+2*b)*x*y(x)+(c+2*b)*y(x)^2
```

Maple raw output

```
-1/3*ln((x+y(x))*(a*x^2+2*b*x*y(x)+c*y(x)^2)/x^3)-ln(x)-_C1 = 0
```

4.640 $y'(x)\left(ax^2+2bxy(x)+cy(x)^2\right)+2axy(x)+by(x)^2+kx^2=0$

ODE

$$y'(x)\left(ax^2+2bxy(x)+cy(x)^2\right)+2axy(x)+by(x)^2+kx^2=0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, _dAlembert]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0705899 (sec), leaf count = 744

$$\left\{\left\{y(x)\to \frac{2^{2/3}\sqrt[3]{\sqrt{\left(3abcx^3-2b^3x^3+c^2\left(e^{3c_1}-kx^3\right)\right)^2-4x^6\left(b^2-ac\right)^3}+3abcx^3-2b^3x^3-c^2kx^3+c^2e^{3c_1}}+\frac{}{\sqrt[3]{\sqrt{(3abc}}}}{2c}\right.\right.$$

Maple ✓
cpu = 0.015 (sec), leaf count = 46

$$\left\{-\frac{1}{3}\ln\left(\frac{3\,ax^2y(x)+3\,bx(y(x))^2+c(y(x))^3+kx^3}{x^3}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[k*x^2 + 2*a*x*y[x] + b*y[x]^2 + (a*x^2 + 2*b*x*y[x] + c*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*b*x + (2*2^(1/3)*(b^2 - a*c)*x^2)/(c^2*E^(3*C[1]) - 2*b^3*x^3 + 3*
a*b*c*x^3 - c^2*k*x^3 + Sqrt[-4*(b^2 - a*c)^3*x^6 + (-2*b^3*x^3 + 3*a*b*c*x^3 +
c^2*(E^(3*C[1]) - k*x^3))^2])^(1/3) + 2^(2/3)*(c^2*E^(3*C[1]) - 2*b^3*x^3 + 3*a*
b*c*x^3 - c^2*k*x^3 + Sqrt[-4*(b^2 - a*c)^3*x^6 + (-2*b^3*x^3 + 3*a*b*c*x^3 + c^
2*(E^(3*C[1]) - k*x^3))^2])^(1/3))/(2*c)}, {y[x] -> (-36*b*x + (18*2^(1/3)*(1 +
I*Sqrt[3])*(-b^2 + a*c)*x^2)/(c^2*E^(3*C[1]) - 2*b^3*x^3 + 3*a*b*c*x^3 - c^2*k*x
^3 + Sqrt[-4*(b^2 - a*c)^3*x^6 + (-2*b^3*x^3 + 3*a*b*c*x^3 + c^2*(E^(3*C[1]) - k
*x^3))^2])^(1/3) + (9*I)*2^(2/3)*(I + Sqrt[3])*(c^2*E^(3*C[1]) - 2*b^3*x^3 + 3*a
*b*c*x^3 - c^2*k*x^3 + Sqrt[-4*(b^2 - a*c)^3*x^6 + (-2*b^3*x^3 + 3*a*b*c*x^3 + c
^2*(E^(3*C[1]) - k*x^3))^2])^(1/3))/(36*c)}, {y[x] -> (-36*b*x + ((18*I)*2^(1/3)
*(I + Sqrt[3])*(b^2 - a*c)*x^2)/(c^2*E^(3*C[1]) - 2*b^3*x^3 + 3*a*b*c*x^3 - c^2*
```

```
k*x^3 + Sqrt[-4*(b^2 - a*c)^3*x^6 + (-2*b^3*x^3 + 3*a*b*c*x^3 + c^2*(E^(3*C[1])
- k*x^3))^2])^(1/3) - 9*2^(2/3)*(1 + I*Sqrt[3])*(c^2*E^(3*C[1]) - 2*b^3*x^3 + 3*
a*b*c*x^3 - c^2*k*x^3 + Sqrt[-4*(b^2 - a*c)^3*x^6 + (-2*b^3*x^3 + 3*a*b*c*x^3 +
c^2*(E^(3*C[1]) - k*x^3))^2])^(1/3))/(36*c)}}
```

Maple raw input

```
dsolve((a*x^2+2*b*x*y(x)+c*y(x)^2)*diff(y(x),x)+k*x^2+2*a*x*y(x)+b*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-1/3*ln((3*a*x^2*y(x)+3*b*x*y(x)^2+c*y(x)^3+k*x^3)/x^3)-ln(x)-_C1 = 0
```

4.641 $x(1-y(x)^2)\,y'(x) = (x^2+1)\,y(x)$

ODE

$$x(1-y(x)^2)\,y'(x) = (x^2+1)\,y(x)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0272619 (sec), leaf count = 57

$$\left\{\left\{y(x) \to -i\sqrt{W\left(x^2\left(-e^{x^2-2c_1}\right)\right)}\right\}, \left\{y(x) \to i\sqrt{W\left(x^2\left(-e^{x^2-2c_1}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 23

$$\left\{\frac{x^2}{2} + \ln(x) + \frac{(y(x))^2}{2} - \ln(y(x)) + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*(1 - y[x]^2)*y'[x] == (1 + x^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-I)*Sqrt[ProductLog[-(E^(x^2 - 2*C[1])*x^2)]]}, {y[x] -> I*Sqrt[Produ
ctLog[-(E^(x^2 - 2*C[1])*x^2)]]}}
```

Maple raw input

```
dsolve(x*(1-y(x)^2)*diff(y(x),x) = (x^2+1)*y(x), y(x),'implicit')
```

Maple raw output

```
1/2*x^2+ln(x)+1/2*y(x)^2-ln(y(x))+_C1 = 0
```

4.642 $x(3x-y(x)^2)\,y'(x)+y(x)\,(5x-2y(x)^2)=0$

ODE

$$x\left(3x-y(x)^2\right)y'(x)+y(x)\left(5x-2y(x)^2\right)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0915318 (sec), leaf count = 661

$$\left\{\left\{y(x)\to \text{Root}\left[-\#1^{15}-\frac{25\#1^2e^{\frac{65c_1}{2}}}{x^{26}}+\frac{65e^{\frac{65c_1}{2}}}{x^{25}}\&,1\right]\right\},\left\{y(x)\to \text{Root}\left[-\#1^{15}-\frac{25\#1^2e^{\frac{65c_1}{2}}}{x^{26}}+\frac{65e^{\frac{65c_1}{2}}}{x^{25}}\&,2\right]\right\},\left\{y(x)\right.$$

Maple ✓
cpu = 0.02 (sec), leaf count = 35

$$\left\{\ln(x)-\_C1-\frac{2}{65}\ln\left(\frac{5\left(y(x)\right)^2-13\,x}{x}\right)+\frac{6}{13}\ln\left(y(x)\,\frac{1}{\sqrt{x}}\right)=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(5*x - 2*y[x]^2) + x*(3*x - y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[(65*E^((65*C[1])/2))/x^25 - (25*E^((65*C[1])/2)*#1^2)/x^26 - #1^1
5 & , 1]}, {y[x] -> Root[(65*E^((65*C[1])/2))/x^25 - (25*E^((65*C[1])/2)*#1^2)/x
^26 - #1^15 & , 2]}, {y[x] -> Root[(65*E^((65*C[1])/2))/x^25 - (25*E^((65*C[1])/
2)*#1^2)/x^26 - #1^15 & , 3]}, {y[x] -> Root[(65*E^((65*C[1])/2))/x^25 - (25*E^(
(65*C[1])/2)*#1^2)/x^26 - #1^15 & , 4]}, {y[x] -> Root[(65*E^((65*C[1])/2))/x^25
 - (25*E^((65*C[1])/2)*#1^2)/x^26 - #1^15 & , 5]}, {y[x] -> Root[(65*E^((65*C[1]
)/2))/x^25 - (25*E^((65*C[1])/2)*#1^2)/x^26 - #1^15 & , 6]}, {y[x] -> Root[(65*E
^((65*C[1])/2))/x^25 - (25*E^((65*C[1])/2)*#1^2)/x^26 - #1^15 & , 7]}, {y[x] ->
Root[(65*E^((65*C[1])/2))/x^25 - (25*E^((65*C[1])/2)*#1^2)/x^26 - #1^15 & , 8]},
 {y[x] -> Root[(65*E^((65*C[1])/2))/x^25 - (25*E^((65*C[1])/2)*#1^2)/x^26 - #1^1
5 & , 9]}, {y[x] -> Root[(65*E^((65*C[1])/2))/x^25 - (25*E^((65*C[1])/2)*#1^2)/x
^26 - #1^15 & , 10]}, {y[x] -> Root[(65*E^((65*C[1])/2))/x^25 - (25*E^((65*C[1])
/2)*#1^2)/x^26 - #1^15 & , 11]}, {y[x] -> Root[(65*E^((65*C[1])/2))/x^25 - (25*E
^((65*C[1])/2)*#1^2)/x^26 - #1^15 & , 12]}, {y[x] -> Root[(65*E^((65*C[1])/2))/x
^25 - (25*E^((65*C[1])/2)*#1^2)/x^26 - #1^15 & , 13]}, {y[x] -> Root[(65*E^((65*
```

```
C[1])/2))/x^25 - (25*E^((65*C[1])/2)*#1^2)/x^26 - #1^15 & , 14]}, {y[x] -> Root[
(65*E^((65*C[1])/2))/x^25 - (25*E^((65*C[1])/2)*#1^2)/x^26 - #1^15 & , 15]}}
```

Maple raw input

```
dsolve(x*(3*x-y(x)^2)*diff(y(x),x)+(5*x-2*y(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-2/65*ln((5*y(x)^2-13*x)/x)+6/13*ln(y(x)/x^(1/2)) = 0
```

4.643 $x(x^2+y(x)^2)\,y'(x) = y(x)\,(x^4+x^2+y(x)^2)$

ODE

$$x(x^2+y(x)^2)\,y'(x) = y(x)\,(x^4+x^2+y(x)^2)$$

ODE Classification

[[_homogeneous, `class D`], _rational]

Book solution method
Homogeneous equation, $xy'(x) = xf(x)g(u) + y(x)$

Mathematica ✓
cpu = 0.0199941 (sec), leaf count = 44

$$\left\{\left\{y(x)\to -x\sqrt{W\left(e^{2c_1+x^2}\right)}\right\},\left\{y(x)\to x\sqrt{W\left(e^{2c_1+x^2}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 28

$$\left\{\ln\left(\frac{y(x)}{x}\right)+\frac{(y(x))^2}{2\,x^2}-\frac{x^2}{2}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^2 + y[x]^2)*y'[x] == y[x]*(x^2 + x^4 + y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x*Sqrt[ProductLog[E^(x^2 + 2*C[1])]])}, {y[x] -> x*Sqrt[ProductLog[E
^(x^2 + 2*C[1])]]}}
```

Maple raw input

```
dsolve(x*(x^2+y(x)^2)*diff(y(x),x) = (x^2+x^4+y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
ln(y(x)/x)+1/2/x^2*y(x)^2-1/2*x^2-_C1 = 0
```

4.644 $x(-x^2+y(x)^2+1)\,y'(x)+y(x)\,(x^2-y(x)^2+1)=0$

ODE

$$x(-x^2+y(x)^2+1)\,y'(x)+y(x)\,(x^2-y(x)^2+1)=0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Homogeneous equation, special

Mathematica ✓
cpu = 0.0656861 (sec), leaf count = 83

$$\left\{\left\{y(x)\to\frac{-\sqrt{-4c_1x^2+4c_1^2+x^2}-2c_1x+x}{2c_1}\right\},\left\{y(x)\to\frac{\sqrt{-4c_1x^2+4c_1^2+x^2}-2c_1x+x}{2c_1}\right\}\right\}$$

Maple ✓
cpu = 0.091 (sec), leaf count = 116

$$\left\{\left((y(x))^{-2}-\left(x^2-1\right)^{-1}\right)^{-1}-x\sqrt{-1+x}\sqrt{1+x}\frac{1}{\sqrt{\_C1-2\,(1+x)^{-1}+2\,(-1+x)^{-1}}}+\frac{(-1+x)\,(1+x)}{2}=0,\left((y(x))^{-}\right.\right.$$

Mathematica raw input

```
DSolve[y[x]*(1 + x^2 - y[x]^2) + x*(1 - x^2 + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - 2*x*C[1] - Sqrt[x^2 - 4*x^2*C[1] + 4*C[1]^2])/(2*C[1])}, {y[x] ->
  (x - 2*x*C[1] + Sqrt[x^2 - 4*x^2*C[1] + 4*C[1]^2])/(2*C[1])}}
```

Maple raw input

```
dsolve(x*(1-x^2+y(x)^2)*diff(y(x),x)+(1+x^2-y(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/(1/y(x)^2-1/(x^2-1))+(-1+x)^(1/2)*(1+x)^(1/2)*x/(_C1-2/(1+x)+2/(-1+x))^(1/2)+1
/2*(-1+x)*(1+x) = 0, 1/(1/y(x)^2-1/(x^2-1))-(-1+x)^(1/2)*(1+x)^(1/2)*x/(_C1-2/(1
+x)+2/(-1+x))^(1/2)+1/2*(-1+x)*(1+x) = 0
```

4.645 $x(a-x^2-y(x)^2)\,y'(x)+y(x)\,(a+x^2+y(x)^2)=0$

ODE

$$x(a-x^2-y(x)^2)\,y'(x)+y(x)\,(a+x^2+y(x)^2)=0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Homogeneous equation, special

Mathematica ✓
cpu = 0.0290743 (sec), leaf count = 65

$$\left\{\left\{y(x)\to\frac{1}{2}\left(c_1x-\sqrt{(c_1^2+4)\,x^2-4a}\right)\right\},\left\{y(x)\to\frac{1}{2}\left(\sqrt{(c_1^2+4)\,x^2-4a}+c_1x\right)\right\}\right\}$$

Maple ✓
cpu = 0.092 (sec), leaf count = 114

$$\left\{\left((y(x))^{-2}-\left(-x^2+a\right)^{-1}\right)^{-1}-x\sqrt{x^2-a}\frac{1}{\sqrt{\_C1+4\frac{a}{x^2-a}}}-\frac{x^2}{2}+\frac{a}{2}=0,\left((y(x))^{-2}-\left(-x^2+a\right)^{-1}\right)^{-1}+x\sqrt{x^2-a}\frac{}{\sqrt{}}\right.$$

Mathematica raw input

```
DSolve[y[x]*(a + x^2 + y[x]^2) + x*(a - x^2 - y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*C[1] - Sqrt[-4*a + x^2*(4 + C[1]^2)])/2}, {y[x] -> (x*C[1] + Sqrt[-
4*a + x^2*(4 + C[1]^2)])/2}}
```

Maple raw input

```
dsolve(x*(a-x^2-y(x)^2)*diff(y(x),x)+(a+x^2+y(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/(1/y(x)^2-1/(-x^2+a))+x*(x^2-a)^(1/2)/(_C1+4*a/(x^2-a))^(1/2)-1/2*x^2+1/2*a =
0, 1/(1/y(x)^2-1/(-x^2+a))-x*(x^2-a)^(1/2)/(_C1+4*a/(x^2-a))^(1/2)-1/2*x^2+1/2*a
 = 0
```

4.646 $x(2x^2+y(x)^2)\,y'(x) = y(x)\,(2x^2+3y(x)^2)$

ODE

$$x(2x^2+y(x)^2)\,y'(x) = y(x)\,(2x^2+3y(x)^2)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0379948 (sec), leaf count = 56

$$\left\{\left\{y(x)\to -\frac{\sqrt{2}x}{\sqrt{W\left(\frac{2e^{-2c_1}}{x^4}\right)}}\right\},\left\{y(x)\to \frac{\sqrt{2}x}{\sqrt{W\left(\frac{2e^{-2c_1}}{x^4}\right)}}\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 29

$$\left\{\frac{1}{2}\ln\left(\frac{y(x)}{x}\right)-\frac{x^2}{2\,(y(x))^2}-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(2*x^2 + y[x]^2)*y'[x] == y[x]*(2*x^2 + 3*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((Sqrt[2]*x)/Sqrt[ProductLog[2/(E^(2*C[1])*x^4)]])}, {y[x] -> (Sqrt[2
]*x)/Sqrt[ProductLog[2/(E^(2*C[1])*x^4)]]}}
```

Maple raw input

```
dsolve(x*(2*x^2+y(x)^2)*diff(y(x),x) = (2*x^2+3*y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
1/2*ln(y(x)/x)-1/2*x^2/y(x)^2-ln(x)-_C1 = 0
```

4.647 $(x(a-x^2-y(x)^2)+y(x))\,y'(x)-y(x)\,(a-x^2-y(x)^2)+x=0$

ODE

$$(x(a-x^2-y(x)^2)+y(x))\,y'(x)-y(x)\,(a-x^2-y(x)^2)+x=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational]

Book solution method
Change of Variable, Two new variables

Mathematica ✓
cpu = 0.0884609 (sec), leaf count = 48

$$\text{Solve}\left[\frac{2ac_1-\log\left(-a+x^2+y(x)^2\right)+2a\tan^{-1}\left(\frac{y(x)}{x}\right)+\log\left(x^2+y(x)^2\right)}{a}=0,y(x)\right]$$

Maple ✓
cpu = 0.151 (sec), leaf count = 40

$$\left\{-2\arctan\left(\frac{y(x)}{x}\right)a+\ln\left(x^2+(y(x))^2-a\right)-\ln\left(x^2+(y(x))^2\right)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x - y[x]*(a - x^2 - y[x]^2) + (y[x] + x*(a - x^2 - y[x]^2))*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[(2*a*ArcTan[y[x]/x] + 2*a*C[1] + Log[x^2 + y[x]^2] - Log[-a + x^2 + y[x]^2
])/a == 0, y[x]]
```

Maple raw input

```
dsolve((x*(a-x^2-y(x)^2)+y(x))*diff(y(x),x)+x-(a-x^2-y(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-2*arctan(y(x)/x)*a+ln(x^2+y(x)^2-a)-ln(x^2+y(x)^2)-_C1 = 0
```

4.648 $x(a+y(x))^2y'(x) = by(x)^2$

ODE

$$x(a+y(x))^2y'(x) = by(x)^2$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0569887 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{a^2}{\#1} + 2a\log(\#1) + \#1\&\right][b\log(x) + c_1]\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 34

$$\left\{\ln(x) - \frac{y(x)}{b} + \frac{a^2}{by(x)} - 2\frac{a\ln(y(x))}{b} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*(a + y[x])^2*y'[x] == b*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[2*a*Log[#1] - a^2/#1 + #1 & ][C[1] + b*Log[x]]}}
```

Maple raw input

```
dsolve(x*(a+y(x))^2*diff(y(x),x) = b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-1/b*y(x)+1/b*a^2/y(x)-2/b*a*ln(y(x))+_C1 = 0
```

4.649 $x(x^2 - xy(x) + y(x)^2)\,y'(x) + y(x)\,(x^2 + xy(x) + y(x)^2) = 0$

ODE

$$x(x^2 - xy(x) + y(x)^2)\,y'(x) + y(x)\,(x^2 + xy(x) + y(x)^2) = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0363929 (sec), leaf count = 26

$$\text{Solve}\left[c_1 + \tan^{-1}\left(\frac{y(x)}{x}\right) = \log\left(\frac{y(x)}{x}\right) + 2\log(x), y(x)\right]$$

Maple ✓
cpu = 0.018 (sec), leaf count = 29

$$\left\{\frac{1}{2}\arctan\left(\frac{y(x)}{x}\right) - \frac{1}{2}\ln\left(\frac{y(x)}{x}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(x^2 + x*y[x] + y[x]^2) + x*(x^2 - x*y[x] + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[ArcTan[y[x]/x] + C[1] == 2*Log[x] + Log[y[x]/x], y[x]]
```

Maple raw input

```
dsolve(x*(x^2-x*y(x)+y(x)^2)*diff(y(x),x)+(x^2+x*y(x)+y(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/2*arctan(y(x)/x)-1/2*ln(y(x)/x)-ln(x)-_C1 = 0
```

4.650 $x(x^2 - xy(x) - y(x)^2)\,y'(x) = y(x)\,(x^2 + xy(x) - y(x)^2)$

ODE

$$x(x^2 - xy(x) - y(x)^2)\,y'(x) = y(x)\,(x^2 + xy(x) - y(x)^2)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.133746 (sec), leaf count = 30

$$\text{Solve}\left[c_1 = \frac{x}{y(x)} + \frac{y(x)}{x} + \log\left(\frac{y(x)}{x}\right) + 2\log(x), y(x)\right]$$

Maple ✓
cpu = 0.018 (sec), leaf count = 34

$$\left\{-\frac{1}{2}\ln\left(\frac{y(x)}{x}\right) - \frac{x}{2\,y\,(x)} - \frac{y(x)}{2\,x} - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*(x^2 - x*y[x] - y[x]^2)*y'[x] == y[x]*(x^2 + x*y[x] - y[x]^2),y[x],x]
```

Mathematica raw output

```
Solve[C[1] == 2*Log[x] + Log[y[x]/x] + x/y[x] + y[x]/x, y[x]]
```

Maple raw input

```
dsolve(x*(x^2-x*y(x)-y(x)^2)*diff(y(x),x) = (x^2+x*y(x)-y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
-1/2*ln(y(x)/x)-1/2*x/y(x)-1/2*y(x)/x-ln(x)-_C1 = 0
```

4.651 $x(axy(x)+x^2+y(x)^2)\,y'(x)=y(x)\,(bxy(x)+x^2+y(x)^2)$

ODE

$$x(axy(x)+x^2+y(x)^2)\,y'(x)=y(x)\,(bxy(x)+x^2+y(x)^2)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0820612 (sec), leaf count = 37

$$\text{Solve}\left[(b-a)\log(x)+c_1+\frac{x}{y(x)}=a\log\left(\frac{y(x)}{x}\right)+\frac{y(x)}{x},y(x)\right]$$

Maple ✓
cpu = 0.018 (sec), leaf count = 49

$$\left\{\frac{1}{(a-b)\,xy\,(x)}\left(-a\ln\left(\frac{y(x)}{x}\right)xy(x)-(y(x))^2+x^2\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^2 + a*x*y[x] + y[x]^2)*y'[x] == y[x]*(x^2 + b*x*y[x] + y[x]^2),y[x],x]
```

Mathematica raw output

```
Solve[C[1] + (-a + b)*Log[x] + x/y[x] == a*Log[y[x]/x] + y[x]/x, y[x]]
```

Maple raw input

```
dsolve(x*(x^2+a*x*y(x)+y(x)^2)*diff(y(x),x) = (x^2+b*x*y(x)+y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
(-a*ln(y(x)/x)*x*y(x)-y(x)^2+x^2)/(a-b)/x/y(x)-ln(x)-_C1 = 0
```

4.652 $x(x^2-2y(x)^2)\,y'(x)=y(x)\,(2x^2-y(x)^2)$

ODE

$$x(x^2-2y(x)^2)\,y'(x)=y(x)\,(2x^2-y(x)^2)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.50535 (sec), leaf count = 1069

$$\left\{\left\{y(x)\to -\sqrt{\frac{\sqrt[3]{\frac{2}{3}}e^{2c_1}x^2}{\sqrt[3]{\sqrt{81e^{4c_1}x^8-12e^{6c_1}x^6}-9e^{2c_1}x^4}}-x^2+\frac{\sqrt[3]{\sqrt{81e^{4c_1}x^8-12e^{6c_1}x^6}-9e^{2c_1}x^4}}{\sqrt[3]{2}3^{2/3}}}\right\},\left\{y(x)\to \sqrt{\frac{\sqrt[3]{\frac{2}{3}}e^{2c_1}x^2}{\sqrt[3]{\sqrt{81e^{4c_1}x^8-12e^{6c_1}x^6}-9e^{2c_1}x^4}}-x^2+\frac{\sqrt[3]{\sqrt{81e^{4c_1}x^8-12e^{6c_1}x^6}-9e^{2c_1}x^4}}{\sqrt[3]{2}3^{2/3}}}\right\}\right\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 33

$$\left\{-\frac{3}{2}\ln\left(\frac{x^2+(y(x))^2}{x^2}\right)+\ln\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^2 - 2*y[x]^2)*y'[x] == y[x]*(2*x^2 - y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-x^2 + ((2/3)^(1/3)*E^(2*C[1])*x^2)/(-9*E^(2*C[1])*x^4 + Sqrt[-1
2*E^(6*C[1])*x^6 + 81*E^(4*C[1])*x^8])^(1/3) + (-9*E^(2*C[1])*x^4 + Sqrt[-12*E^(
6*C[1])*x^6 + 81*E^(4*C[1])*x^8])^(1/3)/(2^(1/3)*3^(2/3))]}, {y[x] -> Sqrt[-x^2
+ ((2/3)^(1/3)*E^(2*C[1])*x^2)/(-9*E^(2*C[1])*x^4 + Sqrt[-12*E^(6*C[1])*x^6 + 81
*E^(4*C[1])*x^8])^(1/3) + (-9*E^(2*C[1])*x^4 + Sqrt[-12*E^(6*C[1])*x^6 + 81*E^(4
*C[1])*x^8])^(1/3)/(2^(1/3)*3^(2/3))]}, {y[x] -> -Sqrt[(-2*2^(1/3)*3^(1/6)*(-3*I
 + Sqrt[3])*E^(2*C[1])*x^2 - 12*x^2*(-9*E^(2*C[1])*x^4 + Sqrt[-12*E^(6*C[1])*x^6
 + 81*E^(4*C[1])*x^8])^(1/3) + 3^(1/3)*(-1 - I*Sqrt[3])*(-18*E^(2*C[1])*x^4 + 2*
Sqrt[-12*E^(6*C[1])*x^6 + 81*E^(4*C[1])*x^8])^(2/3))/(-9*E^(2*C[1])*x^4 + Sqrt[-
12*E^(6*C[1])*x^6 + 81*E^(4*C[1])*x^8])^(1/3)]/(2*Sqrt[3])}, {y[x] -> Sqrt[(-2*2
```

```
^(1/3)*3^(1/6)*(-3*I + Sqrt[3])*E^(2*C[1])*x^2 - 12*x^2*(-9*E^(2*C[1])*x^4 + Sqr
t[-12*E^(6*C[1])*x^6 + 81*E^(4*C[1])*x^8])^(1/3) + 3^(1/3)*(-1 - I*Sqrt[3])*(-18
*E^(2*C[1])*x^4 + 2*Sqrt[-12*E^(6*C[1])*x^6 + 81*E^(4*C[1])*x^8])^(2/3))/(-9*E^(
2*C[1])*x^4 + Sqrt[-12*E^(6*C[1])*x^6 + 81*E^(4*C[1])*x^8])^(1/3)]/(2*Sqrt[3])},
 {y[x] -> -Sqrt[(-2*2^(1/3)*3^(1/6)*(3*I + Sqrt[3])*E^(2*C[1])*x^2 - 12*x^2*(-9*
E^(2*C[1])*x^4 + Sqrt[-12*E^(6*C[1])*x^6 + 81*E^(4*C[1])*x^8])^(1/3) + I*3^(1/3)
*(I + Sqrt[3])*(-18*E^(2*C[1])*x^4 + 2*Sqrt[-12*E^(6*C[1])*x^6 + 81*E^(4*C[1])*x
^8])^(2/3))/(-9*E^(2*C[1])*x^4 + Sqrt[-12*E^(6*C[1])*x^6 + 81*E^(4*C[1])*x^8])^(
1/3)]/(2*Sqrt[3])}, {y[x] -> Sqrt[(-2*2^(1/3)*3^(1/6)*(3*I + Sqrt[3])*E^(2*C[1])
*x^2 - 12*x^2*(-9*E^(2*C[1])*x^4 + Sqrt[-12*E^(6*C[1])*x^6 + 81*E^(4*C[1])*x^8])
^(1/3) + I*3^(1/3)*(I + Sqrt[3])*(-18*E^(2*C[1])*x^4 + 2*Sqrt[-12*E^(6*C[1])*x^6
 + 81*E^(4*C[1])*x^8])^(2/3))/(-9*E^(2*C[1])*x^4 + Sqrt[-12*E^(6*C[1])*x^6 + 81*
E^(4*C[1])*x^8])^(1/3)]/(2*Sqrt[3])}}
```

Maple raw input

```
dsolve(x*(x^2-2*y(x)^2)*diff(y(x),x) = (2*x^2-y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
-3/2*ln((x^2+y(x)^2)/x^2)+ln(y(x)/x)-ln(x)-_C1 = 0
```

4.653 $x(x^2+2y(x)^2)\,y'(x) = y(x)\,(2x^2+3y(x)^2)$

ODE

$$x\left(x^2+2y(x)^2\right)y'(x) = y(x)\left(2x^2+3y(x)^2\right)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.043949 (sec), leaf count = 163

$$\left\{\left\{y(x)\to -\frac{\sqrt{-\sqrt{4e^{2c_1}x^6+x^4}-x^2}}{\sqrt{2}}\right\},\left\{y(x)\to \frac{\sqrt{-\sqrt{4e^{2c_1}x^6+x^4}-x^2}}{\sqrt{2}}\right\},\left\{y(x)\to -\frac{\sqrt{\sqrt{4e^{2c_1}x^6+x^4}-x^2}}{\sqrt{2}}\right\},\left\{y(x)\right.\right.$$

Maple ✓
cpu = 0.019 (sec), leaf count = 33

$$\left\{\frac{1}{2}\ln\left(\frac{x^2+(y(x))^2}{x^2}\right)+\ln\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^2 + 2*y[x]^2)*y'[x] == y[x]*(2*x^2 + 3*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-x^2 - Sqrt[x^4 + 4*E^(2*C[1])*x^6]]/Sqrt[2])}, {y[x] -> Sqrt[-
x^2 - Sqrt[x^4 + 4*E^(2*C[1])*x^6]]/Sqrt[2]}, {y[x] -> -(Sqrt[-x^2 + Sqrt[x^4 +
4*E^(2*C[1])*x^6]]/Sqrt[2])}, {y[x] -> Sqrt[-x^2/2 + Sqrt[x^4 + 4*E^(2*C[1])*x^6
]/2]}}
```

Maple raw input

```
dsolve(x*(x^2+2*y(x)^2)*diff(y(x),x) = (2*x^2+3*y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
1/2*ln((x^2+y(x)^2)/x^2)+ln(y(x)/x)-ln(x)-_C1 = 0
```

4.654 $2x(5x^2+y(x)^2)\,y'(x) = x^2y(x) - y(x)^3$

ODE

$$2x(5x^2+y(x)^2)\,y'(x) = x^2y(x) - y(x)^3$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0608681 (sec), leaf count = 216

$$\left\{\left\{y(x)\to \text{Root}\left[-\#1^5+\frac{\#1^2e^{3c_1}}{x^{3/2}}+3e^{3c_1}\sqrt{x}\&,1\right]\right\},\left\{y(x)\to \text{Root}\left[-\#1^5+\frac{\#1^2e^{3c_1}}{x^{3/2}}+3e^{3c_1}\sqrt{x}\&,2\right]\right\},\left\{y(x)\to \text{Root}\right.\right.$$

Maple ✓
cpu = 0.021 (sec), leaf count = 37

$$\left\{\frac{2}{9}\ln\left(\frac{3x^2+(y(x))^2}{x^2}\right)-\frac{10}{9}\ln\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*x*(5*x^2 + y[x]^2)*y'[x] == x^2*y[x] - y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[3*E^(3*C[1])*Sqrt[x] + (E^(3*C[1])*#1^2)/x^(3/2) - #1^5 & , 1]},
{y[x] -> Root[3*E^(3*C[1])*Sqrt[x] + (E^(3*C[1])*#1^2)/x^(3/2) - #1^5 & , 2]}, {
y[x] -> Root[3*E^(3*C[1])*Sqrt[x] + (E^(3*C[1])*#1^2)/x^(3/2) - #1^5 & , 3]}, {y
[x] -> Root[3*E^(3*C[1])*Sqrt[x] + (E^(3*C[1])*#1^2)/x^(3/2) - #1^5 & , 4]}, {y[
x] -> Root[3*E^(3*C[1])*Sqrt[x] + (E^(3*C[1])*#1^2)/x^(3/2) - #1^5 & , 5]}}
```

Maple raw input

```
dsolve(2*x*(5*x^2+y(x)^2)*diff(y(x),x) = x^2*y(x)-y(x)^3, y(x),'implicit')
```

Maple raw output

```
2/9*ln((3*x^2+y(x)^2)/x^2)-10/9*ln(y(x)/x)-ln(x)-_C1 = 0
```

4.655 $x(axy(x)+x^2+2y(x)^2)\,y'(x)=y(x)^2(ax+2y(x))$

ODE

$$x(axy(x)+x^2+2y(x)^2)\,y'(x)=y(x)^2(ax+2y(x))$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0639051 (sec), leaf count = 31

$$\text{Solve}\left[\frac{ay(x)}{x}+\frac{y(x)^2}{x^2}+\log\left(\frac{y(x)}{x}\right)+\log(x)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.013 (sec), leaf count = 37

$$\left\{-\frac{ay(x)}{x}-\ln\left(\frac{y(x)}{x}\right)-\frac{(y(x))^2}{x^2}-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^2 + a*x*y[x] + 2*y[x]^2)*y'[x] == y[x]^2*(a*x + 2*y[x]),y[x],x]
```

Mathematica raw output

```
Solve[Log[x] + Log[y[x]/x] + (a*y[x])/x + y[x]^2/x^2 == C[1], y[x]]
```

Maple raw input

```
dsolve(x*(x^2+a*x*y(x)+2*y(x)^2)*diff(y(x),x) = (a*x+2*y(x))*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-a/x*y(x)-ln(y(x)/x)-1/x^2*y(x)^2-ln(x)-_C1 = 0
```

4.656 $3xy(x)^2y'(x) = 2x - y(x)^3$

ODE

$$3xy(x)^2y'(x) = 2x - y(x)^3$$

ODE Classification

[[_homogeneous, `class G`], _exact, _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00758456 (sec), leaf count = 72

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{c_1 + x^2}}{\sqrt[3]{x}}\right\}, \left\{y(x) \to -\frac{\sqrt[3]{-1}\sqrt[3]{c_1 + x^2}}{\sqrt[3]{x}}\right\}, \left\{y(x) \to \frac{(-1)^{2/3}\sqrt[3]{c_1 + x^2}}{\sqrt[3]{x}}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 17

$$\left\{-x - \frac{\_C1}{x} + (y(x))^3 = 0\right\}$$

Mathematica raw input

```
DSolve[3*x*y[x]^2*y'[x] == 2*x - y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2 + C[1])^(1/3)/x^(1/3)}, {y[x] -> -(((-1)^(1/3)*(x^2 + C[1])^(1/3)
)/x^(1/3))}, {y[x] -> ((-1)^(2/3)*(x^2 + C[1])^(1/3))/x^(1/3)}}
```

Maple raw input

```
dsolve(3*x*y(x)^2*diff(y(x),x) = 2*x-y(x)^3, y(x),'implicit')
```

Maple raw output

```
-x-1/x*_C1+y(x)^3 = 0
```

4.657 $(3xy(x)^2 - 4x + 1)\, y'(x) = y(x)\,(2 - y(x)^2)$

ODE

$$(3xy(x)^2 - 4x + 1)\, y'(x) = y(x)\,(2 - y(x)^2)$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.159935 (sec), leaf count = 2348

$$\left\{\left\{y(x) \to -\frac{\sqrt{\frac{8\sqrt[3]{2}x^4+8\sqrt[3]{2}x^3+2\left(2\sqrt[3]{16x^6+24x^5-3\left(9c_1^2-4\right)x^4+2x^3+3\sqrt{3}\sqrt{-x^7c_1^2\left(32x^3+48x^2-27c_1^2x+24x+4\right)}}\right.}{x^2\sqrt[3]{16x^6+24x}}}}{\right.$$

Maple ✓
cpu = 0.021 (sec), leaf count = 24

$$\left\{x + (y(x))^{-2} - \frac{\_C1}{(y(x))^2}\frac{1}{\sqrt{(y(x))^2-2}} = 0\right\}$$

Mathematica raw input

```
DSolve[(1 - 4*x + 3*x*y[x]^2)*y'[x] == y[x]*(2 - y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[(8*2^(1/3)*x^3 + 8*2^(1/3)*x^4 - 4*x*(2*x^3 + 24*x^5 + 16*x^6 -
  3*x^4*(-4 + 9*C[1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3
  - 27*x*C[1]^2))])^(1/3) + (4*x^3 + 48*x^5 + 32*x^6 - 6*x^4*(-4 + 9*C[1]^2) + 6*
Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(2/3) +
2*x^2*(2^(1/3) + 2*(2*x^3 + 24*x^5 + 16*x^6 - 3*x^4*(-4 + 9*C[1]^2) + 3*Sqrt[3]*
Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(1/3)))/(x^2*(2*
x^3 + 24*x^5 + 16*x^6 - 3*x^4*(-4 + 9*C[1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 +
```

```
 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(1/3))]/Sqrt[6])}, {y[x] -> Sqrt[(8*2^
(1/3)*x^3 + 8*2^(1/3)*x^4 - 4*x*(2*x^3 + 24*x^5 + 16*x^6 - 3*x^4*(-4 + 9*C[1]^2)
 + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(1/
3) + (4*x^3 + 48*x^5 + 32*x^6 - 6*x^4*(-4 + 9*C[1]^2) + 6*Sqrt[3]*Sqrt[-(x^7*C[1
]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(2/3) + 2*x^2*(2^(1/3) + 2*(2*
x^3 + 24*x^5 + 16*x^6 - 3*x^4*(-4 + 9*C[1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 +
 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(1/3)))/(x^2*(2*x^3 + 24*x^5 + 16*x^6
- 3*x^4*(-4 + 9*C[1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^
3 - 27*x*C[1]^2))])^(1/3))]/Sqrt[6]}, {y[x] -> -Sqrt[((8*I)*2^(1/3)*(I + Sqrt[3]
)*x^3 + (8*I)*2^(1/3)*(I + Sqrt[3])*x^4 - 8*x*(2*x^3 + 24*x^5 + 16*x^6 - 3*x^4*(
-4 + 9*C[1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*
C[1]^2))])^(1/3) - I*(-I + Sqrt[3])*(4*x^3 + 48*x^5 + 32*x^6 - 6*x^4*(-4 + 9*C[1
]^2) + 6*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])
^(2/3) + 2*x^2*(-2^(1/3) + I*2^(1/3)*Sqrt[3] + 4*(2*x^3 + 24*x^5 + 16*x^6 - 3*x^
4*(-4 + 9*C[1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27
*x*C[1]^2))])^(1/3)))/(x^2*(2*x^3 + 24*x^5 + 16*x^6 - 3*x^4*(-4 + 9*C[1]^2) + 3*
Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(1/3))]/
(2*Sqrt[3])}, {y[x] -> Sqrt[((8*I)*2^(1/3)*(I + Sqrt[3])*x^3 + (8*I)*2^(1/3)*(I
+ Sqrt[3])*x^4 - 8*x*(2*x^3 + 24*x^5 + 16*x^6 - 3*x^4*(-4 + 9*C[1]^2) + 3*Sqrt[3
]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(1/3) - I*(-I
+ Sqrt[3])*(4*x^3 + 48*x^5 + 32*x^6 - 6*x^4*(-4 + 9*C[1]^2) + 6*Sqrt[3]*Sqrt[-(x
^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(2/3) + 2*x^2*(-2^(1/3)
+ I*2^(1/3)*Sqrt[3] + 4*(2*x^3 + 24*x^5 + 16*x^6 - 3*x^4*(-4 + 9*C[1]^2) + 3*Sqr
t[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(1/3)))/(x^
2*(2*x^3 + 24*x^5 + 16*x^6 - 3*x^4*(-4 + 9*C[1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2
*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(1/3))]/(2*Sqrt[3])}, {y[x] -> -S
qrt[((-8*I)*2^(1/3)*(-I + Sqrt[3])*x^3 - (8*I)*2^(1/3)*(-I + Sqrt[3])*x^4 - 8*x*
(2*x^3 + 24*x^5 + 16*x^6 - 3*x^4*(-4 + 9*C[1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(
4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(1/3) + I*(I + Sqrt[3])*(4*x^3 + 48
*x^5 + 32*x^6 - 6*x^4*(-4 + 9*C[1]^2) + 6*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x +
48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(2/3) + 2*x^2*(-2^(1/3) - I*2^(1/3)*Sqrt[3] +
4*(2*x^3 + 24*x^5 + 16*x^6 - 3*x^4*(-4 + 9*C[1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2
*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))])^(1/3)))/(x^2*(2*x^3 + 24*x^5 + 16
*x^6 - 3*x^4*(-4 + 9*C[1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 +
32*x^3 - 27*x*C[1]^2))])^(1/3))]/(2*Sqrt[3])}, {y[x] -> Sqrt[((-8*I)*2^(1/3)*(-I
 + Sqrt[3])*x^3 - (8*I)*2^(1/3)*(-I + Sqrt[3])*x^4 - 8*x*(2*x^3 + 24*x^5 + 16*x^
6 - 3*x^4*(-4 + 9*C[1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*
x^3 - 27*x*C[1]^2))])^(1/3) + I*(I + Sqrt[3])*(4*x^3 + 48*x^5 + 32*x^6 - 6*x^4*(
-4 + 9*C[1]^2) + 6*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*
C[1]^2))])^(2/3) + 2*x^2*(-2^(1/3) - I*2^(1/3)*Sqrt[3] + 4*(2*x^3 + 24*x^5 + 16*
x^6 - 3*x^4*(-4 + 9*C[1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 3
2*x^3 - 27*x*C[1]^2))])^(1/3)))/(x^2*(2*x^3 + 24*x^5 + 16*x^6 - 3*x^4*(-4 + 9*C[
1]^2) + 3*Sqrt[3]*Sqrt[-(x^7*C[1]^2*(4 + 24*x + 48*x^2 + 32*x^3 - 27*x*C[1]^2))]
)^(1/3))]/(2*Sqrt[3])}}
```

Maple raw input

```
dsolve((1-4*x+3*x*y(x)^2)*diff(y(x),x) = (2-y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
x+1/y(x)^2-1/(y(x)^2-2)^(1/2)/y(x)^2*_C1 = 0
```

4.658 $x(x-3y(x)^2)\,y'(x)+y(x)\,(2x-y(x)^2)=0$

ODE

$$x(x-3y(x)^2)\,y'(x)+y(x)\,(2x-y(x)^2)=0$$

ODE Classification

[[_homogeneous, `class G`], _exact, _rational]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0192639 (sec), leaf count = 328

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{2}\left(9c_1x^2+\sqrt{81c_1^2x^4-12x^9}\right)^{2/3}+2\sqrt[3]{3}x^3}{6^{2/3}x\sqrt[3]{9c_1x^2+\sqrt{81c_1^2x^4-12x^9}}}\right\},\left\{y(x)\to \frac{\sqrt[3]{3}(1-i\sqrt{3})\left(18c_1x^2+2\sqrt{81c_1^2x^4-12x^9}\right)^{2/3}+2}{12x\sqrt[3]{9c_1x^2+\sqrt{81c_1^2x^4-12x^9}}}\right.\right.$$

Maple ✓
cpu = 0.014 (sec), leaf count = 27

$$\left\{\ln(x)-\_C1+\frac{2}{5}\ln\left(-y(x)\left(x-(y(x))^2\right)x^{-\frac{3}{2}}\right)=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(2*x - y[x]^2) + x*(x - 3*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((2*3^(1/3)*x^3 + 2^(1/3)*(9*x^2*C[1] + Sqrt[-12*x^9 + 81*x^4*C[1]^2]
)^(2/3))/(6^(2/3)*x*(9*x^2*C[1] + Sqrt[-12*x^9 + 81*x^4*C[1]^2])^(1/3)))}, {y[x]
 -> (2*2^(1/3)*3^(1/6)*(3*I + Sqrt[3])*x^3 + 3^(1/3)*(1 - I*Sqrt[3])*(18*x^2*C[1
] + 2*Sqrt[-12*x^9 + 81*x^4*C[1]^2])^(2/3))/(12*x*(9*x^2*C[1] + Sqrt[-12*x^9 + 8
1*x^4*C[1]^2])^(1/3))}, {y[x] -> (2*2^(1/3)*3^(1/6)*(-3*I + Sqrt[3])*x^3 + 3^(1/
3)*(1 + I*Sqrt[3])*(18*x^2*C[1] + 2*Sqrt[-12*x^9 + 81*x^4*C[1]^2])^(2/3))/(12*x*
(9*x^2*C[1] + Sqrt[-12*x^9 + 81*x^4*C[1]^2])^(1/3))}}
```

Maple raw input

```
dsolve(x*(x-3*y(x)^2)*diff(y(x),x)+(2*x-y(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+2/5*ln(-y(x)*(x-y(x)^2)/x^(3/2)) = 0
```

4.659 $x^3+3x(y(x)^2+x)\,y'(x)-3xy(x)-2y(x)^3=0$

ODE

$$x^3+3x(y(x)^2+x)\,y'(x)-3xy(x)-2y(x)^3=0$$

ODE Classification

[_rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0242262 (sec), leaf count = 362

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{c_1x^2+\sqrt{x^3\left(-2c_1x^2+c_1^2x+x^3+4\right)}-x^3}}{\sqrt[3]{2}}-\frac{\sqrt[3]{2}x}{\sqrt[3]{c_1x^2+\sqrt{x^3\left(-2c_1x^2+c_1^2x+x^3+4\right)}-x^3}}\right\},\left\{y(x)\to \frac{i\sqrt[3]{2}}{}\right.$$

Maple ✓
cpu = 0.024 (sec), leaf count = 21

$$\left\{x+3\,\frac{y(x)}{x}+\frac{(y(x))^3}{x^2}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x^3 - 3*x*y[x] - 2*y[x]^3 + 3*x*(x + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((2^(1/3)*x)/(-x^3 + x^2*C[1] + Sqrt[x^3*(4 + x^3 - 2*x^2*C[1] + x*C[
1]^2)])^(1/3)) + (-x^3 + x^2*C[1] + Sqrt[x^3*(4 + x^3 - 2*x^2*C[1] + x*C[1]^2)])
^(1/3)/2^(1/3)}, {y[x] -> ((2 + (2*I)*Sqrt[3])*x + I*2^(1/3)*(I + Sqrt[3])*(-x^3
 + x^2*C[1] + Sqrt[x^3*(4 + x^3 - 2*x^2*C[1] + x*C[1]^2)])^(2/3))/(2*2^(2/3)*(-x
^3 + x^2*C[1] + Sqrt[x^3*(4 + x^3 - 2*x^2*C[1] + x*C[1]^2)])^(1/3))}, {y[x] -> (
(2 - (2*I)*Sqrt[3])*x - I*2^(1/3)*(-I + Sqrt[3])*(-x^3 + x^2*C[1] + Sqrt[x^3*(4
+ x^3 - 2*x^2*C[1] + x*C[1]^2)])^(2/3))/(2*2^(2/3)*(-x^3 + x^2*C[1] + Sqrt[x^3*(
4 + x^3 - 2*x^2*C[1] + x*C[1]^2)])^(1/3))}}
```

Maple raw input

```
dsolve(3*x*(x+y(x)^2)*diff(y(x),x)+x^3-3*x*y(x)-2*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
x+3*y(x)/x+y(x)^3/x^2+_C1 = 0
```

4.660 $x(-3x^3y(x)+x^3+4y(x)^2)\,y'(x)=6y(x)^3$

ODE

$$x(-3x^3y(x)+x^3+4y(x)^2)\,y'(x)=6y(x)^3$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]]

Book solution method
Change of Variable, new independent variable

Mathematica ✓
cpu = 0.397961 (sec), leaf count = 27

$$\text{Solve}\left[\frac{y(x)^2}{x^3}+\frac{1}{2}(\log(y(x))-3y(x))=c_1,y(x)\right]$$

Maple ✓
cpu = 0.112 (sec), leaf count = 23

$$\left\{\_C1-\frac{y(x)}{2}+\frac{\ln(y(x))}{6}+\frac{(y(x))^2}{3x^3}=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^3 - 3*x^3*y[x] + 4*y[x]^2)*y'[x] == 6*y[x]^3,y[x],x]
```

Mathematica raw output

```
Solve[(Log[y[x]] - 3*y[x])/2 + y[x]^2/x^3 == C[1], y[x]]
```

Maple raw input

```
dsolve(x*(x^3-3*x^3*y(x)+4*y(x)^2)*diff(y(x),x) = 6*y(x)^3, y(x),'implicit')
```

Maple raw output

```
_C1-1/2*y(x)+1/6*ln(y(x))+1/3/x^3*y(x)^2 = 0
```

4.661 $6xy(x)^2y'(x) + 2y(x)^3 + x = 0$

ODE

$$6xy(x)^2y'(x) + 2y(x)^3 + x = 0$$

ODE Classification

[[_homogeneous, `class G`], _exact, _rational, _Bernoulli]

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 0.00777719 (sec), leaf count = 99

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{4c_1 - x^2}}{2^{2/3}\sqrt[3]{x}}\right\}, \left\{y(x) \to -\frac{\sqrt[3]{-1}\sqrt[3]{4c_1 - x^2}}{2^{2/3}\sqrt[3]{x}}\right\}, \left\{y(x) \to \frac{(-1)^{2/3}\sqrt[3]{4c_1 - x^2}}{2^{2/3}\sqrt[3]{x}}\right\}\right\}$$

Maple ✓
cpu = 0.004 (sec), leaf count = 17

$$\left\{(y(x))^3 + \frac{x}{4} - \frac{\_C1}{x} = 0\right\}$$

Mathematica raw input

```
DSolve[x + 2*y[x]^3 + 6*x*y[x]^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-x^2 + 4*C[1])^(1/3)/(2^(2/3)*x^(1/3))}, {y[x] -> -(((-1)^(1/3)*(-x^2
 + 4*C[1])^(1/3))/(2^(2/3)*x^(1/3)))}, {y[x] -> ((-1)^(2/3)*(-x^2 + 4*C[1])^(1/3
))/(2^(2/3)*x^(1/3))}}
```

Maple raw input

```
dsolve(6*x*y(x)^2*diff(y(x),x)+x+2*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^3+1/4*x-1/x*_C1 = 0
```

4.662 $x(6y(x)^2+x)\,y'(x)-3y(x)^3+xy(x)=0$

ODE

$$x(6y(x)^2+x)\,y'(x)-3y(x)^3+xy(x)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.035346 (sec), leaf count = 64

$$\left\{\left\{y(x)\to -\frac{\sqrt{x}\sqrt{W\left(\frac{6e^{3c_1}}{x^3}\right)}}{\sqrt{6}}\right\},\left\{y(x)\to \frac{\sqrt{x}\sqrt{W\left(\frac{6e^{3c_1}}{x^3}\right)}}{\sqrt{6}}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 30

$$\left\{\ln(x)-\_C1+\frac{2}{3\,x}\left(\ln\left(y(x)\,\frac{1}{\sqrt{x}}\right)x+3\,(y(x))^2\right)=0\right\}$$

Mathematica raw input

```
DSolve[x*y[x] - 3*y[x]^3 + x*(x + 6*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((Sqrt[x]*Sqrt[ProductLog[(6*E^(3*C[1]))/x^3]])/Sqrt[6])}, {y[x] -> (
Sqrt[x]*Sqrt[ProductLog[(6*E^(3*C[1]))/x^3]])/Sqrt[6]}}
```

Maple raw input

```
dsolve(x*(x+6*y(x)^2)*diff(y(x),x)+x*y(x)-3*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+2/3*(ln(y(x)/x^(1/2))*x+3*y(x)^2)/x = 0
```

4.663 $x(x^2-6y(x)^2)\,y'(x)=4y(x)\,(x^2+3y(x)^2)$

ODE

$$x(x^2-6y(x)^2)\,y'(x)=4y(x)\,(x^2+3y(x)^2)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0366464 (sec), leaf count = 67

$$\left\{\left\{y(x)\to \frac{e^{c_1}-\sqrt{e^{2c_1}-24x^6}}{12x^2}\right\},\left\{y(x)\to \frac{\sqrt{e^{2c_1}-24x^6}+e^{c_1}}{12x^2}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 37

$$\left\{-\frac{1}{3}\ln\left(\frac{x^2+6\left(y(x)\right)^2}{x^2}\right)+\frac{1}{3}\ln\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^2 - 6*y[x]^2)*y'[x] == 4*y[x]*(x^2 + 3*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^C[1] - Sqrt[E^(2*C[1]) - 24*x^6])/(12*x^2)}, {y[x] -> (E^C[1] + Sqr
t[E^(2*C[1]) - 24*x^6])/(12*x^2)}}
```

Maple raw input

```
dsolve(x*(x^2-6*y(x)^2)*diff(y(x),x) = 4*(x^2+3*y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
-1/3*ln((x^2+6*y(x)^2)/x^2)+1/3*ln(y(x)/x)-ln(x)-_C1 = 0
```

4.664 $x(3x-7y(x)^2)\,y'(x)+y(x)\,(5x-3y(x)^2)=0$

ODE

$$x(3x-7y(x)^2)\,y'(x)+y(x)\,(5x-3y(x)^2)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0485907 (sec), leaf count = 288

$$\{\{y(x)\to \text{Root}\left[4\#1^7x^3-8\#1^5x^4+4\#1^3x^5-c_1^2\&,1\right]\},\{y(x)\to \text{Root}\left[4\#1^7x^3-8\#1^5x^4+4\#1^3x^5-c_1^2\&,2\right]\},\{y(x)-$$

Maple ✓
cpu = 0.028 (sec), leaf count = 46

$$\left\{\ln(x)-\_C1+\frac{4}{13}\ln\left(1(y(x)-\sqrt{x})\,\frac{1}{\sqrt{x}}\right)+\frac{4}{13}\ln\left(1(y(x)+\sqrt{x})\,\frac{1}{\sqrt{x}}\right)+\frac{6}{13}\ln\left(y(x)\,\frac{1}{\sqrt{x}}\right)=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(5*x - 3*y[x]^2) + x*(3*x - 7*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[-C[1]^2 + 4*x^5*#1^3 - 8*x^4*#1^5 + 4*x^3*#1^7 & , 1]}, {y[x] ->
Root[-C[1]^2 + 4*x^5*#1^3 - 8*x^4*#1^5 + 4*x^3*#1^7 & , 2]}, {y[x] -> Root[-C[1]
^2 + 4*x^5*#1^3 - 8*x^4*#1^5 + 4*x^3*#1^7 & , 3]}, {y[x] -> Root[-C[1]^2 + 4*x^5
*#1^3 - 8*x^4*#1^5 + 4*x^3*#1^7 & , 4]}, {y[x] -> Root[-C[1]^2 + 4*x^5*#1^3 - 8*
x^4*#1^5 + 4*x^3*#1^7 & , 5]}, {y[x] -> Root[-C[1]^2 + 4*x^5*#1^3 - 8*x^4*#1^5 +
 4*x^3*#1^7 & , 6]}, {y[x] -> Root[-C[1]^2 + 4*x^5*#1^3 - 8*x^4*#1^5 + 4*x^3*#1^
7 & , 7]}}
```

Maple raw input

```
dsolve(x*(3*x-7*y(x)^2)*diff(y(x),x)+(5*x-3*y(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+4/13*ln((y(x)-x^(1/2))/x^(1/2))+4/13*ln((y(x)+x^(1/2))/x^(1/2))+6/13*l
n(y(x)/x^(1/2)) = 0
```

4.665 $x^3 + x^2 y(x)^2 y'(x) - x + 1 = 0$

ODE

$$x^3 + x^2 y(x)^2 y'(x) - x + 1 = 0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00993195 (sec), leaf count = 111

$$\left\{\left\{y(x) \to -\frac{\sqrt[3]{-\frac{3}{2}}\sqrt[3]{2c_1 x - x^3 + 2x\log(x) + 2}}{\sqrt[3]{x}}\right\}, \left\{y(x) \to \frac{\sqrt[3]{3c_1 x - \frac{3x^3}{2} + 3x\log(x) + 3}}{\sqrt[3]{x}}\right\}, \left\{y(x) \to \frac{(-1)^{2/3}\sqrt[3]{3c_1 x -}\right.\right.$$

Maple ✓
cpu = 0.006 (sec), leaf count = 25

$$\left\{(y(x))^3 + \frac{3x^2}{2} - 3\ln(x) - 3x^{-1} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[1 - x + x^3 + x^2*y[x]^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(((-3/2)^(1/3)*(2 - x^3 + 2*x*C[1] + 2*x*Log[x])^(1/3))/x^(1/3))}, {y
[x] -> (3 - (3*x^3)/2 + 3*x*C[1] + 3*x*Log[x])^(1/3)/x^(1/3)}, {y[x] -> ((-1)^(2
/3)*(3 - (3*x^3)/2 + 3*x*C[1] + 3*x*Log[x])^(1/3))/x^(1/3)}}
```

Maple raw input

```
dsolve(x^2*y(x)^2*diff(y(x),x)+1-x+x^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^3+3/2*x^2-3*ln(x)-3/x-_C1 = 0
```

4.666 $(1-x^2y(x)^2)\,y'(x) = xy(x)^3$

ODE

$$(1-x^2y(x)^2)\,y'(x) = xy(x)^3$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.021548 (sec), leaf count = 55

$$\left\{\left\{y(x)\to -\frac{i\sqrt{W\left(-e^{-2c_1}x^2\right)}}{x}\right\},\left\{y(x)\to \frac{i\sqrt{W\left(-e^{-2c_1}x^2\right)}}{x}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 25

$$\left\{\ln(x)-\_C1+\frac{x^2(y(x))^2}{2}-\ln(xy(x))=0\right\}$$

Mathematica raw input

```
DSolve[(1 - x^2*y[x]^2)*y'[x] == x*y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*Sqrt[ProductLog[-(x^2/E^(2*C[1]))]])/x}, {y[x] -> (I*Sqrt[Produc
tLog[-(x^2/E^(2*C[1]))]])/x}}
```

Maple raw input

```
dsolve((1-x^2*y(x)^2)*diff(y(x),x) = x*y(x)^3, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+1/2*x^2*y(x)^2-ln(x*y(x)) = 0
```

4.667 $(1-x^2y(x)^2)\,y'(x)=y(x)^2(xy(x)+1)$

ODE

$$(1-x^2y(x)^2)\,y'(x)=y(x)^2(xy(x)+1)$$

ODE Classification

[[_homogeneous, `class G`], _rational, [_Abel, `2nd type`, `class B`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0385589 (sec), leaf count = 29

$$\left\{\left\{y(x)\to -\frac{1}{x}\right\},\left\{y(x)\to -\frac{W(-e^{-c_1}x)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 27

$$\left\{x+\frac{-\ln(y(x))-\_C1}{y(x)}=0, y(x)=-x^{-1}\right\}$$

Mathematica raw input

```
DSolve[(1 - x^2*y[x]^2)*y'[x] == y[x]^2*(1 + x*y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x^(-1)}, {y[x] -> -(ProductLog[-(x/E^C[1])]/x)}}
```

Maple raw input

```
dsolve((1-x^2*y(x)^2)*diff(y(x),x) = (1+x*y(x))*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/x, x+(-ln(y(x))-_C1)/y(x) = 0
```

4.668 $x(xy(x)^2+1)\,y'(x)+y(x)=0$

ODE

$$x(xy(x)^2+1)\,y'(x)+y(x)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0167009 (sec), leaf count = 60

$$\left\{\left\{y(x)\to\frac{1}{2}\left(c_1-\frac{\sqrt{c_1^2x+4}}{\sqrt{x}}\right)\right\},\left\{y(x)\to\frac{1}{2}\left(\frac{\sqrt{c_1^2x+4}}{\sqrt{x}}+c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 40

$$\left\{\ln(x)-\_C1-2\ln\left(y(x)\sqrt{x}-1\right)-2\ln\left(y(x)\sqrt{x}+1\right)+2\ln\left(y(x)\sqrt{x}\right)=0\right\}$$

Mathematica raw input

```
DSolve[y[x] + x*(1 + x*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] - Sqrt[4 + x*C[1]^2]/Sqrt[x])/2}, {y[x] -> (C[1] + Sqrt[4 + x*C[
1]^2]/Sqrt[x])/2}}
```

Maple raw input

```
dsolve(x*(1+x*y(x)^2)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-2*ln(y(x)*x^(1/2)-1)-2*ln(y(x)*x^(1/2)+1)+2*ln(y(x)*x^(1/2)) = 0
```

4.669 $x(xy(x)^2+1)\,y'(x) = y(x)\,(2-3xy(x)^2)$

ODE

$$x(xy(x)^2+1)\,y'(x) = y(x)\,(2-3xy(x)^2)$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0578267 (sec), leaf count = 75

$$\left\{\left\{y(x)\to -\frac{\sqrt{e^{5c_1}+4x^5}+e^{\frac{5c_1}{2}}}{2x^3}\right\},\left\{y(x)\to \frac{\sqrt{e^{5c_1}+4x^5}-e^{\frac{5c_1}{2}}}{2x^3}\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 40

$$\left\{\ln(x)-\_C1+\frac{2}{5}\ln\left(y(x)\sqrt{x}-1\right)+\frac{2}{5}\ln\left(y(x)\sqrt{x}+1\right)-\frac{2}{5}\ln\left(y(x)\sqrt{x}\right)=0\right\}$$

Mathematica raw input

```
DSolve[x*(1 + x*y[x]^2)*y'[x] == y[x]*(2 - 3*x*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(E^((5*C[1])/2) + Sqrt[E^(5*C[1]) + 4*x^5])/(2*x^3)}, {y[x] -> (-E^((
5*C[1])/2) + Sqrt[E^(5*C[1]) + 4*x^5])/(2*x^3)}}
```

Maple raw input

```
dsolve(x*(1+x*y(x)^2)*diff(y(x),x) = (2-3*x*y(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+2/5*ln(y(x)*x^(1/2)-1)+2/5*ln(y(x)*x^(1/2)+1)-2/5*ln(y(x)*x^(1/2)) = 0
```

4.670 $x^2(a+y(x))^2y'(x) = (x^2+1)\left(a^2+y(x)^2\right)$

ODE

$$x^2(a+y(x))^2y'(x) = (x^2+1)\left(a^2+y(x)^2\right)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0654535 (sec), leaf count = 30

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[a\log\left(\#1^2+a^2\right)+\#1\&\right]\left[c_1+x-\frac{1}{x}\right]\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 27

$$\left\{x-x^{-1}-y(x)-a\ln\left(\left(y(x)\right)^2+a^2\right)+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x^2*(a + y[x])^2*y'[x] == (1 + x^2)*(a^2 + y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[a*Log[a^2 + #1^2] + #1 & ][-x^(-1) + x + C[1]]}}
```

Maple raw input

```
dsolve(x^2*(a+y(x))^2*diff(y(x),x) = (x^2+1)*(y(x)^2+a^2), y(x),'implicit')
```

Maple raw output

```
x-1/x-y(x)-a*ln(y(x)^2+a^2)+_C1 = 0
```

4.671 $(x^2+1)\left(y(x)^2+1\right)y'(x)+2xy(x)\left(1-y(x)^2\right)=0$

ODE

$$(x^2+1)\left(y(x)^2+1\right)y'(x)+2xy(x)\left(1-y(x)^2\right)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0531684 (sec), leaf count = 83

$$\left\{\left\{y(x)\to\frac{1}{2}\left(-e^{c_1}\left(x^2+1\right)-\sqrt{e^{2c_1}\left(x^2+1\right)^2+4}\right)\right\},\left\{y(x)\to\frac{1}{2}\left(\sqrt{e^{2c_1}\left(x^2+1\right)^2+4}-e^{c_1}\left(x^2+1\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 28

$$\left\{\_C1+\ln\left(x^2+1\right)-\ln\left(y(x)-1\right)-\ln\left(1+y(x)\right)+\ln\left(y(x)\right)=0\right\}$$

Mathematica raw input

```
DSolve[2*x*y[x]*(1 - y[x]^2) + (1 + x^2)*(1 + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(E^C[1]*(1 + x^2)) - Sqrt[4 + E^(2*C[1])*(1 + x^2)^2])/2}, {y[x] ->
(-(E^C[1]*(1 + x^2)) + Sqrt[4 + E^(2*C[1])*(1 + x^2)^2])/2}}
```

Maple raw input

```
dsolve((x^2+1)*(1+y(x)^2)*diff(y(x),x)+2*x*y(x)*(1-y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
_C1+ln(x^2+1)-ln(y(x)-1)-ln(1+y(x))+ln(y(x)) = 0
```

4.672 $(x^2+1)\left(y(x)^2+1\right)y'(x)+2xy(x)(1-y(x))^2=0$

ODE

$$(x^2+1)\left(y(x)^2+1\right)y'(x)+2xy(x)(1-y(x))^2=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0720819 (sec), leaf count = 30

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\log(\#1)-\frac{2}{\#1-1}\&\right]\left[c_1-\log\left(x^2+1\right)\right]\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 26

$$\left\{\frac{\ln\left(x^2+1\right)}{2}+\frac{\ln\left(y(x)\right)}{2}-\left(y(x)-1\right)^{-1}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*x*(1 - y[x])^2*y[x] + (1 + x^2)*(1 + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Log[#1] - 2/(-1 + #1) & ][C[1] - Log[1 + x^2]]}}
```

Maple raw input

```
dsolve((x^2+1)*(1+y(x)^2)*diff(y(x),x)+2*x*y(x)*(1-y(x))^2 = 0, y(x),'implicit')
```

Maple raw output

```
1/2*ln(x^2+1)+1/2*ln(y(x))-1/(y(x)-1)+_C1 = 0
```

4.673 $(-x^3+6x^2y(x)^2+1)\,y'(x)=x(-4y(x)^3+3xy(x)+6)$

ODE

$$(-x^3+6x^2y(x)^2+1)\,y'(x)=x(-4y(x)^3+3xy(x)+6)$$

ODE Classification

[_exact, _rational]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0271848 (sec), leaf count = 424

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{2}(x^3-1)}{\sqrt[3]{108c_1x^4+\sqrt{(108c_1x^4-324x^6)^2-864x^6\left(x^3-1\right)^3}-324x^6}}-\frac{\sqrt[3]{108c_1x^4+\sqrt{(108c_1x^4-324x^6)^2-864x}}}{6\sqrt[3]{2}x^2}\right.\right.$$

Maple ✓
cpu = 0.017 (sec), leaf count = 28

$$\left\{2\,x^2(y(x))^3-x^3y(x)-3\,x^2+\_C1+y(x)=0\right\}$$

Mathematica raw input

```
DSolve[(1 - x^3 + 6*x^2*y[x]^2)*y'[x] == x*(6 + 3*x*y[x] - 4*y[x]^3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((2^(1/3)*(-1 + x^3))/(-324*x^6 + 108*x^4*C[1] + Sqrt[-864*x^6*(-1 +
x^3)^3 + (-324*x^6 + 108*x^4*C[1])^2])^(1/3)) - (-324*x^6 + 108*x^4*C[1] + Sqrt[
-864*x^6*(-1 + x^3)^3 + (-324*x^6 + 108*x^4*C[1])^2])^(1/3)/(6*2^(1/3)*x^2)}, {y
[x] -> ((1 + I*Sqrt[3])*(-1 + x^3))/(2^(2/3)*(-324*x^6 + 108*x^4*C[1] + Sqrt[-86
4*x^6*(-1 + x^3)^3 + (-324*x^6 + 108*x^4*C[1])^2])^(1/3)) + ((1 - I*Sqrt[3])*(-3
24*x^6 + 108*x^4*C[1] + Sqrt[-864*x^6*(-1 + x^3)^3 + (-324*x^6 + 108*x^4*C[1])^2
])^(1/3))/(12*2^(1/3)*x^2)}, {y[x] -> ((1 - I*Sqrt[3])*(-1 + x^3))/(2^(2/3)*(-32
4*x^6 + 108*x^4*C[1] + Sqrt[-864*x^6*(-1 + x^3)^3 + (-324*x^6 + 108*x^4*C[1])^2]
)^(1/3)) + ((1 + I*Sqrt[3])*(-324*x^6 + 108*x^4*C[1] + Sqrt[-864*x^6*(-1 + x^3)^
3 + (-324*x^6 + 108*x^4*C[1])^2])^(1/3))/(12*2^(1/3)*x^2)}}
```

Maple raw input

```
dsolve((1-x^3+6*x^2*y(x)^2)*diff(y(x),x) = (6+3*x*y(x)-4*y(x)^3)*x, y(x),'implicit')
```

Maple raw output

```
2*x^2*y(x)^3-x^3*y(x)-3*x^2+_C1+y(x) = 0
```

4.674

$$x(4x^2y(x)-12xy(x)^2+5x+3)\,y'(x)+y(x)\,(6x^2y(x)-8xy(x)^2+10x+3)=0$$

ODE

$$x(4x^2y(x)-12xy(x)^2+5x+3)\,y'(x)+y(x)\,(6x^2y(x)-8xy(x)^2+10x+3)=0$$

ODE Classification

[_exact, _rational]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0343729 (sec), leaf count = 660

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{432c_1x^4+8\sqrt{\left(-54c_1x^4+2x^9+45x^7+27x^6\right)^2-4x^9\left(x^3+15x+9\right)^3}-16x^9-360x^7-216x^6}}{12\sqrt[3]{2}x^2}-\frac{\quad}{3\,2^{2/3}\sqrt[3]{}}\right.\right.$$

Maple ✓
cpu = 0.024 (sec), leaf count = 35

$$\left\{-4\,x^2(y(x))^3+2\,x^3(y(x))^2+\left(5\,x^2+3\,x\right)y(x)+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(3 + 10*x + 6*x^2*y[x] - 8*x*y[x]^2) + x*(3 + 5*x + 4*x^2*y[x] - 12*x*y[x]^2)*y'[x] == 0,
```

Mathematica raw output

```
{{y[x] -> x/6 - (x*(9 + 15*x + x^3))/(3*2^(2/3)*(-27*x^6 - 45*x^7 - 2*x^9 + 54*x
^4*C[1] + 3*Sqrt[3]*Sqrt[-(x^8*(108*x + 509*x^4 + 25*x^6 - 108*C[1]^2 + 108*x^2*
(5 + C[1]) + 180*x^3*(5 + C[1]) + x^5*(30 + 8*C[1])))])^(1/3)) - (-216*x^6 - 360
*x^7 - 16*x^9 + 432*x^4*C[1] + 8*Sqrt[-4*x^9*(9 + 15*x + x^3)^3 + (27*x^6 + 45*x
^7 + 2*x^9 - 54*x^4*C[1])^2])^(1/3)/(12*2^(1/3)*x^2)}, {y[x] -> x/6 + ((1 + I*Sq
rt[3])*x*(9 + 15*x + x^3))/(6*2^(2/3)*(-27*x^6 - 45*x^7 - 2*x^9 + 54*x^4*C[1] +
3*Sqrt[3]*Sqrt[-(x^8*(108*x + 509*x^4 + 25*x^6 - 108*C[1]^2 + 108*x^2*(5 + C[1])
 + 180*x^3*(5 + C[1]) + x^5*(30 + 8*C[1])))])^(1/3)) + ((1 - I*Sqrt[3])*(-216*x^
6 - 360*x^7 - 16*x^9 + 432*x^4*C[1] + 8*Sqrt[-4*x^9*(9 + 15*x + x^3)^3 + (27*x^6
 + 45*x^7 + 2*x^9 - 54*x^4*C[1])^2])^(1/3))/(24*2^(1/3)*x^2)}, {y[x] -> x/6 + ((
1 - I*Sqrt[3])*x*(9 + 15*x + x^3))/(6*2^(2/3)*(-27*x^6 - 45*x^7 - 2*x^9 + 54*x^4
*C[1] + 3*Sqrt[3]*Sqrt[-(x^8*(108*x + 509*x^4 + 25*x^6 - 108*C[1]^2 + 108*x^2*(5
```

```
 + C[1]) + 180*x^3*(5 + C[1]) + x^5*(30 + 8*C[1]))])^(1/3)) + ((1 + I*Sqrt[3])*
(-216*x^6 - 360*x^7 - 16*x^9 + 432*x^4*C[1] + 8*Sqrt[-4*x^9*(9 + 15*x + x^3)^3 +
 (27*x^6 + 45*x^7 + 2*x^9 - 54*x^4*C[1])^2])^(1/3))/(24*2^(1/3)*x^2)}}
```

Maple raw input

```
dsolve(x*(3+5*x-12*x*y(x)^2+4*x^2*y(x))*diff(y(x),x)+(3+10*x-8*x*y(x)^2+6*x^2*y(x))*y(x) = 0, y(x),'i
```

Maple raw output

```
-4*x^2*y(x)^3+2*x^3*y(x)^2+(5*x^2+3*x)*y(x)+_C1 = 0
```

4.675 $x^3(y(x)^2+1)\,y'(x)+3x^2y(x)=0$

ODE

$$x^3\left(y(x)^2+1\right)y'(x)+3x^2y(x)=0$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0110813 (sec), leaf count = 41

$$\left\{\left\{y(x)\to -\sqrt{W\left(\frac{e^{2c_1}}{x^6}\right)}\right\},\left\{y(x)\to \sqrt{W\left(\frac{e^{2c_1}}{x^6}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 18

$$\left\{\ln(x)+\frac{(y(x))^2}{6}+\frac{\ln(y(x))}{3}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[3*x^2*y[x] + x^3*(1 + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[ProductLog[E^(2*C[1])/x^6]]}, {y[x] -> Sqrt[ProductLog[E^(2*C[1]
)/x^6]]}}
```

Maple raw input

```
dsolve(x^3*(1+y(x)^2)*diff(y(x),x)+3*x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)+1/6*y(x)^2+1/3*ln(y(x))+_C1 = 0
```

4.676 $y(x)\left(x^2y(x)^2+1\right)+x(1-xy(x))^2y'(x)=0$

ODE

$$y(x)\left(x^2y(x)^2+1\right)+x(1-xy(x))^2y'(x)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Homogeneous equation, isobaric equation

Mathematica ✓
cpu = 0.066161 (sec), leaf count = 24

$$\text{Solve}\left[c_1+\frac{1}{xy(x)}+2\log(y(x))=xy(x),y(x)\right]$$

Maple ✓
cpu = 0.018 (sec), leaf count = 43

$$\left\{\frac{-2\ln\left(xy(x)\right)xy(x)-1+x^2(y(x))^2-2x(\_C1-\ln(x))y(x)}{2xy(x)}=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 + x^2*y[x]^2) + x*(1 - x*y[x])^2*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] + 2*Log[y[x]] + 1/(x*y[x]) == x*y[x], y[x]]
```

Maple raw input

```
dsolve(x*(1-x*y(x))^2*diff(y(x),x)+(1+x^2*y(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/2*(-2*ln(x*y(x))*x*y(x)-1+x^2*y(x)^2-2*x*(_C1-ln(x))*y(x))/x/y(x) = 0
```

4.677 $(1-x^4y(x)^2)\,y'(x)=x^3y(x)^3$

ODE

$$(1-x^4y(x)^2)\,y'(x)=x^3y(x)^3$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0178003 (sec), leaf count = 117

$$\left\{\left\{y(x)\to -\sqrt{\frac{1-\sqrt{4c_1x^4+1}}{x^4}}\right\},\left\{y(x)\to \sqrt{\frac{1-\sqrt{4c_1x^4+1}}{x^4}}\right\},\left\{y(x)\to -\sqrt{\frac{\sqrt{4c_1x^4+1}+1}{x^4}}\right\},\left\{y(x)\to \sqrt{\frac{\sqrt{4c_1x^4}\right.\right.$$

Maple ✓
cpu = 0.016 (sec), leaf count = 31

$$\left\{\ln(x)-\_C1-\frac{\ln\left(x^4(y(x))^2-2\right)}{4}-\frac{\ln\left(x^2y(x)\right)}{2}=0\right\}$$

Mathematica raw input

```
DSolve[(1 - x^4*y[x]^2)*y'[x] == x^3*y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[(1 - Sqrt[1 + 4*x^4*C[1]])/x^4]}, {y[x] -> Sqrt[(1 - Sqrt[1 + 4*
x^4*C[1]])/x^4]}, {y[x] -> -Sqrt[(1 + Sqrt[1 + 4*x^4*C[1]])/x^4]}, {y[x] -> Sqrt
[(1 + Sqrt[1 + 4*x^4*C[1]])/x^4]}}
```

Maple raw input

```
dsolve((1-x^4*y(x)^2)*diff(y(x),x) = x^3*y(x)^3, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-1/4*ln(x^4*y(x)^2-2)-1/2*ln(x^2*y(x)) = 0
```

4.678 $\left(3x-y(x)^3\right)y'(x)=x^2-3y(x)$

ODE

$$\left(3x-y(x)^3\right)y'(x)=x^2-3y(x)$$

ODE Classification

[_exact, _rational]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0951783 (sec), leaf count = 1211

$$\left\{\left\{y(x)\to -\frac{\sqrt{\frac{4x^3+12c_1+\left(243x^2-\frac{1}{432}\sqrt{11019960576x^4-4\left(144x^3+432c_1\right)^3}\right)^{2/3}}{\sqrt[3]{243x^2-\frac{1}{432}\sqrt{11019960576x^4-4\left(144x^3+432c_1\right)^3}}}}}{\sqrt{6}}-\frac{1}{2}\sqrt{-\frac{12\sqrt{6}x}{\sqrt{\frac{4x^3+12c_1+\left(243x^2-\frac{1}{432}\sqrt{11019960576x^4-4(1}}{\sqrt[3]{243x^2-\frac{1}{432}\sqrt{11019960576x^4-4(1}}}}}\right.\right.\right.$$

Maple ✓
cpu = 0.013 (sec), leaf count = 21

$$\left\{-\frac{x^3}{3}+3\,xy(x)-\frac{(y(x))^4}{4}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(3*x - y[x]^3)*y'[x] == x^2 - 3*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[(4*x^3 + 12*C[1] + (243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3
  + 432*C[1])^3]/432)^(2/3))/(243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C
[1])^3]/432)^(1/3)]/Sqrt[6]) - Sqrt[(-8*(x^3 + 3*C[1]))/(3*(243*x^2 - Sqrt[11019
960576*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(1/3)) - (2*(243*x^2 - Sqrt[11019960
576*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(1/3))/3 - (12*Sqrt[6]*x)/Sqrt[(4*x^3 +
  12*C[1] + (243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(2/3
))/(243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(1/3)]]/2},
{y[x] -> -(Sqrt[(4*x^3 + 12*C[1] + (243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3
+ 432*C[1])^3]/432)^(2/3))/(243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C[
1])^3]/432)^(1/3)]/Sqrt[6]) + Sqrt[(-8*(x^3 + 3*C[1]))/(3*(243*x^2 - Sqrt[110199
```

```
60576*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(1/3)) - (2*(243*x^2 - Sqrt[110199605
76*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(1/3))/3 - (12*Sqrt[6]*x)/Sqrt[(4*x^3 +
12*C[1] + (243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(2/3)
)/(243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(1/3)]]/2}, {
y[x] -> Sqrt[(4*x^3 + 12*C[1] + (243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 4
32*C[1])^3]/432)^(2/3))/(243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C[1])
^3]/432)^(1/3)]/Sqrt[6] - Sqrt[(-8*(x^3 + 3*C[1]))/(3*(243*x^2 - Sqrt[1101996057
6*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(1/3)) - (2*(243*x^2 - Sqrt[11019960576*x
^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(1/3))/3 + (12*Sqrt[6]*x)/Sqrt[(4*x^3 + 12*C
[1] + (243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(2/3))/(2
43*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(1/3)]]/2}, {y[x]
 -> Sqrt[(4*x^3 + 12*C[1] + (243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C
[1])^3]/432)^(2/3))/(243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C[1])^3]/
432)^(1/3)]/Sqrt[6] + Sqrt[(-8*(x^3 + 3*C[1]))/(3*(243*x^2 - Sqrt[11019960576*x^
4 - 4*(144*x^3 + 432*C[1])^3]/432)^(1/3)) - (2*(243*x^2 - Sqrt[11019960576*x^4 -
 4*(144*x^3 + 432*C[1])^3]/432)^(1/3))/3 + (12*Sqrt[6]*x)/Sqrt[(4*x^3 + 12*C[1]
+ (243*x^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(2/3))/(243*x
^2 - Sqrt[11019960576*x^4 - 4*(144*x^3 + 432*C[1])^3]/432)^(1/3)]]/2}}
```

Maple raw input

```
dsolve((3*x-y(x)^3)*diff(y(x),x) = x^2-3*y(x), y(x),'implicit')
```

Maple raw output

```
-1/3*x^3+3*x*y(x)-1/4*y(x)^4+_C1 = 0
```

4.679 $(x^3 - y(x)^3)\, y'(x) + x^2 y(x) = 0$

ODE

$$(x^3 - y(x)^3)\, y'(x) + x^2 y(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0461361 (sec), leaf count = 201

$$\left\{\left\{y(x) \to \sqrt[3]{x^3 - \sqrt{x^6 - e^{6c_1}}}\right\}, \left\{y(x) \to -\sqrt[3]{-1}\sqrt[3]{x^3 - \sqrt{x^6 - e^{6c_1}}}\right\}, \left\{y(x) \to (-1)^{2/3}\sqrt[3]{x^3 - \sqrt{x^6 - e^{6c_1}}}\right\}, \left\{y(x) \to \right.\right.$$

Maple ✓
cpu = 0.019 (sec), leaf count = 37

$$\left\{-\frac{1}{6}\ln\left(\frac{-2x^3 + (y(x))^3}{x^3}\right) - \frac{1}{2}\ln\left(\frac{y(x)}{x}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y[x] + (x^3 - y[x]^3)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^3 - Sqrt[-E^(6*C[1]) + x^6])^(1/3)}, {y[x] -> -((-1)^(1/3)*(x^3 - S
qrt[-E^(6*C[1]) + x^6])^(1/3))}, {y[x] -> (-1)^(2/3)*(x^3 - Sqrt[-E^(6*C[1]) + x
^6])^(1/3)}, {y[x] -> (x^3 + Sqrt[-E^(6*C[1]) + x^6])^(1/3)}, {y[x] -> -((-1)^(1
/3)*(x^3 + Sqrt[-E^(6*C[1]) + x^6])^(1/3))}, {y[x] -> (-1)^(2/3)*(x^3 + Sqrt[-E^
(6*C[1]) + x^6])^(1/3)}}
```

Maple raw input

```
dsolve((x^3-y(x)^3)*diff(y(x),x)+x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/6*ln((-2*x^3+y(x)^3)/x^3)-1/2*ln(y(x)/x)-ln(x)-_C1 = 0
```

4.680 $x^2(ax+3y(x))+\left(x^3+y(x)^3\right)y'(x)=0$

ODE

$$x^2(ax+3y(x))+\left(x^3+y(x)^3\right)y'(x)=0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, _dAlembert]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.159115 (sec), leaf count = 1430

$$\left\{\left\{y(x)\to \frac{\sqrt{\frac{\sqrt[3]{3}ax^4-\sqrt[3]{3}e^{4c_1}+\left(9x^6+\sqrt{3}\sqrt{27x^{12}+\left(e^{4c_1}-ax^4\right)^3}\right)^{2/3}}{\sqrt[3]{9x^6+\sqrt{3}\sqrt{27x^{12}+\left(e^{4c_1}-ax^4\right)^3}}}}-\sqrt{-\frac{6\sqrt{2}x^3}{\sqrt{\frac{\sqrt[3]{3}ax^4-\sqrt[3]{3}e^{4c_1}+\left(9x^6+\sqrt{3}\sqrt{27x^{12}+\left(e^{4c_1}-ax^4\right)^3}\right)^{2/3}}{\sqrt[3]{9x^6+\sqrt{3}\sqrt{27x^{12}+\left(e^{4c_1}-ax^4\right)^3}}}}}-\sqrt[3]{9x^6}}{\sqrt{2}\sqrt[3]{3}}\right.\right.$$

Maple ✓
cpu = 0.014 (sec), leaf count = 35

$$\left\{-\frac{1}{4}\ln\left(\frac{ax^4+4x^3y(x)+(y(x))^4}{x^4}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x^2*(a*x + 3*y[x]) + (x^3 + y[x]^3)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[(-(3^(1/3)*E^(4*C[1])) + 3^(1/3)*a*x^4 + (9*x^6 + Sqrt[3]*Sqrt[2
7*x^12 + (E^(4*C[1]) - a*x^4)^3])^(2/3))/(9*x^6 + Sqrt[3]*Sqrt[27*x^12 + (E^(4*C
[1]) - a*x^4)^3])^(1/3)] - Sqrt[(3^(1/3)*(E^(4*C[1]) - a*x^4))/(9*x^6 + Sqrt[3]*
Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(1/3) - (9*x^6 + Sqrt[3]*Sqrt[27*x^12 +
(E^(4*C[1]) - a*x^4)^3])^(1/3) - (6*Sqrt[2]*x^3)/Sqrt[(-(3^(1/3)*E^(4*C[1])) + 3
^(1/3)*a*x^4 + (9*x^6 + Sqrt[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(2/3))/(
9*x^6 + Sqrt[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(1/3)]])/(Sqrt[2]*3^(1/3
))}, {y[x] -> (Sqrt[(-(3^(1/3)*E^(4*C[1])) + 3^(1/3)*a*x^4 + (9*x^6 + Sqrt[3]*Sq
```

```
rt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(2/3))/(9*x^6 + Sqrt[3]*Sqrt[27*x^12 + (E^
(4*C[1]) - a*x^4)^3])^(1/3)] + Sqrt[(3^(1/3)*(E^(4*C[1]) - a*x^4))/(9*x^6 + Sqrt
[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(1/3) - (9*x^6 + Sqrt[3]*Sqrt[27*x^1
2 + (E^(4*C[1]) - a*x^4)^3])^(1/3) - (6*Sqrt[2]*x^3)/Sqrt[(-(3^(1/3)*E^(4*C[1]))
 + 3^(1/3)*a*x^4 + (9*x^6 + Sqrt[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(2/3
))/(9*x^6 + Sqrt[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(1/3)]])/(Sqrt[2]*3^
(1/3))}, {y[x] -> -((Sqrt[(-(3^(1/3)*E^(4*C[1])) + 3^(1/3)*a*x^4 + (9*x^6 + Sqrt
[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(2/3))/(9*x^6 + Sqrt[3]*Sqrt[27*x^12
 + (E^(4*C[1]) - a*x^4)^3])^(1/3)] + Sqrt[(3^(1/3)*(E^(4*C[1]) - a*x^4))/(9*x^6
+ Sqrt[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(1/3) - (9*x^6 + Sqrt[3]*Sqrt[
27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(1/3) + (6*Sqrt[2]*x^3)/Sqrt[(-(3^(1/3)*E^(4*
C[1])) + 3^(1/3)*a*x^4 + (9*x^6 + Sqrt[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3]
)^(2/3))/(9*x^6 + Sqrt[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(1/3)]])/(Sqrt
[2]*3^(1/3)))}, {y[x] -> (-Sqrt[(-(3^(1/3)*E^(4*C[1])) + 3^(1/3)*a*x^4 + (9*x^6
+ Sqrt[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(2/3))/(9*x^6 + Sqrt[3]*Sqrt[2
7*x^12 + (E^(4*C[1]) - a*x^4)^3])^(1/3)] + Sqrt[(3^(1/3)*(E^(4*C[1]) - a*x^4))/(
9*x^6 + Sqrt[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(1/3) - (9*x^6 + Sqrt[3]
*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(1/3) + (6*Sqrt[2]*x^3)/Sqrt[(-(3^(1/3)
*E^(4*C[1])) + 3^(1/3)*a*x^4 + (9*x^6 + Sqrt[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x
^4)^3])^(2/3))/(9*x^6 + Sqrt[3]*Sqrt[27*x^12 + (E^(4*C[1]) - a*x^4)^3])^(1/3)]])
/(Sqrt[2]*3^(1/3))}}
```

Maple raw input

```
dsolve((x^3+y(x)^3)*diff(y(x),x)+x^2*(a*x+3*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
-1/4*ln((a*x^4+4*x^3*y(x)+y(x)^4)/x^4)-ln(x)-_C1 = 0
```

4.681 $\left(-x^2y(x)-y(x)^3+x\right)y'(x)=x^3+xy(x)^2-y(x)$

ODE

$$\left(-x^2y(x)-y(x)^3+x\right)y'(x)=x^3+xy(x)^2-y(x)$$

ODE Classification

[_exact, _rational]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.115507 (sec), leaf count = 1807

$$\left\{\left\{y(x)\to -\frac{\sqrt{-2x^2+\sqrt[3]{-8x^6+9\left(4c_1+3\right)x^2+3\sqrt{3}\sqrt{-16x^8+\left(-16c_1^2+72c_1+27\right)x^4+64c_1^3}}+\frac{\sqrt[3]{-8x^6+9\left(4c_1+3\right)}}{\sqrt{6}}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 29

$$\left\{-\frac{x^4}{4}-\frac{x^2(y(x))^2}{2}+xy(x)-\frac{(y(x))^4}{4}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(x - x^2*y[x] - y[x]^3)*y'[x] == x^3 - y[x] + x*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-2*x^2 + (4*(x^4 - 3*C[1]))/(-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sq
rt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(1/3) + (-8*x^
6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1]
- 16*C[1]^2)])^(1/3)]/Sqrt[6]) - Sqrt[(-8*x^2)/3 - (8*(x^4 - 3*C[1]))/(3*(-8*x^6
  + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] -
  16*C[1]^2)])^(1/3)) - (2*(-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8
+ 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(1/3))/3 - (4*Sqrt[6]*x)/Sqrt[-2*
x^2 + (4*(x^4 - 3*C[1]))/(-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 +
  64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(1/3) + (-8*x^6 + 9*x^2*(3 + 4*C[1
]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(1/3)
```

```
]]/2}, {y[x] -> -(Sqrt[-2*x^2 + (4*(x^4 - 3*C[1]))/(-8*x^6 + 9*x^2*(3 + 4*C[1])
+ 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(1/3) +
(-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72
*C[1] - 16*C[1]^2)])^(1/3)]/Sqrt[6]) + Sqrt[(-8*x^2)/3 - (8*(x^4 - 3*C[1]))/(3*(
-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*
C[1] - 16*C[1]^2)])^(1/3)) - (2*(-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-1
6*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(1/3))/3 - (4*Sqrt[6]*x)/Sq
rt[-2*x^2 + (4*(x^4 - 3*C[1]))/(-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16
*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(1/3) + (-8*x^6 + 9*x^2*(3 +
 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])
^(1/3)]]/2}, {y[x] -> Sqrt[-2*x^2 + (4*(x^4 - 3*C[1]))/(-8*x^6 + 9*x^2*(3 + 4*C[
1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(1/3
) + (-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27
+ 72*C[1] - 16*C[1]^2)])^(1/3)]/Sqrt[6] - Sqrt[(-8*x^2)/3 - (8*(x^4 - 3*C[1]))/(
3*(-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 +
72*C[1] - 16*C[1]^2)])^(1/3)) - (2*(-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt
[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(1/3))/3 + (4*Sqrt[6]*x)
/Sqrt[-2*x^2 + (4*(x^4 - 3*C[1]))/(-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[
-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(1/3) + (-8*x^6 + 9*x^2*(
3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2
)])^(1/3)]]/2}, {y[x] -> Sqrt[-2*x^2 + (4*(x^4 - 3*C[1]))/(-8*x^6 + 9*x^2*(3 + 4
*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(
1/3) + (-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(
27 + 72*C[1] - 16*C[1]^2)])^(1/3)]/Sqrt[6] + Sqrt[(-8*x^2)/3 - (8*(x^4 - 3*C[1])
)/(3*(-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27
 + 72*C[1] - 16*C[1]^2)])^(1/3)) - (2*(-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*S
qrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(1/3))/3 + (4*Sqrt[6]
*x)/Sqrt[-2*x^2 + (4*(x^4 - 3*C[1]))/(-8*x^6 + 9*x^2*(3 + 4*C[1]) + 3*Sqrt[3]*Sq
rt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1]^2)])^(1/3) + (-8*x^6 + 9*x^
2*(3 + 4*C[1]) + 3*Sqrt[3]*Sqrt[-16*x^8 + 64*C[1]^3 + x^4*(27 + 72*C[1] - 16*C[1
]^2)])^(1/3)]]/2}}
```

Maple raw input

```
dsolve((x-x^2*y(x)-y(x)^3)*diff(y(x),x) = x^3-y(x)+x*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-1/4*x^4-1/2*x^2*y(x)^2+x*y(x)-1/4*y(x)^4+_C1 = 0
```

4.682 $\left(a^2 x + y(x)\left(x^2 - y(x)^2\right)\right) y'(x) + x\left(x^2 - y(x)^2\right) = a^2 y(x)$

ODE

$$\left(a^2 x + y(x)\left(x^2 - y(x)^2\right)\right) y'(x) + x\left(x^2 - y(x)^2\right) = a^2 y(x)$$

ODE Classification

[_rational]

Book solution method
Change of Variable, Two new variables

Mathematica ✓
cpu = 0.126636 (sec), leaf count = 37

$$\text{Solve}\left[a^2 \log(y(x) + x) + x^2 + y(x)^2 = a^2 \log(x - y(x)) + 2c_1, y(x)\right]$$

Maple ✗
cpu = 0.016 (sec), leaf count = 0 , exception

```
numeric exception: division by zero
```

Mathematica raw input

```
DSolve[x*(x^2 - y[x]^2) + (a^2*x + y[x]*(x^2 - y[x]^2))*y'[x] == a^2*y[x],y[x],x]
```

Mathematica raw output

```
Solve[x^2 + a^2*Log[x + y[x]] + y[x]^2 == 2*C[1] + a^2*Log[x - y[x]], y[x]]
```

Maple raw input

```
dsolve((a^2*x+(x^2-y(x)^2)*y(x))*diff(y(x),x)+x*(x^2-y(x)^2) = a^2*y(x), y(x),'implicit')
```

Maple raw output

```
numeric exception: division by zero
```

4.683 $y(x)\left(a+x^2+y(x)^2\right)y'(x)=x(a-x^2-y(x)^2)$

ODE

$$y(x)\left(a+x^2+y(x)^2\right)y'(x)=x(a-x^2-y(x)^2)$$

ODE Classification

[_exact, _rational]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0244473 (sec), leaf count = 149

$$\left\{\left\{y(x)\to -\sqrt{-\sqrt{a^2+4ax^2+4c_1}-a-x^2}\right\},\left\{y(x)\to \sqrt{-\sqrt{a^2+4ax^2+4c_1}-a-x^2}\right\},\left\{y(x)\to -\sqrt{\sqrt{a^2+4ax^2+4}\right.\right.$$

Maple ✓
cpu = 0.016 (sec), leaf count = 37

$$\left\{\frac{(y(x))^4}{4}+\frac{\left(2x^2+2a\right)(y(x))^2}{4}+\frac{x^4}{4}-\frac{ax^2}{2}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(a + x^2 + y[x]^2)*y'[x] == x*(a - x^2 - y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-a - x^2 - Sqrt[a^2 + 4*a*x^2 + 4*C[1]]]}, {y[x] -> Sqrt[-a - x^
2 - Sqrt[a^2 + 4*a*x^2 + 4*C[1]]]}, {y[x] -> -Sqrt[-a - x^2 + Sqrt[a^2 + 4*a*x^2
 + 4*C[1]]]}, {y[x] -> Sqrt[-a - x^2 + Sqrt[a^2 + 4*a*x^2 + 4*C[1]]]}}
```

Maple raw input

```
dsolve((a+x^2+y(x)^2)*y(x)*diff(y(x),x) = x*(a-x^2-y(x)^2), y(x),'implicit')
```

Maple raw output

```
1/4*y(x)^4+1/4*(2*x^2+2*a)*y(x)^2+1/4*x^4-1/2*a*x^2+_C1 = 0
```

4.684 $y(x)\left(3x^2+y(x)^2\right)y'(x)+x(x^2+3y(x)^2)=0$

ODE

$$y(x)\left(3x^2+y(x)^2\right)y'(x)+x(x^2+3y(x)^2)=0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, _dAlembert]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0382626 (sec), leaf count = 129

$$\left\{\left\{y(x)\to -\sqrt{-\sqrt{e^{4c_1}+8x^4}-3x^2}\right\},\left\{y(x)\to \sqrt{-\sqrt{e^{4c_1}+8x^4}-3x^2}\right\},\left\{y(x)\to -\sqrt{\sqrt{e^{4c_1}+8x^4}-3x^2}\right\},\left\{y(x)\to \sqrt{\right.\right.$$

Maple ✓
cpu = 0.016 (sec), leaf count = 35

$$\left\{-\frac{1}{4}\ln\left(\frac{x^4+6\,x^2(y(x))^2+(y(x))^4}{x^4}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^2 + 3*y[x]^2) + y[x]*(3*x^2 + y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-3*x^2 - Sqrt[E^(4*C[1]) + 8*x^4]]}, {y[x] -> Sqrt[-3*x^2 - Sqrt
[E^(4*C[1]) + 8*x^4]]}, {y[x] -> -Sqrt[-3*x^2 + Sqrt[E^(4*C[1]) + 8*x^4]]}, {y[x
] -> Sqrt[-3*x^2 + Sqrt[E^(4*C[1]) + 8*x^4]]}}
```

Maple raw input

```
dsolve((3*x^2+y(x)^2)*y(x)*diff(y(x),x)+x*(x^2+3*y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
-1/4*ln((x^4+6*x^2*y(x)^2+y(x)^4)/x^4)-ln(x)-_C1 = 0
```

4.685 $y(x)\left(a-3x^2-y(x)^2\right)y'(x)+x(a-x^2+y(x)^2)=0$

ODE

$$y(x)\left(a-3x^2-y(x)^2\right)y'(x)+x\left(a-x^2+y(x)^2\right)=0$$

ODE Classification

[_rational]

Book solution method
Change of Variable, Two new variables

Mathematica ✓
cpu = 0.207636 (sec), leaf count = 39

$$\text{Solve}\left[\frac{1}{2}\left(\frac{a+2y(x)^2}{x^2+y(x)^2}+\log\left(x^2+y(x)^2\right)\right)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.191 (sec), leaf count = 47

$$\left\{\frac{(y(x))^2}{x^2+(y(x))^2}+\frac{a}{2\,(y(x))^2+2\,x^2}+\frac{\ln\left(x^2+(y(x))^2\right)}{2}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(a - x^2 + y[x]^2) + y[x]*(a - 3*x^2 - y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[(Log[x^2 + y[x]^2] + (a + 2*y[x]^2)/(x^2 + y[x]^2))/2 == C[1], y[x]]
```

Maple raw input

```
dsolve((a-3*x^2-y(x)^2)*y(x)*diff(y(x),x)+x*(a-x^2+y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
1/(x^2+y(x)^2)*y(x)^2+a/(2*y(x)^2+2*x^2)+1/2*ln(x^2+y(x)^2)+_C1 = 0
```

4.686 $2y(x)^3y'(x) = x^3 - xy(x)^2$

ODE

$$2y(x)^3y'(x) = x^3 - xy(x)^2$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.101282 (sec), leaf count = 878

$$\left\{\left\{y(x) \to -\frac{\sqrt{\frac{x^4}{\sqrt[3]{x^6 - 2e^{12c_1} + 2\sqrt{e^{24c_1} - e^{12c_1}x^6}}} - x^2 + \sqrt[3]{x^6 - 2e^{12c_1} + 2\sqrt{e^{24c_1} - e^{12c_1}x^6}}}}{\sqrt{2}}\right\}, \left\{y(x) \to \frac{\sqrt{\frac{}{\sqrt[3]{x^6 - 2e^{1}}}}\right.\right.$$

Maple ✓
cpu = 0.023 (sec), leaf count = 45

$$\left\{-\frac{1}{6}\ln\left(\frac{-x^2 + 2\left(y(x)\right)^2}{x^2}\right) - \frac{1}{3}\ln\left(\frac{x^2 + \left(y(x)\right)^2}{x^2}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[2*y[x]^3*y'[x] == x^3 - x*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-x^2 + x^4/(-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) - E^(12*C
[1])*x^6])^(1/3) + (-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) - E^(12*C[1])*x^6]
)^(1/3)]/Sqrt[2])}, {y[x] -> Sqrt[-x^2 + x^4/(-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(2
4*C[1]) - E^(12*C[1])*x^6])^(1/3) + (-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) -
 E^(12*C[1])*x^6])^(1/3)]/Sqrt[2]}, {y[x] -> -Sqrt[(I*(I + Sqrt[3])*x^4 - 2*x^2*
(-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) - E^(12*C[1])*x^6])^(1/3) + (-1 - I*S
qrt[3])*(-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) - E^(12*C[1])*x^6])^(2/3))/(-
2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) - E^(12*C[1])*x^6])^(1/3)]/2}, {y[x] ->
 Sqrt[(I*(I + Sqrt[3])*x^4 - 2*x^2*(-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) -
E^(12*C[1])*x^6])^(1/3) + (-1 - I*Sqrt[3])*(-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*
C[1]) - E^(12*C[1])*x^6])^(2/3))/(-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) - E^
```

```
(12*C[1])*x^6])^(1/3)]/2}, {y[x] -> -Sqrt[((-1 - I*Sqrt[3])*x^4 - 2*x^2*(-2*E^(1
2*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) - E^(12*C[1])*x^6])^(1/3) + I*(I + Sqrt[3])*(
-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) - E^(12*C[1])*x^6])^(2/3))/(-2*E^(12*C
[1]) + x^6 + 2*Sqrt[E^(24*C[1]) - E^(12*C[1])*x^6])^(1/3)]/2}, {y[x] -> Sqrt[((-
1 - I*Sqrt[3])*x^4 - 2*x^2*(-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) - E^(12*C[
1])*x^6])^(1/3) + I*(I + Sqrt[3])*(-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) - E
^(12*C[1])*x^6])^(2/3))/(-2*E^(12*C[1]) + x^6 + 2*Sqrt[E^(24*C[1]) - E^(12*C[1])
*x^6])^(1/3)]/2}}
```

Maple raw input

```
dsolve(2*y(x)^3*diff(y(x),x) = x^3-x*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-1/6*ln((-x^2+2*y(x)^2)/x^2)-1/3*ln((x^2+y(x)^2)/x^2)-ln(x)-_C1 = 0
```

4.687 $y(x)\left(2y(x)^2+1\right)y'(x)=x(2x^2+1)$

ODE

$$y(x)\left(2y(x)^2+1\right)y'(x)=x(2x^2+1)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0118461 (sec), leaf count = 151

$$\left\{\left\{y(x)\to -\frac{\sqrt{-\sqrt{8c_1+4x^4+4x^2+1}-1}}{\sqrt{2}}\right\},\left\{y(x)\to \frac{\sqrt{-\sqrt{8c_1+4x^4+4x^2+1}-1}}{\sqrt{2}}\right\},\left\{y(x)\to -\frac{\sqrt{\sqrt{8c_1+4x^4+4x^2}}}{\sqrt{2}}\right.\right.$$

Maple ✓
cpu = 0.009 (sec), leaf count = 23

$$\left\{x^4-(y(x))^4+x^2-(y(x))^2+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 + 2*y[x]^2)*y'[x] == x*(1 + 2*x^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-1 - Sqrt[1 + 4*x^2 + 4*x^4 + 8*C[1]]]/Sqrt[2])}, {y[x] -> Sqrt
[-1 - Sqrt[1 + 4*x^2 + 4*x^4 + 8*C[1]]]/Sqrt[2]}, {y[x] -> -(Sqrt[-1 + Sqrt[1 +
4*x^2 + 4*x^4 + 8*C[1]]]/Sqrt[2])}, {y[x] -> Sqrt[-1 + Sqrt[1 + 4*x^2 + 4*x^4 +
8*C[1]]]/Sqrt[2]}}
```

Maple raw input

```
dsolve(y(x)*(1+2*y(x)^2)*diff(y(x),x) = x*(2*x^2+1), y(x),'implicit')
```

Maple raw output

```
x^4-y(x)^4+x^2-y(x)^2+_C1 = 0
```

4.688 $x^3 + y(x)\left(3x^2 + 2y(x)^2\right)y'(x) = 0$

ODE

$$x^3 + y(x)\left(3x^2 + 2y(x)^2\right)y'(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0653655 (sec), leaf count = 209

$$\left\{\left\{y(x) \to -\frac{\sqrt{-\sqrt{8e^{2c_1}x^2 + e^{4c_1}} + e^{2c_1} - 4x^2}}{2\sqrt{2}}\right\}, \left\{y(x) \to \frac{\sqrt{-\sqrt{8e^{2c_1}x^2 + e^{4c_1}} + e^{2c_1} - 4x^2}}{2\sqrt{2}}\right\}, \left\{y(x) \to -\frac{\sqrt{\sqrt{8e^{2c_1}x^2 +}\right.\right.$$

Maple ✓
cpu = 0.024 (sec), leaf count = 43

$$\left\{\frac{1}{2}\ln\left(\frac{x^2 + (y(x))^2}{x^2}\right) - \ln\left(\frac{x^2 + 2(y(x))^2}{x^2}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^3 + y[x]*(3*x^2 + 2*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[E^(2*C[1]) - 4*x^2 - Sqrt[E^(4*C[1]) + 8*E^(2*C[1])*x^2]]/(2*Sqr
t[2])}, {y[x] -> Sqrt[E^(2*C[1]) - 4*x^2 - Sqrt[E^(4*C[1]) + 8*E^(2*C[1])*x^2]]/
(2*Sqrt[2])}, {y[x] -> -Sqrt[E^(2*C[1]) - 4*x^2 + Sqrt[E^(4*C[1]) + 8*E^(2*C[1])
*x^2]]/(2*Sqrt[2])}, {y[x] -> Sqrt[E^(2*C[1]) - 4*x^2 + Sqrt[E^(4*C[1]) + 8*E^(2
*C[1])*x^2]]/(2*Sqrt[2])}}
```

Maple raw input

```
dsolve((3*x^2+2*y(x)^2)*y(x)*diff(y(x),x)+x^3 = 0, y(x),'implicit')
```

Maple raw output

```
1/2*ln((x^2+y(x)^2)/x^2)-ln((x^2+2*y(x)^2)/x^2)-ln(x)-_C1 = 0
```

4.689 $y(x)\left(5x^2+2y(x)^2\right)y'(x)+x(x^2+5y(x)^2)=0$

ODE

$$y(x)\left(5x^2+2y(x)^2\right)y'(x)+x\left(x^2+5y(x)^2\right)=0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, _dAlembert]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0415178 (sec), leaf count = 159

$$\left\{\left\{y(x)\to -\frac{\sqrt{-\sqrt{2e^{4c_1}+23x^4}-5x^2}}{\sqrt{2}}\right\},\left\{y(x)\to \frac{\sqrt{-\sqrt{2e^{4c_1}+23x^4}-5x^2}}{\sqrt{2}}\right\},\left\{y(x)\to -\frac{\sqrt{\sqrt{2e^{4c_1}+23x^4}-5x^2}}{\sqrt{2}}\right\},\left\{y\right.\right.$$

Maple ✓
cpu = 0.015 (sec), leaf count = 37

$$\left\{-\frac{1}{4}\ln\left(\frac{x^4+10\,x^2(y(x))^2+2\,(y(x))^4}{x^4}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^2 + 5*y[x]^2) + y[x]*(5*x^2 + 2*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-5*x^2 - Sqrt[2*E^(4*C[1]) + 23*x^4]]/Sqrt[2])}, {y[x] -> Sqrt[
-5*x^2 - Sqrt[2*E^(4*C[1]) + 23*x^4]]/Sqrt[2]}, {y[x] -> -(Sqrt[-5*x^2 + Sqrt[2*
E^(4*C[1]) + 23*x^4]]/Sqrt[2])}, {y[x] -> Sqrt[-5*x^2 + Sqrt[2*E^(4*C[1]) + 23*x
^4]]/Sqrt[2]}}
```

Maple raw input

```
dsolve((5*x^2+2*y(x)^2)*y(x)*diff(y(x),x)+x*(x^2+5*y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
-1/4*ln((x^4+10*x^2*y(x)^2+2*y(x)^4)/x^4)-ln(x)-_C1 = 0
```

4.690 $2x^3+3x^2y(x)+\left(-x^3+x^2+3xy(x)^2+2y(x)^3\right)y'(x)-y(x)^3+y(x)^2=0$

ODE

$$2x^3+3x^2y(x)+\left(-x^3+x^2+3xy(x)^2+2y(x)^3\right)y'(x)-y(x)^3+y(x)^2=0$$

ODE Classification

[_rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0442185 (sec), leaf count = 364

$$\left\{\left\{y(x)\to \frac{6\sqrt[3]{2}(c_1+x)-2^{2/3}\left(\sqrt{729\left(c_1x+x^3\right)^2+108\left(c_1+x\right)^3}+27c_1x+27x^3\right)^{2/3}}{6\sqrt[3]{\sqrt{729\left(c_1x+x^3\right)^2+108\left(c_1+x\right)^3}+27c_1x+27x^3}}\right\},\left\{y(x)\to \frac{2^{2/3}\left(1-i\sqrt{3}\right)\left(\sqrt{72}\right.\right.\right.$$

Maple ✓
cpu = 0.162 (sec), leaf count = 28

$$\left\{\frac{(y(x))^3+(x+\_C1)\,y(x)+x\left(x^2+\_C1\right)}{x+y(x)}=0\right\}$$

Mathematica raw input

```
DSolve[2*x^3 + 3*x^2*y[x] + y[x]^2 - y[x]^3 + (x^2 - x^3 + 3*x*y[x]^2 + 2*y[x]^3)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (6*2^(1/3)*(x + C[1]) - 2^(2/3)*(27*x^3 + 27*x*C[1] + Sqrt[108*(x + C[
1])^3 + 729*(x^3 + x*C[1])^2])^(2/3))/(6*(27*x^3 + 27*x*C[1] + Sqrt[108*(x + C[1
])^3 + 729*(x^3 + x*C[1])^2])^(1/3))}, {y[x] -> ((-6*I)*2^(1/3)*(-I + Sqrt[3])*(
x + C[1]) + 2^(2/3)*(1 - I*Sqrt[3])*(27*x^3 + 27*x*C[1] + Sqrt[108*(x + C[1])^3
+ 729*(x^3 + x*C[1])^2])^(2/3))/(12*(27*x^3 + 27*x*C[1] + Sqrt[108*(x + C[1])^3
+ 729*(x^3 + x*C[1])^2])^(1/3))}, {y[x] -> ((6*I)*2^(1/3)*(I + Sqrt[3])*(x + C[1
]) + 2^(2/3)*(1 + I*Sqrt[3])*(27*x^3 + 27*x*C[1] + Sqrt[108*(x + C[1])^3 + 729*(
x^3 + x*C[1])^2])^(2/3))/(12*(27*x^3 + 27*x*C[1] + Sqrt[108*(x + C[1])^3 + 729*(
x^3 + x*C[1])^2])^(1/3))}}
```

Maple raw input

```
dsolve((x^2-x^3+3*x*y(x)^2+2*y(x)^3)*diff(y(x),x)+2*x^3+3*x^2*y(x)+y(x)^2-y(x)^3 = 0, y(x),'implicit'
```

Maple raw output

```
(y(x)^3+(x+_C1)*y(x)+x*(x^2+_C1))/(x+y(x)) = 0
```

4.691

$$4x^3+9x^2y(x)+\left(3x^3+6x^2y(x)-3xy(x)^2+20y(x)^3\right)y'(x)+6xy(x)^2-y(x)^3=0$$

ODE

$$4x^3+9x^2y(x)+\left(3x^3+6x^2y(x)-3xy(x)^2+20y(x)^3\right)y'(x)+6xy(x)^2-y(x)^3=0$$

ODE Classification

[[_homogeneous, `class A`], _exact, _rational, _dAlembert]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.17773 (sec), leaf count = 2201

$$\left\{\left\{y(x)\to \frac{x}{20}+\frac{1}{2}\sqrt{-\frac{39x^2}{100}+\frac{\sqrt[3]{99x^6+351e^{c_1}x^2+\sqrt{3}\sqrt{-67037x^{12}+185406e^{c_1}x^8-83733e^{2c_1}x^4+32000e^{3c_1}}}}{5\sqrt[3]{2}3^{2/3}}+\frac{}{5\sqrt[3]{99x}}\right.\right.\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 51

$$\left\{-\frac{1}{4}\ln\left(\frac{x^4+3x^3y(x)+3x^2(y(x))^2-x(y(x))^3+5(y(x))^4}{x^4}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[4*x^3 + 9*x^2*y[x] + 6*x*y[x]^2 - y[x]^3 + (3*x^3 + 6*x^2*y[x] - 3*x*y[x]^2 + 20*y[x]^3)*y'[x]
```

Mathematica raw output

```
{{y[x] -> x/20 + Sqrt[(-39*x^2)/100 + (2*(2/3)^(1/3)*(-10*E^C[1] + 13*x^4))/(5*(
351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 +
 185406*E^C[1]*x^8 - 67037*x^12])^(1/3)) + (351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sq
rt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^(1
/3)/(5*2^(1/3)*3^(2/3))]/2 - Sqrt[(-39*x^2)/50 + (2*(2/3)^(1/3)*(10*E^C[1] - 13*
x^4))/(5*(351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C
[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^(1/3)) - (351*E^C[1]*x^2 + 99*x^6 +
Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037
```

```
*x^12])^(1/3)/(5*2^(1/3)*3^(2/3)) - (659*x^3)/(500*Sqrt[(-39*x^2)/100 + (2*(2/3)
^(1/3)*(-10*E^C[1] + 13*x^4))/(5*(351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E
^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^(1/3)) + (35
1*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 1
85406*E^C[1]*x^8 - 67037*x^12])^(1/3)/(5*2^(1/3)*3^(2/3))])]/2}, {y[x] -> x/20 +
 Sqrt[(-39*x^2)/100 + (2*(2/3)^(1/3)*(-10*E^C[1] + 13*x^4))/(5*(351*E^C[1]*x^2 +
 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x
^8 - 67037*x^12])^(1/3)) + (351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[
1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^(1/3)/(5*2^(1/3)*3
^(2/3))]/2 + Sqrt[(-39*x^2)/50 + (2*(2/3)^(1/3)*(10*E^C[1] - 13*x^4))/(5*(351*E^
C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 18540
6*E^C[1]*x^8 - 67037*x^12])^(1/3)) - (351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[320
00*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^(1/3)/(5
*2^(1/3)*3^(2/3)) - (659*x^3)/(500*Sqrt[(-39*x^2)/100 + (2*(2/3)^(1/3)*(-10*E^C[
1] + 13*x^4))/(5*(351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 8373
3*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^(1/3)) + (351*E^C[1]*x^2 + 9
9*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8
 - 67037*x^12])^(1/3)/(5*2^(1/3)*3^(2/3))])]/2}, {y[x] -> x/20 - Sqrt[(-39*x^2)/
100 + (2*(2/3)^(1/3)*(-10*E^C[1] + 13*x^4))/(5*(351*E^C[1]*x^2 + 99*x^6 + Sqrt[3
]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12]
)^(1/3)) + (351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2
*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^(1/3)/(5*2^(1/3)*3^(2/3))]/2 - Sqr
t[(-39*x^2)/50 + (2*(2/3)^(1/3)*(10*E^C[1] - 13*x^4))/(5*(351*E^C[1]*x^2 + 99*x^
6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 6
7037*x^12])^(1/3)) - (351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) -
83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^(1/3)/(5*2^(1/3)*3^(2/3)
) + (659*x^3)/(500*Sqrt[(-39*x^2)/100 + (2*(2/3)^(1/3)*(-10*E^C[1] + 13*x^4))/(5
*(351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4
 + 185406*E^C[1]*x^8 - 67037*x^12])^(1/3)) + (351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*
Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^
(1/3)/(5*2^(1/3)*3^(2/3))])]/2}, {y[x] -> x/20 - Sqrt[(-39*x^2)/100 + (2*(2/3)^(
1/3)*(-10*E^C[1] + 13*x^4))/(5*(351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(
3*C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^(1/3)) + (351*
E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 185
406*E^C[1]*x^8 - 67037*x^12])^(1/3)/(5*2^(1/3)*3^(2/3))]/2 + Sqrt[(-39*x^2)/50 +
 (2*(2/3)^(1/3)*(10*E^C[1] - 13*x^4))/(5*(351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt
[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^(1/3
)) - (351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])
*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^(1/3)/(5*2^(1/3)*3^(2/3)) + (659*x^3)/(5
00*Sqrt[(-39*x^2)/100 + (2*(2/3)^(1/3)*(-10*E^C[1] + 13*x^4))/(5*(351*E^C[1]*x^2
 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]
*x^8 - 67037*x^12])^(1/3)) + (351*E^C[1]*x^2 + 99*x^6 + Sqrt[3]*Sqrt[32000*E^(3*
C[1]) - 83733*E^(2*C[1])*x^4 + 185406*E^C[1]*x^8 - 67037*x^12])^(1/3)/(5*2^(1/3)
*3^(2/3))])]/2}}
```

Maple raw input

```
dsolve((3*x^3+6*x^2*y(x)-3*x*y(x)^2+20*y(x)^3)*diff(y(x),x)+4*x^3+9*x^2*y(x)+6*x*y(x)^2-
y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
-1/4*ln((x^4+3*x^3*y(x)+3*x^2*y(x)^2-x*y(x)^3+5*y(x)^4)/x^4)-ln(x)-_C1 = 0
```

4.692 $(ay(x)^3 + x^3)\, y'(x) = x^2 y(x)$

ODE

$$(ay(x)^3 + x^3)\, y'(x) = x^2 y(x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0378831 (sec), leaf count = 108

$$\left\{\left\{y(x) \to \frac{x}{\sqrt[3]{a}\sqrt[3]{W\left(\frac{x^3 e^{-\frac{3c_1}{a}}}{a}\right)}}\right\}, \left\{y(x) \to -\frac{\sqrt[3]{-1}x}{\sqrt[3]{a}\sqrt[3]{W\left(\frac{x^3 e^{-\frac{3c_1}{a}}}{a}\right)}}\right\}, \left\{y(x) \to \frac{(-1)^{2/3}x}{\sqrt[3]{a}\sqrt[3]{W\left(\frac{x^3 e^{-\frac{3c_1}{a}}}{a}\right)}}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 32

$$\left\{-\ln\left(\frac{y(x)}{x}\right) + \frac{x^3}{3a\left(y(x)\right)^3} - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[(x^3 + a*y[x]^3)*y'[x] == x^2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x/(a^(1/3)*ProductLog[x^3/(a*E^((3*C[1])/a))]^(1/3))}, {y[x] -> -(((-1
)^(1/3)*x)/(a^(1/3)*ProductLog[x^3/(a*E^((3*C[1])/a))]^(1/3)))}, {y[x] -> ((-1)^
(2/3)*x)/(a^(1/3)*ProductLog[x^3/(a*E^((3*C[1])/a))]^(1/3))}}
```

Maple raw input

```
dsolve((x^3+a*y(x)^3)*diff(y(x),x) = x^2*y(x), y(x),'implicit')
```

Maple raw output

```
-ln(y(x)/x)+1/3/a*x^3/y(x)^3-ln(x)-_C1 = 0
```

4.693

$$y'(x)\left(ax^2-bx^3+3cxy(x)^2+2cy(x)^3\right)+ay(x)^2+2bx^3+3bx^2y(x)-cy(x)^3=0$$

ODE

$$y'(x)\left(ax^2-bx^3+3cxy(x)^2+2cy(x)^3\right)+ay(x)^2+2bx^3+3bx^2y(x)-cy(x)^3=0$$

ODE Classification

[_rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0790246 (sec), leaf count = 524

$$\left\{\left\{y(x)\to\frac{-\sqrt[3]{2}\left(\sqrt{3}\sqrt{c^3\left(4\left(ax+c_1\right)^3+27cx^2\left(bx^2+c_1\right)^2\right)}+9bc^2x^3+9c^2c_1x\right)^{2/3}+2\sqrt[3]{3}acx+2\sqrt[3]{3}cc_1}{6^{2/3}c\sqrt[3]{\sqrt{3}\sqrt{c^3\left(4\left(ax+c_1\right)^3+27cx^2\left(bx^2+c_1\right)^2\right)}+9bc^2x^3+9c^2c_1x}}\right\},\left\{y(x)\to\frac{2^{2/}}{}\right.\right.$$

Maple ✓
cpu = 0.199 (sec), leaf count = 36

$$\left\{\frac{-c(y(x))^3+(-ax+\_C1)\,y(x)-bx^3+\_C1\,x}{x+y(x)}=0\right\}$$

Mathematica raw input

```
DSolve[2*b*x^3 + 3*b*x^2*y[x] + a*y[x]^2 - c*y[x]^3 + (a*x^2 - b*x^3 + 3*c*x*y[x]^2 + 2*c*y[x]^3)*y'[
```

Mathematica raw output

```
{{y[x] -> (2*3^(1/3)*a*c*x + 2*3^(1/3)*c*C[1] - 2^(1/3)*(9*b*c^2*x^3 + 9*c^2*x*C
[1] + Sqrt[3]*Sqrt[c^3*(4*(a*x + C[1])^3 + 27*c*x^2*(b*x^2 + C[1])^2)])^(2/3))/(
6^(2/3)*c*(9*b*c^2*x^3 + 9*c^2*x*C[1] + Sqrt[3]*Sqrt[c^3*(4*(a*x + C[1])^3 + 27*
c*x^2*(b*x^2 + C[1])^2)])^(1/3))}, {y[x] -> ((-6*I)*2^(1/3)*(-I + Sqrt[3])*c*(a*
x + C[1]) + 2^(2/3)*(1 - I*Sqrt[3])*(27*b*c^2*x^3 + 27*c^2*x*C[1] + Sqrt[4*(3*a*
c*x + 3*c*C[1])^3 + (27*b*c^2*x^3 + 27*c^2*x*C[1])^2])^(2/3))/(12*c*(27*b*c^2*x^
3 + 27*c^2*x*C[1] + Sqrt[4*(3*a*c*x + 3*c*C[1])^3 + (27*b*c^2*x^3 + 27*c^2*x*C[1
])^2])^(1/3))}, {y[x] -> ((6*I)*2^(1/3)*(I + Sqrt[3])*c*(a*x + C[1]) + 2^(2/3)*(
1 + I*Sqrt[3])*(27*b*c^2*x^3 + 27*c^2*x*C[1] + Sqrt[4*(3*a*c*x + 3*c*C[1])^3 + (
27*b*c^2*x^3 + 27*c^2*x*C[1])^2])^(2/3))/(12*c*(27*b*c^2*x^3 + 27*c^2*x*C[1] + S
qrt[4*(3*a*c*x + 3*c*C[1])^3 + (27*b*c^2*x^3 + 27*c^2*x*C[1])^2])^(1/3))}}
```

Maple raw input

```
dsolve((a*x^2-b*x^3+3*c*x*y(x)^2+2*c*y(x)^3)*diff(y(x),x)+2*b*x^3+3*b*x^2*y(x)+a*y(x)^2-
c*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
(-c*y(x)^3+(-a*x+_C1)*y(x)-b*x^3+_C1*x)/(x+y(x)) = 0
```

4.694 $xy(x)^3y'(x) = (1-x^2)\left(y(x)^2+1\right)$

ODE

$$xy(x)^3y'(x) = (1-x^2)\left(y(x)^2+1\right)$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0237565 (sec), leaf count = 61

$$\left\{\left\{y(x)\to -\sqrt{-W\left(-\frac{e^{-2c_1+x^2-1}}{x^2}\right)-1}\right\},\left\{y(x)\to \sqrt{-W\left(-\frac{e^{-2c_1+x^2-1}}{x^2}\right)-1}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 29

$$\left\{\frac{x^2}{2}-\ln(x)+\frac{(y(x))^2}{2}-\frac{\ln\left(1+(y(x))^2\right)}{2}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*y[x]^3*y'[x] == (1 - x^2)*(1 + y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-1 - ProductLog[-(E^(-1 + x^2 - 2*C[1])/x^2)]]}, {y[x] -> Sqrt[-
1 - ProductLog[-(E^(-1 + x^2 - 2*C[1])/x^2)]]}}
```

Maple raw input

```
dsolve(x*y(x)^3*diff(y(x),x) = (-x^2+1)*(1+y(x)^2), y(x),'implicit')
```

Maple raw output

```
1/2*x^2-ln(x)+1/2*y(x)^2-1/2*ln(1+y(x)^2)+_C1 = 0
```

4.695 $x(x-y(x)^3)\,y'(x) = y(x)\,(y(x)^3+3x)$

ODE

$$x(x-y(x)^3)\,y'(x) = y(x)\,(y(x)^3+3x)$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.127114 (sec), leaf count = 359

$$\left\{\left\{y(x)\to \frac{e^{\frac{8c_1}{3}}}{\sqrt[3]{3\sqrt{3}\sqrt{-x^6\left(e^{8c_1}-27x^8\right)}-27x^7}}+\frac{\sqrt[3]{\sqrt{3}\sqrt{-x^6\left(e^{8c_1}-27x^8\right)}-9x^7}}{3^{2/3}x^2}\right\},\left\{y(x)\to \frac{i\sqrt[6]{3}(\sqrt{3}+i)\left(\sqrt{3}\sqrt{-x^6\,(e\right.}}{2\,3^{5/6}x^2\sqrt[3]{\sqrt{}}}\right.$$

Maple ✓
cpu = 0.021 (sec), leaf count = 33

$$\left\{\ln(x)-\_C1+\frac{3}{8}\ln\left(\frac{(y(x))^3+2x}{x}\right)-\frac{3}{8}\ln\left(y(x)\,\frac{1}{\sqrt[3]{x}}\right)=0\right\}$$

Mathematica raw input

```
DSolve[x*(x - y[x]^3)*y'[x] == y[x]*(3*x + y[x]^3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-9*x^7 + Sqrt[3]*Sqrt[-(x^6*(E^(8*C[1]) - 27*x^8))])^(1/3)/(3^(2/3)*x
^2) + E^((8*C[1])/3)/(-27*x^7 + 3*Sqrt[3]*Sqrt[-(x^6*(E^(8*C[1]) - 27*x^8))])^(1
/3)}, {y[x] -> (-((3*I + Sqrt[3])*E^((8*C[1])/3)*x^2) + I*3^(1/6)*(I + Sqrt[3])*
(-9*x^7 + Sqrt[3]*Sqrt[-(x^6*(E^(8*C[1]) - 27*x^8))])^(2/3))/(2*3^(5/6)*x^2*(-9*
x^7 + Sqrt[3]*Sqrt[-(x^6*(E^(8*C[1]) - 27*x^8))])^(1/3))}, {y[x] -> (I*3^(1/3)*(
I + Sqrt[3])*E^((8*C[1])/3) + ((-1 - I*Sqrt[3])*(-9*x^7 + Sqrt[3]*Sqrt[-(x^6*(E^
(8*C[1]) - 27*x^8))])^(2/3))/x^2)/(2*3^(2/3)*(-9*x^7 + Sqrt[3]*Sqrt[-(x^6*(E^(8*
C[1]) - 27*x^8))])^(1/3))}}
```

Maple raw input

```
dsolve(x*(x-y(x)^3)*diff(y(x),x) = (3*x+y(x)^3)*y(x), y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+3/8*ln((y(x)^3+2*x)/x)-3/8*ln(1/x^(1/3)*y(x)) = 0
```

4.696 $x(2x^3+y(x)^3)\,y'(x)=y(x)\,(2x^3-x^2y(x)+y(x)^3)$

ODE

$$x(2x^3+y(x)^3)\,y'(x)=y(x)\,(2x^3-x^2y(x)+y(x)^3)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0291453 (sec), leaf count = 370

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{\frac{2}{3}}\left(3\sqrt[3]{2}c_1x^2+3^{2/3}\left(\sqrt{3}\sqrt{x^6\left(2\left(\log(x)-c_1\right)^3+27\right)}+9x^3\right)^{2/3}-3\sqrt[3]{2}x^2\log(x)\right)}{3\sqrt[3]{\sqrt{3}\sqrt{x^6\left(2\left(\log(x)-c_1\right)^3+27\right)}+9x^3}}\right\},\left\{y(x)\to \frac{i(\sqrt{3}+i)\sqrt[3]{\sqrt{}}\right.\right.$$

Maple ✓
cpu = 0.017 (sec), leaf count = 27

$$\left\{2\,\frac{x}{y(x)}-\frac{(y(x))^2}{2\,x^2}-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(2*x^3 + y[x]^3)*y'[x] == y[x]*(2*x^3 - x^2*y[x] + y[x]^3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((2/3)^(1/3)*(3*2^(1/3)*x^2*C[1] - 3*2^(1/3)*x^2*Log[x] + 3^(2/3)*(9*x
^3 + Sqrt[3]*Sqrt[x^6*(27 + 2*(-C[1] + Log[x])^3)])^(2/3)))/(3*(9*x^3 + Sqrt[3]*
Sqrt[x^6*(27 + 2*(-C[1] + Log[x])^3)])^(1/3))}, {y[x] -> ((1 + I*Sqrt[3])*x^2*(-
C[1] + Log[x]))/(6^(1/3)*(9*x^3 + Sqrt[3]*Sqrt[x^6*(27 + 2*(-C[1] + Log[x])^3)])
^(1/3)) + (I*(I + Sqrt[3])*(9*x^3 + Sqrt[3]*Sqrt[x^6*(27 + 2*(-C[1] + Log[x])^3)
])^(1/3))/6^(2/3)}, {y[x] -> (I*(I + Sqrt[3])*x^2*(C[1] - Log[x]))/(6^(1/3)*(9*x
^3 + Sqrt[3]*Sqrt[x^6*(27 + 2*(-C[1] + Log[x])^3)])^(1/3)) - ((1 + I*Sqrt[3])*(9
*x^3 + Sqrt[3]*Sqrt[x^6*(27 + 2*(-C[1] + Log[x])^3)])^(1/3))/6^(2/3)}}
```

Maple raw input

```
dsolve(x*(2*x^3+y(x)^3)*diff(y(x),x) = (2*x^3-x^2*y(x)+y(x)^3)*y(x), y(x),'implicit')
```

Maple raw output

```
2*x/y(x)-1/2/x^2*y(x)^2-ln(x)-_C1 = 0
```

4.697 $x(2x^3 - y(x)^3)\,y'(x) = y(x)\,(x^3 - 2y(x)^3)$

ODE

$$x(2x^3 - y(x)^3)\,y'(x) = y(x)\,(x^3 - 2y(x)^3)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.189442 (sec), leaf count = 433

$$\left\{\left\{y(x) \to \frac{1}{3}\left(e^{c_1}x^2 + \frac{\sqrt[3]{2e^{3c_1}x^6 + 3\sqrt{81x^6 - 12e^{3c_1}x^9} - 27x^3}}{\sqrt[3]{2}} + \frac{\sqrt[3]{2}e^{2c_1}x^4}{\sqrt[3]{2e^{3c_1}x^6 + 3\sqrt{81x^6 - 12e^{3c_1}x^9} - 27x^3}}\right)\right\}, \left\{y(x) \to \right.$$

Maple ✓
cpu = 0.026 (sec), leaf count = 47

$$\left\{\ln\left(\frac{x^2 - xy(x) + (y(x))^2}{x^2}\right) + \ln\left(\frac{x + y(x)}{x}\right) - 2\ln\left(\frac{y(x)}{x}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x*(2*x^3 - y[x]^3)*y'[x] == y[x]*(x^3 - 2*y[x]^3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^C[1]*x^2 + (2^(1/3)*E^(2*C[1])*x^4)/(-27*x^3 + 2*E^(3*C[1])*x^6 + 3
*Sqrt[81*x^6 - 12*E^(3*C[1])*x^9])^(1/3) + (-27*x^3 + 2*E^(3*C[1])*x^6 + 3*Sqrt[
81*x^6 - 12*E^(3*C[1])*x^9])^(1/3)/2^(1/3))/3}, {y[x] -> (E^C[1]*x^2)/3 - ((I/3)
*(-I + Sqrt[3])*E^(2*C[1])*x^4)/(2^(2/3)*(-27*x^3 + 2*E^(3*C[1])*x^6 + 3*Sqrt[81
*x^6 - 12*E^(3*C[1])*x^9])^(1/3)) + ((I/6)*(I + Sqrt[3])*(-27*x^3 + 2*E^(3*C[1])
*x^6 + 3*Sqrt[81*x^6 - 12*E^(3*C[1])*x^9])^(1/3))/2^(1/3)}, {y[x] -> (E^C[1]*x^2
)/3 + ((I/3)*(I + Sqrt[3])*E^(2*C[1])*x^4)/(2^(2/3)*(-27*x^3 + 2*E^(3*C[1])*x^6
+ 3*Sqrt[81*x^6 - 12*E^(3*C[1])*x^9])^(1/3)) - ((I/6)*(-I + Sqrt[3])*(-27*x^3 +
2*E^(3*C[1])*x^6 + 3*Sqrt[81*x^6 - 12*E^(3*C[1])*x^9])^(1/3))/2^(1/3)}}
```

Maple raw input

```
dsolve(x*(2*x^3-y(x)^3)*diff(y(x),x) = (x^3-2*y(x)^3)*y(x), y(x),'implicit')
```

Maple raw output

```
ln((x^2-x*y(x)+y(x)^2)/x^2)+ln((x+y(x))/x)-2*ln(y(x)/x)-ln(x)-_C1 = 0
```

4.698 $x(x^3+3x^2y(x)+y(x)^3)\,y'(x)=y(x)^2\,(3x^2+y(x)^2)$

ODE

$$x(x^3+3x^2y(x)+y(x)^3)\,y'(x)=y(x)^2\,(3x^2+y(x)^2)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.065418 (sec), leaf count = 34

$$\text{Solve}\left[\frac{y(x)^3}{3x^3}+\frac{3y(x)}{x}+\log\left(\frac{y(x)}{x}\right)+\log(x)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.014 (sec), leaf count = 36

$$\left\{-3\,\frac{y(x)}{x}-\ln\left(\frac{y(x)}{x}\right)-\frac{(y(x))^3}{3\,x^3}-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^3 + 3*x^2*y[x] + y[x]^3)*y'[x] == y[x]^2*(3*x^2 + y[x]^2),y[x],x]
```

Mathematica raw output

```
Solve[Log[x] + Log[y[x]/x] + (3*y[x])/x + y[x]^3/(3*x^3) == C[1], y[x]]
```

Maple raw input

```
dsolve(x*(x^3+3*x^2*y(x)+y(x)^3)*diff(y(x),x) = (3*x^2+y(x)^2)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-3*y(x)/x-ln(y(x)/x)-1/3/x^3*y(x)^3-ln(x)-_C1 = 0
```

4.699 $x(x^3-2y(x)^3)\,y'(x)=y(x)\,(2x^3-y(x)^3)$

ODE

$$x(x^3-2y(x)^3)\,y'(x)=y(x)\,(2x^3-y(x)^3)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.106763 (sec), leaf count = 331

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{2}\left(\sqrt{81x^6-12e^{3c_1}x^3}-9x^3\right)^{2/3}+2\sqrt[3]{3}e^{c_1}x}{6^{2/3}\sqrt[3]{\sqrt{81x^6-12e^{3c_1}x^3}-9x^3}}\right\},\left\{y(x)\to \frac{i\sqrt[3]{2}\sqrt[6]{3}(\sqrt{3}+i)\left(\sqrt{81x^6-12e^{3c_1}x^3}-9x^3\right)^{2/3}-2}{2\ 2^{2/3}3^{5/6}\sqrt[3]{\sqrt{81x^6-12e^{3c_1}x^3}-9x^3}}\right.\right.$$

Maple ✓
cpu = 0.025 (sec), leaf count = 49

$$\left\{-\ln\left(\frac{x^2-xy(x)+(y(x))^2}{x^2}\right)-\ln\left(\frac{x+y(x)}{x}\right)+\ln\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^3 - 2*y[x]^3)*y'[x] == y[x]*(2*x^3 - y[x]^3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*3^(1/3)*E^C[1]*x + 2^(1/3)*(-9*x^3 + Sqrt[-12*E^(3*C[1])*x^3 + 81*x
^6])^(2/3))/(6^(2/3)*(-9*x^3 + Sqrt[-12*E^(3*C[1])*x^3 + 81*x^6])^(1/3))}, {y[x]
 -> (-2*(3*I + Sqrt[3])*E^C[1]*x + I*2^(1/3)*3^(1/6)*(I + Sqrt[3])*(-9*x^3 + Sqr
t[-12*E^(3*C[1])*x^3 + 81*x^6])^(2/3))/(2*2^(2/3)*3^(5/6)*(-9*x^3 + Sqrt[-12*E^(
3*C[1])*x^3 + 81*x^6])^(1/3))}, {y[x] -> (-2*(-3*I + Sqrt[3])*E^C[1]*x + 2^(1/3)
*3^(1/6)*(-1 - I*Sqrt[3])*(-9*x^3 + Sqrt[-12*E^(3*C[1])*x^3 + 81*x^6])^(2/3))/(2
*2^(2/3)*3^(5/6)*(-9*x^3 + Sqrt[-12*E^(3*C[1])*x^3 + 81*x^6])^(1/3))}}
```

Maple raw input

```
dsolve(x*(x^3-2*y(x)^3)*diff(y(x),x) = (2*x^3-y(x)^3)*y(x), y(x),'implicit')
```

Maple raw output

```
-ln((x^2-x*y(x)+y(x)^2)/x^2)-ln((x+y(x))/x)+ln(y(x)/x)-ln(x)-_C1 = 0
```

4.700 $x(x^4-2y(x)^3)\,y'(x)+y(x)\,(2x^4+y(x)^3)=0$

ODE

$$x(x^4-2y(x)^3)\,y'(x)+y(x)\,(2x^4+y(x)^3)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0962784 (sec), leaf count = 1139

$$\left\{\left\{y(x)\to\frac{1}{6}\left(-\sqrt[6]{2}3^{2/3}\sqrt{\frac{4\sqrt[3]{6}c_1x^2+\left(9x^8-\sqrt{81x^{16}-384x^6c_1^3}\right)^{2/3}}{\sqrt[3]{9x^8-\sqrt{81x^{16}-384x^6c_1^3}}}}-3\sqrt{-\frac{4\sqrt{3}x^4}{\sqrt{\frac{4\ 6^{2/3}c_1x^2+\sqrt[3]{6}\left(9x^8-\sqrt{81x^{16}-384x^6c_1^3}\right)^{2/3}}{\sqrt[3]{9x^8-\sqrt{81x^{16}-384x^6c_1^3}}}}}-\right.\right.\right.$$

Maple ✓
cpu = 0.016 (sec), leaf count = 29

$$\left\{\ln(x)-\_C1+\frac{3}{10}\ln\left(-2\,\frac{\left(x^4-1/2\,(y(x))^3\right)y(x)}{x^{16/3}}\right)=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(2*x^4 + y[x]^3) + x*(x^4 - 2*y[x]^3)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(2^(1/6)*3^(2/3)*Sqrt[(4*6^(1/3)*x^2*C[1] + (9*x^8 - Sqrt[81*x^16 -
384*x^6*C[1]^3])^(2/3))/(9*x^8 - Sqrt[81*x^16 - 384*x^6*C[1]^3])^(1/3)]) - 3*Sqr
t[(-4*2^(2/3)*x^2*C[1])/(27*x^8 - 3*Sqrt[81*x^16 - 384*x^6*C[1]^3])^(1/3) - (18*
x^8 - 2*Sqrt[81*x^16 - 384*x^6*C[1]^3])^(1/3)/3^(2/3) - (4*Sqrt[3]*x^4)/Sqrt[(4*
6^(2/3)*x^2*C[1] + 6^(1/3)*(9*x^8 - Sqrt[81*x^16 - 384*x^6*C[1]^3])^(2/3))/(9*x^
8 - Sqrt[81*x^16 - 384*x^6*C[1]^3])^(1/3)]])/6}, {y[x] -> (-(2^(1/6)*3^(2/3)*Sqr
t[(4*6^(1/3)*x^2*C[1] + (9*x^8 - Sqrt[81*x^16 - 384*x^6*C[1]^3])^(2/3))/(9*x^8 -
 Sqrt[81*x^16 - 384*x^6*C[1]^3])^(1/3)]) + 3*Sqrt[(-4*2^(2/3)*x^2*C[1])/(27*x^8
- 3*Sqrt[81*x^16 - 384*x^6*C[1]^3])^(1/3) - (18*x^8 - 2*Sqrt[81*x^16 - 384*x^6*C
```

```
[1]^3])^(1/3)/3^(2/3) - (4*Sqrt[3]*x^4)/Sqrt[(4*6^(2/3)*x^2*C[1] + 6^(1/3)*(9*x^
8 - Sqrt[81*x^16 - 384*x^6*C[1]^3])^(2/3))/(9*x^8 - Sqrt[81*x^16 - 384*x^6*C[1]^
3])^(1/3)]])/6}, {y[x] -> (2^(1/6)*3^(2/3)*Sqrt[(4*6^(1/3)*x^2*C[1] + (9*x^8 - S
qrt[81*x^16 - 384*x^6*C[1]^3])^(2/3))/(9*x^8 - Sqrt[81*x^16 - 384*x^6*C[1]^3])^(
1/3)] - 3*Sqrt[(-4*2^(2/3)*x^2*C[1])/(27*x^8 - 3*Sqrt[81*x^16 - 384*x^6*C[1]^3])
^(1/3) - (18*x^8 - 2*Sqrt[81*x^16 - 384*x^6*C[1]^3])^(1/3)/3^(2/3) + (4*Sqrt[3]*
x^4)/Sqrt[(4*6^(2/3)*x^2*C[1] + 6^(1/3)*(9*x^8 - Sqrt[81*x^16 - 384*x^6*C[1]^3])
^(2/3))/(9*x^8 - Sqrt[81*x^16 - 384*x^6*C[1]^3])^(1/3)]])/6}, {y[x] -> (2^(1/6)*
3^(2/3)*Sqrt[(4*6^(1/3)*x^2*C[1] + (9*x^8 - Sqrt[81*x^16 - 384*x^6*C[1]^3])^(2/3
))/(9*x^8 - Sqrt[81*x^16 - 384*x^6*C[1]^3])^(1/3)] + 3*Sqrt[(-4*2^(2/3)*x^2*C[1]
)/(27*x^8 - 3*Sqrt[81*x^16 - 384*x^6*C[1]^3])^(1/3) - (18*x^8 - 2*Sqrt[81*x^16 -
 384*x^6*C[1]^3])^(1/3)/3^(2/3) + (4*Sqrt[3]*x^4)/Sqrt[(4*6^(2/3)*x^2*C[1] + 6^(
1/3)*(9*x^8 - Sqrt[81*x^16 - 384*x^6*C[1]^3])^(2/3))/(9*x^8 - Sqrt[81*x^16 - 384
*x^6*C[1]^3])^(1/3)]])/6}}
```

Maple raw input

```
dsolve(x*(x^4-2*y(x)^3)*diff(y(x),x)+(2*x^4+y(x)^3)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+3/10*ln(-2*(x^4-1/2*y(x)^3)/x^(16/3)*y(x)) = 0
```

4.701 $x(2y(x)^3+y(x)+x)\,y'(x)=(x-y(x))y(x)$

ODE

$$x\left(2y(x)^3+y(x)+x\right)y'(x)=(x-y(x))y(x)$$

ODE Classification

[_rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.504613 (sec), leaf count = 23

$$\text{Solve}\left[c_1+\frac{x}{y(x)}=y(x)^2+\log(y(x))+\log(x),y(x)\right]$$

Maple ✓
cpu = 0.092 (sec), leaf count = 26

$$\left\{-\ln(x)+\frac{x}{y(x)}-(y(x))^2-\ln(y(x))+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(x + y[x] + 2*y[x]^3)*y'[x] == (x - y[x])*y[x],y[x],x]
```

Mathematica raw output

```
Solve[C[1] + x/y[x] == Log[x] + Log[y[x]] + y[x]^2, y[x]]
```

Maple raw input

```
dsolve(x*(x+y(x)+2*y(x)^3)*diff(y(x),x) = (x-y(x))*y(x), y(x),'implicit')
```

Maple raw output

```
-ln(x)+x/y(x)-y(x)^2-ln(y(x))+_C1 = 0
```

4.702 $(-7xy(x)^3 - y(x) + 5x)\,y'(x) - y(x)^4 + 5y(x) = 0$

ODE

$$(-7xy(x)^3 - y(x) + 5x)\,y'(x) - y(x)^4 + 5y(x) = 0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0212264 (sec), leaf count = 302

$$\left\{\left\{y(x) \to \text{Root}\left[10\#1^7 x + 2\#1^5 - 100\#1^4 x - 25\#1^2 + 250\#1 x - 10c_1 \&, 1\right]\right\}, \left\{y(x) \to \text{Root}\left[10\#1^7 x + 2\#1^5 - 100\#1^4 x\right.\right.\right.$$

Maple ✓
cpu = 0.016 (sec), leaf count = 35

$$\left\{x + \frac{2\left(y(x)\right)^5 - 25\left(y(x)\right)^2 - 10\_C1}{10\,y\left(x\right)\left(\left(y\left(x\right)\right)^3 - 5\right)^2} = 0\right\}$$

Mathematica raw input

```
DSolve[5*y[x] - y[x]^4 + (5*x - y[x] - 7*x*y[x]^3)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[-10*C[1] + 250*x*#1 - 25*#1^2 - 100*x*#1^4 + 2*#1^5 + 10*x*#1^7 &
  , 1]}, {y[x] -> Root[-10*C[1] + 250*x*#1 - 25*#1^2 - 100*x*#1^4 + 2*#1^5 + 10*x
*#1^7 & , 2]}, {y[x] -> Root[-10*C[1] + 250*x*#1 - 25*#1^2 - 100*x*#1^4 + 2*#1^5
 + 10*x*#1^7 & , 3]}, {y[x] -> Root[-10*C[1] + 250*x*#1 - 25*#1^2 - 100*x*#1^4 +
 2*#1^5 + 10*x*#1^7 & , 4]}, {y[x] -> Root[-10*C[1] + 250*x*#1 - 25*#1^2 - 100*x
*#1^4 + 2*#1^5 + 10*x*#1^7 & , 5]}, {y[x] -> Root[-10*C[1] + 250*x*#1 - 25*#1^2
- 100*x*#1^4 + 2*#1^5 + 10*x*#1^7 & , 6]}, {y[x] -> Root[-10*C[1] + 250*x*#1 - 2
5*#1^2 - 100*x*#1^4 + 2*#1^5 + 10*x*#1^7 & , 7]}}
```

Maple raw input

```
dsolve((5*x-y(x)-7*x*y(x)^3)*diff(y(x),x)+5*y(x)-y(x)^4 = 0, y(x),'implicit')
```

Maple raw output

```
x+1/10*(2*y(x)^5-25*y(x)^2-10*_C1)/y(x)/(y(x)^3-5)^2 = 0
```

4.703 $y(x)\left(1-2x^3y(x)\right)+x\left(1-2xy(x)^3\right)y'(x)=0$

ODE

$$y(x)\left(1-2x^3y(x)\right)+x\left(1-2xy(x)^3\right)y'(x)=0$$

ODE Classification

[_rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0305952 (sec), leaf count = 358

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{2}\left(c_1x-x^3\right)}{\sqrt[3]{\sqrt{108x^3\left(x^3-c_1x\right)^3+729x^4}-27x^2}}+\frac{\sqrt[3]{\sqrt{108x^3\left(x^3-c_1x\right)^3+729x^4}-27x^2}}{3\sqrt[3]{2}x}\right\},\left\{y(x)\to \frac{(1-}{2^{2/3}\sqrt[3]{\sqrt{108x^3}}}\right.$$

Maple ✓
cpu = 0.108 (sec), leaf count = 20

$$\left\{\_C1+x^2+\frac{1}{xy(x)}+(y(x))^2=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 - 2*x^3*y[x]) + x*(1 - 2*x*y[x]^3)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2^(1/3)*(-x^3 + x*C[1]))/(-27*x^2 + Sqrt[729*x^4 + 108*x^3*(x^3 - x*C
[1])^3])^(1/3) + (-27*x^2 + Sqrt[729*x^4 + 108*x^3*(x^3 - x*C[1])^3])^(1/3)/(3*2
^(1/3)*x)}, {y[x] -> ((1 + I*Sqrt[3])*(x^3 - x*C[1]))/(2^(2/3)*(-27*x^2 + Sqrt[7
29*x^4 + 108*x^3*(x^3 - x*C[1])^3])^(1/3)) - ((1 - I*Sqrt[3])*(-27*x^2 + Sqrt[72
9*x^4 + 108*x^3*(x^3 - x*C[1])^3])^(1/3))/(6*2^(1/3)*x)}, {y[x] -> ((1 - I*Sqrt[
3])*(x^3 - x*C[1]))/(2^(2/3)*(-27*x^2 + Sqrt[729*x^4 + 108*x^3*(x^3 - x*C[1])^3]
)^(1/3)) - ((1 + I*Sqrt[3])*(-27*x^2 + Sqrt[729*x^4 + 108*x^3*(x^3 - x*C[1])^3])
^(1/3))/(6*2^(1/3)*x)}}
```

Maple raw input

```
dsolve(x*(1-2*x*y(x)^3)*diff(y(x),x)+(1-2*x^3*y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
_C1+x^2+1/x/y(x)+y(x)^2 = 0
```

4.704 $x(-2xy(x)^3 - xy(x)^2 + 2)\,y'(x) + 2y(x) + 1 = 0$

ODE

$$x(-2xy(x)^3 - xy(x)^2 + 2)\,y'(x) + 2y(x) + 1 = 0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]]

Book solution method
Change of Variable, new independent variable

Mathematica ✓
cpu = 0.280131 (sec), leaf count = 42

$$\text{Solve}\left[\frac{1}{64}\left(-4y(x)^2 + 4y(x) - \frac{16}{2xy(x) + x} - 2\log(8y(x) + 4) + 3\right) = c_1, y(x)\right]$$

Maple ✓
cpu = 0.139 (sec), leaf count = 33

$$\left\{(2\,xy(x) + x)^{-1} + \frac{(y(x))^2}{4} - \frac{y(x)}{4} + \frac{\ln(1 + 2\,y(x))}{8} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[1 + 2*y[x] + x*(2 - x*y[x]^2 - 2*x*y[x]^3)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[(3 - 2*Log[4 + 8*y[x]] + 4*y[x] - 4*y[x]^2 - 16/(x + 2*x*y[x]))/64 == C[1]
, y[x]]
```

Maple raw input

```
dsolve(x*(2-x*y(x)^2-2*x*y(x)^3)*diff(y(x),x)+1+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/(2*x*y(x)+x)+1/4*y(x)^2-1/4*y(x)+1/8*ln(1+2*y(x))+_C1 = 0
```

4.705 $(-10x^2y(x)^3+3y(x)^2+2)\,y'(x)=x(5y(x)^4+1)$

ODE

$$(-10x^2y(x)^3+3y(x)^2+2)\,y'(x)=x(5y(x)^4+1)$$

ODE Classification

[_exact , _rational , [_1st_order , `_with_symmetry_[F(x)*G(y),0]`]]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.199571 (sec), leaf count = 2097

$$\left\{\left\{y(x)\to -\frac{\sqrt{3}\sqrt{\frac{5\sqrt[3]{6}\sqrt[3]{189x^2-18c_1+\sqrt{3}\sqrt{27\left(21x^2-2c_1\right)^2-16\left(5x^4-10c_1x^2-2\right)^3}}x^2+\frac{10\ 6^{2/}}{\sqrt[3]{189x^2-18c_1+\sqrt{3}\sqrt{27(2}}}}{x^4}}\right.\right.$$

Maple ✓
cpu = 0.021 (sec), leaf count = 27

$$\left\{-\frac{5\,x^2(y(x))^4}{2}+(y(x))^3-\frac{x^2}{2}+2\,y(x)+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(2 + 3*y[x]^2 - 10*x^2*y[x]^3)*y'[x] == x*(1 + 5*y[x]^4),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(-3 + Sqrt[3]*x^2*Sqrt[(3 + (10*6^(2/3)*x^2*(-2 + 5*x^4 - 10*x^2*C[1]
))/(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 1
0*x^2*C[1])^3])^(1/3) + 5*6^(1/3)*x^2*(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x
^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3))/x^4] + Sqrt[3]*x^2*Sqr
t[-((-6*x^2 + (10*6^(2/3)*x^4*(-2 + 5*x^4 - 10*x^2*C[1]))/(189*x^2 - 18*C[1] + S
qrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3) + 5
*6^(1/3)*x^4*(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 +
```

```
 5*x^4 - 10*x^2*C[1])^3])^(1/3) + (6*Sqrt[3]*(1 + 100*x^4))/Sqrt[(3 + (10*6^(2/3
)*x^2*(-2 + 5*x^4 - 10*x^2*C[1]))/(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 -
 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3) + 5*6^(1/3)*x^2*(189*x^2 -
18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3]
)^(1/3))/x^4])/x^6)])/(30*x^2)}, {y[x] -> (3 - Sqrt[3]*x^2*Sqrt[(3 + (10*6^(2/3)
*x^2*(-2 + 5*x^4 - 10*x^2*C[1]))/(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 -
2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3) + 5*6^(1/3)*x^2*(189*x^2 - 1
8*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])
^(1/3))/x^4] + Sqrt[3]*x^2*Sqrt[-((-6*x^2 + (10*6^(2/3)*x^4*(-2 + 5*x^4 - 10*x^2
*C[1]))/(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^
4 - 10*x^2*C[1])^3])^(1/3) + 5*6^(1/3)*x^4*(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*
(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3) + (6*Sqrt[3]*(1 +
100*x^4))/Sqrt[(3 + (10*6^(2/3)*x^2*(-2 + 5*x^4 - 10*x^2*C[1]))/(189*x^2 - 18*C[
1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/
3) + 5*6^(1/3)*x^2*(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16
*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3))/x^4])/x^6)])/(30*x^2)}, {y[x] -> (3 + Sqr
t[3]*x^2*Sqrt[(3 + (10*6^(2/3)*x^2*(-2 + 5*x^4 - 10*x^2*C[1]))/(189*x^2 - 18*C[1
] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3
) + 5*6^(1/3)*x^2*(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*
(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3))/x^4] - Sqrt[3]*x^2*Sqrt[(6*x^2 - (10*6^(2/
3)*x^4*(-2 + 5*x^4 - 10*x^2*C[1]))/(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2
- 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3) - 5*6^(1/3)*x^4*(189*x^2 -
 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3
])^(1/3) + (6*Sqrt[3]*(1 + 100*x^4))/Sqrt[(3 + (10*6^(2/3)*x^2*(-2 + 5*x^4 - 10*
x^2*C[1]))/(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5
*x^4 - 10*x^2*C[1])^3])^(1/3) + 5*6^(1/3)*x^2*(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[
27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3))/x^4])/x^6])/(3
0*x^2)}, {y[x] -> (3 + Sqrt[3]*x^2*Sqrt[(3 + (10*6^(2/3)*x^2*(-2 + 5*x^4 - 10*x^
2*C[1]))/(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x
^4 - 10*x^2*C[1])^3])^(1/3) + 5*6^(1/3)*x^2*(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27
*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3))/x^4] + Sqrt[3]*x
^2*Sqrt[(6*x^2 - (10*6^(2/3)*x^4*(-2 + 5*x^4 - 10*x^2*C[1]))/(189*x^2 - 18*C[1]
+ Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3)
- 5*6^(1/3)*x^4*(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-
2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3) + (6*Sqrt[3]*(1 + 100*x^4))/Sqrt[(3 + (10*6^(
2/3)*x^2*(-2 + 5*x^4 - 10*x^2*C[1]))/(189*x^2 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^
2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])^3])^(1/3) + 5*6^(1/3)*x^2*(189*x^2
 - 18*C[1] + Sqrt[3]*Sqrt[27*(21*x^2 - 2*C[1])^2 - 16*(-2 + 5*x^4 - 10*x^2*C[1])
^3])^(1/3))/x^4])/x^6])/(30*x^2)}}
```

Maple raw input

```
dsolve((2-10*x^2*y(x)^3+3*y(x)^2)*diff(y(x),x) = x*(1+5*y(x)^4), y(x),'implicit')
```

Maple raw output

```
-5/2*x^2*y(x)^4+y(x)^3-1/2*x^2+2*y(x)+_C1 = 0
```

4.706 $xy'(x)\left(a+bxy(x)^3\right)+y(x)\left(a+cx^3y(x)\right)=0$

ODE

$$xy'(x)\left(a+bxy(x)^3\right)+y(x)\left(a+cx^3y(x)\right)=0$$

ODE Classification

[_rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0417136 (sec), leaf count = 491

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{3}\left(\sqrt{3}\sqrt{b^3x^4\left(27a^2b+x^2\left(cx^2-2c_1\right)^3\right)}+9ab^2x^2\right)^{2/3}+3^{2/3}bx^2\left(2c_1-cx^2\right)}{3bx\sqrt[3]{\sqrt{3}\sqrt{b^3x^4\left(27a^2b+x^2\left(cx^2-2c_1\right)^3\right)}+9ab^2x^2}}\right\},\left\{y(x)\to \frac{i\sqrt[6]{3}(\sqrt{3}+i)\left(\sqrt{3}\sqrt{}\right.\right.}{2}$$

Maple ✓
cpu = 0.114 (sec), leaf count = 27

$$\left\{-\frac{cx^2}{2}+\frac{a}{xy(x)}-\frac{b(y(x))^2}{2}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(a + c*x^3*y[x]) + x*(a + b*x*y[x]^3)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3^(1/3)*(9*a*b^2*x^2 + Sqrt[3]*Sqrt[b^3*x^4*(27*a^2*b + x^2*(c*x^2 -
2*C[1])^3)])^(2/3) + 3^(2/3)*b*x^2*(-(c*x^2) + 2*C[1]))/(3*b*x*(9*a*b^2*x^2 + Sq
rt[3]*Sqrt[b^3*x^4*(27*a^2*b + x^2*(c*x^2 - 2*C[1])^3)])^(1/3))}, {y[x] -> (I*3^
(1/6)*(I + Sqrt[3])*(9*a*b^2*x^2 + Sqrt[3]*Sqrt[b^3*x^4*(27*a^2*b + x^2*(c*x^2 -
 2*C[1])^3)])^(2/3) + (3*I + Sqrt[3])*b*x^2*(c*x^2 - 2*C[1]))/(2*3^(5/6)*b*x*(9*
a*b^2*x^2 + Sqrt[3]*Sqrt[b^3*x^4*(27*a^2*b + x^2*(c*x^2 - 2*C[1])^3)])^(1/3))},
{y[x] -> ((-I)*3^(1/6)*(-I + Sqrt[3])*(9*a*b^2*x^2 + Sqrt[3]*Sqrt[b^3*x^4*(27*a^
2*b + x^2*(c*x^2 - 2*C[1])^3)])^(2/3) + (-3*I + Sqrt[3])*b*x^2*(c*x^2 - 2*C[1]))
/(2*3^(5/6)*b*x*(9*a*b^2*x^2 + Sqrt[3]*Sqrt[b^3*x^4*(27*a^2*b + x^2*(c*x^2 - 2*C
[1])^3)])^(1/3))}}
```

Maple raw input

```
dsolve(x*(a+b*x*y(x)^3)*diff(y(x),x)+(a+c*x^3*y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*c*x^2+1/y(x)/x*a-1/2*b*y(x)^2+_C1 = 0
```

4.707 $y(x)\left(1-2x^3y(x)^2\right)+x\left(1-2x^2y(x)^3\right)y'(x)=0$

ODE

$$y(x)\left(1-2x^3y(x)^2\right)+x\left(1-2x^2y(x)^3\right)y'(x)=0$$

ODE Classification

[_rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.031638 (sec), leaf count = 672

$$\left\{\left\{y(x)\to \frac{c_1x^2+\frac{x^4(c_1-2x)^2}{\sqrt[3]{12c_1x^8-6c_1^2x^7+c_1^3x^6+3\sqrt{3}\sqrt{x^8\left(-24c_1x^4+12c_1^2x^3-2c_1^3x^2+16x^5+27\right)}-8x^9-27x^4}}+\sqrt[3]{12c_1}$$

Maple ✓
cpu = 0.119 (sec), leaf count = 21

$$\left\{-2\,x-\frac{1}{2\,x^2\left(y\left(x\right)\right)^2}-2\,y(x)+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 - 2*x^3*y[x]^2) + x*(1 - 2*x^2*y[x]^3)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*x^3 + x^2*C[1] + (x^4*(-2*x + C[1])^2)/(-27*x^4 - 8*x^9 + 12*x^8*C
[1] - 6*x^7*C[1]^2 + x^6*C[1]^3 + 3*Sqrt[3]*Sqrt[x^8*(27 + 16*x^5 - 24*x^4*C[1]
+ 12*x^3*C[1]^2 - 2*x^2*C[1]^3)])^(1/3) + (-27*x^4 - 8*x^9 + 12*x^8*C[1] - 6*x^7
*C[1]^2 + x^6*C[1]^3 + 3*Sqrt[3]*Sqrt[x^8*(27 + 16*x^5 - 24*x^4*C[1] + 12*x^3*C[
1]^2 - 2*x^2*C[1]^3)])^(1/3))/(6*x^2)}, {y[x] -> (2*x^2*(-2*x + C[1]) - (I*(-I +
 Sqrt[3])*x^4*(-2*x + C[1])^2)/(-27*x^4 - 8*x^9 + 12*x^8*C[1] - 6*x^7*C[1]^2 + x
^6*C[1]^3 + 3*Sqrt[3]*Sqrt[x^8*(27 + 16*x^5 - 24*x^4*C[1] + 12*x^3*C[1]^2 - 2*x^
2*C[1]^3)])^(1/3) + I*(I + Sqrt[3])*(-27*x^4 - 8*x^9 + 12*x^8*C[1] - 6*x^7*C[1]^
2 + x^6*C[1]^3 + 3*Sqrt[3]*Sqrt[x^8*(27 + 16*x^5 - 24*x^4*C[1] + 12*x^3*C[1]^2 -
 2*x^2*C[1]^3)])^(1/3))/(12*x^2)}, {y[x] -> (2*x^2*(-2*x + C[1]) + (I*(I + Sqrt[
3])*x^4*(-2*x + C[1])^2)/(-27*x^4 - 8*x^9 + 12*x^8*C[1] - 6*x^7*C[1]^2 + x^6*C[1
```

```
]^3 + 3*Sqrt[3]*Sqrt[x^8*(27 + 16*x^5 - 24*x^4*C[1] + 12*x^3*C[1]^2 - 2*x^2*C[1]
^3)])^(1/3) - (1 + I*Sqrt[3])*(-27*x^4 - 8*x^9 + 12*x^8*C[1] - 6*x^7*C[1]^2 + x^
6*C[1]^3 + 3*Sqrt[3]*Sqrt[x^8*(27 + 16*x^5 - 24*x^4*C[1] + 12*x^3*C[1]^2 - 2*x^2
*C[1]^3)])^(1/3))/(12*x^2)}}
```

Maple raw input

```
dsolve(x*(1-2*x^2*y(x)^3)*diff(y(x),x)+(1-2*x^3*y(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-2*x-1/2/y(x)^2/x^2-2*y(x)+_C1 = 0
```

4.708 $x(1-xy(x))\left(1-x^2y(x)^2\right)y'(x)+y(x)(xy(x)+1)\left(x^2y(x)^2+1\right)=0$

ODE

$$x(1-xy(x))\left(1-x^2y(x)^2\right)y'(x)+y(x)(xy(x)+1)\left(x^2y(x)^2+1\right)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0607449 (sec), leaf count = 34

$$\left\{\left\{y(x)\to -\frac{1}{x}\right\},\text{Solve}\left[c_1+\frac{1}{xy(x)}+2\log(y(x))=xy(x),y(x)\right]\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 51

$$\left\{\frac{-2\ln(xy(x))\,xy(x)-1+x^2(y(x))^2-2x(\_C1-\ln(x))\,y(x)}{2xy(x)}=0,y(x)=-x^{-1}\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 + x*y[x])*(1 + x^2*y[x]^2) + x*(1 - x*y[x])*(1 - x^2*y[x]^2)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x^(-1)}, Solve[C[1] + 2*Log[y[x]] + 1/(x*y[x]) == x*y[x], y[x]]}
```

Maple raw input

```
dsolve(x*(1-x*y(x))*(1-x^2*y(x)^2)*diff(y(x),x)+(1+x*y(x))*(1+x^2*y(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/x, 1/2*(-2*ln(x*y(x))*x*y(x)-1+x^2*y(x)^2-2*x*(_C1-ln(x))*y(x))/x/y(x)
 = 0
```

4.709 $(x^2 - y(x)^4)\, y'(x) = xy(x)$

ODE

$$(x^2 - y(x)^4)\, y'(x) = xy(x)$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Change of Variable, new independent variable

Mathematica ✓
cpu = 0.639934 (sec), leaf count = 117

$$\left\{\left\{y(x) \to -\sqrt{-\sqrt{c_1^2 - x^2} - c_1}\right\}, \left\{y(x) \to \sqrt{-\sqrt{c_1^2 - x^2} - c_1}\right\}, \left\{y(x) \to -\sqrt{\sqrt{c_1^2 - x^2} - c_1}\right\}, \left\{y(x) \to \sqrt{\sqrt{c_1^2 - x^2} -\right.\right.$$

Maple ✓
cpu = 0.017 (sec), leaf count = 31

$$\left\{\ln(x) - \_C1 + \ln\left(\frac{(y(x))^4 + x^2}{x^2}\right) - 2\ln\left(\frac{y(x)}{\sqrt{x}}\right) = 0\right\}$$

Mathematica raw input

```
DSolve[(x^2 - y[x]^4)*y'[x] == x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-C[1] - Sqrt[-x^2 + C[1]^2]]}, {y[x] -> Sqrt[-C[1] - Sqrt[-x^2 +
  C[1]^2]]}, {y[x] -> -Sqrt[-C[1] + Sqrt[-x^2 + C[1]^2]]}, {y[x] -> Sqrt[-C[1] +
Sqrt[-x^2 + C[1]^2]]}}
```

Maple raw input

```
dsolve((x^2-y(x)^4)*diff(y(x),x) = x*y(x), y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+ln((y(x)^4+x^2)/x^2)-2*ln(y(x)/x^(1/2)) = 0
```

4.710 $(x^3 - y(x)^4)\, y'(x) = 3x^2 y(x)$

ODE

$$(x^3 - y(x)^4)\, y'(x) = 3x^2 y(x)$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0724627 (sec), leaf count = 1021

$$\left\{\left\{y(x) \to \frac{1}{2}\sqrt{\frac{4\sqrt[3]{2}x^3}{\sqrt[3]{9c_1^2 - \sqrt{81c_1^4 - 256x^9}}} + \frac{\sqrt[3]{9c_1^2 - \sqrt{81c_1^4 - 256x^9}}}{\sqrt[3]{2}}} - \frac{1}{2}\sqrt{-\frac{4\sqrt[3]{2}x^3}{\sqrt[3]{9c_1^2 - \sqrt{81c_1^4 - 256x^9}}} - \frac{\sqrt[3]{9c_1^2 - \sqrt{81c_1^4 -}}}{\sqrt[3]{2}}}\right.\right.$$

Maple ✓
cpu = 0.019 (sec), leaf count = 35

$$\left\{\ln(x) - \_C1 + \frac{4}{9}\ln\left(\frac{(y(x))^4 + 3x^3}{x^3}\right) - \frac{4}{9}\ln\left(y(x)\, x^{-\frac{3}{4}}\right) = 0\right\}$$

Mathematica raw input

```
DSolve[(x^3 - y[x]^4)*y'[x] == 3*x^2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[(4*2^(1/3)*x^3)/(9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3) + (
9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3)/2^(1/3)]/2 - Sqrt[(-4*2^(1/3)*x^3)/
(9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3) - (9*C[1]^2 - Sqrt[-256*x^9 + 81*C
[1]^4])^(1/3)/2^(1/3) - (6*C[1])/Sqrt[(4*2^(1/3)*x^3)/(9*C[1]^2 - Sqrt[-256*x^9
+ 81*C[1]^4])^(1/3) + (9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3)/2^(1/3)]]/2}
, {y[x] -> Sqrt[(4*2^(1/3)*x^3)/(9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3) +
(9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3)/2^(1/3)]/2 + Sqrt[(-4*2^(1/3)*x^3)
/(9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3) - (9*C[1]^2 - Sqrt[-256*x^9 + 81*
C[1]^4])^(1/3)/2^(1/3) - (6*C[1])/Sqrt[(4*2^(1/3)*x^3)/(9*C[1]^2 - Sqrt[-256*x^9
```

```
 + 81*C[1]^4])^(1/3) + (9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3)/2^(1/3)]]/2
}, {y[x] -> -Sqrt[(4*2^(1/3)*x^3)/(9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3)
+ (9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3)/2^(1/3)]/2 - Sqrt[(-4*2^(1/3)*x^
3)/(9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3) - (9*C[1]^2 - Sqrt[-256*x^9 + 8
1*C[1]^4])^(1/3)/2^(1/3) + (6*C[1])/Sqrt[(4*2^(1/3)*x^3)/(9*C[1]^2 - Sqrt[-256*x
^9 + 81*C[1]^4])^(1/3) + (9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3)/2^(1/3)]]
/2}, {y[x] -> -Sqrt[(4*2^(1/3)*x^3)/(9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3
) + (9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3)/2^(1/3)]/2 + Sqrt[(-4*2^(1/3)*
x^3)/(9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3) - (9*C[1]^2 - Sqrt[-256*x^9 +
 81*C[1]^4])^(1/3)/2^(1/3) + (6*C[1])/Sqrt[(4*2^(1/3)*x^3)/(9*C[1]^2 - Sqrt[-256
*x^9 + 81*C[1]^4])^(1/3) + (9*C[1]^2 - Sqrt[-256*x^9 + 81*C[1]^4])^(1/3)/2^(1/3)
]]/2}}
```

Maple raw input

```
dsolve((x^3-y(x)^4)*diff(y(x),x) = 3*x^2*y(x), y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+4/9*ln((y(x)^4+3*x^3)/x^3)-4/9*ln(y(x)/x^(3/4)) = 0
```

4.711 $\left(a^2x^2+\left(x^2+y(x)^2\right)^2\right)y'(x)=a^2xy(x)$

ODE

$$\left(a^2x^2+\left(x^2+y(x)^2\right)^2\right)y'(x)=a^2xy(x)$$

ODE Classification

[_rational]

Book solution method
Change of Variable, Two new variables

Mathematica ✓
cpu = 0.153113 (sec), leaf count = 239

$$\left\{\left\{y(x)\to -\frac{\sqrt{-\sqrt{\left(a^2-c_1^2+x^2\right)^2+4c_1^2x^2}-a^2+c_1^2-x^2}}{\sqrt{2}}\right\},\left\{y(x)\to \frac{\sqrt{-\sqrt{\left(a^2-c_1^2+x^2\right)^2+4c_1^2x^2}-a^2+c_1^2-x^2}}{\sqrt{2}}\right\}\right.$$

Maple ✓
cpu = 0.422 (sec), leaf count = 37

$$\left\{\frac{(y(x))^4+\left(a^2+x^2+\_C1\right)(y(x))^2+x^2\_C1}{x^2+(y(x))^2}=0\right\}$$

Mathematica raw input

```
DSolve[(a^2*x^2 + (x^2 + y[x]^2)^2)*y'[x] == a^2*x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-a^2 - x^2 + C[1]^2 - Sqrt[4*x^2*C[1]^2 + (a^2 + x^2 - C[1]^2)^
2]]/Sqrt[2])}, {y[x] -> Sqrt[-a^2 - x^2 + C[1]^2 - Sqrt[4*x^2*C[1]^2 + (a^2 + x^
2 - C[1]^2)^2]]/Sqrt[2]}, {y[x] -> -(Sqrt[-a^2 - x^2 + C[1]^2 + Sqrt[4*x^2*C[1]^
2 + (a^2 + x^2 - C[1]^2)^2]]/Sqrt[2])}, {y[x] -> Sqrt[-a^2 - x^2 + C[1]^2 + Sqrt
[4*x^2*C[1]^2 + (a^2 + x^2 - C[1]^2)^2]]/Sqrt[2]}}
```

Maple raw input

```
dsolve((a^2*x^2+(x^2+y(x)^2)^2)*diff(y(x),x) = a^2*x*y(x), y(x),'implicit')
```

Maple raw output

```
(y(x)^4+(a^2+x^2+_C1)*y(x)^2+x^2*_C1)/(x^2+y(x)^2) = 0
```

4.712 $2(x-y(x)^4)\,y'(x)=y(x)$

ODE

$$2\left(x-y(x)^4\right)y'(x)=y(x)$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0126665 (sec), leaf count = 123

$$\left\{\left\{y(x)\to -\frac{\sqrt{c_1-\sqrt{c_1^2-4x}}}{\sqrt{2}}\right\},\left\{y(x)\to \frac{\sqrt{c_1-\sqrt{c_1^2-4x}}}{\sqrt{2}}\right\},\left\{y(x)\to -\frac{\sqrt{\sqrt{c_1^2-4x}+c_1}}{\sqrt{2}}\right\},\left\{y(x)\to \frac{\sqrt{\sqrt{c_1^2-4x}+}\right.\right.$$

Maple ✓
cpu = 0.006 (sec), leaf count = 16

$$\left\{(y(x))^4-(y(x))^2\_C1+x=0\right\}$$

Mathematica raw input

```
DSolve[2*(x - y[x]^4)*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[C[1] - Sqrt[-4*x + C[1]^2]]/Sqrt[2])}, {y[x] -> Sqrt[C[1] - Sqr
t[-4*x + C[1]^2]]/Sqrt[2]}, {y[x] -> -(Sqrt[C[1] + Sqrt[-4*x + C[1]^2]]/Sqrt[2])
}, {y[x] -> Sqrt[C[1] + Sqrt[-4*x + C[1]^2]]/Sqrt[2]}}
```

Maple raw input

```
dsolve(2*(x-y(x)^4)*diff(y(x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
y(x)^4-y(x)^2*_C1+x = 0
```

4.713 $\left(-2y(x)^4 - xy(x)^3 + 4x\right) y'(x) = y(x)\left(y(x)^3 + 2\right)$

ODE

$$\left(-2y(x)^4 - xy(x)^3 + 4x\right) y'(x) = y(x)\left(y(x)^3 + 2\right)$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x)*G(y),0]`]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.150154 (sec), leaf count = 2021

$$\left\{\left\{y(x) \to -\frac{x}{4} - \frac{1}{2}\sqrt{\frac{x^2}{4} + \frac{2c_1}{3} + \frac{\sqrt[3]{54x^3 + 144c_1x - 2c_1^3 + \sqrt{\left(54x^3 + 144c_1x - 2c_1^3\right)^2 - 4\left(c_1^2 + 24x\right)^3}}}{3\sqrt[3]{2}} + \frac{}{3\sqrt[3]{54x^3 + 144c}}\right.\right.$$

Maple ✓
cpu = 0.016 (sec), leaf count = 27

$$\left\{x - \frac{\left(-(y(x))^2 + \_C1\right)(y(x))^2}{2 + (y(x))^3} = 0\right\}$$

Mathematica raw input

```
DSolve[(4*x - x*y[x]^3 - 2*y[x]^4)*y'[x] == y[x]*(2 + y[x]^3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x/4 - Sqrt[x^2/4 + (2*C[1])/3 + (2^(1/3)*(24*x + C[1]^2))/(3*(54*x^3
+ 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C
[1]^3)^2])^(1/3)) + (54*x^3 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3
+ (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)/(3*2^(1/3))]/2 - Sqrt[x^2/2 + (4*C[
1])/3 - (2^(1/3)*(24*x + C[1]^2))/(3*(54*x^3 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(
24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)) - (54*x^3 + 144*x
*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^
2])^(1/3)/(3*2^(1/3)) + (x*(x^2 + 4*C[1]))/(4*Sqrt[x^2/4 + (2*C[1])/3 + (2^(1/3)
```

```
*(24*x + C[1]^2))/(3*(54*x^3 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3
 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)) + (54*x^3 + 144*x*C[1] - 2*C[1]^3
 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)/(3*2^(
1/3))])]/2}, {y[x] -> -x/4 - Sqrt[x^2/4 + (2*C[1])/3 + (2^(1/3)*(24*x + C[1]^2))
/(3*(54*x^3 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*
x*C[1] - 2*C[1]^3)^2])^(1/3)) + (54*x^3 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x
+ C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)/(3*2^(1/3))]/2 + Sqrt[x
^2/2 + (4*C[1])/3 - (2^(1/3)*(24*x + C[1]^2))/(3*(54*x^3 + 144*x*C[1] - 2*C[1]^3
 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)) - (54
*x^3 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1]
- 2*C[1]^3)^2])^(1/3)/(3*2^(1/3)) + (x*(x^2 + 4*C[1]))/(4*Sqrt[x^2/4 + (2*C[1])/
3 + (2^(1/3)*(24*x + C[1]^2))/(3*(54*x^3 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x
 + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)) + (54*x^3 + 144*x*C[1
] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^
(1/3)/(3*2^(1/3))])]/2}, {y[x] -> -x/4 + Sqrt[x^2/4 + (2*C[1])/3 + (2^(1/3)*(24*
x + C[1]^2))/(3*(54*x^3 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (5
4*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)) + (54*x^3 + 144*x*C[1] - 2*C[1]^3 + Sq
rt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)/(3*2^(1/3))
]/2 - Sqrt[x^2/2 + (4*C[1])/3 - (2^(1/3)*(24*x + C[1]^2))/(3*(54*x^3 + 144*x*C[1
] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^
(1/3)) - (54*x^3 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 +
 144*x*C[1] - 2*C[1]^3)^2])^(1/3)/(3*2^(1/3)) - (x*(x^2 + 4*C[1]))/(4*Sqrt[x^2/4
 + (2*C[1])/3 + (2^(1/3)*(24*x + C[1]^2))/(3*(54*x^3 + 144*x*C[1] - 2*C[1]^3 + S
qrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)) + (54*x^3
 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*
C[1]^3)^2])^(1/3)/(3*2^(1/3))])]/2}, {y[x] -> -x/4 + Sqrt[x^2/4 + (2*C[1])/3 + (
2^(1/3)*(24*x + C[1]^2))/(3*(54*x^3 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[
1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)) + (54*x^3 + 144*x*C[1] - 2
*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)
/(3*2^(1/3))]/2 + Sqrt[x^2/2 + (4*C[1])/3 - (2^(1/3)*(24*x + C[1]^2))/(3*(54*x^3
 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*
C[1]^3)^2])^(1/3)) - (54*x^3 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3
 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3)/(3*2^(1/3)) - (x*(x^2 + 4*C[1]))/(
4*Sqrt[x^2/4 + (2*C[1])/3 + (2^(1/3)*(24*x + C[1]^2))/(3*(54*x^3 + 144*x*C[1] -
2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144*x*C[1] - 2*C[1]^3)^2])^(1/3
)) + (54*x^3 + 144*x*C[1] - 2*C[1]^3 + Sqrt[-4*(24*x + C[1]^2)^3 + (54*x^3 + 144
*x*C[1] - 2*C[1]^3)^2])^(1/3)/(3*2^(1/3))])]/2}}
```

Maple raw input

```
dsolve((4*x-x*y(x)^3-2*y(x)^4)*diff(y(x),x) = (2+y(x)^3)*y(x), y(x),'implicit')
```

Maple raw output

```
x-(-y(x)^2+_C1)/(2+y(x)^3)*y(x)^2 = 0
```

4.714 $y(x)y'(x)\left((ax+by(x))^3+ax^3\right)+x\left((ax+by(x))^3+by(x)^3\right)=0$

ODE

$$y(x)y'(x)\left((ax+by(x))^3+ax^3\right)+x\left((ax+by(x))^3+by(x)^3\right)=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 4.63731 (sec), leaf count = 1

$Aborted

Maple ✓
cpu = 0.045 (sec), leaf count = 81

$$\left\{-\frac{1}{2}\ln\left(\frac{b^2(y(x))^4+2ab(y(x))^3x+x^2\left(a^2+b^2+1\right)(y(x))^2+2abyx^3+a^2x^4}{x^4}\right)+\ln\left(\frac{ax+by(x)}{x}\right)-\ln(x)-\_C1=\right.$$

Mathematica raw input

```
DSolve[x*(b*y[x]^3 + (a*x + b*y[x])^3) + y[x]*(a*x^3 + (a*x + b*y[x])^3)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((a*x^3+(a*x+b*y(x))^3)*y(x)*diff(y(x),x)+x*((a*x+b*y(x))^3+b*y(x)^3) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln((b^2*y(x)^4+2*a*b*y(x)^3*x+x^2*(a^2+b^2+1)*y(x)^2+2*a*b*y(x)*x^3+a^2*x^4
)/x^4)+ln((a*x+b*y(x))/x)-ln(x)-_C1 = 0
```

4.715 $(2x^2y(x)^3 + xy(x)^4 + 2y(x) + x)\,y'(x) + y(x)\,(y(x)^4 + 1) = 0$

ODE

$$(2x^2y(x)^3 + xy(x)^4 + 2y(x) + x)\,y'(x) + y(x)\,(y(x)^4 + 1) = 0$$

ODE Classification

[_rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.422075 (sec), leaf count = 584

$$\left\{\left\{y(x) \to \frac{\frac{2\sqrt[3]{2}c_1\left(c_1+3x^2\right)}{\sqrt[3]{9\left(c_1^2+3\right)x^2+3\sqrt{3}\sqrt{-4c_1^3x^6+\left(-c_1^4+18c_1^2+27\right)x^4+4c_1^3x^2}+2c_1^3}}+2^{2/3}\sqrt[3]{9\left(c_1^2+3\right)x^2+3\sqrt{3}\sqrt{-4c_1^3x^6+}}}{6x}\right.\right.$$

Maple ✓
cpu = 0.118 (sec), leaf count = 22

$$\left\{\_C1 + \frac{(x+y(x))\,y(x)}{x\,(y(x))^3 - 1} = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 + y[x]^4) + (x + 2*y[x] + 2*x^2*y[x]^3 + x*y[x]^4)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*C[1] + (2*2^(1/3)*C[1]*(3*x^2 + C[1]))/(2*C[1]^3 + 9*x^2*(3 + C[1]^
2) + 3*Sqrt[3]*Sqrt[4*x^2*C[1]^3 - 4*x^6*C[1]^3 + x^4*(27 + 18*C[1]^2 - C[1]^4)]
)^(1/3) + 2^(2/3)*(2*C[1]^3 + 9*x^2*(3 + C[1]^2) + 3*Sqrt[3]*Sqrt[4*x^2*C[1]^3 -
  4*x^6*C[1]^3 + x^4*(27 + 18*C[1]^2 - C[1]^4)])^(1/3))/(6*x)}, {y[x] -> (4*C[1]
- ((2*I)*2^(1/3)*(-I + Sqrt[3])*C[1]*(3*x^2 + C[1]))/(2*C[1]^3 + 9*x^2*(3 + C[1]
^2) + 3*Sqrt[3]*Sqrt[4*x^2*C[1]^3 - 4*x^6*C[1]^3 + x^4*(27 + 18*C[1]^2 - C[1]^4)
])^(1/3) + I*2^(2/3)*(I + Sqrt[3])*(2*C[1]^3 + 9*x^2*(3 + C[1]^2) + 3*Sqrt[3]*Sq
rt[4*x^2*C[1]^3 - 4*x^6*C[1]^3 + x^4*(27 + 18*C[1]^2 - C[1]^4)])^(1/3))/(12*x)},
  {y[x] -> (4*C[1] + ((2*I)*2^(1/3)*(I + Sqrt[3])*C[1]*(3*x^2 + C[1]))/(2*C[1]^3
+ 9*x^2*(3 + C[1]^2) + 3*Sqrt[3]*Sqrt[4*x^2*C[1]^3 - 4*x^6*C[1]^3 + x^4*(27 + 18
*C[1]^2 - C[1]^4)])^(1/3) - 2^(2/3)*(1 + I*Sqrt[3])*(2*C[1]^3 + 9*x^2*(3 + C[1]^
```

```
2) + 3*Sqrt[3]*Sqrt[4*x^2*C[1]^3 - 4*x^6*C[1]^3 + x^4*(27 + 18*C[1]^2 - C[1]^4)]
)^(1/3))/(12*x)}}
```

Maple raw input

```
dsolve((x+2*y(x)+2*x^2*y(x)^3+x*y(x)^4)*diff(y(x),x)+(1+y(x)^4)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
_C1+(x+y(x))*y(x)/(x*y(x)^3-1) = 0
```

4.716 $2x(x^3+y(x)^4)\,y'(x) = y(x)\,(x^3+2y(x)^4)$

ODE

$$2x(x^3+y(x)^4)\,y'(x) = y(x)\,(x^3+2y(x)^4)$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0246659 (sec), leaf count = 161

$$\left\{\left\{y(x)\to -\frac{\sqrt{c_1x^2-x^{3/2}\sqrt{c_1^2x+4}}}{\sqrt{2}}\right\},\left\{y(x)\to \frac{\sqrt{c_1x^2-x^{3/2}\sqrt{c_1^2x+4}}}{\sqrt{2}}\right\},\left\{y(x)\to -\frac{\sqrt{x^{3/2}\sqrt{c_1^2x+4}+c_1x^2}}{\sqrt{2}}\right\},\left\{y(\right.\right.$$

Maple ✓
cpu = 0.035 (sec), leaf count = 61

$$\left\{\ln(x)-\_C1-2\ln\left(\frac{y(x)-x^{3/4}}{x^{3/4}}\right)-2\ln\left(\frac{x^{3/4}+y(x)}{x^{3/4}}\right)-2\ln\left(\frac{x^{3/2}+(y(x))^2}{x^{3/2}}\right)+4\ln\left(\frac{y(x)}{x^{3/4}}\right)=0\right\}$$

Mathematica raw input

```
DSolve[2*x*(x^3 + y[x]^4)*y'[x] == y[x]*(x^3 + 2*y[x]^4),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[x^2*C[1] - x^(3/2)*Sqrt[4 + x*C[1]^2]]/Sqrt[2])}, {y[x] -> Sqrt
[x^2*C[1] - x^(3/2)*Sqrt[4 + x*C[1]^2]]/Sqrt[2]}, {y[x] -> -(Sqrt[x^2*C[1] + x^(
3/2)*Sqrt[4 + x*C[1]^2]]/Sqrt[2])}, {y[x] -> Sqrt[x^2*C[1] + x^(3/2)*Sqrt[4 + x*
C[1]^2]]/Sqrt[2]}}
```

Maple raw input

```
dsolve(2*x*(x^3+y(x)^4)*diff(y(x),x) = (x^3+2*y(x)^4)*y(x), y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-2*ln((y(x)-x^(3/4))/x^(3/4))-2*ln((x^(3/4)+y(x))/x^(3/4))-2*ln((x^(3/2
)+y(x)^2)/x^(3/2))+4*ln(y(x)/x^(3/4)) = 0
```

4.717 $x(1-x^2y(x)^4)\,y'(x)+y(x)=0$

ODE

$$x(1-x^2y(x)^4)\,y'(x)+y(x)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0194031 (sec), leaf count = 139

$$\left\{\left\{y(x)\to -\sqrt{c_1-\frac{\sqrt{x^2\left(c_1^2x^2-1\right)}}{x^2}}\right\},\left\{y(x)\to \sqrt{c_1-\frac{\sqrt{x^2\left(c_1^2x^2-1\right)}}{x^2}}\right\},\left\{y(x)\to -\sqrt{\frac{\sqrt{x^2\left(c_1^2x^2-1\right)}}{x^2}+c_1}\right\},\left\{y(x)\right.\right.$$

Maple ✓
cpu = 0.019 (sec), leaf count = 31

$$\left\{\ln(x)-\_C1-\ln\left(x^2(y(x))^4+1\right)+2\ln\left(y(x)\sqrt{x}\right)=0\right\}$$

Mathematica raw input

```
DSolve[y[x] + x*(1 - x^2*y[x]^4)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[C[1] - Sqrt[x^2*(-1 + x^2*C[1]^2)]/x^2]}, {y[x] -> Sqrt[C[1] - S
qrt[x^2*(-1 + x^2*C[1]^2)]/x^2]}, {y[x] -> -Sqrt[C[1] + Sqrt[x^2*(-1 + x^2*C[1]^
2)]/x^2]}, {y[x] -> Sqrt[C[1] + Sqrt[x^2*(-1 + x^2*C[1]^2)]/x^2]}}
```

Maple raw input

```
dsolve(x*(1-x^2*y(x)^4)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-ln(x^2*y(x)^4+1)+2*ln(y(x)*x^(1/2)) = 0
```

4.718 $(x^2 - y(x)^5)\, y'(x) = 2xy(x)$

ODE

$$(x^2 - y(x)^5)\, y'(x) = 2xy(x)$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0127628 (sec), leaf count = 116

$$\left\{\left\{y(x) \to \text{Root}\left[\#1^5 + 4\#1 c_1 + 4x^2 \&, 1\right]\right\}, \left\{y(x) \to \text{Root}\left[\#1^5 + 4\#1 c_1 + 4x^2 \&, 2\right]\right\}, \left\{y(x) \to \text{Root}\left[\#1^5 + 4\#1 c_1 + 4x^2 \&\right.\right.\right.$$

Maple ✓
cpu = 0.02 (sec), leaf count = 35

$$\left\{\ln(x) - \_C1 - \frac{5}{8}\ln\left(y(x)\, x^{-\frac{2}{5}}\right) + \frac{5}{8}\ln\left(\frac{(y(x))^5 + 4x^2}{x^2}\right) = 0\right\}$$

Mathematica raw input

```
DSolve[(x^2 - y[x]^5)*y'[x] == 2*x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[4*x^2 + 4*C[1]*#1 + #1^5 & , 1]}, {y[x] -> Root[4*x^2 + 4*C[1]*#1
 + #1^5 & , 2]}, {y[x] -> Root[4*x^2 + 4*C[1]*#1 + #1^5 & , 3]}, {y[x] -> Root[4
*x^2 + 4*C[1]*#1 + #1^5 & , 4]}, {y[x] -> Root[4*x^2 + 4*C[1]*#1 + #1^5 & , 5]}}
```

Maple raw input

```
dsolve((x^2-y(x)^5)*diff(y(x),x) = 2*x*y(x), y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-5/8*ln(y(x)/x^(2/5))+5/8*ln((y(x)^5+4*x^2)/x^2) = 0
```

4.719 $x(x^3+y(x)^5)\,y'(x)=y(x)\,(x^3-y(x)^5)$

ODE

$$x(x^3+y(x)^5)\,y'(x)=y(x)\,(x^3-y(x)^5)$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0161518 (sec), leaf count = 141

$$\left\{\left\{y(x)\to \text{Root}\left[4\#1^5x-4\#1^4c_1-x^4\&,1\right]\right\},\left\{y(x)\to \text{Root}\left[4\#1^5x-4\#1^4c_1-x^4\&,2\right]\right\},\left\{y(x)\to \text{Root}\left[4\#1^5x-4\#1^4c\right.\right.\right.$$

Maple ✓
cpu = 0.02 (sec), leaf count = 37

$$\left\{\ln(x)-\_C1-\frac{5}{2}\ln\left(y(x)\,x^{-\frac{3}{5}}\right)+\frac{5}{8}\ln\left(\frac{4\,(y(x))^5-x^3}{x^3}\right)=0\right\}$$

Mathematica raw input

```
DSolve[x*(x^3 + y[x]^5)*y'[x] == y[x]*(x^3 - y[x]^5),y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[-x^4 - 4*C[1]*#1^4 + 4*x*#1^5 & , 1]}, {y[x] -> Root[-x^4 - 4*C[1
]*#1^4 + 4*x*#1^5 & , 2]}, {y[x] -> Root[-x^4 - 4*C[1]*#1^4 + 4*x*#1^5 & , 3]},
{y[x] -> Root[-x^4 - 4*C[1]*#1^4 + 4*x*#1^5 & , 4]}, {y[x] -> Root[-x^4 - 4*C[1]
*#1^4 + 4*x*#1^5 & , 5]}}
```

Maple raw input

```
dsolve(x*(x^3+y(x)^5)*diff(y(x),x) = (x^3-y(x)^5)*y(x), y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-5/2*ln(y(x)/x^(3/5))+5/8*ln((4*y(x)^5-x^3)/x^3) = 0
```

4.720 $y(x)^3\left(3x^5y(x)^5-1\right)+x^3\left(5x^3y(x)^7+1\right)y'(x)=0$

ODE

$$y(x)^3\left(3x^5y(x)^5-1\right)+x^3\left(5x^3y(x)^7+1\right)y'(x)=0$$

ODE Classification

[_rational]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0246112 (sec), leaf count = 253

$$\left\{\left\{y(x)\to \text{Root}\left[2\#1^7x^5+\#1^2\left(1-2c_1x^2\right)-x^2\&,1\right]\right\},\left\{y(x)\to \text{Root}\left[2\#1^7x^5+\#1^2\left(1-2c_1x^2\right)-x^2\&,2\right]\right\},\left\{y(x)\to \text{Ro}\right.\right.$$

Maple ✓
cpu = 0.172 (sec), leaf count = 25

$$\left\{-x^3(y(x))^5-\frac{1}{2\,x^2}+\frac{1}{2\,(y\,(x))^2}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x]^3*(-1 + 3*x^5*y[x]^5) + x^3*(1 + 5*x^3*y[x]^7)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[-x^2 + (1 - 2*x^2*C[1])*#1^2 + 2*x^5*#1^7 & , 1]}, {y[x] -> Root[
-x^2 + (1 - 2*x^2*C[1])*#1^2 + 2*x^5*#1^7 & , 2]}, {y[x] -> Root[-x^2 + (1 - 2*x
^2*C[1])*#1^2 + 2*x^5*#1^7 & , 3]}, {y[x] -> Root[-x^2 + (1 - 2*x^2*C[1])*#1^2 +
 2*x^5*#1^7 & , 4]}, {y[x] -> Root[-x^2 + (1 - 2*x^2*C[1])*#1^2 + 2*x^5*#1^7 & ,
 5]}, {y[x] -> Root[-x^2 + (1 - 2*x^2*C[1])*#1^2 + 2*x^5*#1^7 & , 6]}, {y[x] ->
Root[-x^2 + (1 - 2*x^2*C[1])*#1^2 + 2*x^5*#1^7 & , 7]}}
```

Maple raw input

```
dsolve(x^3*(1+5*x^3*y(x)^7)*diff(y(x),x)+(3*x^5*y(x)^5-1)*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
-x^3*y(x)^5-1/2/x^2+1/2/y(x)^2+_C1 = 0
```

4.721 $y'(x)(\mathbf{f1}(x,y(x))+x\mathbf{f2}(x,y(x)))=y(x)\mathbf{f2}(x,y(x))+\mathbf{f3}(x,y(x))$

ODE

$$y'(x)(\text{f1}(x,y(x))+x\text{f2}(x,y(x)))=y(x)\text{f2}(x,y(x))+\text{f3}(x,y(x))$$

ODE Classification

[NONE]

Book solution method
Homogeneous equation, Darbooux type

Mathematica ✗
cpu = 5.96996 (sec), leaf count = 0 , could not solve

```
DSolve[(f1[x, y[x]] + x*f2[x, y[x]])*Derivative[1][y][x] == f3[x, y[x]] + f2[x, y[x]]*y[x], y[x], x]
```

Maple ✗
cpu = 0.002 (sec), leaf count = 0 , could not solve

```
dsolve((f1(x,y(x))+x*f2(x,y(x)))*diff(y(x),x) = f3(x,y(x))+y(x)*f2(x,y(x)), y(x),'implicit')
```

Mathematica raw input

```
DSolve[(f1[x, y[x]] + x*f2[x, y[x]])*y'[x] == f3[x, y[x]] + f2[x, y[x]]*y[x],y[x],x]
```

Mathematica raw output

```
DSolve[(f1[x, y[x]] + x*f2[x, y[x]])*Derivative[1][y][x] == f3[x, y[x]] + f2[x,
y[x]]*y[x], y[x], x]
```

Maple raw input

```
dsolve((f1(x,y(x))+x*f2(x,y(x)))*diff(y(x),x) = f3(x,y(x))+y(x)*f2(x,y(x)), y(x),'implicit')
```

Maple raw output

```
dsolve((f1(x,y(x))+x*f2(x,y(x)))*diff(y(x),x) = f3(x,y(x))+y(x)*f2(x,y(x)), y(x)
,'implicit')
```

4.722 $y'(x)(a(y(x)+x)+1)^n+a(y(x)+x)^n=0$

ODE

$$y'(x)(a(y(x)+x)+1)^n+a(y(x)+x)^n=0$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
Exact equation

Mathematica ✗
cpu = 599.993 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.123 (sec), leaf count = 40

$$\left\{x+\int^{x+y(x)}\frac{(\_a\,a+1)^n}{a\_a^n-(\_a\,a+1)^n}d\_a-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[a*(x + y[x])^n + (1 + a*(x + y[x]))^n*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((1+a*(x+y(x)))^n*diff(y(x),x)+a*(x+y(x))^n = 0, y(x),'implicit')
```

Maple raw output

```
x+Intat((_a*a+1)^n/(a*_a^n-(_a*a+1)^n),_a = x+y(x))-_C1 = 0
```

4.723 $xy'(x)\left(a+xy(x)^n\right)+by(x)=0$

ODE

$$xy'(x)\left(a+xy(x)^n\right)+by(x)=0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Change of Variable, new independent variable

Mathematica ✓
cpu = 0.164489 (sec), leaf count = 50

$$\text{Solve}\left[\frac{n(a\log(y(x)(a-bn))-b\log\left(a-bn+xy(x)^n\right)+b\log(x))}{bn-a}=c_1,y(x)\right]$$

Maple ✓
cpu = 0.085 (sec), leaf count = 37

$$\left\{\frac{((y(x))^n)^a x^{bn}}{\left(x\left(y\left(x\right)\right)^n-bn+a\right)^{bn}}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[b*y[x] + x*(a + x*y[x]^n)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[(n*(b*Log[x] + a*Log[(a - b*n)*y[x]] - b*Log[a - b*n + x*y[x]^n]))/(-a + b
*n) == C[1], y[x]]
```

Maple raw input

```
dsolve(x*(a+x*y(x)^n)*diff(y(x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
(y(x)^n)^a/((x*y(x)^n-b*n+a)^(b*n))*x^(b*n)-_C1 = 0
```

4.724 $f(x)y(x)^m y'(x) + g(x)y(x)^{m+1} + h(x)y(x)^n = 0$

ODE

$$f(x)y(x)^m y'(x) + g(x)y(x)^{m+1} + h(x)y(x)^n = 0$$

ODE Classification

```
[_Bernoulli]
```

Book solution method
The Bernoulli ODE

Mathematica ✓
cpu = 1.04416 (sec), leaf count = 93

$$\left\{\left\{y(x)\to \left(\exp\left((m-n+1)\int_1^x -\frac{g(K[1])}{f(K[1])}\,dK[1]\right)\left((m-n+1)\int_1^x -\frac{h(K[2])\exp\left(-(m-n+1)\int_1^{K[2]} -\frac{g(K[1])}{f(K[1])}\,dK[1\right.}{f(K[2])}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.035 (sec), leaf count = 70

$$\left\{(y(x))^{m-n+1} + 1\left(-\int -\frac{h(x)\,(m-n+1)}{f(x)} e^{\int \frac{g(x)(m-n+1)}{f(x)}\,dx}\,dx - _C1\right)\left(e^{\int \frac{g(x)(m-n+1)}{f(x)}\,dx}\right)^{-1} = 0\right\}$$

Mathematica raw input

```
DSolve[g[x]*y[x]^(1 + m) + h[x]*y[x]^n + f[x]*y[x]^m*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^((1 + m - n)*Integrate[-(g[K[1]]/f[K[1]]), {K[1], 1, x}])*(C[1] + (
1 + m - n)*Integrate[-(h[K[2]]/(E^((1 + m - n)*Integrate[-(g[K[1]]/f[K[1]]), {K[
1], 1, K[2]}])*f[K[2]])), {K[2], 1, x}]))^(1 + m - n)^(-1)}}
```

Maple raw input

```
dsolve(f(x)*y(x)^m*diff(y(x),x)+g(x)*y(x)^(m+1)+h(x)*y(x)^n = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^(m-n+1)+(-Int(-exp(Int(1/f(x)*g(x)*(m-n+1),x))*h(x)/f(x)*(m-n+1),x)-_C1)/ex
p(Int(1/f(x)*g(x)*(m-n+1),x)) = 0
```

4.725 $\sqrt{b^2+y(x)^2}y'(x)=\sqrt{a^2+x^2}$

ODE

$$\sqrt{b^2+y(x)^2}y'(x)=\sqrt{a^2+x^2}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.17614 (sec), leaf count = 89

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{1}{2}\#1\sqrt{\#1^2+b^2}+\frac{1}{2}b^2\log\left(\sqrt{\#1^2+b^2}+\#1\right)\&\right]\left[\frac{1}{2}x\sqrt{a^2+x^2}+\frac{1}{2}a^2\log\left(\sqrt{a^2+x^2}+x\right)+\right.\right.$$

Maple ✓
cpu = 0.013 (sec), leaf count = 67

$$\left\{\frac{x}{2}\sqrt{a^2+x^2}+\frac{a^2}{2}\ln\left(x+\sqrt{a^2+x^2}\right)-\frac{y(x)}{2}\sqrt{b^2+(y(x))^2}-\frac{b^2}{2}\ln\left(y(x)+\sqrt{b^2+(y(x))^2}\right)+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[Sqrt[b^2 + y[x]^2]*y'[x] == Sqrt[a^2 + x^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(b^2*Log[#1 + Sqrt[b^2 + #1^2]])/2 + (#1*Sqrt[b^2 + #1
^2])/2 & ][(x*Sqrt[a^2 + x^2])/2 + C[1] + (a^2*Log[x + Sqrt[a^2 + x^2]])/2]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(b^2+y(x)^2)^(1/2) = (a^2+x^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
1/2*x*(a^2+x^2)^(1/2)+1/2*a^2*ln(x+(a^2+x^2)^(1/2))-1/2*y(x)*(b^2+y(x)^2)^(1/2)-
1/2*b^2*ln(y(x)+(b^2+y(x)^2)^(1/2))+_C1 = 0
```

4.726 $\sqrt{b^2-y(x)^2}y'(x)=\sqrt{a^2-x^2}$

ODE

$$\sqrt{b^2-y(x)^2}y'(x)=\sqrt{a^2-x^2}$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.0880849 (sec), leaf count = 94

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{1}{2}\left(\#1\sqrt{b^2-\#1^2}+b^2\tan^{-1}\left(\frac{\#1}{\sqrt{b^2-\#1^2}}\right)\right)\&\right]\left[\frac{1}{2}\left(x\sqrt{a^2-x^2}+a^2\tan^{-1}\left(\frac{x}{\sqrt{a^2-x^2}}\right)\right)\right.\right.$$

Maple ✓
cpu = 0.02 (sec), leaf count = 75

$$\left\{\frac{x}{2}\sqrt{a^2-x^2}+\frac{a^2}{2}\arctan\left(x\frac{1}{\sqrt{a^2-x^2}}\right)-\frac{y(x)}{2}\sqrt{b^2-(y(x))^2}-\frac{b^2}{2}\arctan\left(y(x)\frac{1}{\sqrt{b^2-(y(x))^2}}\right)+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[Sqrt[b^2 - y[x]^2]*y'[x] == Sqrt[a^2 - x^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(b^2*ArcTan[#1/Sqrt[b^2 - #1^2]] + #1*Sqrt[b^2 - #1^2]
)/2 & ][(x*Sqrt[a^2 - x^2] + a^2*ArcTan[x/Sqrt[a^2 - x^2]])/2 + C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(b^2-y(x)^2)^(1/2) = (a^2-x^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
1/2*x*(a^2-x^2)^(1/2)+1/2*a^2*arctan(1/(a^2-x^2)^(1/2)*x)-1/2*y(x)*(b^2-y(x)^2)^
(1/2)-1/2*b^2*arctan(1/(b^2-y(x)^2)^(1/2)*y(x))+_C1 = 0
```

4.727 $\sqrt{Y}y'(x) = \sqrt{X}$

ODE

$$\sqrt{Y}y'(x) = \sqrt{X}$$

ODE Classification

[_quadrature]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.00334414 (sec), leaf count = 20

$$\left\{\left\{y(x) \to c_1 + \frac{x\sqrt{X}}{\sqrt{Y}}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 14

$$\left\{y(x) = x\sqrt{X}\frac{1}{\sqrt{Y}} + \_C1\right\}$$

Mathematica raw input

```
DSolve[Sqrt[Y]*y'[x] == Sqrt[X],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*Sqrt[X])/Sqrt[Y] + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*Y^(1/2) = X^(1/2), y(x),'implicit')
```

Maple raw output

```
y(x) = X^(1/2)/Y^(1/2)*x+_C1
```

4.728 $\left(\sqrt{y(x)+x}+1\right)y'(x)+1=0$

ODE

$$\left(\sqrt{y(x)+x}+1\right)y'(x)+1=0$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
Change of Variable, new dependent variable

Mathematica ✓
cpu = 0.0324476 (sec), leaf count = 39

$$\left\{\left\{y(x)\to -2\sqrt{c_1+x+1}+c_1+2\right\},\left\{y(x)\to 2\sqrt{c_1+x+1}+c_1+2\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 19

$$\left\{-2\sqrt{x+y\left(x\right)}-y(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[1 + (1 + Sqrt[x + y[x]])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2 + C[1] - 2*Sqrt[1 + x + C[1]]}, {y[x] -> 2 + C[1] + 2*Sqrt[1 + x + C
[1]]}}
```

Maple raw input

```
dsolve((1+(x+y(x))^(1/2))*diff(y(x),x)+1 = 0, y(x),'implicit')
```

Maple raw output

```
-2*(x+y(x))^(1/2)-y(x)-_C1 = 0
```

4.729 $\sqrt{xy(x)}y'(x) - y(x) + x = \sqrt{xy(x)}$

ODE

$$\sqrt{xy(x)}y'(x) - y(x) + x = \sqrt{xy(x)}$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0872606 (sec), leaf count = 60

$$\text{Solve}\left[\frac{1}{2}\left(-\frac{2}{\sqrt{\frac{y(x)}{x}}-1}+3\log\left(1-\sqrt{\frac{y(x)}{x}}\right)+\log\left(\sqrt{\frac{y(x)}{x}}+1\right)\right)+\log(x)=c_1, y(x)\right]$$

Maple ✓
cpu = 0.071 (sec), leaf count = 50

$$\left\{\frac{1}{3}\ln\left(\sqrt{xy\left(x\right)}+x\right)+2\,\frac{x}{3\,x-3\,\sqrt{xy\left(x\right)}}+\ln\left(-x+\sqrt{xy\left(x\right)}\right)-\frac{2\,\ln\left(x\right)}{3}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x - y[x] + Sqrt[x*y[x]]*y'[x] == Sqrt[x*y[x]],y[x],x]
```

Mathematica raw output

```
Solve[Log[x] + (3*Log[1 - Sqrt[y[x]/x]] + Log[1 + Sqrt[y[x]/x]] - 2/(-1 + Sqrt[y
[x]/x]))/2 == C[1], y[x]]
```

Maple raw input

```
dsolve(diff(y(x),x)*(x*y(x))^(1/2)+x-y(x) = (x*y(x))^(1/2), y(x),'implicit')
```

Maple raw output

```
1/3*ln((x*y(x))^(1/2)+x)+2*x/(3*x-3*(x*y(x))^(1/2))+ln(-x+(x*y(x))^(1/2))-2/3*ln
(x)-_C1 = 0
```

4.730 $\left(x-2\sqrt{xy(x)}\right)y'(x)=y(x)$

ODE

$$\left(x-2\sqrt{xy(x)}\right)y'(x)=y(x)$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0885838 (sec), leaf count = 28

$$\text{Solve}\left[2\left(\frac{1}{\sqrt{\frac{y(x)}{x}}}+\log\left(\frac{y(x)}{x}\right)+\log(x)\right)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.034 (sec), leaf count = 18

$$\left\{\ln\left(y(x)\right)+x\frac{1}{\sqrt{xy\left(x\right)}}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(x - 2*Sqrt[x*y[x]])*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
Solve[2*(Log[x] + Log[y[x]/x] + 1/Sqrt[y[x]/x]) == C[1], y[x]]
```

Maple raw input

```
dsolve((x-2*(x*y(x))^(1/2))*diff(y(x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
ln(y(x))+1/(x*y(x))^(1/2)*x-_C1 = 0
```

4.731 $(x^2+1)^{3/2}\left(y(x)+\sqrt{y(x)^2+1}\right)y'(x)=y(x)^2+1$

ODE

$$(x^2+1)^{3/2}\left(y(x)+\sqrt{y(x)^2+1}\right)y'(x)=y(x)^2+1$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.127647 (sec), leaf count = 321

$$\left\{\left\{y(x)\to -\frac{i\left(\sinh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)+\cosh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)-1\right)}{\sqrt{-2\sinh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)-2\cosh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)+1}}\right\},\left\{y(x)\to \frac{i\left(\sinh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)+\cosh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)\right.\right.\right.$$
$$\left.\left.\left.\sqrt{-2\sinh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)-2\cosh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)}\right.\right.\right.$$

Maple ✓
cpu = 0.015 (sec), leaf count = 28

$$\left\{x\frac{1}{\sqrt{x^2+1}}-Arcsinh(y(x))-\frac{\ln\left(1+(y(x))^2\right)}{2}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(1 + x^2)^(3/2)*(y[x] + Sqrt[1 + y[x]^2])*y'[x] == 1 + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*(-1 + Cosh[x/Sqrt[1 + x^2] + C[1]] + Sinh[x/Sqrt[1 + x^2] + C[1]
]))/Sqrt[1 - 2*Cosh[x/Sqrt[1 + x^2] + C[1]] - 2*Sinh[x/Sqrt[1 + x^2] + C[1]]]},
{y[x] -> (I*(-1 + Cosh[x/Sqrt[1 + x^2] + C[1]] + Sinh[x/Sqrt[1 + x^2] + C[1]]))/
Sqrt[1 - 2*Cosh[x/Sqrt[1 + x^2] + C[1]] - 2*Sinh[x/Sqrt[1 + x^2] + C[1]]]}, {y[x
] -> ((-I)*(1 + Cosh[x/Sqrt[1 + x^2] + C[1]] + Sinh[x/Sqrt[1 + x^2] + C[1]]))/Sq
rt[1 + 2*Cosh[x/Sqrt[1 + x^2] + C[1]] + 2*Sinh[x/Sqrt[1 + x^2] + C[1]]]}, {y[x]
-> (I*(1 + Cosh[x/Sqrt[1 + x^2] + C[1]] + Sinh[x/Sqrt[1 + x^2] + C[1]]))/Sqrt[1
+ 2*Cosh[x/Sqrt[1 + x^2] + C[1]] + 2*Sinh[x/Sqrt[1 + x^2] + C[1]]]}}
```

Maple raw input

```
dsolve((y(x)+(1+y(x)^2)^(1/2))*(x^2+1)^(3/2)*diff(y(x),x) = 1+y(x)^2, y(x),'implicit')
```

Maple raw output

```
1/(x^2+1)^(1/2)*x-arcsinh(y(x))-1/2*ln(1+y(x)^2)+_C1 = 0
```

4.732 $(x^2+1)^{3/2}\left(y(x)+\sqrt{y(x)^2+1}\right)y'(x)=y(x)^2+1$

ODE

$$(x^2+1)^{3/2}\left(y(x)+\sqrt{y(x)^2+1}\right)y'(x)=y(x)^2+1$$

ODE Classification

[_separable]

Book solution method
Separable ODE, Neither variable missing

Mathematica ✓
cpu = 0.108219 (sec), leaf count = 321

$$\left\{\left\{y(x)\to -\frac{i\left(\sinh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)+\cosh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)-1\right)}{\sqrt{-2\sinh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)-2\cosh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)+1}}\right\},\left\{y(x)\to \frac{i\left(\sinh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)+\cosh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)\right.}{\sqrt{-2\sinh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)-2\cosh\left(c_1+\frac{x}{\sqrt{x^2+1}}\right)}}\right.$$

Maple ✓
cpu = 0.01 (sec), leaf count = 28

$$\left\{x\frac{1}{\sqrt{x^2+1}}-Arcsinh(y(x))-\frac{\ln\left(1+(y(x))^2\right)}{2}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(1 + x^2)^(3/2)*(y[x] + Sqrt[1 + y[x]^2])*y'[x] == 1 + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*(-1 + Cosh[x/Sqrt[1 + x^2] + C[1]] + Sinh[x/Sqrt[1 + x^2] + C[1]
]))/Sqrt[1 - 2*Cosh[x/Sqrt[1 + x^2] + C[1]] - 2*Sinh[x/Sqrt[1 + x^2] + C[1]]]},
{y[x] -> (I*(-1 + Cosh[x/Sqrt[1 + x^2] + C[1]] + Sinh[x/Sqrt[1 + x^2] + C[1]]))/
Sqrt[1 - 2*Cosh[x/Sqrt[1 + x^2] + C[1]] - 2*Sinh[x/Sqrt[1 + x^2] + C[1]]]}, {y[x
] -> ((-I)*(1 + Cosh[x/Sqrt[1 + x^2] + C[1]] + Sinh[x/Sqrt[1 + x^2] + C[1]]))/Sq
rt[1 + 2*Cosh[x/Sqrt[1 + x^2] + C[1]] + 2*Sinh[x/Sqrt[1 + x^2] + C[1]]]}, {y[x]
-> (I*(1 + Cosh[x/Sqrt[1 + x^2] + C[1]] + Sinh[x/Sqrt[1 + x^2] + C[1]]))/Sqrt[1
+ 2*Cosh[x/Sqrt[1 + x^2] + C[1]] + 2*Sinh[x/Sqrt[1 + x^2] + C[1]]]}}
```

Maple raw input

```
dsolve((y(x)+(1+y(x)^2)^(1/2))*(x^2+1)^(3/2)*diff(y(x),x) = 1+y(x)^2, y(x),'implicit')
```

Maple raw output

```
1/(x^2+1)^(1/2)*x-arcsinh(y(x))-1/2*ln(1+y(x)^2)+_C1 = 0
```

4.733 $\left(x-\sqrt{x^2+y(x)^2}\right)y'(x)=y(x)$

ODE

$$\left(x-\sqrt{x^2+y(x)^2}\right)y'(x)=y(x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0447243 (sec), leaf count = 52

$$\left\{\left\{y(x)\to -e^{\frac{c_1}{2}}\sqrt{e^{c_1}-2x}\right\},\left\{y(x)\to e^{\frac{c_1}{2}}\sqrt{e^{c_1}-2x}\right\}\right\}$$

Maple ✓
cpu = 0.062 (sec), leaf count = 18

$$\left\{-\_C1+x+\sqrt{x^2+(y(x))^2}=0\right\}$$

Mathematica raw input

```
DSolve[(x - Sqrt[x^2 + y[x]^2])*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(E^(C[1]/2)*Sqrt[E^C[1] - 2*x])}, {y[x] -> E^(C[1]/2)*Sqrt[E^C[1] - 2
*x]}}
```

Maple raw input

```
dsolve((x-(x^2+y(x)^2)^(1/2))*diff(y(x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
-_C1+x+(x^2+y(x)^2)^(1/2) = 0
```

4.734 $x\left(1-\sqrt{x^2-y(x)^2}\right)y'(x)=y(x)$

ODE

$$x\left(1-\sqrt{x^2-y(x)^2}\right)y'(x)=y(x)$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 1.13682 (sec), leaf count = 40

$$\text{Solve}\left[c_1+i\log\left(\frac{2\left(\sqrt{x^2-y(x)^2}-iy(x)\right)}{x}\right)=y(x),y(x)\right]$$

Maple ✓
cpu = 0.283 (sec), leaf count = 27

$$\left\{y(x)-\arctan\left(y(x)\frac{1}{\sqrt{x^2-\left(y\left(x\right)\right)^2}}\right)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*(1 - Sqrt[x^2 - y[x]^2])*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
Solve[C[1] + I*Log[(2*((-I)*y[x] + Sqrt[x^2 - y[x]^2]))/x] == y[x], y[x]]
```

Maple raw input

```
dsolve(x*(1-(x^2-y(x)^2)^(1/2))*diff(y(x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
y(x)-arctan(1/(x^2-y(x)^2)^(1/2)*y(x))-_C1 = 0
```

4.735 $x\left(\sqrt{x^2+y(x)^2}+x\right)y'(x)+\sqrt{x^2+y(x)^2}y(x)=0$

ODE

$$x\left(\sqrt{x^2+y(x)^2}+x\right)y'(x)+\sqrt{x^2+y(x)^2}y(x)=0$$

ODE Classification

[[_homogeneous, `class G`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 1.15496 (sec), leaf count = 2949

$$\left\{\left\{y(x)\to -\frac{1}{2}\sqrt{\frac{x^{16}+8e^{6c_1}x^{10}-\sqrt[3]{-x^{24}+20e^{6c_1}x^{18}+8e^{12c_1}x^{12}+8\sqrt{e^{6c_1}x^{24}\left(e^{6c_1}-x^6\right)^3}}x^8+\left(-x^{24}+20e^{6c_1}x^{18}+8e\right.}{x^6\sqrt[3]{-x^{24}+20e^{6c_1}x^{18}+8e^{12c_1}x^{12}+8\sqrt{e^{6c_1}x^{24}\left(e^{6c_1}-x^6\right)^3}}}}\right.\right.$$

Maple ✓
cpu = 0.132 (sec), leaf count = 133

$$\left\{\int_{\_b}^{x}-\frac{1}{\_a}\sqrt{\_a^2+(y(x))^2}\left(2\sqrt{\_a^2+(y(x))^2}+\_a\right)^{-1}d\_a+\int^{y(x)}-\frac{1}{\_f}\left(x+\sqrt{\_f^2+x^2}\right)\left(2\sqrt{\_f^2+x^2}+x\right)^{-1}-\right.$$

Mathematica raw input

```
DSolve[y[x]*Sqrt[x^2 + y[x]^2] + x*(x + Sqrt[x^2 + y[x]^2])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[(8*E^(6*C[1])*x^10 + x^16 - x^8*(8*E^(12*C[1])*x^12 + 20*E^(6*C[
1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) - x^6)^3])^(1/3) + (8*E^(12
*C[1])*x^12 + 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) - x
^6)^3])^(2/3))/(x^6*(8*E^(12*C[1])*x^12 + 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(
6*C[1])*x^24*(E^(6*C[1]) - x^6)^3])^(1/3))]/2}, {y[x] -> Sqrt[(8*E^(6*C[1])*x^10
 + x^16 - x^8*(8*E^(12*C[1])*x^12 + 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1]
)*x^24*(E^(6*C[1]) - x^6)^3])^(1/3) + (8*E^(12*C[1])*x^12 + 20*E^(6*C[1])*x^18 -
 x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) - x^6)^3])^(2/3))/(x^6*(8*E^(12*C[1])
```

```
*x^12 + 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) - x^6)^3]
)^(1/3))]/2}, {y[x] -> -Sqrt[((-I)*(-8*(I + Sqrt[3])*E^(6*C[1])*x^10 + (x^8 + (8
*E^(12*C[1])*x^12 + 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1
]) - x^6)^3])^(1/3))*(-((I + Sqrt[3])*x^8) + (-I + Sqrt[3])*(8*E^(12*C[1])*x^12
+ 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) - x^6)^3])^(1/3
))))/(x^6*(8*E^(12*C[1])*x^12 + 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^
24*(E^(6*C[1]) - x^6)^3])^(1/3))]/(2*Sqrt[2])}, {y[x] -> Sqrt[((-I)*(-8*(I + Sqr
t[3])*E^(6*C[1])*x^10 + (x^8 + (8*E^(12*C[1])*x^12 + 20*E^(6*C[1])*x^18 - x^24 +
 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) - x^6)^3])^(1/3))*(-((I + Sqrt[3])*x^8) + (-
I + Sqrt[3])*(8*E^(12*C[1])*x^12 + 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])
*x^24*(E^(6*C[1]) - x^6)^3])^(1/3))))/(x^6*(8*E^(12*C[1])*x^12 + 20*E^(6*C[1])*x
^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) - x^6)^3])^(1/3))]/(2*Sqrt[2])},
 {y[x] -> -Sqrt[(I*(-8*(-I + Sqrt[3])*E^(6*C[1])*x^10 + (x^8 + (8*E^(12*C[1])*x^
12 + 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) - x^6)^3])^(
1/3))*(-((-I + Sqrt[3])*x^8) + (I + Sqrt[3])*(8*E^(12*C[1])*x^12 + 20*E^(6*C[1])
*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) - x^6)^3])^(1/3))))/(x^6*(8*E^
(12*C[1])*x^12 + 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1])
- x^6)^3])^(1/3))]/(2*Sqrt[2])}, {y[x] -> Sqrt[(I*(-8*(-I + Sqrt[3])*E^(6*C[1])*
x^10 + (x^8 + (8*E^(12*C[1])*x^12 + 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1]
)*x^24*(E^(6*C[1]) - x^6)^3])^(1/3))*(-((-I + Sqrt[3])*x^8) + (I + Sqrt[3])*(8*E
^(12*C[1])*x^12 + 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1])
 - x^6)^3])^(1/3))))/(x^6*(8*E^(12*C[1])*x^12 + 20*E^(6*C[1])*x^18 - x^24 + 8*Sq
rt[E^(6*C[1])*x^24*(E^(6*C[1]) - x^6)^3])^(1/3))]/(2*Sqrt[2])}, {y[x] -> -Sqrt[(
-8*E^(6*C[1])*x^10 + x^16 - x^8*(8*E^(12*C[1])*x^12 - 20*E^(6*C[1])*x^18 - x^24
+ 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) + x^6)^3])^(1/3) + (8*E^(12*C[1])*x^12 - 20
*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) + x^6)^3])^(2/3))/(
x^6*(8*E^(12*C[1])*x^12 - 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^
(6*C[1]) + x^6)^3])^(1/3))]/2}, {y[x] -> Sqrt[(-8*E^(6*C[1])*x^10 + x^16 - x^8*(
8*E^(12*C[1])*x^12 - 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[
1]) + x^6)^3])^(1/3) + (8*E^(12*C[1])*x^12 - 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[
E^(6*C[1])*x^24*(E^(6*C[1]) + x^6)^3])^(2/3))/(x^6*(8*E^(12*C[1])*x^12 - 20*E^(6
*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) + x^6)^3])^(1/3))]/2}, {
y[x] -> -Sqrt[(8*(1 - I*Sqrt[3])*E^(6*C[1])*x^10 - I*(x^8 + (8*E^(12*C[1])*x^12
- 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) + x^6)^3])^(1/3
))*(-((I + Sqrt[3])*x^8) + (-I + Sqrt[3])*(8*E^(12*C[1])*x^12 - 20*E^(6*C[1])*x^
18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) + x^6)^3])^(1/3)))/(x^6*(8*E^(12*
C[1])*x^12 - 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) + x^
6)^3])^(1/3))]/(2*Sqrt[2])}, {y[x] -> Sqrt[(8*(1 - I*Sqrt[3])*E^(6*C[1])*x^10 -
I*(x^8 + (8*E^(12*C[1])*x^12 - 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^2
4*(E^(6*C[1]) + x^6)^3])^(1/3))*(-((I + Sqrt[3])*x^8) + (-I + Sqrt[3])*(8*E^(12*
C[1])*x^12 - 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) + x^
6)^3])^(1/3)))/(x^6*(8*E^(12*C[1])*x^12 - 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(
6*C[1])*x^24*(E^(6*C[1]) + x^6)^3])^(1/3))]/(2*Sqrt[2])}, {y[x] -> -Sqrt[(8*(1 +
 I*Sqrt[3])*E^(6*C[1])*x^10 + I*(x^8 + (8*E^(12*C[1])*x^12 - 20*E^(6*C[1])*x^18
- x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) + x^6)^3])^(1/3))*(-((-I + Sqrt[3])*
x^8) + (I + Sqrt[3])*(8*E^(12*C[1])*x^12 - 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^
(6*C[1])*x^24*(E^(6*C[1]) + x^6)^3])^(1/3)))/(x^6*(8*E^(12*C[1])*x^12 - 20*E^(6*
```

```
C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) + x^6)^3])^(1/3))]/(2*Sqr
t[2])}, {y[x] -> Sqrt[(8*(1 + I*Sqrt[3])*E^(6*C[1])*x^10 + I*(x^8 + (8*E^(12*C[1
])*x^12 - 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) + x^6)^
3])^(1/3))*(-((-I + Sqrt[3])*x^8) + (I + Sqrt[3])*(8*E^(12*C[1])*x^12 - 20*E^(6*
C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[1]) + x^6)^3])^(1/3)))/(x^6*(
8*E^(12*C[1])*x^12 - 20*E^(6*C[1])*x^18 - x^24 + 8*Sqrt[E^(6*C[1])*x^24*(E^(6*C[
1]) + x^6)^3])^(1/3))]/(2*Sqrt[2])}}
```

Maple raw input

```
dsolve(x*(x+(x^2+y(x)^2)^(1/2))*diff(y(x),x)+y(x)*(x^2+y(x)^2)^(1/2) = 0, y(x),'implicit')
```

Maple raw output

```
Int(-(_a^2+y(x)^2)^(1/2)/_a/(2*(_a^2+y(x)^2)^(1/2)+_a),_a = _b .. x)+Intat(-(x+(
_f^2+x^2)^(1/2))/_f/(2*(_f^2+x^2)^(1/2)+x)-Int(-(-2+1/(_a^2+_f^2)^(1/2)*(2*(_a^2
+_f^2)^(1/2)+_a))*_f/_a/(2*(_a^2+_f^2)^(1/2)+_a)^2,_a = _b .. x),_f = y(x))+_C1
= 0
```

4.736 $xy(x)\left(\sqrt{x^2-y(x)^2}+x\right)y'(x)=xy(x)^2-\left(x^2-y(x)^2\right)^{3/2}$

ODE

$$xy(x)\left(\sqrt{x^2-y(x)^2}+x\right)y'(x)=xy(x)^2-\left(x^2-y(x)^2\right)^{3/2}$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 1.22711 (sec), leaf count = 429

$$\left\{\left\{y(x)\to -\sqrt{2}\sqrt{-\sqrt{2}\sqrt{-x^4\left(c_1-\log(x)-1\right)}+\left(c_1-1\right)x^2-x^2\log(x)}\right\},\left\{y(x)\to \sqrt{2}\sqrt{-\sqrt{2}\sqrt{-x^4\left(c_1-\log(x)-1\right)}+(\right.\right.$$

Maple ✓
cpu = 0.061 (sec), leaf count = 35

$$\left\{\frac{\left(y(x)\right)^2}{2x^2}-\frac{1}{x}\sqrt{x^2-\left(y\left(x\right)\right)^2}+\ln\left(x\right)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[x*y[x]*(x + Sqrt[x^2 - y[x]^2])*y'[x] == x*y[x]^2 - (x^2 - y[x]^2)^(3/2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2]*Sqrt[x^2*(-1 + C[1]) - Sqrt[2]*Sqrt[-(x^4*(-1 + C[1] - Log[x
]))] - x^2*Log[x]])}, {y[x] -> Sqrt[2]*Sqrt[x^2*(-1 + C[1]) - Sqrt[2]*Sqrt[-(x^4
*(-1 + C[1] - Log[x]))] - x^2*Log[x]]}, {y[x] -> -(Sqrt[2]*Sqrt[x^2*(-1 + C[1])
+ Sqrt[2]*Sqrt[-(x^4*(-1 + C[1] - Log[x]))] - x^2*Log[x]])}, {y[x] -> Sqrt[2]*Sq
rt[x^2*(-1 + C[1]) + Sqrt[2]*Sqrt[-(x^4*(-1 + C[1] - Log[x]))] - x^2*Log[x]]}, {
y[x] -> -(Sqrt[2]*Sqrt[-(x^2*(1 + C[1])) - Sqrt[2]*Sqrt[x^4*(1 + C[1] - Log[x])]
 + x^2*Log[x]])}, {y[x] -> Sqrt[2]*Sqrt[-(x^2*(1 + C[1])) - Sqrt[2]*Sqrt[x^4*(1
+ C[1] - Log[x])] + x^2*Log[x]]}, {y[x] -> -(Sqrt[2]*Sqrt[-(x^2*(1 + C[1])) + Sq
rt[2]*Sqrt[x^4*(1 + C[1] - Log[x])] + x^2*Log[x]])}, {y[x] -> Sqrt[2]*Sqrt[-(x^2
*(1 + C[1])) + Sqrt[2]*Sqrt[x^4*(1 + C[1] - Log[x])] + x^2*Log[x]]}}
```

Maple raw input

```
dsolve(x*y(x)*(x+(x^2-y(x)^2)^(1/2))*diff(y(x),x) = x*y(x)^2-(x^2-y(x)^2)^(3/2), y(x),'implicit')
```

Maple raw output

```
1/2/x^2*y(x)^2-1/x*(x^2-y(x)^2)^(1/2)+ln(x)-_C1 = 0
```

4.737 $\left(x-y(x)^2\sqrt{y(x)^2-x^2}\right)y'(x)=y(x)\left(x\sqrt{y(x)^2-x^2}+1\right)$

ODE

$$\left(x-y(x)^2\sqrt{y(x)^2-x^2}\right)y'(x)=y(x)\left(x\sqrt{y(x)^2-x^2}+1\right)$$

ODE Classification

[NONE]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 3.75411 (sec), leaf count = 35

$$\text{Solve}\left[2\tan^{-1}\left(\frac{x}{\sqrt{y(x)^2-x^2}}\right)+x^2+y(x)^2=2c_1,y(x)\right]$$

Maple ✓
cpu = 0.413 (sec), leaf count = 73

$$\left\{\frac{1}{2}\left(2x\ln\left(\frac{-2x^2+2\sqrt{-x^2}\sqrt{(y(x))^2-x^2}}{y(x)}\right)+\left(x^2+(y(x))^2-2\_C1\right)\sqrt{-x^2}-2x\ln(x)\right)\frac{1}{\sqrt{-x^2}}=0\right\}$$

Mathematica raw input

```
DSolve[(x - y[x]^2*Sqrt[-x^2 + y[x]^2])*y'[x] == y[x]*(1 + x*Sqrt[-x^2 + y[x]^2]),y[x],x]
```

Mathematica raw output

```
Solve[x^2 + 2*ArcTan[x/Sqrt[-x^2 + y[x]^2]] + y[x]^2 == 2*C[1], y[x]]
```

Maple raw input

```
dsolve((x-y(x)^2*(y(x)^2-x^2)^(1/2))*diff(y(x),x) = (1+x*(y(x)^2-x^2)^(1/2))*y(x), y(x),'implicit')
```

Maple raw output

```
1/2*(2*x*ln((-2*x^2+2*(-x^2)^(1/2)*(y(x)^2-x^2)^(1/2))/y(x))+(x^2+y(x)^2-2*_C1)*
(-x^2)^(1/2)-2*x*ln(x))/(-x^2)^(1/2) = 0
```

4.738 $\left(x\sqrt{x^2+y(x)^2+1}-y(x)\left(x^2+y(x)^2\right)\right)y'(x)=\sqrt{x^2+y(x)^2+1}y(x)+x(x^2+y(x)^2)$

ODE

$$\left(x\sqrt{x^2+y(x)^2+1}-y(x)\left(x^2+y(x)^2\right)\right)y'(x)=\sqrt{x^2+y(x)^2+1}y(x)+x(x^2+y(x)^2)$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.126706 (sec), leaf count = 27

$$\text{Solve}\left[\sqrt{x^2+y(x)^2+1}+\tan^{-1}\left(\frac{x}{y(x)}\right)=c_1,y(x)\right]$$

Maple ✓
cpu = 0.167 (sec), leaf count = 27

$$\left\{\arctan\left(\frac{y(x)}{x}\right)-\sqrt{1+x^2+\left(y\left(x\right)\right)^2}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(-(y[x]*(x^2 + y[x]^2)) + x*Sqrt[1 + x^2 + y[x]^2])*y'[x] == x*(x^2 + y[x]^2) + y[x]*Sqrt[1 +
```

Mathematica raw output

```
Solve[ArcTan[x/y[x]] + Sqrt[1 + x^2 + y[x]^2] == C[1], y[x]]
```

Maple raw input

```
dsolve((x*(1+x^2+y(x)^2)^(1/2)-y(x)*(x^2+y(x)^2))*diff(y(x),x) = x*(x^2+y(x)^2)+y(x)*(1+x^2+y(x)^2)^(
```

Maple raw output

```
arctan(y(x)/x)-(1+x^2+y(x)^2)^(1/2)-_C1 = 0
```

4.739 $y'(x)\left(x^2\sec(x)\cos(y(x))+1\right)-y(x)\tan(x)+\sec(x)\sin(y(x))=0$

ODE

$$y'(x)\left(x^2\sec(x)\cos(y(x))+1\right)-y(x)\tan(x)+\sec(x)\sin(y(x))=0$$

ODE Classification

[NONE]

Book solution method
Exact equation, integrating factor

Mathematica ✗
cpu = 11.0559 (sec), leaf count = 0 , could not solve

```
DSolve[Sec[x]*Sin[y[x]] - Tan[x]*y[x] + (1 + x^2*Cos[y[x]]*Sec[x])*Derivative[1][y][x] == 0, y[x], x]
```

Maple ✗
cpu = 85.502 (sec), leaf count = 0 , could not solve

```
dsolve((1+x^2*sec(x)*cos(y(x)))*diff(y(x),x)-y(x)*tan(x)+sec(x)*sin(y(x)) = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[Sec[x]*Sin[y[x]] - Tan[x]*y[x] + (1 + x^2*Cos[y[x]]*Sec[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[Sec[x]*Sin[y[x]] - Tan[x]*y[x] + (1 + x^2*Cos[y[x]]*Sec[x])*Derivative[1]
[y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve((1+x^2*sec(x)*cos(y(x)))*diff(y(x),x)-y(x)*tan(x)+sec(x)*sin(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
dsolve((1+x^2*sec(x)*cos(y(x)))*diff(y(x),x)-y(x)*tan(x)+sec(x)*sin(y(x)) = 0, y
(x),'implicit')
```

4.740

$$y'(x)\cos(y(x))(\cos(y(x))-\sin(A)\sin(x))+\cos(x)(\cos(x)-\sin(A)\sin(y(x)))=0$$

ODE

$$y'(x)\cos(y(x))(\cos(y(x))-\sin(A)\sin(x))+\cos(x)(\cos(x)-\sin(A)\sin(y(x)))=0$$

ODE Classification

[_exact]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.143213 (sec), leaf count = 32

$$\text{Solve}[c_1+2y(x)+\sin(2y(x))+2x+\sin(2x)=4\sin(A)\sin(x)\sin(y(x)),y(x)]$$

Maple ✓
cpu = 0.271 (sec), leaf count = 33

$$\left\{\frac{(-2\sin(A)\sin(x)+\cos(y(x)))\sin(y(x))}{2}+\frac{\cos(x)\sin(x)}{2}+\frac{x}{2}+\_C1+\frac{y(x)}{2}=0\right\}$$

Mathematica raw input

```
DSolve[Cos[x]*(Cos[x] - Sin[A]*Sin[y[x]]) + Cos[y[x]]*(Cos[y[x]] - Sin[A]*Sin[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[2*x + C[1] + Sin[2*x] + Sin[2*y[x]] + 2*y[x] == 4*Sin[A]*Sin[x]*Sin[y[x]],
 y[x]]
```

Maple raw input

```
dsolve(diff(y(x),x)*cos(y(x))*(cos(y(x))-sin(A)*sin(x))+cos(x)*(cos(x)-sin(A)*sin(y(x))) = 0, y(x),'i
```

Maple raw output

```
1/2*(-2*sin(A)*sin(x)+cos(y(x)))*sin(y(x))+1/2*cos(x)*sin(x)+1/2*x+_C1+1/2*y(x)
= 0
```

4.741

$$y'(x)(a\cos(ay(x)+bx)-b\sin(ax+by(x)))-a\sin(ax+by(x))+b\cos(ay(x)+bx)=0$$

ODE

$$y'(x)(a\cos(ay(x)+bx)-b\sin(ax+by(x)))-a\sin(ax+by(x))+b\cos(ay(x)+bx)=0$$

ODE Classification

[_exact]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.419222 (sec), leaf count = 26

$$\text{Solve}[\sin(ay(x)+bx)+\cos(ax+by(x))+c_1=0,y(x)]$$

Maple ✓
cpu = 0.17 (sec), leaf count = 23

$$\{\sin(bx+ay(x))+\cos(ax+by(x))+\_C1=0\}$$

Mathematica raw input

```
DSolve[b*Cos[b*x + a*y[x]] - a*Sin[a*x + b*y[x]] + (a*Cos[b*x + a*y[x]] - b*Sin[a*x + b*y[x]])*y'[x]
```

Mathematica raw output

```
Solve[C[1] + Cos[a*x + b*y[x]] + Sin[b*x + a*y[x]] == 0, y[x]]
```

Maple raw input

```
dsolve((a*cos(b*x+a*y(x))-b*sin(a*x+b*y(x)))*diff(y(x),x)+b*cos(b*x+a*y(x))-a*sin(a*x+b*y(x)) = 0, y(
```

Maple raw output

```
sin(b*x+a*y(x))+cos(a*x+b*y(x))+_C1 = 0
```

4.742 $y'(x)(a\sin(xy(x)) - \sin(y(x)) + \cos(y(x)+x)) + y(x)\sin(xy(x)) + \cos(y(x)+x) + \cos(x) = 0$

ODE

$$y'(x)(a\sin(xy(x)) - \sin(y(x)) + \cos(y(x)+x)) + y(x)\sin(xy(x)) + \cos(y(x)+x) + \cos(x) = 0$$

ODE Classification

[NONE]

Book solution method
Exact equation

Mathematica ✗
cpu = 191.247 (sec), leaf count = 0 , could not solve

```
DSolve[Cos[x] + Cos[x + y[x]] + Sin[x*y[x]]*y[x] + (Cos[x + y[x]] - Sin[y[x]] + a*Sin[x*y[x]])*Deriva
```

Maple ✗
cpu = 89.007 (sec), leaf count = 0 , could not solve

```
dsolve((a*sin(x*y(x))+cos(x+y(x))-sin(y(x)))*diff(y(x),x)+y(x)*sin(x*y(x))+cos(x+y(x))+cos(x) = 0, y(
```

Mathematica raw input

```
DSolve[Cos[x] + Cos[x + y[x]] + Sin[x*y[x]]*y[x] + (Cos[x + y[x]] - Sin[y[x]] + a*Sin[x*y[x]])*y'[x]
```

Mathematica raw output

```
DSolve[Cos[x] + Cos[x + y[x]] + Sin[x*y[x]]*y[x] + (Cos[x + y[x]] - Sin[y[x]] +
a*Sin[x*y[x]])*Derivative[1][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve((a*sin(x*y(x))+cos(x+y(x))-sin(y(x)))*diff(y(x),x)+y(x)*sin(x*y(x))+cos(x+y(x))+cos(x) = 0, y(
```

Maple raw output

```
dsolve((a*sin(x*y(x))+cos(x+y(x))-sin(y(x)))*diff(y(x),x)+y(x)*sin(x*y(x))+cos(x
+y(x))+cos(x) = 0, y(x),'implicit')
```

4.743 $y'(x)(\cos(x)\sec(y(x))+x)+\tan(y(x))-y(x)\sin(x)\sec(y(x))=0$

ODE

$$y'(x)(\cos(x)\sec(y(x))+x)+\tan(y(x))-y(x)\sin(x)\sec(y(x))=0$$

ODE Classification

[NONE]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0577803 (sec), leaf count = 17

$$\text{Solve}[c_1 = x\sin(y(x))+y(x)\cos(x), y(x)]$$

Maple ✓
cpu = 0.08 (sec), leaf count = 15

$$\{y(x)\cos(x)+\sin(y(x))x+\_C1=0\}$$

Mathematica raw input

```
DSolve[Tan[y[x]] - Sec[y[x]]*Sin[x]*y[x] + (x + Cos[x]*Sec[y[x]])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] == x*Sin[y[x]] + Cos[x]*y[x], y[x]]
```

Maple raw input

```
dsolve((x+cos(x)*sec(y(x)))*diff(y(x),x)+tan(y(x))-y(x)*sin(x)*sec(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)*cos(x)+sin(y(x))*x+_C1 = 0
```

4.744

$$y'(x)\left(x^2+2y(x)\sin(x)\sec(y(x))\right)+2x\tan(y(x))+y(x)^2\cos(x)\sec(y(x))=0$$

ODE

$$y'(x)\left(x^2+2y(x)\sin(x)\sec(y(x))\right)+2x\tan(y(x))+y(x)^2\cos(x)\sec(y(x))=0$$

ODE Classification

[NONE]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0705649 (sec), leaf count = 21

$$\text{Solve}\left[c_1=x^2\sin(y(x))+y(x)^2\sin(x),y(x)\right]$$

Maple ✓
cpu = 0.105 (sec), leaf count = 19

$$\left\{(y(x))^2\sin(x)+x^2\sin(y(x))+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*x*Tan[y[x]] + Cos[x]*Sec[y[x]]*y[x]^2 + (x^2 + 2*Sec[y[x]]*Sin[x]*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] == x^2*Sin[y[x]] + Sin[x]*y[x]^2, y[x]]
```

Maple raw input

```
dsolve((x^2+2*y(x)*sin(x)*sec(y(x)))*diff(y(x),x)+2*x*tan(y(x))+y(x)^2*cos(x)*sec(y(x)) = 0, y(x),'im
```

Maple raw output

```
y(x)^2*sin(x)+x^2*sin(y(x))+_C1 = 0
```

4.745 $y'(x)\left(x^2\sec^2(y(x))-6xy(x)+2\right)-3y(x)^2+2x\tan(y(x))=0$

ODE

$$y'(x)\left(x^2\sec^2(y(x))-6xy(x)+2\right)-3y(x)^2+2x\tan(y(x))=0$$

ODE Classification

[_exact]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.122084 (sec), leaf count = 27

$$\text{Solve}\left[c_1+6xy(x)^2=2x^2\tan(y(x))+4y(x),y(x)\right]$$

Maple ✓
cpu = 0.081 (sec), leaf count = 23

$$\left\{\tan\left(y(x)\right)x^2-3\,x(y(x))^2+2\,y(x)+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*x*Tan[y[x]] - 3*y[x]^2 + (2 + x^2*Sec[y[x]]^2 - 6*x*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] + 6*x*y[x]^2 == 2*x^2*Tan[y[x]] + 4*y[x], y[x]]
```

Maple raw input

```
dsolve((2-6*x*y(x)+x^2*sec(y(x))^2)*diff(y(x),x)+2*x*tan(y(x))-3*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
tan(y(x))*x^2-3*x*y(x)^2+2*y(x)+_C1 = 0
```

4.746 $y'(x)((y(x)+x)\tan(y(x))+1)+1=0$

ODE

$$y'(x)((y(x)+x)\tan(y(x))+1)+1=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.084345 (sec), leaf count = 14

$$\text{Solve}[y(x)+x=c_1\cos(y(x)),y(x)]$$

Maple ✓
cpu = 0.066 (sec), leaf count = 13

$$\{x+y(x)-\cos(y(x))\_C1=0\}$$

Mathematica raw input

```
DSolve[1 + (1 + Tan[y[x]]*(x + y[x]))*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[x + y[x] == C[1]*Cos[y[x]], y[x]]
```

Maple raw input

```
dsolve((1+(x+y(x))*tan(y(x)))*diff(y(x),x)+1 = 0, y(x),'implicit')
```

Maple raw output

```
x+y(x)-cos(y(x))*_C1 = 0
```

4.747 $xy'(x)\left(x-y(x)\tan\left(\frac{y(x)}{x}\right)\right)+y(x)\left(y(x)\tan\left(\frac{y(x)}{x}\right)+x\right)=0$

ODE

$$xy'(x)\left(x-y(x)\tan\left(\frac{y(x)}{x}\right)\right)+y(x)\left(y(x)\tan\left(\frac{y(x)}{x}\right)+x\right)=0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous equation

Mathematica ✓
cpu = 0.0737839 (sec), leaf count = 27

$$\text{Solve}\left[c_1+\log\left(\frac{y(x)}{x}\right)+\log\left(\cos\left(\frac{y(x)}{x}\right)\right)+2\log(x)=0,y(x)\right]$$

Maple ✓
cpu = 0.021 (sec), leaf count = 30

$$\left\{-\frac{1}{2}\ln\left(\cos\left(\frac{y(x)}{x}\right)\right)-\frac{1}{2}\ln\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*(x + Tan[y[x]/x]*y[x]) + x*(x - Tan[y[x]/x]*y[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] + 2*Log[x] + Log[Cos[y[x]/x]] + Log[y[x]/x] == 0, y[x]]
```

Maple raw input

```
dsolve(x*(x-y(x)*tan(y(x)/x))*diff(y(x),x)+(x+y(x)*tan(y(x)/x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln(cos(y(x)/x))-1/2*ln(y(x)/x)-ln(x)-_C1 = 0
```

4.748 $\left(xe^{y(x)}+e^{x}\right)y'(x)+e^{x}y(x)+e^{y(x)}=0$

ODE

$$\left(xe^{y(x)}+e^{x}\right)y'(x)+e^{x}y(x)+e^{y(x)}=0$$

ODE Classification

[_exact]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0690978 (sec), leaf count = 33

$$\left\{\left\{y(x)\to c_1e^{-x}-W\left(xe^{c_1e^{-x}-x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.034 (sec), leaf count = 15

$$\left\{y(x)\,\mathrm{e}^{x}+x\mathrm{e}^{y(x)}+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[E^y[x] + E^x*y[x] + (E^x + E^y[x]*x)*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^x - ProductLog[E^(-x + C[1]/E^x)*x]}}
```

Maple raw input

```
dsolve((exp(x)+x*exp(y(x)))*diff(y(x),x)+y(x)*exp(x)+exp(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)*exp(x)+x*exp(y(x))+_C1 = 0
```

4.749 $y'(x)(-\log(y(x))-2x+1)+2y(x)=0$

ODE

$$y'(x)(-\log(y(x))-2x+1)+2y(x)=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Exact equation, integrating factor

Mathematica ✓
cpu = 0.0260441 (sec), leaf count = 23

$$\left\{\left\{y(x)\to -\frac{W\left(-2c_1e^{-2x}\right)}{2c_1}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 15

$$\left\{x+\frac{\ln(y(x))}{2}-y(x)\_C1=0\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + (1 - 2*x - Log[y[x]])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ProductLog[(-2*C[1])/E^(2*x)]/(2*C[1])}}
```

Maple raw input

```
dsolve((1-2*x-ln(y(x)))*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x+1/2*ln(y(x))-y(x)*_C1 = 0
```

4.750 $y'(x)(x\cosh(y(x))+\sinh(x))+\sinh(y(x))+y(x)\cosh(x)=0$

ODE

$$y'(x)(x\cosh(y(x))+\sinh(x))+\sinh(y(x))+y(x)\cosh(x)=0$$

ODE Classification

[_exact]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0571608 (sec), leaf count = 17

$$\text{Solve}[c_1=x\sinh(y(x))+y(x)\sinh(x),y(x)]$$

Maple ✓
cpu = 0.071 (sec), leaf count = 15

$$\{\sinh(x)\,y(x)+x\sinh(y(x))+\_C1=0\}$$

Mathematica raw input

```
DSolve[Sinh[y[x]] + Cosh[x]*y[x] + (x*Cosh[y[x]] + Sinh[x])*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] == x*Sinh[y[x]] + Sinh[x]*y[x], y[x]]
```

Maple raw input

```
dsolve((sinh(x)+x*cosh(y(x)))*diff(y(x),x)+y(x)*cosh(x)+sinh(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
sinh(x)*y(x)+x*sinh(y(x))+_C1 = 0
```

4.751 $(\sinh(x)+1)y'(x)\sinh(y(x))+\cosh(x)(\cosh(y(x))-1)=0$

ODE

$$(\sinh(x)+1)y'(x)\sinh(y(x))+\cosh(x)(\cosh(y(x))-1)=0$$

ODE Classification

[_separable]

Book solution method
Exact equation

Mathematica ✓
cpu = 0.0846531 (sec), leaf count = 27

$$\left\{\{y(x)\to 0\},\left\{y(x)\to 2\sinh^{-1}\left(\frac{c_1}{4\sqrt{\sinh(x)+1}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.045 (sec), leaf count = 18

$$\{\ln(1+\sinh(x))+\ln(-\cosh(y(x))+1)+\_C1=0\}$$

Mathematica raw input

```
DSolve[Cosh[x]*(-1 + Cosh[y[x]]) + (1 + Sinh[x])*Sinh[y[x]]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 0}, {y[x] -> 2*ArcSinh[C[1]/(4*Sqrt[1 + Sinh[x]])]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(1+sinh(x))*sinh(y(x))+cosh(x)*(cosh(y(x))-1) = 0, y(x),'implicit')
```

Maple raw output

```
ln(1+sinh(x))+ln(-cosh(y(x))+1)+_C1 = 0
```

4.752 $y'(x)^2 = ax^n$

ODE

$$y'(x)^2 = ax^n$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0298183 (sec), leaf count = 57

$$\left\{\left\{y(x) \to c_1 - \frac{2\sqrt{a}x^{\frac{n}{2}+1}}{n+2}\right\}, \left\{y(x) \to \frac{2\sqrt{a}x^{\frac{n}{2}+1}}{n+2} + c_1\right\}\right\}$$

Maple ✓
cpu = 0.446 (sec), leaf count = 41

$$\left\{y(x) = -2\frac{x\sqrt{ax^n}}{2+n} + \_C1, y(x) = 2\frac{x\sqrt{ax^n}}{2+n} + \_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 == a*x^n,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*Sqrt[a]*x^(1 + n/2))/(2 + n) + C[1]}, {y[x] -> (2*Sqrt[a]*x^(1 + n
/2))/(2 + n) + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = a*x^n, y(x),'implicit')
```

Maple raw output

```
y(x) = 2*x/(2+n)*(a*x^n)^(1/2)+_C1, y(x) = -2*x/(2+n)*(a*x^n)^(1/2)+_C1
```

4.753 $y'(x)^2 = y(x)$

ODE

$$y'(x)^2 = y(x)$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✓
cpu = 0.0150853 (sec), leaf count = 31

$$\left\{\left\{y(x) \to \frac{1}{4}(x - c_1)^2\right\}, \left\{y(x) \to \frac{1}{4}(c_1 + x)^2\right\}\right\}$$

Maple ✓
cpu = 0.034 (sec), leaf count = 31

$$\left\{x - 2\sqrt{y(x)} - \_C1 = 0, x + 2\sqrt{y(x)} - \_C1 = 0, y(x) = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - C[1])^2/4}, {y[x] -> (x + C[1])^2/4}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 0, x-2*y(x)^(1/2)-_C1 = 0, x+2*y(x)^(1/2)-_C1 = 0
```

4.754 $y'(x)^2 = x - y(x)$

ODE

$$y'(x)^2 = x - y(x)$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.20376 (sec), leaf count = 46

$$\left\{\left\{y(x) \to -W\left(-e^{\frac{1}{2}(c_1-x-2)}\right)^2 - 2W\left(-e^{\frac{1}{2}(c_1-x-2)}\right) + x - 1\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 35

$$\{[x(\_T) = -2\_T - 2\ln(\_T - 1) + \_C1, y(\_T) = -\_T^2 - 2\_T - 2\ln(\_T - 1) + \_C1]\}$$

Mathematica raw input

```
DSolve[y'[x]^2 == x - y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 + x - 2*ProductLog[-E^((-2 - x + C[1])/2)] - ProductLog[-E^((-2 - x
 + C[1])/2)]^2}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = x-y(x), y(x),'implicit')
```

Maple raw output

```
[x(_T) = -2*_T-2*ln(_T-1)+_C1, y(_T) = -_T^2-2*_T-2*ln(_T-1)+_C1]
```

4.755 $y'(x)^2 = x^2 + y(x)$

ODE

$$y'(x)^2 = x^2 + y(x)$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
Homogeneous ODE, The Isobaric equation

Mathematica ✗
cpu = 599.991 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 1.037 (sec), leaf count = 267

$$\left\{ -\ln\left(-x^4 - x^2 y(x) + 4\,(y(x))^2\right) - \ln\left(-\sqrt{x^2 + y\,(x)}x + 2\,y(x)\right) + \ln\left(\sqrt{x^2 + y\,(x)}x + 2\,y(x)\right) + \frac{\sqrt{17}}{17}\left(-2\,\mathit{Artanh}\left(1/1 \right.\right.\right.$$

Mathematica raw input

```
DSolve[y'[x]^2 == x^2 + y[x],y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = x^2+y(x), y(x),'implicit')
```

Maple raw output

```
-ln(-x^4-x^2*y(x)+4*y(x)^2)-ln(-(x^2+y(x))^(1/2)*x+2*y(x))+ln((x^2+y(x))^(1/2)*x
+2*y(x))+1/17*(-2*arctanh(1/17*(x-4*(x^2+y(x))^(1/2))*17^(1/2)/x)-2*arctanh(1/17
*(x^2-8*y(x))*17^(1/2)/x^2)+2*arctanh(1/17*(4*(x^2+y(x))^(1/2)+x)*17^(1/2)/x))*1
7^(1/2)-_C1 = 0, ln(-x^4-x^2*y(x)+4*y(x)^2)-ln(-(x^2+y(x))^(1/2)*x+2*y(x))+ln((x
^2+y(x))^(1/2)*x+2*y(x))+1/17*(-2*arctanh(1/17*(x-4*(x^2+y(x))^(1/2))*17^(1/2)/x
)+2*arctanh(1/17*(x^2-8*y(x))*17^(1/2)/x^2)+2*arctanh(1/17*(4*(x^2+y(x))^(1/2)+x
)*17^(1/2)/x))*17^(1/2)-_C1 = 0
```

4.756 $x^2 + y'(x)^2 = 4y(x)$

ODE

$$x^2 + y'(x)^2 = 4y(x)$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.673638 (sec), leaf count = 158

$$\left\{\text{Solve}\left[\frac{y(x)}{x^2-2y(x)}+\frac{1}{2}\left(\log\left(x^2-2y(x)\right)-\frac{x\sqrt{4y(x)-x^2}}{x^2-2y(x)}\right)+\tanh^{-1}\left(\frac{x}{\sqrt{4y(x)-x^2}}\right)=c_1,y(x)\right],\text{Solve}\left[\frac{1}{2}\left(\frac{x\sqrt{4y(x)}}{x^2-2y}\right.\right.\right.$$

Maple ✓
cpu = 0.137 (sec), leaf count = 212

$$\left\{-x\left(\sqrt{4\,y\left(x\right)-x^2}+x\right)^{-1}-\ln\left(\sqrt{4\,y\left(x\right)-x^2}+x\right)+x\left(x-\sqrt{4\,y\left(x\right)-x^2}\right)^{-1}+\ln\left(-x+\sqrt{4\,y\left(x\right)-x^2}\right)-\frac{x^2}{x^2-2\,y\left(x\right.}\right.$$

Mathematica raw input

```
DSolve[x^2 + y'[x]^2 == 4*y[x],y[x],x]
```

Mathematica raw output

```
{Solve[ArcTanh[x/Sqrt[-x^2 + 4*y[x]]] + y[x]/(x^2 - 2*y[x]) + (Log[x^2 - 2*y[x]]
 - (x*Sqrt[-x^2 + 4*y[x]])/(x^2 - 2*y[x]))/2 == C[1], y[x]], Solve[(-2*ArcTanh[x
/Sqrt[-x^2 + 4*y[x]]] + Log[x^2 - 2*y[x]] + (2*y[x])/(x^2 - 2*y[x]) + (x*Sqrt[-x
^2 + 4*y[x]])/(x^2 - 2*y[x]))/2 == C[1], y[x]]}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+x^2 = 4*y(x), y(x),'implicit')
```

Maple raw output

```
-x/((4*y(x)-x^2)^(1/2)+x)-ln((4*y(x)-x^2)^(1/2)+x)+x/(x-(4*y(x)-x^2)^(1/2))+ln(-
x+(4*y(x)-x^2)^(1/2))+x^2/(x^2-2*y(x))+ln(-x^2+2*y(x))-_C1 = 0, -x/((4*y(x)-x^2)
^(1/2)+x)-ln((4*y(x)-x^2)^(1/2)+x)+x/(x-(4*y(x)-x^2)^(1/2))+ln(-x+(4*y(x)-x^2)^(
1/2))-x^2/(x^2-2*y(x))-ln(-x^2+2*y(x))-_C1 = 0
```

4.757 $3x^2 + y'(x)^2 = 8y(x)$

ODE

$$3x^2 + y'(x)^2 = 8y(x)$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.740935 (sec), leaf count = 1865

$$\left\{\left\{y(x) \to \frac{1}{96}\left(144x^2 + 32\cosh(2c_1) + 32\sinh(2c_1) - 8\ 2^{2/3}\sqrt[3]{-729\cosh(2c_1)\,x^4 - 729\sinh(2c_1)\,x^4 - 270\cosh(4c_1)\,x^2 -\right.\right.$$

Maple ✓
cpu = 0.137 (sec), leaf count = 418

$$\left\{\frac{1}{\left(3x^2 - 2y(x)\right)^3}\left(\left(3x^5 - 14x^3 y(x) + 16x(y(x))^2\right)\sqrt{8y(x) - 3x^2} - 512\_C1\,(y(x))^5 + 1536x^2\_C1\,(y(x))^4 + \left(64\,(8y(\right.\right.$$

Mathematica raw input

```
DSolve[3*x^2 + y'[x]^2 == 8*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (144*x^2 + 32*Cosh[2*C[1]] + 32*Sinh[2*C[1]] - (16*2^(1/3)*(54*x^2*Cos
h[2*C[1]] + Cosh[4*C[1]] + 54*x^2*Sinh[2*C[1]] + Sinh[4*C[1]]))/(-729*x^4*Cosh[2
*C[1]] - 270*x^2*Cosh[4*C[1]] + 2*Cosh[6*C[1]] - 729*x^4*Sinh[2*C[1]] - 270*x^2*
Sinh[4*C[1]] + 2*Sinh[6*C[1]] + 3*Sqrt[3]*Sqrt[x^2*((-4 + 27*x^2)*Cosh[C[1]] - (
4 + 27*x^2)*Sinh[C[1]])^3*(Cosh[7*C[1]] + Sinh[7*C[1]])])^(1/3) - 8*2^(2/3)*(-72
9*x^4*Cosh[2*C[1]] - 270*x^2*Cosh[4*C[1]] + 2*Cosh[6*C[1]] - 729*x^4*Sinh[2*C[1]
] - 270*x^2*Sinh[4*C[1]] + 2*Sinh[6*C[1]] + 3*Sqrt[3]*Sqrt[x^2*((-4 + 27*x^2)*Co
sh[C[1]] - (4 + 27*x^2)*Sinh[C[1]])^3*(Cosh[7*C[1]] + Sinh[7*C[1]])])^(1/3))/96}
, {y[x] -> (288*x^2 + 64*Cosh[2*C[1]] + 64*Sinh[2*C[1]] + (16*2^(1/3)*(1 + I*Sqr
t[3])*(54*x^2*Cosh[2*C[1]] + Cosh[4*C[1]] + 54*x^2*Sinh[2*C[1]] + Sinh[4*C[1]]))
/(-729*x^4*Cosh[2*C[1]] - 270*x^2*Cosh[4*C[1]] + 2*Cosh[6*C[1]] - 729*x^4*Sinh[2
*C[1]] - 270*x^2*Sinh[4*C[1]] + 2*Sinh[6*C[1]] + 3*Sqrt[3]*Sqrt[x^2*((-4 + 27*x^
2)*Cosh[C[1]] - (4 + 27*x^2)*Sinh[C[1]])^3*(Cosh[7*C[1]] + Sinh[7*C[1]])])^(1/3)
```

```
 + 8*2^(2/3)*(1 - I*Sqrt[3])*(-729*x^4*Cosh[2*C[1]] - 270*x^2*Cosh[4*C[1]] + 2*C
osh[6*C[1]] - 729*x^4*Sinh[2*C[1]] - 270*x^2*Sinh[4*C[1]] + 2*Sinh[6*C[1]] + 3*S
qrt[3]*Sqrt[x^2*((-4 + 27*x^2)*Cosh[C[1]] - (4 + 27*x^2)*Sinh[C[1]])^3*(Cosh[7*C
[1]] + Sinh[7*C[1]])])^(1/3))/192}, {y[x] -> (288*x^2 + 64*Cosh[2*C[1]] + 64*Sin
h[2*C[1]] + (16*2^(1/3)*(1 - I*Sqrt[3])*(54*x^2*Cosh[2*C[1]] + Cosh[4*C[1]] + 54
*x^2*Sinh[2*C[1]] + Sinh[4*C[1]]))/(-729*x^4*Cosh[2*C[1]] - 270*x^2*Cosh[4*C[1]]
 + 2*Cosh[6*C[1]] - 729*x^4*Sinh[2*C[1]] - 270*x^2*Sinh[4*C[1]] + 2*Sinh[6*C[1]]
 + 3*Sqrt[3]*Sqrt[x^2*((-4 + 27*x^2)*Cosh[C[1]] - (4 + 27*x^2)*Sinh[C[1]])^3*(Co
sh[7*C[1]] + Sinh[7*C[1]])])^(1/3) + 8*2^(2/3)*(1 + I*Sqrt[3])*(-729*x^4*Cosh[2*
C[1]] - 270*x^2*Cosh[4*C[1]] + 2*Cosh[6*C[1]] - 729*x^4*Sinh[2*C[1]] - 270*x^2*S
inh[4*C[1]] + 2*Sinh[6*C[1]] + 3*Sqrt[3]*Sqrt[x^2*((-4 + 27*x^2)*Cosh[C[1]] - (4
 + 27*x^2)*Sinh[C[1]])^3*(Cosh[7*C[1]] + Sinh[7*C[1]])])^(1/3))/192}, {y[x] -> (
144*x^2 - 32*Cosh[2*C[1]] - 32*Sinh[2*C[1]] + (16*2^(1/3)*(54*x^2*Cosh[2*C[1]] -
 Cosh[4*C[1]] + 54*x^2*Sinh[2*C[1]] - Sinh[4*C[1]]))/(729*x^4*Cosh[2*C[1]] - 270
*x^2*Cosh[4*C[1]] - 2*Cosh[6*C[1]] + 729*x^4*Sinh[2*C[1]] - 270*x^2*Sinh[4*C[1]]
 - 2*Sinh[6*C[1]] + 3*Sqrt[3]*Sqrt[x^2*((4 + 27*x^2)*Cosh[C[1]] + (4 - 27*x^2)*S
inh[C[1]])^3*(Cosh[7*C[1]] + Sinh[7*C[1]])])^(1/3) - 8*2^(2/3)*(729*x^4*Cosh[2*C
[1]] - 270*x^2*Cosh[4*C[1]] - 2*Cosh[6*C[1]] + 729*x^4*Sinh[2*C[1]] - 270*x^2*Si
nh[4*C[1]] - 2*Sinh[6*C[1]] + 3*Sqrt[3]*Sqrt[x^2*((4 + 27*x^2)*Cosh[C[1]] + (4 -
 27*x^2)*Sinh[C[1]])^3*(Cosh[7*C[1]] + Sinh[7*C[1]])])^(1/3))/96}, {y[x] -> (288
*x^2 - 64*Cosh[2*C[1]] - 64*Sinh[2*C[1]] - ((16*I)*2^(1/3)*(-I + Sqrt[3])*(54*x^
2*Cosh[2*C[1]] - Cosh[4*C[1]] + 54*x^2*Sinh[2*C[1]] - Sinh[4*C[1]]))/(729*x^4*Co
sh[2*C[1]] - 270*x^2*Cosh[4*C[1]] - 2*Cosh[6*C[1]] + 729*x^4*Sinh[2*C[1]] - 270*
x^2*Sinh[4*C[1]] - 2*Sinh[6*C[1]] + 3*Sqrt[3]*Sqrt[x^2*((4 + 27*x^2)*Cosh[C[1]]
 + (4 - 27*x^2)*Sinh[C[1]])^3*(Cosh[7*C[1]] + Sinh[7*C[1]])])^(1/3) + 8*2^(2/3)*(
1 - I*Sqrt[3])*(729*x^4*Cosh[2*C[1]] - 270*x^2*Cosh[4*C[1]] - 2*Cosh[6*C[1]] + 7
29*x^4*Sinh[2*C[1]] - 270*x^2*Sinh[4*C[1]] - 2*Sinh[6*C[1]] + 3*Sqrt[3]*Sqrt[x^2
*((4 + 27*x^2)*Cosh[C[1]] + (4 - 27*x^2)*Sinh[C[1]])^3*(Cosh[7*C[1]] + Sinh[7*C[
1]])])^(1/3))/192}, {y[x] -> (288*x^2 - 64*Cosh[2*C[1]] - 64*Sinh[2*C[1]] + ((16
*I)*2^(1/3)*(I + Sqrt[3])*(54*x^2*Cosh[2*C[1]] - Cosh[4*C[1]] + 54*x^2*Sinh[2*C[
1]] - Sinh[4*C[1]]))/(729*x^4*Cosh[2*C[1]] - 270*x^2*Cosh[4*C[1]] - 2*Cosh[6*C[1
]] + 729*x^4*Sinh[2*C[1]] - 270*x^2*Sinh[4*C[1]] - 2*Sinh[6*C[1]] + 3*Sqrt[3]*Sq
rt[x^2*((4 + 27*x^2)*Cosh[C[1]] + (4 - 27*x^2)*Sinh[C[1]])^3*(Cosh[7*C[1]] + Sin
h[7*C[1]])])^(1/3) + 8*2^(2/3)*(1 + I*Sqrt[3])*(729*x^4*Cosh[2*C[1]] - 270*x^2*C
osh[4*C[1]] - 2*Cosh[6*C[1]] + 729*x^4*Sinh[2*C[1]] - 270*x^2*Sinh[4*C[1]] - 2*S
inh[6*C[1]] + 3*Sqrt[3]*Sqrt[x^2*((4 + 27*x^2)*Cosh[C[1]] + (4 - 27*x^2)*Sinh[C[
1]])^3*(Cosh[7*C[1]] + Sinh[7*C[1]])])^(1/3))/192}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+3*x^2 = 8*y(x), y(x),'implicit')
```

Maple raw output

```
((3*x^5-14*x^3*y(x)+16*x*y(x)^2)*(8*y(x)-3*x^2)^(1/2)-512*_C1*y(x)^5+1536*x^2*_C
1*y(x)^4+(64*(8*y(x)-3*x^2)^(3/2)*x*_C1+576*x^4*_C1+16)*y(x)^3+(-288*(8*y(x)-3*x
```

```
^2)^(3/2)*x^3*_C1-6048*_C1*x^6+16*x^2)*y(x)^2+(432*(8*y(x)-3*x^2)^(3/2)*x^5*_C1+
6480*_C1*x^8-30*x^4)*y(x)-216*(8*y(x)-3*x^2)^(3/2)*_C1*x^7-1944*_C1*x^10+9*x^6)/
(3*x-(8*y(x)-3*x^2)^(1/2))^3/((8*y(x)-3*x^2)^(1/2)+x)/(3*x^2-2*y(x))^3 = 0, (81*
x*(x^2-8/3*y(x))*(x^2-2/3*y(x))^3*(8*y(x)-3*x^2)^(1/2)+64*y(x)^5-192*x^2*y(x)^4+
(-72*x^4-128*_C1)*y(x)^3+(756*x^6-128*_C1*x^2)*y(x)^2+(-810*x^8+16*(8*y(x)-3*x^2
)^(3/2)*x*_C1+240*x^4*_C1)*y(x)+243*x^10-8*(8*y(x)-3*x^2)^(3/2)*x^3*_C1-72*_C1*x
^6)/(3*x-(8*y(x)-3*x^2)^(1/2))^3/((8*y(x)-3*x^2)^(1/2)+x)/(x^2-2*y(x)) = 0
```

4.758 $ax^2 + by(x) + y'(x)^2 = 0$

ODE

$$ax^2 + by(x) + y'(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✗
cpu = 599.992 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.249 (sec), leaf count = 280

$$\left\{\int_{\_b}^{x} -1\sqrt{-\_a^2 a - by\left(\_a\right)}\left(\sqrt{-\_a^2 a - by\left(\_a\right)}\_a - 2\,y(x)\right)^{-1} d\_a + \int^{y(x)} \left(\sqrt{-ax^2 - \_f\,bx} - 2\,\_f\right)^{-1} - \int_{\_b}^{x} 1\left(-\_f\,b\frac{}{\sqrt{-}}\right.$$

Mathematica raw input

```
DSolve[a*x^2 + b*y[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^2+a*x^2+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
Int(-1/((-_a^2*a-b*y(x))^(1/2)*_a-2*y(x))*(-_a^2*a-b*y(x))^(1/2),_a = _b .. x)+I
ntat(1/((-a*x^2-_f*b)^(1/2)*x-2*_f)-Int((-b*_f/(-_a^2*a-_f*b)^(1/2)-2*(-_a^2*a-_
f*b)^(1/2))/((-_a^2*a-_f*b)^(1/2)*_a-2*_f)^2,_a = _b .. x),_f = y(x))+_C1 = 0, I
nt(-1/((-_a^2*a-b*y(x))^(1/2)*_a+2*y(x))*(-_a^2*a-b*y(x))^(1/2),_a = _b .. x)+In
tat(-1/((-a*x^2-_f*b)^(1/2)*x+2*_f)-Int((b*_f/(-_a^2*a-_f*b)^(1/2)+2*(-_a^2*a-_f
*b)^(1/2))/((-_a^2*a-_f*b)^(1/2)*_a+2*_f)^2,_a = _b .. x),_f = y(x))+_C1 = 0
```

4.759 $y'(x)^2 = y(x)^2 + 1$

ODE

$$y'(x)^2 = y(x)^2 + 1$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0182653 (sec), leaf count = 23

$$\{\{y(x) \to -\sinh(x - c_1)\}, \{y(x) \to \sinh(c_1 + x)\}\}$$

Maple ✓
cpu = 0.037 (sec), leaf count = 31

$$\left\{1 + (y(x))^2 = 0, x - Arcsinh(y(x)) - \_C1 = 0, x + Arcsinh(y(x)) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 == 1 + y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sinh[x - C[1]]}, {y[x] -> Sinh[x + C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = 1+y(x)^2, y(x),'implicit')
```

Maple raw output

```
1+y(x)^2 = 0, x-arcsinh(y(x))-_C1 = 0, x+arcsinh(y(x))-_C1 = 0
```

4.760 $y'(x)^2 = 1 - y(x)^2$

ODE

$$y'(x)^2 = 1 - y(x)^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0206683 (sec), leaf count = 23

$$\{\{y(x) \to -\sin(x - c_1)\}, \{y(x) \to \sin(c_1 + x)\}\}$$

Maple ✓
cpu = 0.036 (sec), leaf count = 31

$$\left\{(y(x))^2 - 1 = 0, x - \arcsin(y(x)) - \_C1 = 0, x + \arcsin(y(x)) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 == 1 - y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sin[x - C[1]]}, {y[x] -> Sin[x + C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = 1-y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x)^2-1 = 0, x-arcsin(y(x))-_C1 = 0, x+arcsin(y(x))-_C1 = 0
```

4.761 $y'(x)^2 = a^2 - y(x)^2$

ODE

$$y'(x)^2 = a^2 - y(x)^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0446303 (sec), leaf count = 99

$$\left\{\left\{y(x) \to -\frac{a\tan(x-c_1)}{\sqrt{\sec^2(x-c_1)}}\right\}, \left\{y(x) \to \frac{a\tan(x-c_1)}{\sqrt{\sec^2(x-c_1)}}\right\}, \left\{y(x) \to -\frac{a\tan(c_1+x)}{\sqrt{\sec^2(c_1+x)}}\right\}, \left\{y(x) \to \frac{a\tan(c_1+x)}{\sqrt{\sec^2(c_1+x)}}\right\}\right\}$$

Maple ✓
cpu = 0.047 (sec), leaf count = 61

$$\left\{(y(x))^2 - a^2 = 0, x - \arctan\left(y(x)\frac{1}{\sqrt{a^2-(y(x))^2}}\right) - \_C1 = 0, x + \arctan\left(y(x)\frac{1}{\sqrt{a^2-(y(x))^2}}\right) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 == a^2 - y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a*Tan[x - C[1]])/Sqrt[Sec[x - C[1]]^2])}, {y[x] -> (a*Tan[x - C[1]]
)/Sqrt[Sec[x - C[1]]^2]}, {y[x] -> -((a*Tan[x + C[1]])/Sqrt[Sec[x + C[1]]^2])},
{y[x] -> (a*Tan[x + C[1]])/Sqrt[Sec[x + C[1]]^2]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = a^2-y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x)^2-a^2 = 0, x-arctan(y(x)/(a^2-y(x)^2)^(1/2))-_C1 = 0, x+arctan(y(x)/(a^2-y(
x)^2)^(1/2))-_C1 = 0
```

4.762 $y'(x)^2 = a^2 y(x)^2$

ODE

$$y'(x)^2 = a^2 y(x)^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.00433385 (sec), leaf count = 26

$$\left\{\left\{y(x) \to c_1 e^{-ax}\right\}, \left\{y(x) \to c_1 e^{ax}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 20

$$\left\{y(x) = \_C1\, \mathrm{e}^{ax}, y(x) = \_C1\, \mathrm{e}^{-ax}\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 == a^2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(a*x)}, {y[x] -> E^(a*x)*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = a^2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(a*x), y(x) = _C1*exp(-a*x)
```

4.763 $y'(x)^2 = a + by(x)^2$

ODE

$$y'(x)^2 = a + by(x)^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0973104 (sec), leaf count = 93

$$\left\{\left\{y(x) \to \frac{e^{-\sqrt{b}(c_1+x)}\left(e^{2\sqrt{b}(c_1+x)} - ab\right)}{2b}\right\}, \left\{y(x) \to \frac{e^{-\sqrt{b}(c_1+x)}\left(e^{2\sqrt{b}c_1} - abe^{2\sqrt{b}x}\right)}{2b}\right\}\right\}$$

Maple ✓
cpu = 0.036 (sec), leaf count = 72

$$\left\{(y(x))^2 + \frac{a}{b} = 0, x - 1\ln\left(\sqrt{b}y(x) + \sqrt{a + b\left(y\left(x\right)\right)^2}\right)\frac{1}{\sqrt{b}} - \_C1 = 0, x + 1\ln\left(\sqrt{b}y(x) + \sqrt{a + b\left(y\left(x\right)\right)^2}\right)\frac{1}{\sqrt{b}} - \_C1 =\right.$$

Mathematica raw input

```
DSolve[y'[x]^2 == a + b*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(a*b) + E^(2*Sqrt[b]*(x + C[1])))/(2*b*E^(Sqrt[b]*(x + C[1])))}, {y[
x] -> (-(a*b*E^(2*Sqrt[b]*x)) + E^(2*Sqrt[b]*C[1]))/(2*b*E^(Sqrt[b]*(x + C[1])))
}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = a+b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x)^2+a/b = 0, x-ln(b^(1/2)*y(x)+(a+b*y(x)^2)^(1/2))/b^(1/2)-_C1 = 0, x+ln(b^(1
/2)*y(x)+(a+b*y(x)^2)^(1/2))/b^(1/2)-_C1 = 0
```

4.764 $y'(x)^2 = x^2 y(x)^2$

ODE

$$y'(x)^2 = x^2 y(x)^2$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00432521 (sec), leaf count = 33

$$\left\{\left\{y(x) \to c_1 e^{-\frac{x^2}{2}}\right\}, \left\{y(x) \to c_1 e^{\frac{x^2}{2}}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 23

$$\left\{y(x) = \_C1\, \mathrm{e}^{-\frac{x^2}{2}}, y(x) = \_C1\, \mathrm{e}^{\frac{x^2}{2}}\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 == x^2*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(x^2/2)}, {y[x] -> E^(x^2/2)*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = x^2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(1/2*x^2), y(x) = _C1*exp(-1/2*x^2)
```

4.765 $y'(x)^2 = (y(x)-1)y(x)^2$

ODE

$$y'(x)^2 = (y(x)-1)y(x)^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0217739 (sec), leaf count = 35

$$\left\{\left\{y(x)\to \sec^2\left(\frac{1}{2}(x-c_1)\right)\right\},\left\{y(x)\to \tan^2\left(\frac{1}{2}(c_1+x)\right)+1\right\}\right\}$$

Maple ✓
cpu = 0.035 (sec), leaf count = 37

$$\left\{x-2\arctan\left(\sqrt{y(x)-1}\right)-\_C1=0, x+2\arctan\left(\sqrt{y(x)-1}\right)-\_C1=0, y(x)=1\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 == (-1 + y[x])*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sec[(x - C[1])/2]^2}, {y[x] -> 1 + Tan[(x + C[1])/2]^2}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = (y(x)-1)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1, x-2*arctan((y(x)-1)^(1/2))-_C1 = 0, x+2*arctan((y(x)-1)^(1/2))-_C1 = 0
```

4.766 $y'(x)^2 = (y(x)-a)(y(x)-b)(y(x)-c)$

ODE

$$y'(x)^2 = (y(x)-a)(y(x)-b)(y(x)-c)$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.602337 (sec), leaf count = 173

$$\left\{\left\{y(x)\to \text{ns}\left(\frac{1}{2}\sqrt{a-b}(c_1-ix)\,|\,\frac{a-c}{a-b}\right)^2\left(a\text{sn}\left(\frac{1}{2}\sqrt{a-b}(c_1-ix)\,|\,\frac{a-c}{a-b}\right)^2-a+b\right)\right\},\left\{y(x)\to \text{ns}\left(\frac{1}{2}\sqrt{a-b}(ix+c_1)\,|\,\frac{c}{a}\right.\right.\right.$$

Maple ✓
cpu = 0.159 (sec), leaf count = 90

$$\left\{-(c-y(x))\,(b-y(x))\,(a-y(x))=0, x-\int^{y(x)}\frac{1}{\sqrt{(\_a-a)\,(\_a-b)\,(\_a-c)}}d\_a-\_C1=0, x-\int^{y(x)}-\frac{}{\sqrt{-(-\_a+}\right.$$

Mathematica raw input

```
DSolve[y'[x]^2 == (-a + y[x])*(-b + y[x])*(-c + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> JacobiNS[(Sqrt[a - b]*((-I)*x + C[1]))/2, (a - c)/(a - b)]^2*(-a + b +
  a*JacobiSN[(Sqrt[a - b]*((-I)*x + C[1]))/2, (a - c)/(a - b)]^2)}, {y[x] -> Jaco
biNS[(Sqrt[a - b]*(I*x + C[1]))/2, (a - c)/(a - b)]^2*(-a + b + a*JacobiSN[(Sqrt
[a - b]*(I*x + C[1]))/2, (a - c)/(a - b)]^2)}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = (y(x)-a)*(y(x)-b)*(y(x)-c), y(x),'implicit')
```

Maple raw output

```
-(c-y(x))*(b-y(x))*(a-y(x)) = 0, x-Intat(1/((_a-a)*(_a-b)*(_a-c))^(1/2),_a = y(x
))-_C1 = 0, x-Intat(-1/(-(-_a+a)*(-_a+b)*(c-_a))^(1/2),_a = y(x))-_C1 = 0
```

4.767 $y'(x)^2 = a^2 y(x)^n$

ODE

$$y'(x)^2 = a^2 y(x)^n$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0470141 (sec), leaf count = 68

$$\left\{\left\{y(x) \to 2^{\frac{2}{n-2}} \left(-(n-2)(ax+c_1)\right)^{-\frac{2}{n-2}}\right\}, \left\{y(x) \to 2^{\frac{2}{n-2}} \left((n-2)(ax-c_1)\right)^{-\frac{2}{n-2}}\right\}\right\}$$

Maple ✓
cpu = 0.035 (sec), leaf count = 51

$$\left\{x - 2\frac{y(x)}{(n-2)\sqrt{(y(x))^n a}} - \_C1 = 0, x + 2\frac{y(x)}{(n-2)\sqrt{(y(x))^n a}} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 == a^2*y[x]^n,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2^(2/(-2 + n))/(-((-2 + n)*(a*x + C[1])))^(2/(-2 + n))}, {y[x] -> 2^(2
/(-2 + n))/((-2 + n)*(a*x - C[1]))^(2/(-2 + n))}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = a^2*y(x)^n, y(x),'implicit')
```

Maple raw output

```
x+2*y(x)/(n-2)/(y(x)^n)^(1/2)/a-_C1 = 0, x-2*y(x)/(n-2)/(y(x)^n)^(1/2)/a-_C1 = 0
```

4.768 $y'(x)^2 = a^2 y(x)^2 \left(1 - \log^2(y(x))\right)$

ODE

$$y'(x)^2 = a^2 y(x)^2 \left(1 - \log^2(y(x))\right)$$

ODE Classification

[_quadrature]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.091701 (sec), leaf count = 71

$$\left\{\left\{y(x) \to e^{\frac{1}{2}\left(e^{-c_1+iax}+e^{c_1-iax}\right)}\right\}, \left\{y(x) \to \exp\left(\frac{1}{2}\left(e^{-c_1-iax}+e^{c_1+iax}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.143 (sec), leaf count = 50

$$\left\{x - \frac{\arcsin\left(\ln\left(y(x)\right)\right)}{a} - \_C1 = 0, x + \frac{\arcsin\left(\ln\left(y(x)\right)\right)}{a} - \_C1 = 0, y(x) = \mathrm{e}^{RootOf\left(a^2\left(\mathrm{e}^{-Z}\right)^2\left(\_Z^2-1\right)\right)}\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 == a^2*(1 - Log[y[x]]^2)*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^((E^(I*a*x - C[1]) + E^((-I)*a*x + C[1]))/2)}, {y[x] -> E^((E^((-I)*
a*x - C[1]) + E^(I*a*x + C[1]))/2)}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = a^2*(1-ln(y(x))^2)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(RootOf(a^2*exp(_Z)^2*(_Z^2-1))), x-1/a*arcsin(ln(y(x)))-_C1 = 0, x+1/
a*arcsin(ln(y(x)))-_C1 = 0
```

4.769 $f(x)(y(x)-a)(y(x)-b)+y'(x)^2=0$

ODE

$$f(x)(y(x)-a)(y(x)-b)+y'(x)^2=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 0.239171 (sec), leaf count = 243

$$\left\{\left\{y(x)\to \frac{1}{4}\left(a^2\left(-e^{c_1+\int_1^x -i\sqrt{f(K[1])}\,dK[1]}\right)+2a\left(1+be^{c_1+\int_1^x -i\sqrt{f(K[1])}\,dK[1]}\right)-e^{-c_1-\int_1^x -i\sqrt{f(K[1])}\,dK[1]}\left(-1+be^{c_1+\int_1^x -i\right.\right.\right.$$

Maple ✓
cpu = 0.396 (sec), leaf count = 212

$$\left\{1\sqrt{(y(x)-a)(y(x)-b)}\ln\left(-\frac{a}{2}-\frac{b}{2}+y(x)+\sqrt{(y(x))^2+(-a-b)y(x)+ab}\right)\frac{1}{\sqrt{y(x)-a}}\frac{1}{\sqrt{y(x)-b}}+\int^x 1\sqrt{-f(\_\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])*(-b + y[x]) + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(a^2*E^(C[1] + Integrate[(-I)*Sqrt[f[K[1]]], {K[1], 1, x}])) - E^(-C
[1] - Integrate[(-I)*Sqrt[f[K[1]]], {K[1], 1, x}])*(-1 + b*E^(C[1] + Integrate[(
-I)*Sqrt[f[K[1]]], {K[1], 1, x}]))^2 + 2*a*(1 + b*E^(C[1] + Integrate[(-I)*Sqrt[
f[K[1]]], {K[1], 1, x}])))/4}, {y[x] -> (-(a^2*E^(C[1] + Integrate[I*Sqrt[f[K[2]
]], {K[2], 1, x}])) - E^(-C[1] - Integrate[I*Sqrt[f[K[2]]], {K[2], 1, x}])*(-1 +
 b*E^(C[1] + Integrate[I*Sqrt[f[K[2]]], {K[2], 1, x}]))^2 + 2*a*(1 + b*E^(C[1] +
 Integrate[I*Sqrt[f[K[2]]], {K[2], 1, x}])))/4}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+f(x)*(y(x)-a)*(y(x)-b) = 0, y(x),'implicit')
```

Maple raw output

```
((y(x)-a)*(y(x)-b))^(1/2)/(y(x)-a)^(1/2)/(y(x)-b)^(1/2)*ln(-1/2*a-1/2*b+y(x)+(y(
x)^2+(-a-b)*y(x)+a*b)^(1/2))+Intat(-(-f(_a)*(a-y(x))*(b-y(x)))^(1/2)/(y(x)-a)^(1
/2)/(y(x)-b)^(1/2),_a = x)+_C1 = 0, ((y(x)-a)*(y(x)-b))^(1/2)/(y(x)-a)^(1/2)/(y(
x)-b)^(1/2)*ln(-1/2*a-1/2*b+y(x)+(y(x)^2+(-a-b)*y(x)+a*b)^(1/2))+Intat((-f(_a)*(
a-y(x))*(b-y(x)))^(1/2)/(y(x)-a)^(1/2)/(y(x)-b)^(1/2),_a = x)+_C1 = 0
```

4.770 $f(x)(y(x)-a)^2(y(x)-b)+y'(x)^2=0$

ODE

$$f(x)(y(x)-a)^2(y(x)-b)+y'(x)^2=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 0.265047 (sec), leaf count = 91

$$\left\{\left\{y(x)\to (b-a)\tan^2\left(\frac{1}{2}\sqrt{a-b}\left(\int_1^x -\sqrt{f(K[1])}\,dK[1]+c_1\right)\right)+b\right\},\left\{y(x)\to (b-a)\tan^2\left(\frac{1}{2}\sqrt{a-b}\left(\int_1^x \sqrt{f(K[2])}\,d\right.\right.\right.$$

Maple ✓
cpu = 0.149 (sec), leaf count = 110

$$\left\{2\,\frac{1}{\sqrt{-a+b}}\arctan\left(\frac{\sqrt{y(x)-b}}{\sqrt{-a+b}}\right)+\int^x 1\sqrt{f(\_a)\,(b-y(x))}\,\frac{1}{\sqrt{y(x)-b}}\,d\_a+\_C1=0,2\,\frac{1}{\sqrt{-a+b}}\arctan\left(\frac{\sqrt{y(x)-b}}{\sqrt{-a+b}}\right.\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])^2*(-b + y[x]) + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> b + (-a + b)*Tan[(Sqrt[a - b]*(C[1] + Integrate[-Sqrt[f[K[1]]], {K[1],
  1, x}]))/2]^2}, {y[x] -> b + (-a + b)*Tan[(Sqrt[a - b]*(C[1] + Integrate[Sqrt[f
[K[2]]], {K[2], 1, x}]))/2]^2}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+f(x)*(y(x)-a)^2*(y(x)-b) = 0, y(x),'implicit')
```

Maple raw output

```
2/(-a+b)^(1/2)*arctan((y(x)-b)^(1/2)/(-a+b)^(1/2))+Intat((f(_a)*(b-y(x)))^(1/2)/
(y(x)-b)^(1/2),_a = x)+_C1 = 0, 2/(-a+b)^(1/2)*arctan((y(x)-b)^(1/2)/(-a+b)^(1/2
))+Intat(-(f(_a)*(b-y(x)))^(1/2)/(y(x)-b)^(1/2),_a = x)+_C1 = 0
```

4.771 $f(x)(y(x)-a)(y(x)-b)(y(x)-c)+y'(x)^2=0$

ODE

$$f(x)(y(x)-a)(y(x)-b)(y(x)-c)+y'(x)^2=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 0.491013 (sec), leaf count = 209

$$\left\{\left\{y(x)\to \text{ns}\left(\frac{1}{2}\sqrt{a-b}\left(c_1+\int_1^x-\sqrt{f(K[1])}\,dK[1]\right)|\frac{a-c}{a-b}\right)^2\left(a\text{sn}\left(\frac{1}{2}\sqrt{a-b}\left(c_1+\int_1^x-\sqrt{f(K[1])}\,dK[1]\right)|\frac{a-c}{a-b}\right)^2-\right.\right.$$

Maple ✓
cpu = 0.195 (sec), leaf count = 158

$$\left\{\int^{y(x)}\frac{1}{\sqrt{-(-\_a+c)(-\_a+b)(-\_a+a)}}d\_a+\int^x 1\sqrt{f(\_a)(c-y(x))(b-y(x))(a-y(x))}\frac{1}{\sqrt{-(c-y(x))(b-y(x)}}\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])*(-b + y[x])*(-c + y[x]) + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> JacobiNS[(Sqrt[a - b]*(C[1] + Integrate[-Sqrt[f[K[1]]], {K[1], 1, x}])
)/2, (a - c)/(a - b)]^2*(-a + b + a*JacobiSN[(Sqrt[a - b]*(C[1] + Integrate[-Sqr
t[f[K[1]]], {K[1], 1, x}]))/2, (a - c)/(a - b)]^2)}, {y[x] -> JacobiNS[(Sqrt[a -
 b]*(C[1] + Integrate[Sqrt[f[K[2]]], {K[2], 1, x}]))/2, (a - c)/(a - b)]^2*(-a +
 b + a*JacobiSN[(Sqrt[a - b]*(C[1] + Integrate[Sqrt[f[K[2]]], {K[2], 1, x}]))/2,
 (a - c)/(a - b)]^2)}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+f(x)*(y(x)-a)*(y(x)-b)*(y(x)-c) = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/(-(-_a+c)*(-_a+b)*(-_a+a))^(1/2),_a = y(x))+Intat(-(f(_a)*(c-y(x))*(b-y(
x))*(a-y(x)))^(1/2)/(-(c-y(x))*(b-y(x))*(a-y(x)))^(1/2),_a = x)+_C1 = 0, Intat(1
/(-(-_a+c)*(-_a+b)*(-_a+a))^(1/2),_a = y(x))+Intat((f(_a)*(c-y(x))*(b-y(x))*(a-y
(x)))^(1/2)/(-(c-y(x))*(b-y(x))*(a-y(x)))^(1/2),_a = x)+_C1 = 0
```

4.772 $f(x)(y(x)-a)^2(y(x)-b)(y(x)-c)+y'(x)^2=0$

ODE

$$f(x)(y(x)-a)^2(y(x)-b)(y(x)-c)+y'(x)^2=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 0.720837 (sec), leaf count = 931

$$\left\{\left\{y(x)\to \frac{a\left(e^{2\sqrt{b-a}\sqrt{c-a}\left(c_1+\int_1^x -i\sqrt{f(K[1])}\,dK[1]\right)}b^2-2e^{\sqrt{b-a}\sqrt{c-a}\left(c_1+\int_1^x -i\sqrt{f(K[1])}\,dK[1]\right)}\left(ce^{\sqrt{b-a}\sqrt{c-a}\left(c_1+\int_1^x -i\sqrt{f(K[1])}\,dK[1]\right.}\right.\right.\right.}{e^{2\sqrt{b-a}\sqrt{c-a}\left(c_1+\int_1^x -i\sqrt{f(K[1])}\,dK[1]\right)}b^2-2e^{\sqrt{b-a}\sqrt{c-a}\left(c_1+\int_1^x -i\sqrt{f(K[1])}\,dK[1]\right)}\left(e^{\sqrt{b-a}\sqrt{c-a}\left(c_1+\int_1^x -i\sqrt{f(K[1])}\,dK\right.}\right.}$$

Maple ✓
cpu = 0.247 (sec), leaf count = 382

$$\left\{\frac{1}{(a-b)(a-c)}\left(-\ln\left(\frac{1}{a-y(x)}\left(-2\sqrt{(a-b)(a-c)}\sqrt{(b-y(x))(c-y(x))}+(-2a+b+c)y(x)+(b+c)a-2cb\right)\right)\sqrt{\right.\right.\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])^2*(-b + y[x])*(-c + y[x]) + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-4*b*c*E^(Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + Integrate[(-I)*Sqrt[f[K[1
]]], {K[1], 1, x}])) + a*(b^2*E^(2*Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + Integrate[(
-I)*Sqrt[f[K[1]]], {K[1], 1, x}])) - 2*b*E^(Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + In
tegrate[(-I)*Sqrt[f[K[1]]], {K[1], 1, x}]))*(-1 + c*E^(Sqrt[-a + b]*Sqrt[-a + c]
*(C[1] + Integrate[(-I)*Sqrt[f[K[1]]], {K[1], 1, x}]))) + (1 + c*E^(Sqrt[-a + b]
*Sqrt[-a + c]*(C[1] + Integrate[(-I)*Sqrt[f[K[1]]], {K[1], 1, x}])))^2))/(4*a*E^
(Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + Integrate[(-I)*Sqrt[f[K[1]]], {K[1], 1, x}]))
 + b^2*E^(2*Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + Integrate[(-I)*Sqrt[f[K[1]]], {K[1
], 1, x}])) + (-1 + c*E^(Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + Integrate[(-I)*Sqrt[f
[K[1]]], {K[1], 1, x}])))^2 - 2*b*E^(Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + Integrate
[(-I)*Sqrt[f[K[1]]], {K[1], 1, x}]))*(1 + c*E^(Sqrt[-a + b]*Sqrt[-a + c]*(C[1] +
 Integrate[(-I)*Sqrt[f[K[1]]], {K[1], 1, x}])))}, {y[x] -> (-4*b*c*E^(Sqrt[-a +
```

```
 b]*Sqrt[-a + c]*(C[1] + Integrate[I*Sqrt[f[K[2]]], {K[2], 1, x}])) + a*(b^2*E^(
2*Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + Integrate[I*Sqrt[f[K[2]]], {K[2], 1, x}])) -
 2*b*E^(Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + Integrate[I*Sqrt[f[K[2]]], {K[2], 1, x
}]))*(-1 + c*E^(Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + Integrate[I*Sqrt[f[K[2]]], {K[
2], 1, x}]))) + (1 + c*E^(Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + Integrate[I*Sqrt[f[K
[2]]], {K[2], 1, x}])))^2))/(4*a*E^(Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + Integrate[
I*Sqrt[f[K[2]]], {K[2], 1, x}])) + b^2*E^(2*Sqrt[-a + b]*Sqrt[-a + c]*(C[1] + In
tegrate[I*Sqrt[f[K[2]]], {K[2], 1, x}])) + (-1 + c*E^(Sqrt[-a + b]*Sqrt[-a + c]*
(C[1] + Integrate[I*Sqrt[f[K[2]]], {K[2], 1, x}]))^2 - 2*b*E^(Sqrt[-a + b]*Sqrt
[-a + c]*(C[1] + Integrate[I*Sqrt[f[K[2]]], {K[2], 1, x}]))*(1 + c*E^(Sqrt[-a +
b]*Sqrt[-a + c]*(C[1] + Integrate[I*Sqrt[f[K[2]]], {K[2], 1, x}])))))}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+f(x)*(y(x)-a)^2*(y(x)-b)*(y(x)-c) = 0, y(x),'implicit')
```

Maple raw output

```
(-ln((-2*((a-b)*(a-c))^(1/2)*((b-y(x))*(c-y(x)))^(1/2)+(-2*a+b+c)*y(x)+(b+c)*a-2
*c*b)/(a-y(x)))*((a-b)*(a-c))^(1/2)*(y(x)-c)^(1/2)*(y(x)-b)^(1/2)+((b-y(x))*(c-y
(x)))^(1/2)*(a-c)*(a-b)*(Intat((-f(_a)*(c-y(x))*(b-y(x)))^(1/2)/(y(x)-b)^(1/2)/(
y(x)-c)^(1/2),_a = x)+_C1))/((b-y(x))*(c-y(x)))^(1/2)/(a-c)/(a-b) = 0, (-ln((-2*
((a-b)*(a-c))^(1/2)*((b-y(x))*(c-y(x)))^(1/2)+(-2*a+b+c)*y(x)+(b+c)*a-2*c*b)/(a-
y(x)))*((a-b)*(a-c))^(1/2)*(y(x)-c)^(1/2)*(y(x)-b)^(1/2)+((b-y(x))*(c-y(x)))^(1/
2)*(a-c)*(a-b)*(Intat(-(-f(_a)*(c-y(x))*(b-y(x)))^(1/2)/(y(x)-b)^(1/2)/(y(x)-c)^
(1/2),_a = x)+_C1))/((b-y(x))*(c-y(x)))^(1/2)/(a-c)/(a-b) = 0
```

4.773 $f(x)(y(x)-\mathbf{a1})(y(x)-\mathbf{a2})(y(x)-\mathbf{a3})(y(x)-\mathbf{a4})+y'(x)^2=0$

ODE

$$f(x)(y(x)-\text{a1})(y(x)-\text{a2})(y(x)-\text{a3})(y(x)-\text{a4})+y'(x)^2=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 2.85498 (sec), leaf count = 413

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{2\sqrt{\text{a2}-\#1}\sqrt{\text{a4}-\#1}\sqrt{\frac{(\#1-\text{a3})(\text{a1}-\text{a2})}{(\#1-\text{a1})(\text{a3}-\text{a2})}}F\left(\sin^{-1}\left(\sqrt{\frac{(\text{a1}-\text{a4})(\#1-\text{a2})}{(\text{a2}-\text{a4})(\#1-\text{a1})}}\right)|\frac{(\text{a1}-\text{a3})(\text{a2}-\text{a4})}{(\text{a2}-\text{a3})(\text{a1}-\text{a4})}\right)}{\sqrt{\text{a1}-\#1}\sqrt{\text{a3}-\#1}(\text{a2}-\text{a4})\sqrt{\frac{(\text{a2}-\#1)(\#1-\text{a4})(\text{a1}-\text{a2})(\text{a1}-\text{a4})}{(\text{a1}-\#1)^2(\text{a2}-\text{a4})^2}}}\&\right.\right.$$

Maple ✓
cpu = 0.242 (sec), leaf count = 190

$$\left\{\int^{y(x)}\frac{1}{\sqrt{(-\_a+a4)(-\_a+a3)(-\_a+a2)(-\_a+a1)}}d\_a+\int^{x}1\sqrt{-f(\_a)(a4-y(x))(a3-y(x))(a2-y(x))(a\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a1 + y[x])*(-a2 + y[x])*(-a3 + y[x])*(-a4 + y[x]) + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(2*EllipticF[ArcSin[Sqrt[((a1 - a4)*(-a2 + #1))/((a2 -
  a4)*(-a1 + #1))]], ((a1 - a3)*(a2 - a4))/((a2 - a3)*(a1 - a4))]*Sqrt[a2 - #1]*S
qrt[a4 - #1]*Sqrt[((a1 - a2)*(-a3 + #1))/((-a2 + a3)*(-a1 + #1))])/((a2 - a4)*Sq
rt[a1 - #1]*Sqrt[a3 - #1]*Sqrt[((a1 - a2)*(a1 - a4)*(a2 - #1)*(-a4 + #1))/((a2 -
  a4)^2*(a1 - #1)^2)]) & ][C[1] + Integrate[(-I)*Sqrt[f[K[1]]], {K[1], 1, x}]]},
{y[x] -> InverseFunction[(2*EllipticF[ArcSin[Sqrt[((a1 - a4)*(-a2 + #1))/((a2 -
a4)*(-a1 + #1))]], ((a1 - a3)*(a2 - a4))/((a2 - a3)*(a1 - a4))]*Sqrt[a2 - #1]*Sq
rt[a4 - #1]*Sqrt[((a1 - a2)*(-a3 + #1))/((-a2 + a3)*(-a1 + #1))])/((a2 - a4)*Sqr
t[a1 - #1]*Sqrt[a3 - #1]*Sqrt[((a1 - a2)*(a1 - a4)*(a2 - #1)*(-a4 + #1))/((a2 -
a4)^2*(a1 - #1)^2)]) & ][C[1] + Integrate[I*Sqrt[f[K[2]]], {K[2], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+f(x)*(y(x)-a1)*(y(x)-a2)*(y(x)-a3)*(y(x)-a4) = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/((-_a+a4)*(-_a+a3)*(-_a+a2)*(-_a+a1))^(1/2),_a = y(x))+Intat(-(-f(_a)*(a
4-y(x))*(a3-y(x))*(a2-y(x))*(a1-y(x)))^(1/2)/((a4-y(x))*(a3-y(x))*(a2-y(x))*(a1-
y(x)))^(1/2),_a = x)+_C1 = 0, Intat(1/((-_a+a4)*(-_a+a3)*(-_a+a2)*(-_a+a1))^(1/2
),_a = y(x))+Intat((-f(_a)*(a4-y(x))*(a3-y(x))*(a2-y(x))*(a1-y(x)))^(1/2)/((a4-y
(x))*(a3-y(x))*(a2-y(x))*(a1-y(x)))^(1/2),_a = x)+_C1 = 0
```

4.774 $y'(x)^2 = f(x)^2(y(x)-a)(y(x)-b)(y(x)-c)^2$

ODE

$$y'(x)^2 = f(x)^2(y(x)-a)(y(x)-b)(y(x)-c)^2$$

ODE Classification

[_separable]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.585993 (sec), leaf count = 865

$$\left\{\left\{y(x)\to \frac{c\left(e^{2\sqrt{a-c}\sqrt{b-c}\left(c_1+\int_1^x -f(K[1])\,dK[1]\right)}a^2-2e^{\sqrt{a-c}\sqrt{b-c}\left(c_1+\int_1^x -f(K[1])\,dK[1]\right)}\left(be^{\sqrt{a-c}\sqrt{b-c}\left(c_1+\int_1^x -f(K\right.\right.\right.}{e^{2\sqrt{a-c}\sqrt{b-c}\left(c_1+\int_1^x -f(K[1])\,dK[1]\right)}a^2-2e^{\sqrt{a-c}\sqrt{b-c}\left(c_1+\int_1^x -f(K[1])\,dK[1]\right)}\left(e^{\sqrt{a-c}\sqrt{b-c}\left(c_1+\int_1^x -f(K[1])\,dK[1]\right)}b+1\right)a+}\right\}\right\}$$

Maple ✓
cpu = 0.154 (sec), leaf count = 195

$$\left\{1\left(-\ln\left(\frac{1}{c-y(x)}\left(-2\sqrt{(b-c)(a-c)}\sqrt{(a-y(x))(b-y(x))}+(a+b-2c)y(x)+(a+b)c-2ab\right)\right)+\sqrt{(b-c)(a-\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[y'[x]^2 == f[x]^2*(-a + y[x])*(-b + y[x])*(-c + y[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-4*a*b*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[-f[K[1]], {K[1],
1, x}])) + c*(a^2*E^(2*Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[-f[K[1]], {K[1]
, 1, x}])) - 2*a*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[-f[K[1]], {K[1], 1
, x}]))*(-1 + b*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[-f[K[1]], {K[1], 1,
 x}]))) + (1 + b*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[-f[K[1]], {K[1], 1
, x}])))^2))/(1 - 2*b*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[-f[K[1]], {K[
1], 1, x}])) + 4*c*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[-f[K[1]], {K[1],
 1, x}])) + a^2*E^(2*Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[-f[K[1]], {K[1],
1, x}])) + b^2*E^(2*Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[-f[K[1]], {K[1], 1
, x}])) - 2*a*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[-f[K[1]], {K[1], 1, x
}]))*(1 + b*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[-f[K[1]], {K[1], 1, x}]
))))}, {y[x] -> (-4*a*b*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[f[K[2]], {K
[2], 1, x}])) + c*(a^2*E^(2*Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[f[K[2]], {
```

```
K[2], 1, x}])) - 2*a*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[f[K[2]], {K[2]
, 1, x}]))*(-1 + b*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[f[K[2]], {K[2],
1, x}])) + (1 + b*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[f[K[2]], {K[2],
1, x}])))^2))/(1 - 2*b*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[f[K[2]], {K[
2], 1, x}])) + 4*c*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[f[K[2]], {K[2],
1, x}])) + a^2*E^(2*Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[f[K[2]], {K[2], 1,
 x}])) + b^2*E^(2*Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[f[K[2]], {K[2], 1, x
}])) - 2*a*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[f[K[2]], {K[2], 1, x}]))
*(1 + b*E^(Sqrt[a - c]*Sqrt[b - c]*(C[1] + Integrate[f[K[2]], {K[2], 1, x}])))))}
}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = f(x)^2*(y(x)-a)*(y(x)-b)*(y(x)-c)^2, y(x),'implicit')
```

Maple raw output

```
(-ln((-2*((b-c)*(a-c))^(1/2)*((a-y(x))*(b-y(x)))^(1/2)+(a+b-2*c)*y(x)+(a+b)*c-2*
a*b)/(c-y(x)))+((b-c)*(a-c))^(1/2)*(_C1+Int(f(x),x)))/((b-c)*(a-c))^(1/2) = 0, (
ln((-2*((b-c)*(a-c))^(1/2)*((a-y(x))*(b-y(x)))^(1/2)+(a+b-2*c)*y(x)+(a+b)*c-2*a*
b)/(c-y(x)))+((b-c)*(a-c))^(1/2)*(_C1+Int(f(x),x)))/((b-c)*(a-c))^(1/2) = 0
```

4.775 $y'(x)^2 = f(x)^2(y(x)-a)(y(x)-b)(y(x)-u(x))^2$

ODE

$$y'(x)^2 = f(x)^2(y(x)-a)(y(x)-b)(y(x)-u(x))^2$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of variable

Mathematica ✗
cpu = 1.90824 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x]^2 == f[x]^2*(-a + y[x])*(-b + y[x])*(-u[x] + y[x])^2, y[x], x]
```

Maple ✗
cpu = 496.507 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x)^2 = f(x)^2*(y(x)-u(x))^2*(y(x)-a)*(y(x)-b), y(x),'implicit')
```

Mathematica raw input

```
DSolve[y'[x]^2 == f[x]^2*(-a + y[x])*(-b + y[x])*(-u[x] + y[x])^2,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x]^2 == f[x]^2*(-a + y[x])*(-b + y[x])*(-u[x] + y[x])^2,
 y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = f(x)^2*(y(x)-u(x))^2*(y(x)-a)*(y(x)-b), y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x)^2 = f(x)^2*(y(x)-u(x))^2*(y(x)-a)*(y(x)-b), y(x),'implicit')
```

4.776 $y'(x)^2 + 2y'(x) + x = 0$

ODE

$$y'(x)^2 + 2y'(x) + x = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0177357 (sec), leaf count = 47

$$\left\{\left\{y(x) \to c_1 - \frac{2}{3}(1-x)^{3/2} - x\right\}, \left\{y(x) \to c_1 + \frac{2}{3}(1-x)^{3/2} - x\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 35

$$\left\{y(x) = -x - \frac{2}{3}(1-x)^{\frac{3}{2}} + \_C1, y(x) = -x + \frac{2}{3}(1-x)^{\frac{3}{2}} + \_C1\right\}$$

Mathematica raw input

```
DSolve[x + 2*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*(1 - x)^(3/2))/3 - x + C[1]}, {y[x] -> (2*(1 - x)^(3/2))/3 - x + C
[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+2*diff(y(x),x)+x = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -x+2/3*(1-x)^(3/2)+_C1, y(x) = -x-2/3*(1-x)^(3/2)+_C1
```

4.777 $a(x-y(x))+y'(x)^2-2y'(x)=0$

ODE

$$a(x-y(x))+y'(x)^2-2y'(x)=0$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.28003 (sec), leaf count = 76

$$\left\{\left\{y(x)\to \frac{1}{4}\left(a\left(-2\sqrt{2}c_1x+2c_1^2+x^2\right)-\frac{4}{a}+4x\right)\right\},\left\{y(x)\to \frac{1}{4}a\left(2\sqrt{2}c_1x+2c_1^2+x^2\right)-\frac{1}{a}+x\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 39

$$\left\{y(x)=\frac{ax-1}{a},[x(\_T)=2\frac{\_T}{a}+\_C1,y(\_T)=\frac{\_C1\,a+\_T^2}{a}]\right\}$$

Mathematica raw input

```
DSolve[a*(x - y[x]) - 2*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-4/a + 4*x + a*(x^2 - 2*Sqrt[2]*x*C[1] + 2*C[1]^2))/4}, {y[x] -> -a^(
-1) + x + (a*(x^2 + 2*Sqrt[2]*x*C[1] + 2*C[1]^2))/4}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-2*diff(y(x),x)+a*(x-y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (a*x-1)/a, [x(_T) = 2*_T/a+_C1, y(_T) = (_C1*a+_T^2)/a]
```

4.778 $y'(x)^2 - 2y'(x) - y(x)^2 = 0$

ODE

$$y'(x)^2 - 2y'(x) - y(x)^2 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0633867 (sec), leaf count = 73

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{\sqrt{\#1^2+1}}{\#1} - \frac{1}{\#1} + \sinh^{-1}(\#1)\&\right][c_1 - x]\right\}, \left\{y(x) \to \text{InverseFunction}\left[-\frac{\sqrt{\#1^2+1}}{\#1} + \frac{1}{\#}\right.\right.\right.$$

Maple ✓
cpu = 0.029 (sec), leaf count = 85

$$\left\{x - (y(x))^{-1} - \frac{1}{y(x)}\left(1+(y(x))^2\right)^{\frac{3}{2}} + y(x)\sqrt{1+(y(x))^2} + Arcsinh(y(x)) - \_C1 = 0, x - (y(x))^{-1} + \frac{1}{y(x)}\left(1+(y(x))^{2}\right.\right.$$

Mathematica raw input

```
DSolve[-y[x]^2 - 2*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[ArcSinh[#1] - #1^(-1) - Sqrt[1 + #1^2]/#1 & ][-x + C[1
]]}, {y[x] -> InverseFunction[ArcSinh[#1] + #1^(-1) - Sqrt[1 + #1^2]/#1 & ][x +
C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-2*diff(y(x),x)-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x-1/y(x)-1/y(x)*(1+y(x)^2)^(3/2)+y(x)*(1+y(x)^2)^(1/2)+arcsinh(y(x))-_C1 = 0, x-
1/y(x)+1/y(x)*(1+y(x)^2)^(3/2)-y(x)*(1+y(x)^2)^(1/2)-arcsinh(y(x))-_C1 = 0
```

4.779 $y'(x)^2 - 5y'(x) + 6 = 0$

ODE

$$y'(x)^2 - 5y'(x) + 6 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Both independent and dependent variable missing

Mathematica ✓
cpu = 0.00234516 (sec), leaf count = 21

$$\{\{y(x) \to c_1 + 2x\}, \{y(x) \to c_1 + 3x\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 17

$$\{y(x) = 2\,x + \_C1, y(x) = 3\,x + \_C1\}$$

Mathematica raw input

```
DSolve[6 - 5*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*x + C[1]}, {y[x] -> 3*x + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-5*diff(y(x),x)+6 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 3*x+_C1, y(x) = 2*x+_C1
```

4.780 $y'(x)^2 - 7y'(x) + 12 = 0$

ODE

$$y'(x)^2 - 7y'(x) + 12 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Both independent and dependent variable missing

Mathematica ✓
cpu = 0.00231956 (sec), leaf count = 21

$$\{\{y(x) \to c_1 + 3x\}, \{y(x) \to c_1 + 4x\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 17

$$\{y(x) = 3\,x + \_C1, y(x) = 4\,x + \_C1\}$$

Mathematica raw input

```
DSolve[12 - 7*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 3*x + C[1]}, {y[x] -> 4*x + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-7*diff(y(x),x)+12 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 4*x+_C1, y(x) = 3*x+_C1
```

4.781 $ay'(x)+b+y'(x)^2=0$

ODE

$$ay'(x)+b+y'(x)^2=0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Both independent and dependent variable missing

Mathematica ✓
cpu = 0.00767415 (sec), leaf count = 53

$$\left\{\left\{y(x)\to c_1-\frac{1}{2}x\left(\sqrt{a^2-4b}+a\right)\right\},\left\{y(x)\to\frac{1}{2}x\left(\sqrt{a^2-4b}-a\right)+c_1\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 43

$$\left\{y(x)=-\frac{x}{2}\sqrt{a^2-4\,b}-\frac{ax}{2}+\_C1,y(x)=\frac{x}{2}\sqrt{a^2-4\,b}-\frac{ax}{2}+\_C1\right\}$$

Mathematica raw input

```
DSolve[b + a*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a + Sqrt[a^2 - 4*b])*x)/2 + C[1]}, {y[x] -> ((-a + Sqrt[a^2 - 4*b])
*x)/2 + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+a*diff(y(x),x)+b = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2*(a^2-4*b)^(1/2)*x-1/2*a*x+_C1, y(x) = 1/2*(a^2-4*b)^(1/2)*x-1/2*a*x+
_C1
```

4.782 $ay'(x) + bx + y'(x)^2 = 0$

ODE

$$ay'(x) + bx + y'(x)^2 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for x

Mathematica ✓
cpu = 0.0403969 (sec), leaf count = 68

$$\left\{\left\{y(x) \to c_1 - \frac{\left(a^2 - 4bx\right)^{3/2} + 6abx}{12b}\right\}, \left\{y(x) \to \frac{1}{2}\left(\frac{\left(a^2 - 4bx\right)^{3/2}}{6b} - ax\right) + c_1\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 49

$$\left\{y(x) = -\frac{ax}{2} - \frac{1}{12\,b}\left(a^2 - 4\,bx\right)^{\frac{3}{2}} + \_C1, y(x) = -\frac{ax}{2} + \frac{1}{12\,b}\left(a^2 - 4\,bx\right)^{\frac{3}{2}} + \_C1\right\}$$

Mathematica raw input

```
DSolve[b*x + a*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(6*a*b*x + (a^2 - 4*b*x)^(3/2))/(12*b) + C[1]}, {y[x] -> (-(a*x) + (a
^2 - 4*b*x)^(3/2)/(6*b))/2 + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+a*diff(y(x),x)+b*x = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2*a*x+1/12*(a^2-4*b*x)^(3/2)/b+_C1, y(x) = -1/2*a*x-1/12*(a^2-4*b*x)^(
3/2)/b+_C1
```

4.783 $ay'(x) + by(x) + y'(x)^2 = 0$

ODE

$$ay'(x) + by(x) + y'(x)^2 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✓
cpu = 0.313858 (sec), leaf count = 110

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{\sqrt{a^2-4\#1b}+a\log\left(\sqrt{a^2-4\#1b}-a\right)}{2b}\&\right]\left[c_1+\frac{x}{2}\right]\right\},\left\{y(x) \to \text{InverseFunction}\left[-\frac{\sqrt{a^2}\right.\right.\right.$$

Maple ✓
cpu = 0.043 (sec), leaf count = 141

$$\left\{\frac{1}{2\,b}\left(a\ln\left(y(x)\right)+\left(-\ln\left(a+\sqrt{a^2-4\,by\left(x\right)}\right)+\ln\left(-a+\sqrt{a^2-4\,by\left(x\right)}\right)\right)a+\left(2\,x-2\,\_C1\right)b+2\sqrt{a^2-4\,by\left(x\right)}\right)=0,\right.$$

Mathematica raw input

```
DSolve[b*y[x] + a*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-(a*Log[-a + Sqrt[a^2 - 4*b*#1]] + Sqrt[a^2 - 4*b*#1])
/(2*b) & ][x/2 + C[1]]}, {y[x] -> InverseFunction[-(-(a*Log[a + Sqrt[a^2 - 4*b*#
1]]) + Sqrt[a^2 - 4*b*#1])/(2*b) & ][-x/2 + C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+a*diff(y(x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/2*(a*ln(y(x))+(ln(a+(a^2-4*b*y(x))^(1/2))-ln(-a+(a^2-4*b*y(x))^(1/2)))*a+(2*x-
2*_C1)*b-2*(a^2-4*b*y(x))^(1/2))/b = 0, 1/2*(a*ln(y(x))+(-ln(a+(a^2-4*b*y(x))^(1
/2))+ln(-a+(a^2-4*b*y(x))^(1/2)))*a+(2*x-2*_C1)*b+2*(a^2-4*b*y(x))^(1/2))/b = 0
```

4.784 $y'(x)^2 + xy'(x) + 1 = 0$

ODE

$$y'(x)^2 + xy'(x) + 1 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for x

Mathematica ✓
cpu = 0.033692 (sec), leaf count = 83

$$\left\{\left\{y(x) \to c_1 - \frac{x^2}{4} + \frac{1}{4}\sqrt{x^2-4}x - \log\left(\sqrt{x^2-4}+x\right)\right\}, \left\{y(x) \to c_1 - \frac{x^2}{4} - \frac{1}{4}\sqrt{x^2-4}x + \log\left(\sqrt{x^2-4}+x\right)\right\}\right\}$$

Maple ✓
cpu = 0.029 (sec), leaf count = 63

$$\left\{y(x) = -\frac{x^2}{4} - \frac{x}{4}\sqrt{x^2-4} + \ln\left(x+\sqrt{x^2-4}\right) + \_C1, y(x) = -\frac{x^2}{4} + \frac{x}{4}\sqrt{x^2-4} - \ln\left(x+\sqrt{x^2-4}\right) + \_C1\right\}$$

Mathematica raw input

```
DSolve[1 + x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x^2/4 + (x*Sqrt[-4 + x^2])/4 + C[1] - Log[x + Sqrt[-4 + x^2]]}, {y[x]
  -> -x^2/4 - (x*Sqrt[-4 + x^2])/4 + C[1] + Log[x + Sqrt[-4 + x^2]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+x*diff(y(x),x)+1 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/4*x^2-1/4*x*(x^2-4)^(1/2)+ln(x+(x^2-4)^(1/2))+_C1, y(x) = -1/4*x^2+1/4
*x*(x^2-4)^(1/2)-ln(x+(x^2-4)^(1/2))+_C1
```

4.785 $y'(x)^2 + xy'(x) - y(x) = 0$

ODE

$$y'(x)^2 + xy'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.00275505 (sec), leaf count = 12

$$\{\{y(x) \to c_1(c_1 + x)\}\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 17

$$\left\{y(x) = \_C1\,(\_C1 + x), y(x) = -\frac{x^2}{4}\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*(x + C[1])}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/4*x^2, y(x) = _C1*(_C1+x)
```

4.786 $y'(x)^2 - xy'(x) + y(x) = 0$

ODE

$$y'(x)^2 - xy'(x) + y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.00232628 (sec), leaf count = 14

$$\{\{y(x) \to c_1(x - c_1)\}\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 19

$$\left\{y(x) = \_C1\,(x - \_C1)\,, y(x) = \frac{x^2}{4}\right\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - C[1])*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*x^2, y(x) = _C1*(x-_C1)
```

4.787 $y'(x)^2 - xy'(x) - y(x) = 0$

ODE

$$y'(x)^2 - xy'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.28834 (sec), leaf count = 1493

$$\left\{\left\{y(x) \to \frac{x^2}{2} + \frac{\left(x^3 + 8\cosh(3c_1) + 8\sinh(3c_1)\right)x}{4\sqrt[3]{-x^6 + 20\cosh(3c_1)x^3 + 20\sinh(3c_1)x^3 + 8\cosh(6c_1) + 8\sinh(6c_1) + 8\sqrt{-\left((x^3-1)\cosh\left(\frac{3c_1}{2}\right) -\right.}}}\right.\right.$$

Maple ✓
cpu = 0.016 (sec), leaf count = 31

$$\left\{[x(\_T) = 1\left(\frac{2}{3}\_T^{\frac{3}{2}} + \_C1\right)\frac{1}{\sqrt{\_T}}, y(\_T) = \frac{\_T^2}{3} - \sqrt{\_T}\,\_C1]\right\}$$

Mathematica raw input

```
DSolve[-y[x] - x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2/2 + (x*(x^3 + 8*Cosh[3*C[1]] + 8*Sinh[3*C[1]]))/(4*(-x^6 + 20*x^3*
Cosh[3*C[1]] + 8*Cosh[6*C[1]] + 20*x^3*Sinh[3*C[1]] + 8*Sinh[6*C[1]] + 8*Sqrt[-(
((-1 + x^3)*Cosh[(3*C[1])/2] - (1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2]
+ Sinh[(15*C[1])/2]))])^(1/3)) + (-x^6 + 20*x^3*Cosh[3*C[1]] + 8*Cosh[6*C[1]] +
20*x^3*Sinh[3*C[1]] + 8*Sinh[6*C[1]] + 8*Sqrt[-(((-1 + x^3)*Cosh[(3*C[1])/2] - (
1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]))])^(1/3)/4}
, {y[x] -> x^2/2 - ((I/8)*(-I + Sqrt[3])*x*(x^3 + 8*Cosh[3*C[1]] + 8*Sinh[3*C[1]
]))/(-x^6 + 20*x^3*Cosh[3*C[1]] + 8*Cosh[6*C[1]] + 20*x^3*Sinh[3*C[1]] + 8*Sinh[
6*C[1]] + 8*Sqrt[-(((-1 + x^3)*Cosh[(3*C[1])/2] - (1 + x^3)*Sinh[(3*C[1])/2])^3*
(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]))])^(1/3) + (I/8)*(I + Sqrt[3])*(-x^6 + 2
0*x^3*Cosh[3*C[1]] + 8*Cosh[6*C[1]] + 20*x^3*Sinh[3*C[1]] + 8*Sinh[6*C[1]] + 8*S
qrt[-(((-1 + x^3)*Cosh[(3*C[1])/2] - (1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1
```

```
])/2] + Sinh[(15*C[1])/2]))])^(1/3)}, {y[x] -> x^2/2 + ((I/8)*(I + Sqrt[3])*x*(x
^3 + 8*Cosh[3*C[1]] + 8*Sinh[3*C[1]]))/(-x^6 + 20*x^3*Cosh[3*C[1]] + 8*Cosh[6*C[
1]] + 20*x^3*Sinh[3*C[1]] + 8*Sinh[6*C[1]] + 8*Sqrt[-(((-1 + x^3)*Cosh[(3*C[1])/
2] - (1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]))])^(1
/3) - (I/8)*(-I + Sqrt[3])*(-x^6 + 20*x^3*Cosh[3*C[1]] + 8*Cosh[6*C[1]] + 20*x^3
*Sinh[3*C[1]] + 8*Sinh[6*C[1]] + 8*Sqrt[-(((-1 + x^3)*Cosh[(3*C[1])/2] - (1 + x^
3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]))])^(1/3)}, {y[x]
-> x^2/2 + (x*(x^3 - 2*Cosh[3*C[1]] - 2*Sinh[3*C[1]]))/(2*2^(2/3)*(-2*x^6 - 10*x
^3*Cosh[3*C[1]] + Cosh[6*C[1]] - 10*x^3*Sinh[3*C[1]] + Sinh[6*C[1]] + Sqrt[((1 +
 4*x^3)*Cosh[(3*C[1])/2] + (1 - 4*x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] +
Sinh[(15*C[1])/2])])^(1/3)) + (-2*x^6 - 10*x^3*Cosh[3*C[1]] + Cosh[6*C[1]] - 10*
x^3*Sinh[3*C[1]] + Sinh[6*C[1]] + Sqrt[((1 + 4*x^3)*Cosh[(3*C[1])/2] + (1 - 4*x^
3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2])])^(1/3)/(4*2^(1/3
))}, {y[x] -> x^2/2 - ((I/4)*(-I + Sqrt[3])*x*(x^3 - 2*Cosh[3*C[1]] - 2*Sinh[3*C
[1]]))/(2^(2/3)*(-2*x^6 - 10*x^3*Cosh[3*C[1]] + Cosh[6*C[1]] - 10*x^3*Sinh[3*C[1
]] + Sinh[6*C[1]] + Sqrt[((1 + 4*x^3)*Cosh[(3*C[1])/2] + (1 - 4*x^3)*Sinh[(3*C[1
])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2])])^(1/3)) + ((I/8)*(I + Sqrt[3])
*(-2*x^6 - 10*x^3*Cosh[3*C[1]] + Cosh[6*C[1]] - 10*x^3*Sinh[3*C[1]] + Sinh[6*C[1
]] + Sqrt[((1 + 4*x^3)*Cosh[(3*C[1])/2] + (1 - 4*x^3)*Sinh[(3*C[1])/2])^3*(Cosh[
(15*C[1])/2] + Sinh[(15*C[1])/2])])^(1/3))/2^(1/3)}, {y[x] -> x^2/2 + ((I/4)*(I
+ Sqrt[3])*x*(x^3 - 2*Cosh[3*C[1]] - 2*Sinh[3*C[1]]))/(2^(2/3)*(-2*x^6 - 10*x^3*
Cosh[3*C[1]] + Cosh[6*C[1]] - 10*x^3*Sinh[3*C[1]] + Sinh[6*C[1]] + Sqrt[((1 + 4*
x^3)*Cosh[(3*C[1])/2] + (1 - 4*x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sin
h[(15*C[1])/2])])^(1/3)) - ((I/8)*(-I + Sqrt[3])*(-2*x^6 - 10*x^3*Cosh[3*C[1]] +
 Cosh[6*C[1]] - 10*x^3*Sinh[3*C[1]] + Sinh[6*C[1]] + Sqrt[((1 + 4*x^3)*Cosh[(3*C
[1])/2] + (1 - 4*x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]
)])^(1/3))/2^(1/3)}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^(1/2)*(2/3*_T^(3/2)+_C1), y(_T) = 1/3*_T^2-_T^(1/2)*_C1]
```

4.788 $y'(x)^2 + xy'(x) - y(x) + x = 0$

ODE

$$y'(x)^2 + xy'(x) - y(x) + x = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 0.601162 (sec), leaf count = 122

$$\left\{\text{Solve}\left[c_1 + 2\log\left(-x^2 - 4y(x) + 4x + 4\right) + \sqrt{4y(x) + (x-4)x} = \log\left(x^2 + 4y(x) + 4\sqrt{4y(x) + (x-4)x} - 4x + 4\right) + x, y\right.\right.$$

Maple ✓
cpu = 0.015 (sec), leaf count = 48

$$\{[x(\_T) = ((-2\_T + 2)\,\mathrm{e}^{-T} + \_C1)\,\mathrm{e}^{-\_C1-T}, y(\_T) = \left(-2\_T^2\mathrm{e}^{-T} + \_T\,\_C1 + \_C1 + 2\,\mathrm{e}^{-T}\right)\mathrm{e}^{-\_C1-T} + \_T^2]\}$$

Mathematica raw input

```
DSolve[x - y[x] + x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[C[1] + 2*Log[4 + 4*x - x^2 - 4*y[x]] + Sqrt[(-4 + x)*x + 4*y[x]] == x + L
og[4 - 4*x + x^2 + 4*y[x] + 4*Sqrt[(-4 + x)*x + 4*y[x]]], y[x]], Solve[x + Sqrt[
(-4 + x)*x + 4*y[x]] == C[1] + Log[4 - 4*x + x^2 + 4*y[x] + 4*Sqrt[(-4 + x)*x +
4*y[x]]], y[x]]}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+x*diff(y(x),x)+x-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = ((-2*_T+2)*exp(_T)+_C1)*exp(-_T), y(_T) = (-2*_T^2*exp(_T)+_T*_C1+_C1+2
*exp(_T))*exp(-_T)+_T^2]
```

4.789 $y'(x)^2 + (1-x)y'(x) + y(x) = 0$

ODE

$$y'(x)^2 + (1-x)y'(x) + y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.00243283 (sec), leaf count = 15

$$\{\{y(x) \to c_1(-c_1 + x - 1)\}\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 22

$$\left\{y(x) = \_C1\,(-\_C1 + x - 1), y(x) = \frac{(-1+x)^2}{4}\right\}$$

Mathematica raw input

```
DSolve[y[x] + (1 - x)*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + x - C[1])*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+(1-x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(-1+x)^2, y(x) = _C1*(-_C1+x-1)
```

4.790 $y'(x)^2 - (x+1)y'(x) + y(x) = 0$

ODE

$$y'(x)^2 - (x+1)y'(x) + y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.00241427 (sec), leaf count = 15

$$\{\{y(x) \to c_1(-c_1 + x + 1)\}\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 22

$$\left\{y(x) = \_C1\,(-\_C1 + x + 1), y(x) = \frac{(1+x)^2}{4}\right\}$$

Mathematica raw input

```
DSolve[y[x] - (1 + x)*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x - C[1])*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-(1+x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(1+x)^2, y(x) = _C1*(-_C1+x+1)
```

4.791 $y'(x)^2-(2-x)y'(x)-y(x)+1=0$

ODE

$$y'(x)^2-(2-x)y'(x)-y(x)+1=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.0025685 (sec), leaf count = 17

$$\{\{y(x)\to c_1(x-2)+c_1^2+1\}\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 24

$$\left\{y(x)=-\frac{x^2}{4}+x, y(x)=1+\_C1^2+(x-2)\_C1\right\}$$

Mathematica raw input

```
DSolve[1 - y[x] - (2 - x)*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1 + (-2 + x)*C[1] + C[1]^2}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-(2-x)*diff(y(x),x)+1-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/4*x^2+x, y(x) = 1+_C1^2+(x-2)*_C1
```

4.792 $(a+x)y'(x)+y'(x)^2-y(x)=0$

ODE

$$(a+x)y'(x)+y'(x)^2-y(x)=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.00254642 (sec), leaf count = 13

$$\{\{y(x)\to c_1(a+c_1+x)\}\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 20

$$\left\{y(x)=\_C1\,(\_C1+a+x)\,,y(x)=-\frac{(a+x)^2}{4}\right\}$$

Mathematica raw input

```
DSolve[-y[x] + (a + x)*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*(a + x + C[1])}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+(a+x)*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/4*(a+x)^2, y(x) = _C1*(_C1+a+x)
```

4.793 $y'(x)^2 - 2xy'(x) + 1 = 0$

ODE

$$y'(x)^2 - 2xy'(x) + 1 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for x

Mathematica ✓
cpu = 0.0301126 (sec), leaf count = 82

$$\left\{\left\{y(x) \to \frac{1}{2}\left(2c_1 + x^2 + \sqrt{x^2-1}x - \log\left(\sqrt{x^2-1}+x\right)\right)\right\}, \left\{y(x) \to \frac{1}{2}\left(2c_1 + x^2 - \sqrt{x^2-1}x + \log\left(\sqrt{x^2-1}+x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 65

$$\left\{y(x) = \frac{x^2}{2} - \frac{x}{2}\sqrt{x^2-1} + \frac{1}{2}\ln\left(x+\sqrt{x^2-1}\right) + \_C1, y(x) = \frac{x^2}{2} + \frac{x}{2}\sqrt{x^2-1} - \frac{1}{2}\ln\left(x+\sqrt{x^2-1}\right) + \_C1\right\}$$

Mathematica raw input

```
DSolve[1 - 2*x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2 + x*Sqrt[-1 + x^2] + 2*C[1] - Log[x + Sqrt[-1 + x^2]])/2}, {y[x]
-> (x^2 - x*Sqrt[-1 + x^2] + 2*C[1] + Log[x + Sqrt[-1 + x^2]])/2}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-2*x*diff(y(x),x)+1 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x^2-1/2*(x^2-1)^(1/2)*x+1/2*ln(x+(x^2-1)^(1/2))+_C1, y(x) = 1/2*x^2+1
/2*(x^2-1)^(1/2)*x-1/2*ln(x+(x^2-1)^(1/2))+_C1
```

4.794 $-3x^2 + 2xy'(x) + y'(x)^2 = 0$

ODE

$$-3x^2 + 2xy'(x) + y'(x)^2 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.00271602 (sec), leaf count = 29

$$\left\{\left\{y(x) \to c_1 - \frac{3x^2}{2}\right\}, \left\{y(x) \to c_1 + \frac{x^2}{2}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 21

$$\left\{y(x) = -\frac{3\,x^2}{2} + \_C1, y(x) = \frac{x^2}{2} + \_C1\right\}$$

Mathematica raw input

```
DSolve[-3*x^2 + 2*x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-3*x^2)/2 + C[1]}, {y[x] -> x^2/2 + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+2*x*diff(y(x),x)-3*x^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x^2+_C1, y(x) = -3/2*x^2+_C1
```

4.795 $y'(x)^2 + 2xy'(x) - y(x) = 0$

ODE

$$y'(x)^2 + 2xy'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.404325 (sec), leaf count = 1445

$$\left\{\left\{y(x) \to \frac{1}{36}\left(-9x^2 - \frac{9\left(x^3 + 8\cosh(3c_1) + 8\sinh(3c_1)\right)x}{\sqrt[3]{x^6 - 20\cosh(3c_1)x^3 - 20\sinh(3c_1)x^3 - 8\cosh(6c_1) - 8\sinh(6c_1) + 8\sqrt{-\left((x^3-1)\cosh\left(\frac{3c}{2}\right.\right.\right.}}}\right.\right.$$

Maple ✓
cpu = 0.014 (sec), leaf count = 33

$$\left\{[x(\_T) = \frac{1}{\_T^2}\left(-\frac{2\_T^3}{3} + \_C1\right), y(\_T) = \frac{-\_T^3 + 6\_C1}{3\_T}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] + 2*x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-9*x^2 - (9*x*(x^3 + 8*Cosh[3*C[1]] + 8*Sinh[3*C[1]]))/(x^6 - 20*x^3*
Cosh[3*C[1]] - 8*Cosh[6*C[1]] - 20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[-(
((-1 + x^3)*Cosh[(3*C[1])/2] - (1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2]
+ Sinh[(15*C[1])/2]))])^(1/3) - 9*(x^6 - 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] -
20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[-(((-1 + x^3)*Cosh[(3*C[1])/2] - (
1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]))])^(1/3))/3
6}, {y[x] -> (-18*x^2 + (9*(1 + I*Sqrt[3])*x*(x^3 + 8*Cosh[3*C[1]] + 8*Sinh[3*C[
1]]))/(x^6 - 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] - 20*x^3*Sinh[3*C[1]] - 8*Sinh
[6*C[1]] + 8*Sqrt[-(((-1 + x^3)*Cosh[(3*C[1])/2] - (1 + x^3)*Sinh[(3*C[1])/2])^3
*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]))])^(1/3) + 9*(1 - I*Sqrt[3])*(x^6 - 20*
x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] - 20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqr
t[-(((-1 + x^3)*Cosh[(3*C[1])/2] - (1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])
```

```
/2] + Sinh[(15*C[1])/2]))])^(1/3))/72}, {y[x] -> (-18*x^2 + (9*(1 - I*Sqrt[3])*x
*(x^3 + 8*Cosh[3*C[1]] + 8*Sinh[3*C[1]]))/(x^6 - 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*
C[1]] - 20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[-(((-1 + x^3)*Cosh[(3*C[1]
)/2] - (1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]))])^
(1/3) + 9*(1 + I*Sqrt[3])*(x^6 - 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] - 20*x^3*S
inh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[-(((-1 + x^3)*Cosh[(3*C[1])/2] - (1 + x^3)
*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]))])^(1/3))/72}, {y[x
] -> (-9*x^2 - (9*x*(x^3 - 8*Cosh[3*C[1]] - 8*Sinh[3*C[1]]))/(x^6 + 20*x^3*Cosh[
3*C[1]] - 8*Cosh[6*C[1]] + 20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[((1 + x
^3)*Cosh[(3*C[1])/2] - (-1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[
(15*C[1])/2])])^(1/3) - 9*(x^6 + 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] + 20*x^3*S
inh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[((1 + x^3)*Cosh[(3*C[1])/2] - (-1 + x^3)*S
inh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2])])^(1/3))/36}, {y[x] -
> (-18*x^2 + (9*(1 + I*Sqrt[3])*x*(x^3 - 8*Cosh[3*C[1]] - 8*Sinh[3*C[1]]))/(x^6
+ 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] + 20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] +
8*Sqrt[((1 + x^3)*Cosh[(3*C[1])/2] - (-1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[
1])/2] + Sinh[(15*C[1])/2])])^(1/3) + 9*(1 - I*Sqrt[3])*(x^6 + 20*x^3*Cosh[3*C[1
]] - 8*Cosh[6*C[1]] + 20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[((1 + x^3)*C
osh[(3*C[1])/2] - (-1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C
[1])/2])])^(1/3))/72}, {y[x] -> (-18*x^2 + (9*(1 - I*Sqrt[3])*x*(x^3 - 8*Cosh[3*
C[1]] - 8*Sinh[3*C[1]]))/(x^6 + 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] + 20*x^3*Si
nh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[((1 + x^3)*Cosh[(3*C[1])/2] - (-1 + x^3)*Si
nh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2])])^(1/3) + 9*(1 + I*Sqr
t[3])*(x^6 + 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] + 20*x^3*Sinh[3*C[1]] - 8*Sinh
[6*C[1]] + 8*Sqrt[((1 + x^3)*Cosh[(3*C[1])/2] - (-1 + x^3)*Sinh[(3*C[1])/2])^3*(
Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2])])^(1/3))/72}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+2*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^2*(-2/3*_T^3+_C1), y(_T) = 1/3*(-_T^3+6*_C1)/_T]
```

4.796 $y'(x)^2 + 2xy'(x) - y(x) = 0$

ODE

$$y'(x)^2 + 2xy'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.37362 (sec), leaf count = 1445

$$\left\{\left\{y(x) \to \frac{1}{36}\left(-9x^2 - \frac{9\left(x^3 + 8\cosh(3c_1) + 8\sinh(3c_1)\right)x}{\sqrt[3]{x^6 - 20\cosh(3c_1)x^3 - 20\sinh(3c_1)x^3 - 8\cosh(6c_1) - 8\sinh(6c_1) + 8\sqrt{-\left((x^3-1)\cosh\left(\frac{3c}{2}\right.\right.\right.}}}\right.\right.$$

Maple ✓
cpu = 0.013 (sec), leaf count = 33

$$\left\{[x(\_T) = \frac{1}{\_T^2}\left(-\frac{2\_T^3}{3} + \_C1\right), y(\_T) = \frac{-\_T^3 + 6\_C1}{3\_T}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] + 2*x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-9*x^2 - (9*x*(x^3 + 8*Cosh[3*C[1]] + 8*Sinh[3*C[1]]))/(x^6 - 20*x^3*
Cosh[3*C[1]] - 8*Cosh[6*C[1]] - 20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[-(
((-1 + x^3)*Cosh[(3*C[1])/2] - (1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2]
+ Sinh[(15*C[1])/2]))])^(1/3) - 9*(x^6 - 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] -
20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[-(((-1 + x^3)*Cosh[(3*C[1])/2] - (
1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]))])^(1/3))/3
6}, {y[x] -> (-18*x^2 + (9*(1 + I*Sqrt[3])*x*(x^3 + 8*Cosh[3*C[1]] + 8*Sinh[3*C[
1]]))/(x^6 - 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] - 20*x^3*Sinh[3*C[1]] - 8*Sinh
[6*C[1]] + 8*Sqrt[-(((-1 + x^3)*Cosh[(3*C[1])/2] - (1 + x^3)*Sinh[(3*C[1])/2])^3
*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]))])^(1/3) + 9*(1 - I*Sqrt[3])*(x^6 - 20*
x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] - 20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqr
t[-(((-1 + x^3)*Cosh[(3*C[1])/2] - (1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])
```

```
/2] + Sinh[(15*C[1])/2]))])^(1/3))/72}, {y[x] -> (-18*x^2 + (9*(1 - I*Sqrt[3])*x
*(x^3 + 8*Cosh[3*C[1]] + 8*Sinh[3*C[1]]))/(x^6 - 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*
C[1]] - 20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[-(((-1 + x^3)*Cosh[(3*C[1]
)/2] - (1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]))])^
(1/3) + 9*(1 + I*Sqrt[3])*(x^6 - 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] - 20*x^3*S
inh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[-(((-1 + x^3)*Cosh[(3*C[1])/2] - (1 + x^3)
*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2]))])^(1/3))/72}, {y[x
] -> (-9*x^2 - (9*x*(x^3 - 8*Cosh[3*C[1]] - 8*Sinh[3*C[1]]))/(x^6 + 20*x^3*Cosh[
3*C[1]] - 8*Cosh[6*C[1]] + 20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[((1 + x
^3)*Cosh[(3*C[1])/2] - (-1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[
(15*C[1])/2])])^(1/3) - 9*(x^6 + 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] + 20*x^3*S
inh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[((1 + x^3)*Cosh[(3*C[1])/2] - (-1 + x^3)*S
inh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2])])^(1/3))/36}, {y[x] -
> (-18*x^2 + (9*(1 + I*Sqrt[3])*x*(x^3 - 8*Cosh[3*C[1]] - 8*Sinh[3*C[1]]))/(x^6
+ 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] + 20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] +
8*Sqrt[((1 + x^3)*Cosh[(3*C[1])/2] - (-1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[
1])/2] + Sinh[(15*C[1])/2])])^(1/3) + 9*(1 - I*Sqrt[3])*(x^6 + 20*x^3*Cosh[3*C[1
]] - 8*Cosh[6*C[1]] + 20*x^3*Sinh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[((1 + x^3)*C
osh[(3*C[1])/2] - (-1 + x^3)*Sinh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C
[1])/2])])^(1/3))/72}, {y[x] -> (-18*x^2 + (9*(1 - I*Sqrt[3])*x*(x^3 - 8*Cosh[3*
C[1]] - 8*Sinh[3*C[1]]))/(x^6 + 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] + 20*x^3*Si
nh[3*C[1]] - 8*Sinh[6*C[1]] + 8*Sqrt[((1 + x^3)*Cosh[(3*C[1])/2] - (-1 + x^3)*Si
nh[(3*C[1])/2])^3*(Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2])])^(1/3) + 9*(1 + I*Sqr
t[3])*(x^6 + 20*x^3*Cosh[3*C[1]] - 8*Cosh[6*C[1]] + 20*x^3*Sinh[3*C[1]] - 8*Sinh
[6*C[1]] + 8*Sqrt[((1 + x^3)*Cosh[(3*C[1])/2] - (-1 + x^3)*Sinh[(3*C[1])/2])^3*(
Cosh[(15*C[1])/2] + Sinh[(15*C[1])/2])])^(1/3))/72}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+2*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^2*(-2/3*_T^3+_C1), y(_T) = 1/3*(-_T^3+6*_C1)/_T]
```

4.797 $y'(x)^2 - 2xy'(x) + 2y(x) = 0$

ODE

$$y'(x)^2 - 2xy'(x) + 2y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.306237 (sec), leaf count = 123

$$\left\{\left\{y(x) \to -\frac{1}{2}(e^{c_1}-1)\left(e^{c_1}-2x-1\right)\right\}, \left\{y(x) \to -\frac{1}{2}(e^{c_1}+1)\left(e^{c_1}+2x+1\right)\right\}, \left\{y(x) \to \frac{1}{2}\left(-2\sqrt{-e^{2c_1}(x+1)^2}+e^{2c_1}-\right.\right.\right.$$

Maple ✓
cpu = 0.022 (sec), leaf count = 20

$$\left\{y(x) = \frac{x^2}{2}, y(x) = -\frac{\_C1\,(\_C1 - 2\,x)}{2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 2*x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-1 + E^C[1])*(-1 + E^C[1] - 2*x))/2}, {y[x] -> -((1 + E^C[1])*(1 +
E^C[1] + 2*x))/2}, {y[x] -> (-1 + E^(2*C[1]) - 2*x - 2*Sqrt[-(E^(2*C[1])*(1 + x)
^2)])/2}, {y[x] -> -1/2 + E^(2*C[1])/2 - x + Sqrt[-(E^(2*C[1])*(1 + x)^2)]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-2*x*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x^2, y(x) = -1/2*_C1*(_C1-2*x)
```

4.798 $y'(x)^2-(2x+1)y'(x)-(1-x)x=0$

ODE

$$y'(x)^2-(2x+1)y'(x)-(1-x)x=0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.027179 (sec), leaf count = 62

$$\left\{\left\{y(x)\to c_1+\frac{x^2}{2}+\frac{x}{2}-\frac{1}{24}(8x+1)^{3/2}\right\},\left\{y(x)\to c_1+\frac{1}{2}\left(x^2+x+\frac{1}{12}(8x+1)^{3/2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.027 (sec), leaf count = 45

$$\left\{y(x)=\frac{x^2}{2}+\frac{x}{2}-\frac{1}{24}(8x+1)^{\frac{3}{2}}+\_C1,y(x)=\frac{x^2}{2}+\frac{x}{2}+\frac{1}{24}(8x+1)^{\frac{3}{2}}+\_C1\right\}$$

Mathematica raw input

```
DSolve[-((1 - x)*x) - (1 + 2*x)*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x/2 + x^2/2 - (1 + 8*x)^(3/2)/24 + C[1]}, {y[x] -> (x + x^2 + (1 + 8*x
)^(3/2)/12)/2 + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-(1+2*x)*diff(y(x),x)-x*(1-x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x^2+1/2*x-1/24*(8*x+1)^(3/2)+_C1, y(x) = 1/2*x^2+1/2*x+1/24*(8*x+1)^(
3/2)+_C1
```

4.799 $y'(x)^2 + 2(1-x)y'(x) - 2(x-y(x)) = 0$

ODE

$$y'(x)^2 + 2(1-x)y'(x) - 2(x-y(x)) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 1.3226 (sec), leaf count = 287

$$\left\{\text{Solve}\left[2c_1 + 2\sqrt{x^2-2y(x)+1} + \log\left(\sqrt{2}\sqrt{y(x)} - x\right) + \log\left(\sqrt{2}\sqrt{y(x)} + x\right) + \log(1-2y(x)) = \log\left(x^2-2y(x)\right) + \log\left(\right.\right.\right.$$

Maple ✓
cpu = 0.016 (sec), leaf count = 42

$$\left\{[x(\_T) = \mathrm{e}^{-\_T}\left(\mathrm{e}^{\_T}\_T + \_C1\right), y(\_T) = (1+\_T)\,\mathrm{e}^{-\_T}\left(\mathrm{e}^{\_T}\_T + \_C1\right) - \frac{T^2}{2} - \_T]\right\}$$

Mathematica raw input

```
DSolve[-2*(x - y[x]) + 2*(1 - x)*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[2*C[1] + Log[-x + Sqrt[2]*Sqrt[y[x]]] + Log[x + Sqrt[2]*Sqrt[y[x]]] + Log
[1 - 2*y[x]] + 2*Sqrt[1 + x^2 - 2*y[x]] == 2*x + Log[x^2 - 2*y[x]] + Log[1 + Sqr
t[1 + x^2 - 2*y[x]] - Sqrt[2]*x*Sqrt[y[x]] - 2*y[x]] + Log[1 + Sqrt[1 + x^2 - 2*
y[x]] + Sqrt[2]*x*Sqrt[y[x]] - 2*y[x]], y[x]], Solve[2*x + Log[-x + Sqrt[2]*Sqrt
[y[x]]] + Log[x + Sqrt[2]*Sqrt[y[x]]] + Log[x^2 - 2*y[x]] + Log[-1 + 2*y[x]] + 2
*Sqrt[1 + x^2 - 2*y[x]] == 2*C[1] + Log[1 + Sqrt[1 + x^2 - 2*y[x]] - Sqrt[2]*x*S
qrt[y[x]] - 2*y[x]] + Log[1 + Sqrt[1 + x^2 - 2*y[x]] + Sqrt[2]*x*Sqrt[y[x]] - 2*
y[x]], y[x]]}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+2*(1-x)*diff(y(x),x)-2*x+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = exp(-_T)*(exp(_T)*_T+_C1), y(_T) = (1+_T)*exp(-_T)*(exp(_T)*_T+_C1)-1/2
*_T^2-_T]
```

4.800 $y'(x)^2 + 3xy'(x) - y(x) = 0$

ODE

$$y'(x)^2 + 3xy'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.281866 (sec), leaf count = 771

$$\{\{y(x) \to \text{Root}\left[16\#1^5 + 40\#1^4 x^2 + 25\#1^3 x^4 - 160\#1^2 e^{5c_1} x - 360\#1 e^{5c_1} x^3 - 216 e^{5c_1} x^5 - 64 e^{10c_1} \&, 1\right]\}, \{y(x) \to \text{Root}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 33

$$\left\{[x(\_T) = 1\left(-\frac{2}{5}\_T^{\frac{5}{2}} + \_C1\right)\_T^{-\frac{3}{2}}, y(\_T) = \frac{1}{5}\left(-\_T^{\frac{5}{2}} + 15\,\_C1\right)\frac{1}{\sqrt{\_T}}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] + 3*x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[-64*E^(10*C[1]) - 216*E^(5*C[1])*x^5 - 360*E^(5*C[1])*x^3*#1 - 16
0*E^(5*C[1])*x*#1^2 + 25*x^4*#1^3 + 40*x^2*#1^4 + 16*#1^5 & , 1]}, {y[x] -> Root
[-64*E^(10*C[1]) - 216*E^(5*C[1])*x^5 - 360*E^(5*C[1])*x^3*#1 - 160*E^(5*C[1])*x
*#1^2 + 25*x^4*#1^3 + 40*x^2*#1^4 + 16*#1^5 & , 2]}, {y[x] -> Root[-64*E^(10*C[1
]) - 216*E^(5*C[1])*x^5 - 360*E^(5*C[1])*x^3*#1 - 160*E^(5*C[1])*x*#1^2 + 25*x^4
*#1^3 + 40*x^2*#1^4 + 16*#1^5 & , 3]}, {y[x] -> Root[-64*E^(10*C[1]) - 216*E^(5*
C[1])*x^5 - 360*E^(5*C[1])*x^3*#1 - 160*E^(5*C[1])*x*#1^2 + 25*x^4*#1^3 + 40*x^2
*#1^4 + 16*#1^5 & , 4]}, {y[x] -> Root[-64*E^(10*C[1]) - 216*E^(5*C[1])*x^5 - 36
0*E^(5*C[1])*x^3*#1 - 160*E^(5*C[1])*x*#1^2 + 25*x^4*#1^3 + 40*x^2*#1^4 + 16*#1^
5 & , 5]}, {y[x] -> Root[-E^(10*C[1]) + 216*E^(5*C[1])*x^5 + 360*E^(5*C[1])*x^3*
#1 + 160*E^(5*C[1])*x*#1^2 + 1600*x^4*#1^3 + 2560*x^2*#1^4 + 1024*#1^5 & , 1]},
{y[x] -> Root[-E^(10*C[1]) + 216*E^(5*C[1])*x^5 + 360*E^(5*C[1])*x^3*#1 + 160*E^
(5*C[1])*x*#1^2 + 1600*x^4*#1^3 + 2560*x^2*#1^4 + 1024*#1^5 & , 2]}, {y[x] -> Ro
ot[-E^(10*C[1]) + 216*E^(5*C[1])*x^5 + 360*E^(5*C[1])*x^3*#1 + 160*E^(5*C[1])*x*
#1^2 + 1600*x^4*#1^3 + 2560*x^2*#1^4 + 1024*#1^5 & , 3]}, {y[x] -> Root[-E^(10*C
[1]) + 216*E^(5*C[1])*x^5 + 360*E^(5*C[1])*x^3*#1 + 160*E^(5*C[1])*x*#1^2 + 1600
```

```
*x^4*#1^3 + 2560*x^2*#1^4 + 1024*#1^5 & , 4]}, {y[x] -> Root[-E^(10*C[1]) + 216*
E^(5*C[1])*x^5 + 360*E^(5*C[1])*x^3*#1 + 160*E^(5*C[1])*x*#1^2 + 1600*x^4*#1^3 +
 2560*x^2*#1^4 + 1024*#1^5 & , 5]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+3*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^(3/2)*(-2/5*_T^(5/2)+_C1), y(_T) = 1/5*(-_T^(5/2)+15*_C1)/_T^(1/2)
]
```

4.801 $y'(x)^2 - 4(x+1)y'(x) + 4y(x) = 0$

ODE

$$y'(x)^2 - 4(x+1)y'(x) + 4y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, $f(y - xy', y') = 0$

Mathematica ✓
cpu = 0.144586 (sec), leaf count = 21

$$\{\{y(x) \to -e^{c_1}(e^{c_1} - 2(x+1))\}\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 21

$$\left\{y(x) = (1+x)^2, y(x) = -\frac{\_C1\,(-4x + \_C1 - 4)}{4}\right\}$$

Mathematica raw input

```
DSolve[4*y[x] - 4*(1 + x)*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(E^C[1]*(E^C[1] - 2*(1 + x)))}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-4*(1+x)*diff(y(x),x)+4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (1+x)^2, y(x) = -1/4*_C1*(-4*x+_C1-4)
```

4.802 $axy'(x) + y'(x)^2 = bcx^2$

ODE

$$axy'(x) + y'(x)^2 = bcx^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0150139 (sec), leaf count = 59

$$\left\{\left\{y(x) \to \frac{1}{4}x^2\left(\sqrt{a^2+4bc}-a\right)+c_1\right\}, \left\{y(x) \to c_1 - \frac{1}{4}x^2\left(\sqrt{a^2+4bc}+a\right)\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 47

$$\left\{y(x) = \frac{x^2}{4}\left(-a+\sqrt{a^2+4\,cb}\right)+\_C1, y(x) = -\frac{x^2}{4}\left(a+\sqrt{a^2+4\,cb}\right)+\_C1\right\}$$

Mathematica raw input

```
DSolve[a*x*y'[x] + y'[x]^2 == b*c*x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-a + Sqrt[a^2 + 4*b*c])*x^2)/4 + C[1]}, {y[x] -> -((a + Sqrt[a^2 + 4
*b*c])*x^2)/4 + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+a*x*diff(y(x),x) = b*c*x^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(-a+(a^2+4*b*c)^(1/2))*x^2+_C1, y(x) = -1/4*(a+(a^2+4*b*c)^(1/2))*x^2
+_C1
```

4.803 $-axy'(x) + ay(x) + y'(x)^2 = 0$

ODE

$$-axy'(x) + ay(x) + y'(x)^2 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.774037 (sec), leaf count = 167

$$\left\{\left\{y(x) \to \frac{1}{16}\left(-4\sqrt{-ae^{2c_1}(x+1)^2} - 4a(2x+1) + e^{2c_1}\right)\right\}, \left\{y(x) \to -\sqrt{-ae^{2c_1}(x+1)^2} - \frac{1}{4}a(2x+1) + e^{2c_1}\right\}, \left\{y(x) \to\right.\right.$$

Maple ✓
cpu = 0.019 (sec), leaf count = 25

$$\left\{y(x) = \frac{\_C1\,(ax - \_C1)}{a}, y(x) = \frac{ax^2}{4}\right\}$$

Mathematica raw input

```
DSolve[a*y[x] - a*x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(2*C[1]) - 4*Sqrt[-(a*E^(2*C[1])*(1 + x)^2)] - 4*a*(1 + 2*x))/16},
{y[x] -> E^(2*C[1]) - Sqrt[-(a*E^(2*C[1])*(1 + x)^2)] - (a*(1 + 2*x))/4}, {y[x]
-> (E^(2*C[1]) + 4*Sqrt[-(a*E^(2*C[1])*(1 + x)^2)] - 4*a*(1 + 2*x))/16}, {y[x] -
> E^(2*C[1]) + Sqrt[-(a*E^(2*C[1])*(1 + x)^2)] - (a*(1 + 2*x))/4}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-a*x*diff(y(x),x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*a*x^2, y(x) = _C1*(a*x-_C1)/a
```

4.804 $axy'(x) + bx^2 + cy(x) + y'(x)^2 = 0$

ODE

$$axy'(x) + bx^2 + cy(x) + y'(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✗
cpu = 600. (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.182 (sec), leaf count = 394

$$\left\{\int_{\_b}^{x} 1\left(-\_a\,a-\sqrt{-4\,cy\left(x\right)+\left(a^2-4\,b\right)\_a^2}\right)\left(\_a^2a+\_a\sqrt{-4\,cy\left(x\right)+\left(a^2-4\,b\right)\_a^2}+4\,y(x)\right)^{-1}\mathrm{d}\_a+\int^{y(x)}-2\left(ax^2\right.\right.$$

Mathematica raw input

```
DSolve[b*x^2 + c*y[x] + a*x*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^2+a*x*diff(y(x),x)+b*x^2+c*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
Int((-_a*a-(-4*c*y(x)+(a^2-4*b)*_a^2)^(1/2))/(_a^2*a+_a*(-4*c*y(x)+(a^2-4*b)*_a^
2)^(1/2)+4*y(x)),_a = _b .. x)+Intat(-2/(a*x^2+x*((a^2-4*b)*x^2-4*_f*c)^(1/2)+4*
_f)-Int((8*c*_f/((a^2-4*b)*_a^2-4*_f*c)^(1/2)+4*_a*a+4*((a^2-4*b)*_a^2-4*_f*c)^(
1/2))/(_a^2*a+_a*((a^2-4*b)*_a^2-4*_f*c)^(1/2)+4*_f)^2,_a = _b .. x),_f = y(x))+
_C1 = 0, Int((-_a*a+(-4*c*y(x)+(a^2-4*b)*_a^2)^(1/2))/(_a^2*a-_a*(-4*c*y(x)+(a^2
-4*b)*_a^2)^(1/2)+4*y(x)),_a = _b .. x)+Intat(2/(-a*x^2+x*((a^2-4*b)*x^2-4*_f*c)
^(1/2)-4*_f)-Int((-8*c*_f/((a^2-4*b)*_a^2-4*_f*c)^(1/2)+4*_a*a-4*((a^2-4*b)*_a^2
-4*_f*c)^(1/2))/(_a^2*a-_a*((a^2-4*b)*_a^2-4*_f*c)^(1/2)+4*_f)^2,_a = _b .. x),_
f = y(x))+_C1 = 0
```

4.805 $(a+bx)y'(x)+c+y'(x)^2=by(x)$

ODE

$$(a+bx)y'(x)+c+y'(x)^2=by(x)$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 1.78067 (sec), leaf count = 101

$$\left\{\left\{y(x)\to \frac{-a^2-2abx+b^2(2x+1)-2be^{c_1}(x+1)+e^{2c_1}+4c}{4b}\right\},\left\{y(x)\to \frac{-a^2-2abx+b^2(2x+1)+2be^{c_1}(x+1)+e^{2c_1}}{4b}\right.\right.$$

Maple ✓
cpu = 0.023 (sec), leaf count = 50

$$\left\{y(x)=\frac{\_C1^2+(bx+a)\_C1+c}{b},y(x)=\frac{-b^2x^2-2\,abx-a^2+4\,c}{4\,b}\right\}$$

Mathematica raw input

```
DSolve[c + (a + b*x)*y'[x] + y'[x]^2 == b*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-a^2 + 4*c + E^(2*C[1]) - 2*a*b*x - 2*b*E^C[1]*(1 + x) + b^2*(1 + 2*x
))/(4*b)}, {y[x] -> (-a^2 + 4*c + E^(2*C[1]) - 2*a*b*x + 2*b*E^C[1]*(1 + x) + b^
2*(1 + 2*x))/(4*b)}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+(b*x+a)*diff(y(x),x)+c = b*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(-b^2*x^2-2*a*b*x-a^2+4*c)/b, y(x) = (_C1^2+(b*x+a)*_C1+c)/b
```

4.806 $-2x^2y'(x)+2xy'(x)+y'(x)^2=0$

ODE

$$-2x^2y'(x)+2xy'(x)+y'(x)^2=0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.00402702 (sec), leaf count = 26

$$\left\{\{y(x)\to c_1\},\left\{y(x)\to c_1+\frac{2x^3}{3}-x^2\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 20

$$\left\{y(x)=\_C1, y(x)=\frac{2\,x^3}{3}-x^2+\_C1\right\}$$

Mathematica raw input

```
DSolve[2*x*y'[x] - 2*x^2*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]}, {y[x] -> -x^2 + (2*x^3)/3 + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-2*x^2*diff(y(x),x)+2*x*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 2/3*x^3-x^2+_C1, y(x) = _C1
```

4.807 $ax^2y'(x) + bxy(x) + y'(x)^2 = 0$

ODE

$$ax^2y'(x) + bxy(x) + y'(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
Homogeneous ODE, The Isobaric equation

Mathematica ✗
cpu = 599.997 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.231 (sec), leaf count = 368

$$\left\{\int_{\_b}^{x} 1\left(-\_a^2 a-\sqrt{\_a^4 a^2-4\,\_a\,b y\left(x\right)}\right)\left(a\_a^3+\_a\sqrt{\_a^4 a^2-4\,\_a\,b y\left(x\right)}+6\,y(x)\right)^{-1}\mathrm{d}\_a+\int^{y(x)} -2\left(ax^3+x\sqrt{a^2x^4}\right.\right.$$

Mathematica raw input

```
DSolve[b*x*y[x] + a*x^2*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^2+a*x^2*diff(y(x),x)+b*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
Int((-_a^2*a-(_a^4*a^2-4*_a*b*y(x))^(1/2))/(a*_a^3+_a*(_a^4*a^2-4*_a*b*y(x))^(1/
2)+6*y(x)),_a = _b .. x)+Intat(-2/(a*x^3+x*(a^2*x^4-4*_f*b*x)^(1/2)+6*_f)-Int((1
2*b*_a*_f/(_a^4*a^2-4*_a*_f*b)^(1/2)+6*_a^2*a+6*(_a^4*a^2-4*_a*_f*b)^(1/2))/(a*_
a^3+_a*(_a^4*a^2-4*_a*_f*b)^(1/2)+6*_f)^2,_a = _b .. x),_f = y(x))+_C1 = 0, Int(
(-_a^2*a+(_a^4*a^2-4*_a*b*y(x))^(1/2))/(a*_a^3-_a*(_a^4*a^2-4*_a*b*y(x))^(1/2)+6
*y(x)),_a = _b .. x)+Intat(2/(-a*x^3+x*(a^2*x^4-4*_f*b*x)^(1/2)-6*_f)-Int((-12*b
*_a*_f/(_a^4*a^2-4*_a*_f*b)^(1/2)+6*_a^2*a-6*(_a^4*a^2-4*_a*_f*b)^(1/2))/(a*_a^3
-_a*(_a^4*a^2-4*_a*_f*b)^(1/2)+6*_f)^2,_a = _b .. x),_f = y(x))+_C1 = 0
```

4.808 $ax^3y'(x) - 2ax^2y(x) + y'(x)^2 = 0$

ODE

$$ax^3y'(x) - 2ax^2y(x) + y'(x)^2 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Homogeneous ODE, The Isobaric equation

Mathematica ✓
cpu = 0.219418 (sec), leaf count = 56

$$\left\{\left\{y(x) \to 2ae^{2c_1}\left(4e^{2c_1} + x^2\right)\right\}, \left\{y(x) \to \frac{e^{4c_1} - 2ae^{2c_1}x^2}{8a}\right\}\right\}$$

Maple ✓
cpu = 0.413 (sec), leaf count = 27

$$\left\{y(x) = -\frac{ax^4}{8}, y(x) = \_C1\, x^2 + 2\,\frac{\_C1^2}{a}\right\}$$

Mathematica raw input

```
DSolve[-2*a*x^2*y[x] + a*x^3*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*a*E^(2*C[1])*(4*E^(2*C[1]) + x^2)}, {y[x] -> (E^(4*C[1]) - 2*a*E^(2*
C[1])*x^2)/(8*a)}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+a*x^3*diff(y(x),x)-2*a*x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/8*a*x^4, y(x) = _C1*x^2+2*_C1^2/a
```

4.809 $-2ax^3y'(x) + 4ax^2y(x) + y'(x)^2 = 0$

ODE

$$-2ax^3y'(x) + 4ax^2y(x) + y'(x)^2 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of variable

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.403 (sec), leaf count = 27

$$\left\{y(x) = \frac{\_C1\left(ax^2 - \_C1\right)}{a}, y(x) = \frac{ax^4}{4}\right\}$$

Mathematica raw input

```
DSolve[4*a*x^2*y[x] - 2*a*x^3*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^2-2*a*x^3*diff(y(x),x)+4*a*x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*a*x^4, y(x) = _C1*(a*x^2-_C1)/a
```

4.810 $4x^5y'(x) - 12x^4y(x) + y'(x)^2 = 0$

ODE

$$4x^5y'(x) - 12x^4y(x) + y'(x)^2 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 1.09311 (sec), leaf count = 217

$$\left\{\text{Solve}\left[\frac{x^2\sqrt{x^6+3y(x)}\log(y(x)) + \sqrt{x^4\left(x^6+3y(x)\right)}\left(\log\left(\frac{x^6}{3y(x)}+1\right) - \log\left(\frac{3y(x)}{x^6}+1\right) + 2\log\left(\sqrt{x^6+3y(x)}+x^3\right)\right)}{6x^2\sqrt{x^6+3y(x)}} =\right.\right.$$

Maple ✓
cpu = 0.205 (sec), leaf count = 23

$$\left\{y(x) = -\frac{x^6}{3}, y(x) = \_C1\, x^3 + \frac{3\_C1^2}{4}\right\}$$

Mathematica raw input

```
DSolve[-12*x^4*y[x] + 4*x^5*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(x^2*Log[y[x]]*Sqrt[x^6 + 3*y[x]] + (Log[1 + x^6/(3*y[x])] - Log[1 + (3*y
[x])/x^6] + 2*Log[x^3 + Sqrt[x^6 + 3*y[x]]])*Sqrt[x^4*(x^6 + 3*y[x])])/(6*x^2*Sq
rt[x^6 + 3*y[x]]) == C[1], y[x]], Solve[(x^2*Log[y[x]]*Sqrt[x^6 + 3*y[x]] + (-Lo
g[1 + x^6/(3*y[x])] + Log[1 + (3*y[x])/x^6] - 2*Log[x^3 + Sqrt[x^6 + 3*y[x]]])*S
qrt[x^4*(x^6 + 3*y[x])])/(6*x^2*Sqrt[x^6 + 3*y[x]]) == C[1], y[x]]}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+4*x^5*diff(y(x),x)-12*x^4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/3*x^6, y(x) = _C1*x^3+3/4*_C1^2
```

4.811 $y'(x)^2 - 2\cosh(x)y'(x) + 1 = 0$

ODE

$$y'(x)^2 - 2\cosh(x)y'(x) + 1 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0167839 (sec), leaf count = 25

$$\{\{y(x) \to c_1 + \sinh(x) - \cosh(x)\}, \{y(x) \to c_1 + \sinh(x) + \cosh(x)\}\}$$

Maple ✓
cpu = 0.035 (sec), leaf count = 19

$$\left\{y(x) = -(e^x)^{-1} + \_C1, y(x) = e^x + \_C1\right\}$$

Mathematica raw input

```
DSolve[1 - 2*Cosh[x]*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] - Cosh[x] + Sinh[x]}, {y[x] -> C[1] + Cosh[x] + Sinh[x]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-2*diff(y(x),x)*cosh(x)+1 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/exp(x)+_C1, y(x) = exp(x)+_C1
```

4.812 $y'(x)^2 + y(x)y'(x) = x(y(x) + x)$

ODE

$$y'(x)^2 + y(x)y'(x) = x(y(x) + x)$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00528489 (sec), leaf count = 32

$$\left\{\left\{y(x) \to c_1 + \frac{x^2}{2}\right\}, \{y(x) \to c_1 e^{-x} - x + 1\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 25

$$\left\{y(x) = \frac{x^2}{2} + \_C1, y(x) = -x + 1 + \mathrm{e}^{-x}\_C1\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x] + y'[x]^2 == x*(x + y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2/2 + C[1]}, {y[x] -> 1 - x + C[1]/E^x}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+y(x)*diff(y(x),x) = x*(x+y(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x^2+_C1, y(x) = -x+1+exp(-x)*_C1
```

4.813 $y'(x)^2 - y(x)y'(x) + e^x = 0$

ODE

$$y'(x)^2 - y(x)y'(x) + e^x = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.196364 (sec), leaf count = 137

$$\left\{\left\{y(x) \to -\frac{2ie^{x/2}}{\sqrt{\tanh^2\left(\frac{1}{2}(x-c_1)\right)-1}}\right\}, \left\{y(x) \to \frac{2ie^{x/2}}{\sqrt{\tanh^2\left(\frac{1}{2}(x-c_1)\right)-1}}\right\}, \left\{y(x) \to -\frac{2ie^{x/2}}{\sqrt{\tanh^2\left(\frac{1}{2}(c_1-x)\right)-1}}\right\}, \left\{\right.$$

Maple ✓
cpu = 0.269 (sec), leaf count = 23

$$\left\{(y(x))^2 - 4\,\mathrm{e}^x = 0, y(x) = \_C1^{-1} + \_C1\,\mathrm{e}^x\right\}$$

Mathematica raw input

```
DSolve[E^x - y[x]*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-2*I)*E^(x/2))/Sqrt[-1 + Tanh[(x - C[1])/2]^2]}, {y[x] -> ((2*I)*E^(
x/2))/Sqrt[-1 + Tanh[(x - C[1])/2]^2]}, {y[x] -> ((-2*I)*E^(x/2))/Sqrt[-1 + Tanh
[(-x + C[1])/2]^2]}, {y[x] -> ((2*I)*E^(x/2))/Sqrt[-1 + Tanh[(-x + C[1])/2]^2]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-y(x)*diff(y(x),x)+exp(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-4*exp(x) = 0, y(x) = 1/_C1+_C1*exp(x)
```

4.814 $y'(x)^2 + (y(x)+x)y'(x) + xy(x) = 0$

ODE

$$y'(x)^2 + (y(x)+x)y'(x) + xy(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0032437 (sec), leaf count = 27

$$\left\{\{y(x) \to c_1 e^{-x}\}, \left\{y(x) \to c_1 - \frac{x^2}{2}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 20

$$\left\{y(x) = \_C1\, \mathrm{e}^{-x}, y(x) = -\frac{x^2}{2} + \_C1\right\}$$

Mathematica raw input

```
DSolve[x*y[x] + (x + y[x])*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^x}, {y[x] -> -x^2/2 + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+(x+y(x))*diff(y(x),x)+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2*x^2+_C1, y(x) = _C1*exp(-x)
```

4.815 $y'(x)^2 - 2y(x)y'(x) - 2x = 0$

ODE

$$y'(x)^2 - 2y(x)y'(x) - 2x = 0$$

ODE Classification

[_dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.718113 (sec), leaf count = 41

$$\text{Solve}\left[\left\{x = \frac{\text{K\$219290}\left(2c_1 + \sinh^{-1}(\text{K\$219290})\right)}{2\sqrt{\text{K\$219290}^2 + 1}}, \text{K\$219290} = 2\left(\frac{x}{\text{K\$219290}} + y(x)\right)\right\}, \{y(x), \text{K\$219290}\}\right]$$

Maple ✓
cpu = 0.029 (sec), leaf count = 42

$$\left\{[x(\_T) = \_T\left(\frac{Arcsinh(\_T)}{2} + \_C1\right)\frac{1}{\sqrt{\_T^2+1}}, y(\_T) = -1\left(\frac{Arcsinh(\_T)}{2} + \_C1\right)\frac{1}{\sqrt{\_T^2+1}} + \frac{\_T}{2}]\right\}$$

Mathematica raw input

```
DSolve[-2*x - 2*y[x]*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
Solve[{x == (K$219290*(ArcSinh[K$219290] + 2*C[1]))/(2*Sqrt[1 + K$219290^2]), K$
219290 == 2*(x/K$219290 + y[x])}, {y[x], K$219290}]
```

Maple raw input

```
dsolve(diff(y(x),x)^2-2*y(x)*diff(y(x),x)-2*x = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T^2+1)^(1/2)*_T*(1/2*arcsinh(_T)+_C1), y(_T) = -1/(_T^2+1)^(1/2)*(1
/2*arcsinh(_T)+_C1)+1/2*_T]
```

4.816 $y'(x)^2 + (2y(x)+1)y'(x) + (y(x)-1)y(x) = 0$

ODE

$$y'(x)^2 + (2y(x)+1)y'(x) + (y(x)-1)y(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Use new variable

Mathematica ✓
cpu = 0.116337 (sec), leaf count = 1373

$$\left\{\left\{y(x) \to \frac{e^{-2x}\left(128e^x\left(12e^x+e^{2c_1}\right)+64\sqrt[3]{24\sqrt{3}\sqrt{-e^{7x+4c_1}\left(-27e^x+e^{2c_1}\right)^3}+540e^{4(x+c_1)}+5832e^{5x+2c_1}-e^{3x+6c_1}}+\right.}{1536}\right.$$

Maple ✓
cpu = 0.061 (sec), leaf count = 143

$$\left\{x+\frac{3\ln(y(x)-1)}{2}-\frac{\ln(y(x))}{2}-\frac{1}{2}\ln\left(\sqrt{8y(x)+1}-1\right)+\frac{3}{2}\ln\left(\sqrt{8y(x)+1}-3\right)-\frac{3}{2}\ln\left(\sqrt{8y(x)+1}+3\right)+\frac{1}{2}\ln\left(\sqrt{\right.}\right.$$

Mathematica raw input

```
DSolve[(-1 + y[x])*y[x] + (1 + 2*y[x])*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (128*E^x*(12*E^x + E^(2*C[1])) + (64*E^(2*(x + C[1]))*(216*E^x + E^(2*
C[1])))/(540*E^(4*(x + C[1])) + 5832*E^(5*x + 2*C[1]) - E^(3*x + 6*C[1]) + 24*Sq
rt[3]*Sqrt[-(E^(7*x + 4*C[1])*(-27*E^x + E^(2*C[1]))^3)])^(1/3) + 64*(540*E^(4*(
x + C[1])) + 5832*E^(5*x + 2*C[1]) - E^(3*x + 6*C[1]) + 24*Sqrt[3]*Sqrt[-(E^(7*x
 + 4*C[1])*(-27*E^x + E^(2*C[1]))^3)])^(1/3))/(1536*E^(2*x))}, {y[x] -> (256*E^x
*(12*E^x + E^(2*C[1])) - ((64*I)*(-I + Sqrt[3])*E^(2*(x + C[1]))*(216*E^x + E^(2
*C[1])))/(540*E^(4*(x + C[1])) + 5832*E^(5*x + 2*C[1]) - E^(3*x + 6*C[1]) + 24*S
qrt[3]*Sqrt[-(E^(7*x + 4*C[1])*(-27*E^x + E^(2*C[1]))^3)])^(1/3) + (64*I)*(I + S
qrt[3])*(540*E^(4*(x + C[1])) + 5832*E^(5*x + 2*C[1]) - E^(3*x + 6*C[1]) + 24*Sq
```

```
rt[3]*Sqrt[-(E^(7*x + 4*C[1])*(-27*E^x + E^(2*C[1]))^3)])^(1/3))/(3072*E^(2*x))}
, {y[x] -> (256*E^x*(12*E^x + E^(2*C[1])) + ((64*I)*(I + Sqrt[3])*E^(2*(x + C[1]
))*(216*E^x + E^(2*C[1])))/(540*E^(4*(x + C[1])) + 5832*E^(5*x + 2*C[1]) - E^(3*
x + 6*C[1]) + 24*Sqrt[3]*Sqrt[-(E^(7*x + 4*C[1])*(-27*E^x + E^(2*C[1]))^3)])^(1/
3) - 64*(1 + I*Sqrt[3])*(540*E^(4*(x + C[1])) + 5832*E^(5*x + 2*C[1]) - E^(3*x +
 6*C[1]) + 24*Sqrt[3]*Sqrt[-(E^(7*x + 4*C[1])*(-27*E^x + E^(2*C[1]))^3)])^(1/3))
/(3072*E^(2*x))}, {y[x] -> (128*E^(x + 2*C[1])*(1 + 12*E^(x + 2*C[1])) + (64*E^(
2*x + 4*C[1])*(1 + 216*E^(x + 2*C[1])))/(5832*E^(5*(x + 2*C[1])) - E^(3*x + 6*C[
1]) + 540*E^(4*x + 8*C[1]) + 24*Sqrt[3]*Sqrt[E^(7*(x + 2*C[1]))*(-1 + 27*E^(x +
2*C[1]))^3])^(1/3) + 64*(5832*E^(5*(x + 2*C[1])) - E^(3*x + 6*C[1]) + 540*E^(4*x
 + 8*C[1]) + 24*Sqrt[3]*Sqrt[E^(7*(x + 2*C[1]))*(-1 + 27*E^(x + 2*C[1]))^3])^(1/
3))/(1536*E^(2*(x + 2*C[1])))}, {y[x] -> (256*E^(x + 2*C[1])*(1 + 12*E^(x + 2*C[
1])) - ((64*I)*(-I + Sqrt[3])*E^(2*x + 4*C[1])*(1 + 216*E^(x + 2*C[1])))/(5832*E
^(5*(x + 2*C[1])) - E^(3*x + 6*C[1]) + 540*E^(4*x + 8*C[1]) + 24*Sqrt[3]*Sqrt[E^
(7*(x + 2*C[1]))*(-1 + 27*E^(x + 2*C[1]))^3])^(1/3) + (64*I)*(I + Sqrt[3])*(5832
*E^(5*(x + 2*C[1])) - E^(3*x + 6*C[1]) + 540*E^(4*x + 8*C[1]) + 24*Sqrt[3]*Sqrt[
E^(7*(x + 2*C[1]))*(-1 + 27*E^(x + 2*C[1]))^3])^(1/3))/(3072*E^(2*(x + 2*C[1])))
}, {y[x] -> (256*E^(x + 2*C[1])*(1 + 12*E^(x + 2*C[1])) + ((64*I)*(I + Sqrt[3])*
E^(2*x + 4*C[1])*(1 + 216*E^(x + 2*C[1])))/(5832*E^(5*(x + 2*C[1])) - E^(3*x + 6
*C[1]) + 540*E^(4*x + 8*C[1]) + 24*Sqrt[3]*Sqrt[E^(7*(x + 2*C[1]))*(-1 + 27*E^(x
 + 2*C[1]))^3])^(1/3) - 64*(1 + I*Sqrt[3])*(5832*E^(5*(x + 2*C[1])) - E^(3*x + 6
*C[1]) + 540*E^(4*x + 8*C[1]) + 24*Sqrt[3]*Sqrt[E^(7*(x + 2*C[1]))*(-1 + 27*E^(x
 + 2*C[1]))^3])^(1/3))/(3072*E^(2*(x + 2*C[1])))}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+(1+2*y(x))*diff(y(x),x)+y(x)*(y(x)-1) = 0, y(x),'implicit')
```

Maple raw output

```
x+3/2*ln(y(x)-1)-1/2*ln(y(x))+1/2*ln((8*y(x)+1)^(1/2)-1)-3/2*ln((8*y(x)+1)^(1/2)
-3)+3/2*ln((8*y(x)+1)^(1/2)+3)-1/2*ln((8*y(x)+1)^(1/2)+1)-_C1 = 0, x+3/2*ln(y(x)
-1)-1/2*ln(y(x))-1/2*ln((8*y(x)+1)^(1/2)-1)+3/2*ln((8*y(x)+1)^(1/2)-3)-3/2*ln((8
*y(x)+1)^(1/2)+3)+1/2*ln((8*y(x)+1)^(1/2)+1)-_C1 = 0
```

4.817 $y'(x)^2 - 2(x - y(x))y'(x) - 4xy(x) = 0$

ODE

$$y'(x)^2 - 2(x - y(x))y'(x) - 4xy(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00340433 (sec), leaf count = 23

$$\left\{\left\{y(x) \to c_1 e^{-2x}\right\}, \left\{y(x) \to c_1 + x^2\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 18

$$\{y(x) = \_C1\, \mathrm{e}^{-2x}, y(x) = x^2 + \_C1\}$$

Mathematica raw input

```
DSolve[-4*x*y[x] - 2*(x - y[x])*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(2*x)}, {y[x] -> x^2 + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-2*(x-y(x))*diff(y(x),x)-4*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^2+_C1, y(x) = _C1*exp(-2*x)
```

4.818 $y'(x)^2 - (4y(x)+1)y'(x) + y(x)(4y(x)+1) = 0$

ODE

$$y'(x)^2 - (4y(x)+1)y'(x) + y(x)(4y(x)+1) = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0499261 (sec), leaf count = 55

$$\left\{\left\{y(x) \to \frac{1}{4}e^{x-4c_1}\left(e^x - 2e^{2c_1}\right)\right\}, \left\{y(x) \to \frac{1}{4}e^{2c_1+x}\left(e^{2c_1+x} - 2\right)\right\}\right\}$$

Maple ✓
cpu = 0.048 (sec), leaf count = 49

$$\left\{x - \frac{\ln(y(x))}{2} - Artanh\left(\sqrt{1+4y(x)}\right) - \_C1 = 0, x - \frac{\ln(y(x))}{2} + Artanh\left(\sqrt{1+4y(x)}\right) - \_C1 = 0, y(x) = -\frac{1}{4}\right\}$$

Mathematica raw input

```
DSolve[y[x]*(1 + 4*y[x]) - (1 + 4*y[x])*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(x - 4*C[1])*(E^x - 2*E^(2*C[1])))/4}, {y[x] -> (E^(x + 2*C[1])*(-2
 + E^(x + 2*C[1])))/4}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-(1+4*y(x))*diff(y(x),x)+(1+4*y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/4, x-1/2*ln(y(x))+arctanh((1+4*y(x))^(1/2))-_C1 = 0, x-1/2*ln(y(x))-ar
ctanh((1+4*y(x))^(1/2))-_C1 = 0
```

4.819 $y'(x)^2 - 2(1-3y(x))y'(x) - (4-9y(x))y(x) = 0$

ODE

$$y'(x)^2 - 2(1-3y(x))y'(x) - (4-9y(x))y(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.571143 (sec), leaf count = 4913

$$\left\{\left\{y(x)\to \frac{1}{18}\left(-\sqrt{\frac{9e^{6(c_1-2x)}\left(8e^{6x}+e^{6c_1}\right)}{\sqrt[3]{e^{-36x}\left(8\sqrt{e^{42x+12c_1}\left(e^{6x}-e^{6c_1}\right)^3}-e^{18(x+c_1)}+20e^{12(2x+c_1)}+8e^{6(5x+c_1)}\right)}}}-9e^{6c_1-6x}+9\sqrt[3]{e^{-36x}\left(\right.}\right.\right.$$

Maple ✓
cpu = 0.063 (sec), leaf count = 155

$$\left\{x+\frac{\ln\left(9\,y(x)-4\right)}{12}+\frac{\ln\left(y(x)\right)}{4}-\frac{1}{4}\ln\left(\sqrt{1-2\,y\left(x\right)}-1\right)+\frac{1}{4}\ln\left(\sqrt{1-2\,y\left(x\right)}+1\right)-\frac{1}{12}\ln\left(3\sqrt{1-2\,y\left(x\right)}+1\right)+\frac{1}{12}\ln\right.$$

Mathematica raw input

```
DSolve[-((4 - 9*y[x])*y[x]) - 2*(1 - 3*y[x])*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2 - Sqrt[4 - 9*E^(-6*x + 6*C[1]) + (9*E^(6*(-2*x + C[1]))*(8*E^(6*x)
+ E^(6*C[1])))/((-E^(18*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1
])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3) + 9*(
(-E^(18*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(
42*x + 12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3)] - 9*Sqrt[8/81 - (2*E
^(-6*x + 6*C[1]))/9 + (E^(6*(-2*x + C[1]))*(-8*E^(6*x) - E^(6*C[1])))/(9*((-E^(1
8*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x +
 12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3)) - ((-E^(18*(x + C[1])) + 2
```

```
0*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x
) - E^(6*C[1]))^3])/E^(36*x))^(1/3)/9 - (16*(1 + 27*E^(-6*x + 6*C[1])))/(81*Sqrt
[4 - 9*E^(-6*x + 6*C[1]) + (9*E^(6*(-2*x + C[1]))*(8*E^(6*x) + E^(6*C[1])))/((-E
^(18*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*
x + 12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3) + 9*((-E^(18*(x + C[1]))
 + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^
(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3)])])/18}, {y[x] -> (2 - Sqrt[4 - 9*E^(-6*
x + 6*C[1]) + (9*E^(6*(-2*x + C[1]))*(8*E^(6*x) + E^(6*C[1])))/((-E^(18*(x + C[1
])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*
(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3) + 9*((-E^(18*(x + C[1])) + 20*E^(12*(
2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x) - E^(6*
C[1]))^3])/E^(36*x))^(1/3)] + 9*Sqrt[8/81 - (2*E^(-6*x + 6*C[1]))/9 + (E^(6*(-2*
x + C[1]))*(-8*E^(6*x) - E^(6*C[1])))/(9*((-E^(18*(x + C[1])) + 20*E^(12*(2*x +
C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x) - E^(6*C[1]))
^3])/E^(36*x))^(1/3)) - ((-E^(18*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(
5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1
/3)/9 - (16*(1 + 27*E^(-6*x + 6*C[1])))/(81*Sqrt[4 - 9*E^(-6*x + 6*C[1]) + (9*E^
(6*(-2*x + C[1]))*(8*E^(6*x) + E^(6*C[1])))/((-E^(18*(x + C[1])) + 20*E^(12*(2*x
 + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x) - E^(6*C[1
]))^3])/E^(36*x))^(1/3) + 9*((-E^(18*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8*E^
(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36*x)
)^(1/3)])])/18}, {y[x] -> (2 + Sqrt[4 - 9*E^(-6*x + 6*C[1]) + (9*E^(6*(-2*x + C[
1]))*(8*E^(6*x) + E^(6*C[1])))/((-E^(18*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8
*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36
*x))^(1/3) + 9*((-E^(18*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1
])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3)] - 9*
Sqrt[8/81 - (2*E^(-6*x + 6*C[1]))/9 + (E^(6*(-2*x + C[1]))*(-8*E^(6*x) - E^(6*C[
1])))/(9*((-E^(18*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) +
8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3)) - ((-E^(18
*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x +
12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3)/9 + (16*(1 + 27*E^(-6*x + 6*
C[1])))/(81*Sqrt[4 - 9*E^(-6*x + 6*C[1]) + (9*E^(6*(-2*x + C[1]))*(8*E^(6*x) + E
^(6*C[1])))/((-E^(18*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1]))
 + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3) + 9*((-E
^(18*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*
x + 12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3)])])/18}, {y[x] -> (2 + S
qrt[4 - 9*E^(-6*x + 6*C[1]) + (9*E^(6*(-2*x + C[1]))*(8*E^(6*x) + E^(6*C[1])))/(
(-E^(18*(x + C[1])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(
42*x + 12*C[1])*(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3) + 9*((-E^(18*(x + C[1
])) + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*
(E^(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3)] + 9*Sqrt[8/81 - (2*E^(-6*x + 6*C[1])
)/9 + (E^(6*(-2*x + C[1]))*(-8*E^(6*x) - E^(6*C[1])))/(9*((-E^(18*(x + C[1])) +
20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*
x) - E^(6*C[1]))^3])/E^(36*x))^(1/3)) - ((-E^(18*(x + C[1])) + 20*E^(12*(2*x + C
[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x) - E^(6*C[1]))^
3])/E^(36*x))^(1/3)/9 + (16*(1 + 27*E^(-6*x + 6*C[1])))/(81*Sqrt[4 - 9*E^(-6*x +
 6*C[1]) + (9*E^(6*(-2*x + C[1]))*(8*E^(6*x) + E^(6*C[1])))/((-E^(18*(x + C[1]))
```

```
 + 20*E^(12*(2*x + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^
(6*x) - E^(6*C[1]))^3])/E^(36*x))^(1/3) + 9*((-E^(18*(x + C[1])) + 20*E^(12*(2*x
 + C[1])) + 8*E^(6*(5*x + C[1])) + 8*Sqrt[E^(42*x + 12*C[1])*(E^(6*x) - E^(6*C[1
]))^3])/E^(36*x))^(1/3)])])/18}, {y[x] -> (2 - Sqrt[4 - 9/E^(6*(x + C[1])) + (9
+ 72*E^(6*(x + C[1])))/(E^(12*(x + C[1]))*((-E^(18*(x + C[1])) + 20*E^(24*(x + C
[1])) + 8*E^(30*(x + C[1])) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3
])/E^(36*(x + C[1])))^(1/3)) + 9*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8
*E^(30*(x + C[1])) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*
(x + C[1])))^(1/3)] - 9*Sqrt[8/81 - 2/(9*E^(6*(x + C[1]))) + (-1 - 8*E^(6*(x + C
[1])))/(9*E^(12*(x + C[1]))*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(3
0*(x + C[1])) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x +
C[1])))^(1/3)) - ((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1]
)) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/
3)/9 - (16*(1 + 27/E^(6*(x + C[1]))))/(81*Sqrt[4 - 9/E^(6*(x + C[1])) + (9 + 72*
E^(6*(x + C[1])))/(E^(12*(x + C[1]))*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1]))
 + 8*E^(30*(x + C[1])) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^
(36*(x + C[1])))^(1/3)) + 9*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(3
0*(x + C[1])) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x +
C[1])))^(1/3)])])/18}, {y[x] -> (2 - Sqrt[4 - 9/E^(6*(x + C[1])) + (9 + 72*E^(6*
(x + C[1])))/(E^(12*(x + C[1]))*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*
E^(30*(x + C[1])) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(
x + C[1])))^(1/3)) + 9*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x
+ C[1])) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])
))^(1/3)] + 9*Sqrt[8/81 - 2/(9*E^(6*(x + C[1]))) + (-1 - 8*E^(6*(x + C[1])))/(9*
E^(12*(x + C[1]))*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1
])) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1
/3)) - ((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1])) + 8*Sqr
t[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/3)/9 - (16
*(1 + 27/E^(6*(x + C[1]))))/(81*Sqrt[4 - 9/E^(6*(x + C[1])) + (9 + 72*E^(6*(x +
C[1])))/(E^(12*(x + C[1]))*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30
*(x + C[1])) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C
[1])))^(1/3)) + 9*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1
])) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1
/3))])])/18}, {y[x] -> (2 + Sqrt[4 - 9/E^(6*(x + C[1])) + (9 + 72*E^(6*(x + C[1])
))/(E^(12*(x + C[1]))*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x +
 C[1])) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1]))
)^(1/3)) + 9*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1])) +
 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/3)]
- 9*Sqrt[8/81 - 2/(9*E^(6*(x + C[1]))) + (-1 - 8*E^(6*(x + C[1])))/(9*E^(12*(x +
 C[1]))*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1])) + 8*Sq
rt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/3)) - ((-
E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1])) + 8*Sqrt[E^(42*(x
 + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/3)/9 + (16*(1 + 27/E
^(6*(x + C[1]))))/(81*Sqrt[4 - 9/E^(6*(x + C[1])) + (9 + 72*E^(6*(x + C[1])))/(E
^(12*(x + C[1]))*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1]
)) + 8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/
3)) + 9*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1])) + 8*Sq
```

```
rt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/3)])])/18
}, {y[x] -> (2 + Sqrt[4 - 9/E^(6*(x + C[1])) + (9 + 72*E^(6*(x + C[1])))/(E^(12*
(x + C[1]))*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1])) +
8*Sqrt[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/3)) +
 9*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1])) + 8*Sqrt[E^
(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/3)] + 9*Sqrt[8
/81 - 2/(9*E^(6*(x + C[1]))) + (-1 - 8*E^(6*(x + C[1])))/(9*E^(12*(x + C[1]))*((
-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1])) + 8*Sqrt[E^(42*(
x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/3)) - ((-E^(18*(x +
 C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1])) + 8*Sqrt[E^(42*(x + C[1]))*
(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/3)/9 + (16*(1 + 27/E^(6*(x + C
[1])))))/(81*Sqrt[4 - 9/E^(6*(x + C[1])) + (9 + 72*E^(6*(x + C[1])))/(E^(12*(x +
C[1]))*((-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1])) + 8*Sqr
t[E^(42*(x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/3)) + 9*((
-E^(18*(x + C[1])) + 20*E^(24*(x + C[1])) + 8*E^(30*(x + C[1])) + 8*Sqrt[E^(42*(
x + C[1]))*(-1 + E^(6*(x + C[1])))^3])/E^(36*(x + C[1])))^(1/3)])])/18}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-2*(1-3*y(x))*diff(y(x),x)-(4-9*y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x+1/12*ln(9*y(x)-4)+1/4*ln(y(x))+1/4*ln((1-2*y(x))^(1/2)-1)-1/4*ln((1-2*y(x))^(1
/2)+1)+1/12*ln(3*(1-2*y(x))^(1/2)+1)-1/12*ln(3*(1-2*y(x))^(1/2)-1)-_C1 = 0, x+1/
12*ln(9*y(x)-4)+1/4*ln(y(x))-1/4*ln((1-2*y(x))^(1/2)-1)+1/4*ln((1-2*y(x))^(1/2)+
1)-1/12*ln(3*(1-2*y(x))^(1/2)+1)+1/12*ln(3*(1-2*y(x))^(1/2)-1)-_C1 = 0
```

4.820 $y(x)(3a+b+9y(x))+(a+6y(x))y'(x)+y'(x)^2=0$

ODE

$$y(x)(3a+b+9y(x))+(a+6y(x))y'(x)+y'(x)^2=0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.346644 (sec), leaf count = 226

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{6a\tanh^{-1}\left(\frac{\sqrt{a^2-4\#1b}}{a}\right)-2(3a+2b)\tanh^{-1}\left(\frac{3\sqrt{a^2-4\#1b}}{3a+2b}\right)+3a\log(9\#1+3a+b)+2b\log}{12(3a+b)}\right.\right.$$

Maple ✓
cpu = 0.067 (sec), leaf count = 69

$$\left\{x-\int^{y(x)}-2\left(a+6\_a-\sqrt{-4\_a\,b+a^2}\right)^{-1}d\_a-\_C1=0,x-\int^{y(x)}-2\left(a+6\_a+\sqrt{-4\_a\,b+a^2}\right)^{-1}d\_a-\_C1\right.$$

Mathematica raw input

```
DSolve[y[x]*(3*a + b + 9*y[x]) + (a + 6*y[x])*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(6*a*ArcTanh[Sqrt[a^2 - 4*b*#1]/a] - 2*(3*a + 2*b)*Arc
Tanh[(3*Sqrt[a^2 - 4*b*#1])/(3*a + 2*b)] + 3*a*Log[#1] + 3*a*Log[3*a + b + 9*#1]
 + 2*b*Log[3*a + b + 9*#1])/(12*(3*a + b)) & ][-x/2 + C[1]]}, {y[x] -> InverseFu
nction[-(-6*a*ArcTanh[Sqrt[a^2 - 4*b*#1]/a] + (6*a + 4*b)*ArcTanh[(3*Sqrt[a^2 -
4*b*#1])/(3*a + 2*b)] + 3*a*Log[#1] + 3*a*Log[3*a + b + 9*#1] + 2*b*Log[3*a + b
+ 9*#1])/(12*(3*a + b)) & ][x/2 + C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+(a+6*y(x))*diff(y(x),x)+y(x)*(3*a+b+9*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
x-Intat(-2/(a+6*_a+(-4*_a*b+a^2)^(1/2)),_a = y(x))-_C1 = 0, x-Intat(-2/(a+6*_a-(
-4*_a*b+a^2)^(1/2)),_a = y(x))-_C1 = 0
```

4.821 $ay(x)y'(x) - ax + y'(x)^2 = 0$

ODE

$$ay(x)y'(x) - ax + y'(x)^2 = 0$$

ODE Classification

[_dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 1.46942 (sec), leaf count = 45

$$\text{Solve}\left[\left\{x = \frac{\text{K\$230729}\left(ac_1 + \sin^{-1}(\text{K\$230729})\right)}{a\sqrt{1 - \text{K\$230729}^2}}, \frac{\text{K\$230729}}{a} + y(x) = \frac{x}{\text{K\$230729}}\right\}, \{y(x), \text{K\$230729}\}\right]$$

Maple ✓
cpu = 0.041 (sec), leaf count = 106

$$\left\{[x(\_T) = \_T\left(-\frac{1}{a}\sqrt{\_T-1}\sqrt{\_T+1}\ln\left(\_T + \sqrt{\_T^2-1}\right)\frac{1}{\sqrt{\_T^2-1}} + \_C1\right)\frac{1}{\sqrt{\_T-1}}\frac{1}{\sqrt{\_T+1}}, y(\_T) = 1\left(-\right.\right.$$

Mathematica raw input

```
DSolve[-(a*x) + a*y[x]*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
Solve[{x == (K$230729*(ArcSin[K$230729] + a*C[1]))/(a*Sqrt[1 - K$230729^2]), K$2
30729/a + y[x] == x/K$230729}, {y[x], K$230729}]
```

Maple raw input

```
dsolve(diff(y(x),x)^2+a*y(x)*diff(y(x),x)-a*x = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T-1)^(1/2)/(_T+1)^(1/2)*_T*(-1/a*(_T-1)^(1/2)*(_T+1)^(1/2)/(_T^2-1)
^(1/2)*ln(_T+(_T^2-1)^(1/2))+_C1), y(_T) = 1/(_T-1)^(1/2)/(_T+1)^(1/2)*(-1/a*(_T
-1)^(1/2)*(_T+1)^(1/2)/(_T^2-1)^(1/2)*ln(_T+(_T^2-1)^(1/2))+_C1)-_T/a]
```

4.822 $-ay(x)y'(x) - ax + y'(x)^2 = 0$

ODE

$$-ay(x)y'(x) - ax + y'(x)^2 = 0$$

ODE Classification

[_dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 1.13249 (sec), leaf count = 43

$$\text{Solve}\left[\left\{x = \frac{\text{K\$230907}\left(ac_1 + \sinh^{-1}(\text{K\$230907})\right)}{a\sqrt{\text{K\$230907}^2 + 1}}, \frac{x}{\text{K\$230907}} + y(x) = \frac{\text{K\$230907}}{a}\right\}, \{y(x), \text{K\$230907}\}\right]$$

Maple ✓
cpu = 0.02 (sec), leaf count = 48

$$\left\{[x(\_T) = \_T\left(\frac{Arcsinh(\_T)}{a} + \_C1\right)\frac{1}{\sqrt{\_T^2+1}}, y(\_T) = -1\left(\frac{Arcsinh(\_T)}{a} + \_C1\right)\frac{1}{\sqrt{\_T^2+1}} + \frac{\_T}{a}]\right\}$$

Mathematica raw input

```
DSolve[-(a*x) - a*y[x]*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
Solve[{x == (K$230907*(ArcSinh[K$230907] + a*C[1]))/(a*Sqrt[1 + K$230907^2]), x/
K$230907 + y[x] == K$230907/a}, {y[x], K$230907}]
```

Maple raw input

```
dsolve(diff(y(x),x)^2-a*y(x)*diff(y(x),x)-a*x = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T^2+1)^(1/2)*_T*(1/a*arcsinh(_T)+_C1), y(_T) = -1/(_T^2+1)^(1/2)*(1
/a*arcsinh(_T)+_C1)+_T/a]
```

4.823 $y'(x)(ax+by(x))+abxy(x)+y'(x)^2=0$

ODE

$$y'(x)(ax+by(x))+abxy(x)+y'(x)^2=0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00502154 (sec), leaf count = 29

$$\left\{\left\{y(x)\to c_1 e^{-bx}\right\},\left\{y(x)\to c_1-\frac{ax^2}{2}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 22

$$\left\{y(x)=\_C1\,\mathrm{e}^{-bx},y(x)=-\frac{ax^2}{2}+\_C1\right\}$$

Mathematica raw input

```
DSolve[a*b*x*y[x] + (a*x + b*y[x])*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(b*x)}, {y[x] -> -(a*x^2)/2 + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+(a*x+b*y(x))*diff(y(x),x)+a*b*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2*a*x^2+_C1, y(x) = _C1*exp(-b*x)
```

4.824 $y(x)^2 \log(ay(x)) - xy(x)y'(x) + y'(x)^2 = 0$

ODE

$$y(x)^2 \log(ay(x)) - xy(x)y'(x) + y'(x)^2 = 0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(y)]`]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.242426 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{e^{\frac{1}{4}c_1(2x-c_1)}}{a}\right\}\right\}$$

Maple ✓
cpu = 0.273 (sec), leaf count = 56

$$\left\{-\_C1 + x - \sqrt{x^2 - 4\ln(ay(x))} = 0, -\_C1 + \sqrt{x^2 - 4\ln(ay(x))} + x = 0, y(x) = \frac{1}{a}e^{\frac{x^2}{4}}\right\}$$

Mathematica raw input

```
DSolve[Log[a*y[x]]*y[x]^2 - x*y[x]*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(((2*x - C[1])*C[1])/4)/a}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-x*y(x)*diff(y(x),x)+y(x)^2*ln(a*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(1/4*x^2)/a, -_C1+x-(x^2-4*ln(a*y(x)))^(1/2) = 0, -_C1+(x^2-4*ln(a*y(x
)))^(1/2)+x = 0
```

4.825 $y'(x)^2 - (2xy(x)+1)y'(x) + 2xy(x) = 0$

ODE

$$y'(x)^2 - (2xy(x)+1)y'(x) + 2xy(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00333074 (sec), leaf count = 21

$$\left\{\left\{y(x) \to c_1 e^{x^2}\right\}, \{y(x) \to c_1 + x\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 16

$$\left\{y(x) = \_C1\, \mathrm{e}^{x^2}, y(x) = x + \_C1\right\}$$

Mathematica raw input

```
DSolve[2*x*y[x] - (1 + 2*x*y[x])*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x^2*C[1]}, {y[x] -> x + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-(1+2*x*y(x))*diff(y(x),x)+2*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(x^2), y(x) = x+_C1
```

4.826 $y'(x)^2 - (y(x)^2+4)\,y'(x) + y(x)^2 + 4 = 0$

ODE

$$y'(x)^2 - (y(x)^2+4)\,y'(x) + y(x)^2 + 4 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Use new variable

Mathematica ✓
cpu = 0.0510093 (sec), leaf count = 59

$$\left\{\left\{y(x) \to \frac{-4c_1 x + 4c_1^2 + x^2 - 1}{x - 2c_1}\right\}, \left\{y(x) \to \frac{4c_1 x + 4c_1^2 + x^2 - 1}{2c_1 + x}\right\}\right\}$$

Maple ✓
cpu = 0.036 (sec), leaf count = 79

$$\left\{4 + (y(x))^2 = 0, x - \int^{y(x)} 2\left(\_a^2 - \sqrt{\_a^2\left(\_a^2+4\right)} + 4\right)^{-1} d\_a - \_C1 = 0, x - \int^{y(x)} 2\left(\_a^2 + \sqrt{\_a^2\left(\_a^2+4\right)} + 4\right)\right.$$

Mathematica raw input

```
DSolve[4 + y[x]^2 - (4 + y[x]^2)*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + x^2 - 4*x*C[1] + 4*C[1]^2)/(x - 2*C[1])}, {y[x] -> (-1 + x^2 + 4
*x*C[1] + 4*C[1]^2)/(x + 2*C[1])}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-(4+y(x)^2)*diff(y(x),x)+4+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
4+y(x)^2 = 0, x-Intat(2/(_a^2-(_a^2*(_a^2+4))^(1/2)+4),_a = y(x))-_C1 = 0, x-Int
at(2/(_a^2+(_a^2*(_a^2+4))^(1/2)+4),_a = y(x))-_C1 = 0
```

4.827 $-(x-y(x))y(x)y'(x)+y'(x)^2-xy(x)^3=0$

ODE

$$-(x-y(x))y(x)y'(x)+y'(x)^2-xy(x)^3=0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00665667 (sec), leaf count = 29

$$\left\{\left\{y(x)\to \frac{1}{x-c_1}\right\},\left\{y(x)\to c_1 e^{\frac{x^2}{2}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 25

$$\left\{(y(x))^{-1}-x-\_C1=0,y(x)=\_C1\,\mathrm{e}^{\frac{x^2}{2}}\right\}$$

Mathematica raw input

```
DSolve[-(x*y[x]^3) - (x - y[x])*y[x]*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - C[1])^(-1)}, {y[x] -> E^(x^2/2)*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-(x-y(x))*y(x)*diff(y(x),x)-x*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(1/2*x^2), 1/y(x)-x-_C1 = 0
```

4.828 $xy(x)^2y'(x) + y'(x)^2 + y(x)^3 = 0$

ODE

$$xy(x)^2y'(x) + y'(x)^2 + y(x)^3 = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.195719 (sec), leaf count = 47

$$\left\{\left\{y(x) \to -\frac{4e^{-c_1}}{e^{c_1} - 2x}\right\}, \left\{y(x) \to -\frac{e^{-c_1}}{4e^{c_1} - 2x}\right\}\right\}$$

Maple ✓
cpu = 0.187 (sec), leaf count = 82

$$\left\{x^2 + \frac{x}{y(x)}\sqrt{x^2(y(x))^2 - 4y(x)} - 2(y(x))^{-1} - \_C1 = 0, x^2(y(x))^2 + y(x)\sqrt{x^2(y(x))^2 - 4y(x)}x - 2y(x) - \_C1 = 0, \right.$$

Mathematica raw input

```
DSolve[y[x]^3 + x*y[x]^2*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -4/(E^C[1]*(E^C[1] - 2*x))}, {y[x] -> -(1/(E^C[1]*(4*E^C[1] - 2*x)))}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+x*y(x)^2*diff(y(x),x)+y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 4/x^2, x^2+1/y(x)*(x^2*y(x)^2-4*y(x))^(1/2)*x-2/y(x)-_C1 = 0, x^2*y(x)^2+
y(x)*(x^2*y(x)^2-4*y(x))^(1/2)*x-2*y(x)-_C1 = 0
```

4.829 $-2x^3y(x)^2y'(x) - 4x^2y(x)^3 + y'(x)^2 = 0$

ODE

$$-2x^3y(x)^2y'(x) - 4x^2y(x)^3 + y'(x)^2 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.587685 (sec), leaf count = 136

$$\left\{\text{Solve}\left[4c_1 + \frac{2x\sqrt{x^4y(x)+4}\,y(x)^{3/2}\sinh^{-1}\left(\frac{1}{2}x^2\sqrt{y(x)}\right)}{\sqrt{x^2y(x)^3\left(x^4y(x)+4\right)}} + \log(y(x)) = 0, y(x)\right], \text{Solve}\left[4c_1 + \log(y(x)) = \frac{2xy(x)^{3/2}\sqrt{x}\right.\right.$$

Maple ✓
cpu = 0.294 (sec), leaf count = 86

$$\left\{x^4 + \frac{x^2}{y(x)}\sqrt{x^4\left(y(x)\right)^2 + 4y(x)} + 2\left(y(x)\right)^{-1} - \_C1 = 0, x^4(y(x))^2 + y(x)\,x^2\sqrt{x^4\left(y(x)\right)^2 + 4y(x)} + 2y(x) - \_C1 = 0,\right.$$

Mathematica raw input

```
DSolve[-4*x^2*y[x]^3 - 2*x^3*y[x]^2*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[4*C[1] + Log[y[x]] + (2*x*ArcSinh[(x^2*Sqrt[y[x]])/2]*y[x]^(3/2)*Sqrt[4 +
  x^4*y[x]])/Sqrt[x^2*y[x]^3*(4 + x^4*y[x])] == 0, y[x]], Solve[4*C[1] + Log[y[x]
] == (2*x*ArcSinh[(x^2*Sqrt[y[x]])/2]*y[x]^(3/2)*Sqrt[4 + x^4*y[x]])/Sqrt[x^2*y[
x]^3*(4 + x^4*y[x])], y[x]]}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-2*x^3*y(x)^2*diff(y(x),x)-4*x^2*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -4/x^4, x^4*y(x)^2+y(x)*x^2*(x^4*y(x)^2+4*y(x))^(1/2)+2*y(x)-_C1 = 0, x^4
+1/y(x)*x^2*(x^4*y(x)^2+4*y(x))^(1/2)+2/y(x)-_C1 = 0
```

4.830 $x^4 y(x)^4 - x(x^2 + y(x)^2)\, y(x) y'(x) + y'(x)^2 = 0$

ODE

$$x^4 y(x)^4 - x\left(x^2 + y(x)^2\right) y(x) y'(x) + y'(x)^2 = 0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00775166 (sec), leaf count = 55

$$\left\{\left\{y(x) \to -\frac{1}{\sqrt{-2c_1 - x^2}}\right\}, \left\{y(x) \to \frac{1}{\sqrt{-2c_1 - x^2}}\right\}, \left\{y(x) \to c_1 e^{\frac{x^4}{4}}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 25

$$\left\{(y(x))^{-2} + x^2 - \_C1 = 0, y(x) = \_C1\, \mathrm{e}^{\frac{x^4}{4}}\right\}$$

Mathematica raw input

```
DSolve[x^4*y[x]^4 - x*y[x]*(x^2 + y[x]^2)*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1/Sqrt[-x^2 - 2*C[1]])}, {y[x] -> 1/Sqrt[-x^2 - 2*C[1]]}, {y[x] -> E
^(x^4/4)*C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-x*y(x)*(x^2+y(x)^2)*diff(y(x),x)+x^4*y(x)^4 = 0, y(x),'implicit')
```

Maple raw output

```
1/y(x)^2+x^2-_C1 = 0, y(x) = _C1*exp(1/4*x^4)
```

4.831 $2xy(x)^3y'(x) + y'(x)^2 + y(x)^4 = 0$

ODE

$$2xy(x)^3y'(x) + y'(x)^2 + y(x)^4 = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.773611 (sec), leaf count = 199

$$\left\{\text{Solve}\left[\frac{\sqrt{x^2y(x)^2-1}y(x)^2\left(c_1+\log(y(x))\right)+\sqrt{y(x)^4\left(x^2y(x)^2-1\right)}\left(\log(y(x))-\log\left(y(x)\left(\sqrt{x^2y(x)^2-1}+xy(x)\right)\right)\right)}{y(x)\sqrt{x^2y(x)^2-1}}=\right.\right.$$

Maple ✓
cpu = 0.075 (sec), leaf count = 81

$$\left\{(y(x))^2-x^{-2}=0,\ln(x)-\_C1-\ln\left(xy(x)+\sqrt{x^2\left(y(x)\right)^2-1}\right)-\ln(xy(x))=0,\ln(x)-\_C1+\ln\left(xy(x)+\sqrt{x^2(y\right.\right.$$

Mathematica raw input

```
DSolve[y[x]^4 + 2*x*y[x]^3*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[((C[1] + Log[y[x]])*y[x]^2*Sqrt[-1 + x^2*y[x]^2] + (Log[y[x]] - Log[y[x]*
(x*y[x] + Sqrt[-1 + x^2*y[x]^2])])*Sqrt[y[x]^4*(-1 + x^2*y[x]^2)])/(y[x]*Sqrt[-1
 + x^2*y[x]^2]) == 0, y[x]], Solve[((C[1] + Log[y[x]])*y[x]^2*Sqrt[-1 + x^2*y[x]
^2] + (-Log[y[x]] + Log[y[x]*(x*y[x] + Sqrt[-1 + x^2*y[x]^2])])*Sqrt[y[x]^4*(-1
+ x^2*y[x]^2)])/(y[x]*Sqrt[-1 + x^2*y[x]^2]) == 0, y[x]]}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+2*x*y(x)^3*diff(y(x),x)+y(x)^4 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-1/x^2 = 0, ln(x)-_C1+ln(x*y(x)+(x^2*y(x)^2-1)^(1/2))-ln(x*y(x)) = 0, ln(x
)-_C1-ln(x*y(x)+(x^2*y(x)^2-1)^(1/2))-ln(x*y(x)) = 0
```

4.832 $y'(x)^2 + 2y(x)\cot(x)y'(x) - y(x)^2 = 0$

ODE

$$y'(x)^2 + 2y(x)\cot(x)y'(x) - y(x)^2 = 0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.032357 (sec), leaf count = 31

$$\left\{\left\{y(x) \to c_1 \csc^2\left(\frac{x}{2}\right)\right\}, \left\{y(x) \to c_1 \sec^2\left(\frac{x}{2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.107 (sec), leaf count = 91

$$\left\{y(x) - \frac{\_C1}{\tan(x)}\sqrt{1-\left((\tan(x))^2+1\right)^{-1}}\sqrt{(\tan(x))^2+1}\left(\frac{1}{\sqrt{(\tan(x))^2+1}}+1\right)^{-1} = 0, y(x) - \frac{\_C1}{\tan(x)}\left(\frac{1}{\sqrt{(\tan(x))^2+}\right.\right.$$

Mathematica raw input

```
DSolve[-y[x]^2 + 2*Cot[x]*y[x]*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Csc[x/2]^2}, {y[x] -> C[1]*Sec[x/2]^2}}
```

Maple raw input

```
dsolve(diff(y(x),x)^2+2*y(x)*diff(y(x),x)*cot(x)-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)-_C1/(1/(tan(x)^2+1)^(1/2)+1)*(1-1/(tan(x)^2+1))^(1/2)*(tan(x)^2+1)^(1/2)/ta
n(x) = 0, y(x)-_C1*(1/(tan(x)^2+1)^(1/2)+1)/(1-1/(tan(x)^2+1))^(1/2)*(tan(x)^2+1
)^(1/2)/tan(x) = 0
```

4.833 $y'(x)^2 - 3xy(x)^{2/3}y'(x) + 9y(x)^{5/3} = 0$

ODE

$$y'(x)^2 - 3xy(x)^{2/3}y'(x) + 9y(x)^{5/3} = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.971818 (sec), leaf count = 175

$$\left\{ \text{Solve}\left[\frac{1}{6}\left(-6c_1 + \frac{\left(x^2 - 4\sqrt[3]{y(x)}\right)^{3/2} y(x)^2 \left(6\log\left(\sqrt{x^2 - 4\sqrt[3]{y(x)}} + x\right) - \log(y(x))\right)}{\left(\left(x^2 - 4\sqrt[3]{y(x)}\right) y(x)^{4/3}\right)^{3/2}} + \log(y(x)) \right) = 0, y(x) \right], \text{Solve}\left[\right.$$

Maple ✓
cpu = 2.484 (sec), leaf count = 142

$$\left\{ \sqrt[3]{y(x)} - \frac{x^2}{4} = 0, \ln(x) - \frac{1}{6}\ln\left(4\sqrt[3]{\frac{y(x)}{x^6}} - 1\right) + \frac{1}{6}\ln\left(\frac{y(x)}{x^6}\right) - 1\sqrt{-4\left(\frac{y(x)}{x^6}\right)^{5/3} + \left(\frac{y(x)}{x^6}\right)^{\frac{4}{3}}}\, Artanh\left(\sqrt{-4\sqrt[3]{\frac{y(x)}{x^6}}\right.\right.$$

Mathematica raw input

```
DSolve[9*y[x]^(5/3) - 3*x*y[x]^(2/3)*y'[x] + y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(-6*C[1] + Log[y[x]] + ((6*Log[x + Sqrt[x^2 - 4*y[x]^(1/3)]] - Log[y[x]])
*(x^2 - 4*y[x]^(1/3))^(3/2)*y[x]^2)/((x^2 - 4*y[x]^(1/3))*y[x]^(4/3))^(3/2))/6 =
= 0, y[x]], Solve[(-6*C[1] + Log[y[x]] + ((-6*Log[x + Sqrt[x^2 - 4*y[x]^(1/3)]]
+ Log[y[x]])*(x^2 - 4*y[x]^(1/3))^(3/2)*y[x]^2)/((x^2 - 4*y[x]^(1/3))*y[x]^(4/3)
)^(3/2))/6 == 0, y[x]]}
```

Maple raw input

```
dsolve(diff(y(x),x)^2-3*x*y(x)^(2/3)*diff(y(x),x)+9*y(x)^(5/3) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^(1/3)-1/4*x^2 = 0, ln(x)-1/6*ln(4*(y(x)/x^6)^(1/3)-1)+1/6*ln(y(x)/x^6)-(-4*
(y(x)/x^6)^(5/3)+(y(x)/x^6)^(4/3))^(1/2)/(y(x)/x^6)^(2/3)/(-4*(y(x)/x^6)^(1/3)+1
)^(1/2)*arctanh((-4*(y(x)/x^6)^(1/3)+1)^(1/2))-1/6*ln(16*(y(x)/x^6)^(2/3)+4*(y(x
)/x^6)^(1/3)+1)+1/6*ln(64*y(x)/x^6-1)-_C1 = 0
```

4.834 $y'(x)^2 = e^{4x-2y(x)}(y'(x)-1)$

ODE

$$y'(x)^2 = e^{4x-2y(x)}(y'(x)-1)$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
Change of variable

Mathematica ✗
cpu = 0 (sec), leaf count = 0 , $Failed

$Failed

Maple ✓
cpu = 0.372 (sec), leaf count = 259

$$\left\{x - \frac{e^{2y(x)-4x}}{2}\sqrt{-\left(4e^{2y(x)-4x}-1\right)e^{8x-4y(x)}}\,Artanh\left(\frac{1}{\sqrt{-4e^{2y(x)-4x}+1}}\right)\frac{1}{\sqrt{-4e^{2y(x)-4x}+1}} - \frac{\ln\left(2e^{y(x)-2x}-1\right)}{4} +$$

Mathematica raw input

```
DSolve[y'[x]^2 == E^(4*x - 2*y[x])*(-1 + y'[x]),y[x],x]
```

Mathematica raw output

```
{}
```

Maple raw input

```
dsolve(diff(y(x),x)^2 = exp(4*x-2*y(x))*(diff(y(x),x)-1), y(x),'implicit')
```

Maple raw output

```
x-1/2*(-(4*exp(2*y(x)-4*x)-1)*exp(8*x-4*y(x)))^(1/2)*exp(2*y(x)-4*x)/(-4*exp(2*y
(x)-4*x)+1)^(1/2)*arctanh(1/(-4*exp(2*y(x)-4*x)+1)^(1/2))-1/4*ln(2*exp(y(x)-2*x)
-1)+1/2*ln(exp(y(x)-2*x))-1/4*ln(1+2*exp(y(x)-2*x))+1/4*ln(4*exp(2*y(x)-4*x)-1)-
_C1 = 0, x+1/4*ln(4*exp(2*y(x)-4*x)-1)-1/4*ln(2*exp(y(x)-2*x)-1)+1/2*ln(exp(y(x)
-2*x))-1/4*ln(1+2*exp(y(x)-2*x))+1/2*(-(4*exp(2*y(x)-4*x)-1)*exp(8*x-4*y(x)))^(1
/2)*exp(2*y(x)-4*x)/(-4*exp(2*y(x)-4*x)+1)^(1/2)*arctanh(1/(-4*exp(2*y(x)-4*x)+1
)^(1/2))-_C1 = 0
```

4.835 $2y'(x)^2 + xy'(x) - 2y(x) = 0$

ODE

$$2y'(x)^2 + xy'(x) - 2y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 0.468759 (sec), leaf count = 102

$$\left\{\text{Solve}\left[\frac{x\left(\sqrt{x^2+16y(x)}-x\right)}{16y(x)}+\log\left(\sqrt{x^2+16y(x)}+x\right)=c_1,y(x)\right],\text{Solve}\left[\frac{16y(x)\left(c_1+\log\left(\sqrt{x^2+16y(x)}+x\right)-\text{lo}\right.}{y(x)}\right.\right.$$

Maple ✓
cpu = 0.015 (sec), leaf count = 28

$$\left\{[x(\_T)=\_T\left(4\ln\left(\_T\right)+\_C1\right),y(\_T)=\frac{\_T^2(2+4\ln\left(\_T\right)+\_C1)}{2}]\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + x*y'[x] + 2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[Log[x + Sqrt[x^2 + 16*y[x]]] + (x*(-x + Sqrt[x^2 + 16*y[x]]))/(16*y[x]) =
= C[1], y[x]], Solve[(16*(C[1] - Log[y[x]] + Log[x + Sqrt[x^2 + 16*y[x]]])*y[x]
+ x*(x + Sqrt[x^2 + 16*y[x]]))/y[x] == 0, y[x]]}
```

Maple raw input

```
dsolve(2*diff(y(x),x)^2+x*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = _T*(4*ln(_T)+_C1), y(_T) = 1/2*_T^2*(2+4*ln(_T)+_C1)]
```

4.836 $2y'(x)^2 - (1-x)y'(x) - y(x) = 0$

ODE

$$2y'(x)^2 - (1-x)y'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.00254165 (sec), leaf count = 15

$$\{\{y(x) \to c_1(2c_1 + x - 1)\}\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 22

$$\left\{y(x) = \_C1\,(2\,\_C1 + x - 1), y(x) = -\frac{(-1+x)^2}{8}\right\}$$

Mathematica raw input

```
DSolve[-y[x] - (1 - x)*y'[x] + 2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*(-1 + x + 2*C[1])}}
```

Maple raw input

```
dsolve(2*diff(y(x),x)^2-(1-x)*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/8*(-1+x)^2, y(x) = _C1*(2*_C1+x-1)
```

4.837 $-2x^2y'(x) + 2y'(x)^2 + 3xy(x) = 0$

ODE

$$-2x^2y'(x) + 2y'(x)^2 + 3xy(x) = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
Homogeneous ODE, The Isobaric equation

Mathematica ✗
cpu = 599.999 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.13 (sec), leaf count = 122

$$\left\{1\left(\left(-\_C1+y(x)\right)\sqrt{x^4-6\,xy\,(x)}-x^2(\_C1+y(x))\right)\left(x^2+\sqrt{x^4-6\,xy\,(x)}\right)^{-1}=0,-\frac{x^2}{y\,(x)}\left(x^2+\sqrt{x^4-6\,xy\,(x)}\right)^{-1}+\right.$$

Mathematica raw input

```
DSolve[3*x*y[x] - 2*x^2*y'[x] + 2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(2*diff(y(x),x)^2-2*x^2*diff(y(x),x)+3*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/6*x^3, ((-_C1+y(x))*(x^4-6*x*y(x))^(1/2)-x^2*(_C1+y(x)))/(x^2+(x^4-6*x*
y(x))^(1/2)) = 0, -1/y(x)/(x^2+(x^4-6*x*y(x))^(1/2))*x^2+1/y(x)/(x^2+(x^4-6*x*y(
x))^(1/2))*(x^4-6*x*y(x))^(1/2)-_C1 = 0
```

4.838 $2y'(x)^2 + 2(6y(x) - 1)y'(x) + 3y(x)(6y(x) - 1) = 0$

ODE

$$2y'(x)^2 + 2(6y(x) - 1)y'(x) + 3y(x)(6y(x) - 1) = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0566033 (sec), leaf count = 69

$$\left\{\left\{y(x) \to -\frac{1}{6}e^{3c_1-3x}\left(e^{3c_1} - 2e^{3x/2}\right)\right\}, \left\{y(x) \to \frac{1}{6}e^{-3(2c_1+x)}\left(2e^{3c_1+\frac{3x}{2}} - 1\right)\right\}\right\}$$

Maple ✓
cpu = 0.051 (sec), leaf count = 51

$$\left\{x + \frac{\ln(y(x))}{3} - \frac{2}{3}Artanh\left(\sqrt{-6\,y(x)+1}\right) - \_C1 = 0, x + \frac{\ln(y(x))}{3} + \frac{2}{3}Artanh\left(\sqrt{-6\,y(x)+1}\right) - \_C1 = 0, y(x) = \frac{1}{6}\right\}$$

Mathematica raw input

```
DSolve[3*y[x]*(-1 + 6*y[x]) + 2*(-1 + 6*y[x])*y'[x] + 2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(E^(-3*x + 3*C[1])*(-2*E^((3*x)/2) + E^(3*C[1])))/6}, {y[x] -> (-1 +
2*E^((3*x)/2 + 3*C[1]))/(6*E^(3*(x + 2*C[1])))}}
```

Maple raw input

```
dsolve(2*diff(y(x),x)^2+2*(6*y(x)-1)*diff(y(x),x)+3*y(x)*(6*y(x)-1) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/6, x+1/3*ln(y(x))-2/3*arctanh((-6*y(x)+1)^(1/2))-_C1 = 0, x+1/3*ln(y(x)
)+2/3*arctanh((-6*y(x)+1)^(1/2))-_C1 = 0
```

4.839 $3y'(x)^2 - 2xy'(x) + y(x) = 0$

ODE

$$3y'(x)^2 - 2xy'(x) + y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.327781 (sec), leaf count = 1093

$$\{\{y(x) \to \text{Root}\left[-16e^{6c_1}x^6 + 3\#1^4x^4 + 144e^{6c_1}\#1x^4 - 24\#1^5x^2 - 378e^{6c_1}\#1^2x^2 + 243e^{12c_1} + 48\#1^6 + 216e^{6c_1}\#1^3\&, 1\right]\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 30

$$\left\{[x(\_T) = \frac{2\_T^3 + \_C1}{\_T^2}, y(\_T) = \frac{\_T^3 + 2\_C1}{\_T}]\right\}$$

Mathematica raw input

```
DSolve[y[x] - 2*x*y'[x] + 3*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[243*E^(12*C[1]) - 16*E^(6*C[1])*x^6 + 144*E^(6*C[1])*x^4*#1 - 378
*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 3*x^4*#1^4 - 24*x^2*#1^5 + 48*#1^6
& , 1]}, {y[x] -> Root[243*E^(12*C[1]) - 16*E^(6*C[1])*x^6 + 144*E^(6*C[1])*x^4*
#1 - 378*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 3*x^4*#1^4 - 24*x^2*#1^5 +
48*#1^6 & , 2]}, {y[x] -> Root[243*E^(12*C[1]) - 16*E^(6*C[1])*x^6 + 144*E^(6*C[
1])*x^4*#1 - 378*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 3*x^4*#1^4 - 24*x^2
*#1^5 + 48*#1^6 & , 3]}, {y[x] -> Root[243*E^(12*C[1]) - 16*E^(6*C[1])*x^6 + 144
*E^(6*C[1])*x^4*#1 - 378*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 3*x^4*#1^4
- 24*x^2*#1^5 + 48*#1^6 & , 4]}, {y[x] -> Root[243*E^(12*C[1]) - 16*E^(6*C[1])*x
^6 + 144*E^(6*C[1])*x^4*#1 - 378*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 3*x
^4*#1^4 - 24*x^2*#1^5 + 48*#1^6 & , 5]}, {y[x] -> Root[243*E^(12*C[1]) - 16*E^(6
*C[1])*x^6 + 144*E^(6*C[1])*x^4*#1 - 378*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1
^3 + 3*x^4*#1^4 - 24*x^2*#1^5 + 48*#1^6 & , 6]}, {y[x] -> Root[3*E^(12*C[1]) - 1
6*E^(6*C[1])*x^6 + 144*E^(6*C[1])*x^4*#1 - 378*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[
1])*#1^3 + 243*x^4*#1^4 - 1944*x^2*#1^5 + 3888*#1^6 & , 1]}, {y[x] -> Root[3*E^(
12*C[1]) - 16*E^(6*C[1])*x^6 + 144*E^(6*C[1])*x^4*#1 - 378*E^(6*C[1])*x^2*#1^2 +
```

```
 216*E^(6*C[1])*#1^3 + 243*x^4*#1^4 - 1944*x^2*#1^5 + 3888*#1^6 & , 2]}, {y[x] -
> Root[3*E^(12*C[1]) - 16*E^(6*C[1])*x^6 + 144*E^(6*C[1])*x^4*#1 - 378*E^(6*C[1]
)*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 243*x^4*#1^4 - 1944*x^2*#1^5 + 3888*#1^6 & ,
3]}, {y[x] -> Root[3*E^(12*C[1]) - 16*E^(6*C[1])*x^6 + 144*E^(6*C[1])*x^4*#1 - 3
78*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 243*x^4*#1^4 - 1944*x^2*#1^5 + 38
88*#1^6 & , 4]}, {y[x] -> Root[3*E^(12*C[1]) - 16*E^(6*C[1])*x^6 + 144*E^(6*C[1]
)*x^4*#1 - 378*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 243*x^4*#1^4 - 1944*x
^2*#1^5 + 3888*#1^6 & , 5]}, {y[x] -> Root[3*E^(12*C[1]) - 16*E^(6*C[1])*x^6 + 1
44*E^(6*C[1])*x^4*#1 - 378*E^(6*C[1])*x^2*#1^2 + 216*E^(6*C[1])*#1^3 + 243*x^4*#
1^4 - 1944*x^2*#1^5 + 3888*#1^6 & , 6]}}
```

Maple raw input

```
dsolve(3*diff(y(x),x)^2-2*x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^2*(2*_T^3+_C1), y(_T) = (_T^3+2*_C1)/_T]
```

4.840 $x^2 + 4xy'(x) + 3y'(x)^2 - y(x) = 0$

ODE

$$x^2 + 4xy'(x) + 3y'(x)^2 - y(x) = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
Change of variable

Mathematica ✗
cpu = 600.006 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.125 (sec), leaf count = 138

$$\left\{1\left(\left(2x^2 - 2\_C1 + 8y(x)\right)\sqrt{x^2+3y(x)} - x\left(x^2 + \_C1 + 4y(x)\right)\right)\left(2\sqrt{x^2+3y(x)} + x\right)^{-1} = 0, 2\frac{\sqrt{x^2+3y}}{\left(2\sqrt{x^2+3y(x)}+x\right.}\right.$$

Mathematica raw input

```
DSolve[x^2 - y[x] + 4*x*y'[x] + 3*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(3*diff(y(x),x)^2+4*x*diff(y(x),x)+x^2-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/3*x^2, 2/(2*(x^2+3*y(x))^(1/2)+x)/(x^2+4*y(x))*(x^2+3*y(x))^(1/2)-1/(2
*(x^2+3*y(x))^(1/2)+x)/(x^2+4*y(x))*x-_C1 = 0, ((2*x^2-2*_C1+8*y(x))*(x^2+3*y(x)
)^(1/2)-x*(x^2+_C1+4*y(x)))/(2*(x^2+3*y(x))^(1/2)+x) = 0
```

4.841 $4y'(x)^2 = 9x$

ODE

$$4y'(x)^2 = 9x$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.00518793 (sec), leaf count = 27

$$\left\{\left\{y(x) \to c_1 - x^{3/2}\right\}, \left\{y(x) \to c_1 + x^{3/2}\right\}\right\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 19

$$\left\{y(x) = -x^{\frac{3}{2}} + \_C1, y(x) = x^{\frac{3}{2}} + \_C1\right\}$$

Mathematica raw input

```
DSolve[4*y'[x]^2 == 9*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x^(3/2) + C[1]}, {y[x] -> x^(3/2) + C[1]}}
```

Maple raw input

```
dsolve(4*diff(y(x),x)^2 = 9*x, y(x),'implicit')
```

Maple raw output

```
y(x) = -x^(3/2)+_C1, y(x) = x^(3/2)+_C1
```

4.842 $4y'(x)^2 + 2xe^{-2y(x)}y'(x) - e^{-2y(x)} = 0$

ODE

$$4y'(x)^2 + 2xe^{-2y(x)}y'(x) - e^{-2y(x)} = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.254795 (sec), leaf count = 56

$$\left\{\left\{y(x) \to \frac{1}{2}\log\left(\frac{1}{4}e^{c_1}(e^{c_1} - 2x)\right)\right\}, \text{Solve}\left[c_1 + \log\left(\sqrt{x^2 + 4e^{2y(x)}} + x\right) = 2y(x), y(x)\right]\right\}$$

Maple ✓
cpu = 0.733 (sec), leaf count = 83

$$\left\{\ln(x) - \frac{\ln\left(\mathrm{e}^{-2\,y(x)}x^2\right)}{2} - \frac{\mathrm{e}^{2\,y(x)}}{x^2}\sqrt{\left(4\,\frac{\mathrm{e}^{2\,y(x)}}{x^2} + 1\right)x^4\mathrm{e}^{-4\,y(x)}}\,Artanh\left(\frac{1}{\sqrt{4\,\frac{\mathrm{e}^{2\,y(x)}}{x^2} + 1}}\right)\frac{1}{\sqrt{4\,\frac{\mathrm{e}^{2\,y(x)}}{x^2} + 1}} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[-E^(-2*y[x]) + (2*x*y'[x])/E^(2*y[x]) + 4*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Log[(E^C[1]*(E^C[1] - 2*x))/4]/2}, Solve[C[1] + Log[x + Sqrt[4*E^(2*y[
x]) + x^2]] == 2*y[x], y[x]]}
```

Maple raw input

```
dsolve(4*diff(y(x),x)^2+2*x*exp(-2*y(x))*diff(y(x),x)-exp(-2*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-1/2*ln(exp(-2*y(x))*x^2)-((4/x^2*exp(2*y(x))+1)*x^4*exp(-4*y(x)))^(1/2)/x^
2*exp(2*y(x))/(4/x^2*exp(2*y(x))+1)^(1/2)*arctanh(1/(4/x^2*exp(2*y(x))+1)^(1/2))
-_C1 = 0
```

4.843 $4y'(x)^2 + 2e^{2x-2y(x)}y'(x) - e^{2x-2y(x)} = 0$

ODE

$$4y'(x)^2 + 2e^{2x-2y(x)}y'(x) - e^{2x-2y(x)} = 0$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
Change of variable

Mathematica ✗
cpu = 0 (sec), leaf count = 0 , $Failed

$Failed

Maple ✓
cpu = 0.303 (sec), leaf count = 164

$$\left\{x + \mathrm{e}^{2\,y(x)-2\,x}\sqrt{\left(4\,\mathrm{e}^{2\,y(x)-2\,x}+1\right)\mathrm{e}^{-4\,y(x)+4\,x}}\,Artanh\left(\frac{1}{\sqrt{4\,\mathrm{e}^{2\,y(x)-2\,x}+1}}\right)\frac{1}{\sqrt{4\,\mathrm{e}^{2\,y(x)-2\,x}+1}} + \ln\left(\mathrm{e}^{y(x)-x}\right) - \_C1 = 0, x\right.$$

Mathematica raw input

```
DSolve[-E^(2*x - 2*y[x]) + 2*E^(2*x - 2*y[x])*y'[x] + 4*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{}
```

Maple raw input

```
dsolve(4*diff(y(x),x)^2+2*exp(2*x-2*y(x))*diff(y(x),x)-exp(2*x-2*y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
x+((4*exp(2*y(x)-2*x)+1)*exp(-4*y(x)+4*x))^(1/2)*exp(2*y(x)-2*x)/(4*exp(2*y(x)-2
*x)+1)^(1/2)*arctanh(1/(4*exp(2*y(x)-2*x)+1)^(1/2))+ln(exp(y(x)-x))-_C1 = 0, x+l
n(exp(y(x)-x))-((4*exp(2*y(x)-2*x)+1)*exp(-4*y(x)+4*x))^(1/2)*exp(2*y(x)-2*x)/(4
*exp(2*y(x)-2*x)+1)^(1/2)*arctanh(1/(4*exp(2*y(x)-2*x)+1)^(1/2))-_C1 = 0
```

4.844 $5y'(x)^2 + 3xy'(x) - y(x) = 0$

ODE

$$5y'(x)^2 + 3xy'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.297902 (sec), leaf count = 771

$$\left\{\left\{y(x) \to \text{Root}\left[80\#1^5 + 40\#1^4 x^2 + 5\#1^3 x^4 - 4000\#1^2 e^{5c_1} x - 1800\#1 e^{5c_1} x^3 - 216 e^{5c_1} x^5 - 40000 e^{10c_1} \&, 1\right]\right\}, \{y(x) \to \text{I}\right.$$

Maple ✓
cpu = 0.018 (sec), leaf count = 32

$$\left\{[x(\_T) = 1\left(-2\_T^{5/2} + \_C1\right)\_T^{-\frac{3}{2}}, y(\_T) = 1\left(-\_T^{\frac{5}{2}} + 3\_C1\right)\frac{1}{\sqrt{\_T}}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] + 3*x*y'[x] + 5*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[-40000*E^(10*C[1]) - 216*E^(5*C[1])*x^5 - 1800*E^(5*C[1])*x^3*#1
- 4000*E^(5*C[1])*x*#1^2 + 5*x^4*#1^3 + 40*x^2*#1^4 + 80*#1^5 & , 1]}, {y[x] ->
Root[-40000*E^(10*C[1]) - 216*E^(5*C[1])*x^5 - 1800*E^(5*C[1])*x^3*#1 - 4000*E^(
5*C[1])*x*#1^2 + 5*x^4*#1^3 + 40*x^2*#1^4 + 80*#1^5 & , 2]}, {y[x] -> Root[-4000
0*E^(10*C[1]) - 216*E^(5*C[1])*x^5 - 1800*E^(5*C[1])*x^3*#1 - 4000*E^(5*C[1])*x*
#1^2 + 5*x^4*#1^3 + 40*x^2*#1^4 + 80*#1^5 & , 3]}, {y[x] -> Root[-40000*E^(10*C[
1]) - 216*E^(5*C[1])*x^5 - 1800*E^(5*C[1])*x^3*#1 - 4000*E^(5*C[1])*x*#1^2 + 5*x
^4*#1^3 + 40*x^2*#1^4 + 80*#1^5 & , 4]}, {y[x] -> Root[-40000*E^(10*C[1]) - 216*
E^(5*C[1])*x^5 - 1800*E^(5*C[1])*x^3*#1 - 4000*E^(5*C[1])*x*#1^2 + 5*x^4*#1^3 +
40*x^2*#1^4 + 80*#1^5 & , 5]}, {y[x] -> Root[-5*E^(10*C[1]) + 216*E^(5*C[1])*x^5
 + 1800*E^(5*C[1])*x^3*#1 + 4000*E^(5*C[1])*x*#1^2 + 40000*x^4*#1^3 + 320000*x^2
*#1^4 + 640000*#1^5 & , 1]}, {y[x] -> Root[-5*E^(10*C[1]) + 216*E^(5*C[1])*x^5 +
 1800*E^(5*C[1])*x^3*#1 + 4000*E^(5*C[1])*x*#1^2 + 40000*x^4*#1^3 + 320000*x^2*#
1^4 + 640000*#1^5 & , 2]}, {y[x] -> Root[-5*E^(10*C[1]) + 216*E^(5*C[1])*x^5 + 1
800*E^(5*C[1])*x^3*#1 + 4000*E^(5*C[1])*x*#1^2 + 40000*x^4*#1^3 + 320000*x^2*#1^
4 + 640000*#1^5 & , 3]}, {y[x] -> Root[-5*E^(10*C[1]) + 216*E^(5*C[1])*x^5 + 180
```

```
0*E^(5*C[1])*x^3*#1 + 4000*E^(5*C[1])*x*#1^2 + 40000*x^4*#1^3 + 320000*x^2*#1^4
+ 640000*#1^5 & , 4]}, {y[x] -> Root[-5*E^(10*C[1]) + 216*E^(5*C[1])*x^5 + 1800*
E^(5*C[1])*x^3*#1 + 4000*E^(5*C[1])*x*#1^2 + 40000*x^4*#1^3 + 320000*x^2*#1^4 +
640000*#1^5 & , 5]}}
```

Maple raw input

```
dsolve(5*diff(y(x),x)^2+3*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^(3/2)*(-2*_T^(5/2)+_C1), y(_T) = (-_T^(5/2)+3*_C1)/_T^(1/2)]
```

4.845 $5y'(x)^2 + 6xy'(x) - 2y(x) = 0$

ODE

$$5y'(x)^2 + 6xy'(x) - 2y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.29187 (sec), leaf count = 771

$$\{\{y(x) \to \text{Root}\left[20\#1^5 + 20\#1^4 x^2 + 5\#1^3 x^4 - 1000\#1^2 e^{5c_1} x - 900\#1 e^{5c_1} x^3 - 216 e^{5c_1} x^5 - 5000 e^{10c_1} \&, 1\right]\}, \{y(x) \to \text{Ro}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 33

$$\left\{[x(\_T) = 1\left(-\_T^{\frac{5}{2}} + \_C1\right)\_T^{-\frac{3}{2}}, y(\_T) = \frac{1}{2}\left(-\_T^{\frac{5}{2}} + 6\_C1\right)\frac{1}{\sqrt{\_T}}]\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 6*x*y'[x] + 5*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[-5000*E^(10*C[1]) - 216*E^(5*C[1])*x^5 - 900*E^(5*C[1])*x^3*#1 -
1000*E^(5*C[1])*x*#1^2 + 5*x^4*#1^3 + 20*x^2*#1^4 + 20*#1^5 & , 1]}, {y[x] -> Ro
ot[-5000*E^(10*C[1]) - 216*E^(5*C[1])*x^5 - 900*E^(5*C[1])*x^3*#1 - 1000*E^(5*C[
1])*x*#1^2 + 5*x^4*#1^3 + 20*x^2*#1^4 + 20*#1^5 & , 2]}, {y[x] -> Root[-5000*E^(
10*C[1]) - 216*E^(5*C[1])*x^5 - 900*E^(5*C[1])*x^3*#1 - 1000*E^(5*C[1])*x*#1^2 +
 5*x^4*#1^3 + 20*x^2*#1^4 + 20*#1^5 & , 3]}, {y[x] -> Root[-5000*E^(10*C[1]) - 2
16*E^(5*C[1])*x^5 - 900*E^(5*C[1])*x^3*#1 - 1000*E^(5*C[1])*x*#1^2 + 5*x^4*#1^3
+ 20*x^2*#1^4 + 20*#1^5 & , 4]}, {y[x] -> Root[-5000*E^(10*C[1]) - 216*E^(5*C[1]
)*x^5 - 900*E^(5*C[1])*x^3*#1 - 1000*E^(5*C[1])*x*#1^2 + 5*x^4*#1^3 + 20*x^2*#1^
4 + 20*#1^5 & , 5]}, {y[x] -> Root[-5*E^(10*C[1]) + 216*E^(5*C[1])*x^5 + 900*E^(
5*C[1])*x^3*#1 + 1000*E^(5*C[1])*x*#1^2 + 5000*x^4*#1^3 + 20000*x^2*#1^4 + 20000
*#1^5 & , 1]}, {y[x] -> Root[-5*E^(10*C[1]) + 216*E^(5*C[1])*x^5 + 900*E^(5*C[1]
)*x^3*#1 + 1000*E^(5*C[1])*x*#1^2 + 5000*x^4*#1^3 + 20000*x^2*#1^4 + 20000*#1^5
& , 2]}, {y[x] -> Root[-5*E^(10*C[1]) + 216*E^(5*C[1])*x^5 + 900*E^(5*C[1])*x^3*
#1 + 1000*E^(5*C[1])*x*#1^2 + 5000*x^4*#1^3 + 20000*x^2*#1^4 + 20000*#1^5 & , 3]
}, {y[x] -> Root[-5*E^(10*C[1]) + 216*E^(5*C[1])*x^5 + 900*E^(5*C[1])*x^3*#1 + 1
```

```
000*E^(5*C[1])*x*#1^2 + 5000*x^4*#1^3 + 20000*x^2*#1^4 + 20000*#1^5 & , 4]}, {y[
x] -> Root[-5*E^(10*C[1]) + 216*E^(5*C[1])*x^5 + 900*E^(5*C[1])*x^3*#1 + 1000*E^
(5*C[1])*x*#1^2 + 5000*x^4*#1^3 + 20000*x^2*#1^4 + 20000*#1^5 & , 5]}}
```

Maple raw input

```
dsolve(5*diff(y(x),x)^2+6*x*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^(3/2)*(-_T^(5/2)+_C1), y(_T) = 1/2*(-_T^(5/2)+6*_C1)/_T^(1/2)]
```

4.846 $3xy(x)^4y'(x) + 9y'(x)^2 + y(x)^5 = 0$

ODE

$$3xy(x)^4y'(x) + 9y'(x)^2 + y(x)^5 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 1.15263 (sec), leaf count = 193

$$\left\{\text{Solve}\left[\frac{1}{2}\left(-2c_1+\frac{\sqrt{x^2y(x)^3-4}y(x)^{5/2}\left(3\log(y(x))-2\log\left(\sqrt{x^2y(x)^3-4}y(x)^{3/2}+xy(x)^3\right)\right)}{\sqrt{y(x)^5\left(x^2y(x)^3-4\right)}}-3\log(y(x))\right)=0, y(x)\right.\right.$$

Maple ✓
cpu = 0.452 (sec), leaf count = 60

$$\left\{(y(x))^3-4x^{-2}=0, \ln(x)-\int^{y(x)x^{\frac{2}{3}}}\frac{3}{2\_a\left(\_a^3-4\right)}\left(\_a^3+\sqrt{\_a^3\left(\_a^3-4\right)}-4\right)d\_a-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[y[x]^5 + 3*x*y[x]^4*y'[x] + 9*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(-2*C[1] - 3*Log[y[x]] + ((3*Log[y[x]] - 2*Log[x*y[x]^3 + y[x]^(3/2)*Sqrt
[-4 + x^2*y[x]^3]])*y[x]^(5/2)*Sqrt[-4 + x^2*y[x]^3])/Sqrt[y[x]^5*(-4 + x^2*y[x]
^3)])/2 == 0, y[x]], Solve[(-2*C[1] - 3*Log[y[x]] + ((-3*Log[y[x]] + 2*Log[x*y[x
]^3 + y[x]^(3/2)*Sqrt[-4 + x^2*y[x]^3]])*y[x]^(5/2)*Sqrt[-4 + x^2*y[x]^3])/Sqrt[
y[x]^5*(-4 + x^2*y[x]^3)])/2 == 0, y[x]]}
```

Maple raw input

```
dsolve(9*diff(y(x),x)^2+3*x*y(x)^4*diff(y(x),x)+y(x)^5 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^3-4/x^2 = 0, ln(x)-Intat(3/2*(_a^3+(_a^3*(_a^3-4))^(1/2)-4)/_a/(_a^3-4),_a
= y(x)*x^(2/3))-_C1 = 0
```

4.847 $xy'(x)^2 = a$

ODE

$$xy'(x)^2 = a$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0059783 (sec), leaf count = 39

$$\left\{\left\{y(x) \to c_1 - 2\sqrt{a}\sqrt{x}\right\}, \left\{y(x) \to 2\sqrt{a}\sqrt{x} + c_1\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 25

$$\left\{y(x) = -2\sqrt{ax} + \_C1, y(x) = 2\sqrt{ax} + \_C1\right\}$$

Mathematica raw input

```
DSolve[x*y'[x]^2 == a,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2*Sqrt[a]*Sqrt[x] + C[1]}, {y[x] -> 2*Sqrt[a]*Sqrt[x] + C[1]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2 = a, y(x),'implicit')
```

Maple raw output

```
y(x) = 2*(a*x)^(1/2)+_C1, y(x) = -2*(a*x)^(1/2)+_C1
```

4.848 $xy'(x)^2 = a - x^2$

ODE

$$xy'(x)^2 = a - x^2$$

ODE Classification

[_quadrature]

Book solution method

Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓

cpu = 0.236688 (sec), leaf count = 167

$$\left\{\left\{y(x) \to c_1 - \frac{2\sqrt{a-x^2}\left(x^{3/2} - \frac{2iaF\left(i\sinh^{-1}\left(\frac{\sqrt{-\sqrt{a}}}{\sqrt{x}}\right)\middle|-1\right)}{\sqrt{-\sqrt{a}}\sqrt{1-\frac{a}{x^2}}}\right)}{3x}\right\}, \left\{y(x) \to c_1 + \frac{2\sqrt{a-x^2}\left(x^{3/2} - \frac{2iaF\left(i\sinh^{-1}\left(\frac{\sqrt{-\sqrt{a}}}{\sqrt{x}}\right)\middle|-1\right)}{\sqrt{-\sqrt{a}}\sqrt{1-\frac{a}{x^2}}}\right)}{3x}\right.\right.$$

Maple ✓

cpu = 0.025 (sec), leaf count = 46

$$\left\{y(x) = \int \frac{1}{x}\sqrt{x\left(-x^2+a\right)}\,dx + \_C1, y(x) = \int -\frac{1}{x}\sqrt{x\left(-x^2+a\right)}\,dx + \_C1\right\}$$

Mathematica raw input

```
DSolve[x*y'[x]^2 == a - x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] - (2*Sqrt[a - x^2]*(x^(3/2) - ((2*I)*a*EllipticF[I*ArcSinh[Sqrt[-
Sqrt[a]]/Sqrt[x]], -1])/(Sqrt[-Sqrt[a]]*Sqrt[1 - a/x^2])))/(3*x)}, {y[x] -> C[1]
 + (2*Sqrt[a - x^2]*(x^(3/2) - ((2*I)*a*EllipticF[I*ArcSinh[Sqrt[-Sqrt[a]]/Sqrt[
x]], -1])/(Sqrt[-Sqrt[a]]*Sqrt[1 - a/x^2])))/(3*x)}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2 = -x^2+a, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(1/x*(x*(-x^2+a))^(1/2),x)+_C1, y(x) = Int(-1/x*(x*(-x^2+a))^(1/2),x)+
_C1
```

4.849 $xy'(x)^2 = y(x)$

ODE

$$xy'(x)^2 = y(x)$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.283944 (sec), leaf count = 41

$$\left\{\left\{y(x) \to \frac{1}{4}\left(c_1 - 2\sqrt{x}\right)^2\right\}, \left\{y(x) \to \frac{1}{4}\left(c_1 + 2\sqrt{x}\right)^2\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 29

$$\left\{y(x) = 0, [x(\_T) = \frac{\_C1}{(\_T-1)^2}, y(\_T) = \frac{\_C1\,\_T^2}{(\_T-1)^2}]\right\}$$

Mathematica raw input

```
DSolve[x*y'[x]^2 == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*Sqrt[x] + C[1])^2/4}, {y[x] -> (2*Sqrt[x] + C[1])^2/4}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2 = y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 0, [x(_T) = 1/(_T-1)^2*_C1, y(_T) = 1/(_T-1)^2*_C1*_T^2]
```

4.850 $xy'(x)^2 - 2y(x) + x = 0$

ODE

$$xy'(x)^2 - 2y(x) + x = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 1.12971 (sec), leaf count = 163

$$\left\{ \text{Solve}\left[\frac{\left(\sqrt{\frac{2y(x)}{x}-1}-1\right)\left(\left(\sqrt{\frac{2y(x)}{x}-1}-1\right)\log\left(\sqrt{\frac{2y(x)}{x}-1}-1\right)-1\right)}{\sqrt{\frac{2y(x)}{x}-1}-\frac{y(x)}{x}} = c_1 + \log(x), y(x) \right], \text{Solve}\left[x\left(\sqrt{\frac{2y(x)}{x}-1}+ \right. \right. \right.$$

Maple ✓
cpu = 0.021 (sec), leaf count = 44

$$\left\{ [x(\_T) = \frac{\left(\mathrm{e}^{(\_T-1)^{-1}}\right)^2 \_C1}{(\_T-1)^2}, y(\_T) = \frac{(\_T^2+1)\left(\mathrm{e}^{(\_T-1)^{-1}}\right)^2 \_C1}{2\,(\_T-1)^2}] \right\}$$

Mathematica raw input

```
DSolve[x - 2*y[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[((-1 + Sqrt[-1 + (2*y[x])/x])*(-1 + Log[-1 + Sqrt[-1 + (2*y[x])/x]]*(-1 +
  Sqrt[-1 + (2*y[x])/x])))/(-(y[x]/x) + Sqrt[-1 + (2*y[x])/x]) == C[1] + Log[x],
y[x]], Solve[Log[x] + (x*(1 + Sqrt[-1 + (2*y[x])/x])*(1 + Log[1 + Sqrt[-1 + (2*y
[x])/x]]*(1 + Sqrt[-1 + (2*y[x])/x])))/(y[x] + x*Sqrt[-1 + (2*y[x])/x]) == C[1],
 y[x]]}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+x-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T-1)^2*exp(1/(_T-1))^2*_C1, y(_T) = 1/2*(_T^2+1)*exp(1/(_T-1))^2*_C
1/(_T-1)^2]
```

4.851 $xy'(x)^2 + y'(x) = y(x)$

ODE

$$xy'(x)^2 + y'(x) = y(x)$$

ODE Classification

[_rational, _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 1.23018 (sec), leaf count = 32

$$\text{Solve}\left[\left\{x = \frac{c_1 - \text{K\$1057} + \log(\text{K\$1057})}{(\text{K\$1057} - 1)^2}, \text{K\$1057}^2 x + \text{K\$1057} = y(x)\right\}, \{y(x), \text{K\$1057}\}\right]$$

Maple ✓
cpu = 0.018 (sec), leaf count = 39

$$\left\{[x(\_T) = \frac{-\_T + \ln(\_T) + \_C1}{(\_T - 1)^2}, y(\_T) = \frac{\_T(\_T \ln(\_T) + 1 + (\_C1 - 2)\_T)}{(\_T - 1)^2}]\right\}$$

Mathematica raw input

```
DSolve[y'[x] + x*y'[x]^2 == y[x],y[x],x]
```

Mathematica raw output

```
Solve[{x == (-K$1057 + C[1] + Log[K$1057])/(-1 + K$1057)^2, K$1057 + K$1057^2*x
== y[x]}, {y[x], K$1057}]
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+diff(y(x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T-1)^2*(-_T+ln(_T)+_C1), y(_T) = _T*(_T*ln(_T)+1+(_C1-2)*_T)/(_T-1)
^2]
```

4.852 $xy'(x)^2 + 2y'(x) - y(x) = 0$

ODE

$$xy'(x)^2 + 2y'(x) - y(x) = 0$$

ODE Classification

[_rational, _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 13.296 (sec), leaf count = 34

$$\text{Solve}\left[\left\{x = \frac{c_1 - 2\text{K\$1206} + 2\log(\text{K\$1206})}{(\text{K\$1206} - 1)^2}, \text{K\$1206}(\text{K\$1206}x + 2) = y(x)\right\}, \{y(x), \text{K\$1206}\}\right]$$

Maple ✓
cpu = 0.017 (sec), leaf count = 42

$$\left\{[x(\_T) = \frac{-2\_T + 2\ln(\_T) + \_C1}{(\_T - 1)^2}, y(\_T) = \frac{\_T(2\_T\ln(\_T) + 2 + (\_C1 - 4)\_T)}{(\_T - 1)^2}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] + 2*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
Solve[{x == (-2*K$1206 + C[1] + 2*Log[K$1206])/(-1 + K$1206)^2, K$1206*(2 + K$12
06*x) == y[x]}, {y[x], K$1206}]
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+2*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T-1)^2*(-2*_T+2*ln(_T)+_C1), y(_T) = _T*(2*_T*ln(_T)+2+(_C1-4)*_T)/
(_T-1)^2]
```

4.853 $xy'(x)^2 - 2y'(x) - y(x) = 0$

ODE

$$xy'(x)^2 - 2y'(x) - y(x) = 0$$

ODE Classification

[_rational, _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 30.7129 (sec), leaf count = 39

$$\text{Solve}\left[\left\{\text{K\$1374}x = \frac{y(\text{K\$1374})}{\text{K\$1374}} + 2, y(x) = \frac{\text{K\$1374}(c_1 \text{K\$1374} - 2\text{K\$1374}\log(\text{K\$1374}) - 2)}{(\text{K\$1374} - 1)^2}\right\}, \{y(x), \text{K\$1374}\}\right]$$

Maple ✓
cpu = 0.016 (sec), leaf count = 42

$$\left\{[x(\_T) = \frac{-2\ln(\_T) + 2\_T + \_C1}{(\_T - 1)^2}, y(\_T) = \frac{\_T(-2\_T\ln(\_T) - 2 + (\_C1 + 4)\_T)}{(\_T - 1)^2}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] - 2*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
Solve[{K$1374*x == 2 + y[K$1374]/K$1374, y[x] == (K$1374*(-2 + K$1374*C[1] - 2*K
$1374*Log[K$1374]))/(-1 + K$1374)^2}, {y[x], K$1374}]
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-2*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T-1)^2*(-2*ln(_T)+2*_T+_C1), y(_T) = _T*(-2*_T*ln(_T)-2+(_C1+4)*_T)
/(_T-1)^2]
```

4.854 $xy'(x)^2 + 4y'(x) - 2y(x) = 0$

ODE

$$xy'(x)^2 + 4y'(x) - 2y(x) = 0$$

ODE Classification

[_rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 30.997 (sec), leaf count = 40

$$\text{Solve}\left[\left\{\text{K\$1655}x + 4 = \frac{2y(\text{K\$1655})}{\text{K\$1655}}, y(x) = \frac{\text{K\$1655}(c_1\text{K\$1655} + 4\text{K\$1655}\log(\text{K\$1655}) + 8)}{(\text{K\$1655} - 2)^2}\right\}, \{y(x), \text{K\$1655}\}\right]$$

Maple ✓
cpu = 0.019 (sec), leaf count = 43

$$\left\{[x(\_T) = \frac{-4\_T + 8\ln(\_T) + \_C1}{(-2+\_T)^2}, y(\_T) = \frac{\_T(8\_T\ln(\_T) + 16 + (\_C1 - 16)\_T)}{2(-2+\_T)^2}]\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 4*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
Solve[{4 + K$1655*x == (2*y[K$1655])/K$1655, y[x] == (K$1655*(8 + K$1655*C[1] +
4*K$1655*Log[K$1655]))/(-2 + K$1655)^2}, {y[x], K$1655}]
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+4*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(-2+_T)^2*(-4*_T+8*ln(_T)+_C1), y(_T) = 1/2*_T*(8*_T*ln(_T)+16+(_C1-1
6)*_T)/(-2+_T)^2]
```

4.855 $xy'(x)^2 + xy'(x) - y(x) = 0$

ODE

$$xy'(x)^2 + xy'(x) - y(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 1.03203 (sec), leaf count = 180

$$\left\{ \text{Solve}\left[\frac{x\left(\sqrt{\frac{4y(x)}{x}+1}-1\right)\left(\left(\sqrt{\frac{4y(x)}{x}+1}-1\right)\log\left(\sqrt{\frac{4y(x)}{x}+1}-1\right)-1\right)}{2x\left(\sqrt{\frac{4y(x)}{x}+1}-1\right)-4y(x)} = c_1 + \frac{\log(x)}{2}, y(x) \right], \text{Solve}\left[x\left(\sqrt{\frac{4y(x)}{x}+1\right.}\right.\right.$$

Maple ✓
cpu = 0.021 (sec), leaf count = 29

$$\left\{ [x(\_T) = \frac{\mathrm{e}^{-\_T^{-1}}\_C1}{\_T^2}, y(\_T) = \frac{(\_T+1)\,\mathrm{e}^{-\_T^{-1}}\_C1}{\_T}] \right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(x*(-1 + Sqrt[1 + (4*y[x])/x])*(-1 + Log[-1 + Sqrt[1 + (4*y[x])/x]]*(-1 +
  Sqrt[1 + (4*y[x])/x])))/(-4*y[x] + 2*x*(-1 + Sqrt[1 + (4*y[x])/x])) == C[1] + L
og[x]/2, y[x]], Solve[Log[x]/2 + (x*(1 + Sqrt[1 + (4*y[x])/x])*(1 + Log[1 + Sqrt
[1 + (4*y[x])/x]]*(1 + Sqrt[1 + (4*y[x])/x])))/(2*(x + 2*y[x] + x*Sqrt[1 + (4*y[
x])/x])) == C[1], y[x]]}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = exp(1/_T)/_T^2*_C1, y(_T) = 1/_T*(_T+1)*exp(1/_T)*_C1]
```

4.856 $-(x^2+1)\,y'(x)+xy'(x)^2+x=0$

ODE

$$-(x^2+1)\,y'(x)+xy'(x)^2+x=0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.00480235 (sec), leaf count = 24

$$\left\{\left\{y(x)\to c_1+\frac{x^2}{2}\right\},\{y(x)\to c_1+\log(x)\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 18

$$\left\{y(x)=\frac{x^2}{2}+\_C1, y(x)=\ln(x)+\_C1\right\}$$

Mathematica raw input

```
DSolve[x - (1 + x^2)*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2/2 + C[1]}, {y[x] -> C[1] + Log[x]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-(x^2+1)*diff(y(x),x)+x = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x^2+_C1, y(x) = ln(x)+_C1
```

4.857 $a + xy'(x)^2 + y(x)y'(x) = 0$

ODE

$$a + xy'(x)^2 + y(x)y'(x) = 0$$

ODE Classification

[[_homogeneous, `class G`], _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 25.8856 (sec), leaf count = 1

$Aborted

Maple ✓
cpu = 0.02 (sec), leaf count = 39

$$\left\{[x(\_T) = \frac{1}{3\_T^2}\left(3\_C1\ \_T^{3/2} - a\right), y(\_T) = -\frac{1}{3\_T^2}\left(3\_T^{5/2}\_C1 + 2\_T\, a\right)]\right\}$$

Mathematica raw input

```
DSolve[a + y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+y(x)*diff(y(x),x)+a = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/3*(3*_C1*_T^(3/2)-a)/_T^2, y(_T) = -1/3/_T^2*(3*_T^(5/2)*_C1+2*_T*a)]
```

4.858 $a + xy'(x)^2 - y(x)y'(x) = 0$

ODE

$$a + xy'(x)^2 - y(x)y'(x) = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.370407 (sec), leaf count = 183

$$\left\{\left\{y(x) \to -\frac{-8a^2 - \sqrt{a\left(\sinh\left(2c_1\right) + \cosh\left(2c_1\right)\right)\left((-4a + x - 1)\sinh\left(\frac{c_1}{2}\right) + (4a - x - 1)\cosh\left(\frac{c_1}{2}\right)\right)^2} + 2a\sinh\left(c_1\right) + 2a\right.}{-4a + \sinh\left(c_1\right) + \cosh\left(c_1\right)}\right.$$

Maple ✓
cpu = 0.022 (sec), leaf count = 26

$$\left\{(y(x))^2 - 4\,ax = 0, y(x) = \frac{x\_C1^2 + a}{\_C1}\right\}$$

Mathematica raw input

```
DSolve[a - y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-8*a^2 - 2*a*x + 2*a*Cosh[C[1]] + 2*a*Sinh[C[1]] - Sqrt[a*((-1 + 4*
a - x)*Cosh[C[1]/2] + (-1 - 4*a + x)*Sinh[C[1]/2])^2*(Cosh[2*C[1]] + Sinh[2*C[1]
])])/(-4*a + Cosh[C[1]] + Sinh[C[1]]))}, {y[x] -> -((-8*a^2 - 2*a*x + 2*a*Cosh[C
[1]] + 2*a*Sinh[C[1]] + Sqrt[a*((-1 + 4*a - x)*Cosh[C[1]/2] + (-1 - 4*a + x)*Sin
h[C[1]/2])^2*(Cosh[2*C[1]] + Sinh[2*C[1]])])/(-4*a + Cosh[C[1]] + Sinh[C[1]]))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-y(x)*diff(y(x),x)+a = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-4*a*x = 0, y(x) = (_C1^2*x+a)/_C1
```

4.859 $ax + xy'(x)^2 - y(x)y'(x) = 0$

ODE

$$ax + xy'(x)^2 - y(x)y'(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.24869 (sec), leaf count = 167

$$\left\{ \text{Solve}\left[\frac{4a \tan^{-1}\left(\frac{y(x)}{x\sqrt{4a - \frac{y(x)^2}{x^2}}} \right) + \frac{y(x)\left(\sqrt{4a - \frac{y(x)^2}{x^2}} - \frac{i y(x)}{x} \right)}{x}}{8a} = c_1 + \frac{1}{2} i \log(x), y(x) \right], \text{Solve}\left[\frac{4ax^2\left(\tan^{-1}\left(\frac{y(x)}{x\sqrt{4a - \frac{y(x)^2}{x^2}}} \right) - 2 \right.} \right.$$

Maple ✓
cpu = 0.028 (sec), leaf count = 36

$$\left\{ [x(\_T) = \mathrm{e}^{-\frac{\_T^2}{2a}} \_T \_C1, y(\_T) = \left(\_T^2 + a\right) \mathrm{e}^{-\frac{\_T^2}{2a}} \_C1] \right\}$$

Mathematica raw input

```
DSolve[a*x - y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(4*a*ArcTan[y[x]/(x*Sqrt[4*a - y[x]^2/x^2])] + (y[x]*(((-I)*y[x])/x + Sqr
t[4*a - y[x]^2/x^2]))/x)/(8*a) == C[1] + (I/2)*Log[x], y[x]], Solve[(4*a*x^2*(Ar
cTan[y[x]/(x*Sqrt[4*a - y[x]^2/x^2])] - 2*C[1] + I*Log[x]) + I*y[x]^2 + x*y[x]*S
qrt[4*a - y[x]^2/x^2])/(a*x) == 0, y[x]]}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-y(x)*diff(y(x),x)+a*x = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = exp(-1/2/a*_T^2)*_T*_C1, y(_T) = (_T^2+a)*exp(-1/2/a*_T^2)*_C1]
```

4.860 $-x^2 + xy'(x)^2 + y(x)y'(x) = 0$

ODE

$$-x^2 + xy'(x)^2 + y(x)y'(x) = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Homogeneous ODE, The Isobaric equation

Mathematica ✗
cpu = 600.002 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.178 (sec), leaf count = 269

$$\left\{\int_{\_b}^{x} \frac{1}{\_a}\left(-y(x) - \sqrt{4\_a^3 + (y(x))^2}\right)\left(\sqrt{4\_a^3 + (y(x))^2} + 4y(x)\right)^{-1} d\_a + \int^{y(x)} 1\left(-2 + \left(-48\_f - 12\sqrt{4x^3 + \_f^2}\right.\right.\right.$$

Mathematica raw input

```
DSolve[-x^2 + y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+y(x)*diff(y(x),x)-x^2 = 0, y(x),'implicit')
```

Maple raw output

```
Int((-y(x)+(4*_a^3+y(x)^2)^(1/2))/(4*y(x)-(4*_a^3+y(x)^2)^(1/2))/_a,_a = _b .. x
)+Intat((-2+(48*_f-12*(4*x^3+_f^2)^(1/2))*Int(1/(-4*_f+(4*_a^3+_f^2)^(1/2))^2*_a
^2/(4*_a^3+_f^2)^(1/2),_a = _b .. x))/(4*_f-(4*x^3+_f^2)^(1/2)),_f = y(x))+_C1 =
 0, Int((-y(x)-(4*_a^3+y(x)^2)^(1/2))/((4*_a^3+y(x)^2)^(1/2)+4*y(x))/_a,_a = _b
.. x)+Intat((-2+(-48*_f-12*(4*x^3+_f^2)^(1/2))*Int(1/((4*_a^3+_f^2)^(1/2)+4*_f)^
2*_a^2/(4*_a^3+_f^2)^(1/2),_a = _b .. x))/((4*x^3+_f^2)^(1/2)+4*_f),_f = y(x))+_
C1 = 0
```

4.861 $x^3 + xy'(x)^2 + y(x)y'(x) = 0$

ODE

$$x^3 + xy'(x)^2 + y(x)y'(x) = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Homogeneous ODE, The Isobaric equation

Mathematica ✗
cpu = 600.003 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.183 (sec), leaf count = 269

$$\left\{\int_{\_b}^{x}\frac{1}{\_a}\left(-y(x)-\sqrt{-4\_a^4+(y(x))^2}\right)\left(\sqrt{-4\_a^4+(y(x))^2}+5y(x)\right)^{-1}d\_a+\int^{y(x)}1\left(-2+\left(80\_f+16\sqrt{-4x^4+\right.\right.\right.$$

Mathematica raw input

```
DSolve[x^3 + y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+y(x)*diff(y(x),x)+x^3 = 0, y(x),'implicit')
```

Maple raw output

```
Int((-y(x)+(-4*_a^4+y(x)^2)^(1/2))/(5*y(x)-(-4*_a^4+y(x)^2)^(1/2))/_a,_a = _b ..
 x)+Intat((-2+(-80*_f+16*(-4*x^4+_f^2)^(1/2))*Int(1/(-5*_f+(-4*_a^4+_f^2)^(1/2))
^2*_a^3/(-4*_a^4+_f^2)^(1/2),_a = _b .. x))/(5*_f-(-4*x^4+_f^2)^(1/2)),_f = y(x)
)+_C1 = 0, Int((-y(x)-(-4*_a^4+y(x)^2)^(1/2))/((-4*_a^4+y(x)^2)^(1/2)+5*y(x))/_a
,_a = _b .. x)+Intat((-2+(80*_f+16*(-4*x^4+_f^2)^(1/2))*Int(1/((-4*_a^4+_f^2)^(1
/2)+5*_f)^2*_a^3/(-4*_a^4+_f^2)^(1/2),_a = _b .. x))/((-4*x^4+_f^2)^(1/2)+5*_f),
_f = y(x))+_C1 = 0
```

4.862 $ay(x) + xy'(x)^2 - y(x)y'(x) = 0$

ODE

$$ay(x) + xy'(x)^2 - y(x)y'(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.805737 (sec), leaf count = 158

$$\left\{\text{Solve}\left[\frac{y(x)}{ax} + \frac{\sqrt{\frac{y(x)}{x}}\sqrt{\frac{y(x)}{x} - 4a}}{a} + 4c_1 + 2\log(x) = 4\log\left(\sqrt{\frac{y(x)}{x} - 4a} + \sqrt{\frac{y(x)}{x}}\right), y(x)\right], \text{Solve}\left[\frac{\sqrt{\frac{y(x)}{x}}\sqrt{\frac{y(x)}{x} - 4a}}{a} +\right.\right.$$

Maple ✓
cpu = 0.027 (sec), leaf count = 40

$$\left\{y(x) = 0, [x(\_T) = (\_T - a)\,\_C1\left(\mathrm{e}^{\frac{\_T}{a}}\right)^{-1}, y(\_T) = \_T^2\,\_C1\left(\mathrm{e}^{\frac{\_T}{a}}\right)^{-1}]\right\}$$

Mathematica raw input

```
DSolve[a*y[x] - y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[4*C[1] + 2*Log[x] + y[x]/(a*x) + (Sqrt[y[x]/x]*Sqrt[-4*a + y[x]/x])/a ==
4*Log[Sqrt[y[x]/x] + Sqrt[-4*a + y[x]/x]], y[x]], Solve[4*C[1] + (Sqrt[y[x]/x]*S
qrt[-4*a + y[x]/x])/a == 2*Log[x] + 4*Log[Sqrt[y[x]/x] + Sqrt[-4*a + y[x]/x]] +
y[x]/(a*x), y[x]]}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-y(x)*diff(y(x),x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 0, [x(_T) = (_T-a)*_C1/exp(_T/a), y(_T) = _T^2*_C1/exp(_T/a)]
```

4.863 $y(x)y'(x) + xy'(x)^2 - y(x)^4 = 0$

ODE

$$y(x)y'(x) + xy'(x)^2 - y(x)^4 = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.204213 (sec), leaf count = 133

$$\left\{\left\{y(x) \to -\frac{\sqrt{\tanh^2\left(\frac{1}{2}\left(c_1 - \log(x)\right)\right) - 1}}{2\sqrt{x}}\right\}, \left\{y(x) \to \frac{\sqrt{\tanh^2\left(\frac{1}{2}\left(c_1 - \log(x)\right)\right) - 1}}{2\sqrt{x}}\right\}, \left\{y(x) \to -\frac{\sqrt{\tanh^2\left(\frac{1}{2}\left(\log(x) -\right.\right.\right.}$$

Maple ✓
cpu = 0.072 (sec), leaf count = 57

$$\left\{(y(x))^2 + \frac{1}{4x} = 0, \ln(x) - \_C1 - 2\,Artanh\left(\frac{1}{\sqrt{4x\left(y(x)\right)^2 + 1}}\right) = 0, \ln(x) - \_C1 + 2\,Artanh\left(\frac{1}{\sqrt{4x\left(y(x)\right)^2 + 1}}\right) =$$

Mathematica raw input

```
DSolve[-y[x]^4 + y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-1 + Tanh[(C[1] - Log[x])/2]^2]/(2*Sqrt[x])}, {y[x] -> Sqrt[-1 +
  Tanh[(C[1] - Log[x])/2]^2]/(2*Sqrt[x])}, {y[x] -> -Sqrt[-1 + Tanh[(-C[1] + Log[
x])/2]^2]/(2*Sqrt[x])}, {y[x] -> Sqrt[-1 + Tanh[(-C[1] + Log[x])/2]^2]/(2*Sqrt[x
])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+y(x)*diff(y(x),x)-y(x)^4 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+1/4/x = 0, ln(x)-_C1+2*arctanh(1/(4*x*y(x)^2+1)^(1/2)) = 0, ln(x)-_C1-2*a
rctanh(1/(4*x*y(x)^2+1)^(1/2)) = 0
```

4.864 $(a - y(x))y'(x) + b + xy'(x)^2 = 0$

ODE

$$(a - y(x))y'(x) + b + xy'(x)^2 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational, _Clairaut]

Book solution method
Clairaut's equation and related types, $f(y - xy', y') = 0$

Mathematica ✓
cpu = 0.702642 (sec), leaf count = 212

$$\left\{\left\{y(x) \to -\frac{-ab + a\sinh(2c_1) + a\cosh(2c_1) + b^2 + \sqrt{b(\sinh(4c_1) + \cosh(4c_1))((-b + x - 1)\sinh(c_1) + (b - x - 1)\cosh}{b - \sinh(2c_1) - \cosh(2c_1)}\right.\right.$$

Maple ✓
cpu = 0.027 (sec), leaf count = 37

$$\left\{(y(x))^2 - 2ay(x) + a^2 - 4bx = 0, y(x) = \frac{x\_C1^2 + a\_C1 + b}{\_C1}\right\}$$

Mathematica raw input

```
DSolve[b + (a - y[x])*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-(a*b) + b^2 + b*x + a*Cosh[2*C[1]] - b*Cosh[2*C[1]] + a*Sinh[2*C[1
]] - b*Sinh[2*C[1]] + Sqrt[b*((-1 + b - x)*Cosh[C[1]] + (-1 - b + x)*Sinh[C[1]])
^2*(Cosh[4*C[1]] + Sinh[4*C[1]])])/(b - Cosh[2*C[1]] - Sinh[2*C[1]]))}, {y[x] ->
 (a*b - b^2 - b*x - a*Cosh[2*C[1]] + b*Cosh[2*C[1]] - a*Sinh[2*C[1]] + b*Sinh[2*
C[1]] + Sqrt[b*((-1 + b - x)*Cosh[C[1]] + (-1 - b + x)*Sinh[C[1]])^2*(Cosh[4*C[1
]] + Sinh[4*C[1]])])/(b - Cosh[2*C[1]] - Sinh[2*C[1]])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+(a-y(x))*diff(y(x),x)+b = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-2*a*y(x)+a^2-4*b*x = 0, y(x) = (_C1^2*x+_C1*a+b)/_C1
```

4.865 $xy'(x)^2 + (x - y(x))y'(x) - y(x) + 1 = 0$

ODE

$$xy'(x)^2 + (x - y(x))y'(x) - y(x) + 1 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational, _dAlembert]

Book solution method
Clairaut's equation and related types, $f(y - xy', y') = 0$

Mathematica ✓
cpu = 0.311527 (sec), leaf count = 16

$$\left\{\left\{y(x) \to \left(\frac{1}{c_1} - 1\right)x + c_1\right\}\right\}$$

Maple ✓
cpu = 0.03 (sec), leaf count = 38

$$\left\{(y(x))^2 + 2xy(x) + x^2 - 4x = 0, y(x) = \frac{\_C1^2 + \_C1\,x + 1}{\_C1 + 1}\right\}$$

Mathematica raw input

```
DSolve[1 - y[x] + (x - y[x])*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(-1 + C[1]^(-1)) + C[1]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+(x-y(x))*diff(y(x),x)+1-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+2*x*y(x)+x^2-4*x = 0, y(x) = (_C1^2*x+_C1*x+1)/(_C1+1)
```

4.866 $(a - y(x) + x)y'(x) + xy'(x)^2 - y(x) = 0$

ODE

$$(a - y(x) + x)y'(x) + xy'(x)^2 - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational, _dAlembert]

Book solution method
Clairaut's equation and related types, $f(y - xy', y') = 0$

Mathematica ✓
cpu = 0.877841 (sec), leaf count = 145

$$\left\{\left\{y(x) \to -\frac{-3a^2 + \sqrt{-ae^{4c_1}\left(a + e^{4c_1} + 4x\right)^2} - 3ae^{4c_1} + 6ax + 2e^{4c_1}x}{2\left(a + e^{4c_1}\right)}\right\}, \left\{y(x) \to \frac{3a^2 + 3a\left(e^{4c_1} - 2x\right) + \sqrt{-ae^{4c_1}\left(a +\right.}\right.$$

Maple ✓
cpu = 0.038 (sec), leaf count = 39

$$\left\{(y(x))^2 + (-2\,a + 2\,x)\,y(x) + (a + x)^2 = 0, y(x) = \frac{\_C1\,(\_C1\,x + a + x)}{\_C1 + 1}\right\}$$

Mathematica raw input

```
DSolve[-y[x] + (a + x - y[x])*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(-3*a^2 - 3*a*E^(4*C[1]) + 6*a*x + 2*E^(4*C[1])*x + Sqrt[-(a*E^(4*C[1
])*(a + E^(4*C[1]) + 4*x)^2)])/(2*(a + E^(4*C[1]))), {y[x] -> (3*a^2 + 3*a*(E^(
4*C[1]) - 2*x) - 2*E^(4*C[1])*x + Sqrt[-(a*E^(4*C[1])*(a + E^(4*C[1]) + 4*x)^2)]
)/(2*(a + E^(4*C[1])))}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+(a+x-y(x))*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+(-2*a+2*x)*y(x)+(a+x)^2 = 0, y(x) = _C1*(_C1*x+a+x)/(_C1+1)
```

4.867 $xy'(x)^2 - (3x - y(x))y'(x) + y(x) = 0$

ODE

$$xy'(x)^2 - (3x - y(x))y'(x) + y(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✗
cpu = 604.473 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.043 (sec), leaf count = 29

$$\left\{y(x) = x, [x(\_T) = (1 + \_T)\,\_C1\,\_T^{-\frac{3}{2}}, y(\_T) = -(\_T - 3)\,\_C1\frac{1}{\sqrt{\_T}}]\right\}$$

Mathematica raw input

```
DSolve[y[x] - (3*x - y[x])*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-(3*x-y(x))*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x, [x(_T) = (1+_T)*_C1/_T^(3/2), y(_T) = -1/_T^(1/2)*(_T-3)*_C1]
```

4.868 $a - by(x) + bx + xy'(x)^2 - y(x) = 0$

ODE

$$a - by(x) + bx + xy'(x)^2 - y(x) = 0$$

ODE Classification

[[_homogeneous, `class C`], _rational, _dAlembert]

Book solution method
Clairaut's equation and related types, $f(y - xy', y') = 0$

Mathematica ✓
cpu = 2.83238 (sec), leaf count = 323

$$\left\{ \text{Solve}\left[\frac{(b+1)\left(\log(a+(b+1)(x-y(x))) - b\log(a+(b+1)(bx-y(x))) - \frac{2\sqrt{(b+1)y(x)-a}\tan^{-1}\left(\frac{\sqrt{x}\sqrt{(b+1)y(x)-a}}{\sqrt{a-(b+1)y(x)}\sqrt{-a+(b+1)y(x)-b}}\right.\right.}{\sqrt{a-(b+1)y(x)}} \right.\right.$$

Maple ✓
cpu = 0.034 (sec), leaf count = 196

$$\left\{ [x(\_T) = \_C1\left((\_T-b)^{-\frac{b^2}{(b+1)(-1+b)}}\right)^2\left((\_T-b)^{-\frac{b}{(b+1)(-1+b)}}\right)^2\left((\_T-1)^{-\frac{b}{(b+1)(-1+b)}}\right)^{-2}\left((\_T-1)^{-\frac{1}{(b+1)(-1+b)}}\right)^{-2}, y \right.$$

Mathematica raw input

```
DSolve[a + b*x - y[x] - b*y[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[((1 + b)*(-2*b*ArcTanh[(b*Sqrt[x])/Sqrt[-a - b*x + y[x] + b*y[x]]] + Log[
a + (1 + b)*(x - y[x])] - b*Log[a + (1 + b)*(b*x - y[x])] - (2*ArcTan[(Sqrt[x]*S
qrt[-a + (1 + b)*y[x]])/(Sqrt[a - (1 + b)*y[x]]*Sqrt[-a - b*x + (1 + b)*y[x]])*
Sqrt[-a + (1 + b)*y[x]])/Sqrt[a - (1 + b)*y[x]]))/(1 - b^2) == C[1], y[x]], Solv
e[((1 + b)*(2*b*ArcTanh[(b*Sqrt[x])/Sqrt[-a - b*x + y[x] + b*y[x]]] + Log[a + (1
 + b)*(x - y[x])] - b*Log[a + (1 + b)*(b*x - y[x])] + (2*ArcTan[(Sqrt[x]*Sqrt[-a
 + (1 + b)*y[x]])/(Sqrt[a - (1 + b)*y[x]]*Sqrt[-a - b*x + (1 + b)*y[x]])]*Sqrt[-
a + (1 + b)*y[x]])/Sqrt[a - (1 + b)*y[x]]))/(1 - b^2) == C[1], y[x]]}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+a+b*x-y(x)-b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = ((_T-b)^(-b^2/(b+1)/(-1+b)))^2/((_T-1)^(-b/(b+1)/(-1+b)))^2*((_T-b)^(-b
/(b+1)/(-1+b)))^2/((_T-1)^(-1/(b+1)/(-1+b)))^2*_C1, y(_T) = (_T^2+b)*((_T-b)^(1/
(-b-1)*b^2/(-1+b)))^2*((_T-b)^(1/(-b-1)*b/(-1+b)))^2*_C1/(b+1)/((_T-1)^(1/(-b-1)
*b/(-1+b)))^2/((_T-1)^(1/(-b-1)/(-1+b)))^2+a/(b+1)]
```

4.869 $a + xy'(x)^2 - 2y(x)y'(x) = 0$

ODE

$$a + xy'(x)^2 - 2y(x)y'(x) = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 1.70487 (sec), leaf count = 9391

Maple ✓
cpu = 0.017 (sec), leaf count = 33

$$\left\{[x(\_T) = \_T\left(\frac{a}{3\_T^3} + \_C1\right), y(\_T) = \frac{3\_C1\,\_T^3 + 4a}{6\_T}]\right\}$$

Mathematica raw input

```
DSolve[a - 2*y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[16*a*x + 3*a^2*x^4*Cosh[3*C[1]] - 3*a^2*x^4*Sinh[3*C[1]] - (32*a
^3*x^5)/(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256
*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a
^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt
[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a
*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Si
```

```
nh[(33*C[1])/2]))])^(1/3) + (9*a^4*x^8*(Cosh[3*C[1]] - Sinh[3*C[1]]))/(27*a^6*x^
12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[
1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]
] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^
3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1]
)/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))]
)^(1/3) + (32*a^2*x^2*(Cosh[3*C[1]] + Sinh[3*C[1]]))/(27*a^6*x^12 - 144*a^5*x^9*
Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cos
h[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*S
inh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/
2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3
)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(1/3) + (Cosh[3
*C[1]] - Sinh[3*C[1]])*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cos
h[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[
3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*
C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])
/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(3
3*C[1])/2] + Sinh[(33*C[1])/2]))])^(1/3)]/4}, {y[x] -> Sqrt[16*a*x + 3*a^2*x^4*C
osh[3*C[1]] - 3*a^2*x^4*Sinh[3*C[1]] - (32*a^3*x^5)/(27*a^6*x^12 - 144*a^5*x^9*C
osh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh
[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Si
nh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2
] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)
*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(1/3) + (9*a^4*x
^8*(Cosh[3*C[1]] - Sinh[3*C[1]]))/(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*
a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^
5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a
^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Si
nh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])
^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(1/3) + (32*a^2*x^2*(Cosh[3*C[1]]
+ Sinh[3*C[1]]))/(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[
1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]
] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]]
+ 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3
*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1]
)/2] + Sinh[(33*C[1])/2]))])^(1/3) + (Cosh[3*C[1]] - Sinh[3*C[1]])*(27*a^6*x^12
- 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]]
 + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] -
 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*
Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2
] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(
1/3)]/4}, {y[x] -> -Sqrt[(32*a^3*x^5 - (32*I)*Sqrt[3]*a^3*x^5 - 32*a^2*x^2*Cosh[
3*C[1]] + (32*I)*Sqrt[3]*a^2*x^2*Cosh[3*C[1]] - 9*a^4*x^8*Cosh[3*C[1]] + (9*I)*S
qrt[3]*a^4*x^8*Cosh[3*C[1]] - 32*a^2*x^2*Sinh[3*C[1]] + (32*I)*Sqrt[3]*a^2*x^2*S
inh[3*C[1]] + 9*a^4*x^8*Sinh[3*C[1]] - (9*I)*Sqrt[3]*a^4*x^8*Sinh[3*C[1]] + 32*a
*x*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*
x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^
```

```
6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^
4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)
*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(3
3*C[1])/2]))])^(1/3) + 6*a^2*x^4*Cosh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*
C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[
1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C
[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1
 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[
(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(1/3) - 6*a^2*x^4*Sinh
[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 25
6*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*
a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqr
t[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 +
a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + S
inh[(33*C[1])/2]))])^(1/3) - Cosh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]
] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]]
- 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]]
 + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a
*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C
[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(2/3) - I*Sqrt[3]*Cosh[3*C
[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^
3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*
x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(
a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^
3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[
(33*C[1])/2]))])^(2/3) + Sinh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] +
272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 14
4*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 1
28*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3
)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])
/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(2/3) + I*Sqrt[3]*Sinh[3*C[1]]
*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^
3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*
Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*
((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*C
osh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*
C[1])/2]))])^(2/3))/(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6
*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C
[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1
]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2]
)^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C
[1])/2] + Sinh[(33*C[1])/2]))])^(1/3)]/(4*Sqrt[2])}, {y[x] -> Sqrt[(32*a^3*x^5 -
 (32*I)*Sqrt[3]*a^3*x^5 - 32*a^2*x^2*Cosh[3*C[1]] + (32*I)*Sqrt[3]*a^2*x^2*Cosh[
3*C[1]] - 9*a^4*x^8*Cosh[3*C[1]] + (9*I)*Sqrt[3]*a^4*x^8*Cosh[3*C[1]] - 32*a^2*x
^2*Sinh[3*C[1]] + (32*I)*Sqrt[3]*a^2*x^2*Sinh[3*C[1]] + 9*a^4*x^8*Sinh[3*C[1]] -
 (9*I)*Sqrt[3]*a^4*x^8*Sinh[3*C[1]] + 32*a*x*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C
[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1
```

```
]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[
1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1
+ a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(
3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(1/3) + 6*a^2*x^4*Cosh[
3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256
*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a
^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt
[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a
*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Si
nh[(33*C[1])/2]))])^(1/3) - 6*a^2*x^4*Sinh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Co
sh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[
12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sin
h[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2]
 - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*
Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(1/3) - Cosh[3*C[
1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3
*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x
^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a
^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3
)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(
33*C[1])/2]))])^(2/3) - I*Sqrt[3]*Cosh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3
*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C
[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*
C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (
1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh
[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(2/3) + Sinh[3*C[1]]*
(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3
*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*S
inh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*(
(-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Co
sh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C
[1])/2]))])^(2/3) + I*Sqrt[3]*Sinh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1
]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]]
 - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]
] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 +
a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*
C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(2/3))/(27*a^6*x^12 - 144
*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 12
8*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*
a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[
(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (
2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(1/3)]
/(4*Sqrt[2])}, {y[x] -> -Sqrt[(32*a^3*x^5 + (32*I)*Sqrt[3]*a^3*x^5 - 32*a^2*x^2*
Cosh[3*C[1]] - (32*I)*Sqrt[3]*a^2*x^2*Cosh[3*C[1]] - 9*a^4*x^8*Cosh[3*C[1]] - (9
*I)*Sqrt[3]*a^4*x^8*Cosh[3*C[1]] - 32*a^2*x^2*Sinh[3*C[1]] - (32*I)*Sqrt[3]*a^2*
x^2*Sinh[3*C[1]] + 9*a^4*x^8*Sinh[3*C[1]] + (9*I)*Sqrt[3]*a^4*x^8*Sinh[3*C[1]] +
 32*a*x*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256
```

```
*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a
^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt
[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a
*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Si
nh[(33*C[1])/2]))])^(1/3) + 6*a^2*x^4*Cosh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Co
sh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[
12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sin
h[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2]
 - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*
Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(1/3) - 6*a^2*x^4
*Sinh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]]
 - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] +
 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 6
4*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((
-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2
] + Sinh[(33*C[1])/2]))])^(1/3) - Cosh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3
*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C
[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*
C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (
1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh
[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(2/3) + I*Sqrt[3]*Cos
h[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 2
56*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272
*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sq
rt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 +
 a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] +
Sinh[(33*C[1])/2]))])^(2/3) + Sinh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1
]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]]
 - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]
] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 +
a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*
C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(2/3) - I*Sqrt[3]*Sinh[3*
C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a
^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4
*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-
(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x
^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh
[(33*C[1])/2]))])^(2/3))/(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*C
osh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sin
h[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[1
2*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1
])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[
(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(1/3)]/(4*Sqrt[2])}, {y[x] -> Sqrt[(32*a^3*
x^5 + (32*I)*Sqrt[3]*a^3*x^5 - 32*a^2*x^2*Cosh[3*C[1]] - (32*I)*Sqrt[3]*a^2*x^2*
Cosh[3*C[1]] - 9*a^4*x^8*Cosh[3*C[1]] - (9*I)*Sqrt[3]*a^4*x^8*Cosh[3*C[1]] - 32*
a^2*x^2*Sinh[3*C[1]] - (32*I)*Sqrt[3]*a^2*x^2*Sinh[3*C[1]] + 9*a^4*x^8*Sinh[3*C[
1]] + (9*I)*Sqrt[3]*a^4*x^8*Sinh[3*C[1]] + 32*a*x*(27*a^6*x^12 - 144*a^5*x^9*Cos
```

```
h[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[1
2*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh
[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2]
- (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*S
inh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(1/3) + 6*a^2*x^4*
Cosh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]]
- 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] +
272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64
*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-
2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2]
 + Sinh[(33*C[1])/2]))])^(1/3) - 6*a^2*x^4*Sinh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x
^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*
Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^
3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1
])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*
x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(1/3) - Cosh
[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 25
6*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*
a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqr
t[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 +
a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + S
inh[(33*C[1])/2]))])^(2/3) + I*Sqrt[3]*Cosh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*C
osh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh
[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Si
nh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2
] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)
*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(2/3) + Sinh[3*C
[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^
3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*
x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(
a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^
3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[
(33*C[1])/2]))])^(2/3) - I*Sqrt[3]*Sinh[3*C[1]]*(27*a^6*x^12 - 144*a^5*x^9*Cosh[
3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]] + 128*a^2*Cosh[12*
C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] - 256*a^3*x^3*Sinh[9
*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*Cosh[(3*C[1])/2] -
(1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2] - (2 + a*x^3)*Sin
h[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(2/3))/(27*a^6*x^12
- 144*a^5*x^9*Cosh[3*C[1]] + 272*a^4*x^6*Cosh[6*C[1]] - 256*a^3*x^3*Cosh[9*C[1]]
 + 128*a^2*Cosh[12*C[1]] - 144*a^5*x^9*Sinh[3*C[1]] + 272*a^4*x^6*Sinh[6*C[1]] -
 256*a^3*x^3*Sinh[9*C[1]] + 128*a^2*Sinh[12*C[1]] + 64*Sqrt[-(a^4*((-1 + a*x^3)*
Cosh[(3*C[1])/2] - (1 + a*x^3)*Sinh[(3*C[1])/2])^3*((-2 + a*x^3)*Cosh[(3*C[1])/2
] - (2 + a*x^3)*Sinh[(3*C[1])/2])^2*(Cosh[(33*C[1])/2] + Sinh[(33*C[1])/2]))])^(
1/3)]/(4*Sqrt[2])}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-2*y(x)*diff(y(x),x)+a = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = _T*(1/3*a/_T^3+_C1), y(_T) = 1/6/_T*(3*_C1*_T^3+4*a)]
```

4.870 $xy'(x)^2 + 2y(x)y'(x) - x = 0$

ODE

$$xy'(x)^2 + 2y(x)y'(x) - x = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right) = 0$, Solve for p

Mathematica ✓
cpu = 1.46566 (sec), leaf count = 6977

Maple ✓
cpu = 0.029 (sec), leaf count = 37

$$\left\{[x(\_T) = \_T\,\_C1\left(3\_T^2 - 1\right)^{-\frac{2}{3}}, y(\_T) = -\frac{\left(\_T^2 - 1\right)\_C1}{2}\left(3\_T^2 - 1\right)^{-\frac{2}{3}}]\right\}$$

Mathematica raw input

```
DSolve[-x + 2*y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Cosh[3*C[1]] + Sinh[3*C[1]] - x^2*Sqrt[(36*x^6 + Cosh[6*C[1]] + Sinh[
6*C[1]] + (36*2^(2/3)*x^4*(2*x^6 - Cosh[6*C[1]] - Sinh[6*C[1]]))/(32*x^12 + 40*x
^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1
 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*
C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] +
40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*
```

```
x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3))/x^4] - 9*x^2*Sqrt[
(8*x^2)/9 + (2*Cosh[6*C[1]])/(81*x^4) + (2*Sinh[6*C[1]])/(81*x^4) - (4*2^(2/3)*(
2*x^6 - Cosh[6*C[1]] - Sinh[6*C[1]]))/(9*(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[1
2*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]]
+ (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3)) - (2^(1/
3)*(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[1
2*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[1
5*C[1]] + Sinh[15*C[1]])])^(1/3))/(9*x^2) - (2*(-432*x^6*Cosh[3*C[1]] + Cosh[9*C
[1]] - 432*x^6*Sinh[3*C[1]] + Sinh[9*C[1]]))/(81*x^6*Sqrt[(36*x^6 + Cosh[6*C[1]]
 + Sinh[6*C[1]] + (36*2^(2/3)*x^4*(2*x^6 - Cosh[6*C[1]] - Sinh[6*C[1]]))/(32*x^1
2 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] +
Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] +
Sinh[15*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*
C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] +
(1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3))/x^4])])/(1
8*x^2)}, {y[x] -> (Cosh[3*C[1]] + Sinh[3*C[1]] - x^2*Sqrt[(36*x^6 + Cosh[6*C[1]]
 + Sinh[6*C[1]] + (36*2^(2/3)*x^4*(2*x^6 - Cosh[6*C[1]] - Sinh[6*C[1]]))/(32*x^1
2 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] +
Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] +
Sinh[15*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*
C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] +
(1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3))/x^4] + 9*x
^2*Sqrt[(8*x^2)/9 + (2*Cosh[6*C[1]])/(81*x^4) + (2*Sinh[6*C[1]])/(81*x^4) - (4*2
^(2/3)*(2*x^6 - Cosh[6*C[1]] - Sinh[6*C[1]]))/(9*(32*x^12 + 40*x^6*Cosh[6*C[1]]
- Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[
3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3))
- (2^(1/3)*(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]]
- Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3
*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3))/(9*x^2) - (2*(-432*x^6*Cosh[3*C[1]] +
Cosh[9*C[1]] - 432*x^6*Sinh[3*C[1]] + Sinh[9*C[1]]))/(81*x^6*Sqrt[(36*x^6 + Cosh
[6*C[1]] + Sinh[6*C[1]] + (36*2^(2/3)*x^4*(2*x^6 - Cosh[6*C[1]] - Sinh[6*C[1]]))
/(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*
C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*
C[1]] + Sinh[15*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^6*Cosh[6*C[1]] -
Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*
C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3))/x^
4])])/(18*x^2)}, {y[x] -> (Cosh[3*C[1]] + Sinh[3*C[1]] + x^2*Sqrt[(36*x^6 + Cosh
[6*C[1]] + Sinh[6*C[1]] + (36*2^(2/3)*x^4*(2*x^6 - Cosh[6*C[1]] - Sinh[6*C[1]]))
/(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*
C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*
C[1]] + Sinh[15*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^6*Cosh[6*C[1]] -
Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*
C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3))/x^
4] - 9*x^2*Sqrt[(8*x^2)/9 + (2*Cosh[6*C[1]])/(81*x^4) + (2*Sinh[6*C[1]])/(81*x^4
) - (4*2^(2/3)*(2*x^6 - Cosh[6*C[1]] - Sinh[6*C[1]]))/(9*(32*x^12 + 40*x^6*Cosh[
6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^
6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])
```

```
^(1/3)) - (2^(1/3)*(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[
6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*
C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3))/(9*x^2) + (2*(-432*x^6*Cosh[3*
C[1]] + Cosh[9*C[1]] - 432*x^6*Sinh[3*C[1]] + Sinh[9*C[1]]))/(81*x^6*Sqrt[(36*x^
6 + Cosh[6*C[1]] + Sinh[6*C[1]] + (36*2^(2/3)*x^4*(2*x^6 - Cosh[6*C[1]] - Sinh[6
*C[1]]))/(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] -
Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(
Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^6*Cosh[6*
C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)
*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(
1/3))/x^4])])/(18*x^2)}, {y[x] -> (Cosh[3*C[1]] + Sinh[3*C[1]] + x^2*Sqrt[(36*x^
6 + Cosh[6*C[1]] + Sinh[6*C[1]] + (36*2^(2/3)*x^4*(2*x^6 - Cosh[6*C[1]] - Sinh[6
*C[1]]))/(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] -
Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(
Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^6*Cosh[6*
C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)
*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(
1/3))/x^4] + 9*x^2*Sqrt[(8*x^2)/9 + (2*Cosh[6*C[1]])/(81*x^4) + (2*Sinh[6*C[1]])
/(81*x^4) - (4*2^(2/3)*(2*x^6 - Cosh[6*C[1]] - Sinh[6*C[1]]))/(9*(32*x^12 + 40*x
^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1
 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*
C[1]])])^(1/3)) - (2^(1/3)*(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x
^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)
*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3))/(9*x^2) + (2*(-432*x^6
*Cosh[3*C[1]] + Cosh[9*C[1]] - 432*x^6*Sinh[3*C[1]] + Sinh[9*C[1]]))/(81*x^6*Sqr
t[(36*x^6 + Cosh[6*C[1]] + Sinh[6*C[1]] + (36*2^(2/3)*x^4*(2*x^6 - Cosh[6*C[1]]
- Sinh[6*C[1]]))/(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*
C[1]] - Sinh[12*C[1]] + Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[
1]])^3*(Cosh[15*C[1]] + Sinh[15*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^6
*Cosh[6*C[1]] - Cosh[12*C[1]] + 40*x^6*Sinh[6*C[1]] - Sinh[12*C[1]] + Sqrt[((1 +
 16*x^6)*Cosh[3*C[1]] + (1 - 16*x^6)*Sinh[3*C[1]])^3*(Cosh[15*C[1]] + Sinh[15*C[
1]])])^(1/3))/x^4])])/(18*x^2)}, {y[x] -> -(Cosh[3*C[1]] - Sinh[3*C[1]] + x^2*Sq
rt[(36*x^6 + Cosh[6*C[1]] - Sinh[6*C[1]] + (36*2^(2/3)*x^4*(Cosh[3*C[1]] - Sinh[
3*C[1]])*((-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^12 + 40*x
^6*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18
*C[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C
[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^
6*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*
C[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[
1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^4] + x^2*Sqrt[72*x^2 + (2*Cosh
[6*C[1]])/x^4 - (2*Sinh[6*C[1]])/x^4 + (36*2^(2/3)*(-Cosh[3*C[1]] + Sinh[3*C[1]]
)*((-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^12 + 40*x^6*Cosh
[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*C[1]]
- Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3
*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) - (9*2^(1/3)*(32*x^12 + 40*x^6*Cosh[6*C
[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*C[1]] - Si
nh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Co
```

```
sh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^2 - (2*(432*x^6*Cosh[3*C[1]] - Cosh[9*C[
1]] - 432*x^6*Sinh[3*C[1]] + Sinh[9*C[1]]))/(x^6*Sqrt[(36*x^6 + Cosh[6*C[1]] - S
inh[6*C[1]] + (36*2^(2/3)*x^4*(Cosh[3*C[1]] - Sinh[3*C[1]])*((-1 + 2*x^6)*Cosh[3
*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1
]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[
((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh
[21*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]
] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[(
(1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[
21*C[1]])])^(1/3))/x^4])])/(18*x^2)}, {y[x] -> (-Cosh[3*C[1]] + Sinh[3*C[1]] - x
^2*Sqrt[(36*x^6 + Cosh[6*C[1]] - Sinh[6*C[1]] + (36*2^(2/3)*x^4*(Cosh[3*C[1]] -
Sinh[3*C[1]])*((-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^12 +
 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Co
sh[18*C[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sin
h[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 +
40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cos
h[18*C[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh
[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^4] + x^2*Sqrt[72*x^2 + (2
*Cosh[6*C[1]])/x^4 - (2*Sinh[6*C[1]])/x^4 + (36*2^(2/3)*(-Cosh[3*C[1]] + Sinh[3*
C[1]])*((-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^12 + 40*x^6
*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*C
[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1
]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) - (9*2^(1/3)*(32*x^12 + 40*x^6*Cos
h[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*C[1]]
 - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^
3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^2 - (2*(432*x^6*Cosh[3*C[1]] - Cosh
[9*C[1]] - 432*x^6*Sinh[3*C[1]] + Sinh[9*C[1]]))/(x^6*Sqrt[(36*x^6 + Cosh[6*C[1]
] - Sinh[6*C[1]] + (36*2^(2/3)*x^4*(Cosh[3*C[1]] - Sinh[3*C[1]])*((-1 + 2*x^6)*C
osh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[1
2*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*C[1]] - Sinh[18*C[1]])*
Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] +
 Sinh[21*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12
*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*C[1]] - Sinh[18*C[1]])*S
qrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] +
Sinh[21*C[1]])])^(1/3))/x^4])])/(18*x^2)}, {y[x] -> (-Cosh[3*C[1]] + Sinh[3*C[1]
] + x^2*Sqrt[(36*x^6 + Cosh[6*C[1]] - Sinh[6*C[1]] + (36*2^(2/3)*x^4*(Cosh[3*C[1
]] - Sinh[3*C[1]])*((-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x
^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]]
+ (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6
)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^
12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] +
 (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)
*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^4] - x^2*Sqrt[72*x^2
 + (2*Cosh[6*C[1]])/x^4 - (2*Sinh[6*C[1]])/x^4 + (36*2^(2/3)*(-Cosh[3*C[1]] + Si
nh[3*C[1]])*((-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^12 + 4
0*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh
[18*C[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[
```

```
3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) - (9*2^(1/3)*(32*x^12 + 40*x^
6*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*
C[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[
1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^2 + (2*(432*x^6*Cosh[3*C[1]] -
 Cosh[9*C[1]] - 432*x^6*Sinh[3*C[1]] + Sinh[9*C[1]]))/(x^6*Sqrt[(36*x^6 + Cosh[6
*C[1]] - Sinh[6*C[1]] + (36*2^(2/3)*x^4*(Cosh[3*C[1]] - Sinh[3*C[1]])*((-1 + 2*x
^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^12 + 40*x^6*Cosh[6*C[1]] - C
osh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*C[1]] - Sinh[18*C[
1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[
1]] + Sinh[21*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^6*Cosh[6*C[1]] - Co
sh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*C[1]] - Sinh[18*C[1
]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1
]] + Sinh[21*C[1]])])^(1/3))/x^4])])/(18*x^2)}, {y[x] -> (-Cosh[3*C[1]] + Sinh[3
*C[1]] + x^2*Sqrt[(36*x^6 + Cosh[6*C[1]] - Sinh[6*C[1]] + (36*2^(2/3)*x^4*(Cosh[
3*C[1]] - Sinh[3*C[1]])*((-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/
(32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C
[1]] + (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 1
6*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(
32*x^12 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[
1]] + (Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16
*x^6)*Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^4] + x^2*Sqrt[7
2*x^2 + (2*Cosh[6*C[1]])/x^4 - (2*Sinh[6*C[1]])/x^4 + (36*2^(2/3)*(-Cosh[3*C[1]]
 + Sinh[3*C[1]])*((-1 + 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^1
2 + 40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] +
(Cosh[18*C[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*
Sinh[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3) - (9*2^(1/3)*(32*x^12 +
40*x^6*Cosh[6*C[1]] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cos
h[18*C[1]] - Sinh[18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh
[3*C[1]])^3*(Cosh[21*C[1]] + Sinh[21*C[1]])])^(1/3))/x^2 + (2*(432*x^6*Cosh[3*C[
1]] - Cosh[9*C[1]] - 432*x^6*Sinh[3*C[1]] + Sinh[9*C[1]]))/(x^6*Sqrt[(36*x^6 + C
osh[6*C[1]] - Sinh[6*C[1]] + (36*2^(2/3)*x^4*(Cosh[3*C[1]] - Sinh[3*C[1]])*((-1
+ 2*x^6)*Cosh[3*C[1]] + (1 + 2*x^6)*Sinh[3*C[1]]))/(32*x^12 + 40*x^6*Cosh[6*C[1]
] - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*C[1]] - Sinh[
18*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[
21*C[1]] + Sinh[21*C[1]])])^(1/3) + 9*2^(1/3)*x^2*(32*x^12 + 40*x^6*Cosh[6*C[1]]
 - Cosh[12*C[1]] - 40*x^6*Sinh[6*C[1]] + Sinh[12*C[1]] + (Cosh[18*C[1]] - Sinh[1
8*C[1]])*Sqrt[((1 + 16*x^6)*Cosh[3*C[1]] + (-1 + 16*x^6)*Sinh[3*C[1]])^3*(Cosh[2
1*C[1]] + Sinh[21*C[1]])])^(1/3))/x^4])])/(18*x^2)}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+2*y(x)*diff(y(x),x)-x = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(3*_T^2-1)^(2/3)*_T*_C1, y(_T) = -1/2*(_T^2-1)*_C1/(3*_T^2-1)^(2/3)]
```

4.871 $ax + xy'(x)^2 - 2y(x)y'(x) = 0$

ODE

$$ax + xy'(x)^2 - 2y(x)y'(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right) = 0$, Solve for y

Mathematica ✓
cpu = 0.072401 (sec), leaf count = 151

$$\left\{\left\{y(x) \to -\frac{\sqrt{a}x\tan\left(c_1 - i\log(x)\right)}{\sqrt{\sec^2\left(c_1 - i\log(x)\right)}}\right\}, \left\{y(x) \to \frac{\sqrt{a}x\tan\left(c_1 - i\log(x)\right)}{\sqrt{\sec^2\left(c_1 - i\log(x)\right)}}\right\}, \left\{y(x) \to -\frac{\sqrt{a}x\tan\left(c_1 + i\log(x)\right)}{\sqrt{\sec^2\left(c_1 + i\log(x)\right)}}\right\}, \left\{y(x) -\right.$$

Maple ✓
cpu = 0.023 (sec), leaf count = 32

$$\left\{\left(y(x)\right)^2 - ax^2 = 0, [x(\_T) = \_T\,\_C1, y(\_T) = \frac{\left(\_T^2 + a\right)\_C1}{2}]\right\}$$

Mathematica raw input

```
DSolve[a*x - 2*y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((Sqrt[a]*x*Tan[C[1] - I*Log[x]])/Sqrt[Sec[C[1] - I*Log[x]]^2])}, {y[
x] -> (Sqrt[a]*x*Tan[C[1] - I*Log[x]])/Sqrt[Sec[C[1] - I*Log[x]]^2]}, {y[x] -> -
((Sqrt[a]*x*Tan[C[1] + I*Log[x]])/Sqrt[Sec[C[1] + I*Log[x]]^2])}, {y[x] -> (Sqrt
[a]*x*Tan[C[1] + I*Log[x]])/Sqrt[Sec[C[1] + I*Log[x]]^2]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-2*y(x)*diff(y(x),x)+a*x = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-a*x^2 = 0, [x(_T) = _T*_C1, y(_T) = 1/2*(_T^2+a)*_C1]
```

4.872 $xy'(x)^2 - 2y(x)y'(x) + 2y(x) + x = 0$

ODE

$$xy'(x)^2 - 2y(x)y'(x) + 2y(x) + x = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.0752985 (sec), leaf count = 51

$$\left\{\left\{y(x) \to -e^{-c_1}x^2 - \frac{e^{c_1}}{2} + x\right\}, \left\{y(x) \to -\frac{1}{2}e^{c_1}x^2 - e^{-c_1} + x\right\}\right\}$$

Maple ✓
cpu = 0.032 (sec), leaf count = 47

$$\left\{(y(x))^2 - 2\,xy(x) - x^2 = 0, [x(\_T) = (\_T - 1)\,\_C1, y(\_T) = \frac{(\_T^2 + 1)\,(\_T - 1)\,\_C1}{2\,\_T - 2}]\right\}$$

Mathematica raw input

```
DSolve[x + 2*y[x] - 2*y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -E^C[1]/2 + x - x^2/E^C[1]}, {y[x] -> -E^(-C[1]) + x - (E^C[1]*x^2)/2}
}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-2*y(x)*diff(y(x),x)+x+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-2*x*y(x)-x^2 = 0, [x(_T) = (_T-1)*_C1, y(_T) = (_T^2+1)*(_T-1)*_C1/(2*_T-
2)]
```

4.873 $9x^2 + xy'(x)^2 - 3y(x)y'(x) = 0$

ODE

$$9x^2 + xy'(x)^2 - 3y(x)y'(x) = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 1.82809 (sec), leaf count = 357

$$\left\{\text{Solve}\left[\frac{\left(y(x)\left(\sqrt{y(x)^2-4x^3}-y(x)\right)+4x^3\right)\left(\sqrt{1-\frac{4x^3}{y(x)^2}}y(x)\left(\log\left(1-\frac{4x^3}{y(x)^2}\right)-\log\left(1-\frac{y(x)^2}{4x^3}\right)\right)+2\sqrt{y(x)^2-4x^3}\tan\right.\right.}{3\sqrt{1-\frac{4x^3}{y(x)^2}}y(x)\sqrt{y(x)^2-4x^3}\left(y(x)-\sqrt{y(x)^2-4x^3}\right)}$$

Maple ✓
cpu = 0.096 (sec), leaf count = 61

$$\left\{(y(x))^2-4x^3=0,\frac{y(x)}{x^3}+\frac{1}{x^3}\sqrt{(y(x))^2-4x^3}-\_C1=0,y(x)+\sqrt{(y(x))^2-4x^3}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[9*x^2 - 3*y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(2*Log[y[x]])/3 + (((Log[1 - (4*x^3)/y[x]^2] - Log[1 - y[x]^2/(4*x^3)])*S
qrt[1 - (4*x^3)/y[x]^2]*y[x] + 2*ArcTanh[Sqrt[1 - (4*x^3)/y[x]^2]]*Sqrt[-4*x^3 +
 y[x]^2])*(4*x^3 + y[x]*(-y[x] + Sqrt[-4*x^3 + y[x]^2])))/(3*Sqrt[1 - (4*x^3)/y[
x]^2]*y[x]*Sqrt[-4*x^3 + y[x]^2]*(y[x] - Sqrt[-4*x^3 + y[x]^2])) == C[1], y[x]],
 Solve[(2*Log[y[x]])/3 == C[1] + (((-Log[1 - (4*x^3)/y[x]^2] + Log[1 - y[x]^2/(4
*x^3)])*Sqrt[1 - (4*x^3)/y[x]^2]*y[x] + 2*ArcTanh[Sqrt[1 - (4*x^3)/y[x]^2]]*Sqrt
[-4*x^3 + y[x]^2])*(-4*x^3 + y[x]*(y[x] + Sqrt[-4*x^3 + y[x]^2])))/(3*Sqrt[1 - (
4*x^3)/y[x]^2]*y[x]*Sqrt[-4*x^3 + y[x]^2]*(y[x] + Sqrt[-4*x^3 + y[x]^2])), y[x]]
}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-3*y(x)*diff(y(x),x)+9*x^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-4*x^3 = 0, y(x)+(y(x)^2-4*x^3)^(1/2)-_C1 = 0, 1/x^3*y(x)+1/x^3*(y(x)^2-4*
x^3)^(1/2)-_C1 = 0
```

4.874 $xy'(x)^2 - (3y(x) + 2x)y'(x) + 6y(x) = 0$

ODE

$$xy'(x)^2 - (3y(x) + 2x)y'(x) + 6y(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00351953 (sec), leaf count = 21

$$\{\{y(x) \to c_1 x^3\}, \{y(x) \to c_1 + 2x\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 17

$$\{y(x) = \_C1\, x^3, y(x) = 2\,x + \_C1\}$$

Mathematica raw input

```
DSolve[6*y[x] - (2*x + 3*y[x])*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^3*C[1]}, {y[x] -> 2*x + C[1]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-(2*x+3*y(x))*diff(y(x),x)+6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^3, y(x) = 2*x+_C1
```

4.875 $-ay(x)y'(x) + b + xy'(x)^2 = 0$

ODE

$$-ay(x)y'(x) + b + xy'(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.635193 (sec), leaf count = 243

$$\left\{\text{Solve}\left[\frac{-2a\tanh^{-1}\left(\frac{\sqrt{a^2y(x)^2-4bx}}{ay(x)}\right)-2(a-1)\tanh^{-1}\left(\frac{\sqrt{a^2y(x)^2-4bx}}{y(x)-ay(x)}\right)+a\log\left((1-2a)y(x)^2+4bx\right)-\log\left((1-2a)y(x)^2\right.\right.\right.}{2a-1}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 106

$$\left\{[x(\_T)=\_T^{\frac{1}{a}\left(1-a^{-1}\right)^{-1}}\left(\frac{b}{\_T^{(a-1)^{-1}}(2a-1)\_T^2}+\_C1\right),y(\_T)=\frac{1}{\_T\,a\_T^{(a-1)^{-1}}(2a-1)}\left(2\left(\_C1\,\_T^{(a-1)^{-1}}\_\right.\right.\right.$$

Mathematica raw input

```
DSolve[b - a*y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(-2*a*ArcTanh[Sqrt[-4*b*x + a^2*y[x]^2]/(a*y[x])] - 2*(-1 + a)*ArcTanh[Sq
rt[-4*b*x + a^2*y[x]^2]/(y[x] - a*y[x])] + a*Log[4*b*x] - Log[4*b*x + (1 - 2*a)*
y[x]^2] + a*Log[4*b*x + (1 - 2*a)*y[x]^2])/(-1 + 2*a) == C[1], y[x]], Solve[(2*a
*ArcTanh[Sqrt[-4*b*x + a^2*y[x]^2]/(a*y[x])] + 2*(-1 + a)*ArcTanh[Sqrt[-4*b*x +
a^2*y[x]^2]/(y[x] - a*y[x])] + a*Log[4*b*x] - Log[4*b*x + (1 - 2*a)*y[x]^2] + a*
Log[4*b*x + (1 - 2*a)*y[x]^2])/(-1 + 2*a) == C[1], y[x]]}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-a*y(x)*diff(y(x),x)+b = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = _T^(1/a/(1-1/a))*(b/(_T^(1/(a-1)))/(2*a-1)/_T^2+_C1), y(_T) = (2*(_C1*_
T^(1/(a-1))*_T^2+b)*(a-1/2)*_T^(1/(a-1))+_T^(1/(a-1))*b)/_T/a/(_T^(1/(a-1)))/(2*
a-1)]
```

4.876 $ay(x)y'(x) + bx + xy'(x)^2 = 0$

ODE

$$ay(x)y'(x) + bx + xy'(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.591939 (sec), leaf count = 223

$$\left\{ \text{Solve}\left[\frac{-2a\tan^{-1}\left(\frac{ay(x)}{x\sqrt{4b-\frac{a^2y(x)^2}{x^2}}}\right) + (a+2)\left(2\tan^{-1}\left(\frac{(a+2)y(x)}{x\sqrt{4b-\frac{a^2y(x)^2}{x^2}}}\right) - i\log\left(\frac{(a+1)y(x)^2}{x^2}+b\right)\right)}{8(a+1)} = c_1 + \frac{1}{2}i\log(x), y(x)\right]\right.$$

Maple ✓
cpu = 0.044 (sec), leaf count = 96

$$\left\{ [x(\_T) = \frac{\_T\,\_C1}{\left((1+a)\,\_T^2+b\right)^{(1+a)^{-1}}}\left((1+a)\,\_T^2+b\right)^{-\frac{a}{2+2a}}, y(\_T) = -\frac{\left(\_T^2+b\right)\_C1}{a\left((1+a)\,\_T^2+b\right)^{(1+a)^{-1}}}\left((1+a)\,\_T^2+b\right)^{-}\right.$$

Mathematica raw input

```
DSolve[b*x + a*y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(-2*a*ArcTan[(a*y[x])/(x*Sqrt[4*b - (a^2*y[x]^2)/x^2])] + (2 + a)*(2*ArcT
an[((2 + a)*y[x])/(x*Sqrt[4*b - (a^2*y[x]^2)/x^2])] - I*Log[b + ((1 + a)*y[x]^2)
/x^2]))/(8*(1 + a)) == C[1] + (I/2)*Log[x], y[x]], Solve[(-2*a*ArcTan[(a*y[x])/(
x*Sqrt[4*b - (a^2*y[x]^2)/x^2])] + (2 + a)*(2*ArcTan[((2 + a)*y[x])/(x*Sqrt[4*b
- (a^2*y[x]^2)/x^2])] + I*Log[b + ((1 + a)*y[x]^2)/x^2]))/(8*(1 + a)) == C[1] -
(I/2)*Log[x], y[x]]}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+a*y(x)*diff(y(x),x)+b*x = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = ((1+a)*_T^2+b)^(-a/(2+2*a))/(((1+a)*_T^2+b)^(1/(1+a)))*_T*_C1, y(_T) =
-(_T^2+b)/a*((1+a)*_T^2+b)^(-a/(2+2*a))/(((1+a)*_T^2+b)^(1/(1+a)))*_C1]
```

4.877 $xy'(x)^2 - (xy(x)+1)y'(x) + y(x) = 0$

ODE

$$xy'(x)^2 - (xy(x)+1)y'(x) + y(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00336945 (sec), leaf count = 20

$$\{\{y(x) \to c_1 e^x\}, \{y(x) \to c_1 + \log(x)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 15

$$\{y(x) = \_C1\, \mathrm{e}^x, y(x) = \ln(x) + \_C1\}$$

Mathematica raw input

```
DSolve[y[x] - (1 + x*y[x])*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1]}, {y[x] -> C[1] + Log[x]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2-(1+x*y(x))*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ln(x)+_C1, y(x) = _C1*exp(x)
```

4.878 $(1-x)y(x)y'(x)+xy'(x)^2-y(x)^2=0$

ODE

$$(1-x)y(x)y'(x)+xy'(x)^2-y(x)^2=0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0040427 (sec), leaf count = 21

$$\left\{\{y(x)\to c_1 e^x\},\left\{y(x)\to \frac{c_1}{x}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 16

$$\left\{y(x)=\frac{\_C1}{x},y(x)=\_C1\,\mathrm{e}^x\right\}$$

Mathematica raw input

```
DSolve[-y[x]^2 + (1 - x)*y[x]*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1]}, {y[x] -> C[1]/x}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+y(x)*(1-x)*diff(y(x),x)-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1/x, y(x) = _C1*exp(x)
```

4.879 $(1 - x^2 y(x))\, y'(x) + x y'(x)^2 - x y(x) = 0$

ODE

$$(1 - x^2 y(x))\, y'(x) + x y'(x)^2 - x y(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00344913 (sec), leaf count = 28

$$\left\{\left\{y(x) \to c_1 e^{\frac{x^2}{2}}\right\}, \{y(x) \to c_1 - \log(x)\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 21

$$\left\{y(x) = \_C1\, \mathrm{e}^{\frac{x^2}{2}}, y(x) = -\ln(x) + \_C1\right\}$$

Mathematica raw input

```
DSolve[-(x*y[x]) + (1 - x^2*y[x])*y'[x] + x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x^2/2)*C[1]}, {y[x] -> C[1] - Log[x]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^2+(1-x^2*y(x))*diff(y(x),x)-x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -ln(x)+_C1, y(x) = _C1*exp(1/2*x^2)
```

4.880 $(x+1)y'(x)^2 = y(x)$

ODE

$$(x+1)y'(x)^2 = y(x)$$

ODE Classification

[[_homogeneous, `class C`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0186776 (sec), leaf count = 52

$$\left\{\left\{y(x) \to -c_1\sqrt{x+1} + \frac{c_1^2}{4} + x + 1\right\}, \left\{y(x) \to c_1\sqrt{x+1} + \frac{c_1^2}{4} + x + 1\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 40

$$\left\{y(x) = 0, [x(\_T) = \frac{-\_T^2 + \_C1 + 2\_T}{(\_T-1)^2}, y(\_T) = \frac{\_T^2(\_C1+1)}{(\_T-1)^2}]\right\}$$

Mathematica raw input

```
DSolve[(1 + x)*y'[x]^2 == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1 + x - Sqrt[1 + x]*C[1] + C[1]^2/4}, {y[x] -> 1 + x + Sqrt[1 + x]*C[1
] + C[1]^2/4}}
```

Maple raw input

```
dsolve((1+x)*diff(y(x),x)^2 = y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 0, [x(_T) = 1/(_T-1)^2*(-_T^2+_C1+2*_T), y(_T) = _T^2*(_C1+1)/(_T-1)^2]
```

4.881 $(x+1)y'(x)^2-(y(x)+x)y'(x)+y(x)=0$

ODE

$$(x+1)y'(x)^2-(y(x)+x)y'(x)+y(x)=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational, _dAlembert]

Book solution method
Clairaut's equation and related types, $f(y-xy',y')=0$

Mathematica ✓
cpu = 0.256356 (sec), leaf count = 57

$$\left\{\left\{y(x)\to -\frac{e^{c_1}\left(e^{c_1}-2x\right)}{2\left(e^{c_1}+2\right)}\right\},\left\{y(x)\to \frac{2e^{c_1}\left(x-2e^{c_1}\right)}{2e^{c_1}+1}\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 37

$$\left\{(y(x))^2+(-2x-4)\,y(x)+x^2=0,y(x)=\frac{\_C1\,(\_C1\,x+\_C1-x)}{\_C1-1}\right\}$$

Mathematica raw input

```
DSolve[y[x] - (x + y[x])*y'[x] + (1 + x)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(E^C[1]*(E^C[1] - 2*x))/(2*(2 + E^C[1]))}, {y[x] -> (2*E^C[1]*(-2*E^C
[1] + x))/(1 + 2*E^C[1])}}
```

Maple raw input

```
dsolve((1+x)*diff(y(x),x)^2-(x+y(x))*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+(-2*x-4)*y(x)+x^2 = 0, y(x) = _C1*(_C1*x+_C1-x)/(_C1-1)
```

4.882 $(a-x)y'(x)^2-b+y(x)y'(x)=0$

ODE

$$(a-x)y'(x)^2-b+y(x)y'(x)=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method

Clairaut's equation and related types, $f(y-xy',y')=0$

Mathematica ✓

cpu = 0.584142 (sec), leaf count = 201

$$\left\{\left\{y(x)\to -\frac{\sqrt{b\left(\sinh\left(2c_1\right)+\cosh\left(2c_1\right)\right)\left(\cosh\left(\frac{c_1}{2}\right)\left(a+4b-x-1\right)-\sinh\left(\frac{c_1}{2}\right)\left(a+4b-x+1\right)\right)^2}+2ab-8b^2+2b\sinh($$

Maple ✓

cpu = 0.026 (sec), leaf count = 34

$$\left\{(y(x))^2+4\,b(a-x)=0, y(x)=\frac{(x-a)\_C1^2+b}{\_C1}\right\}$$

Mathematica raw input

```
DSolve[-b + y[x]*y'[x] + (a - x)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((2*a*b - 8*b^2 - 2*b*x + 2*b*Cosh[C[1]] + 2*b*Sinh[C[1]] + Sqrt[b*((
-1 + a + 4*b - x)*Cosh[C[1]/2] - (1 + a + 4*b - x)*Sinh[C[1]/2])^2*(Cosh[2*C[1]]
 + Sinh[2*C[1]])])/(-4*b + Cosh[C[1]] + Sinh[C[1]]))}, {y[x] -> -((2*a*b - 8*b^2
 - 2*b*x + 2*b*Cosh[C[1]] + 2*b*Sinh[C[1]] - Sqrt[b*((-1 + a + 4*b - x)*Cosh[C[1
]/2] - (1 + a + 4*b - x)*Sinh[C[1]/2])^2*(Cosh[2*C[1]] + Sinh[2*C[1]])])/(-4*b +
 Cosh[C[1]] + Sinh[C[1]]))}}
```

Maple raw input

```
dsolve((a-x)*diff(y(x),x)^2+y(x)*diff(y(x),x)-b = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+4*b*(a-x) = 0, y(x) = ((x-a)*_C1^2+b)/_C1
```

4.883 $(a+x)y'(x)^2+y'(x)(\mathbf{a1}+\mathbf{b1}x+\mathbf{c1}y(x))+\mathbf{a2}+\mathbf{b2}x+\mathbf{c2}y(x)=0$

ODE

$$(a+x)y'(x)^2+y'(x)(\text{a1}+\text{b1}x+\text{c1}y(x))+\text{a2}+\text{b2}x+\text{c2}y(x)=0$$

ODE Classification

[_dAlembert]

Book solution method
Change of variable

Mathematica ✓
cpu = 242.704 (sec), leaf count = 286

$$\text{Solve}\left[\left\{x=(\text{c1K\$1535584}+\text{c2})(\text{K\$1535584}(\text{b1}+\text{c1K\$1535584}+\text{c2}+\text{K\$1535584})+\text{b2})^{-\frac{\text{c1}+2}{2\text{c1}+2}}\exp\left(-\frac{(\text{b1c1}-(\text{c1}+2)\right.\right.$$
$$(\text{c1}+1)\sqrt{}$$

Maple ✓
cpu = 0.131 (sec), leaf count = 2085

$$\left\{[x(\_T)=\frac{\_T\,c1+c2}{\left((c1+1)\_T^2+(b1+c2)\_T+b2\right)^{(c1+1)^{-1}}}\left((c1+1)\_T^2+(b1+c2)\_T+b2\right)^{-\frac{c1}{2\,c1+2}}\mathrm{e}^{\frac{c1\,b1}{c1+1}\arctan\left((2\,(c1+1\right.}\right.$$

Mathematica raw input

```
DSolve[a2 + b2*x + c2*y[x] + (a1 + b1*x + c1*y[x])*y'[x] + (a + x)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
Solve[{x == ((c2 + c1*K$1535584)*(C[1] - Integrate[(E^(((b1*c1 - (2 + c1)*c2)*Ar
cTan[(b1 + c2 + 2*(1 + c1)*K$1535584)/Sqrt[-b1^2 + 4*b2*(1 + c1) - 2*b1*c2 - c2^
2]])/((1 + c1)*Sqrt[-b1^2 + 4*b2*(1 + c1) - 2*b1*c2 - c2^2]))*(-(a2*c1) + a1*c2
+ a*K$1535584*(2*c2 + c1*K$1535584)))/((c2 + c1*K$1535584)^2*(b2 + K$1535584*(b1
  + c2 + K$1535584 + c1*K$1535584))^(c1/(2 + 2*c1))), K$1535584]))/(E^(((b1*c1 -
(2 + c1)*c2)*ArcTan[(b1 + c2 + 2*(1 + c1)*K$1535584)/Sqrt[-b1^2 + 4*b2*(1 + c1)
- 2*b1*c2 - c2^2]])/((1 + c1)*Sqrt[-b1^2 + 4*b2*(1 + c1) - 2*b1*c2 - c2^2]))*(b2
```

```
 + K$1535584*(b1 + c2 + K$1535584 + c1*K$1535584))^((2 + c1)/(2 + 2*c1))), y[x]
== -((a2 + a1*K$1535584 + a*K$1535584^2 + b2*x + b1*K$1535584*x + K$1535584^2*x)
/(c2 + c1*K$1535584))}, {y[x], K$1535584}]
```

Maple raw input

```
dsolve((a+x)*diff(y(x),x)^2+(a1+b1*x+c1*y(x))*diff(y(x),x)+a2+b2*x+c2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = ((c1+1)*_T^2+(b1+c2)*_T+b2)^(-c1/(2*c1+2))*exp(1/(-b1^2-2*b1*c2+(4*c1+4
)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/
2))/(c1+1)*c1*b1)*exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*
_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))/(c1+1)*c1*c2)*exp(1/(-b1^2-2*b
1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*
b2-c2^2)^(1/2))/(c1+1)*b1)^2*exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan
((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))/(c1+1)*c2)^2*(_T*c1
+c2)*(Int(-1/(_T*c1+c2)^2*(_T^2*a*c1+2*_T*a*c2+a1*c2-a2*c1)*((c1+1)*_T^2+(b1+c2)
*_T+b2)^(c1/(2*c1+2))*((c1+1)*_T^2+(b1+c2)*_T+b2)^(1/(c1+1))*exp(1/(-b1^2-2*b1*c
2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-
c2^2)^(1/2))*b1)^2/exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)
*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))/(c1+1)*c1*b1)/((c1+1)*_T^2+(b
1+c2)*_T+b2)/exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1
+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))/(c1+1)*b1)^2/exp(1/(-b1^2-2*b1*c2+(
4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^
2)^(1/2))/(c1+1)*c2)^2/exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c
1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))/(c1+1)*c1*c2),_T)+_C1)/((
(c1+1)*_T^2+(b1+c2)*_T+b2)^(1/(c1+1)))/exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1
/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))*b1)^2, y(
_T) = (-((c1+1)*_T^2+(b1+c2)*_T+b2)^(-c1/(2*c1+2))*exp(1/(-b1^2-2*b1*c2+(4*c1+4)
*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2
))/(c1+1)*b1)^2*exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T
+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))/(c1+1)*c2)^2*exp(1/(-b1^2-2*b1*c
2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-
c2^2)^(1/2))/(c1+1)*c1*b1)*exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((
2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))/(c1+1)*c1*c2)*(_T*c1+
c2)*(_T^2+_T*b1+b2)*Int(-1/(_T*c1+c2)^2*(_T^2*a*c1+2*_T*a*c2+a1*c2-a2*c1)*((c1+1
)*_T^2+(b1+c2)*_T+b2)^(c1/(2*c1+2))*((c1+1)*_T^2+(b1+c2)*_T+b2)^(1/(c1+1))*exp(1
/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c
2+(4*c1+4)*b2-c2^2)^(1/2))*b1)^2/exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*ar
ctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))/(c1+1)*c1*b1)/(
(c1+1)*_T^2+(b1+c2)*_T+b2)/exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((
2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))/(c1+1)*b1)^2/exp(1/(-
b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(
4*c1+4)*b2-c2^2)^(1/2))/(c1+1)*c2)^2/exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2
```

```
)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))/(c1+1)*c1*c
2),_T)-((c1+1)*_T^2+(b1+c2)*_T+b2)^(-c1/(2*c1+2))*exp(1/(-b1^2-2*b1*c2+(4*c1+4)*
b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)
)/(c1+1)*b1)^2*exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+
b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))/(c1+1)*c2)^2*exp(1/(-b1^2-2*b1*c2
+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c
2^2)^(1/2))/(c1+1)*c1*c2)*_C1*(_T*c1+c2)*(_T^2+_T*b1+b2)*exp(1/(-b1^2-2*b1*c2+(4
*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2
)^(1/2))/(c1+1)*c1*b1)-((c1+1)*_T^2+(b1+c2)*_T+b2)^(1/(c1+1))*exp(1/(-b1^2-2*b1*
c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c2)/(-b1^2-2*b1*c2+(4*c1+4)*b2
-c2^2)^(1/2))*b1)^2*(_T^2*a+_T*a1+a2))/(_T*c1+c2)/(((c1+1)*_T^2+(b1+c2)*_T+b2)^(
1/(c1+1)))/exp(1/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2)*arctan((2*(c1+1)*_T+b1+c
2)/(-b1^2-2*b1*c2+(4*c1+4)*b2-c2^2)^(1/2))*b1)^2]
```

4.884 $2xy'(x)^2 + (2x - y(x))y'(x) - y(x) + 1 = 0$

ODE

$$2xy'(x)^2 + (2x - y(x))y'(x) - y(x) + 1 = 0$$

ODE Classification

[_rational, _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 2.70518 (sec), leaf count = 2

$$\{\{\}\}$$

Maple ✓
cpu = 0.034 (sec), leaf count = 54

$$\left\{[x(\_T) = \frac{\ln(\_T+1) + (\_T+1)^{-1} + \_C1}{\_T^2}, y(\_T) = \frac{(2\_T+2)\ln(\_T+1) + (2\_C1+1)\_T + 2\_C1 + 2}{\_T\,(\_T+1)}]\right\}$$

Mathematica raw input

```
DSolve[1 - y[x] + (2*x - y[x])*y'[x] + 2*x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{}}
```

Maple raw input

```
dsolve(2*x*diff(y(x),x)^2+(2*x-y(x))*diff(y(x),x)+1-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^2*(ln(_T+1)+1/(_T+1)+_C1), y(_T) = ((2*_T+2)*ln(_T+1)+(2*_C1+1)*_T
+2*_C1+2)/_T/(_T+1)]
```

4.885 $3xy'(x)^2 - 6y(x)y'(x) + 2y(x) + x = 0$

ODE

$$3xy'(x)^2 - 6y(x)y'(x) + 2y(x) + x = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.0732727 (sec), leaf count = 53

$$\left\{\left\{y(x) \to \frac{1}{3}x\left(2\cosh\left(\sqrt{3}c_1 - \log(x)\right) + 1\right)\right\}, \left\{y(x) \to \frac{1}{3}x\left(2\cosh\left(\sqrt{3}c_1 + \log(x)\right) + 1\right)\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 53

$$\left\{-\frac{(x+3\,y(x))\,(x-y(x))}{3} = 0, [x(\_T) = 3\,\_C1\,\_T - \_C1, y(\_T) = \frac{(3\,\_T^2+1)\,(3\,\_T-1)\,\_C1}{6\,\_T-2}]\right\}$$

Mathematica raw input

```
DSolve[x + 2*y[x] - 6*y[x]*y'[x] + 3*x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(1 + 2*Cosh[Sqrt[3]*C[1] - Log[x]]))/3}, {y[x] -> (x*(1 + 2*Cosh[Sq
rt[3]*C[1] + Log[x]]))/3}}
```

Maple raw input

```
dsolve(3*x*diff(y(x),x)^2-6*y(x)*diff(y(x),x)+x+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/3*(x+3*y(x))*(x-y(x)) = 0, [x(_T) = 3*_C1*_T-_C1, y(_T) = (3*_T^2+1)*(3*_T-1)
*_C1/(6*_T-2)]
```

4.886 $(3x+1)y'(x)^2 - 3(y(x)+2)y'(x) + 9 = 0$

ODE

$$(3x+1)y'(x)^2 - 3(y(x)+2)y'(x) + 9 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, $f(y - xy', y') = 0$

Mathematica ✓
cpu = 0.386552 (sec), leaf count = 150

$$\left\{\left\{y(x) \to -\frac{\sqrt{(\sinh(2c_1)+\cosh(2c_1))\left((3x-34)\cosh\left(\frac{c_1}{2}\right)-3(x-12)\sinh\left(\frac{c_1}{2}\right)\right)^2}+8\sinh(c_1)+8\cosh(c_1)-18x-29}{\sinh(c_1)+\cosh(c_1)-36}\right.\right.$$

Maple ✓
cpu = 0.03 (sec), leaf count = 37

$$\left\{(y(x))^2+4\,y(x)-12\,x=0,\,y(x)=\frac{9+(1+3\,x)\,\_C1^{\,2}-6\,\_C1}{3\,\_C1}\right\}$$

Mathematica raw input

```
DSolve[9 - 3*(2 + y[x])*y'[x] + (1 + 3*x)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-294 - 18*x + 8*Cosh[C[1]] + 8*Sinh[C[1]] + Sqrt[((-34 + 3*x)*Cosh[
C[1]/2] - 3*(-12 + x)*Sinh[C[1]/2])^2*(Cosh[2*C[1]] + Sinh[2*C[1]])])/(-36 + Cos
h[C[1]] + Sinh[C[1]]))}, {y[x] -> (294 + 18*x - 8*Cosh[C[1]] - 8*Sinh[C[1]] + Sq
rt[((-34 + 3*x)*Cosh[C[1]/2] - 3*(-12 + x)*Sinh[C[1]/2])^2*(Cosh[2*C[1]] + Sinh[
2*C[1]])])/(-36 + Cosh[C[1]] + Sinh[C[1]])}}
```

Maple raw input

```
dsolve((1+3*x)*diff(y(x),x)^2-3*(2+y(x))*diff(y(x),x)+9 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+4*y(x)-12*x = 0, y(x) = 1/3*(9+(1+3*x)*_C1^2-6*_C1)/_C1
```

4.887 $(3x+5)y'(x)^2-(3y(x)+3)y'(x)+y(x)=0$

ODE

$$(3x+5)y'(x)^2-(3y(x)+3)y'(x)+y(x)=0$$

ODE Classification

[_rational, _dAlembert]

Book solution method
Clairaut's equation and related types, $f(y-xy',y')=0$

Mathematica ✓
cpu = 2.59372 (sec), leaf count = 65

$$\text{Solve}\left[\left\{x=\frac{1}{3}e^{-3\text{K\$1539465}}\left(3c_1(3\text{K\$1539465}-1)+(9-27\text{K\$1539465})\text{Ei}(3\text{K\$1539465})+4e^{3\text{K\$1539465}}\right),y(x)=\frac{\text{K\$15394}}{}\right.\right.$$

Maple ✓
cpu = 0.058 (sec), leaf count = 97

$$\left\{[x(\_T)=\frac{(27\_T-9)\,Ei(1,-3\_T)+4\,\mathrm{e}^{3-T}+(9\_T-3)\,\_C1}{3\,(\mathrm{e}^{-T})^3},y(\_T)=\frac{1}{(\mathrm{e}^{-T})^3\,(3\_T-1)}\left(27\_T^2(\_T-1/3)\,Ei(1\right.\right.$$

Mathematica raw input

```
DSolve[y[x] - (3 + 3*y[x])*y'[x] + (5 + 3*x)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
Solve[{x == (4*E^(3*K$1539465) + 3*(-1 + 3*K$1539465)*C[1] + (9 - 27*K$1539465)*
ExpIntegralEi[3*K$1539465])/(3*E^(3*K$1539465)), y[x] == (K$1539465*(-3 + K$1539
465*(5 + 3*x)))/(-1 + 3*K$1539465)}, {y[x], K$1539465}]
```

Maple raw input

```
dsolve((5+3*x)*diff(y(x),x)^2-(3+3*y(x))*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/3*((27*_T-9)*Ei(1,-3*_T)+4*exp(3*_T)+(9*_T-3)*_C1)/exp(_T)^3, y(_T) =
 (27*_T^2*(_T-1/3)*Ei(1,-3*_T)+4*_T^2*exp(3*_T)+(5*_T^2-3*_T)*exp(_T)^3+9*_T^2*_
C1*(_T-1/3))/(3*_T-1)/exp(_T)^3]
```

4.888 $4xy'(x)^2 = (a-3x)^2$

ODE

$$4xy'(x)^2 = (a-3x)^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.013433 (sec), leaf count = 37

$$\{\{y(x) \to \sqrt{x}(a-x) + c_1\}, \{y(x) \to \sqrt{x}(x-a) + c_1\}\}$$

Maple ✓
cpu = 0.034 (sec), leaf count = 30

$$\{y(x) = -\sqrt{x}(a-x) + \_C1, y(x) = \sqrt{x}(a-x) + \_C1\}$$

Mathematica raw input

```
DSolve[4*x*y'[x]^2 == (a - 3*x)^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a - x)*Sqrt[x] + C[1]}, {y[x] -> Sqrt[x]*(-a + x) + C[1]}}
```

Maple raw input

```
dsolve(4*x*diff(y(x),x)^2 = (a-3*x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = -x^(1/2)*(a-x)+_C1, y(x) = x^(1/2)*(a-x)+_C1
```

4.889 $4xy'(x)^2 + 2xy'(x) - y(x) = 0$

ODE

$$4xy'(x)^2 + 2xy'(x) - y(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.0808966 (sec), leaf count = 58

$$\left\{\left\{y(x) \to \frac{1}{4}e^{2c_1}\left(e^{2c_1} - 2\sqrt{x}\right)\right\}, \left\{y(x) \to \frac{1}{4}e^{-4c_1}\left(1 - 2e^{2c_1}\sqrt{x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 29

$$\left\{y(x) = -\frac{x}{4}, [x(\_T) = \frac{\_C1}{\_T^2}, y(\_T) = \frac{(4\_T + 2)\_C1}{\_T}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] + 2*x*y'[x] + 4*x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(2*C[1])*(E^(2*C[1]) - 2*Sqrt[x]))/4}, {y[x] -> (1 - 2*E^(2*C[1])*S
qrt[x])/(4*E^(4*C[1]))}}
```

Maple raw input

```
dsolve(4*x*diff(y(x),x)^2+2*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/4*x, [x(_T) = 1/_T^2*_C1, y(_T) = (4*_T+2)*_C1/_T]
```

4.890 $4xy'(x)^2 - 3y(x)y'(x) + 3 = 0$

ODE

$$4xy'(x)^2 - 3y(x)y'(x) + 3 = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 1.15782 (sec), leaf count = 613

$$\left\{\left\{y(x) \to -\frac{1}{3}\sqrt{\frac{2}{3}}\sqrt{(\sinh(c_1) - \cosh(c_1))\sqrt{(\sinh(c_1) + \cosh(c_1))(\sinh(c_1) + \cosh(c_1) - 18x)^3} + \sinh(c_1) + \cosh(c_1) +\right.\right.$$

Maple ✓
cpu = 0.021 (sec), leaf count = 33

$$\left\{[x(\_T) = \frac{1}{\_T^4}\left(\frac{3\_T^2}{2} + \_C1\right), y(\_T) = \frac{9\_T^2 + 4\_C1}{3\_T^3}]\right\}$$

Mathematica raw input

```
DSolve[3 - 3*y[x]*y'[x] + 4*x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2/3]*Sqrt[54*x + Cosh[C[1]] + Sinh[C[1]] + (-Cosh[C[1]] + Sinh[
C[1]])*Sqrt[(Cosh[C[1]] + Sinh[C[1]])*(-18*x + Cosh[C[1]] + Sinh[C[1]])^3]])/3},
 {y[x] -> (Sqrt[2/3]*Sqrt[54*x + Cosh[C[1]] + Sinh[C[1]] + (-Cosh[C[1]] + Sinh[C
[1]])*Sqrt[(Cosh[C[1]] + Sinh[C[1]])*(-18*x + Cosh[C[1]] + Sinh[C[1]])^3]])/3},
{y[x] -> -(Sqrt[2/3]*Sqrt[54*x + Cosh[C[1]] + Sinh[C[1]] + (Cosh[C[1]] - Sinh[C[
1]])*Sqrt[(Cosh[C[1]] + Sinh[C[1]])*(-18*x + Cosh[C[1]] + Sinh[C[1]])^3]])/3}, {
y[x] -> (Sqrt[2/3]*Sqrt[54*x + Cosh[C[1]] + Sinh[C[1]] + (Cosh[C[1]] - Sinh[C[1]
])*Sqrt[(Cosh[C[1]] + Sinh[C[1]])*(-18*x + Cosh[C[1]] + Sinh[C[1]])^3]])/3}, {y[
x] -> -(Sqrt[2/3]*Sqrt[54*x - Cosh[C[1]] - Sinh[C[1]] + Cosh[C[1]]*Sqrt[(Cosh[C[
1]] + Sinh[C[1]])*(18*x + Cosh[C[1]] + Sinh[C[1]])^3] - Sinh[C[1]]*Sqrt[(Cosh[C[
1]] + Sinh[C[1]])*(18*x + Cosh[C[1]] + Sinh[C[1]])^3]])/3}, {y[x] -> (Sqrt[2/3]*
Sqrt[54*x - Cosh[C[1]] - Sinh[C[1]] + Cosh[C[1]]*Sqrt[(Cosh[C[1]] + Sinh[C[1]])*
(18*x + Cosh[C[1]] + Sinh[C[1]])^3] - Sinh[C[1]]*Sqrt[(Cosh[C[1]] + Sinh[C[1]])*
(18*x + Cosh[C[1]] + Sinh[C[1]])^3]])/3}, {y[x] -> -(Sqrt[2/3]*Sqrt[54*x - Cosh[
C[1]] - Sinh[C[1]] - Cosh[C[1]]*Sqrt[(Cosh[C[1]] + Sinh[C[1]])*(18*x + Cosh[C[1]
```

```
] + Sinh[C[1]])^3] + Sinh[C[1]]*Sqrt[(Cosh[C[1]] + Sinh[C[1]])*(18*x + Cosh[C[1]
] + Sinh[C[1]])^3]])/3}, {y[x] -> (Sqrt[2/3]*Sqrt[54*x - Cosh[C[1]] - Sinh[C[1]]
 - Cosh[C[1]]*Sqrt[(Cosh[C[1]] + Sinh[C[1]])*(18*x + Cosh[C[1]] + Sinh[C[1]])^3]
 + Sinh[C[1]]*Sqrt[(Cosh[C[1]] + Sinh[C[1]])*(18*x + Cosh[C[1]] + Sinh[C[1]])^3]
])/3}}
```

Maple raw input

```
dsolve(4*x*diff(y(x),x)^2-3*y(x)*diff(y(x),x)+3 = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^4*(3/2*_T^2+_C1), y(_T) = 1/3*(9*_T^2+4*_C1)/_T^3]
```

4.891 $4xy'(x)^2 + 4y(x)y'(x) = 1$

ODE

$$4xy'(x)^2 + 4y(x)y'(x) = 1$$

ODE Classification

[[_homogeneous, `class G`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 20.4233 (sec), leaf count = 1

$Aborted

Maple ✓
cpu = 0.023 (sec), leaf count = 32

$$\left\{[x(\_T) = 1\left(\frac{1}{12}\_T^{-\frac{3}{2}} + \_C1\right)\frac{1}{\sqrt{\_T}}, y(\_T) = \frac{1}{6\_T^2}\left(-6\_T^{5/2}\_C1 + \_T\right)]\right\}$$

Mathematica raw input

```
DSolve[4*y[x]*y'[x] + 4*x*y'[x]^2 == 1,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(4*x*diff(y(x),x)^2+4*y(x)*diff(y(x),x) = 1, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^(1/2)*(1/12/_T^(3/2)+_C1), y(_T) = 1/6*(-6*_T^(5/2)*_C1+_T)/_T^2]
```

4.892 $4y(x)y'(x) + 4xy'(x)^2 - y(x)^4 = 0$

ODE

$$4y(x)y'(x) + 4xy'(x)^2 - y(x)^4 = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.194342 (sec), leaf count = 123

$$\left\{\left\{y(x) \to -\frac{\sqrt{\tanh^2\left(\frac{1}{2}(c_1 - \log(x))\right) - 1}}{\sqrt{x}}\right\}, \left\{y(x) \to \frac{\sqrt{\tanh^2\left(\frac{1}{2}(c_1 - \log(x))\right) - 1}}{\sqrt{x}}\right\}, \left\{y(x) \to -\frac{\sqrt{\tanh^2\left(\frac{1}{2}(\log(x) -\right.}}{\sqrt{x}}\right.$$

Maple ✓
cpu = 0.073 (sec), leaf count = 53

$$\left\{(y(x))^2 + x^{-1} = 0, \ln(x) - \_C1 - 2\,Artanh\left(\frac{1}{\sqrt{1 + x\,(y(x))^2}}\right) = 0, \ln(x) - \_C1 + 2\,Artanh\left(\frac{1}{\sqrt{1 + x\,(y(x))^2}}\right) = 0\right\}$$

Mathematica raw input

```
DSolve[-y[x]^4 + 4*y[x]*y'[x] + 4*x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-1 + Tanh[(C[1] - Log[x])/2]^2]/Sqrt[x])}, {y[x] -> Sqrt[-1 + T
anh[(C[1] - Log[x])/2]^2]/Sqrt[x]}, {y[x] -> -(Sqrt[-1 + Tanh[(-C[1] + Log[x])/2
]^2]/Sqrt[x])}, {y[x] -> Sqrt[-1 + Tanh[(-C[1] + Log[x])/2]^2]/Sqrt[x]}}
```

Maple raw input

```
dsolve(4*x*diff(y(x),x)^2+4*y(x)*diff(y(x),x)-y(x)^4 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+1/x = 0, ln(x)-_C1+2*arctanh(1/(1+x*y(x)^2)^(1/2)) = 0, ln(x)-_C1-2*arcta
nh(1/(1+x*y(x)^2)^(1/2)) = 0
```

4.893 $4(2-x)y'(x)^2+1=0$

ODE

$$4(2-x)y'(x)^2+1=0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.00877178 (sec), leaf count = 31

$$\left\{\left\{y(x)\to c_1-\sqrt{x-2}\right\},\left\{y(x)\to c_1+\sqrt{x-2}\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 23

$$\left\{y(x)=-\sqrt{x-2}+\_C1,y(x)=\sqrt{x-2}+\_C1\right\}$$

Mathematica raw input

```
DSolve[1 + 4*(2 - x)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-2 + x] + C[1]}, {y[x] -> Sqrt[-2 + x] + C[1]}}
```

Maple raw input

```
dsolve(4*(2-x)*diff(y(x),x)^2+1 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -(x-2)^(1/2)+_C1, y(x) = (x-2)^(1/2)+_C1
```

4.894 $8y(x)y'(x) + 16xy'(x)^2 + y(x)^6 = 0$

ODE

$$8y(x)y'(x) + 16xy'(x)^2 + y(x)^6 = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.262324 (sec), leaf count = 263

$$\left\{\left\{y(x) \to -\frac{\sqrt[4]{2}\sqrt[4]{\frac{1}{\cosh(c_1 - \log(x)) + 1}}}{\sqrt[4]{x}}\right\}, \left\{y(x) \to -\frac{i\sqrt[4]{2}\sqrt[4]{\frac{1}{\cosh(c_1 - \log(x)) + 1}}}{\sqrt[4]{x}}\right\}, \left\{y(x) \to \frac{i\sqrt[4]{2}\sqrt[4]{\frac{1}{\cosh(c_1 - \log(x}}\right.$$

Maple ✓
cpu = 0.067 (sec), leaf count = 77

$$\left\{(y(x))^4 - x^{-1} = 0, \ln(x) - \_C1 - 4\int^{y(x)\sqrt[4]{x}} \frac{1}{\_a\sqrt{-\_a^4 + 1}} d\_a = 0, \ln(x) - \_C1 + 4\int^{y(x)\sqrt[4]{x}} \frac{1}{\_a\sqrt{-\_a^4 + 1}} d\_a =\right.$$

Mathematica raw input

```
DSolve[y[x]^6 + 8*y[x]*y'[x] + 16*x*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((2^(1/4)*((1 + Cosh[C[1] - Log[x]])^(-1))^(1/4))/x^(1/4))}, {y[x] ->
  ((-I)*2^(1/4)*((1 + Cosh[C[1] - Log[x]])^(-1))^(1/4))/x^(1/4)}, {y[x] -> (I*2^(
1/4)*((1 + Cosh[C[1] - Log[x]])^(-1))^(1/4))/x^(1/4)}, {y[x] -> (2^(1/4)*((1 + C
osh[C[1] - Log[x]])^(-1))^(1/4))/x^(1/4)}, {y[x] -> -((2^(1/4)*((1 + Cosh[C[1] -
 Log[x]])^(-1))^(1/4))/x^(1/4))}, {y[x] -> ((-I)*2^(1/4)*((1 + Cosh[C[1] - Log[x
]])^(-1))^(1/4))/x^(1/4)}, {y[x] -> (I*2^(1/4)*((1 + Cosh[C[1] - Log[x]])^(-1))^
(1/4))/x^(1/4)}, {y[x] -> (2^(1/4)*((1 + Cosh[C[1] - Log[x]])^(-1))^(1/4))/x^(1/
4)}}
```

Maple raw input

```
dsolve(16*x*diff(y(x),x)^2+8*y(x)*diff(y(x),x)+y(x)^6 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^4-1/x = 0, ln(x)-_C1-4*Intat(1/_a/(-_a^4+1)^(1/2),_a = y(x)*x^(1/4)) = 0, l
n(x)-_C1+4*Intat(1/_a/(-_a^4+1)^(1/2),_a = y(x)*x^(1/4)) = 0
```

4.895 $x^2y'(x)^2 = a^2$

ODE

$$x^2y'(x)^2 = a^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.00319314 (sec), leaf count = 24

$$\{\{y(x) \to c_1 - a\log(x)\}, \{y(x) \to a\log(x) + c_1\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 20

$$\{y(x) = -a\ln(x) + \_C1, y(x) = a\ln(x) + \_C1\}$$

Mathematica raw input

```
DSolve[x^2*y'[x]^2 == a^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] - a*Log[x]}, {y[x] -> C[1] + a*Log[x]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2 = a^2, y(x),'implicit')
```

Maple raw output

```
y(x) = a*ln(x)+_C1, y(x) = -a*ln(x)+_C1
```

4.896 $x^2y'(x)^2 = y(x)^2$

ODE

$$x^2y'(x)^2 = y(x)^2$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00403022 (sec), leaf count = 19

$$\left\{\left\{y(x) \to \frac{c_1}{x}\right\}, \{y(x) \to c_1 x\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 15

$$\left\{y(x) = \frac{\_C1}{x}, y(x) = \_C1\, x\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x]^2 == y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/x}, {y[x] -> x*C[1]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2 = y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1/x, y(x) = _C1*x
```

4.897 $x^2y'(x)^2 + x^2 - y(x)^2 = 0$

ODE

$$x^2y'(x)^2 + x^2 - y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.209988 (sec), leaf count = 147

$$\left\{\text{Solve}\left[x\left(-2c_1+2\sinh^{-1}\left(\frac{\sqrt{\frac{y(x)}{x}-1}}{\sqrt{2}}\right)-2\log(x)-1\right)=\frac{y(x)^2}{x}+\sqrt{\frac{y(x)+x}{x}}\sqrt{\frac{y(x)}{x}-1}y(x),y(x)\right],\text{Solve}\left[x\left(-2c_1\right.\right.\right.$$

Maple ✓
cpu = 0.053 (sec), leaf count = 137

$$\left\{\ln(x)-\frac{y(x)}{2x}\sqrt{\frac{(y(x))^2-x^2}{x^2}}+\frac{1}{2}\ln\left(\frac{1}{x}\left(\sqrt{\frac{(y(x))^2-x^2}{x^2}}x+y(x)\right)\right)+\frac{(y(x))^2}{2x^2}-\_C1=0,\ln(x)+\frac{y(x)}{2x}\sqrt{\frac{(y(x))^2-}{x^2}}\right.$$

Mathematica raw input

```
DSolve[x^2 - y[x]^2 + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[x*(-1 + 2*ArcSinh[Sqrt[-1 + y[x]/x]/Sqrt[2]] - 2*C[1] - 2*Log[x]) == y[x]
^2/x + y[x]*Sqrt[(x + y[x])/x]*Sqrt[-1 + y[x]/x], y[x]], Solve[x*(1 + 2*ArcSinh[
Sqrt[-1 + y[x]/x]/Sqrt[2]] - 2*C[1] + 2*Log[x]) + y[x]^2/x == y[x]*Sqrt[(x + y[x
])/x]*Sqrt[-1 + y[x]/x], y[x]]}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2+x^2-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-1/2*((y(x)^2-x^2)/x^2)^(1/2)/x*y(x)+1/2*ln((((y(x)^2-x^2)/x^2)^(1/2)*x+y(x
))/x)+1/2/x^2*y(x)^2-_C1 = 0, ln(x)+1/2*((y(x)^2-x^2)/x^2)^(1/2)/x*y(x)-1/2*ln((
((y(x)^2-x^2)/x^2)^(1/2)*x+y(x))/x)+1/2/x^2*y(x)^2-_C1 = 0
```

4.898 $x^2y'(x)^2 = (x - y(x))^2$

ODE

$$x^2y'(x)^2 = (x - y(x))^2$$

ODE Classification

[_linear]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0051665 (sec), leaf count = 30

$$\left\{\left\{y(x) \to \frac{c_1}{x} + \frac{x}{2}\right\}, \{y(x) \to x(c_1 - \log(x))\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 24

$$\left\{y(x) = (-\ln(x) + \_C1)\,x, y(x) = \frac{x}{2} + \frac{\_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[x^2*y'[x]^2 == (x - y[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x/2 + C[1]/x}, {y[x] -> x*(C[1] - Log[x])}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2 = (x-y(x))^2, y(x),'implicit')
```

Maple raw output

```
y(x) = (-ln(x)+_C1)*x, y(x) = 1/2*x+1/x*_C1
```

4.899 $x^2y'(x)^2 - y(x)^4 + y(x)^2 = 0$

ODE

$$x^2y'(x)^2 - y(x)^4 + y(x)^2 = 0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0408584 (sec), leaf count = 103

$$\left\{\left\{y(x) \to \sqrt{\sec^2(c_1 - \log(x))}(-\cot(c_1 - \log(x)))\right\}, \left\{y(x) \to \sqrt{\sec^2(c_1 - \log(x))}\cot(c_1 - \log(x))\right\}, \left\{y(x) \to \sqrt{\sec^2(c_1\right.\right.$$

Maple ✓
cpu = 0.077 (sec), leaf count = 45

$$\left\{(y(x))^2 - 1 = 0, \ln(x) - \arctan\left(\frac{1}{\sqrt{(y(x))^2 - 1}}\right) - \_C1 = 0, \ln(x) + \arctan\left(\frac{1}{\sqrt{(y(x))^2 - 1}}\right) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]^2 - y[x]^4 + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Cot[C[1] - Log[x]]*Sqrt[Sec[C[1] - Log[x]]^2])}, {y[x] -> Cot[C[1] -
  Log[x]]*Sqrt[Sec[C[1] - Log[x]]^2]}, {y[x] -> -(Cot[C[1] + Log[x]]*Sqrt[Sec[C[1
] + Log[x]]^2])}, {y[x] -> Cot[C[1] + Log[x]]*Sqrt[Sec[C[1] + Log[x]]^2]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2+y(x)^2-y(x)^4 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-1 = 0, ln(x)-arctan(1/(y(x)^2-1)^(1/2))-_C1 = 0, ln(x)+arctan(1/(y(x)^2-1
)^(1/2))-_C1 = 0
```

4.900 $x^2y'(x)^2 - xy'(x) + (1 - y(x))y(x) = 0$

ODE

$$x^2y'(x)^2 - xy'(x) + (1 - y(x))y(x) = 0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0045838 (sec), leaf count = 21

$$\left\{\{y(x) \to c_1 x\}, \left\{y(x) \to \frac{c_1 + x}{x}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 17

$$\left\{y(x) = \_C1\, x, y(x) = \frac{x + \_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[(1 - y[x])*y[x] - x*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1]}, {y[x] -> (x + C[1])/x}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2-x*diff(y(x),x)+y(x)*(1-y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x, y(x) = (x+_C1)/x
```

4.901 $a^2 + 2axy'(x) - 2ay(x) + x^2y'(x)^2 + x^2 = 0$

ODE

$$a^2 + 2axy'(x) - 2ay(x) + x^2y'(x)^2 + x^2 = 0$$

ODE Classification

[_rational]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 1.7483 (sec), leaf count = 54

$$\text{Solve}\left[\left\{y(x) = \frac{a^2 + 2a\text{K\$1542706}x + \left(\text{K\$1542706}^2 + 1\right)x^2}{2a}, x = \frac{c_1 - a\sinh^{-1}(\text{K\$1542706})}{\sqrt{\text{K\$1542706}^2 + 1}}\right\}, \{y(x), \text{K\$1542706}\}\right]$$

Maple ✓
cpu = 10.321 (sec), leaf count = 80

$$\left\{[y(\_T) = -\frac{1}{a}\left(\left(-\frac{a^2(Arcsinh(\_T))^2}{2} + a\_C1\ Arcsinh(\_T) - \frac{a^2}{2} - \frac{\_C1^2}{2}\right)\sqrt{\_T^2+1} + a\_T\,(aArcsinh(\_T) - \_C1\right.\right.$$

Mathematica raw input

```
DSolve[a^2 + x^2 - 2*a*y[x] + 2*a*x*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
Solve[{y[x] == (a^2 + 2*a*K$1542706*x + (1 + K$1542706^2)*x^2)/(2*a), x == (-(a*
ArcSinh[K$1542706]) + C[1])/Sqrt[1 + K$1542706^2]}, {y[x], K$1542706}]
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2+2*a*x*diff(y(x),x)+a^2+x^2-2*a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[y(_T) = -1/(_T^2+1)^(1/2)*((-1/2*a^2*arcsinh(_T)^2+a*_C1*arcsinh(_T)-1/2*a^2-1/
2*_C1^2)*(_T^2+1)^(1/2)+a*_T*(a*arcsinh(_T)-_C1))/a, x(_T) = (-a*arcsinh(_T)+_C1
)/(_T^2+1)^(1/2)]
```

4.902 $x^2y'(x)^2 - 2xy(x)y'(x) + y(x)(y(x)+1) - x = 0$

ODE

$$x^2y'(x)^2 - 2xy(x)y'(x) + y(x)(y(x)+1) - x = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.0332616 (sec), leaf count = 55

$$\left\{\left\{y(x) \to \frac{c_1^2 x}{4} - ic_1\sqrt{x} + x - 1\right\}, \left\{y(x) \to \frac{c_1^2 x}{4} + ic_1\sqrt{x} + x - 1\right\}\right\}$$

Maple ✓
cpu = 0.244 (sec), leaf count = 22

$$\left\{y(x) = x, y(x) = \sqrt{x}\_C1 - \frac{\_C1^2}{4} + x - 1\right\}$$

Mathematica raw input

```
DSolve[-x + y[x]*(1 + y[x]) - 2*x*y[x]*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1 + x - I*Sqrt[x]*C[1] + (x*C[1]^2)/4}, {y[x] -> -1 + x + I*Sqrt[x]*C
[1] + (x*C[1]^2)/4}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)-x+y(x)*(1+y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x, y(x) = x^(1/2)*_C1-1/4*x*_C1^2+x-1
```

4.903 $-x^4+x^2y'(x)^2+(1-x^2)\,y(x)^2-2xy(x)y'(x)=0$

ODE

$$-x^4+x^2y'(x)^2+(1-x^2)\,y(x)^2-2xy(x)y'(x)=0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.0323304 (sec), leaf count = 26

$$\{\{y(x)\to -x\sinh(x-c_1)\},\{y(x)\to x\sinh(c_1+x)\}\}$$

Maple ✓
cpu = 1.386 (sec), leaf count = 67

$$\left\{x^2+(y(x))^2=0,\ln\left(x\left(y(x)+\sqrt{x^2+(y(x))^2}\right)\right)-x-2\ln(x)-\_C1=0,\ln\left(x\left(y(x)+\sqrt{x^2+(y(x))^2}\right)\right)+x-2\ln\right.$$

Mathematica raw input

```
DSolve[-x^4 + (1 - x^2)*y[x]^2 - 2*x*y[x]*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x*Sinh[x - C[1]])}, {y[x] -> x*Sinh[x + C[1]]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)-x^4+(-x^2+1)*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x^2+y(x)^2 = 0, ln(x*(y(x)+(x^2+y(x)^2)^(1/2)))+x-2*ln(x)-_C1 = 0, ln(x*(y(x)+(x
^2+y(x)^2)^(1/2)))-x-2*ln(x)-_C1 = 0
```

4.904 $x^2y'(x)^2-(2xy(x)+1)y'(x)+y(x)^2+1=0$

ODE

$$x^2y'(x)^2-(2xy(x)+1)y'(x)+y(x)^2+1=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational, _Clairaut]

Book solution method
Clairaut's equation and related types, $f(y-xy',y')=0$

Mathematica ✓
cpu = 0.498578 (sec), leaf count = 101

$$\left\{\left\{y(x)\to \frac{1}{4}e^{-2c_1}x-\frac{e^{-c_1}}{2}+x\right\},\left\{y(x)\to \frac{1}{4}e^{-2c_1}x+\frac{e^{-c_1}}{2}+x\right\},\{y(x)\to 4e^{-2c_1}x-2e^{-c_1}+x\},\{y(x)\to 4e^{-2c_1}x+2e\right.$$

Maple ✓
cpu = 0.045 (sec), leaf count = 42

$$\left\{y(x)=\frac{4x^2-1}{4x},y(x)=\_C1\,x-\sqrt{\_C1-1},y(x)=\_C1\,x+\sqrt{\_C1-1}\right\}$$

Mathematica raw input

```
DSolve[1 + y[x]^2 - (1 + 2*x*y[x])*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1/(2*E^C[1]) + x + x/(4*E^(2*C[1]))}, {y[x] -> 1/(2*E^C[1]) + x + x/(
4*E^(2*C[1]))}, {y[x] -> -2/E^C[1] + x + (4*x)/E^(2*C[1])}, {y[x] -> 2/E^C[1] +
x + (4*x)/E^(2*C[1])}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2-(1+2*x*y(x))*diff(y(x),x)+1+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(4*x^2-1)/x, y(x) = _C1*x-(_C1-1)^(1/2), y(x) = _C1*x+(_C1-1)^(1/2)
```

4.905 $-(a+2xy(x))y'(x)+x^2y'(x)^2+y(x)^2=0$

ODE

$$-(a+2xy(x))y'(x)+x^2y'(x)^2+y(x)^2=0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _Clairaut]

Book solution method
Clairaut's equation and related types, $f(y-xy',y')=0$

Mathematica ✓
cpu = 0.273771 (sec), leaf count = 47

$$\left\{\left\{y(x)\to\frac{x-2\sqrt{a}c_1}{4c_1^2}\right\},\left\{y(x)\to\frac{2\sqrt{a}c_1+x}{4c_1^2}\right\}\right\}$$

Maple ✓
cpu = 0.044 (sec), leaf count = 36

$$\left\{y(x)=-\frac{a}{4\,x},y(x)=\_C1\,x-\sqrt{a\_C1},y(x)=\_C1\,x+\sqrt{a\_C1}\right\}$$

Mathematica raw input

```
DSolve[y[x]^2 - (a + 2*x*y[x])*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - 2*Sqrt[a]*C[1])/(4*C[1]^2)}, {y[x] -> (x + 2*Sqrt[a]*C[1])/(4*C[1
]^2)}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2-(a+2*x*y(x))*diff(y(x),x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/4/x*a, y(x) = _C1*x-(a*_C1)^(1/2), y(x) = _C1*x+(a*_C1)^(1/2)
```

4.906 $x^2y'(x)^2 - x(x-2y(x))y'(x) + y(x)^2 = 0$

ODE

$$x^2y'(x)^2 - x(x-2y(x))y'(x) + y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.107745 (sec), leaf count = 85

$$\left\{\left\{y(x) \to \frac{(\cosh(4c_1) - \sinh(4c_1))(2x\sinh(2c_1) + 2x\cosh(2c_1) - 1)}{4x}\right\}, \left\{y(x) \to -\frac{(\cosh(4c_1) - \sinh(4c_1))(2x\sinh(2c_1)}{4x}\right.\right.$$

Maple ✓
cpu = 0.06 (sec), leaf count = 69

$$\left\{\ln(x) - Artanh\left(\sqrt{\frac{-4y(x)+x}{x}}\right) + \frac{1}{2}\ln\left(\frac{y(x)}{x}\right) - \_C1 = 0, \ln(x) + Artanh\left(\sqrt{\frac{-4y(x)+x}{x}}\right) + \frac{1}{2}\ln\left(\frac{y(x)}{x}\right) - \_C1\right.$$

Mathematica raw input

```
DSolve[y[x]^2 - x*(x - 2*y[x])*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-1 + 2*x*Cosh[2*C[1]] + 2*x*Sinh[2*C[1]])*(Cosh[4*C[1]] - Sinh[4*C[1
]]))/(4*x)}, {y[x] -> -((1 + 2*x*Cosh[2*C[1]] + 2*x*Sinh[2*C[1]])*(Cosh[4*C[1]]
- Sinh[4*C[1]]))/(4*x)}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2-x*(x-2*y(x))*diff(y(x),x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*x, ln(x)-arctanh(((-4*y(x)+x)/x)^(1/2))+1/2*ln(y(x)/x)-_C1 = 0, ln(x)
+arctanh(((-4*y(x)+x)/x)^(1/2))+1/2*ln(y(x)/x)-_C1 = 0
```

4.907 $-4a + x^2 y'(x)^2 + 2x(y(x) + 2x)y'(x) + y(x)^2 = 0$

ODE

$$-4a + x^2 y'(x)^2 + 2x(y(x) + 2x)y'(x) + y(x)^2 = 0$$

ODE Classification

[[_1st_order , `_with_symmetry_[F(x),G(y)]`]]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.498384 (sec), leaf count = 22

$$\left\{\left\{y(x) \to \frac{c_1(c_1 - 2x) - a}{x}\right\}\right\}$$

Maple ✓
cpu = 0.231 (sec), leaf count = 34

$$\left\{y(x) = \frac{-x^2 - a}{x}, y(x) = \_C1 + \frac{\_C1^2 - 4a}{4x}\right\}$$

Mathematica raw input

```
DSolve[-4*a + y[x]^2 + 2*x*(2*x + y[x])*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-a + C[1]*(-2*x + C[1]))/x}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2+2*x*(2*x+y(x))*diff(y(x),x)-4*a+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-x^2-a)/x, y(x) = _C1+1/4*(_C1^2-4*a)/x
```

4.908 $x(x^3-2y(x))\,y'(x)-(2x^3-y(x))\,y(x)+x^2y'(x)^2=0$

ODE

$$x(x^3-2y(x))\,y'(x)-(2x^3-y(x))\,y(x)+x^2y'(x)^2=0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.889102 (sec), leaf count = 154

$$\left\{\text{Solve}\left[\frac{1}{2}\left(-\frac{2x^{5/2}\sqrt{\frac{x^3}{y(x)}+4}\sqrt{y(x)}\sinh^{-1}\left(\frac{x^{3/2}}{2\sqrt{y(x)}}\right)}{\sqrt{x^8+4x^5y(x)}}+\log(y(x))-\log(x)\right)=c_1,y(x)\right],\text{Solve}\left[\frac{x^{5/2}\sqrt{\frac{x^3}{y(x)}+4}\sqrt{y(x)}\sin}{\sqrt{x^8+4x^5y(}}\right.\right.$$

Maple ✓
cpu = 0.173 (sec), leaf count = 130

$$\left\{\frac{1}{x}\left(\left(-\_C1\,x+y(x)\right)\sqrt{x^6+4\,x^3y\left(x\right)}-\_C1\,x^4-x^3y(x)\right)\left(x^3+\sqrt{x^6+4\,x^3y\left(x\right)}\right)^{-1}=0,\frac{1}{y\left(x\right)}\left(\left(-\_C1\,y(x)+x\right)\sqrt{x^6}\right.\right.$$

Mathematica raw input

```
DSolve[-((2*x^3 - y[x])*y[x]) + x*(x^3 - 2*y[x])*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(-Log[x] + Log[y[x]] - (2*x^(5/2)*ArcSinh[x^(3/2)/(2*Sqrt[y[x]])]*Sqrt[4
+ x^3/y[x]]*Sqrt[y[x]])/Sqrt[x^8 + 4*x^5*y[x]])/2 == C[1], y[x]], Solve[-Log[x]/
2 + Log[y[x]]/2 + (x^(5/2)*ArcSinh[x^(3/2)/(2*Sqrt[y[x]])]*Sqrt[4 + x^3/y[x]]*Sq
rt[y[x]])/Sqrt[x^8 + 4*x^5*y[x]] == C[1], y[x]]}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2+x*(x^3-2*y(x))*diff(y(x),x)-(2*x^3-y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/4*x^3, ((-_C1*y(x)+x)*(x^6+4*x^3*y(x))^(1/2)-y(x)*_C1*x^3-x^4)/y(x)/(x
^3+(x^6+4*x^3*y(x))^(1/2)) = 0, ((-_C1*x+y(x))*(x^6+4*x^3*y(x))^(1/2)-_C1*x^4-x^
3*y(x))/(x^3+(x^6+4*x^3*y(x))^(1/2))/x = 0
```

4.909 $x^2y'(x)^2+3xy(x)y'(x)+2y(x)^2=0$

ODE

$$x^2y'(x)^2+3xy(x)y'(x)+2y(x)^2=0$$

ODE Classification

[_separable]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x},y'\right)=0$, Solve for p

Mathematica ✓
cpu = 0.00487243 (sec), leaf count = 21

$$\left\{\left\{y(x)\to\frac{c_1}{x^2}\right\},\left\{y(x)\to\frac{c_1}{x}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 17

$$\left\{y(x)=\frac{\_C1}{x^2},y(x)=\frac{\_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[2*y[x]^2 + 3*x*y[x]*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/x^2}, {y[x] -> C[1]/x}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2+3*x*y(x)*diff(y(x),x)+2*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1/x, y(x) = _C1/x^2
```

4.910 $x^3 + x^2 y'(x)^2 - 3xy(x)y'(x) + 2y(x)^2 = 0$

ODE

$$x^3 + x^2 y'(x)^2 - 3xy(x)y'(x) + 2y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Change of variable

Mathematica ✗
cpu = 600.014 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.105 (sec), leaf count = 69

$$\left\{(y(x))^2 - 4x^3 = 0, \frac{y(x)}{x^2} + \frac{1}{x^2}\sqrt{(y(x))^2 - 4x^3} - \_C1 = 0, \frac{y(x)}{x} + \frac{1}{x}\sqrt{(y(x))^2 - 4x^3} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^3 + 2*y[x]^2 - 3*x*y[x]*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2-3*x*y(x)*diff(y(x),x)+x^3+2*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-4*x^3 = 0, y(x)/x+1/x*(y(x)^2-4*x^3)^(1/2)-_C1 = 0, 1/x^2*y(x)+1/x^2*(y(x
)^2-4*x^3)^(1/2)-_C1 = 0
```

4.911 $x^2y'(x)^2 + 4xy(x)y'(x) - 5y(x)^2 = 0$

ODE

$$x^2y'(x)^2 + 4xy(x)y'(x) - 5y(x)^2 = 0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00461228 (sec), leaf count = 19

$$\left\{\left\{y(x) \to \frac{c_1}{x^5}\right\}, \{y(x) \to c_1 x\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 15

$$\left\{y(x) = \frac{\_C1}{x^5}, y(x) = \_C1\, x\right\}$$

Mathematica raw input

```
DSolve[-5*y[x]^2 + 4*x*y[x]*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/x^5}, {y[x] -> x*C[1]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2+4*x*y(x)*diff(y(x),x)-5*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1/x^5, y(x) = _C1*x
```

4.912 $x^2y'(x)^2 - 4x(y(x)+2)y'(x) + 4y(x)(y(x)+2) = 0$

ODE

$$x^2y'(x)^2 - 4x(y(x)+2)y'(x) + 4y(x)(y(x)+2) = 0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0719412 (sec), leaf count = 59

$$\left\{\left\{y(x) \to e^{-c_1}x\left(x - 2\sqrt{2}e^{\frac{c_1}{2}}\right)\right\}, \left\{y(x) \to e^{c_1}x^2 - 2\sqrt{2}e^{\frac{c_1}{2}}x\right\}\right\}$$

Maple ✓
cpu = 0.055 (sec), leaf count = 83

$$\left\{\ln(x) - \frac{1}{2}\ln\left(\sqrt{2\,y(x)+4}+2\right) + \frac{1}{2}\ln\left(\sqrt{2\,y(x)+4}-2\right) - \frac{\ln(y(x))}{2} - \_C1 = 0, \ln(x) + \frac{1}{2}\ln\left(\sqrt{2\,y(x)+4}+2\right) - \frac{1}{2}\right.$$

Mathematica raw input

```
DSolve[4*y[x]*(2 + y[x]) - 4*x*(2 + y[x])*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(-2*Sqrt[2]*E^(C[1]/2) + x))/E^C[1]}, {y[x] -> -2*Sqrt[2]*E^(C[1]/2
)*x + E^C[1]*x^2}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2-4*x*(2+y(x))*diff(y(x),x)+4*(2+y(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -2, ln(x)-1/2*ln((2*y(x)+4)^(1/2)+2)+1/2*ln((2*y(x)+4)^(1/2)-2)-1/2*ln(y(
x))-_C1 = 0, ln(x)+1/2*ln((2*y(x)+4)^(1/2)+2)-1/2*ln((2*y(x)+4)^(1/2)-2)-1/2*ln(
y(x))-_C1 = 0
```

4.913 $x^2y'(x)^2 - 5xy(x)y'(x) + 6y(x)^2 = 0$

ODE

$$x^2y'(x)^2 - 5xy(x)y'(x) + 6y(x)^2 = 0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00432365 (sec), leaf count = 21

$$\{\{y(x) \to c_1x^2\}, \{y(x) \to c_1x^3\}\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 17

$$\{y(x) = \_C1\ x^2, y(x) = \_C1\ x^3\}$$

Mathematica raw input

```
DSolve[6*y[x]^2 - 5*x*y[x]*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2*C[1]}, {y[x] -> x^3*C[1]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2-5*x*y(x)*diff(y(x),x)+6*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^2, y(x) = _C1*x^3
```

4.914 $x^2y'(x)^2+x\left(x^2+xy(x)-2y(x)\right)y'(x)+(1-x)\left(x^2-y(x)\right)y(x)=0$

ODE

$$x^2y'(x)^2+x\left(x^2+xy(x)-2y(x)\right)y'(x)+(1-x)\left(x^2-y(x)\right)y(x)=0$$

ODE Classification

[_rational]

Book solution method
Change of variable

Mathematica ✗
cpu = 49.8053 (sec), leaf count = 0 , could not solve

```
DSolve[(1 - x)*(x^2 - y[x])*y[x] + x*(x^2 - 2*y[x] + x*y[x])*Derivative[1][y][x] + x^2*Derivative[1][
```

Maple ✗
cpu = 259.019 (sec), leaf count = 0 , could not solve

```
dsolve(x^2*diff(y(x),x)^2+x*(x^2+x*y(x)-2*y(x))*diff(y(x),x)+(1-x)*(x^2-y(x))*y(x) = 0, y(x),'implici
```

Mathematica raw input

```
DSolve[(1 - x)*(x^2 - y[x])*y[x] + x*(x^2 - 2*y[x] + x*y[x])*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
DSolve[(1 - x)*(x^2 - y[x])*y[x] + x*(x^2 - 2*y[x] + x*y[x])*Derivative[1][y][x]
 + x^2*Derivative[1][y][x]^2 == 0, y[x], x]
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2+x*(x^2+x*y(x)-2*y(x))*diff(y(x),x)+(1-x)*(x^2-y(x))*y(x) = 0, y(x),'implici
```

Maple raw output

```
dsolve(x^2*diff(y(x),x)^2+x*(x^2+x*y(x)-2*y(x))*diff(y(x),x)+(1-x)*(x^2-y(x))*y(
x) = 0, y(x),'implicit')
```

4.915 $x^2y'(x)^2 + (y(x)+2x)y(x)y'(x) + y(x)^2 = 0$

ODE

$$x^2y'(x)^2 + (y(x)+2x)y(x)y'(x) + y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.131129 (sec), leaf count = 64

$$\left\{\left\{y(x) \to -\frac{\sinh(4c_1)+\cosh(4c_1)}{\sinh(2c_1)+\cosh(2c_1)-x}\right\}, \left\{y(x) \to \frac{\sinh(4c_1)+\cosh(4c_1)}{\sinh(2c_1)+\cosh(2c_1)+x}\right\}\right\}$$

Maple ✓
cpu = 0.08 (sec), leaf count = 99

$$\left\{\ln(x) - \frac{1}{2}\ln\left(\frac{1}{x}\left(\sqrt{\frac{y(x)\,(y(x)+4x)}{x^2}}x + 2x + y(x)\right)\right) + \frac{1}{2}\ln\left(\frac{y(x)}{x}\right) - \_C1 = 0, \ln(x) + \frac{1}{2}\ln\left(\frac{1}{x}\left(\sqrt{\frac{y(x)\,(y(x)+4}{x^2}}\right.\right.\right.$$

Mathematica raw input

```
DSolve[y[x]^2 + y[x]*(2*x + y[x])*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((Cosh[4*C[1]] + Sinh[4*C[1]])/(-x + Cosh[2*C[1]] + Sinh[2*C[1]]))},
{y[x] -> (Cosh[4*C[1]] + Sinh[4*C[1]])/(x + Cosh[2*C[1]] + Sinh[2*C[1]])}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2+(2*x+y(x))*y(x)*diff(y(x),x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -4*x, ln(x)-1/2*ln(((y(x)*(y(x)+4*x)/x^2)^(1/2)*x+2*x+y(x))/x)+1/2*ln(y(x
)/x)-_C1 = 0, ln(x)+1/2*ln(((y(x)*(y(x)+4*x)/x^2)^(1/2)*x+2*x+y(x))/x)+1/2*ln(y(
x)/x)-_C1 = 0
```

4.916 $x^2y'(x)^2+(2x-y(x))y(x)y'(x)+y(x)^2=0$

ODE

$$x^2y'(x)^2+(2x-y(x))y(x)y'(x)+y(x)^2=0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.132102 (sec), leaf count = 73

$$\left\{\left\{y(x)\to \frac{\sinh(2c_1)-\cosh(2c_1)}{x\sinh(2c_1)+x\cosh(2c_1)-1}\right\},\left\{y(x)\to \frac{\sinh(2c_1)-\cosh(2c_1)}{x\sinh(2c_1)+x\cosh(2c_1)+1}\right\}\right\}$$

Maple ✓
cpu = 0.08 (sec), leaf count = 103

$$\left\{\ln(x)-\frac{1}{2}\ln\left(\frac{1}{x}\left(\sqrt{\frac{-4xy(x)+(y(x))^2}{x^2}}x-2x+y(x)\right)\right)+\frac{1}{2}\ln\left(\frac{y(x)}{x}\right)-\_C1=0,\ln(x)+\frac{1}{2}\ln\left(\frac{1}{x}\left(\sqrt{\frac{-4xy(x)+}{x^2}}\right.\right.\right.$$

Mathematica raw input

```
DSolve[y[x]^2 + (2*x - y[x])*y[x]*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-Cosh[2*C[1]] + Sinh[2*C[1]])/(-1 + x*Cosh[2*C[1]] + x*Sinh[2*C[1]])}
, {y[x] -> (-Cosh[2*C[1]] + Sinh[2*C[1]])/(1 + x*Cosh[2*C[1]] + x*Sinh[2*C[1]])}
}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2+(2*x-y(x))*y(x)*diff(y(x),x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 4*x, ln(x)-1/2*ln((((-4*x*y(x)+y(x)^2)/x^2)^(1/2)*x-2*x+y(x))/x)+1/2*ln(y
(x)/x)-_C1 = 0, ln(x)+1/2*ln((((-4*x*y(x)+y(x)^2)/x^2)^(1/2)*x-2*x+y(x))/x)+1/2*
ln(y(x)/x)-_C1 = 0
```

4.917 $y'(x)\left(a+bx^2y(x)^3\right)+aby(x)^3+x^2y'(x)^2=0$

ODE

$$y'(x)\left(a+bx^2y(x)^3\right)+aby(x)^3+x^2y'(x)^2=0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00684162 (sec), leaf count = 49

$$\left\{\left\{y(x)\to -\frac{1}{\sqrt{2bx-2c_1}}\right\},\left\{y(x)\to \frac{1}{\sqrt{2bx-2c_1}}\right\},\left\{y(x)\to \frac{a}{x}+c_1\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 25

$$\left\{(y(x))^{-2}-2\,bx-\_C1=0,y(x)=\frac{a}{x}+\_C1\right\}$$

Mathematica raw input

```
DSolve[a*b*y[x]^3 + (a + b*x^2*y[x]^3)*y'[x] + x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(1/Sqrt[2*b*x - 2*C[1]])}, {y[x] -> 1/Sqrt[2*b*x - 2*C[1]]}, {y[x] ->
  a/x + C[1]}}
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^2+(a+b*x^2*y(x)^3)*diff(y(x),x)+a*b*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
1/y(x)^2-2*b*x-_C1 = 0, y(x) = 1/x*a+_C1
```

4.918 $(1-x^2)\,y'(x)^2 = 1-y(x)^2$

ODE

$$(1-x^2)\,y'(x)^2 = 1-y(x)^2$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0818556 (sec), leaf count = 88

$$\left\{\left\{y(x)\to \frac{1}{2}e^{-c_1}\left(\left(e^{2c_1}+1\right)x-\left(e^{2c_1}-1\right)\sqrt{x^2-1}\right)\right\},\left\{y(x)\to \frac{1}{2}e^{-c_1}\left(\left(e^{2c_1}-1\right)\sqrt{x^2-1}+\left(e^{2c_1}+1\right)x\right)\right\}\right\}$$

Maple ✓
cpu = 251.375 (sec), leaf count = 166

$$\left\{(y(x))^2-1=0, 1\sqrt{(y(x)-1)(1+y(x))}\ln\left(y(x)+\sqrt{(y(x))^2-1}\right)\frac{1}{\sqrt{y(x)-1}}\frac{1}{\sqrt{1+y(x)}}+\int^{x}\frac{1}{\_a^2-1}\sqrt{(\_a^2-1)\left(\right.\right.$$

Mathematica raw input

```
DSolve[(1 - x^2)*y'[x]^2 == 1 - y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((1 + E^(2*C[1]))*x - (-1 + E^(2*C[1]))*Sqrt[-1 + x^2])/(2*E^C[1])}, {
y[x] -> ((1 + E^(2*C[1]))*x + (-1 + E^(2*C[1]))*Sqrt[-1 + x^2])/(2*E^C[1])}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x)^2 = 1-y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x)^2-1 = 0, ((y(x)-1)*(1+y(x)))^(1/2)/(y(x)-1)^(1/2)/(1+y(x))^(1/2)*ln(y(x)+(y
(x)^2-1)^(1/2))+Intat(-1/(_a^2-1)*((_a^2-1)*(y(x)^2-1))^(1/2)/(y(x)-1)^(1/2)/(1+
y(x))^(1/2),_a = x)+_C1 = 0, ((y(x)-1)*(1+y(x)))^(1/2)/(y(x)-1)^(1/2)/(1+y(x))^(
1/2)*ln(y(x)+(y(x)^2-1)^(1/2))+Intat(1/(_a^2-1)*((_a^2-1)*(y(x)^2-1))^(1/2)/(y(x
)-1)^(1/2)/(1+y(x))^(1/2),_a = x)+_C1 = 0
```

4.919 $(1-x^2)\,y'(x)^2+4x^2+2xy(x)y'(x)=0$

ODE

$$(1-x^2)\,y'(x)^2+4x^2+2xy(x)y'(x)=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(y)]`]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.349725 (sec), leaf count = 24

$$\left\{\left\{y(x)\to \frac{c_1^2-4x^2+4}{2c_1}\right\}\right\}$$

Maple ✓
cpu = 0.292 (sec), leaf count = 31

$$\left\{(y(x))^2+4\,x^2-4=0, y(x)=-\_C1+\_C1\,x^2-\_C1^{-1}\right\}$$

Mathematica raw input

```
DSolve[4*x^2 + 2*x*y[x]*y'[x] + (1 - x^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (4 - 4*x^2 + C[1]^2)/(2*C[1])}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+4*x^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+4*x^2-4 = 0, y(x) = -_C1+_C1*x^2-1/_C1
```

4.920 $(a^2+x^2)\,y'(x)^2 = b^2$

ODE

$$(a^2+x^2)\,y'(x)^2 = b^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0179269 (sec), leaf count = 48

$$\left\{\left\{y(x)\to c_1-b\log\left(\sqrt{a^2+x^2}+x\right)\right\},\left\{y(x)\to b\log\left(\sqrt{a^2+x^2}+x\right)+c_1\right\}\right\}$$

Maple ✓
cpu = 0.032 (sec), leaf count = 40

$$\left\{y(x)=-b\ln\left(x+\sqrt{a^2+x^2}\right)+\_C1, y(x)=b\ln\left(x+\sqrt{a^2+x^2}\right)+\_C1\right\}$$

Mathematica raw input

```
DSolve[(a^2 + x^2)*y'[x]^2 == b^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] - b*Log[x + Sqrt[a^2 + x^2]]}, {y[x] -> C[1] + b*Log[x + Sqrt[a^2
 + x^2]]}}
```

Maple raw input

```
dsolve((a^2+x^2)*diff(y(x),x)^2 = b^2, y(x),'implicit')
```

Maple raw output

```
y(x) = b*ln(x+(a^2+x^2)^(1/2))+_C1, y(x) = -b*ln(x+(a^2+x^2)^(1/2))+_C1
```

4.921 $(a^2 - x^2)\, y'(x)^2 + b^2 = 0$

ODE

$$(a^2 - x^2)\, y'(x)^2 + b^2 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0201466 (sec), leaf count = 52

$$\left\{\left\{y(x) \to c_1 - b \log\left(\sqrt{x^2 - a^2} + x\right)\right\}, \left\{y(x) \to b \log\left(\sqrt{x^2 - a^2} + x\right) + c_1\right\}\right\}$$

Maple ✓
cpu = 0.037 (sec), leaf count = 44

$$\left\{y(x) = -b \ln\left(x + \sqrt{-a^2 + x^2}\right) + \_C1, y(x) = b \ln\left(x + \sqrt{-a^2 + x^2}\right) + \_C1\right\}$$

Mathematica raw input

```
DSolve[b^2 + (a^2 - x^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] - b*Log[x + Sqrt[-a^2 + x^2]]}, {y[x] -> C[1] + b*Log[x + Sqrt[-a
^2 + x^2]]}}
```

Maple raw input

```
dsolve((a^2-x^2)*diff(y(x),x)^2+b^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = b*ln(x+(-a^2+x^2)^(1/2))+_C1, y(x) = -b*ln(x+(-a^2+x^2)^(1/2))+_C1
```

4.922 $(a^2 - x^2)\, y'(x)^2 = b^2$

ODE

$$(a^2 - x^2)\, y'(x)^2 = b^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0225286 (sec), leaf count = 52

$$\left\{\left\{y(x) \to b \tan^{-1}\left(\frac{x}{\sqrt{a^2 - x^2}}\right) + c_1\right\}, \left\{y(x) \to c_1 - b \tan^{-1}\left(\frac{x}{\sqrt{a^2 - x^2}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.035 (sec), leaf count = 44

$$\left\{y(x) = -b \arctan\left(x \frac{1}{\sqrt{a^2 - x^2}}\right) + \_C1, y(x) = b \arctan\left(x \frac{1}{\sqrt{a^2 - x^2}}\right) + \_C1\right\}$$

Mathematica raw input

```
DSolve[(a^2 - x^2)*y'[x]^2 == b^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> b*ArcTan[x/Sqrt[a^2 - x^2]] + C[1]}, {y[x] -> -(b*ArcTan[x/Sqrt[a^2 -
x^2]]) + C[1]}}
```

Maple raw input

```
dsolve((a^2-x^2)*diff(y(x),x)^2 = b^2, y(x),'implicit')
```

Maple raw output

```
y(x) = b*arctan(x/(a^2-x^2)^(1/2))+_C1, y(x) = -b*arctan(x/(a^2-x^2)^(1/2))+_C1
```

4.923 $(a^2 - x^2)\, y'(x)^2 = x^2$

ODE

$$(a^2 - x^2)\, y'(x)^2 = x^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.00876538 (sec), leaf count = 43

$$\left\{\left\{y(x) \to c_1 - \sqrt{a^2 - x^2}\right\}, \left\{y(x) \to \sqrt{a^2 - x^2} + c_1\right\}\right\}$$

Maple ✓
cpu = 0.035 (sec), leaf count = 52

$$\left\{y(x) = -(a-x)\,(a+x)\,\frac{1}{\sqrt{(a-x)\,(a+x)}} + \_C1, y(x) = (a-x)\,(a+x)\,\frac{1}{\sqrt{(a-x)\,(a+x)}} + \_C1\right\}$$

Mathematica raw input

```
DSolve[(a^2 - x^2)*y'[x]^2 == x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[a^2 - x^2] + C[1]}, {y[x] -> Sqrt[a^2 - x^2] + C[1]}}
```

Maple raw input

```
dsolve((a^2-x^2)*diff(y(x),x)^2 = x^2, y(x),'implicit')
```

Maple raw output

```
y(x) = -(a-x)*(a+x)/((a-x)*(a+x))^(1/2)+_C1, y(x) = (a-x)*(a+x)/((a-x)*(a+x))^(1
/2)+_C1
```

4.924 $(a^2-x^2)\,y'(x)^2+x^2+2xy(x)y'(x)=0$

ODE

$$(a^2-x^2)\,y'(x)^2+x^2+2xy(x)y'(x)=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(y)]`]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.416386 (sec), leaf count = 26

$$\left\{\left\{y(x)\to \frac{a^2+c_1^2-x^2}{2c_1}\right\}\right\}$$

Maple ✓
cpu = 0.449 (sec), leaf count = 36

$$\left\{(y(x))^2-a^2+x^2=0, y(x)=\_C1\,x^2-\_C1\,a^2-\frac{1}{4\_C1}\right\}$$

Mathematica raw input

```
DSolve[x^2 + 2*x*y[x]*y'[x] + (a^2 - x^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a^2 - x^2 + C[1]^2)/(2*C[1])}}
```

Maple raw input

```
dsolve((a^2-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+x^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-a^2+x^2 = 0, y(x) = _C1*x^2-_C1*a^2-1/4/_C1
```

4.925 $(a^2 - x^2)\, y'(x)^2 - 2xy(x)y'(x) - y(x)^2 = 0$

ODE

$$(a^2 - x^2)\, y'(x)^2 - 2xy(x)y'(x) - y(x)^2 = 0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00769023 (sec), leaf count = 27

$$\left\{\left\{y(x) \to \frac{c_1}{a - x}\right\}, \left\{y(x) \to \frac{c_1}{a + x}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 23

$$\left\{y(x) = \frac{\_C1}{a - x}, y(x) = \frac{\_C1}{a + x}\right\}$$

Mathematica raw input

```
DSolve[-y[x]^2 - 2*x*y[x]*y'[x] + (a^2 - x^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/(a - x)}, {y[x] -> C[1]/(a + x)}}
```

Maple raw input

```
dsolve((a^2-x^2)*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1/(a-x), y(x) = _C1/(a+x)
```

4.926 $(a^2+x^2)\,y'(x)^2+b-2xy(x)y'(x)+y(x)^2=0$

ODE

$$(a^2+x^2)\,y'(x)^2+b-2xy(x)y'(x)+y(x)^2=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational, _Clairaut]

Book solution method
Clairaut's equation and related types, $f(y-xy',y')=0$

Mathematica ✗
cpu = 601.717 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.044 (sec), leaf count = 69

$$\left\{\frac{a^2(y(x))^2+b(a^2+x^2)}{a^2}=0, y(x)=\_C1\,x-\sqrt{-\_C1^2a^2-b}, y(x)=\_C1\,x+\sqrt{-\_C1^2a^2-b}\right\}$$

Mathematica raw input

```
DSolve[b + y[x]^2 - 2*x*y[x]*y'[x] + (a^2 + x^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((a^2+x^2)*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)+b+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
(a^2*y(x)^2+b*(a^2+x^2))/a^2 = 0, y(x) = _C1*x-(-_C1^2*a^2-b)^(1/2), y(x) = _C1*
x+(-_C1^2*a^2-b)^(1/2)
```

4.927 $(2x^2+1)\,y'(x)^2+(x^2+2xy(x)+y(x)^2+2)\,y'(x)+2y(x)^2+1=0$

ODE

$$(2x^2+1)\,y'(x)^2+(x^2+2xy(x)+y(x)^2+2)\,y'(x)+2y(x)^2+1=0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of variable

Mathematica ✗
cpu = 600.27 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 1.707 (sec), leaf count = 17

$$\left\{(y(x))^2+6\,xy(x)+x^2-4=0\right\}$$

Mathematica raw input

```
DSolve[1 + 2*y[x]^2 + (2 + x^2 + 2*x*y[x] + y[x]^2)*y'[x] + (1 + 2*x^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((2*x^2+1)*diff(y(x),x)^2+(2+x^2+2*x*y(x)+y(x)^2)*diff(y(x),x)+1+2*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+6*x*y(x)+x^2-4 = 0
```

4.928 $4x^2y'(x)^2 - 4xy(x)y'(x) = 8x^3 - y(x)^2$

ODE

$$4x^2y'(x)^2 - 4xy(x)y'(x) = 8x^3 - y(x)^2$$

ODE Classification

[_linear]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00773566 (sec), leaf count = 42

$$\left\{\left\{y(x) \to \sqrt{x}\left(c_1 - \sqrt{2}x\right)\right\}, \left\{y(x) \to \sqrt{x}\left(c_1 + \sqrt{2}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.058 (sec), leaf count = 30

$$\left\{y(x) = \left(-\sqrt{2}x + \_C1\right)\sqrt{x}, y(x) = \left(\sqrt{2}x + \_C1\right)\sqrt{x}\right\}$$

Mathematica raw input

```
DSolve[-4*x*y[x]*y'[x] + 4*x^2*y'[x]^2 == 8*x^3 - y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*(-(Sqrt[2]*x) + C[1])}, {y[x] -> Sqrt[x]*(Sqrt[2]*x + C[1])}}
```

Maple raw input

```
dsolve(4*x^2*diff(y(x),x)^2-4*x*y(x)*diff(y(x),x) = 8*x^3-y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = (-2^(1/2)*x+_C1)*x^(1/2), y(x) = (2^(1/2)*x+_C1)*x^(1/2)
```

4.929 $ax^2y'(x)^2+(1-a)ax^2-2axy(x)y'(x)+y(x)^2=0$

ODE

$$ax^2y'(x)^2+(1-a)ax^2-2axy(x)y'(x)+y(x)^2=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x},y'\right)=0$, Solve for p

Mathematica ✓
cpu = 0.143396 (sec), leaf count = 113

$$\left\{\left\{y(x)\to\frac{1}{2}e^{-c_1}x^{1-\sqrt{\frac{a-1}{a}}}\left(e^{2c_1}-ax^{2\sqrt{\frac{a-1}{a}}}\right)\right\},\left\{y(x)\to\frac{1}{2}e^{c_1}x^{\sqrt{\frac{a-1}{a}}+1}-\frac{1}{2}ae^{-c_1}x^{1-\sqrt{\frac{a-1}{a}}}\right\}\right\}$$

Maple ✓
cpu = 0.103 (sec), leaf count = 99

$$\left\{ax^2+(y(x))^2=0,\ln(x)-\int^{\frac{y(x)}{x}}\frac{1}{(a-1)(\_a^2+a)}\sqrt{(a-1)(\_a^2+a)}\,d\_a-\_C1=0,\ln(x)+\int^{\frac{y(x)}{x}}\frac{1}{(a-1)(\_a^2+a}\right.$$

Mathematica raw input

```
DSolve[(1 - a)*a*x^2 + y[x]^2 - 2*a*x*y[x]*y'[x] + a*x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(1 - Sqrt[(-1 + a)/a])*(E^(2*C[1]) - a*x^(2*Sqrt[(-1 + a)/a])))/(2*
E^C[1])}, {y[x] -> -(a*x^(1 - Sqrt[(-1 + a)/a]))/(2*E^C[1]) + (E^C[1]*x^(1 + Sqr
t[(-1 + a)/a]))/2}}
```

Maple raw input

```
dsolve(a*x^2*diff(y(x),x)^2-2*a*x*y(x)*diff(y(x),x)+a*(1-a)*x^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
a*x^2+y(x)^2 = 0, ln(x)-Intat(((a-1)*(_a^2+a)*a)^(1/2)/(a-1)/(_a^2+a),_a = y(x)/
x)-_C1 = 0, ln(x)+Intat(((a-1)*(_a^2+a)*a)^(1/2)/(a-1)/(_a^2+a),_a = y(x)/x)-_C1
 = 0
```

4.930 $(1-a^2)\,x^2y'(x)^2-a^2x^2-2xy(x)y'(x)+y(x)^2=0$

ODE

$$(1-a^2)\,x^2y'(x)^2-a^2x^2-2xy(x)y'(x)+y(x)^2=0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.688405 (sec), leaf count = 369

$$\left\{\text{Solve}\left[\frac{a\left(2\log\left(x-a^2x\right)-\log\left(\frac{\left(a^2-1\right)\left(y(x)+ix\left(a\sqrt{a^2-\frac{y(x)^2}{x^2}-1}+a^2-1\right)\right)}{a^3(x+iy(x))}\right)\right)+\log\left(\frac{i\left(a^2-1\right)\left(x\left(a\sqrt{a^2-\frac{y(x)^2}{x^2}-1}+a^2-1\right)+iy(x)\right)}{a^3(x-iy(x))}\right)}{2\left(a^2-1\right)}\right.\right.$$

Maple ✓
cpu = 0.119 (sec), leaf count = 229

$$\left\{\frac{1}{2\,a}\left(-2\_C1\,a+2\,a\ln\left(x\right)+\ln\left(\frac{x^2+\left(y(x)\right)^2}{x^2}\right)a-2\sqrt{-a^2}\arctan\left(\frac{a^2y(x)}{\sqrt{-a^2}x}\frac{1}{\sqrt{\frac{(-a^2+1)x^2+(y(x))^2}{x^2}}}\right)+2\ln\left(\frac{1}{x}\left(\sqrt{-a^2x\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[-(a^2*x^2) + y[x]^2 - 2*x*y[x]*y'[x] + (1 - a^2)*x^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[((-2*I)*ArcTan[y[x]/(x*Sqrt[-1 + a^2 - y[x]^2/x^2])] + a*(2*Log[x - a^2*x
] + Log[1 + y[x]^2/x^2] - Log[((-1 + a^2)*(y[x] + I*x*(-1 + a^2 + a*Sqrt[-1 + a^
2 - y[x]^2/x^2])))/(a^3*(x + I*y[x]))] + Log[(I*(-1 + a^2)*(I*y[x] + x*(-1 + a^2
 + a*Sqrt[-1 + a^2 - y[x]^2/x^2])))/(a^3*(x - I*y[x]))]))/(2*(-1 + a^2)) == C[1]
, y[x]], Solve[((2*I)*ArcTan[y[x]/(x*Sqrt[-1 + a^2 - y[x]^2/x^2])] + a*(2*Log[x
- a^2*x] + Log[1 + y[x]^2/x^2] - Log[((-1 + a^2)*(y[x] - I*x*(-1 + a^2 + a*Sqrt[
-1 + a^2 - y[x]^2/x^2])))/(a^3*(x - I*y[x]))] + Log[((-I)*(-1 + a^2)*((-I)*y[x]
+ x*(-1 + a^2 + a*Sqrt[-1 + a^2 - y[x]^2/x^2])))/(a^3*(x + I*y[x]))]))/(2*(-1 +
a^2)) == C[1], y[x]]}
```

Maple raw input

```
dsolve((-a^2+1)*x^2*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)-a^2*x^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
1/2*(-2*_C1*a+2*a*ln(x)+ln((x^2+y(x)^2)/x^2)*a-2*(-a^2)^(1/2)*arctan(a^2/(-a^2)^
(1/2)/(((-a^2+1)*x^2+y(x)^2)/x^2)^(1/2)/x*y(x))+2*ln((((-a^2*x^2+x^2+y(x)^2)/x^2
)^(1/2)*x+y(x))/x))/a = 0, 1/2*(-2*_C1*a+2*a*ln(x)+ln((x^2+y(x)^2)/x^2)*a+2*(-a^
2)^(1/2)*arctan(a^2/(-a^2)^(1/2)/(((-a^2+1)*x^2+y(x)^2)/x^2)^(1/2)/x*y(x))-2*ln(
(((-a^2*x^2+x^2+y(x)^2)/x^2)^(1/2)*x+y(x))/x))/a = 0
```

4.931 $x^3 y'(x)^2 = a$

ODE

$$x^3 y'(x)^2 = a$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.00572455 (sec), leaf count = 39

$$\left\{\left\{y(x) \to c_1 - \frac{2\sqrt{a}}{\sqrt{x}}\right\}, \left\{y(x) \to \frac{2\sqrt{a}}{\sqrt{x}} + c_1\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 31

$$\left\{y(x) = -2\frac{\sqrt{ax}}{x} + \_C1, y(x) = 2\frac{\sqrt{ax}}{x} + \_C1\right\}$$

Mathematica raw input

```
DSolve[x^3*y'[x]^2 == a,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*Sqrt[a])/Sqrt[x] + C[1]}, {y[x] -> (2*Sqrt[a])/Sqrt[x] + C[1]}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x)^2 = a, y(x),'implicit')
```

Maple raw output

```
y(x) = -2/x*(a*x)^(1/2)+_C1, y(x) = 2/x*(a*x)^(1/2)+_C1
```

4.932 $x^3y'(x)^2 + xy'(x) - y(x) = 0$

ODE

$$x^3y'(x)^2 + xy'(x) - y(x) = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 1.39819 (sec), leaf count = 2799

$$\left\{\left\{y(x) \to -\sqrt{3}\sqrt{-\frac{c_1^4x^6}{\sqrt[3]{93312x^5c_1^{10} + 2160x^7c_1^8 - x^9c_1^6 + 48\sqrt{3}\sqrt{-x^{10}c_1^{14}\left(x^2 - 108c_1^2\right)^3}}} - \frac{\sqrt[3]{93312x^5c_1^{10} + 2160x^7c_1^8 - x^9}}{}\right.\right.$$

Maple ✓
cpu = 0.068 (sec), leaf count = 161

$$\left\{\ln(x) - \_C1 + \frac{1}{4}\ln\left(-1 + \sqrt{1 + 4xy(x)}\right) - \frac{3}{4}\ln\left(\sqrt{1 + 4xy(x)} - 3\right) + \frac{3}{4}\ln\left(\sqrt{1 + 4xy(x)} + 3\right) - \frac{1}{4}\ln\left(1 + \sqrt{1 + 4x\right.\right.$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + x^3*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(-36 + Sqrt[3]*x*Sqrt[-((x^3*C[1]^2 - 48*x*C[1]^4 - (x^6*C[1]^4)/(-(x
^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^1
```

```
4*(x^2 - 108*C[1]^2)^3)])^(1/3) - (864*x^4*C[1]^6)/(-(x^9*C[1]^6) + 2160*x^7*C[1
]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])
^(1/3) - (-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[
-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3))/(x^3*C[1]^4))] + Sqrt[3]*x*Sqrt[96
/x^2 - 2/C[1]^2 - (x*(x^2 + 864*C[1]^2))/(-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 9331
2*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3) - (
-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1
]^14*(x^2 - 108*C[1]^2)^3)])^(1/3)/(x^3*C[1]^4) + (96*Sqrt[3]*(x^2 + 4*C[1]^2))/
(x^3*C[1]^2*Sqrt[-((x^3*C[1]^2 - 48*x*C[1]^4 - (x^6*C[1]^4)/(-(x^9*C[1]^6) + 216
0*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1
]^2)^3)])^(1/3) - (864*x^4*C[1]^6)/(-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*
C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3) - (-(x^9*
C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(
x^2 - 108*C[1]^2)^3)])^(1/3))/(x^3*C[1]^4))])])/(24*x)}, {y[x] -> (36 - Sqrt[3]*
x*Sqrt[-((x^3*C[1]^2 - 48*x*C[1]^4 - (x^6*C[1]^4)/(-(x^9*C[1]^6) + 2160*x^7*C[1]
^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^
(1/3) - (864*x^4*C[1]^6)/(-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 +
48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3) - (-(x^9*C[1]^6) +
2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*
C[1]^2)^3)])^(1/3))/(x^3*C[1]^4))] + Sqrt[3]*x*Sqrt[96/x^2 - 2/C[1]^2 - (x*(x^2
+ 864*C[1]^2))/(-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]
*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3) - (-(x^9*C[1]^6) + 2160*x^7*C
[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)
])^(1/3)/(x^3*C[1]^4) + (96*Sqrt[3]*(x^2 + 4*C[1]^2))/(x^3*C[1]^2*Sqrt[-((x^3*C[
1]^2 - 48*x*C[1]^4 - (x^6*C[1]^4)/(-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C
[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3) - (864*x^4
*C[1]^6)/(-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[
-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3) - (-(x^9*C[1]^6) + 2160*x^7*C[1]^8
+ 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/
3))/(x^3*C[1]^4))])])/(24*x)}, {y[x] -> (36 + Sqrt[3]*x*Sqrt[-((x^3*C[1]^2 - 48*
x*C[1]^4 - (x^6*C[1]^4)/(-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 4
8*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3) - (864*x^4*C[1]^6)/(
-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1
]^14*(x^2 - 108*C[1]^2)^3)])^(1/3) - (-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^
5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3))/(x^3*C
[1]^4))] - Sqrt[3]*x*Sqrt[96/x^2 - 2/C[1]^2 - (x*(x^2 + 864*C[1]^2))/(-(x^9*C[1]
^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2
- 108*C[1]^2)^3)])^(1/3) - (-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10
+ 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3)/(x^3*C[1]^4) - (9
6*Sqrt[3]*(x^2 + 4*C[1]^2))/(x^3*C[1]^2*Sqrt[-((x^3*C[1]^2 - 48*x*C[1]^4 - (x^6*
C[1]^4)/(-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-
(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3) - (864*x^4*C[1]^6)/(-(x^9*C[1]^6) +
2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*
C[1]^2)^3)])^(1/3) - (-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*S
qrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3))/(x^3*C[1]^4))])])/(24*
x)}, {y[x] -> (36 + Sqrt[3]*x*Sqrt[-((x^3*C[1]^2 - 48*x*C[1]^4 - (x^6*C[1]^4)/(-
(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]
```

```
^14*(x^2 - 108*C[1]^2)^3)])^(1/3) - (864*x^4*C[1]^6)/(-(x^9*C[1]^6) + 2160*x^7*C
[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)
])^(1/3) - (-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqr
t[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3))/(x^3*C[1]^4))] + Sqrt[3]*x*Sqrt[
96/x^2 - 2/C[1]^2 - (x*(x^2 + 864*C[1]^2))/(-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93
312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3) -
 (-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C
[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3)/(x^3*C[1]^4) - (96*Sqrt[3]*(x^2 + 4*C[1]^2)
)/(x^3*C[1]^2*Sqrt[-((x^3*C[1]^2 - 48*x*C[1]^4 - (x^6*C[1]^4)/(-(x^9*C[1]^6) + 2
160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C
[1]^2)^3)])^(1/3) - (864*x^4*C[1]^6)/(-(x^9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^
5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14*(x^2 - 108*C[1]^2)^3)])^(1/3) - (-(x^
9*C[1]^6) + 2160*x^7*C[1]^8 + 93312*x^5*C[1]^10 + 48*Sqrt[3]*Sqrt[-(x^10*C[1]^14
*(x^2 - 108*C[1]^2)^3)])^(1/3))/(x^3*C[1]^4))])])/(24*x)}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x)^2+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-3/4*ln(x*y(x)-2)-1/4*ln(x*y(x))-1/4*ln(-1+(1+4*x*y(x))^(1/2))+3/4*ln((
1+4*x*y(x))^(1/2)-3)-3/4*ln((1+4*x*y(x))^(1/2)+3)+1/4*ln(1+(1+4*x*y(x))^(1/2)) =
 0, ln(x)-_C1+1/4*ln(-1+(1+4*x*y(x))^(1/2))-3/4*ln((1+4*x*y(x))^(1/2)-3)+3/4*ln(
(1+4*x*y(x))^(1/2)+3)-1/4*ln(1+(1+4*x*y(x))^(1/2))-3/4*ln(x*y(x)-2)-1/4*ln(x*y(x
)) = 0
```

4.933 $a + x^3 y'(x)^2 + x^2 y(x) y'(x) = 0$

ODE

$$a + x^3 y'(x)^2 + x^2 y(x) y'(x) = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.367889 (sec), leaf count = 123

$$\left\{\left\{y(x) \to -\frac{e^{-\frac{c_1}{2}}\left(2ae^{c_1}+x\right)}{\sqrt{2}x}\right\}, \left\{y(x) \to \frac{e^{-\frac{c_1}{2}}\left(2ae^{c_1}+x\right)}{\sqrt{2}x}\right\}, \left\{y(x) \to -\frac{e^{-\frac{c_1}{2}}\left(2ax+e^{c_1}\right)}{\sqrt{2}x}\right\}, \left\{y(x) \to \frac{e^{-\frac{c_1}{2}}\left(2ax+e^{c_1}\right)}{\sqrt{2}x}\right\}\right\}$$

Maple ✓
cpu = 0.138 (sec), leaf count = 66

$$\left\{(y(x))^2 - 4\frac{a}{x} = 0, xy(x) - \_C1 + \sqrt{x^2\left(y\left(x\right)\right)^2 - 4ax} = 0, y(x) + \frac{1}{x}\sqrt{x^2\left(y\left(x\right)\right)^2 - 4ax} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[a + x^2*y[x]*y'[x] + x^3*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((2*a*E^C[1] + x)/(Sqrt[2]*E^(C[1]/2)*x))}, {y[x] -> (2*a*E^C[1] + x)
/(Sqrt[2]*E^(C[1]/2)*x)}, {y[x] -> -((E^C[1] + 2*a*x)/(Sqrt[2]*E^(C[1]/2)*x))},
{y[x] -> (E^C[1] + 2*a*x)/(Sqrt[2]*E^(C[1]/2)*x)}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x)^2+x^2*y(x)*diff(y(x),x)+a = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-4/x*a = 0, y(x)+1/x*(x^2*y(x)^2-4*a*x)^(1/2)-_C1 = 0, x*y(x)-_C1+(x^2*y(x
)^2-4*a*x)^(1/2) = 0
```

4.934 $x^3y'(x)^2-\left(2x^2y(x)+1\right)y'(x)+xy(x)^2=0$

ODE

$$x^3y'(x)^2-\left(2x^2y(x)+1\right)y'(x)+xy(x)^2=0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.515414 (sec), leaf count = 1921

$$\{\{y(x)\to \text{Root}\left[1024x^{12}-576e^{12c_1}\#1^4x^8-2176e^{12c_1}\#1^3x^6+81e^{24c_1}\#1^8x^4-1536e^{12c_1}\#1^2x^4+36e^{24c_1}\#1^7x^2-384e^{12c}\right.$$

Maple ✓
cpu = 0.095 (sec), leaf count = 195

$$\left\{\ln(x)-\_C1+\frac{1}{4}\ln\left(-1+\sqrt{4x^2y(x)+1}\right)-\frac{1}{4}\ln\left(\sqrt{4x^2y(x)+1}+1\right)+\frac{1}{12}\ln\left(3\sqrt{4x^2y(x)+1}+1\right)-\frac{1}{12}\ln\left(3\sqrt{4x}\right.\right.$$

Mathematica raw input

```
DSolve[x*y[x]^2 - (1 + 2*x^2*y[x])*y'[x] + x^3*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Root[-32*E^(12*C[1]) + 1024*x^12 - 384*E^(12*C[1])*x^2*#1 - 1536*E^(12
*C[1])*x^4*#1^2 - 2176*E^(12*C[1])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^4 + 4*E^(24
*C[1])*#1^6 + 36*E^(24*C[1])*x^2*#1^7 + 81*E^(24*C[1])*x^4*#1^8 & , 1]}, {y[x] -
> Root[-32*E^(12*C[1]) + 1024*x^12 - 384*E^(12*C[1])*x^2*#1 - 1536*E^(12*C[1])*x
^4*#1^2 - 2176*E^(12*C[1])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^4 + 4*E^(24*C[1])*#
1^6 + 36*E^(24*C[1])*x^2*#1^7 + 81*E^(24*C[1])*x^4*#1^8 & , 2]}, {y[x] -> Root[-
32*E^(12*C[1]) + 1024*x^12 - 384*E^(12*C[1])*x^2*#1 - 1536*E^(12*C[1])*x^4*#1^2
- 2176*E^(12*C[1])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^4 + 4*E^(24*C[1])*#1^6 + 36
*E^(24*C[1])*x^2*#1^7 + 81*E^(24*C[1])*x^4*#1^8 & , 3]}, {y[x] -> Root[-32*E^(12
*C[1]) + 1024*x^12 - 384*E^(12*C[1])*x^2*#1 - 1536*E^(12*C[1])*x^4*#1^2 - 2176*E
^(12*C[1])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^4 + 4*E^(24*C[1])*#1^6 + 36*E^(24*C
[1])*x^2*#1^7 + 81*E^(24*C[1])*x^4*#1^8 & , 4]}, {y[x] -> Root[-32*E^(12*C[1]) +
 1024*x^12 - 384*E^(12*C[1])*x^2*#1 - 1536*E^(12*C[1])*x^4*#1^2 - 2176*E^(12*C[1
])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^4 + 4*E^(24*C[1])*#1^6 + 36*E^(24*C[1])*x^2
*#1^7 + 81*E^(24*C[1])*x^4*#1^8 & , 5]}, {y[x] -> Root[-32*E^(12*C[1]) + 1024*x^
```

```
12 - 384*E^(12*C[1])*x^2*#1 - 1536*E^(12*C[1])*x^4*#1^2 - 2176*E^(12*C[1])*x^6*#
1^3 - 576*E^(12*C[1])*x^8*#1^4 + 4*E^(24*C[1])*#1^6 + 36*E^(24*C[1])*x^2*#1^7 +
81*E^(24*C[1])*x^4*#1^8 & , 6]}, {y[x] -> Root[-32*E^(12*C[1]) + 1024*x^12 - 384
*E^(12*C[1])*x^2*#1 - 1536*E^(12*C[1])*x^4*#1^2 - 2176*E^(12*C[1])*x^6*#1^3 - 57
6*E^(12*C[1])*x^8*#1^4 + 4*E^(24*C[1])*#1^6 + 36*E^(24*C[1])*x^2*#1^7 + 81*E^(24
*C[1])*x^4*#1^8 & , 7]}, {y[x] -> Root[-32*E^(12*C[1]) + 1024*x^12 - 384*E^(12*C
[1])*x^2*#1 - 1536*E^(12*C[1])*x^4*#1^2 - 2176*E^(12*C[1])*x^6*#1^3 - 576*E^(12*
C[1])*x^8*#1^4 + 4*E^(24*C[1])*#1^6 + 36*E^(24*C[1])*x^2*#1^7 + 81*E^(24*C[1])*x
^4*#1^8 & , 8]}, {y[x] -> Root[-32*E^(12*C[1]) + x^12 - 384*E^(12*C[1])*x^2*#1 -
 1536*E^(12*C[1])*x^4*#1^2 - 2176*E^(12*C[1])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^
4 + 4096*E^(24*C[1])*#1^6 + 36864*E^(24*C[1])*x^2*#1^7 + 82944*E^(24*C[1])*x^4*#
1^8 & , 1]}, {y[x] -> Root[-32*E^(12*C[1]) + x^12 - 384*E^(12*C[1])*x^2*#1 - 153
6*E^(12*C[1])*x^4*#1^2 - 2176*E^(12*C[1])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^4 +
4096*E^(24*C[1])*#1^6 + 36864*E^(24*C[1])*x^2*#1^7 + 82944*E^(24*C[1])*x^4*#1^8
& , 2]}, {y[x] -> Root[-32*E^(12*C[1]) + x^12 - 384*E^(12*C[1])*x^2*#1 - 1536*E^
(12*C[1])*x^4*#1^2 - 2176*E^(12*C[1])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^4 + 4096
*E^(24*C[1])*#1^6 + 36864*E^(24*C[1])*x^2*#1^7 + 82944*E^(24*C[1])*x^4*#1^8 & ,
3]}, {y[x] -> Root[-32*E^(12*C[1]) + x^12 - 384*E^(12*C[1])*x^2*#1 - 1536*E^(12*
C[1])*x^4*#1^2 - 2176*E^(12*C[1])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^4 + 4096*E^(
24*C[1])*#1^6 + 36864*E^(24*C[1])*x^2*#1^7 + 82944*E^(24*C[1])*x^4*#1^8 & , 4]},
 {y[x] -> Root[-32*E^(12*C[1]) + x^12 - 384*E^(12*C[1])*x^2*#1 - 1536*E^(12*C[1]
)*x^4*#1^2 - 2176*E^(12*C[1])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^4 + 4096*E^(24*C
[1])*#1^6 + 36864*E^(24*C[1])*x^2*#1^7 + 82944*E^(24*C[1])*x^4*#1^8 & , 5]}, {y[
x] -> Root[-32*E^(12*C[1]) + x^12 - 384*E^(12*C[1])*x^2*#1 - 1536*E^(12*C[1])*x^
4*#1^2 - 2176*E^(12*C[1])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^4 + 4096*E^(24*C[1])
*#1^6 + 36864*E^(24*C[1])*x^2*#1^7 + 82944*E^(24*C[1])*x^4*#1^8 & , 6]}, {y[x] -
> Root[-32*E^(12*C[1]) + x^12 - 384*E^(12*C[1])*x^2*#1 - 1536*E^(12*C[1])*x^4*#1
^2 - 2176*E^(12*C[1])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^4 + 4096*E^(24*C[1])*#1^
6 + 36864*E^(24*C[1])*x^2*#1^7 + 82944*E^(24*C[1])*x^4*#1^8 & , 7]}, {y[x] -> Ro
ot[-32*E^(12*C[1]) + x^12 - 384*E^(12*C[1])*x^2*#1 - 1536*E^(12*C[1])*x^4*#1^2 -
 2176*E^(12*C[1])*x^6*#1^3 - 576*E^(12*C[1])*x^8*#1^4 + 4096*E^(24*C[1])*#1^6 +
36864*E^(24*C[1])*x^2*#1^7 + 82944*E^(24*C[1])*x^4*#1^8 & , 8]}}
```

Maple raw input

```
dsolve(x^3*diff(y(x),x)^2-(1+2*x^2*y(x))*diff(y(x),x)+x*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1-1/12*ln(9*x^2*y(x)+2)-1/4*ln(x^2*y(x))-1/4*ln(-1+(4*x^2*y(x)+1)^(1/2))
+1/4*ln((4*x^2*y(x)+1)^(1/2)+1)-1/12*ln(3*(4*x^2*y(x)+1)^(1/2)+1)+1/12*ln(3*(4*x
^2*y(x)+1)^(1/2)-1) = 0, ln(x)-_C1+1/4*ln(-1+(4*x^2*y(x)+1)^(1/2))-1/4*ln((4*x^2
*y(x)+1)^(1/2)+1)+1/12*ln(3*(4*x^2*y(x)+1)^(1/2)+1)-1/12*ln(3*(4*x^2*y(x)+1)^(1/
2)-1)-1/12*ln(9*x^2*y(x)+2)-1/4*ln(x^2*y(x)) = 0
```

4.935 $x(1-x^2)\,y'(x)^2-2(1-x^2)\,y(x)y'(x)+x(1-y(x)^2)=0$

ODE

$$x(1-x^2)\,y'(x)^2-2(1-x^2)\,y(x)y'(x)+x(1-y(x)^2)=0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.112043 (sec), leaf count = 61

$$\left\{\left\{y(x)\to x\cos\left(2\tan^{-1}\left(\sqrt{\frac{x-1}{x+1}}\right)+ic_1\right)\right\},\left\{y(x)\to x\cos\left(2\tan^{-1}\left(\sqrt{\frac{x-1}{x+1}}\right)-ic_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.423 (sec), leaf count = 35

$$\left\{(y(x))^2-x^2=0,y(x)=\sqrt{-\_C1^2+1}+\sqrt{x^2-1}\_C1\right\}$$

Mathematica raw input

```
DSolve[x*(1 - y[x]^2) - 2*(1 - x^2)*y[x]*y'[x] + x*(1 - x^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*Cos[2*ArcTan[Sqrt[(-1 + x)/(1 + x)]] + I*C[1]]}, {y[x] -> x*Cos[2*Ar
cTan[Sqrt[(-1 + x)/(1 + x)]] - I*C[1]]}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(y(x),x)^2-2*(-x^2+1)*y(x)*diff(y(x),x)+x*(1-y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-x^2 = 0, y(x) = (-_C1^2+1)^(1/2)+(x^2-1)^(1/2)*_C1
```

4.936 $4x(a-x)(b-x)y'(x)^2 = \left(-2x(a+b)+ab+2x^2\right)^2$

ODE

$$4x(a-x)(b-x)y'(x)^2 = \left(-2x(a+b)+ab+2x^2\right)^2$$

ODE Classification

[_quadrature]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.955217 (sec), leaf count = 297

$$\left\{\left\{y(x)\to c_1-\frac{i(x-a)\left(2x(x-b)+\frac{i\sqrt{\frac{x-b}{a-b}}\left(2\left(a^2-b^2\right)E\left(i\sinh^{-1}\left(\sqrt{\frac{x}{a}-1}\right)|\frac{a}{a-b}\right)+b(a+2b)F\left(i\sinh^{-1}\left(\sqrt{\frac{x}{a}-1}\right)|\frac{a}{a-b}\right)\right)}{\sqrt{1-\frac{a}{x}}}\right)}{3\sqrt{-x(x-a)(x-b)}}\right\},\left\{y(x)\to\right.$$

Maple ✓
cpu = 0.069 (sec), leaf count = 83

$$\left\{y(x)=\int -\frac{2x^2+(-2a-2b)x+ab}{2}\frac{1}{\sqrt{x(b-x)(a-x)}}\,dx+\_C1, y(x)=\int \frac{2x^2+(-2a-2b)x+ab}{2}\frac{1}{\sqrt{x(b-x)(a-\right.$$

Mathematica raw input

```
DSolve[4*(a - x)*(b - x)*x*y'[x]^2 == (a*b - 2*(a + b)*x + 2*x^2)^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] - ((I/3)*(-a + x)*(2*x*(-b + x) + (I*Sqrt[(-b + x)/(a - b)]*(2*(a
^2 - b^2)*EllipticE[I*ArcSinh[Sqrt[-1 + x/a]], a/(a - b)] + b*(a + 2*b)*Elliptic
F[I*ArcSinh[Sqrt[-1 + x/a]], a/(a - b)]))/Sqrt[1 - a/x]))/Sqrt[-(x*(-a + x)*(-b
+ x))]}, {y[x] -> C[1] + ((I/3)*(-a + x)*(2*x*(-b + x) + (I*Sqrt[(-b + x)/(a - b
)]*(2*(a^2 - b^2)*EllipticE[I*ArcSinh[Sqrt[-1 + x/a]], a/(a - b)] + b*(a + 2*b)*
EllipticF[I*ArcSinh[Sqrt[-1 + x/a]], a/(a - b)]))/Sqrt[1 - a/x]))/Sqrt[-(x*(-a +
 x)*(-b + x))]}}
```

Maple raw input

```
dsolve(4*x*(a-x)*(b-x)*diff(y(x),x)^2 = (a*b-2*x*(a+b)+2*x^2)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(-1/2/(x*(b-x)*(a-x))^(1/2)*(2*x^2+(-2*a-2*b)*x+a*b),x)+_C1, y(x) = In
t(1/2/(x*(b-x)*(a-x))^(1/2)*(2*x^2+(-2*a-2*b)*x+a*b),x)+_C1
```

4.937 $x^4y'(x)^2 - xy'(x) - y(x) = 0$

ODE

$$x^4y'(x)^2 - xy'(x) - y(x) = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Homogeneous ODE, The Isobaric equation

Mathematica ✓
cpu = 1.0571 (sec), leaf count = 406

$$\left\{\text{Solve}\left[\frac{2x\sqrt{4x^2y(x)+1}\log(x)+x\sqrt{4x^2y(x)+1}\log(y(x))-x\sqrt{4x^2y(x)+1}\log\left(4x^2y(x)+1\right)-2x\sqrt{4x^2y(x)+1}\log\left(\sqrt{}\right.\right.\right.}{2}$$

Maple ✓
cpu = 0.059 (sec), leaf count = 69

$$\left\{\ln(x)-\_C1-\frac{\ln\left(x^2y(x)\right)}{2}-Artanh\left(\sqrt{4x^2y(x)+1}\right)=0,\ln(x)-\_C1-\frac{\ln\left(x^2y(x)\right)}{2}+Artanh\left(\sqrt{4x^2y(x)+1}\right)=0\right.$$

Mathematica raw input

```
DSolve[-y[x] - x*y'[x] + x^4*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(2*x*Log[x]*Sqrt[1 + 4*x^2*y[x]] + x*Log[y[x]]*Sqrt[1 + 4*x^2*y[x]] - x*L
og[1 + 4*x^2*y[x]]*Sqrt[1 + 4*x^2*y[x]] + x*Log[x + 4*x^3*y[x]]*Sqrt[1 + 4*x^2*y
[x]] - 2*x*Log[1 + Sqrt[1 + 4*x^2*y[x]]]*Sqrt[1 + 4*x^2*y[x]] + Log[1 + 1/(4*x^2
*y[x])]*Sqrt[x^2 + 4*x^4*y[x]] - Log[1 + 4*x^2*y[x]]*Sqrt[x^2 + 4*x^4*y[x]])/(2*
Sqrt[x^2 + 4*x^4*y[x]]) == C[1], y[x]], Solve[(-2*x*Log[x]*Sqrt[1 + 4*x^2*y[x]]
- x*Log[y[x]]*Sqrt[1 + 4*x^2*y[x]] + x*Log[1 + 4*x^2*y[x]]*Sqrt[1 + 4*x^2*y[x]]
- x*Log[x + 4*x^3*y[x]]*Sqrt[1 + 4*x^2*y[x]] + 2*x*Log[1 + Sqrt[1 + 4*x^2*y[x]]]
*Sqrt[1 + 4*x^2*y[x]] + Log[1 + 1/(4*x^2*y[x])]*Sqrt[x^2 + 4*x^4*y[x]] - Log[1 +
  4*x^2*y[x]]*Sqrt[x^2 + 4*x^4*y[x]])/(2*Sqrt[x^2 + 4*x^4*y[x]]) == C[1], y[x]]}
```

Maple raw input

```
dsolve(x^4*diff(y(x),x)^2-x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/4/x^2, ln(x)-_C1-1/2*ln(x^2*y(x))-arctanh((4*x^2*y(x)+1)^(1/2)) = 0, l
n(x)-_C1-1/2*ln(x^2*y(x))+arctanh((4*x^2*y(x)+1)^(1/2)) = 0
```

4.938 $x^4y'(x)^2 + 2x^3y(x)y'(x) - 4 = 0$

ODE

$$x^4y'(x)^2 + 2x^3y(x)y'(x) - 4 = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.630521 (sec), leaf count = 49

$$\left\{\left\{y(x) \to \frac{e^{c_1}}{2x^2} - 2e^{-c_1}\right\}, \left\{y(x) \to \frac{e^{-c_1}}{2} - \frac{2e^{c_1}}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.07 (sec), leaf count = 43

$$\left\{(y(x))^2 + 4x^{-2} = 0, \ln(x) - \_C1 - Arcsinh\left(\frac{xy(x)}{2}\right) = 0, \ln(x) - \_C1 + Arcsinh\left(\frac{xy(x)}{2}\right) = 0\right\}$$

Mathematica raw input

```
DSolve[-4 + 2*x^3*y[x]*y'[x] + x^4*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2/E^C[1] + E^C[1]/(2*x^2)}, {y[x] -> 1/(2*E^C[1]) - (2*E^C[1])/x^2}}
```

Maple raw input

```
dsolve(x^4*diff(y(x),x)^2+2*x^3*y(x)*diff(y(x),x)-4 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+4/x^2 = 0, ln(x)-_C1+arcsinh(1/2*x*y(x)) = 0, ln(x)-_C1-arcsinh(1/2*x*y(x
)) = 0
```

4.939 $x^4y'(x)^2 + xy(x)^2y'(x) - y(x)^3 = 0$

ODE

$$x^4y'(x)^2 + xy(x)^2y'(x) - y(x)^3 = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.20814 (sec), leaf count = 50

$$\left\{\left\{y(x) \to -\frac{4e^{2c_1}x}{2e^{c_1} - x}\right\}, \left\{y(x) \to \frac{e^{2c_1}x}{2e^{c_1} + 4x}\right\}\right\}$$

Maple ✓
cpu = 0.177 (sec), leaf count = 84

$$\left\{2\left(y(x)\right)^{-1} + x^{-2} + \frac{1}{x^2 y\left(x\right)}\sqrt{\left(y\left(x\right)\right)^2 + 4\,x^2 y\left(x\right)} - \_C1 = 0, 2\,y(x) + \frac{\left(y(x)\right)^2}{x^2} + \frac{y(x)}{x^2}\sqrt{\left(y\left(x\right)\right)^2 + 4\,x^2 y\left(x\right)} - \_C1 = 0,\right.$$

Mathematica raw input

```
DSolve[-y[x]^3 + x*y[x]^2*y'[x] + x^4*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-4*E^(2*C[1])*x)/(2*E^C[1] - x)}, {y[x] -> (E^(2*C[1])*x)/(2*E^C[1] +
  4*x)}}
```

Maple raw input

```
dsolve(x^4*diff(y(x),x)^2+x*y(x)^2*diff(y(x),x)-y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -4*x^2, 2*y(x)+y(x)^2/x^2+y(x)/x^2*(y(x)^2+4*x^2*y(x))^(1/2)-_C1 = 0, 2/y
(x)+1/x^2+1/y(x)/x^2*(y(x)^2+4*x^2*y(x))^(1/2)-_C1 = 0
```

4.940 $x^2(a^2-x^2)\,y'(x)^2+1=0$

ODE

$$x^2(a^2-x^2)\,y'(x)^2+1=0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0533868 (sec), leaf count = 139

$$\left\{\left\{y(x)\to c_1-\frac{ix\sqrt{x^2-a^2}\log\left(\frac{2\left(\sqrt{x^2-a^2}-ia\right)}{x}\right)}{a\sqrt{x^4-a^2x^2}}\right\},\left\{y(x)\to c_1+\frac{ix\sqrt{x^2-a^2}\log\left(\frac{2\left(\sqrt{x^2-a^2}-ia\right)}{x}\right)}{a\sqrt{x^4-a^2x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.038 (sec), leaf count = 90

$$\left\{y(x)=-1\ln\left(\frac{1}{x}\left(-2a^2+2\sqrt{-a^2}\sqrt{-a^2+x^2}\right)\right)\frac{1}{\sqrt{-a^2}}+\_C1,y(x)=1\ln\left(\frac{1}{x}\left(-2a^2+2\sqrt{-a^2}\sqrt{-a^2+x^2}\right)\right)\frac{1}{\sqrt{-a^2}}+\right.$$

Mathematica raw input

```
DSolve[1 + x^2*(a^2 - x^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] - (I*x*Sqrt[-a^2 + x^2]*Log[(2*((-I)*a + Sqrt[-a^2 + x^2]))/x])/(
a*Sqrt[-(a^2*x^2) + x^4])}, {y[x] -> C[1] + (I*x*Sqrt[-a^2 + x^2]*Log[(2*((-I)*a
 + Sqrt[-a^2 + x^2]))/x])/(a*Sqrt[-(a^2*x^2) + x^4])}}
```

Maple raw input

```
dsolve(x^2*(a^2-x^2)*diff(y(x),x)^2+1 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/(-a^2)^(1/2)*ln((-2*a^2+2*(-a^2)^(1/2)*(-a^2+x^2)^(1/2))/x)+_C1, y(x)
= 1/(-a^2)^(1/2)*ln((-2*a^2+2*(-a^2)^(1/2)*(-a^2+x^2)^(1/2))/x)+_C1
```

4.941 $3x^4y'(x)^2 - xy(x) - y(x) = 0$

ODE

$$3x^4y'(x)^2 - xy(x) - y(x) = 0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.249133 (sec), leaf count = 166

$$\left\{\left\{y(x) \to \frac{3c_1^2x^2 - 2\sqrt{3}c_1x\sqrt{x+1} + 2x\left(\sqrt{x+1} - \sqrt{3}c_1x\right)\tanh^{-1}\left(\sqrt{x+1}\right) + x^2\tanh^{-1}\left(\sqrt{x+1}\right)^2 + x + 1}{12x^2}\right\}, \left\{y(x) \to \frac{3}{}\right.\right.$$

Maple ✓
cpu = 0.098 (sec), leaf count = 107

$$\left\{-\frac{\sqrt{3}}{3x}\sqrt{xy(x)+y(x)}\frac{1}{\sqrt{y(x)}} - \frac{\sqrt{3}}{3}Artanh\left(1\sqrt{xy(x)+y(x)}\frac{1}{\sqrt{y(x)}}\right) + 2\sqrt{y(x)} + \_C1 = 0, \frac{\sqrt{3}}{3x}\sqrt{xy(x)+y(x)}\frac{1}{\sqrt{y(}}\right.$$

Mathematica raw input

```
DSolve[-y[x] - x*y[x] + 3*x^4*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x + x^2*ArcTanh[Sqrt[1 + x]]^2 - 2*Sqrt[3]*x*Sqrt[1 + x]*C[1] + 3
*x^2*C[1]^2 + 2*x*ArcTanh[Sqrt[1 + x]]*(Sqrt[1 + x] - Sqrt[3]*x*C[1]))/(12*x^2)}
, {y[x] -> (1 + x + x^2*ArcTanh[Sqrt[1 + x]]^2 + 2*Sqrt[3]*x*Sqrt[1 + x]*C[1] +
3*x^2*C[1]^2 + 2*x*ArcTanh[Sqrt[1 + x]]*(Sqrt[1 + x] + Sqrt[3]*x*C[1]))/(12*x^2)
}}
```

Maple raw input

```
dsolve(3*x^4*diff(y(x),x)^2-x*y(x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 0, -1/3*3^(1/2)/y(x)^(1/2)*(x*y(x)+y(x))^(1/2)/x-1/3*3^(1/2)*arctanh((x*y
(x)+y(x))^(1/2)/y(x)^(1/2))+2*y(x)^(1/2)+_C1 = 0, 1/3*3^(1/2)/y(x)^(1/2)*(x*y(x)
+y(x))^(1/2)/x+1/3*3^(1/2)*arctanh((x*y(x)+y(x))^(1/2)/y(x)^(1/2))+2*y(x)^(1/2)+
_C1 = 0
```

4.942 $4x^5y'(x)^2+12x^4y(x)y'(x)+9=0$

ODE

$$4x^5y'(x)^2+12x^4y(x)y'(x)+9=0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.706901 (sec), leaf count = 121

$$\left\{\text{Solve}\left[\log(x)=c_1+\frac{2x^{5/2}\sqrt{1-x^3y(x)^2}\sin^{-1}\left(x^{3/2}y(x)\right)}{3\sqrt{x^5\left(x^3y(x)^2-1\right)}},y(x)\right],\text{Solve}\left[\frac{2x^{5/2}\sqrt{1-x^3y(x)^2}\sin^{-1}\left(x^{3/2}y(x)\right)}{3\sqrt{x^5\left(x^3y(x)^2-1\right)}}+\log(x)=\right.$$

Maple ✓
cpu = 0.158 (sec), leaf count = 67

$$\left\{(y(x))^2-x^{-3}=0,x^3y(x)+x\sqrt{x^4\left(y\left(x\right)\right)^2-x}-\_C1=0,y(x)+\frac{1}{x^2}\sqrt{x^4\left(y\left(x\right)\right)^2-x}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[9 + 12*x^4*y[x]*y'[x] + 4*x^5*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[Log[x] == C[1] + (2*x^(5/2)*ArcSin[x^(3/2)*y[x]]*Sqrt[1 - x^3*y[x]^2])/(3
*Sqrt[x^5*(-1 + x^3*y[x]^2)]), y[x]], Solve[Log[x] + (2*x^(5/2)*ArcSin[x^(3/2)*y
[x]]*Sqrt[1 - x^3*y[x]^2])/(3*Sqrt[x^5*(-1 + x^3*y[x]^2)]) == C[1], y[x]]}
```

Maple raw input

```
dsolve(4*x^5*diff(y(x),x)^2+12*x^4*y(x)*diff(y(x),x)+9 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-1/x^3 = 0, y(x)+1/x^2*(x^4*y(x)^2-x)^(1/2)-_C1 = 0, x^3*y(x)+x*(x^4*y(x)^
2-x)^(1/2)-_C1 = 0
```

4.943 $x^6y'(x)^2 - 2xy'(x) - 4y(x) = 0$

ODE

$$x^6y'(x)^2 - 2xy'(x) - 4y(x) = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.385876 (sec), leaf count = 120

$$\left\{\text{Solve}\left[4c_1 + \frac{2\sqrt{4x^6y(x)+x^2}\tanh^{-1}\left(\sqrt{4x^4y(x)+1}\right)}{x\sqrt{4x^4y(x)+1}} + \log(y(x)) = 0, y(x)\right], \text{Solve}\left[4c_1 + \log(y(x)) = \frac{2\sqrt{4x^6y(x)+x}}{x\sqrt{}}\right.\right.$$

Maple ✓
cpu = 0.063 (sec), leaf count = 71

$$\left\{\ln(x) - \_C1 - \frac{\ln\left(x^4y(x)\right)}{4} - \frac{1}{2}Artanh\left(\sqrt{4x^4y(x)+1}\right) = 0, \ln(x) - \_C1 - \frac{\ln\left(x^4y(x)\right)}{4} + \frac{1}{2}Artanh\left(\sqrt{4x^4y(x)+1}\right)\right.$$

Mathematica raw input

```
DSolve[-4*y[x] - 2*x*y'[x] + x^6*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[4*C[1] + Log[y[x]] + (2*ArcTanh[Sqrt[1 + 4*x^4*y[x]]]*Sqrt[x^2 + 4*x^6*y[
x]])/(x*Sqrt[1 + 4*x^4*y[x]]) == 0, y[x]], Solve[4*C[1] + Log[y[x]] == (2*ArcTan
h[Sqrt[1 + 4*x^4*y[x]]]*Sqrt[x^2 + 4*x^6*y[x]])/(x*Sqrt[1 + 4*x^4*y[x]]), y[x]]}
```

Maple raw input

```
dsolve(x^6*diff(y(x),x)^2-2*x*diff(y(x),x)-4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/4/x^4, ln(x)-_C1-1/4*ln(x^4*y(x))-1/2*arctanh((4*x^4*y(x)+1)^(1/2)) =
0, ln(x)-_C1-1/4*ln(x^4*y(x))+1/2*arctanh((4*x^4*y(x)+1)^(1/2)) = 0
```

4.944 $x^8 y'(x)^2 + 3x y'(x) + 9y(x) = 0$

ODE

$$x^8 y'(x)^2 + 3x y'(x) + 9y(x) = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.415011 (sec), leaf count = 120

$$\left\{ \text{Solve}\left[6c_1 + \frac{2\sqrt{x^2 - 4x^8 y(x)}\tan^{-1}\left(\sqrt{4x^6 y(x) - 1}\right)}{x\sqrt{4x^6 y(x) - 1}} + \log(y(x)) = 0, y(x) \right], \text{Solve}\left[6c_1 + \log(y(x)) = \frac{2\sqrt{x^2 - 4x^8 y(x)}}{x\sqrt{4}} \right.$$

Maple ✓
cpu = 0.069 (sec), leaf count = 71

$$\left\{ \ln(x) - \_C1 - \frac{\ln\left(y(x)\,x^6\right)}{6} - \frac{1}{3}\mathit{Artanh}\left(\sqrt{1 - 4\,y(x)\,x^6}\right) = 0, \ln(x) - \_C1 - \frac{\ln\left(y(x)\,x^6\right)}{6} + \frac{1}{3}\mathit{Artanh}\left(\sqrt{1 - 4\,y(x)\,x^6}\right) \right.$$

Mathematica raw input

```
DSolve[9*y[x] + 3*x*y'[x] + x^8*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[6*C[1] + Log[y[x]] + (2*ArcTan[Sqrt[-1 + 4*x^6*y[x]]]*Sqrt[x^2 - 4*x^8*y[
x]])/(x*Sqrt[-1 + 4*x^6*y[x]]) == 0, y[x]], Solve[6*C[1] + Log[y[x]] == (2*ArcTa
n[Sqrt[-1 + 4*x^6*y[x]]]*Sqrt[x^2 - 4*x^8*y[x]])/(x*Sqrt[-1 + 4*x^6*y[x]]), y[x]
]}
```

Maple raw input

```
dsolve(x^8*diff(y(x),x)^2+3*x*diff(y(x),x)+9*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4/x^6, ln(x)-_C1-1/6*ln(y(x)*x^6)+1/3*arctanh((1-4*y(x)*x^6)^(1/2)) = 0
, ln(x)-_C1-1/6*ln(y(x)*x^6)-1/3*arctanh((1-4*y(x)*x^6)^(1/2)) = 0
```

4.945 $y(x)y'(x)^2 = a$

ODE

$$y(x)y'(x)^2 = a$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0142983 (sec), leaf count = 54

$$\left\{\left\{y(x) \to \left(\frac{3}{2}\right)^{2/3} \left(c_1 - \sqrt{a}x\right)^{2/3}\right\}, \left\{y(x) \to \left(\frac{3}{2}\right)^{2/3} \left(\sqrt{a}x + c_1\right)^{2/3}\right\}\right\}$$

Maple ✓
cpu = 0.031 (sec), leaf count = 39

$$\left\{x - \frac{2\left(y(x)\right)^2}{3}\frac{1}{\sqrt{ay\left(x\right)}} - \_C1 = 0, x + \frac{2\left(y(x)\right)^2}{3}\frac{1}{\sqrt{ay\left(x\right)}} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x]^2 == a,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3/2)^(2/3)*(-(Sqrt[a]*x) + C[1])^(2/3)}, {y[x] -> (3/2)^(2/3)*(Sqrt[a
]*x + C[1])^(2/3)}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2 = a, y(x),'implicit')
```

Maple raw output

```
x-2/3*y(x)^2/(a*y(x))^(1/2)-_C1 = 0, x+2/3*y(x)^2/(a*y(x))^(1/2)-_C1 = 0
```

4.946 $y(x)y'(x)^2 = a^2x$

ODE

$$y(x)y'(x)^2 = a^2x$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0173141 (sec), leaf count = 46

$$\left\{\left\{y(x) \to \left(\frac{3c_1}{2} - ax^{3/2}\right)^{2/3}\right\}, \left\{y(x) \to \left(ax^{3/2} + \frac{3c_1}{2}\right)^{2/3}\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 40

$$\left\{[x(\_T) = \_T^2 \_C1 \left(\_T^3 - a^2\right)^{-\frac{2}{3}}, y(\_T) = a^2 \_C1 \left(\_T^3 - a^2\right)^{-\frac{2}{3}}]\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x]^2 == a^2*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(a*x^(3/2)) + (3*C[1])/2)^(2/3)}, {y[x] -> (a*x^(3/2) + (3*C[1])/2)^
(2/3)}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2 = a^2*x, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T^3-a^2)^(2/3)*_T^2*_C1, y(_T) = a^2/(_T^3-a^2)^(2/3)*_C1]
```

4.947 $y(x)y'(x)^2 = e^{2x}$

ODE

$$y(x)y'(x)^2 = e^{2x}$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.0145078 (sec), leaf count = 47

$$\left\{\left\{y(x) \to \left(\frac{3}{2}\right)^{2/3} (c_1 - e^x)^{2/3}\right\}, \left\{y(x) \to \left(\frac{3}{2}\right)^{2/3} (c_1 + e^x)^{2/3}\right\}\right\}$$

Maple ✓
cpu = 0.076 (sec), leaf count = 50

$$\left\{-1\sqrt{y(x)\,(e^x)^2}\,\frac{1}{\sqrt{y(x)}} + \frac{2}{3}(y(x))^{\frac{3}{2}} + \_C1 = 0, 1\sqrt{y(x)\,(e^x)^2}\,\frac{1}{\sqrt{y(x)}} + \frac{2}{3}(y(x))^{\frac{3}{2}} + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x]^2 == E^(2*x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3/2)^(2/3)*(-E^x + C[1])^(2/3)}, {y[x] -> (3/2)^(2/3)*(E^x + C[1])^(2
/3)}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2 = exp(2*x), y(x),'implicit')
```

Maple raw output

```
-1/y(x)^(1/2)*(y(x)*exp(x)^2)^(1/2)+2/3*y(x)^(3/2)+_C1 = 0, 1/y(x)^(1/2)*(y(x)*e
xp(x)^2)^(1/2)+2/3*y(x)^(3/2)+_C1 = 0
```

4.948 $2axy'(x) - ay(x) + y(x)y'(x)^2 = 0$

ODE

$$2axy'(x) - ay(x) + y(x)y'(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous ODE, $x^n f(\frac{y}{x}, y') = 0$

Mathematica ✓
cpu = 0.0867309 (sec), leaf count = 109

$$\left\{\left\{y(x) \to -\sqrt{e^{c_1}\left(e^{c_1} - 2\sqrt{a}x\right)}\right\}, \left\{y(x) \to \sqrt{e^{c_1}\left(e^{c_1} - 2\sqrt{a}x\right)}\right\}, \left\{y(x) \to -\sqrt{e^{c_1}\left(2\sqrt{a}x + e^{c_1}\right)}\right\}, \left\{y(x) \to \sqrt{e^{c_1}\left(2\sqrt{a}\right.}\right.$$

Maple ✓
cpu = 0.08 (sec), leaf count = 107

$$\left\{ax^2 + (y(x))^2 = 0, \ln(x) - \int^{\frac{y(x)}{x}} \frac{1}{\_a\left(\_a^2 + a\right)}\left(-\_a^2 + \sqrt{\_a^2 a + a^2} - a\right)d\_a - \_C1 = 0, \ln(x) + \int^{\frac{y(x)}{x}} \frac{1}{\_a\left(\_a^2 + a\right.}\right.$$

Mathematica raw input

```
DSolve[-(a*y[x]) + 2*a*x*y'[x] + y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[E^C[1]*(E^C[1] - 2*Sqrt[a]*x)]}, {y[x] -> Sqrt[E^C[1]*(E^C[1] -
2*Sqrt[a]*x)]}, {y[x] -> -Sqrt[E^C[1]*(E^C[1] + 2*Sqrt[a]*x)]}, {y[x] -> Sqrt[E^
C[1]*(E^C[1] + 2*Sqrt[a]*x)]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2+2*a*x*diff(y(x),x)-a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
a*x^2+y(x)^2 = 0, ln(x)-Intat((-_a^2+(_a^2*a+a^2)^(1/2)-a)/_a/(_a^2+a),_a = y(x)
/x)-_C1 = 0, ln(x)+Intat((_a^2+(_a^2*a+a^2)^(1/2)+a)/_a/(_a^2+a),_a = y(x)/x)-_C
1 = 0
```

4.949 $-4a^2xy'(x)+a^2y(x)+y(x)y'(x)^2=0$

ODE

$$-4a^2xy'(x)+a^2y(x)+y(x)y'(x)^2=0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 600.511 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.049 (sec), leaf count = 51

$$\left\{[x(\_T)=(\_T^2+a^2)\,\_C1\frac{1}{\sqrt[3]{\_T^2-3\,a^2}}\_T^{-\frac{4}{3}},y(\_T)=4\frac{a^2\,\_C1}{\sqrt[3]{\_T}\sqrt[3]{\_T^2-3\,a^2}}]\right\}$$

Mathematica raw input

```
DSolve[a^2*y[x] - 4*a^2*x*y'[x] + y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2-4*a^2*x*diff(y(x),x)+a^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = (_T^2+a^2)*_C1/(_T^2-3*a^2)^(1/3)/_T^(4/3), y(_T) = 4*a^2*_C1/_T^(1/3)/
(_T^2-3*a^2)^(1/3)]
```

4.950 $axy'(x) + by(x) + y(x)y'(x)^2 = 0$

ODE

$$axy'(x) + by(x) + y(x)y'(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.467269 (sec), leaf count = 245

$$\left\{ \text{Solve}\left[\frac{1}{8}\left(\frac{2a\tanh^{-1}\left(\frac{\sqrt{a^2-\frac{4by(x)^2}{x^2}}}{a}\right) - 2(a+2b)\tanh^{-1}\left(\frac{\sqrt{a^2-\frac{4by(x)^2}{x^2}}}{a+2b}\right) + a\log\left(a+b+\frac{y(x)^2}{x^2}\right) + 2b\log\left(a+b+\frac{y(x)^2}{x^2}\right)}{a+b}\right.\right.\right.$$

Maple ✓
cpu = 0.057 (sec), leaf count = 112

$$\left\{ [x(\_T) = (\_T^2+b)\,\_C1\,(\_T^2+a+b)^{-\frac{a}{2a+2b}}\left(\_T^{\frac{a}{a+b}}\right)^{-1}\left((\_T^2+a+b)^{\frac{b}{a+b}}\right)^{-1}, y(\_T) = -\_C1\,\_T\,a(\_T^2+a+\right.$$

Mathematica raw input

```
DSolve[b*y[x] + a*x*y'[x] + y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(4*Log[x] + (2*a*ArcTanh[Sqrt[a^2 - (4*b*y[x]^2)/x^2]/a] - 2*(a + 2*b)*Ar
cTanh[Sqrt[a^2 - (4*b*y[x]^2)/x^2]/(a + 2*b)] + a*Log[y[x]^2/x^2] + a*Log[a + b
+ y[x]^2/x^2] + 2*b*Log[a + b + y[x]^2/x^2])/(a + b))/8 == C[1], y[x]], Solve[(4
*Log[x] + (-2*a*ArcTanh[Sqrt[a^2 - (4*b*y[x]^2)/x^2]/a] + 2*(a + 2*b)*ArcTanh[Sq
rt[a^2 - (4*b*y[x]^2)/x^2]/(a + 2*b)] + a*Log[y[x]^2/x^2] + a*Log[a + b + y[x]^2
/x^2] + 2*b*Log[a + b + y[x]^2/x^2])/(a + b))/8 == C[1], y[x]]}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2+a*x*diff(y(x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = (_T^2+a+b)^(-a/(2*a+2*b))*(_T^2+b)*_C1/(_T^(a/(a+b)))/((_T^2+a+b)^(1/(a
+b)*b)), y(_T) = -_T*a*(_T^2+a+b)^(-a/(2*a+2*b))*_C1/(_T^(a/(a+b)))/((_T^2+a+b)^
(1/(a+b)*b))]
```

4.951 $-(a-2bx)y'(x)-by(x)+y(x)y'(x)^2=0$

ODE

$$-(a-2bx)y'(x)-by(x)+y(x)y'(x)^2=0$$

ODE Classification

[[_homogeneous, `class C`], _rational, _dAlembert]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.316216 (sec), leaf count = 146

$$\left\{\left\{y(x)\to -\sqrt{2}e^{\frac{c_1}{2}}\sqrt{a+2b\left(e^{c_1}-x\right)}\right\},\left\{y(x)\to \sqrt{2}e^{\frac{c_1}{2}}\sqrt{a+2b\left(e^{c_1}-x\right)}\right\},\left\{y(x)\to -\frac{e^{\frac{c_1}{2}}\sqrt{-2a+4bx+e^{c_1}}}{2\sqrt{b}}\right\},\left\{y(x)-\right.\right.$$

Maple ✓
cpu = 0.795 (sec), leaf count = 73

$$\left\{\frac{4\,b(y(x))^2+(-2\,bx+a)^2}{4\,b}=0,\ln\left(2\,bx-a\right)-Artanh\left(\frac{1}{\sqrt{4\,\frac{b(y(x))^2}{(-2\,bx+a)^2}+1}}\right)+\ln\left(\frac{y(x)}{-2\,bx+a}\right)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[-(b*y[x]) - (a - 2*b*x)*y'[x] + y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2]*E^(C[1]/2)*Sqrt[a + 2*b*(E^C[1] - x)])}, {y[x] -> Sqrt[2]*E^
(C[1]/2)*Sqrt[a + 2*b*(E^C[1] - x)]}, {y[x] -> -(E^(C[1]/2)*Sqrt[-2*a + E^C[1] +
 4*b*x])/(2*Sqrt[b])}, {y[x] -> (E^(C[1]/2)*Sqrt[-2*a + E^C[1] + 4*b*x])/(2*Sqrt
[b])}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2-(-2*b*x+a)*diff(y(x),x)-b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/4*(4*b*y(x)^2+(-2*b*x+a)^2)/b = 0, ln(2*b*x-a)-arctanh(1/(4*b*y(x)^2/(-2*b*x+a
)^2+1)^(1/2))+ln(y(x)/(-2*b*x+a))-_C1 = 0
```

4.952 $x^3y'(x) - x^2y(x) + y(x)y'(x)^2 = 0$

ODE

$$x^3y'(x) - x^2y(x) + y(x)y'(x)^2 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of variable

Mathematica ✗
cpu = 599.997 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.231 (sec), leaf count = 65

$$\left\{(y(x))^2 + \frac{x^4}{4} = 0, -\_C1 + x^2 + \sqrt{x^4 + 4\,(y\,(x))^2} = 0, -\_C1 + \frac{x^2}{(y\,(x))^2} + \frac{1}{(y\,(x))^2}\sqrt{x^4 + 4\,(y\,(x))^2} = 0\right\}$$

Mathematica raw input

```
DSolve[-(x^2*y[x]) + x^3*y'[x] + y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2+x^3*diff(y(x),x)-x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+1/4*x^4 = 0, -_C1+x^2+(x^4+4*y(x)^2)^(1/2) = 0, -_C1+1/y(x)^2*x^2+1/y(x)^
2*(x^4+4*y(x)^2)^(1/2) = 0
```

4.953 $y(x)y'(x)^2 + (x - y(x))y'(x) - x = 0$

ODE

$$y(x)y'(x)^2 + (x - y(x))y'(x) - x = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00580615 (sec), leaf count = 47

$$\left\{\{y(x) \to c_1 + x\}, \left\{y(x) \to -\sqrt{2c_1 - x^2}\right\}, \left\{y(x) \to \sqrt{2c_1 - x^2}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 20

$$\left\{x^2 + (y(x))^2 - \_C1 = 0, y(x) = x + \_C1\right\}$$

Mathematica raw input

```
DSolve[-x + (x - y[x])*y'[x] + y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x + C[1]}, {y[x] -> -Sqrt[-x^2 + 2*C[1]]}, {y[x] -> Sqrt[-x^2 + 2*C[1]
]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2+(x-y(x))*diff(y(x),x)-x = 0, y(x),'implicit')
```

Maple raw output

```
x^2+y(x)^2-_C1 = 0, y(x) = x+_C1
```

4.954 $y(x)y'(x)^2-(y(x)+x)y'(x)+y(x)=0$

ODE

$$y(x)y'(x)^2-(y(x)+x)y'(x)+y(x)=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.89479 (sec), leaf count = 201

$$\left\{\text{Solve}\left[\frac{x\left(-1-i\sqrt{\frac{y(x)}{x}-1}\sqrt{\frac{3y(x)}{x}+1}\right)+2y(x)\left(\log\left(\frac{y(x)}{x}\right)-i\tan^{-1}\left(\frac{x\sqrt{\frac{y(x)}{x}-1}\sqrt{\frac{3y(x)}{x}+1}}{y(x)+x}\right)+\log(x)\right)}{4y(x)}=c_1,y(x)\right],\text{Sol}\right.$$

Maple ✓
cpu = 0.085 (sec), leaf count = 243

$$\left\{\frac{1}{2\,xy\,(x)}\left(-x^2\left(\frac{(x+3\,y(x))\,(x-y(x))}{x^2}\right)^{\frac{3}{2}}+\left(2\,xy(x)-3\,(y(x))^2\right)\sqrt{\frac{(x+3\,y\,(x))\,(x-y\,(x))}{x^2}}-2\,x\left(-\ln\left(\frac{y(x)}{x}\right)y(x)+\right.\right.\right.$$

Mathematica raw input

```
DSolve[y[x] - (x + y[x])*y'[x] + y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(2*((-I)*ArcTan[(x*Sqrt[-1 + y[x]/x]*Sqrt[1 + (3*y[x])/x])/(x + y[x])] +
Log[x] + Log[y[x]/x])*y[x] + x*(-1 - I*Sqrt[-1 + y[x]/x]*Sqrt[1 + (3*y[x])/x]))/
(4*y[x]) == C[1], y[x]], Solve[(2*(I*ArcTan[(x*Sqrt[-1 + y[x]/x]*Sqrt[1 + (3*y[x
])/x])/(x + y[x])] + Log[x] + Log[y[x]/x])*y[x] + x*(-1 + I*Sqrt[-1 + y[x]/x]*Sq
rt[1 + (3*y[x])/x]))/(4*y[x]) == C[1], y[x]]}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2-(x+y(x))*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x, 1/2*(-x^2*((x+3*y(x))*(x-y(x))/x^2)^(3/2)+(2*x*y(x)-3*y(x)^2)*((x+3*y(
x))*(x-y(x))/x^2)^(1/2)-2*x*(-ln(y(x)/x)*y(x)+(arctanh((x+y(x))/x/((x+3*y(x))*(x
-y(x))/x^2)^(1/2))+_C1-ln(x))*y(x)+1/2*x))/x/y(x) = 0, 1/2*(x^2*((x+3*y(x))*(x-y
(x))/x^2)^(3/2)+(-2*x*y(x)+3*y(x)^2)*((x+3*y(x))*(x-y(x))/x^2)^(1/2)+2*x*(ln(y(x
)/x)*y(x)+(arctanh((x+y(x))/x/((x+3*y(x))*(x-y(x))/x^2)^(1/2))-_C1+ln(x))*y(x)-1
/2*x))/x/y(x) = 0
```

4.955 $y(x)y'(x)^2-(xy(x)+1)y'(x)+x=0$

ODE

$$y(x)y'(x)^2-(xy(x)+1)y'(x)+x=0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0050977 (sec), leaf count = 52

$$\left\{\left\{y(x)\to -\sqrt{2}\sqrt{c_1+x}\right\},\left\{y(x)\to \sqrt{2}\sqrt{c_1+x}\right\},\left\{y(x)\to c_1+\frac{x^2}{2}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 24

$$\left\{(y(x))^2-\_C1-2x=0,y(x)=\frac{x^2}{2}+\_C1\right\}$$

Mathematica raw input

```
DSolve[x - (1 + x*y[x])*y'[x] + y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2]*Sqrt[x + C[1]])}, {y[x] -> Sqrt[2]*Sqrt[x + C[1]]}, {y[x] ->
  x^2/2 + C[1]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2-(1+x*y(x))*diff(y(x),x)+x = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-_C1-2*x = 0, y(x) = 1/2*x^2+_C1
```

4.956 $y(x)y'(x)^2 + (x - y(x)^2)\,y'(x) - xy(x) = 0$

ODE

$$y(x)y'(x)^2 + (x - y(x)^2)\,y'(x) - xy(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00619973 (sec), leaf count = 49

$$\left\{\{y(x) \to c_1 e^x\}, \left\{y(x) \to -\sqrt{2c_1 - x^2}\right\}, \left\{y(x) \to \sqrt{2c_1 - x^2}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 21

$$\left\{x^2 + (y(x))^2 - \_C1 = 0, y(x) = \_C1\, \mathrm{e}^x\right\}$$

Mathematica raw input

```
DSolve[-(x*y[x]) + (x - y[x]^2)*y'[x] + y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1]}, {y[x] -> -Sqrt[-x^2 + 2*C[1]]}, {y[x] -> Sqrt[-x^2 + 2*C[1]
]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2+(x-y(x)^2)*diff(y(x),x)-x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x^2+y(x)^2-_C1 = 0, y(x) = _C1*exp(x)
```

4.957 $y(x)y'(x)^2 + y(x) = a$

ODE

$$y(x)y'(x)^2 + y(x) = a$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Use new variable

Mathematica ✓
cpu = 0.103926 (sec), leaf count = 101

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[a\tan^{-1}\left(\frac{\sqrt{\#1}}{\sqrt{a-\#1}}\right) - \sqrt{\#1}\sqrt{a-\#1}\&\right][c_1 - x]\right\}, \left\{y(x) \to \text{InverseFunction}\left[a\tan^{-1}\left(\frac{\sqrt{}\right.\right.\right.$$

Maple ✓
cpu = 0.045 (sec), leaf count = 87

$$\left\{x - \sqrt{y(x)\,(a-y(x))} + \frac{a}{2}\arctan\left(1\left(y(x) - \frac{a}{2}\right)\frac{1}{\sqrt{y(x)\,(a-y(x))}}\right) - \_C1 = 0, x + \sqrt{y(x)\,(a-y(x))} - \frac{a}{2}\arctan\left(1\right.\right.$$

Mathematica raw input

```
DSolve[y[x] + y[x]*y'[x]^2 == a,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[a*ArcTan[Sqrt[#1]/Sqrt[a - #1]] - Sqrt[a - #1]*Sqrt[#1
] & ][-x + C[1]]}, {y[x] -> InverseFunction[a*ArcTan[Sqrt[#1]/Sqrt[a - #1]] - Sq
rt[a - #1]*Sqrt[#1] & ][x + C[1]]}}
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^2+y(x) = a, y(x),'implicit')
```

Maple raw output

```
y(x) = a, x+(y(x)*(a-y(x)))^(1/2)-1/2*a*arctan((y(x)-1/2*a)/(y(x)*(a-y(x)))^(1/2
))-_C1 = 0, x-(y(x)*(a-y(x)))^(1/2)+1/2*a*arctan((y(x)-1/2*a)/(y(x)*(a-y(x)))^(1
/2))-_C1 = 0
```

4.958 $(y(x)+x)y'(x)^2+2xy'(x)-y(x)=0$

ODE

$$(y(x)+x)y'(x)^2+2xy'(x)-y(x)=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.175631 (sec), leaf count = 121

$$\left\{\left\{y(x)\to -\frac{2}{3}\sqrt{e^{c_1}\left(e^{c_1}-3x\right)}-\frac{e^{c_1}}{3}\right\},\left\{y(x)\to \frac{2}{3}\sqrt{e^{c_1}\left(e^{c_1}-3x\right)}-\frac{e^{c_1}}{3}\right\},\left\{y(x)\to e^{c_1}-2\sqrt{e^{c_1}\left(e^{c_1}+x\right)}\right\},\left\{y(x)\to 2\sqrt{}\right.\right.$$

Maple ✓
cpu = 0.073 (sec), leaf count = 107

$$\left\{x^2+xy(x)+(y(x))^2=0,\ln(x)-\mathit{Artanh}\left(\frac{2x+y(x)}{2x}\frac{1}{\sqrt{\frac{x^2+xy(x)+(y(x))^2}{x^2}}}\right)+\ln\left(\frac{y(x)}{x}\right)-\_C1=0,\ln(x)+\mathit{Artanh}\left(\frac{2}{}\right.\right.$$

Mathematica raw input

```
DSolve[-y[x] + 2*x*y'[x] + (x + y[x])*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -E^C[1]/3 - (2*Sqrt[E^C[1]*(E^C[1] - 3*x)])/3}, {y[x] -> -E^C[1]/3 + (
2*Sqrt[E^C[1]*(E^C[1] - 3*x)])/3}, {y[x] -> E^C[1] - 2*Sqrt[E^C[1]*(E^C[1] + x)]
}, {y[x] -> E^C[1] + 2*Sqrt[E^C[1]*(E^C[1] + x)]}}
```

Maple raw input

```
dsolve((x+y(x))*diff(y(x),x)^2+2*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x^2+x*y(x)+y(x)^2 = 0, ln(x)-arctanh(1/2*(2*x+y(x))/x/((x^2+x*y(x)+y(x)^2)/x^2)^
(1/2))+ln(y(x)/x)-_C1 = 0, ln(x)+arctanh(1/2*(2*x+y(x))/x/((x^2+x*y(x)+y(x)^2)/x
^2)^(1/2))+ln(y(x)/x)-_C1 = 0
```

4.959 $(2x - y(x))y'(x)^2 - 2(1-x)y'(x) - y(x) + 2 = 0$

ODE

$$(2x - y(x))y'(x)^2 - 2(1-x)y'(x) - y(x) + 2 = 0$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.370791 (sec), leaf count = 137

$$\left\{\left\{y(x) \to -\frac{1}{2}\sqrt{-e^{c_1}\left(e^{c_1}+4x-4\right)} - \frac{e^{c_1}}{2} + 2\right\}, \left\{y(x) \to \frac{1}{2}\left(\sqrt{-e^{c_1}\left(e^{c_1}+4x-4\right)} - e^{c_1} + 4\right)\right\}, \left\{y(x) \to -\sqrt{-e^{c_1}\left(e^{c_1}\right.\right.\right.$$

Maple ✓
cpu = 0.378 (sec), leaf count = 102

$$\left\{\_C1 + \ln\left(y(x) - 3 + x + \sqrt{-\left(y\left(x\right)\right)^2 + \left(2+2\,x\right)y\left(x\right) + x^2 - 6\,x + 1}\right) = 0, \ln\left(y(x) - 3 + x + \sqrt{-\left(y\left(x\right)\right)^2 + \left(2+2\,x\right)\right.\right.$$

Mathematica raw input

```
DSolve[2 - y[x] - 2*(1 - x)*y'[x] + (2*x - y[x])*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2 - E^C[1]/2 - Sqrt[-(E^C[1]*(-4 + E^C[1] + 4*x))]/2}, {y[x] -> (4 - E
^C[1] + Sqrt[-(E^C[1]*(-4 + E^C[1] + 4*x))])/2}, {y[x] -> 2 - E^C[1] - Sqrt[-(E^
C[1]*(-2 + E^C[1] + 2*x))]}, {y[x] -> 2 - E^C[1] + Sqrt[-(E^C[1]*(-2 + E^C[1] +
2*x))]}}
```

Maple raw input

```
dsolve((2*x-y(x))*diff(y(x),x)^2-2*(1-x)*diff(y(x),x)+2-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+(-2*x-2)*y(x)-x^2+6*x-1 = 0, _C1+ln(y(x)-3+x+(-y(x)^2+(2+2*x)*y(x)+x^2-6*
x+1)^(1/2)) = 0, ln(y(x)-3+x+(-y(x)^2+(2+2*x)*y(x)+x^2-6*x+1)^(1/2))-2*ln(2-y(x)
)+_C1 = 0
```

4.960 $2y(x)y'(x)^2 + (5-4x)y'(x) + 2y(x) = 0$

ODE

$$2y(x)y'(x)^2 + (5-4x)y'(x) + 2y(x) = 0$$

ODE Classification

[[_homogeneous, `class C`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.225076 (sec), leaf count = 135

$$\left\{\left\{y(x) \to -i\sqrt{2}e^{\frac{c_1}{2}}\sqrt{8e^{c_1}+4x-5}\right\}, \left\{y(x) \to i\sqrt{2}e^{\frac{c_1}{2}}\sqrt{8e^{c_1}+4x-5}\right\}, \left\{y(x) \to -\frac{1}{4}ie^{\frac{c_1}{2}}\sqrt{e^{c_1}+8x-10}\right\}, \left\{y(x) \to \frac{1}{4}ie\right.\right.$$

Maple ✓
cpu = 0.587 (sec), leaf count = 152

$$\left\{(y(x))^2 - \left(x-\frac{5}{4}\right)^2 = 0, \ln\left(x-\frac{5}{4}\right) + \frac{1}{2}\ln\left(16\frac{(y(x))^2}{(-5+4x)^2}-1\right) - \frac{\sqrt{4}}{2}\sqrt{\frac{1}{(-5+4x)^2}\left(-16\,(y(x))^2+16\,(x-5/4)^2\right)}\right.$$

Mathematica raw input

```
DSolve[2*y[x] + (5 - 4*x)*y'[x] + 2*y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-I)*Sqrt[2]*E^(C[1]/2)*Sqrt[-5 + 8*E^C[1] + 4*x]}, {y[x] -> I*Sqrt[2]
*E^(C[1]/2)*Sqrt[-5 + 8*E^C[1] + 4*x]}, {y[x] -> (-I/4)*E^(C[1]/2)*Sqrt[-10 + E^
C[1] + 8*x]}, {y[x] -> (I/4)*E^(C[1]/2)*Sqrt[-10 + E^C[1] + 8*x]}}
```

Maple raw input

```
dsolve(2*y(x)*diff(y(x),x)^2+(5-4*x)*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-(x-5/4)^2 = 0, ln(x-5/4)+1/2*ln(16*y(x)^2/(-5+4*x)^2-1)-1/2*4^(1/2)*((-16
*y(x)^2+16*(x-5/4)^2)/(-5+4*x)^2)^(1/2)+(-16*y(x)^2/(-5+4*x)^2+1)^(1/2)-arctanh(
1/(-16*y(x)^2/(-5+4*x)^2+1)^(1/2))-1/2*ln(4*y(x)/(-5+4*x)+1)-1/2*ln(4*y(x)/(-5+4
*x)-1)+ln(y(x)/(-5+4*x))-_C1 = 0
```

4.961 $4x^3y'(x) - 4x^2y(x) + 9y(x)y'(x)^2 = 0$

ODE

$$4x^3y'(x) - 4x^2y(x) + 9y(x)y'(x)^2 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of variable

Mathematica ✗
cpu = 599.997 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.239 (sec), leaf count = 65

$$\left\{(y(x))^2 + \frac{x^4}{9} = 0, -\_C1 + x^2 + \sqrt{x^4 + 9\,(y\,(x))^2} = 0, -\_C1 + \frac{x^2}{(y\,(x))^2} + \frac{1}{(y\,(x))^2}\sqrt{x^4 + 9\,(y\,(x))^2} = 0\right\}$$

Mathematica raw input

```
DSolve[-4*x^2*y[x] + 4*x^3*y'[x] + 9*y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(9*y(x)*diff(y(x),x)^2+4*x^3*diff(y(x),x)-4*x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+1/9*x^4 = 0, -_C1+1/y(x)^2*x^2+1/y(x)^2*(x^4+9*y(x)^2)^(1/2) = 0, -_C1+x^
2+(x^4+9*y(x)^2)^(1/2) = 0
```

4.962 $(1 - ay(x))y'(x)^2 = ay(x)$

ODE

$$(1 - ay(x))y'(x)^2 = ay(x)$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Use new variable

Mathematica ✓
cpu = 0.0914421 (sec), leaf count = 110

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\sqrt{\#1}\sqrt{1-\#1 a} + \frac{\sin^{-1}\left(\sqrt{\#1}\sqrt{a}\right)}{\sqrt{a}}\&\right]\left[c_1 - \sqrt{a}x\right]\right\}, \left\{y(x) \to \text{InverseFunction}\left[\sqrt{\#1}\sqrt{1-\right.\right.\right.$$

Maple ✓
cpu = 0.052 (sec), leaf count = 136

$$\left\{x - \frac{1}{a}\sqrt{-a^2\left(y\left(x\right)\right)^2 + ay\left(x\right)} - \frac{1}{2}\arctan\left(1\sqrt{a^2}\left(y(x) - \frac{1}{2\,a}\right)\frac{1}{\sqrt{-a^2\left(y\left(x\right)\right)^2 + ay\left(x\right)}}\right)\frac{1}{\sqrt{a^2}} - \_C1 = 0, x + \frac{1}{a}\sqrt{-a^2\left(\right.\right.\right.$$

Mathematica raw input

```
DSolve[(1 - a*y[x])*y'[x]^2 == a*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[ArcSin[Sqrt[a]*Sqrt[#1]]/Sqrt[a] + Sqrt[#1]*Sqrt[1 - a
*#1] & ][-(Sqrt[a]*x) + C[1]]}, {y[x] -> InverseFunction[ArcSin[Sqrt[a]*Sqrt[#1]
]/Sqrt[a] + Sqrt[#1]*Sqrt[1 - a*#1] & ][Sqrt[a]*x + C[1]]}}
```

Maple raw input

```
dsolve((1-a*y(x))*diff(y(x),x)^2 = a*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 0, x+1/a*(-a^2*y(x)^2+a*y(x))^(1/2)+1/2/(a^2)^(1/2)*arctan((a^2)^(1/2)*(y
(x)-1/2/a)/(-a^2*y(x)^2+a*y(x))^(1/2))-_C1 = 0, x-1/a*(-a^2*y(x)^2+a*y(x))^(1/2)
```

```
-1/2/(a^2)^(1/2)*arctan((a^2)^(1/2)*(y(x)-1/2/a)/(-a^2*y(x)^2+a*y(x))^(1/2))-_C1
 = 0
```

4.963

$$y'(x)^2(\mathbf{a0}+\mathbf{b0}x+\mathbf{c0}y(x))+y'(x)(\mathbf{a1}+\mathbf{b1}x+\mathbf{c1}y(x))+\mathbf{a2}+\mathbf{b2}x+\mathbf{c2}y(x)=0$$

ODE

$$y'(x)^2(\mathrm{a0}+\mathrm{b0}x+\mathrm{c0}y(x))+y'(x)(\mathrm{a1}+\mathrm{b1}x+\mathrm{c1}y(x))+\mathrm{a2}+\mathrm{b2}x+\mathrm{c2}y(x)=0$$

ODE Classification

[_dAlembert]

Book solution method
Change of variable

Mathematica ✗
cpu = 600. (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.168 (sec), leaf count = 477

$$\left\{[x(\_T)=\mathrm{e}^{\int \frac{(-b0\ c1+b1\ c0)\_T^2+(-2\ b0\ c2+2\ b2\ c0)\_T-b1\ c2+b2\ c1}{\left(\_T^3 c0+(b0+c1)\_T^2+(b1+c2)\_T+b2\right)\left(\_T^2 c0+\_T\ c1+c2\right)}\mathrm{d}\_T}\left(\int -\frac{(a0\ c1-a1\ c0)\_T^2+(2\ a0\ c2-2\ a2\ c0)\_T+}{\left(\_T^3 c0+(b0+c1)\_T^2+(b1+c2)\_T+b2\right)(\_T}\right.\right.$$

Mathematica raw input

```
DSolve[a2 + b2*x + c2*y[x] + (a1 + b1*x + c1*y[x])*y'[x] + (a0 + b0*x + c0*y[x])*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((a0+b0*x+c0*y(x))*diff(y(x),x)^2+(a1+b1*x+c1*y(x))*diff(y(x),x)+a2+b2*x+c2*y(x) = 0, y(x),'imp
```

Maple raw output

```
[x(_T) = exp(Int(((-b0*c1+b1*c0)*_T^2+(-2*b0*c2+2*b2*c0)*_T-b1*c2+b2*c1)/(_T^3*c
0+(b0+c1)*_T^2+(b1+c2)*_T+b2)/(_T^2*c0+_T*c1+c2),_T))*(Int(-exp(-Int(((-b0*c1+b1
*c0)*_T^2+(-2*b0*c2+2*b2*c0)*_T-b1*c2+b2*c1)/(_T^3*c0+(b0+c1)*_T^2+(b1+c2)*_T+b2
)/(_T^2*c0+_T*c1+c2),_T))*((a0*c1-a1*c0)*_T^2+(2*a0*c2-2*a2*c0)*_T+a1*c2-a2*c1)/
(_T^3*c0+(b0+c1)*_T^2+(b1+c2)*_T+b2)/(_T^2*c0+_T*c1+c2),_T)+_C1), y(_T) = -(_T^2
*b0+_T*b1+b2)/(_T^2*c0+_T*c1+c2)*exp(Int(((-b0*c1+b1*c0)*_T^2+(-2*b0*c2+2*b2*c0)
```

```
*_T-b1*c2+b2*c1)/(_T^3*c0+(b0+c1)*_T^2+(b1+c2)*_T+b2)/(_T^2*c0+_T*c1+c2),_T))*(I
nt(-exp(-Int(((-b0*c1+b1*c0)*_T^2+(-2*b0*c2+2*b2*c0)*_T-b1*c2+b2*c1)/(_T^3*c0+(b
0+c1)*_T^2+(b1+c2)*_T+b2)/(_T^2*c0+_T*c1+c2),_T))*((a0*c1-a1*c0)*_T^2+(2*a0*c2-2
*a2*c0)*_T+a1*c2-a2*c1)/(_T^3*c0+(b0+c1)*_T^2+(b1+c2)*_T+b2)/(_T^2*c0+_T*c1+c2),
_T)+_C1)+(-_T^2*a0-_T*a1-a2)/(_T^2*c0+_T*c1+c2)]
```

4.964 $(x^2 - ay(x))\, y'(x)^2 - 2xy(x)y'(x) = 0$

ODE

$$(x^2 - ay(x))\, y'(x)^2 - 2xy(x)y'(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
Change of variable

Mathematica ✓
cpu = 6.31425 (sec), leaf count = 305

$$\left\{ \{y(x) \to c_1\}, \text{Solve}\left[\frac{\left(2 - \frac{2\left(2axy(x)+x^3\right)}{\sqrt[3]{x^3}\left(x^2-ay(x)\right)}\right)\left(\frac{6x^3}{x^2-ay(x)} - 4x}{\sqrt[3]{x^3}} + 4\right)\left(\left(1 - \frac{x\left(2ay(x)+x^2\right)}{\sqrt[3]{x^3}\left(x^2-ay(x)\right)}\right)\log\left(\frac{2 - \frac{2\left(2axy(x)+x^3\right)}{\sqrt[3]{x^3}\left(x^2-ay(x)\right)}}{\sqrt[3]{2}}\right) + \left(\frac{2ax}{\sqrt[3]{x^3}}\right.\right.\right.$$

$$\left.\left.\left. 18\sqrt[3]{2}\left(-\frac{\left(2ay(x)+x^2\right)^3}{\left(x^2-ay(x)\right)^3} + \frac{3\left(2axy(x)+x^3\right)}{\sqrt[3]{x^3}\left(x^2-ay(x)\right)} - 2\right)\right.\right.\right.$$

Maple ✓
cpu = 0.02 (sec), leaf count = 37

$$\left\{ \ln(x) - \_C1 + \frac{1}{2\,ay(x)}\left(\ln\left(\frac{y(x)}{x^2}\right) ay(x) + x^2\right) = 0, y(x) = \_C1 \right\}$$

Mathematica raw input

```
DSolve[-2*x*y[x]*y'[x] + (x^2 - a*y[x])*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]}, Solve[((2 - (2*(x^3 + 2*a*x*y[x]))/((x^3)^(1/3)*(x^2 - a*y[x]))
)*(4 + (-4*x + (6*x^3)/(x^2 - a*y[x]))/(x^3)^(1/3))*(-3 + Log[(2 - (2*(x^3 + 2*a
*x*y[x]))/((x^3)^(1/3)*(x^2 - a*y[x])))/2^(1/3)]*(1 - (x*(x^2 + 2*a*y[x]))/((x^3
)^(1/3)*(x^2 - a*y[x]))) + Log[(4 + (-4*x + (6*x^3)/(x^2 - a*y[x]))/(x^3)^(1/3))
/2^(1/3)]*(-1 + (x^3 + 2*a*x*y[x])/((x^3)^(1/3)*(x^2 - a*y[x])))))/(18*2^(1/3)*(
-2 - (x^2 + 2*a*y[x])^3/(x^2 - a*y[x])^3 + (3*(x^3 + 2*a*x*y[x]))/((x^3)^(1/3)*(
x^2 - a*y[x])))) == C[1] + (2*2^(2/3)*x*Log[x])/(9*(x^3)^(1/3)), y[x]]}
```

Maple raw input

```
dsolve((x^2-a*y(x))*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C1+1/2*(ln(y(x)/x^2)*a*y(x)+x^2)/a/y(x) = 0, y(x) = _C1
```

4.965 $xy(x)y'(x)^2 + (y(x)+x)y'(x) + 1 = 0$

ODE

$$xy(x)y'(x)^2 + (y(x)+x)y'(x) + 1 = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00559688 (sec), leaf count = 53

$$\left\{\left\{y(x) \to -\sqrt{2}\sqrt{c_1 - x}\right\}, \left\{y(x) \to \sqrt{2}\sqrt{c_1 - x}\right\}, \{y(x) \to c_1 - \log(x)\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 23

$$\left\{(y(x))^2 - \_C1 + 2x = 0, y(x) = -\ln(x) + \_C1\right\}$$

Mathematica raw input

```
DSolve[1 + (x + y[x])*y'[x] + x*y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2]*Sqrt[-x + C[1]])}, {y[x] -> Sqrt[2]*Sqrt[-x + C[1]]}, {y[x]
-> C[1] - Log[x]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)^2+(x+y(x))*diff(y(x),x)+1 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -ln(x)+_C1, y(x)^2-_C1+2*x = 0
```

4.966 $(x^2+y(x)^2)\,y'(x)+xy(x)y'(x)^2+xy(x)=0$

ODE

$$(x^2+y(x)^2)\,y'(x)+xy(x)y'(x)^2+xy(x)=0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00663139 (sec), leaf count = 49

$$\left\{\left\{y(x)\to \frac{c_1}{x}\right\},\left\{y(x)\to -\sqrt{2c_1-x^2}\right\},\left\{y(x)\to \sqrt{2c_1-x^2}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 22

$$\left\{x^2+(y(x))^2-\_C1=0, y(x)=\frac{\_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[x*y[x] + (x^2 + y[x]^2)*y'[x] + x*y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/x}, {y[x] -> -Sqrt[-x^2 + 2*C[1]]}, {y[x] -> Sqrt[-x^2 + 2*C[1]]}
}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)^2+(x^2+y(x)^2)*diff(y(x),x)+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1/x, x^2+y(x)^2-_C1 = 0
```

4.967 $(x^2 - y(x)^2)\, y'(x) + xy(x)y'(x)^2 - xy(x) = 0$

ODE

$$(x^2 - y(x)^2)\, y'(x) + xy(x)y'(x)^2 - xy(x) = 0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00653316 (sec), leaf count = 47

$$\left\{\{y(x) \to c_1 x\}, \left\{y(x) \to -\sqrt{2c_1 - x^2}\right\}, \left\{y(x) \to \sqrt{2c_1 - x^2}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 20

$$\left\{x^2 + (y(x))^2 - \_C1 = 0, y(x) = \_C1\, x\right\}$$

Mathematica raw input

```
DSolve[-(x*y[x]) + (x^2 - y[x]^2)*y'[x] + x*y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1]}, {y[x] -> -Sqrt[-x^2 + 2*C[1]]}, {y[x] -> Sqrt[-x^2 + 2*C[1]]}
}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)^2+(x^2-y(x)^2)*diff(y(x),x)-x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x^2+y(x)^2-_C1 = 0, y(x) = _C1*x
```

4.968 $-(x^2-y(x)^2)\,y'(x)+xy(x)y'(x)^2-xy(x)=0$

ODE

$$-(x^2-y(x)^2)\,y'(x)+xy(x)y'(x)^2-xy(x)=0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00654564 (sec), leaf count = 45

$$\left\{\left\{y(x)\to \frac{c_1}{x}\right\},\left\{y(x)\to -\sqrt{2c_1+x^2}\right\},\left\{y(x)\to \sqrt{2c_1+x^2}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 24

$$\left\{-x^2+(y(x))^2-\_C1=0, y(x)=\frac{\_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[-(x*y[x]) - (x^2 - y[x]^2)*y'[x] + x*y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/x}, {y[x] -> -Sqrt[x^2 + 2*C[1]]}, {y[x] -> Sqrt[x^2 + 2*C[1]]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)^2-(x^2-y(x)^2)*diff(y(x),x)-x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1/x, -x^2+y(x)^2-_C1 = 0
```

4.969 $\left(a+x^2-y(x)^2\right)y'(x)+xy(x)y'(x)^2-xy(x)=0$

ODE

$$\left(a+x^2-y(x)^2\right)y'(x)+xy(x)y'(x)^2-xy(x)=0$$

ODE Classification

[_rational]

Book solution method
Change of variable

Mathematica ✗
cpu = 599.999 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✗
cpu = 0.01 (sec), leaf count = 0 , exception

```
time expired
```

Mathematica raw input

```
DSolve[-(x*y[x]) + (a + x^2 - y[x]^2)*y'[x] + x*y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)^2+(a+x^2-y(x)^2)*diff(y(x),x)-x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
time expired
```

4.970 $-y'(x)\left(a-bx^2+y(x)^2\right)-bxy(x)+xy(x)y'(x)^2=0$

ODE

$$-y'(x)\left(a-bx^2+y(x)^2\right)-bxy(x)+xy(x)y'(x)^2=0$$

ODE Classification

[_rational]

Book solution method
The method of Lagrange

Mathematica ✗
cpu = 600. (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✗
cpu = 0.01 (sec), leaf count = 0 , exception

```
time expired
```

Mathematica raw input

```
DSolve[-(b*x*y[x]) - (a - b*x^2 + y[x]^2)*y'[x] + x*y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)^2-(a-b*x^2+y(x)^2)*diff(y(x),x)-b*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
time expired
```

4.971 $(3x^2 - 2y(x)^2)\, y'(x) + xy(x)y'(x)^2 - 6xy(x) = 0$

ODE

$$(3x^2 - 2y(x)^2)\, y'(x) + xy(x)y'(x)^2 - 6xy(x) = 0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00753407 (sec), leaf count = 49

$$\left\{\left\{y(x) \to c_1 x^2\right\}, \left\{y(x) \to -\sqrt{2c_1 - 3x^2}\right\}, \left\{y(x) \to \sqrt{2c_1 - 3x^2}\right\}\right\}$$

Maple ✓
cpu = 1.554 (sec), leaf count = 24

$$\left\{3\,x^2 + (y(x))^2 - \_C1 = 0, y(x) = \_C1\,x^2\right\}$$

Mathematica raw input

```
DSolve[-6*x*y[x] + (3*x^2 - 2*y[x]^2)*y'[x] + x*y[x]*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2*C[1]}, {y[x] -> -Sqrt[-3*x^2 + 2*C[1]]}, {y[x] -> Sqrt[-3*x^2 + 2*
C[1]]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(y(x),x)^2+(3*x^2-2*y(x)^2)*diff(y(x),x)-6*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^2, 3*x^2+y(x)^2-_C1 = 0
```

4.972 $-2xy(x)y'(x) + x(x-2y(x))y'(x)^2 + y(x)^2 - 2xy(x) = 0$

ODE

$$-2xy(x)y'(x) + x(x-2y(x))y'(x)^2 + y(x)^2 - 2xy(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right) = 0$, Solve for p

Mathematica ✓
cpu = 0.279226 (sec), leaf count = 69

$$\left\{\left\{y(x) \to e^{\frac{c_1}{2}} - \sqrt{x\left(2e^{\frac{c_1}{2}} - x\right)}\right\}, \left\{y(x) \to \sqrt{x\left(2e^{\frac{c_1}{2}} - x\right)} + e^{\frac{c_1}{2}}\right\}\right\}$$

Maple ✓
cpu = 26.886 (sec), leaf count = 103

$$\left\{\ln(x) - \frac{1}{2}\int^{\frac{y(x)}{x}} \frac{1}{\_a\left(\_a^2+1\right)}\left(-2\_a^2 + \sqrt{2}\sqrt{\_a\left(\_a-1\right)^2}\right)d\_a - \_C1 = 0, \ln(x) + \frac{1}{2}\int^{\frac{y(x)}{x}} \frac{1}{\_a\left(\_a^2+1\right)}\left(2\_a^2 +\right.\right.$$

Mathematica raw input

```
DSolve[-2*x*y[x] + y[x]^2 - 2*x*y[x]*y'[x] + x*(x - 2*y[x])*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(C[1]/2) - Sqrt[(2*E^(C[1]/2) - x)*x]}, {y[x] -> E^(C[1]/2) + Sqrt[(
2*E^(C[1]/2) - x)*x]}}
```

Maple raw input

```
dsolve(x*(x-2*y(x))*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)-2*x*y(x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 0, ln(x)-1/2*Intat((-2*_a^2+2^(1/2)*(_a*(_a-1)^2)^(1/2))/_a/(_a^2+1),_a =
 y(x)/x)-_C1 = 0, ln(x)+1/2*Intat((2*_a^2+2^(1/2)*(_a*(_a-1)^2)^(1/2))/_a/(_a^2+
1),_a = y(x)/x)-_C1 = 0
```

4.973 $6xy(x)y'(x) + x(x - 2y(x))y'(x)^2 + y(x)^2 - 2xy(x) = 0$

ODE

$$6xy(x)y'(x) + x(x - 2y(x))y'(x)^2 + y(x)^2 - 2xy(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right) = 0$

Mathematica ✓
cpu = 0.137056 (sec), leaf count = 79

$$\left\{\left\{y(x) \to -\sqrt{x\left(3x - 2e^{\frac{c_1}{2}}\right) - e^{\frac{c_1}{2}} + 2x}\right\}, \left\{y(x) \to \sqrt{x\left(3x - 2e^{\frac{c_1}{2}}\right) - e^{\frac{c_1}{2}} + 2x}\right\}\right\}$$

Maple ✓
cpu = 0.228 (sec), leaf count = 115

$$\left\{\ln(x) - \frac{1}{2}\int^{\frac{y(x)}{x}} \frac{1}{\_a\left(\_a^2 - 4\_a + 1\right)}\left(-2\_a^2 + \sqrt{2}\sqrt{\_a\left(\_a + 1\right)^2} + 4\_a\right) d\_a - \_C1 = 0, \ln(x) + \frac{1}{2}\int^{\frac{y(x)}{x}} \frac{}{\_a\left(\_a^2\right.}\right.$$

Mathematica raw input

```
DSolve[-2*x*y[x] + y[x]^2 + 6*x*y[x]*y'[x] + x*(x - 2*y[x])*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -E^(C[1]/2) + 2*x - Sqrt[x*(-2*E^(C[1]/2) + 3*x)]}, {y[x] -> -E^(C[1]/
2) + 2*x + Sqrt[x*(-2*E^(C[1]/2) + 3*x)]}}
```

Maple raw input

```
dsolve(x*(x-2*y(x))*diff(y(x),x)^2+6*x*y(x)*diff(y(x),x)-2*x*y(x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 0, ln(x)-1/2*Intat((-2*_a^2+2^(1/2)*(_a*(_a+1)^2)^(1/2)+4*_a)/_a/(_a^2-4*
_a+1),_a = y(x)/x)-_C1 = 0, ln(x)+1/2*Intat((2*_a^2+2^(1/2)*(_a*(_a+1)^2)^(1/2)-
4*_a)/_a/(_a^2-4*_a+1),_a = y(x)/x)-_C1 = 0
```

4.974 $y(x)^2 y'(x)^2 = a^2$

ODE

$$y(x)^2 y'(x)^2 = a^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.00769119 (sec), leaf count = 85

$$\left\{\left\{y(x) \to -\sqrt{2}\sqrt{c_1 - ax}\right\}, \left\{y(x) \to \sqrt{2}\sqrt{c_1 - ax}\right\}, \left\{y(x) \to -\sqrt{2}\sqrt{ax + c_1}\right\}, \left\{y(x) \to \sqrt{2}\sqrt{ax + c_1}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 29

$$\left\{-2\,ax + (y(x))^2 - \_C1 = 0, 2\,ax + (y(x))^2 - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]^2*y'[x]^2 == a^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2]*Sqrt[-(a*x) + C[1]])}, {y[x] -> Sqrt[2]*Sqrt[-(a*x) + C[1]]}
, {y[x] -> -(Sqrt[2]*Sqrt[a*x + C[1]])}, {y[x] -> Sqrt[2]*Sqrt[a*x + C[1]]}}
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^2 = a^2, y(x),'implicit')
```

Maple raw output

```
-2*a*x+y(x)^2-_C1 = 0, 2*a*x+y(x)^2-_C1 = 0
```

4.975 $-a^2 + y(x)^2 y'(x)^2 + y(x)^2 = 0$

ODE

$$-a^2 + y(x)^2 y'(x)^2 + y(x)^2 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✓
cpu = 0.0205655 (sec), leaf count = 89

$$\left\{\left\{y(x) \to -\sqrt{a^2 - (c_1 + x)^2}\right\}, \left\{y(x) \to \sqrt{a^2 - (c_1 + x)^2}\right\}, \left\{y(x) \to -\sqrt{a^2 - (x - c_1)^2}\right\}, \left\{y(x) \to \sqrt{a^2 - (x - c_1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.687 (sec), leaf count = 76

$$\left\{(y(x))^2 - a^2 = 0, x - (a - y(x))(a + y(x))\frac{1}{\sqrt{(a - y(x))(a + y(x))}} - \_C1 = 0, x + (a - y(x))(a + y(x))\frac{1}{\sqrt{(a - y(x))(}}\right.$$

Mathematica raw input

```
DSolve[-a^2 + y[x]^2 + y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[a^2 - (x + C[1])^2]}, {y[x] -> Sqrt[a^2 - (x + C[1])^2]}, {y[x]
-> -Sqrt[a^2 - (x - C[1])^2]}, {y[x] -> Sqrt[a^2 - (x - C[1])^2]}}
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^2-a^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-a^2 = 0, x+(a-y(x))*(a+y(x))/((a-y(x))*(a+y(x)))^(1/2)-_C1 = 0, x-(a-y(x)
)*(a+y(x))/((a-y(x))*(a+y(x)))^(1/2)-_C1 = 0
```

4.976 $y(x)^2y'(x)^2 - 3xy'(x) + y(x) = 0$

ODE

$$y(x)^2y'(x)^2 - 3xy'(x) + y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.167357 (sec), leaf count = 177

$$\left\{\left\{y(x) \to -\sqrt[3]{-2}\sqrt[3]{e^{c_1}(3x - 2e^{c_1})}\right\}, \left\{y(x) \to \sqrt[3]{6e^{c_1}x - 4e^{2c_1}}\right\}, \left\{y(x) \to (-1)^{2/3}\sqrt[3]{6e^{c_1}x - 4e^{2c_1}}\right\}, \left\{y(x) \to \frac{\sqrt[3]{-e^{c_1}(e^{c_1}}}{2^{2/3}}\right.\right.$$

Maple ✓
cpu = 14.78 (sec), leaf count = 62

$$\left\{(y(x))^3 - \frac{9x^2}{4} = 0, \ln(x) - \int^{y(x)x^{-\frac{2}{3}}} \frac{1}{8\_a^4 - 18\_a}\left(-12\_a^3 + 9\sqrt{-4\_a^3 + 9} + 27\right)d\_a - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x] - 3*x*y'[x] + y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-2)^(1/3)*(E^C[1]*(-2*E^C[1] + 3*x))^(1/3))}, {y[x] -> (-4*E^(2*C[1
]) + 6*E^C[1]*x)^(1/3)}, {y[x] -> (-1)^(2/3)*(-4*E^(2*C[1]) + 6*E^C[1]*x)^(1/3)}
, {y[x] -> (-(E^C[1]*(E^C[1] - 6*x)))^(1/3)/2^(2/3)}, {y[x] -> -(((-1)^(1/3)*(-(
E^C[1]*(E^C[1] - 6*x)))^(1/3))/2^(2/3))}, {y[x] -> (-1/2)^(2/3)*(-(E^C[1]*(E^C[1
] - 6*x)))^(1/3)}}
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^2-3*x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^3-9/4*x^2 = 0, ln(x)-Intat((-12*_a^3+9*(-4*_a^3+9)^(1/2)+27)/(8*_a^4-18*_a)
,_a = y(x)/x^(2/3))-_C1 = 0
```

4.977 $-6x^3y'(x)+4x^2y(x)+y(x)^2y'(x)^2=0$

ODE

$$-6x^3y'(x)+4x^2y(x)+y(x)^2y'(x)^2=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of variable

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 3.643 (sec), leaf count = 62

$$\left\{(y(x))^3-\frac{9x^4}{4}=0,\ln(x)-\int^{y(x)x^{-\frac{4}{3}}}\frac{1}{16\_a^4-36\_a}\left(-12\_a^3-9\sqrt{-4\_a^3+9}+27\right)d\_a-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[4*x^2*y[x] - 6*x^3*y'[x] + y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^2-6*x^3*diff(y(x),x)+4*x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^3-9/4*x^4 = 0, ln(x)-Intat((-12*_a^3-9*(-4*_a^3+9)^(1/2)+27)/(16*_a^4-36*_a
),_a = y(x)/x^(4/3))-_C1 = 0
```

4.978 $4a^2 - 4ay(x)y'(x) - 4ax + y(x)^2y'(x)^2 + y(x)^2 = 0$

ODE

$$4a^2 - 4ay(x)y'(x) - 4ax + y(x)^2y'(x)^2 + y(x)^2 = 0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(y)]`]]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.344704 (sec), leaf count = 85

$$\left\{\left\{y(x) \to -\frac{\sqrt{16a^3x - 4a^2x^2 - 4ac_1x - c_1^2}}{2a}\right\}, \left\{y(x) \to \frac{\sqrt{16a^3x - 4a^2x^2 - 4ac_1x - c_1^2}}{2a}\right\}\right\}$$

Maple ✓
cpu = 0.821 (sec), leaf count = 63

$$\left\{(y(x))^2 - 4ax = 0, [x(\_T) = \frac{1}{4a}\left((\_C1^2 + 4a^2)\sqrt{\_T^2 + 1} - 4\_C1\,\_T\,a\right)\frac{1}{\sqrt{\_T^2 + 1}}, y(\_T) = \_C1\frac{1}{\sqrt{\_T^2 + 1}}]\right\}$$

Mathematica raw input

```
DSolve[4*a^2 - 4*a*x + y[x]^2 - 4*a*y[x]*y'[x] + y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[16*a^3*x - 4*a^2*x^2 - 4*a*x*C[1] - C[1]^2]/(2*a)}, {y[x] -> Sqr
t[16*a^3*x - 4*a^2*x^2 - 4*a*x*C[1] - C[1]^2]/(2*a)}}
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^2-4*a*y(x)*diff(y(x),x)+4*a^2-4*a*x+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-4*a*x = 0, [x(_T) = 1/4*((_C1^2+4*a^2)*(_T^2+1)^(1/2)-4*_C1*_T*a)/(_T^2+1
)^(1/2)/a, y(_T) = _C1/(_T^2+1)^(1/2)]
```

4.979 $y(x)^2y'(x)^2-(x+1)y(x)y'(x)+x=0$

ODE

$$y(x)^2y'(x)^2-(x+1)y(x)y'(x)+x=0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00772254 (sec), leaf count = 72

$$\left\{\left\{y(x)\to -\sqrt{2}\sqrt{c_1+x}\right\},\left\{y(x)\to \sqrt{2}\sqrt{c_1+x}\right\},\left\{y(x)\to -\sqrt{2c_1+x^2}\right\},\left\{y(x)\to \sqrt{2c_1+x^2}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 29

$$\left\{-x^2+(y(x))^2-\_C1=0,(y(x))^2-\_C1-2x=0\right\}$$

Mathematica raw input

```
DSolve[x - (1 + x)*y[x]*y'[x] + y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2]*Sqrt[x + C[1]])}, {y[x] -> Sqrt[2]*Sqrt[x + C[1]]}, {y[x] ->
  -Sqrt[x^2 + 2*C[1]]}, {y[x] -> Sqrt[x^2 + 2*C[1]]}}
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^2-(1+x)*y(x)*diff(y(x),x)+x = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-_C1-2*x = 0, -x^2+y(x)^2-_C1 = 0
```

4.980 $x^2 + 2xy(x)y'(x) + y(x)^2y'(x)^2 = 0$

ODE

$$x^2 + 2xy(x)y'(x) + y(x)^2y'(x)^2 = 0$$

ODE Classification

[_separable]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right) = 0$, Solve for p

Mathematica ✓
cpu = 0.00560008 (sec), leaf count = 39

$$\left\{\left\{y(x) \to -\sqrt{2c_1 - x^2}\right\}, \left\{y(x) \to \sqrt{2c_1 - x^2}\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 14

$$\left\{x^2 + (y(x))^2 - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2 + 2*x*y[x]*y'[x] + y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-x^2 + 2*C[1]]}, {y[x] -> Sqrt[-x^2 + 2*C[1]]}}
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+x^2 = 0, y(x),'implicit')
```

Maple raw output

```
x^2+y(x)^2-_C1 = 0
```

4.981 $a + y(x)^2 y'(x)^2 + 2xy(x)y'(x) - y(x)^2 = 0$

ODE

$$a + y(x)^2 y'(x)^2 + 2xy(x)y'(x) - y(x)^2 = 0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(y)]`]]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.461299 (sec), leaf count = 41

$$\left\{\left\{y(x) \to -\sqrt{a + c_1 (c_1 - 2x)}\right\}, \left\{y(x) \to \sqrt{a + c_1 (c_1 - 2x)}\right\}\right\}$$

Maple ✓
cpu = 6. (sec), leaf count = 522

$$\left\{(y(x))^2 + x^2 - a = 0, \int_{\_b}^{x} 1\left(\_a - \sqrt{\_a^2 + (y(x))^2 - a}\right)\left(\left(2\_a^2 + (y(x))^2 - 2a\right)\sqrt{\_a^2 + (y(x))^2 - a} + 2\_a\left(-\_a^2 -\right.\right.\right.$$

Mathematica raw input

```
DSolve[a - y[x]^2 + 2*x*y[x]*y'[x] + y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[a + C[1]*(-2*x + C[1])]}, {y[x] -> Sqrt[a + C[1]*(-2*x + C[1])]}
}
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+a-y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+x^2-a = 0, Int((_a+(_a^2+y(x)^2-a)^(1/2))/((-2*_a^2-y(x)^2+2*a)*(_a^2+y(x
)^2-a)^(1/2)+2*_a*(-_a^2-y(x)^2+a)),_a = _b .. x)+Intat(_f/(-2*(_f^2+x^2-a)^(1/2
)*x^2-(_f^2+x^2-a)^(1/2)*_f^2-2*x^3-2*x*_f^2+2*(_f^2+x^2-a)^(1/2)*a+2*a*x)-Int(1
/4*(-_f^3*_a/(_a^2+_f^2-a)^(1/2)+4*(_a+1/2*(_a^2+_f^2-a)^(1/2))*(_a+(_a^2+_f^2-a
)^(1/2))*_f)/((-_a^2-1/2*_f^2+a)*(_a^2+_f^2-a)^(1/2)+_a*(-_a^2-_f^2+a))^2,_a = _
```

```
b .. x),_f = y(x))+_C1 = 0, Int((_a-(_a^2+y(x)^2-a)^(1/2))/((2*_a^2+y(x)^2-2*a)*
(_a^2+y(x)^2-a)^(1/2)+2*_a*(-_a^2-y(x)^2+a)),_a = _b .. x)+Intat(-_f/(-2*(_f^2+x
^2-a)^(1/2)*x^2-(_f^2+x^2-a)^(1/2)*_f^2+2*x^3+2*x*_f^2+2*(_f^2+x^2-a)^(1/2)*a-2*
a*x)-Int(1/4*(_f^3*_a/(_a^2+_f^2-a)^(1/2)+4*(_a-1/2*(_a^2+_f^2-a)^(1/2))*_f*(_a-
(_a^2+_f^2-a)^(1/2)))/((_a^2+1/2*_f^2-a)*(_a^2+_f^2-a)^(1/2)+_a*(-_a^2-_f^2+a))^
2,_a = _b .. x),_f = y(x))+_C1 = 0
```

4.982 $-x^2 - 2xy(x)y'(x) + y(x)^2y'(x)^2 + 2y(x)^2 = 0$

ODE

$$-x^2 - 2xy(x)y'(x) + y(x)^2y'(x)^2 + 2y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Change of variable

Mathematica ✗
cpu = 600.528 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.536 (sec), leaf count = 105

$$\left\{(y(x))^2 - x^2 = 0, \ln(x) - Artanh\left(\frac{\sqrt{2}}{2}\sqrt{\frac{x^2-(y(x))^2}{x^2}}\right) + \frac{1}{2}\ln\left(\frac{x^2+(y(x))^2}{x^2}\right) - \_C1 = 0, \ln(x) + Artanh\left(\frac{\sqrt{2}}{2}\sqrt{x^2\right.\right.$$

Mathematica raw input

```
DSolve[-x^2 + 2*y[x]^2 - 2*x*y[x]*y'[x] + y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)-x^2+2*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-x^2 = 0, ln(x)-arctanh(1/2*2^(1/2)*((x^2-y(x)^2)/x^2)^(1/2))+1/2*ln((x^2+
y(x)^2)/x^2)-_C1 = 0, ln(x)+arctanh(1/2*2^(1/2)*((x^2-y(x)^2)/x^2)^(1/2))+1/2*ln
((x^2+y(x)^2)/x^2)-_C1 = 0
```

4.983 $a - x^2 - 2xy(x)y'(x) + y(x)^2y'(x)^2 + 2y(x)^2 = 0$

ODE

$$a - x^2 - 2xy(x)y'(x) + y(x)^2y'(x)^2 + 2y(x)^2 = 0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(y)]`]]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.570202 (sec), leaf count = 63

$$\left\{\left\{y(x) \to -\sqrt{-\frac{a}{2} + 4c_1x - 2c_1^2 - x^2}\right\}, \left\{y(x) \to \sqrt{-\frac{a}{2} + 4c_1x - 2c_1^2 - x^2}\right\}\right\}$$

Maple ✓
cpu = 0.41 (sec), leaf count = 108

$$\left\{(y(x))^2 - x^2 + \frac{a}{2} = 0, [x(\_T) = 1\left(\sqrt{2\_C1^2 + a}\sqrt{\_T^2 + 1} - \_C1\,\_T\right)\frac{1}{\sqrt{\_T^2 + 1}}, y(\_T) = \_C1\frac{1}{\sqrt{\_T^2 + 1}}], [x(\_1\right.$$

Mathematica raw input

```
DSolve[a - x^2 + 2*y[x]^2 - 2*x*y[x]*y'[x] + y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-a/2 - x^2 + 4*x*C[1] - 2*C[1]^2]}, {y[x] -> Sqrt[-a/2 - x^2 + 4
*x*C[1] - 2*C[1]^2]}}
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)+a-x^2+2*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-x^2+1/2*a = 0, [x(_T) = -((2*_C1^2+a)^(1/2)*(_T^2+1)^(1/2)+_C1*_T)/(_T^2+
1)^(1/2), y(_T) = _C1/(_T^2+1)^(1/2)], [x(_T) = ((2*_C1^2+a)^(1/2)*(_T^2+1)^(1/2
)-_C1*_T)/(_T^2+1)^(1/2), y(_T) = _C1/(_T^2+1)^(1/2)]
```

4.984 $(a-1)b+ax^2+2axy(x)y'(x)+(1-a)y(x)^2+y(x)^2y'(x)^2=0$

ODE

$$(a-1)b+ax^2+2axy(x)y'(x)+(1-a)y(x)^2+y(x)^2y'(x)^2=0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(y)]`]]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right)=0$, Solve for x

Mathematica ✓
cpu = 0.955333 (sec), leaf count = 65

$$\left\{\left\{y(x)\to -\sqrt{-2(a-1)c_1x+(a-1)c_1^2+b-x^2}\right\},\left\{y(x)\to \sqrt{-2(a-1)c_1x+(a-1)c_1^2+b-x^2}\right\}\right\}$$

Maple ✓
cpu = 1.638 (sec), leaf count = 126

$$\left\{(y(x))^2+ax^2-b=0,[x(\_T)=\frac{1}{a}\left(-\_C1\,\_T\,a+\sqrt{\left(\_C1^2-b\right)(a-1)\,a}\sqrt{\_T^2+1}\right)\frac{1}{\sqrt{\_T^2+1}},y(\_T)=\_C1\frac{}{\sqrt{\_}}\right.$$

Mathematica raw input

```
DSolve[(-1 + a)*b + a*x^2 + (1 - a)*y[x]^2 + 2*a*x*y[x]*y'[x] + y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[b - x^2 - 2*(-1 + a)*x*C[1] + (-1 + a)*C[1]^2]}, {y[x] -> Sqrt[b
 - x^2 - 2*(-1 + a)*x*C[1] + (-1 + a)*C[1]^2]}}
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^2+2*a*x*y(x)*diff(y(x),x)+(a-1)*b+a*x^2+(1-a)*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+a*x^2-b = 0, [x(_T) = (-_C1*_T*a+((_C1^2-b)*(a-1)*a)^(1/2)*(_T^2+1)^(1/2)
)/(_T^2+1)^(1/2)/a, y(_T) = _C1/(_T^2+1)^(1/2)], [x(_T) = -(_C1*_T*a+((_C1^2-b)*
(a-1)*a)^(1/2)*(_T^2+1)^(1/2))/(_T^2+1)^(1/2)/a, y(_T) = _C1/(_T^2+1)^(1/2)]
```

4.985 $(1-y(x)^2)\,y'(x)^2=1$

ODE

$$(1-y(x)^2)\,y'(x)^2=1$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0534169 (sec), leaf count = 69

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{1}{2}\left(\#1\sqrt{1-\#1^2}+\sin^{-1}(\#1)\right)\&\right][c_1-x]\right\},\left\{y(x)\to \text{InverseFunction}\left[\frac{1}{2}\left(\#1\sqrt{1-\#1^2}+\text{s}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.449 (sec), leaf count = 53

$$\left\{x-\frac{y(x)}{2}\sqrt{1-(y(x))^2}-\frac{\arcsin(y(x))}{2}-\_C1=0,x+\frac{y(x)}{2}\sqrt{1-(y(x))^2}+\frac{\arcsin(y(x))}{2}-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(1 - y[x]^2)*y'[x]^2 == 1,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(ArcSin[#1] + #1*Sqrt[1 - #1^2])/2 & ][-x + C[1]]}, {y
[x] -> InverseFunction[(ArcSin[#1] + #1*Sqrt[1 - #1^2])/2 & ][x + C[1]]}}
```

Maple raw input

```
dsolve((1-y(x)^2)*diff(y(x),x)^2 = 1, y(x),'implicit')
```

Maple raw output

```
x-1/2*y(x)*(1-y(x)^2)^(1/2)-1/2*arcsin(y(x))-_C1 = 0, x+1/2*y(x)*(1-y(x)^2)^(1/2
)+1/2*arcsin(y(x))-_C1 = 0
```

4.986 $(a^2 - y(x)^2)\, y'(x)^2 = y(x)^2$

ODE

$$(a^2 - y(x)^2)\, y'(x)^2 = y(x)^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.264288 (sec), leaf count = 111

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\sqrt{a^2-\#1^2} - a\log\left(a\sqrt{a^2-\#1^2}+a^2\right) + a\log(\#1)\&\right][c_1 - x]\right\}, \left\{y(x) \to \text{InverseFunction}\right.\right.$$

Maple ✓
cpu = 0.497 (sec), leaf count = 122

$$\left\{x - \sqrt{a^2-(y(x))^2} + a^2\ln\left(\frac{1}{y(x)}\left(2a^2 + 2\sqrt{a^2}\sqrt{a^2-(y(x))^2}\right)\right)\frac{1}{\sqrt{a^2}} - \_C1 = 0, x + \sqrt{a^2-(y(x))^2} - a^2\ln\left(\frac{1}{y(x)}\right.\right.$$

Mathematica raw input

```
DSolve[(a^2 - y[x]^2)*y'[x]^2 == y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[a*Log[#1] - a*Log[a^2 + a*Sqrt[a^2 - #1^2]] + Sqrt[a^2
 - #1^2] & ][-x + C[1]]}, {y[x] -> InverseFunction[a*Log[#1] - a*Log[a^2 + a*Sqr
t[a^2 - #1^2]] + Sqrt[a^2 - #1^2] & ][x + C[1]]}}
```

Maple raw input

```
dsolve((a^2-y(x)^2)*diff(y(x),x)^2 = y(x)^2, y(x),'implicit')
```

Maple raw output

```
x-(a^2-y(x)^2)^(1/2)+a^2/(a^2)^(1/2)*ln((2*a^2+2*(a^2)^(1/2)*(a^2-y(x)^2)^(1/2))
/y(x))-_C1 = 0, x+(a^2-y(x)^2)^(1/2)-a^2/(a^2)^(1/2)*ln((2*a^2+2*(a^2)^(1/2)*(a^
2-y(x)^2)^(1/2))/y(x))-_C1 = 0
```

4.987 $\left(a^2-2axy(x)+y(x)^2\right)y'(x)^2+2ay(x)y'(x)+y(x)^2=0$

ODE

$$\left(a^2-2axy(x)+y(x)^2\right)y'(x)^2+2ay(x)y'(x)+y(x)^2=0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 26.573 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]^2 + 2*a*y[x]*Derivative[1][y][x] + (a^2 - 2*a*x*y[x] + y[x]^2)*Derivative[1][y][x]^2 == 0
```

Maple ✗
cpu = 23.999 (sec), leaf count = 0 , could not solve

```
dsolve((a^2-2*a*x*y(x)+y(x)^2)*diff(y(x),x)^2+2*a*y(x)*diff(y(x),x)+y(x)^2 = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y[x]^2 + 2*a*y[x]*y'[x] + (a^2 - 2*a*x*y[x] + y[x]^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]^2 + 2*a*y[x]*Derivative[1][y][x] + (a^2 - 2*a*x*y[x] + y[x]^2)*Deriv
ative[1][y][x]^2 == 0, y[x], x]
```

Maple raw input

```
dsolve((a^2-2*a*x*y(x)+y(x)^2)*diff(y(x),x)^2+2*a*y(x)*diff(y(x),x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
dsolve((a^2-2*a*x*y(x)+y(x)^2)*diff(y(x),x)^2+2*a*y(x)*diff(y(x),x)+y(x)^2 = 0,
y(x),'implicit')
```

4.988 $(a^2x^2 - y(x)^2)\,y'(x)^2 + (a^2-1)\,x^2 - 2xy(x)y'(x) = 0$

ODE

$$(a^2x^2 - y(x)^2)\,y'(x)^2 + (a^2-1)\,x^2 - 2xy(x)y'(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✗
cpu = 601.706 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.652 (sec), leaf count = 160

$$\left\{-a^2x^2 + (y(x))^2 + x^2 = 0, \ln(x) - \int^{\frac{y(x)}{x}} \frac{1}{(\_a^2+1)(-\_a^2+a^2-1)}\left(-\_a\,a^2 + \_a^3 + \_a - \sqrt{\_a^2a^2 - a^4 + a^2}\right)d\_a -\right.$$

Mathematica raw input

```
DSolve[(-1 + a^2)*x^2 - 2*x*y[x]*y'[x] + (a^2*x^2 - y[x]^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((a^2*x^2-y(x)^2)*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)+(a^2-1)*x^2 = 0, y(x),'implicit')
```

Maple raw output

```
-a^2*x^2+y(x)^2+x^2 = 0, ln(x)-Intat((-_a*a^2+_a^3+_a-(_a^2*a^2-a^4+a^2)^(1/2))/
(_a^2+1)/(-_a^2+a^2-1),_a = y(x)/x)-_C1 = 0, ln(x)+Intat((_a*a^2-_a^3-_a-(_a^2*a
^2-a^4+a^2)^(1/2))/(_a^2+1)/(-_a^2+a^2-1),_a = y(x)/x)-_C1 = 0
```

4.989 $((1-a)x^2+y(x)^2)\,y'(x)^2+2axy(x)y'(x)+(1-a)y(x)^2+x^2=0$

ODE

$$((1-a)x^2+y(x)^2)\,y'(x)^2+2axy(x)y'(x)+(1-a)y(x)^2+x^2=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right)=0$, Solve for p

Mathematica ✓
cpu = 0.149732 (sec), leaf count = 79

$$\left\{\text{Solve}\left[\sqrt{a-1}\tan^{-1}\left(\frac{y(x)}{x}\right)=c_1+\frac{1}{2}\log\left(\frac{y(x)^2}{x^2}+1\right)+\log(x), y(x)\right], \text{Solve}\left[\sqrt{a-1}\tan^{-1}\left(\frac{y(x)}{x}\right)+\frac{1}{2}\log\left(\frac{y(x)^2}{x^2}+1\right.\right.\right.$$

Maple ✓
cpu = 0.322 (sec), leaf count = 74

$$\left\{\ln(x)+\frac{1}{2}\ln\left(\frac{x^2+(y(x))^2}{x^2}\right)-\sqrt{a-1}\arctan\left(\frac{y(x)}{x}\right)-\_C1=0, \ln(x)+\frac{1}{2}\ln\left(\frac{x^2+(y(x))^2}{x^2}\right)+\sqrt{a-1}\arctan\left(\frac{y(x)}{x}\right.\right.$$

Mathematica raw input

```
DSolve[x^2 + (1 - a)*y[x]^2 + 2*a*x*y[x]*y'[x] + ((1 - a)*x^2 + y[x]^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[Sqrt[-1 + a]*ArcTan[y[x]/x] == C[1] + Log[x] + Log[1 + y[x]^2/x^2]/2, y[x
]], Solve[Sqrt[-1 + a]*ArcTan[y[x]/x] + Log[x] + Log[1 + y[x]^2/x^2]/2 == C[1],
y[x]]}
```

Maple raw input

```
dsolve(((1-a)*x^2+y(x)^2)*diff(y(x),x)^2+2*a*x*y(x)*diff(y(x),x)+x^2+(1-a)*y(x)^2 = 0, y(x),'implicit
```

Maple raw output

```
ln(x)+1/2*ln((x^2+y(x)^2)/x^2)-(a-1)^(1/2)*arctan(y(x)/x)-_C1 = 0, ln(x)+1/2*ln(
(x^2+y(x)^2)/x^2)+(a-1)^(1/2)*arctan(y(x)/x)-_C1 = 0
```

4.990 $\left(\left(1-4a^2\right)x^2+y(x)^2\right)y'(x)^2-8a^2xy(x)y'(x)+\left(1-4a^2\right)y(x)^2+x^2=0$

ODE

$$\left(\left(1-4a^2\right)x^2+y(x)^2\right)y'(x)^2-8a^2xy(x)y'(x)+\left(1-4a^2\right)y(x)^2+x^2=0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x},y'\right)=0$, Solve for p

Mathematica ✓
cpu = 0.391856 (sec), leaf count = 317

$$\left\{\text{Solve}\left[c_1=\text{RootSum}\left[-\#1^3+\#1^2\sqrt{2a-1}\sqrt{2a+1}+8\#1a^2-\#1+\sqrt{2a-1}\sqrt{2a+1}\&,\frac{-\#1^2\log\left(\frac{y(x)}{x}-\#1\right)+4a^2\right.\right.\right.$$
$$\left.\left.\left.-3\#1^2+2\#1\sqrt{2a}\right.\right.\right.$$

Maple ✓
cpu = 0.544 (sec), leaf count = 137

$$\left\{\ln(x)+\int^{\frac{y(x)}{x}}\frac{1}{\_a^4-16\_a^2a^2+2\_a^2+1}\left(\_a^3-8\_a\,a^2+\sqrt{\left(\_a^2+1\right)^2\left(4a^2-1\right)}+\_a\right)d\_a-\_C1=0,\ln(x)-\int\right.$$

Mathematica raw input

```
DSolve[x^2 + (1 - 4*a^2)*y[x]^2 - 8*a^2*x*y[x]*y'[x] + ((1 - 4*a^2)*x^2 + y[x]^2)*y'[x]^2 == 0,y[x],x
```

Mathematica raw output

```
{Solve[C[1] == Log[x] + RootSum[Sqrt[-1 + 2*a]*Sqrt[1 + 2*a] - #1 + 8*a^2*#1 + S
qrt[-1 + 2*a]*Sqrt[1 + 2*a]*#1^2 - #1^3 & , (-Log[-#1 + y[x]/x] + 4*a^2*Log[-#1
+ y[x]/x] - Log[-#1 + y[x]/x]*#1^2)/(-1 + 8*a^2 + 2*Sqrt[-1 + 2*a]*Sqrt[1 + 2*a]
*#1 - 3*#1^2) & ], y[x]], Solve[C[1] == Log[x] + RootSum[Sqrt[-1 + 2*a]*Sqrt[1 +
 2*a] + #1 - 8*a^2*#1 + Sqrt[-1 + 2*a]*Sqrt[1 + 2*a]*#1^2 + #1^3 & , (-Log[-#1 +
 y[x]/x] + 4*a^2*Log[-#1 + y[x]/x] - Log[-#1 + y[x]/x]*#1^2)/(-1 + 8*a^2 - 2*Sqr
t[-1 + 2*a]*Sqrt[1 + 2*a]*#1 - 3*#1^2) & ], y[x]]}
```

Maple raw input

```
dsolve(((-4*a^2+1)*x^2+y(x)^2)*diff(y(x),x)^2-8*a^2*x*y(x)*diff(y(x),x)+x^2+(-4*a^2+1)*y(x)^2 = 0, y(
```

Maple raw output

```
ln(x)-Intat((-8*_a*a^2+_a^3+_a-((_a^2+1)^2*(4*a^2-1))^(1/2))/(-1-_a^4+(16*a^2-2)
*_a^2),_a = y(x)/x)-_C1 = 0, ln(x)+Intat((_a^3-8*_a*a^2+((_a^2+1)^2*(4*a^2-1))^(
1/2)+_a)/(_a^4-16*_a^2*a^2+2*_a^2+1),_a = y(x)/x)-_C1 = 0
```

4.991 $((1-a^2)x^2+y(x)^2)y'(x)^2+2a^2xy(x)y'(x)+(1-a^2)y(x)^2+x^2=0$

ODE

$$((1-a^2)x^2+y(x)^2)y'(x)^2+2a^2xy(x)y'(x)+(1-a^2)y(x)^2+x^2=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right)=0$, Solve for p

Mathematica ✓
cpu = 0.176591 (sec), leaf count = 93

$$\left\{\text{Solve}\left[\sqrt{a-1}\sqrt{a+1}\tan^{-1}\left(\frac{y(x)}{x}\right)=c_1+\frac{1}{2}\log\left(\frac{y(x)^2}{x^2}+1\right)+\log(x),y(x)\right],\text{Solve}\left[\sqrt{a-1}\sqrt{a+1}\tan^{-1}\left(\frac{y(x)}{x}\right)+\frac{1}{2}\right.\right.$$

Maple ✓
cpu = 0.545 (sec), leaf count = 78

$$\left\{\ln(x)+\frac{1}{2}\ln\left(\frac{x^2+(y(x))^2}{x^2}\right)-\sqrt{a^2-1}\arctan\left(\frac{y(x)}{x}\right)-\_C1=0,\ln(x)+\frac{1}{2}\ln\left(\frac{x^2+(y(x))^2}{x^2}\right)+\sqrt{a^2-1}\arctan\left(\frac{y}{}\right.\right.$$

Mathematica raw input

```
DSolve[x^2 + (1 - a^2)*y[x]^2 + 2*a^2*x*y[x]*y'[x] + ((1 - a^2)*x^2 + y[x]^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[Sqrt[-1 + a]*Sqrt[1 + a]*ArcTan[y[x]/x] == C[1] + Log[x] + Log[1 + y[x]^2
/x^2]/2, y[x]], Solve[Sqrt[-1 + a]*Sqrt[1 + a]*ArcTan[y[x]/x] + Log[x] + Log[1 +
 y[x]^2/x^2]/2 == C[1], y[x]]}
```

Maple raw input

```
dsolve(((-a^2+1)*x^2+y(x)^2)*diff(y(x),x)^2+2*a^2*x*y(x)*diff(y(x),x)+x^2+(-a^2+1)*y(x)^2 = 0, y(x),
```

Maple raw output

```
ln(x)+1/2*ln((x^2+y(x)^2)/x^2)-(a^2-1)^(1/2)*arctan(y(x)/x)-_C1 = 0, ln(x)+1/2*l
n((x^2+y(x)^2)/x^2)+(a^2-1)^(1/2)*arctan(y(x)/x)-_C1 = 0
```

4.992 $(y(x)+x)^2 y'(x)^2 = y(x)^2$

ODE

$$(y(x)+x)^2 y'(x)^2 = y(x)^2$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0423201 (sec), leaf count = 64

$$\left\{\left\{y(x)\to -\sqrt{e^{2c_1}+x^2}-x\right\},\left\{y(x)\to \sqrt{e^{2c_1}+x^2}-x\right\},\left\{y(x)\to \frac{x}{W\left(e^{-c_1}x\right)}\right\}\right\}$$

Maple ✓
cpu = 0.189 (sec), leaf count = 29

$$\left\{x-(\ln(y(x))+\_C1)\,y(x)=0, x+\frac{y(x)}{2}-\frac{\_C1}{y(x)}=0\right\}$$

Mathematica raw input

```
DSolve[(x + y[x])^2*y'[x]^2 == y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x - Sqrt[E^(2*C[1]) + x^2]}, {y[x] -> -x + Sqrt[E^(2*C[1]) + x^2]}, {
y[x] -> x/ProductLog[x/E^C[1]]}}
```

Maple raw input

```
dsolve((x+y(x))^2*diff(y(x),x)^2 = y(x)^2, y(x),'implicit')
```

Maple raw output

```
x-(ln(y(x))+_C1)*y(x) = 0, x+1/2*y(x)-1/y(x)*_C1 = 0
```

4.993 $-(x^2 - xy(x) - 2y(x)^2)\,y'(x) + (y(x) + x)^2 y'(x)^2 - (x - y(x))y(x) = 0$

ODE

$$-(x^2 - xy(x) - 2y(x)^2)\,y'(x) + (y(x) + x)^2 y'(x)^2 - (x - y(x))y(x) = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0493886 (sec), leaf count = 97

$$\left\{\left\{y(x) \to -\sqrt{e^{2c_1} + x^2} - x\right\}, \left\{y(x) \to \sqrt{e^{2c_1} + x^2} - x\right\}, \left\{y(x) \to -\sqrt{e^{2c_1} + 2x^2} - x\right\}, \left\{y(x) \to \sqrt{e^{2c_1} + 2x^2} - x\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 48

$$\left\{x + \frac{y(x)}{2} - \frac{\_C1}{y(x)} = 0, -\frac{1}{2}\ln\left(\frac{-x^2 + 2\,xy(x) + (y(x))^2}{x^2}\right) - \ln(x) - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[-((x - y[x])*y[x]) - (x^2 - x*y[x] - 2*y[x]^2)*y'[x] + (x + y[x])^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x - Sqrt[E^(2*C[1]) + x^2]}, {y[x] -> -x + Sqrt[E^(2*C[1]) + x^2]}, {
y[x] -> -x - Sqrt[E^(2*C[1]) + 2*x^2]}, {y[x] -> -x + Sqrt[E^(2*C[1]) + 2*x^2]}}
```

Maple raw input

```
dsolve((x+y(x))^2*diff(y(x),x)^2-(x^2-x*y(x)-2*y(x)^2)*diff(y(x),x)-(x-y(x))*y(x) = 0, y(x),'implicit
```

Maple raw output

```
x+1/2*y(x)-1/y(x)*_C1 = 0, -1/2*ln((-x^2+2*x*y(x)+y(x)^2)/x^2)-ln(x)-_C1 = 0
```

4.994 $2a^2y'(x) + (a^2 - (x - y(x))^2)\, y'(x)^2 + a^2 - (x - y(x))^2 = 0$

ODE

$$2a^2y'(x) + (a^2 - (x - y(x))^2)\, y'(x)^2 + a^2 - (x - y(x))^2 = 0$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 94.1786 (sec), leaf count = 53

$$\left\{\left\{y(x) \to c_1 - \sqrt{a^2 - (x - c_1)^2}\right\}, \left\{y(x) \to \sqrt{a^2 - (x - c_1)^2} + c_1\right\}\right\}$$

Maple ✓
cpu = 0.415 (sec), leaf count = 137

$$\left\{x - \int^{y(x)-x} \frac{1}{-2\_a^2 + 4a^2}\left(-2a^2 + \_a^2 - \sqrt{-\_a^4 + 2\_a^2a^2}\right)d\_a - \_C1 = 0, x - \int^{y(x)-x} \frac{1}{-2\_a^2 + 4a^2}\left(-2a^2 + \_\right.\right.$$

Mathematica raw input

```
DSolve[a^2 - (x - y[x])^2 + 2*a^2*y'[x] + (a^2 - (x - y[x])^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[a^2 - (x - C[1])^2] + C[1]}, {y[x] -> Sqrt[a^2 - (x - C[1])^2] +
  C[1]}}
```

Maple raw input

```
dsolve((a^2-(x-y(x))^2)*diff(y(x),x)^2+2*a^2*diff(y(x),x)+a^2-(x-y(x))^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-2*x*y(x)-2*a^2+x^2 = 0, x-Intat((-2*a^2+_a^2+(-_a^4+2*_a^2*a^2)^(1/2))/(-
2*_a^2+4*a^2),_a = y(x)-x)-_C1 = 0, x-Intat((-2*a^2+_a^2-(-_a^4+2*_a^2*a^2)^(1/2
))/(-2*_a^2+4*a^2),_a = y(x)-x)-_C1 = 0
```

4.995 $x^2+2xy(x)y'(x)+2y(x)^2y'(x)^2+y(x)^2-1=0$

ODE

$$x^2+2xy(x)y'(x)+2y(x)^2y'(x)^2+y(x)^2-1=0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(y)]`]]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.452344 (sec), leaf count = 57

$$\left\{\left\{y(x)\to -\sqrt{c_1 x-\frac{c_1^2}{2}-x^2+1}\right\},\left\{y(x)\to \sqrt{c_1 x-\frac{c_1^2}{2}-x^2+1}\right\}\right\}$$

Maple ✓
cpu = 0.256 (sec), leaf count = 106

$$\left\{(y(x))^2+\frac{x^2}{2}-1=0,[x(\_T)=1\left(\sqrt{-\_C1^2+1}\sqrt{\_T^2+1}-\_C1\,\_T\right)\frac{1}{\sqrt{\_T^2+1}},y(\_T)=\_C1\frac{1}{\sqrt{\_T^2+1}}],[x(\_$$

Mathematica raw input

```
DSolve[-1 + x^2 + y[x]^2 + 2*x*y[x]*y'[x] + 2*y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[1 - x^2 + x*C[1] - C[1]^2/2]}, {y[x] -> Sqrt[1 - x^2 + x*C[1] -
C[1]^2/2]}}
```

Maple raw input

```
dsolve(2*y(x)^2*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)-1+x^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+1/2*x^2-1 = 0, [x(_T) = -((-_C1^2+1)^(1/2)*(_T^2+1)^(1/2)+_C1*_T)/(_T^2+1
)^(1/2), y(_T) = _C1/(_T^2+1)^(1/2)], [x(_T) = ((-_C1^2+1)^(1/2)*(_T^2+1)^(1/2)-
_C1*_T)/(_T^2+1)^(1/2), y(_T) = _C1/(_T^2+1)^(1/2)]
```

4.996 $-x^2 - 2xy(x)y'(x) + 3y(x)^2y'(x)^2 + 4y(x)^2 = 0$

ODE

$$-x^2 - 2xy(x)y'(x) + 3y(x)^2y'(x)^2 + 4y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right) = 0$, Solve for x

Mathematica ✓
cpu = 0.188695 (sec), leaf count = 203

$$\left\{\left\{y(x) \to -\frac{\sqrt{-4ix\sinh(3c_1) - 4ix\cosh(3c_1) + \sinh(6c_1) + \cosh(6c_1) - 3x^2}}{\sqrt{3}}\right\}, \left\{y(x) \to \frac{\sqrt{-4ix\sinh(3c_1) - 4ix\cosh(3}\right.$$

Maple ✓
cpu = 0.705 (sec), leaf count = 197

$$\left\{(y(x))^2 - \frac{x^2}{3} = 0, \ln(x) - \frac{\sqrt{3}}{6}\sqrt{\frac{\left(\sqrt{3}x - 3y(x)\right)\left(\sqrt{3}x + 3y(x)\right)}{x^2}} + \frac{1}{2}\sqrt{\frac{x^2 - 3\left(y(x)\right)^2}{x^2}} - Artanh\left(\frac{1}{2}\sqrt{\frac{x^2 - 3\left(y(x)\right)^2}{x^2}}\right)\right.$$

Mathematica raw input

```
DSolve[-x^2 + 4*y[x]^2 - 2*x*y[x]*y'[x] + 3*y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-3*x^2 - (4*I)*x*Cosh[3*C[1]] + Cosh[6*C[1]] - (4*I)*x*Sinh[3*C
[1]] + Sinh[6*C[1]]]/Sqrt[3])}, {y[x] -> Sqrt[-3*x^2 - (4*I)*x*Cosh[3*C[1]] + Co
sh[6*C[1]] - (4*I)*x*Sinh[3*C[1]] + Sinh[6*C[1]]]/Sqrt[3]}, {y[x] -> -(Sqrt[-3*x
^2 + (4*I)*x*Cosh[3*C[1]] + Cosh[6*C[1]] + (4*I)*x*Sinh[3*C[1]] + Sinh[6*C[1]]]/
Sqrt[3])}, {y[x] -> Sqrt[-3*x^2 + (4*I)*x*Cosh[3*C[1]] + Cosh[6*C[1]] + (4*I)*x*
Sinh[3*C[1]] + Sinh[6*C[1]]]/Sqrt[3]}}
```

Maple raw input

```
dsolve(3*y(x)^2*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)-x^2+4*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-1/3*x^2 = 0, ln(x)-1/6*3^(1/2)*((3^(1/2)*x-3*y(x))*(3^(1/2)*x+3*y(x))/x^2
)^(1/2)+1/2*((x^2-3*y(x)^2)/x^2)^(1/2)-arctanh(1/2*((x^2-3*y(x)^2)/x^2)^(1/2))+1
/2*ln((x^2+y(x)^2)/x^2)-_C1 = 0, ln(x)+1/6*3^(1/2)*((3^(1/2)*x-3*y(x))*(3^(1/2)*
x+3*y(x))/x^2)^(1/2)-1/2*((x^2-3*y(x)^2)/x^2)^(1/2)+arctanh(1/2*((x^2-3*y(x)^2)/
x^2)^(1/2))+1/2*ln((x^2+y(x)^2)/x^2)-_C1 = 0
```

4.997 $3x^3 + 2(3x+1)xy(x)y'(x) + 4y(x)^2y'(x)^2 = 0$

ODE

$$3x^3 + 2(3x+1)xy(x)y'(x) + 4y(x)^2y'(x)^2 = 0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0086825 (sec), leaf count = 81

$$\left\{\left\{y(x) \to -\sqrt{2c_1 - x^3}\right\}, \left\{y(x) \to \sqrt{2c_1 - x^3}\right\}, \left\{y(x) \to -\sqrt{2c_1 - \frac{x^2}{2}}\right\}, \left\{y(x) \to \sqrt{2c_1 - \frac{x^2}{2}}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 29

$$\left\{x^3 + (y(x))^2 - \_C1 = 0, (y(x))^2 + \frac{x^2}{2} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[3*x^3 + 2*x*(1 + 3*x)*y[x]*y'[x] + 4*y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-x^3 + 2*C[1]]}, {y[x] -> Sqrt[-x^3 + 2*C[1]]}, {y[x] -> -Sqrt[-
x^2/2 + 2*C[1]]}, {y[x] -> Sqrt[-x^2/2 + 2*C[1]]}}
```

Maple raw input

```
dsolve(4*y(x)^2*diff(y(x),x)^2+2*(1+3*x)*x*y(x)*diff(y(x),x)+3*x^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+1/2*x^2-_C1 = 0, x^3+y(x)^2-_C1 = 0
```

4.998 $(x^2-4y(x)^2)\,y'(x)^2-4x^2+6xy(x)y'(x)+y(x)^2=0$

ODE

$$(x^2-4y(x)^2)\,y'(x)^2-4x^2+6xy(x)y'(x)+y(x)^2=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, [_Abel, `2nd type`, `class A`]]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.161977 (sec), leaf count = 3017

$$\left\{\left\{y(x)\to -\frac{x}{2}-\frac{1}{2}\sqrt{x^2+\frac{\sqrt[3]{2}\sqrt[3]{9e^{2c_1}x^2+\sqrt{81e^{4c_1}x^4-48e^{6c_1}}}}{3^{2/3}}+\frac{2\,2^{2/3}e^{2c_1}}{\sqrt[3]{3}\sqrt[3]{9e^{2c_1}x^2+\sqrt{81e^{4c_1}x^4-48e^{6c_1}}}}}-\frac{1}{2}\sqrt{-\frac{}{\sqrt{x^2+\frac{\sqrt[3]{}}{}}}}\right.\right.$$

Maple ✓
cpu = 0.032 (sec), leaf count = 69

$$\left\{-\frac{3}{4}\ln\left(\frac{y(x)-x}{x}\right)-\frac{1}{4}\ln\left(\frac{x+y(x)}{x}\right)-\ln(x)-\_C1=0,-\frac{1}{4}\ln\left(\frac{y(x)-x}{x}\right)-\frac{3}{4}\ln\left(\frac{x+y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[-4*x^2 + y[x]^2 + 6*x*y[x]*y'[x] + (x^2 - 4*y[x]^2)*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x/2 - Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 +
Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*C[1])*x^2 +
Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]/2 - Sqrt[2*x^2 - (2*2^
(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1
])*x^4])^(1/3)) - (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1
])*x^4])^(1/3))/3^(2/3) - (2*x^3)/Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*
E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*
E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]]/2},
{y[x] -> x/2 + Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sq
rt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*C[1])*x^2 + Sq
```

```
rt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]/2 - Sqrt[2*x^2 - (2*2^(2
/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])
*x^4])^(1/3)) - (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])
*x^4])^(1/3))/3^(2/3) - (2*x^3)/Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^
(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^
(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]]/2}, {y
[x] -> -x/2 - Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqr
t[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqr
t[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]/2 + Sqrt[2*x^2 - (2*2^(2/
3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*
x^4])^(1/3)) - (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*
x^4])^(1/3))/3^(2/3) - (2*x^3)/Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(
2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(
2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]]/2}, {y[
x] -> x/2 + Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[
-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[
-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]/2 + Sqrt[2*x^2 - (2*2^(2/3)
*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^
4])^(1/3)) - (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^
4])^(1/3))/3^(2/3) - (2*x^3)/Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*
C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*
C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]]/2}, {y[x]
 -> x/2 - Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-4
8*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-4
8*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]/2 - Sqrt[2*x^2 - (2*2^(2/3)*E
^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4]
)^(1/3)) - (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4]
)^(1/3))/3^(2/3) + (2*x^3)/Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[
1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*C[
1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]]/2}, {y[x] -
> -x/2 + Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48
*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48
*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]/2 - Sqrt[2*x^2 - (2*2^(2/3)*E^
(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])
^(1/3)) - (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])
^(1/3))/3^(2/3) + (2*x^3)/Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1
])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*C[1
])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]]/2}, {y[x] ->
 x/2 - Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E
^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E
^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]/2 + Sqrt[2*x^2 - (2*2^(2/3)*E^(2
*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(
1/3)) - (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(
1/3))/3^(2/3) + (2*x^3)/Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])
*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*C[1])
*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]]/2}, {y[x] -> -
x/2 + Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^
```

```
(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^
(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]/2 + Sqrt[2*x^2 - (2*2^(2/3)*E^(2*
C[1]))/(3^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1
/3)) - (2^(1/3)*(9*E^(2*C[1])*x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1
/3))/3^(2/3) + (2*x^3)/Sqrt[x^2 + (2*2^(2/3)*E^(2*C[1]))/(3^(1/3)*(9*E^(2*C[1])*
x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3)) + (2^(1/3)*(9*E^(2*C[1])*
x^2 + Sqrt[-48*E^(6*C[1]) + 81*E^(4*C[1])*x^4])^(1/3))/3^(2/3)]]/2}}
```

Maple raw input

```
dsolve((x^2-4*y(x)^2)*diff(y(x),x)^2+6*x*y(x)*diff(y(x),x)-4*x^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-1/4*ln((y(x)-x)/x)-3/4*ln((x+y(x))/x)-ln(x)-_C1 = 0, -3/4*ln((y(x)-x)/x)-1/4*ln
((x+y(x))/x)-ln(x)-_C1 = 0
```

4.999 $9y(x)^2y'(x)^2 - 3xy'(x) + y(x) = 0$

ODE

$$9y(x)^2y'(x)^2 - 3xy'(x) + y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.148992 (sec), leaf count = 180

$$\left\{\left\{y(x) \to -\sqrt[3]{-2}\sqrt[3]{e^{c_1}\left(x-2e^{c_1}\right)}\right\}, \left\{y(x) \to \sqrt[3]{2}\sqrt[3]{e^{c_1}\left(x-2e^{c_1}\right)}\right\}, \left\{y(x) \to (-1)^{2/3}\sqrt[3]{2}\sqrt[3]{e^{c_1}\left(x-2e^{c_1}\right)}\right\}, \left\{y(x) \to \frac{\sqrt[3]{-}}{}\right.$$

Maple ✓
cpu = 1.828 (sec), leaf count = 62

$$\left\{(y(x))^3 - \frac{x^2}{4} = 0, \ln(x) - \int^{y(x)x^{-\frac{2}{3}}} \frac{1}{8\_a^4 - 2\_a}\left(-12\_a^3 + 3\sqrt{-4\_a^3+1} + 3\right)d\_a - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x] - 3*x*y'[x] + 9*y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-2)^(1/3)*(E^C[1]*(-2*E^C[1] + x))^(1/3))}, {y[x] -> 2^(1/3)*(E^C[1
]*(-2*E^C[1] + x))^(1/3)}, {y[x] -> (-1)^(2/3)*2^(1/3)*(E^C[1]*(-2*E^C[1] + x))^
(1/3)}, {y[x] -> (-(E^C[1]*(E^C[1] - 2*x)))^(1/3)/2^(2/3)}, {y[x] -> -(((-1)^(1/
3)*(-(E^C[1]*(E^C[1] - 2*x)))^(1/3))/2^(2/3))}, {y[x] -> (-1/2)^(2/3)*(-(E^C[1]*
(E^C[1] - 2*x)))^(1/3)}}
```

Maple raw input

```
dsolve(9*y(x)^2*diff(y(x),x)^2-3*x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^3-1/4*x^2 = 0, ln(x)-Intat((-12*_a^3+3*(-4*_a^3+1)^(1/2)+3)/(8*_a^4-2*_a),_
a = y(x)/x^(2/3))-_C1 = 0
```

4.1000 $(2-3y(x))^2y'(x)^2=4(1-y(x))$

ODE

$$(2-3y(x))^2y'(x)^2=4(1-y(x))$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0734112 (sec), leaf count = 891

$$\left\{\left\{y(x)\to\frac{1}{12}\left(2\sqrt[3]{-108x^2-108c_1x-27c_1^2+3\sqrt{3}\sqrt{(2x+c_1)^2\left(108x^2+108c_1x+27c_1^2-16\right)}}+8+4+\frac{}{\sqrt[3]{-108x^2-108}}\right.\right.$$

Maple ✓
cpu = 0.043 (sec), leaf count = 42

$$\left\{x-y(x)\sqrt{1-y(x)}-\_C1=0,x+y(x)\sqrt{1-y(x)}-\_C1=0,y(x)=1\right\}$$

Mathematica raw input

```
DSolve[(2 - 3*y[x])^2*y'[x]^2 == 4*(1 - y[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (4 + 8/(8 - 108*x^2 - 108*x*C[1] - 27*C[1]^2 + 3*Sqrt[3]*Sqrt[(2*x + C
[1])^2*(-16 + 108*x^2 + 108*x*C[1] + 27*C[1]^2)])^(1/3) + 2*(8 - 108*x^2 - 108*x
*C[1] - 27*C[1]^2 + 3*Sqrt[3]*Sqrt[(2*x + C[1])^2*(-16 + 108*x^2 + 108*x*C[1] +
27*C[1]^2)])^(1/3))/12}, {y[x] -> (8 - (8*(1 + I*Sqrt[3]))/(8 - 108*x^2 - 108*x*
C[1] - 27*C[1]^2 + 3*Sqrt[3]*Sqrt[(2*x + C[1])^2*(-16 + 108*x^2 + 108*x*C[1] + 2
7*C[1]^2)])^(1/3) + (2*I)*(I + Sqrt[3])*(8 - 108*x^2 - 108*x*C[1] - 27*C[1]^2 +
3*Sqrt[3]*Sqrt[(2*x + C[1])^2*(-16 + 108*x^2 + 108*x*C[1] + 27*C[1]^2)])^(1/3))/
24}, {y[x] -> (8 + ((8*I)*(I + Sqrt[3]))/(8 - 108*x^2 - 108*x*C[1] - 27*C[1]^2 +
 3*Sqrt[3]*Sqrt[(2*x + C[1])^2*(-16 + 108*x^2 + 108*x*C[1] + 27*C[1]^2)])^(1/3)
- 2*(1 + I*Sqrt[3])*(8 - 108*x^2 - 108*x*C[1] - 27*C[1]^2 + 3*Sqrt[3]*Sqrt[(2*x
+ C[1])^2*(-16 + 108*x^2 + 108*x*C[1] + 27*C[1]^2)])^(1/3))/24}, {y[x] -> (4 + 8
/(8 - 108*x^2 + 108*x*C[1] - 27*C[1]^2 + 3*Sqrt[3]*Sqrt[(-2*x + C[1])^2*(-16 + 1
08*x^2 - 108*x*C[1] + 27*C[1]^2)])^(1/3) + 2*(8 - 108*x^2 + 108*x*C[1] - 27*C[1]
^2 + 3*Sqrt[3]*Sqrt[(-2*x + C[1])^2*(-16 + 108*x^2 - 108*x*C[1] + 27*C[1]^2)])^(
```

```
1/3))/12}, {y[x] -> (8 + (-8 - (8*I)*Sqrt[3])/(8 - 108*x^2 + 108*x*C[1] - 27*C[1
]^2 + 3*Sqrt[3]*Sqrt[(-2*x + C[1])^2*(-16 + 108*x^2 - 108*x*C[1] + 27*C[1]^2)])^
(1/3) + (2*I)*(I + Sqrt[3])*(8 - 108*x^2 + 108*x*C[1] - 27*C[1]^2 + 3*Sqrt[3]*Sq
rt[(-2*x + C[1])^2*(-16 + 108*x^2 - 108*x*C[1] + 27*C[1]^2)])^(1/3))/24}, {y[x]
-> (8 + (-8 + (8*I)*Sqrt[3])/(8 - 108*x^2 + 108*x*C[1] - 27*C[1]^2 + 3*Sqrt[3]*S
qrt[(-2*x + C[1])^2*(-16 + 108*x^2 - 108*x*C[1] + 27*C[1]^2)])^(1/3) - 2*(1 + I*
Sqrt[3])*(8 - 108*x^2 + 108*x*C[1] - 27*C[1]^2 + 3*Sqrt[3]*Sqrt[(-2*x + C[1])^2*
(-16 + 108*x^2 - 108*x*C[1] + 27*C[1]^2)])^(1/3))/24}}
```

Maple raw input

```
dsolve((2-3*y(x))^2*diff(y(x),x)^2 = 4-4*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1, x-y(x)*(1-y(x))^(1/2)-_C1 = 0, x+y(x)*(1-y(x))^(1/2)-_C1 = 0
```

4.1001 $a^2(-x^2) - 3a^2xy(x)y'(x) + (1-a^2)\,y(x)^2y'(x)^2 + y(x)^2 = 0$

ODE

$$a^2(-x^2) - 3a^2xy(x)y'(x) + (1-a^2)\,y(x)^2y'(x)^2 + y(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Change of variable

Mathematica ✓
cpu = 2.02438 (sec), leaf count = 763

$$\left\{\text{Solve}\left[\frac{\log\left(\frac{a^2x^4+(3a^2-1)x^2y(x)^2+(a^2-1)y(x)^4}{x^4}\right)+\frac{2\tan^{-1}\left(\frac{\left(3a^2-1\right)x^2+2\left(a^2-1\right)y(x)^2}{\sqrt{-5a^4+2a^2-1}x^2}\right)}{\sqrt{-5a^4+2a^2-1}}+\frac{2\sqrt{5a^4-2a^2-2\sqrt{5a^4-2a^2+1}+2}\tanh^{-1}\left(\frac{\sqrt{\frac{a^2\left(5a^2}}{\sqrt{5a^4-2}}\right.\right.\right.\right.}{\sqrt{5a^4-2a^2+1}}}{8a^2-8}\right.\right.$$

Maple ✓
cpu = 1.169 (sec), leaf count = 181

$$\left\{\ln(x)-\frac{1}{2}\int^{\frac{y(x)}{x}}\frac{1}{(a^2-1)\_a^4+(3a^2-1)\_a^2+a^2}\left(\_a\sqrt{5a^4+(4\_a^2+4)a^2-4\_a^2}+(-2a^2+2)\_a^3-3\_a a^2\right)d\_\right.$$

Mathematica raw input

```
DSolve[-(a^2*x^2) + y[x]^2 - 3*a^2*x*y[x]*y'[x] + (1 - a^2)*y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[((2*ArcTan[((-1 + 3*a^2)*x^2 + 2*(-1 + a^2)*y[x]^2)/(Sqrt[-1 + 2*a^2 - 5*
a^4]*x^2)])/Sqrt[-1 + 2*a^2 - 5*a^4] + (2*Sqrt[2 - 2*a^2 + 5*a^4 - 2*Sqrt[1 - 2*
a^2 + 5*a^4]]*ArcTanh[Sqrt[(a^2*(4 + 5*a^2)*x^2 + 4*(-1 + a^2)*y[x]^2)/x^2]/Sqrt
[2 - 2*a^2 + 5*a^4 - 2*Sqrt[1 - 2*a^2 + 5*a^4]]])/Sqrt[1 - 2*a^2 + 5*a^4] - (2*S
qrt[2 - 2*a^2 + 5*a^4 + 2*Sqrt[1 - 2*a^2 + 5*a^4]]*ArcTanh[Sqrt[(a^2*(4 + 5*a^2)
*x^2 + 4*(-1 + a^2)*y[x]^2)/x^2]/Sqrt[2 - 2*a^2 + 5*a^4 + 2*Sqrt[1 - 2*a^2 + 5*a
^4]]])/Sqrt[1 - 2*a^2 + 5*a^4] + Log[(a^2*x^4 + (-1 + 3*a^2)*x^2*y[x]^2 + (-1 +
a^2)*y[x]^4)/x^4])/(-8 + 8*a^2) == C[1] + Log[-2*(-1 + a^2)*x]/(2 - 2*a^2), y[x]
], Solve[((2*ArcTan[((-1 + 3*a^2)*x^2 + 2*(-1 + a^2)*y[x]^2)/(Sqrt[-1 + 2*a^2 -
5*a^4]*x^2)])/Sqrt[-1 + 2*a^2 - 5*a^4] - (2*Sqrt[2 - 2*a^2 + 5*a^4 - 2*Sqrt[1 -
```

```
2*a^2 + 5*a^4]]*ArcTanh[Sqrt[(a^2*(4 + 5*a^2)*x^2 + 4*(-1 + a^2)*y[x]^2)/x^2]/Sq
rt[2 - 2*a^2 + 5*a^4 - 2*Sqrt[1 - 2*a^2 + 5*a^4]]])/Sqrt[1 - 2*a^2 + 5*a^4] + (2
*Sqrt[2 - 2*a^2 + 5*a^4 + 2*Sqrt[1 - 2*a^2 + 5*a^4]]*ArcTanh[Sqrt[(a^2*(4 + 5*a^
2)*x^2 + 4*(-1 + a^2)*y[x]^2)/x^2]/Sqrt[2 - 2*a^2 + 5*a^4 + 2*Sqrt[1 - 2*a^2 + 5
*a^4]]])/Sqrt[1 - 2*a^2 + 5*a^4] + Log[(a^2*x^4 + (-1 + 3*a^2)*x^2*y[x]^2 + (-1
+ a^2)*y[x]^4)/x^4])/(-8 + 8*a^2) == C[1] + Log[-2*(-1 + a^2)*x]/(2 - 2*a^2), y[
x]]}
```

Maple raw input

```
dsolve((-a^2+1)*y(x)^2*diff(y(x),x)^2-3*a^2*x*y(x)*diff(y(x),x)-a^2*x^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)+1/2*Intat((2*_a^2*a^2-2*_a^2+3*a^2+(5*a^4+(4*_a^2+4)*a^2-4*_a^2)^(1/2))*_a
/((a^2-1)*_a^4+(3*a^2-1)*_a^2+a^2),_a = y(x)/x)-_C1 = 0, ln(x)-1/2*Intat((_a*(5*
a^4+(4*_a^2+4)*a^2-4*_a^2)^(1/2)+(-2*a^2+2)*_a^3-3*_a*a^2)/((a^2-1)*_a^4+(3*a^2-
1)*_a^2+a^2),_a = y(x)/x)-_C1 = 0
```

4.1002 $(a-b)y(x)^2y'(x)^2 - ab + ay(x)^2 - bx^2 - 2bxy(x)y'(x) = 0$

ODE

$$(a-b)y(x)^2y'(x)^2 - ab + ay(x)^2 - bx^2 - 2bxy(x)y'(x) = 0$$

ODE Classification

[_rational, [_1st_order, `_with_symmetry_[F(x),G(y)]`]]

Book solution method
Change of variable

Mathematica ✓
cpu = 1.18568 (sec), leaf count = 86

$$\left\{\left\{y(x) \to -\frac{\sqrt{a\left((x-c_1)^2-b\right)+b\left(b-x^2\right)}}{\sqrt{b-a}}\right\}, \left\{y(x) \to \frac{\sqrt{a\left((x-c_1)^2-b\right)+b\left(b-x^2\right)}}{\sqrt{b-a}}\right\}\right\}$$

Maple ✓
cpu = 0.922 (sec), leaf count = 139

$$\left\{\frac{(y(x))^2(a-b)-b\left(x^2+a-b\right)}{a-b} = 0, [x(\_T) = \frac{1}{b}\left(-\_C1\, b\_T + \sqrt{\left(\_C1^2-b\right)ab}\sqrt{\_T^2+1}\right)\frac{1}{\sqrt{\_T^2+1}}, y(\_T) = \_C\right.$$

Mathematica raw input

```
DSolve[-(a*b) - b*x^2 + a*y[x]^2 - 2*b*x*y[x]*y'[x] + (a - b)*y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[b*(b - x^2) + a*(-b + (x - C[1])^2)]/Sqrt[-a + b])}, {y[x] -> S
qrt[b*(b - x^2) + a*(-b + (x - C[1])^2)]/Sqrt[-a + b]}}
```

Maple raw input

```
dsolve((a-b)*y(x)^2*diff(y(x),x)^2-2*b*x*y(x)*diff(y(x),x)-a*b-b*x^2+a*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
(y(x)^2*(a-b)-b*(x^2+a-b))/(a-b) = 0, [x(_T) = (-_C1*b*_T+((_C1^2-b)*a*b)^(1/2)*
(_T^2+1)^(1/2))/(_T^2+1)^(1/2)/b, y(_T) = _C1/(_T^2+1)^(1/2)], [x(_T) = -(_C1*b*
_T+((_C1^2-b)*a*b)^(1/2)*(_T^2+1)^(1/2))/(_T^2+1)^(1/2)/b, y(_T) = _C1/(_T^2+1)^
(1/2)]
```

4.1003 $a^2y'(x)^2\left(b^2-(cx-ay(x))^2\right)+c^2(b^2-(cx-ay(x))^2)+2ab^2cy'(x)=0$

ODE

$$a^2y'(x)^2\left(b^2-(cx-ay(x))^2\right)+c^2\left(b^2-(cx-ay(x))^2\right)+2ab^2cy'(x)=0$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 1.54616 (sec), leaf count = 71

$$\left\{\left\{y(x)\to\frac{cc_1-\sqrt{b^2-c^2\left(x-c_1\right)^2}}{a}\right\},\left\{y(x)\to\frac{\sqrt{b^2-c^2\left(x-c_1\right)^2}+cc_1}{a}\right\}\right\}$$

Maple ✓
cpu = 1.334 (sec), leaf count = 195

$$\left\{\frac{a^2(y(x))^2-2\,y(x)\,acx+c^2x^2-2\,b^2}{a^2}=0,x-\int^{y(x)-\frac{cx}{a}}-\frac{a}{\left(2\_a^2a^2-4\,b^2\right)c}\left(\_a^2a^2-2\,b^2-\sqrt{-a^2\_a^2\left(\_a^2a^2-2\,b^2\right)}\right)d\_\right.$$

Mathematica raw input

```
DSolve[c^2*(b^2 - (c*x - a*y[x])^2) + 2*a*b^2*c*y'[x] + a^2*(b^2 - (c*x - a*y[x])^2)*y'[x]^2 == 0,y[x
```

Mathematica raw output

```
{{y[x] -> (-Sqrt[b^2 - c^2*(x - C[1])^2] + c*C[1])/a}, {y[x] -> (Sqrt[b^2 - c^2*
(x - C[1])^2] + c*C[1])/a}}
```

Maple raw input

```
dsolve(a^2*(b^2-(c*x-a*y(x))^2)*diff(y(x),x)^2+2*a*b^2*c*diff(y(x),x)+c^2*(b^2-(c*x-a*y(x))^2) = 0, y
```

Maple raw output

```
(a^2*y(x)^2-2*y(x)*a*c*x+c^2*x^2-2*b^2)/a^2 = 0, x-Intat(-1/2*a*(_a^2*a^2-2*b^2+
(-a^2*_a^2*(_a^2*a^2-2*b^2))^(1/2))/(_a^2*a^2-2*b^2)/c,_a = y(x)-1/a*c*x)-_C1 =
0, x-Intat(-1/2*a*(_a^2*a^2-2*b^2-(-a^2*_a^2*(_a^2*a^2-2*b^2))^(1/2))/(_a^2*a^2-
2*b^2)/c,_a = y(x)-1/a*c*x)-_C1 = 0
```

4.1004 $a^2x + y(x)^3\left(-y'(x)\right) + xy(x)^2y'(x)^2 = 0$

ODE

$$a^2x + y(x)^3\left(-y'(x)\right) + xy(x)^2y'(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.345739 (sec), leaf count = 132

$$\left\{\left\{y(x) \to -\sqrt{2a^2e^{c_1} + \frac{1}{2}e^{-c_1}x^2}\right\}, \left\{y(x) \to \sqrt{2a^2e^{c_1} + \frac{1}{2}e^{-c_1}x^2}\right\}, \left\{y(x) \to -\frac{\sqrt{4a^2e^{-c_1}x^2 + e^{c_1}}}{\sqrt{2}}\right\}, \left\{y(x) \to \frac{\sqrt{4a^2e^{-c_1}}}{\sqrt{}}\right.\right.$$

Maple ✓
cpu = 1.575 (sec), leaf count = 161

$$\left\{1\left(\ln\left(\frac{1}{x}\left(2\left(y(x)\right)^4 + 2\sqrt{\left(y\left(x\right)\right)^4}\sqrt{\left(y\left(x\right)\right)^4 - 4a^2x^2}\right)\right)\left(y(x)\right)^2 + \left(\_C1 - \ln\left(x\right)\right)\sqrt{\left(y\left(x\right)\right)^4} - 2\left(y(x)\right)^2\ln\left(y(x)\right)\right)\frac{1}{\sqrt{(y(}}\right.$$

Mathematica raw input

```
DSolve[a^2*x - y[x]^3*y'[x] + x*y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[2*a^2*E^C[1] + x^2/(2*E^C[1])]}, {y[x] -> Sqrt[2*a^2*E^C[1] + x^
2/(2*E^C[1])]}, {y[x] -> -(Sqrt[E^C[1] + (4*a^2*x^2)/E^C[1]]/Sqrt[2])}, {y[x] ->
 Sqrt[E^C[1] + (4*a^2*x^2)/E^C[1]]/Sqrt[2]}}
```

Maple raw input

```
dsolve(x*y(x)^2*diff(y(x),x)^2-y(x)^3*diff(y(x),x)+a^2*x = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^4-4*a^2*x^2 = 0, -(ln((2*y(x)^4+2*(y(x)^4)^(1/2)*(y(x)^4-4*a^2*x^2)^(1/2))/
x)*y(x)^2+(-_C1+ln(x))*(y(x)^4)^(1/2)-2*y(x)^2*ln(y(x)))/(y(x)^4)^(1/2) = 0, (ln
```

```
((2*y(x)^4+2*(y(x)^4)^(1/2)*(y(x)^4-4*a^2*x^2)^(1/2))/x)*y(x)^2+(_C1-ln(x))*(y(x
)^4)^(1/2)-2*y(x)^2*ln(y(x)))/(y(x)^4)^(1/2) = 0
```

4.1005 $(a - x^3 - y(x)^3)\, y'(x) + x^2 y(x) + x y(x)^2 y'(x)^2 = 0$

ODE

$$(a - x^3 - y(x)^3)\, y'(x) + x^2 y(x) + x y(x)^2 y'(x)^2 = 0$$

ODE Classification

[_rational]

Book solution method
Change of variable

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 1.357 (sec), leaf count = 129

$$\left\{ (y(x))^6 + \left(-2x^3 - 2a\right)(y(x))^3 + \left(-x^3 + a\right)^2 = 0, \int_{\_b}^{y(x)} \_a^2 \frac{1}{\sqrt{x^6 + \left(-2\_a^3 - 2a\right)x^3 + \left(-\_a^3 + a\right)^2}}\, \mathrm{d}\_a - \frac{\ln(x)}{2} - \_ \right.$$

Mathematica raw input

```
DSolve[x^2*y[x] + (a - x^3 - y[x]^3)*y'[x] + x*y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x*y(x)^2*diff(y(x),x)^2+(a-x^3-y(x)^3)*diff(y(x),x)+x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^6+(-2*x^3-2*a)*y(x)^3+(-x^3+a)^2 = 0, Int(1/(x^6+(-2*_a^3-2*a)*x^3+(-_a^3+a
)^2)^(1/2)*_a^2,_a = _b .. y(x))+1/2*ln(x)-_C1 = 0, Int(1/(x^6+(-2*_a^3-2*a)*x^3
+(-_a^3+a)^2)^(1/2)*_a^2,_a = _b .. y(x))-1/2*ln(x)-_C1 = 0
```

4.1006 $-x(x^2-2y(x)^2)-2y(x)^3y'(x)+xy(x)^2y'(x)^2=0$

ODE

$$-x(x^2-2y(x)^2)-2y(x)^3y'(x)+xy(x)^2y'(x)^2=0$$

ODE Classification

[_separable]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.0116421 (sec), leaf count = 73

$$\left\{\left\{y(x)\to -\sqrt{2c_1+x^2}\right\},\left\{y(x)\to \sqrt{2c_1+x^2}\right\},\left\{y(x)\to -\sqrt{c_1x^4+x^2}\right\},\left\{y(x)\to \sqrt{c_1x^4+x^2}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 34

$$\left\{-x^2+(y(x))^2-\_C1=0,-x^4\_C1-x^2+(y(x))^2=0\right\}$$

Mathematica raw input

```
DSolve[-(x*(x^2 - 2*y[x]^2)) - 2*y[x]^3*y'[x] + x*y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -Sqrt[x^2 + 2*C[1]]}, {y[x] -> Sqrt[x^2 + 2*C[1]]}, {y[x] -> -Sqrt[x^2
 + x^4*C[1]]}, {y[x] -> Sqrt[x^2 + x^4*C[1]]}}
```

Maple raw input

```
dsolve(x*y(x)^2*diff(y(x),x)^2-2*y(x)^3*diff(y(x),x)-x*(x^2-2*y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
-x^2+y(x)^2-_C1 = 0, -x^4*_C1-x^2+y(x)^2 = 0
```

4.1007 $-a + y(x)^3 (-y'(x)) + 2xy(x)^2 y'(x)^2 = 0$

ODE

$$-a + y(x)^3 (-y'(x)) + 2xy(x)^2 y'(x)^2 = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.28601 (sec), leaf count = 133

$$\left\{\left\{y(x) \to -\frac{e^{-\frac{c_1}{4}}\sqrt{e^{c_1} - 8ax}}{\sqrt{2}}\right\}, \left\{y(x) \to \frac{e^{-\frac{c_1}{4}}\sqrt{e^{c_1} - 8ax}}{\sqrt{2}}\right\}, \left\{y(x) \to -\frac{\sqrt{e^{-\frac{c_1}{2}}(8ax - e^{c_1})}}{\sqrt{2}}\right\}, \left\{y(x) \to \frac{\sqrt{e^{-\frac{c_1}{2}}(8ax -}}{\sqrt{2}}\right.\right.$$

Maple ✓
cpu = 0.151 (sec), leaf count = 104

$$\left\{(y(x))^4 + 8\,ax = 0, -\ln(x) - \ln\left(-(y(x))^2 + \sqrt{(y(x))^4 + 8\,ax}\right) + \ln\left((y(x))^2 + \sqrt{(y(x))^4 + 8\,ax}\right) + \_C1 = 0, -\ln(x)\right.$$

Mathematica raw input

```
DSolve[-a - y[x]^3*y'[x] + 2*x*y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[E^C[1] - 8*a*x]/(Sqrt[2]*E^(C[1]/4)))}, {y[x] -> Sqrt[E^C[1] -
8*a*x]/(Sqrt[2]*E^(C[1]/4))}, {y[x] -> -(Sqrt[(-E^C[1] + 8*a*x)/E^(C[1]/2)]/Sqrt
[2])}, {y[x] -> Sqrt[(-E^C[1] + 8*a*x)/E^(C[1]/2)]/Sqrt[2]}}
```

Maple raw input

```
dsolve(2*x*y(x)^2*diff(y(x),x)^2-y(x)^3*diff(y(x),x)-a = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^4+8*a*x = 0, -ln(x)+ln(-y(x)^2+(y(x)^4+8*a*x)^(1/2))-ln(y(x)^2+(y(x)^4+8*a*
x)^(1/2))+_C1 = 0, -ln(x)-ln(-y(x)^2+(y(x)^4+8*a*x)^(1/2))+ln(y(x)^2+(y(x)^4+8*a
*x)^(1/2))+_C1 = 0
```

4.1008 $4x^2y(x)^2y'(x)^2 = \left(x^2+y(x)^2\right)^2$

ODE

$$4x^2y(x)^2y'(x)^2 = \left(x^2+y(x)^2\right)^2$$

ODE Classification

[[_homogeneous, `class A`], _rational, _Bernoulli]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0134071 (sec), leaf count = 97

$$\left\{\left\{y(x)\to -\sqrt{x}\sqrt{c_1+x}\right\},\left\{y(x)\to \sqrt{x}\sqrt{c_1+x}\right\},\left\{y(x)\to -\frac{\sqrt{3c_1-x^3}}{\sqrt{3}\sqrt{x}}\right\},\left\{y(x)\to \frac{\sqrt{3c_1-x^3}}{\sqrt{3}\sqrt{x}}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 32

$$\left\{\left(y(x)\right)^2-\left(x+\_C1\right)x=0,\left(y(x)\right)^2+\frac{x^2}{3}-\frac{\_C1}{x}=0\right\}$$

Mathematica raw input

```
DSolve[4*x^2*y[x]^2*y'[x]^2 == (x^2 + y[x]^2)^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[x]*Sqrt[x + C[1]])}, {y[x] -> Sqrt[x]*Sqrt[x + C[1]]}, {y[x] ->
  -(Sqrt[-x^3 + 3*C[1]]/(Sqrt[3]*Sqrt[x]))}, {y[x] -> Sqrt[-x^3 + 3*C[1]]/(Sqrt[3
]*Sqrt[x])}}
```

Maple raw input

```
dsolve(4*x^2*y(x)^2*diff(y(x),x)^2 = (x^2+y(x)^2)^2, y(x),'implicit')
```

Maple raw output

```
y(x)^2-(x+_C1)*x = 0, y(x)^2+1/3*x^2-1/x*_C1 = 0
```

4.1009 $-2x(x^3+2y(x)^2)\,y(x)y'(x)+(2x^3+y(x)^2)\,y(x)^2+4x^2y(x)^2y'(x)^2=0$

ODE

$$-2x\left(x^3+2y(x)^2\right)y(x)y'(x)+\left(2x^3+y(x)^2\right)y(x)^2+4x^2y(x)^2y'(x)^2=0$$

ODE Classification

[[_homogeneous, `class G`], _rational, _dAlembert]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.797108 (sec), leaf count = 146

$$\left\{\{y(x)\to 0\},\text{Solve}\left[\log(y(x))=c_1+\frac{x^{5/2}\sqrt{4-\frac{x^3}{y(x)^2}}y(x)\sin^{-1}\left(\frac{x^{3/2}}{2y(x)}\right)}{\sqrt{x^8-4x^5y(x)^2}}+\frac{\log(x)}{2},y(x)\right],\text{Solve}\left[\frac{x^{5/2}\sqrt{4-\frac{x^3}{y(x)^2}}y(x)\sin^{-}\right.\right.$$
$$\left.\left.\sqrt{x^8-4x^5y(x)^2}\right.\right.$$

Maple ✓
cpu = 0.832 (sec), leaf count = 339

$$\left\{(y(x))^2-\frac{x^3}{4}=0,\int_{\_b}^{x}\frac{1}{2\_a\left(\_a^3-4\left(y\left(x\right)\right)^2\right)}\left(\_a^3-4\left(y(x)\right)^2-3\sqrt{\_a^3\left(\_a^3-4\left(y\left(x\right)\right)^2\right)}\right)\mathrm{d}\_a+\int^{y(x)}4\frac{}{x^3-4\_}\right.$$

Mathematica raw input

```
DSolve[y[x]^2*(2*x^3 + y[x]^2) - 2*x*y[x]*(x^3 + 2*y[x]^2)*y'[x] + 4*x^2*y[x]^2*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 0}, Solve[Log[y[x]] == C[1] + Log[x]/2 + (x^(5/2)*ArcSin[x^(3/2)/(2*y[
x])]*Sqrt[4 - x^3/y[x]^2]*y[x])/Sqrt[x^8 - 4*x^5*y[x]^2], y[x]], Solve[-Log[x]/2
 + Log[y[x]] + (x^(5/2)*ArcSin[x^(3/2)/(2*y[x])]*Sqrt[4 - x^3/y[x]^2]*y[x])/Sqrt
[x^8 - 4*x^5*y[x]^2] == C[1], y[x]]}
```

Maple raw input

```
dsolve(4*x^2*y(x)^2*diff(y(x),x)^2-2*x*y(x)*(x^3+2*y(x)^2)*diff(y(x),x)+(2*x^3+y(x)^2)*y(x)^2 = 0, y(
```

Maple raw output

```
y(x) = 0, y(x)^2-1/4*x^3 = 0, Int(1/2*(_a^3-4*y(x)^2+3*(_a^3*(_a^3-4*y(x)^2))^(1
/2))/_a/(_a^3-4*y(x)^2),_a = _b .. x)+Intat(-4*_f/(-x^3+4*_f^2+(x^6-4*_f^2*x^3)^
(1/2))-Int(-6*((_a^6-4*_a^3*_f^2)/(_a^3*(_a^3-4*_f^2))^(1/2)-2*(_a^3*(_a^3-4*_f^
2))^(1/2))*_f/_a/(_a^3-4*_f^2)^2,_a = _b .. x),_f = y(x))+_C1 = 0, Int(1/2*(_a^3
-4*y(x)^2-3*(_a^3*(_a^3-4*y(x)^2))^(1/2))/_a/(_a^3-4*y(x)^2),_a = _b .. x)+Intat
(4*_f/(x^3-4*_f^2+(x^6-4*_f^2*x^3)^(1/2))-Int(6*((_a^6-4*_a^3*_f^2)/(_a^3*(_a^3-
4*_f^2))^(1/2)-2*(_a^3*(_a^3-4*_f^2))^(1/2))*_f/_a/(_a^3-4*_f^2)^2,_a = _b .. x)
,_f = y(x))+_C1 = 0
```

4.1010 $4y(x)^3y'(x)^2 - 4xy'(x) + y(x) = 0$

ODE

$$4y(x)^3y'(x)^2 - 4xy'(x) + y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.15202 (sec), leaf count = 99

$$\left\{\left\{y(x) \to -\sqrt[4]{-e^{c_1}\left(e^{c_1} - 2x\right)}\right\}, \left\{y(x) \to -i\sqrt[4]{-e^{c_1}\left(e^{c_1} - 2x\right)}\right\}, \left\{y(x) \to i\sqrt[4]{-e^{c_1}\left(e^{c_1} - 2x\right)}\right\}, \left\{y(x) \to \sqrt[4]{-e^{c_1}\left(e^{c_1} - 2x\right)}\right\}\right\}$$

Maple ✓
cpu = 1.243 (sec), leaf count = 60

$$\left\{(y(x))^4 - x^2 = 0, \ln(x) - \int^{y(x)\frac{1}{\sqrt{x}}} \frac{1}{\_a^5 - \_a}\left(-2\_a^4 + 2\sqrt{-\_a^4 + 1} + 2\right)d\_a - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x] - 4*x*y'[x] + 4*y[x]^3*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(-(E^C[1]*(E^C[1] - 2*x)))^(1/4)}, {y[x] -> (-I)*(-(E^C[1]*(E^C[1] -
2*x)))^(1/4)}, {y[x] -> I*(-(E^C[1]*(E^C[1] - 2*x)))^(1/4)}, {y[x] -> (-(E^C[1]*
(E^C[1] - 2*x)))^(1/4)}}
```

Maple raw input

```
dsolve(4*y(x)^3*diff(y(x),x)^2-4*x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^4-x^2 = 0, ln(x)-Intat((-2*_a^4+2*(-_a^4+1)^(1/2)+2)/(_a^5-_a),_a = y(x)/x^
(1/2))-_C1 = 0
```

4.1011

$$xy(x)\left(x^2+y(x)^2\right)y'(x)^2-xy(x)\left(x^2+y(x)^2\right)-\left(x^4+x^2y(x)^2+y(x)^4\right)y'(x)=0$$

ODE

$$xy(x)\left(x^2+y(x)^2\right)y'(x)^2-xy(x)\left(x^2+y(x)^2\right)-\left(x^4+x^2y(x)^2+y(x)^4\right)y'(x)=0$$

ODE Classification

```
[[_homogeneous, `class A`], _rational, _Bernoulli]
```

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right)=0$, Solve for p

Mathematica ✓
cpu = 0.0425038 (sec), leaf count = 156

$$\left\{\left\{y(x)\to -\sqrt{-\sqrt{e^{4c_1}+x^4}-x^2}\right\},\left\{y(x)\to \sqrt{-\sqrt{e^{4c_1}+x^4}-x^2}\right\},\left\{y(x)\to -\sqrt{\sqrt{e^{4c_1}+x^4}-x^2}\right\},\left\{y(x)\to \sqrt{\sqrt{e^{4c_1}}\right.\right.$$

Maple ✓
cpu = 0.022 (sec), leaf count = 55

$$\left\{(y(x))^2-(2\ln(x)+\_C1)\,x^2=0,-\frac{1}{4}\ln\left(\frac{2x^2+(y(x))^2}{x^2}\right)-\frac{1}{2}\ln\left(\frac{y(x)}{x}\right)-\ln(x)-\_C1=0\right\}$$

Mathematica raw input

```
DSolve[-(x*y[x]*(x^2 + y[x]^2)) - (x^4 + x^2*y[x]^2 + y[x]^4)*y'[x] + x*y[x]*(x^2 + y[x]^2)*y'[x]^2 =
```

Mathematica raw output

```
{{y[x] -> -Sqrt[-x^2 - Sqrt[E^(4*C[1]) + x^4]]}, {y[x] -> Sqrt[-x^2 - Sqrt[E^(4*
C[1]) + x^4]]}, {y[x] -> -Sqrt[-x^2 + Sqrt[E^(4*C[1]) + x^4]]}, {y[x] -> Sqrt[-x
^2 + Sqrt[E^(4*C[1]) + x^4]]}, {y[x] -> -(x*Sqrt[C[1] + 2*Log[x]])}, {y[x] -> x*
Sqrt[C[1] + 2*Log[x]]}}
```

Maple raw input

```
dsolve(x*y(x)*(x^2+y(x)^2)*diff(y(x),x)^2-(x^4+x^2*y(x)^2+y(x)^4)*diff(y(x),x)-x*y(x)*(x^2+y(x)^2) =
```

Maple raw output

```
-1/4*ln((2*x^2+y(x)^2)/x^2)-1/2*ln(y(x)/x)-ln(x)-_C1 = 0, y(x)^2-(2*ln(x)+_C1)*x
^2 = 0
```

4.1012 $x(a^2x+y(x)\left(x^2-y(x)^2\right))\,y'(x)^2+\left(2a^2xy(x)+\left(x^2-y(x)^2\right)^2\right)y'(x)+a^2y(x)^2-x(x^2-y(x)^2)\,y(x)=0$

ODE

$$x(a^2x+y(x)\left(x^2-y(x)^2\right))\,y'(x)^2+\left(2a^2xy(x)+\left(x^2-y(x)^2\right)^2\right)y'(x)+a^2y(x)^2-x(x^2-y(x)^2)\,y(x)=0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of variable

Mathematica ✗
cpu = 34.7334 (sec), leaf count = 0 , could not solve

```
DSolve[a^2*y[x]^2 - x*y[x]*(x^2 - y[x]^2) + (2*a^2*x*y[x] + (x^2 - y[x]^2)^2)*Derivative[1][y][x] + x
```

Maple ✓
cpu = 24.846 (sec), leaf count = 28

$$\left\{(y(x))^4+2\,x^2(y(x))^2+8\,a^2xy(x)+x^4=0\right\}$$

Mathematica raw input

```
DSolve[a^2*y[x]^2 - x*y[x]*(x^2 - y[x]^2) + (2*a^2*x*y[x] + (x^2 - y[x]^2)^2)*y'[x] + x*(a^2*x + y[x]
```

Mathematica raw output

```
DSolve[a^2*y[x]^2 - x*y[x]*(x^2 - y[x]^2) + (2*a^2*x*y[x] + (x^2 - y[x]^2)^2)*De
rivative[1][y][x] + x*(a^2*x + y[x]*(x^2 - y[x]^2))*Derivative[1][y][x]^2 == 0,
y[x], x]
```

Maple raw input

```
dsolve(x*(a^2*x+(x^2-y(x)^2)*y(x))*diff(y(x),x)^2+(2*a^2*x*y(x)+(x^2-y(x)^2)^2)*diff(y(x),x)+a^2*y(x)
x*y(x)*(x^2-y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^4+2*x^2*y(x)^2+8*a^2*x*y(x)+x^4 = 0
```

4.1013 $x(a^2x+y(x)\left(x^2-y(x)^2\right))\,y'(x)^2-\left(2a^2xy(x)-\left(x^2-y(x)^2\right)^2\right)y'(x)+a^2y(x)^2-x(x^2-y(x)^2)\,y(x)=0$

ODE

$$x(a^2x+y(x)\left(x^2-y(x)^2\right))\,y'(x)^2-\left(2a^2xy(x)-\left(x^2-y(x)^2\right)^2\right)y'(x)+a^2y(x)^2-x(x^2-y(x)^2)\,y(x)=0$$

ODE Classification

[_separable]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.135287 (sec), leaf count = 46

$$\{\{y(x)\to c_1x\},\text{Solve}\left[a^2\log(y(x)+x)+x^2+y(x)^2=a^2\log(x-y(x))+2c_1,y(x)\right]\}$$

Maple ✗
cpu = 24.846 (sec), leaf count = 0 , exception

```
numeric exception: division by zero
```

Mathematica raw input

```
DSolve[a^2*y[x]^2 - x*y[x]*(x^2 - y[x]^2) - (2*a^2*x*y[x] - (x^2 - y[x]^2)^2)*y'[x] + x*(a^2*x + y[x]
```

Mathematica raw output

```
{{y[x] -> x*C[1]}, Solve[x^2 + a^2*Log[x + y[x]] + y[x]^2 == 2*C[1] + a^2*Log[x
- y[x]], y[x]]}
```

Maple raw input

```
dsolve(x*(a^2*x+(x^2-y(x)^2)*y(x))*diff(y(x),x)^2-(2*a^2*x*y(x)-(x^2-y(x)^2)^2)*diff(y(x),x)+a^2*y(x)
x*y(x)*(x^2-y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
numeric exception: division by zero
```

4.1014 $(x^2 - y(x)^2 (x^2 + y(x)^2)) y'(x)^2 - 2xy(x)y'(x) + y(x)^2 = 0$

ODE

$$(x^2 - y(x)^2 (x^2 + y(x)^2)) y'(x)^2 - 2xy(x)y'(x) + y(x)^2 = 0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of variable

Mathematica ✗
cpu = 55.0842 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]^2 - 2*x*y[x]*Derivative[1][y][x] + (x^2 - y[x]^2*(x^2 + y[x]^2))*Derivative[1][y][x]^2 ==
```

Maple ✓
cpu = 2.323 (sec), leaf count = 32

$$\left\{ x^2 + (y(x))^2 = 0, y(x) + Artanh\left(\frac{1}{\sqrt{\frac{(y(x))^2}{x^2} + 1}} \right) - \_C1 = 0 \right\}$$

Mathematica raw input

```
DSolve[y[x]^2 - 2*x*y[x]*y'[x] + (x^2 - y[x]^2*(x^2 + y[x]^2))*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]^2 - 2*x*y[x]*Derivative[1][y][x] + (x^2 - y[x]^2*(x^2 + y[x]^2))*Der
ivative[1][y][x]^2 == 0, y[x], x]
```

Maple raw input

```
dsolve((x^2-(x^2+y(x)^2)*y(x)^2)*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x^2+y(x)^2 = 0, y(x)+arctanh(1/(y(x)^2/x^2+1)^(1/2))-_C1 = 0
```

4.1015 $-2x(x^2+2y(x)^2)\,y(x)y'(x)+(x^4+y(x)^2\,(x^2-y(x)^2))\,y'(x)^2+y(x)^4=0$

ODE

$$-2x(x^2+2y(x)^2)\,y(x)y'(x)+(x^4+y(x)^2\,(x^2-y(x)^2))\,y'(x)^2+y(x)^4=0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x},y'\right)=0$, Solve for p

Mathematica ✓
cpu = 0.188626 (sec), leaf count = 987

$$\left\{\left\{y(x)\to \frac{e^{2c_1}-3x^2}{3\sqrt[3]{-18e^{c_1}x^2+e^{3c_1}+3\sqrt{3}\sqrt{x^6+11e^{2c_1}x^4-e^{4c_1}x^2}}}-\frac{2e^{c_1}}{3}+\frac{1}{3}\sqrt[3]{-18e^{c_1}x^2+e^{3c_1}+3\sqrt{3}\sqrt{x^6+11e^{2c_1}x^4-e}\right.\right.$$

Maple ✓
cpu = 0.177 (sec), leaf count = 79

$$\left\{\ln(x)-Artanh\left(\frac{1}{\sqrt{\frac{x^2+(y(x))^2}{x^2}}}\right)+\frac{1}{2}\ln\left(\frac{x^2+(y(x))^2}{x^2}\right)-\_C1=0,\ln(x)+Artanh\left(\frac{1}{\sqrt{\frac{x^2+(y(x))^2}{x^2}}}\right)+\frac{1}{2}\ln\left(\frac{x^2+(y(x\right.\right.$$

Mathematica raw input

```
DSolve[y[x]^4 - 2*x*y[x]*(x^2 + 2*y[x]^2)*y'[x] + (x^4 + y[x]^2*(x^2 - y[x]^2))*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*E^C[1])/3 + (E^(2*C[1]) - 3*x^2)/(3*(E^(3*C[1]) - 18*E^C[1]*x^2 +
3*Sqrt[3]*Sqrt[-(E^(4*C[1])*x^2) + 11*E^(2*C[1])*x^4 + x^6])^(1/3)) + (E^(3*C[1]
) - 18*E^C[1]*x^2 + 3*Sqrt[3]*Sqrt[-(E^(4*C[1])*x^2) + 11*E^(2*C[1])*x^4 + x^6])
^(1/3)/3}, {y[x] -> (-2*E^C[1])/3 + ((1 + I*Sqrt[3])*(-E^(2*C[1]) + 3*x^2))/(6*(
E^(3*C[1]) - 18*E^C[1]*x^2 + 3*Sqrt[3]*Sqrt[-(E^(4*C[1])*x^2) + 11*E^(2*C[1])*x^
4 + x^6])^(1/3)) + (I/6)*(I + Sqrt[3])*(E^(3*C[1]) - 18*E^C[1]*x^2 + 3*Sqrt[3]*S
qrt[-(E^(4*C[1])*x^2) + 11*E^(2*C[1])*x^4 + x^6])^(1/3)}, {y[x] -> (-2*E^C[1])/3
 + ((I/6)*(I + Sqrt[3])*(E^(2*C[1]) - 3*x^2))/(E^(3*C[1]) - 18*E^C[1]*x^2 + 3*Sq
rt[3]*Sqrt[-(E^(4*C[1])*x^2) + 11*E^(2*C[1])*x^4 + x^6])^(1/3) - ((1 + I*Sqrt[3]
)*(E^(3*C[1]) - 18*E^C[1]*x^2 + 3*Sqrt[3]*Sqrt[-(E^(4*C[1])*x^2) + 11*E^(2*C[1])
*x^4 + x^6])^(1/3))/6}, {y[x] -> (2*E^C[1])/3 + (E^(2*C[1]) - 3*x^2)/(3*(-E^(3*C
[1]) + 18*E^C[1]*x^2 + 3*Sqrt[3]*Sqrt[-(E^(4*C[1])*x^2) + 11*E^(2*C[1])*x^4 + x^
```

```
6])^(1/3)) + (-E^(3*C[1]) + 18*E^C[1]*x^2 + 3*Sqrt[3]*Sqrt[-(E^(4*C[1])*x^2) + 1
1*E^(2*C[1])*x^4 + x^6])^(1/3)/3}, {y[x] -> (2*E^C[1])/3 + ((1 + I*Sqrt[3])*(-E^
(2*C[1]) + 3*x^2))/(6*(-E^(3*C[1]) + 18*E^C[1]*x^2 + 3*Sqrt[3]*Sqrt[-(E^(4*C[1])
*x^2) + 11*E^(2*C[1])*x^4 + x^6])^(1/3)) + (I/6)*(I + Sqrt[3])*(-E^(3*C[1]) + 18
*E^C[1]*x^2 + 3*Sqrt[3]*Sqrt[-(E^(4*C[1])*x^2) + 11*E^(2*C[1])*x^4 + x^6])^(1/3)
}, {y[x] -> (2*E^C[1])/3 + ((I/6)*(I + Sqrt[3])*(E^(2*C[1]) - 3*x^2))/(-E^(3*C[1
]) + 18*E^C[1]*x^2 + 3*Sqrt[3]*Sqrt[-(E^(4*C[1])*x^2) + 11*E^(2*C[1])*x^4 + x^6]
)^(1/3) - ((1 + I*Sqrt[3])*(-E^(3*C[1]) + 18*E^C[1]*x^2 + 3*Sqrt[3]*Sqrt[-(E^(4*
C[1])*x^2) + 11*E^(2*C[1])*x^4 + x^6])^(1/3))/6}}
```

Maple raw input

```
dsolve((x^4+(x^2-y(x)^2)*y(x)^2)*diff(y(x),x)^2-2*x*y(x)*(x^2+2*y(x)^2)*diff(y(x),x)+y(x)^4 = 0, y(x)
```

Maple raw output

```
ln(x)-arctanh(1/((x^2+y(x)^2)/x^2)^(1/2))+1/2*ln((x^2+y(x)^2)/x^2)-_C1 = 0, ln(x
)+arctanh(1/((x^2+y(x)^2)/x^2)^(1/2))+1/2*ln((x^2+y(x)^2)/x^2)-_C1 = 0
```

4.1016 $y(x)^5 (-y'(x)) + 3xy(x)^4 y'(x)^2 + 1 = 0$

ODE

$$y(x)^5 (-y'(x)) + 3xy(x)^4 y'(x)^2 + 1 = 0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.390326 (sec), leaf count = 408

$$\left\{\left\{y(x) \to -\sqrt[3]{-\frac{1}{2}}\sqrt[3]{-e^{-\frac{c_1}{2}}\left(e^{c_1}+12x\right)}\right\},\left\{y(x) \to \frac{\sqrt[3]{-e^{-\frac{c_1}{2}}\left(e^{c_1}+12x\right)}}{\sqrt[3]{2}}\right\},\left\{y(x) \to \frac{(-1)^{2/3}\sqrt[3]{-e^{-\frac{c_1}{2}}\left(e^{c_1}+12x\right)}}{\sqrt[3]{2}}\right\},\{\right.$$

Maple ✓
cpu = 0.146 (sec), leaf count = 99

$$\left\{(y(x))^6 - 12x = 0, -\ln(x) - \ln\left(-(y(x))^3 + \sqrt{(y(x))^6 - 12x}\right) + \ln\left((y(x))^3 + \sqrt{(y(x))^6 - 12x}\right) + \_C1 = 0, -\ln(x)\right.$$

Mathematica raw input

```
DSolve[1 - y[x]^5*y'[x] + 3*x*y[x]^4*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-1/2)^(1/3)*(-((E^C[1] + 12*x)/E^(C[1]/2)))^(1/3))}, {y[x] -> (-((E
^C[1] + 12*x)/E^(C[1]/2)))^(1/3)/2^(1/3)}, {y[x] -> ((-1)^(2/3)*(-((E^C[1] + 12*
x)/E^(C[1]/2)))^(1/3))/2^(1/3)}, {y[x] -> -((24*x - (1 + 144*x^2)*Cosh[C[1]] + (
-1 + 144*x^2)*Sinh[C[1]])^(1/6)/2^(1/3))}, {y[x] -> (24*x - (1 + 144*x^2)*Cosh[C
[1]] + (-1 + 144*x^2)*Sinh[C[1]])^(1/6)/2^(1/3)}, {y[x] -> ((1 - I*Sqrt[3])*(24*
x - (1 + 144*x^2)*Cosh[C[1]] + (-1 + 144*x^2)*Sinh[C[1]])^(1/6))/(2*2^(1/3))}, {
y[x] -> ((I/2)*(I + Sqrt[3])*(24*x - (1 + 144*x^2)*Cosh[C[1]] + (-1 + 144*x^2)*S
inh[C[1]])^(1/6))/2^(1/3)}, {y[x] -> ((-I/2)*(-I + Sqrt[3])*(24*x - (1 + 144*x^2
)*Cosh[C[1]] + (-1 + 144*x^2)*Sinh[C[1]])^(1/6))/2^(1/3)}, {y[x] -> ((1 + I*Sqrt
[3])*(24*x - (1 + 144*x^2)*Cosh[C[1]] + (-1 + 144*x^2)*Sinh[C[1]])^(1/6))/(2*2^(
1/3))}}
```

Maple raw input

```
dsolve(3*x*y(x)^4*diff(y(x),x)^2-y(x)^5*diff(y(x),x)+1 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^6-12*x = 0, -ln(x)+ln(-y(x)^3+(y(x)^6-12*x)^(1/2))-ln(y(x)^3+(y(x)^6-12*x)^
(1/2))+_C1 = 0, -ln(x)-ln(-y(x)^3+(y(x)^6-12*x)^(1/2))+ln(y(x)^3+(y(x)^6-12*x)^(
1/2))+_C1 = 0
```

4.1017 $-a-3y(x)^5y'(x)+9xy(x)^4y'(x)^2=0$

ODE

$$-a-3y(x)^5y'(x)+9xy(x)^4y'(x)^2=0$$

ODE Classification

[[_homogeneous, `class G`], _rational]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.493587 (sec), leaf count = 307

$$\left\{\left\{y(x)\to -\frac{i\left(\cosh\left(\frac{c_1}{6}\right)-\sinh\left(\frac{c_1}{6}\right)\right)\sqrt[3]{4ax+\sinh(c_1)+\cosh(c_1)}}{\sqrt[3]{2}}\right\},\left\{y(x)\to \frac{i\left(\cosh\left(\frac{c_1}{6}\right)-\sinh\left(\frac{c_1}{6}\right)\right)\sqrt[3]{4ax+\sinh(c_1)}}{\sqrt[3]{2}}\right.\right.$$

Maple ✓
cpu = 0.162 (sec), leaf count = 104

$$\left\{(y(x))^6+4ax=0,-\ln(x)-\ln\left(-(y(x))^3+\sqrt{(y(x))^6+4ax}\right)+\ln\left((y(x))^3+\sqrt{(y(x))^6+4ax}\right)+\_C1=0,-\ln(x)\right.$$

Mathematica raw input

```
DSolve[-a - 3*y[x]^5*y'[x] + 9*x*y[x]^4*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*(Cosh[C[1]/6] - Sinh[C[1]/6])*(4*a*x + Cosh[C[1]] + Sinh[C[1]])^
(1/3))/2^(1/3)}, {y[x] -> (I*(Cosh[C[1]/6] - Sinh[C[1]/6])*(4*a*x + Cosh[C[1]] +
 Sinh[C[1]])^(1/3))/2^(1/3)}, {y[x] -> ((-I + Sqrt[3])*(Cosh[C[1]/6] - Sinh[C[1]
/6])*(4*a*x + Cosh[C[1]] + Sinh[C[1]])^(1/3))/(2*2^(1/3))}, {y[x] -> -((-I + Sqr
t[3])*(Cosh[C[1]/6] - Sinh[C[1]/6])*(4*a*x + Cosh[C[1]] + Sinh[C[1]])^(1/3))/(2*
2^(1/3))}, {y[x] -> -((I + Sqrt[3])*(Cosh[C[1]/6] - Sinh[C[1]/6])*(4*a*x + Cosh[
C[1]] + Sinh[C[1]])^(1/3))/(2*2^(1/3))}, {y[x] -> ((I + Sqrt[3])*(Cosh[C[1]/6] -
 Sinh[C[1]/6])*(4*a*x + Cosh[C[1]] + Sinh[C[1]])^(1/3))/(2*2^(1/3))}}
```

Maple raw input

```
dsolve(9*x*y(x)^4*diff(y(x),x)^2-3*y(x)^5*diff(y(x),x)-a = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^6+4*a*x = 0, -ln(x)+ln(-y(x)^3+(y(x)^6+4*a*x)^(1/2))-ln(y(x)^3+(y(x)^6+4*a*
x)^(1/2))+_C1 = 0, -ln(x)-ln(-y(x)^3+(y(x)^6+4*a*x)^(1/2))+ln(y(x)^3+(y(x)^6+4*a
*x)^(1/2))+_C1 = 0
```

4.1018 $9(1-x^2)\,y(x)^4y'(x)^2+4x^2+6xy(x)^5y'(x)=0$

ODE

$$9(1-x^2)\,y(x)^4y'(x)^2+4x^2+6xy(x)^5y'(x)=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Change of variable

Mathematica ✗
cpu = 616.913 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 2.7 (sec), leaf count = 62

$$\left\{-\_C1-(y(x))^3+\sqrt{(y(x))^6+4x^2-4}=0,-\_C1+(y(x))^3+\sqrt{(y(x))^6+4x^2-4}=0,(y(x))^6+4x^2-4=0\right\}$$

Mathematica raw input

```
DSolve[4*x^2 + 6*x*y[x]^5*y'[x] + 9*(1 - x^2)*y[x]^4*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(9*(-x^2+1)*y(x)^4*diff(y(x),x)^2+6*x*y(x)^5*diff(y(x),x)+4*x^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^6+4*x^2-4 = 0, -_C1+y(x)^3+(y(x)^6+4*x^2-4)^(1/2) = 0, -_C1-y(x)^3+(y(x)^6+
4*x^2-4)^(1/2) = 0
```

4.1019 $y'(x)^2 \left(a^2 r(x,y(x)) - x^2\right) + a^2 r(x,y(x)) + 2xy(x)y'(x) - y(x)^2 = 0$

ODE

$$y'(x)^2 \left(a^2 r(x,y(x)) - x^2\right) + a^2 r(x,y(x)) + 2xy(x)y'(x) - y(x)^2 = 0$$

ODE Classification

[NONE]

Book solution method
Change of variable, polar coordinates

Mathematica ✗
cpu = 51.7921 (sec), leaf count = 0 , could not solve

```
DSolve[a^2*r[x, y[x]] - y[x]^2 + 2*x*y[x]*Derivative[1][y][x] + (-x^2 + a^2*r[x, y[x]])*Derivative[1]
```

Maple ✗
cpu = 4.813 (sec), leaf count = 0 , could not solve

```
dsolve((a^2*r(x,y(x))-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+a^2*r(x,y(x))-y(x)^2 = 0, y(x),'impli
```

Mathematica raw input

```
DSolve[a^2*r[x, y[x]] - y[x]^2 + 2*x*y[x]*y'[x] + (-x^2 + a^2*r[x, y[x]])*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a^2*r[x, y[x]] - y[x]^2 + 2*x*y[x]*Derivative[1][y][x] + (-x^2 + a^2*r[x,
 y[x]])*Derivative[1][y][x]^2 == 0, y[x], x]
```

Maple raw input

```
dsolve((a^2*r(x,y(x))-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+a^2*r(x,y(x))-y(x)^2 = 0, y(x),'impli
```

Maple raw output

```
dsolve((a^2*r(x,y(x))-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+a^2*r(x,y(x))-y(
x)^2 = 0, y(x),'implicit')
```

4.1020 $y'(x)^2 \left(ar(x,y(x))-x^2\right)+ar(x,y(x))+2xy(x)y'(x)-y(x)^2=0$

ODE

$$y'(x)^2 \left(ar(x,y(x))-x^2\right)+ar(x,y(x))+2xy(x)y'(x)-y(x)^2=0$$

ODE Classification

[NONE]

Book solution method
Change of variable, polar coordinates

Mathematica ✗
cpu = 49.0659 (sec), leaf count = 0 , could not solve

```
DSolve[a*r[x, y[x]] - y[x]^2 + 2*x*y[x]*Derivative[1][y][x] + (-x^2 + a*r[x, y[x]])*Derivative[1][y]
```

Maple ✗
cpu = 3.33 (sec), leaf count = 0 , could not solve

```
dsolve((a*r(x,y(x))-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+a*r(x,y(x))-y(x)^2 = 0, y(x),'implicit
```

Mathematica raw input

```
DSolve[a*r[x, y[x]] - y[x]^2 + 2*x*y[x]*y'[x] + (-x^2 + a*r[x, y[x]])*y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a*r[x, y[x]] - y[x]^2 + 2*x*y[x]*Derivative[1][y][x] + (-x^2 + a*r[x, y[x
]])*Derivative[1][y][x]^2 == 0, y[x], x]
```

Maple raw input

```
dsolve((a*r(x,y(x))-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+a*r(x,y(x))-y(x)^2 = 0, y(x),'implicit
```

Maple raw output

```
dsolve((a*r(x,y(x))-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+a*r(x,y(x))-y(x)^2
 = 0, y(x),'implicit')
```

4.1021 $y'(x)^3 = a + bx$

ODE

$$y'(x)^3 = a + bx$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0452425 (sec), leaf count = 80

$$\left\{\left\{y(x) \to \frac{3(a+bx)^{4/3}}{4b} + c_1\right\}, \left\{y(x) \to c_1 - \frac{3\sqrt[3]{-1}(a+bx)^{4/3}}{4b}\right\}, \left\{y(x) \to \frac{3(-1)^{2/3}(a+bx)^{4/3}}{4b} + c_1\right\}\right\}$$

Maple ✓
cpu = 0.063 (sec), leaf count = 68

$$\left\{y(x) = \frac{3}{4\,b}(bx+a)^{\frac{4}{3}} + \_C1, y(x) = \frac{\frac{3\,i}{8}\left(-\sqrt{3}+i\right)}{b}(bx+a)^{\frac{4}{3}} + \_C1, y(x) = \frac{\frac{3\,i}{8}\left(\sqrt{3}+i\right)}{b}(bx+a)^{\frac{4}{3}} + \_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x]^3 == a + b*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*(a + b*x)^(4/3))/(4*b) + C[1]}, {y[x] -> (-3*(-1)^(1/3)*(a + b*x)^(
4/3))/(4*b) + C[1]}, {y[x] -> (3*(-1)^(2/3)*(a + b*x)^(4/3))/(4*b) + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3 = b*x+a, y(x),'implicit')
```

Maple raw output

```
y(x) = 3/4*(b*x+a)^(4/3)/b+_C1, y(x) = 3/8*I*(b*x+a)^(4/3)*(-3^(1/2)+I)/b+_C1, y
(x) = 3/8*I*(b*x+a)^(4/3)*(3^(1/2)+I)/b+_C1
```

4.1022 $y'(x)^3 = ax^n$

ODE

$$y'(x)^3 = ax^n$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0137978 (sec), leaf count = 95

$$\left\{\left\{y(x) \to \frac{3\sqrt[3]{a}x^{\frac{n}{3}+1}}{n+3} + c_1\right\}, \left\{y(x) \to c_1 - \frac{3\sqrt[3]{-1}\sqrt[3]{a}x^{\frac{n}{3}+1}}{n+3}\right\}, \left\{y(x) \to \frac{3(-1)^{2/3}\sqrt[3]{a}x^{\frac{n}{3}+1}}{n+3} + c_1\right\}\right\}$$

Maple ✓
cpu = 0.104 (sec), leaf count = 81

$$\left\{y(x) = 3\frac{x\sqrt[3]{ax^n}}{n+3} + \_C1, y(x) = 3\frac{x\left(i\sqrt{3}-1\right)\sqrt[3]{ax^n}}{2n+6} + \_C1, y(x) = -3\frac{x\left(i\sqrt{3}+1\right)\sqrt[3]{ax^n}}{2n+6} + \_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x]^3 == a*x^n,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*a^(1/3)*x^(1 + n/3))/(3 + n) + C[1]}, {y[x] -> (-3*(-1)^(1/3)*a^(1/
3)*x^(1 + n/3))/(3 + n) + C[1]}, {y[x] -> (3*(-1)^(2/3)*a^(1/3)*x^(1 + n/3))/(3
+ n) + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3 = a*x^n, y(x),'implicit')
```

Maple raw output

```
y(x) = 3*x/(n+3)*(a*x^n)^(1/3)+_C1, y(x) = 3*x*(I*3^(1/2)-1)*(a*x^n)^(1/3)/(2*n+
6)+_C1, y(x) = -3*x*(I*3^(1/2)+1)*(a*x^n)^(1/3)/(2*n+6)+_C1
```

4.1023 $y'(x)^3 - y(x) + x = 0$

ODE

$$y'(x)^3 - y(x) + x = 0$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 1.49439 (sec), leaf count = 336

$$\left\{\text{Solve}\left[x = c_1 + \frac{3}{2}(y(x)-x)^{2/3} + 3\sqrt[3]{y(x)-x} + 3\log\left(1 - \sqrt[3]{y(x)-x}\right), y(x)\right], \text{Solve}\left[3\sqrt[3]{-1}\sqrt[3]{y(x)-x} + \log\left(1 - \sqrt[3]{y(x}\right.\right.\right.$$

Maple ✓
cpu = 0.016 (sec), leaf count = 43

$$\left\{[x(\_T) = \frac{3\_T^2}{2} + 3\_T + 3\ln(\_T - 1) + \_C1, y(\_T) = \_T^3 + \frac{3\_T^2}{2} + 3\_T + 3\ln(\_T - 1) + \_C1]\right\}$$

Mathematica raw input

```
DSolve[x - y[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[x == C[1] + 3*Log[1 - (-x + y[x])^(1/3)] + 3*(-x + y[x])^(1/3) + (3*(-x +
  y[x])^(2/3))/2, y[x]], Solve[x - (3*I)*ArcTan[(1 + 2*(-x + y[x])^(1/3))/Sqrt[3]
] + Log[1 - (-x + y[x])^(1/3)] + 3*(-1)^(1/3)*(-x + y[x])^(1/3) == C[1] + Log[1
+ x - y[x]] + Log[1 + (-x + y[x])^(1/3) + (-x + y[x])^(2/3)]/2 + (3*(-1)^(2/3)*(
-x + y[x])^(2/3))/2, y[x]], Solve[Sqrt[3]*(1 + (-1)^(1/3))*ArcTan[(1 + 2*(-x + y
[x])^(1/3))/Sqrt[3]] + (-1)^(2/3)*Log[1 + x - y[x]] + ((-1 + (-1)^(1/3))*Log[1 +
  (-x + y[x])^(1/3) + (-x + y[x])^(2/3)])/2 + (3*(-x + y[x])^(2/3))/2 + (-1)^(2/3
)*(-x + y[x]) == C[1] + (-1 + (-1)^(1/3))*Log[1 - (-x + y[x])^(1/3)] + (-1)^(2/3
)*y[x] + 3*(-1)^(1/3)*(-x + y[x])^(1/3), y[x]]}
```

Maple raw input

```
dsolve(diff(y(x),x)^3+x-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 3/2*_T^2+3*_T+3*ln(_T-1)+_C1, y(_T) = _T^3+3/2*_T^2+3*_T+3*ln(_T-1)+_C1
]
```

4.1024 $y'(x)^3 = f(x)\left(a + by(x) + cy(x)^2\right)$

ODE

$$y'(x)^3 = f(x)\left(a + by(x) + cy(x)^2\right)$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 1.80384 (sec), leaf count = 473

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{3\left(2\#1c - \sqrt{b^2-4ac} + b\right)\sqrt[3]{\frac{2\#1c+\sqrt{b^2-4ac}+b}{\sqrt{b^2-4ac}}}\,{}_2F_1\left(\frac{1}{3},\frac{2}{3};\frac{5}{3};\frac{-b-2c\#1+\sqrt{b^2-4ac}}{2\sqrt{b^2-4ac}}\right)}{4\sqrt[3]{2}c\sqrt[3]{\#1(\#1c+b)+a}}\&\right]\left[\int_1^x\right.\right.$$

Maple ✓
cpu = 0.537 (sec), leaf count = 191

$$\left\{\int^{y(x)}\frac{1}{\sqrt[3]{\_a^2c+\_a\,b+a}}d\_a+\int^{x}-1\sqrt[3]{\left(a+by\left(x\right)+c\left(y\left(x\right)\right)^2\right)f\left(\_a\right)}\frac{1}{\sqrt[3]{a+by\left(x\right)+c\left(y\left(x\right)\right)^2}}d\_a+\_C1=0,\int^{y(x)}\right.$$

Mathematica raw input

```
DSolve[y'[x]^3 == f[x]*(a + b*y[x] + c*y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(3*Hypergeometric2F1[1/3, 2/3, 5/3, (-b + Sqrt[b^2 - 4
*a*c] - 2*c*#1)/(2*Sqrt[b^2 - 4*a*c])]*(b - Sqrt[b^2 - 4*a*c] + 2*c*#1)*((b + Sq
rt[b^2 - 4*a*c] + 2*c*#1)/Sqrt[b^2 - 4*a*c])^(1/3))/(4*2^(1/3)*c*(a + #1*(b + c*
#1))^(1/3)) & ][C[1] + Integrate[f[K[1]]^(1/3), {K[1], 1, x}]]}, {y[x] -> Invers
eFunction[(3*Hypergeometric2F1[1/3, 2/3, 5/3, (-b + Sqrt[b^2 - 4*a*c] - 2*c*#1)/
(2*Sqrt[b^2 - 4*a*c])]*(b - Sqrt[b^2 - 4*a*c] + 2*c*#1)*((b + Sqrt[b^2 - 4*a*c]
+ 2*c*#1)/Sqrt[b^2 - 4*a*c])^(1/3))/(4*2^(1/3)*c*(a + #1*(b + c*#1))^(1/3)) & ][
C[1] + Integrate[-((-1)^(1/3)*f[K[2]]^(1/3)), {K[2], 1, x}]]}, {y[x] -> InverseF
unction[(3*Hypergeometric2F1[1/3, 2/3, 5/3, (-b + Sqrt[b^2 - 4*a*c] - 2*c*#1)/(2
*Sqrt[b^2 - 4*a*c])]*(b - Sqrt[b^2 - 4*a*c] + 2*c*#1)*((b + Sqrt[b^2 - 4*a*c] +
2*c*#1)/Sqrt[b^2 - 4*a*c])^(1/3))/(4*2^(1/3)*c*(a + #1*(b + c*#1))^(1/3)) & ][C[
```

```
1] + Integrate[(-1)^(2/3)*f[K[3]]^(1/3), {K[3], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3 = (a+b*y(x)+c*y(x)^2)*f(x), y(x),'implicit')
```

Maple raw output

```
Intat(1/(_a^2*c+_a*b+a)^(1/3),_a = y(x))+Intat(-((a+b*y(x)+c*y(x)^2)*f(_a))^(1/3
)/(a+b*y(x)+c*y(x)^2)^(1/3),_a = x)+_C1 = 0, Intat(1/(_a^2*c+_a*b+a)^(1/3),_a =
y(x))+Intat(1/2*((a+b*y(x)+c*y(x)^2)*f(_a))^(1/3)*(I*3^(1/2)+1)/(a+b*y(x)+c*y(x)
^2)^(1/3),_a = x)+_C1 = 0, Intat(1/(_a^2*c+_a*b+a)^(1/3),_a = y(x))+Intat(-1/2*(
(a+b*y(x)+c*y(x)^2)*f(_a))^(1/3)*(I*3^(1/2)-1)/(a+b*y(x)+c*y(x)^2)^(1/3),_a = x)
+_C1 = 0
```

4.1025 $y'(x)^3 = (y(x)-a)^2(y(x)-b)^2$

ODE

$$y'(x)^3 = (y(x)-a)^2(y(x)-b)^2$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y'

Mathematica ✓
cpu = 0.760204 (sec), leaf count = 236

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{3\sqrt[3]{a-\#1}\left(\frac{\#1-b}{a-b}\right)^{2/3}\,{}_2F_1\left(\frac{1}{3},\frac{2}{3};\frac{4}{3};\frac{a-\#1}{a-b}\right)}{(b-\#1)^{2/3}}\&\right][c_1+x]\right\},\left\{y(x)\to \text{InverseFunction}\left[-\frac{3\sqrt[3]{}\right.\right.\right.$$

Maple ✓
cpu = 0.187 (sec), leaf count = 133

$$\left\{(a-y(x))\,(b-y(x))=0, x-\int^{y(x)}\frac{1}{\sqrt[3]{(\_a-a)^2\,(\_a-b)^2}}d\_a-\_C1=0, x-\int^{y(x)}2\,\frac{1}{(i\sqrt{3}-1)\,\sqrt[3]{(-\_a+a)^2\,(-\_a+}\right.$$

Mathematica raw input

```
DSolve[y'[x]^3 == (-a + y[x])^2*(-b + y[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(-3*Hypergeometric2F1[1/3, 2/3, 4/3, (a - #1)/(a - b)]
*(a - #1)^(1/3)*((-b + #1)/(a - b))^(2/3))/(b - #1)^(2/3) & ][x + C[1]]}, {y[x]
-> InverseFunction[(-3*Hypergeometric2F1[1/3, 2/3, 4/3, (a - #1)/(a - b)]*(a - #
1)^(1/3)*((-b + #1)/(a - b))^(2/3))/(b - #1)^(2/3) & ][-((-1)^(1/3)*x) + C[1]]},
 {y[x] -> InverseFunction[(-3*Hypergeometric2F1[1/3, 2/3, 4/3, (a - #1)/(a - b)]
*(a - #1)^(1/3)*((-b + #1)/(a - b))^(2/3))/(b - #1)^(2/3) & ][(-1)^(2/3)*x + C[1
]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3 = (y(x)-a)^2*(y(x)-b)^2, y(x),'implicit')
```

Maple raw output

```
(a-y(x))*(b-y(x)) = 0, x-Intat(1/((_a-a)^2*(_a-b)^2)^(1/3),_a = y(x))-_C1 = 0, x
-Intat(-2/(I*3^(1/2)+1)/((-_a+a)^2*(-_a+b)^2)^(1/3),_a = y(x))-_C1 = 0, x-Intat(
2/(I*3^(1/2)-1)/((-_a+a)^2*(-_a+b)^2)^(1/3),_a = y(x))-_C1 = 0
```

4.1026 $f(x)(y(x)-a)^2(y(x)-b)^2+y'(x)^3=0$

ODE

$$f(x)(y(x)-a)^2(y(x)-b)^2+y'(x)^3=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 0.892397 (sec), leaf count = 274

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{3\sqrt[3]{a-\#1}\left(\frac{\#1-b}{a-b}\right)^{2/3}\,{}_2F_1\left(\frac{1}{3},\frac{2}{3};\frac{4}{3};\frac{a-\#1}{a-b}\right)}{(b-\#1)^{2/3}}\&\right]\left[\int_1^x -\sqrt[3]{f(K[1])}\,dK[1]+c_1\right]\right\},\left\{y(x)\to \text{I}\right.$$

Maple ✓
cpu = 0.495 (sec), leaf count = 212

$$\left\{\int^{y(x)}((-\_a+a)(-\_a+b))^{-\frac{2}{3}}\,d\_a+\int^x -1\sqrt[3]{-f(\_a)(a-y(x))^2(b-y(x))^2}((a-y(x))(b-y(x)))^{-\frac{2}{3}}d\_a+\_C1=\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])^2*(-b + y[x])^2 + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(-3*Hypergeometric2F1[1/3, 2/3, 4/3, (a - #1)/(a - b)]
*(a - #1)^(1/3)*((-b + #1)/(a - b))^(2/3))/(b - #1)^(2/3) & ][C[1] + Integrate[-
f[K[1]]^(1/3), {K[1], 1, x}]]}, {y[x] -> InverseFunction[(-3*Hypergeometric2F1[1
/3, 2/3, 4/3, (a - #1)/(a - b)]*(a - #1)^(1/3)*((-b + #1)/(a - b))^(2/3))/(b - #
1)^(2/3) & ][C[1] + Integrate[(-1)^(1/3)*f[K[2]]^(1/3), {K[2], 1, x}]]}, {y[x] -
> InverseFunction[(-3*Hypergeometric2F1[1/3, 2/3, 4/3, (a - #1)/(a - b)]*(a - #1
)^(1/3)*((-b + #1)/(a - b))^(2/3))/(b - #1)^(2/3) & ][C[1] + Integrate[-((-1)^(2
/3)*f[K[3]]^(1/3)), {K[3], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3+f(x)*(y(x)-a)^2*(y(x)-b)^2 = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/((-_a+a)*(-_a+b))^(2/3),_a = y(x))+Intat(-(-f(_a)*(a-y(x))^2*(b-y(x))^2)
^(1/3)/((a-y(x))*(b-y(x)))^(2/3),_a = x)+_C1 = 0, Intat(1/((-_a+a)*(-_a+b))^(2/3
),_a = y(x))+Intat(1/2*(-f(_a)*(a-y(x))^2*(b-y(x))^2)^(1/3)*(I*3^(1/2)+1)/((a-y(
x))*(b-y(x)))^(2/3),_a = x)+_C1 = 0, Intat(1/((-_a+a)*(-_a+b))^(2/3),_a = y(x))+
Intat(-1/2*(-f(_a)*(a-y(x))^2*(b-y(x))^2)^(1/3)*(I*3^(1/2)-1)/((a-y(x))*(b-y(x))
)^(2/3),_a = x)+_C1 = 0
```

4.1027 $f(x)(y(x)-a)^2(y(x)-b)^2(y(x)-c)^2+y'(x)^3=0$

ODE

$$f(x)(y(x)-a)^2(y(x)-b)^2(y(x)-c)^2+y'(x)^3=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 1.51623 (sec), leaf count = 397

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{3\sqrt[3]{a-\#1}\left(\frac{\#1-b}{a-b}\right)^{2/3}\sqrt[3]{\frac{\#1-c}{a-c}}\,{}_2F_1\left(\frac{1}{3},\frac{2}{3};\frac{4}{3};\frac{(c-b)(a-\#1)}{(a-b)(c-\#1)}\right)}{(b-\#1)^{2/3}(c-\#1)^{2/3}}\&\right]\left[\int_1^x -\sqrt[3]{f(K[1])}\,dK[1]+c\right.\right.$$

Maple ✓
cpu = 0.567 (sec), leaf count = 275

$$\left\{\int^{y(x)}(-(-\_a+c)(-\_a+b)(-\_a+a))^{-\frac{2}{3}}\,d\_a+\int^x -1\sqrt[3]{-f(\_a)(c-y(x))^2(b-y(x))^2(a-y(x))^2}(-(c-y(x))(b\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])^2*(-b + y[x])^2*(-c + y[x])^2 + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(-3*Hypergeometric2F1[1/3, 2/3, 4/3, ((-b + c)*(a - #1
))/((a - b)*(c - #1))]*(a - #1)^(1/3)*((-b + #1)/(a - b))^(2/3)*((-c + #1)/(a -
c))^(1/3))/((b - #1)^(2/3)*(c - #1)^(2/3)) & ][C[1] + Integrate[-f[K[1]]^(1/3),
{K[1], 1, x}]]}, {y[x] -> InverseFunction[(-3*Hypergeometric2F1[1/3, 2/3, 4/3, (
(-b + c)*(a - #1))/((a - b)*(c - #1))]*(a - #1)^(1/3)*((-b + #1)/(a - b))^(2/3)*
((-c + #1)/(a - c))^(1/3))/((b - #1)^(2/3)*(c - #1)^(2/3)) & ][C[1] + Integrate[
(-1)^(1/3)*f[K[2]]^(1/3), {K[2], 1, x}]]}, {y[x] -> InverseFunction[(-3*Hypergeo
metric2F1[1/3, 2/3, 4/3, ((-b + c)*(a - #1))/((a - b)*(c - #1))]*(a - #1)^(1/3)*
((-b + #1)/(a - b))^(2/3)*((-c + #1)/(a - c))^(1/3))/((b - #1)^(2/3)*(c - #1)^(2
/3)) & ][C[1] + Integrate[-((-1)^(2/3)*f[K[3]]^(1/3)), {K[3], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3+f(x)*(y(x)-a)^2*(y(x)-b)^2*(y(x)-c)^2 = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/(-(-_a+c)*(-_a+b)*(-_a+a))^(2/3),_a = y(x))+Intat(-(-f(_a)*(c-y(x))^2*(b
-y(x))^2*(a-y(x))^2)^(1/3)/(-(c-y(x))*(b-y(x))*(a-y(x)))^(2/3),_a = x)+_C1 = 0,
Intat(1/(-(-_a+c)*(-_a+b)*(-_a+a))^(2/3),_a = y(x))+Intat(1/2*(-f(_a)*(c-y(x))^2
*(b-y(x))^2*(a-y(x))^2)^(1/3)*(I*3^(1/2)+1)/(-(c-y(x))*(b-y(x))*(a-y(x)))^(2/3),
_a = x)+_C1 = 0, Intat(1/(-(-_a+c)*(-_a+b)*(-_a+a))^(2/3),_a = y(x))+Intat(-1/2*
(-f(_a)*(c-y(x))^2*(b-y(x))^2*(a-y(x))^2)^(1/3)*(I*3^(1/2)-1)/(-(c-y(x))*(b-y(x)
)*(a-y(x)))^(2/3),_a = x)+_C1 = 0
```

4.1028 $a - bx + y'(x)^3 + y'(x) = 0$

ODE

$$a - bx + y'(x)^3 + y'(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for x

Mathematica ✓
cpu = 11.2602 (sec), leaf count = 1862

$$\left\{\left\{y(x) \to \frac{-24\sqrt[3]{2}3^{2/3}\left(-9a+9bx+\sqrt{3}\sqrt{27(a-bx)^2+4}\right)^{2/3}\left(9\sqrt{3}a-9\sqrt{3}bx+\sqrt{27(a-bx)^2+4}\right)-\frac{12\sqrt{3}\left(-9a+9bx+\sqrt{3}\right.}{}\right.\right.$$

Maple ✓
cpu = 0.065 (sec), leaf count = 268

$$\left\{y(x)=\int \frac{i}{12}\left(\left(-\sqrt{3}+i\right)\left(108\,bx-108\,a+12\sqrt{81\,b^2x^2-162\,abx+81\,a^2+12}\right)^{\frac{2}{3}}-12\,i-12\sqrt{3}\right)\frac{}{\sqrt[3]{108\,bx-108\,a+1}}\right.$$

Mathematica raw input

```
DSolve[a - b*x + y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-24*2^(1/3)*3^(2/3)*(9*Sqrt[3]*a - 9*Sqrt[3]*b*x + Sqrt[4 + 27*(a - b
*x)^2])*(-9*a + 9*b*x + Sqrt[3]*Sqrt[4 + 27*(a - b*x)^2])^(2/3) - (12*Sqrt[3]*(-
9*a + 9*b*x + Sqrt[3]*Sqrt[4 + 27*(a - b*x)^2])*(14 + 324*a^2 + 729*a^4 - 648*a*
b*x - 2916*a^3*b*x + 324*b^2*x^2 + 4374*a^2*b^2*x^2 - 2916*a*b^3*x^3 + 729*b^4*x
^4 - 30*Sqrt[3]*a*Sqrt[4 + 27*(a - b*x)^2] - 81*Sqrt[3]*a^3*Sqrt[4 + 27*(a - b*x
)^2] + 30*Sqrt[3]*b*x*Sqrt[4 + 27*(a - b*x)^2] + 243*Sqrt[3]*a^2*b*x*Sqrt[4 + 27
*(a - b*x)^2] - 243*Sqrt[3]*a*b^2*x^2*Sqrt[4 + 27*(a - b*x)^2] + 81*Sqrt[3]*b^3*
x^3*Sqrt[4 + 27*(a - b*x)^2]))/(2 + 27*a^2 - 54*a*b*x + 27*b^2*x^2 - 3*Sqrt[3]*a
*Sqrt[4 + 27*(a - b*x)^2] + 3*Sqrt[3]*b*x*Sqrt[4 + 27*(a - b*x)^2]) - ((a - b*x)
*Sqrt[4 + 27*(a - b*x)^2]*(288 + (-9*a + 9*b*x + Sqrt[3]*Sqrt[4 + 27*(a - b*x)^2
])^4))/((-a + b*x)*(4 + 27*(a - b*x)^2 - 3*Sqrt[3]*a*Sqrt[4 + 27*(a - b*x)^2] +
```

```
3*Sqrt[3]*b*x*Sqrt[4 + 27*(a - b*x)^2]))))/(576*2^(2/3)*3^(5/6)*b*(-9*a + 9*b*x +
 Sqrt[3]*Sqrt[4 + 27*(a - b*x)^2])^(1/3)) + C[1]}, {y[x] -> (24*2^(1/3)*3^(2/3)*
(1 + I*Sqrt[3])*(9*Sqrt[3]*a - 9*Sqrt[3]*b*x + Sqrt[4 + 27*(a - b*x)^2])*(-9*a +
 9*b*x + Sqrt[3]*Sqrt[4 + 27*(a - b*x)^2])^(2/3) + (12*Sqrt[3]*(1 - I*Sqrt[3])*(
-9*a + 9*b*x + Sqrt[3]*Sqrt[4 + 27*(a - b*x)^2])*(14 + 324*a^2 + 729*a^4 - 648*a
*b*x - 2916*a^3*b*x + 324*b^2*x^2 + 4374*a^2*b^2*x^2 - 2916*a*b^3*x^3 + 729*b^4*
x^4 - 30*Sqrt[3]*a*Sqrt[4 + 27*(a - b*x)^2] - 81*Sqrt[3]*a^3*Sqrt[4 + 27*(a - b*
x)^2] + 30*Sqrt[3]*b*x*Sqrt[4 + 27*(a - b*x)^2] + 243*Sqrt[3]*a^2*b*x*Sqrt[4 + 2
7*(a - b*x)^2] - 243*Sqrt[3]*a*b^2*x^2*Sqrt[4 + 27*(a - b*x)^2] + 81*Sqrt[3]*b^3
*x^3*Sqrt[4 + 27*(a - b*x)^2]))/(2 + 27*a^2 - 54*a*b*x + 27*b^2*x^2 - 3*Sqrt[3]*
a*Sqrt[4 + 27*(a - b*x)^2] + 3*Sqrt[3]*b*x*Sqrt[4 + 27*(a - b*x)^2]) + ((1 - I*S
qrt[3])*(a - b*x)*Sqrt[4 + 27*(a - b*x)^2]*(288 + (-9*a + 9*b*x + Sqrt[3]*Sqrt[4
 + 27*(a - b*x)^2])^4))/((-a + b*x)*(4 + 27*(a - b*x)^2 - 3*Sqrt[3]*a*Sqrt[4 + 2
7*(a - b*x)^2] + 3*Sqrt[3]*b*x*Sqrt[4 + 27*(a - b*x)^2]))))/(1152*2^(2/3)*3^(5/6)
*b*(-9*a + 9*b*x + Sqrt[3]*Sqrt[4 + 27*(a - b*x)^2])^(1/3)) + C[1]}, {y[x] -> (2
4*2^(1/3)*3^(2/3)*(1 - I*Sqrt[3])*(9*Sqrt[3]*a - 9*Sqrt[3]*b*x + Sqrt[4 + 27*(a
- b*x)^2])*(-9*a + 9*b*x + Sqrt[3]*Sqrt[4 + 27*(a - b*x)^2])^(2/3) + (12*Sqrt[3]
*(1 + I*Sqrt[3])*(-9*a + 9*b*x + Sqrt[3]*Sqrt[4 + 27*(a - b*x)^2])*(14 + 324*a^2
 + 729*a^4 - 648*a*b*x - 2916*a^3*b*x + 324*b^2*x^2 + 4374*a^2*b^2*x^2 - 2916*a*
b^3*x^3 + 729*b^4*x^4 - 30*Sqrt[3]*a*Sqrt[4 + 27*(a - b*x)^2] - 81*Sqrt[3]*a^3*S
qrt[4 + 27*(a - b*x)^2] + 30*Sqrt[3]*b*x*Sqrt[4 + 27*(a - b*x)^2] + 243*Sqrt[3]*
a^2*b*x*Sqrt[4 + 27*(a - b*x)^2] - 243*Sqrt[3]*a*b^2*x^2*Sqrt[4 + 27*(a - b*x)^2
] + 81*Sqrt[3]*b^3*x^3*Sqrt[4 + 27*(a - b*x)^2]))/(2 + 27*a^2 - 54*a*b*x + 27*b^
2*x^2 - 3*Sqrt[3]*a*Sqrt[4 + 27*(a - b*x)^2] + 3*Sqrt[3]*b*x*Sqrt[4 + 27*(a - b*
x)^2]) + ((1 + I*Sqrt[3])*(a - b*x)*Sqrt[4 + 27*(a - b*x)^2]*(288 + (-9*a + 9*b*
x + Sqrt[3]*Sqrt[4 + 27*(a - b*x)^2])^4))/((-a + b*x)*(4 + 27*(a - b*x)^2 - 3*Sq
rt[3]*a*Sqrt[4 + 27*(a - b*x)^2] + 3*Sqrt[3]*b*x*Sqrt[4 + 27*(a - b*x)^2])))/(11
52*2^(2/3)*3^(5/6)*b*(-9*a + 9*b*x + Sqrt[3]*Sqrt[4 + 27*(a - b*x)^2])^(1/3)) +
C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3+diff(y(x),x)+a-b*x = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(1/12*I/(108*b*x-108*a+12*(81*b^2*x^2-162*a*b*x+81*a^2+12)^(1/2))^(1/3
)*((-3^(1/2)+I)*(108*b*x-108*a+12*(81*b^2*x^2-162*a*b*x+81*a^2+12)^(1/2))^(2/3)-
12*I-12*3^(1/2)),x)+_C1, y(x) = Int(1/12*I/(108*b*x-108*a+12*(81*b^2*x^2-162*a*b
*x+81*a^2+12)^(1/2))^(1/3)*((3^(1/2)+I)*(108*b*x-108*a+12*(81*b^2*x^2-162*a*b*x+
81*a^2+12)^(1/2))^(2/3)-12*I+12*3^(1/2)),x)+_C1, y(x) = Int(1/6*((108*b*x-108*a+
12*(81*b^2*x^2-162*a*b*x+81*a^2+12)^(1/2))^(2/3)-12)/(108*b*x-108*a+12*(81*b^2*x
^2-162*a*b*x+81*a^2+12)^(1/2))^(1/3),x)+_C1
```

4.1029 $y'(x)^3 + y'(x) - y(x) = 0$

ODE

$$y'(x)^3 + y'(x) - y(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✓
cpu = 223.943 (sec), leaf count = 3323

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{\left(243\#1^2 - 27\sqrt{81\#1^2+12}\#1 - 24\sqrt[3]{2}\sqrt[6]{3}\tan^{-1}\left(\frac{1}{\sqrt{3}} - \left(\frac{2}{3}\right)^{2/3}\sqrt[3]{\sqrt{81\#1^2+12}-9\#1}\right)\right)(\sqrt{}\right.\right.\right.$$

Maple ✓
cpu = 0.689 (sec), leaf count = 245

$$\left\{x - \int^{y(x)} 6\frac{\sqrt[3]{108\_a + 12\sqrt{81\_a^2+12}}}{\left(108\_a + 12\sqrt{81\_a^2+12}\right)^{2/3} - 12}d\_a - \_C1 = 0, x - \int^{y(x)} -12\frac{\sqrt[3]{10}}{(i\sqrt{3}-1)\left(-\sqrt[3]{108\_a + 12\sqrt{81\_a^2+}}\right.}\right.$$

Mathematica raw input

```
DSolve[-y[x] + y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-Log[#1]/(3*6^(2/3)) - ((9*Sqrt[3]*#1 + Sqrt[4 + 27*#1
^2])*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3))/(32*3^(5/6)) + (Sqrt[4/3 + 9*#1^2]*(-9*
#1 + Sqrt[12 + 81*#1^2])*(2*2^(2/3)*3^(5/6)*ArcTan[1/Sqrt[3] - (2/3)^(2/3)*(-9*#
1 + Sqrt[12 + 81*#1^2])^(1/3)] + 2*2^(2/3)*3^(5/6)*ArcTan[1/Sqrt[3] + (2/3)^(2/3
)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3)] + 2*2^(2/3)*3^(1/3)*Log[6 - 2^(2/3)*3^(5/6
```

```
)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3)] + 2*2^(2/3)*3^(1/3)*Log[6 + 2^(2/3)*3^(5/6
)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3)] - 2^(2/3)*3^(1/3)*Log[6 - 2^(2/3)*3^(5/6)*
(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3) + 2^(1/3)*3^(2/3)*(-9*#1 + Sqrt[12 + 81*#1^2]
)^(2/3)] - 2^(2/3)*3^(1/3)*Log[6 + 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#1^2])^
(1/3) + 2^(1/3)*3^(2/3)*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)] + 3*(-9*#1 + Sqrt[12
 + 81*#1^2])^(2/3)))/(36*2^(1/3)*(-4 - 27*#1^2 + 3*#1*Sqrt[12 + 81*#1^2])) + ((-
9*#1 + Sqrt[12 + 81*#1^2])^(4/3)*(54 + 243*#1^2 - 27*#1*Sqrt[12 + 81*#1^2] - 24*
2^(1/3)*3^(1/6)*ArcTan[1/Sqrt[3] - (2/3)^(2/3)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3
)]*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3) - 24*2^(1/3)*3^(1/6)*ArcTan[1/Sqrt[3] + (2
/3)^(2/3)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3)]*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)
 + 8*2^(1/3)*3^(2/3)*Log[6 - 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3)]
*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3) + 8*2^(1/3)*3^(2/3)*Log[6 + 2^(2/3)*3^(5/6)*
(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3)]*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3) - 4*2^(1/
3)*3^(2/3)*Log[6 - 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3) + 2^(1/3)*
3^(2/3)*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)]*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3) -
 4*2^(1/3)*3^(2/3)*Log[6 + 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3) +
2^(1/3)*3^(2/3)*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)]*(-9*#1 + Sqrt[12 + 81*#1^2])
^(2/3)))/(864*3^(1/3)*(-2 - 27*#1^2 + 3*#1*Sqrt[12 + 81*#1^2])) & ][-(x/6^(2/3))
 + C[1]]}, {y[x] -> InverseFunction[((-I/3456)*((288*I)*2^(1/3)*Log[#1] + 9*3^(1
/3)*(3 - I*Sqrt[3])*(9*Sqrt[3]*#1 + Sqrt[4 + 27*#1^2])*(-9*#1 + Sqrt[12 + 81*#1^
2])^(1/3) + (4*6^(2/3)*(3 + I*Sqrt[3])*Sqrt[4 + 27*#1^2]*(-9*#1 + Sqrt[12 + 81*#
1^2])*(2*2^(2/3)*3^(5/6)*ArcTan[1/Sqrt[3] - (2/3)^(2/3)*(-9*#1 + Sqrt[12 + 81*#1
^2])^(1/3)] + 2*2^(2/3)*3^(5/6)*ArcTan[1/Sqrt[3] + (2/3)^(2/3)*(-9*#1 + Sqrt[12
+ 81*#1^2])^(1/3)] + 2*2^(2/3)*3^(1/3)*Log[6 - 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12
+ 81*#1^2])^(1/3)] + 2*2^(2/3)*3^(1/3)*Log[6 + 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12
+ 81*#1^2])^(1/3)] - 2^(2/3)*3^(1/3)*Log[6 - 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 +
81*#1^2])^(1/3) + 2^(1/3)*3^(2/3)*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)] - 2^(2/3)*
3^(1/3)*Log[6 + 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3) + 2^(1/3)*3^(
2/3)*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)] + 3*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3))
)/(-4 - 27*#1^2 + 3*#1*Sqrt[12 + 81*#1^2]) - (3^(1/3)*(-I + Sqrt[3])*(-9*#1 + Sq
rt[12 + 81*#1^2])^(4/3)*(54 + 243*#1^2 - 27*#1*Sqrt[12 + 81*#1^2] - 24*2^(1/3)*3
^(1/6)*ArcTan[1/Sqrt[3] - (2/3)^(2/3)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3)]*(-9*#1
 + Sqrt[12 + 81*#1^2])^(2/3) - 24*2^(1/3)*3^(1/6)*ArcTan[1/Sqrt[3] + (2/3)^(2/3)
*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3)]*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3) + 8*2^(1
/3)*3^(2/3)*Log[6 - 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3)]*(-9*#1 +
 Sqrt[12 + 81*#1^2])^(2/3) + 8*2^(1/3)*3^(2/3)*Log[6 + 2^(2/3)*3^(5/6)*(-9*#1 +
Sqrt[12 + 81*#1^2])^(1/3)]*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3) - 4*2^(1/3)*3^(2/3
)*Log[6 - 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3) + 2^(1/3)*3^(2/3)*(
-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)]*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3) - 4*2^(1/3
)*3^(2/3)*Log[6 + 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3) + 2^(1/3)*3
^(2/3)*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)]*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)))/
(-2 - 27*#1^2 + 3*#1*Sqrt[12 + 81*#1^2]))/3^(5/6) & ][x/(2*2^(2/3)*3^(5/6)) + C
[1]]}, {y[x] -> InverseFunction[((I/3456)*((-288*I)*2^(1/3)*Log[#1] + 9*3^(1/3)*
(3 + I*Sqrt[3])*(9*Sqrt[3]*#1 + Sqrt[4 + 27*#1^2])*(-9*#1 + Sqrt[12 + 81*#1^2])^
(1/3) + (4*6^(2/3)*(3 - I*Sqrt[3])*Sqrt[4 + 27*#1^2]*(-9*#1 + Sqrt[12 + 81*#1^2]
)*(2*2^(2/3)*3^(5/6)*ArcTan[1/Sqrt[3] - (2/3)^(2/3)*(-9*#1 + Sqrt[12 + 81*#1^2])
^(1/3)] + 2*2^(2/3)*3^(5/6)*ArcTan[1/Sqrt[3] + (2/3)^(2/3)*(-9*#1 + Sqrt[12 + 81
```

```
*#1^2])^(1/3)] + 2*2^(2/3)*3^(1/3)*Log[6 - 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81
*#1^2])^(1/3)] + 2*2^(2/3)*3^(1/3)*Log[6 + 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81
*#1^2])^(1/3)] - 2^(2/3)*3^(1/3)*Log[6 - 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#
1^2])^(1/3) + 2^(1/3)*3^(2/3)*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)] - 2^(2/3)*3^(1
/3)*Log[6 + 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3) + 2^(1/3)*3^(2/3)
*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)] + 3*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)))/(-
4 - 27*#1^2 + 3*#1*Sqrt[12 + 81*#1^2]) - (3^(1/3)*(I + Sqrt[3])*(-9*#1 + Sqrt[12
 + 81*#1^2])^(4/3)*(54 + 243*#1^2 - 27*#1*Sqrt[12 + 81*#1^2] - 24*2^(1/3)*3^(1/6
)*ArcTan[1/Sqrt[3] - (2/3)^(2/3)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3)]*(-9*#1 + Sq
rt[12 + 81*#1^2])^(2/3) - 24*2^(1/3)*3^(1/6)*ArcTan[1/Sqrt[3] + (2/3)^(2/3)*(-9*
#1 + Sqrt[12 + 81*#1^2])^(1/3)]*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3) + 8*2^(1/3)*3
^(2/3)*Log[6 - 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3)]*(-9*#1 + Sqrt
[12 + 81*#1^2])^(2/3) + 8*2^(1/3)*3^(2/3)*Log[6 + 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[
12 + 81*#1^2])^(1/3)]*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3) - 4*2^(1/3)*3^(2/3)*Log
[6 - 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3) + 2^(1/3)*3^(2/3)*(-9*#1
 + Sqrt[12 + 81*#1^2])^(2/3)]*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3) - 4*2^(1/3)*3^(
2/3)*Log[6 + 2^(2/3)*3^(5/6)*(-9*#1 + Sqrt[12 + 81*#1^2])^(1/3) + 2^(1/3)*3^(2/3
)*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)]*(-9*#1 + Sqrt[12 + 81*#1^2])^(2/3)))/(-2 -
 27*#1^2 + 3*#1*Sqrt[12 + 81*#1^2])))/3^(5/6) & ][x/(2*2^(2/3)*3^(5/6)) + C[1]]}
}
```

Maple raw input

```
dsolve(diff(y(x),x)^3+diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x-Intat(6/((108*_a+12*(81*_a^2+12)^(1/2))^(2/3)-12)*(108*_a+12*(81*_a^2+12)^(1/2
))^(1/3),_a = y(x))-_C1 = 0, x-Intat(-12/(I*3^(1/2)+1)/((108*_a+12*(81*_a^2+12)^
(1/2))^(1/3)+3^(1/2)-3*I)/((108*_a+12*(81*_a^2+12)^(1/2))^(1/3)-3^(1/2)+3*I)*(10
8*_a+12*(81*_a^2+12)^(1/2))^(1/3),_a = y(x))-_C1 = 0, x-Intat(-12*(108*_a+12*(81
*_a^2+12)^(1/2))^(1/3)/(I*3^(1/2)-1)/(-(108*_a+12*(81*_a^2+12)^(1/2))^(1/3)+3^(1
/2)+3*I)/((108*_a+12*(81*_a^2+12)^(1/2))^(1/3)+3^(1/2)+3*I),_a = y(x))-_C1 = 0
```

4.1030 $y'(x)^3 + y'(x) = e^{y(x)}$

ODE

$$y'(x)^3 + y'(x) = e^{y(x)}$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.176 (sec), leaf count = 261

$$\left\{ x - \int^{y(x)} 6 \frac{\sqrt[3]{108\,\mathrm{e}^{-a} + 12\sqrt{12 + 81\,(\mathrm{e}^{-a})^2}}}{\left(108\,\mathrm{e}^{-a} + 12\sqrt{12 + 81\,(\mathrm{e}^{-a})^2}\right)^{2/3} - 12} d\_a - \_C1 = 0, x - \int^{y(x)} -12 \frac{}{(i\sqrt{3}+1)\left(\sqrt[3]{108\,\mathrm{e}^{-a} + 12\sqrt{12+}\right.}$$

Mathematica raw input

```
DSolve[y'[x] + y'[x]^3 == E^y[x],y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3+diff(y(x),x) = exp(y(x)), y(x),'implicit')
```

Maple raw output

```
x-Intat(6/((108*exp(_a)+12*(12+81*exp(_a)^2)^(1/2))^(2/3)-12)*(108*exp(_a)+12*(1
2+81*exp(_a)^2)^(1/2))^(1/3),_a = y(x))-_C1 = 0, x-Intat(-12/(I*3^(1/2)+1)/((108
*exp(_a)+12*(12+81*exp(_a)^2)^(1/2))^(1/3)-3^(1/2)+3*I)/((108*exp(_a)+12*(12+81*
exp(_a)^2)^(1/2))^(1/3)+3^(1/2)-3*I)*(108*exp(_a)+12*(12+81*exp(_a)^2)^(1/2))^(1
/3),_a = y(x))-_C1 = 0, x-Intat(-12*(108*exp(_a)+12*(12+81*exp(_a)^2)^(1/2))^(1/
3)/(I*3^(1/2)-1)/((108*exp(_a)+12*(12+81*exp(_a)^2)^(1/2))^(1/3)+3^(1/2)+3*I)/(-
(108*exp(_a)+12*(12+81*exp(_a)^2)^(1/2))^(1/3)+3^(1/2)+3*I),_a = y(x))-_C1 = 0
```

4.1031 $y'(x)^3 - 7y'(x) + 6 = 0$

ODE

$$y'(x)^3 - 7y'(x) + 6 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Both independent and dependent variable missing

Mathematica ✓
cpu = 0.00284468 (sec), leaf count = 29

$$\{\{y(x) \to c_1 - 3x\}, \{y(x) \to c_1 + x\}, \{y(x) \to c_1 + 2x\}\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 23

$$\{y(x) = -3\,x + \_C1, y(x) = x + \_C1, y(x) = 2\,x + \_C1\}$$

Mathematica raw input

```
DSolve[6 - 7*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -3*x + C[1]}, {y[x] -> x + C[1]}, {y[x] -> 2*x + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3-7*diff(y(x),x)+6 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 2*x+_C1, y(x) = x+_C1, y(x) = -3*x+_C1
```

4.1032 $ay(x) + y'(x)^3 - xy'(x) = 0$

ODE

$$ay(x) + y'(x)^3 - xy'(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✗
cpu = 602.979 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.021 (sec), leaf count = 108

$$\left\{[x(\_T) = \_T^{\frac{1}{a}(1-a^{-1})^{-1}}\left(-3\frac{\_T^2}{\_T^{(a-1)^{-1}}(2a-3)} + \_C1\right), y(\_T) = -2\frac{\left(\left(\_T^2 - \_C1\,\_T^{(a-1)^{-1}}\right)(a-3/2)\,\_T^{(a-1}\right.\right.$$

Mathematica raw input

```
DSolve[a*y[x] - x*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3-x*diff(y(x),x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = _T^(1/a/(1-1/a))*(-3/(_T^(1/(a-1)))*_T^2/(2*a-3)+_C1), y(_T) = -2*((_T^
2-_C1*_T^(1/(a-1)))*(a-3/2)*_T^(1/(a-1))+3/2*_T^(1/(a-1))*_T^2)*_T/(2*a^2-3*a)/(
_T^(1/(a-1)))]
```

4.1033 $y'(x)^3 + 2xy'(x) - y(x) = 0$

ODE

$$y'(x)^3 + 2xy'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✗
cpu = 600. (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.014 (sec), leaf count = 33

$$\left\{[x(\_T) = \frac{1}{\_T^2}\left(-\frac{3\_T^4}{4} + \_C1\right), y(\_T) = \frac{-\_T^4 + 4\_C1}{2\_T}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] + 2*x*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3+2*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^2*(-3/4*_T^4+_C1), y(_T) = 1/2*(-_T^4+4*_C1)/_T]
```

4.1034 $y'(x)^3 - 2xy'(x) - y(x) = 0$

ODE

$$y'(x)^3 - 2xy'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✗
cpu = 600. (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.041 (sec), leaf count = 31

$$\left\{[x(\_T) = 1\left(\frac{3}{8}\_T^{\frac{8}{3}} + \_C1\right)\_T^{-\frac{2}{3}}, y(\_T) = \frac{-T^3}{4} - 2\sqrt[3]{\_T}\_C1]\right\}$$

Mathematica raw input

```
DSolve[-y[x] - 2*x*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3-2*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^(2/3)*(3/8*_T^(8/3)+_C1), y(_T) = 1/4*_T^3-2*_T^(1/3)*_C1]
```

4.1035 $-axy'(x)+x^3+y'(x)^3=0$

ODE

$$-axy'(x)+x^3+y'(x)^3=0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Use new variable

Mathematica ✗
cpu = 599.997 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.053 (sec), leaf count = 231

$$\left\{y(x)=\int i\left(\left(\frac{i}{12}-\frac{\sqrt{3}}{12}\right)\left(-108\,x^3+12\sqrt{-12\,a^3x^3+81\,x^6}\right)^{\frac{2}{3}}+a\left(\sqrt{3}+i\right)x\right)\frac{1}{\sqrt[3]{-108\,x^3+12\sqrt{-12\,a^3x^3+81\,x^6}}}\,dx-\right.$$

Mathematica raw input

```
DSolve[x^3 - a*x*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3-a*x*diff(y(x),x)+x^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(I*((1/12*I-1/12*3^(1/2))*(-108*x^3+12*(-12*a^3*x^3+81*x^6)^(1/2))^(2/
3)+a*(3^(1/2)+I)*x)/(-108*x^3+12*(-12*a^3*x^3+81*x^6)^(1/2))^(1/3),x)+_C1, y(x)
= Int(I*((1/12*I+1/12*3^(1/2))*(-108*x^3+12*(-12*a^3*x^3+81*x^6)^(1/2))^(2/3)+a*
(-3^(1/2)+I)*x)/(-108*x^3+12*(-12*a^3*x^3+81*x^6)^(1/2))^(1/3),x)+_C1, y(x) = In
t(1/6*((-108*x^3+12*(-12*a^3*x^3+81*x^6)^(1/2))^(2/3)+12*a*x)/(-108*x^3+12*(-12*
a^3*x^3+81*x^6)^(1/2))^(1/3),x)+_C1
```

4.1036 $axy'(x) - ay(x) + y'(x)^3 = 0$

ODE

$$axy'(x) - ay(x) + y'(x)^3 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✗
cpu = 600.017 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.021 (sec), leaf count = 28

$$\left\{(y(x))^2 + \frac{4ax^3}{27} = 0, y(x) = \_C1\, x + \frac{\_C1^3}{a}\right\}$$

Mathematica raw input

```
DSolve[-(a*y[x]) + a*x*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3+a*x*diff(y(x),x)-a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+4/27*a*x^3 = 0, y(x) = _C1*x+_C1^3/a
```

4.1037 $-(a+bx)y'(x)+by(x)+y'(x)^3=0$

ODE

$$-(a+bx)y'(x)+by(x)+y'(x)^3=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✗
cpu = 600.013 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.093 (sec), leaf count = 45

$$\left\{\frac{27b^2(y(x))^2-4(bx+a)^3}{27b^2}=0, y(x)=\frac{\_C1\left(-\_C1^2+bx+a\right)}{b}\right\}$$

Mathematica raw input

```
DSolve[b*y[x] - (a + b*x)*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3-(b*x+a)*diff(y(x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/27*(27*b^2*y(x)^2-4*(b*x+a)^3)/b^2 = 0, y(x) = _C1*(-_C1^2+b*x+a)/b
```

4.1038 $y'(x)^3 - y(x)y'(x) - x = 0$

ODE

$$y'(x)^3 - y(x)y'(x) - x = 0$$

ODE Classification

[_dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 185.849 (sec), leaf count = 1

$Aborted

Maple ✓
cpu = 0.019 (sec), leaf count = 52

$$\left\{[x(\_T) = \_T\left(2\sqrt{\_T^2+1}+\_C1\right)\frac{1}{\sqrt{\_T^2+1}}, y(\_T) = -1\left(2\sqrt{\_T^2+1}+\_C1\right)\frac{1}{\sqrt{\_T^2+1}}+\_T^2]\right\}$$

Mathematica raw input

```
DSolve[-x - y[x]*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3-y(x)*diff(y(x),x)-x = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T^2+1)^(1/2)*_T*(2*(_T^2+1)^(1/2)+_C1), y(_T) = -1/(_T^2+1)^(1/2)*(
2*(_T^2+1)^(1/2)+_C1)+_T^2]
```

4.1039 $y'(x)^3 - (y(x)+3)y'(x) + x = 0$

ODE

$$y'(x)^3 - (y(x)+3)y'(x) + x = 0$$

ODE Classification

[_dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 152.507 (sec), leaf count = 1

$Aborted

Maple ✓
cpu = 0.024 (sec), leaf count = 63

$$\left\{[x(\_T) = \_T\left(2\sqrt{\_T-1}\sqrt{\_T+1}+\_C1\right)\frac{1}{\sqrt{\_T-1}}\frac{1}{\sqrt{\_T+1}}, y(\_T) = 1\left(\sqrt{\_T+1}\left(\_T^2-1\right)\sqrt{\_T-1}+\_C1\right)\right.$$

Mathematica raw input

```
DSolve[x - (3 + y[x])*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3-(3+y(x))*diff(y(x),x)+x = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T-1)^(1/2)/(_T+1)^(1/2)*_T*(2*(_T-1)^(1/2)*(_T+1)^(1/2)+_C1), y(_T)
 = ((_T+1)^(1/2)*(_T^2-1)*(_T-1)^(1/2)+_C1)/(_T+1)^(1/2)/(_T-1)^(1/2)]
```

4.1040 $y'(x)^3 - 2y(x)y'(x) + y(x)^2 = 0$

ODE

$$y'(x)^3 - 2y(x)y'(x) + y(x)^2 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✗
cpu = 0 (sec), leaf count = 0 , crash

```
Kernel Crash
```

Maple ✓
cpu = 0.052 (sec), leaf count = 259

$$\left\{x - \int^{y(x)} 6\,\frac{\sqrt[3]{-108\_a^2 + 12\sqrt{3}\sqrt{27\_a^4 - 32\_a^3}}}{\left(-108\_a^2 + 12\sqrt{3}\sqrt{27\_a^4 - 32\_a^3}\right)^{2/3} + 24\_a}\,d\_a - \_C1 = 0, x - \int^{y(x)} 12\,\frac{\sqrt[3]{-108\_}}{(i\sqrt{3}-1)\left(12\,i\_a\sqrt{3} + (-\right.}\right.$$

Mathematica raw input

```
DSolve[y[x]^2 - 2*y[x]*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
""
```

Maple raw input

```
dsolve(diff(y(x),x)^3-2*y(x)*diff(y(x),x)+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x-Intat(6/((-108*_a^2+12*3^(1/2)*(27*_a^4-32*_a^3)^(1/2))^(2/3)+24*_a)*(-108*_a^
2+12*3^(1/2)*(27*_a^4-32*_a^3)^(1/2))^(1/3),_a = y(x))-_C1 = 0, x-Intat(12/(I*3^
(1/2)+1)/(12*I*_a*3^(1/2)-(-108*_a^2+12*3^(1/2)*(27*_a^4-32*_a^3)^(1/2))^(2/3)+1
2*_a)*(-108*_a^2+12*3^(1/2)*(27*_a^4-32*_a^3)^(1/2))^(1/3),_a = y(x))-_C1 = 0, x
-Intat(12/(I*3^(1/2)-1)/(12*I*_a*3^(1/2)+(-108*_a^2+12*3^(1/2)*(27*_a^4-32*_a^3)
^(1/2))^(2/3)-12*_a)*(-108*_a^2+12*3^(1/2)*(27*_a^4-32*_a^3)^(1/2))^(1/3),_a = y
(x))-_C1 = 0
```

4.1041 $-axy(x)y'(x) + 2ay(x)^2 + y'(x)^3 = 0$

ODE

$$-axy(x)y'(x) + 2ay(x)^2 + y'(x)^3 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 599.997 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 1.507 (sec), leaf count = 38

$$\left\{y(x) = \frac{ax^3}{27}, [x(\_T) = \frac{2\_C1^2\_T\,a + 1}{\_C1\,a}, y(\_T) = \_C1\,\_T^2]\right\}$$

Mathematica raw input

```
DSolve[2*a*y[x]^2 - a*x*y[x]*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3-a*x*y(x)*diff(y(x),x)+2*a*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/27*a*x^3, [x(_T) = (2*_C1^2*_T*a+1)/a/_C1, y(_T) = _C1*_T^2]
```

4.1042 $-(x^3+xy(x)+y(x)^2)\,y'(x)+y'(x)^3+xy(x)(y(x)+x)=0$

ODE

$$-(x^3+xy(x)+y(x)^2)\,y'(x)+y'(x)^3+xy(x)(y(x)+x)=0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✗
cpu = 375.028 (sec), leaf count = 0 , could not solve

```
DSolve[x*y[x]*(x + y[x]) - (x^3 + x*y[x] + y[x]^2)*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,
```

Maple ✗
cpu = 1.606 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x)^3-(x^3+x*y(x)+y(x)^2)*diff(y(x),x)+(x+y(x))*x*y(x) = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[x*y[x]*(x + y[x]) - (x^3 + x*y[x] + y[x]^2)*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
DSolve[x*y[x]*(x + y[x]) - (x^3 + x*y[x] + y[x]^2)*Derivative[1][y][x] + Derivat
ive[1][y][x]^3 == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)^3-(x^3+x*y(x)+y(x)^2)*diff(y(x),x)+(x+y(x))*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x)^3-(x^3+x*y(x)+y(x)^2)*diff(y(x),x)+(x+y(x))*x*y(x) = 0, y(x)
,'implicit')
```

4.1043 $-xy(x)^4y'(x) + y'(x)^3 - y(x)^5 = 0$

ODE

$$-xy(x)^4y'(x) + y'(x)^3 - y(x)^5 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 600.002 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.88 (sec), leaf count = 42

$$\left\{(y(x))^2 - \frac{27}{4x^3} = 0, [x(\_T) = \frac{1}{\_T\,\_C1^4}\left(-\_C1^5\sqrt{\_T} + \_T\right), y(\_T) = \_C1\sqrt{\_T}]\right\}$$

Mathematica raw input

```
DSolve[-y[x]^5 - x*y[x]^4*y'[x] + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3-x*y(x)^4*diff(y(x),x)-y(x)^5 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-27/4/x^3 = 0, [x(_T) = (-_C1^5*_T^(1/2)+_T)/_T/_C1^4, y(_T) = _C1*_T^(1/2
)]
```

4.1044 $y'(x)^3 + e^{3x-2y(x)}(y'(x)-1) = 0$

ODE

$$y'(x)^3 + e^{3x-2y(x)}(y'(x)-1) = 0$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
Change of variable

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 284.418 (sec), leaf count = 514

$$\left\{ x + 6\int^{-3/2\,x+y(x)} \frac{e^{2\_a+3}\sqrt[3]{\sqrt{12\,e^{-6}}}}{3\,ie^{2\_a+3}\sqrt[3]{2\,e^{-6\_a}+3\,e^{-2\_a}\sqrt{12\,e^{-6\_a}+81\,e^{-4\_a}}+27\,e^{-4\_a}}\sqrt[6]{3}+3\,ie^{3}\sqrt[6]{3}\sqrt[3]{2}-e^{3}\sqrt[3]{18}+e^{2\_a+3}} \right.$$

Mathematica raw input

```
DSolve[E^(3*x - 2*y[x])*(-1 + y'[x]) + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3+exp(3*x-2*y(x))*(diff(y(x),x)-1) = 0, y(x),'implicit')
```

Maple raw output

```
x-6*Intat(exp(2*_a)*((12*exp(-6*_a)+81*exp(-4*_a))^(1/2)+9*exp(-2*_a))^(1/3)/(2*
exp(2*_a)*(27*exp(-2*_a)*(12*exp(-6*_a)+81*exp(-4*_a))^(1/2)+243*exp(-4*_a)+18*e
xp(-6*_a))^(1/3)-2*18^(1/3)-9*exp(2*_a)*((12*exp(-6*_a)+81*exp(-4*_a))^(1/2)+9*e
xp(-2*_a))^(1/3)),_a = -3/2*x+y(x))-_C1 = 0, x+6*Intat(((12*exp(-6*_a)+81*exp(-4
*_a))^(1/2)+9*exp(-2*_a))^(1/3)/(3*I*exp(2*_a+3)*(2*exp(-6*_a)+3*exp(-2*_a)*(12*
exp(-6*_a)+81*exp(-4*_a))^(1/2)+27*exp(-4*_a))^(1/3)*3^(1/6)+3*I*exp(3)*3^(1/6)*
2^(1/3)-exp(3)*18^(1/3)+exp(2*_a+3)*(27*exp(-2*_a)*(12*exp(-6*_a)+81*exp(-4*_a))
```

```
^(1/2)+243*exp(-4*_a)+18*exp(-6*_a))^(1/3)+9*exp(2*_a+3)*((12*exp(-6*_a)+81*exp(
-4*_a))^(1/2)+9*exp(-2*_a))^(1/3))*exp(2*_a+3),_a = -3/2*x+y(x))-_C1 = 0, x-6*In
tat(((12*exp(-6*_a)+81*exp(-4*_a))^(1/2)+9*exp(-2*_a))^(1/3)/(3*I*exp(2*_a+3)*(2
*exp(-6*_a)+3*exp(-2*_a)*(12*exp(-6*_a)+81*exp(-4*_a))^(1/2)+27*exp(-4*_a))^(1/3
)*3^(1/6)+3*I*exp(3)*3^(1/6)*2^(1/3)+exp(3)*18^(1/3)-exp(2*_a+3)*(27*exp(-2*_a)*
(12*exp(-6*_a)+81*exp(-4*_a))^(1/2)+243*exp(-4*_a)+18*exp(-6*_a))^(1/3)-9*exp(2*
_a+3)*((12*exp(-6*_a)+81*exp(-4*_a))^(1/2)+9*exp(-2*_a))^(1/3))*exp(2*_a+3),_a =
 -3/2*x+y(x))-_C1 = 0
```

4.1045 $y'(x)^3 + \left(e^{2x} + e^{3x}\right) e^{-2y(x)} y'(x) - e^{3x-2y(x)} = 0$

ODE

$$y'(x)^3 + \left(e^{2x} + e^{3x}\right) e^{-2y(x)} y'(x) - e^{3x-2y(x)} = 0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of variable

Mathematica ✗
cpu = 600.047 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.994 (sec), leaf count = 42

$$\left\{[y(\_T) = -\ln(\_T - 1) + \ln(\_T) + \_C1 - \frac{1}{2}\ln\left(-\frac{\_T^2}{e^{\_C1} + 1}\right), x(\_T) = -\ln(\_T - 1) + \ln(\_T) + \_C1]\right\}$$

Mathematica raw input

```
DSolve[-E^(3*x - 2*y[x]) + ((E^(2*x) + E^(3*x))*y'[x])/E^(2*y[x]) + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3+exp(-2*y(x))*(exp(2*x)+exp(3*x))*diff(y(x),x)-exp(3*x-2*y(x)) = 0, y(x),'implic
```

Maple raw output

```
[y(_T) = -ln(_T-1)+ln(_T)+_C1-1/2*ln(-_T^2/(exp(_C1)+1)), x(_T) = -ln(_T-1)+ln(_
T)+_C1]
```

4.1046 $y'(x)^3 + y'(x)^2 - y(x) = 0$

ODE

$$y'(x)^3 + y'(x)^2 - y(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✗
cpu = 0 (sec), leaf count = 0 , crash

```
Kernel Crash
```

Maple ✓
cpu = 0.103 (sec), leaf count = 436

$$\left\{ x - \int^{y(x)} 3 \frac{\sqrt[3]{6}\sqrt[3]{\sqrt{3}\left(27\sqrt{3}\_a - 2\sqrt{3} + 9\sqrt{27\_a^2 - 4\_a}\right)}}{6^{2/3} - \sqrt[3]{6}\sqrt[3]{\sqrt{3}\left(27\sqrt{3}\_a - 2\sqrt{3} + 9\sqrt{27\_a^2 - 4\_a}\right)} + \left(\sqrt{3}\left(27\sqrt{3}\_a - 2\sqrt{3} + 9\sqrt{27\_a^2 - 4\_a}\right)\right)^{2/3}} d\_ \right.$$

Mathematica raw input

```
DSolve[-y[x] + y'[x]^2 + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
""
```

Maple raw input

```
dsolve(diff(y(x),x)^3+diff(y(x),x)^2-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 0, x-Intat(3*6^(1/3)/(6^(2/3)-6^(1/3)*(3^(1/2)*(27*3^(1/2)*_a-2*3^(1/2)+9
*(27*_a^2-4*_a)^(1/2)))^(1/3)+(3^(1/2)*(27*3^(1/2)*_a-2*3^(1/2)+9*(27*_a^2-4*_a)
^(1/2)))^(2/3))*(3^(1/2)*(27*3^(1/2)*_a-2*3^(1/2)+9*(27*_a^2-4*_a)^(1/2)))^(1/3)
,_a = y(x))-_C1 = 0, x-Intat(12*3^(1/3)*2^(1/3)*(3^(1/2)*(27*3^(1/2)*_a-2*3^(1/2
)+9*(27*_a^2-4*_a)^(1/2)))^(1/3)/(I*3^(1/2)+1)/(3^(1/3)*2^(1/3)+(3^(1/2)*(27*3^(
```

```
1/2)*_a-2*3^(1/2)+9*(27*_a^2-4*_a)^(1/2)))^(1/3))/(-2*(3^(1/2)*(27*3^(1/2)*_a-2*
3^(1/2)+9*(27*_a^2-4*_a)^(1/2)))^(1/3)+(I*3^(5/6)+3^(1/3))*2^(1/3)),_a = y(x))-_
C1 = 0, x-Intat(6*3^(1/3)*2^(1/3)*(3^(1/2)*(27*3^(1/2)*_a-2*3^(1/2)+9*(27*_a^2-4
*_a)^(1/2)))^(1/3)/(I*3^(1/2)-1)/(3^(1/3)*2^(1/3)+(3^(1/2)*(27*3^(1/2)*_a-2*3^(1
/2)+9*(27*_a^2-4*_a)^(1/2)))^(1/3))/((1/2*I*3^(5/6)-1/2*3^(1/3))*2^(1/3)+(3^(1/2
)*(27*3^(1/2)*_a-2*3^(1/2)+9*(27*_a^2-4*_a)^(1/2)))^(1/3)),_a = y(x))-_C1 = 0
```

4.1047 $y'(x)^3 - y'(x)^2 + y(x)^2 = 0$

ODE

$$y'(x)^3 - y'(x)^2 + y(x)^2 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Use new variable

Mathematica ✗
cpu = 599.997 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.056 (sec), leaf count = 429

$$\left\{ x - \int^{y(x)} 6 \frac{\sqrt[3]{-4/3\sqrt{3}\left(27\sqrt{3}\_a^2 - 2\sqrt{3} - 9\sqrt{27\_a^4 - 4\_a^2}\right)}}{\left(-4/3\sqrt{3}\left(27\sqrt{3}\_a^2 - 2\sqrt{3} - 9\sqrt{27\_a^4 - 4\_a^2}\right)\right)^{2/3} + 2\sqrt[3]{-4/3\sqrt{3}\left(27\sqrt{3}\_a^2 - 2\sqrt{3} - 9\sqrt{27\_a^4 - 4\_}\right.}} \right.$$

Mathematica raw input

```
DSolve[y[x]^2 - y'[x]^2 + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3-diff(y(x),x)^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x-Intat(6/((-4/3*3^(1/2)*(27*3^(1/2)*_a^2-2*3^(1/2)-9*(27*_a^4-4*_a^2)^(1/2)))^(
2/3)+2*(-4/3*3^(1/2)*(27*3^(1/2)*_a^2-2*3^(1/2)-9*(27*_a^4-4*_a^2)^(1/2)))^(1/3)
+4)*(-4/3*3^(1/2)*(27*3^(1/2)*_a^2-2*3^(1/2)-9*(27*_a^4-4*_a^2)^(1/2)))^(1/3),_a
 = y(x))-_C1 = 0, x-Intat(-12/(I*3^(1/2)+1)/(I*3^(1/2)+(-4/3*3^(1/2)*(27*3^(1/2)
*_a^2-2*3^(1/2)-9*(27*_a^4-4*_a^2)^(1/2)))^(1/3)+1)/((-4/3*3^(1/2)*(27*3^(1/2)*_
```

```
a^2-2*3^(1/2)-9*(27*_a^4-4*_a^2)^(1/2)))^(1/3)-2)*(-4/3*3^(1/2)*(27*3^(1/2)*_a^2
-2*3^(1/2)-9*(27*_a^4-4*_a^2)^(1/2)))^(1/3),_a = y(x))-_C1 = 0, x-Intat(-12*(-4/
3*3^(1/2)*(27*3^(1/2)*_a^2-2*3^(1/2)-9*(27*_a^4-4*_a^2)^(1/2)))^(1/3)/(I*3^(1/2)
-1)/((-4/3*3^(1/2)*(27*3^(1/2)*_a^2-2*3^(1/2)-9*(27*_a^4-4*_a^2)^(1/2)))^(1/3)-2
)/(I*3^(1/2)-(-4/3*3^(1/2)*(27*3^(1/2)*_a^2-2*3^(1/2)-9*(27*_a^4-4*_a^2)^(1/2)))
^(1/3)-1),_a = y(x))-_C1 = 0
```

4.1048 $y'(x)^3 - y'(x)^2 + xy'(x) - y(x) = 0$

ODE

$$y'(x)^3 - y'(x)^2 + xy'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.00248597 (sec), leaf count = 17

$$\{\{y(x) \to c_1((c_1 - 1)\, c_1 + x)\}\}$$

Maple ✓
cpu = 0.039 (sec), leaf count = 40

$$\left\{(y(x))^2 + \frac{(-18\,x + 4)\, y(x)}{27} + \frac{4\,x^3}{27} - \frac{x^2}{27} = 0, y(x) = \_C1\ (\_C1^2 - \_C1 + x)\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] - y'[x]^2 + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*(x + (-1 + C[1])*C[1])}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3-diff(y(x),x)^2+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2+1/27*(-18*x+4)*y(x)+4/27*x^3-1/27*x^2 = 0, y(x) = _C1*(_C1^2-_C1+x)
```

4.1049 $abx - ay'(x)^2 + by(x) + y'(x)^3 = 0$

ODE

$$abx - ay'(x)^2 + by(x) + y'(x)^3 = 0$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.022 (sec), leaf count = 74

$$\left\{[x(\_T) = -\frac{3\_T^2}{2b} + 5\frac{a\_T}{b} - 5\frac{a^2\ln(\_T+a)}{b} + \_C1, y(\_T) = \frac{10\ln(\_T+a)a^3 - 2\_C1\,ab - 2\_T^3 + 5\_T^2a - 1}{2b}\right.$$

Mathematica raw input

```
DSolve[a*b*x + b*y[x] - a*y'[x]^2 + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3-a*diff(y(x),x)^2+b*y(x)+a*b*x = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = -3/2/b*_T^2+5/b*a*_T-5/b*a^2*ln(_T+a)+_C1, y(_T) = 1/2*(10*ln(_T+a)*a^3
-2*_C1*a*b-2*_T^3+5*_T^2*a-10*_T*a^2)/b]
```

4.1050 $\mathbf{a0}y'(x)^2 + \mathbf{a1}y'(x) + \mathbf{a2} + \mathbf{a3}y(x) + y'(x)^3 = 0$

ODE

$$\mathrm{a0}y'(x)^2 + \mathrm{a1}y'(x) + \mathrm{a2} + \mathrm{a3}y(x) + y'(x)^3 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✗
cpu = 600.03 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.158 (sec), leaf count = 831

$$\left\{ x - \int^{y(x)} 6 \frac{\sqrt[3]{36\,a1\,a0 - 10}}{\left(36\,a1\,a0 - 108\,a3\,\_a - 108\,a2 - 8\,a0^3 + 12\sqrt{(12\,a3\,\_a + 12\,a2)\,a0^3 - 3\,a1^2 a0^2 - 54\,a1\,(a3\,\_a + a2)\,a0}\right.} \right.$$

Mathematica raw input

```
DSolve[a2 + a3*y[x] + a1*y'[x] + a0*y'[x]^2 + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3+a0*diff(y(x),x)^2+a1*diff(y(x),x)+a2+a3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x-Intat(6/((36*a1*a0-108*a3*_a-108*a2-8*a0^3+12*((12*_a*a3+12*a2)*a0^3-3*a1^2*a0
^2-54*a1*(_a*a3+a2)*a0+81*_a^2*a3^2+162*_a*a2*a3+12*a1^3+81*a2^2)^(1/2))^(2/3)-2
*a0*(36*a1*a0-108*a3*_a-108*a2-8*a0^3+12*((12*_a*a3+12*a2)*a0^3-3*a1^2*a0^2-54*a
1*(_a*a3+a2)*a0+81*_a^2*a3^2+162*_a*a2*a3+12*a1^3+81*a2^2)^(1/2))^(1/3)+4*a0^2-1
2*a1)*(36*a1*a0-108*a3*_a-108*a2-8*a0^3+12*((12*_a*a3+12*a2)*a0^3-3*a1^2*a0^2-54
```

```
*a1*(_a*a3+a2)*a0+81*_a^2*a3^2+162*_a*a2*a3+12*a1^3+81*a2^2)^(1/2))^(1/3),_a = y
(x))-_C1 = 0, x-Intat(6*(36*a1*a0-108*a3*_a-108*a2-8*a0^3+12*((12*_a*a3+12*a2)*a
0^3-3*a1^2*a0^2-54*a1*(_a*a3+a2)*a0+81*_a^2*a3^2+162*_a*a2*a3+12*a1^3+81*a2^2)^(
1/2))^(1/3)/(-1/2*(36*a1*a0-108*a3*_a-108*a2-8*a0^3+12*((12*_a*a3+12*a2)*a0^3-3*
a1^2*a0^2-54*a1*(_a*a3+a2)*a0+81*_a^2*a3^2+162*_a*a2*a3+12*a1^3+81*a2^2)^(1/2))^
(2/3)+1/2*(I*3^(1/2)-1)*a0*(36*a1*a0-108*a3*_a-108*a2-8*a0^3+12*((12*_a*a3+12*a2
)*a0^3-3*a1^2*a0^2-54*a1*(_a*a3+a2)*a0+81*_a^2*a3^2+162*_a*a2*a3+12*a1^3+81*a2^2
)^(1/2))^(1/3)+(a0^2-3*a1)*(I*3^(1/2)+1))/(I*3^(1/2)+1),_a = y(x))-_C1 = 0, x-In
tat(6*(36*a1*a0-108*a3*_a-108*a2-8*a0^3+12*((12*_a*a3+12*a2)*a0^3-3*a1^2*a0^2-54
*a1*(_a*a3+a2)*a0+81*_a^2*a3^2+162*_a*a2*a3+12*a1^3+81*a2^2)^(1/2))^(1/3)/(I*3^(
1/2)-1)/(1/2*(36*a1*a0-108*a3*_a-108*a2-8*a0^3+12*((12*_a*a3+12*a2)*a0^3-3*a1^2*
a0^2-54*a1*(_a*a3+a2)*a0+81*_a^2*a3^2+162*_a*a2*a3+12*a1^3+81*a2^2)^(1/2))^(2/3)
+1/2*a0*(I*3^(1/2)+1)*(36*a1*a0-108*a3*_a-108*a2-8*a0^3+12*((12*_a*a3+12*a2)*a0^
3-3*a1^2*a0^2-54*a1*(_a*a3+a2)*a0+81*_a^2*a3^2+162*_a*a2*a3+12*a1^3+81*a2^2)^(1/
2))^(1/3)+(a0^2-3*a1)*(I*3^(1/2)-1)),_a = y(x))-_C1 = 0
```

4.1051 $y'(x)^3 + xy'(x)^2 - y(x) = 0$

ODE

$$y'(x)^3 + xy'(x)^2 - y(x) = 0$$

ODE Classification

[_dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 53.0238 (sec), leaf count = 1496

$$\left\{\left\{y(x) \to \frac{-16x^4 + 8\left(\sqrt[3]{-8x^3 - 36x^2 - 54x + 108c_1 + 6\sqrt{6}\sqrt{(2c_1+1)\left(-4x^3 - 18x^2 - 27x + 27c_1\right)}} + 27 - 12\right)x^3 - 4\left(\right.\right.\right.$$

Maple ✓
cpu = 0.021 (sec), leaf count = 50

$$\left\{y(x) = 0, [x(\_T) = \frac{1}{(\_T-1)^2}\left(-\_T^3 + \frac{3\_T^2}{2} + \_C1\right), y(\_T) = -\frac{\_T^2(\_T^2 - 2\_C1 - 2\_T)}{2(\_T-1)^2}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x]^2 + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-16*x^4 + 8*x^3*(-12 + (27 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*Sqr
t[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])])^(1/3)) - 4*x^2*(54 -
 9*(27 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x -
 18*x^2 - 4*x^3 + 27*C[1])])^(1/3) + (27 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*
Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])])^(2/3)) + 6*x*(72*
C[1] + 4*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])] + 9*(27 -
 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2
 - 4*x^3 + 27*C[1])])^(1/3) + 2*(27 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*Sqrt[6
]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])])^(2/3)) + 3*(81 + 12*Sqr
t[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])] + 27*(27 - 54*x - 36*
x^2 - 8*x^3 + 108*C[1] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 2
7*C[1])])^(1/3) + 2*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])
```

```
]*(27 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x -
18*x^2 - 4*x^3 + 27*C[1])])^(1/3) + 9*(27 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6
*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])])^(2/3) + 4*C[1]*(
54 + 9*(27 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27
*x - 18*x^2 - 4*x^3 + 27*C[1])])^(1/3) + 2*(27 - 54*x - 36*x^2 - 8*x^3 + 108*C[1
] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])])^(2/3))))/(2
4*(27 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x -
18*x^2 - 4*x^3 + 27*C[1])])^(2/3))}, {y[x] -> (-2*x + 2*C[1] + (x*(6 - 4*x - (I*
(-I + Sqrt[3])*(3 + 2*x)^2)/(27 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*Sqrt[6]*S
qrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])])^(1/3) + I*(I + Sqrt[3])*(2
7 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x
^2 - 4*x^3 + 27*C[1])])^(1/3)))/3 + (6 - 4*x - (I*(-I + Sqrt[3])*(3 + 2*x)^2)/(2
7 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x
^2 - 4*x^3 + 27*C[1])])^(1/3) + I*(I + Sqrt[3])*(27 - 54*x - 36*x^2 - 8*x^3 + 10
8*C[1] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])])^(1/3))
^2/48)/2}, {y[x] -> (-2*x + 2*C[1] + (x*(6 - 4*x + (I*(I + Sqrt[3])*(3 + 2*x)^2)
/(27 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 1
8*x^2 - 4*x^3 + 27*C[1])])^(1/3) - I*(-I + Sqrt[3])*(27 - 54*x - 36*x^2 - 8*x^3
+ 108*C[1] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])])^(1
/3)))/3 + (6 - 4*x + (I*(I + Sqrt[3])*(3 + 2*x)^2)/(27 - 54*x - 36*x^2 - 8*x^3 +
 108*C[1] + 6*Sqrt[6]*Sqrt[(1 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])])^(1/
3) - I*(-I + Sqrt[3])*(27 - 54*x - 36*x^2 - 8*x^3 + 108*C[1] + 6*Sqrt[6]*Sqrt[(1
 + 2*C[1])*(-27*x - 18*x^2 - 4*x^3 + 27*C[1])])^(1/3))^2/48)/2}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3+x*diff(y(x),x)^2-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 0, [x(_T) = 1/(_T-1)^2*(-_T^3+3/2*_T^2+_C1), y(_T) = -1/2*_T^2*(_T^2-2*_C
1-2*_T)/(_T-1)^2]
```

4.1052 $-x^3-(1-3x)xy'(x)+y'(x)^3+(1-3x)y'(x)^2-1=0$

ODE

$$-x^3-(1-3x)xy'(x)+y'(x)^3+(1-3x)y'(x)^2-1=0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Use new variable

Mathematica ✗
cpu = 599.997 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.225 (sec), leaf count = 378

$$\left\{y(x)=\int -i\left(\left(-\frac{i}{12}-\frac{\sqrt{3}}{12}\right)\left(36x+100+12\sqrt{3}\sqrt{4x^3-x^2+18x+23}\right)^{\frac{2}{3}}+\left(x-\frac{1}{3}\right)\left(i\sqrt[3]{36x+100+12\sqrt{3}\sqrt{4x^3-}\right.\right.\right.$$

Mathematica raw input

```
DSolve[-1 - x^3 - (1 - 3*x)*x*y'[x] + (1 - 3*x)*y'[x]^2 + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^3+(1-3*x)*diff(y(x),x)^2-x*(1-3*x)*diff(y(x),x)-1-x^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(-I/(36*x+100+12*3^(1/2)*(4*x^3-x^2+18*x+23)^(1/2))^(1/3)*((-1/12*I+1/
12*3^(1/2))*(36*x+100+12*3^(1/2)*(4*x^3-x^2+18*x+23)^(1/2))^(2/3)+(I*(36*x+100+1
2*3^(1/2)*(4*x^3-x^2+18*x+23)^(1/2))^(1/3)+I+3^(1/2))*(x-1/3)),x)+_C1, y(x) = In
t(-I*((-1/12*I-1/12*3^(1/2))*(36*x+100+12*3^(1/2)*(4*x^3-x^2+18*x+23)^(1/2))^(2/
3)+(x-1/3)*(I*(36*x+100+12*3^(1/2)*(4*x^3-x^2+18*x+23)^(1/2))^(1/3)+I-3^(1/2)))/
(36*x+100+12*3^(1/2)*(4*x^3-x^2+18*x+23)^(1/2))^(1/3),x)+_C1, y(x) = Int(1/6*((6
*(36*x+100+12*3^(1/2)*(4*x^3-x^2+18*x+23)^(1/2))^(1/3)-12)*x+(36*x+100+12*3^(1/2
```

```
)*(4*x^3-x^2+18*x+23)^(1/2))^(2/3)-2*(36*x+100+12*3^(1/2)*(4*x^3-x^2+18*x+23)^(1
/2))^(1/3)+4)/(36*x+100+12*3^(1/2)*(4*x^3-x^2+18*x+23)^(1/2))^(1/3),x)+_C1
```

4.1053 $y'(x)^3 - y(x)y'(x)^2 + y(x)^2 = 0$

ODE

$$y'(x)^3 - y(x)y'(x)^2 + y(x)^2 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✗
cpu = 0 (sec), leaf count = 0 , crash

```
Kernel Crash
```

Maple ✓
cpu = 0.086 (sec), leaf count = 370

$$\left\{ x - \int^{y(x)} 6 \frac{\sqrt[3]{-108\_a^2 + 8\_a^3 + 12\sqrt{-12\_a^5 + 81\_a^4}}}{\left(-108\_a^2 + 8\_a^3 + 12\sqrt{-12\_a^5 + 81\_a^4}\right)^{2/3} + 2\_a\sqrt[3]{-108\_a^2 + 8\_a^3 + 12\sqrt{-12\_a^5 + 81\_a^4}} + 4\_} \right.$$

Mathematica raw input

```
DSolve[y[x]^2 - y[x]*y'[x]^2 + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
""
```

Maple raw input

```
dsolve(diff(y(x),x)^3-y(x)*diff(y(x),x)^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 0, x-Intat(6/((-108*_a^2+8*_a^3+12*(-12*_a^5+81*_a^4)^(1/2))^(2/3)+2*_a*(
-108*_a^2+8*_a^3+12*(-12*_a^5+81*_a^4)^(1/2))^(1/3)+4*_a^2)*(-108*_a^2+8*_a^3+12
*(-12*_a^5+81*_a^4)^(1/2))^(1/3),_a = y(x))-_C1 = 0, x-Intat(-12/(I*3^(1/2)+1)/(
(-108*_a^2+8*_a^3+12*(-12*_a^5+81*_a^4)^(1/2))^(1/3)+I*3^(1/2)*_a+_a)/((-108*_a^
2+8*_a^3+12*(-12*_a^5+81*_a^4)^(1/2))^(1/3)-2*_a)*(-108*_a^2+8*_a^3+12*(-12*_a^5
+81*_a^4)^(1/2))^(1/3),_a = y(x))-_C1 = 0, x-Intat(12/(I*3^(1/2)-1)/((-108*_a^2+
```

```
8*_a^3+12*(-12*_a^5+81*_a^4)^(1/2))^(1/3)-2*_a)/((-108*_a^2+8*_a^3+12*(-12*_a^5+
81*_a^4)^(1/2))^(1/3)-I*3^(1/2)*_a+_a)*(-108*_a^2+8*_a^3+12*(-12*_a^5+81*_a^4)^(
1/2))^(1/3),_a = y(x))-_C1 = 0
```

4.1054

$$y'(x)^3+y'(x)^2(\cos(x)\cot(x)-y(x))-y'(x)(y(x)\cos(x)\cot(x)+1)+y(x)=0$$

ODE

$$y'(x)^3+y'(x)^2(\cos(x)\cot(x)-y(x))-y'(x)(y(x)\cos(x)\cot(x)+1)+y(x)=0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0740957 (sec), leaf count = 45

$$\left\{\{y(x)\to c_1e^x\},\{y(x)\to c_1-\cos(x)\},\left\{y(x)\to c_1-\log\left(\sin\left(\frac{x}{2}\right)\right)+\log\left(\cos\left(\frac{x}{2}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.089 (sec), leaf count = 32

$$\{y(x)=\_C1\,\mathrm{e}^x,y(x)=-\cos(x)+\_C1,y(x)=-\ln(\csc(x)-\cot(x))+\_C1\}$$

Mathematica raw input

```
DSolve[y[x] - (1 + Cos[x]*Cot[x]*y[x])*y'[x] + (Cos[x]*Cot[x] - y[x])*y'[x]^2 + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1]}, {y[x] -> C[1] - Cos[x]}, {y[x] -> C[1] + Log[Cos[x/2]] - Lo
g[Sin[x/2]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3+(cos(x)*cot(x)-y(x))*diff(y(x),x)^2-(1+y(x)*cos(x)*cot(x))*diff(y(x),x)+y(x) =
```

Maple raw output

```
y(x) = _C1*exp(x), y(x) = -ln(csc(x)-cot(x))+_C1, y(x) = -cos(x)+_C1
```

4.1055 $y'(x)^3 + (2x - y(x)^2)\, y'(x)^2 - 2xy(x)^2 y'(x) = 0$

ODE

$$y'(x)^3 + (2x - y(x)^2)\, y'(x)^2 - 2xy(x)^2 y'(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0092636 (sec), leaf count = 31

$$\left\{\left\{y(x) \to -\frac{1}{c_1 + x}\right\}, \{y(x) \to c_1\}, \{y(x) \to c_1 - x^2\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 26

$$\left\{(y(x))^{-1} + x - \_C1 = 0, y(x) = \_C1, y(x) = -x^2 + \_C1\right\}$$

Mathematica raw input

```
DSolve[-2*x*y[x]^2*y'[x] + (2*x - y[x]^2)*y'[x]^2 + y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x + C[1])^(-1)}, {y[x] -> C[1]}, {y[x] -> -x^2 + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3+(2*x-y(x)^2)*diff(y(x),x)^2-2*x*y(x)^2*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
1/y(x)+x-_C1 = 0, y(x) = -x^2+_C1, y(x) = _C1
```

4.1056 $(x^2+2xy(x)^2-y(x)^2)\,y'(x)-y(x)^2\,(x^2-y(x)^2)+y'(x)^3-(y(x)^2+2x)\,y'(x)^2=0$

ODE

$$(x^2+2xy(x)^2-y(x)^2)\,y'(x)-y(x)^2\,(x^2-y(x)^2)+y'(x)^3-(y(x)^2+2x)\,y'(x)^2=0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0122171 (sec), leaf count = 43

$$\left\{\left\{y(x)\to -\frac{1}{c_1+x}\right\},\{y(x)\to c_1e^{-x}+x-1\},\{y(x)\to c_1e^{x}-x-1\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 36

$$\left\{(y(x))^{-1}+x-\_C1=0,y(x)=-x-1+\mathrm{e}^{x}\_C1,y(x)=x-1+\mathrm{e}^{-x}\_C1\right\}$$

Mathematica raw input

```
DSolve[-(y[x]^2*(x^2 - y[x]^2)) + (x^2 - y[x]^2 + 2*x*y[x]^2)*y'[x] - (2*x + y[x]^2)*y'[x]^2 + y'[x]^
```

Mathematica raw output

```
{{y[x] -> -(x + C[1])^(-1)}, {y[x] -> -1 + x + C[1]/E^x}, {y[x] -> -1 - x + E^x*
C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3-(2*x+y(x)^2)*diff(y(x),x)^2+(x^2-y(x)^2+2*x*y(x)^2)*diff(y(x),x)-
(x^2-y(x)^2)*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
1/y(x)+x-_C1 = 0, y(x) = -x-1+exp(x)*_C1, y(x) = x-1+exp(-x)*_C1
```

4.1057 $-x^3y(x)^3+x\left(x^2+xy(x)+y(x)^2\right)y(x)y'(x)-\left(x^2+xy(x)+y(x)^2\right)y'(x)^2+y'(x)^3=0$

ODE

$$-x^3y(x)^3+x\left(x^2+xy(x)+y(x)^2\right)y(x)y'(x)-\left(x^2+xy(x)+y(x)^2\right)y'(x)^2+y'(x)^3=0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00723968 (sec), leaf count = 43

$$\left\{\left\{y(x)\to -\frac{1}{c_1+x}\right\},\left\{y(x)\to c_1e^{\frac{x^2}{2}}\right\},\left\{y(x)\to c_1+\frac{x^3}{3}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 33

$$\left\{(y(x))^{-1}+x-\_C1=0,y(x)=\_C1\,\mathrm{e}^{\frac{x^2}{2}},y(x)=\frac{x^3}{3}+\_C1\right\}$$

Mathematica raw input

```
DSolve[-(x^3*y[x]^3) + x*y[x]*(x^2 + x*y[x] + y[x]^2)*y'[x] - (x^2 + x*y[x] + y[x]^2)*y'[x]^2 + y'[x]
```

Mathematica raw output

```
{{y[x] -> -(x + C[1])^(-1)}, {y[x] -> E^(x^2/2)*C[1]}, {y[x] -> x^3/3 + C[1]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3-(x^2+x*y(x)+y(x)^2)*diff(y(x),x)^2+x*y(x)*(x^2+x*y(x)+y(x)^2)*diff(y(x),x)-
x^3*y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/3*x^3+_C1, 1/y(x)+x-_C1 = 0, y(x) = _C1*exp(1/2*x^2)
```

4.1058 $-x^3y(x)^6 + x(x^2 + y(x)^4 + xy(x)^2)\,y(x)^2y'(x) - (x^2 + y(x)^4 + xy(x)^2)\,y'(x)^2 + y'(x)^3 = 0$

ODE

$$-x^3y(x)^6 + x\left(x^2 + y(x)^4 + xy(x)^2\right)y(x)^2y'(x) - \left(x^2 + y(x)^4 + xy(x)^2\right)y'(x)^2 + y'(x)^3 = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0105282 (sec), leaf count = 105

$$\left\{\left\{y(x) \to -\frac{\sqrt[3]{-\frac{1}{3}}}{\sqrt[3]{-c_1 - x}}\right\}, \left\{y(x) \to \frac{1}{\sqrt[3]{3}\sqrt[3]{-c_1 - x}}\right\}, \left\{y(x) \to \frac{(-1)^{2/3}}{\sqrt[3]{3}\sqrt[3]{-c_1 - x}}\right\}, \left\{y(x) \to c_1 + \frac{x^3}{3}\right\}, \left\{y(x) \to -\frac{2}{2c_1 + x^2}\right.\right.$$

Maple ✓
cpu = 0.01 (sec), leaf count = 39

$$\left\{(y(x))^{-3} + 3x - \_C1 = 0, (y(x))^{-1} + \frac{x^2}{2} - \_C1 = 0, y(x) = \frac{x^3}{3} + \_C1\right\}$$

Mathematica raw input

```
DSolve[-(x^3*y[x]^6) + x*y[x]^2*(x^2 + x*y[x]^2 + y[x]^4)*y'[x] - (x^2 + x*y[x]^2 + y[x]^4)*y'[x]^2 +
```

Mathematica raw output

```
{{y[x] -> -((-1/3)^(1/3)/(-x - C[1])^(1/3))}, {y[x] -> 1/(3^(1/3)*(-x - C[1])^(1
/3))}, {y[x] -> (-1)^(2/3)/(3^(1/3)*(-x - C[1])^(1/3))}, {y[x] -> x^3/3 + C[1]},
 {y[x] -> -2/(x^2 + 2*C[1])}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3-(x^2+x*y(x)^2+y(x)^4)*diff(y(x),x)^2+x*y(x)^2*(x^2+x*y(x)^2+y(x)^4)*diff(y(x),x
x^3*y(x)^6 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/3*x^3+_C1, 1/y(x)^3+3*x-_C1 = 0, 1/y(x)+1/2*x^2-_C1 = 0
```

4.1059 $2y'(x)^3 + xy'(x) - 2y(x) = 0$

ODE

$$2y'(x)^3 + xy'(x) - 2y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✗
cpu = 599.999 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.016 (sec), leaf count = 25

$$\left\{[x(\_T) = \_T\,(6\_T + \_C1)\,, y(\_T) = \frac{\_T^2(8\_T + \_C1)}{2}]\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + x*y'[x] + 2*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(2*diff(y(x),x)^3+x*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = _T*(6*_T+_C1), y(_T) = 1/2*_T^2*(8*_T+_C1)]
```

4.1060 $2y'(x)^3 + y'(x)^2 - y(x) = 0$

ODE

$$2y'(x)^3 + y'(x)^2 - y(x) = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✗
cpu = 0 (sec), leaf count = 0 , crash

```
Kernel Crash
```

Maple ✓
cpu = 0.094 (sec), leaf count = 412

$$\left\{ x - \int^{y(x)} 6 \frac{\sqrt[3]{3}\sqrt[3]{\sqrt{3}\left(54\sqrt{3}\_a - \sqrt{3} + 18\sqrt{27\_a^2 - \_a}\right)}}{3^{2/3} - \sqrt[3]{3}\sqrt[3]{\sqrt{3}\left(54\sqrt{3}\_a - \sqrt{3} + 18\sqrt{27\_a^2 - \_a}\right)} + \left(\sqrt{3}\left(54\sqrt{3}\_a - \sqrt{3} + 18\sqrt{27\_a^2 - \_a}\right)\right)^{2/3}} d\_a -$$

Mathematica raw input

```
DSolve[-y[x] + y'[x]^2 + 2*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
""
```

Maple raw input

```
dsolve(2*diff(y(x),x)^3+diff(y(x),x)^2-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 0, x-Intat(6*3^(1/3)/(3^(2/3)-3^(1/3)*(3^(1/2)*(54*3^(1/2)*_a-3^(1/2)+18*
(27*_a^2-_a)^(1/2)))^(1/3)+(3^(1/2)*(54*3^(1/2)*_a-3^(1/2)+18*(27*_a^2-_a)^(1/2)
))^(2/3))*(3^(1/2)*(54*3^(1/2)*_a-3^(1/2)+18*(27*_a^2-_a)^(1/2)))^(1/3),_a = y(x
))-_C1 = 0, x-Intat(24*3^(1/3)/(I*3^(1/2)+1)/(I*3^(5/6)+3^(1/3)-2*(3^(1/2)*(54*3
^(1/2)*_a-3^(1/2)+18*(27*_a^2-_a)^(1/2)))^(1/3))/((3^(1/2)*(54*3^(1/2)*_a-3^(1/2
```

```
)+18*(27*_a^2-_a)^(1/2)))^(1/3)+3^(1/3))*(3^(1/2)*(54*3^(1/2)*_a-3^(1/2)+18*(27*
_a^2-_a)^(1/2)))^(1/3),_a = y(x))-_C1 = 0, x-Intat(12*3^(1/3)*(3^(1/2)*(54*3^(1/
2)*_a-3^(1/2)+18*(27*_a^2-_a)^(1/2)))^(1/3)/(I*3^(1/2)-1)/(1/2*I*3^(5/6)+(3^(1/2
)*(54*3^(1/2)*_a-3^(1/2)+18*(27*_a^2-_a)^(1/2)))^(1/3)-1/2*3^(1/3))/((3^(1/2)*(5
4*3^(1/2)*_a-3^(1/2)+18*(27*_a^2-_a)^(1/2)))^(1/3)+3^(1/3)),_a = y(x))-_C1 = 0
```

4.1061 $x^4(-y'(x)) + 2x^3y(x) + 3y'(x)^3 = 0$

ODE

$$x^4(-y'(x)) + 2x^3y(x) + 3y'(x)^3 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✗
cpu = 599.997 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.361 (sec), leaf count = 37

$$\left\{(y(x))^2 - \frac{x^6}{81} = 0, [y(\_T) = \frac{\_C1^4 \_T^2 - 3}{2 \_C1^3}, x(\_T) = \_C1 \_T]\right\}$$

Mathematica raw input

```
DSolve[2*x^3*y[x] - x^4*y'[x] + 3*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(3*diff(y(x),x)^3-x^4*diff(y(x),x)+2*x^3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-1/81*x^6 = 0, [y(_T) = 1/2*(_C1^4*_T^2-3)/_C1^3, x(_T) = _C1*_T]
```

4.1062 $4y'(x)^3 + 4y'(x) = x$

ODE

$$4y'(x)^3 + 4y'(x) = x$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for x

Mathematica ✓
cpu = 2.68298 (sec), leaf count = 828

$$\left\{\left\{y(x) \to \frac{(1+i\sqrt{3})\sqrt[3]{\sqrt{81x^2+192}-9x}\left(9\sqrt{3}x+\sqrt{27x^2+64}\right)}{96\sqrt[6]{3}} + \frac{i\sqrt[6]{3}(i+\sqrt{3})\sqrt{27x^2+64}\left(-243x^4+27\sqrt{81x^2+192}\right.}{256\sqrt[3]{\sqrt{81x^2+192}-9x}\left(-27x^2+\right.}\right.$$

Maple ✓
cpu = 0.225 (sec), leaf count = 166

$$\left\{y(x) = \int \frac{i}{12}\left(\left(-\sqrt{3}+i\right)\left(27x+3\sqrt{81x^2+192}\right)^{\frac{2}{3}} - 12i - 12\sqrt{3}\right)\frac{1}{\sqrt[3]{27x+3\sqrt{81x^2+192}}}\,dx + \_C1, y(x) = \int \frac{i}{12}\left(\right.\right.$$

Mathematica raw input

```
DSolve[4*y'[x] + 4*y'[x]^3 == x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((1 + I*Sqrt[3])*(9*Sqrt[3]*x + Sqrt[64 + 27*x^2])*(-9*x + Sqrt[192 +
81*x^2])^(1/3))/(96*3^(1/6)) + ((I/256)*3^(1/6)*(I + Sqrt[3])*Sqrt[64 + 27*x^2]*
(-512 - 576*x^2 - 243*x^4 + 32*x*Sqrt[192 + 81*x^2] + 27*x^3*Sqrt[192 + 81*x^2])
)/((-9*x + Sqrt[192 + 81*x^2])^(1/3)*(-64 - 27*x^2 + 3*x*Sqrt[192 + 81*x^2])) +
((1 - I*Sqrt[3])*(-9*x + Sqrt[192 + 81*x^2])^(2/3)*(-3584 - 5184*x^2 - 729*x^4 +
 480*x*Sqrt[192 + 81*x^2] + 81*x^3*Sqrt[192 + 81*x^2]))/(1536*3^(1/3)*(-32 - 27*
x^2 + 3*x*Sqrt[192 + 81*x^2])) + C[1]}, {y[x] -> ((1 - I*Sqrt[3])*(9*Sqrt[3]*x +
 Sqrt[64 + 27*x^2])*(-9*x + Sqrt[192 + 81*x^2])^(1/3))/(96*3^(1/6)) - ((I/256)*3
^(1/6)*(-I + Sqrt[3])*Sqrt[64 + 27*x^2]*(-512 - 576*x^2 - 243*x^4 + 32*x*Sqrt[19
2 + 81*x^2] + 27*x^3*Sqrt[192 + 81*x^2]))/((-9*x + Sqrt[192 + 81*x^2])^(1/3)*(-6
4 - 27*x^2 + 3*x*Sqrt[192 + 81*x^2])) + ((1 + I*Sqrt[3])*(-9*x + Sqrt[192 + 81*x
^2])^(2/3)*(-3584 - 5184*x^2 - 729*x^4 + 480*x*Sqrt[192 + 81*x^2] + 81*x^3*Sqrt[
```

```
192 + 81*x^2]))/(1536*3^(1/3)*(-32 - 27*x^2 + 3*x*Sqrt[192 + 81*x^2])) + C[1]},
{y[x] -> (-((9*Sqrt[3]*x + Sqrt[64 + 27*x^2])*(-9*x + Sqrt[192 + 81*x^2])^(1/3))
/(8*3^(1/6)) + ((-9*x + Sqrt[192 + 81*x^2])^(2/3)*(3584 + 5184*x^2 + 729*x^4 - 4
80*x*Sqrt[192 + 81*x^2] - 81*x^3*Sqrt[192 + 81*x^2]))/(128*3^(1/3)*(-32 - 27*x^2
 + 3*x*Sqrt[192 + 81*x^2])) + (3*3^(1/6)*Sqrt[64 + 27*x^2]*(-512 - 576*x^2 - 243
*x^4 + 32*x*Sqrt[192 + 81*x^2] + 27*x^3*Sqrt[192 + 81*x^2]))/(64*(-9*x + Sqrt[19
2 + 81*x^2])^(1/3)*(-64 - 27*x^2 + 3*x*Sqrt[192 + 81*x^2])))/6 + C[1]}}
```

Maple raw input

```
dsolve(4*diff(y(x),x)^3+4*diff(y(x),x) = x, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(1/12*I/(27*x+3*(81*x^2+192)^(1/2))^(1/3)*((-3^(1/2)+I)*(27*x+3*(81*x^
2+192)^(1/2))^(2/3)-12*I-12*3^(1/2)),x)+_C1, y(x) = Int(1/12*I/(27*x+3*(81*x^2+1
92)^(1/2))^(1/3)*((3^(1/2)+I)*(27*x+3*(81*x^2+192)^(1/2))^(2/3)-12*I+12*3^(1/2))
,x)+_C1, y(x) = Int(1/6*((27*x+3*(81*x^2+192)^(1/2))^(2/3)-12)/(27*x+3*(81*x^2+1
92)^(1/2))^(1/3),x)+_C1
```

4.1063 $8y'(x)^3 + 12y'(x)^2 = 27(y(x) + x)$

ODE

$$8y'(x)^3 + 12y'(x)^2 = 27(y(x) + x)$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✗
cpu = 600.003 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.021 (sec), leaf count = 32

$$\left\{y(x) = -x + \frac{4}{27}, [x(\_T) = \frac{4\_T^2}{9} + \_C1, y(\_T) = \frac{8\_T^3}{27} - \_C1]\right\}$$

Mathematica raw input

```
DSolve[12*y'[x]^2 + 8*y'[x]^3 == 27*(x + y[x]),y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(8*diff(y(x),x)^3+12*diff(y(x),x)^2 = 27*x+27*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -x+4/27, [x(_T) = 4/9*_T^2+_C1, y(_T) = 8/27*_T^3-_C1]
```

4.1064 $a + xy'(x)^3 - y(x)y'(x)^2 = 0$

ODE

$$a + xy'(x)^3 - y(x)y'(x)^2 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✗
cpu = 599.999 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.024 (sec), leaf count = 28

$$\left\{(y(x))^3 - \frac{27ax^2}{4} = 0, y(x) = \frac{\_C1^3 x + a}{\_C1^2}\right\}$$

Mathematica raw input

```
DSolve[a - y[x]*y'[x]^2 + x*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x*diff(y(x),x)^3-y(x)*diff(y(x),x)^2+a = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^3-27/4*a*x^2 = 0, y(x) = (_C1^3*x+a)/_C1^2
```

4.1065 $xy'(x)^3 + (2x - y(x))y'(x)^2 + (2 - 2y(x))y'(x) - y(x) + 1 = 0$

ODE

$$xy'(x)^3 + (2x - y(x))y'(x)^2 + (2 - 2y(x))y'(x) - y(x) + 1 = 0$$

ODE Classification

[_dAlembert]

Book solution method
Clairaut's equation and related types, $f(y - xy', y') = 0$

Mathematica ✓
cpu = 526.186 (sec), leaf count = 98

$$\text{Solve}\left[\left\{x = c_1 e^{\frac{1}{2}(\text{K\$215689}+1)^2+\text{K\$215689}}(\text{K\$215689}+1)^2 + \frac{1}{2}\left(\sqrt{2\pi}\left(-e^{\frac{1}{2}(\text{K\$215689}+2)^2}\right)(\text{K\$215689}+1)^2\text{erf}\left(\frac{\text{K\$215689}+2}{\sqrt{2}}\right.\right.\right.$$

Maple ✓
cpu = 0.282 (sec), leaf count = 124

$$\left\{y(x) = 1, [x(\_T) = \mathrm{e}^{\frac{-T^2}{2}}\left(\mathrm{e}^{-T}\right)^2(\_T+1)^2\left(\int -2\frac{\mathrm{e}^{-1/2\_T^2}}{(\_T+1)^3\left(\mathrm{e}^{-T}\right)^2}\,\mathrm{d}\_T + \_C1\right), y(\_T) = \frac{1}{(\_T+1)^2}\left(\_T^2\left(\mathrm{e}^{-T}\right)^2\right.\right.$$

Mathematica raw input

```
DSolve[1 - y[x] + (2 - 2*y[x])*y'[x] + (2*x - y[x])*y'[x]^2 + x*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
Solve[{x == E^(K$215689 + (1 + K$215689)^2/2)*(1 + K$215689)^2*C[1] + (-2*K$2156
89 - E^((2 + K$215689)^2/2)*(1 + K$215689)^2*Sqrt[2*Pi]*Erf[(2 + K$215689)/Sqrt[
2]])/2, y[x] == (1 + 2*K$215689 + 2*K$215689^2*x + K$215689^3*x)/(1 + K$215689)^
2}, {y[x], K$215689}]
```

Maple raw input

```
dsolve(x*diff(y(x),x)^3+(2*x-y(x))*diff(y(x),x)^2+(2-2*y(x))*diff(y(x),x)+1-y(x) = 0, y(x),'implicit
```

Maple raw output

```
y(x) = 1, [x(_T) = exp(1/2*_T^2)*exp(_T)^2*(_T+1)^2*(Int(-2/(_T+1)^3*exp(-1/2*_T
^2)/exp(_T)^2,_T)+_C1), y(_T) = (_T^2*exp(_T)^2*exp(1/2*_T^2)*(_T+2)*(_T+1)^2*In
```

```
t(-2/(_T+1)^3*exp(-1/2*_T^2)/exp(_T)^2,_T)+_T^2*_C1*exp(_T)^2*(_T+2)*(_T+1)^2*ex
p(1/2*_T^2)+2*_T+1)/(_T+1)^2]
```

4.1066 $-(x^2+y(x)+x)\,y'(x)^2+(x^2+xy(x)+y(x))\,y'(x)+xy'(x)^3-xy(x)=0$

ODE

$$-(x^2+y(x)+x)\,y'(x)^2+(x^2+xy(x)+y(x))\,y'(x)+xy'(x)^3-xy(x)=0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.00410926 (sec), leaf count = 31

$$\left\{\{y(x)\to c_1 x\},\{y(x)\to c_1+x\},\left\{y(x)\to c_1+\frac{x^2}{2}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 23

$$\left\{y(x)=\_C1\,x, y(x)=x+\_C1, y(x)=\frac{x^2}{2}+\_C1\right\}$$

Mathematica raw input

```
DSolve[-(x*y[x]) + (x^2 + y[x] + x*y[x])*y'[x] - (x + x^2 + y[x])*y'[x]^2 + x*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1]}, {y[x] -> x + C[1]}, {y[x] -> x^2/2 + C[1]}}
```

Maple raw input

```
dsolve(x*diff(y(x),x)^3-(x+x^2+y(x))*diff(y(x),x)^2+(x^2+y(x)+x*y(x))*diff(y(x),x)-x*y(x) = 0, y(x),
```

Maple raw output

```
y(x) = x+_C1, y(x) = 1/2*x^2+_C1, y(x) = _C1*x
```

4.1067 $4x^2 + xy'(x)^3 - 2y(x)y'(x)^2 = 0$

ODE

$$4x^2 + xy'(x)^3 - 2y(x)y'(x)^2 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✗
cpu = 600.014 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.656 (sec), leaf count = 97

$$\left\{(y(x))^3 - \frac{27x^4}{8} = 0, [x(\_T) = \frac{\_T\left((\_T^2 - \_C1)\,csgn(-\_T^2 + \_C1) - \_T^2\right)}{8}, y(\_T) = -\frac{\_C1\,\_T^2}{16} + \frac{\_C1^2}{32}], [x(\_\right.$$

Mathematica raw input

```
DSolve[4*x^2 - 2*y[x]*y'[x]^2 + x*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x*diff(y(x),x)^3-2*y(x)*diff(y(x),x)^2+4*x^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^3-27/8*x^4 = 0, [x(_T) = 1/8*_T*((_T^2-_C1)*csgn(-_T^2+_C1)-_T^2), y(_T) =
-1/16*_C1*_T^2+1/32*_C1^2], [x(_T) = 1/8*_T*((_T^2+_C1)*csgn(_T^2+_C1)-_T^2), y(
_T) = 1/16*_C1*_T^2+1/32*_C1^2]
```

4.1068 $2xy'(x)^3 - 3y(x)y'(x)^2 - x = 0$

ODE

$$2xy'(x)^3 - 3y(x)y'(x)^2 - x = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✗
cpu = 603.304 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.028 (sec), leaf count = 33

$$\left\{x^3 + (y(x))^3 = 0, [x(\_T) = \_C1\,\_T^2, y(\_T) = \frac{2\,\_C1\,\_T^3}{3} - \frac{\_C1}{3}]\right\}$$

Mathematica raw input

```
DSolve[-x - 3*y[x]*y'[x]^2 + 2*x*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(2*x*diff(y(x),x)^3-3*y(x)*diff(y(x),x)^2-x = 0, y(x),'implicit')
```

Maple raw output

```
x^3+y(x)^3 = 0, [x(_T) = _C1*_T^2, y(_T) = 2/3*_C1*_T^3-1/3*_C1]
```

4.1069 $4xy'(x)^3 - 6y(x)y'(x)^2 + 3y(x) - x = 0$

ODE

$$4xy'(x)^3 - 6y(x)y'(x)^2 + 3y(x) - x = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✗
cpu = 600.011 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.087 (sec), leaf count = 63

$$\left\{(y(x))^2 + xy(x) - \frac{x^2}{2} = 0, y(x) = x, [x(\_T) = 2\_C1\,\_T^2 - \_C1, y(\_T) = \frac{(4\_T^3 - 1)\,(2\_T^2 - 1)\,\_C1}{6\_T^2 - 3}]\right\}$$

Mathematica raw input

```
DSolve[-x + 3*y[x] - 6*y[x]*y'[x]^2 + 4*x*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(4*x*diff(y(x),x)^3-6*y(x)*diff(y(x),x)^2-x+3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x, y(x)^2+x*y(x)-1/2*x^2 = 0, [x(_T) = 2*_C1*_T^2-_C1, y(_T) = (4*_T^3-1)
*(2*_T^2-1)*_C1/(6*_T^2-3)]
```

4.1070 $8xy'(x)^3 - 12y(x)y'(x)^2 + 9y(x) = 0$

ODE

$$8xy'(x)^3 - 12y(x)y'(x)^2 + 9y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 600.002 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.032 (sec), leaf count = 56

$$\left\{(y(x))^2 - \frac{9x^2}{4} = 0, y(x) = 0, [x(\_T) = 4\_C1\,\_T^2 - 3\_C1, y(\_T) = 8\,\frac{(4\_T^2 - 3)\,\_C1\,\_T^3}{12\_T^2 - 9}]\right\}$$

Mathematica raw input

```
DSolve[9*y[x] - 12*y[x]*y'[x]^2 + 8*x*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(8*x*diff(y(x),x)^3-12*y(x)*diff(y(x),x)^2+9*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-9/4*x^2 = 0, y(x) = 0, [x(_T) = 4*_C1*_T^2-3*_C1, y(_T) = 8*(4*_T^2-3)*_C
1*_T^3/(12*_T^2-9)]
```

4.1071 $x^2y'(x)^3 - 2xy(x)y'(x)^2 + y(x)^2y'(x) + 1 = 0$

ODE

$$x^2y'(x)^3 - 2xy(x)y'(x)^2 + y(x)^2y'(x) + 1 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, $f(y - xy', y') = 0$

Mathematica ✗
cpu = 599.997 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.05 (sec), leaf count = 37

$$\left\{(y(x))^3 + \frac{27x}{4} = 0, y(x) = \_C1\, x - \frac{1}{\sqrt{-\_C1}}, y(x) = \_C1\, x + \frac{1}{\sqrt{-\_C1}}\right\}$$

Mathematica raw input

```
DSolve[1 + y[x]^2*y'[x] - 2*x*y[x]*y'[x]^2 + x^2*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x^2*diff(y(x),x)^3-2*x*y(x)*diff(y(x),x)^2+y(x)^2*diff(y(x),x)+1 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^3+27/4*x = 0, y(x) = _C1*x-1/(-_C1)^(1/2), y(x) = _C1*x+1/(-_C1)^(1/2)
```

4.1072 $bx(a^2-x^2)\,y'(x)^2+(a^2-x^2)\,y'(x)^3-bx-y'(x)=0$

ODE

$$bx(a^2-x^2)\,y'(x)^2+(a^2-x^2)\,y'(x)^3-bx-y'(x)=0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0314726 (sec), leaf count = 64

$$\left\{\left\{y(x)\to c_1-\frac{bx^2}{2}\right\},\left\{y(x)\to \tan^{-1}\left(\frac{x}{\sqrt{a^2-x^2}}\right)+c_1\right\},\left\{y(x)\to c_1-\tan^{-1}\left(\frac{x}{\sqrt{a^2-x^2}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.032 (sec), leaf count = 52

$$\left\{y(x)=-\frac{bx^2}{2}+\_C1,y(x)=-\arctan\left(x\frac{1}{\sqrt{a^2-x^2}}\right)+\_C1,y(x)=\arctan\left(x\frac{1}{\sqrt{a^2-x^2}}\right)+\_C1\right\}$$

Mathematica raw input

```
DSolve[-(b*x) - y'[x] + b*x*(a^2 - x^2)*y'[x]^2 + (a^2 - x^2)*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(b*x^2)/2 + C[1]}, {y[x] -> ArcTan[x/Sqrt[a^2 - x^2]] + C[1]}, {y[x]
-> -ArcTan[x/Sqrt[a^2 - x^2]] + C[1]}}
```

Maple raw input

```
dsolve((a^2-x^2)*diff(y(x),x)^3+b*x*(a^2-x^2)*diff(y(x),x)^2-diff(y(x),x)-b*x = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2*b*x^2+_C1, y(x) = arctan(x/(a^2-x^2)^(1/2))+_C1, y(x) = -arctan(x/(a
^2-x^2)^(1/2))+_C1
```

4.1073 $x(x^5+3y(x)^2)\,y'(x)-2x^5y(x)-3x^2y(x)y'(x)^2+xy'(x)^3-y(x)^3=0$

ODE

$$x(x^5+3y(x)^2)\,y'(x)-2x^5y(x)-3x^2y(x)y'(x)^2+xy'(x)^3-y(x)^3=0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of variable

Mathematica ✗
cpu = 588.504 (sec), leaf count = 0 , could not solve

```
DSolve[-2*x^5*y[x] - y[x]^3 + x*(x^5 + 3*y[x]^2)*Derivative[1][y][x] - 3*x^2*y[x]*Derivative[1][y][x]
```

Maple ✗
cpu = 3.612 (sec), leaf count = 0 , could not solve

```
dsolve(x*diff(y(x),x)^3-3*x^2*y(x)*diff(y(x),x)^2+x*(x^5+3*y(x)^2)*diff(y(x),x)-2*x^5*y(x)-
y(x)^3 = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[-2*x^5*y[x] - y[x]^3 + x*(x^5 + 3*y[x]^2)*y'[x] - 3*x^2*y[x]*y'[x]^2 + x*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
DSolve[-2*x^5*y[x] - y[x]^3 + x*(x^5 + 3*y[x]^2)*Derivative[1][y][x] - 3*x^2*y[x
]*Derivative[1][y][x]^2 + x*Derivative[1][y][x]^3 == 0, y[x], x]
```

Maple raw input

```
dsolve(x*diff(y(x),x)^3-3*x^2*y(x)*diff(y(x),x)^2+x*(x^5+3*y(x)^2)*diff(y(x),x)-2*x^5*y(x)-
y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
dsolve(x*diff(y(x),x)^3-3*x^2*y(x)*diff(y(x),x)^2+x*(x^5+3*y(x)^2)*diff(y(x),x)-
2*x^5*y(x)-y(x)^3 = 0, y(x),'implicit')
```

4.1074 $2x^3y'(x)^3+6x^2y(x)y'(x)^2-(1-6xy(x))y(x)y'(x)+2y(x)^3=0$

ODE

$$2x^3y'(x)^3+6x^2y(x)y'(x)^2-(1-6xy(x))y(x)y'(x)+2y(x)^3=0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
Change of variable

Mathematica ✗
cpu = 600.001 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.886 (sec), leaf count = 1532

$$\left\{\int_{\_b}^{x}1\left(-6^{\frac{2}{3}}\left(-9\,y(x)\left(-1/9\,\sqrt{3}\sqrt{\frac{27\,\_a\,(y(x))^2-2\,y(x)}{\_a}}+y(x)\right)\_a^2\right)^{\frac{2}{3}}+6\,\_a\,y(x)\left(\sqrt[3]{-9\,y(x)\left(-1/9\,\sqrt{3}\sqrt{\frac{27\,\_a}{}}\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[2*y[x]^3 - y[x]*(1 - 6*x*y[x])*y'[x] + 6*x^2*y[x]*y'[x]^2 + 2*x^3*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(2*x^3*diff(y(x),x)^3+6*x^2*y(x)*diff(y(x),x)^2-(1-6*x*y(x))*y(x)*diff(y(x),x)+2*y(x)^3 = 0, y(
```

Maple raw output

```
Int((-6^(2/3)*(-9*y(x)*(-1/9*3^(1/2)*((27*_a*y(x)^2-2*y(x))/_a)^(1/2)+y(x))*_a^2
)^(2/3)+6*_a*y(x)*((-9*y(x)*(-1/9*3^(1/2)*((27*_a*y(x)^2-2*y(x))/_a)^(1/2)+y(x))
*_a^2)^(1/3)*6^(1/3)-1))/(6*_a^2*y(x)+_a*6^(2/3)*(-9*y(x)*(-1/9*3^(1/2)*((27*_a*
y(x)^2-2*y(x))/_a)^(1/2)+y(x))*_a^2)^(2/3)),_a = _b .. x)+Intat(6*x*6^(1/3)*(-9*
x^2*(-1/9*3^(1/2)*((27*_f^2*x-2*_f)/x)^(1/2)+_f)*_f)^(1/3)/(6^(2/3)*(-9*x^2*(-1/
9*3^(1/2)*((27*_f^2*x-2*_f)/x)^(1/2)+_f)*_f)^(2/3)+6*_f*x)-Int(324*_a*6^(1/3)*_f
```

```
*(_a*(_f*3^(1/2)*(_a*_f-1/27)/((27*_a*_f^2-2*_f)/_a)^(1/2)-2/3*_a*(-1/18*3^(1/2)
*((27*_a*_f^2-2*_f)/_a)^(1/2)+_f))*_f/(-9*_a^2*(-1/9*3^(1/2)*((27*_a*_f^2-2*_f)/
_a)^(1/2)+_f)*_f)^(2/3)-1/6*(_f*3^(1/2)*(_a*_f-1/27)/((27*_a*_f^2-2*_f)/_a)^(1/2
)+1/3*_a*(-2/9*3^(1/2)*((27*_a*_f^2-2*_f)/_a)^(1/2)+_f))*6^(2/3))/(6^(2/3)*(-9*_
a^2*(-1/9*3^(1/2)*((27*_a*_f^2-2*_f)/_a)^(1/2)+_f)*_f)^(2/3)+6*_a*_f)^2,_a = _b
.. x),_f = y(x))+_C1 = 0, Int(1/6*(6^(2/3)*(I*3^(1/2)+1)*(-9*y(x)*(-1/9*3^(1/2)*
((27*_a*y(x)^2-2*y(x))/_a)^(1/2)+y(x))*_a^2)^(2/3)-6*(I*3^(1/2)-2*(-9*y(x)*(-1/9
*3^(1/2)*((27*_a*y(x)^2-2*y(x))/_a)^(1/2)+y(x))*_a^2)^(1/3)*6^(1/3)-1)*y(x)*_a)/
(-1/6*6^(2/3)*(I*3^(1/2)+1)*(-9*y(x)*(-1/9*3^(1/2)*((27*_a*y(x)^2-2*y(x))/_a)^(1
/2)+y(x))*_a^2)^(2/3)+(I*3^(1/2)-1)*y(x)*_a)/_a,_a = _b .. x)+Intat(-12*x*6^(1/3
)*(-9*x^2*(-1/9*3^(1/2)*((27*_f^2*x-2*_f)/x)^(1/2)+_f)*_f)^(1/3)/(I*6^(2/3)*(-9*
x^2*(-1/9*3^(1/2)*((27*_f^2*x-2*_f)/x)^(1/2)+_f)*_f)^(2/3)*3^(1/2)+6^(2/3)*(-9*x
^2*(-1/9*3^(1/2)*((27*_f^2*x-2*_f)/x)^(1/2)+_f)*_f)^(2/3)-6*I*3^(1/2)*x*_f+6*_f*
x)-Int(18*(_a*(_f*3^(1/2)*(_a*_f-1/27)/((27*_a*_f^2-2*_f)/_a)^(1/2)-2/3*_a*(-1/1
8*3^(1/2)*((27*_a*_f^2-2*_f)/_a)^(1/2)+_f))*(I*3^(1/2)-1)*_f/(-9*_a^2*(-1/9*3^(1
/2)*((27*_a*_f^2-2*_f)/_a)^(1/2)+_f)*_f)^(2/3)+1/6*(I*3^(1/2)+1)*(_f*3^(1/2)*(_a
*_f-1/27)/((27*_a*_f^2-2*_f)/_a)^(1/2)+1/3*_a*(-2/9*3^(1/2)*((27*_a*_f^2-2*_f)/_
a)^(1/2)+_f))*6^(2/3))*_a*6^(1/3)*_f/(-1/6*(I*3^(1/2)+1)*6^(2/3)*(-9*_a^2*(-1/9*
3^(1/2)*((27*_a*_f^2-2*_f)/_a)^(1/2)+_f)*_f)^(2/3)+_a*(I*3^(1/2)-1)*_f)^2,_a = _
b .. x),_f = y(x))+_C1 = 0, Int(1/6*(6^(2/3)*(I*3^(1/2)-1)*(-9*y(x)*(-1/9*3^(1/2
)*((27*_a*y(x)^2-2*y(x))/_a)^(1/2)+y(x))*_a^2)^(2/3)-6*(I*3^(1/2)+2*(-9*y(x)*(-1
/9*3^(1/2)*((27*_a*y(x)^2-2*y(x))/_a)^(1/2)+y(x))*_a^2)^(1/3)*6^(1/3)+1)*y(x)*_a
)/_a/(-1/6*6^(2/3)*(I*3^(1/2)-1)*(-9*y(x)*(-1/9*3^(1/2)*((27*_a*y(x)^2-2*y(x))/_
a)^(1/2)+y(x))*_a^2)^(2/3)+(I*3^(1/2)+1)*y(x)*_a),_a = _b .. x)+Intat(12*x*6^(1/
3)*(-9*x^2*(-1/9*3^(1/2)*((27*_f^2*x-2*_f)/x)^(1/2)+_f)*_f)^(1/3)/(I*6^(2/3)*(-9
*x^2*(-1/9*3^(1/2)*((27*_f^2*x-2*_f)/x)^(1/2)+_f)*_f)^(2/3)*3^(1/2)-6^(2/3)*(-9*
x^2*(-1/9*3^(1/2)*((27*_f^2*x-2*_f)/x)^(1/2)+_f)*_f)^(2/3)-6*I*3^(1/2)*x*_f-6*_f
*x)-Int(-18*_a*6^(1/3)*_f*((I*3^(1/2)+1)*_a*(_f*3^(1/2)*(_a*_f-1/27)/((27*_a*_f^
2-2*_f)/_a)^(1/2)-2/3*_a*(-1/18*3^(1/2)*((27*_a*_f^2-2*_f)/_a)^(1/2)+_f))*_f/(-9
*_a^2*(-1/9*3^(1/2)*((27*_a*_f^2-2*_f)/_a)^(1/2)+_f)*_f)^(2/3)+1/6*(_f*3^(1/2)*(
_a*_f-1/27)/((27*_a*_f^2-2*_f)/_a)^(1/2)+1/3*_a*(-2/9*3^(1/2)*((27*_a*_f^2-2*_f)
/_a)^(1/2)+_f))*(I*3^(1/2)-1)*6^(2/3))/(-1/6*(I*3^(1/2)-1)*6^(2/3)*(-9*_a^2*(-1/
9*3^(1/2)*((27*_a*_f^2-2*_f)/_a)^(1/2)+_f)*_f)^(2/3)+(I*3^(1/2)+1)*_a*_f)^2,_a =
 _b .. x),_f = y(x))+_C1 = 0
```

4.1075 $8x^3y'(x)^3+12x^2y(x)y'(x)^2-\left(1-6xy(x)^2\right)y'(x)+y(x)^3=0$

ODE

$$8x^3y'(x)^3+12x^2y(x)y'(x)^2-\left(1-6xy(x)^2\right)y'(x)+y(x)^3=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✗
cpu = 599.999 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.746 (sec), leaf count = 140

$$\left\{[x(\_T)=1\left(\frac{\ln(\_T)}{9}+\_C1\right)\_T^{-\frac{2}{3}},y(\_T)=-\frac{2\ln(\_T)+18\_C1-9}{9}\sqrt[3]{\_T}],[x(\_T)=-\frac{i\ln(\_T)\sqrt{3}-18\_C1+\right.$$

Mathematica raw input

```
DSolve[y[x]^3 - (1 - 6*x*y[x]^2)*y'[x] + 12*x^2*y[x]*y'[x]^2 + 8*x^3*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(8*x^3*diff(y(x),x)^3+12*x^2*y(x)*diff(y(x),x)^2-(1-6*x*y(x)^2)*diff(y(x),x)+y(x)^3 = 0, y(x),
```

Maple raw output

```
[x(_T) = 1/_T^(2/3)*(1/9*ln(_T)+_C1), y(_T) = -1/9*_T^(1/3)*(2*ln(_T)+18*_C1-9)]
, [x(_T) = -1/18*(I*ln(_T)*3^(1/2)-18*_C1+ln(_T))/_T^(2/3), y(_T) = 1/18*((2*I*l
n(_T)-9*I)*3^(1/2)-36*_C1+2*ln(_T)-9)*_T^(1/3)], [x(_T) = 1/18*(I*ln(_T)*3^(1/2)
-ln(_T)+18*_C1)/_T^(2/3), y(_T) = -1/18*_T^(1/3)*(2*I*ln(_T)*3^(1/2)-9*I*3^(1/2)
-2*ln(_T)+36*_C1+9)]
```

4.1076 $x^4 y'(x)^3 - x^3 y(x) y'(x)^2 - x^2 y(x)^2 y'(x) + x y(x)^3 = 1$

ODE

$$x^4 y'(x)^3 - x^3 y(x) y'(x)^2 - x^2 y(x)^2 y'(x) + x y(x)^3 = 1$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of variable

Mathematica ✗
cpu = 600.012 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 6.289 (sec), leaf count = 400

$$\left\{ (y(x))^3 - \frac{27}{32\,x} = 0, \ln(x) - 6 \int^{y(x)\sqrt[3]{x}} \frac{\sqrt[3]{-16\_a^3 + 3\sqrt{-96\_a^3 + 81}} + 27}{\sqrt[3]{4}\sqrt[3]{\left(-16\_a^3 + 3\sqrt{-96\_a^3 + 81} + 27\right)^2} + 8\sqrt[3]{2}\_a^2 + 4\sqrt[3]{-16\_a^3 + 3\sqrt{-96}} \right.$$

Mathematica raw input

```
DSolve[x*y[x]^3 - x^2*y[x]^2*y'[x] - x^3*y[x]*y'[x]^2 + x^4*y'[x]^3 == 1,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x^4*diff(y(x),x)^3-x^3*y(x)*diff(y(x),x)^2-x^2*y(x)^2*diff(y(x),x)+x*y(x)^3 = 1, y(x),'implici
```

Maple raw output

```
y(x)^3-27/32/x = 0, ln(x)-6*Intat((-16*_a^3+3*(-96*_a^3+81)^(1/2)+27)^(1/3)/(4^(
1/3)*((-16*_a^3+3*(-96*_a^3+81)^(1/2)+27)^2)^(1/3)+8*2^(1/3)*_a^2+4*(-16*_a^3+3*
(-96*_a^3+81)^(1/2)+27)^(1/3)*_a),_a = y(x)*x^(1/3))-_C1 = 0, ln(x)+12*Intat((-1
6*_a^3+3*(-96*_a^3+81)^(1/2)+27)^(1/3)/(I*3^(1/2)*4^(1/3)*((-16*_a^3+3*(-96*_a^3
+81)^(1/2)+27)^2)^(1/3)-8*I*2^(1/3)*3^(1/2)*_a^2+4^(1/3)*((-16*_a^3+3*(-96*_a^3+
81)^(1/2)+27)^2)^(1/3)+8*2^(1/3)*_a^2-8*(-16*_a^3+3*(-96*_a^3+81)^(1/2)+27)^(1/3
```

```
)*_a),_a = y(x)*x^(1/3))-_C1 = 0, ln(x)-12*Intat((-16*_a^3+3*(-96*_a^3+81)^(1/2)
+27)^(1/3)/(I*3^(1/2)*4^(1/3)*((-16*_a^3+3*(-96*_a^3+81)^(1/2)+27)^2)^(1/3)-8*I*
2^(1/3)*3^(1/2)*_a^2-4^(1/3)*((-16*_a^3+3*(-96*_a^3+81)^(1/2)+27)^2)^(1/3)-8*2^(
1/3)*_a^2+8*(-16*_a^3+3*(-96*_a^3+81)^(1/2)+27)^(1/3)*_a),_a = y(x)*x^(1/3))-_C1
 = 0
```

4.1077 $x^6 y'(x)^3 - x y'(x) - y(x) = 0$

ODE

$$x^6 y'(x)^3 - x y'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 1.006 (sec), leaf count = 36

$$\left\{(y(x))^2 - \frac{4}{27\,x^3} = 0, [y(\_T) = \left(\_C1^5 - \sqrt{\_T}\right) \_C1, x(\_T) = \_C1 \frac{1}{\sqrt{\_T}}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] - x*y'[x] + x^6*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x^6*diff(y(x),x)^3-x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-4/27/x^3 = 0, [y(_T) = (_C1^5-_T^(1/2))*_C1, x(_T) = _C1/_T^(1/2)]
```

4.1078 $y(x)y'(x)^3 - 3xy'(x) + 3y(x) = 0$

ODE

$$y(x)y'(x)^3 - 3xy'(x) + 3y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 599.999 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.033 (sec), leaf count = 36

$$\left\{[x(\_T) = \frac{(\_T^3+3)\,\_C1}{\mathrm{e}^{\_T^{-3}}\,\_T^3}, y(\_T) = 3\,\frac{\_C1}{\_T^2\mathrm{e}^{\_T^{-3}}}]\right\}$$

Mathematica raw input

```
DSolve[3*y[x] - 3*x*y'[x] + y[x]*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(y(x)*diff(y(x),x)^3-3*x*diff(y(x),x)+3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = (_T^3+3)*_C1/exp(1/_T^3)/_T^3, y(_T) = 3/_T^2*_C1/exp(1/_T^3)]
```

4.1079 $2y(x)y'(x)^3 - 3xy'(x) + 2y(x) = 0$

ODE

$$2y(x)y'(x)^3 - 3xy'(x) + 2y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 599.999 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.056 (sec), leaf count = 517

$$\left\{ (y(x))^3 - \frac{x^3}{2} = 0, \ln(x) - \int^{\frac{y(x)}{x}} \frac{1}{4\_a^4 - 2\_a} \left(-2 \frac{(i\sqrt{3} - 1)(\_a^3 - 1/2)}{\sqrt[3]{\left(\sqrt{2}\sqrt{(2\_a^4 - \_a)^{-1}}\_a^2 + 1\right)(2\_a^3 - 1)^2}} - i\sqrt{3}\sqrt[3]{\left(\sqrt{2}\sqrt{(2\_\right.\right.\right.$$

Mathematica raw input

```
DSolve[2*y[x] - 3*x*y'[x] + 2*y[x]*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(2*y(x)*diff(y(x),x)^3-3*x*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^3-1/2*x^3 = 0, ln(x)-Intat(((-2*((2^(1/2)*(1/(2*_a^4-_a))^(1/2)*_a^2+1)*(2*
_a^3-1)^2)^(1/3)-2)*_a^3+((2^(1/2)*(1/(2*_a^4-_a))^(1/2)*_a^2+1)*(2*_a^3-1)^2)^(
2/3)+((2^(1/2)*(1/(2*_a^4-_a))^(1/2)*_a^2+1)*(2*_a^3-1)^2)^(1/3)+1)/_a/(2*_a^3-1
)/((2^(1/2)*(1/(2*_a^4-_a))^(1/2)*_a^2+1)*(2*_a^3-1)^2)^(1/3),_a = y(x)/x)-_C1 =
 0, ln(x)-Intat((-2*(I*3^(1/2)-1)*(_a^3-1/2)/((2^(1/2)*(1/(2*_a^4-_a))^(1/2)*_a^
```

```
2+1)*(2*_a^3-1)^2)^(1/3)-I*3^(1/2)*((2^(1/2)*(1/(2*_a^4-_a))^(1/2)*_a^2+1)*(2*_a
^3-1)^2)^(1/3)-4*_a^3-((2^(1/2)*(1/(2*_a^4-_a))^(1/2)*_a^2+1)*(2*_a^3-1)^2)^(1/3
)+2)/(4*_a^4-2*_a),_a = y(x)/x)-_C1 = 0, ln(x)-Intat((2*(I*3^(1/2)+1)*(_a^3-1/2)
/((2^(1/2)*(1/(2*_a^4-_a))^(1/2)*_a^2+1)*(2*_a^3-1)^2)^(1/3)+I*3^(1/2)*((2^(1/2)
*(1/(2*_a^4-_a))^(1/2)*_a^2+1)*(2*_a^3-1)^2)^(1/3)-4*_a^3-((2^(1/2)*(1/(2*_a^4-_
a))^(1/2)*_a^2+1)*(2*_a^3-1)^2)^(1/3)+2)/(4*_a^4-2*_a),_a = y(x)/x)-_C1 = 0
```

4.1080 $2y(x)y'(x)^3 + 3y(x)y'(x) + x = 0$

ODE

$$2y(x)y'(x)^3 + 3y(x)y'(x) + x = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 600.001 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.094 (sec), leaf count = 455

$$\left\{ \frac{x^2}{2} + (y(x))^2 = 0, \ln(x) - \int^{\frac{y(x)}{x}} \frac{1}{2\_a^4 + 3\_a^2 + 1} \left(-2\_a^3 - \_a^2 \frac{1}{\sqrt[3]{\_a \left(2\_a^4 + 3\_a^2 - (2\_a^2+1)^{\frac{3}{2}} + 1\right)(2\_a^2 +} \right.\right.$$

Mathematica raw input

```
DSolve[x + 3*y[x]*y'[x] + 2*y[x]*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(2*y(x)*diff(y(x),x)^3+3*y(x)*diff(y(x),x)+x = 0, y(x),'implicit')
```

Maple raw output

```
1/2*x^2+y(x)^2 = 0, ln(x)-Intat((-2*_a^3-_a^2/(_a*(2*_a^4+3*_a^2-(2*_a^2+1)^(3/2
)+1)/(2*_a^2+1)^(5/2))^(1/3)+2*_a^2*(_a*(2*_a^4+3*_a^2-(2*_a^2+1)^(3/2)+1)/(2*_a
^2+1)^(5/2))^(1/3)-_a+(_a*(2*_a^4+3*_a^2-(2*_a^2+1)^(3/2)+1)/(2*_a^2+1)^(5/2))^(
1/3))/(2*_a^4+3*_a^2+1),_a = y(x)/x)-_C1 = 0, ln(x)-Intat(1/4*(-(I*3^(1/2)-1)*_a
^2/(_a*(2*_a^4+3*_a^2-(2*_a^2+1)^(3/2)+1)/(2*_a^2+1)^(5/2))^(1/3)-2*((I*3^(1/2)+
1)*(_a*(2*_a^4+3*_a^2-(2*_a^2+1)^(3/2)+1)/(2*_a^2+1)^(5/2))^(1/3)+2*_a)*(_a^2+1/
```

```
2))/(_a^2+1/2)/(_a^2+1),_a = y(x)/x)-_C1 = 0, ln(x)-Intat(1/4*(_a^2*(I*3^(1/2)+1
)/(_a*(2*_a^4+3*_a^2-(2*_a^2+1)^(3/2)+1)/(2*_a^2+1)^(5/2))^(1/3)+2*((I*3^(1/2)-1
)*(_a*(2*_a^4+3*_a^2-(2*_a^2+1)^(3/2)+1)/(2*_a^2+1)^(5/2))^(1/3)-2*_a)*(_a^2+1/2
))/(_a^2+1/2)/(_a^2+1),_a = y(x)/x)-_C1 = 0
```

4.1081 $2y(x)y'(x)^3 - y(x)y'(x)^2 + 2xy'(x) - x = 0$

ODE

$$2y(x)y'(x)^3 - y(x)y'(x)^2 + 2xy'(x) - x = 0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0197003 (sec), leaf count = 61

$$\left\{\left\{y(x) \to c_1 + \frac{x}{2}\right\}, \left\{y(x) \to \left(\frac{3c_1}{2} - ix^{3/2}\right)^{2/3}\right\}, \left\{y(x) \to \left(\frac{3c_1}{2} + ix^{3/2}\right)^{2/3}\right\}\right\}$$

Maple ✓
cpu = 0.031 (sec), leaf count = 54

$$\left\{y(x) = \frac{x}{2} + \_C1, [x(\_T) = \_C1\,\_T^2\left(\_T^2 - \_T + 1\right)^{-\frac{2}{3}}\left(\_T + 1\right)^{-\frac{2}{3}}, y(\_T) = -\_C1\left(\_T^2 - \_T + 1\right)^{-\frac{2}{3}}\left(\_T + 1\right)^{-}\right.$$

Mathematica raw input

```
DSolve[-x + 2*x*y'[x] - y[x]*y'[x]^2 + 2*y[x]*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x/2 + C[1]}, {y[x] -> ((-I)*x^(3/2) + (3*C[1])/2)^(2/3)}, {y[x] -> (I*
x^(3/2) + (3*C[1])/2)^(2/3)}}
```

Maple raw input

```
dsolve(2*y(x)*diff(y(x),x)^3-y(x)*diff(y(x),x)^2+2*x*diff(y(x),x)-x = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T^2-_T+1)^(2/3)/(_T+1)^(2/3)*_T^2*_C1, y(_T) = -1/(_T^2-_T+1)^(2/3)
/(_T+1)^(2/3)*_C1], y(x) = 1/2*x+_C1
```

4.1082 $(2y(x)+x)y'(x)^3+3(y(x)+x)y'(x)^2+(y(x)+2x)y'(x)=0$

ODE

$$(2y(x)+x)y'(x)^3+3(y(x)+x)y'(x)^2+(y(x)+2x)y'(x)=0$$

ODE Classification

[_quadrature]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.0229577 (sec), leaf count = 75

$$\left\{\left\{y(x)\to \frac{1}{2}\left(-\sqrt{4e^{c_1}-3x^2}-x\right)\right\},\left\{y(x)\to \frac{1}{2}\left(\sqrt{4e^{c_1}-3x^2}-x\right)\right\},\{y(x)\to c_1\},\{y(x)\to c_1-x\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 42

$$\left\{-\frac{1}{2}\ln\left(\frac{x^2+xy(x)+(y(x))^2}{x^2}\right)-\ln(x)-\_C1=0,y(x)=\_C1,y(x)=-x+\_C1\right\}$$

Mathematica raw input

```
DSolve[(2*x + y[x])*y'[x] + 3*(x + y[x])*y'[x]^2 + (x + 2*y[x])*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-x - Sqrt[4*E^C[1] - 3*x^2])/2}, {y[x] -> (-x + Sqrt[4*E^C[1] - 3*x^2
])/2}, {y[x] -> C[1]}, {y[x] -> -x + C[1]}}
```

Maple raw input

```
dsolve((x+2*y(x))*diff(y(x),x)^3+3*(x+y(x))*diff(y(x),x)^2+(2*x+y(x))*diff(y(x),x) = 0, y(x),'implici
```

Maple raw output

```
y(x) = -x+_C1, -1/2*ln((x^2+x*y(x)+y(x)^2)/x^2)-ln(x)-_C1 = 0, y(x) = _C1
```

4.1083 $y(x)^2 y'(x)^3 - x y'(x) + y(x) = 0$

ODE

$$y(x)^2 y'(x)^3 - x y'(x) + y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 600.001 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.631 (sec), leaf count = 42

$$\left\{[x(\_T) = \frac{16 \_C1^2 \_T^4 + 8 \_C1 \_T^2 - 3}{16 \_T^4}, y(\_T) = \frac{4 \_C1 \_T^2 - 1}{4 \_T^3}]\right\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + y[x]^2*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^3-x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/16*(16*_C1^2*_T^4+8*_C1*_T^2-3)/_T^4, y(_T) = 1/4*(4*_C1*_T^2-1)/_T^3
]
```

4.1084 $y(x)^2 y'(x)^3 + 2xy'(x) - y(x) = 0$

ODE

$$y(x)^2 y'(x)^3 + 2xy'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of variable

Mathematica ✗
cpu = 600.116 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.597 (sec), leaf count = 38

$$\left\{(y(x))^4 + \frac{32\,x^3}{27} = 0, [x(\_T) = -\frac{(\_C1\,\_T^2 - 1)\,\_C1}{2\,\_T^2}, y(\_T) = \frac{\_C1}{\_T}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] + 2*x*y'[x] + y[x]^2*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(y(x)^2*diff(y(x),x)^3+2*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^4+32/27*x^3 = 0, [x(_T) = -1/2*(_C1*_T^2-1)/_T^2*_C1, y(_T) = 1/_T*_C1]
```

4.1085 $4y(x)^2y'(x)^3 - 2xy'(x) + y(x) = 0$

ODE

$$4y(x)^2y'(x)^3 - 2xy'(x) + y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.612 (sec), leaf count = 40

$$\left\{(y(x))^4 - \frac{8x^3}{27} = 0, [x(\_T) = \frac{4\_C1^2\_T^2 + \_C1}{2\_T^2}, y(\_T) = \frac{\_C1}{\_T}]\right\}$$

Mathematica raw input

```
DSolve[y[x] - 2*x*y'[x] + 4*y[x]^2*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(4*y(x)^2*diff(y(x),x)^3-2*x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^4-8/27*x^3 = 0, [x(_T) = 1/2*(4*_C1^2*_T^2+_C1)/_T^2, y(_T) = 1/_T*_C1]
```

4.1086 $16y(x)^2y'(x)^3 + 2xy'(x) - y(x) = 0$

ODE

$$16y(x)^2y'(x)^3 + 2xy'(x) - y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
Change of variable

Mathematica ✗
cpu = 600. (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.605 (sec), leaf count = 40

$$\left\{(y(x))^4 + \frac{2x^3}{27} = 0, [x(\_T) = \frac{-16\_C1^2\_T^2 + \_C1}{2\_T^2}, y(\_T) = \frac{\_C1}{\_T}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] + 2*x*y'[x] + 16*y[x]^2*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(16*y(x)^2*diff(y(x),x)^3+2*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^4+2/27*x^3 = 0, [x(_T) = 1/2*(-16*_C1^2*_T^2+_C1)/_T^2, y(_T) = 1/_T*_C1]
```

4.1087 $x(x^2+1)\,y'(x) - x^2 y(x) + y(x)^3\left(-y'(x)^2\right) + x y(x)^2 y'(x)^3 = 0$

ODE

$$x(x^2+1)\,y'(x) - x^2 y(x) + y(x)^3\left(-y'(x)^2\right) + x y(x)^2 y'(x)^3 = 0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of variable

Mathematica ✗
cpu = 387.175 (sec), leaf count = 0 , could not solve

```
DSolve[-(x^2*y[x]) + x*(1 + x^2)*Derivative[1][y][x] - y[x]^3*Derivative[1][y][x]^2 + x*y[x]^2*Deriva
```

Maple ✓
cpu = 1.536 (sec), leaf count = 37

$$\left\{(y(x))^8 + \frac{\left(8x^4 - 20x^2 - 1\right)(y(x))^4}{4} + x^2\left(x^2+1\right)^3 = 0\right\}$$

Mathematica raw input

```
DSolve[-(x^2*y[x]) + x*(1 + x^2)*y'[x] - y[x]^3*y'[x]^2 + x*y[x]^2*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
DSolve[-(x^2*y[x]) + x*(1 + x^2)*Derivative[1][y][x] - y[x]^3*Derivative[1][y][x
]^2 + x*y[x]^2*Derivative[1][y][x]^3 == 0, y[x], x]
```

Maple raw input

```
dsolve(x*y(x)^2*diff(y(x),x)^3-y(x)^3*diff(y(x),x)^2+x*(x^2+1)*diff(y(x),x)-x^2*y(x) = 0, y(x),'impli
```

Maple raw output

```
y(x)^8+1/4*(8*x^4-20*x^2-1)*y(x)^4+x^2*(x^2+1)^3 = 0
```

4.1088 $x^7 y(x)^2 y'(x)^3 + (1 - 3x^6 y(x)^3)\, y'(x)^2 + 3x^5 y(x)^4 y'(x) - x^4 y(x)^5 = 0$

ODE

$$x^7 y(x)^2 y'(x)^3 + (1 - 3x^6 y(x)^3)\, y'(x)^2 + 3x^5 y(x)^4 y'(x) - x^4 y(x)^5 = 0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
Change of variable

Mathematica ✗
cpu = 599.999 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 1.051 (sec), leaf count = 4164

Too large to display

Mathematica raw input

```
DSolve[-(x^4*y[x]^5) + 3*x^5*y[x]^4*y'[x] + (1 - 3*x^6*y[x]^3)*y'[x]^2 + x^7*y[x]^2*y'[x]^3 == 0,y[x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x^7*y(x)^2*diff(y(x),x)^3+(1-3*x^6*y(x)^3)*diff(y(x),x)^2+3*x^5*y(x)^4*diff(y(x),x)-
x^4*y(x)^5 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^3-4/27/x^6 = 0, Int((-6*(-108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_a^6*y(x)
^3-4))^(1/2)*y(x)^5*_a^9+72*_a^6*y(x)^3-8)^(1/3)*_a^6*y(x)^3+24*_a^6*y(x)^3+2*(-
108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_a^6*y(x)^3-4))^(1/2)*y(x)^5*_a^9+72*_a^
6*y(x)^3-8)^(1/3)-(-108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_a^6*y(x)^3-4))^(1/2
)*y(x)^5*_a^9+72*_a^6*y(x)^3-8)^(2/3)-4)/_a/(18*(-108*y(x)^6*_a^12+12*3^(1/2)*(1
/y(x)*(27*_a^6*y(x)^3-4))^(1/2)*y(x)^5*_a^9+72*_a^6*y(x)^3-8)^(1/3)*_a^6*y(x)^3-
24*_a^6*y(x)^3+(-108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_a^6*y(x)^3-4))^(1/2)*y
(x)^5*_a^9+72*_a^6*y(x)^3-8)^(2/3)-2*(-108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_
a^6*y(x)^3-4))^(1/2)*y(x)^5*_a^9+72*_a^6*y(x)^3-8)^(1/3)+4),_a = _b .. x)+Intat(
```

```
6*(-108*_f^6*x^12+12*3^(1/2)*(1/_f*(27*_f^3*x^6-4))^(1/2)*_f^5*x^9+72*x^6*_f^3-8
)^(1/3)*x^6*_f^2/(18*(-108*_f^6*x^12+12*3^(1/2)*(1/_f*(27*_f^3*x^6-4))^(1/2)*_f^
5*x^9+72*x^6*_f^3-8)^(1/3)*x^6*_f^3-24*x^6*_f^3+(-108*_f^6*x^12+12*3^(1/2)*(1/_f
*(27*_f^3*x^6-4))^(1/2)*_f^5*x^9+72*x^6*_f^3-8)^(2/3)-2*(-108*_f^6*x^12+12*3^(1/
2)*(1/_f*(27*_f^3*x^6-4))^(1/2)*_f^5*x^9+72*x^6*_f^3-8)^(1/3)+4)-Int(-31104*_a^5
*((_a^6*_f^3-1/24*(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5
*_a^9+72*_a^6*_f^3-8)^(2/3)-1/6)*_a^6*_f^3*(3^(1/2)*_f*_a^3*(_a^6*_f^3+2/27)/(1/
_f*(27*_a^6*_f^3-4))^(1/2)-2*_a^6*_f^3+5/27*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2
)*_f^2*_a^3+2/3)/(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*
_a^9+72*_a^6*_f^3-8)^(2/3)+1/12*(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-
4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(1/3)*(-1/72*(-108*_f^6*_a^12+12*3^(1/2)*(1/
_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(2/3)+_a^6*_f^3*(3^(1/2)*_f
*_a^3*(_a^6*_f^3+2/27)/(1/_f*(27*_a^6*_f^3-4))^(1/2)-2*_a^6*_f^3+5/27*3^(1/2)*(1
/_f*(27*_a^6*_f^3-4))^(1/2)*_f^2*_a^3+2/3)/(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27
*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(1/3)+1/36*(-108*_f^6*_a^12+12*3^
(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(1/3)-1/18))*_f^2/
(18*(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*
_f^3-8)^(1/3)*_a^6*_f^3-24*_a^6*_f^3+(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*
_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(2/3)-2*(-108*_f^6*_a^12+12*3^(1/2)*(1/
_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(1/3)+4)^2,_a = _b .. x),_f
 = y(x))+_C1 = 0, Int(((-I*3^(1/2)-1)*(-108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*
_a^6*y(x)^3-4))^(1/2)*y(x)^5*_a^9+72*_a^6*y(x)^3-8)^(2/3)+(12*_a^6*y(x)^3-4)*(-1
08*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_a^6*y(x)^3-4))^(1/2)*y(x)^5*_a^9+72*_a^6
*y(x)^3-8)^(1/3)-24*(_a^6*y(x)^3-1/6)*(I*3^(1/2)-1))/_a/(24*I*3^(1/2)*_a^6*y(x)^
3-36*(-108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_a^6*y(x)^3-4))^(1/2)*y(x)^5*_a^9
+72*_a^6*y(x)^3-8)^(1/3)*_a^6*y(x)^3-24*_a^6*y(x)^3+I*(-108*y(x)^6*_a^12+12*3^(1
/2)*(1/y(x)*(27*_a^6*y(x)^3-4))^(1/2)*y(x)^5*_a^9+72*_a^6*y(x)^3-8)^(2/3)*3^(1/2
)+(-108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_a^6*y(x)^3-4))^(1/2)*y(x)^5*_a^9+72
*_a^6*y(x)^3-8)^(2/3)-4*I*3^(1/2)+4*(-108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_a
^6*y(x)^3-4))^(1/2)*y(x)^5*_a^9+72*_a^6*y(x)^3-8)^(1/3)+4),_a = _b .. x)+Intat(-
12*(-108*_f^6*x^12+12*3^(1/2)*(1/_f*(27*_f^3*x^6-4))^(1/2)*_f^5*x^9+72*x^6*_f^3-
8)^(1/3)*x^6*_f^2/(24*I*3^(1/2)*x^6*_f^3-36*(-108*_f^6*x^12+12*3^(1/2)*(1/_f*(27
*_f^3*x^6-4))^(1/2)*_f^5*x^9+72*x^6*_f^3-8)^(1/3)*x^6*_f^3-24*x^6*_f^3+I*(-108*_
f^6*x^12+12*3^(1/2)*(1/_f*(27*_f^3*x^6-4))^(1/2)*_f^5*x^9+72*x^6*_f^3-8)^(2/3)*3
^(1/2)+(-108*_f^6*x^12+12*3^(1/2)*(1/_f*(27*_f^3*x^6-4))^(1/2)*_f^5*x^9+72*x^6*_
f^3-8)^(2/3)-4*I*3^(1/2)+4*(-108*_f^6*x^12+12*3^(1/2)*(1/_f*(27*_f^3*x^6-4))^(1/
2)*_f^5*x^9+72*x^6*_f^3-8)^(1/3)+4)-Int(-62208*_a^5*(_a^6*((1/24*I*3^(1/2)+1/24)
*(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^
3-8)^(2/3)+(I*3^(1/2)-1)*(_a^6*_f^3-1/6))*_f^3*(3^(1/2)*_f*_a^3*(_a^6*_f^3+2/27)
/(1/_f*(27*_a^6*_f^3-4))^(1/2)-2*_a^6*_f^3+5/27*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^
(1/2)*_f^2*_a^3+2/3)/(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_
f^5*_a^9+72*_a^6*_f^3-8)^(2/3)-1/12*(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_
f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(1/3)*((-1/72*I*3^(1/2)-1/72)*(-108*_f^6
*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(2/3)+
(I*3^(1/2)+1)*_a^6*_f^3*(3^(1/2)*_f*_a^3*(_a^6*_f^3+2/27)/(1/_f*(27*_a^6*_f^3-4)
)^(1/2)-2*_a^6*_f^3+5/27*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^2*_a^3+2/3)/(-
108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8
```

```
)^(1/3)+1/18*I*3^(1/2)-1/18*(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^
(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(1/3)-1/18))*_f^2/(24*I*3^(1/2)*_a^6*_f^3-36*(-1
08*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)
^(1/3)*_a^6*_f^3-24*_a^6*_f^3+I*(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-
4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(2/3)*3^(1/2)+(-108*_f^6*_a^12+12*3^(1/2)*(1
/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(2/3)-4*I*3^(1/2)+4*(-108*
_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(1
/3)+4)^2,_a = _b .. x),_f = y(x))+_C1 = 0, Int(((-I*3^(1/2)+1)*(-108*y(x)^6*_a^1
2+12*3^(1/2)*(1/y(x)*(27*_a^6*y(x)^3-4))^(1/2)*y(x)^5*_a^9+72*_a^6*y(x)^3-8)^(2/
3)+(-12*_a^6*y(x)^3+4)*(-108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_a^6*y(x)^3-4))
^(1/2)*y(x)^5*_a^9+72*_a^6*y(x)^3-8)^(1/3)-24*(_a^6*y(x)^3-1/6)*(I*3^(1/2)+1))/_
a/(24*I*3^(1/2)*_a^6*y(x)^3+36*(-108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_a^6*y(
x)^3-4))^(1/2)*y(x)^5*_a^9+72*_a^6*y(x)^3-8)^(1/3)*_a^6*y(x)^3+24*_a^6*y(x)^3+I*
(-108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_a^6*y(x)^3-4))^(1/2)*y(x)^5*_a^9+72*_
a^6*y(x)^3-8)^(2/3)*3^(1/2)-(-108*y(x)^6*_a^12+12*3^(1/2)*(1/y(x)*(27*_a^6*y(x)^
3-4))^(1/2)*y(x)^5*_a^9+72*_a^6*y(x)^3-8)^(2/3)-4*I*3^(1/2)-4*(-108*y(x)^6*_a^12
+12*3^(1/2)*(1/y(x)*(27*_a^6*y(x)^3-4))^(1/2)*y(x)^5*_a^9+72*_a^6*y(x)^3-8)^(1/3
)-4),_a = _b .. x)+Intat(12*(-108*_f^6*x^12+12*3^(1/2)*(1/_f*(27*_f^3*x^6-4))^(1
/2)*_f^5*x^9+72*x^6*_f^3-8)^(1/3)*x^6*_f^2/(24*I*3^(1/2)*x^6*_f^3+36*(-108*_f^6*
x^12+12*3^(1/2)*(1/_f*(27*_f^3*x^6-4))^(1/2)*_f^5*x^9+72*x^6*_f^3-8)^(1/3)*x^6*_
f^3+24*x^6*_f^3+I*(-108*_f^6*x^12+12*3^(1/2)*(1/_f*(27*_f^3*x^6-4))^(1/2)*_f^5*x
^9+72*x^6*_f^3-8)^(2/3)*3^(1/2)-(-108*_f^6*x^12+12*3^(1/2)*(1/_f*(27*_f^3*x^6-4)
)^(1/2)*_f^5*x^9+72*x^6*_f^3-8)^(2/3)-4*I*3^(1/2)-4*(-108*_f^6*x^12+12*3^(1/2)*(
1/_f*(27*_f^3*x^6-4))^(1/2)*_f^5*x^9+72*x^6*_f^3-8)^(1/3)-4)-Int(62208*_a^5*_f^2
*(_a^6*((1/24*I*3^(1/2)-1/24)*(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4)
)^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(2/3)+(I*3^(1/2)+1)*(_a^6*_f^3-1/6))*_f^3*(3^(
1/2)*_f*_a^3*(_a^6*_f^3+2/27)/(1/_f*(27*_a^6*_f^3-4))^(1/2)-2*_a^6*_f^3+5/27*3^(
1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^2*_a^3+2/3)/(-108*_f^6*_a^12+12*3^(1/2)*(1
/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(2/3)-1/12*((-1/72*I*3^(1/
2)+1/72)*(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*
_a^6*_f^3-8)^(2/3)+_a^6*(I*3^(1/2)-1)*_f^3*(3^(1/2)*_f*_a^3*(_a^6*_f^3+2/27)/(1/
_f*(27*_a^6*_f^3-4))^(1/2)-2*_a^6*_f^3+5/27*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2
)*_f^2*_a^3+2/3)/(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*
_a^9+72*_a^6*_f^3-8)^(1/3)+1/18*I*3^(1/2)+1/18*(-108*_f^6*_a^12+12*3^(1/2)*(1/_f
*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(1/3)+1/18)*(-108*_f^6*_a^12+
12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(1/3))/(24*I*
3^(1/2)*_a^6*_f^3+36*(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_
f^5*_a^9+72*_a^6*_f^3-8)^(1/3)*_a^6*_f^3+24*_a^6*_f^3+I*(-108*_f^6*_a^12+12*3^(1
/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(2/3)*3^(1/2)-(-108*
_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5*_a^9+72*_a^6*_f^3-8)^(2
/3)-4*I*3^(1/2)-4*(-108*_f^6*_a^12+12*3^(1/2)*(1/_f*(27*_a^6*_f^3-4))^(1/2)*_f^5
*_a^9+72*_a^6*_f^3-8)^(1/3)-4)^2,_a = _b .. x),_f = y(x))+_C1 = 0
```

4.1089 $y(x)^3 y'(x)^3 - x y'(x) + y(x) = 0$

ODE

$$y(x)^3 y'(x)^3 - x y'(x) + y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.541 (sec), leaf count = 60

$$\left\{[x(\_T) = \frac{\sqrt{5}}{25}\sqrt{5\_C1\,\_T^{\frac{22}{3}} - 2\_T^{\frac{17}{3}}}\left(5\_C1\,\_T^{5/3} + 3\right)\_T^{-\frac{16}{3}}, y(\_T) = \frac{\sqrt{5}}{5}\sqrt{5\_C1\,\_T^{\frac{22}{3}} - 2\_T^{\frac{17}{3}}}\,\_T^{-\frac{13}{3}}]\right\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + y[x]^3*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(y(x)^3*diff(y(x),x)^3-x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/25*5^(1/2)*(5*_C1*_T^(22/3)-2*_T^(17/3))^(1/2)/_T^(16/3)*(5*_C1*_T^(5
/3)+3), y(_T) = 1/5/_T^(13/3)*5^(1/2)*(5*_C1*_T^(22/3)-2*_T^(17/3))^(1/2)]
```

4.1090 $x^3 + 3x^2 y(x) y'(x) + y(x)^3 y'(x)^3 - (1 - 3x) y(x)^2 y'(x)^2 - y(x)^2 = 0$

ODE

$$x^3 + 3x^2 y(x) y'(x) + y(x)^3 y'(x)^3 - (1 - 3x) y(x)^2 y'(x)^2 - y(x)^2 = 0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of variable

Mathematica ✗
cpu = 600. (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.647 (sec), leaf count = 176

$$\left\{ (y(x))^4 + \frac{\left(54x^2 - 36x + 4\right)(y(x))^2}{27} + x^4 - \frac{4x^3}{27} = 0, [x(\_T) = 1\left(\sqrt[3]{\_C1^2}\sqrt{\_T^2 + 1} - \_C1\,\_T\right)\frac{1}{\sqrt{\_T^2 + 1}}, y(\_T)\right.$$

Mathematica raw input

```
DSolve[x^3 - y[x]^2 + 3*x^2*y[x]*y'[x] - (1 - 3*x)*y[x]^2*y'[x]^2 + y[x]^3*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(y(x)^3*diff(y(x),x)^3-(1-3*x)*y(x)^2*diff(y(x),x)^2+3*x^2*y(x)*diff(y(x),x)+x^3-
y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^4+1/27*(54*x^2-36*x+4)*y(x)^2+x^4-4/27*x^3 = 0, [x(_T) = ((_C1^2)^(1/3)*(_T
^2+1)^(1/2)-_C1*_T)/(_T^2+1)^(1/2), y(_T) = _C1/(_T^2+1)^(1/2)], [x(_T) = -1/2*(
(I*3^(1/2)+1)*(_C1^2)^(1/3)*(_T^2+1)^(1/2)+2*_C1*_T)/(_T^2+1)^(1/2), y(_T) = _C1
/(_T^2+1)^(1/2)], [x(_T) = 1/2*((_C1^2)^(1/3)*(I*3^(1/2)-1)*(_T^2+1)^(1/2)-2*_C1
*_T)/(_T^2+1)^(1/2), y(_T) = _C1/(_T^2+1)^(1/2)]
```

4.1091 $y(x)^4 y'(x)^3 - 6xy'(x) + 2y(x) = 0$

ODE

$$y(x)^4 y'(x)^3 - 6xy'(x) + 2y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 599.999 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.366 (sec), leaf count = 40

$$\left\{(y(x))^6 - 8x^3 = 0, [x(\_T) = -\frac{\_C1}{6}\left(\_C1^3 \_T^{\frac{3}{2}} + 2\right)\_T^{-\frac{3}{2}}, y(\_T) = \_C1 \frac{1}{\sqrt{\_T}}]\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 6*x*y'[x] + y[x]^4*y'[x]^3 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(y(x)^4*diff(y(x),x)^3-6*x*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^6-8*x^3 = 0, [x(_T) = 1/6*(_C1^3*_T^(3/2)+2)*_C1/_T^(3/2), y(_T) = _C1/_T^(
1/2)]
```

4.1092 $y'(x)^4 = (y(x)-a)^3(y(x)-b)^2$

ODE

$$y'(x)^4 = (y(x)-a)^3(y(x)-b)^2$$

ODE Classification

[_quadrature]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.73022 (sec), leaf count = 383

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt[4]{a-\#1}\sqrt{\frac{\#1-b}{a-b}}B_{\frac{a-\#1}{a-b}}\left(\frac{1}{4},\frac{1}{2}\right)}{\sqrt{b-\#1}\sqrt[4]{\frac{a-\#1}{a-b}}}\&\right]\left[c_1-\sqrt[4]{-1}x\right]\right\},\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt[4]{a-\#1}\right.\right.\right.$$

Maple ✓
cpu = 0.175 (sec), leaf count = 144

$$\left\{x-\int^{y(x)}\frac{1}{\sqrt[4]{(\_a-a)^3(\_a-b)^2}}d\_a-\_C1=0,x-\int^{y(x)}-i\frac{1}{\sqrt[4]{-(-\_a+a)^3(-\_a+b)^2}}d\_a-\_C1=0,x-\int^{y(x)}i\right.$$

Mathematica raw input

```
DSolve[y'[x]^4 == (-a + y[x])^3*(-b + y[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/4, 1/2]*(a - #1)^(1/4)*Sqr
t[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/4)*Sqrt[b - #1])) & ][-((-1)^(1/4)*
x) + C[1]]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/4, 1/2]*(a - #
1)^(1/4)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/4)*Sqrt[b - #1])) & ][(
-1)^(1/4)*x + C[1]]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/4, 1/
2]*(a - #1)^(1/4)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/4)*Sqrt[b - #1
])) & ][-((-1)^(3/4)*x) + C[1]]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(a -
 b), 1/4, 1/2]*(a - #1)^(1/4)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/4)
*Sqrt[b - #1])) & ][(-1)^(3/4)*x + C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^4 = (y(x)-a)^3*(y(x)-b)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = a, y(x) = b, x-Intat(1/((_a-a)^3*(_a-b)^2)^(1/4),_a = y(x))-_C1 = 0, x-In
tat(I/(-(-_a+a)^3*(-_a+b)^2)^(1/4),_a = y(x))-_C1 = 0, x-Intat(-I/(-(-_a+a)^3*(-
_a+b)^2)^(1/4),_a = y(x))-_C1 = 0, x-Intat(-1/(-(-_a+a)^3*(-_a+b)^2)^(1/4),_a =
y(x))-_C1 = 0
```

4.1093 $f(x)(y(x)-a)^3(y(x)-b)^2+y'(x)^4=0$

ODE

$$f(x)(y(x)-a)^3(y(x)-b)^2+y'(x)^4=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 0.986594 (sec), leaf count = 415

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt[4]{a-\#1}\sqrt{\frac{\#1-b}{a-b}}B_{\frac{a-\#1}{a-b}}\left(\frac{1}{4},\frac{1}{2}\right)}{\sqrt{b-\#1}\sqrt[4]{\frac{a-\#1}{a-b}}}\&\right]\left[\int_1^x-\sqrt[4]{f(K[1])}\,dK[1]+c_1\right]\right\},\left\{y(x)\to \text{InverseFunct}\right.\right.$$

Maple ✓
cpu = 0.345 (sec), leaf count = 270

$$\left\{\int^{y(x)}1\frac{1}{\sqrt{\_a-b}}(\_a-a)^{-\frac{3}{4}}d\_a+\int^x 1\sqrt[4]{f\left(\_a\right)\left(a-y\left(x\right)\right)^3\left(b-y\left(x\right)\right)^2}\frac{1}{\sqrt{y\left(x\right)-b}}(y(x)-a)^{-\frac{3}{4}}d\_a+\_C1=0,\int^{y(x)}\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])^3*(-b + y[x])^2 + y'[x]^4 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/4, 1/2]*(a - #1)^(1/4)*Sqr
t[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/4)*Sqrt[b - #1])) & ][C[1] + Integr
ate[-f[K[1]]^(1/4), {K[1], 1, x}]]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(
a - b), 1/4, 1/2]*(a - #1)^(1/4)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1
/4)*Sqrt[b - #1])) & ][C[1] + Integrate[(-I)*f[K[2]]^(1/4), {K[2], 1, x}]]}, {y[
x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/4, 1/2]*(a - #1)^(1/4)*Sqrt[(-
b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/4)*Sqrt[b - #1])) & ][C[1] + Integrate[
I*f[K[3]]^(1/4), {K[3], 1, x}]]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(a -
 b), 1/4, 1/2]*(a - #1)^(1/4)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/4)
*Sqrt[b - #1])) & ][C[1] + Integrate[f[K[4]]^(1/4), {K[4], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^4+f(x)*(y(x)-a)^3*(y(x)-b)^2 = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/(_a-b)^(1/2)/(_a-a)^(3/4),_a = y(x))+Intat(-(f(_a)*(a-y(x))^3*(b-y(x))^2
)^(1/4)/(y(x)-b)^(1/2)/(y(x)-a)^(3/4),_a = x)+_C1 = 0, Intat(1/(_a-b)^(1/2)/(_a-
a)^(3/4),_a = y(x))+Intat(I*(f(_a)*(a-y(x))^3*(b-y(x))^2)^(1/4)/(y(x)-b)^(1/2)/(
y(x)-a)^(3/4),_a = x)+_C1 = 0, Intat(1/(_a-b)^(1/2)/(_a-a)^(3/4),_a = y(x))+Inta
t(-I*(f(_a)*(a-y(x))^3*(b-y(x))^2)^(1/4)/(y(x)-b)^(1/2)/(y(x)-a)^(3/4),_a = x)+_
C1 = 0, Intat(1/(_a-b)^(1/2)/(_a-a)^(3/4),_a = y(x))+Intat((f(_a)*(a-y(x))^3*(b-
y(x))^2)^(1/4)/(y(x)-b)^(1/2)/(y(x)-a)^(3/4),_a = x)+_C1 = 0
```

4.1094 $f(x)(y(x)-a)^3(y(x)-b)^3+y'(x)^4=0$

ODE

$$f(x)(y(x)-a)^3(y(x)-b)^3+y'(x)^4=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 1.27277 (sec), leaf count = 371

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{4\sqrt[4]{a-\#1}\left(\frac{\#1-b}{a-b}\right)^{3/4}\,{}_2F_1\left(\frac{1}{4},\frac{3}{4},\frac{5}{4},\frac{a-\#1}{a-b}\right)}{(b-\#1)^{3/4}}\&\right]\left[\int_1^x -\sqrt[4]{-1}\sqrt[4]{f(K[1])}\,dK[1]+c_1\right]\right\},\left\{y(x\right.$$

Maple ✓
cpu = 0.443 (sec), leaf count = 262

$$\left\{\int^{y(x)}((-\_a+a)(-\_a+b))^{-\frac{3}{4}}d\_a+\int^x 1\sqrt[4]{-f(\_a)(b-y(x))^3(a-y(x))^3}((a-y(x))(b-y(x)))^{-\frac{3}{4}}d\_a+\_C1=0\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])^3*(-b + y[x])^3 + y'[x]^4 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(-4*Hypergeometric2F1[1/4, 3/4, 5/4, (a - #1)/(a - b)]
*(a - #1)^(1/4)*((-b + #1)/(a - b))^(3/4))/(b - #1)^(3/4) & ][C[1] + Integrate[-
((-1)^(1/4)*f[K[1]]^(1/4)), {K[1], 1, x}]]}, {y[x] -> InverseFunction[(-4*Hyperg
eometric2F1[1/4, 3/4, 5/4, (a - #1)/(a - b)]*(a - #1)^(1/4)*((-b + #1)/(a - b))^
(3/4))/(b - #1)^(3/4) & ][C[1] + Integrate[(-1)^(1/4)*f[K[2]]^(1/4), {K[2], 1, x
}]]}, {y[x] -> InverseFunction[(-4*Hypergeometric2F1[1/4, 3/4, 5/4, (a - #1)/(a
 - b)]*(a - #1)^(1/4)*((-b + #1)/(a - b))^(3/4))/(b - #1)^(3/4) & ][C[1] + Integr
ate[-((-1)^(3/4)*f[K[3]]^(1/4)), {K[3], 1, x}]]}, {y[x] -> InverseFunction[(-4*H
ypergeometric2F1[1/4, 3/4, 5/4, (a - #1)/(a - b)]*(a - #1)^(1/4)*((-b + #1)/(a -
 b))^(3/4))/(b - #1)^(3/4) & ][C[1] + Integrate[(-1)^(3/4)*f[K[4]]^(1/4), {K[4],
 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^4+f(x)*(y(x)-a)^3*(y(x)-b)^3 = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/((-_a+a)*(-_a+b))^(3/4),_a = y(x))+Intat(-(-f(_a)*(b-y(x))^3*(a-y(x))^3)
^(1/4)/((a-y(x))*(b-y(x)))^(3/4),_a = x)+_C1 = 0, Intat(1/((-_a+a)*(-_a+b))^(3/4
),_a = y(x))+Intat(I*(-f(_a)*(b-y(x))^3*(a-y(x))^3)^(1/4)/((a-y(x))*(b-y(x)))^(3
/4),_a = x)+_C1 = 0, Intat(1/((-_a+a)*(-_a+b))^(3/4),_a = y(x))+Intat(-I*(-f(_a)
*(b-y(x))^3*(a-y(x))^3)^(1/4)/((a-y(x))*(b-y(x)))^(3/4),_a = x)+_C1 = 0, Intat(1
/((-_a+a)*(-_a+b))^(3/4),_a = y(x))+Intat((-f(_a)*(b-y(x))^3*(a-y(x))^3)^(1/4)/(
(a-y(x))*(b-y(x)))^(3/4),_a = x)+_C1 = 0
```

4.1095 $f(x)(y(x)-a)^3(y(x)-b)^3(y(x)-c)^2+y'(x)^4=0$

ODE

$$f(x)(y(x)-a)^3(y(x)-b)^3(y(x)-c)^2+y'(x)^4=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 1.93796 (sec), leaf count = 535

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{4\sqrt[4]{a-\#1}\left(\frac{\#1-b}{a-b}\right)^{3/4}\sqrt[4]{\frac{\#1-c}{a-c}}\,{}_2F_1\left(\frac{1}{4},\frac{3}{4};\frac{5}{4};\frac{(c-b)(a-\#1)}{(a-b)(c-\#1)}\right)}{(b-\#1)^{3/4}\sqrt{c-\#1}}\&\right]\left[\int_1^x -\sqrt[4]{-1}\sqrt[4]{f(K[1])}\,dK[1\right.\right.\right.$$

Maple ✓
cpu = 0.746 (sec), leaf count = 366

$$\left\{\int^{y(x)} 1(\_a-b)^{-\frac{3}{4}}(\_a-a)^{-\frac{3}{4}}\frac{1}{\sqrt{\_a-c}}d\_a+\int^x 1\sqrt[4]{-f(\_a)(c-y(x))^2(b-y(x))^3(a-y(x))^3}(y(x)-b)^{-\frac{3}{4}}(y(x)-\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])^3*(-b + y[x])^3*(-c + y[x])^2 + y'[x]^4 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(-4*Hypergeometric2F1[1/4, 3/4, 5/4, ((-b + c)*(a - #1
))/((a - b)*(c - #1))]*(a - #1)^(1/4)*((-b + #1)/(a - b))^(3/4)*((-c + #1)/(a -
c))^(1/4))/((b - #1)^(3/4)*Sqrt[c - #1]) & ][C[1] + Integrate[-((-1)^(1/4)*f[K[1
]]^(1/4)), {K[1], 1, x}]]}, {y[x] -> InverseFunction[(-4*Hypergeometric2F1[1/4,
3/4, 5/4, ((-b + c)*(a - #1))/((a - b)*(c - #1))]*(a - #1)^(1/4)*((-b + #1)/(a -
 b))^(3/4)*((-c + #1)/(a - c))^(1/4))/((b - #1)^(3/4)*Sqrt[c - #1]) & ][C[1] + I
ntegrate[(-1)^(1/4)*f[K[2]]^(1/4), {K[2], 1, x}]]}, {y[x] -> InverseFunction[(-4
*Hypergeometric2F1[1/4, 3/4, 5/4, ((-b + c)*(a - #1))/((a - b)*(c - #1))]*(a - #
1)^(1/4)*((-b + #1)/(a - b))^(3/4)*((-c + #1)/(a - c))^(1/4))/((b - #1)^(3/4)*Sq
rt[c - #1]) & ][C[1] + Integrate[-((-1)^(3/4)*f[K[3]]^(1/4)), {K[3], 1, x}]]}, {
y[x] -> InverseFunction[(-4*Hypergeometric2F1[1/4, 3/4, 5/4, ((-b + c)*(a - #1))
/((a - b)*(c - #1))]*(a - #1)^(1/4)*((-b + #1)/(a - b))^(3/4)*((-c + #1)/(a - c)
```

```
)^(1/4))/((b - #1)^(3/4)*Sqrt[c - #1]) & ][C[1] + Integrate[(-1)^(3/4)*f[K[4]]^(
1/4), {K[4], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^4+f(x)*(y(x)-a)^3*(y(x)-b)^3*(y(x)-c)^2 = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/(_a-b)^(3/4)/(_a-a)^(3/4)/(_a-c)^(1/2),_a = y(x))+Intat(-(-f(_a)*(c-y(x)
)^2*(b-y(x))^3*(a-y(x))^3)^(1/4)/(y(x)-b)^(3/4)/(y(x)-a)^(3/4)/(y(x)-c)^(1/2),_a
 = x)+_C1 = 0, Intat(1/(_a-b)^(3/4)/(_a-a)^(3/4)/(_a-c)^(1/2),_a = y(x))+Intat(I
*(-f(_a)*(c-y(x))^2*(b-y(x))^3*(a-y(x))^3)^(1/4)/(y(x)-b)^(3/4)/(y(x)-a)^(3/4)/(
y(x)-c)^(1/2),_a = x)+_C1 = 0, Intat(1/(_a-b)^(3/4)/(_a-a)^(3/4)/(_a-c)^(1/2),_a
 = y(x))+Intat(-I*(-f(_a)*(c-y(x))^2*(b-y(x))^3*(a-y(x))^3)^(1/4)/(y(x)-b)^(3/4)
/(y(x)-a)^(3/4)/(y(x)-c)^(1/2),_a = x)+_C1 = 0, Intat(1/(_a-b)^(3/4)/(_a-a)^(3/4
)/(_a-c)^(1/2),_a = y(x))+Intat((-f(_a)*(c-y(x))^2*(b-y(x))^3*(a-y(x))^3)^(1/4)/
(y(x)-b)^(3/4)/(y(x)-a)^(3/4)/(y(x)-c)^(1/2),_a = x)+_C1 = 0
```

4.1096 $y'(x)^4 + xy'(x) - 3y(x) = 0$

ODE

$$y'(x)^4 + xy'(x) - 3y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✗
cpu = 599.999 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.019 (sec), leaf count = 31

$$\left\{[x(\_T) = \sqrt{\_T}\left(\frac{4}{5}\_T^{\frac{5}{2}} + \_C1\right), y(\_T) = \frac{3\_T^4}{5} + \frac{\_C1}{3}\_T^{\frac{3}{2}}]\right\}$$

Mathematica raw input

```
DSolve[-3*y[x] + x*y'[x] + y'[x]^4 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^4+x*diff(y(x),x)-3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = _T^(1/2)*(4/5*_T^(5/2)+_C1), y(_T) = 3/5*_T^4+1/3*_T^(3/2)*_C1]
```

4.1097 $y'(x)^4 - 3(1-x)y'(x)^2 + 3(1-2y(x))y'(x) + 3x = 0$

ODE

$$y'(x)^4 - 3(1-x)y'(x)^2 + 3(1-2y(x))y'(x) + 3x = 0$$

ODE Classification

[_dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✗
cpu = 600.001 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.127 (sec), leaf count = 49

$$\left\{(y(x))^2 - y(x) - x^2 + \frac{2x}{3} + \frac{5}{36} = 0, [x(\_T) = \_T(\_T + \_C1), y(\_T) = \frac{-\_C1\,\_T^2}{2} + \frac{2\_T^3}{3} + \frac{-\_C1}{2} + \frac{1}{2}]\right\}$$

Mathematica raw input

```
DSolve[3*x + 3*(1 - 2*y[x])*y'[x] - 3*(1 - x)*y'[x]^2 + y'[x]^4 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^4-3*(1-x)*diff(y(x),x)^2+3*(1-2*y(x))*diff(y(x),x)+3*x = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^2-y(x)-x^2+2/3*x+5/36 = 0, [x(_T) = _T*(_T+_C1), y(_T) = 1/2*_C1*_T^2+2/3*_
T^3+1/2*_C1+1/2]
```

4.1098 $-4x^2y(x)y'(x)^2+y'(x)^4+16xy(x)^2y'(x)-16y(x)^3=0$

ODE

$$-4x^2y(x)y'(x)^2+y'(x)^4+16xy(x)^2y'(x)-16y(x)^3=0$$

ODE Classification

[[_homogeneous, `class G`]]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 1.73458 (sec), leaf count = 341

$$\left\{\text{Solve}\left[\frac{1}{4}\left(-4c_1+\frac{\sqrt{x^2-4\sqrt{y(x)}}\sqrt{y(x)}\left(4\log\left(\sqrt{x^2-4\sqrt{y(x)}}+x\right)-\log(y(x))\right)}{\sqrt{\left(x^2-4\sqrt{y(x)}\right)y(x)}}+\log(y(x))\right)=0,y(x)\right],\text{Solve}\left[\frac{1}{4}\right.\right.$$

Maple ✓
cpu = 0.311 (sec), leaf count = 118

$$\left\{1\left(\sqrt{x^2-4\sqrt{y\left(x\right)}}-x\right)^{1\sqrt{x^2y(x)-4\left(y(x)\right)^{3/2}}\frac{1}{\sqrt{x^2-4\sqrt{y(x)}}}\frac{1}{\sqrt{y(x)}}}\frac{1}{\sqrt{y\left(x\right)}}\left(\left(\sqrt{x^2-4\sqrt{y\left(x\right)}}+x\right)^{1\sqrt{x^2y(x)-4\left(y(x)\right)^{3/2}}\frac{1}{\sqrt{x^2-4\sqrt{y(x)}}}}\right.\right.$$

Mathematica raw input

```
DSolve[-16*y[x]^3 + 16*x*y[x]^2*y'[x] - 4*x^2*y[x]*y'[x]^2 + y'[x]^4 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(-4*C[1] + Log[y[x]] + ((4*Log[x + Sqrt[x^2 - 4*Sqrt[y[x]]]] - Log[y[x]])
*Sqrt[x^2 - 4*Sqrt[y[x]]]*Sqrt[y[x]])/Sqrt[(x^2 - 4*Sqrt[y[x]])*y[x]])/4 == 0, y
[x]], Solve[(-4*C[1] + Log[y[x]] + ((-4*Log[x + Sqrt[x^2 - 4*Sqrt[y[x]]]] + Log[
y[x]])*Sqrt[x^2 - 4*Sqrt[y[x]]]*Sqrt[y[x]])/Sqrt[(x^2 - 4*Sqrt[y[x]])*y[x]])/4 =
= 0, y[x]], Solve[(-4*C[1] + Log[y[x]] + ((4*Log[x + Sqrt[x^2 + 4*Sqrt[y[x]]]] -
 Log[y[x]])*Sqrt[x^2 + 4*Sqrt[y[x]]]*Sqrt[y[x]])/Sqrt[(x^2 + 4*Sqrt[y[x]])*y[x]]
)/4 == 0, y[x]], Solve[(-4*C[1] + Log[y[x]] + ((-4*Log[x + Sqrt[x^2 + 4*Sqrt[y[x
]]]] + Log[y[x]])*Sqrt[x^2 + 4*Sqrt[y[x]]]*Sqrt[y[x]])/Sqrt[(x^2 + 4*Sqrt[y[x]])
*y[x]])/4 == 0, y[x]]}
```

Maple raw input

```
dsolve(diff(y(x),x)^4-4*x^2*y(x)*diff(y(x),x)^2+16*x*y(x)^2*diff(y(x),x)-16*y(x)^3 = 0, y(x),'implici
```

Maple raw output

```
y(x) = 1/16*x^4, 1/y(x)^(1/2)/(((x^2-4*y(x)^(1/2))^(1/2)+x)^(1/(x^2-4*y(x)^(1/2)
)^(1/2)/y(x)^(1/2)*(x^2*y(x)-4*y(x)^(3/2))^(1/2)))*((x^2-4*y(x)^(1/2))^(1/2)-x)^
(1/(x^2-4*y(x)^(1/2))^(1/2)/y(x)^(1/2)*(x^2*y(x)-4*y(x)^(3/2))^(1/2))-_C1 = 0
```

4.1099

$$y'(x)^4+4y(x)y'(x)^3+6y(x)^2y'(x)^2-(1-4y(x)^3)\,y'(x)-y(x)\,(3-y(x)^3)=0$$

ODE

$$y'(x)^4+4y(x)y'(x)^3+6y(x)^2y'(x)^2-\left(1-4y(x)^3\right)y'(x)-y(x)\left(3-y(x)^3\right)=0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Use new variable

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 4.012 (sec), leaf count = 204

$$\left\{x+\frac{\ln\left(\left(-14640\left(y(x)\right)^6-93435\left(y(x)\right)^3-256\right)\left(RootOf\left(\_Z^4+4\,y(x)\,\_Z^3+6\left(y(x)\right)^2\_Z^2+\left(4\left(y(x)\right)^3-1\right)\_Z+(\right.\right.\right.}{}\right.$$

Mathematica raw input

```
DSolve[-(y[x]*(3 - y[x]^3)) - (1 - 4*y[x]^3)*y'[x] + 6*y[x]^2*y'[x]^2 + 4*y[x]*y'[x]^3 + y'[x]^4 == 0
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^4+4*y(x)*diff(y(x),x)^3+6*y(x)^2*diff(y(x),x)^2-(1-4*y(x)^3)*diff(y(x),x)-
(3-y(x)^3)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
x+1/9*ln((-14640*y(x)^6-93435*y(x)^3-256)*RootOf(_Z^4+4*y(x)*_Z^3+6*y(x)^2*_Z^2+
(4*y(x)^3-1)*_Z+y(x)^4-3*y(x))^3+(-39648*y(x)^7-177915*y(x)^4+2048*y(x))*RootOf(
_Z^4+4*y(x)*_Z^3+6*y(x)^2*_Z^2+(4*y(x)^3-1)*_Z+y(x)^4-3*y(x))^2+(-36144*y(x)^8-1
62033*y(x)^5-9216*y(x)^2)*RootOf(_Z^4+4*y(x)*_Z^3+6*y(x)^2*_Z^2+(4*y(x)^3-1)*_Z+
y(x)^4-3*y(x))-11072*y(x)^9-8169*y(x)^6+124155*y(x)^3)-_C1 = 0
```

4.1100 $2y'(x)^4 - y(x)y'(x) - 2 = 0$

ODE

$$2y'(x)^4 - y(x)y'(x) - 2 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✗
cpu = 600.002 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.14 (sec), leaf count = 50

$$\left\{x + \frac{(y(x))^2}{4} - 2\left(RootOf\left(2\_Z^4 - y(x)\_Z - 2\right)\right)^2 - \frac{y(x)\left(RootOf\left(2\_Z^4 - y(x)\_Z - 2\right)\right)^3}{2} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[-2 - y[x]*y'[x] + 2*y'[x]^4 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(2*diff(y(x),x)^4-y(x)*diff(y(x),x)-2 = 0, y(x),'implicit')
```

Maple raw output

```
x+1/4*y(x)^2-2*RootOf(2*_Z^4-y(x)*_Z-2)^2-1/2*y(x)*RootOf(2*_Z^4-y(x)*_Z-2)^3-_C
1 = 0
```

4.1101 $12x^3 + xy'(x)^4 - 2y(x)y'(x)^3 = 0$

ODE

$$12x^3 + xy'(x)^4 - 2y(x)y'(x)^3 = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries]]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 2.01 (sec), leaf count = 35

$$\left\{(y(x))^4 - \frac{64\,x^6}{9} = 0, [y(\_T) = \frac{(12\,\_C1^2 + \_T^2)\,\_C1}{2}, x(\_T) = \_C1\,\_T]\right\}$$

Mathematica raw input

```
DSolve[12*x^3 - 2*y[x]*y'[x]^3 + x*y'[x]^4 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x*diff(y(x),x)^4-2*y(x)*diff(y(x),x)^3+12*x^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)^4-64/9*x^6 = 0, [y(_T) = 1/2*(12*_C1^2+_T^2)*_C1, x(_T) = _C1*_T]
```

4.1102 $ay'(x)^3 + by'(x)^2 + y'(x)^5 = cy(x)$

ODE

$$ay'(x)^3 + by'(x)^2 + y'(x)^5 = cy(x)$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✓
cpu = 0.502506 (sec), leaf count = 211

$$\left\{\text{Solve}\left[c_1 + x = \int_1^{y(x)} \frac{1}{\text{Root}\left[-cK[1] + \#1^5 + \#1^3 a + \#1^2 b\&, 1\right]}\, dK[1], y(x)\right], \text{Solve}\left[c_1 + x = \int_1^{y(x)} \frac{}{\text{Root}\left[-cK[2] + \#1\right.}\right.$$

Maple ✓
cpu = 0.109 (sec), leaf count = 40

$$\left\{x - \int^{y(x)} \left(RootOf\left(\_Z^5 + a\_Z^3 + b\_Z^2 - \_a\, c\right)\right)^{-1} d\_a - \_C1 = 0, y(x) = 0\right\}$$

Mathematica raw input

```
DSolve[b*y'[x]^2 + a*y'[x]^3 + y'[x]^5 == c*y[x],y[x],x]
```

Mathematica raw output

```
{Solve[x + C[1] == Integrate[Root[-(c*K[1]) + b*#1^2 + a*#1^3 + #1^5 & , 1]^(-1)
 , {K[1], 1, y[x]}], y[x]], Solve[x + C[1] == Integrate[Root[-(c*K[2]) + b*#1^2 +
  a*#1^3 + #1^5 & , 2]^(-1), {K[2], 1, y[x]}], y[x]], Solve[x + C[1] == Integrate
 [Root[-(c*K[3]) + b*#1^2 + a*#1^3 + #1^5 & , 3]^(-1), {K[3], 1, y[x]}], y[x]], S
 olve[x + C[1] == Integrate[Root[-(c*K[4]) + b*#1^2 + a*#1^3 + #1^5 & , 4]^(-1),
{K[4], 1, y[x]}], y[x]], Solve[x + C[1] == Integrate[Root[-(c*K[5]) + b*#1^2 + a
*#1^3 + #1^5 & , 5]^(-1), {K[5], 1, y[x]}], y[x]]}
```

Maple raw input

```
dsolve(diff(y(x),x)^5+a*diff(y(x),x)^3+b*diff(y(x),x)^2 = c*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 0, x-Intat(1/RootOf(_Z^5+_Z^3*a+_Z^2*b-_a*c),_a = y(x))-_C1 = 0
```

4.1103 $ay'(x)^4 + by'(x)^3 + cxy'(x)^2 + y'(x)^5 = cy(x)$

ODE

$$ay'(x)^4 + by'(x)^3 + cxy'(x)^2 + y'(x)^5 = cy(x)$$

ODE Classification

[_dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 317.903 (sec), leaf count = 1

$Aborted

Maple ✓
cpu = 2.625 (sec), leaf count = 107

$$\left\{ y(x) = 0, [x(\_T) = \frac{-12\_T^5 + (-12a+15)\_T^4 + (16a-12b)\_T^3 + 18b\_T^2 + 12\_C1\,c}{12\,(\_T-1)^2 c}, y(\_T) = \frac{-9\_T^6 + (-8a+12)\_T^5 + (12a-6b)\_T^4 + 12\_T^3 b + 12\_C1\,c\,\_T^2}{12\,(\_T-1)^2 c}] \right\}$$

Mathematica raw input

```
DSolve[c*x*y'[x]^2 + b*y'[x]^3 + a*y'[x]^4 + y'[x]^5 == c*y[x],y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^5+a*diff(y(x),x)^4+b*diff(y(x),x)^3+c*x*diff(y(x),x)^2 = c*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 0, [x(_T) = 1/12*(-12*_T^5+(-12*a+15)*_T^4+(16*a-12*b)*_T^3+18*b*_T^2+12*
_C1*c)/(_T-1)^2/c, y(_T) = 1/12*(-9*_T^6+(-8*a+12)*_T^5+(12*a-6*b)*_T^4+12*_T^3*
b+12*_C1*c*_T^2)/(_T-1)^2/c]
```

4.1104 $3y'(x)^5 - y(x)y'(x) + 1 = 0$

ODE

$$3y'(x)^5 - y(x)y'(x) + 1 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✓
cpu = 0.454499 (sec), leaf count = 171

$$\left\{\text{Solve}\left[c_1 + x = \int_1^{y(x)} \frac{1}{\text{Root}\left[-\#1K[1] + 3\#1^5 + 1\&, 1\right]}\, dK[1], y(x)\right], \text{Solve}\left[c_1 + x = \int_1^{y(x)} \frac{1}{\text{Root}\left[-\#1K[2] + 3\#1^5 + 1\right.}\right.$$

Maple ✓
cpu = 0.174 (sec), leaf count = 50

$$\left\{x - \frac{(y(x))^2}{2} - \frac{5\left(RootOf\left(3\_Z^5 - y(x)\_Z + 1\right)\right)^3}{2} + \frac{3y(x)\left(RootOf\left(3\_Z^5 - y(x)\_Z + 1\right)\right)^4}{2} - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[1 - y[x]*y'[x] + 3*y'[x]^5 == 0,y[x],x]
```

Mathematica raw output

```
{Solve[x + C[1] == Integrate[Root[1 - K[1]*#1 + 3*#1^5 & , 1]^(-1), {K[1], 1, y[
x]}], y[x]], Solve[x + C[1] == Integrate[Root[1 - K[2]*#1 + 3*#1^5 & , 2]^(-1),
{K[2], 1, y[x]}], y[x]], Solve[x + C[1] == Integrate[Root[1 - K[3]*#1 + 3*#1^5 &
 , 3]^(-1), {K[3], 1, y[x]}], y[x]], Solve[x + C[1] == Integrate[Root[1 - K[4]*#
1 + 3*#1^5 & , 4]^(-1), {K[4], 1, y[x]}], y[x]], Solve[x + C[1] == Integrate[Roo
t[1 - K[5]*#1 + 3*#1^5 & , 5]^(-1), {K[5], 1, y[x]}], y[x]]}
```

Maple raw input

```
dsolve(3*diff(y(x),x)^5-y(x)*diff(y(x),x)+1 = 0, y(x),'implicit')
```

Maple raw output

```
x-1/2*y(x)^2-5/2*RootOf(3*_Z^5-y(x)*_Z+1)^3+3/2*y(x)*RootOf(3*_Z^5-y(x)*_Z+1)^4-
_C1 = 0
```

4.1105 $y'(x)^6 = (y(x)-a)^4(y(x)-b)^3$

ODE

$$y'(x)^6 = (y(x)-a)^4(y(x)-b)^3$$

ODE Classification

[_quadrature]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.999114 (sec), leaf count = 569

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt[3]{a-\#1}\sqrt{\frac{\#1-b}{a-b}}B_{\frac{a-\#1}{a-b}}\left(\frac{1}{3},\frac{1}{2}\right)}{\sqrt{b-\#1}\sqrt[3]{\frac{a-\#1}{a-b}}}\&\right][c_1-ix]\right\},\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt[3]{a-\#1}\sqrt{\frac{\#}{a}}\right.\right.\right.$$

Maple ✓
cpu = 0.413 (sec), leaf count = 250

$$\left\{x-\int^{y(x)}\frac{1}{\sqrt[6]{(\_a-a)^4(\_a-b)^3}}d\_a-\_C1=0,x-\int^{y(x)}\frac{-2i}{-\sqrt{3}+i}\frac{1}{\sqrt[6]{-(-\_a+a)^4(-\_a+b)^3}}d\_a-\_C1=0,x-\right.$$

Mathematica raw input

```
DSolve[y'[x]^6 == (-a + y[x])^4*(-b + y[x])^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/3, 1/2]*(a - #1)^(1/3)*Sqr
t[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/3)*Sqrt[b - #1])) & ][(-I)*x + C[1]
]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/3, 1/2]*(a - #1)^(1/3)*
Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/3)*Sqrt[b - #1])) & ][I*x + C[1]
]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/3, 1/2]*(a - #1)^(1/3)*
Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/3)*Sqrt[b - #1])) & ][-((-1)^(1/
6)*x) + C[1]]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/3, 1/2]*(a
- #1)^(1/3)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/3)*Sqrt[b - #1])) &
][(-1)^(1/6)*x + C[1]]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/3,
 1/2]*(a - #1)^(1/3)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/3)*Sqrt[b -
 #1])) & ][-((-1)^(5/6)*x) + C[1]]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(
a - b), 1/3, 1/2]*(a - #1)^(1/3)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1
```

```
/3)*Sqrt[b - #1])) & ][(-1)^(5/6)*x + C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^6 = (y(x)-a)^4*(y(x)-b)^3, y(x),'implicit')
```

Maple raw output

```
y(x) = a, y(x) = b, x-Intat(1/((_a-a)^4*(_a-b)^3)^(1/6),_a = y(x))-_C1 = 0, x-In
tat(-2*I/(-(-_a+a)^4*(-_a+b)^3)^(1/6)/(-3^(1/2)+I),_a = y(x))-_C1 = 0, x-Intat(-
2*I/(-(-_a+a)^4*(-_a+b)^3)^(1/6)/(3^(1/2)+I),_a = y(x))-_C1 = 0, x-Intat(2*I/(-(
-_a+a)^4*(-_a+b)^3)^(1/6)/(3^(1/2)+I),_a = y(x))-_C1 = 0, x-Intat(2*I/(-(-_a+a)^
4*(-_a+b)^3)^(1/6)/(-3^(1/2)+I),_a = y(x))-_C1 = 0, x-Intat(-1/(-(-_a+a)^4*(-_a+
b)^3)^(1/6),_a = y(x))-_C1 = 0
```

4.1106 $f(x)(y(x)-a)^4(y(x)-b)^3+y'(x)^6=0$

ODE

$$f(x)(y(x)-a)^4(y(x)-b)^3+y'(x)^6=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 1.47473 (sec), leaf count = 635

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt[3]{a-\#1}\sqrt{\frac{\#1-b}{a-b}}B_{\frac{a-\#1}{a-b}}\left(\frac{1}{3},\frac{1}{2}\right)}{\sqrt{b-\#1}\sqrt[3]{\frac{a-\#1}{a-b}}}\&\right]\left[\int_1^x-\sqrt[6]{f(K[1])}\,dK[1]+c_1\right]\right\},\left\{y(x)\to \text{InverseFunct}\right.\right.$$

Maple ✓
cpu = 0.606 (sec), leaf count = 434

$$\left\{\int^{y(x)}1\frac{1}{\sqrt{\_a-b}}(\_a-a)^{-\frac{2}{3}}d\_a+\int^x1\sqrt[6]{f\left(\_a\right)\left(a-y\left(x\right)\right)^4\left(b-y\left(x\right)\right)^3}\frac{1}{\sqrt{y\left(x\right)-b}}(y(x)-a)^{-\frac{2}{3}}d\_a+\_C1=0,\int^{y(x)}\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])^4*(-b + y[x])^3 + y'[x]^6 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/3, 1/2]*(a - #1)^(1/3)*Sqr
t[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/3)*Sqrt[b - #1])) & ][C[1] + Integr
ate[-f[K[1]]^(1/6), {K[1], 1, x}]]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(
a - b), 1/3, 1/2]*(a - #1)^(1/3)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1
/3)*Sqrt[b - #1])) & ][C[1] + Integrate[f[K[2]]^(1/6), {K[2], 1, x}]]}, {y[x] ->
 InverseFunction[-((Beta[(a - #1)/(a - b), 1/3, 1/2]*(a - #1)^(1/3)*Sqrt[(-b + #
1)/(a - b)])/(((a - #1)/(a - b))^(1/3)*Sqrt[b - #1])) & ][C[1] + Integrate[-((-1
)^(1/3)*f[K[3]]^(1/6)), {K[3], 1, x}]]}, {y[x] -> InverseFunction[-((Beta[(a - #
1)/(a - b), 1/3, 1/2]*(a - #1)^(1/3)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b)
)^(1/3)*Sqrt[b - #1])) & ][C[1] + Integrate[(-1)^(1/3)*f[K[4]]^(1/6), {K[4], 1,
x}]]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/3, 1/2]*(a - #1)^(1/
3)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/3)*Sqrt[b - #1])) & ][C[1] +
```

```
Integrate[-((-1)^(2/3)*f[K[5]]^(1/6)), {K[5], 1, x}]]}, {y[x] -> InverseFunction
[-((Beta[(a - #1)/(a - b), 1/3, 1/2]*(a - #1)^(1/3)*Sqrt[(-b + #1)/(a - b)])/(((
a - #1)/(a - b))^(1/3)*Sqrt[b - #1])) & ][C[1] + Integrate[(-1)^(2/3)*f[K[6]]^(1
/6), {K[6], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^6+f(x)*(y(x)-a)^4*(y(x)-b)^3 = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/(_a-b)^(1/2)/(_a-a)^(2/3),_a = y(x))+Intat(-(f(_a)*(a-y(x))^4*(b-y(x))^3
)^(1/6)/(y(x)-b)^(1/2)/(y(x)-a)^(2/3),_a = x)+_C1 = 0, Intat(1/(_a-b)^(1/2)/(_a-
a)^(2/3),_a = y(x))+Intat(1/2*(I*3^(1/2)+1)*(f(_a)*(a-y(x))^4*(b-y(x))^3)^(1/6)/
(y(x)-b)^(1/2)/(y(x)-a)^(2/3),_a = x)+_C1 = 0, Intat(1/(_a-b)^(1/2)/(_a-a)^(2/3)
,_a = y(x))+Intat(-1/2*(I*3^(1/2)-1)*(f(_a)*(a-y(x))^4*(b-y(x))^3)^(1/6)/(y(x)-b
)^(1/2)/(y(x)-a)^(2/3),_a = x)+_C1 = 0, Intat(1/(_a-b)^(1/2)/(_a-a)^(2/3),_a = y
(x))+Intat(1/2*(I*3^(1/2)-1)*(f(_a)*(a-y(x))^4*(b-y(x))^3)^(1/6)/(y(x)-b)^(1/2)/
(y(x)-a)^(2/3),_a = x)+_C1 = 0, Intat(1/(_a-b)^(1/2)/(_a-a)^(2/3),_a = y(x))+Int
at(-1/2*(I*3^(1/2)+1)*(f(_a)*(a-y(x))^4*(b-y(x))^3)^(1/6)/(y(x)-b)^(1/2)/(y(x)-a
)^(2/3),_a = x)+_C1 = 0, Intat(1/(_a-b)^(1/2)/(_a-a)^(2/3),_a = y(x))+Intat((f(_
a)*(a-y(x))^4*(b-y(x))^3)^(1/6)/(y(x)-b)^(1/2)/(y(x)-a)^(2/3),_a = x)+_C1 = 0
```

4.1107 $f(x)(y(x)-a)^5(y(x)-b)^3+y'(x)^6=0$

ODE

$$f(x)(y(x)-a)^5(y(x)-b)^3+y'(x)^6=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 1.54843 (sec), leaf count = 641

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt[6]{a-\#1}\sqrt{\frac{\#1-b}{a-b}}B_{\frac{a-\#1}{a-b}}\left(\frac{1}{6},\frac{1}{2}\right)}{\sqrt{b-\#1}\sqrt[6]{\frac{a-\#1}{a-b}}}\&\right]\left[c_1+\int_1^x -i\sqrt[6]{f(K[1])}\,dK[1]\right]\right\},\left\{y(x)\to \text{InverseFunc}\right.$$

Maple ✓
cpu = 0.666 (sec), leaf count = 440

$$\left\{\int^{y(x)} 1\frac{1}{\sqrt{\_a-b}}(\_a-a)^{-\frac{5}{6}}d\_a+\int^x 1\sqrt[6]{-f\left(\_a\right)\left(b-y\left(x\right)\right)^3\left(a-y\left(x\right)\right)^5}\frac{1}{\sqrt{y\left(x\right)-b}}(y(x)-a)^{-\frac{5}{6}}d\_a+\_C1=0,\int^{y(}\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])^5*(-b + y[x])^3 + y'[x]^6 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/6, 1/2]*(a - #1)^(1/6)*Sqr
t[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/6)*Sqrt[b - #1])) & ][C[1] + Integr
ate[(-I)*f[K[1]]^(1/6), {K[1], 1, x}]]}, {y[x] -> InverseFunction[-((Beta[(a - #
1)/(a - b), 1/6, 1/2]*(a - #1)^(1/6)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b)
)^(1/6)*Sqrt[b - #1])) & ][C[1] + Integrate[I*f[K[2]]^(1/6), {K[2], 1, x}]]}, {y
[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/6, 1/2]*(a - #1)^(1/6)*Sqrt[(
-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/6)*Sqrt[b - #1])) & ][C[1] + Integrate
[-((-1)^(1/6)*f[K[3]]^(1/6)), {K[3], 1, x}]]}, {y[x] -> InverseFunction[-((Beta[
(a - #1)/(a - b), 1/6, 1/2]*(a - #1)^(1/6)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(
a - b))^(1/6)*Sqrt[b - #1])) & ][C[1] + Integrate[(-1)^(1/6)*f[K[4]]^(1/6), {K[4
], 1, x}]]}, {y[x] -> InverseFunction[-((Beta[(a - #1)/(a - b), 1/6, 1/2]*(a - #
1)^(1/6)*Sqrt[(-b + #1)/(a - b)])/(((a - #1)/(a - b))^(1/6)*Sqrt[b - #1])) & ][C
```

```
[1] + Integrate[-((-1)^(5/6)*f[K[5]]^(1/6)), {K[5], 1, x}]]}, {y[x] -> InverseFu
nction[-((Beta[(a - #1)/(a - b), 1/6, 1/2]*(a - #1)^(1/6)*Sqrt[(-b + #1)/(a - b)
])/(((a - #1)/(a - b))^(1/6)*Sqrt[b - #1])) & ][C[1] + Integrate[(-1)^(5/6)*f[K[
6]]^(1/6), {K[6], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^6+f(x)*(y(x)-a)^5*(y(x)-b)^3 = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/(_a-b)^(1/2)/(_a-a)^(5/6),_a = y(x))+Intat(-(-f(_a)*(b-y(x))^3*(a-y(x))^
5)^(1/6)/(y(x)-b)^(1/2)/(y(x)-a)^(5/6),_a = x)+_C1 = 0, Intat(1/(_a-b)^(1/2)/(_a
-a)^(5/6),_a = y(x))+Intat(1/2*(I*3^(1/2)+1)*(-f(_a)*(b-y(x))^3*(a-y(x))^5)^(1/6
)/(y(x)-b)^(1/2)/(y(x)-a)^(5/6),_a = x)+_C1 = 0, Intat(1/(_a-b)^(1/2)/(_a-a)^(5/
6),_a = y(x))+Intat(-1/2*(I*3^(1/2)-1)*(-f(_a)*(b-y(x))^3*(a-y(x))^5)^(1/6)/(y(x
)-b)^(1/2)/(y(x)-a)^(5/6),_a = x)+_C1 = 0, Intat(1/(_a-b)^(1/2)/(_a-a)^(5/6),_a
= y(x))+Intat(1/2*(I*3^(1/2)-1)*(-f(_a)*(b-y(x))^3*(a-y(x))^5)^(1/6)/(y(x)-b)^(1
/2)/(y(x)-a)^(5/6),_a = x)+_C1 = 0, Intat(1/(_a-b)^(1/2)/(_a-a)^(5/6),_a = y(x))
+Intat(-1/2*(I*3^(1/2)+1)*(-f(_a)*(b-y(x))^3*(a-y(x))^5)^(1/6)/(y(x)-b)^(1/2)/(y
(x)-a)^(5/6),_a = x)+_C1 = 0, Intat(1/(_a-b)^(1/2)/(_a-a)^(5/6),_a = y(x))+Intat
((-f(_a)*(b-y(x))^3*(a-y(x))^5)^(1/6)/(y(x)-b)^(1/2)/(y(x)-a)^(5/6),_a = x)+_C1
= 0
```

4.1108 $f(x)(y(x)-a)^5(y(x)-b)^4+y'(x)^6=0$

ODE

$$f(x)(y(x)-a)^5(y(x)-b)^4+y'(x)^6=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 1.79746 (sec), leaf count = 1

$Aborted

Maple ✓
cpu = 0.918 (sec), leaf count = 434

$$\left\{\int^{y(x)}1(\_a-b)^{-\frac{2}{3}}(\_a-a)^{-\frac{5}{6}}d\_a+\int^{x}1\sqrt[6]{f(\_a)(b-y(x))^4(a-y(x))^5}(y(x)-b)^{-\frac{2}{3}}(y(x)-a)^{-\frac{5}{6}}d\_a+\_C1=0,\int\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])^5*(-b + y[x])^4 + y'[x]^6 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)^6+f(x)*(y(x)-a)^5*(y(x)-b)^4 = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/(_a-b)^(2/3)/(_a-a)^(5/6),_a = y(x))+Intat(-(f(_a)*(b-y(x))^4*(a-y(x))^5
)^(1/6)/(y(x)-b)^(2/3)/(y(x)-a)^(5/6),_a = x)+_C1 = 0, Intat(1/(_a-b)^(2/3)/(_a-
a)^(5/6),_a = y(x))+Intat(1/2*(I*3^(1/2)+1)*(f(_a)*(b-y(x))^4*(a-y(x))^5)^(1/6)/
(y(x)-b)^(2/3)/(y(x)-a)^(5/6),_a = x)+_C1 = 0, Intat(1/(_a-b)^(2/3)/(_a-a)^(5/6)
,_a = y(x))+Intat(-1/2*(I*3^(1/2)-1)*(f(_a)*(b-y(x))^4*(a-y(x))^5)^(1/6)/(y(x)-b
)^(2/3)/(y(x)-a)^(5/6),_a = x)+_C1 = 0, Intat(1/(_a-b)^(2/3)/(_a-a)^(5/6),_a = y
```

```
(x))+Intat(1/2*(I*3^(1/2)-1)*(f(_a)*(b-y(x))^4*(a-y(x))^5)^(1/6)/(y(x)-b)^(2/3)/
(y(x)-a)^(5/6),_a = x)+_C1 = 0, Intat(1/(_a-b)^(2/3)/(_a-a)^(5/6),_a = y(x))+Int
at(-1/2*(I*3^(1/2)+1)*(f(_a)*(b-y(x))^4*(a-y(x))^5)^(1/6)/(y(x)-b)^(2/3)/(y(x)-a
)^(5/6),_a = x)+_C1 = 0, Intat(1/(_a-b)^(2/3)/(_a-a)^(5/6),_a = y(x))+Intat((f(_
a)*(b-y(x))^4*(a-y(x))^5)^(1/6)/(y(x)-b)^(2/3)/(y(x)-a)^(5/6),_a = x)+_C1 = 0
```

4.1109 $f(x)(y(x)-a)^5(y(x)-b)^4(y(x)-c)^3+y'(x)^6=0$

ODE

$$f(x)(y(x)-a)^5(y(x)-b)^4(y(x)-c)^3+y'(x)^6=0$$

ODE Classification

[[_1st_order, `_with_symmetry_[F(x),G(x)*y+H(x)]`]]

Book solution method
Binomial equation $(y')^m+F(x)G(y)=0$

Mathematica ✓
cpu = 2.96344 (sec), leaf count = 797

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{6\,{}_2F_1\left(\frac{1}{6},\frac{2}{3};\frac{7}{6};\frac{(c-b)(a-\#1)}{(a-b)(c-\#1)}\right)\sqrt[6]{a-\#1}\left(\frac{\#1-b}{a-b}\right)^{2/3}\sqrt[3]{\frac{\#1-c}{a-c}}}{(b-\#1)^{2/3}\sqrt{c-\#1}}\&\right]\left[c_1+\int_1^x -i\sqrt[6]{f(K[1])}\,dK[\right.\right.$$

Maple ✓
cpu = 2.018 (sec), leaf count = 578

$$\left\{\int^{y(x)} 1(\_a-b)^{-\frac{2}{3}}(\_a-a)^{-\frac{5}{6}}\frac{1}{\sqrt{\_a-c}}d\_a+\int^x 1\sqrt[6]{-f(\_a)(c-y(x))^3(b-y(x))^4(a-y(x))^5}(y(x)-b)^{-\frac{2}{3}}(y(x)-c\right.$$

Mathematica raw input

```
DSolve[f[x]*(-a + y[x])^5*(-b + y[x])^4*(-c + y[x])^3 + y'[x]^6 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(-6*Hypergeometric2F1[1/6, 2/3, 7/6, ((-b + c)*(a - #1
))/((a - b)*(c - #1))]*(a - #1)^(1/6)*((-b + #1)/(a - b))^(2/3)*((-c + #1)/(a -
c))^(1/3))/((b - #1)^(2/3)*Sqrt[c - #1]) & ][C[1] + Integrate[(-I)*f[K[1]]^(1/6)
, {K[1], 1, x}]]}, {y[x] -> InverseFunction[(-6*Hypergeometric2F1[1/6, 2/3, 7/6,
 ((-b + c)*(a - #1))/((a - b)*(c - #1))]*(a - #1)^(1/6)*((-b + #1)/(a - b))^(2/3
)*((-c + #1)/(a - c))^(1/3))/((b - #1)^(2/3)*Sqrt[c - #1]) & ][C[1] + Integrate[
I*f[K[2]]^(1/6), {K[2], 1, x}]]}, {y[x] -> InverseFunction[(-6*Hypergeometric2F1
[1/6, 2/3, 7/6, ((-b + c)*(a - #1))/((a - b)*(c - #1))]*(a - #1)^(1/6)*((-b + #1
)/(a - b))^(2/3)*((-c + #1)/(a - c))^(1/3))/((b - #1)^(2/3)*Sqrt[c - #1]) & ][C[
1] + Integrate[-((-1)^(1/6)*f[K[3]]^(1/6)), {K[3], 1, x}]]}, {y[x] -> InverseFun
ction[(-6*Hypergeometric2F1[1/6, 2/3, 7/6, ((-b + c)*(a - #1))/((a - b)*(c - #1)
)]*(a - #1)^(1/6)*((-b + #1)/(a - b))^(2/3)*((-c + #1)/(a - c))^(1/3))/((b - #1)
```

```
^(2/3)*Sqrt[c - #1]) & ][C[1] + Integrate[(-1)^(1/6)*f[K[4]]^(1/6), {K[4], 1, x}
]]}, {y[x] -> InverseFunction[(-6*Hypergeometric2F1[1/6, 2/3, 7/6, ((-b + c)*(a
- #1))/((a - b)*(c - #1))]*(a - #1)^(1/6)*((-b + #1)/(a - b))^(2/3)*((-c + #1)/(
a - c))^(1/3))/((b - #1)^(2/3)*Sqrt[c - #1]) & ][C[1] + Integrate[-((-1)^(5/6)*f
[K[5]]^(1/6)), {K[5], 1, x}]]}, {y[x] -> InverseFunction[(-6*Hypergeometric2F1[1
/6, 2/3, 7/6, ((-b + c)*(a - #1))/((a - b)*(c - #1))]*(a - #1)^(1/6)*((-b + #1)/
(a - b))^(2/3)*((-c + #1)/(a - c))^(1/3))/((b - #1)^(2/3)*Sqrt[c - #1]) & ][C[1]
 + Integrate[(-1)^(5/6)*f[K[6]]^(1/6), {K[6], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^6+f(x)*(y(x)-a)^5*(y(x)-b)^4*(y(x)-c)^3 = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/(_a-b)^(2/3)/(_a-a)^(5/6)/(_a-c)^(1/2),_a = y(x))+Intat(-(-f(_a)*(c-y(x)
)^3*(b-y(x))^4*(a-y(x))^5)^(1/6)/(y(x)-b)^(2/3)/(y(x)-a)^(5/6)/(y(x)-c)^(1/2),_a
 = x)+_C1 = 0, Intat(1/(_a-b)^(2/3)/(_a-a)^(5/6)/(_a-c)^(1/2),_a = y(x))+Intat(1
/2*(I*3^(1/2)+1)*(-f(_a)*(c-y(x))^3*(b-y(x))^4*(a-y(x))^5)^(1/6)/(y(x)-b)^(2/3)/
(y(x)-a)^(5/6)/(y(x)-c)^(1/2),_a = x)+_C1 = 0, Intat(1/(_a-b)^(2/3)/(_a-a)^(5/6)
/(_a-c)^(1/2),_a = y(x))+Intat(-1/2*(I*3^(1/2)-1)*(-f(_a)*(c-y(x))^3*(b-y(x))^4*
(a-y(x))^5)^(1/6)/(y(x)-b)^(2/3)/(y(x)-a)^(5/6)/(y(x)-c)^(1/2),_a = x)+_C1 = 0,
Intat(1/(_a-b)^(2/3)/(_a-a)^(5/6)/(_a-c)^(1/2),_a = y(x))+Intat(1/2*(I*3^(1/2)-1
)*(-f(_a)*(c-y(x))^3*(b-y(x))^4*(a-y(x))^5)^(1/6)/(y(x)-b)^(2/3)/(y(x)-a)^(5/6)/
(y(x)-c)^(1/2),_a = x)+_C1 = 0, Intat(1/(_a-b)^(2/3)/(_a-a)^(5/6)/(_a-c)^(1/2),_
a = y(x))+Intat(-1/2*(I*3^(1/2)+1)*(-f(_a)*(c-y(x))^3*(b-y(x))^4*(a-y(x))^5)^(1/
6)/(y(x)-b)^(2/3)/(y(x)-a)^(5/6)/(y(x)-c)^(1/2),_a = x)+_C1 = 0, Intat(1/(_a-b)^
(2/3)/(_a-a)^(5/6)/(_a-c)^(1/2),_a = y(x))+Intat((-f(_a)*(c-y(x))^3*(b-y(x))^4*(
a-y(x))^5)^(1/6)/(y(x)-b)^(2/3)/(y(x)-a)^(5/6)/(y(x)-c)^(1/2),_a = x)+_C1 = 0
```

4.1110 $x^2(y'(x)^6+3y(x)^4+3y(x)^2+1)=a^2$

ODE

$$x^2\left(y'(x)^6+3y(x)^4+3y(x)^2+1\right)=a^2$$

ODE Classification

[_rational]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for x

Mathematica ✗
cpu = 36.1805 (sec), leaf count = 0 , could not solve

```
DSolve[x^2*(1 + 3*y[x]^2 + 3*y[x]^4 + Derivative[1][y][x]^6) == a^2, y[x], x]
```

Maple ✗
cpu = 6.672 (sec), leaf count = 0 , could not solve

```
dsolve(x^2*(diff(y(x),x)^6+3*y(x)^4+3*y(x)^2+1) = a^2, y(x),'implicit')
```

Mathematica raw input

```
DSolve[x^2*(1 + 3*y[x]^2 + 3*y[x]^4 + y'[x]^6) == a^2,y[x],x]
```

Mathematica raw output

```
DSolve[x^2*(1 + 3*y[x]^2 + 3*y[x]^4 + Derivative[1][y][x]^6) == a^2, y[x], x]
```

Maple raw input

```
dsolve(x^2*(diff(y(x),x)^6+3*y(x)^4+3*y(x)^2+1) = a^2, y(x),'implicit')
```

Maple raw output

```
dsolve(x^2*(diff(y(x),x)^6+3*y(x)^4+3*y(x)^2+1) = a^2, y(x),'implicit')
```

4.1111 $y'(x)^n = ax^r + by'(x)^s$

ODE

$$y'(x)^n = ax^r + by'(x)^s$$

ODE Classification

[_quadrature]

Book solution method
Change of variable

Mathematica ✗
cpu = 0.0213661 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x]^n == a*x^r + b*Derivative[1][y][x]^s, y[x], x]
```

Maple ✓
cpu = 0.063 (sec), leaf count = 25

$$\left\{y(x) = \int RootOf(-\_Z^n + ax^r + b\_Z^s)\,\mathrm{d}x + \_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x]^n == a*x^r + b*y'[x]^s,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x]^n == a*x^r + b*Derivative[1][y][x]^s, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)^n = a*x^r+b*diff(y(x),x)^s, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(RootOf(-_Z^n+a*x^r+b*_Z^s),x)+_C1
```

4.1112 $y'(x)^n = f(x)^n (y(x)-a)^{n+1} (y(x)-b)^{n-1}$

ODE

$$y'(x)^n = f(x)^n (y(x)-a)^{n+1} (y(x)-b)^{n-1}$$

ODE Classification

[_separable]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.514525 (sec), leaf count = 79

$$\left\{\left\{y(x) \to \frac{a(a-b)^n \left(\int_1^x (-1)^{\frac{1}{n}+1} f(K[1])\, dK[1] + c_1\right)^n + bn^n}{(a-b)^n \left(\int_1^x (-1)^{\frac{1}{n}+1} f(K[1])\, dK[1] + c_1\right)^n + n^n}\right\}\right\}$$

Maple ✓
cpu = 0.269 (sec), leaf count = 70

$$\left\{\frac{1}{a-b}\left((y(x)-b)^{\frac{1-n}{n}}\, n(b-y(x))\,(a-y(x))\,(y(x)-a)^{\frac{-n-1}{n}} + \left(\_C1 + \int f(x)\,\mathrm{d}x\right)(a-b)\right) = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x]^n == f[x]^n*(-a + y[x])^(1 + n)*(-b + y[x])^(-1 + n),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (b*n^n + a*(a - b)^n*(C[1] + Integrate[(-1)^(1 + n^(-1))*f[K[1]], {K[1
], 1, x}])^n)/(n^n + (a - b)^n*(C[1] + Integrate[(-1)^(1 + n^(-1))*f[K[1]], {K[1
], 1, x}])^n)}}
```

Maple raw input

```
dsolve(diff(y(x),x)^n = f(x)^n*(y(x)-a)^(n+1)*(y(x)-b)^(n-1), y(x),'implicit')
```

Maple raw output

```
((y(x)-b)^((1-n)/n)*n*(b-y(x))*(a-y(x))*(y(x)-a)^((-n-1)/n)+(_C1+Int(f(x),x))*(a
-b))/(a-b) = 0
```

4.1113 $y'(x)^n = f(x)(y(x)-a)^{n+1}$

ODE

$$y'(x)^n = f(x)(y(x)-a)^{n+1}$$

ODE Classification

[_separable]

Book solution method
Binomial equation $(y')^m + F(x)G(y) = 0$

Mathematica ✓
cpu = 0.127541 (sec), leaf count = 41

$$\left\{\left\{y(x) \to a - \left(\frac{\int_1^x (-1)^{\frac{1}{n}+1} f(K[1])^{\frac{1}{n}}\, dK[1] + c_1}{n}\right)^{-n}\right\}\right\}$$

Maple ✓
cpu = 0.058 (sec), leaf count = 38

$$\left\{-n(a-y(x))\,(y(x)-a)^{\frac{-n-1}{n}} + \_C1 + \int \sqrt[n]{f(x)}\,\mathrm{d}x = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x]^n == f[x]*(-a + y[x])^(1 + n),y[x],x]
```

Mathematica raw output

```
{{y[x] -> a - ((C[1] + Integrate[(-1)^(1 + n^(-1))*f[K[1]]^n^(-1), {K[1], 1, x}]
)/n)^(-n)}}
```

Maple raw input

```
dsolve(diff(y(x),x)^n = f(x)*(y(x)-a)^(n+1), y(x),'implicit')
```

Maple raw output

```
-n*(a-y(x))*(y(x)-a)^((-n-1)/n)+_C1+Int(f(x)^(1/n),x) = 0
```

4.1114 $y'(x)^n = f(x)(y(x)-a)^{n-1}(y(x)-b)^{n-1}$

ODE

$$y'(x)^n = f(x)(y(x)-a)^{n-1}(y(x)-b)^{n-1}$$

ODE Classification

[_separable]

Book solution method
Binomial equation $(y')^m + F(x)G(y) = 0$

Mathematica ✓
cpu = 0.532096 (sec), leaf count = 164

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{n(a-\#1)^{\frac{1}{n}}(\#1-b)^{\frac{1}{n}}\left(\frac{a-\#1}{a-b}\right)^{-1/n}\left((n+1)(a-b)\,{}_2F_1\left(-\frac{1}{n},\frac{1}{n};1+\frac{1}{n};\frac{\#1-b}{a-b}\right)+(\#1-b)\,{}_2F_1\right.\right.\right.\right.$$

Maple ✓
cpu = 0.338 (sec), leaf count = 50

$$\left\{\int \sqrt[n]{f(x)}\,dx - \int^{y(x)} \frac{\sqrt[n]{(\_a+a)(\_a+b)}}{(\_a+a)(\_a+b)}\,d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x]^n == f[x]*(-a + y[x])^(-1 + n)*(-b + y[x])^(-1 + n),y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(n*(a - #1)^n^(-1)*(-b + #1)^n^(-1)*((a - b)*(1 + n)*H
ypergeometric2F1[-n^(-1), n^(-1), 1 + n^(-1), (-b + #1)/(a - b)] + Hypergeometri
c2F1[1 + n^(-1), (-1 + n)/n, 2 + n^(-1), (-b + #1)/(a - b)]*(-b + #1)))/((a - b)
^2*(1 + n)*((a - #1)/(a - b))^n^(-1)) & ][C[1] + Integrate[(-1)^((-1 + n)/n)*f[K
[1]]^n^(-1), {K[1], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^n = f(x)*(y(x)-a)^(n-1)*(y(x)-b)^(n-1), y(x),'implicit')
```

Maple raw output

```
Int(f(x)^(1/n),x)-Intat(1/(-_a+a)/(-_a+b)*((-_a+a)*(-_a+b))^(1/n),_a = y(x))+_C1
 = 0
```

4.1115 $f(x)g(x)+y'(x)^n=0$

ODE

$$f(x)g(x)+y'(x)^n=0$$

ODE Classification

[_quadrature]

Book solution method
Form $(y')^m+X(x,y)=0$

Mathematica ✓
cpu = 0.110586 (sec), leaf count = 26

$$\left\{\left\{y(x)\to\int_1^x(-f(K[1])g(K[1]))^{\frac{1}{n}}\,dK[1]+c_1\right\}\right\}$$

Maple ✓
cpu = 0.051 (sec), leaf count = 18

$$\left\{y(x)=\int\sqrt[n]{-f\left(x\right)g\left(x\right)}\,\mathrm{d}x+\_C1\right\}$$

Mathematica raw input

```
DSolve[f[x]*g[x] + y'[x]^n == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + Integrate[(-(f[K[1]]*g[K[1]]))^n^(-1), {K[1], 1, x}]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^n+f(x)*g(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = Int((-f(x)*g(x))^(1/n),x)+_C1
```

4.1116 $f(x,y(x))+y'(x)^n=0$

ODE

$$f(x,y(x))+y'(x)^n=0$$

ODE Classification

[NONE]

Book solution method
Form $(y')^m+X(x,y)=0$

Mathematica ✗
cpu = 13.6805 (sec), leaf count = 0 , could not solve

```
DSolve[f[x, y[x]] + Derivative[1][y][x]^n == 0, y[x], x]
```

Maple ✗
cpu = 0.03 (sec), leaf count = 0 , could not solve

```
dsolve(diff(y(x),x)^n+f(x,y(x)) = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[f[x, y[x]] + y'[x]^n == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f[x, y[x]] + Derivative[1][y][x]^n == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)^n+f(x,y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(y(x),x)^n+f(x,y(x)) = 0, y(x),'implicit')
```

4.1117 $ay'(x) + y'(x)^n = by(x)$

ODE

$$ay'(x) + y'(x)^n = by(x)$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✓
cpu = 0.293822 (sec), leaf count = 46

$$\text{Solve}\left[\left\{x = \frac{a\log(\text{K\$201926}) + \frac{n\text{K\$201926}^{n-1}}{n-1}}{b} + c_1, y(x) = \frac{a\text{K\$201926} + \text{K\$201926}^n}{b}\right\}, \{y(x), \text{K\$201926}\}\right]$$

Maple ✓
cpu = 0.046 (sec), leaf count = 33

$$\left\{x - \int^{y(x)} (RootOf(\_Z^n + a\_Z - b\_a))^{-1} d\_a - \_C1 = 0, y(x) = 0\right\}$$

Mathematica raw input

```
DSolve[a*y'[x] + y'[x]^n == b*y[x],y[x],x]
```

Mathematica raw output

```
Solve[{x == C[1] + ((K$201926^(-1 + n)*n)/(-1 + n) + a*Log[K$201926])/b, y[x] ==
 (a*K$201926 + K$201926^n)/b}, {y[x], K$201926}]
```

Maple raw input

```
dsolve(diff(y(x),x)^n+a*diff(y(x),x) = b*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 0, x-Intat(1/RootOf(_Z^n+a*_Z-b*_a),_a = y(x))-_C1 = 0
```

4.1118 $y'(x)^n + xy'(x) - y(x) = 0$

ODE

$$y'(x)^n + xy'(x) - y(x) = 0$$

ODE Classification

[_Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.0163097 (sec), leaf count = 14

$$\{\{y(x) \to c_1^n + c_1 x\}\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 34

$$\left\{(n-1)\left(\left(-\frac{x}{n}\right)^{(n-1)^{-1}}\right)^n + y(x) = 0, y(x) = \_C1^n + \_C1\, x\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + y'[x]^n == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + C[1]^n}}
```

Maple raw input

```
dsolve(diff(y(x),x)^n+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
(n-1)*((-x/n)^(1/(n-1)))^n+y(x) = 0, y(x) = _C1^n+_C1*x
```

4.1119 $ay'(x)^m + y'(x)^n = by(x)$

ODE

$$ay'(x)^m + y'(x)^n = by(x)$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✓
cpu = 0.202146 (sec), leaf count = 56

$$\text{Solve}\left[\left\{x = \frac{\frac{am\text{K\$252469}^m}{m-1} + \frac{n\text{K\$252469}^n}{n-1}}{b\text{K\$252469}} + c_1, y(x) = \frac{a\text{K\$252469}^m + \text{K\$252469}^n}{b}\right\}, \{y(x), \text{K\$252469}\}\right]$$

Maple ✓
cpu = 0.052 (sec), leaf count = 37

$$\left\{x - \int^{y(x)} (RootOf(-\_Z^n - \_Z^m a + b\_a))^{-1} d\_a - \_C1 = 0, y(x) = 0\right\}$$

Mathematica raw input

```
DSolve[a*y'[x]^m + y'[x]^n == b*y[x],y[x],x]
```

Mathematica raw output

```
Solve[{x == ((a*K$252469^m*m)/(-1 + m) + (K$252469^n*n)/(-1 + n))/(b*K$252469) +
 C[1], y[x] == (a*K$252469^m + K$252469^n)/b}, {y[x], K$252469}]
```

Maple raw input

```
dsolve(diff(y(x),x)^n+a*diff(y(x),x)^m = b*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 0, x-Intat(1/RootOf(-_Z^n-_Z^m*a+b*_a),_a = y(x))-_C1 = 0
```

4.1120 $\mathbf{Y1}(y(x))y'(x)^{n-1}+y'(x)^n=0$

ODE

$$\mathrm{Y1}(y(x))y'(x)^{n-1}+y'(x)^n=0$$

ODE Classification

[_quadrature]

Book solution method
Form $(y')^m+f_1(x,y)(y')^{m-1}\cdots+f_m(x,y)=0$

Mathematica ✓
cpu = 0.0690159 (sec), leaf count = 39

$$\left\{\left\{y(x)\to c_1+0^{\frac{1}{n}}x\right\},\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}\frac{1}{\mathrm{Y1}(K[1])}\,dK[1]\&\right][c_1-x]\right\}\right\}$$

Maple ✗
cpu = 0.052 (sec), leaf count = 0 , exception

```
numeric exception: division by zero
```

Mathematica raw input

```
DSolve[Y1[y[x]]*y'[x]^(-1 + n) + y'[x]^n == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 0^n^(-1)*x + C[1]}, {y[x] -> InverseFunction[Integrate[Y1[K[1]]^(-1),
{K[1], 1, #1}] & ][-x + C[1]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^n+Y1(y(x))*diff(y(x),x)^(n-1) = 0, y(x),'implicit')
```

Maple raw output

```
numeric exception: division by zero
```

4.1121 $\mathbf{X1}(x, y(x))y'(x)^{n-1} + y'(x)^n = 0$

ODE

$$\mathrm{X1}(x, y(x))y'(x)^{n-1} + y'(x)^n = 0$$

ODE Classification

[_quadrature]

Book solution method
Form $(y')^m + f_1(x, y)(y')^{m-1} \cdots + f_m(x, y) = 0$

Mathematica ✗
cpu = 1.42336 (sec), leaf count = 0 , could not solve

```
DSolve[X1[x, y[x]]*Derivative[1][y][x]^(-1 + n) + Derivative[1][y][x]^n == 0, y[x], x]
```

Maple ✓
cpu = 0.063 (sec), leaf count = 5

$$\{y(x) = \_C1\}$$

Mathematica raw input

```
DSolve[X1[x, y[x]]*y'[x]^(-1 + n) + y'[x]^n == 0,y[x],x]
```

Mathematica raw output

```
DSolve[X1[x, y[x]]*Derivative[1][y][x]^(-1 + n) + Derivative[1][y][x]^n == 0, y[
x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)^n+X1(x,y(x))*diff(y(x),x)^(n-1) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1
```

4.1122 $x^{n-1}y'(x)^n - nxy'(x) + y(x) = 0$

ODE

$$x^{n-1}y'(x)^n - nxy'(x) + y(x) = 0$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.114474 (sec), leaf count = 44

$$\text{Solve}\left[\left\{\text{K\$202459}nx = \text{K\$202459}^n x^{n-1} + y(x), x = c_1(\text{K\$202459} - \text{K\$202459}n)^{\frac{n}{1-n}}\right\}, \{y(x), \text{K\$202459}\}\right]$$

Maple ✓
cpu = 0.472 (sec), leaf count = 63

$$\left\{[y(\_T) = -\frac{1}{\_C1}\left(\_C1\,\_T^{-\frac{n}{n-1}}\right)^n \_T^{\frac{n^2}{n-1}} + \_C1\,n\_T^{-(n-1)^{-1}}, x(\_T) = \_C1\,\_T^{-\frac{n}{n-1}}]\right\}$$

Mathematica raw input

```
DSolve[y[x] - n*x*y'[x] + x^(-1 + n)*y'[x]^n == 0,y[x],x]
```

Mathematica raw output

```
Solve[{K$202459*n*x == K$202459^n*x^(-1 + n) + y[x], x == (K$202459 - K$202459*n
)^(n/(1 - n))*C[1]}, {y[x], K$202459}]
```

Maple raw input

```
dsolve(x^(n-1)*diff(y(x),x)^n-n*x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[y(_T) = -(_C1*_T^(-1/(n-1)*n))^n/_C1*_T^(n^2/(n-1))+_C1*n*_T^(-1/(n-1)), x(_T)
= _C1*_T^(-1/(n-1)*n)]
```

4.1123 $\mathbf{X0}(x,y(x))y'(x)^n + \mathbf{X1}(x,y(x))y'(x)^{n-1} = 0$

ODE

$$\mathrm{X0}(x,y(x))y'(x)^n + \mathrm{X1}(x,y(x))y'(x)^{n-1} = 0$$

ODE Classification

[_quadrature]

Book solution method
Form $X_0(x,y)(y')^m + X_1(x,y)(y')^{m-1} + \cdots + X_m(x,y) = 0$

Mathematica ✗
cpu = 0.312848 (sec), leaf count = 0 , could not solve

```
DSolve[X1[x, y[x]]*Derivative[1][y][x]^(-1 + n) + X0[x, y[x]]*Derivative[1][y][x]^n == 0, y[x], x]
```

Maple ✓
cpu = 0.08 (sec), leaf count = 5

$$\{y(x) = \_C1\}$$

Mathematica raw input

```
DSolve[X1[x, y[x]]*y'[x]^(-1 + n) + X0[x, y[x]]*y'[x]^n == 0,y[x],x]
```

Mathematica raw output

```
DSolve[X1[x, y[x]]*Derivative[1][y][x]^(-1 + n) + X0[x, y[x]]*Derivative[1][y][x
]^n == 0, y[x], x]
```

Maple raw input

```
dsolve(X0(x,y(x))*diff(y(x),x)^n+X1(x,y(x))*diff(y(x),x)^(n-1) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1
```

4.1124 $2\sqrt{ay'(x)} + xy'(x) - y(x) = 0$

ODE

$$2\sqrt{ay'(x)} + xy'(x) - y(x) = 0$$

ODE Classification

[[_homogeneous, `class G`], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 91.4646 (sec), leaf count = 93

$$\{\{y(x) \to (\cosh(2c_1) - \sinh(2c_1))\left(-\left(2i\sqrt{a}\sinh(c_1) + 2i\sqrt{a}\cosh(c_1) + x\right)\right)\}, \{y(x) \to i(\cosh(2c_1) - \sinh(2c_1))\left(2\sqrt{a}\sinh\right.$$

Maple ✓
cpu = 0.024 (sec), leaf count = 15

$$\left\{y(x) = 2\sqrt{\_C1\,a} + \_C1\,x\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + 2*Sqrt[a*y'[x]] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x + (2*I)*Sqrt[a]*Cosh[C[1]] + (2*I)*Sqrt[a]*Sinh[C[1]])*(Cosh[2*C[
1]] - Sinh[2*C[1]]))}, {y[x] -> I*(I*x + 2*Sqrt[a]*Cosh[C[1]] + 2*Sqrt[a]*Sinh[C
[1]])*(Cosh[2*C[1]] - Sinh[2*C[1]])}}
```

Maple raw input

```
dsolve(2*(a*diff(y(x),x))^(1/2)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 2*(_C1*a)^(1/2)+_C1*x
```

4.1125 $(x-y(x))\sqrt{y'(x)} = a(y'(x)+1)$

ODE

$$(x-y(x))\sqrt{y'(x)} = a(y'(x)+1)$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 47.1926 (sec), leaf count = 51

$$\left\{\left\{y(x)\to -\frac{a^2+c_1(c_1+x)}{c_1+x}\right\},\left\{y(x)\to -\frac{a^2-c_1x+c_1^2}{x-c_1}\right\}\right\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 37

$$\left\{y(x) = x-2\,a, [x(\_T) = a\frac{1}{\sqrt{\_T}}+\_C1, y(\_T) = 1\left(\_C1\,\sqrt{\_T}-\_T\,a\right)\frac{1}{\sqrt{\_T}}]\right\}$$

Mathematica raw input

```
DSolve[(x - y[x])*Sqrt[y'[x]] == a*(1 + y'[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a^2 + C[1]*(x + C[1]))/(x + C[1]))}, {y[x] -> -((a^2 - x*C[1] + C[1
]^2)/(x - C[1]))}}
```

Maple raw input

```
dsolve((x-y(x))*diff(y(x),x)^(1/2) = a*(1+diff(y(x),x)), y(x),'implicit')
```

Maple raw output

```
y(x) = x-2*a, [x(_T) = a/_T^(1/2)+_C1, y(_T) = (_C1*_T^(1/2)-_T*a)/_T^(1/2)]
```

4.1126 $3xy'(x) + 2(y(x)+1)^{3/2} - 3y(x) = 0$

ODE

$$3xy'(x) + 2(y(x)+1)^{3/2} - 3y(x) = 0$$

ODE Classification

[_separable]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.0369379 (sec), leaf count = 49

$$\text{Solve}\left[3c_1 = \text{RootSum}\left[2\#1^3 - 3\#1^2 + 3\&, \frac{\log\left(\sqrt{y(x)+1} - \#1\right)}{\#1 - 1}\&\right] + \log(x), y(x)\right]$$

Maple ✓
cpu = 0.035 (sec), leaf count = 31

$$\left\{\ln(x) + \int^{y(x)} 3\left((2\_a+2)\sqrt{\_a+1} - 3\_a\right)^{-1} d\_a + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[-3*y[x] + 2*(1 + y[x])^(3/2) + 3*x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[3*C[1] == Log[x] + RootSum[3 - 3*#1^2 + 2*#1^3 & , Log[-#1 + Sqrt[1 + y[x]
]]/(-1 + #1) & ], y[x]]
```

Maple raw input

```
dsolve(2*(1+y(x))^(3/2)+3*x*diff(y(x),x)-3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)+Intat(3/((2*_a+2)*(_a+1)^(1/2)-3*_a),_a = y(x))+_C1 = 0
```

4.1127 $ay'(x) + \sqrt{y'(x)^2 + 1} = x$

ODE

$$ay'(x) + \sqrt{y'(x)^2 + 1} = x$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for x

Mathematica ✓
cpu = 0.07209 (sec), leaf count = 120

$$\left\{\left\{y(x) \to \frac{x\left(ax - \sqrt{a^2+x^2-1}\right) - (a^2-1)\log\left(\sqrt{a^2+x^2-1}+x\right)}{2(a^2-1)} + c_1\right\}, \left\{y(x) \to \frac{x\left(\sqrt{a^2+x^2-1}+ax\right) + (a^2-1\right.\right.$$

Maple ✓
cpu = 0.079 (sec), leaf count = 117

$$\left\{y(x) = \frac{1}{(2a-2)(1+a)}\left(ax^2 - x\sqrt{a^2+x^2-1} - (a-1)\left(\ln\left(x+\sqrt{a^2+x^2-1}\right) - 2\_C1\right)(1+a)\right), y(x) = \frac{1}{(2a-2)(1}\right.$$

Mathematica raw input

```
DSolve[a*y'[x] + Sqrt[1 + y'[x]^2] == x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + (x*(a*x - Sqrt[-1 + a^2 + x^2]) - (-1 + a^2)*Log[x + Sqrt[-1 +
a^2 + x^2]])/(2*(-1 + a^2))}, {y[x] -> C[1] + (x*(a*x + Sqrt[-1 + a^2 + x^2]) +
(-1 + a^2)*Log[x + Sqrt[-1 + a^2 + x^2]])/(2*(-1 + a^2))}}
```

Maple raw input

```
dsolve((1+diff(y(x),x)^2)^(1/2)+a*diff(y(x),x) = x, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*(a*x^2+x*(a^2+x^2-1)^(1/2)+(a-1)*(ln(x+(a^2+x^2-1)^(1/2))+2*_C1)*(1+a
))/(a-1)/(1+a), y(x) = 1/2*(a*x^2-x*(a^2+x^2-1)^(1/2)-(a-1)*(ln(x+(a^2+x^2-1)^(1
/2))-2*_C1)*(1+a))/(a-1)/(1+a)
```

4.1128 $ay'(x) + \sqrt{y'(x)^2 + 1} = y(x)$

ODE

$$ay'(x) + \sqrt{y'(x)^2 + 1} = y(x)$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✓
cpu = 0.238594 (sec), leaf count = 273

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{2\log\left(\sqrt{\#1^2 + a^2 - 1} + \#1\right) - a\log\left(-a\sqrt{\#1^2 + a^2 - 1} - \#1 - a^2 + 1\right) + a\log\left(-a\sqrt{\#1^2}\right.\right.\right.\right.}{2 - 2a^2}$$

Maple ✓
cpu = 0.073 (sec), leaf count = 77

$$\left\{x - \int^{y(x)} (a-1)(1+a)\left(\_a\, a - \sqrt{\_a^2 + a^2 - 1}\right)^{-1} d\_a - \_C1 = 0, x - \int^{y(x)} (a-1)(1+a)\left(\_a\, a + \sqrt{\_a^2 + a^2 - 1}\right)\right.$$

Mathematica raw input

```
DSolve[a*y'[x] + Sqrt[1 + y'[x]^2] == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(a*Log[1 - #1] - a*Log[1 + #1] - a*Log[1 - #1^2] + 2*L
og[#1 + Sqrt[-1 + a^2 + #1^2]] - a*Log[1 - a^2 - #1 - a*Sqrt[-1 + a^2 + #1^2]] +
 a*Log[1 - a^2 + #1 - a*Sqrt[-1 + a^2 + #1^2]])/(2 - 2*a^2) & ][x/(-1 + a^2) + C
[1]]}, {y[x] -> InverseFunction[(a*Log[1 - #1] - a*Log[1 + #1] + a*Log[1 - #1^2]
 + 2*Log[#1 + Sqrt[-1 + a^2 + #1^2]] - a*Log[1 - a^2 - #1 - a*Sqrt[-1 + a^2 + #1
^2]] + a*Log[1 - a^2 + #1 - a*Sqrt[-1 + a^2 + #1^2]])/(2*(-1 + a^2)) & ][x/(-1 +
 a^2) + C[1]]}}
```

Maple raw input

```
dsolve((1+diff(y(x),x)^2)^(1/2)+a*diff(y(x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
x-Intat(1/(_a*a-(_a^2+a^2-1)^(1/2))*(a-1)*(1+a),_a = y(x))-_C1 = 0, x-Intat(1/(_
a*a+(_a^2+a^2-1)^(1/2))*(a-1)*(1+a),_a = y(x))-_C1 = 0
```

4.1129 $\sqrt{y'(x)^2+1} = xy'(x)$

ODE

$$\sqrt{y'(x)^2+1} = xy'(x)$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for y'

Mathematica ✓
cpu = 0.0206125 (sec), leaf count = 41

$$\left\{\left\{y(x) \to c_1 - \log\left(\sqrt{x^2-1}+x\right)\right\}, \left\{y(x) \to c_1 + \log\left(\sqrt{x^2-1}+x\right)\right\}\right\}$$

Maple ✓
cpu = 0.04 (sec), leaf count = 33

$$\left\{y(x) = -\ln\left(x+\sqrt{x^2-1}\right) + \_C1, y(x) = \ln\left(x+\sqrt{x^2-1}\right) + \_C1\right\}$$

Mathematica raw input

```
DSolve[Sqrt[1 + y'[x]^2] == x*y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] - Log[x + Sqrt[-1 + x^2]]}, {y[x] -> C[1] + Log[x + Sqrt[-1 + x^2
]]}}
```

Maple raw input

```
dsolve((1+diff(y(x),x)^2)^(1/2) = x*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
y(x) = ln(x+(x^2-1)^(1/2))+_C1, y(x) = -ln(x+(x^2-1)^(1/2))+_C1
```

4.1130 $-ay(x)y'(x) - ax + \sqrt{y'(x)^2 + 1} = 0$

ODE

$$-ay(x)y'(x) - ax + \sqrt{y'(x)^2 + 1} = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 96.7453 (sec), leaf count = 407

$$\left\{\text{Solve}\left[\sqrt{a^2\left(x^2+y(x)^2\right)-1}+\frac{1}{4}i\log\left(\left(a^2x^2-1\right)y(x)^2-2xy(x)\sqrt{a^2x^2+a^2y(x)^2-1}+a^2y(x)^4+x^2\right)+\frac{1}{4}i\log\left(\left(a^2x^2\right.\right.\right.\right.$$

Maple ✓
cpu = 0.043 (sec), leaf count = 53

$$\left\{[x(\_T)=\_T\left(\frac{\arctan\left(\_T\right)}{a}+\frac{1}{\_T\,a}+\_C1\right)\frac{1}{\sqrt{\_T^2+1}},y(\_T)=-\frac{\_C1\,a-\_T+\arctan\left(\_T\right)}{a}\frac{1}{\sqrt{\_T^2+1}}]\right\}$$

Mathematica raw input

```
DSolve[-(a*x) - a*y[x]*y'[x] + Sqrt[1 + y'[x]^2] == 0,y[x],x]
```

Mathematica raw output

```
{Solve[ArcTan[x/y[x]] + ArcTan[1/Sqrt[-1 + a^2*(x^2 + y[x]^2)]] - (I/2)*Log[x^2
+ y[x]^2] - (I/2)*Log[1 - a^2*y[x]^2] + (I/4)*Log[x^2 + (-1 + a^2*x^2)*y[x]^2 +
a^2*y[x]^4 - 2*x*y[x]*Sqrt[-1 + a^2*x^2 + a^2*y[x]^2]] + (I/4)*Log[x^2 + (-1 + a
^2*x^2)*y[x]^2 + a^2*y[x]^4 + 2*x*y[x]*Sqrt[-1 + a^2*x^2 + a^2*y[x]^2]] + Sqrt[-
1 + a^2*(x^2 + y[x]^2)] == C[1], y[x]], Solve[4*ArcTan[1/Sqrt[-1 + a^2*(x^2 + y[
x]^2)]] + 4*C[1] - (2*I)*Log[x^2 + y[x]^2] - (2*I)*Log[-1 + a^2*y[x]^2] + I*Log[
x^2 - y[x]^2 + a^2*x^2*y[x]^2 + a^2*y[x]^4 - 2*x*y[x]*Sqrt[-1 + a^2*(x^2 + y[x]^
2)]] + I*Log[x^2 - y[x]^2 + a^2*x^2*y[x]^2 + a^2*y[x]^4 + 2*x*y[x]*Sqrt[-1 + a^2
*(x^2 + y[x]^2)]] + 4*Sqrt[-1 + a^2*x^2 + a^2*y[x]^2] == 4*ArcTan[x/y[x]], y[x]]
}
```

Maple raw input

```
dsolve((1+diff(y(x),x)^2)^(1/2)-a*y(x)*diff(y(x),x)-a*x = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T^2+1)^(1/2)*_T*(1/a*arctan(_T)+1/_T/a+_C1), y(_T) = -(_C1*a-_T+arc
tan(_T))/(_T^2+1)^(1/2)/a]
```

4.1131 $-xy'(x)^2+\sqrt{y'(x)^2+1}+y(x)=0$

ODE

$$-xy'(x)^2+\sqrt{y'(x)^2+1}+y(x)=0$$

ODE Classification

[_dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 5.75295 (sec), leaf count = 48

$$\text{Solve}\left[\left\{x=\frac{c_1+\sqrt{\text{K\$258298}^2+1}-\sinh^{-1}(\text{K\$258298})}{(\text{K\$258298}-1)^2},\sqrt{\text{K\$258298}^2+1}+y(x)=\text{K\$258298}^2 x\right\},\{y(x),\text{K\$258298}\}\right]$$

Maple ✓
cpu = 0.033 (sec), leaf count = 57

$$\left\{[x(\_T)=\frac{1}{(\_T-1)^2}\left(\sqrt{\_T^2+1}-Arcsinh(\_T)+\_C1\right),y(\_T)=\frac{1}{(\_T-1)^2}\left((2\_T-1)\sqrt{\_T^2+1}+\_T^2(-Arcs\right.\right.$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x]^2 + Sqrt[1 + y'[x]^2] == 0,y[x],x]
```

Mathematica raw output

```
Solve[{x == (Sqrt[1 + K$258298^2] - ArcSinh[K$258298] + C[1])/(-1 + K$258298)^2,
 Sqrt[1 + K$258298^2] + y[x] == K$258298^2*x}, {y[x], K$258298}]
```

Maple raw input

```
dsolve((1+diff(y(x),x)^2)^(1/2)-x*diff(y(x),x)^2+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T-1)^2*((_T^2+1)^(1/2)-arcsinh(_T)+_C1), y(_T) = ((2*_T-1)*(_T^2+1)
^(1/2)+_T^2*(-arcsinh(_T)+_C1))/(_T-1)^2]
```

4.1132 $\sqrt{a^2+b^2y'(x)^2}+xy'(x)-y(x)=0$

ODE

$$\sqrt{a^2+b^2y'(x)^2}+xy'(x)-y(x)=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✗
cpu = 600.125 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.032 (sec), leaf count = 21

$$\left\{y(x)=\sqrt{b^2\_C1^2+a^2}+\_C1\,x\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + Sqrt[a^2 + b^2*y'[x]^2] == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((a^2+b^2*diff(y(x),x)^2)^(1/2)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1^2*b^2+a^2)^(1/2)+_C1*x
```

4.1133 $\sqrt{ac-b^2}(xy'(x)-y(x))+\sqrt{a+2by'(x)+cy'(x)^2}=0$

ODE

$$\sqrt{ac-b^2}(xy'(x)-y(x))+\sqrt{a+2by'(x)+cy'(x)^2}=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _rational, _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✗
cpu = 600.203 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.209 (sec), leaf count = 178

$$\left\{y(x)+\frac{bx}{c}-a\frac{1}{\sqrt{ca-b^2}}\frac{1}{\sqrt{-\frac{ca}{ax^2c-b^2x^2-c}+\frac{b^2}{ax^2c-b^2x^2-c}}}+\frac{b^2}{c}\frac{1}{\sqrt{ca-b^2}}\frac{1}{\sqrt{-\frac{ca}{ax^2c-b^2x^2-c}+\frac{b^2}{ax^2c-b^2x^2-c}}}=0, y(x)=\_C1\ x\right.$$

Mathematica raw input

```
DSolve[Sqrt[-b^2 + a*c]*(-y[x] + x*y'[x]) + Sqrt[a + 2*b*y'[x] + c*y'[x]^2] == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((a+2*b*diff(y(x),x)+c*diff(y(x),x)^2)^(1/2)+(x*diff(y(x),x)-y(x))*(a*c-b^2)^(1/2) = 0, y(x),'i
```

Maple raw output

```
y(x)+1/c*b*x-1/(a*c-b^2)^(1/2)/(-1/(a*c*x^2-b^2*x^2-c)*c*a+1/(a*c*x^2-b^2*x^2-c)
*b^2)^(1/2)*a+1/(a*c-b^2)^(1/2)/(-1/(a*c*x^2-b^2*x^2-c)*c*a+1/(a*c*x^2-b^2*x^2-c
)*b^2)^(1/2)/c*b^2 = 0, y(x) = _C1*x+(_C1^2*c+2*_C1*b+a)^(1/2)/(a*c-b^2)^(1/2)
```

4.1134 $a\sqrt{y'(x)^2+1}+xy'(x)-y(x)=0$

ODE

$$a\sqrt{y'(x)^2+1}+xy'(x)-y(x)=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
No Missing Variables ODE, Solve for y'

Mathematica ✓
cpu = 0.005442 (sec), leaf count = 22

$$\left\{\left\{y(x)\to a\sqrt{c_1^2+1}+c_1x\right\}\right\}$$

Maple ✓
cpu = 0.028 (sec), leaf count = 17

$$\left\{y(x)=a\sqrt{\_C1^2+1}+\_C1\,x\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + a*Sqrt[1 + y'[x]^2] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + a*Sqrt[1 + C[1]^2]}}
```

Maple raw input

```
dsolve(a*(1+diff(y(x),x)^2)^(1/2)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = a*(_C1^2+1)^(1/2)+_C1*x
```

4.1135 $ax\sqrt{y'(x)^2+1}+xy'(x)-y(x)=0$

ODE

$$ax\sqrt{y'(x)^2+1}+xy'(x)-y(x)=0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.789498 (sec), leaf count = 369

$$\left\{\text{Solve}\left[\frac{a\left(2\log\left(x-a^2x\right)-\log\left(\frac{\left(a^2-1\right)\left(y(x)+ix\left(a\sqrt{a^2-\frac{y(x)^2}{x^2}-1}+a^2-1\right)\right)}{a^3(x+iy(x))}\right)\right)+\log\left(\frac{i\left(a^2-1\right)\left(x\left(a\sqrt{a^2-\frac{y(x)^2}{x^2}-1}+a^2-1\right)+iy(x)\right)}{a^3(x-iy(x))}\right)}{2\left(a^2-1\right)}\right.\right.$$

Maple ✓
cpu = 0.032 (sec), leaf count = 55

$$\left\{[x(\_T)=\_C1\frac{1}{\sqrt{\_T^2+1}}\left(\mathrm{e}^{\frac{Arcsinh(\_T)}{a}}\right)^{-1},y(\_T)=\_C1\left(a\sqrt{\_T^2+1}+\_T\right)\frac{1}{\sqrt{\_T^2+1}}\left(\mathrm{e}^{\frac{Arcsinh(\_T)}{a}}\right)^{-1}]\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + a*x*Sqrt[1 + y'[x]^2] == 0,y[x],x]
```

Mathematica raw output

```
{Solve[((-2*I)*ArcTan[y[x]/(x*Sqrt[-1 + a^2 - y[x]^2/x^2])] + a*(2*Log[x - a^2*x
] + Log[1 + y[x]^2/x^2] - Log[((-1 + a^2)*(y[x] + I*x*(-1 + a^2 + a*Sqrt[-1 + a^
2 - y[x]^2/x^2])))/(a^3*(x + I*y[x]))] + Log[(I*(-1 + a^2)*(I*y[x] + x*(-1 + a^2
 + a*Sqrt[-1 + a^2 - y[x]^2/x^2])))/(a^3*(x - I*y[x]))]))/(2*(-1 + a^2)) == C[1]
, y[x]], Solve[((2*I)*ArcTan[y[x]/(x*Sqrt[-1 + a^2 - y[x]^2/x^2])] + a*(2*Log[x
- a^2*x] + Log[1 + y[x]^2/x^2] - Log[((-1 + a^2)*(y[x] - I*x*(-1 + a^2 + a*Sqrt[
-1 + a^2 - y[x]^2/x^2])))/(a^3*(x - I*y[x]))] + Log[((-I)*(-1 + a^2)*((-I)*y[x]
+ x*(-1 + a^2 + a*Sqrt[-1 + a^2 - y[x]^2/x^2])))/(a^3*(x + I*y[x]))]))/(2*(-1 +
a^2)) == C[1], y[x]]}
```

Maple raw input

```
dsolve(a*x*(1+diff(y(x),x)^2)^(1/2)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T^2+1)^(1/2)/exp(1/a*arcsinh(_T))*_C1, y(_T) = (a*(_T^2+1)^(1/2)+_T
)/(_T^2+1)^(1/2)/exp(1/a*arcsinh(_T))*_C1]
```

4.1136 $-ay(x)y'(x) - ax + y(x)\sqrt{y'(x)^2+1} = 0$

ODE

$$-ay(x)y'(x) - ax + y(x)\sqrt{y'(x)^2+1} = 0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.306254 (sec), leaf count = 148

$$\left\{\left\{y(x)\to -\frac{\sqrt{e^{-2c_1}\left(\left(a^2-1\right)^3\left(-e^{2c_1}\right)x^2+2\left(a^2-1\right)xe^{\left(a^2+1\right)c_1}+e^{2a^2c_1}\right)}}{\sqrt{\left(a^2-1\right)^3}}\right\},\left\{y(x)\to \frac{\sqrt{e^{-2c_1}\left(\left(a^2-1\right)^3\left(-e^{2c_1}\right)x^2+2\right.}}{\sqrt{(a^2-}\right.\right.$$

Maple ✓
cpu = 0.262 (sec), leaf count = 129

$$\left\{[x(\_T)=e^{\int a\left(-\_T\frac{1}{\sqrt{\_T^2+1}}+a\right)\left(a\_T-\sqrt{\_T^2+1}\right)^{-1}\left(a\_T^2-\_T\sqrt{\_T^2+1}+a\right)^{-1}d\_T}\_C1, y(\_T)=\_C1\,ae^{\int a\left(-\_T\frac{1}{\sqrt{\_T^2+1}}+a\right)}\right.$$

Mathematica raw input

```
DSolve[-(a*x) - a*y[x]*y'[x] + y[x]*Sqrt[1 + y'[x]^2] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[(E^(2*a^2*C[1]) + 2*(-1 + a^2)*E^((1 + a^2)*C[1])*x - (-1 + a^2
)^3*E^(2*C[1])*x^2)/E^(2*C[1])]/Sqrt[(-1 + a^2)^3])}, {y[x] -> Sqrt[(E^(2*a^2*C[
1]) + 2*(-1 + a^2)*E^((1 + a^2)*C[1])*x - (-1 + a^2)^3*E^(2*C[1])*x^2)/E^(2*C[1]
)]/Sqrt[(-1 + a^2)^3]}}
```

Maple raw input

```
dsolve(y(x)*(1+diff(y(x),x)^2)^(1/2)-a*y(x)*diff(y(x),x)-a*x = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = exp(Int(a*(-1/(_T^2+1)^(1/2)*_T+a)/(a*_T-(_T^2+1)^(1/2))/(a*_T^2-_T*(_T
^2+1)^(1/2)+a),_T))*_C1, y(_T) = a*exp(Int(a*(-1/(_T^2+1)^(1/2)*_T+a)/(a*_T-(_T^
2+1)^(1/2))/(a*_T^2-_T*(_T^2+1)^(1/2)+a),_T))*_C1/(-a*_T+(_T^2+1)^(1/2))]
```

4.1137 $y(x)\sqrt{y'(x)^2+1} = f(y(x)y'(x)+x)$

ODE

$$y(x)\sqrt{y'(x)^2+1} = f(y(x)y'(x)+x)$$

ODE Classification

[`x=_G(y,y')`]

Book solution method
The method of Lagrange

Mathematica ✓
cpu = 0.334977 (sec), leaf count = 46

$$\text{Solve}\left[\left\{\text{K\$259675}\,y(\text{K\$259675})+x = f^{(-1)}\left(\sqrt{\text{K\$259675}^2+1}\,y(\text{K\$259675})\right), y(x) = \frac{e^{c_1}}{\sqrt{\text{K\$259675}^2+1}}\right\}, \{y(x), \text{K\$25967}$$

Maple ✓
cpu = 0.435 (sec), leaf count = 45

$$\left\{[x(\_T) = 1\left(RootOf(-f(\_Z)+\_C1)\sqrt{\_T^2+1}-\_C1\,\_T\right)\frac{1}{\sqrt{\_T^2+1}}, y(\_T) = \_C1\frac{1}{\sqrt{\_T^2+1}}]\right\}$$

Mathematica raw input

```
DSolve[y[x]*Sqrt[1 + y'[x]^2] == f[x + y[x]*y'[x]],y[x],x]
```

Mathematica raw output

```
Solve[{x + K$259675*y[K$259675] == InverseFunction[f, 1, 1][Sqrt[1 + K$259675^2]
*y[K$259675]], y[x] == E^C[1]/Sqrt[1 + K$259675^2]}, {y[x], K$259675}]
```

Maple raw input

```
dsolve(y(x)*(1+diff(y(x),x)^2)^(1/2) = f(y(x)*diff(y(x),x)+x), y(x),'implicit')
```

Maple raw output

```
[x(_T) = (RootOf(-f(_Z)+_C1)*(_T^2+1)^(1/2)-_C1*_T)/(_T^2+1)^(1/2), y(_T) = _C1/
(_T^2+1)^(1/2)]
```

4.1138 $\sqrt{(ax^2+y(x)^2)\left(y'(x)^2+1\right)}-ax-y(x)y'(x)=0$

ODE

$$\sqrt{(ax^2+y(x)^2)\left(y'(x)^2+1\right)}-ax-y(x)y'(x)=0$$

ODE Classification

[[_homogeneous, `class A`], _rational, _dAlembert]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x},y'\right)=0$, Solve for p

Mathematica ✓
cpu = 0.185505 (sec), leaf count = 113

$$\left\{\left\{y(x)\to \frac{1}{2}e^{-c_1}x^{1-\sqrt{\frac{a-1}{a}}}\left(e^{2c_1}-ax^{2\sqrt{\frac{a-1}{a}}}\right)\right\},\left\{y(x)\to \frac{1}{2}e^{c_1}x^{\sqrt{\frac{a-1}{a}}+1}-\frac{1}{2}ae^{-c_1}x^{1-\sqrt{\frac{a-1}{a}}}\right\}\right\}$$

Maple ✓
cpu = 0.384 (sec), leaf count = 176

$$\left\{\frac{1}{x}\left(\left(\left(a^2-a\right)y(x)+\sqrt{a\left(a-1\right)\left(ax^2+\left(y\left(x\right)\right)^2\right)}\sqrt{a^2-a}\right)x^{\frac{1}{a}\sqrt{a(a-1)}}-\_C1\sqrt{a^2-a}x\right)\frac{1}{\sqrt{a^2-a}}=0,\frac{1}{x}\left(-\_C1\sqrt{a^2\right.}\right.$$

Mathematica raw input

```
DSolve[-(a*x) - y[x]*y'[x] + Sqrt[(a*x^2 + y[x]^2)*(1 + y'[x]^2)] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(1 - Sqrt[(-1 + a)/a])*(E^(2*C[1]) - a*x^(2*Sqrt[(-1 + a)/a])))/(2*
E^C[1])}, {y[x] -> -(a*x^(1 - Sqrt[(-1 + a)/a]))/(2*E^C[1]) + (E^C[1]*x^(1 + Sqr
t[(-1 + a)/a]))/2}}
```

Maple raw input

```
dsolve(((a*x^2+y(x)^2)*(1+diff(y(x),x)^2))^(1/2)-y(x)*diff(y(x),x)-a*x = 0, y(x),'implicit')
```

Maple raw output

```
(((a^2-a)*y(x)+(a*(a-1)*(a*x^2+y(x)^2))^(1/2)*(a^2-a)^(1/2))*x^((a*(a-1))^(1/2)/
a)-_C1*(a^2-a)^(1/2)*x)/(a^2-a)^(1/2)/x = 0, 1/(a^2-a)^(1/2)*(-_C1*(a^2-a)^(1/2)
*x^((a*(a-1))^(1/2)/a)*x+(a^2-a)*y(x)+(a*(a-1)*(a*x^2+y(x)^2))^(1/2)*(a^2-a)^(1/
2))/(x^((a*(a-1))^(1/2)/a))/x = 0
```

4.1139 $a\sqrt[3]{y'(x)^3+1}+xy'(x)-y(x)=0$

ODE

$$a\sqrt[3]{y'(x)^3+1}+xy'(x)-y(x)=0$$

ODE Classification

[_Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.00438413 (sec), leaf count = 22

$$\left\{\left\{y(x)\to a\sqrt[3]{c_1^3+1}+c_1x\right\}\right\}$$

Maple ✓
cpu = 0.028 (sec), leaf count = 17

$$\left\{y(x)=a\sqrt[3]{\_C1^3+1}+\_C1\,x\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + a*(1 + y'[x]^3)^(1/3) == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + a*(1 + C[1]^3)^(1/3)}}
```

Maple raw input

```
dsolve(a*(1+diff(y(x),x)^3)^(1/3)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = a*(_C1^3+1)^(1/3)+_C1*x
```

4.1140 $y'(x)\left(a+x\sqrt{y'(x)^2+1}\right)=y(x)\sqrt{y'(x)^2+1}$

ODE

$$y'(x)\left(a+x\sqrt{y'(x)^2+1}\right)=y(x)\sqrt{y'(x)^2+1}$$

ODE Classification

[_Clairaut]

Book solution method
Clairaut's equation and related types, $f(y-xy',y')=0$

Mathematica ✗
cpu = 600.575 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.029 (sec), leaf count = 18

$$\left\{y(x)=\_C1\,x+\_C1\,a\frac{1}{\sqrt{\_C1^2+1}}\right\}$$

Mathematica raw input

```
DSolve[y'[x]*(a + x*Sqrt[1 + y'[x]^2]) == y[x]*Sqrt[1 + y'[x]^2],y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(y(x),x)*(a+x*(1+diff(y(x),x)^2)^(1/2)) = y(x)*(1+diff(y(x),x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x+_C1*a/(_C1^2+1)^(1/2)
```

4.1141 $xy'(x) + \cos(y'(x)) = y(x)$

ODE

$$xy'(x) + \cos(y'(x)) = y(x)$$

ODE Classification

[_Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.00992181 (sec), leaf count = 13

$$\{\{y(x) \to c_1 x + \cos(c_1)\}\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 31

$$\left\{y(x) - \arcsin(x)\, x - \sqrt{-x^2+1} = 0, y(x) = \cos(\_C1) + \_C1\, x\right\}$$

Mathematica raw input

```
DSolve[Cos[y'[x]] + x*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + Cos[C[1]]}}
```

Maple raw input

```
dsolve(cos(diff(y(x),x))+x*diff(y(x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
y(x)-arcsin(x)*x-(-x^2+1)^(1/2) = 0, y(x) = cos(_C1)+_C1*x
```

4.1142 $a\cos(y'(x)) + by'(x) + x = 0$

ODE

$$a\cos(y'(x)) + by'(x) + x = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for x

Mathematica ✗
cpu = 0.00944599 (sec), leaf count = 0 , could not solve

```
DSolve[x + a*Cos[Derivative[1][y][x]] + b*Derivative[1][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.028 (sec), leaf count = 18

$$\left\{y(x) = \int RootOf(a\cos(\_Z) + b\_Z + x)\,dx + \_C1\right\}$$

Mathematica raw input

```
DSolve[x + a*Cos[y'[x]] + b*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[x + a*Cos[Derivative[1][y][x]] + b*Derivative[1][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(a*cos(diff(y(x),x))+b*diff(y(x),x)+x = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(RootOf(a*cos(_Z)+b*_Z+x),x)+_C1
```

4.1143 $y'(x) + \sin(y'(x)) = x$

ODE

$$y'(x) + \sin(y'(x)) = x$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for x

Mathematica ✗
cpu = 0.00797693 (sec), leaf count = 0 , could not solve

```
DSolve[Sin[Derivative[1][y][x]] + Derivative[1][y][x] == x, y[x], x]
```

Maple ✓
cpu = 0.03 (sec), leaf count = 16

$$\left\{y(x) = \int RootOf(\_Z + \sin(\_Z) - x)\, dx + \_C1\right\}$$

Mathematica raw input

```
DSolve[Sin[y'[x]] + y'[x] == x,y[x],x]
```

Mathematica raw output

```
DSolve[Sin[Derivative[1][y][x]] + Derivative[1][y][x] == x, y[x], x]
```

Maple raw input

```
dsolve(sin(diff(y(x),x))+diff(y(x),x) = x, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(RootOf(_Z+sin(_Z)-x),x)+_C1
```

4.1144 $y'(x)\sin(y'(x))+\cos(y'(x))=y(x)$

ODE

$$y'(x)\sin(y'(x))+\cos(y'(x))=y(x)$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✓
cpu = 0.0299593 (sec), leaf count = 23

$$\text{Solve}[\{x=c_1+\sin(\text{K\$262546}),\text{K\$262546}\sin(\text{K\$262546})+\cos(\text{K\$262546})=y(x)\},\{y(x),\text{K\$262546}\}]$$

Maple ✓
cpu = 0.063 (sec), leaf count = 32

$$\left\{x-\int^{y(x)}(RootOf(\sin(\_Z)\_Z+\cos(\_Z)-\_a))^{-1}d\_a-\_C1=0,y(x)=1\right\}$$

Mathematica raw input

```
DSolve[Cos[y'[x]] + Sin[y'[x]]*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
Solve[{x == C[1] + Sin[K$262546], Cos[K$262546] + K$262546*Sin[K$262546] == y[x]
}, {y[x], K$262546}]
```

Maple raw input

```
dsolve(diff(y(x),x)*sin(diff(y(x),x))+cos(diff(y(x),x)) = y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1, x-Intat(1/RootOf(sin(_Z)*_Z+cos(_Z)-_a),_a = y(x))-_C1 = 0
```

4.1145 $y'(x)^2 \sin(y'(x)) = y(x)$

ODE

$$y'(x)^2 \sin(y'(x)) = y(x)$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✓
cpu = 0.0484101 (sec), leaf count = 27

$$\text{Solve}\left[\left\{\cos(\text{K\$262683}) + x = c_1 + \text{K\$262683}\sin(\text{K\$262683}), \text{K\$262683}^2 \sin(\text{K\$262683}) = y(x)\right\}, \{y(x), \text{K\$262683}\}\right]$$

Maple ✓
cpu = 0.066 (sec), leaf count = 32

$$\left\{x - \int^{y(x)} \left(RootOf\left(\sin(\_Z)\_Z^2 - \_a\right)\right)^{-1} d\_a - \_C1 = 0, y(x) = 0\right\}$$

Mathematica raw input

```
DSolve[Sin[y'[x]]*y'[x]^2 == y[x],y[x],x]
```

Mathematica raw output

```
Solve[{x + Cos[K$262683] == C[1] + K$262683*Sin[K$262683], K$262683^2*Sin[K$2626
83] == y[x]}, {y[x], K$262683}]
```

Maple raw input

```
dsolve(diff(y(x),x)^2*sin(diff(y(x),x)) = y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 0, x-Intat(1/RootOf(sin(_Z)*_Z^2-_a),_a = y(x))-_C1 = 0
```

4.1146 $y'(x)^2 (\sin (y'(x)) + x) = y(x)$

ODE

$$y'(x)^2 (\sin (y'(x)) + x) = y(x)$$

ODE Classification

[_dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.109613 (sec), leaf count = 40

$$\text{Solve}\left[\left\{x = \frac{c_1 - (\text{K\$262842} - 1)\text{K\$262842}\sin(\text{K\$262842}) - \cos(\text{K\$262842})}{(\text{K\$262842} - 1)^2}, \text{K\$262842}^2(\sin(\text{K\$262842}) + x) = y(x)\right\}, \{y($$

Maple ✓
cpu = 0.042 (sec), leaf count = 56

$$\left\{y(x) = 0, [x(\_T) = \frac{(-\_T^2 + \_T)\sin(\_T) + \_C1 - \cos(\_T)}{(\_T - 1)^2}, y(\_T) = -\frac{\_T^2((\_T - 1)\sin(\_T) - \_C1 + \cos(\_T$$

Mathematica raw input

```
DSolve[(x + Sin[y'[x]])*y'[x]^2 == y[x],y[x],x]
```

Mathematica raw output

```
Solve[{x == (C[1] - Cos[K$262842] - (-1 + K$262842)*K$262842*Sin[K$262842])/(-1
+ K$262842)^2, K$262842^2*(x + Sin[K$262842]) == y[x]}, {y[x], K$262842}]
```

Maple raw input

```
dsolve(diff(y(x),x)^2*(x+sin(diff(y(x),x))) = y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 0, [x(_T) = ((-_T^2+_T)*sin(_T)+_C1-cos(_T))/(_T-1)^2, y(_T) = -_T^2*((_T
-1)*sin(_T)-_C1+cos(_T))/(_T-1)^2]
```

4.1147 $(y'(x)^2+1)\sin^2(y(x)-xy'(x))=1$

ODE

$$(y'(x)^2+1)\sin^2(y(x)-xy'(x))=1$$

ODE Classification

[_Clairaut]

Book solution method
Clairaut's equation and related types, $f(y-xy',y')=0$

Mathematica ✓
cpu = 0.0377712 (sec), leaf count = 59

$$\left\{\left\{y(x)\to c_1x-\frac{1}{2}\cos^{-1}\left(\frac{c_1^2-1}{c_1^2+1}\right)\right\},\left\{y(x)\to c_1x+\frac{1}{2}\cos^{-1}\left(\frac{c_1^2-1}{c_1^2+1}\right)\right\}\right\}$$

Maple ✓
cpu = 0.862 (sec), leaf count = 151

$$\left\{y(x)-\sqrt{1-x}\sqrt{x^{-1}}x-\arcsin\left(\sqrt{x^{-1}}x\right)=0,y(x)+\sqrt{1-x}\sqrt{x^{-1}}x+\arcsin\left(\sqrt{x^{-1}}x\right)=0,y(x)-\sqrt{1+x}\sqrt{-x^{-1}}x-\text{ar}\right.$$

Mathematica raw input

```
DSolve[Sin[y[x] - x*y'[x]]^2*(1 + y'[x]^2) == 1,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ArcCos[(-1 + C[1]^2)/(1 + C[1]^2)]/2 + x*C[1]}, {y[x] -> ArcCos[(-1 +
  C[1]^2)/(1 + C[1]^2)]/2 + x*C[1]}}
```

Maple raw input

```
dsolve((1+diff(y(x),x)^2)*sin(x*diff(y(x),x)-y(x))^2 = 1, y(x),'implicit')
```

Maple raw output

```
y(x)-(1-x)^(1/2)*(1/x)^(1/2)*x-arcsin((1/x)^(1/2)*x) = 0, y(x)+(1-x)^(1/2)*(1/x)
^(1/2)*x+arcsin((1/x)^(1/2)*x) = 0, y(x)-(1+x)^(1/2)*(-1/x)^(1/2)*x-arcsin((-1/x
)^(1/2)*x) = 0, y(x)+(1+x)^(1/2)*(-1/x)^(1/2)*x+arcsin((-1/x)^(1/2)*x) = 0, y(x)
 = _C1*x-arcsin(1/(_C1^2+1)^(1/2)), y(x) = _C1*x+arcsin(1/(_C1^2+1)^(1/2))
```

4.1148 $-\sqrt{1-y'(x)^2}+y'(x)\left(\cos^{-1}\left(y'(x)\right)-x\right)+y(x)=0$

ODE

$$-\sqrt{1-y'(x)^2}+y'(x)\left(\cos^{-1}\left(y'(x)\right)-x\right)+y(x)=0$$

ODE Classification

[_Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.0189176 (sec), leaf count = 29

$$\left\{\left\{y(x)\to c_1 x+\sqrt{1-c_1^2}-c_1\cos^{-1}\left(c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.084 (sec), leaf count = 39

$$\left\{y(x)-\frac{1}{2}\sqrt{2-2\cos\left(2x\right)}=0,y(x)=\_C1\,x-\_C1\,\arccos\left(\_C1\right)+\sqrt{-\_C1^{\,2}+1}\right\}$$

Mathematica raw input

```
DSolve[y[x] + (-x + ArcCos[y'[x]])*y'[x] - Sqrt[1 - y'[x]^2] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] - ArcCos[C[1]]*C[1] + Sqrt[1 - C[1]^2]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*(arccos(diff(y(x),x))-x)-(1-diff(y(x),x)^2)^(1/2)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)-1/2*(2-2*cos(2*x))^(1/2) = 0, y(x) = _C1*x-_C1*arccos(_C1)+(-_C1^2+1)^(1/2)
```

4.1149 $(y'(x)^2+1)\left(ax+\tan^{-1}(y'(x))\right)+y'(x)=0$

ODE

$$(y'(x)^2+1)\left(ax+\tan^{-1}(y'(x))\right)+y'(x)=0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for x

Mathematica ✗
cpu = 0.105349 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x] + (a*x + ArcTan[Derivative[1][y][x]])*(1 + Derivative[1][y][x]^2) == 0, y
```

Maple ✓
cpu = 0.074 (sec), leaf count = 30

$$\left\{y(x)=\int \tan\left(RootOf\left(ax(\tan(\_Z))^2+(\tan(\_Z))^2\_Z+ax+\tan(\_Z)+\_Z\right)\right)\,dx+\_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x] + (a*x + ArcTan[y'[x]])*(1 + y'[x]^2) == 0,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x] + (a*x + ArcTan[Derivative[1][y][x]])*(1 + Derivative
[1][y][x]^2) == 0, y[x], x]
```

Maple raw input

```
dsolve((1+diff(y(x),x)^2)*(arctan(diff(y(x),x))+a*x)+diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(tan(RootOf(a*x*tan(_Z)^2+tan(_Z)^2*_Z+a*x+tan(_Z)+_Z)),x)+_C1
```

4.1150 $-y'(x)^2 + e^{y'(x)-y(x)} + 1 = 0$

ODE

$$-y'(x)^2 + e^{y'(x)-y(x)} + 1 = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing, Solve for y

Mathematica ✓
cpu = 0.112294 (sec), leaf count = 35

$$\text{Solve}\left[\left\{\log(1-\text{K\$263323}) + x = c_1 + \log(\text{K\$263323}) + \log(\text{K\$263323}+1), \text{K\$263323} = \log\left(\text{K\$263323}^2 - 1\right) + y(x)\right\}, \{y\right.$$

Maple ✓
cpu = 0.03 (sec), leaf count = 31

$$\left\{x - \int^{y(x)} \left(RootOf\left(-\mathrm{e}^{-\_a+\_Z} + \_Z^2 - 1\right)\right)^{-1} d\_a - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[1 + E^(-y[x] + y'[x]) - y'[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
Solve[{x + Log[1 - K$263323] == C[1] + Log[K$263323] + Log[1 + K$263323], K$2633
23 == Log[-1 + K$263323^2] + y[x]}, {y[x], K$263323}]
```

Maple raw input

```
dsolve(exp(diff(y(x),x)-y(x))-diff(y(x),x)^2+1 = 0, y(x),'implicit')
```

Maple raw output

```
x-Intat(1/RootOf(-exp(-_a+_Z)+_Z^2-1),_a = y(x))-_C1 = 0
```

4.1151 $y'(x) + \log(y'(x)) = x$

ODE

$$y'(x) + \log(y'(x)) = x$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for x

Mathematica ✓
cpu = 0.0149661 (sec), leaf count = 22

$$\left\{\left\{y(x) \to c_1 + \frac{1}{2}W(e^x)^2 + W(e^x)\right\}\right\}$$

Maple ✓
cpu = 0.06 (sec), leaf count = 16

$$\left\{y(x) = \frac{(lambertW(\mathrm{e}^x))^2}{2} + lambertW(\mathrm{e}^x) + \_C1\right\}$$

Mathematica raw input

```
DSolve[Log[y'[x]] + y'[x] == x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + ProductLog[E^x] + ProductLog[E^x]^2/2}}
```

Maple raw input

```
dsolve(ln(diff(y(x),x))+diff(y(x),x) = x, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*LambertW(exp(x))^2+LambertW(exp(x))+_C1
```

4.1152 $a + xy'(x) + \log(y'(x)) = 0$

ODE

$$a + xy'(x) + \log(y'(x)) = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing, Solve for x

Mathematica ✓
cpu = 0.00995125 (sec), leaf count = 30

$$\left\{\left\{y(x) \to \frac{1}{2}W\left(e^{-a}x\right)^2 + W\left(e^{-a}x\right) + c_1\right\}\right\}$$

Maple ✓
cpu = 0.056 (sec), leaf count = 24

$$\left\{y(x) = \frac{1}{2}\left(lambertW\left(\frac{x}{\mathrm{e}^a}\right)\right)^2 + lambertW\left(\frac{x}{\mathrm{e}^a}\right) + \_C1\right\}$$

Mathematica raw input

```
DSolve[a + Log[y'[x]] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + ProductLog[x/E^a] + ProductLog[x/E^a]^2/2}}
```

Maple raw input

```
dsolve(ln(diff(y(x),x))+x*diff(y(x),x)+a = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*LambertW(x/exp(a))^2+LambertW(x/exp(a))+_C1
```

4.1153 $a + xy'(x) + \log(y'(x)) = y(x)$

ODE

$$a + xy'(x) + \log(y'(x)) = y(x)$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.0412561 (sec), leaf count = 22

$$\{\{y(x) \to xe^{-a-c_1} - c_1\}\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 28

$$\{y(x) - \ln(-x^{-1}) - a + 1 = 0, y(x) = \ln(\_C1) + \_C1\, x + a\}$$

Mathematica raw input

```
DSolve[a + Log[y'[x]] + x*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(-a - C[1])*x - C[1]}}
```

Maple raw input

```
dsolve(ln(diff(y(x),x))+x*diff(y(x),x)+a = y(x), y(x),'implicit')
```

Maple raw output

```
y(x)-ln(-1/x)-a+1 = 0, y(x) = ln(_C1)+_C1*x+a
```

4.1154 $a + by(x) + xy'(x) + \log(y'(x)) = 0$

ODE

$$a + by(x) + xy'(x) + \log(y'(x)) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 0.149511 (sec), leaf count = 57

$$\text{Solve}\left[\frac{bW\left(xe^{-a-by(x)}\right) + (b+1)\log\left(1 - bW\left(xe^{-a-by(x)}\right)\right) + b^2 y(x)}{b} = c_1, y(x)\right]$$

Maple ✓
cpu = 0.012 (sec), leaf count = 88

$$\left\{[x(\_T) = \frac{\_C1\, b\_T + \_T^{(b+1)^{-1}}}{\_T^{(b+1)^{-1}} b\_T}, y(\_T) = \frac{-\_T^{(b+1)^{-1}} - b\_T^{(b+1)^{-1}} \ln(\_T) + \left(-a\_T^{(b+1)^{-1}} - \_C1\, \_T\right) b}{b^2 \_T^{(b+1)^{-1}}}]\right\}$$

Mathematica raw input

```
DSolve[a + Log[y'[x]] + b*y[x] + x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[((1 + b)*Log[1 - b*ProductLog[E^(-a - b*y[x])*x]] + b*ProductLog[E^(-a - b
*y[x])*x] + b^2*y[x])/b == C[1], y[x]]
```

Maple raw input

```
dsolve(ln(diff(y(x),x))+x*diff(y(x),x)+a+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = (_C1*b*_T+_T^(1/(b+1)))/(_T^(1/(b+1)))/b/_T, y(_T) = (-_T^(1/(b+1))-b*_
T^(1/(b+1))*ln(_T)+(-a*_T^(1/(b+1))-_C1*_T)*b)/b^2/(_T^(1/(b+1)))]
```

4.1155 $4xy'(x) + \log(y'(x)) - 2y(x) = 0$

ODE

$$4xy'(x) + \log(y'(x)) - 2y(x) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 0.114256 (sec), leaf count = 34

$$\text{Solve}\left[c_1 + \log\left(W\left(4xe^{2y(x)}\right) + 2\right) + 2y(x) = W\left(4xe^{2y(x)}\right), y(x)\right]$$

Maple ✓
cpu = 0.008 (sec), leaf count = 33

$$\left\{[x(\_T) = \frac{1}{\_T^2}\left(-\frac{\_T}{2} + \_C1\right), y(\_T) = \frac{\ln(\_T)}{2} + \frac{-\_T + 2\_C1}{\_T}]\right\}$$

Mathematica raw input

```
DSolve[Log[y'[x]] - 2*y[x] + 4*x*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] + Log[2 + ProductLog[4*E^(2*y[x])*x]] + 2*y[x] == ProductLog[4*E^(2*y
[x])*x], y[x]]
```

Maple raw input

```
dsolve(ln(diff(y(x),x))+4*x*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/_T^2*(-1/2*_T+_C1), y(_T) = 1/2*ln(_T)+(-_T+2*_C1)/_T]
```

4.1156 $a(xy'(x) - y(x)) + \log(y'(x)) = 0$

ODE

$$a(xy'(x) - y(x)) + \log(y'(x)) = 0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, $f(y - xy', y') = 0$

Mathematica ✓
cpu = 0.0403451 (sec), leaf count = 21

$$\left\{\left\{y(x) \to e^{-c_1}x - \frac{c_1}{a}\right\}\right\}$$

Maple ✓
cpu = 0.034 (sec), leaf count = 36

$$\left\{y(x) - \frac{1}{a}\ln\left(-\frac{1}{ax}\right) + a^{-1} = 0, y(x) = \_C1\, x + \frac{\ln(\_C1)}{a}\right\}$$

Mathematica raw input

```
DSolve[Log[y'[x]] + a*(-y[x] + x*y'[x]) == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x/E^C[1] - C[1]/a}}
```

Maple raw input

```
dsolve(ln(diff(y(x),x))+a*(x*diff(y(x),x)-y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)-1/a*ln(-1/a/x)+1/a = 0, y(x) = _C1*x+ln(_C1)/a
```

4.1157 $a(\log(y'(x)) - y'(x)) + y(x) - x = 0$

ODE

$$a(\log(y'(x)) - y'(x)) + y(x) - x = 0$$

ODE Classification

[[_homogeneous, `class C`], _dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 0.0544786 (sec), leaf count = 22

$$\left\{\left\{y(x) \to a e^{\frac{x-c_1}{a}} + c_1\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 25

$$\{y(x) = a + x, [x(\_T) = a\ln(\_T) + \_C1, y(\_T) = a\_T + \_C1]\}$$

Mathematica raw input

```
DSolve[-x + y[x] + a*(Log[y'[x]] - y'[x]) == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> a*E^((x - C[1])/a) + C[1]}}
```

Maple raw input

```
dsolve(a*(ln(diff(y(x),x))-diff(y(x),x))-x+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = a+x, [x(_T) = a*ln(_T)+_C1, y(_T) = _T*a+_C1]
```

4.1158 $y'(x) + y(x) \log(y'(x)) - xy(x) - y(x) \log(y(x)) = 0$

ODE

$$y'(x) + y(x) \log(y'(x)) - xy(x) - y(x) \log(y(x)) = 0$$

ODE Classification

[_separable]

Book solution method
No Missing Variables ODE, Solve for x

Mathematica ✓
cpu = 0.0092828 (sec), leaf count = 24

$$\left\{\left\{y(x) \to c_1 e^{\frac{1}{2}W(e^x)(W(e^x)+2)}\right\}\right\}$$

Maple ✓
cpu = 0.153 (sec), leaf count = 17

$$\left\{y(x) = \_C1 \, \mathrm{e}^{\frac{lambertW(\mathrm{e}^x)(lambertW(\mathrm{e}^x)+2)}{2}}\right\}$$

Mathematica raw input

```
DSolve[-(x*y[x]) - Log[y[x]]*y[x] + Log[y'[x]]*y[x] + y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^((ProductLog[E^x]*(2 + ProductLog[E^x]))/2)*C[1]}}
```

Maple raw input

```
dsolve(y(x)*ln(diff(y(x),x))+diff(y(x),x)-y(x)*ln(y(x))-x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(1/2*LambertW(exp(x))*(LambertW(exp(x))+2))
```

4.1159 $-(x+1)y'(x)+y'(x)\log(y'(x))+y(x)=0$

ODE

$$-(x+1)y'(x)+y'(x)\log(y'(x))+y(x)=0$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.00210199 (sec), leaf count = 16

$$\{\{y(x)\to c_1(-\log(c_1)+x+1)\}\}$$

Maple ✓
cpu = 0.038 (sec), leaf count = 22

$$\{y(x)-e^x=0, y(x)=\_C1\,(-\ln(\_C1)+x+1)\}$$

Mathematica raw input

```
DSolve[y[x] - (1 + x)*y'[x] + Log[y'[x]]*y'[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*(1 + x - Log[C[1]])}}
```

Maple raw input

```
dsolve(diff(y(x),x)*ln(diff(y(x),x))-(1+x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x)-exp(x) = 0, y(x) = _C1*(-ln(_C1)+x+1)
```

4.1160 $\log(xy'(x) - y(x)) = y'(x)$

ODE

$$\log(xy'(x) - y(x)) = y'(x)$$

ODE Classification

[[_1st_order, _with_linear_symmetries], _Clairaut]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.113049 (sec), leaf count = 20

$$\{\{y(x) \to e^{c_1} + (c_1 - i\pi)\, x\}\}$$

Maple ✓
cpu = 0.076 (sec), leaf count = 23

$$\{y(x) - x\ln(x) + x = 0, y(x) = -\mathrm{e}^{-C1} + \_C1\, x\}$$

Mathematica raw input

```
DSolve[Log[-y[x] + x*y'[x]] == y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^C[1] + x*((-I)*Pi + C[1])}}
```

Maple raw input

```
dsolve(ln(x*diff(y(x),x)-y(x)) = diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
y(x)-x*ln(x)+x = 0, y(x) = -exp(_C1)+_C1*x
```

4.1161 $y'(x)\log\left(\sqrt{a+y'(x)^2}+y'(x)\right)-xy'(x)-\sqrt{y'(x)^2+1}+y(x)=0$

ODE

$$y'(x)\log\left(\sqrt{a+y'(x)^2}+y'(x)\right)-xy'(x)-\sqrt{y'(x)^2+1}+y(x)=0$$

ODE Classification

[_Clairaut]

Book solution method
Clairaut's equation and related types, $f(y-xy',y')=0$

Mathematica ✓
cpu = 0.0740249 (sec), leaf count = 38

$$\left\{\left\{y(x)\to -c_1\log\left(\sqrt{a+c_1^2}+c_1\right)+c_1x+\sqrt{c_1^2+1}\right\}\right\}$$

Maple ✓
cpu = 2.413 (sec), leaf count = 129

$$\left\{y(x)=-\_C1\ \ln\left(\_C1+\sqrt{\_C1^2+a}\right)+\sqrt{\_C1^2+1}+\_C1\ x,[x(\_T)=1\left(\ln\left(\_T+\sqrt{\_T^2+a}\right)\sqrt{\_T^2+a}\sqrt{\_T\right.\right.\right.$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + Log[y'[x] + Sqrt[a + y'[x]^2]]*y'[x] - Sqrt[1 + y'[x]^2] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + Sqrt[1 + C[1]^2] - C[1]*Log[C[1] + Sqrt[a + C[1]^2]]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*ln(diff(y(x),x)+(a+diff(y(x),x)^2)^(1/2))-(1+diff(y(x),x)^2)^(1/2)-
x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = 1/(_T^2+a)^(1/2)/(_T^2+1)^(1/2)*(ln(_T+(_T^2+a)^(1/2))*(_T^2+a)^(1/2)*(
_T^2+1)^(1/2)+_T*((_T^2+1)^(1/2)-(_T^2+a)^(1/2))), y(_T) = ((_T^2+1)^(1/2)*_T^2+
(_T^2+a)^(1/2))/(_T^2+a)^(1/2)/(_T^2+1)^(1/2)], y(x) = -_C1*ln(_C1+(_C1^2+a)^(1/
2))+(_C1^2+1)^(1/2)+_C1*x
```

4.1162 $y'(x)\tan(y'(x))+\log(\cos(y'(x)))=y(x)$

ODE

$$y'(x)\tan(y'(x))+\log(\cos(y'(x)))=y(x)$$

ODE Classification

[_dAlembert]

Book solution method
No Missing Variables ODE, Solve for y

Mathematica ✓
cpu = 0.0666211 (sec), leaf count = 24

$$\text{Solve}[\{x=c_1+\tan(\text{K\$267289}),\text{K\$267289}\tan(\text{K\$267289})+\log(\cos(\text{K\$267289}))=y(x)\},\{y(x),\text{K\$267289}\}]$$

Maple ✓
cpu = 0.082 (sec), leaf count = 33

$$\left\{x-\int^{y(x)}(RootOf(\ln(\cos(\_Z))+\_Z\tan(\_Z)-\_a))^{-1}d\_a-\_C1=0,y(x)=0\right\}$$

Mathematica raw input

```
DSolve[Log[Cos[y'[x]]] + Tan[y'[x]]*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
Solve[{x == C[1] + Tan[K$267289], Log[Cos[K$267289]] + K$267289*Tan[K$267289] ==
 y[x]}, {y[x], K$267289}]
```

Maple raw input

```
dsolve(ln(cos(diff(y(x),x)))+diff(y(x),x)*tan(diff(y(x),x)) = y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 0, x-Intat(1/RootOf(ln(cos(_Z))+_Z*tan(_Z)-_a),_a = y(x))-_C1 = 0
```

4.1163 $f(y'(x)) = 0$

ODE

$$f(y'(x)) = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Both independent and dependent variable missing

Mathematica ✓
cpu = 0.33189 (sec), leaf count = 15

$$\left\{\left\{y(x) \to c_1 + f^{(-1)}(0)x\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 11

$$\{y(x) = RootOf(f(\_Z))\, x + \_C1\}$$

Mathematica raw input

```
DSolve[f[y'[x]] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*InverseFunction[f, 1, 1][0]}}
```

Maple raw input

```
dsolve(f(diff(y(x),x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = RootOf(f(_Z))*x+_C1
```

4.1164 $f(x, y'(x)) = 0$

ODE

$$f(x, y'(x)) = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Dependent variable missing

Mathematica ✓
cpu = 0.294467 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \int_1^x \text{InverseFunction}[f, 2, 2][K[1], 0]\, dK[1] + c_1\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 12

$$\left\{y(x) = \int RootOf(f(x, \_Z))\ \mathrm{d}x + \_C1\right\}$$

Mathematica raw input

```
DSolve[f[x, y'[x]] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + Integrate[InverseFunction[f, 2, 2][K[1], 0], {K[1], 1, x}]}}
```

Maple raw input

```
dsolve(f(x,diff(y(x),x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(RootOf(f(x,_Z)),x)+_C1
```

4.1165 $f(xy'(x)^2) = y(x) - 2xy'(x)$

ODE

$$f\left(xy'(x)^2\right) = y(x) - 2xy'(x)$$

ODE Classification

[`y=_G(x,y')`]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.0170185 (sec), leaf count = 42

$$\left\{\left\{y(x) \to f(c_1) - 2\sqrt{c_1}\sqrt{x}, y(x) \to f(c_1) + 2\sqrt{c_1}\sqrt{x}\right\}\right\}$$

Maple ✓
cpu = 0.295 (sec), leaf count = 16

$$\left\{y(x) = f\left(\frac{\_C1^2}{4}\right) + \sqrt{x}\_C1\right\}$$

Mathematica raw input

```
DSolve[f[x*y'[x]^2] == y[x] - 2*x*y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2*Sqrt[x]*Sqrt[C[1]] + f[C[1]], y[x] -> 2*Sqrt[x]*Sqrt[C[1]] + f[C[1]
]}}
```

Maple raw input

```
dsolve(f(x*diff(y(x),x)^2) = y(x)-2*x*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
y(x) = f(1/4*_C1^2)+x^(1/2)*_C1
```

4.1166 $f(y(x), y'(x)) = 0$

ODE

$$f(y(x), y'(x)) = 0$$

ODE Classification

[_quadrature]

Book solution method
Missing Variables ODE, Independent variable missing

Mathematica ✓
cpu = 1.08851 (sec), leaf count = 27

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{\text{InverseFunction}[f,2,2][K[1],0]}\, dK[1]\&\right][c_1 + x]\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 28

$$\left\{x - \int^{y(x)} (RootOf(f(\_a, \_Z)))^{-1}\, d\_a - \_C1 = 0, y(x) = RootOf(f(\_Z, 0))\right\}$$

Mathematica raw input

```
DSolve[f[y[x], y'[x]] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Integrate[InverseFunction[f, 2, 2][K[1], 0]^(-1), {K[1
], 1, #1}] & ][x + C[1]]}}
```

Maple raw input

```
dsolve(f(y(x),diff(y(x),x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = RootOf(f(_Z,0)), x-Intat(1/RootOf(f(_a,_Z)),_a = y(x))-_C1 = 0
```

4.1167 $f(y'(x)) + xy'(x) = y(x)$

ODE

$$f(y'(x)) + xy'(x) = y(x)$$

ODE Classification

[_Clairaut]

Book solution method
Clairaut's equation and related types, main form

Mathematica ✓
cpu = 0.00480011 (sec), leaf count = 13

$$\{\{y(x) \to f(c_1) + c_1 x\}\}$$

Maple ✓
cpu = 0.073 (sec), leaf count = 33

$$\left\{y(x) = f(\_C1) + \_C1\, x, [x(\_T) = -\frac{\mathrm{d}}{\mathrm{d}\_T} f(\_T), y(\_T) = -\_T \frac{\mathrm{d}}{\mathrm{d}\_T} f(\_T) + f(\_T)]\right\}$$

Mathematica raw input

```
DSolve[f[y'[x]] + x*y'[x] == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + f[C[1]]}}
```

Maple raw input

```
dsolve(f(diff(y(x),x))+x*diff(y(x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
[x(_T) = -diff(f(_T),_T), y(_T) = -_T*diff(f(_T),_T)+f(_T)], y(x) = f(_C1)+_C1*x
```

4.1168 $f(y'(x)) + xg(y'(x)) = y(x)$

ODE

$$f(y'(x)) + xg(y'(x)) = y(x)$$

ODE Classification

[_dAlembert]

Book solution method
Clairaut's equation and related types, d'Alembert's equation (also call Lagrange's)

Mathematica ✓
cpu = 0.233448 (sec), leaf count = 87

$$\text{Solve}\left[\left\{x = \exp\left(\int_1^{\text{K\$271269}} \frac{g'(K[1])}{K[1]-g(K[1])}\,dK[1]\right)\left(\int \frac{f'(\text{K\$271269})\exp\left(-\int_1^{\text{K\$271269}} \frac{g'(K[1])}{K[1]-g(K[1])}\,dK[1]\right)}{\text{K\$271269}-g(\text{K\$271269})}\,d\text{K\$271269}\right.\right.$$

Maple ✓
cpu = 0.099 (sec), leaf count = 138

$$\left\{y(x) = x\,RootOf(\_Z - g(\_Z)) + f(RootOf(\_Z - g(\_Z))), [x(\_T) = \mathrm{e}^{\int \frac{\frac{\mathrm{d}}{\mathrm{d}\_T}g(\_T)}{\_T - g(\_T)}\,\mathrm{d}\_T}\left(\int \frac{\frac{\mathrm{d}}{\mathrm{d}\_T}f(\_T)}{\_T - g(\_T)}\mathrm{e}^{-\int \frac{\frac{\mathrm{d}}{\mathrm{d}\_T}g(\_T)}{\_T - g(\_T)}\,\mathrm{d}\_}\right.\right.$$

Mathematica raw input

```
DSolve[f[y'[x]] + x*g[y'[x]] == y[x],y[x],x]
```

Mathematica raw output

```
Solve[{x == E^Integrate[Derivative[1][g][K[1]]/(-g[K[1]] + K[1]), {K[1], 1, K$27
1269}]*(C[1] + Integrate[Derivative[1][f][K$271269]/(E^Integrate[Derivative[1][g
][K[1]]/(-g[K[1]] + K[1]), {K[1], 1, K$271269}]*(K$271269 - g[K$271269])), K$271
269]), f[K$271269] + x*g[K$271269] == y[x]}, {y[x], K$271269}]
```

Maple raw input

```
dsolve(f(diff(y(x),x))+x*g(diff(y(x),x)) = y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = x*RootOf(_Z-g(_Z))+f(RootOf(_Z-g(_Z))), [x(_T) = exp(Int(1/(_T-g(_T))*dif
f(g(_T),_T),_T))*(Int(1/(_T-g(_T))*diff(f(_T),_T)*exp(-Int(1/(_T-g(_T))*diff(g(_
T),_T),_T)),_T)+_C1), y(_T) = f(_T)+exp(Int(1/(_T-g(_T))*diff(g(_T),_T),_T))*(In
t(1/(_T-g(_T))*diff(f(_T),_T)*exp(-Int(1/(_T-g(_T))*diff(g(_T),_T),_T)),_T)+_C1)
*g(_T)]
```

4.1169 $f(y'(x), y(x) - xy'(x)) = 0$

ODE

$$f(y'(x), y(x) - xy'(x)) = 0$$

ODE Classification

[_Clairaut]

Book solution method
Clairaut's equation and related types, $f(y - xy', y') = 0$

Mathematica ✓
cpu = 0.0059319 (sec), leaf count = 17

$$\{\{y(x) \to \text{InverseFunction}[f, 2, 2][c_1, 0] + c_1 x\}\}$$

Maple ✓
cpu = 0.158 (sec), leaf count = 63

$$\left\{y(x) = \_C1\, x + RootOf(f(\_C1, \_Z)), [x(\_T) = \frac{D_1(f)(\_T, RootOf(f(\_T, \_Z)))}{D_2(f)(\_T, RootOf(f(\_T, \_Z)))}, y(\_T) = \frac{D_1(f)(\_T, RootOf(f(\_\right.$$

Mathematica raw input

```
DSolve[f[y'[x], y[x] - x*y'[x]] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + InverseFunction[f, 2, 2][C[1], 0]}}
```

Maple raw input

```
dsolve(f(diff(y(x),x),y(x)-x*diff(y(x),x)) = 0, y(x),'implicit')
```

Maple raw output

```
[x(_T) = D[1](f)(_T,RootOf(f(_T,_Z)))/D[2](f)(_T,RootOf(f(_T,_Z))), y(_T) = (D[1
](f)(_T,RootOf(f(_T,_Z)))*_T+D[2](f)(_T,RootOf(f(_T,_Z)))*RootOf(f(_T,_Z)))/D[2]
(f)(_T,RootOf(f(_T,_Z)))], y(x) = _C1*x+RootOf(f(_C1,_Z))
```

4.1170 $f(xy'(x), y(x)) = 0$

ODE

$$f(xy'(x), y(x)) = 0$$

ODE Classification

[_separable]

Book solution method
Homogeneous ODE, The Isobaric equation

Mathematica ✓
cpu = 1.12419 (sec), leaf count = 28

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{\text{InverseFunction}[f,1,2][0,K[1]]}\, dK[1]\&\right][c_1 + \log(x)]\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 22

$$\left\{\ln(x) - \int^{y(x)} RootOf\left(f\left(\_Z^{-1}, \_a\right)\right) d\_a - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[f[x*y'[x], y[x]] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Integrate[InverseFunction[f, 1, 2][0, K[1]]^(-1), {K[1
], 1, #1}] & ][C[1] + Log[x]]}}
```

Maple raw input

```
dsolve(f(x*diff(y(x),x),y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-Intat(RootOf(f(1/_Z,_a)),_a = y(x))-_C1 = 0
```

4.1171 $x^n f\left(y'(x), \frac{y(x)}{x}\right) = 0$

ODE

$$x^n f\left(y'(x), \frac{y(x)}{x}\right) = 0$$

ODE Classification

[[_homogeneous, `class A`], _dAlembert]

Book solution method
Homogeneous ODE, $x^n f\left(\frac{y}{x}, y'\right) = 0$

Mathematica ✓
cpu = 0.877079 (sec), leaf count = 34

$$\text{Solve}\left[c_1 = \int_1^{\frac{y(x)}{x}} \frac{1}{K[1] - \text{InverseFunction}[f, 1, 2][0, K[1]]}\, dK[1] + \log(x), y(x)\right]$$

Maple ✓
cpu = 0.033 (sec), leaf count = 30

$$\left\{\ln(x) - \int^{\frac{y(x)}{x}} (RootOf(f(\_Z, \_a)) - \_a)^{-1}\, d\_a - \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^n*f[y'[x], y[x]/x] == 0,y[x],x]
```

Mathematica raw output

```
Solve[C[1] == Integrate[(K[1] - InverseFunction[f, 1, 2][0, K[1]])^(-1), {K[1],
1, y[x]/x}] + Log[x], y[x]]
```

Maple raw input

```
dsolve(x^n*f(diff(y(x),x),y(x)/x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-Intat(1/(RootOf(f(_Z,_a))-_a),_a = y(x)/x)-_C1 = 0
```

4.1172 $f(y(x)y'(x)+x)=y(x)^2\left(y'(x)^2+1\right)$

ODE

$$f(y(x)y'(x)+x)=y(x)^2\left(y'(x)^2+1\right)$$

ODE Classification

[` x=_G(y ,y ') `]

Book solution method
Change of variable

Mathematica ✓
cpu = 0.0989407 (sec), leaf count = 42

$$\text{Solve}\left[\left\{\text{K\$278007}y(\text{K\$278007})+x=f^{(-1)}\left(\left(\text{K\$278007}^2+1\right)y(\text{K\$278007})^2\right),y(x)=\frac{c_1}{\sqrt{\text{K\$278007}^2+1}}\right\},\{y(x),\text{K\$278}\right.$$

Maple ✓
cpu = 0.151 (sec), leaf count = 47

$$\left\{[x(\_T)=1\left(RootOf\left(\_C1^2-f(\_Z)\right)\sqrt{\_T^2+1}-\_C1\,\_T\right)\frac{1}{\sqrt{\_T^2+1}},y(\_T)=\_C1\frac{1}{\sqrt{\_T^2+1}}]\right\}$$

Mathematica raw input

```
DSolve[f[x + y[x]*y'[x]] == y[x]^2*(1 + y'[x]^2),y[x],x]
```

Mathematica raw output

```
Solve[{x + K$278007*y[K$278007] == InverseFunction[f, 1, 1][(1 + K$278007^2)*y[K
$278007]^2], y[x] == C[1]/Sqrt[1 + K$278007^2]}, {y[x], K$278007}]
```

Maple raw input

```
dsolve(f(y(x)*diff(y(x),x)+x) = (1+diff(y(x),x)^2)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
[x(_T) = (RootOf(_C1^2-f(_Z))*(_T^2+1)^(1/2)-_C1*_T)/(_T^2+1)^(1/2), y(_T) = _C1
/(_T^2+1)^(1/2)]
```

4.1173 $y(x)f\left(\frac{y'(x)}{y(x)},x\right)=0$

ODE

$$y(x)f\left(\frac{y'(x)}{y(x)},x\right)=0$$

ODE Classification

[_separable]

Book solution method
Homogeneous ODE, equation of form $yf(x,\frac{y'}{y})$

Mathematica ✓
cpu = 0.289583 (sec), leaf count = 28

$$\left\{\{y(x)\to 0\},\left\{y(x)\to c_1 e^{\int_1^x \text{InverseFunction}[f,1,2][0,K[1]]\,dK[1]}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 20

$$\left\{y(x)-\_C1\,\mathrm{e}^{\int RootOf(f(\_Z,x))\,\mathrm{d}x}=0,y(x)=0\right\}$$

Mathematica raw input

```
DSolve[f[y'[x]/y[x], x]*y[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 0}, {y[x] -> E^Integrate[InverseFunction[f, 1, 2][0, K[1]], {K[1], 1,
x}]*C[1]}}
```

Maple raw input

```
dsolve(y(x)*f(diff(y(x),x)/y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 0, y(x)-_C1*exp(Int(RootOf(f(_Z,x)),x)) = 0
```

4.1174 $f(x, y(x), y'(x)) = 0$

ODE

$$f(x, y(x), y'(x)) = 0$$

ODE Classification

[NONE]

Book solution method
No Missing Variables ODE

Mathematica ✗
cpu = 1.38775 (sec), leaf count = 0 , could not solve

```
DSolve[f[x, y[x], Derivative[1][y][x]] == 0, y[x], x]
```

Maple ✗
cpu = 0.014 (sec), leaf count = 0 , could not solve

```
dsolve(f(x,y(x),diff(y(x),x)) = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[f[x, y[x], y'[x]] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f[x, y[x], Derivative[1][y][x]] == 0, y[x], x]
```

Maple raw input

```
dsolve(f(x,y(x),diff(y(x),x)) = 0, y(x),'implicit')
```

Maple raw output

```
dsolve(f(x,y(x),diff(y(x),x)) = 0, y(x),'implicit')
```

4.1175 $y''(x) = 0$

ODE

$$y''(x) = 0$$

ODE Classification

[[_2nd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0253483 (sec), leaf count = 12

$$\{\{y(x) \to c_2 x + c_1\}\}$$

Maple ✓
cpu = 0.003 (sec), leaf count = 9

$$\{y(x) = \_C1\, x + \_C2\}$$

Mathematica raw input

```
DSolve[y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x+_C2
```

4.1176 $y''(x) = x + \sin(x)$

ODE

$$y''(x) = x + \sin(x)$$

ODE Classification

[[_2nd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0219306 (sec), leaf count = 23

$$\left\{\left\{y(x) \to c_2 x + c_1 + \frac{x^3}{6} - \sin(x)\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 18

$$\left\{y(x) = \frac{x^3}{6} - \sin(x) + \_C1\, x + \_C2\right\}$$

Mathematica raw input

```
DSolve[y''[x] == x + Sin[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^3/6 + C[1] + x*C[2] - Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = x+sin(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/6*x^3-sin(x)+_C1*x+_C2
```

4.1177 $y''(x) = \mathbf{c1}\cos(ax) + \mathbf{c2}\sin(bx)$

ODE

$$y''(x) = \text{c1}\cos(ax) + \text{c2}\sin(bx)$$

ODE Classification

[[_2nd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0399112 (sec), leaf count = 32

$$\left\{\left\{y(x) \to -\frac{\text{c1}\cos(ax)}{a^2} - \frac{\text{c2}\sin(bx)}{b^2} + c_2 x + c_1\right\}\right\}$$

Maple ✓
cpu = 0.029 (sec), leaf count = 29

$$\left\{y(x) = -\frac{c1\ \cos(ax)}{a^2} - \frac{c2\ \sin(bx)}{b^2} + \_C1\ x + \_C2\right\}$$

Mathematica raw input

```
DSolve[y''[x] == c1*Cos[a*x] + c2*Sin[b*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*C[2] - (c1*Cos[a*x])/a^2 - (c2*Sin[b*x])/b^2}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = c1*cos(a*x)+c2*sin(b*x), y(x),'implicit')
```

Maple raw output

```
y(x) = -c1/a^2*cos(a*x)-c2/b^2*sin(b*x)+_C1*x+_C2
```

4.1178 $y''(x) = e^x x$

ODE

$$y''(x) = e^x x$$

ODE Classification

[[_2nd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0069149 (sec), leaf count = 19

$$\{\{y(x) \to c_2 x + c_1 + e^x (x-2)\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 15

$$\{y(x) = (x-2)\,\mathrm{e}^x + \_C1\,x + \_C2\}$$

Mathematica raw input

```
DSolve[y''[x] == E^x*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(-2 + x) + C[1] + x*C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = x*exp(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (x-2)*exp(x)+_C1*x+_C2
```

4.1179 $y''(x) = \mathbf{c1}e^{ax} + \mathbf{c2}e^{-bx}$

ODE

$$y''(x) = \mathrm{c1}e^{ax} + \mathrm{c2}e^{-bx}$$

ODE Classification

[[_2nd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0431898 (sec), leaf count = 33

$$\left\{\left\{y(x) \to \frac{\mathrm{c1}e^{ax}}{a^2} + \frac{\mathrm{c2}e^{-bx}}{b^2} + c_2 x + c_1\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 28

$$\left\{y(x) = \frac{c1\ \mathrm{e}^{ax}}{a^2} + \frac{c2\ \mathrm{e}^{-bx}}{b^2} + \_C1\ x + \_C2\right\}$$

Mathematica raw input

```
DSolve[y''[x] == c1*E^(a*x) + c2/E^(b*x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (c1*E^(a*x))/a^2 + c2/(b^2*E^(b*x)) + C[1] + x*C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = c1*exp(a*x)+c2*exp(-b*x), y(x),'implicit')
```

Maple raw output

```
y(x) = c1/a^2*exp(a*x)+c2/b^2*exp(-b*x)+_C1*x+_C2
```

4.1180 $y''(x) + y(x) = 0$

ODE

$$y''(x) + y(x) = 0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0210058 (sec), leaf count = 16

$$\{\{y(x) \to c_2 \sin(x) + c_1 \cos(x)\}\}$$

Maple ✓
cpu = 0.003 (sec), leaf count = 13

$$\{y(x) = \_C1 \sin(x) + \_C2 \cos(x)\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[x] + C[2]*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(x)+_C2*cos(x)
```

4.1181 $y''(x) - y(x) = 0$

ODE

$$y''(x) - y(x) = 0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00240598 (sec), leaf count = 20

$$\{\{y(x) \to c_1 e^x + c_2 e^{-x}\}\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 15

$$\{y(x) = \_C1\, \mathrm{e}^{-x} + \_C2\, \mathrm{e}^{x}\}$$

Mathematica raw input

```
DSolve[-y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1] + C[2]/E^x}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-x)+_C2*exp(x)
```

4.1182 $y''(x) + y(x) = ax$

ODE

$$y''(x) + y(x) = ax$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00327922 (sec), leaf count = 19

$$\{\{y(x) \to ax + c_2 \sin(x) + c_1 \cos(x)\}\}$$

Maple ✓
cpu = 0.204 (sec), leaf count = 16

$$\{y(x) = \sin(x) \_C2 + \cos(x) \_C1 + ax\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == a*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> a*x + C[1]*Cos[x] + C[2]*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = a*x, y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)*_C2+cos(x)*_C1+a*x
```

4.1183 $y''(x) + y(x) = a\cos(bx)$

ODE

$$y''(x) + y(x) = a\cos(bx)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.091125 (sec), leaf count = 41

$$\left\{\left\{y(x) \to \frac{-a\cos(bx) + \left(b^2-1\right)c_2\sin(x) + \left(b^2-1\right)c_1\cos(x)}{b^2-1}\right\}\right\}$$

Maple ✓
cpu = 0.185 (sec), leaf count = 27

$$\left\{y(x) = \sin(x)\_C2 + \cos(x)\_C1 - \frac{a\cos(bx)}{b^2-1}\right\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == a*Cos[b*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-1 + b^2)*C[1]*Cos[x] - a*Cos[b*x] + (-1 + b^2)*C[2]*Sin[x])/(-1 + b
^2)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = a*cos(b*x), y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)*_C2+cos(x)*_C1-a*cos(b*x)/(b^2-1)
```

4.1184 $y''(x) + y(x) = 8\cos(x)\cos(2x)$

ODE

$$y''(x) + y(x) = 8\cos(x)\cos(2x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0344939 (sec), leaf count = 30

$$\left\{\left\{y(x) \to (c_2 + 2x)\sin(x) + (c_1 + 1)\cos(x) - \frac{1}{2}\cos(3x)\right\}\right\}$$

Maple ✓
cpu = 0.092 (sec), leaf count = 25

$$\left\{y(x) = 2\left(\sin(x)\right)^2\cos(x) + (2x + \_C2)\sin(x) + \cos(x)\_C1\right\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == 8*Cos[x]*Cos[2*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + C[1])*Cos[x] - Cos[3*x]/2 + (2*x + C[2])*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = 8*cos(x)*cos(2*x), y(x),'implicit')
```

Maple raw output

```
y(x) = 2*sin(x)^2*cos(x)+(2*x+_C2)*sin(x)+cos(x)*_C1
```

4.1185 $y''(x) + y(x) = \sec(x)$

ODE

$$y''(x) + y(x) = \sec(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0170495 (sec), leaf count = 22

$$\{\{y(x) \to (c_2 + x)\sin(x) + \cos(x)(c_1 + \log(\cos(x)))\}\}$$

Maple ✓
cpu = 0.038 (sec), leaf count = 24

$$\left\{y(x) = -\ln\left((\cos(x))^{-1}\right)\cos(x) + \cos(x)\_C1 + \sin(x)(x + \_C2)\right\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == Sec[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> Cos[x]*(C[1] + Log[Cos[x]]) + (x + C[2])*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = sec(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -ln(1/cos(x))*cos(x)+cos(x)*_C1+sin(x)*(x+_C2)
```

4.1186 $y''(x) + y(x) = a \sin(bx)$

ODE

$$y''(x) + y(x) = a \sin(bx)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0839624 (sec), leaf count = 41

$$\left\{\left\{y(x) \to \frac{-a \sin(bx) + \left(b^2-1\right) c_2 \sin(x) + \left(b^2-1\right) c_1 \cos(x)}{b^2-1}\right\}\right\}$$

Maple ✓
cpu = 0.032 (sec), leaf count = 27

$$\left\{y(x) = \sin(x) \_C2 + \cos(x) \_C1 - \frac{a \sin(bx)}{b^2-1}\right\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == a*Sin[b*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-1 + b^2)*C[1]*Cos[x] + (-1 + b^2)*C[2]*Sin[x] - a*Sin[b*x])/(-1 + b
^2)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = a*sin(b*x), y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)*_C2+cos(x)*_C1-a*sin(b*x)/(b^2-1)
```

4.1187 $y''(x) + y(x) = \sin(ax)\sin(bx)$

ODE

$$y''(x) + y(x) = \sin(ax)\sin(bx)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.485967 (sec), leaf count = 159

$$\left\{\left\{y(x) \to \frac{a^4 c_2 \sin(x) - 2a^2 b^2 c_2 \sin(x) - a^2 \sin(ax)\sin(bx) - 2a^2 c_2 \sin(x) + c_1\left(a^4 - 2a^2\left(b^2+1\right) + \left(b^2-1\right)^2\right)\cos(x) - b^2}{(a-b-1)(a-b+1)(a+b-}\right.\right.$$

Maple ✓
cpu = 0.121 (sec), leaf count = 82

$$\left\{y(x) = \sin(x)\_C2 + \cos(x)\_C1 + \frac{-(1+a+b)(a+b-1)\cos(x(a-b)) + \cos(x(a+b))(a-b+1)(a-b-1)}{2a^4 + (-4b^2-4)a^2 + 2b^4 - 4b^2 + 2}\right\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == Sin[a*x]*Sin[b*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((a^4 + (-1 + b^2)^2 - 2*a^2*(1 + b^2))*C[1]*Cos[x] - 2*a*b*Cos[a*x]*C
os[b*x] + C[2]*Sin[x] - 2*a^2*C[2]*Sin[x] + a^4*C[2]*Sin[x] - 2*b^2*C[2]*Sin[x]
- 2*a^2*b^2*C[2]*Sin[x] + b^4*C[2]*Sin[x] + Sin[a*x]*Sin[b*x] - a^2*Sin[a*x]*Sin
[b*x] - b^2*Sin[a*x]*Sin[b*x])/((-1 + a - b)*(1 + a - b)*(-1 + a + b)*(1 + a + b
))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = sin(a*x)*sin(b*x), y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)*_C2+cos(x)*_C1+(-(1+a+b)*(a+b-1)*cos(x*(a-b))+cos(x*(a+b))*(a-b+1)
*(a-b-1))/(2*a^4+(-4*b^2-4)*a^2+2*b^4-4*b^2+2)
```

4.1188 $y''(x) + y(x) = 4x \sin(x)$

ODE

$$y''(x) + y(x) = 4x \sin(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0212413 (sec), leaf count = 27

$$\left\{\left\{y(x) \to \left(c_1 - x^2 + \frac{1}{2}\right)\cos(x) + (c_2 + x)\sin(x)\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 21

$$\{y(x) = (-x^2 + \_C1)\cos(x) + \sin(x)(x + \_C2)\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == 4*x*Sin[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1/2 - x^2 + C[1])*Cos[x] + (x + C[2])*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = 4*x*sin(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-x^2+_C1)*cos(x)+sin(x)*(x+_C2)
```

4.1189 $y''(x) + y(x) = x(\cos(x) - x\sin(x))$

ODE

$$y''(x) + y(x) = x(\cos(x) - x\sin(x))$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0553819 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \left(c_1 + \frac{x^3}{6}\right)\cos(x) + c_2\sin(x)\right\}\right\}$$

Maple ✓
cpu = 0.079 (sec), leaf count = 20

$$\left\{y(x) = \frac{(x^3 + 6\_C1)\cos(x)}{6} + \sin(x)\_C2\right\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == x*(Cos[x] - x*Sin[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^3/6 + C[1])*Cos[x] + C[2]*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = x*(cos(x)-x*sin(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/6*(x^3+6*_C1)*cos(x)+sin(x)*_C2
```

4.1190 $y''(x) + y(x) = \tan^2(x)$

ODE

$$y''(x) + y(x) = \tan^2(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.083973 (sec), leaf count = 50

$$\left\{\left\{y(x) \to c_1 \cos(x) + \sin(x)\left(c_2 - \log\left(\cos\left(\frac{x}{2}\right) - \sin\left(\frac{x}{2}\right)\right) + \log\left(\sin\left(\frac{x}{2}\right) + \cos\left(\frac{x}{2}\right)\right)\right) - 2\right\}\right\}$$

Maple ✓
cpu = 0.09 (sec), leaf count = 27

$$\left\{y(x) = \sin(x)\_C2 + \cos(x)\_C1 - 2 + \sin(x)\ln\left(\frac{1+\sin(x)}{\cos(x)}\right)\right\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == Tan[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2 + C[1]*Cos[x] + (C[2] - Log[Cos[x/2] - Sin[x/2]] + Log[Cos[x/2] + S
in[x/2]])*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = tan(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)*_C2+cos(x)*_C1-2+sin(x)*ln((1+sin(x))/cos(x))
```

4.1191 $y''(x) + y(x) = e^{-x}$

ODE

$$y''(x) + y(x) = e^{-x}$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0243605 (sec), leaf count = 25

$$\left\{\left\{y(x) \to c_2 \sin(x) + c_1 \cos(x) + \frac{e^{-x}}{2}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 19

$$\left\{y(x) = \sin(x)\_C2 + \cos(x)\_C1 + \frac{\mathrm{e}^{-x}}{2}\right\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == E^(-x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1/(2*E^x) + C[1]*Cos[x] + C[2]*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = exp(-x), y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)*_C2+cos(x)*_C1+1/2*exp(-x)
```

4.1192 $y''(x) + y(x) = e^x(x^2 - 1)$

ODE

$$y''(x) + y(x) = e^x (x^2 - 1)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0940996 (sec), leaf count = 27

$$\left\{\left\{y(x) \to c_2 \sin(x) + c_1 \cos(x) + \frac{1}{2} e^x (x-2)x\right\}\right\}$$

Maple ✓
cpu = 0.105 (sec), leaf count = 24

$$\left\{y(x) = \frac{\left(x^2 - 2\,x\right) \mathrm{e}^x}{2} + \cos\left(x\right) \_C1 + \sin\left(x\right) \_C2\right\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == E^x*(-1 + x^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*(-2 + x)*x)/2 + C[1]*Cos[x] + C[2]*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = exp(x)*(x^2-1), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*(x^2-2*x)*exp(x)+cos(x)*_C1+sin(x)*_C2
```

4.1193 $y''(x) + y(x) = e^x \sin(2x)$

ODE

$$y''(x) + y(x) = e^x \sin(2x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.111858 (sec), leaf count = 37

$$\left\{\left\{y(x) \to c_2 \sin(x) + \cos(x)\left(c_1 - \frac{1}{5}e^x \sin(x)\right) - \frac{1}{5}e^x \cos(2x)\right\}\right\}$$

Maple ✓
cpu = 0.074 (sec), leaf count = 28

$$\left\{y(x) = \sin(x)\_C2 + \cos(x)\_C1 - \frac{e^x(\sin(2x) + 2\cos(2x))}{10}\right\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == E^x*Sin[2*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(E^x*Cos[2*x])/5 + C[2]*Sin[x] + Cos[x]*(C[1] - (E^x*Sin[x])/5)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = exp(x)*sin(2*x), y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)*_C2+cos(x)*_C1-1/10*exp(x)*(sin(2*x)+2*cos(2*x))
```

4.1194 $y''(x) + y(x) = e^{2x}\cos(x)$

ODE

$$y''(x) + y(x) = e^{2x}\cos(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0393135 (sec), leaf count = 36

$$\left\{\left\{y(x) \to \frac{1}{8}\left(\left(8c_2 + e^{2x}\right)\sin(x) + \left(8c_1 + e^{2x}\right)\cos(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 24

$$\left\{y(x) = \sin(x)\_C2 + \cos(x)\_C1 + \frac{e^{2x}(\cos(x) + \sin(x))}{8}\right\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] == E^(2*x)*Cos[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((E^(2*x) + 8*C[1])*Cos[x] + (E^(2*x) + 8*C[2])*Sin[x])/8}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x) = exp(2*x)*cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)*_C2+cos(x)*_C1+1/8*exp(2*x)*(cos(x)+sin(x))
```

4.1195 $y''(x) - 2y(x) = 0$

ODE

$$y''(x) - 2y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00308243 (sec), leaf count = 31

$$\left\{\left\{y(x) \to c_1 e^{\sqrt{2}x} + c_2 e^{-\sqrt{2}x}\right\}\right\}$$

Maple ✓
cpu = 0.004 (sec), leaf count = 22

$$\left\{y(x) = \_C1\, \mathrm{e}^{\sqrt{2}x} + \_C2\, \mathrm{e}^{-\sqrt{2}x}\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(Sqrt[2]*x)*C[1] + C[2]/E^(Sqrt[2]*x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(2^(1/2)*x)+_C2*exp(-2^(1/2)*x)
```

4.1196 $y''(x) - 2y(x) = 4e^{x^2}x^2$

ODE

$$y''(x) - 2y(x) = 4e^{x^2}x^2$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0879552 (sec), leaf count = 36

$$\left\{\left\{y(x) \to c_1 e^{\sqrt{2}x} + c_2 e^{-\sqrt{2}x} + e^{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 26

$$\left\{y(x) = \mathrm{e}^{\sqrt{2}x}\_C2 + \mathrm{e}^{-\sqrt{2}x}\_C1 + \mathrm{e}^{x^2}\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + y''[x] == 4*E^x^2*x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x^2 + E^(Sqrt[2]*x)*C[1] + C[2]/E^(Sqrt[2]*x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*y(x) = 4*x^2*exp(x^2), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(2^(1/2)*x)*_C2+exp(-2^(1/2)*x)*_C1+exp(x^2)
```

4.1197 $y''(x) + 4y(x) = 0$

ODE

$$y''(x) + 4y(x) = 0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00307763 (sec), leaf count = 20

$$\{\{y(x) \to c_2 \sin(2x) + c_1 \cos(2x)\}\}$$

Maple ✓
cpu = 0.004 (sec), leaf count = 17

$$\{y(x) = \_C1 \sin(2x) + \_C2 \cos(2x)\}$$

Mathematica raw input

```
DSolve[4*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[2*x] + C[2]*Sin[2*x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(2*x)+_C2*cos(2*x)
```

4.1198 $y''(x) + 4y(x) = x \sin^2(x)$

ODE

$$y''(x) + 4y(x) = x \sin^2(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.108201 (sec), leaf count = 41

$$\left\{\left\{y(x) \to \frac{1}{128}\left((128c_2 - 8x^2 + 1)\sin(2x) - 4(x - 32c_1)\cos(2x) + 16x\right)\right\}\right\}$$

Maple ✓
cpu = 0.083 (sec), leaf count = 37

$$\left\{y(x) = \frac{(-8\,x^2 + 128\_C2 + 1)\sin(2\,x)}{128} + \frac{(-4\,x + 128\_C1)\cos(2\,x)}{128} + \frac{x}{8}\right\}$$

Mathematica raw input

```
DSolve[4*y[x] + y''[x] == x*Sin[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (16*x - 4*(x - 32*C[1])*Cos[2*x] + (1 - 8*x^2 + 128*C[2])*Sin[2*x])/12
8}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+4*y(x) = x*sin(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/128*(-8*x^2+128*_C2+1)*sin(2*x)+1/128*(-4*x+128*_C1)*cos(2*x)+1/8*x
```

4.1199 $y''(x) + 4y(x) = 2\tan(x)$

ODE

$$y''(x) + 4y(x) = 2\tan(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0237999 (sec), leaf count = 28

$$\{\{y(x) \to (c_1 - x)\cos(2x) + \sin(2x)\,(c_2 + \log(\cos(x)))\}\}$$

Maple ✓
cpu = 0.063 (sec), leaf count = 36

$$\left\{y(x) = (\cos(x)\sin(x) - x + \_C1)\cos(2x) + \sin(2x)\left(-(\cos(x))^2 + \_C2 + \ln(\cos(x))\right)\right\}$$

Mathematica raw input

```
DSolve[4*y[x] + y''[x] == 2*Tan[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-x + C[1])*Cos[2*x] + (C[2] + Log[Cos[x]])*Sin[2*x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+4*y(x) = 2*tan(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (cos(x)*sin(x)-x+_C1)*cos(2*x)+sin(2*x)*(-cos(x)^2+_C2+ln(cos(x)))
```

4.1200 $y''(x) + 4y(x) = 2\tan(x)$

ODE

$$y''(x) + 4y(x) = 2\tan(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0145926 (sec), leaf count = 28

$$\{\{y(x) \to (c_1 - x)\cos(2x) + \sin(2x)\,(c_2 + \log(\cos(x)))\}\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 36

$$\left\{y(x) = (\cos(x)\sin(x) - x + \_C1)\cos(2x) + \sin(2x)\left(-(\cos(x))^2 + \_C2 + \ln(\cos(x))\right)\right\}$$

Mathematica raw input

```
DSolve[4*y[x] + y''[x] == 2*Tan[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-x + C[1])*Cos[2*x] + (C[2] + Log[Cos[x]])*Sin[2*x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+4*y(x) = 2*tan(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (cos(x)*sin(x)-x+_C1)*cos(2*x)+sin(2*x)*(-cos(x)^2+_C2+ln(cos(x)))
```

4.1201 $y''(x) - a^2 y(x) = x + 1$

ODE

$$y''(x) - a^2 y(x) = x + 1$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.147951 (sec), leaf count = 31

$$\left\{\left\{y(x) \to -\frac{x+1}{a^2} + c_1 e^{ax} + c_2 e^{-ax}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 27

$$\left\{y(x) = \mathrm{e}^{ax}\_C2 + \mathrm{e}^{-ax}\_C1 + \frac{-x-1}{a^2}\right\}$$

Mathematica raw input

```
DSolve[-(a^2*y[x]) + y''[x] == 1 + x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((1 + x)/a^2) + E^(a*x)*C[1] + C[2]/E^(a*x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-a^2*y(x) = 1+x, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(a*x)*_C2+exp(-a*x)*_C1+(-x-1)/a^2
```

4.1202 $y''(x) = ax + by(x)$

ODE

$$y''(x) = ax + by(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.003564 (sec), leaf count = 38

$$\left\{\left\{y(x) \to -\frac{ax}{b} + c_1 e^{\sqrt{b}x} + c_2 e^{-\sqrt{b}x}\right\}\right\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 29

$$\left\{y(x) = \mathrm{e}^{\sqrt{b}x}\_C2 + \mathrm{e}^{-\sqrt{b}x}\_C1 - \frac{ax}{b}\right\}$$

Mathematica raw input

```
DSolve[y''[x] == a*x + b*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a*x)/b) + E^(Sqrt[b]*x)*C[1] + C[2]/E^(Sqrt[b]*x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a*x+b*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(b^(1/2)*x)*_C2+exp(-b^(1/2)*x)*_C1-a/b*x
```

4.1203 $a^2 y(x) + y''(x) = x^2 + x + 1$

ODE

$$a^2 y(x) + y''(x) = x^2 + x + 1$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00386767 (sec), leaf count = 36

$$\left\{\left\{y(x) \to \frac{a^2\left(x^2+x+1\right)-2}{a^4} + c_2 \sin(ax) + c_1 \cos(ax)\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 38

$$\left\{y(x) = \frac{\cos(ax)\_C1\, a^4 + \sin(ax)\_C2\, a^4 - 2 + \left(x^2+x+1\right) a^2}{a^4}\right\}$$

Mathematica raw input

```
DSolve[a^2*y[x] + y''[x] == 1 + x + x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2 + a^2*(1 + x + x^2))/a^4 + C[1]*Cos[a*x] + C[2]*Sin[a*x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a^2*y(x) = x^2+x+1, y(x),'implicit')
```

Maple raw output

```
y(x) = (cos(a*x)*_C1*a^4+sin(a*x)*_C2*a^4-2+(x^2+x+1)*a^2)/a^4
```

4.1204 $a^2 y(x) + y''(x) = \cos(bx)$

ODE

$$a^2 y(x) + y''(x) = \cos(bx)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.173507 (sec), leaf count = 55

$$\left\{\left\{y(x) \to \frac{c_2\left(a^2-b^2\right)\sin(ax) + c_1\left(a^2-b^2\right)\cos(ax) + \cos(bx)}{(a-b)(a+b)}\right\}\right\}$$

Maple ✓
cpu = 0.063 (sec), leaf count = 33

$$\left\{y(x) = \sin(ax)\_C2 + \cos(ax)\_C1 + \frac{\cos(bx)}{a^2-b^2}\right\}$$

Mathematica raw input

```
DSolve[a^2*y[x] + y''[x] == Cos[b*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((a^2 - b^2)*C[1]*Cos[a*x] + Cos[b*x] + (a^2 - b^2)*C[2]*Sin[a*x])/((a
 - b)*(a + b))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a^2*y(x) = cos(b*x), y(x),'implicit')
```

Maple raw output

```
y(x) = sin(a*x)*_C2+cos(a*x)*_C1+cos(b*x)/(a^2-b^2)
```

4.1205 $a^2 y(x) + y''(x) = \cot(ax)$

ODE

$$a^2 y(x) + y''(x) = \cot(ax)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0358404 (sec), leaf count = 46

$$\left\{\left\{y(x) \to \frac{\sin(ax)\left(a^2 c_2 + \log\left(\sin\left(\frac{ax}{2}\right)\right) - \log\left(\cos\left(\frac{ax}{2}\right)\right)\right)}{a^2} + c_1 \cos(ax)\right\}\right\}$$

Maple ✓
cpu = 0.182 (sec), leaf count = 41

$$\left\{y(x) = \sin(ax)\_C2 + \cos(ax)\_C1 + \frac{\sin(ax)}{a^2} \ln\left(\frac{1-\cos(ax)}{\sin(ax)}\right)\right\}$$

Mathematica raw input

```
DSolve[a^2*y[x] + y''[x] == Cot[a*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[a*x] + ((a^2*C[2] - Log[Cos[(a*x)/2]] + Log[Sin[(a*x)/2]])*Si
n[a*x])/a^2}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a^2*y(x) = cot(a*x), y(x),'implicit')
```

Maple raw output

```
y(x) = sin(a*x)*_C2+cos(a*x)*_C1+sin(a*x)*ln((1-cos(a*x))/sin(a*x))/a^2
```

4.1206 $a^2 y(x) + y''(x) = \sin(bx)$

ODE

$$a^2 y(x) + y''(x) = \sin(bx)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.10936 (sec), leaf count = 55

$$\left\{\left\{y(x) \to \frac{c_2 (a^2 - b^2) \sin(ax) + c_1 (a^2 - b^2) \cos(ax) + \sin(bx)}{(a-b)(a+b)}\right\}\right\}$$

Maple ✓
cpu = 0.044 (sec), leaf count = 33

$$\left\{y(x) = \sin(ax) \_C2 + \cos(ax) \_C1 + \frac{\sin(bx)}{a^2 - b^2}\right\}$$

Mathematica raw input

```
DSolve[a^2*y[x] + y''[x] == Sin[b*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((a^2 - b^2)*C[1]*Cos[a*x] + (a^2 - b^2)*C[2]*Sin[a*x] + Sin[b*x])/((a
 - b)*(a + b))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a^2*y(x) = sin(b*x), y(x),'implicit')
```

Maple raw output

```
y(x) = sin(a*x)*_C2+cos(a*x)*_C1+sin(b*x)/(a^2-b^2)
```

4.1207 $y''(x) + xy(x) = 0$

ODE

$$y''(x) + xy(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0177762 (sec), leaf count = 28

$$\{\{y(x) \to c_1 \text{Ai}\left(\sqrt[3]{-1}x\right) + c_2 \text{Bi}\left(\sqrt[3]{-1}x\right)\}\}$$

Maple ✓
cpu = 0.043 (sec), leaf count = 17

$$\{y(x) = \_C1\ \text{Ai}(-x) + \_C2\ \text{Bi}(-x)\}$$

Mathematica raw input

```
DSolve[x*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> AiryAi[(-1)^(1/3)*x]*C[1] + AiryBi[(-1)^(1/3)*x]*C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*AiryAi(-x)+_C2*AiryBi(-x)
```

4.1208 $y(x)(a+bx)+y''(x)=0$

ODE

$$y(x)(a+bx)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00841147 (sec), leaf count = 42

$$\left\{\left\{y(x)\to c_1\text{Ai}\left(-\frac{a+bx}{(-b)^{2/3}}\right)+c_2\text{Bi}\left(-\frac{a+bx}{(-b)^{2/3}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.115 (sec), leaf count = 31

$$\left\{y(x)=\_C1\ \text{Ai}\left(-(bx+a)b^{-\frac{2}{3}}\right)+\_C2\ \text{Bi}\left(-(bx+a)b^{-\frac{2}{3}}\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> AiryAi[-((a + b*x)/(-b)^(2/3))]*C[1] + AiryBi[-((a + b*x)/(-b)^(2/3))]
*C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*AiryAi(-1/b^(2/3)*(b*x+a))+_C2*AiryBi(-1/b^(2/3)*(b*x+a))
```

4.1209 $(a+x^2)\,y(x)+y''(x)=0$

ODE

$$(a+x^2)\,y(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00677539 (sec), leaf count = 46

$$\left\{\left\{y(x)\to c_1 D_{-\frac{1}{2}i(a-i)}((1+i)x)+c_2 D_{\frac{1}{2}i(a+i)}((-1+i)x)\right\}\right\}$$

Maple ✓
cpu = 0.307 (sec), leaf count = 37

$$\left\{y(x)=1\left(\_C2\,W_{-\frac{i}{4}a,\frac{1}{4}}\left(ix^2\right)+\_C1\,M_{-\frac{i}{4}a,\frac{1}{4}}\left(ix^2\right)\right)\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[(a + x^2)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*ParabolicCylinderD[(-I/2)*(-I + a), (1 + I)*x] + C[2]*ParabolicCy
linderD[(I/2)*(I + a), (-1 + I)*x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(x^2+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*WhittakerW(-1/4*I*a,1/4,I*x^2)+_C1*WhittakerM(-1/4*I*a,1/4,I*x^2))/x
^(1/2)
```

4.1210 $(a - x^2)\, y(x) + y''(x) = 0$

ODE

$$(a - x^2)\, y(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0050641 (sec), leaf count = 47

$$\left\{\left\{y(x) \to c_1 D_{\frac{a-1}{2}}\left(\sqrt{2}x\right) + c_2 D_{\frac{1}{2}(-a-1)}\left(i\sqrt{2}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.125 (sec), leaf count = 29

$$\left\{y(x) = 1\left(\_C2\, W_{\frac{a}{4},\frac{1}{4}}\left(x^2\right) + \_C1\, M_{\frac{a}{4},\frac{1}{4}}\left(x^2\right)\right)\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[(a - x^2)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]*ParabolicCylinderD[(-1 - a)/2, I*Sqrt[2]*x] + C[1]*ParabolicCylin
derD[(-1 + a)/2, Sqrt[2]*x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(-x^2+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*WhittakerW(1/4*a,1/4,x^2)+_C1*WhittakerM(1/4*a,1/4,x^2))/x^(1/2)
```

4.1211 $y''(x) = (a + x^2)\, y(x)$

ODE

$$y''(x) = (a + x^2)\, y(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00515818 (sec), leaf count = 47

$$\left\{\left\{y(x) \to c_1 D_{\frac{1}{2}(-a-1)}\left(\sqrt{2}x\right) + c_2 D_{\frac{a-1}{2}}\left(i\sqrt{2}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.128 (sec), leaf count = 29

$$\left\{y(x) = 1\left(\_C2\, W_{-\frac{a}{4},\frac{1}{4}}\left(x^2\right) + \_C1\, M_{-\frac{a}{4},\frac{1}{4}}\left(x^2\right)\right)\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[y''[x] == (a + x^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*ParabolicCylinderD[(-1 - a)/2, Sqrt[2]*x] + C[2]*ParabolicCylinde
rD[(-1 + a)/2, I*Sqrt[2]*x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = (x^2+a)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*WhittakerW(-1/4*a,1/4,x^2)+_C1*WhittakerM(-1/4*a,1/4,x^2))/x^(1/2)
```

4.1212 $y(x)\left(a+b^2x^2\right)+y''(x)=0$

ODE

$$y(x)\left(a+b^2x^2\right)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.013713 (sec), leaf count = 62

$$\left\{\left\{y(x)\to c_2 D_{\frac{ia}{2b}-\frac{1}{2}}\left((-1+i)\sqrt{b}x\right)+c_1 D_{-\frac{ia+b}{2b}}\left((1+i)\sqrt{b}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.143 (sec), leaf count = 45

$$\left\{y(x)=1\left(\_C2\,W_{-\frac{i}{4}\frac{a}{b},\frac{1}{4}}\left(ibx^2\right)+\_C1\,M_{-\frac{i}{4}\frac{a}{b},\frac{1}{4}}\left(ibx^2\right)\right)\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[(a + b^2*x^2)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]*ParabolicCylinderD[-1/2 + ((I/2)*a)/b, (-1 + I)*Sqrt[b]*x] + C[1]
*ParabolicCylinderD[-(I*a + b)/(2*b), (1 + I)*Sqrt[b]*x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(b^2*x^2+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*WhittakerW(-1/4*I*a/b,1/4,I*b*x^2)+_C1*WhittakerM(-1/4*I*a/b,1/4,I*b
*x^2))/x^(1/2)
```

4.1213 $y(x)\left(a+bx+cx^2\right)+y''(x)=0$

ODE

$$y(x)\left(a+bx+cx^2\right)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.025916 (sec), leaf count = 110

$$\left\{\left\{y(x)\to c_2 D_{\frac{-ib^2-4c^{3/2}+4iac}{8c^{3/2}}}\left(-\frac{\left(\frac{1}{2}-\frac{i}{2}\right)(b+2cx)}{c^{3/4}}\right)+c_1 D_{\frac{i\left(b^2+4ic^{3/2}-4ac\right)}{8c^{3/2}}}\left(\frac{\left(\frac{1}{2}+\frac{i}{2}\right)(b+2cx)}{c^{3/4}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.108 (sec), leaf count = 109

$$\left\{y(x)=\left(\_C2\,(2\,cx+b)\,{}_1\mathrm{F}_1\left(\frac{1}{16}\left(12\,c^{3/2}+4\,iac-ib^2\right)c^{-\frac{3}{2}};\ \frac{3}{2};\ \frac{i}{4}(2\,cx+b)^2\,c^{-\frac{3}{2}}\right)+\_C1\,{}_1\mathrm{F}_1\left(\frac{1}{16}\left(4\,c^{3/2}+4\,iac-ib^2\right)c^{-\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a + b*x + c*x^2)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]*ParabolicCylinderD[((-I)*b^2 + (4*I)*a*c - 4*c^(3/2))/(8*c^(3/2))
, ((-1/2 + I/2)*(b + 2*c*x))/c^(3/4)] + C[1]*ParabolicCylinderD[((I/8)*(b^2 - 4*
a*c + (4*I)*c^(3/2)))/c^(3/2), ((1/2 + I/2)*(b + 2*c*x))/c^(3/4)]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(c*x^2+b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*(2*c*x+b)*hypergeom([1/16*(12*c^(3/2)+4*I*a*c-I*b^2)/c^(3/2)],[3/2],
1/4*I*(2*c*x+b)^2/c^(3/2))+_C1*hypergeom([1/16*(4*c^(3/2)+4*I*a*c-I*b^2)/c^(3/2)
],[1/2],1/4*I*(2*c*x+b)^2/c^(3/2)))*exp(-1/2*I*x*(c*x+b)/c^(1/2))
```

4.1214 $y(x)\left(\mathbf{a0}+\mathbf{a1}x^2+x^4\right)+y''(x)=0$

ODE

$$y(x)\left(\mathrm{a0}+\mathrm{a1}x^2+x^4\right)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.723731 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{\left(x^4+\mathrm{a1}x^2+\mathrm{a0}\right)y(x)+y''(x)=0,y(0)=c_1,y'(0)=c_2\right\}\right)(x)\right\}\right\}$$

Maple ✓
cpu = 0.294 (sec), leaf count = 109

$$\left\{y(x)=\_C1\,\mathrm{e}^{\frac{i}{6}x\left(2x^2+3\,a1\right)}\,HeunT\left(\frac{\left(a1^2-4\,a0\right)3^{\frac{2}{3}}\sqrt[3]{2}}{8},0,-\frac{a1\,2^{\frac{2}{3}}\sqrt[3]{3}}{2},\frac{i}{3}\sqrt[3]{2}3^{\frac{2}{3}}x\right)+\_C2\,HeunT\left(\frac{\left(a1^2-4\,a0\right)3^{\frac{2}{3}}\sqrt[3]{2}}{8},0\right.\right.$$

Mathematica raw input

```
DSolve[(a0 + a1*x^2 + x^4)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(\[FormalX]^4 + a
0 + \[FormalX]^2*a1)*\[FormalY][\[FormalX]] + Derivative[2][\[FormalY]][\[Formal
X]] == 0, \[FormalY][0] == C[1], Derivative[1][\[FormalY]][0] == C[2]}]][x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(x^4+a1*x^2+a0)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(1/6*I*x*(2*x^2+3*a1))*HeunT(1/8*(a1^2-4*a0)*3^(2/3)*2^(1/3),0,-1/
2*a1*2^(2/3)*3^(1/3),1/3*I*2^(1/3)*3^(2/3)*x)+_C2*HeunT(1/8*(a1^2-4*a0)*3^(2/3)*
2^(1/3),0,-1/2*a1*2^(2/3)*3^(1/3),-1/3*I*2^(1/3)*3^(2/3)*x)*exp(-1/6*I*x*(2*x^2+
3*a1))
```

4.1215 $ax^k y(x) + y''(x) = 0$

ODE

$$ax^k y(x) + y''(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0699298 (sec), leaf count = 112

$$\left\{\left\{y(x) \to (k+2)^{-\frac{1}{k+2}} \sqrt{x} a^{\frac{1}{2k+4}} \left(c_1 \Gamma\left(\frac{k+1}{k+2}\right) J_{-\frac{1}{k+2}}\left(\frac{2\sqrt{a} x^{\frac{k}{2}+1}}{k+2}\right) + c_2 \Gamma\left(1+\frac{1}{k+2}\right) J_{\frac{1}{k+2}}\left(\frac{2\sqrt{a} x^{\frac{k}{2}+1}}{k+2}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.141 (sec), leaf count = 59

$$\left\{y(x) = \sqrt{x}\left(Y_{(k+2)^{-1}}\left(2\,\frac{\sqrt{a} x^{k/2+1}}{k+2}\right)\_C2 + J_{(k+2)^{-1}}\left(2\,\frac{\sqrt{a} x^{k/2+1}}{k+2}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[a*x^k*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a^(4 + 2*k)^(-1)*Sqrt[x]*(BesselJ[-(2 + k)^(-1), (2*Sqrt[a]*x^(1 + k/
2))/(2 + k)]*C[1]*Gamma[(1 + k)/(2 + k)] + BesselJ[(2 + k)^(-1), (2*Sqrt[a]*x^(1
 + k/2))/(2 + k)]*C[2]*Gamma[1 + (2 + k)^(-1)]))/(2 + k)^(2 + k)^(-1)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*x^k*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(BesselY(1/(k+2),2*a^(1/2)*x^(1/2*k+1)/(k+2))*_C2+BesselJ(1/(k+2)
,2*a^(1/2)*x^(1/2*k+1)/(k+2))*_C1)
```

4.1216 $y(x)\left(\mathbf{a0}+\mathbf{a1}x+\mathbf{a2}x^2+\mathbf{a3}x^3+\mathbf{a4}x^4+x^8\right)+y''(x)=0$

ODE

$$y(x)\left(\mathrm{a0}+\mathrm{a1}x+\mathrm{a2}x^2+\mathrm{a3}x^3+\mathrm{a4}x^4+x^8\right)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 2.13896 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{\left(x^8+\mathrm{a4}x^4+\mathrm{a3}x^3+\mathrm{a2}x^2+\mathrm{a1}x+\mathrm{a0}\right)y(x)+y''(x)=0,y(0)=c_1,y'(0)=c_2\right\}\right)(x)\right\}\right\}$$

Maple ✗
cpu = 1.177 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)+\sum_{n=0}^{m}a(n)\,x^n\_Y(x)\right\},\{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[(a0 + a1*x + a2*x^2 + a3*x^3 + a4*x^4 + x^8)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(\[FormalX]^8 + a
0 + \[FormalX]*a1 + \[FormalX]^2*a2 + \[FormalX]^3*a3 + \[FormalX]^4*a4)*\[Forma
lY][\[FormalX]] + Derivative[2][\[FormalY]][\[FormalX]] == 0, \[FormalY][0] == C
[1], Derivative[1][\[FormalY]][0] == C[2]}]][x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+sum(a(n)*x^n,n = 0 .. m)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+sum(a(n)*x^n,n = 0 .. m)*_Y(x)},{_Y(x)})
```

4.1217 $y(x)(a+b\cos(2x))+y''(x)=0$

ODE

$$y(x)(a+b\cos(2x))+y''(x)=0$$

ODE Classification

[_ellipsoidal]

Book solution method
TO DO

Mathematica ✓
cpu = 0.025772 (sec), leaf count = 28

$$\left\{\left\{y(x)\to c_1\text{MathieuC}\left[a,-\frac{b}{2},x\right]+c_2\text{MathieuS}\left[a,-\frac{b}{2},x\right]\right\}\right\}$$

Maple ✓
cpu = 0.396 (sec), leaf count = 21

$$\left\{y(x)=\_C1\ MathieuC\left(a,-\frac{b}{2},x\right)+\_C2\ MathieuS\left(a,-\frac{b}{2},x\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*Cos[2*x])*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*MathieuC[a, -b/2, x] + C[2]*MathieuS[a, -b/2, x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(a+b*cos(2*x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*MathieuC(a,-1/2*b,x)+_C2*MathieuS(a,-1/2*b,x)
```

4.1218 $y(x)(a+b\cos(2x)+k\cos(4x))+y''(x)=0$

ODE

$$y(x)(a+b\cos(2x)+k\cos(4x))+y''(x)=0$$

ODE Classification

[_ellipsoidal]

Book solution method
TO DO

Mathematica ✗
cpu = 0.750669 (sec), leaf count = 0 , could not solve

```
DSolve[(a + b*Cos[2*x] + k*Cos[4*x])*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.446 (sec), leaf count = 82

$$\left\{y(x)=\mathrm{e}^{\sqrt{2}\sqrt{k}(\cos(x))^2}\left(\cos(x)\,HeunC\left(2\sqrt{2}\sqrt{k},\frac{1}{2},-\frac{1}{2},-\frac{b}{2},\frac{3}{8}-\frac{a}{4}+\frac{b}{4}-\frac{k}{4},(\cos(x))^2\right)\_C2+HeunC\left(2\sqrt{2}\sqrt{k},-\frac{1}{2},-\frac{1}{2}\right.\right.$$

Mathematica raw input

```
DSolve[(a + b*Cos[2*x] + k*Cos[4*x])*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[(a + b*Cos[2*x] + k*Cos[4*x])*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(a+b*cos(2*x)+k*cos(4*x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(2^(1/2)*k^(1/2)*cos(x)^2)*(cos(x)*HeunC(2*2^(1/2)*k^(1/2),1/2,-1/2,-1
/2*b,3/8-1/4*a+1/4*b-1/4*k,cos(x)^2)*_C2+HeunC(2*2^(1/2)*k^(1/2),-1/2,-1/2,-1/2*
b,3/8-1/4*a+1/4*b-1/4*k,cos(x)^2)*_C1)
```

4.1219 $y(x)\left(\sum_{n=0}^{m} a(n)\cos(2nx)\right)+y''(x)=0$

ODE

$$y(x)\left(\sum_{n=0}^{m} a(n)\cos(2nx)\right)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 2.30941 (sec), leaf count = 0 , could not solve

```
DSolve[Sum[a[n]*Cos[2*n*x], {n, 0, m}]*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 2.187 (sec), leaf count = 45

$$\left\{y(x)=\_C1\ MathieuC\left(0,-\frac{\sum_{n=0}^{m} a(n)}{2n^2},nx\right)+\_C2\ MathieuS\left(0,-\frac{\sum_{n=0}^{m} a(n)}{2n^2},nx\right)\right\}$$

Mathematica raw input

```
DSolve[Sum[a[n]*Cos[2*n*x], {n, 0, m}]*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[Sum[a[n]*Cos[2*n*x], {n, 0, m}]*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+sum(a(n)*cos(2*n*x),n = 0 .. m)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*MathieuC(0,-1/2*sum(a(n),n = 0 .. m)/n^2,n*x)+_C2*MathieuS(0,-1/2*sum
(a(n),n = 0 .. m)/n^2,n*x)
```

4.1220 $y''(x) = 2y(x)\csc^2(x)$

ODE

$$y''(x) = 2y(x)\csc^2(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0846629 (sec), leaf count = 54

$$\left\{\left\{y(x) \to \frac{\cos(x)\left(c_2 \log\left(\sqrt{-\sin^2(x)} + \cos(x)\right) + c_1\right) - c_2\sqrt{-\sin^2(x)}}{\sqrt{-\sin^2(x)}}\right\}\right\}$$

Maple ✓
cpu = 0.248 (sec), leaf count = 50

$$\left\{y(x) = \frac{i\ln\left(\cos\left(2x\right) + i\sin\left(2x\right)\right)\sin\left(2x\right)\_C2 + \_C1\ \sin\left(2x\right) - 2\_C2\left(-1 + \cos\left(2x\right)\right)}{-1 + \cos\left(2x\right)}\right\}$$

Mathematica raw input

```
DSolve[y''[x] == 2*Csc[x]^2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Cos[x]*(C[1] + C[2]*Log[Cos[x] + Sqrt[-Sin[x]^2]]) - C[2]*Sqrt[-Sin[x
]^2])/Sqrt[-Sin[x]^2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = 2*y(x)*csc(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = (I*ln(cos(2*x)+I*sin(2*x))*sin(2*x)*_C2+_C1*sin(2*x)-2*_C2*(-1+cos(2*x)))
/(-1+cos(2*x))
```

4.1221 $ay(x)\csc^2(x) + y''(x) = 0$

ODE

$$ay(x)\csc^2(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0805149 (sec), leaf count = 61

$$\left\{\left\{y(x) \to \sqrt[4]{-\sin^2(x)}\left(c_1 P_{-\frac{1}{2}}^{\frac{1}{2}\sqrt{1-4a}}(\cos(x)) + c_2 Q_{-\frac{1}{2}}^{\frac{1}{2}\sqrt{1-4a}}(\cos(x))\right)\right\}\right\}$$

Maple ✓
cpu = 0.345 (sec), leaf count = 132

$$\left\{y(x) = 1\sqrt[4]{2\cos(2x)+2}\left(\frac{\cos(2x)}{2} - \frac{1}{2}\right)^{\frac{1}{4}\sqrt{1-4a}}\sqrt{-2\cos(2x)+2}\left(\sqrt{2\cos(2x)+2}\,{}_2\mathrm{F}_1\left(\frac{1}{4}\sqrt{1-4a} + \frac{3}{4}, \frac{1}{4}\sqrt{1-4a} + \right.\right.\right.$$

Mathematica raw input

```
DSolve[a*Csc[x]^2*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*LegendreP[-1/2, Sqrt[1 - 4*a]/2, Cos[x]] + C[2]*LegendreQ[-1/2,
Sqrt[1 - 4*a]/2, Cos[x]])*(-Sin[x]^2)^(1/4)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*y(x)*csc(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (2*cos(2*x)+2)^(1/4)*(1/2*cos(2*x)-1/2)^(1/4*(1-4*a)^(1/2))*(-2*cos(2*x)+
2)^(1/2)*((2*cos(2*x)+2)^(1/2)*hypergeom([1/4*(1-4*a)^(1/2)+3/4, 1/4*(1-4*a)^(1/
2)+3/4],[3/2],1/2*cos(2*x)+1/2)*_C2+hypergeom([1/4*(1-4*a)^(1/2)+1/4, 1/4*(1-4*a
)^(1/2)+1/4],[1/2],1/2*cos(2*x)+1/2)*_C1)/sin(2*x)^(1/2)
```

4.1222 $y(x)\left(\mathbf{a0}+\mathbf{a1}\cos^2(x)+\mathbf{a2}\csc^2(x)\right)+y''(x)=0$

ODE

$$y(x)\left(\mathrm{a0}+\mathrm{a1}\cos^2(x)+\mathrm{a2}\csc^2(x)\right)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.41209 (sec), leaf count = 0 , could not solve

```
DSolve[(a0 + a1*Cos[x]^2 + a2*Csc[x]^2)*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.37 (sec), leaf count = 80

$$\left\{y(x)=(\sin(x))^{\frac{1}{2}+\frac{1}{2}\sqrt{-4\,a2+1}}\left(\cos(x)\,HeunC\left(0,\frac{1}{2},\frac{1}{2}\sqrt{-4\,a2+1},-\frac{a1}{4},\frac{3}{8}-\frac{a0}{4}-\frac{a2}{4},(\cos(x))^2\right)\_C2+HeunC\left(0,-\frac{1}{2}\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a0 + a1*Cos[x]^2 + a2*Csc[x]^2)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[(a0 + a1*Cos[x]^2 + a2*Csc[x]^2)*y[x] + Derivative[2][y][x] == 0, y[x], x
]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(a0+a1*cos(x)^2+a2*csc(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)^(1/2+1/2*(-4*a2+1)^(1/2))*(cos(x)*HeunC(0,1/2,1/2*(-4*a2+1)^(1/2),
-1/4*a1,3/8-1/4*a0-1/4*a2,cos(x)^2)*_C2+HeunC(0,-1/2,1/2*(-4*a2+1)^(1/2),-1/4*a1
,3/8-1/4*a0-1/4*a2,cos(x)^2)*_C1)
```

4.1223 $y''(x) = y(x)\left(a^2 + (p-1)p\csc^2(x) + (q-1)q\sec^2(x)\right)$

ODE

$$y''(x) = y(x)\left(a^2 + (p-1)p\csc^2(x) + (q-1)q\sec^2(x)\right)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.890018 (sec), leaf count = 146

$$\left\{\left\{y(x) \to \frac{(-1)^{-q}\left(-\sin^2(x)\right)^{p/2}\cos^2(x)^{-\frac{q}{2}-\frac{1}{4}}\left(c_1(-1)^q\cos^2(x)^{q+\frac{1}{2}}\,{}_2F_1\left(\frac{1}{2}(-ia+p+q),\frac{1}{2}(ia+p+q);q+\frac{1}{2};\cos^2(x)\right)+i\right.\right.}{\sqrt{\cos(x)}}$$

Maple ✓
cpu = 0.348 (sec), leaf count = 94

$$\left\{y(x) = (\sin(x))^p\left((\cos(x))^{-q+1}\,{}_2\mathrm{F}_1\left(\frac{p}{2}-\frac{q}{2}+\frac{i}{2}a+\frac{1}{2},\frac{p}{2}-\frac{q}{2}-\frac{i}{2}a+\frac{1}{2};\frac{3}{2}-q;(\cos(x))^2\right)\_C2+(\cos(x))^q\,{}_2\mathrm{F}_1\left(\frac{p}{2}+\frac{q}{2}+\right.\right.$$

Mathematica raw input

```
DSolve[y''[x] == (a^2 + (-1 + p)*p*Csc[x]^2 + (-1 + q)*q*Sec[x]^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((Cos[x]^2)^(-1/4 - q/2)*(I*C[2]*Cos[x]^2*Hypergeometric2F1[(1 - I*a +
  p - q)/2, (1 + I*a + p - q)/2, 3/2 - q, Cos[x]^2] + (-1)^q*C[1]*(Cos[x]^2)^(1/2
  + q)*Hypergeometric2F1[((-I)*a + p + q)/2, (I*a + p + q)/2, 1/2 + q, Cos[x]^2])
*(-Sin[x]^2)^(p/2))/((-1)^q*Sqrt[Cos[x]])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = (a^2+p*(p-1)*csc(x)^2+q*(q-1)*sec(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)^p*(cos(x)^(-q+1)*hypergeom([1/2*p-1/2*q+1/2*I*a+1/2, 1/2*p-1/2*q-1
/2*I*a+1/2],[3/2-q],cos(x)^2)*_C2+cos(x)^q*hypergeom([1/2*p+1/2*q+1/2*I*a, 1/2*p
+1/2*q-1/2*I*a],[1/2+q],cos(x)^2)*_C1)
```

4.1224 $y(x)\left(a+b\sin^2(x)\right)+y''(x)=0$

ODE

$$y(x)\left(a+b\sin^2(x)\right)+y''(x)=0$$

ODE Classification

[_ellipsoidal]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0327791 (sec), leaf count = 40

$$\left\{\left\{y(x)\to c_1\text{MathieuC}\left[a+\frac{b}{2},\frac{b}{4},x\right]+c_2\text{MathieuS}\left[a+\frac{b}{2},\frac{b}{4},x\right]\right\}\right\}$$

Maple ✓
cpu = 0.302 (sec), leaf count = 29

$$\left\{y(x)=\_C1\ MathieuC\left(\frac{b}{2}+a,\frac{b}{4},x\right)+\_C2\ MathieuS\left(\frac{b}{2}+a,\frac{b}{4},x\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*Sin[x]^2)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*MathieuC[a + b/2, b/4, x] + C[2]*MathieuS[a + b/2, b/4, x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(a+b*sin(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*MathieuC(1/2*b+a,1/4*b,x)+_C2*MathieuS(1/2*b+a,1/4*b,x)
```

4.1225 $y''(x) = y(x)\left(2\tan^2(x)+1\right)$

ODE

$$y''(x) = y(x)\left(2\tan^2(x)+1\right)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.153532 (sec), leaf count = 54

$$\left\{\left\{y(x)\to \frac{\sqrt[4]{\sin^2(x)}\left(-c_2\sqrt{\sin^2(x)}+2c_1\sec(x)+c_2\sec(x)\sin^{-1}(\cos(x))\right)}{2\sqrt[4]{-\sin^2(x)}}\right\}\right\}$$

Maple ✓
cpu = 0.15 (sec), leaf count = 30

$$\left\{y(x) = \frac{i\sin(x)\cos(x)\_C2+\ln(\cos(x)+i\sin(x))\_C2+\_C1}{\cos(x)}\right\}$$

Mathematica raw input

```
DSolve[y''[x] == (1 + 2*Tan[x]^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((Sin[x]^2)^(1/4)*(2*C[1]*Sec[x] + ArcSin[Cos[x]]*C[2]*Sec[x] - C[2]*S
qrt[Sin[x]^2]))/(2*(-Sin[x]^2)^(1/4))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = (1+2*tan(x)^2)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (I*sin(x)*cos(x)*_C2+ln(cos(x)+I*sin(x))*_C2+_C1)/cos(x)
```

4.1226 $y''(x) - y(x)\left(a^2 - be^x\right) = 0$

ODE

$$y''(x) - y(x)\left(a^2 - be^x\right) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0280964 (sec), leaf count = 60

$$\left\{\left\{y(x) \to c_1\Gamma(1-2a)J_{-2a}\left(2\sqrt{b}\sqrt{e^x}\right) + c_2\Gamma(2a+1)J_{2a}\left(2\sqrt{b}\sqrt{e^x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.074 (sec), leaf count = 35

$$\left\{y(x) = \_C1\, J_{2\,a}\left(2\sqrt{b}e^{x/2}\right) + \_C2\, Y_{2\,a}\left(2\sqrt{b}e^{x/2}\right)\right\}$$

Mathematica raw input

```
DSolve[-((a^2 - b*E^x)*y[x]) + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselJ[-2*a, 2*Sqrt[b]*Sqrt[E^x]]*C[1]*Gamma[1 - 2*a] + BesselJ[2*a,
2*Sqrt[b]*Sqrt[E^x]]*C[2]*Gamma[1 + 2*a]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-(a^2-b*exp(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselJ(2*a,2*b^(1/2)*exp(1/2*x))+_C2*BesselY(2*a,2*b^(1/2)*exp(1/2*x
))
```

4.1227 $y''(x) - (a^2 - e^{2x})\, y(x) = 0$

ODE

$$y''(x) - \left(a^2 - e^{2x}\right) y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0278276 (sec), leaf count = 46

$$\left\{\left\{y(x) \to c_1 \Gamma(1-a) J_{-a}\left(\sqrt{e^{2x}}\right) + c_2 \Gamma(a+1) J_a\left(\sqrt{e^{2x}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.061 (sec), leaf count = 17

$$\{y(x) = \_C1\ J_a(\mathrm{e}^x) + \_C2\ Y_a(\mathrm{e}^x)\}$$

Mathematica raw input

```
DSolve[-((a^2 - E^(2*x))*y[x]) + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselJ[-a, Sqrt[E^(2*x)]]*C[1]*Gamma[1 - a] + BesselJ[a, Sqrt[E^(2*x)
]]*C[2]*Gamma[1 + a]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-(a^2-exp(2*x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselJ(a,exp(x))+_C2*BesselY(a,exp(x))
```

4.1228 $y(x)\left(a+be^{x}+ce^{2x}\right)+y''(x)=0$

ODE

$$y(x)\left(a+be^{x}+ce^{2x}\right)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.656868 (sec), leaf count = 136

$$\left\{\left\{y(x)\to (e^{x})^{i\sqrt{a}}\,e^{-i\sqrt{c}e^{x}}\left(c_1 U\left(\frac{ib}{2\sqrt{c}}+i\sqrt{a}+\frac{1}{2},2i\sqrt{a}+1,2i\sqrt{c}e^{x}\right)+c_2 L^{2i\sqrt{a}}_{-i\sqrt{a}-\frac{ib}{2\sqrt{c}}-\frac{1}{2}}\left(2i\sqrt{c}e^{x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.375 (sec), leaf count = 58

$$\left\{y(x)=\mathrm{e}^{-\frac{x}{2}}\left(W_{-\frac{i}{2}b\frac{1}{\sqrt{c}},i\sqrt{a}}\left(2\,i\sqrt{c}\mathrm{e}^{x}\right)\_C2+M_{-\frac{i}{2}b\frac{1}{\sqrt{c}},i\sqrt{a}}\left(2\,i\sqrt{c}\mathrm{e}^{x}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*E^x + c*E^(2*x))*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((E^x)^(I*Sqrt[a])*(C[1]*HypergeometricU[1/2 + I*Sqrt[a] + ((I/2)*b)/S
qrt[c], 1 + (2*I)*Sqrt[a], (2*I)*Sqrt[c]*E^x] + C[2]*LaguerreL[-1/2 - I*Sqrt[a]
- ((I/2)*b)/Sqrt[c], (2*I)*Sqrt[a], (2*I)*Sqrt[c]*E^x]))/E^(I*Sqrt[c]*E^x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(a+b*exp(x)+c*exp(2*x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*x)*(WhittakerW(-1/2*I*b/c^(1/2),I*a^(1/2),2*I*c^(1/2)*exp(x))*_C
2+WhittakerM(-1/2*I*b/c^(1/2),I*a^(1/2),2*I*c^(1/2)*exp(x))*_C1)
```

4.1229 $ae^{bx}y(x)+y''(x)=0$

ODE

$$ae^{bx}y(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0317967 (sec), leaf count = 55

$$\left\{\left\{y(x)\to c_1 J_0\left(\frac{2\sqrt{a}\sqrt{e^{bx}}}{b}\right)+2c_2 Y_0\left(\frac{2\sqrt{a}\sqrt{e^{bx}}}{b}\right)\right\}\right\}$$

Maple ✓
cpu = 0.129 (sec), leaf count = 39

$$\left\{y(x)=\_C1\ J_0\left(2\,\frac{\sqrt{a}e^{1/2\,bx}}{b}\right)+\_C2\ Y_0\left(2\,\frac{\sqrt{a}e^{1/2\,bx}}{b}\right)\right\}$$

Mathematica raw input

```
DSolve[a*E^(b*x)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselJ[0, (2*Sqrt[a]*Sqrt[E^(b*x)])/b]*C[1] + 2*BesselY[0, (2*Sqrt[a]
*Sqrt[E^(b*x)])/b]*C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*exp(b*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselJ(0,2/b*a^(1/2)*exp(1/2*b*x))+_C2*BesselY(0,2/b*a^(1/2)*exp(1/2
*b*x))
```

4.1230 $y(x)\left(a+b\cosh^2(x)\right)+y''(x)=0$

ODE

$$y(x)\left(a+b\cosh^2(x)\right)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0333032 (sec), leaf count = 53

$$\left\{\left\{y(x)\to c_1\text{MathieuC}\left[-a-\frac{b}{2},\frac{b}{4},ix\right]-c_2\text{MathieuS}\left[-a-\frac{b}{2},\frac{b}{4},ix\right]\right\}\right\}$$

Maple ✓
cpu = 0.339 (sec), leaf count = 39

$$\left\{y(x)=\_C1\ MathieuC\left(-\frac{b}{2}-a,\frac{b}{4},ix\right)+\_C2\ MathieuS\left(-\frac{b}{2}-a,\frac{b}{4},ix\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*Cosh[x]^2)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*MathieuC[-a - b/2, b/4, I*x] - C[2]*MathieuS[-a - b/2, b/4, I*x]}
}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(a+b*cosh(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*MathieuC(-1/2*b-a,1/4*b,I*x)+_C2*MathieuS(-1/2*b-a,1/4*b,I*x)
```

4.1231 $y(x)\left(a+b\sinh^2(x)\right)+y''(x)=0$

ODE

$$y(x)\left(a+b\sinh^2(x)\right)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.031149 (sec), leaf count = 53

$$\left\{\left\{y(x)\to c_1\text{MathieuC}\left[\frac{1}{2}(b-2a),\frac{b}{4},ix\right]-c_2\text{MathieuS}\left[\frac{1}{2}(b-2a),\frac{b}{4},ix\right]\right\}\right\}$$

Maple ✓
cpu = 0.599 (sec), leaf count = 39

$$\left\{y(x)=\_C1\ MathieuC\left(\frac{b}{2}-a,\frac{b}{4},ix\right)+\_C2\ MathieuS\left(\frac{b}{2}-a,\frac{b}{4},ix\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*Sinh[x]^2)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*MathieuC[(-2*a + b)/2, b/4, I*x] - C[2]*MathieuS[(-2*a + b)/2, b/
4, I*x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(a+b*sinh(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*MathieuC(1/2*b-a,1/4*b,I*x)+_C2*MathieuS(1/2*b-a,1/4*b,I*x)
```

4.1232 $y(x)\left(a+b\sin^2(x)\right)+y''(x)=0$

ODE

$$y(x)\left(a+b\sin^2(x)\right)+y''(x)=0$$

ODE Classification

[_ellipsoidal]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0147203 (sec), leaf count = 40

$$\left\{\left\{y(x)\to c_1\text{MathieuC}\left[a+\frac{b}{2},\frac{b}{4},x\right]+c_2\text{MathieuS}\left[a+\frac{b}{2},\frac{b}{4},x\right]\right\}\right\}$$

Maple ✓
cpu = 0.264 (sec), leaf count = 29

$$\left\{y(x)=\_C1\ MathieuC\left(\frac{b}{2}+a,\frac{b}{4},x\right)+\_C2\ MathieuS\left(\frac{b}{2}+a,\frac{b}{4},x\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*Sin[x]^2)*y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*MathieuC[a + b/2, b/4, x] + C[2]*MathieuS[a + b/2, b/4, x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(a+b*sin(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*MathieuC(1/2*b+a,1/4*b,x)+_C2*MathieuS(1/2*b+a,1/4*b,x)
```

4.1233 $\frac{(a+b)y(x)}{x^2} + y''(x) = 0$

ODE

$$\frac{(a+b)y(x)}{x^2} + y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0167078 (sec), leaf count = 61

$$\left\{\left\{y(x) \to x^{\frac{1}{2}\left(1-\sqrt{a+b}\sqrt{\frac{1}{a+b}-4}\right)}\left(c_2 x^{\sqrt{a+b}\sqrt{\frac{1}{a+b}-4}} + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 1.219 (sec), leaf count = 47

$$\left\{y(x) = \_C1\,(WeierstrassP(x,0,0))^{-\frac{1}{4}-\frac{1}{4}\sqrt{1-4\,a-4\,b}} + \_C2\,(WeierstrassP(x,0,0))^{-\frac{1}{4}+\frac{1}{4}\sqrt{1-4\,a-4\,b}}\right\}$$

Mathematica raw input

```
DSolve[((a + b)*y[x])/x^2 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^((1 - Sqrt[a + b]*Sqrt[-4 + (a + b)^(-1)])/2)*(C[1] + x^(Sqrt[a + b]
*Sqrt[-4 + (a + b)^(-1)])*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(a+b)*WeierstrassP(x,0,0)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*WeierstrassP(x,0,0)^(-1/4-1/4*(1-4*a-4*b)^(1/2))+_C2*WeierstrassP(x,0
,0)^(-1/4+1/4*(1-4*a-4*b)^(1/2))
```

4.1234 $y''(x) - y'(x) + xy(x) = 0$

ODE

$$y''(x) - y'(x) + xy(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0157907 (sec), leaf count = 50

$$\left\{\left\{y(x) \to e^{x/2}\left(c_1 \text{Ai}\left(\frac{1}{4}\sqrt[3]{-1}(4x-1)\right) + c_2 \text{Bi}\left(\frac{1}{4}\sqrt[3]{-1}(4x-1)\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.056 (sec), leaf count = 26

$$\left\{y(x) = \text{e}^{\frac{x}{2}}\left(\text{Bi}\left(\frac{1}{4}-x\right)\_C2 + \text{Ai}\left(\frac{1}{4}-x\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[x*y[x] - y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x/2)*(AiryAi[((-1)^(1/3)*(-1 + 4*x))/4]*C[1] + AiryBi[((-1)^(1/3)*(
-1 + 4*x))/4]*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-diff(y(x),x)+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(1/2*x)*(AiryBi(1/4-x)*_C2+AiryAi(1/4-x)*_C1)
```

4.1235 $y''(x) + 2y'(x) + y(x) = 0$

ODE

$$y''(x) + 2y'(x) + y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00649604 (sec), leaf count = 18

$$\{\{y(x) \to e^{-x}(c_2 x + c_1)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 14

$$\{y(x) = \mathrm{e}^{-x}(\_C2\, x + \_C1)\}$$

Mathematica raw input

```
DSolve[y[x] + 2*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2])/E^x}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x)*(_C2*x+_C1)
```

4.1236 $y''(x) - 2y'(x) + y(x) = (x-6)x^2$

ODE

$$y''(x) - 2y'(x) + y(x) = (x-6)x^2$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00545256 (sec), leaf count = 26

$$\{\{y(x) \to x(c_2 e^x - 6) + c_1 e^x + x^3 - 12\}\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 20

$$\{y(x) = (\_C1\, x + \_C2)\, \mathrm{e}^x + x^3 - 6\, x - 12\}$$

Mathematica raw input

```
DSolve[y[x] - 2*y'[x] + y''[x] == (-6 + x)*x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -12 + x^3 + E^x*C[1] + x*(-6 + E^x*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*diff(y(x),x)+y(x) = x^2*(x-6), y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x+_C2)*exp(x)+x^3-6*x-12
```

4.1237 $y''(x) - 2y'(x) + y(x) = e^x$

ODE

$$y''(x) - 2y'(x) + y(x) = e^x$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00676547 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{1}{2}e^x\left(2c_2x + 2c_1 + x^2\right)\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 19

$$\left\{y(x) = \frac{\mathrm{e}^x\left(2\_C1\,x + x^2 + 2\,\_C2\right)}{2}\right\}$$

Mathematica raw input

```
DSolve[y[x] - 2*y'[x] + y''[x] == E^x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*(x^2 + 2*C[1] + 2*x*C[2]))/2}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*diff(y(x),x)+y(x) = exp(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*exp(x)*(2*_C1*x+x^2+2*_C2)
```

4.1238 $y''(x) - 2y'(x) + y(x) = e^x(3x^2 + 2x + 1)$

ODE

$$y''(x) - 2y'(x) + y(x) = e^x\left(3x^2 + 2x + 1\right)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00968982 (sec), leaf count = 36

$$\left\{\left\{y(x) \to \frac{1}{12}e^x\left(12c_2x + 12c_1 + \left(3x^2 + 4x + 6\right)x^2\right)\right\}\right\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 29

$$\left\{y(x) = \frac{e^x}{4}\left(x^4 + \frac{4x^3}{3} + 2x^2 + 4\_C1\,x + 4\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[y[x] - 2*y'[x] + y''[x] == E^x*(1 + 2*x + 3*x^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*(x^2*(6 + 4*x + 3*x^2) + 12*C[1] + 12*x*C[2]))/12}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*diff(y(x),x)+y(x) = exp(x)*(3*x^2+2*x+1), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*exp(x)*(x^4+4/3*x^3+2*x^2+4*_C1*x+4*_C2)
```

4.1239 $y''(x) - 2y'(x) + y(x) = e^x \sin(x)$

ODE

$$y''(x) - 2y'(x) + y(x) = e^x \sin(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0128263 (sec), leaf count = 20

$$\{\{y(x) \to e^x(c_2 x + c_1 - \sin(x))\}\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 16

$$\{y(x) = \mathrm{e}^x(\_C1\, x + \_C2 - \sin(x))\}$$

Mathematica raw input

```
DSolve[y[x] - 2*y'[x] + y''[x] == E^x*Sin[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(C[1] + x*C[2] - Sin[x])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*diff(y(x),x)+y(x) = exp(x)*sin(x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(x)*(_C1*x+_C2-sin(x))
```

4.1240 $y''(x) + 2y'(x) + y(x) = x^2 + 3e^{2x} - \cos(x)$

ODE

$$y''(x) + 2y'(x) + y(x) = x^2 + 3e^{2x} - \cos(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0321189 (sec), leaf count = 41

$$\left\{\left\{y(x) \to e^{-x}(c_2 x + c_1) + x^2 - 4x + \frac{e^{2x}}{3} - \frac{\sin(x)}{2} + 6\right\}\right\}$$

Maple ✓
cpu = 0.035 (sec), leaf count = 35

$$\left\{y(x) = \mathrm{e}^{-x}\_C2 + x\mathrm{e}^{-x}\_C1 + x^2 - 4x + 6 - \frac{\sin(x)}{2} + \frac{\mathrm{e}^{2x}}{3}\right\}$$

Mathematica raw input

```
DSolve[y[x] + 2*y'[x] + y''[x] == 3*E^(2*x) + x^2 - Cos[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 6 + E^(2*x)/3 - 4*x + x^2 + (C[1] + x*C[2])/E^x - Sin[x]/2}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*diff(y(x),x)+y(x) = x^2-cos(x)+3*exp(2*x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x)*_C2+x*exp(-x)*_C1+x^2-4*x+6-1/2*sin(x)+1/3*exp(2*x)
```

4.1241 $y''(x) - 2y'(x) + y(x) = 8e^{3x}x^2$

ODE

$$y''(x) - 2y'(x) + y(x) = 8e^{3x}x^2$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0101736 (sec), leaf count = 32

$$\{\{y(x) \to e^x(c_2x + c_1 + e^{2x}(2x^2 - 4x + 3))\}\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 28

$$\{y(x) = (2x^2 - 4x + 3)\,\mathrm{e}^{3x} + \mathrm{e}^x(\_C1\,x + \_C2)\}$$

Mathematica raw input

```
DSolve[y[x] - 2*y'[x] + y''[x] == 8*E^(3*x)*x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(E^(2*x)*(3 - 4*x + 2*x^2) + C[1] + x*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*diff(y(x),x)+y(x) = 8*x^2*exp(3*x), y(x),'implicit')
```

Maple raw output

```
y(x) = (2*x^2-4*x+3)*exp(3*x)+exp(x)*(_C1*x+_C2)
```

4.1242 $y''(x) - 2y'(x) + y(x) = 50\cos(x)\cosh(x)$

ODE

$$y''(x) - 2y'(x) + y(x) = 50\cos(x)\cosh(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0312428 (sec), leaf count = 41

$$\{\{y(x) \to e^{-x}\left(e^{2x}(c_2 x + c_1) - 4\sin(x) + \left(3 - 25e^{2x}\right)\cos(x)\right)\}\}$$

Maple ✓
cpu = 0.084 (sec), leaf count = 31

$$\{y(x) = (3\cos(x) - 4\sin(x))\,\mathrm{e}^{-x} + \mathrm{e}^{x}(\_C1\,x + \_C2 - 25\cos(x))\}$$

Mathematica raw input

```
DSolve[y[x] - 2*y'[x] + y''[x] == 50*Cos[x]*Cosh[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(2*x)*(C[1] + x*C[2]) + (3 - 25*E^(2*x))*Cos[x] - 4*Sin[x])/E^x}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*diff(y(x),x)+y(x) = 50*cos(x)*cosh(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (3*cos(x)-4*sin(x))*exp(-x)+exp(x)*(_C1*x+_C2-25*cos(x))
```

4.1243 $y''(x) + 2y'(x) + 3y(x) = 0$

ODE

$$y''(x) + 2y'(x) + 3y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00548936 (sec), leaf count = 34

$$\left\{\left\{y(x) \to e^{-x}\left(c_1 \sin\left(\sqrt{2}x\right) + c_2 \cos\left(\sqrt{2}x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 26

$$\left\{y(x) = \mathrm{e}^{-x}\left(\sin\left(\sqrt{2}x\right) \_C1 + \cos\left(\sqrt{2}x\right) \_C2\right)\right\}$$

Mathematica raw input

```
DSolve[3*y[x] + 2*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[2]*Cos[Sqrt[2]*x] + C[1]*Sin[Sqrt[2]*x])/E^x}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*diff(y(x),x)+3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x)*(sin(2^(1/2)*x)*_C1+cos(2^(1/2)*x)*_C2)
```

4.1244 $y''(x) + 2y'(x) + y(x) = e^{-x}\cos(x)$

ODE

$$y''(x) + 2y'(x) + y(x) = e^{-x}\cos(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0164886 (sec), leaf count = 22

$$\{\{y(x) \to e^{-x}(c_2 x + c_1 - \cos(x))\}\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 18

$$\{y(x) = \mathrm{e}^{-x}(\_C1\, x + \_C2 - \cos(x))\}$$

Mathematica raw input

```
DSolve[y[x] + 2*y'[x] + y''[x] == Cos[x]/E^x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2] - Cos[x])/E^x}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*diff(y(x),x)+y(x) = exp(-x)*cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x)*(_C1*x+_C2-cos(x))
```

4.1245 $y''(x) + 2y'(x) + 5y(x) = 0$

ODE

$$y''(x) + 2y'(x) + 5y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00432781 (sec), leaf count = 26

$$\{\{y(x) \to e^{-x}(c_1 \sin(2x) + c_2 \cos(2x))\}\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 22

$$\{y(x) = \mathrm{e}^{-x}(\sin(2x)\_C1 + \cos(2x)\_C2)\}$$

Mathematica raw input

```
DSolve[5*y[x] + 2*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[2]*Cos[2*x] + C[1]*Sin[2*x])/E^x}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*diff(y(x),x)+5*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x)*(sin(2*x)*_C1+cos(2*x)*_C2)
```

4.1246 $y''(x) + 2y'(x) + 5y(x) = 8\sinh(x)$

ODE

$$y''(x) + 2y'(x) + 5y(x) = 8\sinh(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0293027 (sec), leaf count = 37

$$\left\{\left\{y(x) \to \frac{1}{2}e^{-x}\left(2c_1\sin(2x) + 2c_2\cos(2x) + e^{2x} - 2\right)\right\}\right\}$$

Maple ✓
cpu = 0.091 (sec), leaf count = 34

$$\left\{y(x) = \frac{((2\_C1 - 2)\cos(2x) + 2\_C2\ \sin(2x) - 2)\,\mathrm{e}^{-x}}{2} + \frac{\mathrm{e}^{x}}{2}\right\}$$

Mathematica raw input

```
DSolve[5*y[x] + 2*y'[x] + y''[x] == 8*Sinh[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2 + E^(2*x) + 2*C[2]*Cos[2*x] + 2*C[1]*Sin[2*x])/(2*E^x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*diff(y(x),x)+5*y(x) = 8*sinh(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*((2*_C1-2)*cos(2*x)+2*_C2*sin(2*x)-2)*exp(-x)+1/2*exp(x)
```

4.1247 $-2\tan(a)y'(x)+\csc^2(a)y(x)+y''(x)=0$

ODE

$$-2\tan(a)y'(x)+\csc^2(a)y(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0159926 (sec), leaf count = 58

$$\left\{\left\{y(x)\to c_1 e^{x\left(\tan(a)-\sqrt{\tan^2(a)-\csc^2(a)}\right)}+c_2 e^{x\left(\tan(a)+\sqrt{\tan^2(a)-\csc^2(a)}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.08 (sec), leaf count = 99

$$\left\{y(x)=\_C1\, \mathrm{e}^{-\frac{x}{(\sin(a))^3-\sin(a)}\left(\cos(a)(\sin(a))^2-\sqrt{-1+((\cos(a))^2-1)(\sin(a))^4+2(\sin(a))^2}\right)}+\_C2\, \mathrm{e}^{-\frac{x}{(\sin(a))^3-\sin(a)}\left(\cos(a)(\sin(a))^2+\sqrt{-1+}\right.\right.$$

Mathematica raw input

```
DSolve[Csc[a]^2*y[x] - 2*Tan[a]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x*(Tan[a] - Sqrt[-Csc[a]^2 + Tan[a]^2]))*C[1] + E^(x*(Tan[a] + Sqrt
[-Csc[a]^2 + Tan[a]^2]))*C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*diff(y(x),x)*tan(a)+y(x)*csc(a)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-(cos(a)*sin(a)^2-(-1+(cos(a)^2-1)*sin(a)^4+2*sin(a)^2)^(1/2))*x/
(sin(a)^3-sin(a)))+_C2*exp(-(cos(a)*sin(a)^2+(-1+(cos(a)^2-1)*sin(a)^4+2*sin(a)^
2)^(1/2))*x/(sin(a)^3-sin(a)))
```

4.1248 $-2\tan(a)y'(x)+\csc^2(a)y(x)+y''(x)=x^2e^{x\tan(a)}$

ODE

$$-2\tan(a)y'(x)+\csc^2(a)y(x)+y''(x)=x^2e^{x\tan(a)}$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.241353 (sec), leaf count = 250

$$\left\{\left\{y(x)\to \frac{64\cos^4(a)\exp\left(-x\sqrt{\frac{8\cos(2a)-\cos(4a)+1}{\cos(4a)-1}}\right)\left(\cos(2a)\tan^2(a)\left(2c_1e^{x\tan(a)}+2c_2e^{x\left(\tan(a)+2\sqrt{\tan^2(a)-\csc^2(a)}\right)}+x^2e^{x}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.105 (sec), leaf count = 181

$$\left\{y(x)=\mathrm{e}^{-\frac{x}{(\sin(a))^3-\sin(a)}\left(\cos(a)(\sin(a))^2-\sqrt{(\cos(a))^2(\sin(a))^4-(\sin(a))^4+2(\sin(a))^2-1}\right)}\_C2+\mathrm{e}^{-\frac{x}{(\sin(a))^3-\sin(a)}\left(\cos(a)(\sin(a))^2+\sqrt{(\cos(a)\right.}}\right.$$

Mathematica raw input

```
DSolve[Csc[a]^2*y[x] - 2*Tan[a]*y'[x] + y''[x] == E^(x*Tan[a])*x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (64*Cos[a]^4*((E^(x*Tan[a])*C[1] + E^(x*(Tan[a] + 2*Sqrt[-Csc[a]^2 + T
an[a]^2]))*C[2])*Cos[2*a]^2*Sec[a]^4 + (E^(x*(Tan[a] + Sqrt[-Csc[a]^2 + Tan[a]^2
]))*(-2 + x^2) + E^(x*Tan[a])*C[1] + E^(x*(Tan[a] + 2*Sqrt[-Csc[a]^2 + Tan[a]^2]
))*C[2])*Sin[a]^4 + (E^(x*(Tan[a] + Sqrt[-Csc[a]^2 + Tan[a]^2]))*x^2 + 2*E^(x*Ta
n[a])*C[1] + 2*E^(x*(Tan[a] + 2*Sqrt[-Csc[a]^2 + Tan[a]^2]))*C[2])*Cos[2*a]*Tan[
a]^2))/(E^(x*Sqrt[(1 + 8*Cos[2*a] - Cos[4*a])/(-1 + Cos[4*a])])*(-1 - 8*Cos[2*a]
 + Cos[4*a])^2)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*diff(y(x),x)*tan(a)+y(x)*csc(a)^2 = x^2*exp(x*tan(a)), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-(cos(a)*sin(a)^2-(cos(a)^2*sin(a)^4-sin(a)^4+2*sin(a)^2-1)^(1/2))*x/
(sin(a)^3-sin(a)))*_C2+exp(-(cos(a)*sin(a)^2+(cos(a)^2*sin(a)^4-sin(a)^4+2*sin(a
)^2-1)^(1/2))*x/(sin(a)^3-sin(a)))*_C1-(cos(a)^4*x^2-2*cos(a)^4-3*x^2*cos(a)^2+2
*cos(a)^2+x^2)*exp(x*sin(a)/cos(a))*cos(a)^2*sin(a)^2/(cos(a)^2+cos(a)-1)^2/(cos
(a)^2-cos(a)-1)^2
```

4.1249 $y''(x) + 3y'(x) + 2y(x) = 0$

ODE

$$y''(x) + 3y'(x) + 2y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00445741 (sec), leaf count = 20

$$\{\{y(x) \to e^{-2x}(c_2 e^x + c_1)\}\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 17

$$\{y(x) = \_C1\, \mathrm{e}^{-x} + \_C2\, \mathrm{e}^{-2x}\}$$

Mathematica raw input

```
DSolve[2*y[x] + 3*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + E^x*C[2])/E^(2*x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+3*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-x)+_C2*exp(-2*x)
```

4.1250 $y''(x) + 3y'(x) + 2y(x) = \cos(ax)$

ODE

$$y''(x) + 3y'(x) + 2y(x) = \cos(ax)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0239404 (sec), leaf count = 54

$$\left\{\left\{y(x) \to \frac{3a\sin(ax) - (a^2-2)\cos(ax)}{a^4+5a^2+4} + c_1 e^{-2x} + c_2 e^{-x}\right\}\right\}$$

Maple ✓
cpu = 0.085 (sec), leaf count = 81

$$\left\{y(x) = \frac{(-\_C1\,a^4 - 5\,\_C1\,a^2 - 4\,\_C1)\,\mathrm{e}^{-2x} + (a^4\_C2 + 5\,a^2\_C2 + 4\,\_C2)\,\mathrm{e}^{-x} - \cos(ax)\,a^2 + 3\,a\sin(ax) + 2\,\cos(ax}{a^4+5\,a^2+4}\right.$$

Mathematica raw input

```
DSolve[2*y[x] + 3*y'[x] + y''[x] == Cos[a*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(2*x) + C[2]/E^x + (-((-2 + a^2)*Cos[a*x]) + 3*a*Sin[a*x])/(4 +
  5*a^2 + a^4)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+3*diff(y(x),x)+2*y(x) = cos(a*x), y(x),'implicit')
```

Maple raw output

```
y(x) = ((-_C1*a^4-5*_C1*a^2-4*_C1)*exp(-2*x)+(_C2*a^4+5*_C2*a^2+4*_C2)*exp(-x)-c
os(a*x)*a^2+3*a*sin(a*x)+2*cos(a*x))/(a^4+5*a^2+4)
```

4.1251 $y''(x) + 3y'(x) + 2y(x) = e^x + \sin(x)$

ODE

$$y''(x) + 3y'(x) + 2y(x) = e^x + \sin(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0181714 (sec), leaf count = 40

$$\left\{\left\{y(x) \to c_1 e^{-2x} + c_2 e^{-x} + \frac{1}{30}(5e^x + 3\sin(x) - 9\cos(x))\right\}\right\}$$

Maple ✓
cpu = 0.051 (sec), leaf count = 30

$$\left\{y(x) = -\frac{3\cos(x)}{10} + \frac{\sin(x)}{10} + \frac{e^x}{6} - \_C1\, e^{-2x} + e^{-x}\_C2\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + 3*y'[x] + y''[x] == E^x + Sin[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(2*x) + C[2]/E^x + (5*E^x - 9*Cos[x] + 3*Sin[x])/30}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+3*diff(y(x),x)+2*y(x) = sin(x)+exp(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -3/10*cos(x)+1/10*sin(x)+1/6*exp(x)-_C1*exp(-2*x)+exp(-x)*_C2
```

4.1252 $y''(x) - 3y'(x) + 2y(x) = x^2 + 2e^{-x}$

ODE

$$y''(x) - 3y'(x) + 2y(x) = x^2 + 2e^{-x}$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.018117 (sec), leaf count = 43

$$\left\{\left\{y(x) \to c_1 e^x + c_2 e^{2x} + \frac{1}{4}(2x^2 + 6x + 7) + \frac{e^{-x}}{3}\right\}\right\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 30

$$\left\{y(x) = \frac{x^2}{2} + \frac{3x}{2} + \frac{7}{4} + \frac{\mathrm{e}^{-x}}{3} + \mathrm{e}^{2x}\_C1 + \_C2\,\mathrm{e}^x\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 3*y'[x] + y''[x] == 2/E^x + x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1/(3*E^x) + (7 + 6*x + 2*x^2)/4 + E^x*C[1] + E^(2*x)*C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-3*diff(y(x),x)+2*y(x) = x^2+2*exp(-x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x^2+3/2*x+7/4+1/3*exp(-x)+exp(2*x)*_C1+_C2*exp(x)
```

4.1253 $y''(x) - 3y'(x) + 2y(x) = xe^{ax}$

ODE

$$y''(x) - 3y'(x) + 2y(x) = xe^{ax}$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0153091 (sec), leaf count = 75

$$\left\{\left\{y(x) \to \frac{e^x\left(\left(a^2-3a+2\right)^2 c_2 e^x + \left(a^2-3a+2\right)^2 c_1 + e^{(a-1)x}\left(a^2x - a(3x+2) + 2x + 3\right)\right)}{(a-2)^2(a-1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 59

$$\left\{y(x) = \frac{\mathrm{e}^x\left(\left(a^2x + (-3x-2)a + 2x + 3\right)\mathrm{e}^{(a-1)x} + (a-1)^2(a-2)^2\left(\mathrm{e}^x \_C1 + \_C2\right)\right)}{(a-1)^2(a-2)^2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 3*y'[x] + y''[x] == E^(a*x)*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*(E^((-1 + a)*x)*(3 + 2*x + a^2*x - a*(2 + 3*x)) + (2 - 3*a + a^2)
^2*C[1] + (2 - 3*a + a^2)^2*E^x*C[2]))/((-2 + a)^2*(-1 + a)^2)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-3*diff(y(x),x)+2*y(x) = x*exp(a*x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(x)*((a^2*x+(-3*x-2)*a+2*x+3)*exp((a-1)*x)+(a-1)^2*(a-2)^2*(exp(x)*_C1
+_C2))/(a-1)^2/(a-2)^2
```

4.1254 $y''(x) - 3y'(x) - 4y(x) = 0$

ODE

$$y''(x) - 3y'(x) - 4y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00455052 (sec), leaf count = 22

$$\{\{y(x) \to e^{-x}\left(c_2 e^{5x} + c_1\right)\}\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 17

$$\{y(x) = \_C1\, \mathrm{e}^{4x} + \_C2\, \mathrm{e}^{-x}\}$$

Mathematica raw input

```
DSolve[-4*y[x] - 3*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + E^(5*x)*C[2])/E^x}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-3*diff(y(x),x)-4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(4*x)+_C2*exp(-x)
```

4.1255 $y''(x) - 3y'(x) - 4y(x) = 10\cos(2x)$

ODE

$$y''(x) - 3y'(x) - 4y(x) = 10\cos(2x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0123723 (sec), leaf count = 38

$$\left\{\left\{y(x) \to c_1 e^{-x} + c_2 e^{4x} - \frac{3}{5}\sin(2x) - \frac{4}{5}\cos(2x)\right\}\right\}$$

Maple ✓
cpu = 0.028 (sec), leaf count = 29

$$\left\{y(x) = \mathrm{e}^{4x}\_C2 + \_C1\,\mathrm{e}^{-x} - \frac{4\cos(2x)}{5} - \frac{3\sin(2x)}{5}\right\}$$

Mathematica raw input

```
DSolve[-4*y[x] - 3*y'[x] + y''[x] == 10*Cos[2*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^x + E^(4*x)*C[2] - (4*Cos[2*x])/5 - (3*Sin[2*x])/5}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-3*diff(y(x),x)-4*y(x) = 10*cos(2*x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(4*x)*_C2+_C1*exp(-x)-4/5*cos(2*x)-3/5*sin(2*x)
```

4.1256 $y''(x) - 4y'(x) + 4y(x) = 0$

ODE

$$y''(x) - 4y'(x) + 4y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00437453 (sec), leaf count = 18

$$\{\{y(x) \to e^{2x}(c_2 x + c_1)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 14

$$\{y(x) = \mathrm{e}^{2x}(\_C2\, x + \_C1)\}$$

Mathematica raw input

```
DSolve[4*y[x] - 4*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(2*x)*(C[1] + x*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-4*diff(y(x),x)+4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(2*x)*(_C2*x+_C1)
```

4.1257 $y''(x) - 4y'(x) + 4y(x) = e^{2x}\cos^2(x)$

ODE

$$y''(x) - 4y'(x) + 4y(x) = e^{2x}\cos^2(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0169225 (sec), leaf count = 35

$$\left\{\left\{y(x) \to \frac{1}{8}e^{2x}\left(8c_2x + 8c_1 + 2x^2 - \cos(2x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 28

$$\left\{y(x) = -\frac{e^{2x}\left(\left(\cos(x)\right)^2 - 4\_C1\,x - x^2 - 4\_C2 - 1\right)}{4}\right\}$$

Mathematica raw input

```
DSolve[4*y[x] - 4*y'[x] + y''[x] == E^(2*x)*Cos[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(2*x)*(2*x^2 + 8*C[1] + 8*x*C[2] - Cos[2*x]))/8}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-4*diff(y(x),x)+4*y(x) = exp(2*x)*cos(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/4*exp(2*x)*(cos(x)^2-4*_C1*x-x^2-4*_C2-1)
```

4.1258 $y''(x) + 4y'(x) + 5y(x) = 0$

ODE

$$y''(x) + 4y'(x) + 5y(x) = 0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00449196 (sec), leaf count = 22

$$\{\{y(x) \to e^{-2x}(c_1 \sin(x) + c_2 \cos(x))\}\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 18

$$\{y(x) = \mathrm{e}^{-2x}(\sin(x)\_C1 + \cos(x)\_C2)\}$$

Mathematica raw input

```
DSolve[5*y[x] + 4*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[2]*Cos[x] + C[1]*Sin[x])/E^(2*x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+4*diff(y(x),x)+5*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-2*x)*(sin(x)*_C1+cos(x)*_C2)
```

4.1259 $y''(x) + 4y'(x) + 5y(x) = \sin(x)$

ODE

$$y''(x) + 4y'(x) + 5y(x) = \sin(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0157289 (sec), leaf count = 38

$$\left\{\left\{y(x) \to \frac{1}{8}\left(8c_1 e^{-2x}\sin(x) + 8c_2 e^{-2x}\cos(x) + \sin(x) - \cos(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 29

$$\left\{y(x) = \mathrm{e}^{-2x}\sin(x)\_C2 + \mathrm{e}^{-2x}\cos(x)\_C1 - \frac{\cos(x)}{8} + \frac{\sin(x)}{8}\right\}$$

Mathematica raw input

```
DSolve[5*y[x] + 4*y'[x] + y''[x] == Sin[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-Cos[x] + (8*C[2]*Cos[x])/E^(2*x) + Sin[x] + (8*C[1]*Sin[x])/E^(2*x))
/8}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+4*diff(y(x),x)+5*y(x) = sin(x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-2*x)*sin(x)*_C2+exp(-2*x)*cos(x)*_C1-1/8*cos(x)+1/8*sin(x)
```

4.1260 $y''(x) - 4y'(x) + 13y(x) = 0$

ODE

$$y''(x) - 4y'(x) + 13y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00436173 (sec), leaf count = 26

$$\{\{y(x) \to e^{2x}(c_1 \sin(3x) + c_2 \cos(3x))\}\}$$

Maple ✓
cpu = 0.003 (sec), leaf count = 22

$$\{y(x) = \mathrm{e}^{2x}(\sin(3x)\_C1 + \cos(3x)\_C2)\}$$

Mathematica raw input

```
DSolve[13*y[x] - 4*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(2*x)*(C[2]*Cos[3*x] + C[1]*Sin[3*x])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-4*diff(y(x),x)+13*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(2*x)*(sin(3*x)*_C1+cos(3*x)*_C2)
```

4.1261 $y''(x) - 5y'(x) + 6y(x) = 0$

ODE

$$y''(x) - 5y'(x) + 6y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00427917 (sec), leaf count = 20

$$\{\{y(x) \to e^{2x}(c_2 e^x + c_1)\}\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 17

$$\{y(x) = \_C1\, \mathrm{e}^{3x} + \_C2\, \mathrm{e}^{2x}\}$$

Mathematica raw input

```
DSolve[6*y[x] - 5*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(2*x)*(C[1] + E^x*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-5*diff(y(x),x)+6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(3*x)+_C2*exp(2*x)
```

4.1262 $y''(x) - 5y'(x) + 6y(x) = 4e^x x^2$

ODE

$$y''(x) - 5y'(x) + 6y(x) = 4e^x x^2$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0114033 (sec), leaf count = 33

$$\{\{y(x) \to e^x \left(c_1 e^x + c_2 e^{2x} + 2x^2 + 6x + 7\right)\}\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 29

$$\{y(x) = \mathrm{e}^{2\,x}\_C1 + \mathrm{e}^{3\,x}\_C2 + 2\,\mathrm{e}^{x}\left(x^2 + 3\,x + 7/2\right)\}$$

Mathematica raw input

```
DSolve[6*y[x] - 5*y'[x] + y''[x] == 4*E^x*x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(7 + 6*x + 2*x^2 + E^x*C[1] + E^(2*x)*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-5*diff(y(x),x)+6*y(x) = 4*x^2*exp(x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(2*x)*_C1+exp(3*x)*_C2+2*exp(x)*(x^2+3*x+7/2)
```

4.1263 $y''(x) - 5y'(x) + 6y(x) = e^{ax}$

ODE

$$y''(x) - 5y'(x) + 6y(x) = e^{ax}$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0206845 (sec), leaf count = 54

$$\left\{\left\{y(x) \to \frac{e^{2x}\left(\left(a^2-5a+6\right)c_2 e^x + \left(a^2-5a+6\right)c_1 + e^{(a-2)x}\right)}{(a-3)(a-2)}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 32

$$\left\{y(x) = \mathrm{e}^{3x}\_C2 + \mathrm{e}^{2x}\_C1 + \frac{\mathrm{e}^{ax}}{a^2-5a+6}\right\}$$

Mathematica raw input

```
DSolve[6*y[x] - 5*y'[x] + y''[x] == E^(a*x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(2*x)*(E^((-2 + a)*x) + (6 - 5*a + a^2)*C[1] + (6 - 5*a + a^2)*E^x*
C[2]))/((-3 + a)*(-2 + a))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-5*diff(y(x),x)+6*y(x) = exp(a*x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(3*x)*_C2+exp(2*x)*_C1+1/(a^2-5*a+6)*exp(a*x)
```

4.1264 $y''(x) + 6y'(x) + 9y(x) = 0$

ODE

$$y''(x) + 6y'(x) + 9y(x) = 0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00489547 (sec), leaf count = 18

$$\{\{y(x) \to e^{-3x}(c_2 x + c_1)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 14

$$\{y(x) = \mathrm{e}^{-3x}(\_C2\, x + \_C1)\}$$

Mathematica raw input

```
DSolve[9*y[x] + 6*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2])/E^(3*x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+6*diff(y(x),x)+9*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-3*x)*(_C2*x+_C1)
```

4.1265 $y''(x) + 6y'(x) + 9y(x) = e^{-3x}\cosh(x)$

ODE

$$y''(x) + 6y'(x) + 9y(x) = e^{-3x}\cosh(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0383382 (sec), leaf count = 33

$$\left\{\left\{y(x) \to \frac{1}{2}e^{-4x}\left(2e^{x}(c_2 x + c_1) + e^{2x} + 1\right)\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 16

$$\{y(x) = \mathrm{e}^{-3x}(\_C1\, x + \cosh(x) + \_C2)\}$$

Mathematica raw input

```
DSolve[9*y[x] + 6*y'[x] + y''[x] == Cosh[x]/E^(3*x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + E^(2*x) + 2*E^x*(C[1] + x*C[2]))/(2*E^(4*x))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+6*diff(y(x),x)+9*y(x) = exp(-3*x)*cosh(x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-3*x)*(_C1*x+cosh(x)+_C2)
```

4.1266 $y''(x) - 7y'(x) + 12y(x) = 0$

ODE

$$y''(x) - 7y'(x) + 12y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00470252 (sec), leaf count = 20

$$\{\{y(x) \to e^{3x}(c_2 e^x + c_1)\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 17

$$\{y(x) = \_C1\, \mathrm{e}^{4x} + \_C2\, \mathrm{e}^{3x}\}$$

Mathematica raw input

```
DSolve[12*y[x] - 7*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(3*x)*(C[1] + E^x*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-7*diff(y(x),x)+12*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(4*x)+_C2*exp(3*x)
```

4.1267 $y''(x) - 7y'(x) + 12y(x) = x$

ODE

$$y''(x) - 7y'(x) + 12y(x) = x$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.005434 (sec), leaf count = 30

$$\left\{\left\{y(x) \to c_1 e^{3x} + c_2 e^{4x} + \frac{x}{12} + \frac{7}{144}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 21

$$\left\{y(x) = \mathrm{e}^{4x}\_C2 + \mathrm{e}^{3x}\_C1 + \frac{x}{12} + \frac{7}{144}\right\}$$

Mathematica raw input

```
DSolve[12*y[x] - 7*y'[x] + y''[x] == x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 7/144 + x/12 + E^(3*x)*C[1] + E^(4*x)*C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-7*diff(y(x),x)+12*y(x) = x, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(4*x)*_C2+exp(3*x)*_C1+1/12*x+7/144
```

4.1268 $y''(x) + 8y'(x) + 16y(x) = 0$

ODE

$$y''(x) + 8y'(x) + 16y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00492811 (sec), leaf count = 18

$$\{\{y(x) \to e^{-4x}(c_2 x + c_1)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 14

$$\{y(x) = \mathrm{e}^{-4x}(\_C2\, x + \_C1)\}$$

Mathematica raw input

```
DSolve[16*y[x] + 8*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2])/E^(4*x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+8*diff(y(x),x)+16*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-4*x)*(_C2*x+_C1)
```

4.1269 $y''(x) + 8y'(x) + 16y(x) = 4e^x - e^{2x}$

ODE

$$y''(x) + 8y'(x) + 16y(x) = 4e^x - e^{2x}$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0371696 (sec), leaf count = 35

$$\left\{\left\{y(x) \to e^{-4x}(c_2 x + c_1) + \frac{4e^x}{25} - \frac{e^{2x}}{36}\right\}\right\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 28

$$\left\{y(x) = \mathrm{e}^{-4x}\_C2 + \mathrm{e}^{-4x} x \_C1 + \frac{4\,\mathrm{e}^x}{25} - \frac{\mathrm{e}^{2x}}{36}\right\}$$

Mathematica raw input

```
DSolve[16*y[x] + 8*y'[x] + y''[x] == 4*E^x - E^(2*x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (4*E^x)/25 - E^(2*x)/36 + (C[1] + x*C[2])/E^(4*x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+8*diff(y(x),x)+16*y(x) = 4*exp(x)-exp(2*x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-4*x)*_C2+exp(-4*x)*x*_C1+4/25*exp(x)-1/36*exp(2*x)
```

4.1270 $y''(x) - 9y'(x) + 20y(x) = 0$

ODE

$$y''(x) - 9y'(x) + 20y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00476011 (sec), leaf count = 20

$$\{\{y(x) \to e^{4x}(c_2 e^x + c_1)\}\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 17

$$\{y(x) = \_C1\, \mathrm{e}^{4x} + \_C2\, \mathrm{e}^{5x}\}$$

Mathematica raw input

```
DSolve[20*y[x] - 9*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(4*x)*(C[1] + E^x*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-9*diff(y(x),x)+20*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(4*x)+_C2*exp(5*x)
```

4.1271 $y''(x) - 9y'(x) + 20y(x) = e^{3x}x^2$

ODE

$$y''(x) - 9y'(x) + 20y(x) = e^{3x}x^2$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0198894 (sec), leaf count = 40

$$\left\{\left\{y(x) \to \frac{1}{4}e^{3x}\left(4c_1e^x + 4c_2e^{2x} + 2x^2 + 6x + 7\right)\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 33

$$\left\{y(x) = \mathrm{e}^{4\,x}\_C2 + \mathrm{e}^{5\,x}\_C1 + \frac{\left(2\,x^2 + 6\,x + 7\right)\mathrm{e}^{3\,x}}{4}\right\}$$

Mathematica raw input

```
DSolve[20*y[x] - 9*y'[x] + y''[x] == E^(3*x)*x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(3*x)*(7 + 6*x + 2*x^2 + 4*E^x*C[1] + 4*E^(2*x)*C[2]))/4}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-9*diff(y(x),x)+20*y(x) = x^2*exp(3*x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(4*x)*_C2+exp(5*x)*_C1+1/4*(2*x^2+6*x+7)*exp(3*x)
```

4.1272 $2ay'(x) + b^2 y(x) + y''(x) = 0$

ODE

$$2ay'(x) + b^2 y(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0051537 (sec), leaf count = 50

$$\left\{\left\{y(x) \to e^{x\left(-\left(\sqrt{a^2-b^2}+a\right)\right)}\left(c_2 e^{2x\sqrt{a^2-b^2}} + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 44

$$\left\{y(x) = \_C1\, \mathrm{e}^{\left(-a+\sqrt{a^2-b^2}\right)x} + \_C2\, \mathrm{e}^{-\left(a+\sqrt{a^2-b^2}\right)x}\right\}$$

Mathematica raw input

```
DSolve[b^2*y[x] + 2*a*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + E^(2*Sqrt[a^2 - b^2]*x)*C[2])/E^((a + Sqrt[a^2 - b^2])*x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*a*diff(y(x),x)+b^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp((-a+(a^2-b^2)^(1/2))*x)+_C2*exp(-(a+(a^2-b^2)^(1/2))*x)
```

4.1273 $2ay'(x) + b^2 y(x) + y''(x) = c\sin(kx)$

ODE

$$2ay'(x) + b^2 y(x) + y''(x) = c\sin(kx)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.373616 (sec), leaf count = 103

$$\left\{\left\{y(x) \to c_1 e^{x\left(-\left(\sqrt{a^2-b^2}+a\right)\right)} + c_2 e^{x\left(\sqrt{a^2-b^2}-a\right)} + \frac{c\left(\left(b^2-k^2\right)\sin(kx) - 2ak\cos(kx)\right)}{4a^2k^2 + b^4 - 2b^2k^2 + k^4}\right\}\right\}$$

Maple ✓
cpu = 0.082 (sec), leaf count = 98

$$\left\{y(x) = \mathrm{e}^{\left(-a+\sqrt{a^2-b^2}\right)x}\_C2 + \mathrm{e}^{-\left(a+\sqrt{a^2-b^2}\right)x}\_C1 - \frac{c\left(2\cos(kx)\,ak - \sin(kx)\,b^2 + \sin(kx)\,k^2\right)}{4\,a^2k^2 + b^4 - 2\,b^2k^2 + k^4}\right\}$$

Mathematica raw input

```
DSolve[b^2*y[x] + 2*a*y'[x] + y''[x] == c*Sin[k*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^((a + Sqrt[a^2 - b^2])*x) + E^((-a + Sqrt[a^2 - b^2])*x)*C[2] +
  (c*(-2*a*k*Cos[k*x] + (b^2 - k^2)*Sin[k*x]))/(b^4 + 4*a^2*k^2 - 2*b^2*k^2 + k^4
)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*a*diff(y(x),x)+b^2*y(x) = c*sin(k*x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp((-a+(a^2-b^2)^(1/2))*x)*_C2+exp(-(a+(a^2-b^2)^(1/2))*x)*_C1-c*(2*cos(
k*x)*a*k-sin(k*x)*b^2+sin(k*x)*k^2)/(4*a^2*k^2+b^4-2*b^2*k^2+k^4)
```

4.1274 $a^2y(x) - 2ay'(x) + y''(x) = e^x$

ODE

$$a^2y(x) - 2ay'(x) + y''(x) = e^x$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0301625 (sec), leaf count = 33

$$\left\{\left\{y(x) \to \frac{(a-1)^2 e^{ax}(c_2 x + c_1) + e^x}{(a-1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 28

$$\left\{y(x) = \frac{(a-1)^2 (\_C1\, x + \_C2)\, \mathrm{e}^{ax} + \mathrm{e}^x}{(a-1)^2}\right\}$$

Mathematica raw input

```
DSolve[a^2*y[x] - 2*a*y'[x] + y''[x] == E^x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x + (-1 + a)^2*E^(a*x)*(C[1] + x*C[2]))/(-1 + a)^2}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*a*diff(y(x),x)+a^2*y(x) = exp(x), y(x),'implicit')
```

Maple raw output

```
y(x) = ((a-1)^2*(_C1*x+_C2)*exp(a*x)+exp(x))/(a-1)^2
```

4.1275 $\left(a^2+b^2\right)^2 y(x)-4aby'(x)+y''(x)=0$

ODE

$$\left(a^2+b^2\right)^2 y(x)-4aby'(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00661155 (sec), leaf count = 62

$$\left\{\left\{y(x)\to e^{2abx-x\sqrt{-\left(a^2-b^2\right)^2}}\left(c_2 e^{2x\sqrt{-\left(a^2-b^2\right)^2}}+c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 44

$$\left\{y(x)=-\mathrm{e}^{2\,abx}\left(\sin\left(a^2x-b^2x\right)\_C1-\cos\left(a^2x-b^2x\right)\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[(a^2 + b^2)^2*y[x] - 4*a*b*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(2*a*b*x - Sqrt[-(a^2 - b^2)^2]*x)*(C[1] + E^(2*Sqrt[-(a^2 - b^2)^2]
*x)*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-4*a*b*diff(y(x),x)+(a^2+b^2)^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -exp(2*a*b*x)*(sin(a^2*x-b^2*x)*_C1-cos(a^2*x-b^2*x)*_C2)
```

4.1276 $ay'(x) + by(x) + y''(x) = 0$

ODE

$$ay'(x) + by(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00480619 (sec), leaf count = 47

$$\left\{\left\{y(x) \to e^{-\frac{1}{2}x\left(\sqrt{a^2-4b}+a\right)}\left(c_2 e^{x\sqrt{a^2-4b}} + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 41

$$\left\{y(x) = \_C1\, \mathrm{e}^{-\frac{x}{2}\left(a-\sqrt{a^2-4\,b}\right)} + \_C2\, \mathrm{e}^{-\frac{x}{2}\left(a+\sqrt{a^2-4\,b}\right)}\right\}$$

Mathematica raw input

```
DSolve[b*y[x] + a*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + E^(Sqrt[a^2 - 4*b]*x)*C[2])/E^(((a + Sqrt[a^2 - 4*b])*x)/2)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-1/2*(a-(a^2-4*b)^(1/2))*x)+_C2*exp(-1/2*(a+(a^2-4*b)^(1/2))*x)
```

4.1277 $ay'(x) + by(x) + y''(x) = f(x)$

ODE

$$ay'(x) + by(x) + y''(x) = f(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.755774 (sec), leaf count = 150

$$\left\{\left\{y(x) \to e^{-\frac{1}{2}x\left(\sqrt{a^2-4b}+a\right)}\left(\int_1^x -\frac{f(K[1])e^{\frac{1}{2}\left(\sqrt{a^2-4b}+a\right)K[1]}}{\sqrt{a^2-4b}}\,dK[1] + e^{x\sqrt{a^2-4b}}\int_1^x \frac{f(K[2])e^{\frac{1}{2}\left(a-\sqrt{a^2-4b}\right)K[2]}}{\sqrt{a^2-4b}}\,dK[2] + c_2 e^{x\sqrt}\right.\right.$$

Maple ✓
cpu = 0.197 (sec), leaf count = 124

$$\left\{y(x) = \mathrm{e}^{-\frac{x}{2}\left(a-\sqrt{a^2-4\,b}\right)}\_C2 + \mathrm{e}^{-\frac{x}{2}\left(a+\sqrt{a^2-4\,b}\right)}\_C1 + 1\left(\int f(x)\,\mathrm{e}^{-\frac{x}{2}\left(-a+\sqrt{a^2-4\,b}\right)}\,\mathrm{d}x\mathrm{e}^{\sqrt{a^2-4\,b}x} - \int f(x)\,\mathrm{e}^{\frac{x}{2}\left(a+\sqrt{a^2-4\,b}\right)}\,\mathrm{d}x\right)\right.$$

Mathematica raw input

```
DSolve[b*y[x] + a*y'[x] + y''[x] == f[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + E^(Sqrt[a^2 - 4*b]*x)*C[2] + Integrate[-((E^(((a + Sqrt[a^2 -
4*b])*K[1])/2)*f[K[1]])/Sqrt[a^2 - 4*b]), {K[1], 1, x}] + E^(Sqrt[a^2 - 4*b]*x)*
Integrate[(E^(((a - Sqrt[a^2 - 4*b])*K[2])/2)*f[K[2]])/Sqrt[a^2 - 4*b], {K[2], 1
, x}])/E^(((a + Sqrt[a^2 - 4*b])*x)/2)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*y(x) = f(x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*(a-(a^2-4*b)^(1/2))*x)*_C2+exp(-1/2*(a+(a^2-4*b)^(1/2))*x)*_C1+(
Int(f(x)*exp(-1/2*(-a+(a^2-4*b)^(1/2))*x),x)*exp((a^2-4*b)^(1/2)*x)-Int(f(x)*exp
(1/2*(a+(a^2-4*b)^(1/2))*x),x))/(a^2-4*b)^(1/2)*exp(-1/2*(a+(a^2-4*b)^(1/2))*x)
```

4.1278 $ay'(x) + y(x)(b + cx) + y''(x) = 0$

ODE

$$ay'(x) + y(x)(b + cx) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00843867 (sec), leaf count = 67

$$\left\{\left\{y(x) \to e^{-\frac{ax}{2}}\left(c_1 \text{Ai}\left(\frac{a^2 - 4(b + cx)}{4(-c)^{2/3}}\right) + c_2 \text{Bi}\left(\frac{a^2 - 4(b + cx)}{4(-c)^{2/3}}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.053 (sec), leaf count = 49

$$\left\{y(x) = \mathrm{e}^{-\frac{ax}{2}}\left(\text{Bi}\left(\frac{a^2 - 4\,cx - 4\,b}{4}c^{-\frac{2}{3}}\right)\_C2 + \text{Ai}\left(\frac{a^2 - 4\,cx - 4\,b}{4}c^{-\frac{2}{3}}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(b + c*x)*y[x] + a*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (AiryAi[(a^2 - 4*(b + c*x))/(4*(-c)^(2/3))]*C[1] + AiryBi[(a^2 - 4*(b
+ c*x))/(4*(-c)^(2/3))]*C[2])/E^((a*x)/2)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+(c*x+b)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*a*x)*(AiryBi(1/4*(a^2-4*c*x-4*b)/c^(2/3))*_C2+AiryAi(1/4*(a^2-4*
c*x-4*b)/c^(2/3))*_C1)
```

4.1279 $ay'(x) + y(x)\left(b + cx^2\right) + y''(x) = 0$

ODE

$$ay'(x) + y(x)\left(b + cx^2\right) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0262869 (sec), leaf count = 117

$$\left\{\left\{y(x) \to e^{\frac{1}{2}x\left(-a-i\sqrt{c}x\right)}\left(c_1 H_{\frac{i\left(a^2-4b+4i\sqrt{c}\right)}{8\sqrt{c}}}\left(\sqrt[4]{-1}\sqrt[4]{c}x\right) + c_2\,{}_1F_1\left(-\frac{i\left(a^2-4b+4i\sqrt{c}\right)}{16\sqrt{c}};\frac{1}{2};i\sqrt{c}x^2\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.227 (sec), leaf count = 88

$$\left\{y(x) = \mathrm{e}^{-\frac{x}{2}\left(i\sqrt{c}x+a\right)}x\left(U\left(-\frac{1}{16}\left(ia^2-4\,ib-12\,\sqrt{c}\right)\frac{1}{\sqrt{c}},\frac{3}{2},i\sqrt{c}x^2\right)\_C2 + M\left(-\frac{1}{16}\left(ia^2-4\,ib-12\,\sqrt{c}\right)\frac{1}{\sqrt{c}},\frac{3}{2},i\sqrt{c}x^2\right)\_\right.$$

Mathematica raw input

```
DSolve[(b + c*x^2)*y[x] + a*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^((x*(-a - I*Sqrt[c]*x))/2)*(C[1]*HermiteH[((I/8)*(a^2 - 4*b + (4*I)*
Sqrt[c]))/Sqrt[c], (-1)^(1/4)*c^(1/4)*x] + C[2]*Hypergeometric1F1[((-I/16)*(a^2
- 4*b + (4*I)*Sqrt[c]))/Sqrt[c], 1/2, I*Sqrt[c]*x^2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+(c*x^2+b)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*x*(I*c^(1/2)*x+a))*x*(KummerU(-1/16*(I*a^2-4*I*b-12*c^(1/2))/c^(
1/2),3/2,I*c^(1/2)*x^2)*_C2+KummerM(-1/16*(I*a^2-4*I*b-12*c^(1/2))/c^(1/2),3/2,I
*c^(1/2)*x^2)*_C1)
```

4.1280 $ay'(x) + y(x)\left(b + ce^x\right) + y''(x) = 0$

ODE

$$ay'(x) + y(x)\left(b + ce^x\right) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0599587 (sec), leaf count = 99

$$\left\{\left\{y(x) \to e^{-\frac{ax}{2}}\left(c_1\Gamma\left(1-\sqrt{a^2-4b}\right)J_{-\sqrt{a^2-4b}}\left(2\sqrt{ce^x}\right) + c_2\Gamma\left(\sqrt{a^2-4b}+1\right)J_{\sqrt{a^2-4b}}\left(2\sqrt{ce^x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.068 (sec), leaf count = 53

$$\left\{y(x) = \mathrm{e}^{-\frac{ax}{2}}\left(Y_{\sqrt{a^2-4\,b}}\left(2\,\sqrt{c}\mathrm{e}^{x/2}\right)\_C2 + J_{\sqrt{a^2-4\,b}}\left(2\,\sqrt{c}\mathrm{e}^{x/2}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(b + c*E^x)*y[x] + a*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (BesselJ[-Sqrt[a^2 - 4*b], 2*Sqrt[c*E^x]]*C[1]*Gamma[1 - Sqrt[a^2 - 4*
b]] + BesselJ[Sqrt[a^2 - 4*b], 2*Sqrt[c*E^x]]*C[2]*Gamma[1 + Sqrt[a^2 - 4*b]])/E
^((a*x)/2)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+(b+c*exp(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*a*x)*(BesselY((a^2-4*b)^(1/2),2*c^(1/2)*exp(1/2*x))*_C2+BesselJ(
(a^2-4*b)^(1/2),2*c^(1/2)*exp(1/2*x))*_C1)
```

4.1281 $be^{2ax}y(x)+ay'(x)+y''(x)=0$

ODE

$$be^{2ax}y(x)+ay'(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0349082 (sec), leaf count = 78

$$\left\{\left\{y(x)\to \frac{\sqrt{a}e^{-\frac{ax}{2}}\left(c_2\sin\left(\frac{\sqrt{be^{2ax}}}{a}\right)+2c_1\cos\left(\frac{\sqrt{be^{2ax}}}{a}\right)\right)}{\sqrt{2}\sqrt[4]{be^{2ax}}}\right\}\right\}$$

Maple ✓
cpu = 0.133 (sec), leaf count = 39

$$\left\{y(x)=\mathrm{e}^{-ax}\left(\sin\left(\frac{\mathrm{e}^{ax}}{a}\sqrt{b}\right)\_C1+\cos\left(\frac{\mathrm{e}^{ax}}{a}\sqrt{b}\right)\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[b*E^(2*a*x)*y[x] + a*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[a]*(2*C[1]*Cos[Sqrt[b*E^(2*a*x)]/a] + C[2]*Sin[Sqrt[b*E^(2*a*x)]
/a]))/(Sqrt[2]*E^((a*x)/2)*(b*E^(2*a*x))^(1/4))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*exp(2*a*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-a*x)*(sin(1/a*b^(1/2)*exp(a*x))*_C1+cos(1/a*b^(1/2)*exp(a*x))*_C2)
```

4.1282 $ay'(x) + be^{kx} y(x) + y''(x) = 0$

ODE

$$ay'(x) + be^{kx} y(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0372947 (sec), leaf count = 83

$$\left\{\left\{y(x) \to e^{-\frac{ax}{2}}\left(c_1\Gamma\left(1-\frac{a}{k}\right)J_{-\frac{a}{k}}\left(\frac{2\sqrt{be^{kx}}}{k}\right)+c_2\Gamma\left(\frac{a+k}{k}\right)J_{\frac{a}{k}}\left(\frac{2\sqrt{be^{kx}}}{k}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.089 (sec), leaf count = 53

$$\left\{y(x) = \mathrm{e}^{-\frac{ax}{2}}\left(Y_{\frac{a}{k}}\left(2\,\frac{\sqrt{b}\mathrm{e}^{1/2\,kx}}{k}\right)\_C2 + J_{\frac{a}{k}}\left(2\,\frac{\sqrt{b}\mathrm{e}^{1/2\,kx}}{k}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[b*E^(k*x)*y[x] + a*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (BesselJ[-(a/k), (2*Sqrt[b*E^(k*x)])/k]*C[1]*Gamma[1 - a/k] + BesselJ[
a/k, (2*Sqrt[b*E^(k*x)])/k]*C[2]*Gamma[(a + k)/k])/E^((a*x)/2)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*exp(k*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*a*x)*(BesselY(1/k*a,2/k*b^(1/2)*exp(1/2*k*x))*_C2+BesselJ(1/k*a,
2/k*b^(1/2)*exp(1/2*k*x))*_C1)
```

4.1283 $y''(x) + xy'(x) + y(x) = 0$

ODE

$$y''(x) + xy'(x) + y(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0189758 (sec), leaf count = 41

$$\left\{\left\{y(x) \to \frac{1}{2} e^{-\frac{x^2}{2}} \left(\sqrt{2\pi} c_1 \text{erfi}\left(\frac{x}{\sqrt{2}}\right) + 2c_2\right)\right\}\right\}$$

Maple ✓
cpu = 0.028 (sec), leaf count = 25

$$\left\{y(x) = \left(Erf\left(\frac{i}{2}\sqrt{2}x\right) \_C1 + \_C2\right) \left(e^{\frac{x^2}{2}}\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[y[x] + x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*C[2] + Sqrt[2*Pi]*C[1]*Erfi[x/Sqrt[2]])/(2*E^(x^2/2))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (erf(1/2*I*2^(1/2)*x)*_C1+_C2)/exp(1/2*x^2)
```

4.1284 $y''(x) + xy'(x) - y(x) = 0$

ODE

$$y''(x) + xy'(x) - y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0301907 (sec), leaf count = 45

$$\left\{\left\{y(x) \to -\sqrt{\frac{\pi}{2}}c_2 x \operatorname{erf}\left(\frac{x}{\sqrt{2}}\right) - c_2 e^{-\frac{x^2}{2}} + c_1 x\right\}\right\}$$

Maple ✓
cpu = 0.078 (sec), leaf count = 33

$$\left\{y(x) = \mathrm{e}^{-\frac{x^2}{2}}\sqrt{\pi}\sqrt{2}\_C2 + x\left(\pi \_C2\, Erf\left(\frac{\sqrt{2}x}{2}\right) + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] - C[2]/E^(x^2/2) - Sqrt[Pi/2]*x*C[2]*Erf[x/Sqrt[2]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*x^2)*Pi^(1/2)*2^(1/2)*_C2+x*(Pi*_C2*erf(1/2*2^(1/2)*x)+_C1)
```

4.1285 $y''(x) - xy'(x) + 2y(x) = 0$

ODE

$$y''(x) - xy'(x) + 2y(x) = 0$$

ODE Classification

[_Hermite]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0431732 (sec), leaf count = 55

$$\left\{\left\{y(x) \to c_1\left(x^2-1\right) - \frac{1}{4}c_2\left(2e^{\frac{x^2}{2}}x - \sqrt{2\pi}\left(x^2-1\right)\operatorname{erfi}\left(\frac{x}{\sqrt{2}}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.571 (sec), leaf count = 42

$$\left\{y(x) = 2\,\mathrm{e}^{1/2\,x^2}\_C1\,x - \left(-1+x\right)\left(1+x\right)\left(\sqrt{2}erfi\left(\frac{\sqrt{2}x}{2}\right)\sqrt{\pi}\_C1 - \_C2\right)\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + x^2)*C[1] - (C[2]*(2*E^(x^2/2)*x - Sqrt[2*Pi]*(-1 + x^2)*Erfi[x/
Sqrt[2]]))/4}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-x*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 2*exp(1/2*x^2)*_C1*x-(-1+x)*(1+x)*(2^(1/2)*erfi(1/2*2^(1/2)*x)*Pi^(1/2)*_
C1-_C2)
```

4.1286 $ny(x) + y''(x) - xy'(x) = 0$

ODE

$$ny(x) + y''(x) - xy'(x) = 0$$

ODE Classification

[_Hermite]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00799517 (sec), leaf count = 37

$$\left\{\left\{y(x) \to c_1 H_n\left(\frac{x}{\sqrt{2}}\right) + c_2\, {}_1F_1\left(-\frac{n}{2}; \frac{1}{2}; \frac{x^2}{2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.085 (sec), leaf count = 35

$$\left\{y(x) = x\left(U\left(\frac{1}{2} - \frac{n}{2}, \frac{3}{2}, \frac{x^2}{2}\right)\_C2 + M\left(\frac{1}{2} - \frac{n}{2}, \frac{3}{2}, \frac{x^2}{2}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[n*y[x] - x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*HermiteH[n, x/Sqrt[2]] + C[2]*Hypergeometric1F1[-n/2, 1/2, x^2/2]
}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-x*diff(y(x),x)+n*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(KummerU(1/2-1/2*n,3/2,1/2*x^2)*_C2+KummerM(1/2-1/2*n,3/2,1/2*x^2)*_C1)
```

4.1287 $-ay(x)+y''(x)-xy'(x)=0$

ODE

$$-ay(x)+y''(x)-xy'(x)=0$$

ODE Classification

[_Hermite]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00691234 (sec), leaf count = 39

$$\left\{\left\{y(x)\to c_1 H_{-a}\left(\frac{x}{\sqrt{2}}\right)+c_2\,{}_1F_1\left(\frac{a}{2};\frac{1}{2};\frac{x^2}{2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.087 (sec), leaf count = 35

$$\left\{y(x)=x\left(U\left(\frac{1}{2}+\frac{a}{2},\frac{3}{2},\frac{x^2}{2}\right)\_C2+M\left(\frac{1}{2}+\frac{a}{2},\frac{3}{2},\frac{x^2}{2}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-(a*y[x]) - x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*HermiteH[-a, x/Sqrt[2]] + C[2]*Hypergeometric1F1[a/2, 1/2, x^2/2]
}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-x*diff(y(x),x)-a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(KummerU(1/2+1/2*a,3/2,1/2*x^2)*_C2+KummerM(1/2+1/2*a,3/2,1/2*x^2)*_C1)
```

4.1288 $y''(x) - xy'(x) - (1-x)y(x) = 0$

ODE

$$y''(x) - xy'(x) - (1-x)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0198225 (sec), leaf count = 39

$$\left\{\left\{y(x) \to \sqrt{\frac{\pi}{2}} c_2 e^{x-2} \text{erfi}\left(\frac{x-2}{\sqrt{2}}\right) + c_1 e^x\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 21

$$\left\{y(x) = \mathrm{e}^x \left(Erf\left(\frac{i}{2}\sqrt{2}(x-2)\right) \_C1 + \_C2\right)\right\}$$

Mathematica raw input

```
DSolve[-((1 - x)*y[x]) - x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1] + E^(-2 + x)*Sqrt[Pi/2]*C[2]*Erfi[(-2 + x)/Sqrt[2]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-x*diff(y(x),x)-(1-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(x)*(erf(1/2*I*2^(1/2)*(x-2))*_C1+_C2)
```

4.1289 $y''(x) - 2xy'(x) + 6y(x) = 0$

ODE

$$y''(x) - 2xy'(x) + 6y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0122955 (sec), leaf count = 85

$$\left\{\left\{y(x) \to \frac{\sqrt{\pi}c_2\left(2x^2-3\right)x^2\text{erfi}\left(\sqrt{x^2}\right) + 2\sqrt{x^2}\left(8c_1x^3 - c_2e^{x^2}x^2 + c_2e^{x^2} - 12c_1x\right)}{2\sqrt{x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.243 (sec), leaf count = 27

$$\left\{y(x) = \_C2\,{}_1\mathrm{F}_1(-\frac{3}{2};\frac{1}{2};x^2) + \frac{\left(-2x^3+3x\right)\_C1}{3}\right\}$$

Mathematica raw input

```
DSolve[6*y[x] - 2*x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*Sqrt[x^2]*(-12*x*C[1] + 8*x^3*C[1] + E^x^2*C[2] - E^x^2*x^2*C[2]) +
  Sqrt[Pi]*x^2*(-3 + 2*x^2)*C[2]*Erfi[Sqrt[x^2]])/(2*Sqrt[x^2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*x*diff(y(x),x)+6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*hypergeom([-3/2],[1/2],x^2)+1/3*(-2*x^3+3*x)*_C1
```

4.1290 $y''(x) + 2xy'(x) - 8y(x) = 0$

ODE

$$y''(x) + 2xy'(x) - 8y(x) = 0$$

ODE Classification

[_erf]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00584071 (sec), leaf count = 36

$$\left\{\left\{y(x) \to c_1 e^{-x^2} H_{-5}(x) + c_2\left(\frac{4x^4}{3} + 4x^2 + 1\right)\right\}\right\}$$

Maple ✓
cpu = 0.182 (sec), leaf count = 44

$$\left\{y(x) = \left(4\_C1\, x^3 + 10\_C1\, x\right) \mathrm{e}^{-x^2} + 4\left(x^4 + 3x^2 + 3/4\right)\left(Erf(x)\sqrt{\pi}\_C1 + \_C2\right)\right\}$$

Mathematica raw input

```
DSolve[-8*y[x] + 2*x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + 4*x^2 + (4*x^4)/3)*C[2] + (C[1]*HermiteH[-5, x])/E^x^2}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*x*diff(y(x),x)-8*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (4*_C1*x^3+10*_C1*x)*exp(-x^2)+4*(x^4+3*x^2+3/4)*(erf(x)*Pi^(1/2)*_C1+_C2
)
```

4.1291 $2ny(x) + y''(x) - 2xy'(x) = 0$

ODE

$$2ny(x) + y''(x) - 2xy'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00684482 (sec), leaf count = 27

$$\left\{\left\{y(x) \to c_1 H_n(x) + c_2\, {}_1F_1\left(-\frac{n}{2}; \frac{1}{2}; x^2\right)\right\}\right\}$$

Maple ✓
cpu = 0.106 (sec), leaf count = 31

$$\left\{y(x) = x\left(U\left(\frac{1}{2} - \frac{n}{2}, \frac{3}{2}, x^2\right)\_C2 + M\left(\frac{1}{2} - \frac{n}{2}, \frac{3}{2}, x^2\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[2*n*y[x] - 2*x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*HermiteH[n, x] + C[2]*Hypergeometric1F1[-n/2, 1/2, x^2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*x*diff(y(x),x)+2*n*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(KummerU(1/2-1/2*n,3/2,x^2)*_C2+KummerM(1/2-1/2*n,3/2,x^2)*_C1)
```

4.1292 $-(-x^2-x+1)\,y(x)+y''(x)-(2x+1)y'(x)=0$

ODE

$$-(-x^2-x+1)\,y(x)+y''(x)-(2x+1)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0138564 (sec), leaf count = 24

$$\left\{\left\{y(x)\to e^{\frac{x^2}{2}}\left(c_2e^x+c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.05 (sec), leaf count = 22

$$\left\{y(x)=\_C1\,\mathrm{e}^{\frac{x^2}{2}}+\_C2\,\mathrm{e}^{\frac{x(2+x)}{2}}\right\}$$

Mathematica raw input

```
DSolve[-((1 - x - x^2)*y[x]) - (1 + 2*x)*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x^2/2)*(C[1] + E^x*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-(1+2*x)*diff(y(x),x)-(-x^2-x+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(1/2*x^2)+_C2*exp(1/2*x*(2+x))
```

4.1293 $2(2x^2+1)\,y(x)+y''(x)+4xy'(x)=0$

ODE

$$2(2x^2+1)\,y(x)+y''(x)+4xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0130026 (sec), leaf count = 20

$$\left\{\left\{y(x)\to e^{-x^2}(c_2x+c_1)\right\}\right\}$$

Maple ✓
cpu = 0.12 (sec), leaf count = 16

$$\left\{y(x)=\mathrm{e}^{-x^2}(\_C2\,x+\_C1)\right\}$$

Mathematica raw input

```
DSolve[2*(1 + 2*x^2)*y[x] + 4*x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2])/E^x^2}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+4*x*diff(y(x),x)+2*(2*x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x^2)*(_C2*x+_C1)
```

4.1294 $-(3-4x^2)\,y(x)+y''(x)-4xy'(x)=0$

ODE

$$-(3-4x^2)\,y(x)+y''(x)-4xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0162278 (sec), leaf count = 29

$$\left\{\left\{y(x)\to \frac{1}{2}e^{(x-1)x}\left(c_2e^{2x}+2c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.046 (sec), leaf count = 21

$$\left\{y(x)=\_C1\,\mathrm{e}^{(1+x)x}+\_C2\,\mathrm{e}^{x(-1+x)}\right\}$$

Mathematica raw input

```
DSolve[-((3 - 4*x^2)*y[x]) - 4*x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^((-1 + x)*x)*(2*C[1] + E^(2*x)*C[2]))/2}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-4*x*diff(y(x),x)-(-4*x^2+3)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp((1+x)*x)+_C2*exp(x*(-1+x))
```

4.1295 $-(3-4x^2)\,y(x)+y''(x)-4xy'(x)=e^{x^2}$

ODE

$$-(3-4x^2)\,y(x)+y''(x)-4xy'(x)=e^{x^2}$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0295146 (sec), leaf count = 34

$$\left\{\left\{y(x)\to \frac{1}{2}e^{(x-1)x}\left(c_2e^{2x}+2c_1-2e^x\right)\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 27

$$\left\{y(x)=\mathrm{e}^{(1+x)x}\_C2+\mathrm{e}^{x(-1+x)}\_C1-\mathrm{e}^{x^2}\right\}$$

Mathematica raw input

```
DSolve[-((3 - 4*x^2)*y[x]) - 4*x*y'[x] + y''[x] == E^x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^((-1 + x)*x)*(-2*E^x + 2*C[1] + E^(2*x)*C[2]))/2}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-4*x*diff(y(x),x)-(-4*x^2+3)*y(x) = exp(x^2), y(x),'implicit')
```

Maple raw output

```
y(x) = exp((1+x)*x)*_C2+exp(x*(-1+x))*_C1-exp(x^2)
```

4.1296 $a^2x^2y(x) - 2axy'(x) + y''(x) = 0$

ODE

$$a^2x^2y(x) - 2axy'(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0412539 (sec), leaf count = 63

$$\left\{\left\{y(x) \to \frac{e^{\frac{1}{2}x\left(ax-2\sqrt{-a}\right)}\left(c_2e^{2\sqrt{-a}x} + 2\sqrt{-a}c_1\right)}{2\sqrt{-a}}\right\}\right\}$$

Maple ✓
cpu = 0.052 (sec), leaf count = 39

$$\left\{y(x) = \_C1\, \mathrm{e}^{\frac{x}{2}\left(ax+2\sqrt{-a}\right)} + \_C2\, \mathrm{e}^{\frac{x}{2}\left(ax-2\sqrt{-a}\right)}\right\}$$

Mathematica raw input

```
DSolve[a^2*x^2*y[x] - 2*a*x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^((x*(-2*Sqrt[-a] + a*x))/2)*(2*Sqrt[-a]*C[1] + E^(2*Sqrt[-a]*x)*C[2
]))/(2*Sqrt[-a])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*a*x*diff(y(x),x)+a^2*x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(1/2*x*(a*x+2*(-a)^(1/2)))+_C2*exp(1/2*x*(a*x-2*(-a)^(1/2)))
```

4.1297 $axy'(x)+by(x)+y''(x)=0$

ODE

$$axy'(x)+by(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0197895 (sec), leaf count = 67

$$\left\{\left\{y(x)\to e^{-\frac{ax^2}{2}}\left(c_1 H_{\frac{b}{a}-1}\left(\frac{\sqrt{a}x}{\sqrt{2}}\right)+c_2\,{}_1F_1\left(\frac{a-b}{2a};\frac{1}{2};\frac{ax^2}{2}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.096 (sec), leaf count = 58

$$\left\{y(x)=\mathrm{e}^{-\frac{ax^2}{2}}x\left(U\left(\frac{2a-b}{2a},\frac{3}{2},\frac{ax^2}{2}\right)\_C2+M\left(\frac{2a-b}{2a},\frac{3}{2},\frac{ax^2}{2}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[b*y[x] + a*x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*HermiteH[-1 + b/a, (Sqrt[a]*x)/Sqrt[2]] + C[2]*Hypergeometric1F1
[(a - b)/(2*a), 1/2, (a*x^2)/2])/E^((a*x^2)/2)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*x*diff(y(x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*a*x^2)*x*(KummerU(1/2/a*(2*a-b),3/2,1/2*a*x^2)*_C2+KummerM(1/2/a
*(2*a-b),3/2,1/2*a*x^2)*_C1)
```

4.1298 $(a+bx)y'(x)+cy(x)+y''(x)=0$

ODE

$$(a+bx)y'(x)+cy(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0277966 (sec), leaf count = 81

$$\left\{\left\{y(x)\to e^{-\frac{1}{2}x(2a+bx)}\left(c_1 H_{\frac{c}{b}-1}\left(\frac{a+bx}{\sqrt{2}\sqrt{b}}\right)+c_2\,{}_1F_1\left(\frac{b-c}{2b};\frac{1}{2};\frac{(a+bx)^2}{2b}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.044 (sec), leaf count = 49

$$\left\{y(x)=\_C1\,M\left(\frac{c}{2\,b},\frac{1}{2},-\frac{(bx+a)^2}{2\,b}\right)+\_C2\,U\left(\frac{c}{2\,b},\frac{1}{2},-\frac{(bx+a)^2}{2\,b}\right)\right\}$$

Mathematica raw input

```
DSolve[c*y[x] + (a + b*x)*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*HermiteH[-1 + c/b, (a + b*x)/(Sqrt[2]*Sqrt[b])] + C[2]*Hypergeom
etric1F1[(b - c)/(2*b), 1/2, (a + b*x)^2/(2*b)])/E^((x*(2*a + b*x))/2)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(b*x+a)*diff(y(x),x)+c*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*KummerM(1/2*c/b,1/2,-1/2/b*(b*x+a)^2)+_C2*KummerU(1/2*c/b,1/2,-1/2/b*
(b*x+a)^2)
```

4.1299 $(\mathbf{a0}+\mathbf{b0}x)y'(x)+y(x)(\mathbf{a1}+\mathbf{b1}x)+y''(x)=0$

ODE

$$(\mathrm{a0}+\mathrm{b0}x)y'(x)+y(x)(\mathrm{a1}+\mathrm{b1}x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0522915 (sec), leaf count = 132

$$\left\{\left\{y(x)\to e^{-\mathrm{a0}x+\frac{\mathrm{b1}x}{\mathrm{b0}}-\frac{\mathrm{b0}x^2}{2}}\left(c_2\,{}_1F_1\left(\frac{\mathrm{b0}^3-\mathrm{a1b0}^2+\mathrm{a0b1b0}-\mathrm{b1}^2}{2\mathrm{b0}^3};\frac{1}{2};\frac{\left(x\mathrm{b0}^2+\mathrm{a0b0}-2\mathrm{b1}\right)^2}{2\mathrm{b0}^3}\right)+c_1 H_{\frac{-\mathrm{a0b0b1}+\mathrm{a1b0}^2-\mathrm{b0}^3+\mathrm{b1}^2}{\mathrm{b0}^3}}\right.\right.$$

Maple ✓
cpu = 0.074 (sec), leaf count = 98

$$\left\{y(x)=\mathrm{e}^{-\frac{b1\,x}{b0}}\left(U\left(\frac{-a0\;b0\;b1+a1\;b0^2+b1^2}{2\,b0^3},\frac{1}{2},-\frac{\left(xb0^2+a0\;b0-2\,b1\right)^2}{2\,b0^3}\right)\_C2+M\left(\frac{-a0\;b0\;b1+a1\;b0^2+b1^2}{2\,b0^3},\frac{1}{2},\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a1 + b1*x)*y[x] + (a0 + b0*x)*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(-(a0*x) + (b1*x)/b0 - (b0*x^2)/2)*(C[1]*HermiteH[(a1*b0^2 - b0^3 -
a0*b0*b1 + b1^2)/b0^3, (a0*b0 - 2*b1 + b0^2*x)/(Sqrt[2]*b0^(3/2))] + C[2]*Hyperg
eometric1F1[(-(a1*b0^2) + b0^3 + a0*b0*b1 - b1^2)/(2*b0^3), 1/2, (a0*b0 - 2*b1 +
 b0^2*x)^2/(2*b0^3)])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(b0*x+a0)*diff(y(x),x)+(b1*x+a1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-b1/b0*x)*(KummerU(1/2*(-a0*b0*b1+a1*b0^2+b1^2)/b0^3,1/2,-1/2/b0^3*(b
0^2*x+a0*b0-2*b1)^2)*_C2+KummerM(1/2*(-a0*b0*b1+a1*b0^2+b1^2)/b0^3,1/2,-1/2/b0^3
*(b0^2*x+a0*b0-2*b1)^2)*_C1)
```

4.1300 $(\mathbf{a0}+\mathbf{b0}x)y'(x)+y(x)\left(\mathbf{a1}+\mathbf{b1}x+\mathbf{c1}x^2\right)+y''(x)=0$

ODE

$$(\text{a0}+\text{b0}x)y'(x)+y(x)\left(\text{a1}+\text{b1}x+\text{c1}x^2\right)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.141929 (sec), leaf count = 303

$$\left\{\left\{y(x)\to \exp\left(-\frac{x\left(2\text{a0}\left(\sqrt{\text{b0}^2-4\text{c1}}+\text{b0}\right)+x\left(\text{b0}\sqrt{\text{b0}^2-4\text{c1}}+\text{b0}^2-4\text{c1}\right)-4\text{b1}\right)}{4\sqrt{\text{b0}^2-4\text{c1}}}\right)\left(c_1 H_{\frac{2\text{a0}^2\text{c1}-2\text{a0b0b1}+2\text{a1}\left(\text{b0}^2-4\text{c1}\right)}{}}\right.\right.\right.$$

Maple ✓
cpu = 0.319 (sec), leaf count = 258

$$\left\{y(x)=\left(\_C2\left(x b0^2+a0\,b0-4\,c1\,x-2\,b1\right){}_1\mathrm{F}_1\left(-\frac{1}{2}\left(-\frac{3}{2}\left(b0^2-4\,c1\right)^{\frac{3}{2}}-\frac{b0^3}{2}+a1\,b0^2+\left(-a0\,b1+2\,c1\right)b0+\left(a0^2\right.\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a1 + b1*x + c1*x^2)*y[x] + (a0 + b0*x)*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*HermiteH[(-b0^3 - 2*a0*b0*b1 + 2*b1^2 - b0^2*Sqrt[b0^2 - 4*c1] +
  2*a1*(b0^2 - 4*c1) + 2*a0^2*c1 + 4*b0*c1 + 4*Sqrt[b0^2 - 4*c1]*c1)/(2*(b0^2 - 4
*c1)^(3/2)), (a0*b0 - 2*b1 + b0^2*x - 4*c1*x)/(Sqrt[2]*(b0^2 - 4*c1)^(3/4))] + C
 [2]*Hypergeometric1F1[(-2*a1*b0^2 + b0^3 + 2*a0*b0*b1 - 2*b1^2 + b0^2*Sqrt[b0^2
 - 4*c1] - 2*a0^2*c1 + 8*a1*c1 - 4*b0*c1 - 4*Sqrt[b0^2 - 4*c1]*c1)/(4*(b0^2 - 4*c
 1)^(3/2)), 1/2, (a0*b0 - 2*b1 + b0^2*x - 4*c1*x)^2/(2*(b0^2 - 4*c1)^(3/2))])/E^(
 (x*(-4*b1 + 2*a0*(b0 + Sqrt[b0^2 - 4*c1]) + (b0^2 + b0*Sqrt[b0^2 - 4*c1] - 4*c1)
 *x))/(4*Sqrt[b0^2 - 4*c1]))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(b0*x+a0)*diff(y(x),x)+(c1*x^2+b1*x+a1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*(b0^2*x+a0*b0-4*c1*x-2*b1)*hypergeom([-1/2/(b0^2-4*c1)^(3/2)*(-3/2*(
b0^2-4*c1)^(3/2)-1/2*b0^3+a1*b0^2+(-a0*b1+2*c1)*b0+(a0^2-4*a1)*c1+b1^2)],[3/2],1
/2*(b0^2*x+a0*b0-4*c1*x-2*b1)^2/(b0^2-4*c1)^(3/2))+_C1*hypergeom([-1/2/(b0^2-4*c
1)^(3/2)*(-1/2*(b0^2-4*c1)^(3/2)-1/2*b0^3+a1*b0^2+(-a0*b1+2*c1)*b0+(a0^2-4*a1)*c
1+b1^2)],[1/2],1/2*(b0^2*x+a0*b0-4*c1*x-2*b1)^2/(b0^2-4*c1)^(3/2)))*exp(-1/4/(b0
^2-4*c1)^(3/2)*x*((b0*x+2*a0)*(b0^2-4*c1)^(3/2)+(b0^2-4*c1)*(b0^2*x+2*a0*b0-4*c1
*x-4*b1)))
```

4.1301 $-2a(1-2ax^2)\,y(x)-4axy'(x)+y''(x)=0$

ODE

$$-2a(1-2ax^2)\,y(x)-4axy'(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0157116 (sec), leaf count = 20

$$\left\{\left\{y(x)\to e^{ax^2}(c_2x+c_1)\right\}\right\}$$

Maple ✓
cpu = 0.077 (sec), leaf count = 16

$$\left\{y(x)=\mathrm{e}^{ax^2}(\_C2\,x+\_C1)\right\}$$

Mathematica raw input

```
DSolve[-2*a*(1 - 2*a*x^2)*y[x] - 4*a*x*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(a*x^2)*(C[1] + x*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-4*a*x*diff(y(x),x)-2*a*(-2*a*x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(a*x^2)*(_C2*x+_C1)
```

4.1302 $x^2(-y'(x)) + y''(x) + xy(x) = 0$

ODE

$$x^2(-y'(x)) + y''(x) + xy(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.055221 (sec), leaf count = 51

$$\left\{\left\{y(x) \to -c_2 e^{\frac{x^3}{3}} + \frac{c_2 \sqrt[3]{-x^3}\,\Gamma\left(\frac{2}{3}, -\frac{x^3}{3}\right)}{\sqrt[3]{3}} + c_1 x\right\}\right\}$$

Maple ✓
cpu = 0.201 (sec), leaf count = 47

$$\left\{y(x) = \frac{1}{x^2}\left(e^{\frac{x^3}{3}} (-x^3)^{\frac{2}{3}}\, \sqrt[3]{3}\_C2 + x^3\left(-\Gamma\left(\frac{2}{3}\right)\_C2 + \_C2\,\Gamma\left(\frac{2}{3}, -\frac{x^3}{3}\right) + \_C1\right)\right)\right\}$$

Mathematica raw input

```
DSolve[x*y[x] - x^2*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] - E^(x^3/3)*C[2] + ((-x^3)^(1/3)*C[2]*Gamma[2/3, -x^3/3])/3^(1/
3)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-x^2*diff(y(x),x)+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (exp(1/3*x^3)*(-x^3)^(2/3)*3^(1/3)*_C2+x^3*(-GAMMA(2/3)*_C2+_C2*GAMMA(2/3
,-1/3*x^3)+_C1))/x^2
```

4.1303 $x^2(-y'(x)) + y''(x) + xy(x) = x$

ODE

$$x^2(-y'(x)) + y''(x) + xy(x) = x$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0695336 (sec), leaf count = 52

$$\left\{\left\{y(x) \to -c_2 e^{\frac{x^3}{3}} + \frac{c_2 \sqrt[3]{-x^3}\,\Gamma\left(\frac{2}{3}, -\frac{x^3}{3}\right)}{\sqrt[3]{3}} + c_1 x + 1\right\}\right\}$$

Maple ✓
cpu = 0.038 (sec), leaf count = 49

$$\left\{y(x) = x\_C2 + \frac{\_C1}{x^2}\left(\sqrt[3]{3}\mathrm{e}^{\frac{x^3}{3}}\left(-x^3\right)^{\frac{2}{3}} - x^3\left(\Gamma\left(\frac{2}{3}\right) - \Gamma\left(\frac{2}{3}, -\frac{x^3}{3}\right)\right)\right) + 1\right\}$$

Mathematica raw input

```
DSolve[x*y[x] - x^2*y'[x] + y''[x] == x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1 + x*C[1] - E^(x^3/3)*C[2] + ((-x^3)^(1/3)*C[2]*Gamma[2/3, -x^3/3])/3
^(1/3)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-x^2*diff(y(x),x)+x*y(x) = x, y(x),'implicit')
```

Maple raw output

```
y(x) = x*_C2+(3^(1/3)*exp(1/3*x^3)*(-x^3)^(2/3)-x^3*(GAMMA(2/3)-GAMMA(2/3,-1/3*x
^3)))/x^2*_C1+1
```

4.1304 $x^2y'(x)+y''(x)-4xy(x)=0$

ODE

$$x^2y'(x)+y''(x)-4xy(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.42298 (sec), leaf count = 87

$$\left\{\left\{y(x)\to \frac{1}{36}e^{-\frac{x^3}{3}}\left(36c_1e^{\frac{x^3}{3}}x\left(x^3+4\right)-3c_2\left(x^3+3\right)+3^{2/3}c_2e^{\frac{x^3}{3}}\sqrt[3]{x^3}\left(x^3+4\right)\Gamma\left(\frac{2}{3},\frac{x^3}{3}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.23 (sec), leaf count = 31

$$\left\{y(x)=\_C1\,x\left(x^3+4\right)+\_C2\,\mathrm{e}^{-\frac{x^3}{3}}{}_1\mathrm{F}_1(2;\,\frac{2}{3};\,\frac{x^3}{3})\right\}$$

Mathematica raw input

```
DSolve[-4*x*y[x] + x^2*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (36*E^(x^3/3)*x*(4 + x^3)*C[1] - 3*(3 + x^3)*C[2] + 3^(2/3)*E^(x^3/3)*
(x^3)^(1/3)*(4 + x^3)*C[2]*Gamma[2/3, x^3/3])/(36*E^(x^3/3))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+x^2*diff(y(x),x)-4*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x*(x^3+4)+_C2*exp(-1/3*x^3)*hypergeom([2],[2/3],1/3*x^3)
```

4.1305 $x^4 y'(x) - x^3 y(x) + y''(x) = 0$

ODE

$$x^4 y'(x) - x^3 y(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0529286 (sec), leaf count = 49

$$\left\{\left\{y(x) \to -c_2 e^{-\frac{x^5}{5}} + \frac{c_2 \sqrt[5]{x^5}\,\Gamma\left(\frac{4}{5}, \frac{x^5}{5}\right)}{\sqrt[5]{5}} + c_1 x\right\}\right\}$$

Maple ✓
cpu = 0.107 (sec), leaf count = 56

$$\left\{y(x) = \frac{1}{x^7}\left(9\,\_C2\, \mathrm{e}^{-1/10\,x^5}\left(x^5+4\right) M_{7/5,\,\frac{9}{10}}\left(1/5\,x^5\right) + x^8\left(x^2\,\_C2\, \mathrm{e}^{-\frac{x^5}{10}} M_{\frac{2}{5},\,\frac{9}{10}}\left(\frac{x^5}{5}\right) + \_C1\right)\right)\right\}$$

Mathematica raw input

```
DSolve[-(x^3*y[x]) + x^4*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] - C[2]/E^(x^5/5) + ((x^5)^(1/5)*C[2]*Gamma[4/5, x^5/5])/5^(1/5)
}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+x^4*diff(y(x),x)-x^3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (9*_C2*exp(-1/10*x^5)*(x^5+4)*WhittakerM(7/5,9/10,1/5*x^5)+x^8*(x^2*_C2*e
xp(-1/10*x^5)*WhittakerM(2/5,9/10,1/5*x^5)+_C1))/x^7
```

4.1306 $a(k+1)x^{k-1}y(x)+ax^k y'(x)+y''(x)=0$

ODE

$$a(k+1)x^{k-1}y(x)+ax^k y'(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.40809 (sec), leaf count = 0 , could not solve

```
DSolve[a*(1 + k)*x^(-1 + k)*y[x] + a*x^k*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.39 (sec), leaf count = 151

$$\left\{y(x)=\_C1\, \mathrm{e}^{-\frac{ax^{k+1}}{k+1}}x+\_C2\left((k+1)\left(x^{-\frac{k}{2}}a-x^{-\frac{3k}{2}-1}k\right)M_{\frac{-2-k}{2k+2},\frac{1+2k}{2k+2}}\left(-\frac{ax^{k+1}}{k+1}\right)-M_{\frac{k}{2k+2},\frac{1+2k}{2k+2}}\left(-\frac{ax^{k+1}}{k+1}\right)x^{-\frac{3k}{2}-1}k^2\right.\right.$$

Mathematica raw input

```
DSolve[a*(1 + k)*x^(-1 + k)*y[x] + a*x^k*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a*(1 + k)*x^(-1 + k)*y[x] + a*x^k*Derivative[1][y][x] + Derivative[2][y][
x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*x^k*diff(y(x),x)+a*(k+1)*x^(k-1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-x^(k+1)/(k+1)*a)*x+_C2*((k+1)*(x^(-1/2*k)*a-x^(-3/2*k-1)*k)*Whit
takerM((-2-k)/(2*k+2),(1+2*k)/(2*k+2),-x^(k+1)/(k+1)*a)-WhittakerM(k/(2*k+2),(1+
2*k)/(2*k+2),-x^(k+1)/(k+1)*a)*x^(-3/2*k-1)*k^2)*exp(-a*x^(k+1)/(2*k+2))
```

4.1307 $akx^{k-1}y(x)+ax^k y'(x)+y''(x)=0$

ODE

$$akx^{k-1}y(x)+ax^k y'(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0837096 (sec), leaf count = 74

$$\left\{\left\{y(x)\to e^{-\frac{ax^{k+1}}{k+1}}\left(c_2-\frac{c_1 x\left(-\frac{ax^{k+1}}{k+1}\right)^{-\frac{1}{k+1}}\Gamma\left(\frac{1}{k+1},-\frac{ax^{k+1}}{k+1}\right)}{k+1}\right)\right\}\right\}$$

Maple ✓
cpu = 0.054 (sec), leaf count = 216

$$\left\{y(x)=1\left(-\left(-\frac{ax^{k+1}}{k+1}\right)^{\frac{-2-k}{2k+2}}\_C1\,x^{-k}\mathrm{e}^{\frac{ax^{k+1}}{2k+2}}(k+2)^2\,M_{\frac{k+2}{2k+2},\frac{2k+3}{2k+2}}\left(-\frac{ax^{k+1}}{k+1}\right)+\left(-\frac{ax^{k+1}}{k+1}\right)^{\frac{-2-k}{2k+2}}\_C1\,x^{-k}\mathrm{e}^{\frac{ax^{k+1}}{2k+2}}(k+1)\right.\right.$$

Mathematica raw input

```
DSolve[a*k*x^(-1 + k)*y[x] + a*x^k*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[2] - (x*C[1]*Gamma[(1 + k)^(-1), -((a*x^(1 + k))/(1 + k))])/((1 + k
)*(-((a*x^(1 + k))/(1 + k)))^(1 + k)^(-1)))/E^((a*x^(1 + k))/(1 + k))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*x^k*diff(y(x),x)+a*k*x^(k-1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-(-x^(k+1)/(k+1)*a)^((-2-k)/(2*k+2))*_C1*x^(-k)*exp(a*x^(k+1)/(2*k+2))*(
k+2)^2*WhittakerM((k+2)/(2*k+2),(2*k+3)/(2*k+2),-x^(k+1)/(k+1)*a)+(-x^(k+1)/(k+1
)*a)^((-2-k)/(2*k+2))*_C1*x^(-k)*exp(a*x^(k+1)/(2*k+2))*(k+1)*(a*x^(k+1)-k-2)*Wh
ittakerM(-k/(2*k+2),(2*k+3)/(2*k+2),-x^(k+1)/(k+1)*a)+_C2)/exp(x^(k+1)/(k+1)*a)
```

4.1308 $-ax^{k-1}y(x)+ax^k y'(x)+y''(x)=0$

ODE

$$-ax^{k-1}y(x)+ax^k y'(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0477762 (sec), leaf count = 90

$$\left\{\left\{y(x)\to \frac{\left(\frac{1}{k}+1\right)^{-\frac{1}{k+1}} k^{-\frac{1}{k+1}} a^{\frac{1}{k+1}} \left(x^k\right)^{\frac{1}{k}} \left(c_2(-1)^{\frac{1}{k+1}}(k+1)-c_1\Gamma\left(-\frac{1}{k+1},0,\frac{a\left(x^k\right)^{1+\frac{1}{k}}}{k+1}\right)\right)}{k+1}\right\}\right\}$$

Maple ✓
cpu = 0.248 (sec), leaf count = 133

$$\left\{y(x)=\_C1\,x+\_C2\left((k+1)\left(x^{-\frac{k}{2}}a+x^{-\frac{3k}{2}-1}k\right)M_{\frac{-2-k}{2k+2},\frac{1+2k}{2k+2}}\left(\frac{ax^{k+1}}{k+1}\right)+M_{\frac{k}{2k+2},\frac{1+2k}{2k+2}}\left(\frac{ax^{k+1}}{k+1}\right)x^{-\frac{3k}{2}-1}k^2\right)\mathrm{e}^{-\frac{ax^{k+1}}{2k+2}}\right\}$$

Mathematica raw input

```
DSolve[-(a*x^(-1 + k)*y[x]) + a*x^k*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a^(1 + k)^(-1)*(x^k)^k^(-1)*((-1)^(1 + k)^(-1)*(1 + k)*C[2] - C[1]*Ga
mma[-(1 + k)^(-1), 0, (a*(x^k)^(1 + k^(-1)))/(1 + k)]))/((1 + k^(-1))^(1 + k)^(-
1)*k^(1 + k)^(-1)*(1 + k))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*x^k*diff(y(x),x)-a*x^(k-1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x+_C2*((k+1)*(x^(-1/2*k)*a+x^(-3/2*k-1)*k)*WhittakerM((-2-k)/(2*k+2),
(1+2*k)/(2*k+2),x^(k+1)/(k+1)*a)+WhittakerM(k/(2*k+2),(1+2*k)/(2*k+2),x^(k+1)/(k
+1)*a)*x^(-3/2*k-1)*k^2)*exp(-a*x^(k+1)/(2*k+2))
```

4.1309 $ax^k y'(x) + bx^{k-1} y(x) + y''(x) = 0$

ODE

$$ax^k y'(x) + bx^{k-1} y(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0472613 (sec), leaf count = 120

$$\left\{\left\{y(x) \to c_2 \left(\frac{1}{k}+1\right)^{-\frac{1}{k+1}} k^{-\frac{1}{k+1}} a^{\frac{1}{k+1}} \left(x^k\right)^{\frac{1}{k}} {}_1F_1\left(\frac{a+b}{ka+a}; \frac{k+2}{k+1}; -\frac{a\left(x^k\right)^{1+\frac{1}{k}}}{k+1}\right) + c_1 {}_1F_1\left(\frac{b}{ka+a}; \frac{k}{k+1}; -\frac{a\left(x^k\right)^{1+\frac{1}{k}}}{k+1}\right)\right.\right.$$

Maple ✓
cpu = 0.211 (sec), leaf count = 105

$$\left\{y(x) = \mathrm{e}^{-\frac{ax^{k+1}}{k+1}} x\left(U\left(\frac{a(k+1)-b}{a\,(k+1)}, \frac{k+2}{k+1}, \frac{ax^{k+1}}{k+1}\right)\_C2 + M\left(\frac{a(k+1)-b}{a\,(k+1)}, \frac{k+2}{k+1}, \frac{ax^{k+1}}{k+1}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[b*x^(-1 + k)*y[x] + a*x^k*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric1F1[b/(a + a*k), k/(1 + k), -((a*(x^k)^(1 + k^(-1))
)/(1 + k))] + (a^(1 + k)^(-1)*(x^k)^k^(-1)*C[2]*Hypergeometric1F1[(a + b)/(a + a
*k), (2 + k)/(1 + k), -((a*(x^k)^(1 + k^(-1)))/(1 + k))])/((1 + k^(-1))^(1 + k)^
(-1)*k^(1 + k)^(-1))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*x^k*diff(y(x),x)+b*x^(k-1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x^(k+1)/(k+1)*a)*x*(KummerU((a*(k+1)-b)/a/(k+1),(k+2)/(k+1),x^(k+1)/
(k+1)*a)*_C2+KummerM((a*(k+1)-b)/a/(k+1),(k+2)/(k+1),x^(k+1)/(k+1)*a)*_C1)
```

4.1310 $y''(x) - \cot(x)y'(x) + 2y(x) = 0$

ODE

$$y''(x) - \cot(x)y'(x) + 2y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.11491 (sec), leaf count = 45

$$\left\{\left\{y(x) \to -c_1 \sin^2(x) - \frac{1}{4}c_2\left(2\cos(x) + \sin^2(x)(\log(\cos(x)+1) - \log(1-\cos(x)))\right)\right\}\right\}$$

Maple ✓
cpu = 0.244 (sec), leaf count = 30

$$\left\{y(x) = \left(-\_C2\,(\cos(x))^2 + \_C2\right) Artanh\left((\cos(x))^{-1}\right) + \_C1\,(\sin(x))^2 + \cos(x)\,\_C2\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - Cot[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(C[1]*Sin[x]^2) - (C[2]*(2*Cos[x] + (-Log[1 - Cos[x]] + Log[1 + Cos[x
]])*Sin[x]^2))/4}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-cot(x)*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-_C2*cos(x)^2+_C2)*arctanh(1/cos(x))+_C1*sin(x)^2+cos(x)*_C2
```

4.1311 $k(k+1)y(x)+y''(x)+\cot(x)y'(x)=0$

ODE

$$k(k+1)y(x)+y''(x)+\cot(x)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.133458 (sec), leaf count = 20

$$\{\{y(x)\to c_1 P_k(\cos(x))+c_2 Q_k(\cos(x))\}\}$$

Maple ✓
cpu = 0.26 (sec), leaf count = 45

$$\left\{y(x)=\_C1\ {}_2\mathrm{F}_1(-\frac{k}{2},\frac{1}{2}+\frac{k}{2};\frac{1}{2};(\cos(x))^2)+\_C2\ \cos(x)\ {}_2\mathrm{F}_1(\frac{k}{2}+1,\frac{1}{2}-\frac{k}{2};\frac{3}{2};(\cos(x))^2)\right\}$$

Mathematica raw input

```
DSolve[k*(1 + k)*y[x] + Cot[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*LegendreP[k, Cos[x]] + C[2]*LegendreQ[k, Cos[x]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+cot(x)*diff(y(x),x)+k*(k+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([-1/2*k, 1/2+1/2*k],[1/2],cos(x)^2)+_C2*cos(x)*hypergeom([1
/2*k+1, 1/2-1/2*k],[3/2],cos(x)^2)
```

4.1312 $y''(x) + \cot(x)y'(x) - y(x)\csc^2(x) = 0$

ODE

$$y''(x) + \cot(x)y'(x) - y(x)\csc^2(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0584413 (sec), leaf count = 51

$$\left\{\left\{y(x) \to c_1 \cosh\left(\log\left(\cos\left(\frac{x}{2}\right)\right) - \log\left(\sin\left(\frac{x}{2}\right)\right)\right) - ic_2 \sinh\left(\log\left(\cos\left(\frac{x}{2}\right)\right) - \log\left(\sin\left(\frac{x}{2}\right)\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 25

$$\left\{y(x) = \frac{\sin(x)\_C1}{\cos(x) - 1} + \frac{(\cos(x) - 1)\_C2}{\sin(x)}\right\}$$

Mathematica raw input

```
DSolve[-(Csc[x]^2*y[x]) + Cot[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[Log[Cos[x/2]] - Log[Sin[x/2]]] - I*C[2]*Sinh[Log[Cos[x/2]] -
  Log[Sin[x/2]]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+cot(x)*diff(y(x),x)-y(x)*csc(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)/(cos(x)-1)*_C1+(cos(x)-1)/sin(x)*_C2
```

4.1313 $y(x)\left(p(p+1)-k^2\csc^2(x)\right)+y''(x)+\cot(x)y'(x)=0$

ODE

$$y(x)\left(p(p+1)-k^2\csc^2(x)\right)+y''(x)+\cot(x)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.558687 (sec), leaf count = 22

$$\{\{y(x)\to c_1 P_p^k(\cos(x))+c_2 Q_p^k(\cos(x))\}\}$$

Maple ✓
cpu = 0.236 (sec), leaf count = 19

$$\{y(x)=\_C1\ LegendreP(p,k,\cos(x))+\_C2\ LegendreQ(p,k,\cos(x))\}$$

Mathematica raw input

```
DSolve[(p*(1 + p) - k^2*Csc[x]^2)*y[x] + Cot[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*LegendreP[p, k, Cos[x]] + C[2]*LegendreQ[p, k, Cos[x]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+cot(x)*diff(y(x),x)+(p*(p+1)-k^2*csc(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*LegendreP(p,k,cos(x))+_C2*LegendreQ(p,k,cos(x))
```

4.1314 $y(x)\left(\mathbf{a0}+4\mathbf{a1}\sin^2(x)-\mathbf{a2}\csc^2(x)\right)+y''(x)+\cot(x)y'(x)=0$

ODE

$$y(x)\left(\text{a0}+4\text{a1}\sin^2(x)-\text{a2}\csc^2(x)\right)+y''(x)+\cot(x)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.74622 (sec), leaf count = 0 , could not solve

```
DSolve[(a0 - a2*Csc[x]^2 + 4*a1*Sin[x]^2)*y[x] + Cot[x]*Derivative[1][y][x] + Derivative[2][y][x] ==
```

Maple ✓
cpu = 0.395 (sec), leaf count = 67

$$\left\{y(x)=\_C1\,(\sin(x))^{\sqrt{a2}}\,HeunC\left(0,\sqrt{a2},-\frac{1}{2},-a1,\frac{a2}{4}+\frac{1}{4}-\frac{a0}{4},(\sin(x))^2\right)+\_C2\,(\sin(x))^{-\sqrt{a2}}\,HeunC\left(0,-\sqrt{a2},-\right.\right.$$

Mathematica raw input

```
DSolve[(a0 - a2*Csc[x]^2 + 4*a1*Sin[x]^2)*y[x] + Cot[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[(a0 - a2*Csc[x]^2 + 4*a1*Sin[x]^2)*y[x] + Cot[x]*Derivative[1][y][x] + De
rivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+cot(x)*diff(y(x),x)+(a0+4*a1*sin(x)^2-a2*csc(x)^2)*y(x) = 0, y(x),'implic
```

Maple raw output

```
y(x) = _C1*sin(x)^(a2^(1/2))*HeunC(0,a2^(1/2),-1/2,-a1,1/4*a2+1/4-1/4*a0,sin(x)^
2)+_C2*sin(x)^(-a2^(1/2))*HeunC(0,-a2^(1/2),-1/2,-a1,1/4*a2+1/4-1/4*a0,sin(x)^2)
```

4.1315 $y''(x) + 2\cot(x)y'(x) + 3y(x) = 0$

ODE

$$y''(x) + 2\cot(x)y'(x) + 3y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.112467 (sec), leaf count = 42

$$\left\{\left\{y(x) \to \frac{c_2 e^{3ix}}{2\left(-1+e^{2ix}\right)} + c_1 e^{-2ix}\csc(x)\right\}\right\}$$

Maple ✓
cpu = 0.051 (sec), leaf count = 22

$$\left\{y(x) = \frac{\_C1\ \sin(2x) + \_C2\ \cos(2x)}{\sin(x)}\right\}$$

Mathematica raw input

```
DSolve[3*y[x] + 2*Cot[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^((3*I)*x)*C[2])/(2*(-1 + E^((2*I)*x))) + (C[1]*Csc[x])/E^((2*I)*x)}
}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*cot(x)*diff(y(x),x)+3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*sin(2*x)+_C2*cos(2*x))/sin(x)
```

4.1316 $y''(x) + 2\cot(x)y'(x) + 3y(x) = e^x \csc(x)$

ODE

$$y''(x) + 2\cot(x)y'(x) + 3y(x) = e^x \csc(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0999582 (sec), leaf count = 56

$$\left\{\left\{y(x) \to \frac{e^{-ix}\left(5c_2e^{4ix} + 20ic_1 + 4ie^{(1+2i)x}\right)}{10\left(-1 + e^{2ix}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.441 (sec), leaf count = 76

$$\left\{y(x) = \frac{-((-2+i)\cos(2x) - (1+2i)\sin(2x))\,e^{x}e^{-2ix} + e^{x}((2+i)\cos(2x) + (1-2i)\sin(2x))\,e^{2ix} + 20\cos(2x)\_C1}{20\sin(x)}\right.$$

Mathematica raw input

```
DSolve[3*y[x] + 2*Cot[x]*y'[x] + y''[x] == E^x*Csc[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((4*I)*E^((1 + 2*I)*x) + (20*I)*C[1] + 5*E^((4*I)*x)*C[2])/(10*E^(I*x)
*(-1 + E^((2*I)*x)))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*cot(x)*diff(y(x),x)+3*y(x) = exp(x)*csc(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/20*(-((-2+I)*cos(2*x)-(1+2*I)*sin(2*x))*exp(x)*exp(-2*I*x)+exp(x)*((2+I
)*cos(2*x)+(1-2*I)*sin(2*x))*exp(2*I*x)+20*cos(2*x)*_C1+20*sin(2*x)*_C2)/sin(x)
```

4.1317 $a\cot(x)y'(x)+y(x)\left(b+k^2\cos^2(x)\right)+y''(x)=0$

ODE

$$a\cot(x)y'(x)+y(x)\left(b+k^2\cos^2(x)\right)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.06933 (sec), leaf count = 0 , could not solve

```
DSolve[(b + k^2*Cos[x]^2)*y[x] + a*Cot[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.383 (sec), leaf count = 77

$$\left\{y(x)=\_C1\ HeunC\left(0,\frac{a}{2}-\frac{1}{2},-\frac{1}{2},\frac{k^2}{4},-\frac{a}{8}+\frac{3}{8}-\frac{k^2}{4}-\frac{b}{4},(\sin(x))^2\right)+\_C2\ HeunC\left(0,-\frac{a}{2}+\frac{1}{2},-\frac{1}{2},\frac{k^2}{4},-\frac{a}{8}+\frac{3}{8}-\frac{k^2}{4}\right.\right.$$

Mathematica raw input

```
DSolve[(b + k^2*Cos[x]^2)*y[x] + a*Cot[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[(b + k^2*Cos[x]^2)*y[x] + a*Cot[x]*Derivative[1][y][x] + Derivative[2][y]
[x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*cot(x)*diff(y(x),x)+(b+k^2*cos(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*HeunC(0,1/2*a-1/2,-1/2,1/4*k^2,-1/8*a+3/8-1/4*k^2-1/4*b,sin(x)^2)+_C2
*HeunC(0,-1/2*a+1/2,-1/2,1/4*k^2,-1/8*a+3/8-1/4*k^2-1/4*b,sin(x)^2)*sin(x)^(1-a)
```

4.1318 $y(x)\left(a\cot^2(x)+b\cot(x)\csc(x)+c\csc^2(x)\right)+k\cot(x)y'(x)+y''(x)=0$

ODE

$$y(x)\left(a\cot^2(x)+b\cot(x)\csc(x)+c\csc^2(x)\right)+k\cot(x)y'(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 67.4996 (sec), leaf count = 1

$Aborted

Maple ✓
cpu = 0.632 (sec), leaf count = 398

$$\left\{y(x)=\left(\frac{\cos(x)}{2}-\frac{1}{2}\right)^{\frac{1}{4}\sqrt{k^2-4a-4b-4c-2k+1}}\sqrt{2-2\cos(x)}(\sin(x))^{-\frac{k}{2}-\frac{1}{2}}\left({}_2\mathrm{F}_1(\frac{1}{4}\sqrt{k^2-4a-4b-4c-2k+1}+\frac{1}{2}\sqrt{k}\right.\right.$$

Mathematica raw input

```
DSolve[(a*Cot[x]^2 + b*Cot[x]*Csc[x] + c*Csc[x]^2)*y[x] + k*Cot[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+k*cot(x)*diff(y(x),x)+(a*cot(x)^2+b*cot(x)*csc(x)+c*csc(x)^2)*y(x) = 0, y
```

Maple raw output

```
y(x) = (1/2*cos(x)-1/2)^(1/4*(k^2-4*a-4*b-4*c-2*k+1)^(1/2))*(2-2*cos(x))^(1/2)*s
in(x)^(-1/2*k-1/2)*(hypergeom([1/4*(k^2-4*a-4*b-4*c-2*k+1)^(1/2)+1/2*(k^2-4*a)^(
1/2)+1/4*(k^2-4*a+4*b-4*c-2*k+1)^(1/2)+1/2, 1/4*(k^2-4*a-4*b-4*c-2*k+1)^(1/2)-1/
2*(k^2-4*a)^(1/2)+1/4*(k^2-4*a+4*b-4*c-2*k+1)^(1/2)+1/2],[1+1/2*(k^2-4*a+4*b-4*c
-2*k+1)^(1/2)],1/2*cos(x)+1/2)*(2*cos(x)+2)^(1/2+1/4*(k^2-4*a+4*b-4*c-2*k+1)^(1/
2))*_C2+(2*cos(x)+2)^(1/2-1/4*(k^2-4*a+4*b-4*c-2*k+1)^(1/2))*hypergeom([1/4*(k^2
```

```
-4*a-4*b-4*c-2*k+1)^(1/2)+1/2*(k^2-4*a)^(1/2)-1/4*(k^2-4*a+4*b-4*c-2*k+1)^(1/2)+
1/2, 1/4*(k^2-4*a-4*b-4*c-2*k+1)^(1/2)-1/2*(k^2-4*a)^(1/2)-1/4*(k^2-4*a+4*b-4*c-
2*k+1)^(1/2)+1/2],[1-1/2*(k^2-4*a+4*b-4*c-2*k+1)^(1/2)],1/2*cos(x)+1/2)*_C1)
```

4.1319 $y''(x) - \cot(2x)y'(x) + 2y(x) = 0$

ODE

$$y''(x) - \cot(2x)y'(x) + 2y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.238621 (sec), leaf count = 64

$$\left\{\left\{y(x) \to -\frac{2}{3}c_2 \cos(2x)\cos^{\frac{3}{2}}(x)\,{}_2F_1\left(\frac{1}{4},\frac{3}{4};\frac{7}{4};\cos^2(x)\right) + \frac{1}{2}c_1\cos(2x) - 2c_2\sin^2(x)^{3/4}\cos^{\frac{3}{2}}(x)\right\}\right\}$$

Maple ✓
cpu = 0.428 (sec), leaf count = 32

$$\left\{y(x) = \_C2\,(\cos(x)\sin(x))^{\frac{3}{2}}\,{}_2\mathrm{F}_1(\frac{1}{2},2;\,\frac{7}{4};\,(\sin(x))^2) - 2\,(\cos(x))^2\,\_C1 + \_C1\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - Cot[2*x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*Cos[2*x])/2 - (2*C[2]*Cos[x]^(3/2)*Cos[2*x]*Hypergeometric2F1[1/
4, 3/4, 7/4, Cos[x]^2])/3 - 2*C[2]*Cos[x]^(3/2)*(Sin[x]^2)^(3/4)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-cot(2*x)*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*(cos(x)*sin(x))^(3/2)*hypergeom([1/2, 2],[7/4],sin(x)^2)-2*cos(x)^2*_
C1+_C1
```

4.1320 $ay(x)\tan^2(x) + y''(x) - 2\cot(2x)y'(x) = 0$

ODE

$$ay(x)\tan^2(x) + y''(x) - 2\cot(2x)y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.791327 (sec), leaf count = 42

$$\left\{\left\{y(x) \to \cos^{1-\sqrt{1-a}}(x)\left(c_2 \cos^{2\sqrt{1-a}}(x) + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.276 (sec), leaf count = 35

$$\left\{y(x) = \_C1\,(\cos(x))^{1+\sqrt{1-a}} + \_C2\,(\cos(x))^{1-\sqrt{1-a}}\right\}$$

Mathematica raw input

```
DSolve[a*Tan[x]^2*y[x] - 2*Cot[2*x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Cos[x]^(1 - Sqrt[1 - a])*(C[1] + C[2]*Cos[x]^(2*Sqrt[1 - a]))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*cot(2*x)*diff(y(x),x)+a*y(x)*tan(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*cos(x)^(1+(1-a)^(1/2))+_C2*cos(x)^(1-(1-a)^(1/2))
```

4.1321 $a\cot(bx)y'(x)+cy(x)+y''(x)=0$

ODE

$$a\cot(bx)y'(x)+cy(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.978557 (sec), leaf count = 0 , could not solve

```
DSolve[c*y[x] + a*Cot[b*x]*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.271 (sec), leaf count = 91

$$\left\{y(x)=(\sin(bx))^{-\frac{a-b}{2b}}\left(LegendreQ\left(\frac{1}{2b}\left(-b+\sqrt{a^2+4c}\right),\frac{a-b}{2b},\cos(bx)\right)\_C2+LegendreP\left(\frac{1}{2b}\left(-b+\sqrt{a^2+4c}\right),\frac{a-\right.\right.$$

Mathematica raw input

```
DSolve[c*y[x] + a*Cot[b*x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[c*y[x] + a*Cot[b*x]*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x],
 x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*cot(b*x)*diff(y(x),x)+c*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = sin(b*x)^(-1/2*(a-b)/b)*(LegendreQ(1/2/b*(-b+(a^2+4*c)^(1/2)),1/2*(a-b)/b
,cos(b*x))*_C2+LegendreP(1/2/b*(-b+(a^2+4*c)^(1/2)),1/2*(a-b)/b,cos(b*x))*_C1)
```

4.1322 $(b^2 - a^2)\, y(x) + 2a \cot(ax) y'(x) + y''(x) = 0$

ODE

$$(b^2 - a^2)\, y(x) + 2a \cot(ax) y'(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.1099 (sec), leaf count = 58

$$\left\{\left\{y(x) \to \frac{1}{2} e^{-\sqrt{-b^2}x} \csc(ax) \left(\frac{c_2 e^{2\sqrt{-b^2}x}}{\sqrt{-b^2}} + 2c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.089 (sec), leaf count = 24

$$\left\{y(x) = \frac{\_C1 \sin(bx) + \_C2 \cos(bx)}{\sin(ax)}\right\}$$

Mathematica raw input

```
DSolve[(-a^2 + b^2)*y[x] + 2*a*Cot[a*x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((2*C[1] + (E^(2*Sqrt[-b^2]*x)*C[2])/Sqrt[-b^2])*Csc[a*x])/(2*E^(Sqrt[
-b^2]*x))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*a*cot(a*x)*diff(y(x),x)+(-a^2+b^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*sin(b*x)+_C2*cos(b*x))/sin(a*x)
```

4.1323 $ay(x)\tan^2\left(\frac{x}{2}\right)+y''(x)-\csc(x)y'(x)=0$

ODE

$$ay(x)\tan^2\left(\frac{x}{2}\right)+y''(x)-\csc(x)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0884163 (sec), leaf count = 43

$$\left\{\left\{y(x)\to c_1\cos\left(2\sqrt{a}\log\left(\cos\left(\frac{x}{2}\right)\right)\right)-c_2\sin\left(2\sqrt{a}\log\left(\cos\left(\frac{x}{2}\right)\right)\right)\right\}\right\}$$

Maple ✓
cpu = 22.558 (sec), leaf count = 31

$$\left\{y(x)=\_C1\,(1+\cos(x))^{-i\sqrt{a}}+\_C2\,(1+\cos(x))^{i\sqrt{a}}\right\}$$

Mathematica raw input

```
DSolve[a*Tan[x/2]^2*y[x] - Csc[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[2*Sqrt[a]*Log[Cos[x/2]]] - C[2]*Sin[2*Sqrt[a]*Log[Cos[x/2]]]}
}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-diff(y(x),x)*csc(x)+a*y(x)*tan(1/2*x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(1+cos(x))^(-I*a^(1/2))+_C2*(1+cos(x))^(I*a^(1/2))
```

4.1324 $y''(x) + y'(x)(\cot(x) + \csc(x)) = a\csc(x) + 1$

ODE

$$y''(x) + y'(x)(\cot(x) + \csc(x)) = a\csc(x) + 1$$

ODE Classification

[[_2nd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.194706 (sec), leaf count = 77

$$\left\{\left\{y(x) \to \frac{e^{ix}(2ax + 2c_2 - ix + 1) + 2ia(1 + e^{ix})\log\left(1 + e^{ix}\right) + 2ic_1 - ix - 1}{-1 + e^{ix}}\right\}\right\}$$

Maple ✓
cpu = 1.181 (sec), leaf count = 274

$$\left\{y(x) = \frac{1}{-1 + \mathrm{e}^{ix}}\left(-a\pi\left(csgn\left(\frac{i\mathrm{e}^{ix}}{\left(1 + \mathrm{e}^{ix}\right)^2}\right)\right)^3 + a\pi\left(csgn\left(i\mathrm{e}^{ix}\right) + csgn\left(\frac{i}{\left(1 + \mathrm{e}^{ix}\right)^2}\right)\right)\left(csgn\left(\frac{i\mathrm{e}^{ix}}{\left(1 + \mathrm{e}^{ix}\right)^2}\right)\right)^2 - a\pi\ csg\right.$$

Mathematica raw input

```
DSolve[(Cot[x] + Csc[x])*y'[x] + y''[x] == 1 + a*Csc[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 - I*x + (2*I)*C[1] + E^(I*x)*(1 - I*x + 2*a*x + 2*C[2]) + (2*I)*a*
(1 + E^(I*x))*Log[1 + E^(I*x)])/(-1 + E^(I*x))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(cot(x)+csc(x))*diff(y(x),x) = 1+a*csc(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-a*Pi*csgn(I*exp(I*x)/(1+exp(I*x))^2)^3+a*Pi*(csgn(I*exp(I*x))+csgn(I/(1
+exp(I*x))^2))*csgn(I*exp(I*x)/(1+exp(I*x))^2)^2-a*Pi*csgn(I/(1+exp(I*x))^2)*csg
n(I*exp(I*x))*csgn(I*exp(I*x)/(1+exp(I*x))^2)+a*Pi*csgn(I*(1+exp(I*x))^2)^3-2*a*
```

```
Pi*csgn(I+I*exp(I*x))*csgn(I*(1+exp(I*x))^2)^2+a*Pi*csgn(I+I*exp(I*x))^2*csgn(I*
(1+exp(I*x))^2)+2*I*a*(1+exp(I*x))*ln(1+exp(I*x))-2*I*a*ln(exp(I*x))+(-I*x+2*a*x
+_C2)*exp(I*x)-4*I*ln(2)*a-I*x-2*I*_C1-2*a*x-_C2)/(-1+exp(I*x))
```

4.1325 $y''(x) - \csc(2x)y'(x) + y(x)\left(\sin^2(x) + 2\right)\csc^2(x) = 0$

ODE

$$y''(x) - \csc(2x)y'(x) + y(x)\left(\sin^2(x) + 2\right)\csc^2(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.825591 (sec), leaf count = 146

$$\left\{\left\{y(x) \to \frac{\left(-\sin^2(x)\right)^{\frac{1}{2}-\frac{i\sqrt{23}}{8}}\cos^2(x)^{3/8}\left(c_1\,{}_2F_1\left(-\frac{1}{8}-\frac{i\sqrt{23}}{8},\frac{7}{8}-\frac{i\sqrt{23}}{8};\frac{3}{4};\cos^2(x)\right)+\sqrt[4]{-1}c_2\sqrt[4]{\cos^2(x)}\,{}_2F_1\left(\frac{1}{8}-\frac{i\sqrt{23}}{8},\frac{9}{8}-\right.\right.}{\sqrt[8]{\sin^2(x)}\cos^{\frac{3}{4}}(x)}$$

Maple ✓
cpu = 0.579 (sec), leaf count = 98

$$\left\{y(x) = \sqrt{\cos(x)}\left((\sin(x))^{\frac{3}{4}+\frac{i}{4}\sqrt{23}}\,{}_2\mathrm{F}_1(\frac{9}{8}+\frac{i}{8}\sqrt{23},\frac{1}{8}+\frac{i}{8}\sqrt{23};\,1+\frac{i}{4}\sqrt{23};\,(\sin(x))^2)\_C2+(\sin(x))^{\frac{3}{4}-\frac{i}{4}\sqrt{23}}\,{}_2\mathrm{F}_1(\frac{9}{8}-\frac{i}{8}\sqrt{\right.\right.$$

Mathematica raw input

```
DSolve[Csc[x]^2*(2 + Sin[x]^2)*y[x] - Csc[2*x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((Cos[x]^2)^(3/8)*(C[1]*Hypergeometric2F1[-1/8 - (I/8)*Sqrt[23], 7/8 -
  (I/8)*Sqrt[23], 3/4, Cos[x]^2] + (-1)^(1/4)*C[2]*(Cos[x]^2)^(1/4)*Hypergeometri
c2F1[1/8 - (I/8)*Sqrt[23], 9/8 - (I/8)*Sqrt[23], 5/4, Cos[x]^2])*(-Sin[x]^2)^(1/
2 - (I/8)*Sqrt[23]))/(Cos[x]^(3/4)*(Sin[x]^2)^(1/8))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-diff(y(x),x)*csc(2*x)+csc(x)^2*(2+sin(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = cos(x)^(1/2)*(sin(x)^(3/4+1/4*I*23^(1/2))*hypergeom([9/8+1/8*I*23^(1/2),
1/8+1/8*I*23^(1/2)],[1+1/4*I*23^(1/2)],sin(x)^2)*_C2+sin(x)^(3/4-1/4*I*23^(1/2))
*hypergeom([9/8-1/8*I*23^(1/2), 1/8-1/8*I*23^(1/2)],[1-1/4*I*23^(1/2)],sin(x)^2)
*_C1)
```

4.1326 $ay(x)\csc^2(x) + y''(x) + (\cos(x) + 2)\csc(x)y'(x) = 0$

ODE

$$ay(x)\csc^2(x) + y''(x) + (\cos(x) + 2)\csc(x)y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.152252 (sec), leaf count = 71

$$\left\{\left\{y(x) \to \left(c_2 e^{\sqrt{1-a}(\log(1-\cos(x))-\log(\cos(x)+1))} + c_1\right)\exp\left(-\frac{1}{2}\left(\sqrt{1-a}+1\right)(\log(1-\cos(x))-\log(\cos(x)+1))\right)\right\}\right\}$$

Maple ✓
cpu = 0.829 (sec), leaf count = 74

$$\left\{y(x) = \frac{1}{\sin(x)}\left(\_C1\,(1+\cos(x))^{1+\frac{1}{2}\sqrt{1-a}}(\cos(x)-1)^{-\frac{1}{2}\sqrt{1-a}} + \_C2\,(1+\cos(x))^{1-\frac{1}{2}\sqrt{1-a}}(\cos(x)-1)^{\frac{1}{2}\sqrt{1-a}}\right)\right\}$$

Mathematica raw input

```
DSolve[a*Csc[x]^2*y[x] + (2 + Cos[x])*Csc[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + E^(Sqrt[1 - a]*(Log[1 - Cos[x]] - Log[1 + Cos[x]]))*C[2])/E^((
(1 + Sqrt[1 - a])*(Log[1 - Cos[x]] - Log[1 + Cos[x]]))/2)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)*csc(x)*(2+cos(x))+a*y(x)*csc(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*(1+cos(x))^(1+1/2*(1-a)^(1/2))*(cos(x)-1)^(-1/2*(1-a)^(1/2))+_C2*(1+
cos(x))^(1-1/2*(1-a)^(1/2))*(cos(x)-1)^(1/2*(1-a)^(1/2)))/sin(x)
```

4.1327 $y''(x) - (3\cos(x) + 2)\csc(x)y'(x) - 2y(x)(\cos(x) + 1)\sec(x) = 0$

ODE

$$y''(x) - (3\cos(x) + 2)\csc(x)y'(x) - 2y(x)(\cos(x) + 1)\sec(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.273099 (sec), leaf count = 30

$$\{\{y(x) \to c_2(-\cos^2(x) + 2\cos(x)\log(\cos(x)) + 1) - c_1\cos(x)\}\}$$

Maple ✓
cpu = 0.868 (sec), leaf count = 26

$$\left\{y(x) = -(\cos(x))^2 \_C2 + \cos(x)\ln\left((\cos(x))^2\right)\_C2 + \_C1\ \cos(x) + \_C2\right\}$$

Mathematica raw input

```
DSolve[-2*(1 + Cos[x])*Sec[x]*y[x] - (2 + 3*Cos[x])*Csc[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(C[1]*Cos[x]) + C[2]*(1 - Cos[x]^2 + 2*Cos[x]*Log[Cos[x]])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-diff(y(x),x)*csc(x)*(2+3*cos(x))-2*y(x)*sec(x)*(1+cos(x)) = 0, y(x),'impl
```

Maple raw output

```
y(x) = -cos(x)^2*_C2+cos(x)*ln(cos(x)^2)*_C2+_C1*cos(x)+_C2
```

4.1328 $y''(x) - y'(x)(\cot(x) - \sin(x)) + y(x)\sin^2(x) = 0$

ODE

$$y''(x) - y'(x)(\cot(x) - \sin(x)) + y(x)\sin^2(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.144804 (sec), leaf count = 45

$$\left\{\left\{y(x) \to e^{\frac{\cos(x)}{2}}\left(c_1 \cos\left(\frac{1}{2}\sqrt{3}\cos(x)\right) + c_2 \sin\left(\frac{1}{2}\sqrt{3}\cos(x)\right)\right)\right\}\right\}$$

Maple ✓
cpu = 11.259 (sec), leaf count = 59

$$\left\{y(x) = \mathrm{e}^{\frac{\cot(x)}{2}\frac{1}{\sqrt{(\cot(x))^2+1}}}\left(\sinh\left(\frac{\cot(x)\sqrt{3}}{2}\frac{1}{\sqrt{-1-(\cot(x))^2}}\right)\_C1 + \cosh\left(\frac{\cot(x)\sqrt{3}}{2}\frac{1}{\sqrt{-1-(\cot(x))^2}}\right)\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[Sin[x]^2*y[x] - (Cot[x] - Sin[x])*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(Cos[x]/2)*(C[1]*Cos[(Sqrt[3]*Cos[x])/2] + C[2]*Sin[(Sqrt[3]*Cos[x])
/2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-(cot(x)-sin(x))*diff(y(x),x)+y(x)*sin(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(1/2*cot(x)/(cot(x)^2+1)^(1/2))*(sinh(1/2*cot(x)/(-1-cot(x)^2)^(1/2)*3
^(1/2))*_C1+cosh(1/2*cot(x)/(-1-cot(x)^2)^(1/2)*3^(1/2))*_C2)
```

4.1329 $y''(x) - \sin(x)y'(x) + y(x)(-\cos(x)) = a - x + x\log(x)$

ODE

$$y''(x) - \sin(x)y'(x) + y(x)(-\cos(x)) = a - x + x\log(x)$$

ODE Classification

[[_2nd_order, _exact, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 25.372 (sec), leaf count = 55

$$\left\{\left\{y(x) \to e^{-\cos(x)}\left(\int_1^x \frac{1}{4}e^{\cos(K[1])}\left(4aK[1] - 3K[1]^2 + 2K[1]^2\log(K[1]) + 4c_1\right)\,dK[1] + c_2\right)\right\}\right\}$$

Maple ✓
cpu = 0.077 (sec), leaf count = 35

$$\left\{y(x) = \left(\_C2 + \int\left(\_C1 + ax - \frac{3\,x^2}{4} + \frac{x^2\ln(x)}{2}\right)\mathrm{e}^{\cos(x)}\,\mathrm{d}x\right)\mathrm{e}^{-\cos(x)}\right\}$$

Mathematica raw input

```
DSolve[-(Cos[x]*y[x]) - Sin[x]*y'[x] + y''[x] == a - x + x*Log[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[2] + Integrate[(E^Cos[K[1]]*(4*C[1] + 4*a*K[1] - 3*K[1]^2 + 2*K[1]^
2*Log[K[1]]))/4, {K[1], 1, x}])/E^Cos[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-diff(y(x),x)*sin(x)-y(x)*cos(x) = a-x+x*ln(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2+Int((_C1+a*x-3/4*x^2+1/2*x^2*ln(x))*exp(cos(x)),x))*exp(-cos(x))
```

4.1330 $-2\csc(2x)\left(1-a\sin^2(x)\right)y'(x)+by(x)\tan^2(x)+y''(x)=0$

ODE

$$-2\csc(2x)\left(1-a\sin^2(x)\right)y'(x)+by(x)\tan^2(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.900835 (sec), leaf count = 48

$$\left\{\left\{y(x)\to \cos^{\frac{1}{2}\left(a-\sqrt{a^2-4b}\right)}(x)\left(c_2\cos^{\sqrt{a^2-4b}}(x)+c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.232 (sec), leaf count = 45

$$\left\{y(x)=\_C1\left(\cos(x)\right)^{\frac{a}{2}+\frac{1}{2}\sqrt{a^2-4\,b}}+\_C2\left(\cos(x)\right)^{\frac{a}{2}-\frac{1}{2}\sqrt{a^2-4\,b}}\right\}$$

Mathematica raw input

```
DSolve[b*Tan[x]^2*y[x] - 2*Csc[2*x]*(1 - a*Sin[x]^2)*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Cos[x]^((a - Sqrt[a^2 - 4*b])/2)*(C[1] + C[2]*Cos[x]^Sqrt[a^2 - 4*b])}
}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*diff(y(x),x)*csc(2*x)*(1-a*sin(x)^2)+b*y(x)*tan(x)^2 = 0, y(x),'implici
```

Maple raw output

```
y(x) = _C1*cos(x)^(1/2*a+1/2*(a^2-4*b)^(1/2))+_C2*cos(x)^(1/2*a-1/2*(a^2-4*b)^(1
/2))
```

4.1331 $ay(x)\cos^2(x) + y''(x) + \tan(x)y'(x) = 0$

ODE

$$ay(x)\cos^2(x) + y''(x) + \tan(x)y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0403675 (sec), leaf count = 30

$$\{\{y(x) \to c_2 \sin\left(\sqrt{a}\sin(x)\right) + c_1 \cos\left(\sqrt{a}\sin(x)\right)\}\}$$

Maple ✓
cpu = 0.119 (sec), leaf count = 23

$$\{y(x) = \_C1 \sin\left(\sqrt{a}\sin(x)\right) + \_C2 \cos\left(\sqrt{a}\sin(x)\right)\}$$

Mathematica raw input

```
DSolve[a*Cos[x]^2*y[x] + Tan[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[Sqrt[a]*Sin[x]] + C[2]*Sin[Sqrt[a]*Sin[x]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)*tan(x)+a*y(x)*cos(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(a^(1/2)*sin(x))+_C2*cos(a^(1/2)*sin(x))
```

4.1332 $ay(x)\cot^2(x) + y''(x) + \tan(x)y'(x) = 0$

ODE

$$ay(x)\cot^2(x) + y''(x) + \tan(x)y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.305244 (sec), leaf count = 56

$$\left\{\left\{y(x) \to (-\sin^2(x))^{\frac{1}{4}-\frac{1}{4}\sqrt{1-4a}}\left(c_2(-\sin^2(x))^{\frac{1}{2}\sqrt{1-4a}} + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.171 (sec), leaf count = 37

$$\left\{y(x) = \_C1\,(\sin(x))^{\frac{1}{2}\sqrt{1-4\,a}+\frac{1}{2}} + \_C2\,(\sin(x))^{\frac{1}{2}-\frac{1}{2}\sqrt{1-4\,a}}\right\}$$

Mathematica raw input

```
DSolve[a*Cot[x]^2*y[x] + Tan[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-Sin[x]^2)^(1/4 - Sqrt[1 - 4*a]/4)*(C[1] + C[2]*(-Sin[x]^2)^(Sqrt[1 -
  4*a]/2))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)*tan(x)+a*y(x)*cot(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(x)^(1/2*(1-4*a)^(1/2)+1/2)+_C2*sin(x)^(1/2-1/2*(1-4*a)^(1/2))
```

4.1333 $-a(a+1)y(x)\csc^2(x)+y''(x)-\tan(x)y'(x)=0$

ODE

$$-a(a+1)y(x)\csc^2(x)+y''(x)-\tan(x)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.22065 (sec), leaf count = 0 , could not solve

```
DSolve[-(a*(1 + a)*Csc[x]^2*y[x]) - Tan[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.218 (sec), leaf count = 61

$$\left\{y(x)=\_C1\ {}_2\mathrm{F}_1(-\frac{a}{2},-\frac{a}{2}+\frac{1}{2};\ \frac{1}{2}-a;\ (\sin(x))^2)(\sin(x))^{-a}+\_C2\ {}_2\mathrm{F}_1(\frac{a}{2}+1,\frac{1}{2}+\frac{a}{2};\ \frac{3}{2}+a;\ (\sin(x))^2)(\sin(x))^{1+a}\right\}$$

Mathematica raw input

```
DSolve[-(a*(1 + a)*Csc[x]^2*y[x]) - Tan[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[-(a*(1 + a)*Csc[x]^2*y[x]) - Tan[x]*Derivative[1][y][x] + Derivative[2][y
][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-diff(y(x),x)*tan(x)-a*(1+a)*y(x)*csc(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([-1/2*a, -1/2*a+1/2],[1/2-a],sin(x)^2)*sin(x)^(-a)+_C2*hype
rgeom([1/2*a+1, 1/2+1/2*a],[3/2+a],sin(x)^2)*sin(x)^(1+a)
```

4.1334 $y(x)\left(a\cos^2(x)-\sec^2(x)\right)+y''(x)-\tan(x)y'(x)=0$

ODE

$$y(x)\left(a\cos^2(x)-\sec^2(x)\right)+y''(x)-\tan(x)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 200.591 (sec), leaf count = 0 , could not solve

```
DSolve[(a*Cos[x]^2 - Sec[x]^2)*y[x] - Tan[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.327 (sec), leaf count = 32

$$\left\{y(x)=\frac{1}{\cos(x)}\left(\_C1\ \sinh\left(\sqrt{-a}\sin(x)\right)+\_C2\ \cosh\left(\sqrt{-a}\sin(x)\right)\right)\right\}$$

Mathematica raw input

```
DSolve[(a*Cos[x]^2 - Sec[x]^2)*y[x] - Tan[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[(a*Cos[x]^2 - Sec[x]^2)*y[x] - Tan[x]*Derivative[1][y][x] + Derivative[2]
[y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-diff(y(x),x)*tan(x)+(a*cos(x)^2-sec(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*sinh((-a)^(1/2)*sin(x))+_C2*cosh((-a)^(1/2)*sin(x)))/cos(x)
```

4.1335 $y''(x) + 2\tan(x)y'(x) - y(x) = 0$

ODE

$$y''(x) + 2\tan(x)y'(x) - y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.144565 (sec), leaf count = 36

$$\left\{\left\{y(x) \to c_1\sqrt{\sin^2(x)} + c_2\left(\cos(x) - \sqrt{\sin^2(x)}\sin^{-1}(\cos(x))\right)\right\}\right\}$$

Maple ✓
cpu = 0.134 (sec), leaf count = 28

$$\{y(x) = \sin(x)\ln(\sin(x) + i\cos(x))\_C2 - i\cos(x)\_C2 + \_C1\ \sin(x)\}$$

Mathematica raw input

```
DSolve[-y[x] + 2*Tan[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Sqrt[Sin[x]^2] + C[2]*(Cos[x] - ArcSin[Cos[x]]*Sqrt[Sin[x]^2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*diff(y(x),x)*tan(x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x)*ln(sin(x)+I*cos(x))*_C2-I*cos(x)*_C2+_C1*sin(x)
```

4.1336 $y''(x) + 2\tan(x)y'(x) - y(x) = (x+1)\sec(x)$

ODE

$$y''(x) + 2\tan(x)y'(x) - y(x) = (x+1)\sec(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.244391 (sec), leaf count = 60

$$\left\{\left\{y(x) \to c_1\sqrt{\sin^2(x)} + c_2\left(\cos(x) - \sqrt{\sin^2(x)}\sin^{-1}(\cos(x))\right) + \frac{1}{2}\left(\sqrt{\sin^2(x)} - \cos^{-1}(\cos(x))\cos(x) - \cos(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.649 (sec), leaf count = 114

$$\left\{y(x) = \frac{1}{2\left(\cos(x)\right)^2}\left(2i\int \frac{(1+x)\left(\ln\left(\sin(x) + i\cos(x)\right)\sin(x) - i\cos(x)\right)}{\left(\cos(x)\right)^3}\,dx \sin(x)\left(\cos(x)\right)^2 + \left(-i(\cos(x))^3 + 2\sin(x\right.\right.$$

Mathematica raw input

```
DSolve[-y[x] + 2*Tan[x]*y'[x] + y''[x] == (1 + x)*Sec[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Sqrt[Sin[x]^2] + (-Cos[x] - ArcCos[Cos[x]]*Cos[x] + Sqrt[Sin[x]^2
])/2 + C[2]*(Cos[x] - ArcSin[Cos[x]]*Sqrt[Sin[x]^2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*diff(y(x),x)*tan(x)-y(x) = sec(x)*(1+x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*(2*I*Int((1+x)*(ln(sin(x)+I*cos(x))*sin(x)-I*cos(x))/cos(x)^3,x)*sin(
x)*cos(x)^2+(-I*cos(x)^3+2*sin(x)*cos(x)^2*_C1+I*cos(x)-I*sin(x)*(1+x))*ln(sin(x
)+I*cos(x))-2*cos(x)*(I*_C1*cos(x)^2-(_C2+1/2)*sin(x)*cos(x)+1/2*x+1/2))/cos(x)^
2
```

4.1337 $y''(x) + 2\tan(x)y'(x) + 3y(x) = 0$

ODE

$$y''(x) + 2\tan(x)y'(x) + 3y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.104406 (sec), leaf count = 33

$$\left\{\left\{y(x) \to c_1 \cos^3(x) - \frac{1}{3}c_2\sqrt{\sin^2(x)}(\cos(2x)+2)\right\}\right\}$$

Maple ✓
cpu = 0.129 (sec), leaf count = 25

$$\left\{y(x) = \left(-2\_C2\,(\cos(x))^2 - \_C2\right)\sin(x) + \_C1\,(\cos(x))^3\right\}$$

Mathematica raw input

```
DSolve[3*y[x] + 2*Tan[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[x]^3 - (C[2]*(2 + Cos[2*x])*Sqrt[Sin[x]^2])/3}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*diff(y(x),x)*tan(x)+3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-2*_C2*cos(x)^2-_C2)*sin(x)+_C1*cos(x)^3
```

4.1338 $by(x) + y''(x) - 2\tan(x)y'(x) = 0$

ODE

$$by(x) + y''(x) - 2\tan(x)y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0913941 (sec), leaf count = 54

$$\left\{\left\{y(x) \to \sec(x)\left(c_1 e^{-\sqrt{-b-1}x} + \frac{c_2 e^{\sqrt{-b-1}x}}{2\sqrt{-b-1}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.065 (sec), leaf count = 34

$$\left\{y(x) = \frac{1}{\cos(x)}\left(\_C1 \sinh\left(\sqrt{-b-1}x\right) + \_C2 \cosh\left(\sqrt{-b-1}x\right)\right)\right\}$$

Mathematica raw input

```
DSolve[b*y[x] - 2*Tan[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]/E^(Sqrt[-1 - b]*x) + (E^(Sqrt[-1 - b]*x)*C[2])/(2*Sqrt[-1 - b]))
*Sec[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*diff(y(x),x)*tan(x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*sinh((-b-1)^(1/2)*x)+_C2*cosh((-b-1)^(1/2)*x))/cos(x)
```

4.1339 $-(a^2+1)\,y(x)+y''(x)-2\tan(x)y'(x)=0$

ODE

$$-(a^2+1)\,y(x)+y''(x)-2\tan(x)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0758277 (sec), leaf count = 48

$$\left\{\left\{y(x)\to \sec(x)\left(c_1 e^{-\sqrt{a^2}x}+\frac{c_2 e^{\sqrt{a^2}x}}{2\sqrt{a^2}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.06 (sec), leaf count = 22

$$\left\{y(x)=\frac{\_C2\,\cosh(ax)+\_C1\,\sinh(ax)}{\cos(x)}\right\}$$

Mathematica raw input

```
DSolve[-((1 + a^2)*y[x]) - 2*Tan[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]/E^(Sqrt[a^2]*x) + (E^(Sqrt[a^2]*x)*C[2])/(2*Sqrt[a^2]))*Sec[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*diff(y(x),x)*tan(x)-(a^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*cosh(a*x)+_C1*sinh(a*x))/cos(x)
```

4.1340 $-(a^2+1)\,y(x)+y''(x)-2\tan(x)y'(x)=\sin(x)$

ODE

$$-(a^2+1)\,y(x)+y''(x)-2\tan(x)y'(x)=\sin(x)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.182743 (sec), leaf count = 62

$$\left\{\left\{y(x)\to\frac{1}{2}\sec(x)\left(2c_1e^{-\sqrt{a^2}x}+\frac{c_2e^{\sqrt{a^2}x}}{\sqrt{a^2}}-\frac{\sin(2x)}{a^2+4}\right)\right\}\right\}$$

Maple ✓
cpu = 0.253 (sec), leaf count = 148

$$\left\{y(x)=\frac{-(\cosh(ax)-\sinh(ax))\,\mathrm{e}^{-ax}(ia-2)\,\mathrm{e}^{-2\,x(i-a)}+(ia+2)\,(\cosh(ax)-\sinh(ax))\,\mathrm{e}^{-ax}\mathrm{e}^{2\,x(i+a)}-(\sinh(ax)+\cos\right.}{8\,\cos(x)\,a\,(a^2+4)}$$

Mathematica raw input

```
DSolve[-((1 + a^2)*y[x]) - 2*Tan[x]*y'[x] + y''[x] == Sin[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sec[x]*((2*C[1])/E^(Sqrt[a^2]*x) + (E^(Sqrt[a^2]*x)*C[2])/Sqrt[a^2] -
 Sin[2*x]/(4 + a^2)))/2}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-2*diff(y(x),x)*tan(x)-(a^2+1)*y(x) = sin(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/8*(-(cosh(a*x)-sinh(a*x))*exp(-a*x)*(I*a-2)*exp(-2*x*(I-a))+(I*a+2)*(co
sh(a*x)-sinh(a*x))*exp(-a*x)*exp(2*x*(I+a))-(sinh(a*x)+cosh(a*x))*((I*a+2)*exp(-
2*I*x)+(-I*a+2)*exp(2*I*x))*exp(-a*x)+8*a*(a^2+4)*(cosh(a*x)*_C1+_C2*sinh(a*x)))
/cos(x)/a/(a^2+4)
```

4.1341 $a\tan(x)y'(x)+by(x)+y''(x)=0$

ODE

$$a\tan(x)y'(x)+by(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.306397 (sec), leaf count = 129

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(\frac{1}{4}\left(-a-\sqrt{a^2+4b}\right),\frac{1}{4}\left(\sqrt{a^2+4b}-a\right);\frac{1-a}{2};\cos^2(x)\right)+i^{a+1}c_2\cos^{a+1}(x)\,{}_2F_1\left(\frac{1}{4}\left(a-\sqrt{a^2+4b}+2\right)\right.\right.\right.$$

Maple ✓
cpu = 0.185 (sec), leaf count = 60

$$\left\{y(x)=(\cos(x))^{\frac{1}{2}+\frac{a}{2}}\left(LegendreQ\left(\frac{1}{2}\sqrt{a^2+4\,b}-\frac{1}{2},\frac{1}{2}+\frac{a}{2},\sin(x)\right)\_C2+LegendreP\left(\frac{1}{2}\sqrt{a^2+4\,b}-\frac{1}{2},\frac{1}{2}+\frac{a}{2},\sin(x)\right)\right.\right.$$

Mathematica raw input

```
DSolve[b*y[x] + a*Tan[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[(-a - Sqrt[a^2 + 4*b])/4, (-a + Sqrt[a^2 + 4*b]
)/4, (1 - a)/2, Cos[x]^2] + I^(1 + a)*C[2]*Cos[x]^(1 + a)*Hypergeometric2F1[(2 +
 a - Sqrt[a^2 + 4*b])/4, (2 + a + Sqrt[a^2 + 4*b])/4, (3 + a)/2, Cos[x]^2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)*tan(x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = cos(x)^(1/2+1/2*a)*(LegendreQ(1/2*(a^2+4*b)^(1/2)-1/2,1/2+1/2*a,sin(x))*_
C2+LegendreP(1/2*(a^2+4*b)^(1/2)-1/2,1/2+1/2*a,sin(x))*_C1)
```

4.1342 $y''(x) - (2e^x + 1)\, y'(x) + e^{2x} y(x) = 0$

ODE

$$y''(x) - (2e^x + 1)\, y'(x) + e^{2x} y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0144557 (sec), leaf count = 20

$$\left\{\left\{y(x) \to e^{e^x}\left(c_2 e^x + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.076 (sec), leaf count = 25

$$\left\{y(x) = \mathrm{e}^{\frac{x}{2}+\mathrm{e}^x}\left(\sinh\left(\frac{x}{2}\right)\_C1 + \cosh\left(\frac{x}{2}\right)\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[E^(2*x)*y[x] - (1 + 2*E^x)*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^E^x*(C[1] + E^x*C[2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)-(1+2*exp(x))*diff(y(x),x)+exp(2*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(1/2*x+exp(x))*(sinh(1/2*x)*_C1+cosh(1/2*x)*_C2)
```

4.1343 $y(x)\left(\mathbf{a0}+4\mathbf{a1}\sinh^2(x)-\mathbf{a2csch}^2(x)\right)+y''(x)+\coth(x)y'(x)=0$

ODE

$$y(x)\left(\mathrm{a0}+4\mathrm{a1}\sinh^2(x)-\mathrm{a2csch}^2(x)\right)+y''(x)+\coth(x)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 2.21835 (sec), leaf count = 0 , could not solve

```
DSolve[(a0 - a2*Csch[x]^2 + 4*a1*Sinh[x]^2)*y[x] + Coth[x]*Derivative[1][y][x] + Derivative[2][y][x]
```

Maple ✓
cpu = 0.71 (sec), leaf count = 71

$$\left\{y(x)=\_C1\,(\sinh(x))^{\sqrt{a2}}\,HeunC\left(0,\sqrt{a2},-\frac{1}{2},-a1,\frac{1}{4}+\frac{a0}{4}+\frac{a2}{4},-(\sinh(x))^2\right)+\_C2\,(\sinh(x))^{-\sqrt{a2}}\,HeunC\left(0,-\sqrt{\right.\right.$$

Mathematica raw input

```
DSolve[(a0 - a2*Csch[x]^2 + 4*a1*Sinh[x]^2)*y[x] + Coth[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[(a0 - a2*Csch[x]^2 + 4*a1*Sinh[x]^2)*y[x] + Coth[x]*Derivative[1][y][x] +
 Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)*coth(x)+(a0+4*a1*sinh(x)^2-a2*csch(x)^2)*y(x) = 0, y(x),'imp
```

Maple raw output

```
y(x) = _C1*sinh(x)^(a2^(1/2))*HeunC(0,a2^(1/2),-1/2,-a1,1/4+1/4*a0+1/4*a2,-sinh(
x)^2)+_C2*sinh(x)^(-a2^(1/2))*HeunC(0,-a2^(1/2),-1/2,-a1,1/4+1/4*a0+1/4*a2,-sinh
(x)^2)
```

4.1344 $y(x)\left(\mathbf{a0}+4\mathbf{a1}\cosh^2(x)-\mathbf{a2sech}^2(x)\right)+y''(x)+\tanh(x)y'(x)=0$

ODE

$$y(x)\left(\mathrm{a0}+4\mathrm{a1}\cosh^2(x)-\mathrm{a2sech}^2(x)\right)+y''(x)+\tanh(x)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 2.1481 (sec), leaf count = 0 , could not solve

```
DSolve[(a0 + 4*a1*Cosh[x]^2 - a2*Sech[x]^2)*y[x] + Tanh[x]*Derivative[1][y][x] + Derivative[2][y][x]
```

Maple ✓
cpu = 1.084 (sec), leaf count = 71

$$\left\{y(x)=\_C1\ HeunC\left(0,i\sqrt{a2},-\frac{1}{2},a1,\frac{1}{4}+\frac{a0}{4}-\frac{a2}{4},(\cosh(x))^2\right)(\cosh(x))^{i\sqrt{a2}}+\_C2\ HeunC\left(0,-i\sqrt{a2},-\frac{1}{2},a1,\frac{1}{4}+\right.\right.$$

Mathematica raw input

```
DSolve[(a0 + 4*a1*Cosh[x]^2 - a2*Sech[x]^2)*y[x] + Tanh[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[(a0 + 4*a1*Cosh[x]^2 - a2*Sech[x]^2)*y[x] + Tanh[x]*Derivative[1][y][x] +
 Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)*tanh(x)+(a0+4*a1*cosh(x)^2-a2*sech(x)^2)*y(x) = 0, y(x),'imp
```

Maple raw output

```
y(x) = _C1*HeunC(0,I*a2^(1/2),-1/2,a1,1/4+1/4*a0-1/4*a2,cosh(x)^2)*cosh(x)^(I*a2
^(1/2))+_C2*HeunC(0,-I*a2^(1/2),-1/2,a1,1/4+1/4*a0-1/4*a2,cosh(x)^2)*cosh(x)^(-I
*a2^(1/2))
```

4.1345 $by(x) + y''(x) + 2\tanh(x)y'(x) = 0$

ODE

$$by(x) + y''(x) + 2\tanh(x)y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0721108 (sec), leaf count = 54

$$\left\{\left\{y(x) \to \text{sech}(x)\left(c_1 e^{-\sqrt{1-b}x} + \frac{c_2 e^{\sqrt{1-b}x}}{2\sqrt{1-b}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.087 (sec), leaf count = 34

$$\left\{y(x) = \frac{1}{\cosh(x)}\left(\_C1\ \sinh\left(\sqrt{1-b}x\right) + \_C2\ \cosh\left(\sqrt{1-b}x\right)\right)\right\}$$

Mathematica raw input

```
DSolve[b*y[x] + 2*Tanh[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]/E^(Sqrt[1 - b]*x) + (E^(Sqrt[1 - b]*x)*C[2])/(2*Sqrt[1 - b]))*Se
ch[x]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*diff(y(x),x)*tanh(x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*sinh((1-b)^(1/2)*x)+_C2*cosh((1-b)^(1/2)*x))/cosh(x)
```

4.1346 $a \tanh(x) y'(x) + b y(x) + y''(x) = 0$

ODE

$$a \tanh(x) y'(x) + b y(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.471855 (sec), leaf count = 75

$$\left\{\left\{y(x) \to \left(-\text{sech}^2(x)\right)^{a/4} \left(c_1 P^{\frac{1}{2}\sqrt{a^2-4b}}_{\frac{a-2}{2}}(\tanh(x)) + c_2 Q^{\frac{1}{2}\sqrt{a^2-4b}}_{\frac{a-2}{2}}(\tanh(x))\right)\right\}\right\}$$

Maple ✓
cpu = 0.202 (sec), leaf count = 54

$$\left\{y(x) = (\cosh(x))^{-\frac{a}{2}} \left(LegendreQ\left(\frac{a}{2} - 1, \frac{1}{2}\sqrt{a^2 - 4b}, \tanh(x)\right) \_C2 + LegendreP\left(\frac{a}{2} - 1, \frac{1}{2}\sqrt{a^2 - 4b}, \tanh(x)\right) \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[b*y[x] + a*Tanh[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*LegendreP[(-2 + a)/2, Sqrt[a^2 - 4*b]/2, Tanh[x]] + C[2]*Legendr
eQ[(-2 + a)/2, Sqrt[a^2 - 4*b]/2, Tanh[x]])*(-Sech[x]^2)^(a/4)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)*tanh(x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = cosh(x)^(-1/2*a)*(LegendreQ(1/2*a-1,1/2*(a^2-4*b)^(1/2),tanh(x))*_C2+Lege
ndreP(1/2*a-1,1/2*(a^2-4*b)^(1/2),tanh(x))*_C1)
```

4.1347 $f(x)y'(x)+y''(x)=0$

ODE

$$f(x)y'(x)+y''(x)=0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.552011 (sec), leaf count = 31

$$\left\{\left\{y(x)\to \int_1^x c_1 e^{\int_1^{K[2]}-f(K[1])\,dK[1]}\,dK[2]+c_2\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 17

$$\left\{y(x)=\_C1+\int e^{\int -f(x)\,dx}\,dx\_C2\right\}$$

Mathematica raw input

```
DSolve[f[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + Integrate[E^Integrate[-f[K[1]], {K[1], 1, K[2]}]*C[1], {K[2], 1
, x}]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+f(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+Int(exp(Int(-f(x),x)),x)*_C2
```

4.1348 $akx^{k-1}y(x)+2ax^k y'(x)+2y''(x)=0$

ODE

$$akx^{k-1}y(x)+2ax^k y'(x)+2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0348926 (sec), leaf count = 120

$$\left\{\left\{y(x)\to c_2\left(\frac{1}{k}+1\right)^{-\frac{1}{k+1}}k^{-\frac{1}{k+1}}a^{\frac{1}{k+1}}\left(x^k\right)^{\frac{1}{k}}\ {}_1F_1\left(\frac{k+2}{2k+2};\frac{k+2}{k+1};-\frac{a\left(x^k\right)^{1+\frac{1}{k}}}{k+1}\right)+c_1\ {}_1F_1\left(\frac{k}{2k+2};\frac{k}{k+1};-\frac{a\left(x^k\right)^{1+\frac{1}{k}}}{k+1}\right)\right\}\right\}$$

Maple ✓
cpu = 0.635 (sec), leaf count = 85

$$\left\{y(x)=\sqrt{x}\mathrm{e}^{-\frac{ax^{k+1}}{2k+2}}\left(Y_{(2k+2)^{-1}}\left(\frac{x^{k+1}}{2k+2}\sqrt{-a^2}\right)\_C2+J_{(2k+2)^{-1}}\left(\frac{x^{k+1}}{2k+2}\sqrt{-a^2}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[a*k*x^(-1 + k)*y[x] + 2*a*x^k*y'[x] + 2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric1F1[k/(2 + 2*k), k/(1 + k), -((a*(x^k)^(1 + k^(-1))
)/(1 + k))] + (a^(1 + k)^(-1)*(x^k)^k^(-1)*C[2]*Hypergeometric1F1[(2 + k)/(2 + 2
*k), (2 + k)/(1 + k), -((a*(x^k)^(1 + k^(-1)))/(1 + k))])/((1 + k^(-1))^(1 + k)^
(-1)*k^(1 + k)^(-1))}}
```

Maple raw input

```
dsolve(2*diff(diff(y(x),x),x)+2*a*x^k*diff(y(x),x)+a*k*x^(k-1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*exp(-a*x^(k+1)/(2*k+2))*(BesselY(1/(2*k+2),(-a^2)^(1/2)*x^(k+1)/(
2*k+2))*_C2+BesselJ(1/(2*k+2),(-a^2)^(1/2)*x^(k+1)/(2*k+2))*_C1)
```

4.1349 $3y''(x) - 10y'(x) + 3y(x) = 0$

ODE

$$3y''(x) - 10y'(x) + 3y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0055124 (sec), leaf count = 24

$$\left\{\left\{y(x) \to c_1 e^{x/3} + c_2 e^{3x}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 17

$$\{y(x) = \_C1\, \mathrm{e}^{3x} + \_C2\, \mathrm{e}^{\frac{x}{3}}\}$$

Mathematica raw input

```
DSolve[3*y[x] - 10*y'[x] + 3*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x/3)*C[1] + E^(3*x)*C[2]}}
```

Maple raw input

```
dsolve(3*diff(diff(y(x),x),x)-10*diff(y(x),x)+3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(3*x)+_C2*exp(1/3*x)
```

4.1350 $4y''(x) = (a + x^2)\, y(x)$

ODE

$$4y''(x) = (a + x^2)\, y(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0200702 (sec), leaf count = 36

$$\left\{\left\{y(x) \to c_1 D_{\frac{1}{4}(-a-2)}(x) + c_2 D_{\frac{a-2}{4}}(ix)\right\}\right\}$$

Maple ✓
cpu = 0.148 (sec), leaf count = 33

$$\left\{y(x) = 1\left(\_C2\, W_{-\frac{a}{8},\frac{1}{4}}\left(\frac{x^2}{2}\right) + \_C1\, M_{-\frac{a}{8},\frac{1}{4}}\left(\frac{x^2}{2}\right)\right)\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[4*y''[x] == (a + x^2)*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*ParabolicCylinderD[(-2 - a)/4, x] + C[2]*ParabolicCylinderD[(-2 +
  a)/4, I*x]}}
```

Maple raw input

```
dsolve(4*diff(diff(y(x),x),x) = (x^2+a)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*WhittakerW(-1/8*a,1/4,1/2*x^2)+_C1*WhittakerM(-1/8*a,1/4,1/2*x^2))/x
^(1/2)
```

4.1351 $(4a - x^2 + 2)\, y(x) + 4y''(x) = 0$

ODE

$$(4a - x^2 + 2)\, y(x) + 4y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00853339 (sec), leaf count = 26

$$\{\{y(x) \to c_1 D_a(x) + c_2 D_{-a-1}(ix)\}\}$$

Maple ✓
cpu = 0.126 (sec), leaf count = 37

$$\left\{y(x) = 1\left(\_C2\, W_{\frac{a}{2}+\frac{1}{4},\frac{1}{4}}\left(\frac{x^2}{2}\right) + \_C1\, M_{\frac{a}{2}+\frac{1}{4},\frac{1}{4}}\left(\frac{x^2}{2}\right)\right)\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[(2 + 4*a - x^2)*y[x] + 4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]*ParabolicCylinderD[-1 - a, I*x] + C[1]*ParabolicCylinderD[a, x]}}
```

Maple raw input

```
dsolve(4*diff(diff(y(x),x),x)+(-x^2+4*a+2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*WhittakerW(1/2*a+1/4,1/4,1/2*x^2)+_C1*WhittakerM(1/2*a+1/4,1/4,1/2*x
^2))/x^(1/2)
```

4.1352 $4y''(x) - 8y'(x) + 3y(x) = 0$

ODE

$$4y''(x) - 8y'(x) + 3y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00551528 (sec), leaf count = 22

$$\left\{\left\{y(x) \to e^{x/2}(c_2 e^x + c_1)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 17

$$\left\{y(x) = \_C1\, \mathrm{e}^{\frac{x}{2}} + \_C2\, \mathrm{e}^{\frac{3x}{2}}\right\}$$

Mathematica raw input

```
DSolve[3*y[x] - 8*y'[x] + 4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x/2)*(C[1] + E^x*C[2])}}
```

Maple raw input

```
dsolve(4*diff(diff(y(x),x),x)-8*diff(y(x),x)+3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(1/2*x)+_C2*exp(3/2*x)
```

4.1353 $xy''(x) + y(x) = 0$

ODE

$$xy''(x) + y(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0404792 (sec), leaf count = 39

$$\{\{y(x) \to \sqrt{x}\left(c_1 J_1\left(2\sqrt{x}\right) + 2ic_2 Y_1\left(2\sqrt{x}\right)\right)\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 27

$$\{y(x) = \sqrt{x}\left(Y_1\left(2\sqrt{x}\right)\_C2 + J_1\left(2\sqrt{x}\right)\_C1\right)\}$$

Mathematica raw input

```
DSolve[y[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*(BesselJ[1, 2*Sqrt[x]]*C[1] + (2*I)*BesselY[1, 2*Sqrt[x]]*C[2]
)}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(BesselY(1,2*x^(1/2))*_C2+BesselJ(1,2*x^(1/2))*_C1)
```

4.1354 $(a+x)y(x)+xy''(x)=0$

ODE

$$(a+x)y(x)+xy''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.12342 (sec), leaf count = 53

$$\left\{\left\{y(x)\to e^{-ix}x\left(c_2\,{}_1F_1\left(\frac{ia}{2}+1;2;2ix\right)+c_1U\left(\frac{ia}{2}+1,2,2ix\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.161 (sec), leaf count = 29

$$\left\{y(x)=\_C1\,M_{-\frac{i}{2}a,\frac{1}{2}}(2\,ix)+\_C2\,W_{-\frac{i}{2}a,\frac{1}{2}}(2\,ix)\right\}$$

Mathematica raw input

```
DSolve[(a + x)*y[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(C[2]*Hypergeometric1F1[1 + (I/2)*a, 2, (2*I)*x] + C[1]*Hypergeomet
ricU[1 + (I/2)*a, 2, (2*I)*x]))/E^(I*x)}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(a+x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*WhittakerM(-1/2*I*a,1/2,2*I*x)+_C2*WhittakerW(-1/2*I*a,1/2,2*I*x)
```

4.1355 $xy''(x) + y'(x) = 0$

ODE

$$xy''(x) + y'(x) = 0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00525641 (sec), leaf count = 13

$$\{\{y(x) \to c_1 \log(x) + c_2\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 10

$$\{y(x) = \_C2 \ln(x) + \_C1\}$$

Mathematica raw input

```
DSolve[y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + C[1]*Log[x]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*ln(x)+_C1
```

4.1356 $xy''(x) + y'(x) = x^n$

ODE

$$xy''(x) + y'(x) = x^n$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.194637 (sec), leaf count = 24

$$\left\{\left\{y(x) \to c_1 \log(x) + c_2 + \frac{x^{n+1}}{(n+1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.126 (sec), leaf count = 37

$$\left\{y(x) = \frac{\_C1\,(n+1)\ln\left(x^{n+1}\right) + \_C2\,n^2 + 2\,\_C2\,n + \_C2 + x^{n+1}}{(n+1)^2}\right\}$$

Mathematica raw input

```
DSolve[y'[x] + x*y''[x] == x^n,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^(1 + n)/(1 + n)^2 + C[2] + C[1]*Log[x]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x) = x^n, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*(n+1)*ln(x^(n+1))+_C2*n^2+2*_C2*n+_C2+x^(n+1))/(n+1)^2
```

4.1357 $xy''(x) + y'(x) - y(x) = 0$

ODE

$$xy''(x) + y'(x) - y(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.147823 (sec), leaf count = 31

$$\{\{y(x) \to c_1 I_0\left(2\sqrt{x}\right) + 2c_2 K_0\left(2\sqrt{x}\right)\}\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 23

$$\{y(x) = \_C1\, I_0\left(2\sqrt{x}\right) + \_C2\, K_0\left(2\sqrt{x}\right)\}$$

Mathematica raw input

```
DSolve[-y[x] + y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselI[0, 2*Sqrt[x]]*C[1] + 2*BesselK[0, 2*Sqrt[x]]*C[2]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselI(0,2*x^(1/2))+_C2*BesselK(0,2*x^(1/2))
```

4.1358 $xy''(x) + y'(x) - (x+1)y(x) = 0$

ODE

$$xy''(x) + y'(x) - (x+1)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0844123 (sec), leaf count = 19

$$\{\{y(x) \to e^x(c_2 \text{Ei}(-2x) + c_1)\}\}$$

Maple ✓
cpu = 0.07 (sec), leaf count = 16

$$\{y(x) = \mathrm{e}^x(Ei(1, 2\,x)\_C2 + \_C1)\}$$

Mathematica raw input

```
DSolve[-((1 + x)*y[x]) + y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(C[1] + C[2]*ExpIntegralEi[-2*x])}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)-(1+x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(x)*(Ei(1,2*x)*_C2+_C1)
```

4.1359 $4x^3y(x) + xy''(x) - y'(x) = 0$

ODE

$$4x^3y(x) + xy''(x) - y'(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0452003 (sec), leaf count = 20

$$\{\{y(x) \to c_2 \sin\left(x^2\right) + c_1 \cos\left(x^2\right)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 17

$$\{y(x) = \_C1 \sin\left(x^2\right) + \_C2 \cos\left(x^2\right)\}$$

Mathematica raw input

```
DSolve[4*x^3*y[x] - y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[x^2] + C[2]*Sin[x^2]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-diff(y(x),x)+4*x^3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(x^2)+_C2*cos(x^2)
```

4.1360 $-a^2x^3y(x)+xy''(x)-y'(x)=0$

ODE

$$-a^2x^3y(x)+xy''(x)-y'(x)=0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0101554 (sec), leaf count = 33

$$\left\{\left\{y(x)\to c_1\cosh\left(\frac{ax^2}{2}\right)+ic_2\sinh\left(\frac{ax^2}{2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 23

$$\left\{y(x)=\_C1\ \sinh\left(\frac{ax^2}{2}\right)+\_C2\ \cosh\left(\frac{ax^2}{2}\right)\right\}$$

Mathematica raw input

```
DSolve[-(a^2*x^3*y[x]) - y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[(a*x^2)/2] + I*C[2]*Sinh[(a*x^2)/2]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-diff(y(x),x)-a^2*x^3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sinh(1/2*a*x^2)+_C2*cosh(1/2*a*x^2)
```

4.1361 $x^3\left(e^{x^2}-k^2\right)y(x)+xy''(x)-y'(x)=0$

ODE

$$x^3\left(e^{x^2}-k^2\right)y(x)+xy''(x)-y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.1249 (sec), leaf count = 46

$$\left\{\left\{y(x)\to c_1\Gamma(1-k)J_{-k}\left(\sqrt{e^{x^2}}\right)+c_2\Gamma(k+1)J_k\left(\sqrt{e^{x^2}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.076 (sec), leaf count = 25

$$\left\{y(x)=\_C1\,J_k\left(\mathrm{e}^{\frac{x^2}{2}}\right)+\_C2\,Y_k\left(\mathrm{e}^{\frac{x^2}{2}}\right)\right\}$$

Mathematica raw input

```
DSolve[(E^x^2 - k^2)*x^3*y[x] - y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselJ[-k, Sqrt[E^x^2]]*C[1]*Gamma[1 - k] + BesselJ[k, Sqrt[E^x^2]]*C
[2]*Gamma[1 + k]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-diff(y(x),x)+x^3*(exp(x^2)-k^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselJ(k,exp(1/2*x^2))+_C2*BesselY(k,exp(1/2*x^2))
```

4.1362 $xy''(x) + 2y'(x) = 0$

ODE

$$xy''(x) + 2y'(x) = 0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0114309 (sec), leaf count = 15

$$\left\{\left\{y(x) \to c_2 - \frac{c_1}{x}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 11

$$\left\{y(x) = \_C1 + \frac{\_C2}{x}\right\}$$

Mathematica raw input

```
DSolve[2*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(C[1]/x) + C[2]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2/x
```

4.1363 $xy''(x) + 2y'(x) = 0$

ODE

$$xy''(x) + 2y'(x) = 0$$

ODE Classification

[[_2nd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00522729 (sec), leaf count = 15

$$\left\{\left\{y(x) \to c_2 - \frac{c_1}{x}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 11

$$\left\{y(x) = \_C1 + \frac{\_C2}{x}\right\}$$

Mathematica raw input

```
DSolve[2*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(C[1]/x) + C[2]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2/x
```

4.1364 $xy''(x) + 2y'(x) - xy(x) = e^x$

ODE

$$xy''(x) + 2y'(x) - xy(x) = e^x$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0301526 (sec), leaf count = 37

$$\left\{\left\{y(x) \to \frac{e^{-x}\left(e^{2x}(2c_2 + 2x - 1) + 4c_1\right)}{4x}\right\}\right\}$$

Maple ✓
cpu = 0.078 (sec), leaf count = 23

$$\left\{y(x) = \frac{\sinh(x)\_C2}{x} + \frac{\cosh(x)\_C1}{x} + \frac{e^x}{2}\right\}$$

Mathematica raw input

```
DSolve[-(x*y[x]) + 2*y'[x] + x*y''[x] == E^x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (4*C[1] + E^(2*x)*(-1 + 2*x + 2*C[2]))/(4*E^x*x)}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)-x*y(x) = exp(x), y(x),'implicit')
```

Maple raw output

```
y(x) = sinh(x)/x*_C2+cosh(x)/x*_C1+1/2*exp(x)
```

4.1365 $axy(x) + xy''(x) + 2y'(x) = 0$

ODE

$$axy(x) + xy''(x) + 2y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0286669 (sec), leaf count = 51

$$\left\{\left\{y(x) \to \frac{e^{-\sqrt{-a}x}\left(\frac{c_2 e^{2\sqrt{-a}x}}{\sqrt{-a}} + 2c_1\right)}{2x}\right\}\right\}$$

Maple ✓
cpu = 0.048 (sec), leaf count = 29

$$\left\{y(x) = \frac{1}{x}(\_C1 \sinh\left(\sqrt{-a}x\right) + \_C2 \cosh\left(\sqrt{-a}x\right))\right\}$$

Mathematica raw input

```
DSolve[a*x*y[x] + 2*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*C[1] + (E^(2*Sqrt[-a]*x)*C[2])/Sqrt[-a])/(2*E^(Sqrt[-a]*x)*x)}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+a*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*sinh((-a)^(1/2)*x)+_C2*cosh((-a)^(1/2)*x))/x
```

4.1366 $ax^2y(x) + xy''(x) + 2y'(x) = 0$

ODE

$$ax^2y(x) + xy''(x) + 2y'(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0111032 (sec), leaf count = 36

$$\left\{\left\{y(x) \to \frac{c_1 \text{Ai}\left(\sqrt[3]{-a}x\right) + c_2 \text{Bi}\left(\sqrt[3]{-a}x\right)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.072 (sec), leaf count = 33

$$\left\{y(x) = 1\left(\_C2\, Y_{\frac{1}{3}}\left(\frac{2}{3}\sqrt{a}x^{\frac{3}{2}}\right) + \_C1\, J_{\frac{1}{3}}\left(\frac{2}{3}\sqrt{a}x^{\frac{3}{2}}\right)\right)\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[a*x^2*y[x] + 2*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (AiryAi[(-a)^(1/3)*x]*C[1] + AiryBi[(-a)^(1/3)*x]*C[2])/x}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+a*x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*BesselY(1/3,2/3*a^(1/2)*x^(3/2))+_C1*BesselJ(1/3,2/3*a^(1/2)*x^(3/2)
))/x^(1/2)
```

4.1367 $ay'(x) + xy''(x) = 0$

ODE

$$ay'(x) + xy''(x) = 0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0178824 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{c_1 x^{1-a}}{1-a} + c_2\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 15

$$\{y(x) = \_C1 + \_C2\, x^{1-a}\}$$

Mathematica raw input

```
DSolve[a*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(1 - a)*C[1])/(1 - a) + C[2]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*x^(1-a)
```

4.1368 $(a+1)y'(x)+xy''(x)+y(x)=0$

ODE

$$(a+1)y'(x)+xy''(x)+y(x)=0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0623154 (sec), leaf count = 50

$$\left\{\left\{y(x)\to x^{-a/2}\left(c_2\Gamma(1-a)J_{-a}\left(2\sqrt{x}\right)+c_1\Gamma(a+1)J_a\left(2\sqrt{x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 29

$$\left\{y(x)=x^{-\frac{a}{2}}\left(Y_a\left(2\sqrt{x}\right)\_C2+J_a\left(2\sqrt{x}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[y[x] + (1 + a)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (BesselJ[-a, 2*Sqrt[x]]*C[2]*Gamma[1 - a] + BesselJ[a, 2*Sqrt[x]]*C[1]
*Gamma[1 + a])/x^(a/2)}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(1+a)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a)*(BesselY(a,2*x^(1/2))*_C2+BesselJ(a,2*x^(1/2))*_C1)
```

4.1369 $(1-a)y'(x)+xy''(x)+y(x)=0$

ODE

$$(1-a)y'(x)+xy''(x)+y(x)=0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0301097 (sec), leaf count = 50

$$\left\{\left\{y(x)\to x^{a/2}\left(c_1\Gamma(1-a)J_{-a}\left(2\sqrt{x}\right)+c_2\Gamma(a+1)J_a\left(2\sqrt{x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 29

$$\left\{y(x)=x^{\frac{a}{2}}\left(Y_a\left(2\sqrt{x}\right)\_C2+J_a\left(2\sqrt{x}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[y[x] + (1 - a)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^(a/2)*(BesselJ[-a, 2*Sqrt[x]]*C[1]*Gamma[1 - a] + BesselJ[a, 2*Sqrt[
x]]*C[2]*Gamma[1 + a])}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(1-a)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2*a)*(BesselY(a,2*x^(1/2))*_C2+BesselJ(a,2*x^(1/2))*_C1)
```

4.1370 $(a+1)y'(x)+xy''(x)-y(x)=0$

ODE

$$(a+1)y'(x)+xy''(x)-y(x)=0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0320165 (sec), leaf count = 58

$$\left\{\left\{y(x)\to (-1)^{-a}x^{-a/2}\left(c_2\Gamma(1-a)I_{-a}\left(2\sqrt{x}\right)+(-1)^a c_1\Gamma(a+1)I_a\left(2\sqrt{x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 29

$$\left\{y(x)=x^{-\frac{a}{2}}\left(K_a\left(2\sqrt{x}\right)\_C2+I_a\left(2\sqrt{x}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-y[x] + (1 + a)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (BesselI[-a, 2*Sqrt[x]]*C[2]*Gamma[1 - a] + (-1)^a*BesselI[a, 2*Sqrt[x
]]*C[1]*Gamma[1 + a])/((-1)^a*x^(a/2))}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(1+a)*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a)*(BesselK(a,2*x^(1/2))*_C2+BesselI(a,2*x^(1/2))*_C1)
```

4.1371 $2ny'(x) + xy''(x) - y(x) = 0$

ODE

$$2ny'(x) + xy''(x) - y(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0451766 (sec), leaf count = 69

$$\left\{\left\{y(x) \to (-1)^{-2n} x^{\frac{1}{2}-n}\left(c_1(-1)^{2n}\Gamma(2n) I_{2n-1}\left(2\sqrt{x}\right) - c_2\Gamma(2-2n) I_{1-2n}\left(2\sqrt{x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 39

$$\left\{y(x) = x^{-n+\frac{1}{2}}\left(K_{2\,n-1}\left(2\sqrt{x}\right)\_C2 + I_{2\,n-1}\left(2\sqrt{x}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-y[x] + 2*n*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(1/2 - n)*(-(BesselI[1 - 2*n, 2*Sqrt[x]]*C[2]*Gamma[2 - 2*n]) + (-1
)^(2*n)*BesselI[-1 + 2*n, 2*Sqrt[x]]*C[1]*Gamma[2*n]))/(-1)^(2*n)}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+2*n*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-n+1/2)*(BesselK(2*n-1,2*x^(1/2))*_C2+BesselI(2*n-1,2*x^(1/2))*_C1)
```

4.1372 $ay'(x) + by(x) + xy''(x) = 0$

ODE

$$ay'(x) + by(x) + xy''(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0532441 (sec), leaf count = 77

$$\left\{\left\{y(x) \to b^{\frac{1}{2}-\frac{a}{2}} x^{\frac{1}{2}-\frac{a}{2}} \left(c_2 \Gamma(2-a) J_{1-a}\left(2\sqrt{b}\sqrt{x}\right) + c_1 \Gamma(a) J_{a-1}\left(2\sqrt{b}\sqrt{x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 41

$$\left\{y(x) = x^{-\frac{a}{2}+\frac{1}{2}} \left(Y_{a-1}\left(2\sqrt{b}\sqrt{x}\right)\_C2 + J_{a-1}\left(2\sqrt{b}\sqrt{x}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[b*y[x] + a*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> b^(1/2 - a/2)*x^(1/2 - a/2)*(BesselJ[1 - a, 2*Sqrt[b]*Sqrt[x]]*C[2]*Ga
mma[2 - a] + BesselJ[-1 + a, 2*Sqrt[b]*Sqrt[x]]*C[1]*Gamma[a])}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a+1/2)*(BesselY(a-1,2*b^(1/2)*x^(1/2))*_C2+BesselJ(a-1,2*b^(1/2)*
x^(1/2))*_C1)
```

4.1373 $ay'(x) + bxy(x) + xy''(x) = 0$

ODE

$$ay'(x) + bxy(x) + xy''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0225325 (sec), leaf count = 54

$$\left\{\left\{y(x) \to x^{\frac{1}{2}-\frac{a}{2}}\left(c_1 J_{\frac{a-1}{2}}\left(\sqrt{b}x\right) + c_2 Y_{\frac{a-1}{2}}\left(\sqrt{b}x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.043 (sec), leaf count = 39

$$\left\{y(x) = x^{-\frac{a}{2}+\frac{1}{2}}\left(Y_{\frac{a}{2}-\frac{1}{2}}\left(\sqrt{b}x\right)\_C2 + J_{\frac{a}{2}-\frac{1}{2}}\left(\sqrt{b}x\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[b*x*y[x] + a*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^(1/2 - a/2)*(BesselJ[(-1 + a)/2, Sqrt[b]*x]*C[1] + BesselY[(-1 + a)/
2, Sqrt[b]*x]*C[2])}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x)+b*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a+1/2)*(BesselY(1/2*a-1/2,b^(1/2)*x)*_C2+BesselJ(1/2*a-1/2,b^(1/2
)*x)*_C1)
```

4.1374 $ay'(x) + y(x)(\mathbf{b1} + \mathbf{b2}x) + xy''(x) = 0$

ODE

$$ay'(x) + y(x)(\text{b1} + \text{b2}x) + xy''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0817264 (sec), leaf count = 85

$$\left\{\left\{y(x) \to e^{-i\sqrt{\text{b2}}x}\left(c_1 U\left(\frac{1}{2}\left(a + \frac{i\text{b1}}{\sqrt{\text{b2}}}\right), a, 2i\sqrt{\text{b2}}x\right) + c_2 L^{a-1}_{-\frac{a}{2}-\frac{i\text{b1}}{2\sqrt{\text{b2}}}}\left(2i\sqrt{\text{b2}}x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.184 (sec), leaf count = 66

$$\left\{y(x) = \mathrm{e}^{-i\sqrt{b2}x}\left(U\left(\frac{1}{2}\left(a\sqrt{b2} + ib1\right)\frac{1}{\sqrt{b2}}, a, 2\,i\sqrt{b2}x\right)\_C2 + M\left(\frac{1}{2}\left(a\sqrt{b2} + ib1\right)\frac{1}{\sqrt{b2}}, a, 2\,i\sqrt{b2}x\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(b1 + b2*x)*y[x] + a*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*HypergeometricU[(a + (I*b1)/Sqrt[b2])/2, a, (2*I)*Sqrt[b2]*x] +
C[2]*LaguerreL[-a/2 - ((I/2)*b1)/Sqrt[b2], -1 + a, (2*I)*Sqrt[b2]*x])/E^(I*Sqrt[
b2]*x)}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x)+(b2*x+b1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-I*b2^(1/2)*x)*(KummerU(1/2*(a*b2^(1/2)+I*b1)/b2^(1/2),a,2*I*b2^(1/2)
*x)*_C2+KummerM(1/2*(a*b2^(1/2)+I*b1)/b2^(1/2),a,2*I*b2^(1/2)*x)*_C1)
```

4.1375 $ay'(x) + y(x)\left(\mathbf{a1} + \mathbf{b1}x + \mathbf{c1}x^2\right) + xy''(x) = 0$

ODE

$$ay'(x) + y(x)\left(\text{a1} + \text{b1}x + \text{c1}x^2\right) + xy''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 2.5341 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x) \to \text{DifferentialRoot}\left(\{y, x\}, \left\{\left(\text{c1}x^2 + \text{b1}x + \text{a1}\right)y(x) + ay'(x) + xy''(x) = 0, y(1) = c_1, y'(1) = c_2\right\}\right)(x)\right\}\right\}$$

Maple ✗
cpu = 0.295 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x) = DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x) + \frac{a\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{x} + \frac{\left(c1\,x^2 + b1\,x + a1\right)\_Y(x)}{x}\right\}, \{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[(a1 + b1*x + c1*x^2)*y[x] + a*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(a1 + \[FormalX]*
b1 + \[FormalX]^2*c1)*\[FormalY][\[FormalX]] + a*Derivative[1][\[FormalY]][\[For
malX]] + \[FormalX]*Derivative[2][\[FormalY]][\[FormalX]] == 0, \[FormalY][1] ==
 C[1], Derivative[1][\[FormalY]][1] == C[2]}]][x]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x)+(c1*x^2+b1*x+a1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+1/x*a*diff(_Y(x),x)+(c1*x^2+b1*x+a1)/x*_Y(x)
},{_Y(x)})
```

4.1376 $ay'(x) + bx^k y(x) + xy''(x) = 0$

ODE

$$ay'(x) + bx^k y(x) + xy''(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0554993 (sec), leaf count = 165

$$\left\{\left\{y(x) \to \left(\frac{1}{k}+1\right)^{\frac{a-1}{k+1}} k^{\frac{a-1}{k+1}} b^{\frac{1-a}{2k+2}} \left(x^k\right)^{-\frac{a-1}{2k}} \left(c_2 \Gamma\left(\frac{-a+k+2}{k+1}\right) J_{\frac{1-a}{k+1}}\left(\frac{2\sqrt{b}\left(x^k\right)^{\frac{k+1}{2k}}}{k+1}\right) + c_1 \Gamma\left(\frac{a+k}{k+1}\right) J_{\frac{a-1}{k+1}}\left(\frac{2\sqrt{b}\left(x^k\right)^{\frac{k+}{2}}}{k+1}\right.\right.\right.$$

Maple ✓
cpu = 0.103 (sec), leaf count = 71

$$\left\{y(x) = x^{-\frac{a}{2}+\frac{1}{2}} \left(Y_{\frac{a-1}{k+1}}\left(2\,\frac{\sqrt{b}x^{1/2+k/2}}{k+1}\right)\_C2 + J_{\frac{a-1}{k+1}}\left(2\,\frac{\sqrt{b}x^{1/2+k/2}}{k+1}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[b*x^k*y[x] + a*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (b^((1 - a)/(2 + 2*k))*(1 + k^(-1))^((-1 + a)/(1 + k))*k^((-1 + a)/(1
 + k))*(BesselJ[(1 - a)/(1 + k), (2*Sqrt[b]*(x^k)^((1 + k)/(2*k)))/(1 + k)]*C[2]*
Gamma[(2 - a + k)/(1 + k)] + BesselJ[(-1 + a)/(1 + k), (2*Sqrt[b]*(x^k)^((1 + k)
/(2*k)))/(1 + k)]*C[1]*Gamma[(a + k)/(1 + k)]))/(x^k)^((-1 + a)/(2*k))}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x)+b*x^k*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a+1/2)*(BesselY((a-1)/(k+1),2*b^(1/2)*x^(1/2+1/2*k)/(k+1))*_C2+Be
sselJ((a-1)/(k+1),2*b^(1/2)*x^(1/2+1/2*k)/(k+1))*_C1)
```

4.1377 $xy''(x) - (x+1)y'(x) + y(x) = 0$

ODE

$$xy''(x) - (x+1)y'(x) + y(x) = 0$$

ODE Classification

[_Laguerre]

Book solution method
TO DO

Mathematica ✓
cpu = 0.660348 (sec), leaf count = 19

$$\{\{y(x) \to c_1 e^x - c_2(x+1)\}\}$$

Maple ✓
cpu = 0.027 (sec), leaf count = 13

$$\{y(x) = \_C2\, \mathrm{e}^x + \_C1\, x + \_C1\}$$

Mathematica raw input

```
DSolve[y[x] - (1 + x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1] - (1 + x)*C[2]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(1+x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*exp(x)+_C1*x+_C1
```

4.1378 $ny(x) + xy''(x) + (1 - x)y'(x) = 0$

ODE

$$ny(x) + xy''(x) + (1 - x)y'(x) = 0$$

ODE Classification

[_Laguerre]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0869933 (sec), leaf count = 21

$$\{\{y(x) \to c_1 U(-n, 1, x) + c_2 L_n(x)\}\}$$

Maple ✓
cpu = 0.093 (sec), leaf count = 21

$$\{y(x) = \_C1\, M(-n,\, 1,\, x) + \_C2\, U(-n,\, 1,\, x)\}$$

Mathematica raw input

```
DSolve[n*y[x] + (1 - x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*HypergeometricU[-n, 1, x] + C[2]*LaguerreL[n, x]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(1-x)*diff(y(x),x)+n*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*KummerM(-n,1,x)+_C2*KummerU(-n,1,x)
```

4.1379 $(k-x+1)y'(x)+ny(x)+xy''(x)=0$

ODE

$$(k-x+1)y'(x)+ny(x)+xy''(x)=0$$

ODE Classification

[_Laguerre]

Book solution method
TO DO

Mathematica ✓
cpu = 0.041458 (sec), leaf count = 24

$$\{\{y(x)\to c_1U(-n,k+1,x)+c_2L_n^k(x)\}\}$$

Maple ✓
cpu = 0.095 (sec), leaf count = 25

$$\{y(x)=\_C1\,M(-n,\,k+1,\,x)+\_C2\,U(-n,\,k+1,\,x)\}$$

Mathematica raw input

```
DSolve[n*y[x] + (1 + k - x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*HypergeometricU[-n, 1 + k, x] + C[2]*LaguerreL[n, k, x]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(1+k-x)*diff(y(x),x)+n*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*KummerM(-n,k+1,x)+_C2*KummerU(-n,k+1,x)
```

4.1380 $xy''(x) - (x+1)y'(x) + 2(1-x)y(x) = 0$

ODE

$$xy''(x) - (x+1)y'(x) + 2(1-x)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.101505 (sec), leaf count = 30

$$\left\{\left\{y(x) \to c_1 e^{2x} - \frac{1}{9}c_2 e^{-x}(3x+1)\right\}\right\}$$

Maple ✓
cpu = 0.045 (sec), leaf count = 22

$$\{y(x) = \_C1\, \mathrm{e}^{2x} + \_C2\, \mathrm{e}^{-x}(1+3x)\}$$

Mathematica raw input

```
DSolve[2*(1 - x)*y[x] - (1 + x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(2*x)*C[1] - ((1 + 3*x)*C[2])/(9*E^x)}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(1+x)*diff(y(x),x)+2*(1-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(2*x)+_C2*exp(-x)*(1+3*x)
```

4.1381 $xy''(x) - (2-x)y'(x) - y(x) = 0$

ODE

$$xy''(x) - (2-x)y'(x) - y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0573575 (sec), leaf count = 72

$$\left\{\left\{y(x) \to -\frac{2e^{-x/2}\sqrt{x}\left((c_1 x + 2ic_2)\cosh\left(\frac{x}{2}\right) - (2c_1 + ic_2 x)\sinh\left(\frac{x}{2}\right)\right)}{\sqrt{\pi}\sqrt{-ix}}\right\}\right\}$$

Maple ✓
cpu = 0.047 (sec), leaf count = 19

$$\{y(x) = \_C1\,(x-2) + \_C2\,\mathrm{e}^{-x}(2+x)\}$$

Mathematica raw input

```
DSolve[-y[x] - (2 - x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*Sqrt[x]*((x*C[1] + (2*I)*C[2])*Cosh[x/2] - (2*C[1] + I*x*C[2])*Sin
h[x/2]))/(E^(x/2)*Sqrt[Pi]*Sqrt[(-I)*x])}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(2-x)*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(x-2)+_C2*exp(-x)*(2+x)
```

4.1382 $xy''(x) - (x+3)y'(x) + y(x) = 0$

ODE

$$xy''(x) - (x+3)y'(x) + y(x) = 0$$

ODE Classification

[_Laguerre]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0390818 (sec), leaf count = 26

$$\{\{y(x) \to c_2 e^x (x^2 - 4x + 6) + c_1 (x+3)\}\}$$

Maple ✓
cpu = 0.031 (sec), leaf count = 22

$$\{y(x) = \_C1\,(3+x) + \_C2\,\mathrm{e}^x (x^2 - 4\,x + 6)\}$$

Mathematica raw input

```
DSolve[y[x] - (3 + x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3 + x)*C[1] + E^x*(6 - 4*x + x^2)*C[2]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(3+x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(3+x)+_C2*exp(x)*(x^2-4*x+6)
```

4.1383 $xy''(x) - (x+3)y'(x) + 3y(x) = 0$

ODE

$$xy''(x) - (x+3)y'(x) + 3y(x) = 0$$

ODE Classification

[_Laguerre]

Book solution method
TO DO

Mathematica ✓
cpu = 0.016726 (sec), leaf count = 29

$$\{\{y(x) \to c_1 e^x - c_2(x^3 + 3x^2 + 6x + 6)\}\}$$

Maple ✓
cpu = 0.043 (sec), leaf count = 24

$$\{y(x) = \_C1\, e^x + \_C2\, (x^3 + 3\,x^2 + 6\,x + 6)\}$$

Mathematica raw input

```
DSolve[3*y[x] - (3 + x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1] - (6 + 6*x + 3*x^2 + x^3)*C[2]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(3+x)*diff(y(x),x)+3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(x)+_C2*(x^3+3*x^2+6*x+6)
```

4.1384 $(a+x)y'(x)+by(x)+xy''(x)=0$

ODE

$$(a+x)y'(x)+by(x)+xy''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0293648 (sec), leaf count = 36

$$\{\{y(x)\to e^{-x}\left(c_1 U(a-b,a,x)+c_2 L_{b-a}^{a-1}(x)\right)\}\}$$

Maple ✓
cpu = 0.079 (sec), leaf count = 30

$$\{y(x) = \mathrm{e}^{-x}(U(a-b,\,a,\,x)\_C2+M(a-b,\,a,\,x)\_C1)\}$$

Mathematica raw input

```
DSolve[b*y[x] + (a + x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*HypergeometricU[a - b, a, x] + C[2]*LaguerreL[-a + b, -1 + a, x]
)/E^x}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(a+x)*diff(y(x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x)*(KummerU(a-b,a,x)*_C2+KummerM(a-b,a,x)*_C1)
```

4.1385 $-ay(x) + (c - x)y'(x) + xy''(x) = 0$

ODE

$$-ay(x) + (c - x)y'(x) + xy''(x) = 0$$

ODE Classification

[_Laguerre]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0234825 (sec), leaf count = 24

$$\{\{y(x) \to c_1 U(a, c, x) + c_2 L_{-a}^{c-1}(x)\}\}$$

Maple ✓
cpu = 0.097 (sec), leaf count = 17

$$\{y(x) = \_C1\, M(a, c, x) + \_C2\, U(a, c, x)\}$$

Mathematica raw input

```
DSolve[-(a*y[x]) + (c - x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*HypergeometricU[a, c, x] + C[2]*LaguerreL[-a, -1 + c, x]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(c-x)*diff(y(x),x)-a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*KummerM(a,c,x)+_C2*KummerU(a,c,x)
```

4.1386 $xy''(x) + (1-2x)y'(x) - (1-x)y(x) = 0$

ODE

$$xy''(x) + (1-2x)y'(x) - (1-x)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0127374 (sec), leaf count = 17

$$\{\{y(x) \to e^x(c_2 \log(x) + c_1)\}\}$$

Maple ✓
cpu = 0.045 (sec), leaf count = 13

$$\{y(x) = \mathrm{e}^x(\ln(x)\_C2 + \_C1)\}$$

Mathematica raw input

```
DSolve[-((1 - x)*y[x]) + (1 - 2*x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(C[1] + C[2]*Log[x])}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(1-2*x)*diff(y(x),x)-(1-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(x)*(ln(x)*_C2+_C1)
```

4.1387 $xy''(x) - (2x+1)y'(x) + (x+1)y(x) = 0$

ODE

$$xy''(x) - (2x+1)y'(x) + (x+1)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0131348 (sec), leaf count = 23

$$\left\{\left\{y(x) \to \frac{1}{2}e^x\left(c_2x^2 + 2c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.037 (sec), leaf count = 14

$$\{y(x) = \mathrm{e}^x\left(\_C2\,x^2 + \_C1\right)\}$$

Mathematica raw input

```
DSolve[(1 + x)*y[x] - (1 + 2*x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*(2*C[1] + x^2*C[2]))/2}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(1+2*x)*diff(y(x),x)+(1+x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(x)*(_C2*x^2+_C1)
```

4.1388 $xy''(x) - (2x+1)y'(x) + (x+1)y(x) = x^2 - x - 1$

ODE

$$xy''(x) - (2x+1)y'(x) + (x+1)y(x) = x^2 - x - 1$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0600118 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{1}{2}c_2 e^x x^2 + c_1 e^x + x\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 16

$$\{y(x) = (\_C1\, x^2 + \_C2)\, \mathrm{e}^x + x\}$$

Mathematica raw input

```
DSolve[(1 + x)*y[x] - (1 + 2*x)*y'[x] + x*y''[x] == -1 - x + x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x + E^x*C[1] + (E^x*x^2*C[2])/2}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(1+2*x)*diff(y(x),x)+(1+x)*y(x) = x^2-x-1, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x^2+_C2)*exp(x)+x
```

4.1389 $(a+bx)y'(x)+cy(x)+xy''(x)=0$

ODE

$$(a+bx)y'(x)+cy(x)+xy''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0355092 (sec), leaf count = 48

$$\left\{\left\{y(x)\to e^{-bx}\left(c_1 U\left(a-\frac{c}{b},a,bx\right)+c_2 L_{\frac{c}{b}-a}^{a-1}(bx)\right)\right\}\right\}$$

Maple ✓
cpu = 0.096 (sec), leaf count = 47

$$\left\{y(x)=\mathrm{e}^{-bx}\left(U\left(\frac{ab-c}{b},\,a,\,bx\right)\_C2+M\left(\frac{ab-c}{b},\,a,\,bx\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[c*y[x] + (a + b*x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*HypergeometricU[a - c/b, a, b*x] + C[2]*LaguerreL[-a + c/b, -1 +
  a, b*x])/E^(b*x)}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(b*x+a)*diff(y(x),x)+c*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-b*x)*(KummerU((a*b-c)/b,a,b*x)*_C2+KummerM((a*b-c)/b,a,b*x)*_C1)
```

4.1390 $(\mathbf{a1}+\mathbf{b1}x)y'(x)+y(x)(\mathbf{a2}+\mathbf{b2}x)+xy''(x)=0$

ODE

$$(\mathrm{a1}+\mathrm{b1}x)y'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)+xy''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0221795 (sec), leaf count = 134

$$\left\{\left\{y(x)\to e^{-\frac{1}{2}x\left(\sqrt{\mathrm{b1}^2-4\mathrm{b2}}+\mathrm{b1}\right)}\left(c_1U\left(\frac{\mathrm{a1}\left(\mathrm{b1}+\sqrt{\mathrm{b1}^2-4\mathrm{b2}}\right)-2\mathrm{a2}}{2\sqrt{\mathrm{b1}^2-4\mathrm{b2}}},\mathrm{a1},\sqrt{\mathrm{b1}^2-4\mathrm{b2}}x\right)+c_2L^{\mathrm{a1}-1}_{\frac{2\mathrm{a2}-\mathrm{a1}\left(\sqrt{\mathrm{b1}^2-4\mathrm{b2}}+\mathrm{b1}\right)}{2\sqrt{\mathrm{b1}^2-4\mathrm{b2}}}}\left(x\sqrt{\mathrm{b1}\right.\right.\right.$$

Maple ✓
cpu = 0.253 (sec), leaf count = 109

$$\left\{y(x)=\mathrm{e}^{-\frac{x}{2}\left(b1+\sqrt{b1^2-4\,b2}\right)}\left(U\left(\frac{1}{2}\left(a1\,\sqrt{b1^2-4\,b2}+a1\,b1-2\,a2\right)\frac{1}{\sqrt{b1^2-4\,b2}},\,a1,\,\sqrt{b1^2-4\,b2}x\right)\_C2+M\left(\frac{1}{2}\left(a\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a2 + b2*x)*y[x] + (a1 + b1*x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*HypergeometricU[(-2*a2 + a1*(b1 + Sqrt[b1^2 - 4*b2]))/(2*Sqrt[b1
^2 - 4*b2]), a1, Sqrt[b1^2 - 4*b2]*x] + C[2]*LaguerreL[(2*a2 - a1*(b1 + Sqrt[b1^
2 - 4*b2]))/(2*Sqrt[b1^2 - 4*b2]), -1 + a1, Sqrt[b1^2 - 4*b2]*x])/E^(((b1 + Sqrt
[b1^2 - 4*b2])*x)/2)}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(b1*x+a1)*diff(y(x),x)+(b2*x+a2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*x*(b1+(b1^2-4*b2)^(1/2)))*(KummerU(1/2*(a1*(b1^2-4*b2)^(1/2)+a1*
b1-2*a2)/(b1^2-4*b2)^(1/2),a1,(b1^2-4*b2)^(1/2)*x)*_C2+KummerM(1/2*(a1*(b1^2-4*b
2)^(1/2)+a1*b1-2*a2)/(b1^2-4*b2)^(1/2),a1,(b1^2-4*b2)^(1/2)*x)*_C1)
```

4.1391 $-2(a+bx)y'(x)+y(x)(2a+bx)+xy''(x)=0$

ODE

$$-2(a+bx)y'(x)+y(x)(2a+bx)+xy''(x)=0$$

ODE Classification

```
[[_2nd_order, _with_linear_symmetries]]
```

Book solution method
TO DO

Mathematica ✓
cpu = 0.0247 (sec), leaf count = 117

$$\left\{\left\{y(x)\to x^{2a+1}e^{bx-\sqrt{b-1}\sqrt{b}x}\left(c_1U\left(\sqrt{\frac{b-1}{b}}a+a+1,2a+2,2\sqrt{b-1}\sqrt{b}x\right)+c_2L_{-a\left(\sqrt{\frac{b-1}{b}}+1\right)-1}^{2a+1}\left(2\sqrt{b-1}\sqrt{b}x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.198 (sec), leaf count = 106

$$\left\{y(x)=e^{x\left(b-\sqrt{b}\sqrt{-1+b}\right)}x^{2\,a+1}\left(M\left(1\left(\sqrt{-1+b}a+a\sqrt{b}+\sqrt{b}\right)\frac{1}{\sqrt{b}},\,2\,a+2,\,2\,\sqrt{b}\sqrt{-1+b}x\right)_C1+U\left(1\left(\sqrt{-1+b}a+a\sqrt{}\right.\right.\right.$$

Mathematica raw input

```
DSolve[(2*a + b*x)*y[x] - 2*(a + b*x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(-(Sqrt[-1 + b]*Sqrt[b]*x) + b*x)*x^(1 + 2*a)*(C[1]*HypergeometricU[
1 + a + a*Sqrt[(-1 + b)/b], 2 + 2*a, 2*Sqrt[-1 + b]*Sqrt[b]*x] + C[2]*LaguerreL[
-1 - a*(1 + Sqrt[(-1 + b)/b]), 1 + 2*a, 2*Sqrt[-1 + b]*Sqrt[b]*x])}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-2*(b*x+a)*diff(y(x),x)+(b*x+2*a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(x*(b-b^(1/2)*(-1+b)^(1/2)))*x^(2*a+1)*(KummerM(((-1+b)^(1/2)*a+a*b^(1
/2)+b^(1/2))/b^(1/2),2*a+2,2*b^(1/2)*(-1+b)^(1/2)*x)*_C1+KummerU(((-1+b)^(1/2)*a
+a*b^(1/2)+b^(1/2))/b^(1/2),2*a+2,2*b^(1/2)*(-1+b)^(1/2)*x)*_C2)
```

4.1392 $y'(x)(x(a+b)+m+n)+y(x)(abx+an+bm)+xy''(x)=0$

ODE

$$y'(x)(x(a+b)+m+n)+y(x)(abx+an+bm)+xy''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0913131 (sec), leaf count = 46

$$\{\{y(x)\to e^{-ax}\left(c_1 U(m,m+n,(a-b)x)+c_2 L_{-m}^{m+n-1}(x(a-b))\right)\}\}$$

Maple ✓
cpu = 0.124 (sec), leaf count = 39

$$\{y(x)=\mathrm{e}^{-ax}(U(m,\,n+m,\,x(a-b))\_C2+M(m,\,n+m,\,x(a-b))\_C1)\}$$

Mathematica raw input

```
DSolve[(b*m + a*n + a*b*x)*y[x] + (m + n + (a + b)*x)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*HypergeometricU[m, m + n, (a - b)*x] + C[2]*LaguerreL[-m, -1 + m
 + n, (a - b)*x])/E^(a*x)}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(m+n+x*(a+b))*diff(y(x),x)+(a*b*x+a*n+b*m)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-a*x)*(KummerU(m,n+m,x*(a-b))*_C2+KummerM(m,n+m,x*(a-b))*_C1)
```

4.1393 $xy''(x) - (1-x^2)\,y'(x) = 0$

ODE

$$xy''(x) - (1-x^2)\,y'(x) = 0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00819388 (sec), leaf count = 21

$$\left\{\left\{y(x) \to c_2 - c_1 e^{-\frac{x^2}{2}}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 14

$$\left\{y(x) = \_C1 + \mathrm{e}^{-\frac{x^2}{2}}\_C2\right\}$$

Mathematica raw input

```
DSolve[-((1 - x^2)*y'[x]) + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(C[1]/E^(x^2/2)) + C[2]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(-x^2+1)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+exp(-1/2*x^2)*_C2
```

4.1394 $-(4-x^2)\,y'(x)+xy''(x)+2xy(x)=0$

ODE

$$-(4-x^2)\,y'(x)+xy''(x)+2xy(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0261531 (sec), leaf count = 68

$$\left\{\left\{y(x)\to \frac{1}{30}\left(\sqrt{2\pi}c_2 e^{-\frac{x^2}{2}}x^5\operatorname{erfi}\left(\frac{x}{\sqrt{2}}\right)+30c_1 e^{-\frac{x^2}{2}}x^5-2c_2\left(x^4+x^2+3\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.055 (sec), leaf count = 46

$$\left\{y(x)=x^5\left(i\_C2\,\sqrt{2}\sqrt{\pi}\,Erf\left(\frac{i}{2}\sqrt{2}x\right)+\_C1\right)\mathrm{e}^{-\frac{x^2}{2}}+2\,\_C2\,\left(x^4+x^2+3\right)\right\}$$

Mathematica raw input

```
DSolve[2*x*y[x] - (4 - x^2)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((30*x^5*C[1])/E^(x^2/2) - 2*(3 + x^2 + x^4)*C[2] + (Sqrt[2*Pi]*x^5*C[
2]*Erfi[x/Sqrt[2]])/E^(x^2/2))/30}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(-x^2+4)*diff(y(x),x)+2*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^5*(I*_C2*2^(1/2)*Pi^(1/2)*erf(1/2*I*2^(1/2)*x)+_C1)*exp(-1/2*x^2)+2*_C2
*(x^4+x^2+3)
```

4.1395 $x^3 y(x) - (2x^2+1)\, y'(x) + x y''(x) = 0$

ODE

$$x^3 y(x) - (2x^2+1)\, y'(x) + x y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0120907 (sec), leaf count = 29

$$\left\{\left\{y(x) \to \frac{1}{2} e^{\frac{x^2}{2}} \left(c_2 x^2 + 2c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.035 (sec), leaf count = 18

$$\left\{y(x) = \mathrm{e}^{\frac{x^2}{2}} \left(\_C2\, x^2 + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[x^3*y[x] - (1 + 2*x^2)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(x^2/2)*(2*C[1] + x^2*C[2]))/2}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(2*x^2+1)*diff(y(x),x)+x^3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(1/2*x^2)*(_C2*x^2+_C1)
```

4.1396 $-8x^3y(x) - (2x^2+1)\,y'(x) + xy''(x) = 0$

ODE

$$-8x^3y(x) - (2x^2+1)\,y'(x) + xy''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0174306 (sec), leaf count = 26

$$\left\{\left\{y(x) \to e^{-x^2}\left(c_1 e^{3x^2} + c_2\right)\right\}\right\}$$

Maple ✓
cpu = 0.031 (sec), leaf count = 21

$$\left\{y(x) = \_C1\, \mathrm{e}^{2x^2} + \_C2\, \mathrm{e}^{-x^2}\right\}$$

Mathematica raw input

```
DSolve[-8*x^3*y[x] - (1 + 2*x^2)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(3*x^2)*C[1] + C[2])/E^x^2}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(2*x^2+1)*diff(y(x),x)-8*x^3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(2*x^2)+_C2*exp(-x^2)
```

4.1397 $-8x^3y(x) - (2x^2+1)\,y'(x) + xy''(x) = 4e^{-x^2}x^3$

ODE

$$-8x^3y(x) - (2x^2+1)\,y'(x) + xy''(x) = 4e^{-x^2}x^3$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0303971 (sec), leaf count = 38

$$\left\{\left\{y(x) \to \frac{1}{9}e^{-x^2}\left(9c_1e^{3x^2} + 9c_2 - 3x^2 - 1\right)\right\}\right\}$$

Maple ✓
cpu = 0.027 (sec), leaf count = 30

$$\left\{y(x) = \frac{\left(-x^2 + 3\_C1\right)\mathrm{e}^{-x^2}}{3} + \mathrm{e}^{2x^2}\_C2\right\}$$

Mathematica raw input

```
DSolve[-8*x^3*y[x] - (1 + 2*x^2)*y'[x] + x*y''[x] == (4*x^3)/E^x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 - 3*x^2 + 9*E^(3*x^2)*C[1] + 9*C[2])/(9*E^x^2)}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(2*x^2+1)*diff(y(x),x)-8*x^3*y(x) = 4*x^3*exp(-x^2), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/3*(-x^2+3*_C1)*exp(-x^2)+exp(2*x^2)*_C2
```

4.1398 $(4x^2+1)\,y'(x)+4x(x^2+1)\,y(x)+xy''(x)=0$

ODE

$$(4x^2+1)\,y'(x)+4x(x^2+1)\,y(x)+xy''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0150125 (sec), leaf count = 21

$$\left\{\left\{y(x)\to e^{-x^2}\left(c_2\log(x)+c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.056 (sec), leaf count = 17

$$\left\{y(x)=\mathrm{e}^{-x^2}\left(\ln(x)\_C2+\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[4*x*(1 + x^2)*y[x] + (1 + 4*x^2)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + C[2]*Log[x])/E^x^2}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(4*x^2+1)*diff(y(x),x)+4*x*(x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x^2)*(ln(x)*_C2+_C1)
```

4.1399 $-(1-2ax^3)\,y'(x)+ax^2(ax^3+1)\,y(x)+xy''(x)=0$

ODE

$$-(1-2ax^3)\,y'(x)+ax^2(ax^3+1)\,y(x)+xy''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0189973 (sec), leaf count = 30

$$\left\{\left\{y(x)\to \frac{1}{2}e^{-\frac{ax^3}{3}}\left(c_2x^2+2c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.052 (sec), leaf count = 19

$$\left\{y(x)=\mathrm{e}^{-\frac{ax^3}{3}}\left(\_C2\,x^2+\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[a*x^2*(1 + a*x^3)*y[x] - (1 - 2*a*x^3)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*C[1] + x^2*C[2])/(2*E^((a*x^3)/3))}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)-(-2*a*x^3+1)*diff(y(x),x)+a*(a*x^3+1)*x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/3*a*x^3)*(_C2*x^2+_C1)
```

4.1400 $(xf(x)+2)y'(x)+f(x)y(x)+xy''(x)=0$

ODE

$$(xf(x)+2)y'(x)+f(x)y(x)+xy''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.211402 (sec), leaf count = 0 , could not solve

```
DSolve[f[x]*y[x] + (2 + x*f[x])*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.28 (sec), leaf count = 32

$$\left\{y(x)=\frac{1}{x}\left(\_C2\int e^{\int\frac{-2-xf(x)}{x}dx}x^2\,dx+\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[f[x]*y[x] + (2 + x*f[x])*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f[x]*y[x] + (2 + x*f[x])*Derivative[1][y][x] + x*Derivative[2][y][x] == 0
, y[x], x]
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(2+x*f(x))*diff(y(x),x)+f(x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*Int(exp(Int((-2-x*f(x))/x,x))*x^2,x)+_C1)/x
```

4.1401 $(1-x)y''(x)+xy'(x)-y(x)=0$

ODE

$$(1-x)y''(x)+xy'(x)-y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0167708 (sec), leaf count = 17

$$\{\{y(x)\to c_1 e^x-c_2 x\}\}$$

Maple ✓
cpu = 0.03 (sec), leaf count = 12

$$\{y(x)=\_C1\,x+\_C2\,\mathrm{e}^x\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + (1 - x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1] - x*C[2]}}
```

Maple raw input

```
dsolve((1-x)*diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x+_C2*exp(x)
```

4.1402 $(1-x)y''(x)+xy'(x)-y(x)=(1-x)^2$

ODE

$$(1-x)y''(x)+xy'(x)-y(x)=(1-x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0233116 (sec), leaf count = 22

$$\{\{y(x)\to -c_2 x+c_1 e^x+x^2+x+1\}\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 16

$$\{y(x)=x\_C2+\mathrm{e}^x\_C1+x^2+1\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + (1 - x)*y''[x] == (1 - x)^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1 + x + x^2 + E^x*C[1] - x*C[2]}}
```

Maple raw input

```
dsolve((1-x)*diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x) = (1-x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = x*_C2+exp(x)*_C1+x^2+1
```

4.1403 $(3-x)y''(x)-(9-4x)y'(x)+3(2-x)y(x)=0$

ODE

$$(3-x)y''(x)-(9-4x)y'(x)+3(2-x)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.028233 (sec), leaf count = 42

$$\left\{\left\{y(x)\to \frac{1}{8}c_2 e^{3x-9}\left(4x^3-42x^2+150x-183\right)+c_1 e^{x-3}\right\}\right\}$$

Maple ✓
cpu = 0.039 (sec), leaf count = 30

$$\left\{y(x)=\mathrm{e}^{x}\_C1+\_C2\,\mathrm{e}^{3\,x}\left(4\,x^3-42\,x^2+150\,x-183\right)\right\}$$

Mathematica raw input

```
DSolve[3*(2 - x)*y[x] - (9 - 4*x)*y'[x] + (3 - x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(-3 + x)*C[1] + (E^(-9 + 3*x)*(-183 + 150*x - 42*x^2 + 4*x^3)*C[2])/
8}}
```

Maple raw input

```
dsolve((3-x)*diff(diff(y(x),x),x)-(9-4*x)*diff(y(x),x)+3*(2-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(x)*_C1+_C2*exp(3*x)*(4*x^3-42*x^2+150*x-183)
```

4.1404 $(a-x)y''(x)-2y'(x)=0$

ODE

$$(a-x)y''(x)-2y'(x)=0$$

ODE Classification

[[_2nd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00789502 (sec), leaf count = 18

$$\left\{\left\{y(x)\to \frac{c_1}{a-x}+c_2\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 15

$$\left\{y(x)=\_C1+\frac{\_C2}{x-a}\right\}$$

Mathematica raw input

```
DSolve[-2*y'[x] + (a - x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/(a - x) + C[2]}}
```

Maple raw input

```
dsolve((a-x)*diff(diff(y(x),x),x)-2*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2/(x-a)
```

4.1405 $(a+x)y''(x)+(\mathbf{a1}+\mathbf{b1}x)y'(x)+y(x)(\mathbf{a2}+\mathbf{b2}x)=0$

ODE

$$(a+x)y''(x)+(\mathrm{a1}+\mathrm{b1}x)y'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0388146 (sec), leaf count = 239

$$\left\{\left\{y(x)\to e^{-\frac{1}{2}x\left(\sqrt{\mathrm{b1}^2-4\mathrm{b2}}+\mathrm{b1}\right)}(a+x)^{a\mathrm{b1}-\mathrm{a1}+1}\left(c_1U\left(\frac{-a\mathrm{b1}^2+\mathrm{a1b1}+a\sqrt{\mathrm{b1}^2-4\mathrm{b2}}\mathrm{b1}-2\mathrm{a2}+2a\mathrm{b2}-\mathrm{a1}\sqrt{\mathrm{b1}^2-4\mathrm{b2}}+}{2\sqrt{\mathrm{b1}^2-4\mathrm{b2}}}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.164 (sec), leaf count = 171

$$\left\{y(x)=\mathrm{e}^{-\frac{x}{2}\left(b1+\sqrt{b1^2-4\,b2}\right)}(a+x)^{b1\,a-a1+1}\left(U\left(-\frac{1}{2}\left(\left(-b1\,a+a1-2\right)\sqrt{b1^2-4\,b2}+ab1^2-2\,ab2-a1\,b1+2\,a2\right)\frac{}{\sqrt{}}\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a2 + b2*x)*y[x] + (a1 + b1*x)*y'[x] + (a + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((a + x)^(1 - a1 + a*b1)*(C[1]*HypergeometricU[(-2*a2 + a1*b1 - a*b1^2
 + 2*Sqrt[b1^2 - 4*b2] - a1*Sqrt[b1^2 - 4*b2] + a*b1*Sqrt[b1^2 - 4*b2] + 2*a*b2)
/(2*Sqrt[b1^2 - 4*b2]), 2 - a1 + a*b1, Sqrt[b1^2 - 4*b2]*(a + x)] + C[2]*Laguerr
eL[(2*a2 - a1*b1 + a*b1^2 - 2*Sqrt[b1^2 - 4*b2] + a1*Sqrt[b1^2 - 4*b2] - a*b1*Sq
rt[b1^2 - 4*b2] - 2*a*b2)/(2*Sqrt[b1^2 - 4*b2]), 1 - a1 + a*b1, Sqrt[b1^2 - 4*b2
]*(a + x)]))/E^(((b1 + Sqrt[b1^2 - 4*b2])*x)/2)}}
```

Maple raw input

```
dsolve((a+x)*diff(diff(y(x),x),x)+(b1*x+a1)*diff(y(x),x)+(b2*x+a2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*x*(b1+(b1^2-4*b2)^(1/2)))*(a+x)^(a*b1-a1+1)*(KummerU(-1/2/(b1^2-
4*b2)^(1/2)*((-a*b1+a1-2)*(b1^2-4*b2)^(1/2)+a*b1^2-2*a*b2-a1*b1+2*a2),a*b1-a1+2,
(b1^2-4*b2)^(1/2)*(a+x))*_C2+KummerM(-1/2/(b1^2-4*b2)^(1/2)*((-a*b1+a1-2)*(b1^2-
4*b2)^(1/2)+a*b1^2-2*a*b2-a1*b1+2*a2),a*b1-a1+2,(b1^2-4*b2)^(1/2)*(a+x))*_C1)
```

4.1406 $2xy''(x) + y'(x) = 0$

ODE

$$2xy''(x) + y'(x) = 0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00571911 (sec), leaf count = 17

$$\{\{y(x) \to 2c_1\sqrt{x} + c_2\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 11

$$\{y(x) = \_C1 + \sqrt{x}\_C2\}$$

Mathematica raw input

```
DSolve[y'[x] + 2*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*Sqrt[x]*C[1] + C[2]}}
```

Maple raw input

```
dsolve(2*x*diff(diff(y(x),x),x)+diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+x^(1/2)*_C2
```

4.1407 $ay(x) + 2xy''(x) + y'(x) = 0$

ODE

$$ay(x) + 2xy''(x) + y'(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0097279 (sec), leaf count = 46

$$\left\{\left\{y(x) \to c_2 \sin\left(\sqrt{2}\sqrt{a}\sqrt{x}\right) + c_1 \cos\left(\sqrt{2}\sqrt{a}\sqrt{x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 31

$$\left\{y(x) = \_C1 \sin\left(\sqrt{x}\sqrt{2}\sqrt{a}\right) + \_C2 \cos\left(\sqrt{x}\sqrt{2}\sqrt{a}\right)\right\}$$

Mathematica raw input

```
DSolve[a*y[x] + y'[x] + 2*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[Sqrt[2]*Sqrt[a]*Sqrt[x]] + C[2]*Sin[Sqrt[2]*Sqrt[a]*Sqrt[x]]}
}
```

Maple raw input

```
dsolve(2*x*diff(diff(y(x),x),x)+diff(y(x),x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(x^(1/2)*2^(1/2)*a^(1/2))+_C2*cos(x^(1/2)*2^(1/2)*a^(1/2))
```

4.1408 $-ay(x)+2xy''(x)+y'(x)=0$

ODE

$$-ay(x)+2xy''(x)+y'(x)=0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0102824 (sec), leaf count = 49

$$\left\{\left\{y(x)\to c_1\cosh\left(\sqrt{2}\sqrt{a}\sqrt{x}\right)+ic_2\sinh\left(\sqrt{2}\sqrt{a}\sqrt{x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 31

$$\left\{y(x)=\_C1\ \sinh\left(\sqrt{x}\sqrt{2}\sqrt{a}\right)+\_C2\ \cosh\left(\sqrt{x}\sqrt{2}\sqrt{a}\right)\right\}$$

Mathematica raw input

```
DSolve[-(a*y[x]) + y'[x] + 2*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[Sqrt[2]*Sqrt[a]*Sqrt[x]] + I*C[2]*Sinh[Sqrt[2]*Sqrt[a]*Sqrt[
x]]}}
```

Maple raw input

```
dsolve(2*x*diff(diff(y(x),x),x)+diff(y(x),x)-a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sinh(x^(1/2)*2^(1/2)*a^(1/2))+_C2*cosh(x^(1/2)*2^(1/2)*a^(1/2))
```

4.1409 $y(x)(a+bx)+2xy''(x)+y'(x)=0$

ODE

$$y(x)(a+bx)+2xy''(x)+y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0223117 (sec), leaf count = 115

$$\left\{\left\{y(x)\to \sqrt{x}e^{-\frac{i\sqrt{b}x}{\sqrt{2}}}\left(c_1 U\left(\frac{1}{4}\left(\frac{i\sqrt{2}a}{\sqrt{b}}+3\right),\frac{3}{2},i\sqrt{2}\sqrt{b}x\right)+c_2 L^{\frac{1}{2}}_{\frac{1}{4}\left(-3-\frac{i\sqrt{2}a}{\sqrt{b}}\right)}\left(i\sqrt{2}\sqrt{b}x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.21 (sec), leaf count = 84

$$\left\{y(x)=\sqrt{x}\mathrm{e}^{-\frac{i}{2}\sqrt{2}\sqrt{b}x}\left(U\left(\frac{1}{4}\left(ia\sqrt{2}+3\sqrt{b}\right)\frac{1}{\sqrt{b}},\frac{3}{2},i\sqrt{2}\sqrt{b}x\right)\_C2+M\left(\frac{1}{4}\left(ia\sqrt{2}+3\sqrt{b}\right)\frac{1}{\sqrt{b}},\frac{3}{2},i\sqrt{2}\sqrt{b}x\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x)*y[x] + y'[x] + 2*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[x]*(C[1]*HypergeometricU[(3 + (I*Sqrt[2]*a)/Sqrt[b])/4, 3/2, I*S
qrt[2]*Sqrt[b]*x] + C[2]*LaguerreL[(-3 - (I*Sqrt[2]*a)/Sqrt[b])/4, 1/2, I*Sqrt[2
]*Sqrt[b]*x]))/E^((I*Sqrt[b]*x)/Sqrt[2])}}
```

Maple raw input

```
dsolve(2*x*diff(diff(y(x),x),x)+diff(y(x),x)+(b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*exp(-1/2*I*2^(1/2)*b^(1/2)*x)*(KummerU(1/4*(I*a*2^(1/2)+3*b^(1/2)
)/b^(1/2),3/2,I*2^(1/2)*b^(1/2)*x)*_C2+KummerM(1/4*(I*a*2^(1/2)+3*b^(1/2))/b^(1/
2),3/2,I*2^(1/2)*b^(1/2)*x)*_C1)
```

4.1410 $-(2x^2+1)\,y'(x)+2xy''(x)-xy(x)=0$

ODE

$$-(2x^2+1)\,y'(x)+2xy''(x)-xy(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0273022 (sec), leaf count = 55

$$\left\{\left\{y(x)\to \frac{1}{2}e^{\frac{x^2}{2}}\left(2c_1-\frac{2^{3/4}c_2\sqrt[4]{x^2}\Gamma\left(\frac{3}{4},\frac{x^2}{2}\right)}{\sqrt{x}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.217 (sec), leaf count = 29

$$\left\{y(x)=x^{\frac{3}{2}}\left(M\left(1,\frac{7}{4},\frac{x^2}{2}\right)\_C1+U\left(1,\frac{7}{4},\frac{x^2}{2}\right)\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[-(x*y[x]) - (1 + 2*x^2)*y'[x] + 2*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(x^2/2)*(2*C[1] - (2^(3/4)*(x^2)^(1/4)*C[2]*Gamma[3/4, x^2/2])/Sqrt
[x]))/2}}
```

Maple raw input

```
dsolve(2*x*diff(diff(y(x),x),x)-(2*x^2+1)*diff(y(x),x)-x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(3/2)*(KummerM(1,7/4,1/2*x^2)*_C1+KummerU(1,7/4,1/2*x^2)*_C2)
```

4.1411 $(1-2x)y''(x)-(x+2)y'(x)-y(x)=0$

ODE

$$(1-2x)y''(x)-(x+2)y'(x)-y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00857915 (sec), leaf count = 50

$$\left\{\left\{y(x)\to e^{-x/2}\left(c_2 L^{\frac{1}{4}}_{-\frac{1}{4}}\left(\frac{x}{2}-\frac{1}{4}\right)+\frac{\sqrt{2}c_1}{\sqrt[4]{2x-1}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.14 (sec), leaf count = 37

$$\left\{y(x)=1\mathrm{e}^{-\frac{x}{2}}\left(\sqrt[4]{-1+2x}_1\mathrm{F}_1(\frac{1}{4};\frac{5}{4};-\frac{1}{4}+\frac{x}{2})\_C1+\_C2\right)\frac{1}{\sqrt[4]{-1+2x}}\right\}$$

Mathematica raw input

```
DSolve[-y[x] - (2 + x)*y'[x] + (1 - 2*x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((Sqrt[2]*C[1])/(-1 + 2*x)^(1/4) + C[2]*LaguerreL[-1/4, 1/4, -1/4 + x/
2])/E^(x/2)}}
```

Maple raw input

```
dsolve((1-2*x)*diff(diff(y(x),x),x)-(2+x)*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*x)*((-1+2*x)^(1/4)*hypergeom([1/4],[5/4],-1/4+1/2*x)*_C1+_C2)/(-
1+2*x)^(1/4)
```

4.1412 $(1-2x)y''(x)-(4-3x)y'(x)+(3-x)y(x)=0$

ODE

$$(1-2x)y''(x)-(4-3x)y'(x)+(3-x)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.045262 (sec), leaf count = 78

$$\left\{\left\{y(x)\to 2^{5/8}c_1e^{x-\frac{1}{2}}-\frac{2^{3/8}c_2e^{\frac{x}{2}-\frac{1}{4}}}{\sqrt[4]{2x-1}}+\frac{c_2e^{x-\frac{1}{2}}\Gamma\left(\frac{3}{4},\frac{1}{4}(2x-1)\right)}{\sqrt[8]{2}}\right\}\right\}$$

Maple ✓
cpu = 0.119 (sec), leaf count = 37

$$\left\{y(x)=1e^{\frac{x}{2}}\left(U\left(1,\frac{3}{4},-\frac{1}{4}+\frac{x}{2}\right)\_C2+M\left(1,\frac{3}{4},-\frac{1}{4}+\frac{x}{2}\right)\_C1\right)\frac{1}{\sqrt[4]{-1+2x}}\right\}$$

Mathematica raw input

```
DSolve[(3 - x)*y[x] - (4 - 3*x)*y'[x] + (1 - 2*x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2^(5/8)*E^(-1/2 + x)*C[1] - (2^(3/8)*E^(-1/4 + x/2)*C[2])/(-1 + 2*x)^(
1/4) + (E^(-1/2 + x)*C[2]*Gamma[3/4, (-1 + 2*x)/4])/2^(1/8)}}
```

Maple raw input

```
dsolve((1-2*x)*diff(diff(y(x),x),x)-(4-3*x)*diff(y(x),x)+(3-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(1/2*x)*(KummerU(1,3/4,-1/4+1/2*x)*_C2+KummerM(1,3/4,-1/4+1/2*x)*_C1)/
(-1+2*x)^(1/4)
```

4.1413 $4y''(x) + 2y'(x) + y(x) = 0$

ODE

$$4y''(x) + 2y'(x) + y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0068397 (sec), leaf count = 42

$$\left\{\left\{y(x) \to e^{-x/4}\left(c_1 \sin\left(\frac{\sqrt{3}x}{4}\right) + c_2 \cos\left(\frac{\sqrt{3}x}{4}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.003 (sec), leaf count = 28

$$\left\{y(x) = \mathrm{e}^{-\frac{x}{4}}\left(\sin\left(\frac{\sqrt{3}x}{4}\right)\_C1 + \cos\left(\frac{\sqrt{3}x}{4}\right)\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[y[x] + 2*y'[x] + 4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[2]*Cos[(Sqrt[3]*x)/4] + C[1]*Sin[(Sqrt[3]*x)/4])/E^(x/4)}}
```

Maple raw input

```
dsolve(4*diff(diff(y(x),x),x)+2*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/4*x)*(sin(1/4*3^(1/2)*x)*_C1+cos(1/4*3^(1/2)*x)*_C2)
```

4.1414 $4y''(x) - 2y'(x) - y(x) = 0$

ODE

$$4y''(x) - 2y'(x) - y(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00617189 (sec), leaf count = 38

$$\left\{\left\{y(x) \to e^{-\frac{1}{4}\left(\sqrt{5}-1\right)x}\left(c_2 e^{\frac{\sqrt{5}x}{2}} + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.004 (sec), leaf count = 27

$$\left\{y(x) = \_C1\, \mathrm{e}^{\frac{\left(\sqrt{5}+1\right)x}{4}} + \_C2\, \mathrm{e}^{-\frac{\left(\sqrt{5}-1\right)x}{4}}\right\}$$

Mathematica raw input

```
DSolve[-y[x] - 2*y'[x] + 4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + E^((Sqrt[5]*x)/2)*C[2])/E^(((-1 + Sqrt[5])*x)/4)}}
```

Maple raw input

```
dsolve(4*diff(diff(y(x),x),x)-2*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(1/4*(5^(1/2)+1)*x)+_C2*exp(-1/4*(5^(1/2)-1)*x)
```

4.1415 $4xy''(x) + 4\coth(x)y'(x) + y(x) = 0$

ODE

$$4xy''(x) + 4\coth(x)y'(x) + y(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.611336 (sec), leaf count = 0 , could not solve

```
DSolve[y[x] + 4*Coth[x]*Derivative[1][y][x] + 4*x*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✗
cpu = 1.12 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x) = DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x) + \frac{\coth(x)\,\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{x} + \frac{\_Y(x)}{4\,x}\right\}, \{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[y[x] + 4*Coth[x]*y'[x] + 4*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[y[x] + 4*Coth[x]*Derivative[1][y][x] + 4*x*Derivative[2][y][x] == 0, y[x]
, x]
```

Maple raw input

```
dsolve(4*x*diff(diff(y(x),x),x)+4*diff(y(x),x)*coth(x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+coth(x)/x*diff(_Y(x),x)+1/4/x*_Y(x)},{_Y(x)}
)
```

4.1416 $y(x)(a+bx)+16xy''(x)+8y'(x)=0$

ODE

$$y(x)(a+bx)+16xy''(x)+8y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0153446 (sec), leaf count = 96

$$\left\{\left\{y(x)\to \sqrt{x}e^{-\frac{1}{4}i\sqrt{b}x}\left(c_1 U\left(\frac{ia}{8\sqrt{b}}+\frac{3}{4},\frac{3}{2},\frac{1}{2}i\sqrt{b}x\right)+c_2 L^{\frac{1}{2}}_{-\frac{3}{4}-\frac{ia}{8\sqrt{b}}}\left(\frac{1}{2}i\sqrt{b}x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.18 (sec), leaf count = 69

$$\left\{y(x)=\sqrt{x}\mathrm{e}^{-\frac{i}{4}\sqrt{b}x}\left(U\left(\frac{1}{8}\left(ia+6\sqrt{b}\right)\frac{1}{\sqrt{b}},\frac{3}{2},\frac{i}{2}\sqrt{b}x\right)\_C2+M\left(\frac{1}{8}\left(ia+6\sqrt{b}\right)\frac{1}{\sqrt{b}},\frac{3}{2},\frac{i}{2}\sqrt{b}x\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x)*y[x] + 8*y'[x] + 16*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[x]*(C[1]*HypergeometricU[3/4 + ((I/8)*a)/Sqrt[b], 3/2, (I/2)*Sqr
t[b]*x] + C[2]*LaguerreL[-3/4 - ((I/8)*a)/Sqrt[b], 1/2, (I/2)*Sqrt[b]*x]))/E^((I
/4)*Sqrt[b]*x)}}
```

Maple raw input

```
dsolve(16*x*diff(diff(y(x),x),x)+8*diff(y(x),x)+(b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*exp(-1/4*I*b^(1/2)*x)*(KummerU(1/8*(I*a+6*b^(1/2))/b^(1/2),3/2,1/
2*I*b^(1/2)*x)*_C2+KummerM(1/8*(I*a+6*b^(1/2))/b^(1/2),3/2,1/2*I*b^(1/2)*x)*_C1)
```

4.1417 $(a+bx)y''(x)+cy'(x)=0$

ODE

$$(a+bx)y''(x)+cy'(x)=0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0170434 (sec), leaf count = 32

$$\left\{\left\{y(x)\to \frac{c_1(a+bx)^{1-\frac{c}{b}}}{b-c}+c_2\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 25

$$\left\{y(x)=\_C1+\_C2\left(x+\frac{a}{b}\right)^{\frac{b-c}{b}}\right\}$$

Mathematica raw input

```
DSolve[c*y'[x] + (a + b*x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((a + b*x)^(1 - c/b)*C[1])/(b - c) + C[2]}}
```

Maple raw input

```
dsolve((b*x+a)*diff(diff(y(x),x),x)+c*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*(x+a/b)^((b-c)/b)
```

4.1418 $(\mathbf{a0}+\mathbf{b0}x)y''(x)+(\mathbf{a1}+\mathbf{b1}x)y'(x)+y(x)(\mathbf{a2}+\mathbf{b2}x)=0$

ODE

$$(\mathrm{a0}+\mathrm{b0}x)y''(x)+(\mathrm{a1}+\mathrm{b1}x)y'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.127287 (sec), leaf count = 307

$$\left\{\left\{y(x)\to e^{-\frac{x\left(\sqrt{\mathrm{b1}^2-4\mathrm{b0b2}}+\mathrm{b1}\right)}{2\mathrm{b0}}}(\mathrm{a0}+\mathrm{b0}x)^{\frac{\mathrm{a0b1}-\mathrm{a1b0}+\mathrm{b0}^2}{\mathrm{b0}^2}}\left(c_1U\left(\frac{-2\mathrm{a2b0}^2+2\sqrt{\mathrm{b1}^2-4\mathrm{b0b2}}\mathrm{b0}^2+2\mathrm{a0b2b0}+\mathrm{a1}\left(\mathrm{b1}-\sqrt{\mathrm{b}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.216 (sec), leaf count = 248

$$\left\{y(x)=\mathrm{e}^{-\frac{x}{2\,b0}\left(\sqrt{-4\,b2\,b0+b1^2}+b1\right)}(b0\,x+a0)^{\frac{a0\,b1-a1\,b0+b0^2}{b0^2}}\left(U\left(\frac{1}{2\,b0^2}\left(\left(a0\,b1-a1\,b0+2\,b0^2\right)\sqrt{-4\,b2\,b0+b1^2}-2\,a2\,b0\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a2 + b2*x)*y[x] + (a1 + b1*x)*y'[x] + (a0 + b0*x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((a0 + b0*x)^((-(a1*b0) + b0^2 + a0*b1)/b0^2)*(C[1]*HypergeometricU[(-
2*a2*b0^2 - a0*b1^2 + 2*a0*b0*b2 + 2*b0^2*Sqrt[b1^2 - 4*b0*b2] + a0*b1*Sqrt[b1^2
 - 4*b0*b2] + a1*b0*(b1 - Sqrt[b1^2 - 4*b0*b2]))/(2*b0^2*Sqrt[b1^2 - 4*b0*b2]),
2 - a1/b0 + (a0*b1)/b0^2, (Sqrt[b1^2 - 4*b0*b2]*(a0 + b0*x))/b0^2] + C[2]*Laguer
reL[(2*a2*b0^2 + a0*b1^2 - 2*a0*b0*b2 - 2*b0^2*Sqrt[b1^2 - 4*b0*b2] - a0*b1*Sqrt
[b1^2 - 4*b0*b2] + a1*b0*(-b1 + Sqrt[b1^2 - 4*b0*b2]))/(2*b0^2*Sqrt[b1^2 - 4*b0*
b2]), (-(a1*b0) + b0^2 + a0*b1)/b0^2, (Sqrt[b1^2 - 4*b0*b2]*(a0 + b0*x))/b0^2]))
/E^(((b1 + Sqrt[b1^2 - 4*b0*b2])*x)/(2*b0))}}
```

Maple raw input

```
dsolve((b0*x+a0)*diff(diff(y(x),x),x)+(b1*x+a1)*diff(y(x),x)+(b2*x+a2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2/b0*((-4*b0*b2+b1^2)^(1/2)+b1)*x)*(b0*x+a0)^(1/b0^2*(a0*b1-a1*b0+
b0^2))*(KummerU(1/2*((a0*b1-a1*b0+2*b0^2)*(-4*b0*b2+b1^2)^(1/2)-2*a2*b0^2+(2*a0*
b2+a1*b1)*b0-a0*b1^2)/(-4*b0*b2+b1^2)^(1/2)/b0^2,(a0*b1-a1*b0+2*b0^2)/b0^2,1/b0^
2*(-4*b0*b2+b1^2)^(1/2)*(b0*x+a0))*_C2+KummerM(1/2*((a0*b1-a1*b0+2*b0^2)*(-4*b0*
b2+b1^2)^(1/2)-2*a2*b0^2+(2*a0*b2+a1*b1)*b0-a0*b1^2)/(-4*b0*b2+b1^2)^(1/2)/b0^2,
(a0*b1-a1*b0+2*b0^2)/b0^2,1/b0^2*(-4*b0*b2+b1^2)^(1/2)*(b0*x+a0))*_C1)
```

4.1419 $(1 - x\cot(x))y''(x) - xy'(x) + y(x) = 0$

ODE

$$(1 - x\cot(x))y''(x) - xy'(x) + y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.06986 (sec), leaf count = 0 , could not solve

```
DSolve[y[x] - x*Derivative[1][y][x] + (1 - x*Cot[x])*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 2.069 (sec), leaf count = 92

$$\left\{y(x) = -\frac{1}{2\,\mathrm{e}^{2\,ix}+2}\left(\left(-2\_C2\,x\sqrt{\frac{\mathrm{e}^{2\,ix}}{\left(\mathrm{e}^{2\,ix}+1\right)^2}}+i\_C1\right)\mathrm{e}^{2\,ix}-2\,\_C2\,x\sqrt{\frac{\mathrm{e}^{2\,ix}}{\left(\mathrm{e}^{2\,ix}+1\right)^2}}-i\_C1\right)\frac{1}{\sqrt{\frac{\mathrm{e}^{2\,ix}}{\left(\mathrm{e}^{2\,ix}+1\right)^2}}}\right\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + (1 - x*Cot[x])*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[y[x] - x*Derivative[1][y][x] + (1 - x*Cot[x])*Derivative[2][y][x] == 0, y
[x], x]
```

Maple raw input

```
dsolve((1-x*cot(x))*diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -((-2*_C2*x*(exp(2*I*x)/(exp(2*I*x)+1)^2)^(1/2)+I*_C1)*exp(2*I*x)-2*_C2*x
*(exp(2*I*x)/(exp(2*I*x)+1)^2)^(1/2)-I*_C1)/(exp(2*I*x)/(exp(2*I*x)+1)^2)^(1/2)/
(2*exp(2*I*x)+2)
```

4.1420 $x^2y''(x) = a + bx$

ODE

$$x^2y''(x) = a + bx$$

ODE Classification

[[_2nd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00876634 (sec), leaf count = 26

$$\{\{y(x) \to \log(x)(bx - a) - bx + c_2x + c_1\}\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 23

$$\{y(x) = (bx - a)\ln(x) + (-b + \_C1)x + \_C2\}$$

Mathematica raw input

```
DSolve[x^2*y''[x] == a + b*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(b*x) + C[1] + x*C[2] + (-a + b*x)*Log[x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x) = b*x+a, y(x),'implicit')
```

Maple raw output

```
y(x) = (b*x-a)*ln(x)+(-b+_C1)*x+_C2
```

4.1421 $x^2y''(x) = 2y(x)$

ODE

$$x^2y''(x) = 2y(x)$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.016399 (sec), leaf count = 18

$$\left\{\left\{y(x) \to \frac{c_1x^3 + c_2}{x}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 15

$$\left\{y(x) = \frac{\_C2\,x^3 + \_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[x^2*y''[x] == 2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^3*C[1] + C[2])/x}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x) = 2*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*x^3+_C1)/x
```

4.1422 $x^2y''(x) = 6y(x)$

ODE

$$x^2y''(x) = 6y(x)$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0183291 (sec), leaf count = 18

$$\left\{\left\{y(x) \to \frac{c_1x^5 + c_2}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 15

$$\left\{y(x) = \frac{\_C1\,x^5 + \_C2}{x^2}\right\}$$

Mathematica raw input

```
DSolve[x^2*y''[x] == 6*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^5*C[1] + C[2])/x^2}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x) = 6*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x^5+_C2)/x^2
```

4.1423 $x^2y''(x) = 12y(x)$

ODE

$$x^2y''(x) = 12y(x)$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0157884 (sec), leaf count = 18

$$\left\{\left\{y(x) \to \frac{c_1x^7 + c_2}{x^3}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 15

$$\left\{y(x) = \frac{\_C1\,x^7 + \_C2}{x^3}\right\}$$

Mathematica raw input

```
DSolve[x^2*y''[x] == 12*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^7*C[1] + C[2])/x^3}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x) = 12*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x^7+_C2)/x^3
```

4.1424 $ay(x) + x^2 y''(x) = 0$

ODE

$$ay(x) + x^2 y''(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00973846 (sec), leaf count = 42

$$\left\{\left\{y(x) \to x^{\frac{1}{2}-\frac{1}{2}\sqrt{1-4a}}\left(c_2 x^{\sqrt{1-4a}} + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 35

$$\left\{y(x) = \_C1\, x^{\frac{1}{2}\sqrt{1-4\,a}+\frac{1}{2}} + \_C2\, x^{\frac{1}{2}-\frac{1}{2}\sqrt{1-4\,a}}\right\}$$

Mathematica raw input

```
DSolve[a*y[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^(1/2 - Sqrt[1 - 4*a]/2)*(C[1] + x^Sqrt[1 - 4*a]*C[2])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^(1/2*(1-4*a)^(1/2)+1/2)+_C2*x^(1/2-1/2*(1-4*a)^(1/2))
```

4.1425 $y(x)(a+bx)+x^2y''(x)=0$

ODE

$$y(x)(a+bx)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0528246 (sec), leaf count = 95

$$\left\{\left\{y(x)\to \sqrt{b}\sqrt{x}\left(c_1\Gamma\left(1-\sqrt{1-4a}\right)J_{-\sqrt{1-4a}}\left(2\sqrt{b}\sqrt{x}\right)+c_2\Gamma\left(\sqrt{1-4a}+1\right)J_{\sqrt{1-4a}}\left(2\sqrt{b}\sqrt{x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 45

$$\left\{y(x)=\sqrt{x}\left(Y_{\sqrt{1-4\,a}}\left(2\,\sqrt{b}\sqrt{x}\right)\_C2+J_{\sqrt{1-4\,a}}\left(2\,\sqrt{b}\sqrt{x}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x)*y[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[b]*Sqrt[x]*(BesselJ[-Sqrt[1 - 4*a], 2*Sqrt[b]*Sqrt[x]]*C[1]*Gamma
[1 - Sqrt[1 - 4*a]] + BesselJ[Sqrt[1 - 4*a], 2*Sqrt[b]*Sqrt[x]]*C[2]*Gamma[1 + S
qrt[1 - 4*a]])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+(b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(BesselY((1-4*a)^(1/2),2*b^(1/2)*x^(1/2))*_C2+BesselJ((1-4*a)^(1/
2),2*b^(1/2)*x^(1/2))*_C1)
```

4.1426 $x^2y''(x) - (2-x^2)\,y(x) = 0$

ODE

$$x^2y''(x) - (2-x^2)\,y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00824444 (sec), leaf count = 42

$$\left\{\left\{y(x) \to -\frac{\sqrt{\frac{2}{\pi}}((c_2x - c_1)\sin(x) + (c_1x + c_2)\cos(x))}{x}\right\}\right\}$$

Maple ✓
cpu = 0.087 (sec), leaf count = 27

$$\left\{y(x) = \frac{(\_C1\,x + \_C2)\cos(x) + \sin(x)\,(\_C2\,x - \_C1)}{x}\right\}$$

Mathematica raw input

```
DSolve[-((2 - x^2)*y[x]) + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((Sqrt[2/Pi]*((x*C[1] + C[2])*Cos[x] + (-C[1] + x*C[2])*Sin[x]))/x)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-(-x^2+2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ((_C1*x+_C2)*cos(x)+sin(x)*(_C2*x-_C1))/x
```

4.1427 $x^2y''(x) - (2-x^2)\,y(x) = x^4$

ODE

$$x^2y''(x) - (2-x^2)\,y(x) = x^4$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.062428 (sec), leaf count = 53

$$\left\{\left\{y(x) \to \frac{\sqrt{\frac{2}{\pi}}(c_1 - c_2 x)\sin(x) - \sqrt{\frac{2}{\pi}}(c_1 x + c_2)\cos(x) + x^3}{x}\right\}\right\}$$

Maple ✓
cpu = 0.051 (sec), leaf count = 30

$$\left\{y(x) = \frac{(\_C2\,x + \_C1)\cos(x) + (\_C1\,x - \_C2)\sin(x) + x^3}{x}\right\}$$

Mathematica raw input

```
DSolve[-((2 - x^2)*y[x]) + x^2*y''[x] == x^4,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^3 - Sqrt[2/Pi]*(x*C[1] + C[2])*Cos[x] + Sqrt[2/Pi]*(C[1] - x*C[2])*
Sin[x])/x}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-(-x^2+2)*y(x) = x^4, y(x),'implicit')
```

Maple raw output

```
y(x) = ((_C2*x+_C1)*cos(x)+(_C1*x-_C2)*sin(x)+x^3)/x
```

4.1428 $x^2y''(x) - (a^2x^2 + 2)\,y(x) = 0$

ODE

$$x^2y''(x) - (a^2x^2 + 2)\,y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0166918 (sec), leaf count = 67

$$\left\{\left\{y(x) \to -\frac{\sqrt{\frac{2}{\pi}}ax^{3/2}((c_1 + iac_2x)\sinh(ax) - (ac_1x + ic_2)\cosh(ax))}{(-iax)^{5/2}}\right\}\right\}$$

Maple ✓
cpu = 0.052 (sec), leaf count = 32

$$\left\{y(x) = \frac{\_C2\,(ax+1)\,\mathrm{e}^{-ax} + \mathrm{e}^{ax}\_C1\,(ax-1)}{x}\right\}$$

Mathematica raw input

```
DSolve[-((2 + a^2*x^2)*y[x]) + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a*Sqrt[2/Pi]*x^(3/2)*(-((a*x*C[1] + I*C[2])*Cosh[a*x]) + (C[1] + I*
a*x*C[2])*Sinh[a*x]))/((-I)*a*x)^(5/2))}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-(a^2*x^2+2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*(a*x+1)*exp(-a*x)+exp(a*x)*_C1*(a*x-1))/x
```

4.1429 $x^2y''(x) - (6 - a^2x^2)\,y(x) = 0$

ODE

$$x^2y''(x) - (6 - a^2x^2)\,y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0141424 (sec), leaf count = 79

$$\left\{\left\{y(x) \to -\frac{\sqrt{\frac{2}{\pi}}\sqrt{x}\left(\left(c_1\left(a^2x^2-3\right)+3ac_2x\right)\sin(ax)+\left(-a^2c_2x^2+3ac_1x+3c_2\right)\cos(ax)\right)}{(ax)^{5/2}}\right\}\right\}$$

Maple ✓
cpu = 0.244 (sec), leaf count = 53

$$\left\{y(x) = \frac{\left(\_C1\,a^2x^2+3\,\_C2\,ax-3\,\_C1\right)\cos\left(ax\right)+\sin\left(ax\right)\left(\_C2\,a^2x^2-3\,\_C1\,ax-3\,\_C2\right)}{x^2}\right\}$$

Mathematica raw input

```
DSolve[-((6 - a^2*x^2)*y[x]) + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((Sqrt[2/Pi]*Sqrt[x]*((3*a*x*C[1] + 3*C[2] - a^2*x^2*C[2])*Cos[a*x] +
  ((-3 + a^2*x^2)*C[1] + 3*a*x*C[2])*Sin[a*x]))/(a*x)^(5/2))}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-(-a^2*x^2+6)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ((_C1*a^2*x^2+3*_C2*a*x-3*_C1)*cos(a*x)+sin(a*x)*(_C2*a^2*x^2-3*_C1*a*x-3
*_C2))/x^2
```

4.1430 $x^2y''(x) - y(x)\left(a^2x^2 + n(n+1)\right) = 0$

ODE

$$x^2y''(x) - y(x)\left(a^2x^2 + n(n+1)\right) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0290829 (sec), leaf count = 42

$$\left\{\left\{y(x) \to \sqrt{x}\left(c_1 J_{n+\frac{1}{2}}(-iax) + c_2 Y_{n+\frac{1}{2}}(-iax)\right)\right\}\right\}$$

Maple ✓
cpu = 0.038 (sec), leaf count = 39

$$\left\{y(x) = \sqrt{x}\left(Y_{n+\frac{1}{2}}\left(\sqrt{-a^2}x\right)\_C2 + J_{n+\frac{1}{2}}\left(\sqrt{-a^2}x\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-((n*(1 + n) + a^2*x^2)*y[x]) + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*(BesselJ[1/2 + n, (-I)*a*x]*C[1] + BesselY[1/2 + n, (-I)*a*x]*
C[2])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-(n*(n+1)+a^2*x^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(BesselY(n+1/2,(-a^2)^(1/2)*x)*_C2+BesselJ(n+1/2,(-a^2)^(1/2)*x)*
_C1)
```

4.1431 $x^2y''(x) - y(x)\left((n-1)n - a^2x^2\right) = 0$

ODE

$$x^2y''(x) - y(x)\left((n-1)n - a^2x^2\right) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0306886 (sec), leaf count = 36

$$\left\{\left\{y(x) \to \sqrt{x}\left(c_1 J_{n-\frac{1}{2}}(ax) + c_2 Y_{n-\frac{1}{2}}(ax)\right)\right\}\right\}$$

Maple ✓
cpu = 0.05 (sec), leaf count = 27

$$\left\{y(x) = \sqrt{x}\left(Y_{n-\frac{1}{2}}(ax)\_C2 + J_{n-\frac{1}{2}}(ax)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-(((-1 + n)*n - a^2*x^2)*y[x]) + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*(BesselJ[-1/2 + n, a*x]*C[1] + BesselY[-1/2 + n, a*x]*C[2])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-(n*(n-1)-a^2*x^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(BesselY(n-1/2,a*x)*_C2+BesselJ(n-1/2,a*x)*_C1)
```

4.1432 $y(x)\left(a+bx+cx^2\right)+x^2y''(x)=0$

ODE

$$y(x)\left(a+bx+cx^2\right)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0177698 (sec), leaf count = 88

$$\left\{\left\{y(x)\to c_1 M_{-\frac{ib}{2\sqrt{c}},-\frac{1}{2}i\sqrt{4a-1}}\left(2i\sqrt{c}x\right)+c_2 W_{-\frac{ib}{2\sqrt{c}},-\frac{1}{2}i\sqrt{4a-1}}\left(2i\sqrt{c}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.151 (sec), leaf count = 57

$$\left\{y(x)=\_C1\, M_{-\frac{i}{2}b\frac{1}{\sqrt{c}},\frac{1}{2}\sqrt{1-4\,a}}\left(2\,i\sqrt{c}x\right)+\_C2\, W_{-\frac{i}{2}b\frac{1}{\sqrt{c}},\frac{1}{2}\sqrt{1-4\,a}}\left(2\,i\sqrt{c}x\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x + c*x^2)*y[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*WhittakerM[((-I/2)*b)/Sqrt[c], (-I/2)*Sqrt[-1 + 4*a], (2*I)*Sqrt[
c]*x] + C[2]*WhittakerW[((-I/2)*b)/Sqrt[c], (-I/2)*Sqrt[-1 + 4*a], (2*I)*Sqrt[c]
*x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+(c*x^2+b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*WhittakerM(-1/2*I*b/c^(1/2),1/2*(1-4*a)^(1/2),2*I*c^(1/2)*x)+_C2*Whit
takerW(-1/2*I*b/c^(1/2),1/2*(1-4*a)^(1/2),2*I*c^(1/2)*x)
```

4.1433 $x^2y''(x) - y(x)\left((a-1)a - bx^k\right) = 0$

ODE

$$x^2y''(x) - y(x)\left((a-1)a - bx^k\right) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0398959 (sec), leaf count = 116

$$\left\{\left\{y(x) \to k^{-1/k} b^{\frac{1}{2}/k} \left(x^k\right)^{\frac{1}{2}/k} \left(c_1 \Gamma\left(\frac{-2a+k+1}{k}\right) J_{\frac{1-2a}{k}}\left(\frac{2\sqrt{b}\sqrt{x^k}}{k}\right) + c_2 \Gamma\left(\frac{2a+k-1}{k}\right) J_{\frac{2a-1}{k}}\left(\frac{2\sqrt{b}\sqrt{x^k}}{k}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.047 (sec), leaf count = 67

$$\left\{y(x) = \sqrt{x}\left(Y_{\frac{1}{k}\sqrt{(2a-1)^2}}\left(2\frac{\sqrt{b}x^{k/2}}{k}\right)\_C2 + J_{\frac{1}{k}\sqrt{(2a-1)^2}}\left(2\frac{\sqrt{b}x^{k/2}}{k}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-(((-1 + a)*a - b*x^k)*y[x]) + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (b^(1/(2*k))*(x^k)^(1/(2*k))*(BesselJ[(1 - 2*a)/k, (2*Sqrt[b]*Sqrt[x^k
])/k]*C[1]*Gamma[(1 - 2*a + k)/k] + BesselJ[(-1 + 2*a)/k, (2*Sqrt[b]*Sqrt[x^k])/
k]*C[2]*Gamma[(-1 + 2*a + k)/k]))/k^k^(-1)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-(a*(a-1)-b*x^k)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(BesselY(((2*a-1)^2)^(1/2)/k,2*b^(1/2)/k*x^(1/2*k))*_C2+BesselJ((
(2*a-1)^2)^(1/2)/k,2*b^(1/2)/k*x^(1/2*k))*_C1)
```

4.1434 $x^k y(x) \left(a+bx^k\right)+x^2 y''(x)=0$

ODE

$$x^k y(x) \left(a+bx^k\right)+x^2 y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0622507 (sec), leaf count = 147

$$\left\{\left\{y(x)\to 2^{\frac{k+1}{2k}} x^{\frac{1}{2}-\frac{k}{2}} \left(x^k\right)^{\frac{k+1}{2k}} e^{\frac{i\sqrt{b}x^k}{k}} \left(c_1 U\left(\frac{-\frac{ia}{\sqrt{b}}+k+1}{2k},1+\frac{1}{k},-\frac{2i\sqrt{b}x^k}{k}\right)+c_2 L^{\frac{1}{k}}_{-\frac{-\frac{ia}{\sqrt{b}}+k+1}{2k}}\left(-\frac{2i\sqrt{b}x^k}{k}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.203 (sec), leaf count = 73

$$\left\{y(x)=x^{\frac{1}{2}-\frac{k}{2}}\left(W_{-\frac{\frac{i}{2}a}{k},\frac{1}{\sqrt{b}},\frac{1}{2k}}\left(\frac{2ix^k}{k}\sqrt{b}\right)\_C2+M_{-\frac{\frac{i}{2}a}{k},\frac{1}{\sqrt{b}},\frac{1}{2k}}\left(\frac{2ix^k}{k}\sqrt{b}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[x^k*(a + b*x^k)*y[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2^((1 + k)/(2*k))*E^((I*Sqrt[b]*x^k)/k)*x^(1/2 - k/2)*(x^k)^((1 + k)/(
2*k))*(C[1]*HypergeometricU[(1 - (I*a)/Sqrt[b] + k)/(2*k), 1 + k^(-1), ((-2*I)*S
qrt[b]*x^k)/k] + C[2]*LaguerreL[-(1 - (I*a)/Sqrt[b] + k)/(2*k), k^(-1), ((-2*I)*
Sqrt[b]*x^k)/k])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x^k*(a+b*x^k)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2-1/2*k)*(WhittakerW(-1/2*I/k/b^(1/2)*a,1/2/k,2*I/k*b^(1/2)*x^k)*_C2
+WhittakerM(-1/2*I/k/b^(1/2)*a,1/2/k,2*I/k*b^(1/2)*x^k)*_C1)
```

4.1435 $-by(x)\left(a+bx^2\right)+ay'(x)+x^2y''(x)=0$

ODE

$$-by(x)\left(a+bx^2\right)+ay'(x)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 12.1458 (sec), leaf count = 37

$$\left\{\left\{y(x)\to e^{bx}\left(c_2\int_1^x e^{\frac{a}{K[1]}-2bK[1]}\,dK[1]+c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.334 (sec), leaf count = 178

$$\left\{y(x)=\sqrt{x}\left(HeunD\left(-4\sqrt{2}\sqrt{ab},-1-4\sqrt{2}\sqrt{ab},8\sqrt{2}\sqrt{ab},-4\sqrt{2}\sqrt{ab}+1,1\left(\sqrt{2}\sqrt{ab}x-a\right)\left(\sqrt{2}\sqrt{ab}x+a\right)^{-1}\right)e^{bx}\_C2+\right.\right.$$

Mathematica raw input

```
DSolve[-(b*(a + b*x^2)*y[x]) + a*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(b*x)*(C[1] + C[2]*Integrate[E^(a/K[1] - 2*b*K[1]), {K[1], 1, x}])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a*diff(y(x),x)-b*(b*x^2+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(HeunD(-4*2^(1/2)*(a*b)^(1/2),-1-4*2^(1/2)*(a*b)^(1/2),8*2^(1/2)*
(a*b)^(1/2),-4*2^(1/2)*(a*b)^(1/2)+1,(2^(1/2)*(a*b)^(1/2)*x-a)/(2^(1/2)*(a*b)^(1
/2)*x+a))*exp(b*x)*_C2+HeunD(4*2^(1/2)*(a*b)^(1/2),-1-4*2^(1/2)*(a*b)^(1/2),8*2^
(1/2)*(a*b)^(1/2),-4*2^(1/2)*(a*b)^(1/2)+1,(2^(1/2)*(a*b)^(1/2)*x-a)/(2^(1/2)*(a
*b)^(1/2)*x+a))*exp((-b*x^2+a)/x)*_C1)
```

4.1436 $x^2y''(x) + xy'(x) + y(x) = 0$

ODE

$$x^2y''(x) + xy'(x) + y(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0092332 (sec), leaf count = 18

$$\{\{y(x) \to c_2 \sin(\log(x)) + c_1 \cos(\log(x))\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 15

$$\{y(x) = \_C1 \sin(\ln(x)) + \_C2 \cos(\ln(x))\}$$

Mathematica raw input

```
DSolve[y[x] + x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[Log[x]] + C[2]*Sin[Log[x]]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(ln(x))+_C2*cos(ln(x))
```

4.1437 $x^2y''(x) + xy'(x) - y(x) = 0$

ODE

$$x^2y''(x) + xy'(x) - y(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00764287 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \frac{c_1(x^2+1) + ic_2(x^2-1)}{2x}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 15

$$\left\{y(x) = \frac{\_C2\,x^2 + \_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((1 + x^2)*C[1] + I*(-1 + x^2)*C[2])/(2*x)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*x^2+_C1)/x
```

4.1438 $x^2y''(x) - xy'(x) + y(x) = 0$

ODE

$$x^2y''(x) - xy'(x) + y(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00805277 (sec), leaf count = 15

$$\{\{y(x) \to x(c_2 \log(x) + c_1)\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 12

$$\{y(x) = x(\ln(x)\_C2 + \_C1)\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[1] + C[2]*Log[x])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(ln(x)*_C2+_C1)
```

4.1439 $x^2y''(x) + xy'(x) - y(x) = ax^2$

ODE

$$x^2y''(x) + xy'(x) - y(x) = ax^2$$

ODE Classification

[[_2nd_order, _exact, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0139472 (sec), leaf count = 41

$$\left\{\left\{y(x) \to \frac{2ax^3 + 3(c_1(x^2+1) + ic_2(x^2-1))}{6x}\right\}\right\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 19

$$\left\{y(x) = x\_C2 + \frac{ax^2}{3} + \frac{\_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + x^2*y''[x] == a*x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*a*x^3 + 3*((1 + x^2)*C[1] + I*(-1 + x^2)*C[2]))/(6*x)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x) = a*x^2, y(x),'implicit')
```

Maple raw output

```
y(x) = x*_C2+1/3*a*x^2+1/x*_C1
```

4.1440 $x^2y''(x) - xy'(x) + y(x) = x^2(x+3)$

ODE

$$x^2y''(x) - xy'(x) + y(x) = x^2(x+3)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0116347 (sec), leaf count = 27

$$\left\{\left\{y(x) \to \frac{1}{4}x\left(4c_2\log(x) + 4c_1 + x^2 + 12x\right)\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 22

$$\left\{y(x) = \frac{x\left(4\ln(x)\_C1 + x^2 + 4\_C2 + 12x\right)}{4}\right\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + x^2*y''[x] == x^2*(3 + x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(12*x + x^2 + 4*C[1] + 4*C[2]*Log[x]))/4}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x) = x^2*(3+x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*x*(4*ln(x)*_C1+x^2+4*_C2+12*x)
```

4.1441 $x^2y''(x) - xy'(x) + y(x) = 3x^3$

ODE

$$x^2y''(x) - xy'(x) + y(x) = 3x^3$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0103605 (sec), leaf count = 23

$$\left\{\left\{y(x) \to c_1 x + c_2 x \log(x) + \frac{3x^3}{4}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 21

$$\left\{y(x) = \frac{x\left(4\ln(x)\_C1 + 3x^2 + 4\_C2\right)}{4}\right\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + x^2*y''[x] == 3*x^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*x^3)/4 + x*C[1] + x*C[2]*Log[x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x) = 3*x^3, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*x*(4*ln(x)*_C1+3*x^2+4*_C2)
```

4.1442 $x^2y''(x) + xy'(x) + y(x) = \log(x)$

ODE

$$x^2y''(x) + xy'(x) + y(x) = \log(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0206333 (sec), leaf count = 20

$$\{\{y(x) \to c_2 \sin(\log(x)) + c_1 \cos(\log(x)) + \log(x)\}\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 17

$$\{y(x) = \sin(\ln(x))\_C2 + \cos(\ln(x))\_C1 + \ln(x)\}$$

Mathematica raw input

```
DSolve[y[x] + x*y'[x] + x^2*y''[x] == Log[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[Log[x]] + Log[x] + C[2]*Sin[Log[x]]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)+y(x) = ln(x), y(x),'implicit')
```

Maple raw output

```
y(x) = sin(ln(x))*_C2+cos(ln(x))*_C1+ln(x)
```

4.1443 $x^2y''(x) - xy'(x) + 2y(x) = 0$

ODE

$$x^2y''(x) - xy'(x) + 2y(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0117796 (sec), leaf count = 20

$$\{\{y(x) \to x(c_1 \sin(\log(x)) + c_2 \cos(\log(x)))\}\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 17

$$\{y(x) = x(\sin(\ln(x))\_C1 + \cos(\ln(x))\_C2)\}$$

Mathematica raw input

```
DSolve[2*y[x] - x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[2]*Cos[Log[x]] + C[1]*Sin[Log[x]])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-x*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(sin(ln(x))*_C1+cos(ln(x))*_C2)
```

4.1444 $x^2y''(x) - xy'(x) + 2y(x) = x\log(x)$

ODE

$$x^2y''(x) - xy'(x) + 2y(x) = x\log(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0214698 (sec), leaf count = 22

$$\{\{y(x) \to x(c_1 \sin(\log(x)) + c_2 \cos(\log(x)) + \log(x))\}\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 19

$$\{y(x) = x(\sin(\ln(x))\_C2 + \cos(\ln(x))\_C1 + \ln(x))\}$$

Mathematica raw input

```
DSolve[2*y[x] - x*y'[x] + x^2*y''[x] == x*Log[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[2]*Cos[Log[x]] + Log[x] + C[1]*Sin[Log[x]])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-x*diff(y(x),x)+2*y(x) = x*ln(x), y(x),'implicit')
```

Maple raw output

```
y(x) = x*(sin(ln(x))*_C2+cos(ln(x))*_C1+ln(x))
```

4.1445 $x^2y''(x) - xy'(x) - 3y(x) = 0$

ODE

$$x^2y''(x) - xy'(x) - 3y(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0262405 (sec), leaf count = 18

$$\left\{\left\{y(x) \to \frac{c_1 x^4 + c_2}{x}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 15

$$\left\{y(x) = \frac{\_C1\, x^4 + \_C2}{x}\right\}$$

Mathematica raw input

```
DSolve[-3*y[x] - x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^4*C[1] + C[2])/x}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-x*diff(y(x),x)-3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x^4+_C2)/x
```

4.1446 $a^2(-y(x)) + x^2 y''(x) + x y'(x) = 0$

ODE

$$a^2(-y(x)) + x^2 y''(x) + x y'(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0124055 (sec), leaf count = 25

$$\{\{y(x) \to c_1 \cosh(a \log(x)) + i c_2 \sinh(a \log(x))\}\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 17

$$\{y(x) = \_C1\, x^{-a} + \_C2\, x^{a}\}$$

Mathematica raw input

```
DSolve[-(a^2*y[x]) + x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[a*Log[x]] + I*C[2]*Sinh[a*Log[x]]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-a^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^(-a)+_C2*x^a
```

4.1447 $y(x)(a+bx)+x^2y''(x)+xy'(x)=0$

ODE

$$y(x)(a+bx)+x^2y''(x)+xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0502349 (sec), leaf count = 80

$$\left\{\left\{y(x)\to c_1\Gamma\left(1-2i\sqrt{a}\right)J_{-2i\sqrt{a}}\left(2\sqrt{b}\sqrt{x}\right)+c_2\Gamma\left(2i\sqrt{a}+1\right)J_{2i\sqrt{a}}\left(2\sqrt{b}\sqrt{x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 41

$$\left\{y(x)=\_C1\,J_{2\sqrt{-a}}\left(2\sqrt{b}\sqrt{x}\right)+\_C2\,Y_{2\sqrt{-a}}\left(2\sqrt{b}\sqrt{x}\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x)*y[x] + x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselJ[(-2*I)*Sqrt[a], 2*Sqrt[b]*Sqrt[x]]*C[1]*Gamma[1 - (2*I)*Sqrt[a
]] + BesselJ[(2*I)*Sqrt[a], 2*Sqrt[b]*Sqrt[x]]*C[2]*Gamma[1 + (2*I)*Sqrt[a]]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)+(b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselJ(2*(-a)^(1/2),2*b^(1/2)*x^(1/2))+_C2*BesselY(2*(-a)^(1/2),2*b^
(1/2)*x^(1/2))
```

4.1448 $-(p^2-x^2)\,y(x)+x^2y''(x)+xy'(x)=0$

ODE

$$-(p^2-x^2)\,y(x)+x^2y''(x)+xy'(x)=0$$

ODE Classification

[_Bessel]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0134756 (sec), leaf count = 18

$$\{\{y(x)\to c_1 J_p(x)+c_2 Y_p(x)\}\}$$

Maple ✓
cpu = 0.029 (sec), leaf count = 15

$$\{y(x)=\_C1\,J_p(x)+\_C2\,Y_p(x)\}$$

Mathematica raw input

```
DSolve[-((p^2 - x^2)*y[x]) + x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselJ[p, x]*C[1] + BesselY[p, x]*C[2]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-(p^2-x^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselJ(p,x)+_C2*BesselY(p,x)
```

4.1449 $-(p^2+x^2)\,y(x)+x^2y''(x)+xy'(x)=0$

ODE

$$-(p^2+x^2)\,y(x)+x^2y''(x)+xy'(x)=0$$

ODE Classification

[[_Bessel, _modified]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00922328 (sec), leaf count = 26

$$\{\{y(x)\to c_1 J_p(-ix)+c_2 Y_p(-ix)\}\}$$

Maple ✓
cpu = 0.028 (sec), leaf count = 15

$$\{y(x)=\_C1\,I_p(x)+\_C2\,K_p(x)\}$$

Mathematica raw input

```
DSolve[-((p^2 + x^2)*y[x]) + x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselJ[p, (-I)*x]*C[1] + BesselY[p, (-I)*x]*C[2]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-(p^2+x^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselI(p,x)+_C2*BesselK(p,x)
```

4.1450 $-(p^2+ix^2)\,y(x)+x^2y''(x)+xy'(x)=0$

ODE

$$-(p^2+ix^2)\,y(x)+x^2y''(x)+xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0101922 (sec), leaf count = 32

$$\left\{\left\{y(x)\to c_1 J_p\left(-(-1)^{3/4}x\right)+c_2 Y_p\left(-(-1)^{3/4}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.082 (sec), leaf count = 29

$$\left\{y(x)=\_C1\,I_p\left(\left(-\frac{1}{2}-\frac{i}{2}\right)\sqrt{2}x\right)+\_C2\,K_p\left(\left(-\frac{1}{2}-\frac{i}{2}\right)\sqrt{2}x\right)\right\}$$

Mathematica raw input

```
DSolve[-((p^2 + I*x^2)*y[x]) + x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselJ[p, -((-1)^(3/4)*x)]*C[1] + BesselY[p, -((-1)^(3/4)*x)]*C[2]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-(p^2+I*x^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselI(p,(-1/2-1/2*I)*2^(1/2)*x)+_C2*BesselK(p,(-1/2-1/2*I)*2^(1/2)*
x)
```

4.1451 $-y(x)\left(p^2-a^2x^2\right)+x^2y''(x)+xy'(x)=0$

ODE

$$-y(x)\left(p^2-a^2x^2\right)+x^2y''(x)+xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0103336 (sec), leaf count = 22

$$\{\{y(x)\to c_1J_p(ax)+c_2Y_p(ax)\}\}$$

Maple ✓
cpu = 0.036 (sec), leaf count = 19

$$\{y(x)=\_C1\,J_p(ax)+\_C2\,Y_p(ax)\}$$

Mathematica raw input

```
DSolve[-((p^2 - a^2*x^2)*y[x]) + x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselJ[p, a*x]*C[1] + BesselY[p, a*x]*C[2]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-(-a^2*x^2+p^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselJ(p,a*x)+_C2*BesselY(p,a*x)
```

4.1452 $-y(x)\left(a+bx+cx^2\right)+x^2y''(x)+xy'(x)=0$

ODE

$$-y(x)\left(a+bx+cx^2\right)+x^2y''(x)+xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0136535 (sec), leaf count = 104

$$\left\{\left\{y(x)\to x^{\sqrt{a}}e^{-\sqrt{c}x}\left(c_1U\left(\frac{b}{2\sqrt{c}}+\sqrt{a}+\frac{1}{2},2\sqrt{a}+1,2\sqrt{c}x\right)+c_2L^{2\sqrt{a}}_{-\sqrt{a}-\frac{b}{2\sqrt{c}}-\frac{1}{2}}\left(2\sqrt{c}x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.195 (sec), leaf count = 45

$$\left\{y(x)=1\left(\_C2\,W_{-\frac{b}{2}\frac{1}{\sqrt{c}},\sqrt{a}}\left(2\sqrt{c}x\right)+\_C1\,M_{-\frac{b}{2}\frac{1}{\sqrt{c}},\sqrt{a}}\left(2\sqrt{c}x\right)\right)\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[-((a + b*x + c*x^2)*y[x]) + x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^Sqrt[a]*(C[1]*HypergeometricU[1/2 + Sqrt[a] + b/(2*Sqrt[c]), 1 + 2*
Sqrt[a], 2*Sqrt[c]*x] + C[2]*LaguerreL[-1/2 - Sqrt[a] - b/(2*Sqrt[c]), 2*Sqrt[a]
, 2*Sqrt[c]*x]))/E^(Sqrt[c]*x)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-(c*x^2+b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*WhittakerW(-1/2*b/c^(1/2),a^(1/2),2*c^(1/2)*x)+_C1*WhittakerM(-1/2*b
/c^(1/2),a^(1/2),2*c^(1/2)*x))/x^(1/2)
```

4.1453 $-y(x)\left(4ax^2+n^2-x^4\right)+x^2y''(x)+xy'(x)=0$

ODE

$$-y(x)\left(4ax^2+n^2-x^4\right)+x^2y''(x)+xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.131236 (sec), leaf count = 93

$$\left\{\left\{y(x)\to \frac{2^{\frac{n+1}{2}}e^{-\frac{ix^2}{2}}\left(x^2\right)^{\frac{n+1}{2}}\left(c_1U\left(\frac{1}{2}(-2ia+n+1),n+1,ix^2\right)+c_2L^n_{ia-\frac{n}{2}-\frac{1}{2}}\left(ix^2\right)\right)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.092 (sec), leaf count = 41

$$\left\{y(x)=\frac{1}{x}\left(\_C2\,W_{ia,\frac{n}{2}}\left(ix^2\right)+\_C1\,M_{ia,\frac{n}{2}}\left(ix^2\right)\right)\right\}$$

Mathematica raw input

```
DSolve[-((n^2 + 4*a*x^2 - x^4)*y[x]) + x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2^((1 + n)/2)*(x^2)^((1 + n)/2)*(C[1]*HypergeometricU[(1 - (2*I)*a +
n)/2, 1 + n, I*x^2] + C[2]*LaguerreL[-1/2 + I*a - n/2, n, I*x^2]))/(E^((I/2)*x^2
)*x)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-(-x^4+4*a*x^2+n^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*WhittakerW(I*a,1/2*n,I*x^2)+_C1*WhittakerM(I*a,1/2*n,I*x^2))/x
```

4.1454 $-y(x)\left(a^2+b^2x^2+c^2x^4\right)+x^2y''(x)+xy'(x)=0$

ODE

$$-y(x)\left(a^2+b^2x^2+c^2x^4\right)+x^2y''(x)+xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.12044 (sec), leaf count = 96

$$\left\{\left\{y(x)\to \frac{2^{\frac{a+1}{2}}\left(x^2\right)^{\frac{a+1}{2}}e^{-\frac{cx^2}{2}}\left(c_1U\left(\frac{b^2+2(a+1)c}{4c},a+1,cx^2\right)+c_2L^a_{-\frac{2(a+1)c+b^2}{4c}}\left(cx^2\right)\right)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.114 (sec), leaf count = 47

$$\left\{y(x)=\frac{1}{x}\left(\_C2\,W_{-\frac{b^2}{4c},\frac{a}{2}}\left(cx^2\right)+\_C1\,M_{-\frac{b^2}{4c},\frac{a}{2}}\left(cx^2\right)\right)\right\}$$

Mathematica raw input

```
DSolve[-((a^2 + b^2*x^2 + c^2*x^4)*y[x]) + x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2^((1 + a)/2)*(x^2)^((1 + a)/2)*(C[1]*HypergeometricU[(b^2 + 2*(1 + a
)*c)/(4*c), 1 + a, c*x^2] + C[2]*LaguerreL[-(b^2 + 2*(1 + a)*c)/(4*c), a, c*x^2]
))/(E^((c*x^2)/2)*x)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-(c^2*x^4+b^2*x^2+a^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*WhittakerW(-1/4/c*b^2,1/2*a,c*x^2)+_C1*WhittakerM(-1/4/c*b^2,1/2*a,c
*x^2))/x
```

4.1455 $(m+1)a(m)x^m y(x) + x^2 y''(x) + xy'(x) = 0$

ODE

$$(m+1)a(m)x^m y(x) + x^2 y''(x) + xy'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0272174 (sec), leaf count = 63

$$\left\{\left\{y(x) \to c_1 I_0\left(\frac{2\sqrt{x^m}\sqrt{-(m+1)a(m)}}{m}\right) + 2c_2 K_0\left(\frac{2\sqrt{x^m}\sqrt{-(m+1)a(m)}}{m}\right)\right\}\right\}$$

Maple ✓
cpu = 0.036 (sec), leaf count = 49

$$\left\{y(x) = \_C1\, J_0\left(2\,\frac{\sqrt{(m+1)\,a\,(m)}x^{m/2}}{m}\right) + \_C2\, Y_0\left(2\,\frac{\sqrt{(m+1)\,a\,(m)}x^{m/2}}{m}\right)\right\}$$

Mathematica raw input

```
DSolve[(1 + m)*x^m*a[m]*y[x] + x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselI[0, (2*Sqrt[x^m]*Sqrt[-((1 + m)*a[m])])/m]*C[1] + 2*BesselK[0,
(2*Sqrt[x^m]*Sqrt[-((1 + m)*a[m])])/m]*C[2]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)+(m+1)*a(m)*x^m*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselJ(0,2*((m+1)*a(m))^(1/2)*x^(1/2*m)/m)+_C2*BesselY(0,2*((m+1)*a(
m))^(1/2)*x^(1/2*m)/m)
```

4.1456 $(a+x)y'(x)+x^2y''(x)-y(x)=0$

ODE

$$(a+x)y'(x)+x^2y''(x)-y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0333029 (sec), leaf count = 33

$$\left\{\left\{y(x)\to \frac{c_1(a+x)-\frac{c_2 x e^{a/x}}{a^2}}{a+1}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 19

$$\{y(x)=(a+x)\_C1+\_C2\,\mathrm{e}^{\frac{a}{x}}x\}$$

Mathematica raw input

```
DSolve[-y[x] + (a + x)*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((a + x)*C[1] - (E^(a/x)*x*C[2])/a^2)/(1 + a)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+(a+x)*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (a+x)*_C1+_C2*exp(1/x*a)*x
```

4.1457 $x^2y''(x) - 2xy'(x) + 2y(x) = 0$

ODE

$$x^2y''(x) - 2xy'(x) + 2y(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0110526 (sec), leaf count = 14

$$\{\{y(x) \to x(c_2x + c_1)\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 11

$$\{y(x) = x(\_C1\,x + \_C2)\}$$

Mathematica raw input

```
DSolve[2*y[x] - 2*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[1] + x*C[2])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(_C1*x+_C2)
```

4.1458 $x^2y''(x) - 2xy'(x) + 2y(x) = 4x^3$

ODE

$$x^2y''(x) - 2xy'(x) + 2y(x) = 4x^3$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0124222 (sec), leaf count = 19

$$\{\{y(x) \to x(c_2x + c_1 + 2x^2)\}\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 18

$$\{y(x) = x^2\_C2 + 2\,x^3 + \_C1\,x\}$$

Mathematica raw input

```
DSolve[2*y[x] - 2*x*y'[x] + x^2*y''[x] == 4*x^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(2*x^2 + C[1] + x*C[2])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+2*y(x) = 4*x^3, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*x^2+2*x^3+_C1*x
```

4.1459 $x^2y''(x) - 2xy'(x) + 2y(x) = x^3 \sin(x)$

ODE

$$x^2y''(x) - 2xy'(x) + 2y(x) = x^3 \sin(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0171717 (sec), leaf count = 18

$$\{\{y(x) \to x(c_2 x + c_1 - \sin(x))\}\}$$

Maple ✓
cpu = 0.046 (sec), leaf count = 15

$$\{y(x) = x(\_C2\, x + \_C1 - \sin(x))\}$$

Mathematica raw input

```
DSolve[2*y[x] - 2*x*y'[x] + x^2*y''[x] == x^3*Sin[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[1] + x*C[2] - Sin[x])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+2*y(x) = x^3*sin(x), y(x),'implicit')
```

Maple raw output

```
y(x) = x*(_C2*x+_C1-sin(x))
```

4.1460 $x^2y''(x) - 2xy'(x) + 2y(x) = 2x\log(x)$

ODE

$$x^2y''(x) - 2xy'(x) + 2y(x) = 2x\log(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0150336 (sec), leaf count = 25

$$\{\{y(x) \to x(c_2x + c_1 - \log^2(x) - 2\log(x) - 2)\}\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 22

$$\left\{y(x) = x\left(\_C2\,x - (\ln(x))^2 + \_C1 - 2\ln(x) - 2\right)\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 2*x*y'[x] + x^2*y''[x] == 2*x*Log[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(-2 + C[1] + x*C[2] - 2*Log[x] - Log[x]^2)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+2*y(x) = 2*x*ln(x), y(x),'implicit')
```

Maple raw output

```
y(x) = x*(_C2*x-ln(x)^2+_C1-2*ln(x)-2)
```

4.1461 $x^2y''(x) - 2xy'(x) + 2y(x) = x^5 \log(x)$

ODE

$$x^2y''(x) - 2xy'(x) + 2y(x) = x^5 \log(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.015462 (sec), leaf count = 32

$$\left\{\left\{y(x) \to c_2x^2 + c_1x - \frac{7x^5}{144} + \frac{1}{12}x^5 \log(x)\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 25

$$\left\{y(x) = \frac{x^5 \ln(x)}{12} - \frac{7x^5}{144} + x^2\_C2 + \_C1\, x\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 2*x*y'[x] + x^2*y''[x] == x^5*Log[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-7*x^5)/144 + x*C[1] + x^2*C[2] + (x^5*Log[x])/12}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+2*y(x) = x^5*ln(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/12*x^5*ln(x)-7/144*x^5+x^2*_C2+_C1*x
```

4.1462 $x^2y''(x) + 2xy'(x) - 6y(x) = 0$

ODE

$$x^2y''(x) + 2xy'(x) - 6y(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0169455 (sec), leaf count = 18

$$\left\{\left\{y(x) \to \frac{c_1 x^5 + c_2}{x^3}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 15

$$\left\{y(x) = \frac{x^5 \_C2 + \_C1}{x^3}\right\}$$

Mathematica raw input

```
DSolve[-6*y[x] + 2*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^5*C[1] + C[2])/x^3}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*x^5+_C1)/x^3
```

4.1463 $x^2y''(x) + 2xy'(x) - 6y(x) = 2 - x$

ODE

$$x^2y''(x) + 2xy'(x) - 6y(x) = 2 - x$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0191627 (sec), leaf count = 26

$$\left\{\left\{y(x) \to \frac{c_2}{x^3} + c_1x^2 + \frac{x}{4} - \frac{1}{3}\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 19

$$\left\{y(x) = \frac{\_C2}{x^3} + x^2\_C1 + \frac{x}{4} - \frac{1}{3}\right\}$$

Mathematica raw input

```
DSolve[-6*y[x] + 2*x*y'[x] + x^2*y''[x] == 2 - x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1/3 + x/4 + x^2*C[1] + C[2]/x^3}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-6*y(x) = 2-x, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/x^3*_C2+x^2*_C1+1/4*x-1/3
```

4.1464 $(a^2x^2+2)\,y(x)+x^2y''(x)-2xy'(x)=0$

ODE

$$(a^2x^2+2)\,y(x)+x^2y''(x)-2xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0138308 (sec), leaf count = 53

$$\left\{\left\{y(x)\to c_1xe^{-\sqrt{-a^2}x}+\frac{c_2xe^{\sqrt{-a^2}x}}{2\sqrt{-a^2}}\right\}\right\}$$

Maple ✓
cpu = 0.035 (sec), leaf count = 19

$$\{y(x)=x(\cos(ax)\_C2+\sin(ax)\_C1)\}$$

Mathematica raw input

```
DSolve[(2 + a^2*x^2)*y[x] - 2*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*C[1])/E^(Sqrt[-a^2]*x) + (E^(Sqrt[-a^2]*x)*x*C[2])/(2*Sqrt[-a^2])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+(a^2*x^2+2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(cos(a*x)*_C2+sin(a*x)*_C1)
```

4.1465 $-y(x)\left(n(n+1)-a^2x^2\right)+x^2y''(x)+2xy'(x)=0$

ODE

$$-y(x)\left(n(n+1)-a^2x^2\right)+x^2y''(x)+2xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0206893 (sec), leaf count = 22

$$\{\{y(x)\to c_1 j_n(ax)+c_2 y_n(ax)\}\}$$

Maple ✓
cpu = 0.062 (sec), leaf count = 27

$$\left\{y(x)=1\left(\_C2\,Y_{n+\frac{1}{2}}(ax)+\_C1\,J_{n+\frac{1}{2}}(ax)\right)\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[-((n*(1 + n) - a^2*x^2)*y[x]) + 2*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*SphericalBesselJ[n, a*x] + C[2]*SphericalBesselY[n, a*x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-(n*(n+1)-a^2*x^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*BesselY(n+1/2,a*x)+_C1*BesselJ(n+1/2,a*x))/x^(1/2)
```

4.1466 $y(x)\left(a+bx^2\right)+x^2y''(x)+2xy'(x)=0$

ODE

$$y(x)\left(a+bx^2\right)+x^2y''(x)+2xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0104063 (sec), leaf count = 58

$$\left\{\left\{y(x)\to c_1 j_{\frac{1}{2}\left(\sqrt{1-4a}-1\right)}\left(\sqrt{b}x\right)+c_2 y_{\frac{1}{2}\left(\sqrt{1-4a}-1\right)}\left(\sqrt{b}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.06 (sec), leaf count = 43

$$\left\{y(x)=1\left(\_C2\,Y_{\frac{1}{2}\sqrt{1-4\,a}}\left(\sqrt{b}x\right)+\_C1\,J_{\frac{1}{2}\sqrt{1-4\,a}}\left(\sqrt{b}x\right)\right)\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[(a + b*x^2)*y[x] + 2*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*SphericalBesselJ[(-1 + Sqrt[1 - 4*a])/2, Sqrt[b]*x] + C[2]*Spheri
calBesselY[(-1 + Sqrt[1 - 4*a])/2, Sqrt[b]*x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)+(b*x^2+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*BesselY(1/2*(1-4*a)^(1/2),b^(1/2)*x)+_C1*BesselJ(1/2*(1-4*a)^(1/2),b
^(1/2)*x))/x^(1/2)
```

4.1467 $ay(x) + x^2y''(x) - 2(1-x)y'(x) = 0$

ODE

$$ay(x) + x^2y''(x) - 2(1-x)y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0484321 (sec), leaf count = 145

$$\left\{\left\{y(x) \to 2^{\frac{1}{2}-\frac{1}{2}\sqrt{1-4a}}\left(\frac{1}{x}\right)^{\frac{1}{2}-\frac{1}{2}\sqrt{1-4a}}\left(2^{\sqrt{1-4a}}c_2\left(\frac{1}{x}\right)^{\sqrt{1-4a}}\ {}_1F_1\left(\frac{1}{2}\left(\sqrt{1-4a}+1\right);\sqrt{1-4a}+1;-\frac{2}{x}\right)+c_1\ {}_1F_1\left(\frac{1}{2}-\frac{1}{2}\sqrt{\right.\right.\right.\right.$$

Maple ✓
cpu = 0.041 (sec), leaf count = 47

$$\left\{y(x) = \mathrm{e}^{-x^{-1}}\sqrt{x^{-1}}\left(K_{\frac{1}{2}\sqrt{1-4\,a}}\left(x^{-1}\right)\_C2 + I_{\frac{1}{2}\sqrt{1-4\,a}}\left(x^{-1}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[a*y[x] - 2*(1 - x)*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2^(1/2 - Sqrt[1 - 4*a]/2)*(x^(-1))^(1/2 - Sqrt[1 - 4*a]/2)*(C[1]*Hyper
geometric1F1[1/2 - Sqrt[1 - 4*a]/2, 1 - Sqrt[1 - 4*a], -2/x] + 2^Sqrt[1 - 4*a]*(
x^(-1))^Sqrt[1 - 4*a]*C[2]*Hypergeometric1F1[(1 + Sqrt[1 - 4*a])/2, 1 + Sqrt[1 -
 4*a], -2/x])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*(1-x)*diff(y(x),x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/x)*(1/x)^(1/2)*(BesselK(1/2*(1-4*a)^(1/2),1/x)*_C2+BesselI(1/2*(1-
4*a)^(1/2),1/x)*_C1)
```

4.1468 $x^2y''(x) + 3xy'(x) + y(x) = 0$

ODE

$$x^2y''(x) + 3xy'(x) + y(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00716481 (sec), leaf count = 17

$$\left\{\left\{y(x) \to \frac{c_2 \log(x) + c_1}{x}\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 14

$$\left\{y(x) = \frac{\_C2 \ln(x) + \_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[y[x] + 3*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + C[2]*Log[x])/x}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+3*x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*ln(x)+_C1)/x
```

4.1469 $x^2y''(x) + 3xy'(x) + y(x) = x$

ODE

$$x^2y''(x) + 3xy'(x) + y(x) = x$$

ODE Classification

[[_2nd_order, _exact, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00960758 (sec), leaf count = 26

$$\left\{\left\{y(x) \to \frac{4c_2 \log(x) + 4c_1 + x^2}{4x}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 20

$$\left\{y(x) = \frac{\_C2}{x} + \frac{x}{4} + \frac{\_C1 \ln(x)}{x}\right\}$$

Mathematica raw input

```
DSolve[y[x] + 3*x*y'[x] + x^2*y''[x] == x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2 + 4*C[1] + 4*C[2]*Log[x])/(4*x)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+3*x*diff(y(x),x)+y(x) = x, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2/x+1/4*x+1/x*_C1*ln(x)
```

4.1470 $x^2y''(x) + 3xy'(x) + y(x) = a - x + x\log(x)$

ODE

$$x^2y''(x) + 3xy'(x) + y(x) = a - x + x\log(x)$$

ODE Classification

[[_2nd_order, _exact, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0136877 (sec), leaf count = 33

$$\left\{\left\{y(x) \to a + \frac{c_1}{x} + \left(\frac{c_2}{x} + \frac{x}{4}\right)\log(x) - \frac{x}{2}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 32

$$\left\{y(x) = \frac{(x^2 + 4\_C1)\ln(x) + 4ax - 2x^2 + 4\_C2}{4x}\right\}$$

Mathematica raw input

```
DSolve[y[x] + 3*x*y'[x] + x^2*y''[x] == a - x + x*Log[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> a - x/2 + C[1]/x + (x/4 + C[2]/x)*Log[x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+3*x*diff(y(x),x)+y(x) = a-x+x*ln(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*((x^2+4*_C1)*ln(x)+4*a*x-2*x^2+4*_C2)/x
```

4.1471 $x^2y''(x) - 3xy'(x) + 4y(x) = 0$

ODE

$$x^2y''(x) - 3xy'(x) + 4y(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00729568 (sec), leaf count = 18

$$\{\{y(x) \to x^2(2c_2 \log(x) + c_1)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 14

$$\{y(x) = x^2(\ln(x)\_C2 + \_C1)\}$$

Mathematica raw input

```
DSolve[4*y[x] - 3*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2*(C[1] + 2*C[2]*Log[x])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-3*x*diff(y(x),x)+4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^2*(ln(x)*_C2+_C1)
```

4.1472 $x^2y''(x) - 3xy'(x) + 4y(x) = 5x$

ODE

$$x^2y''(x) - 3xy'(x) + 4y(x) = 5x$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0106962 (sec), leaf count = 20

$$\{\{y(x) \to x(c_1x + 2c_2x\log(x) + 5)\}\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 20

$$\{y(x) = x^2\_C2 + x^2\ln(x)\_C1 + 5x\}$$

Mathematica raw input

```
DSolve[4*y[x] - 3*x*y'[x] + x^2*y''[x] == 5*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(5 + x*C[1] + 2*x*C[2]*Log[x])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-3*x*diff(y(x),x)+4*y(x) = 5*x, y(x),'implicit')
```

Maple raw output

```
y(x) = x^2*_C2+x^2*ln(x)*_C1+5*x
```

4.1473 $x^2y''(x) - 3xy'(x) - 5y(x) = 0$

ODE

$$x^2y''(x) - 3xy'(x) - 5y(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.014432 (sec), leaf count = 18

$$\left\{\left\{y(x) \to \frac{c_1 x^6 + c_2}{x}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 15

$$\left\{y(x) = \frac{\_C1\, x^6 + \_C2}{x}\right\}$$

Mathematica raw input

```
DSolve[-5*y[x] - 3*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^6*C[1] + C[2])/x}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-3*x*diff(y(x),x)-5*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x^6+_C2)/x
```

4.1474 $x^2y''(x) - 3xy'(x) - 5y(x) = x^2\log(x)$

ODE

$$x^2y''(x) - 3xy'(x) - 5y(x) = x^2\log(x)$$

ODE Classification

[[_2nd_order, _exact, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0196094 (sec), leaf count = 27

$$\left\{\left\{y(x) \to c_1x^5 + \frac{c_2}{x} - \frac{1}{9}x^2\log(x)\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 22

$$\left\{y(x) = x^5\_C2 + \frac{\_C1}{x} - \frac{x^2\ln(x)}{9}\right\}$$

Mathematica raw input

```
DSolve[-5*y[x] - 3*x*y'[x] + x^2*y''[x] == x^2*Log[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^5*C[1] + C[2]/x - (x^2*Log[x])/9}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-3*x*diff(y(x),x)-5*y(x) = x^2*ln(x), y(x),'implicit')
```

Maple raw output

```
y(x) = x^5*_C2+1/x*_C1-1/9*x^2*ln(x)
```

4.1475 $x^2y''(x) + 4xy'(x) + 2y(x) = 0$

ODE

$$x^2y''(x) + 4xy'(x) + 2y(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.011539 (sec), leaf count = 16

$$\left\{\left\{y(x) \to \frac{c_1 x + c_2}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 13

$$\left\{y(x) = \frac{\_C1\, x + \_C2}{x^2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + 4*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*C[1] + C[2])/x^2}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x+_C2)/x^2
```

4.1476 $x^2y''(x) + 4xy'(x) + 2y(x) = e^x$

ODE

$$x^2y''(x) + 4xy'(x) + 2y(x) = e^x$$

ODE Classification

[[_2nd_order, _exact, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0145965 (sec), leaf count = 19

$$\left\{\left\{y(x) \to \frac{c_1 x + c_2 + e^x}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 15

$$\left\{y(x) = \frac{\_C2 + \_C1\, x + \mathrm{e}^x}{x^2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + 4*x*y'[x] + x^2*y''[x] == E^x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x + x*C[1] + C[2])/x^2}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)+2*y(x) = exp(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2+_C1*x+exp(x))/x^2
```

4.1477 $x^2y''(x) + 4xy'(x) + 2y(x) = \log(x+1)$

ODE

$$x^2y''(x) + 4xy'(x) + 2y(x) = \log(x+1)$$

ODE Classification

[[_2nd_order, _exact, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0162777 (sec), leaf count = 41

$$\left\{\left\{y(x) \to \frac{(4c_1 - 2)\,x + 4c_2 - 3x^2 + 2(x+1)^2\log(x+1)}{4x^2}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 37

$$\left\{y(x) = \frac{2\ln(1+x)(1+x)^2 - 3x^2 + (4\_C1 - 6)\,x + 4\_C2 - 1}{4x^2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + 4*x*y'[x] + x^2*y''[x] == Log[1 + x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-3*x^2 + x*(-2 + 4*C[1]) + 4*C[2] + 2*(1 + x)^2*Log[1 + x])/(4*x^2)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)+2*y(x) = ln(1+x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(2*ln(1+x)*(1+x)^2-3*x^2+(4*_C1-6)*x+4*_C2-1)/x^2
```

4.1478 $x^2y''(x) - 4xy'(x) + 6y(x) = 0$

ODE

$$x^2y''(x) - 4xy'(x) + 6y(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0127617 (sec), leaf count = 16

$$\{\{y(x) \to x^2(c_2x + c_1)\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 13

$$\{y(x) = x^2(\_C1\,x + \_C2)\}$$

Mathematica raw input

```
DSolve[6*y[x] - 4*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2*(C[1] + x*C[2])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-4*x*diff(y(x),x)+6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^2*(_C1*x+_C2)
```

4.1479 $x^2y''(x) - 4xy'(x) + 6y(x) = x^2(x^2-1)$

ODE

$$x^2y''(x) - 4xy'(x) + 6y(x) = x^2(x^2-1)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0142279 (sec), leaf count = 30

$$\left\{\left\{y(x) \to \frac{1}{2}x^2(2c_2x + 2c_1 + x^2 + 2\log(x) + 2)\right\}\right\}$$

Maple ✓
cpu = 0.031 (sec), leaf count = 25

$$\left\{y(x) = \frac{x^2(2\,x\_C2 + x^2 + 2\,\ln(x) + 2\,\_C1 + 2)}{2}\right\}$$

Mathematica raw input

```
DSolve[6*y[x] - 4*x*y'[x] + x^2*y''[x] == x^2*(-1 + x^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2*(2 + x^2 + 2*C[1] + 2*x*C[2] + 2*Log[x]))/2}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-4*x*diff(y(x),x)+6*y(x) = x^2*(x^2-1), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x^2*(2*x*_C2+x^2+2*ln(x)+2*_C1+2)
```

4.1480 $x^2y''(x) + (2 - x^2)\,y(x) + 4xy'(x) = 0$

ODE

$$x^2y''(x) + (2 - x^2)\,y(x) + 4xy'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00952535 (sec), leaf count = 28

$$\left\{\left\{y(x) \to \frac{2c_1e^{-x} + c_2e^{x}}{2x^2}\right\}\right\}$$

Maple ✓
cpu = 0.036 (sec), leaf count = 17

$$\left\{y(x) = \frac{\_C2\,\cosh(x) + \_C1\,\sinh(x)}{x^2}\right\}$$

Mathematica raw input

```
DSolve[(2 - x^2)*y[x] + 4*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((2*C[1])/E^x + E^x*C[2])/(2*x^2)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)+(-x^2+2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*cosh(x)+_C1*sinh(x))/x^2
```

4.1481 $x^2y''(x) + (x^2+6)\,y(x) + 4xy'(x) = 0$

ODE

$$x^2y''(x) + (x^2+6)\,y(x) + 4xy'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00869498 (sec), leaf count = 44

$$\left\{\left\{y(x) \to \frac{c_1 J_{\frac{i\sqrt{15}}{2}}(x) + c_2 Y_{\frac{i\sqrt{15}}{2}}(x)}{x^{3/2}}\right\}\right\}$$

Maple ✓
cpu = 0.059 (sec), leaf count = 29

$$\left\{y(x) = (\_C1\, J_{\frac{i}{2}\sqrt{15}}(x) + \_C2\, Y_{\frac{i}{2}\sqrt{15}}(x))x^{-\frac{3}{2}}\right\}$$

Mathematica raw input

```
DSolve[(6 + x^2)*y[x] + 4*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (BesselJ[(I/2)*Sqrt[15], x]*C[1] + BesselY[(I/2)*Sqrt[15], x]*C[2])/x^
(3/2)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)+(x^2+6)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*BesselJ(1/2*I*15^(1/2),x)+_C2*BesselY(1/2*I*15^(1/2),x))/x^(3/2)
```

4.1482 $x^2y''(x) + 5xy'(x) + 13y(x) = 0$

ODE

$$x^2y''(x) + 5xy'(x) + 13y(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0112846 (sec), leaf count = 26

$$\left\{\left\{y(x) \to \frac{c_1 \sin(3\log(x)) + c_2 \cos(3\log(x))}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 23

$$\left\{y(x) = \frac{\_C1 \sin(3\ln(x)) + \_C2 \cos(3\ln(x))}{x^2}\right\}$$

Mathematica raw input

```
DSolve[13*y[x] + 5*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[2]*Cos[3*Log[x]] + C[1]*Sin[3*Log[x]])/x^2}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+5*x*diff(y(x),x)+13*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*sin(3*ln(x))+_C2*cos(3*ln(x)))/x^2
```

4.1483 $x^2y''(x) - 7xy'(x) + 16y(x) = 0$

ODE

$$x^2y''(x) - 7xy'(x) + 16y(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00754879 (sec), leaf count = 18

$$\{\{y(x) \to x^4(4c_2 \log(x) + c_1)\}\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 14

$$\{y(x) = x^4(\ln(x)\_C2 + \_C1)\}$$

Mathematica raw input

```
DSolve[16*y[x] - 7*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^4*(C[1] + 4*C[2]*Log[x])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-7*x*diff(y(x),x)+16*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^4*(ln(x)*_C2+_C1)
```

4.1484 $y(x)\left(a(a+1)+b^2x^2\right)-2axy'(x)+x^2y''(x)=0$

ODE

$$y(x)\left(a(a+1)+b^2x^2\right)-2axy'(x)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0198417 (sec), leaf count = 57

$$\left\{\left\{y(x)\to c_1x^ae^{-\sqrt{-b^2}x}+\frac{c_2x^ae^{\sqrt{-b^2}x}}{2\sqrt{-b^2}}\right\}\right\}$$

Maple ✓
cpu = 0.041 (sec), leaf count = 21

$$\{y(x)=x^a(\cos(bx)\_C2+\sin(bx)\_C1)\}$$

Mathematica raw input

```
DSolve[(a*(1 + a) + b^2*x^2)*y[x] - 2*a*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^a*C[1])/E^(Sqrt[-b^2]*x) + (E^(Sqrt[-b^2]*x)*x^a*C[2])/(2*Sqrt[-b^2
])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*a*x*diff(y(x),x)+(a*(1+a)+b^2*x^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^a*(cos(b*x)*_C2+sin(b*x)*_C1)
```

4.1485 $\mathbf{a1}xy'(x)+\mathbf{a2}y(x)+x^2y''(x)=0$

ODE

$$\mathrm{a1}xy'(x)+\mathrm{a2}y(x)+x^2y''(x)=0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0105266 (sec), leaf count = 57

$$\left\{\left\{y(x)\to x^{\frac{1}{2}\left(-\sqrt{\mathrm{a1}^2-2\mathrm{a1}-4\mathrm{a2}+1}-\mathrm{a1}+1\right)}\left(c_2x^{\sqrt{\mathrm{a1}^2-2\mathrm{a1}-4\mathrm{a2}+1}}+c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 53

$$\left\{y(x)=\_C1\,x^{-\frac{a1}{2}+\frac{1}{2}+\frac{1}{2}\sqrt{a1^2-2\,a1-4\,a2+1}}+\_C2\,x^{-\frac{a1}{2}+\frac{1}{2}-\frac{1}{2}\sqrt{a1^2-2\,a1-4\,a2+1}}\right\}$$

Mathematica raw input

```
DSolve[a2*y[x] + a1*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^((1 - a1 - Sqrt[1 - 2*a1 + a1^2 - 4*a2])/2)*(C[1] + x^Sqrt[1 - 2*a1
 + a1^2 - 4*a2]*C[2])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a1*x*diff(y(x),x)+a2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^(-1/2*a1+1/2+1/2*(a1^2-2*a1-4*a2+1)^(1/2))+_C2*x^(-1/2*a1+1/2-1/2*(
a1^2-2*a1-4*a2+1)^(1/2))
```

4.1486 $\mathbf{a1}xy'(x)+y(x)(\mathbf{a2}+\mathbf{b2}x)+x^2y''(x)=0$

ODE

$$\mathrm{a1}xy'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0721095 (sec), leaf count = 131

$$\left\{\left\{y(x)\to \mathrm{b2}^{\frac{1}{2}-\frac{\mathrm{a1}}{2}}x^{\frac{1}{2}-\frac{\mathrm{a1}}{2}}\left(c_1\Gamma\left(1-\sqrt{\mathrm{a1}^2-2\mathrm{a1}-4\mathrm{a2}+1}\right)J_{-\sqrt{\mathrm{a1}^2-2\mathrm{a1}-4\mathrm{a2}+1}}\left(2\sqrt{\mathrm{b2}}\sqrt{x}\right)+c_2\Gamma\left(\sqrt{\mathrm{a1}^2-2\mathrm{a1}-4\mathrm{a2}+1}+1\right.\right.\right.$$

Maple ✓
cpu = 0.023 (sec), leaf count = 61

$$\left\{y(x)=x^{-\frac{a1}{2}+\frac{1}{2}}\left(Y_{\sqrt{a1^2-2\,a1-4\,a2+1}}\left(2\sqrt{b2}\sqrt{x}\right)\_C2+J_{\sqrt{a1^2-2\,a1-4\,a2+1}}\left(2\sqrt{b2}\sqrt{x}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(a2 + b2*x)*y[x] + a1*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> b2^(1/2 - a1/2)*x^(1/2 - a1/2)*(BesselJ[-Sqrt[1 - 2*a1 + a1^2 - 4*a2],
  2*Sqrt[b2]*Sqrt[x]]*C[1]*Gamma[1 - Sqrt[1 - 2*a1 + a1^2 - 4*a2]] + BesselJ[Sqrt
[1 - 2*a1 + a1^2 - 4*a2], 2*Sqrt[b2]*Sqrt[x]]*C[2]*Gamma[1 + Sqrt[1 - 2*a1 + a1^
2 - 4*a2]])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a1*x*diff(y(x),x)+(b2*x+a2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a1+1/2)*(BesselY((a1^2-2*a1-4*a2+1)^(1/2),2*b2^(1/2)*x^(1/2))*_C2
+BesselJ((a1^2-2*a1-4*a2+1)^(1/2),2*b2^(1/2)*x^(1/2))*_C1)
```

4.1487 $\mathbf{a1}xy'(x)+y(x)\left(\mathbf{a2}+\mathbf{b2}x^2\right)+x^2y''(x)=0$

ODE

$$\mathrm{a1}xy'(x)+y(x)\left(\mathrm{a2}+\mathrm{b2}x^2\right)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0199611 (sec), leaf count = 78

$$\left\{\left\{y(x)\to x^{\frac{1}{2}-\frac{\mathrm{a1}}{2}}\left(c_1 J_{\frac{1}{2}\sqrt{\mathrm{a1}^2-2\mathrm{a1}-4\mathrm{a2}+1}}\left(\sqrt{\mathrm{b2}}x\right)+c_2 Y_{\frac{1}{2}\sqrt{\mathrm{a1}^2-2\mathrm{a1}-4\mathrm{a2}+1}}\left(\sqrt{\mathrm{b2}}x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.042 (sec), leaf count = 59

$$\left\{y(x)=x^{-\frac{a1}{2}+\frac{1}{2}}\left(Y_{\frac{1}{2}\sqrt{a1^2-2\,a1-4\,a2+1}}\left(\sqrt{b2}x\right)\_C2+J_{\frac{1}{2}\sqrt{a1^2-2\,a1-4\,a2+1}}\left(\sqrt{b2}x\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(a2 + b2*x^2)*y[x] + a1*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^(1/2 - a1/2)*(BesselJ[Sqrt[1 - 2*a1 + a1^2 - 4*a2]/2, Sqrt[b2]*x]*C[
1] + BesselY[Sqrt[1 - 2*a1 + a1^2 - 4*a2]/2, Sqrt[b2]*x]*C[2])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a1*x*diff(y(x),x)+(b2*x^2+a2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a1+1/2)*(BesselY(1/2*(a1^2-2*a1-4*a2+1)^(1/2),b2^(1/2)*x)*_C2+Bes
selJ(1/2*(a1^2-2*a1-4*a2+1)^(1/2),b2^(1/2)*x)*_C1)
```

4.1488 $\mathbf{a1}xy'(x)+y(x)\left(\mathbf{a2}+\mathbf{b2}x+\mathbf{c2}x^2\right)+x^2y''(x)=0$

ODE

$$\mathrm{a1}xy'(x)+y(x)\left(\mathrm{a2}+\mathrm{b2}x+\mathrm{c2}x^2\right)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.056347 (sec), leaf count = 169

$$\left\{\left\{y(x)\to e^{-i\sqrt{\mathrm{c2}}x}x^{\frac{1}{2}\left(\sqrt{\mathrm{a1}^2-2\mathrm{a1}-4\mathrm{a2}+1}-\mathrm{a1}+1\right)}\left(c_1U\left(\frac{1}{2}\left(\frac{i\mathrm{b2}}{\sqrt{\mathrm{c2}}}+\sqrt{\mathrm{a1}^2-2\mathrm{a1}-4\mathrm{a2}+1}+1\right),\sqrt{\mathrm{a1}^2-2\mathrm{a1}-4\mathrm{a2}+1}+1,2i\sqrt{}\right.\right.\right.$$

Maple ✓
cpu = 0.204 (sec), leaf count = 75

$$\left\{y(x)=x^{-\frac{a1}{2}}\left(M_{-\frac{i}{2}b2\frac{1}{\sqrt{c2}},\frac{1}{2}\sqrt{a1^2-2\,a1-4\,a2+1}}\left(2\,i\sqrt{c2}x\right)\_C1+W_{-\frac{i}{2}b2\frac{1}{\sqrt{c2}},\frac{1}{2}\sqrt{a1^2-2\,a1-4\,a2+1}}\left(2\,i\sqrt{c2}x\right)\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[(a2 + b2*x + c2*x^2)*y[x] + a1*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^((1 - a1 + Sqrt[1 - 2*a1 + a1^2 - 4*a2])/2)*(C[1]*HypergeometricU[(
1 + Sqrt[1 - 2*a1 + a1^2 - 4*a2] + (I*b2)/Sqrt[c2])/2, 1 + Sqrt[1 - 2*a1 + a1^2
- 4*a2], (2*I)*Sqrt[c2]*x] + C[2]*LaguerreL[(-1 - Sqrt[1 - 2*a1 + a1^2 - 4*a2] -
  (I*b2)/Sqrt[c2])/2, Sqrt[1 - 2*a1 + a1^2 - 4*a2], (2*I)*Sqrt[c2]*x]))/E^(I*Sqrt
[c2]*x)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a1*x*diff(y(x),x)+(c2*x^2+b2*x+a2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a1)*(WhittakerM(-1/2*I*b2/c2^(1/2),1/2*(a1^2-2*a1-4*a2+1)^(1/2),2
*I*c2^(1/2)*x)*_C1+WhittakerW(-1/2*I*b2/c2^(1/2),1/2*(a1^2-2*a1-4*a2+1)^(1/2),2*
I*c2^(1/2)*x)*_C2)
```

4.1489 $axy'(x) + y(x)\left(b + cx^3\right) + x^2y''(x) = 0$

ODE

$$axy'(x) + y(x)\left(b + cx^3\right) + x^2y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0802224 (sec), leaf count = 156

$$\left\{\left\{y(x) \to 3^{\frac{a-1}{3}} c^{\frac{1}{6}-\frac{a}{6}} x^{\frac{1}{2}-\frac{a}{2}} \left(c_1 \Gamma\left(1-\frac{1}{3}\sqrt{a^2-2a-4b+1}\right) J_{-\frac{1}{3}\sqrt{a^2-2a-4b+1}}\left(\frac{2}{3}\sqrt{c}x^{3/2}\right) + c_2 \Gamma\left(\frac{1}{3}\sqrt{a^2-2a-4b+1}+1\right.\right.\right.$$

Maple ✓
cpu = 0.039 (sec), leaf count = 65

$$\left\{y(x) = x^{-\frac{a}{2}+\frac{1}{2}}\left(Y_{\frac{1}{3}\sqrt{a^2-2\,a-4\,b+1}}\left(\frac{2}{3}\sqrt{c}x^{\frac{3}{2}}\right)\_C2 + J_{\frac{1}{3}\sqrt{a^2-2\,a-4\,b+1}}\left(\frac{2}{3}\sqrt{c}x^{\frac{3}{2}}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(b + c*x^3)*y[x] + a*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 3^((-1 + a)/3)*c^(1/6 - a/6)*x^(1/2 - a/2)*(BesselJ[-Sqrt[1 - 2*a + a^
2 - 4*b]/3, (2*Sqrt[c]*x^(3/2))/3]*C[1]*Gamma[1 - Sqrt[1 - 2*a + a^2 - 4*b]/3] +
 BesselJ[Sqrt[1 - 2*a + a^2 - 4*b]/3, (2*Sqrt[c]*x^(3/2))/3]*C[2]*Gamma[1 + Sqrt
[1 - 2*a + a^2 - 4*b]/3])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a*x*diff(y(x),x)+(c*x^3+b)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a+1/2)*(BesselY(1/3*(a^2-2*a-4*b+1)^(1/2),2/3*c^(1/2)*x^(3/2))*_C
2+BesselJ(1/3*(a^2-2*a-4*b+1)^(1/2),2/3*c^(1/2)*x^(3/2))*_C1)
```

4.1490 $axy'(x) + x^2 y(x) (\mathbf{a1} + \mathbf{b1} x^2) + x^2 y''(x) = 0$

ODE

$$axy'(x) + x^2 y(x) (\mathrm{a1} + \mathrm{b1} x^2) + x^2 y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0917486 (sec), leaf count = 136

$$\left\{\left\{y(x) \to 2^{\frac{a+1}{4}} x^{\frac{1}{2}(-a-1)} \left(x^2\right)^{\frac{a+1}{4}} e^{\frac{1}{2} i \sqrt{\mathrm{b1}} x^2} \left(c_1 U\left(\frac{1}{4}\left(a - \frac{i\mathrm{a1}}{\sqrt{\mathrm{b1}}} + 1\right), \frac{a+1}{2}, -i\sqrt{\mathrm{b1}} x^2\right) + c_2 L^{\frac{a-1}{2}}_{\frac{1}{4}\left(-a + \frac{i\mathrm{a1}}{\sqrt{\mathrm{b1}}} - 1\right)}\left(-i\sqrt{\mathrm{b1}} x^2\right)\right)\right.$$

Maple ✓
cpu = 0.185 (sec), leaf count = 86

$$\left\{y(x) = \mathrm{e}^{-\frac{i}{2}\sqrt{b1}x^2}\left(U\left(\frac{1}{4}\left(a\sqrt{b1} + ia1 + \sqrt{b1}\right)\frac{1}{\sqrt{b1}}, \frac{1}{2} + \frac{a}{2}, i\sqrt{b1}x^2\right)\_C2 + M\left(\frac{1}{4}\left(a\sqrt{b1} + ia1 + \sqrt{b1}\right)\frac{1}{\sqrt{b1}}, \frac{1}{2} + \frac{a}{2},\right.\right.$$

Mathematica raw input

```
DSolve[x^2*(a1 + b1*x^2)*y[x] + a*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2^((1 + a)/4)*E^((I/2)*Sqrt[b1]*x^2)*x^((-1 - a)/2)*(x^2)^((1 + a)/4)*
(C[1]*HypergeometricU[(1 + a - (I*a1)/Sqrt[b1])/4, (1 + a)/2, (-I)*Sqrt[b1]*x^2]
 + C[2]*LaguerreL[(-1 - a + (I*a1)/Sqrt[b1])/4, (-1 + a)/2, (-I)*Sqrt[b1]*x^2])}
}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a*x*diff(y(x),x)+x^2*(b1*x^2+a1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*I*b1^(1/2)*x^2)*(KummerU(1/4*(a*b1^(1/2)+I*a1+b1^(1/2))/b1^(1/2)
,1/2+1/2*a,I*b1^(1/2)*x^2)*_C2+KummerM(1/4*(a*b1^(1/2)+I*a1+b1^(1/2))/b1^(1/2),1
/2+1/2*a,I*b1^(1/2)*x^2)*_C1)
```

4.1491 $axy'(x)+y(x)\left(b+cx^{2k}\right)+x^2y''(x)=0$

ODE

$$axy'(x)+y(x)\left(b+cx^{2k}\right)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0939198 (sec), leaf count = 561

$$\left\{\left\{y(x)\to 2^{-\frac{\sqrt{k^2\left(a^2-2a-4b+1\right)}+k\sqrt{a^2-2a-4b+1}-ak+k}{2k^2}}k^{-\frac{\sqrt{k^2\left(a^2-2a-4b+1\right)}+k\sqrt{a^2-2a-4b+1}-ak+k}{2k^2}}c^{-\frac{\sqrt{k^2\left(a^2-2a-4b+1\right)}+k\left(\sqrt{a^2-2a-4b+1}+a-1\right)}{4k^2}}(x^{\right.\right.$$

Maple ✓
cpu = 0.036 (sec), leaf count = 75

$$\left\{y(x)=x^{-\frac{a}{2}+\frac{1}{2}}\left(Y_{\frac{1}{2k}\sqrt{a^2-2a-4b+1}}\left(\frac{x^k}{k}\sqrt{c}\right)\_C2+J_{\frac{1}{2k}\sqrt{a^2-2a-4b+1}}\left(\frac{x^k}{k}\sqrt{c}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(b + c*x^(2*k))*y[x] + a*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2^(Sqrt[1 - 2*a + a^2 - 4*b]/k)*c^(Sqrt[(1 - 2*a + a^2 - 4*b)*k^2]/(2
*k^2))*k^(Sqrt[1 - 2*a + a^2 - 4*b]/k)*(x^(2*k))^(Sqrt[(1 - 2*a + a^2 - 4*b)*k^2
]/(2*k^2))*BesselJ[-Sqrt[(1 - 2*a + a^2 - 4*b)*k^2]/(2*k^2), (Sqrt[c]*Sqrt[x^(2*
k)])/k]*C[1]*Gamma[1 - Sqrt[1 - 2*a + a^2 - 4*b]/(2*k)] + 2^(Sqrt[(1 - 2*a + a^2
 - 4*b)*k^2]/k^2)*c^(Sqrt[1 - 2*a + a^2 - 4*b]/(2*k))*k^(Sqrt[(1 - 2*a + a^2 - 4
*b)*k^2]/k^2)*(x^(2*k))^(Sqrt[1 - 2*a + a^2 - 4*b]/(2*k))*BesselJ[Sqrt[(1 - 2*a
+ a^2 - 4*b)*k^2]/(2*k^2), (Sqrt[c]*Sqrt[x^(2*k)])/k]*C[2]*Gamma[1 + Sqrt[1 - 2*
a + a^2 - 4*b]/(2*k)])/(2^((k - a*k + Sqrt[1 - 2*a + a^2 - 4*b]*k + Sqrt[(1 - 2*
a + a^2 - 4*b)*k^2])/(2*k^2))*c^(((-1 + a + Sqrt[1 - 2*a + a^2 - 4*b])*k + Sqrt[
(1 - 2*a + a^2 - 4*b)*k^2])/(4*k^2))*k^((k - a*k + Sqrt[1 - 2*a + a^2 - 4*b]*k +
 Sqrt[(1 - 2*a + a^2 - 4*b)*k^2])/(2*k^2))*(x^(2*k))^(((-1 + a + Sqrt[1 - 2*a +
a^2 - 4*b])*k + Sqrt[(1 - 2*a + a^2 - 4*b)*k^2])/(4*k^2)))}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a*x*diff(y(x),x)+(b+c*x^(2*k))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a+1/2)*(BesselY(1/2*(a^2-2*a-4*b+1)^(1/2)/k,c^(1/2)*x^k/k)*_C2+Be
sselJ(1/2*(a^2-2*a-4*b+1)^(1/2)/k,c^(1/2)*x^k/k)*_C1)
```

4.1492 $(a+bx)y'(x)+cy(x)+x^2y''(x)=0$

ODE

$$(a+bx)y'(x)+cy(x)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0728397 (sec), leaf count = 243

$$\left\{\left\{y(x)\to -i^{-\sqrt{b^2-2b-4c+1}+b+1}a^{\frac{1}{2}\left(-\sqrt{b^2-2b-4c+1}+b-1\right)}\left(\frac{1}{x}\right)^{\frac{1}{2}\left(-\sqrt{b^2-2b-4c+1}+b-1\right)}\left(c_1\,{}_1F_1\left(\frac{1}{2}\left(b-\sqrt{b^2-2b-4c+1}-1\right)\right.\right.\right.$$

Maple ✓
cpu = 0.184 (sec), leaf count = 114

$$\left\{y(x)=x^{-\frac{1}{2}\sqrt{b^2-2\,b-4\,c+1}-\frac{b}{2}+\frac{1}{2}}\left(U\left(-\frac{1}{2}+\frac{1}{2}\sqrt{b^2-2\,b-4\,c+1}+\frac{b}{2},\,1+\sqrt{b^2-2\,b-4\,c+1},\,\frac{a}{x}\right)\_C2+M\left(-\frac{1}{2}+\frac{1}{2}\sqrt{b^2}\right.\right.\right.$$

Mathematica raw input

```
DSolve[c*y[x] + (a + b*x)*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(I^(1 + b - Sqrt[1 - 2*b + b^2 - 4*c])*a^((-1 + b - Sqrt[1 - 2*b + b^
2 - 4*c])/2)*(x^(-1))^((-1 + b - Sqrt[1 - 2*b + b^2 - 4*c])/2)*(C[1]*Hypergeomet
ric1F1[(-1 + b - Sqrt[1 - 2*b + b^2 - 4*c])/2, 1 - Sqrt[1 - 2*b + b^2 - 4*c], a/
x] + I^(2*Sqrt[1 - 2*b + b^2 - 4*c])*a^Sqrt[1 - 2*b + b^2 - 4*c]*(x^(-1))^Sqrt[1
 - 2*b + b^2 - 4*c]*C[2]*Hypergeometric1F1[(-1 + b + Sqrt[1 - 2*b + b^2 - 4*c])/
2, 1 + Sqrt[1 - 2*b + b^2 - 4*c], a/x]))}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+(b*x+a)*diff(y(x),x)+c*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*(b^2-2*b-4*c+1)^(1/2)-1/2*b+1/2)*(KummerU(-1/2+1/2*(b^2-2*b-4*c+1
)^(1/2)+1/2*b,1+(b^2-2*b-4*c+1)^(1/2),1/x*a)*_C2+KummerM(-1/2+1/2*(b^2-2*b-4*c+1
)^(1/2)+1/2*b,1+(b^2-2*b-4*c+1)^(1/2),1/x*a)*_C1)
```

4.1493 $-2axy'(x)+a(a+1)y(x)+x^2y''(x)=0$

ODE

$$-2axy'(x)+a(a+1)y(x)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0216746 (sec), leaf count = 105

$$\left\{\left\{y(x)\to x^{\frac{-\sqrt{\frac{1}{a^2+a}}\sqrt{a}-\sqrt{\frac{1}{a^2+a}}a^{3/2}+2\sqrt{a+1}a+\sqrt{a+1}}{2\sqrt{a+1}}}\left(c_2x^{\sqrt{a}\sqrt{a+1}\sqrt{\frac{1}{a^2+a}}}+c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 17

$$\{y(x)=\_C1\,x^{1+a}+\_C2\,x^a\}$$

Mathematica raw input

```
DSolve[a*(1 + a)*y[x] - 2*a*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^((Sqrt[1 + a] + 2*a*Sqrt[1 + a] - Sqrt[a]*Sqrt[(a + a^2)^(-1)] - a^(
3/2)*Sqrt[(a + a^2)^(-1)])/(2*Sqrt[1 + a]))*(C[1] + x^(Sqrt[a]*Sqrt[1 + a]*Sqrt[
(a + a^2)^(-1)])*C[2])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*a*x*diff(y(x),x)+a*(1+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^(1+a)+_C2*x^a
```

4.1494 $-2axy'(x)+a(a+1)y(x)+x^2y''(x)=e^x x^{a+2}$

ODE

$$-2axy'(x)+a(a+1)y(x)+x^2y''(x)=e^x x^{a+2}$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.270628 (sec), leaf count = 302

$$\left\{\left\{y(x)\to (-x)^{\frac{1}{2}\left(-\sqrt{a}\sqrt{a+1}\sqrt{\frac{1}{a^2+a}}-1\right)}x^a\left(c_1 x^{\frac{1}{2}\left(1-\sqrt{a}\sqrt{a+1}\sqrt{\frac{1}{a^2+a}}\right)}(-x)^{\frac{1}{2}\left(\sqrt{a}\sqrt{a+1}\sqrt{\frac{1}{a^2+a}}+1\right)}+c_2\left(-x^2\right)^{\frac{1}{2}\left(\sqrt{a}\sqrt{a+1}\sqrt{\frac{1}{a^2+a}}+1\right)}+\right.\right.\right.$$

Maple ✓
cpu = 0.023 (sec), leaf count = 20

$$\{y(x)=x^{1+a}\_C2+x^a(\_C1+\mathrm{e}^x)\}$$

Mathematica raw input

```
DSolve[a*(1 + a)*y[x] - 2*a*x*y'[x] + x^2*y''[x] == E^x*x^(2 + a),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-x)^((-1 - Sqrt[a]*Sqrt[1 + a]*Sqrt[(a + a^2)^(-1)])/2)*x^a*((-x)^((1
 + Sqrt[a]*Sqrt[1 + a]*Sqrt[(a + a^2)^(-1)])/2)*x^((1 - Sqrt[a]*Sqrt[1 + a]*Sqrt
[(a + a^2)^(-1)])/2)*C[1] + (-x^2)^((1 + Sqrt[a]*Sqrt[1 + a]*Sqrt[(a + a^2)^(-1)
])/2)*C[2] + Sqrt[a]*Sqrt[1 + a]*Sqrt[(a + a^2)^(-1)]*(-x)^(Sqrt[a]*Sqrt[1 + a]*
Sqrt[(a + a^2)^(-1)])*x*Gamma[(3 - Sqrt[a]*Sqrt[1 + a]*Sqrt[(a + a^2)^(-1)])/2,
-x] - Sqrt[a]*Sqrt[1 + a]*Sqrt[(a + a^2)^(-1)]*x*Gamma[(3 + Sqrt[a]*Sqrt[1 + a]*
Sqrt[(a + a^2)^(-1)])/2, -x])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*a*x*diff(y(x),x)+a*(1+a)*y(x) = exp(x)*x^(a+2), y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1+a)*_C2+x^a*(_C1+exp(x))
```

4.1495 $y(x)\left(a(a+1)+b^2x^2\right)-2axy'(x)+x^2y''(x)=0$

ODE

$$y(x)\left(a(a+1)+b^2x^2\right)-2axy'(x)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0389132 (sec), leaf count = 57

$$\left\{\left\{y(x)\to c_1x^ae^{-\sqrt{-b^2}x}+\frac{c_2x^ae^{\sqrt{-b^2}x}}{2\sqrt{-b^2}}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 21

$$\{y(x)=x^a(\cos(bx)\_C2+\sin(bx)\_C1)\}$$

Mathematica raw input

```
DSolve[(a*(1 + a) + b^2*x^2)*y[x] - 2*a*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^a*C[1])/E^(Sqrt[-b^2]*x) + (E^(Sqrt[-b^2]*x)*x^a*C[2])/(2*Sqrt[-b^2
])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*a*x*diff(y(x),x)+(a*(1+a)+b^2*x^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^a*(cos(b*x)*_C2+sin(b*x)*_C1)
```

4.1496 $y(x)(a+bx)+2axy'(x)+x^2y''(x)=0$

ODE

$$y(x)(a+bx)+2axy'(x)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.063338 (sec), leaf count = 123

$$\left\{\left\{y(x)\to b^{\frac{1}{2}-a}x^{\frac{1}{2}-a}\left(c_1\Gamma\left(1-\sqrt{4a^2-8a+1}\right)J_{-\sqrt{4a^2-8a+1}}\left(2\sqrt{b}\sqrt{x}\right)+c_2\Gamma\left(\sqrt{4a^2-8a+1}+1\right)J_{\sqrt{4a^2-8a+1}}\left(2\sqrt{b}\sqrt{x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 59

$$\left\{y(x)=x^{\frac{1}{2}-a}\left(Y_{\sqrt{4\,a^2-8\,a+1}}\left(2\,\sqrt{b}\sqrt{x}\right)\_C2+J_{\sqrt{4\,a^2-8\,a+1}}\left(2\,\sqrt{b}\sqrt{x}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x)*y[x] + 2*a*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> b^(1/2 - a)*x^(1/2 - a)*(BesselJ[-Sqrt[1 - 8*a + 4*a^2], 2*Sqrt[b]*Sqr
t[x]]*C[1]*Gamma[1 - Sqrt[1 - 8*a + 4*a^2]] + BesselJ[Sqrt[1 - 8*a + 4*a^2], 2*S
qrt[b]*Sqrt[x]]*C[2]*Gamma[1 + Sqrt[1 - 8*a + 4*a^2]])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+2*a*x*diff(y(x),x)+(b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2-a)*(BesselY((4*a^2-8*a+1)^(1/2),2*b^(1/2)*x^(1/2))*_C2+BesselJ((4*
a^2-8*a+1)^(1/2),2*b^(1/2)*x^(1/2))*_C1)
```

4.1497 $x^2y''(x) - x^2y'(x) - 2x^2y(x) = 2x^2\log(x) + x + 1$

ODE

$$x^2y''(x) - x^2y'(x) - 2x^2y(x) = 2x^2\log(x) + x + 1$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0361264 (sec), leaf count = 26

$$\{\{y(x) \to c_1 e^{-x} + c_2 e^{2x} - \log(x)\}\}$$

Maple ✓
cpu = 0.036 (sec), leaf count = 21

$$\{y(x) = \mathrm{e}^{-x}\_C2 + \mathrm{e}^{2x}\_C1 - \ln(x)\}$$

Mathematica raw input

```
DSolve[-2*x^2*y[x] - x^2*y'[x] + x^2*y''[x] == 1 + x + 2*x^2*Log[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^x + E^(2*x)*C[2] - Log[x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-x^2*diff(y(x),x)-2*x^2*y(x) = 1+x+2*x^2*ln(x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x)*_C2+exp(2*x)*_C1-ln(x)
```

4.1498 $y(x)\left(a+bx^2\right)+x^2y''(x)+x^2y'(x)=0$

ODE

$$y(x)\left(a+bx^2\right)+x^2y''(x)+x^2y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0299254 (sec), leaf count = 85

$$\left\{\left\{y(x)\to e^{-x/2}\sqrt{x}\left(c_1 J_{\frac{1}{2}\sqrt{1-4a}}\left(-\frac{1}{2}i\sqrt{1-4b}x\right)+c_2 Y_{\frac{1}{2}\sqrt{1-4a}}\left(-\frac{1}{2}i\sqrt{1-4b}x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.068 (sec), leaf count = 57

$$\left\{y(x)=\sqrt{x}\mathrm{e}^{-\frac{x}{2}}\left(Y_{\frac{1}{2}\sqrt{1-4\,a}}\left(\frac{x}{2}\sqrt{4\,b-1}\right)\_C2+J_{\frac{1}{2}\sqrt{1-4\,a}}\left(\frac{x}{2}\sqrt{4\,b-1}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x^2)*y[x] + x^2*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[x]*(BesselJ[Sqrt[1 - 4*a]/2, (-I/2)*Sqrt[1 - 4*b]*x]*C[1] + Bess
elY[Sqrt[1 - 4*a]/2, (-I/2)*Sqrt[1 - 4*b]*x]*C[2]))/E^(x/2)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x^2*diff(y(x),x)+(b*x^2+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*exp(-1/2*x)*(BesselY(1/2*(1-4*a)^(1/2),1/2*(4*b-1)^(1/2)*x)*_C2+B
esselJ(1/2*(1-4*a)^(1/2),1/2*(4*b-1)^(1/2)*x)*_C1)
```

4.1499 $x^2y''(x) - (1-x^2)\,y'(x) - y(x) = 0$

ODE

$$x^2y''(x) - (1-x^2)\,y'(x) - y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 8.95038 (sec), leaf count = 34

$$\left\{\left\{y(x) \to e^{-x}\left(c_2 \int_1^x e^{K[1]-\frac{1}{K[1]}}\,dK[1] + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.176 (sec), leaf count = 51

$$\left\{y(x) = \sqrt{x}\left(\mathrm{e}^{-x}\mathit{HeunD}\left(4,3,-8,5,\frac{-1+x}{1+x}\right)\_C1 + \mathrm{e}^{-x^{-1}}\mathit{HeunD}\left(-4,3,-8,5,\frac{-1+x}{1+x}\right)\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[-y[x] - (1 - x^2)*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + C[2]*Integrate[E^(-K[1]^(-1) + K[1]), {K[1], 1, x}])/E^x}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-(-x^2+1)*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(exp(-x)*HeunD(4,3,-8,5,(-1+x)/(1+x))*_C1+exp(-1/x)*HeunD(-4,3,-8
,5,(-1+x)/(1+x))*_C2)
```

4.1500 $x^2y''(x) + (1-x)xy'(x) - (1-x)y(x) = 0$

ODE

$$x^2y''(x) + (1-x)xy'(x) - (1-x)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0239135 (sec), leaf count = 34

$$\left\{\left\{y(x) \to c_1 x - \frac{c_2\left(e^x(x+1) - x^2\text{Ei}(x)\right)}{2x}\right\}\right\}$$

Maple ✓
cpu = 0.06 (sec), leaf count = 31

$$\left\{y(x) = \frac{Ei(1,-x)\_C2\,x^2 + \_C2\,(1+x)\,e^x + \_C1\,x^2}{x}\right\}$$

Mathematica raw input

```
DSolve[-((1 - x)*y[x]) + (1 - x)*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] - (C[2]*(E^x*(1 + x) - x^2*ExpIntegralEi[x]))/(2*x)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(1-x)*diff(y(x),x)-(1-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (Ei(1,-x)*_C2*x^2+_C2*(1+x)*exp(x)+_C1*x^2)/x
```

4.1501 $x^2y''(x) - (x+2)xy'(x) + (x+2)y(x) = 0$

ODE

$$x^2y''(x) - (x+2)xy'(x) + (x+2)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0112814 (sec), leaf count = 16

$$\{\{y(x) \to x(c_2e^x + c_1)\}\}$$

Maple ✓
cpu = 0.045 (sec), leaf count = 12

$$\{y(x) = x(\_C1 + \_C2\, \mathrm{e}^x)\}$$

Mathematica raw input

```
DSolve[(2 + x)*y[x] - x*(2 + x)*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[1] + E^x*C[2])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-x*(2+x)*diff(y(x),x)+(2+x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(_C1+_C2*exp(x))
```

4.1502 $x^2y''(x) - (x+2)xy'(x) + (x+2)y(x) = x^3$

ODE

$$x^2y''(x) - (x+2)xy'(x) + (x+2)y(x) = x^3$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0164543 (sec), leaf count = 22

$$\{\{y(x) \to -x(-c_2e^x - c_1 + x + 1)\}\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 15

$$\{y(x) = x(\mathrm{e}^x\_C1 + \_C2 - x)\}$$

Mathematica raw input

```
DSolve[(2 + x)*y[x] - x*(2 + x)*y'[x] + x^2*y''[x] == x^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x*(1 + x - C[1] - E^x*C[2]))}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-x*(2+x)*diff(y(x),x)+(2+x)*y(x) = x^3, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(exp(x)*_C1+_C2-x)
```

4.1503 $x^2y''(x) + (2-x)xy'(x) - (3x+2)y(x) = 0$

ODE

$$x^2y''(x) + (2-x)xy'(x) - (3x+2)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0208458 (sec), leaf count = 41

$$\left\{\left\{y(x) \to c_1 e^x x - \frac{c_2\left(e^x x^3 \text{Ei}(-x) + x^2 - x + 2\right)}{6x^2}\right\}\right\}$$

Maple ✓
cpu = 0.048 (sec), leaf count = 37

$$\left\{y(x) = \frac{\mathrm{e}^x Ei(1,x)\_C2\, x^3 + \_C1\, x^3 \mathrm{e}^x - \_C2\, \left(x^2 - x + 2\right)}{x^2}\right\}$$

Mathematica raw input

```
DSolve[-((2 + 3*x)*y[x]) + (2 - x)*x*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*x*C[1] - (C[2]*(2 - x + x^2 + E^x*x^3*ExpIntegralEi[-x]))/(6*x^2)}
}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(2-x)*diff(y(x),x)-(2+3*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (exp(x)*Ei(1,x)*_C2*x^3+_C1*x^3*exp(x)-_C2*(x^2-x+2))/x^2
```

4.1504 $x^2y''(x)+(x+3)xy'(x)-y(x)=0$

ODE

$$x^2y''(x)+(x+3)xy'(x)-y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0254063 (sec), leaf count = 63

$$\left\{\left\{y(x)\to e^{-x}x^{\sqrt{2}-1}\left(c_1U\left(2+\sqrt{2},1+2\sqrt{2},x\right)+c_2L^{2\sqrt{2}}_{-2-\sqrt{2}}(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.144 (sec), leaf count = 93

$$\left\{y(x)=-1e^{-\frac{x}{2}}\left(-\_C1\left(\sqrt{2}+x+1\right)I_{-\frac{1}{2}+\sqrt{2}}\left(\frac{x}{2}\right)-\_C1\left(x-\sqrt{2}+1\right)I_{\frac{1}{2}+\sqrt{2}}\left(\frac{x}{2}\right)+\left(\left(-\sqrt{2}-x-1\right)K_{-\frac{1}{2}+\sqrt{2}}\left(\frac{x}{2}\right)+I\right.\right.\right.$$

Mathematica raw input

```
DSolve[-y[x] + x*(3 + x)*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(-1 + Sqrt[2])*(C[1]*HypergeometricU[2 + Sqrt[2], 1 + 2*Sqrt[2], x]
 + C[2]*LaguerreL[-2 - Sqrt[2], 2*Sqrt[2], x]))/E^x}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(3+x)*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -exp(-1/2*x)*(-_C1*(2^(1/2)+x+1)*BesselI(-1/2+2^(1/2),1/2*x)-_C1*(x-2^(1/
2)+1)*BesselI(1/2+2^(1/2),1/2*x)+((-2^(1/2)-x-1)*BesselK(-1/2+2^(1/2),1/2*x)+Bes
selK(1/2+2^(1/2),1/2*x)*(x-2^(1/2)+1))*_C2)/x^(1/2)
```

4.1505 $x^2y''(x) - 2(x+1)xy'(x) + 2(x+1)y(x) = 0$

ODE

$$x^2y''(x) - 2(x+1)xy'(x) + 2(x+1)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0128183 (sec), leaf count = 21

$$\left\{\left\{y(x) \to x\left(\frac{1}{2}c_2e^{2x} + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 14

$$\{y(x) = x(e^{2x}\_C2 + \_C1)\}$$

Mathematica raw input

```
DSolve[2*(1 + x)*y[x] - 2*x*(1 + x)*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[1] + (E^(2*x)*C[2])/2)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*(1+x)*diff(y(x),x)+2*(1+x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(exp(2*x)*_C2+_C1)
```

4.1506 $ax^2y'(x) + x^2y''(x) - 2y(x) = 0$

ODE

$$ax^2y'(x) + x^2y''(x) - 2y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0207021 (sec), leaf count = 80

$$\left\{\left\{y(x) \to -\frac{ax^{3/2}e^{-\frac{ax}{2}}\left(2(2c_1 + iac_2x)\sinh\left(\frac{ax}{2}\right) - 2(ac_1x + 2ic_2)\cosh\left(\frac{ax}{2}\right)\right)}{\sqrt{\pi}(-iax)^{5/2}}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 28

$$\left\{y(x) = \frac{\_C2\,(ax+2)\,\mathrm{e}^{-ax} + \_C1\,(ax-2)}{x}\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + a*x^2*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a*x^(3/2)*(-2*(a*x*C[1] + (2*I)*C[2])*Cosh[(a*x)/2] + 2*(2*C[1] + I
*a*x*C[2])*Sinh[(a*x)/2]))/(E^((a*x)/2)*Sqrt[Pi]*((-I)*a*x)^(5/2)))}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a*x^2*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*(a*x+2)*exp(-a*x)+_C1*(a*x-2))/x
```

4.1507 $-x(ax+5)y'(x)+(3ax+5)y(x)+x^2y''(x)=0$

ODE

$$-x(ax+5)y'(x)+(3ax+5)y(x)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0902348 (sec), leaf count = 41

$$\left\{\left\{y(x)\to \frac{c_2x\left(a^2x^2+4ax+6\right)}{a^4}-c_1xe^{ax}(ax-3)\right\}\right\}$$

Maple ✓
cpu = 0.043 (sec), leaf count = 33

$$\left\{y(x)=\left(\_C2\,(ax-3)\,\mathrm{e}^{ax}+\_C1\,\left(a^2x^2+4\,ax+6\right)\right)x\right\}$$

Mathematica raw input

```
DSolve[(5 + 3*a*x)*y[x] - x*(5 + a*x)*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(E^(a*x)*x*(-3 + a*x)*C[1]) + (x*(6 + 4*a*x + a^2*x^2)*C[2])/a^4}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-x*(a*x+5)*diff(y(x),x)+(3*a*x+5)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*(a*x-3)*exp(a*x)+_C1*(a^2*x^2+4*a*x+6))*x
```

4.1508 $x(\mathbf{a1}+\mathbf{b1}x)y'(x)+y(x)\left(\mathbf{a2}+\mathbf{b2}x+\mathbf{c2}x^2\right)+x^2y''(x)=0$

ODE

$$x(\mathrm{a1}+\mathrm{b1}x)y'(x)+y(x)\left(\mathrm{a2}+\mathrm{b2}x+\mathrm{c2}x^2\right)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0740569 (sec), leaf count = 223

$$\left\{\left\{y(x)\to x^{\frac{1}{2}\left(\sqrt{\mathrm{a1}^2-2\mathrm{a1}-4\mathrm{a2}+1}-\mathrm{a1}+1\right)}e^{-\frac{1}{2}x\left(\sqrt{\mathrm{b1}^2-4\mathrm{c2}}+\mathrm{b1}\right)}\left(c_1U\left(\frac{\sqrt{\mathrm{b1}^2-4\mathrm{c2}}\left(\sqrt{\mathrm{a1}^2-2\mathrm{a1}-4\mathrm{a2}+1}+1\right)+\mathrm{a1b1}-2\mathrm{b2}}{2\sqrt{\mathrm{b1}^2-4\mathrm{c2}}},\sqrt{}\right.\right.\right.$$

Maple ✓
cpu = 0.266 (sec), leaf count = 110

$$\left\{y(x)=\mathrm{e}^{-\frac{b1\,x}{2}}x^{-\frac{a1}{2}}\left(W_{-\frac{a1\,b1-2\,b2}{2}\frac{1}{\sqrt{b1^2-4\,c2}},\frac{1}{2}\sqrt{a1^2-2\,a1-4\,a2+1}}\left(\sqrt{b1^2-4\,c2}x\right)\_C2+M_{-\frac{a1\,b1-2\,b2}{2}\frac{1}{\sqrt{b1^2-4\,c2}},\frac{1}{2}\sqrt{a1^2-2\,a1-4\,a2+}}\right.\right.$$

Mathematica raw input

```
DSolve[(a2 + b2*x + c2*x^2)*y[x] + x*(a1 + b1*x)*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^((1 - a1 + Sqrt[1 - 2*a1 + a1^2 - 4*a2])/2)*(C[1]*HypergeometricU[(
a1*b1 - 2*b2 + (1 + Sqrt[1 - 2*a1 + a1^2 - 4*a2])*Sqrt[b1^2 - 4*c2])/(2*Sqrt[b1^
2 - 4*c2]), 1 + Sqrt[1 - 2*a1 + a1^2 - 4*a2], Sqrt[b1^2 - 4*c2]*x] + C[2]*Laguer
reL[(-(a1*b1) + 2*b2 - (1 + Sqrt[1 - 2*a1 + a1^2 - 4*a2])*Sqrt[b1^2 - 4*c2])/(2*
Sqrt[b1^2 - 4*c2]), Sqrt[1 - 2*a1 + a1^2 - 4*a2], Sqrt[b1^2 - 4*c2]*x]))/E^(((b1
 + Sqrt[b1^2 - 4*c2])*x)/2)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(b1*x+a1)*diff(y(x),x)+(c2*x^2+b2*x+a2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/2*b1*x)*x^(-1/2*a1)*(WhittakerW(-1/2*(a1*b1-2*b2)/(b1^2-4*c2)^(1/2
),1/2*(a1^2-2*a1-4*a2+1)^(1/2),(b1^2-4*c2)^(1/2)*x)*_C2+WhittakerM(-1/2*(a1*b1-2
*b2)/(b1^2-4*c2)^(1/2),1/2*(a1^2-2*a1-4*a2+1)^(1/2),(b1^2-4*c2)^(1/2)*x)*_C1)
```

4.1509 $x^3y'(x)+x^2y''(x)-(2-x^2)\,y(x)=0$

ODE

$$x^3y'(x)+x^2y''(x)-\left(2-x^2\right)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0337592 (sec), leaf count = 49

$$\left\{\left\{y(x)\to \frac{\sqrt{2\pi}c_2\text{erf}\left(\frac{x}{\sqrt{2}}\right)-2c_2e^{-\frac{x^2}{2}}x+2c_1}{2x}\right\}\right\}$$

Maple ✓
cpu = 0.049 (sec), leaf count = 35

$$\left\{y(x)=\frac{1}{x}\left(\sqrt{\pi}Erf\left(\frac{\sqrt{2}x}{2}\right)\sqrt{2}\_C2-2\,\mathrm{e}^{-1/2\,x^2}\_C2\,x+\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-((2 - x^2)*y[x]) + x^3*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*C[1] - (2*x*C[2])/E^(x^2/2) + Sqrt[2*Pi]*C[2]*Erf[x/Sqrt[2]])/(2*x)
}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x^3*diff(y(x),x)-(-x^2+2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (Pi^(1/2)*erf(1/2*2^(1/2)*x)*2^(1/2)*_C2-2*exp(-1/2*x^2)*_C2*x+_C1)/x
```

4.1510 $x^2y''(x) + (1-x^2)\,xy'(x) - (x^2+1)\,y(x) = 0$

ODE

$$x^2y''(x) + (1-x^2)\,xy'(x) - (x^2+1)\,y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.01265 (sec), leaf count = 26

$$\left\{\left\{y(x) \to \frac{c_2 e^{\frac{x^2}{2}} - c_1}{x}\right\}\right\}$$

Maple ✓
cpu = 0.098 (sec), leaf count = 18

$$\left\{y(x) = \frac{1}{x}\left(\_C2\, \mathrm{e}^{\frac{x^2}{2}} + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-((1 + x^2)*y[x]) + x*(1 - x^2)*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-C[1] + E^(x^2/2)*C[2])/x}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(-x^2+1)*diff(y(x),x)-(x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*exp(1/2*x^2)+_C1)/x
```

4.1511 $4x^3y'(x) + x^2y''(x) + (4x^4 + 2x^2 + 1)\,y(x) = 0$

ODE

$$4x^3y'(x) + x^2y''(x) + \left(4x^4 + 2x^2 + 1\right)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0267278 (sec), leaf count = 60

$$\left\{\left\{y(x) \to \frac{1}{3}e^{-x^2}x^{\frac{1}{2}-\frac{i\sqrt{3}}{2}}\left(3c_1 - i\sqrt{3}c_2x^{i\sqrt{3}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.081 (sec), leaf count = 36

$$\left\{y(x) = \mathrm{e}^{-x^2}\left(x^{\frac{1}{2}-\frac{i}{2}\sqrt{3}}\_C2 + x^{\frac{1}{2}+\frac{i}{2}\sqrt{3}}\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(1 + 2*x^2 + 4*x^4)*y[x] + 4*x^3*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(1/2 - (I/2)*Sqrt[3])*(3*C[1] - I*Sqrt[3]*x^(I*Sqrt[3])*C[2]))/(3*E
^x^2)}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+4*x^3*diff(y(x),x)+(4*x^4+2*x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x^2)*(x^(1/2-1/2*I*3^(1/2))*_C2+x^(1/2+1/2*I*3^(1/2))*_C1)
```

4.1512 $xy'(x)\left(\mathbf{a0}+\mathbf{b0}x^k\right)+y(x)\left(\mathbf{a1}+\mathbf{b1}x^k+\mathbf{c1}x^{2k}\right)+x^2y''(x)=0$

ODE

$$xy'(x)\left(\mathrm{a0}+\mathrm{b0}x^k\right)+y(x)\left(\mathrm{a1}+\mathrm{b1}x^k+\mathrm{c1}x^{2k}\right)+x^2y''(x)=0$$

ODE Classification

```
[[_2nd_order, _with_linear_symmetries]]
```

Book solution method
TO DO

Mathematica ✓
cpu = 0.124977 (sec), leaf count = 414

$$\left\{\left\{y(x)\to 2^{\frac{1}{2}\left(\frac{\sqrt{k^2\left(\mathrm{a0}^2-2\mathrm{a0}-4\mathrm{a1}+1\right)}}{k^2}+1\right)}x^{\frac{1}{2}(-\mathrm{a0}-k+1)}\left(x^k\right)^{\frac{1}{2}\left(\frac{\sqrt{k^2\left(\mathrm{a0}^2-2\mathrm{a0}-4\mathrm{a1}+1\right)}}{k^2}+1\right)}e^{-\frac{\left(\sqrt{\mathrm{b0}^2-4\mathrm{c1}}+\mathrm{b0}\right)x^k}{2k}}\left(c_1U\left(\frac{\left(k^2+\sqrt{(\mathrm{a0}^2-\right.}{}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.222 (sec), leaf count = 148

$$\left\{y(x)=x^{-\frac{a0}{2}+\frac{1}{2}-\frac{k}{2}}\mathrm{e}^{-\frac{b0\,x^k}{2\,k}}\left(W_{-\frac{(a0-1+k)b0-2\,b1}{2\,k}\frac{1}{\sqrt{b0^2-4\,c1}},\,\frac{1}{2\,k}\sqrt{a0^2-2\,a0-4\,a1+1}}\left(\frac{x^k}{k}\sqrt{b0^2-4\,c1}\right)_C2+M_{-\frac{(a0-1+k)b0-2\,b1}{2\,k}\frac{1}{\sqrt{b0^2-}}}\right.\right.$$

Mathematica raw input

```
DSolve[(a1 + b1*x^k + c1*x^(2*k))*y[x] + x*(a0 + b0*x^k)*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2^((1 + Sqrt[(1 - 2*a0 + a0^2 - 4*a1)*k^2]/k^2)/2)*x^((1 - a0 - k)/2)
*(x^k)^((1 + Sqrt[(1 - 2*a0 + a0^2 - 4*a1)*k^2]/k^2)/2)*(C[1]*HypergeometricU[(b
0*Sqrt[b0^2 - 4*c1]*k*(-1 + a0 + k) + b0^2*(k^2 + Sqrt[(1 - 2*a0 + a0^2 - 4*a1)*
k^2]) - 2*(b1*Sqrt[b0^2 - 4*c1]*k + 2*c1*(k^2 + Sqrt[(1 - 2*a0 + a0^2 - 4*a1)*k^
2])))/(2*(b0^2 - 4*c1)*k^2), (k^2 + Sqrt[(1 - 2*a0 + a0^2 - 4*a1)*k^2])/k^2, (Sq
rt[b0^2 - 4*c1]*x^k)/k] + C[2]*LaguerreL[-(b0*Sqrt[b0^2 - 4*c1]*k*(-1 + a0 + k)
+ b0^2*(k^2 + Sqrt[(1 - 2*a0 + a0^2 - 4*a1)*k^2]) - 2*(b1*Sqrt[b0^2 - 4*c1]*k +
2*c1*(k^2 + Sqrt[(1 - 2*a0 + a0^2 - 4*a1)*k^2])))/(2*(b0^2 - 4*c1)*k^2), Sqrt[(1
 - 2*a0 + a0^2 - 4*a1)*k^2]/k^2, (Sqrt[b0^2 - 4*c1]*x^k)/k]))/E^(((b0 + Sqrt[b0^
2 - 4*c1])*x^k)/(2*k))}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(a0+b0*x^k)*diff(y(x),x)+(a1+b1*x^k+c1*x^(2*k))*y(x) = 0, y(x),'imp
```

Maple raw output

```
y(x) = x^(-1/2*a0+1/2-1/2*k)*exp(-1/2/k*b0*x^k)*(WhittakerW(-1/2/(b0^2-4*c1)^(1/
2)*((a0-1+k)*b0-2*b1)/k,1/2*(a0^2-2*a0-4*a1+1)^(1/2)/k,(b0^2-4*c1)^(1/2)/k*x^k)*
_C2+WhittakerM(-1/2/(b0^2-4*c1)^(1/2)*((a0-1+k)*b0-2*b1)/k,1/2*(a0^2-2*a0-4*a1+1
)^(1/2)/k,(b0^2-4*c1)^(1/2)/k*x^k)*_C1)
```

4.1513 $xy'(x)\left(\mathbf{a0}+\mathbf{a1}x^r+\mathbf{a2}x^s\right)+y(x)\left(\mathbf{b0}+\mathbf{b1}x^r+\mathbf{b2}x^{2r}+\mathbf{b3}x^s+\mathbf{b4}x^{2s}+\mathbf{b5}x^{r+s}\right)+x^2y''(x)=0$

ODE

$$xy'(x)\left(\text{a0}+\text{a1}x^r+\text{a2}x^s\right)+y(x)\left(\text{b0}+\text{b1}x^r+\text{b2}x^{2r}+\text{b3}x^s+\text{b4}x^{2s}+\text{b5}x^{r+s}\right)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 2.40625 (sec), leaf count = 0 , could not solve

```
DSolve[(b0 + b1*x^r + b2*x^(2*r) + b3*x^s + b4*x^(2*s) + b5*x^(r + s))*y[x] + x*(a0 + a1*x^r + a2*x^s
```

Maple ✗
cpu = 2.178 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)+\frac{(a0+a1\,x^r+a2\,x^s)\,\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{x}+\frac{\left(b0+b1\,x^r+b2\,x^{2\,r}+b3\,x^s+b4\,x^{2\,s}+b5\,x^{r+s}\right)\_Y\right.\right.$$

Mathematica raw input

```
DSolve[(b0 + b1*x^r + b2*x^(2*r) + b3*x^s + b4*x^(2*s) + b5*x^(r + s))*y[x] + x*(a0 + a1*x^r + a2*x^s
```

Mathematica raw output

```
DSolve[(b0 + b1*x^r + b2*x^(2*r) + b3*x^s + b4*x^(2*s) + b5*x^(r + s))*y[x] + x*
(a0 + a1*x^r + a2*x^s)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0, y[x],
 x]
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(a0+a1*x^r+a2*x^s)*diff(y(x),x)+(b0+b1*x^r+b2*x^(2*r)+b3*x^s+b4*x^(
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+1/x*(a0+a1*x^r+a2*x^s)*diff(_Y(x),x)+(b0+b1*
x^r+b2*x^(2*r)+b3*x^s+b4*x^(2*s)+b5*x^(r+s))/x^2*_Y(x)},{_Y(x)})
```

4.1514 $ay(x) + x^2 y''(x) + 2x^2 \cot(x) y'(x) = 0$

ODE

$$ay(x) + x^2 y''(x) + 2x^2 \cot(x) y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0671049 (sec), leaf count = 50

$$\left\{\left\{y(x) \to \sqrt{x} \csc(x) \left(c_1 J_{\frac{1}{2}\sqrt{1-4a}}(x) + c_2 Y_{\frac{1}{2}\sqrt{1-4a}}(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.032 (sec), leaf count = 39

$$\left\{y(x) = \frac{1}{\sin(x)} \sqrt{x} \left(J_{\frac{1}{2}\sqrt{1-4a}}(x) \_C1 + Y_{\frac{1}{2}\sqrt{1-4a}}(x) \_C2\right)\right\}$$

Mathematica raw input

```
DSolve[a*y[x] + 2*x^2*Cot[x]*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*(BesselJ[Sqrt[1 - 4*a]/2, x]*C[1] + BesselY[Sqrt[1 - 4*a]/2, x
]*C[2])*Csc[x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x^2*diff(y(x),x)*cot(x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(BesselJ(1/2*(1-4*a)^(1/2),x)*_C1+BesselY(1/2*(1-4*a)^(1/2),x)*_C
2)/sin(x)
```

4.1515 $-y(x)(a - x\cot(x)) + x^2y''(x) + x(2x\cot(x) + 1)y'(x) = 0$

ODE

$$-y(x)(a - x\cot(x)) + x^2y''(x) + x(2x\cot(x) + 1)y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.134359 (sec), leaf count = 29

$$\{\{y(x) \to \csc(x)\left(c_1 J_{\sqrt{a}}(x) + c_2 Y_{\sqrt{a}}(x)\right)\}\}$$

Maple ✓
cpu = 0.04 (sec), leaf count = 24

$$\left\{y(x) = \frac{1}{\sin(x)}\left(\_C2\, Y_{\sqrt{a}}(x) + \_C1\, J_{\sqrt{a}}(x)\right)\right\}$$

Mathematica raw input

```
DSolve[-((a - x*Cot[x])*y[x]) + x*(1 + 2*x*Cot[x])*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (BesselJ[Sqrt[a], x]*C[1] + BesselY[Sqrt[a], x]*C[2])*Csc[x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+(1+2*x*cot(x))*x*diff(y(x),x)-(a-x*cot(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*BesselY(a^(1/2),x)+_C1*BesselJ(a^(1/2),x))/sin(x)
```

4.1516 $ay(x) + x^2 y''(x) - 2x^2 \tan(x) y'(x) = 0$

ODE

$$ay(x) + x^2 y''(x) - 2x^2 \tan(x) y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0644282 (sec), leaf count = 50

$$\left\{\left\{y(x) \to \sqrt{x} \sec(x) \left(c_1 J_{\frac{1}{2}\sqrt{1-4a}}(x) + c_2 Y_{\frac{1}{2}\sqrt{1-4a}}(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 39

$$\left\{y(x) = \frac{1}{\cos(x)} \sqrt{x} \left(Y_{\frac{1}{2}\sqrt{1-4a}}(x) \_C2 + J_{\frac{1}{2}\sqrt{1-4a}}(x) \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[a*y[x] - 2*x^2*Tan[x]*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*(BesselJ[Sqrt[1 - 4*a]/2, x]*C[1] + BesselY[Sqrt[1 - 4*a]/2, x
]*C[2])*Sec[x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x^2*diff(y(x),x)*tan(x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(BesselY(1/2*(1-4*a)^(1/2),x)*_C2+BesselJ(1/2*(1-4*a)^(1/2),x)*_C
1)/cos(x)
```

4.1517 $-y(x)(a+x\tan(x))+x^2y''(x)+x(1-2x\tan(x))y'(x)=0$

ODE

$$-y(x)(a+x\tan(x))+x^2y''(x)+x(1-2x\tan(x))y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.158315 (sec), leaf count = 29

$$\{\{y(x)\to \sec(x)\left(c_1 J_{\sqrt{a}}(x)+c_2 Y_{\sqrt{a}}(x)\right)\}\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 24

$$\left\{y(x)=\frac{1}{\cos(x)}\left(\_C2\,Y_{\sqrt{a}}(x)+\_C1\,J_{\sqrt{a}}(x)\right)\right\}$$

Mathematica raw input

```
DSolve[-((a + x*Tan[x])*y[x]) + x*(1 - 2*x*Tan[x])*y'[x] + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (BesselJ[Sqrt[a], x]*C[1] + BesselY[Sqrt[a], x]*C[2])*Sec[x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+(1-2*x*tan(x))*x*diff(y(x),x)-(a+x*tan(x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*BesselY(a^(1/2),x)+_C1*BesselJ(a^(1/2),x))/cos(x)
```

4.1518 $y(x)\left(f(x)\left(\mathbf{a1}+\mathbf{b1}x^k-1\right)+\mathbf{a2}+\mathbf{b2}x^k+\mathbf{c2}x^{2k}+f'(x)+f(x)^2\right)+xy'(x)\left(\mathbf{a1}+\mathbf{b1}x^k+2f(x)\right)+x^2y''(x)=0$

ODE

$$y(x)\left(f(x)\left(\mathrm{a1}+\mathrm{b1}x^k-1\right)+\mathrm{a2}+\mathrm{b2}x^k+\mathrm{c2}x^{2k}+f'(x)+f(x)^2\right)+xy'(x)\left(\mathrm{a1}+\mathrm{b1}x^k+2f(x)\right)+x^2y''(x)=0$$

ODE Classification

```
(ODEtools/info) missing specification of intermediate function
```

Book solution method
TO DO

Mathematica ✗
cpu = 1.85504 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*(a2 + b2*x^k + c2*x^(2*k) + (-1 + a1 + b1*x^k)*f[x] + f[x]^2 + Derivative[1][f][x]) + x*(
```

Maple ✗
cpu = 2.788 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}_Y(x)+\frac{\left(a1+b1\,x^k+2\,f(x)\right)\frac{\mathrm{d}}{\mathrm{d}x}_Y(x)}{x}+\frac{\left(a2+b2\,x^k+c2\,x^{2\,k}+\left(a1+b1\,x^k-1\right)f(x)+(f(\right.}{x^2}\right.\right.\right.$$

Mathematica raw input

```
DSolve[y[x]*(a2 + b2*x^k + c2*x^(2*k) + (-1 + a1 + b1*x^k)*f[x] + f[x]^2 + f'[x]) + x*(a1 + b1*x^k +
```

Mathematica raw output

```
DSolve[y[x]*(a2 + b2*x^k + c2*x^(2*k) + (-1 + a1 + b1*x^k)*f[x] + f[x]^2 + Deriv
ative[1][f][x]) + x*(a1 + b1*x^k + 2*f[x])*Derivative[1][y][x] + x^2*Derivative[
2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(a1+b1*x^k+2*f(x))*diff(y(x),x)+(a2+b2*x^k+c2*x^(2*k)+(a1+b1*x^k-
1)*f(x)+f(x)^2+diff(f(x),x))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+1/x*(a1+b1*x^k+2*f(x))*diff(_Y(x),x)+(a2+b2*
x^k+c2*x^(2*k)+(a1+b1*x^k-1)*f(x)+f(x)^2+diff(f(x),x))/x^2*_Y(x)},{_Y(x)})
```

4.1519 $(x^2+1)\,y''(x)-2y(x)=0$

ODE

$$(x^2+1)\,y''(x)-2y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0232831 (sec), leaf count = 30

$$\left\{\left\{y(x)\to c_1(x^2+1)+\frac{1}{2}c_2\left((x^2+1)\tan^{-1}(x)+x\right)\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 29

$$\left\{y(x)=\left(\left(\frac{x}{2\,x^2+2}+\frac{\arctan(x)}{2}\right)\_C1+\_C2\right)(x^2+1)\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + (1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x^2)*C[1] + ((x + (1 + x^2)*ArcTan[x])*C[2])/2}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ((1/2*x/(x^2+1)+1/2*arctan(x))*_C1+_C2)*(x^2+1)
```

4.1520 $a + (x^2+1)\,y''(x) - xy'(x) = 0$

ODE

$$a + (x^2+1)\,y''(x) - xy'(x) = 0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0477726 (sec), leaf count = 38

$$\left\{\left\{y(x) \to \frac{1}{2}\left(-ax^2 + c_1\sqrt{x^2+1}x + c_1 \sinh^{-1}(x) + 2c_2\right)\right\}\right\}$$

Maple ✓
cpu = 0.029 (sec), leaf count = 28

$$\left\{y(x) = \frac{\_C1\,x}{2}\sqrt{x^2+1} + \frac{\_C1\,Arcsinh(x)}{2} - \frac{ax^2}{2} + \_C2\right\}$$

Mathematica raw input

```
DSolve[a - x*y'[x] + (1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(a*x^2) + x*Sqrt[1 + x^2]*C[1] + ArcSinh[x]*C[1] + 2*C[2])/2}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)-x*diff(y(x),x)+a = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*_C1*x*(x^2+1)^(1/2)+1/2*_C1*arcsinh(x)-1/2*a*x^2+_C2
```

4.1521 $(1-x^2)\,y''(x)+xy'(x)=x$

ODE

$$(1-x^2)\,y''(x)+xy'(x)=x$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0234863 (sec), leaf count = 43

$$\left\{\left\{y(x)\to \frac{1}{2}c_1\sqrt{x^2-1}x-\frac{1}{2}c_1\log\left(\sqrt{x^2-1}+x\right)+c_2+x\right\}\right\}$$

Maple ✓
cpu = 0.037 (sec), leaf count = 61

$$\left\{y(x)=-\frac{1}{2}\left(-2\sqrt{1+x}(x+\_C2)\sqrt{-1+x}+\left(-x^3+\ln\left(x+\sqrt{x^2-1}\right)\sqrt{(-1+x)(1+x)}+x\right)\_C1\right)\frac{1}{\sqrt{-1+x}}\frac{1}{\sqrt{1+x}}\right.$$

Mathematica raw input

```
DSolve[x*y'[x] + (1 - x^2)*y''[x] == x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x + (x*Sqrt[-1 + x^2]*C[1])/2 + C[2] - (C[1]*Log[x + Sqrt[-1 + x^2]])/
2}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)+x*diff(y(x),x) = x, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2/(1+x)^(1/2)/(-1+x)^(1/2)*(-2*(1+x)^(1/2)*(x+_C2)*(-1+x)^(1/2)+(-x^3+
ln(x+(x^2-1)^(1/2))*((-1+x)*(1+x))^(1/2)+x)*_C1)
```

4.1522 $(x^2+1)\,y''(x) - xy'(x) + y(x) = 0$

ODE

$$(x^2+1)\,y''(x) - xy'(x) + y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0301513 (sec), leaf count = 29

$$\left\{\left\{y(x) \to -c_2\sqrt{x^2+1} + c_1 x + c_2 x \sinh^{-1}(x)\right\}\right\}$$

Maple ✓
cpu = 0.038 (sec), leaf count = 23

$$\left\{y(x) = -\sqrt{x^2+1}\_C2 + x(\_C2\ Arcsinh(x) + \_C1)\right\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + (1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] - Sqrt[1 + x^2]*C[2] + x*ArcSinh[x]*C[2]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -(x^2+1)^(1/2)*_C2+x*(_C2*arcsinh(x)+_C1)
```

4.1523 $(1-x^2)\,y''(x)+xy'(x)-y(x)=0$

ODE

$$(1-x^2)\,y''(x)+xy'(x)-y(x)=0$$

ODE Classification

[_Gegenbauer]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0309846 (sec), leaf count = 39

$$\left\{\left\{y(x)\to -c_2\sqrt{x^2-1}+c_2 x\log\left(\sqrt{x^2-1}+x\right)+c_1 x\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 31

$$\left\{y(x)=\left(\ln\left(x+\sqrt{x^2-1}\right)\_C2+\_C1\right)x-\sqrt{x^2-1}\_C2\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] - Sqrt[-1 + x^2]*C[2] + x*C[2]*Log[x + Sqrt[-1 + x^2]]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (ln(x+(x^2-1)^(1/2))*_C2+_C1)*x-(x^2-1)^(1/2)*_C2
```

4.1524 $(1-x^2)\,y''(x)-xy'(x)+y(x)=0$

ODE

$$(1-x^2)\,y''(x)-xy'(x)+y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0639342 (sec), leaf count = 63

$$\left\{\left\{y(x)\to c_1\cosh\left(\frac{\sqrt{1-x^2}\sin^{-1}(x)}{\sqrt{x^2-1}}\right)+ic_2\sinh\left(\frac{\sqrt{1-x^2}\sin^{-1}(x)}{\sqrt{x^2-1}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 20

$$\left\{y(x)=\_C1\,x+\_C2\,\sqrt{-1+x}\sqrt{1+x}\right\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[(Sqrt[1 - x^2]*ArcSin[x])/Sqrt[-1 + x^2]] + I*C[2]*Sinh[(Sqr
t[1 - x^2]*ArcSin[x])/Sqrt[-1 + x^2]]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x+_C2*(-1+x)^(1/2)*(1+x)^(1/2)
```

4.1525 $(1-x^2)\,y''(x)-xy'(x)-y(x)=0$

ODE

$$(1-x^2)\,y''(x)-xy'(x)-y(x)=0$$

ODE Classification

[_Gegenbauer, [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.023909 (sec), leaf count = 38

$$\left\{\left\{y(x)\to c_2 \sin\left(\log\left(\sqrt{x^2-1}+x\right)\right)+c_1\cos\left(\log\left(\sqrt{x^2-1}+x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 37

$$\left\{y(x)=1\left(\_C1\left(\left(x+\sqrt{x^2-1}\right)^i\right)^2+\_C2\right)\left(\left(x+\sqrt{x^2-1}\right)^i\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[-y[x] - x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[Log[x + Sqrt[-1 + x^2]]] + C[2]*Sin[Log[x + Sqrt[-1 + x^2]]]}
}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*((x+(x^2-1)^(1/2))^I)^2+_C2)/((x+(x^2-1)^(1/2))^I)
```

4.1526 $(1-x^2)\,y''(x)+xy'(x)-y(x)=x(1-x^2)^{3/2}$

ODE

$$(1-x^2)\,y''(x)+xy'(x)-y(x)=x(1-x^2)^{3/2}$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.108009 (sec), leaf count = 173

$$\left\{\left\{y(x)\to \frac{(x^2-1)\left(-9c_1\sqrt{1-x^2}x+9c_2\sqrt{-(x^2-1)^2}+x^5-2x^3+x\right)-3\left(-3c_2\sqrt{1-x^2}x+3c_2\sqrt{1-x^2}x^3+\sqrt{x^2-1}\right.\right.}{9\,(1-x^2)^{3/2}}\right.$$

Maple ✓
cpu = 0.053 (sec), leaf count = 49

$$\left\{y(x)=\frac{x^3-x}{9}\sqrt{-x^2+1}+\ln\left(x+\sqrt{x^2-1}\right)\_C1\,x+x\_C2-\sqrt{x^2-1}\_C1\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + (1 - x^2)*y''[x] == x*(1 - x^2)^(3/2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-1 + x^2)*(x - 2*x^3 + x^5 - 9*x*Sqrt[1 - x^2]*C[1] + 9*Sqrt[-(-1 +
x^2)^2]*C[2]) - 3*(x^6*Sqrt[-1 + x^2] - x^4*(Sqrt[-1 + x^2] - Sqrt[1 - x^2]*Sqrt
[-(-1 + x^2)^2]) - 3*x*Sqrt[1 - x^2]*C[2] + 3*x^3*Sqrt[1 - x^2]*C[2])*Log[x + Sq
rt[-1 + x^2]])/(9*(1 - x^2)^(3/2))}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x) = x*(-x^2+1)^(3/2), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/9*(x^3-x)*(-x^2+1)^(1/2)+ln(x+(x^2-1)^(1/2))*_C1*x+x*_C2-(x^2-1)^(1/2)*
_C1
```

4.1527 $(1-x^2)\,y''(x)+xy'(x)+3y(x)=0$

ODE

$$(1-x^2)\,y''(x)+xy'(x)+3y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0560571 (sec), leaf count = 75

$$\left\{\left\{y(x)\to \frac{(x^2-1)^{3/4}\left(\sqrt{\pi}c_2(1-x^2)^{3/4}Q^{\frac{3}{2}}_{\frac{3}{2}}(x)+\sqrt{2}c_1x(2x^2-3)\right)}{\sqrt{\pi}\,(1-x^2)^{3/4}}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 28

$$\left\{y(x)=\_C2\,(-1+x)^{\frac{3}{2}}\,(1+x)^{\frac{3}{2}}+\left(2\,x^3-3\,x\right)\_C1\right\}$$

Mathematica raw input

```
DSolve[3*y[x] + x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-1 + x^2)^(3/4)*(Sqrt[2]*x*(-3 + 2*x^2)*C[1] + Sqrt[Pi]*(1 - x^2)^(3
/4)*C[2]*LegendreQ[3/2, 3/2, x]))/(Sqrt[Pi]*(1 - x^2)^(3/4))}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)+x*diff(y(x),x)+3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*(-1+x)^(3/2)*(1+x)^(3/2)+(2*x^3-3*x)*_C1
```

4.1528 $(x^2+1)\,y''(x)+xy'(x)-4y(x)=0$

ODE

$$(x^2+1)\,y''(x)+xy'(x)-4y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0188008 (sec), leaf count = 25

$$\{\{y(x)\to c_1\cosh\left(2\sinh^{-1}(x)\right)+ic_2\sinh\left(2\sinh^{-1}(x)\right)\}\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 39

$$\left\{y(x)=\_C1\,\sin\left(2\arctan\left(\frac{x}{\sqrt{-x^2-1}}\right)\right)+\_C2\,\cos\left(2\arctan\left(\frac{x}{\sqrt{-x^2-1}}\right)\right)\right\}$$

Mathematica raw input

```
DSolve[-4*y[x] + x*y'[x] + (1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[2*ArcSinh[x]] + I*C[2]*Sinh[2*ArcSinh[x]]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+x*diff(y(x),x)-4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(2*arctan(x/(-x^2-1)^(1/2)))+_C2*cos(2*arctan(x/(-x^2-1)^(1/2)))
```

4.1529 $(x^2+1)\,y''(x)+xy'(x)-4y(x)=0$

ODE

$$(x^2+1)\,y''(x)+xy'(x)-4y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0131415 (sec), leaf count = 25

$$\{\{y(x)\to c_1\cosh\left(2\sinh^{-1}(x)\right)+ic_2\sinh\left(2\sinh^{-1}(x)\right)\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 39

$$\left\{y(x)=\_C1\,\sin\left(2\arctan\left(\frac{x}{\sqrt{-x^2-1}}\right)\right)+\_C2\,\cos\left(2\arctan\left(\frac{x}{\sqrt{-x^2-1}}\right)\right)\right\}$$

Mathematica raw input

```
DSolve[-4*y[x] + x*y'[x] + (1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[2*ArcSinh[x]] + I*C[2]*Sinh[2*ArcSinh[x]]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+x*diff(y(x),x)-4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(2*arctan(x/(-x^2-1)^(1/2)))+_C2*cos(2*arctan(x/(-x^2-1)^(1/2)))
```

4.1530 $n^2 y(x) + (1 - x^2) y''(x) - x y'(x) = 0$

ODE

$$n^2 y(x) + (1 - x^2) y''(x) - x y'(x) = 0$$

ODE Classification

[_Gegenbauer, [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0288051 (sec), leaf count = 45

$$\left\{\left\{y(x) \to c_1 \cosh\left(n \log\left(\sqrt{x^2-1}+x\right)\right) + i c_2 \sinh\left(n \log\left(\sqrt{x^2-1}+x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 19

$$\{y(x) = \_C1 \sin(n \arcsin(x)) + \_C2 \cos(n \arcsin(x))\}$$

Mathematica raw input

```
DSolve[n^2*y[x] - x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[n*Log[x + Sqrt[-1 + x^2]]] + I*C[2]*Sinh[n*Log[x + Sqrt[-1 +
  x^2]]]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-x*diff(y(x),x)+n^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(n*arcsin(x))+_C2*cos(n*arcsin(x))
```

4.1531 $a^2 y(x) + (x^2+1)\, y''(x) + x y'(x) = 0$

ODE

$$a^2 y(x) + (x^2+1)\, y''(x) + x y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0180882 (sec), leaf count = 22

$$\{\{y(x) \to c_2 \sin\left(a \sinh^{-1}(x)\right) + c_1 \cos\left(a \sinh^{-1}(x)\right)\}\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 19

$$\{y(x) = \_C1 \sin(a\,Arcsinh(x)) + \_C2 \cos(a\,Arcsinh(x))\}$$

Mathematica raw input

```
DSolve[a^2*y[x] + x*y'[x] + (1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[a*ArcSinh[x]] + C[2]*Sin[a*ArcSinh[x]]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+x*diff(y(x),x)+a^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(a*arcsinh(x))+_C2*cos(a*arcsinh(x))
```

4.1532 $a^2 y(x) + (1 - x^2) y''(x) - x y'(x) = 0$

ODE

$$a^2 y(x) + (1 - x^2) y''(x) - x y'(x) = 0$$

ODE Classification

[_Gegenbauer, [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0281873 (sec), leaf count = 45

$$\left\{\left\{y(x) \to c_1 \cosh\left(a \log\left(\sqrt{x^2-1}+x\right)\right) + i c_2 \sinh\left(a \log\left(\sqrt{x^2-1}+x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 19

$$\{y(x) = \_C1 \sin(a \arcsin(x)) + \_C2 \cos(a \arcsin(x))\}$$

Mathematica raw input

```
DSolve[a^2*y[x] - x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[a*Log[x + Sqrt[-1 + x^2]]] + I*C[2]*Sinh[a*Log[x + Sqrt[-1 +
  x^2]]]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-x*diff(y(x),x)+a^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(a*arcsin(x))+_C2*cos(a*arcsin(x))
```

4.1533 $y(x)\left(a+bx^2\right)+\left(1-x^2\right)y''(x)-xy'(x)=0$

ODE

$$y(x)\left(a+bx^2\right)+\left(1-x^2\right)y''(x)-xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0175672 (sec), leaf count = 42

$$\left\{\left\{y(x)\to c_1\text{MathieuC}\left[a+\frac{b}{2},-\frac{b}{4},\cos^{-1}(x)\right]+c_2\text{MathieuS}\left[a+\frac{b}{2},-\frac{b}{4},\cos^{-1}(x)\right]\right\}\right\}$$

Maple ✓
cpu = 0.178 (sec), leaf count = 31

$$\left\{y(x)=\_C1\ MathieuC\left(\frac{b}{2}+a,-\frac{b}{4},\arccos(x)\right)+\_C2\ MathieuS\left(\frac{b}{2}+a,-\frac{b}{4},\arccos(x)\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x^2)*y[x] - x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*MathieuC[a + b/2, -b/4, ArcCos[x]] + C[2]*MathieuS[a + b/2, -b/4,
  ArcCos[x]]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-x*diff(y(x),x)+(b*x^2+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*MathieuC(1/2*b+a,-1/4*b,arccos(x))+_C2*MathieuS(1/2*b+a,-1/4*b,arccos
(x))
```

4.1534 $y(x)\left(\sum_{m=0}^{n} a(m)x^{2m}\right)+\left(1-x^2\right)y''(x)-xy'(x)=0$

ODE

$$y(x)\left(\sum_{m=0}^{n} a(m)x^{2m}\right)+\left(1-x^2\right)y''(x)-xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.19961 (sec), leaf count = 0 , could not solve

```
DSolve[Sum[x^(2*m)*a[m], {m, 0, n}]*y[x] - x*Derivative[1][y][x] + (1 - x^2)*Derivative[2][y][x] == 0
```

Maple ✗
cpu = 9.066 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)-\frac{x\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{-x^2+1}+\frac{\sum_{m=0}^{n} a(m)\,x^{2\,m}\_Y(x)}{-x^2+1}\right\},\{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[Sum[x^(2*m)*a[m], {m, 0, n}]*y[x] - x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[Sum[x^(2*m)*a[m], {m, 0, n}]*y[x] - x*Derivative[1][y][x] + (1 - x^2)*Der
ivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-x*diff(y(x),x)+sum(a(m)*x^(2*m),m = 0 .. n)*y(x) = 0, y(x),'impl
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)-x/(-x^2+1)*diff(_Y(x),x)+sum(a(m)*x^(2*m),m
= 0 .. n)/(-x^2+1)*_Y(x)},{_Y(x)})
```

4.1535 $(1-x^2)\,y''(x)-2xy'(x)=0$

ODE

$$(1-x^2)\,y''(x)-2xy'(x)=0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0114869 (sec), leaf count = 27

$$\left\{\left\{y(x)\to \frac{1}{2}c_1(\log(1-x)-\log(x+1))+c_2\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 20

$$\left\{y(x)=\_C1+\frac{(\ln(-1+x)-\ln(1+x))\,\_C2}{2}\right\}$$

Mathematica raw input

```
DSolve[-2*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + (C[1]*(Log[1 - x] - Log[1 + x]))/2}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-2*x*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+1/2*(ln(-1+x)-ln(1+x))*_C2
```

4.1536 $a + (1 - x^2)\, y''(x) - 2xy'(x) = 0$

ODE

$$a + (1 - x^2)\, y''(x) - 2xy'(x) = 0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0789975 (sec), leaf count = 36

$$\left\{\left\{y(x) \to \frac{1}{2}(a + c_1)\log(1 - x) + \frac{1}{2}(a - c_1)\log(x + 1) + c_2\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 26

$$\left\{y(x) = \frac{(a + \_C1)\ln(-1 + x)}{2} + \frac{(a - \_C1)\ln(1 + x)}{2} + \_C2\right\}$$

Mathematica raw input

```
DSolve[a - 2*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + ((a + C[1])*Log[1 - x])/2 + ((a - C[1])*Log[1 + x])/2}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+a = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*(a+_C1)*ln(-1+x)+1/2*(a-_C1)*ln(1+x)+_C2
```

4.1537 $(x^2+1)\,y''(x)+2xy'(x)-2y(x)=0$

ODE

$$(x^2+1)\,y''(x)+2xy'(x)-2y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0586701 (sec), leaf count = 48

$$\left\{\left\{y(x)\to \frac{1}{2}i(2c_1x-c_2x\log(1-ix)+c_2x\log(1+ix)+2ic_2)\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 14

$$\{y(x)=\arctan(x)\_C2\,x+\_C1\,x+\_C2\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 2*x*y'[x] + (1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (I/2)*(2*x*C[1] + (2*I)*C[2] - x*C[2]*Log[1 - I*x] + x*C[2]*Log[1 + I*
x])}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = arctan(x)*_C2*x+_C1*x+_C2
```

4.1538 $(x^2+1)\,y''(x) - 2xy'(x) + 2y(x) = 0$

ODE

$$(x^2+1)\,y''(x) - 2xy'(x) + 2y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.447214 (sec), leaf count = 21

$$\{\{y(x) \to c_2 x - c_1 (x-i)^2\}\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 16

$$\{y(x) = \_C2\, x^2 + \_C1\, x - \_C2\}$$

Mathematica raw input

```
DSolve[2*y[x] - 2*x*y'[x] + (1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-I + x)^2*C[1]) + x*C[2]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*x^2+_C1*x-_C2
```

4.1539 $(1-x^2)\,y''(x)+2xy'(x)-2y(x)=(1-x^2)^2$

ODE

$$(1-x^2)\,y''(x)+2xy'(x)-2y(x)=(1-x^2)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.180522 (sec), leaf count = 109

$$\left\{\left\{y(x)\to \frac{3x^2\left(2c_1\sqrt{-\left(x^2-1\right)^2}+1\right)-2x\left(6c_1\sqrt{-\left(x^2-1\right)^2}-3c_2\sqrt{-\left(x^2-1\right)^2}+1\right)+6c_1\sqrt{-\left(x^2-1\right)^2}+x^6-4x^4+}{6-6x^2}\right.\right.$$

Maple ✓
cpu = 0.03 (sec), leaf count = 20

$$\left\{y(x)=x\_C2+\_C1\,x^2+\_C1-\frac{1}{2}-\frac{x^4}{6}\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 2*x*y'[x] + (1 - x^2)*y''[x] == (1 - x^2)^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x^3 - 4*x^4 + x^6 + 6*Sqrt[-(-1 + x^2)^2]*C[1] + 3*x^2*(1 + 2*Sqrt[
-(-1 + x^2)^2]*C[1]) - 2*x*(1 + 6*Sqrt[-(-1 + x^2)^2]*C[1] - 3*Sqrt[-(-1 + x^2)^
2]*C[2]))/(6 - 6*x^2)}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-2*y(x) = (-x^2+1)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = x*_C2+_C1*x^2+_C1-1/2-1/6*x^4
```

4.1540 $n(n+1)y(x)+(1-x^2)\,y''(x)-2xy'(x)=0$

ODE

$$n(n+1)y(x)+\left(1-x^2\right)y''(x)-2xy'(x)=0$$

ODE Classification

[_Gegenbauer]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0215056 (sec), leaf count = 18

$$\{\{y(x)\to c_1P_n(x)+c_2Q_n(x)\}\}$$

Maple ✓
cpu = 0.046 (sec), leaf count = 15

$$\{y(x)=\_C1\ LegendreP(n,x)+\_C2\ LegendreQ(n,x)\}$$

Mathematica raw input

```
DSolve[n*(1 + n)*y[x] - 2*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*LegendreP[n, x] + C[2]*LegendreQ[n, x]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+n*(n+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*LegendreP(n,x)+_C2*LegendreQ(n,x)
```

4.1541 $n(n+1)y(x)+(1-x^2)y''(x)-2xy'(x)=\frac{2((-n-1)xP_n(x)+(n+1)P_{n+1}(x))}{x^2-1}$

ODE

$$n(n+1)y(x)+(1-x^2)y''(x)-2xy'(x)=\frac{2((-n-1)xP_n(x)+(n+1)P_{n+1}(x))}{x^2-1}$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.168 (sec), leaf count = 119

$$\left\{y(x)=LegendreP(n,x)\_C2+LegendreQ(n,x)\_C1-2\int\frac{LegendreQ(n,x)\,(-xLegendreP(n,x)+Legend}{(LegendreP\,(n+1,x)\,LegendreQ\,(n,x)-LegendreP\,(n,x)\,L}\right.$$

Mathematica raw input

```
DSolve[n*(1 + n)*y[x] - 2*x*y'[x] + (1 - x^2)*y''[x] == (2*((-1 - n)*x*LegendreP[n, x] + (1 + n)*Lege
1 + x^2),y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+n*(n+1)*y(x) = 2*((n+1)*LegendreP(n+1,x)-
(n+1)*x*LegendreP(n,x))/(x^2-1), y(x),'implicit')
```

Maple raw output

```
y(x) = LegendreP(n,x)*_C2+LegendreQ(n,x)*_C1-2*Int(LegendreQ(n,x)*(-x*LegendreP(
n,x)+LegendreP(n+1,x))/(LegendreP(n+1,x)*LegendreQ(n,x)-LegendreP(n,x)*LegendreQ
(n+1,x))/(x^2-1),x)*LegendreP(n,x)+2*Int((-x*LegendreP(n,x)+LegendreP(n+1,x))*Le
gendreP(n,x)/(LegendreP(n+1,x)*LegendreQ(n,x)-LegendreP(n,x)*LegendreQ(n+1,x))/(
x^2-1),x)*LegendreQ(n,x)
```

4.1542 $-p(p+1)y(x)+\left(x^2+1\right)y''(x)+2xy'(x)=0$

ODE

$$-p(p+1)y(x)+\left(x^2+1\right)y''(x)+2xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0162185 (sec), leaf count = 26

$$\{\{y(x)\to c_1P_p(ix)+c_2Q_p(ix)\}\}$$

Maple ✓
cpu = 0.053 (sec), leaf count = 21

$$\{y(x)=\_C1\ LegendreP(p,ix)+\_C2\ LegendreQ(p,ix)\}$$

Mathematica raw input

```
DSolve[-(p*(1 + p)*y[x]) + 2*x*y'[x] + (1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*LegendreP[p, I*x] + C[2]*LegendreQ[p, I*x]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-p*(p+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*LegendreP(p,I*x)+_C2*LegendreQ(p,I*x)
```

4.1543 $p(p+1)y(x)+(1-x^2)\,y''(x)-2xy'(x)=0$

ODE

$$p(p+1)y(x)+\left(1-x^2\right)y''(x)-2xy'(x)=0$$

ODE Classification

[_Gegenbauer]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0120584 (sec), leaf count = 18

$$\{\{y(x)\to c_1P_p(x)+c_2Q_p(x)\}\}$$

Maple ✓
cpu = 0.049 (sec), leaf count = 15

$$\{y(x)=\_C1\ LegendreP(p,x)+\_C2\ LegendreQ(p,x)\}$$

Mathematica raw input

```
DSolve[p*(1 + p)*y[x] - 2*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*LegendreP[p, x] + C[2]*LegendreQ[p, x]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+p*(p+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*LegendreP(p,x)+_C2*LegendreQ(p,x)
```

4.1544 $n(n+2)y(x)+(1-x^2)\,y''(x)-3xy'(x)=0$

ODE

$$n(n+2)y(x)+\left(1-x^2\right)y''(x)-3xy'(x)=0$$

ODE Classification

[_Gegenbauer]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0222323 (sec), leaf count = 42

$$\left\{\left\{y(x)\to \frac{c_1 P^{\frac{1}{2}}_{n+\frac{1}{2}}(x)+c_2 Q^{\frac{1}{2}}_{n+\frac{1}{2}}(x)}{\sqrt[4]{x^2-1}}\right\}\right\}$$

Maple ✓
cpu = 0.108 (sec), leaf count = 68

$$\left\{y(x)=1\left(\_C1\left(-\sqrt{x^2-1}+x\right)\left(x+\sqrt{x^2-1}\right)^{-n-1}-\_C2\left(x+\sqrt{x^2-1}\right)^{n}\right)\frac{1}{\sqrt{x^2-1}}\left(-\sqrt{x^2-1}+x\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[n*(2 + n)*y[x] - 3*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*LegendreP[1/2 + n, 1/2, x] + C[2]*LegendreQ[1/2 + n, 1/2, x])/(-
1 + x^2)^(1/4)}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-3*x*diff(y(x),x)+n*(2+n)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/(x^2-1)^(1/2)*(_C1*(-(x^2-1)^(1/2)+x)*(x+(x^2-1)^(1/2))^(-n-1)-_C2*(x+(
x^2-1)^(1/2))^n)/(-(x^2-1)^(1/2)+x)
```

4.1545 $-ay(x) + (1-x^2)\,y''(x) - 3xy'(x) = 0$

ODE

$$-ay(x) + (1-x^2)\,y''(x) - 3xy'(x) = 0$$

ODE Classification

[_Gegenbauer]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0152825 (sec), leaf count = 58

$$\left\{\left\{y(x) \to \frac{c_1 P^{\frac{1}{2}}_{\sqrt{1-a}-\frac{1}{2}}(x) + c_2 Q^{\frac{1}{2}}_{\sqrt{1-a}-\frac{1}{2}}(x)}{\sqrt[4]{x^2-1}}\right\}\right\}$$

Maple ✓
cpu = 0.105 (sec), leaf count = 53

$$\left\{y(x) = 1\left(\_C2\left(x+\sqrt{x^2-1}\right)^{-\sqrt{1-a}} + \_C1\left(x+\sqrt{x^2-1}\right)^{\sqrt{1-a}}\right)\frac{1}{\sqrt{x^2-1}}\right\}$$

Mathematica raw input

```
DSolve[-(a*y[x]) - 3*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*LegendreP[-1/2 + Sqrt[1 - a], 1/2, x] + C[2]*LegendreQ[-1/2 + Sq
rt[1 - a], 1/2, x])/(-1 + x^2)^(1/4)}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-3*x*diff(y(x),x)-a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*(x+(x^2-1)^(1/2))^(-(1-a)^(1/2))+_C1*(x+(x^2-1)^(1/2))^((1-a)^(1/2))
)/(x^2-1)^(1/2)
```

4.1546 $(x^2+1)\,y''(x)+4xy'(x)+2y(x)=2(\cos(x)-x)$

ODE

$$(x^2+1)\,y''(x)+4xy'(x)+2y(x)=2(\cos(x)-x)$$

ODE Classification

[[_2nd_order, _exact, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.046286 (sec), leaf count = 33

$$\left\{\left\{y(x)\to -\frac{-3c_2x-3c_1+x^3+6\cos(x)}{3x^2+3}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 31

$$\left\{y(x)=\frac{-x^3+3\_C1\,x-6\,\cos(x)+3\_C2}{3\,x^2+3}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + 4*x*y'[x] + (1 + x^2)*y''[x] == 2*(-x + Cos[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x^3 - 3*C[1] - 3*x*C[2] + 6*Cos[x])/(3 + 3*x^2))}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+4*x*diff(y(x),x)+2*y(x) = 2*cos(x)-2*x, y(x),'implicit')
```

Maple raw output

```
y(x) = (-x^3+3*_C1*x-6*cos(x)+3*_C2)/(3*x^2+3)
```

4.1547 $(x^2+1)\,y''(x) - 4xy'(x) + 6y(x) = 0$

ODE

$$(x^2+1)\,y''(x) - 4xy'(x) + 6y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0522044 (sec), leaf count = 33

$$\left\{\left\{y(x) \to -\frac{1}{3}i\left(c_2\left(3x^2-1\right)+3c_1(x-i)^3\right)\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 21

$$\{y(x) = \_C2\,x^3 - 3\,\_C1\,x^2 - 3\,\_C2\,x + \_C1\}$$

Mathematica raw input

```
DSolve[6*y[x] - 4*x*y'[x] + (1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-I/3)*(3*(-I + x)^3*C[1] + (-1 + 3*x^2)*C[2])}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)-4*x*diff(y(x),x)+6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*x^3-3*_C1*x^2-3*_C2*x+_C1
```

4.1548 $(1-x^2)\,y''(x)-(x^2+1)\,y(x)-4xy'(x)=0$

ODE

$$(1-x^2)\,y''(x)-(x^2+1)\,y(x)-4xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0268193 (sec), leaf count = 41

$$\left\{\left\{y(x)\to \frac{e^{-ix}\left(2c_1-ic_2e^{2ix}\right)}{2\left(x^2-1\right)}\right\}\right\}$$

Maple ✓
cpu = 0.04 (sec), leaf count = 21

$$\left\{y(x)=\frac{\_C1\,\sin(x)+\_C2\,\cos(x)}{x^2-1}\right\}$$

Mathematica raw input

```
DSolve[-((1 + x^2)*y[x]) - 4*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*C[1] - I*E^((2*I)*x)*C[2])/(2*E^(I*x)*(-1 + x^2))}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-4*x*diff(y(x),x)-(x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*sin(x)+_C2*cos(x))/(x^2-1)
```

4.1549 $(1-x^2)\,y''(x)-6xy'(x)-4y(x)=0$

ODE

$$(1-x^2)\,y''(x)-6xy'(x)-4y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0407649 (sec), leaf count = 44

$$\left\{\left\{y(x)\to \frac{3c_1-c_2x\left(x^2-3\right)}{3\sqrt{1-x^2}\left(x^2-1\right)^{3/2}}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 26

$$\left\{y(x)=\frac{\_C1\,x^3-3\,\_C1\,x+\_C2}{\left(-1+x\right)^2\left(1+x\right)^2}\right\}$$

Mathematica raw input

```
DSolve[-4*y[x] - 6*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*C[1] - x*(-3 + x^2)*C[2])/(3*Sqrt[1 - x^2]*(-1 + x^2)^(3/2))}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-6*x*diff(y(x),x)-4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x^3-3*_C1*x+_C2)/(-1+x)^2/(1+x)^2
```

4.1550 $ny(x)(a+b+n+1)+(-x(a+b+2)-a+b)y'(x)+(1-x^2)\,y''(x)=0$

ODE

$$ny(x)(a+b+n+1)+(-x(a+b+2)-a+b)y'(x)+\left(1-x^2\right)y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.248012 (sec), leaf count = 69

$$\left\{\left\{y(x)\to 2^a c_2(x-1)^{-a}\,{}_2F_1\left(-a-n,b+n+1;1-a;\frac{1-x}{2}\right)+c_1\,{}_2F_1\left(-n,a+b+n+1;a+1;\frac{1-x}{2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.081 (sec), leaf count = 61

$$\left\{y(x)=\_C1\,{}_2\mathrm{F}_1(-n,1+a+b+n;\,b+1;\,\frac{1}{2}+\frac{x}{2})+\_C2\left(\frac{1}{2}+\frac{x}{2}\right)^{-b}\,{}_2\mathrm{F}_1(-n-b,1+a+n;\,1-b;\,\frac{1}{2}+\frac{x}{2})\right\}$$

Mathematica raw input

```
DSolve[n*(1 + a + b + n)*y[x] + (-a + b - (2 + a + b)*x)*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2^a*C[2]*Hypergeometric2F1[-a - n, 1 + b + n, 1 - a, (1 - x)/2])/(-1
+ x)^a + C[1]*Hypergeometric2F1[-n, 1 + a + b + n, 1 + a, (1 - x)/2]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)+(b-a-(2+a+b)*x)*diff(y(x),x)+n*(1+a+b+n)*y(x) = 0, y(x),'implici
```

Maple raw output

```
y(x) = _C1*hypergeom([-n, 1+a+b+n],[b+1],1/2+1/2*x)+_C2*(1/2+1/2*x)^(-b)*hyperge
om([-n-b, 1+a+n],[1-b],1/2+1/2*x)
```

4.1551 $p(2k+p)y(x)-(2k+1)xy'(x)+(1-x^2)\,y''(x)=0$

ODE

$$p(2k+p)y(x)-(2k+1)xy'(x)+\left(1-x^2\right)y''(x)=0$$

ODE Classification

[_Gegenbauer]

Book solution method
TO DO

Mathematica ✓
cpu = 0.038135 (sec), leaf count = 54

$$\left\{\left\{y(x)\to \left(x^2-1\right)^{\frac{1}{4}-\frac{k}{2}}\left(c_1 P^{k-\frac{1}{2}}_{k+p-\frac{1}{2}}(x)+c_2 Q^{k-\frac{1}{2}}_{k+p-\frac{1}{2}}(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.089 (sec), leaf count = 39

$$\left\{y(x)=\left(x^2-1\right)^{\frac{1}{4}-\frac{k}{2}}\left(LegendreQ\left(p+k-\frac{1}{2},-\frac{1}{2}+k,x\right)\_C2+LegendreP\left(p+k-\frac{1}{2},-\frac{1}{2}+k,x\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[p*(2*k + p)*y[x] - (1 + 2*k)*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + x^2)^(1/4 - k/2)*(C[1]*LegendreP[-1/2 + k + p, -1/2 + k, x] + C[
2]*LegendreQ[-1/2 + k + p, -1/2 + k, x])}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-(1+2*k)*x*diff(y(x),x)+p*(p+2*k)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2-1)^(1/4-1/2*k)*(LegendreQ(p+k-1/2,-1/2+k,x)*_C2+LegendreP(p+k-1/2,-1
/2+k,x)*_C1)
```

4.1552 $ny(x)(a+b+n+1)+(-x(a+b+2)-a+b)y'(x)+(1-x^2)\,y''(x)=0$

ODE

$$ny(x)(a+b+n+1)+(-x(a+b+2)-a+b)y'(x)+(1-x^2)\,y''(x)=0$$

ODE Classification

[_Gegenbauer]

Book solution method
TO DO

Mathematica ✓
cpu = 0.144938 (sec), leaf count = 69

$$\left\{\left\{y(x)\to 2^a c_2(x-1)^{-a}\,{}_2F_1\left(-a-n,b+n+1;1-a;\frac{1-x}{2}\right)+c_1\,{}_2F_1\left(-n,a+b+n+1;a+1;\frac{1-x}{2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.056 (sec), leaf count = 31

$$\left\{y(x)=\left(x^2-1\right)^{-\frac{k}{2}}\left(LegendreQ(k+p,k,x)\_C2+LegendreP(k+p,k,x)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[n*(1 + a + b + n)*y[x] + (-a + b - (2 + a + b)*x)*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2^a*C[2]*Hypergeometric2F1[-a - n, 1 + b + n, 1 - a, (1 - x)/2])/(-1
+ x)^a + C[1]*Hypergeometric2F1[-n, 1 + a + b + n, 1 + a, (1 - x)/2]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-2*(k+1)*x*diff(y(x),x)+p*(1+p+2*k)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2-1)^(-1/2*k)*(LegendreQ(k+p,k,x)*_C2+LegendreP(k+p,k,x)*_C1)
```

4.1553 $-(k-p)(k+p+1)y(x)-2(k+1)xy'(x)+(1-x^2)\,y''(x)=0$

ODE

$$-(k-p)(k+p+1)y(x)-2(k+1)xy'(x)+\left(1-x^2\right)y''(x)=0$$

ODE Classification

[_Gegenbauer]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0286874 (sec), leaf count = 32

$$\left\{\left\{y(x)\to\left(x^2-1\right)^{-k/2}\left(c_1P_p^k(x)+c_2Q_p^k(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.057 (sec), leaf count = 27

$$\left\{y(x)=\left(x^2-1\right)^{-\frac{k}{2}}\left(LegendreP(p,k,x)\_C1+LegendreQ(p,k,x)\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[-((k - p)*(1 + k + p)*y[x]) - 2*(1 + k)*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*LegendreP[p, k, x] + C[2]*LegendreQ[p, k, x])/(-1 + x^2)^(k/2)}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-2*(k+1)*x*diff(y(x),x)-(k-p)*(1+k+p)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2-1)^(-1/2*k)*(LegendreP(p,k,x)*_C1+LegendreQ(p,k,x)*_C2)
```

4.1554 $-2axy'(x)+(1-a)ay(x)+(1-x^2)\,y''(x)=0$

ODE

$$-2axy'(x)+(1-a)ay(x)+\left(1-x^2\right)y''(x)=0$$

ODE Classification

[_Gegenbauer]

Book solution method
TO DO

Mathematica ✓
cpu = 0.200511 (sec), leaf count = 87

$$\left\{\left\{y(x)\to \frac{\sqrt{1-x^2}\left(x^2-1\right)^{-a/2}e^{-\sqrt{(a-1)^2}\tanh^{-1}(x)}\left(c_2e^{2\sqrt{(a-1)^2}\tanh^{-1}(x)}+2\sqrt{(a-1)^2}c_1\right)}{2\sqrt{(a-1)^2}}\right\}\right\}$$

Maple ✓
cpu = 0.028 (sec), leaf count = 27

$$\left\{y(x)=\_C1\,(1+x)^{1-a}+\_C2\,(-1+x)^{1-a}\right\}$$

Mathematica raw input

```
DSolve[(1 - a)*a*y[x] - 2*a*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[1 - x^2]*(2*Sqrt[(-1 + a)^2]*C[1] + E^(2*Sqrt[(-1 + a)^2]*ArcTan
h[x])*C[2]))/(2*Sqrt[(-1 + a)^2]*E^(Sqrt[(-1 + a)^2]*ArcTanh[x])*(-1 + x^2)^(a/2
))}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)-2*a*x*diff(y(x),x)+a*(1-a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(1+x)^(1-a)+_C2*(-1+x)^(1-a)
```

4.1555 $axy'(x) - (2-a)y(x) + (x^2+1)\,y''(x) = 0$

ODE

$$axy'(x) - (2-a)y(x) + (x^2+1)\,y''(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0237286 (sec), leaf count = 68

$$\left\{\left\{y(x) \to (x^2+1)^{\frac{1}{2}-\frac{a}{4}}\left(c_1 P^{\frac{a-2}{2}}_{\frac{a-4}{2}}(ix) + c_2 Q^{\frac{a-2}{2}}_{\frac{a-4}{2}}(ix)\right)\right\}\right\}$$

Maple ✓
cpu = 0.156 (sec), leaf count = 36

$$\left\{y(x) = \_C1\,(x^2+1)^{1-\frac{a}{2}} + \_C2\,{}_2\mathrm{F}_1(1, \frac{a}{2} - \frac{1}{2}; \frac{3}{2}; -x^2)x\right\}$$

Mathematica raw input

```
DSolve[-((2 - a)*y[x]) + a*x*y'[x] + (1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x^2)^(1/2 - a/4)*(C[1]*LegendreP[(-4 + a)/2, (-2 + a)/2, I*x] + C
[2]*LegendreQ[(-4 + a)/2, (-2 + a)/2, I*x])}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+a*x*diff(y(x),x)-(2-a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(x^2+1)^(1-1/2*a)+_C2*hypergeom([1, 1/2*a-1/2],[3/2],-x^2)*x
```

4.1556 $axy'(x) + by(x) + (1 - x^2)\, y''(x) = 0$

ODE

$$axy'(x) + by(x) + (1 - x^2)\, y''(x) = 0$$

ODE Classification

[_Gegenbauer]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0251679 (sec), leaf count = 86

$$\left\{\left\{y(x) \to (x^2-1)^{\frac{a+2}{4}} \left(c_1 P^{\frac{a+2}{2}}_{\frac{1}{2}\left(\sqrt{a^2+2a+4b+1}-1\right)}(x) + c_2 Q^{\frac{a+2}{2}}_{\frac{1}{2}\left(\sqrt{a^2+2a+4b+1}-1\right)}(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.12 (sec), leaf count = 69

$$\left\{y(x) = (x^2-1)^{\frac{a}{4}+\frac{1}{2}} \left(LegendreQ\left(\frac{1}{2}\sqrt{a^2+2a+4b+1} - \frac{1}{2}, \frac{a}{2}+1, x\right) \_C2 + LegendreP\left(\frac{1}{2}\sqrt{a^2+2a+4b+1} - \frac{1}{2}, \frac{a}{2}\right.\right.$$

Mathematica raw input

```
DSolve[b*y[x] + a*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + x^2)^((2 + a)/4)*(C[1]*LegendreP[(-1 + Sqrt[1 + 2*a + a^2 + 4*b]
)/2, (2 + a)/2, x] + C[2]*LegendreQ[(-1 + Sqrt[1 + 2*a + a^2 + 4*b])/2, (2 + a)/
2, x])}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)+a*x*diff(y(x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2-1)^(1/4*a+1/2)*(LegendreQ(1/2*(a^2+2*a+4*b+1)^(1/2)-1/2,1/2*a+1,x)*_
C2+LegendreP(1/2*(a^2+2*a+4*b+1)^(1/2)-1/2,1/2*a+1,x)*_C1)
```

4.1557 $axy'(x) + y(x)\left(\mathbf{a0} + \mathbf{b0}x + \mathbf{c0}x^2\right) + \left(1 - x^2\right)y''(x) = 0$

ODE

$$axy'(x) + y(x)\left(\mathrm{a0} + \mathrm{b0}x + \mathrm{c0}x^2\right) + \left(1 - x^2\right)y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 2.53225 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x) \to \text{DifferentialRoot}\left(\{y, x\}, \left\{\left(-\mathrm{c0}x^2 - \mathrm{b0}x - \mathrm{a0}\right)y(x) - xay'(x) + \left(x^2 - 1\right)y''(x) = 0, y(0) = c_1, y'(0) = c_2\right\}\right)(x)\right\}\right.$$

Maple ✓
cpu = 0.254 (sec), leaf count = 134

$$\left\{y(x) = \left(x^2 - 1\right)^{\frac{a}{4}} \mathrm{e}^{\sqrt{c0}x}\left(\left(\frac{1}{2} + \frac{x}{2}\right)^{-\frac{a}{4}} HeunC\left(4\sqrt{c0}, -\frac{a}{2} - 1, \frac{a}{2} + 1, -2\,b0, -a0 + b0 - \frac{a^2}{8} - c0 + \frac{1}{2}, \frac{1}{2} + \frac{x}{2}\right)\left(-\frac{1}{2} +\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a0 + b0*x + c0*x^2)*y[x] + a*x*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(-a0 - \[FormalX]
*b0 - \[FormalX]^2*c0)*\[FormalY][\[FormalX]] - \[FormalX]*a*Derivative[1][\[For
malY]][\[FormalX]] + (-1 + \[FormalX]^2)*Derivative[2][\[FormalY]][\[FormalX]] =
= 0, \[FormalY][0] == C[1], Derivative[1][\[FormalY]][0] == C[2]}]][x]}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)+a*x*diff(y(x),x)+(c0*x^2+b0*x+a0)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2-1)^(1/4*a)*exp(c0^(1/2)*x)*((1/2+1/2*x)^(-1/4*a)*HeunC(4*c0^(1/2),-1
/2*a-1,1/2*a+1,-2*b0,-a0+b0-1/8*a^2-c0+1/2,1/2+1/2*x)*(-1/2+1/2*x)^(1/4*a+1)*_C2
+((-1+x)*(1+x))^(1/4*a+1)*HeunC(4*c0^(1/2),1/2*a+1,1/2*a+1,-2*b0,-a0+b0-1/8*a^2-
c0+1/2,1/2+1/2*x)*_C1)
```

4.1558 $(a+bx)y'(x)+cy(x)+(1-x^2)\,y''(x)=0$

ODE

$$(a+bx)y'(x)+cy(x)+\left(1-x^2\right)y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.156769 (sec), leaf count = 184

$$\left\{\left\{y(x)\to 2^{\frac{1}{2}(-a-b-2)}\left(c_2(x-1)^{\frac{1}{2}(a+b+2)}\,{}_2F_1\left(\frac{1}{2}\left(a-\sqrt{b^2+2b+4c+1}+1\right),\frac{1}{2}\left(a+\sqrt{b^2+2b+4c+1}+1\right);\frac{1}{2}(a+b+\right.\right.\right.$$

Maple ✓
cpu = 0.087 (sec), leaf count = 134

$$\left\{y(x)=\_C1\,{}_2\mathrm{F}_1(-\frac{1}{2}-\frac{b}{2}-\frac{1}{2}\sqrt{b^2+2\,b+4\,c+1},-\frac{1}{2}-\frac{b}{2}+\frac{1}{2}\sqrt{b^2+2\,b+4\,c+1};\ \frac{a}{2}-\frac{b}{2};\ \frac{1}{2}+\frac{x}{2})+\_C2\left(\frac{1}{2}+\frac{x}{2}\right)^{1-\frac{a}{2}-}\right.$$

Mathematica raw input

```
DSolve[c*y[x] + (a + b*x)*y'[x] + (1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2^((-2 - a - b)/2)*((-1 + x)^((2 + a + b)/2)*C[2]*Hypergeometric2F1[(1
  + a - Sqrt[1 + 2*b + b^2 + 4*c])/2, (1 + a + Sqrt[1 + 2*b + b^2 + 4*c])/2, (4 +
  a + b)/2, (1 - x)/2] + 2^((2 + a + b)/2)*C[1]*Hypergeometric2F1[(-1 - b - Sqrt[
1 + 2*b + b^2 + 4*c])/2, (-1 - b + Sqrt[1 + 2*b + b^2 + 4*c])/2, (-a - b)/2, (1
 - x)/2])}}
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(y(x),x),x)+(b*x+a)*diff(y(x),x)+c*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([-1/2-1/2*b-1/2*(b^2+2*b+4*c+1)^(1/2), -1/2-1/2*b+1/2*(b^2+
2*b+4*c+1)^(1/2)],[1/2*a-1/2*b],1/2+1/2*x)+_C2*(1/2+1/2*x)^(1-1/2*a+1/2*b)*hyper
geom([1/2-1/2*(b^2+2*b+4*c+1)^(1/2)-1/2*a, 1/2+1/2*(b^2+2*b+4*c+1)^(1/2)-1/2*a],
[2-1/2*a+1/2*b],1/2+1/2*x)
```

4.1559 $(a^2 - x^2)\, y''(x) + y(x)\,(b^2 + c^2 x^2) - x y'(x) = 0$

ODE

$$(a^2 - x^2)\, y''(x) + y(x)\,(b^2 + c^2 x^2) - x y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0309123 (sec), leaf count = 74

$$\left\{\left\{y(x) \to c_1 \text{MathieuC}\left[\frac{a^2c^2}{2} + b^2, -\frac{1}{4}a^2c^2, \cos^{-1}\left(\frac{x}{a}\right)\right] + c_2 \text{MathieuS}\left[\frac{a^2c^2}{2} + b^2, -\frac{1}{4}a^2c^2, \cos^{-1}\left(\frac{x}{a}\right)\right]\right\}\right\}$$

Maple ✓
cpu = 0.234 (sec), leaf count = 63

$$\left\{y(x) = \_C1\ MathieuC\left(\frac{a^2c^2}{2} + b^2, -\frac{a^2c^2}{4}, \arccos\left(\frac{x}{a}\right)\right) + \_C2\ MathieuS\left(\frac{a^2c^2}{2} + b^2, -\frac{a^2c^2}{4}, \arccos\left(\frac{x}{a}\right)\right)\right\}$$

Mathematica raw input

```
DSolve[(b^2 + c^2*x^2)*y[x] - x*y'[x] + (a^2 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*MathieuC[b^2 + (a^2*c^2)/2, -(a^2*c^2)/4, ArcCos[x/a]] + C[2]*Mat
hieuS[b^2 + (a^2*c^2)/2, -(a^2*c^2)/4, ArcCos[x/a]]}}
```

Maple raw input

```
dsolve((a^2-x^2)*diff(diff(y(x),x),x)-x*diff(y(x),x)+(c^2*x^2+b^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*MathieuC(1/2*a^2*c^2+b^2,-1/4*a^2*c^2,arccos(x/a))+_C2*MathieuS(1/2*a
^2*c^2+b^2,-1/4*a^2*c^2,arccos(x/a))
```

4.1560 $(a^2 - x^2)\, y''(x) - 8xy'(x) - 12y(x) = 0$

ODE

$$(a^2 - x^2)\, y''(x) - 8xy'(x) - 12y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0472978 (sec), leaf count = 38

$$\left\{\left\{y(x) \to \frac{\frac{c_2\left(a^2+3x^2\right)}{(a-x)^3} + 3c_1}{3(a+x)^3}\right\}\right\}$$

Maple ✓
cpu = 0.03 (sec), leaf count = 41

$$\left\{y(x) = \frac{3\_C2\, a^2 x + \_C2\, x^3 + \_C1\, a^2 + 3\_C1\, x^2}{(a-x)^3 (a+x)^3}\right\}$$

Mathematica raw input

```
DSolve[-12*y[x] - 8*x*y'[x] + (a^2 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*C[1] + ((a^2 + 3*x^2)*C[2])/(a - x)^3)/(3*(a + x)^3)}}
```

Maple raw input

```
dsolve((a^2-x^2)*diff(diff(y(x),x),x)-8*x*diff(y(x),x)-12*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (3*_C2*a^2*x+_C2*x^3+_C1*a^2+3*_C1*x^2)/(a-x)^3/(a+x)^3
```

4.1561 $(1-x)xy''(x)+2y'(x)+y(x)=0$

ODE

$$(1-x)xy''(x)+2y'(x)+y(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.146186 (sec), leaf count = 73

$$\left\{\left\{y(x)\to c_2 G^{2,0}_{2,2}\left(x\left|\begin{array}{c}\frac{1}{2}\left(3-\sqrt{5}\right),\frac{1}{2}\left(3+\sqrt{5}\right)\\ -1,0\end{array}\right.\right)+c_1\,{}_2F_1\left(\frac{1}{2}\left(-1-\sqrt{5}\right),\frac{1}{2}\left(-1+\sqrt{5}\right);2;x\right)\right\}\right\}$$

Maple ✓
cpu = 0.117 (sec), leaf count = 85

$$\left\{y(x)=(-1+x)^3\left(\_C1\,x^{\frac{\sqrt{5}}{2}-\frac{5}{2}}{}_2\mathrm{F}_1(\frac{3}{2}-\frac{\sqrt{5}}{2},\frac{5}{2}-\frac{\sqrt{5}}{2};-\sqrt{5}+1;x^{-1})+\_C2\,x^{-\frac{5}{2}-\frac{\sqrt{5}}{2}}{}_2\mathrm{F}_1(\frac{3}{2}+\frac{\sqrt{5}}{2},\frac{5}{2}+\frac{\sqrt{5}}{2};\sqrt{5}+1;x^{-1}\right)\right.$$

Mathematica raw input

```
DSolve[y[x] + 2*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[(-1 - Sqrt[5])/2, (-1 + Sqrt[5])/2, 2, x] + C[2
]*MeijerG[{{}, {(3 - Sqrt[5])/2, (3 + Sqrt[5])/2}}, {{-1, 0}, {}}, x]}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)+2*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-1+x)^3*(_C1*x^(1/2*5^(1/2)-5/2)*hypergeom([3/2-1/2*5^(1/2), 5/2-1/2*5^(
1/2)],[-5^(1/2)+1],1/x)+_C2*x^(-5/2-1/2*5^(1/2))*hypergeom([3/2+1/2*5^(1/2), 5/2
+1/2*5^(1/2)],[5^(1/2)+1],1/x))
```

4.1562 $(1-x)xy''(x)-2y'(x)+2y(x)=0$

ODE

$$(1-x)xy''(x)-2y'(x)+2y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0170453 (sec), leaf count = 24

$$\left\{\left\{y(x)\to \frac{c_2x^3+3c_1}{3-3x}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 17

$$\left\{y(x)=\frac{x^3\_C2+\_C1}{-1+x}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 2*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*C[1] + x^3*C[2])/(3 - 3*x)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)-2*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*x^3+_C1)/(-1+x)
```

4.1563 $(1-x)xy''(x)+2y'(x)+6y(x)=0$

ODE

$$(1-x)xy''(x)+2y'(x)+6y(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0525542 (sec), leaf count = 90

$$\left\{\left\{y(x)\to \frac{-3c_1x^4+9c_1x^3+12c_2x^3-9c_1x^2-30c_2x^2+3c_1x+22c_2x+12c_2(x-1)^3x\log(1-x)-12c_2(x-1)^3x\log(x)-}{3x}\right.\right.$$

Maple ✓
cpu = 0.042 (sec), leaf count = 54

$$\left\{y(x)=\_C1\,(-1+x)^3+12\,\frac{\_C2}{x}\left(-x(-1+x)^3\ln(-1+x)+x(-1+x)^3\ln(x)-x^3+5/2\,x^2-\frac{11\,x}{6}+1/4\right)\right\}$$

Mathematica raw input

```
DSolve[6*y[x] + 2*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*x*C[1] - 9*x^2*C[1] + 9*x^3*C[1] - 3*x^4*C[1] - 3*C[2] + 22*x*C[2]
- 30*x^2*C[2] + 12*x^3*C[2] + 12*(-1 + x)^3*x*C[2]*Log[1 - x] - 12*(-1 + x)^3*x*
C[2]*Log[x])/(3*x)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)+2*diff(y(x),x)+6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(-1+x)^3+12*_C2*(-x*(-1+x)^3*ln(-1+x)+x*(-1+x)^3*ln(x)-x^3+5/2*x^2-11
/6*x+1/4)/x
```

4.1564 $(1-x)xy''(x)-2y'(x)+6y(x)=0$

ODE

$$(1-x)xy''(x)-2y'(x)+6y(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0482478 (sec), leaf count = 62

$$\left\{\left\{y(x)\to c_1x^3-\frac{c_2\left(12x^3+12(x-1)x^3\log(1-x)-12(x-1)x^3\log(x)-6x^2-2x-1\right)}{3(x-1)}\right\}\right\}$$

Maple ✓
cpu = 0.044 (sec), leaf count = 62

$$\left\{y(x)=\frac{-12\_C2\,x^3(-1+x)\ln(-1+x)+12\_C2\,x^3(-1+x)\ln(x)+\_C1\,x^4+(-\_C1-12\_C2)\,x^3+6\_C2\,x^2+2\_}{-1+x}\right.$$

Mathematica raw input

```
DSolve[6*y[x] - 2*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^3*C[1] - (C[2]*(-1 - 2*x - 6*x^2 + 12*x^3 + 12*(-1 + x)*x^3*Log[1 -
x] - 12*(-1 + x)*x^3*Log[x]))/(3*(-1 + x))}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)-2*diff(y(x),x)+6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-12*_C2*x^3*(-1+x)*ln(-1+x)+12*_C2*x^3*(-1+x)*ln(x)+_C1*x^4+(-_C1-12*_C2
)*x^3+6*_C2*x^2+2*_C2*x+_C2)/(-1+x)
```

4.1565 $(1-x)xy''(x)+3y'(x)+2y(x)=0$

ODE

$$(1-x)xy''(x)+3y'(x)+2y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0308723 (sec), leaf count = 30

$$\left\{\left\{y(x)\to \frac{12c_1(x-1)^4+c_2(4x-1)}{12x^2}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 25

$$\left\{y(x)=\frac{(4x-1)\_C1}{x^2}+\frac{\_C2\,(-1+x)^4}{x^2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + 3*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (12*(-1 + x)^4*C[1] + (-1 + 4*x)*C[2])/(12*x^2)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)+3*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (4*x-1)/x^2*_C1+_C2*(-1+x)^4/x^2
```

4.1566 $(1-x)xy''(x)-3y'(x)+2y(x)=0$

ODE

$$(1-x)xy''(x)-3y'(x)+2y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0271246 (sec), leaf count = 31

$$\left\{\left\{y(x)\to \frac{12c_1x^4+4c_2x-3c_2}{12(x-1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 23

$$\left\{y(x)=\frac{x^4\_C2+4\_C1\,x-3\_C1}{(-1+x)^2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 3*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (12*x^4*C[1] - 3*C[2] + 4*x*C[2])/(12*(-1 + x)^2)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)-3*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*x^4+4*_C1*x-3*_C1)/(-1+x)^2
```

4.1567 $(1-x)xy''(x)-3y'(x)+2y(x)=x(3x^3+1)$

ODE

$$(1-x)xy''(x)-3y'(x)+2y(x)=x\left(3x^3+1\right)$$

ODE Classification

[[_2nd_order, _exact, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.034747 (sec), leaf count = 51

$$\left\{\left\{y(x)\to \frac{60c_1x^4+20c_2x-15c_2-18x^6+36x^5+30x^3-15x^2}{60(x-1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.032 (sec), leaf count = 45

$$\left\{y(x)=\frac{-6\,x^6+20\,\_C2\,x^4+12\,x^5+10\,x^3+80\,\_C1\,x-5\,x^2-60\,\_C1}{20\,\left(-1+x\right)^2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 3*y'[x] + (1 - x)*x*y''[x] == x*(1 + 3*x^3),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-15*x^2 + 30*x^3 + 36*x^5 - 18*x^6 + 60*x^4*C[1] - 15*C[2] + 20*x*C[2
])/(60*(-1 + x)^2)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)-3*diff(y(x),x)+2*y(x) = x*(3*x^3+1), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/20*(-6*x^6+20*_C2*x^4+12*x^5+10*x^3+80*_C1*x-5*x^2-60*_C1)/(-1+x)^2
```

4.1568 $-ay'(x)+(1-x)xy''(x)+2y(x)=0$

ODE

$$-ay'(x)+(1-x)xy''(x)+2y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.190273 (sec), leaf count = 87

$$\left\{\left\{y(x)\to \frac{(a^2+a(2x-1)+2(x-1)x)\left(\frac{c_2 x^{a+1}(1-x)^{1-a}}{(a-1)a(a+1)(a^2+a(2x-1)+2(x-1)x)}+c_1\right)}{a^2+3a+4}\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 42

$$\left\{y(x)=\_C1\left(a^2+a(-1+2x)+2x^2-2x\right)+\frac{\_C2\, x^a x(-1+x)}{(-1+x)^a}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - a*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((a^2 + 2*(-1 + x)*x + a*(-1 + 2*x))*(C[1] + ((1 - x)^(1 - a)*x^(1 + a
)*C[2])/((-1 + a)*a*(1 + a)*(a^2 + 2*(-1 + x)*x + a*(-1 + 2*x)))))/(4 + 3*a + a^
2)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)-a*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(a^2+a*(-1+2*x)+2*x^2-2*x)+_C2/((-1+x)^a)*(-1+x)*x^a*x
```

4.1569 $x(x+1)y''(x)+(1-x)y'(x)+y(x)=0$

ODE

$$x(x+1)y''(x)+(1-x)y'(x)+y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0340468 (sec), leaf count = 23

$$\{\{y(x)\to c_1(x-1)+c_2((x-1)\log(x)-4)\}\}$$

Maple ✓
cpu = 0.047 (sec), leaf count = 20

$$\{y(x)=\_C2\,(-1+x)\ln(x)-4\_C2+\_C1\,(-1+x)\}$$

Mathematica raw input

```
DSolve[y[x] + (1 - x)*y'[x] + x*(1 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + x)*C[1] + C[2]*(-4 + (-1 + x)*Log[x])}}
```

Maple raw input

```
dsolve(x*(1+x)*diff(diff(y(x),x),x)+(1-x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*(-1+x)*ln(x)-4*_C2+_C1*(-1+x)
```

4.1570 $(1-x)xy''(x)-(x+1)y'(x)+y(x)=0$

ODE

$$(1-x)xy''(x)-(x+1)y'(x)+y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0160223 (sec), leaf count = 24

$$\left\{\left\{y(x)\to \frac{c_2x^2+2c_1}{2-2x}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 17

$$\left\{y(x)=\frac{x^2\_C2+\_C1}{-1+x}\right\}$$

Mathematica raw input

```
DSolve[y[x] - (1 + x)*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*C[1] + x^2*C[2])/(2 - 2*x)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)-(1+x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*x^2+_C1)/(-1+x)
```

4.1571 $(1-x)xy''(x)-(x+4)y'(x)+4y(x)=0$

ODE

$$(1-x)xy''(x)-(x+4)y'(x)+4y(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0402533 (sec), leaf count = 38

$$\left\{\left\{y(x)\to \frac{20c_1(x-2)x^5+c_2\left(5x^2-6x+2\right)}{20(x-1)^4}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 35

$$\left\{y(x)=\frac{\_C1\,x^6-2\,\_C1\,x^5+5\,\_C2\,x^2-6\,\_C2\,x+2\,\_C2}{\left(-1+x\right)^4}\right\}$$

Mathematica raw input

```
DSolve[4*y[x] - (4 + x)*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (20*(-2 + x)*x^5*C[1] + (2 - 6*x + 5*x^2)*C[2])/(20*(-1 + x)^4)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)-(4+x)*diff(y(x),x)+4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x^6-2*_C1*x^5+5*_C2*x^2-6*_C2*x+2*_C2)/(-1+x)^4
```

4.1572 $(1-x)xy''(x)+2xy'(x)-2y(x)=0$

ODE

$$(1-x)xy''(x)+2xy'(x)-2y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0187877 (sec), leaf count = 26

$$\{\{y(x)\to c_2\left(-x^2+2x\log(x)+1\right)-c_1x\}\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 22

$$\{y(x)=-2\ln(x)\_C2\,x+\_C2\,x^2+\_C1\,x-\_C2\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 2*x*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x*C[1]) + C[2]*(1 - x^2 + 2*x*Log[x])}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -2*ln(x)*_C2*x+_C2*x^2+_C1*x-_C2
```

4.1573 $(1-x)xy''(x)+(1-2x)y'(x)+6y(x)=0$

ODE

$$(1-x)xy''(x)+(1-2x)y'(x)+6y(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0123803 (sec), leaf count = 56

$$\left\{\left\{y(x)\to c_1\left(6x^2-6x+1\right)+c_2\left(-\frac{1}{2}\left(6x^2-6x+1\right)\left(\log(2-2x)-\log(2x)\right)-3x+\frac{3}{2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.049 (sec), leaf count = 51

$$\left\{y(x)=-6\left(x^2-x+1/6\right)\_C2\ \ln(-1+x)+6\left(x^2-x+1/6\right)\_C2\ \ln(x)+(-6x+3)\_C2+6\left(x^2-x+1/6\right)\_C1\right\}$$

Mathematica raw input

```
DSolve[6*y[x] + (1 - 2*x)*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 - 6*x + 6*x^2)*C[1] + C[2]*(3/2 - 3*x - ((1 - 6*x + 6*x^2)*(Log[2 -
  2*x] - Log[2*x]))/2)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)+(1-2*x)*diff(y(x),x)+6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -6*(x^2-x+1/6)*_C2*ln(-1+x)+6*(x^2-x+1/6)*_C2*ln(x)+(-6*x+3)*_C2+6*(x^2-x
+1/6)*_C1
```

4.1574 $p(p+1)y(x)+(1-x)xy''(x)+(1-2x)y'(x)=0$

ODE

$$p(p+1)y(x)+(1-x)xy''(x)+(1-2x)y'(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0415777 (sec), leaf count = 26

$$\{\{y(x)\to c_1 P_p(2x-1)+c_2 Q_p(2x-1)\}\}$$

Maple ✓
cpu = 0.125 (sec), leaf count = 51

$$\{y(x)=\_C1\ {}_2\mathrm{F}_1(-p,-p;\,-2\,p;\,x^{-1})x^p+\_C2\ {}_2\mathrm{F}_1(p+1,p+1;\,2+2\,p;\,x^{-1})x^{-p-1}\}$$

Mathematica raw input

```
DSolve[p*(1 + p)*y[x] + (1 - 2*x)*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*LegendreP[p, -1 + 2*x] + C[2]*LegendreQ[p, -1 + 2*x]}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)+(1-2*x)*diff(y(x),x)+p*(p+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([-p, -p],[-2*p],1/x)*x^p+_C2*hypergeom([p+1, p+1],[2+2*p],1
/x)*x^(-p-1)
```

4.1575 $(1-x)xy''(x)+(1-x)y'(x)+2y(x)=0$

ODE

$$(1-x)xy''(x)+(1-x)y'(x)+2y(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0811213 (sec), leaf count = 53

$$\left\{\left\{y(x)\to c_2 G^{2,0}_{2,2}\left(x\left|\begin{array}{c}1-\sqrt{2},1+\sqrt{2}\\0,0\end{array}\right.\right)+c_1\,{}_2F_1\left(-\sqrt{2},\sqrt{2};1;x\right)\right\}\right\}$$

Maple ✓
cpu = 0.111 (sec), leaf count = 79

$$\left\{y(x)=\_C1\,{}_2\mathrm{F}_1(-\sqrt{2},-\sqrt{2}+1;\,1-2\sqrt{2};\,-(-1+x)^{-1})(-1+x)^{\sqrt{2}}+\_C2\,{}_2\mathrm{F}_1(\sqrt{2},1+\sqrt{2};\,1+2\sqrt{2};\,-(-1+x)^{-1})(-\right.$$

Mathematica raw input

```
DSolve[2*y[x] + (1 - x)*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[-Sqrt[2], Sqrt[2], 1, x] + C[2]*MeijerG[{{}, {1
 - Sqrt[2], 1 + Sqrt[2]}}, {{0, 0}, {}}, x]}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)+(1-x)*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([-2^(1/2), -2^(1/2)+1],[1-2*2^(1/2)],-1/(-1+x))*(-1+x)^(2^(
1/2))+_C2*hypergeom([2^(1/2), 1+2^(1/2)],[1+2*2^(1/2)],-1/(-1+x))*(-1+x)^(-2^(1/
2))
```

4.1576 $(1-x)xy''(x)-3xy'(x)-y(x)=0$

ODE

$$(1-x)xy''(x)-3xy'(x)-y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0601935 (sec), leaf count = 38

$$\left\{\left\{y(x)\to \frac{c_1 x-c_2 x\log(x)-c_2}{\sqrt{1-x}(x-1)^{3/2}}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 20

$$\left\{y(x)=\frac{\ln(x)\_C1\,x+\_C2\,x+\_C1}{(-1+x)^2}\right\}$$

Mathematica raw input

```
DSolve[-y[x] - 3*x*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*C[1] - C[2] - x*C[2]*Log[x])/(Sqrt[1 - x]*(-1 + x)^(3/2))}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)-3*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (ln(x)*_C1*x+_C2*x+_C1)/(-1+x)^2
```

4.1577 $x(x+1)y''(x)+(3x+2)y'(x)+y(x)=0$

ODE

$$x(x+1)y''(x)+(3x+2)y'(x)+y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0621307 (sec), leaf count = 28

$$\left\{\left\{y(x)\to \frac{c_2\log(2(x+1))+2c_1}{\sqrt{2}x}\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 16

$$\left\{y(x)=\frac{\_C1\ \ln(1+x)+\_C2}{x}\right\}$$

Mathematica raw input

```
DSolve[y[x] + (2 + 3*x)*y'[x] + x*(1 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*C[1] + C[2]*Log[2*(1 + x)])/(Sqrt[2]*x)}}
```

Maple raw input

```
dsolve(x*(1+x)*diff(diff(y(x),x),x)+(2+3*x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*ln(1+x)+_C2)/x
```

4.1578 $(1-x)xy''(x)+(1-4x)y'(x)-2y(x)=0$

ODE

$$(1-x)xy''(x)+(1-4x)y'(x)-2y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.022975 (sec), leaf count = 24

$$\left\{\left\{y(x)\to \frac{-c_2x+c_2\log(x)+c_1}{(x-1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 20

$$\left\{y(x)=\frac{\_C1\ \ln(x)-\_C1\ x+\_C2}{(-1+x)^2}\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + (1 - 4*x)*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] - x*C[2] + C[2]*Log[x])/(-1 + x)^2}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)+(1-4*x)*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*ln(x)-_C1*x+_C2)/(-1+x)^2
```

4.1579 $(1-x)xy''(x)-2(2x+1)y'(x)-2y(x)=0$

ODE

$$(1-x)xy''(x)-2(2x+1)y'(x)-2y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0317103 (sec), leaf count = 52

$$\left\{\left\{y(x)\to \frac{-3c_2x^4-3c_1x^3+12c_2x^3\log(x)+18c_2x^2-6c_2x+c_2}{3(x-1)^5}\right\}\right\}$$

Maple ✓
cpu = 0.031 (sec), leaf count = 41

$$\left\{y(x)=\frac{12\ln(x)\_C1\,x^3+\left(-3x^4+18x^2-6x+1\right)\_C1+x^3\_C2}{(-1+x)^5}\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] - 2*(1 + 2*x)*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-3*x^3*C[1] + C[2] - 6*x*C[2] + 18*x^2*C[2] - 3*x^4*C[2] + 12*x^3*C[2
]*Log[x])/(3*(-1 + x)^5)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)-2*(1+2*x)*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (12*ln(x)*_C1*x^3+(-3*x^4+18*x^2-6*x+1)*_C1+x^3*_C2)/(-1+x)^5
```

4.1580 $(1-x)xy''(x)-2(1-2x)y'(x)-6y(x)=0$

ODE

$$(1-x)xy''(x)-2(1-2x)y'(x)-6y(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.030462 (sec), leaf count = 31

$$\left\{\left\{y(x)\to \frac{1}{3}c_2\left(3x^2-3x+1\right)-c_1(x-1)^3\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 22

$$\{y(x) = \_C1\, x^3+\_C2\, \left(3\, x^2-3\, x+1\right)\}$$

Mathematica raw input

```
DSolve[-6*y[x] - 2*(1 - 2*x)*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-1 + x)^3*C[1]) + ((1 - 3*x + 3*x^2)*C[2])/3}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)-2*(1-2*x)*diff(y(x),x)-6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^3+_C2*(3*x^2-3*x+1)
```

4.1581 $(p-k)(k+p+1)y(x)+(k+1)(1-2x)y'(x)+(1-x)xy''(x)=0$

ODE

$$(p-k)(k+p+1)y(x)+(k+1)(1-2x)y'(x)+(1-x)xy''(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0269441 (sec), leaf count = 41

$$\left\{\left\{y(x)\to (-(x-1)x)^{-k/2}\left(c_1 P_p^k(2x-1)+c_2 Q_p^k(2x-1)\right)\right\}\right\}$$

Maple ✓
cpu = 0.063 (sec), leaf count = 45

$$\left\{y(x)=\_C1\,{}_2\mathrm{F}_1(k-p,1+k+p;\,k+1;\,x)+\_C2\,x^{-k}{}_2\mathrm{F}_1(-p,p+1;\,1-k;\,x)\right\}$$

Mathematica raw input

```
DSolve[(-k + p)*(1 + k + p)*y[x] + (1 + k)*(1 - 2*x)*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]*LegendreP[p, k, -1 + 2*x] + C[2]*LegendreQ[p, k, -1 + 2*x])/(-((
-1 + x)*x))^(k/2)}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)+(k+1)*(1-2*x)*diff(y(x),x)+(p-k)*(1+k+p)*y(x) = 0, y(x),'implicit
```

Maple raw output

```
y(x) = _C1*hypergeom([k-p, 1+k+p],[k+1],x)+_C2*x^(-k)*hypergeom([-p, p+1],[1-k],
x)
```

4.1582 $(c-(a+1)x)y'(x)+n(a+n)y(x)+(1-x)xy''(x)=0$

ODE

$$(c-(a+1)x)y'(x)+n(a+n)y(x)+(1-x)xy''(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.155941 (sec), leaf count = 57

$$\{\{y(x)\to (-1)^{1-c}c_2x^{1-c}\,{}_2F_1(-c-n+1,a-c+n+1;2-c;x)+c_1\,{}_2F_1(-n,a+n;c;x)\}\}$$

Maple ✓
cpu = 0.063 (sec), leaf count = 51

$$\{y(x)=\_C1\,{}_2\mathrm{F}_1(-n,n+a;\,c;\,x)+\_C2\,x^{-c+1}{}_2\mathrm{F}_1(-n-c+1,n+a-c+1;\,-c+2;\,x)\}$$

Mathematica raw input

```
DSolve[n*(a + n)*y[x] + (c - (1 + a)*x)*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1)^(1 - c)*x^(1 - c)*C[2]*Hypergeometric2F1[1 - c - n, 1 + a - c + n
, 2 - c, x] + C[1]*Hypergeometric2F1[-n, a + n, c, x]}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)+(c-(1+a)*x)*diff(y(x),x)+n*(n+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([-n, n+a],[c],x)+_C2*x^(-c+1)*hypergeom([-n-c+1, n+a-c+1],[
-c+2],x)
```

4.1583 $(a+bx)y'(x)+cy(x)+x(x+1)y''(x)=0$

ODE

$$(a+bx)y'(x)+cy(x)+x(x+1)y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.153564 (sec), leaf count = 131

$$\left\{\left\{y(x)\to c_2 x^{1-a}\,{}_2F_1\left(\frac{1}{2}\left(-2a+b-\sqrt{b^2-2b-4c+1}+1\right),\frac{1}{2}\left(-2a+b+\sqrt{b^2-2b-4c+1}+1\right);2-a;-x\right)+c_1\,{}_2F_1\right.\right.$$

Maple ✓
cpu = 0.069 (sec), leaf count = 124

$$\left\{y(x)=\_C1\,{}_2\mathrm{F}_1(-\frac{1}{2}+\frac{1}{2}\sqrt{b^2-2\,b-4\,c+1}+\frac{b}{2},-\frac{1}{2}-\frac{1}{2}\sqrt{b^2-2\,b-4\,c+1}+\frac{b}{2};-a+b;1+x)+\_C2\,(1+x)^{a-b+1}\,{}_2\right.$$

Mathematica raw input

```
DSolve[c*y[x] + (a + b*x)*y'[x] + x*(1 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[(-1 + b - Sqrt[1 - 2*b + b^2 - 4*c])/2, (-1 + b
 + Sqrt[1 - 2*b + b^2 - 4*c])/2, a, -x] + x^(1 - a)*C[2]*Hypergeometric2F1[(1 -
2*a + b - Sqrt[1 - 2*b + b^2 - 4*c])/2, (1 - 2*a + b + Sqrt[1 - 2*b + b^2 - 4*c]
)/2, 2 - a, -x]}}
```

Maple raw input

```
dsolve(x*(1+x)*diff(diff(y(x),x),x)+(b*x+a)*diff(y(x),x)+c*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([-1/2+1/2*(b^2-2*b-4*c+1)^(1/2)+1/2*b, -1/2-1/2*(b^2-2*b-4*
c+1)^(1/2)+1/2*b],[-a+b],1+x)+_C2*(1+x)^(a-b+1)*hypergeom([1/2-1/2*(b^2-2*b-4*c+
1)^(1/2)-1/2*b+a, 1/2+1/2*(b^2-2*b-4*c+1)^(1/2)-1/2*b+a],[2+a-b],1+x)
```

4.1584 $y'(x)(c-x(a+b+1))-aby(x)+(1-x)xy''(x)=0$

ODE

$$y'(x)(c-x(a+b+1))-aby(x)+(1-x)xy''(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.149333 (sec), leaf count = 50

$$\{\{y(x)\to (-1)^{1-c}c_2x^{1-c}\,{}_2F_1(a-c+1,b-c+1;2-c;x)+c_1\,{}_2F_1(a,b;c;x)\}\}$$

Maple ✓
cpu = 0.059 (sec), leaf count = 44

$$\{y(x)=\_C1\,{}_2\mathrm{F}_1(a,b;\,c;\,x)+\_C2\,x^{-c+1}{}_2\mathrm{F}_1(b-c+1,a-c+1;\,-c+2;\,x)\}$$

Mathematica raw input

```
DSolve[-(a*b*y[x]) + (c - (1 + a + b)*x)*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[a, b, c, x] + (-1)^(1 - c)*x^(1 - c)*C[2]*Hyper
geometric2F1[1 + a - c, 1 + b - c, 2 - c, x]}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)+(c-(1+a+b)*x)*diff(y(x),x)-a*b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([a, b],[c],x)+_C2*x^(-c+1)*hypergeom([b-c+1, a-c+1],[-c+2],
x)
```

4.1585 $-(a-(2-a)x)y'(x)-ay(x)+x(x+1)y''(x)=0$

ODE

$$-(a-(2-a)x)y'(x)-ay(x)+x(x+1)y''(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.142953 (sec), leaf count = 67

$$\left\{\left\{y(x)\to \frac{x^{\frac{1}{2}\left(a-\sqrt{(a+1)^2}+1\right)}\left(c_2 x^{\sqrt{(a+1)^2}}+\sqrt{(a+1)^2}c_1\right)}{\sqrt{(a+1)^2}(x+1)}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 18

$$\left\{y(x)=\frac{x^a x\_C2+\_C1}{1+x}\right\}$$

Mathematica raw input

```
DSolve[-(a*y[x]) - (a - (2 - a)*x)*y'[x] + x*(1 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^((1 + a - Sqrt[(1 + a)^2])/2)*(Sqrt[(1 + a)^2]*C[1] + x^Sqrt[(1 + a
)^2]*C[2]))/(Sqrt[(1 + a)^2]*(1 + x))}}
```

Maple raw input

```
dsolve(x*(1+x)*diff(diff(y(x),x),x)-(a-(2-a)*x)*diff(y(x),x)-a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^a*x*_C2+_C1)/(1+x)
```

4.1586 $-(a-(2-a)x)y'(x)-ay(x)+x(x+1)y''(x)=0$

ODE

$$-(a-(2-a)x)y'(x)-ay(x)+x(x+1)y''(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0258654 (sec), leaf count = 67

$$\left\{\left\{y(x)\to \frac{x^{\frac{1}{2}\left(a-\sqrt{(a+1)^2}+1\right)}\left(c_2 x^{\sqrt{(a+1)^2}}+\sqrt{(a+1)^2}c_1\right)}{\sqrt{(a+1)^2}(x+1)}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 18

$$\left\{y(x)=\frac{x^a x\_C2+\_C1}{1+x}\right\}$$

Mathematica raw input

```
DSolve[-(a*y[x]) - (a - (2 - a)*x)*y'[x] + x*(1 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^((1 + a - Sqrt[(1 + a)^2])/2)*(Sqrt[(1 + a)^2]*C[1] + x^Sqrt[(1 + a
)^2]*C[2]))/(Sqrt[(1 + a)^2]*(1 + x))}}
```

Maple raw input

```
dsolve(x*(1+x)*diff(diff(y(x),x),x)-(a-(2-a)*x)*diff(y(x),x)-a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^a*x*_C2+_C1)/(1+x)
```

4.1587 $(a+bx)y'(x)+cy(x)+(1-x)xy''(x)=0$

ODE

$$(a+bx)y'(x)+cy(x)+(1-x)xy''(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.138508 (sec), leaf count = 142

$$\left\{\left\{y(x)\to (-1)^{1-a}c_2x^{1-a}\,{}_2F_1\left(\frac{1}{2}\left(-2a-b-\sqrt{b^2+2b+4c+1}+1\right),\frac{1}{2}\left(-2a-b+\sqrt{b^2+2b+4c+1}+1\right);2-a;x\right)+\right.\right.$$

Maple ✓
cpu = 0.067 (sec), leaf count = 116

$$\left\{y(x)=\_C1\,{}_2\mathrm{F}_1(-\frac{1}{2}-\frac{b}{2}-\frac{1}{2}\sqrt{b^2+2\,b+4\,c+1},-\frac{1}{2}-\frac{b}{2}+\frac{1}{2}\sqrt{b^2+2\,b+4\,c+1};\,a;\,x)+\_C2\,x^{1-a}{}_2\mathrm{F}_1(\frac{1}{2}-\frac{b}{2}-\frac{1}{2}\sqrt{b^2}\right.$$

Mathematica raw input

```
DSolve[c*y[x] + (a + b*x)*y'[x] + (1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[(-1 - b - Sqrt[1 + 2*b + b^2 + 4*c])/2, (-1 - b
  + Sqrt[1 + 2*b + b^2 + 4*c])/2, a, x] + (-1)^(1 - a)*x^(1 - a)*C[2]*Hypergeomet
ric2F1[(1 - 2*a - b - Sqrt[1 + 2*b + b^2 + 4*c])/2, (1 - 2*a - b + Sqrt[1 + 2*b
+ b^2 + 4*c])/2, 2 - a, x]}}
```

Maple raw input

```
dsolve(x*(1-x)*diff(diff(y(x),x),x)+(b*x+a)*diff(y(x),x)+c*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([-1/2-1/2*b-1/2*(b^2+2*b+4*c+1)^(1/2), -1/2-1/2*b+1/2*(b^2+
2*b+4*c+1)^(1/2)],[a],x)+_C2*x^(1-a)*hypergeom([1/2-1/2*b-1/2*(b^2+2*b+4*c+1)^(1
/2)-a, 1/2-1/2*b+1/2*(b^2+2*b+4*c+1)^(1/2)-a],[2-a],x)
```

4.1588 $y(x)\left(\sum_{m=0}^{n} a(m)x^m\right) + a(1-2x)y'(x) + x(x+1)y''(x) = 0$

ODE

$$y(x)\left(\sum_{m=0}^{n} a(m)x^m\right) + a(1-2x)y'(x) + x(x+1)y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 4.67855 (sec), leaf count = 0 , could not solve

```
DSolve[Sum[x^m*a[m], {m, 0, n}]*y[x] + a*(1 - 2*x)*Derivative[1][y][x] + x*(1 + x)*Derivative[2][y][x
```

Maple ✗
cpu = 23.138 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x) = DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x) + \frac{a(1-2\,x)\,\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{(1+x)\,x} + \frac{\sum_{m=0}^{n} a(m)\,x^m\,\_Y(x)}{(1+x)\,x}\right\}, \{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[Sum[x^m*a[m], {m, 0, n}]*y[x] + a*(1 - 2*x)*y'[x] + x*(1 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[Sum[x^m*a[m], {m, 0, n}]*y[x] + a*(1 - 2*x)*Derivative[1][y][x] + x*(1 +
x)*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x*(1+x)*diff(diff(y(x),x),x)+a*(1-2*x)*diff(y(x),x)+sum(a(m)*x^m,m = 0 .. n)*y(x) = 0, y(x),'i
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+a*(1-2*x)/x/(1+x)*diff(_Y(x),x)+sum(a(m)*x^m
,m = 0 .. n)/x/(1+x)*_Y(x)},{_Y(x)})
```

4.1589 $(-x^2-x+2)\,y''(x)+(1-x)xy'(x)+x(6x+7)y(x)=0$

ODE

$$(-x^2-x+2)\,y''(x)+(1-x)xy'(x)+x(6x+7)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0856123 (sec), leaf count = 60

$$\left\{\left\{y(x)\to \frac{1}{5}e^{-3x-5}\left(195c_2e^{5x}(x-1)\text{Ei}(5-5x)-e^5\left(5c_1e^{5x}(x-1)-c_2(x+44)\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.085 (sec), leaf count = 42

$$\{y(x) = -195\,\mathrm{e}^{2\,x-5}\_C2\,(-1+x)\,Ei(1,5\,x-5)+\_C2\,(x+44)\,\mathrm{e}^{-3\,x}+\_C1\,\mathrm{e}^{2\,x}(-1+x)\}$$

Mathematica raw input

```
DSolve[x*(7 + 6*x)*y[x] + (1 - x)*x*y'[x] + (2 - x - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(-5 - 3*x)*(-(E^5*(5*E^(5*x)*(-1 + x)*C[1] - (44 + x)*C[2])) + 195*
E^(5*x)*(-1 + x)*C[2]*ExpIntegralEi[5 - 5*x]))/5}}
```

Maple raw input

```
dsolve((-x^2-x+2)*diff(diff(y(x),x),x)+x*(1-x)*diff(y(x),x)+x*(7+6*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -195*exp(2*x-5)*_C2*(-1+x)*Ei(1,5*x-5)+_C2*(x+44)*exp(-3*x)+_C1*exp(2*x)*
(-1+x)
```

4.1590 $(2-x)xy''(x)+2(1-x)y'(x)+2y(x)=0$

ODE

$$(2-x)xy''(x)+2(1-x)y'(x)+2y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.012954 (sec), leaf count = 37

$$\left\{\left\{y(x)\to c_1(x-1)-\frac{1}{2}c_2((x-1)\log(2-x)-x\log(x)+\log(x)+2)\right\}\right\}$$

Maple ✓
cpu = 0.052 (sec), leaf count = 32

$$\left\{y(x)=-\frac{\_C2\,(-1+x)\ln(x-2)}{2}+\frac{\_C2\,(-1+x)\ln(x)}{2}+\_C1\,x-\_C1-\_C2\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + 2*(1 - x)*y'[x] + (2 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + x)*C[1] - (C[2]*(2 + (-1 + x)*Log[2 - x] + Log[x] - x*Log[x]))/2
}}
```

Maple raw input

```
dsolve(x*(2-x)*diff(diff(y(x),x),x)+2*(1-x)*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2*_C2*(-1+x)*ln(x-2)+1/2*_C2*(-1+x)*ln(x)+_C1*x-_C1-_C2
```

4.1591 $-(2-x^2)\,y'(x)+(2-x)xy''(x)+2(1-x)y(x)=0$

ODE

$$-(2-x^2)\,y'(x)+(2-x)xy''(x)+2(1-x)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0353396 (sec), leaf count = 18

$$\{\{y(x)\to c_2x^2+c_1e^x\}\}$$

Maple ✓
cpu = 0.034 (sec), leaf count = 14

$$\{y(x)=\_C1\,x^2+\_C2\,\mathrm{e}^x\}$$

Mathematica raw input

```
DSolve[2*(1 - x)*y[x] - (2 - x^2)*y'[x] + (2 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1] + x^2*C[2]}}
```

Maple raw input

```
dsolve(x*(2-x)*diff(diff(y(x),x),x)-(-x^2+2)*diff(y(x),x)+2*(1-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^2+_C2*exp(x)
```

4.1592 $(1-x)^2y''(x)-4(1-x)y'(x)+2y(x)=0$

ODE

$$(1-x)^2y''(x)-4(1-x)y'(x)+2y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0229209 (sec), leaf count = 20

$$\left\{\left\{y(x)\to \frac{c_1(x-1)+c_2}{(x-1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 17

$$\left\{y(x)=\frac{\_C1+\_C2\,(-1+x)}{(-1+x)^2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 4*(1 - x)*y'[x] + (1 - x)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-1 + x)*C[1] + C[2])/(-1 + x)^2}}
```

Maple raw input

```
dsolve((1-x)^2*diff(diff(y(x),x),x)-4*(1-x)*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1+_C2*(-1+x))/(-1+x)^2
```

4.1593 $(1-x)^2y''(x)-4(1-x)y'(x)+2y(x)=\cos(x)$

ODE

$$(1-x)^2y''(x)-4(1-x)y'(x)+2y(x)=\cos(x)$$

ODE Classification

[[_2nd_order, _exact, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0386188 (sec), leaf count = 24

$$\left\{\left\{y(x)\to \frac{c_1(x-1)+c_2-\cos(x)}{(x-1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 19

$$\left\{y(x)=\frac{\_C2+\_C1\,x-\cos\left(x\right)}{\left(-1+x\right)^2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 4*(1 - x)*y'[x] + (1 - x)^2*y''[x] == Cos[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-1 + x)*C[1] + C[2] - Cos[x])/(-1 + x)^2}}
```

Maple raw input

```
dsolve((1-x)^2*diff(diff(y(x),x),x)-4*(1-x)*diff(y(x),x)+2*y(x) = cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2+_C1*x-cos(x))/(-1+x)^2
```

4.1594 $(x+1)^2 y''(x) - 4(x+1)y'(x) + 6y(x) = 0$

ODE

$$(x+1)^2 y''(x) - 4(x+1)y'(x) + 6y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.654448 (sec), leaf count = 20

$$\{\{y(x) \to (x+1)^2 (c_2(x+1) + c_1)\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 17

$$\{y(x) = (1+x)^2 (\_C1 + \_C2 (1+x))\}$$

Mathematica raw input

```
DSolve[6*y[x] - 4*(1 + x)*y'[x] + (1 + x)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x)^2*(C[1] + (1 + x)*C[2])}}
```

Maple raw input

```
dsolve((1+x)^2*diff(diff(y(x),x),x)-4*(1+x)*diff(y(x),x)+6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (1+x)^2*(_C1+_C2*(1+x))
```

4.1595 $(x+1)^2 y''(x) - 4(x+1)y'(x) + 6y(x) = x$

ODE

$$(x+1)^2 y''(x) - 4(x+1)y'(x) + 6y(x) = x$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.186771 (sec), leaf count = 31

$$\left\{\left\{y(x) \to c_2(x+1)^3 + c_1(x+1)^2 + \frac{1}{6}(3x+2)\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 27

$$\left\{y(x) = (1+x)^2 \_C2 + (1+x)^3 \_C1 - \frac{x^2}{3} - \frac{x}{6}\right\}$$

Mathematica raw input

```
DSolve[6*y[x] - 4*(1 + x)*y'[x] + (1 + x)^2*y''[x] == x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2 + 3*x)/6 + (1 + x)^2*C[1] + (1 + x)^3*C[2]}}
```

Maple raw input

```
dsolve((1+x)^2*diff(diff(y(x),x),x)-4*(1+x)*diff(y(x),x)+6*y(x) = x, y(x),'implicit')
```

Maple raw output

```
y(x) = (1+x)^2*_C2+(1+x)^3*_C1-1/3*x^2-1/6*x
```

4.1596 $-(-x^2-x+1)\,y'(x)+(x+1)^2y''(x)-(x+2)y(x)=0$

ODE

$$-(-x^2-x+1)\,y'(x)+(x+1)^2y''(x)-(x+2)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 32.6117 (sec), leaf count = 45

$$\left\{\left\{y(x)\to e^{-x}\left(c_2\int_1^x e^{\frac{K[1]^2+K[1]-1}{K[1]+1}}(K[1]+1)\,dK[1]+c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.331 (sec), leaf count = 53

$$\left\{y(x)=(1+x)\left(\_C2\,HeunD\left(-4,4,-8,12,\frac{x}{2+x}\right)e^{\frac{-1+x}{2+2\,x}}+\_C1\,e^{-x}HeunD\left(4,4,-8,12,\frac{x}{2+x}\right)\right)\right\}$$

Mathematica raw input

```
DSolve[-((2 + x)*y[x]) - (1 - x - x^2)*y'[x] + (1 + x)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + C[2]*Integrate[E^((-1 + K[1] + K[1]^2)/(1 + K[1]))*(1 + K[1]),
  {K[1], 1, x}])/E^x}}
```

Maple raw input

```
dsolve((1+x)^2*diff(diff(y(x),x),x)-(-x^2-x+1)*diff(y(x),x)-(2+x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (1+x)*(_C2*HeunD(-4,4,-8,12,x/(2+x))*exp((-1+x)/(2+2*x))+_C1*exp(-x)*Heun
D(4,4,-8,12,x/(2+x)))
```

4.1597 $(1-x)^2y''(x)-2(1-x)^2y'(x)+(1-x)^2y(x)=e^x$

ODE

$$(1-x)^2y''(x)-2(1-x)^2y'(x)+(1-x)^2y(x)=e^x$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0412875 (sec), leaf count = 23

$$\{\{y(x)\to e^x(c_2x+c_1-\log(x-1)-1)\}\}$$

Maple ✓
cpu = 0.03 (sec), leaf count = 19

$$\{y(x)=\mathrm{e}^x(\_C1\,x+\_C2-\ln(-1+x)-1)\}$$

Mathematica raw input

```
DSolve[(1 - x)^2*y[x] - 2*(1 - x)^2*y'[x] + (1 - x)^2*y''[x] == E^x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(-1 + C[1] + x*C[2] - Log[-1 + x])}}
```

Maple raw input

```
dsolve((1-x)^2*diff(diff(y(x),x),x)-2*(1-x)^2*diff(y(x),x)+(1-x)^2*y(x) = exp(x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(x)*(_C1*x+_C2-ln(-1+x)-1)
```

4.1598 $(x^2+3x+4)\,y''(x)+(x^2+x+1)\,y'(x)-(2x+3)y(x)=0$

ODE

$$(x^2+3x+4)\,y''(x)+(x^2+x+1)\,y'(x)-(2x+3)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0566449 (sec), leaf count = 23

$$\{\{y(x)\to c_2(x^2+x+3)+c_1e^{-x}\}\}$$

Maple ✓
cpu = 0.044 (sec), leaf count = 19

$$\{y(x)=\_C1\,\mathrm{e}^{-x}+\_C2\,(x^2+x+3)\}$$

Mathematica raw input

```
DSolve[-((3 + 2*x)*y[x]) + (1 + x + x^2)*y'[x] + (4 + 3*x + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^x + (3 + x + x^2)*C[2]}}
```

Maple raw input

```
dsolve((x^2+3*x+4)*diff(diff(y(x),x),x)+(x^2+x+1)*diff(y(x),x)-(3+2*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-x)+_C2*(x^2+x+3)
```

4.1599 $(x+2)^2y''(x)-(x+2)y'(x)+2y(x)=0$

ODE

$$(x+2)^2y''(x)-(x+2)y'(x)+2y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0228534 (sec), leaf count = 26

$$\{\{y(x)\to (x+2)\left(c_1 \sin(\log(x+2))+c_2 \cos(\log(x+2))\right)\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 23

$$\{y(x)=(2+x)\left(\_C1 \sin\left(\ln\left(2+x\right)\right)+\_C2 \cos\left(\ln\left(2+x\right)\right)\right)\}$$

Mathematica raw input

```
DSolve[2*y[x] - (2 + x)*y'[x] + (2 + x)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2 + x)*(C[2]*Cos[Log[2 + x]] + C[1]*Sin[Log[2 + x]])}}
```

Maple raw input

```
dsolve((2+x)^2*diff(diff(y(x),x),x)-(2+x)*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (2+x)*(_C1*sin(ln(2+x))+_C2*cos(ln(2+x)))
```

4.1600 $(2-x)^2y''(x)+(2-x)y'(x)-3y(x)=0$

ODE

$$(2-x)^2y''(x)+(2-x)y'(x)-3y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.041108 (sec), leaf count = 22

$$\left\{\left\{y(x)\to c_1(x-2)^3+\frac{c_2}{x-2}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 19

$$\left\{y(x)=\frac{\_C1\,(x-2)^4+\_C2}{x-2}\right\}$$

Mathematica raw input

```
DSolve[-3*y[x] + (2 - x)*y'[x] + (2 - x)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2 + x)^3*C[1] + C[2]/(-2 + x)}}
```

Maple raw input

```
dsolve((2-x)^2*diff(diff(y(x),x),x)+(2-x)*diff(y(x),x)-3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*(x-2)^4+_C2)/(x-2)
```

4.1601 $x(\mathbf{a0}+x)y''(x)+(\mathbf{a1}+\mathbf{b1}x)y'(x)+\mathbf{a2}y(x)=0$

ODE

$$x(\mathrm{a0}+x)y''(x)+(\mathrm{a1}+\mathrm{b1}x)y'(x)+\mathrm{a2}y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.266966 (sec), leaf count = 160

$$\left\{\left\{y(x)\to c_2\mathrm{a0}^{\frac{\mathrm{a1}}{\mathrm{a0}}-1}x^{1-\frac{\mathrm{a1}}{\mathrm{a0}}}\,{}_2F_1\left(\frac{\mathrm{a0}\left(\mathrm{b1}-\sqrt{(\mathrm{b1}-1)^2-4\mathrm{a2}}+1\right)-2\mathrm{a1}}{2\mathrm{a0}},\frac{\mathrm{a0}\left(\mathrm{b1}+\sqrt{(\mathrm{b1}-1)^2-4\mathrm{a2}}+1\right)-2\mathrm{a1}}{2\mathrm{a0}};2-\frac{\mathrm{a1}}{\mathrm{a0}};-\right.\right.\right.$$

Maple ✓
cpu = 0.15 (sec), leaf count = 249

$$\left\{y(x)=\_C1\,{}_2\mathrm{F}_1(-\frac{1}{2}+\frac{b1}{2}-\frac{1}{2}\sqrt{b1^2-4\,a2-2\,b1+1},-\frac{1}{2}+\frac{b1}{2}+\frac{1}{2}\sqrt{b1^2-4\,a2-2\,b1+1};\frac{1}{2}\left(b1\,\sqrt{a0^2}+b1\,a0-2\right.\right.$$

Mathematica raw input

```
DSolve[a2*y[x] + (a1 + b1*x)*y'[x] + x*(a0 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[(-1 - Sqrt[-4*a2 + (-1 + b1)^2] + b1)/2, (-1 +
Sqrt[-4*a2 + (-1 + b1)^2] + b1)/2, a1/a0, -(x/a0)] + a0^(-1 + a1/a0)*x^(1 - a1/a
0)*C[2]*Hypergeometric2F1[(-2*a1 + a0*(1 - Sqrt[-4*a2 + (-1 + b1)^2] + b1))/(2*a
0), (-2*a1 + a0*(1 + Sqrt[-4*a2 + (-1 + b1)^2] + b1))/(2*a0), 2 - a1/a0, -(x/a0)
]}}
```

Maple raw input

```
dsolve(x*(a0+x)*diff(diff(y(x),x),x)+(b1*x+a1)*diff(y(x),x)+a2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([-1/2+1/2*b1-1/2*(b1^2-4*a2-2*b1+1)^(1/2), -1/2+1/2*b1+1/2*
(b1^2-4*a2-2*b1+1)^(1/2)],[1/2*(b1*(a0^2)^(1/2)+b1*a0-2*a1)/(a0^2)^(1/2)],1/2/(a
0^2)^(1/2)*((a0^2)^(1/2)+a0+2*x))+_C2*((a0^2)^(1/2)+a0+2*x)^(-1/2*((b1-2)*(a0^2)
^(1/2)+b1*a0-2*a1)*(a0^2)^(1/2)/a0^2)*hypergeom([-1/2/(a0^2)^(1/2)*((b1^2-4*a2-2
*b1+1)^(1/2)*(a0^2)^(1/2)-(a0^2)^(1/2)+b1*a0-2*a1), 1/2/(a0^2)^(1/2)*((a0^2)^(1/
2)+(b1^2-4*a2-2*b1+1)^(1/2)*(a0^2)^(1/2)-b1*a0+2*a1)],[-1/2/(a0^2)^(1/2)*((b1-4)
*(a0^2)^(1/2)+b1*a0-2*a1)],1/2/(a0^2)^(1/2)*((a0^2)^(1/2)+a0+2*x))
```

4.1602 $-4(a+x)y'(x)+(\mathbf{a0}+x)^2y''(x)+6y(x)=0$

ODE

$$-4(a+x)y'(x)+(\mathrm{a0}+x)^2y''(x)+6y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.475826 (sec), leaf count = 179

$$\left\{\left\{y(x)\to \frac{(8a^2-4a(\mathrm{a0}-3x)-\mathrm{a0}^2-6\mathrm{a0}x+3x^2)\left(\frac{1}{9}c_2\left(e^{-\frac{4(a-\mathrm{a0})}{\mathrm{a0}+x}}\left(x-\frac{8(a-\mathrm{a0})^2(6a+\mathrm{a0}+7x)}{8a^2-4a(\mathrm{a0}-3x)-\mathrm{a0}^2-6\mathrm{a0}x+3x^2}\right)\right.\right.\right.\right.+12a\mathrm{Ei}\left(-\frac{4(a-\mathrm{a0})}{\mathrm{a0}+}\right.$$
$$8a^2-4a\mathrm{a0}-\mathrm{a0}^2$$

Maple ✓
cpu = 0.127 (sec), leaf count = 132

$$\left\{y(x)=-32\left(-1/8\,a0^2+\left(-a/2-3/4\,x\right)a0+a^2+3/2\,ax+3/8\,x^2\right)(a-a0)\_C2\,Ei\left(1,\frac{4\,a-4\,a0}{a0+x}\right)+8\,(a0+x)\_C2\,(\right.$$

Mathematica raw input

```
DSolve[6*y[x] - 4*(a + x)*y'[x] + (a0 + x)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((8*a^2 - a0^2 - 4*a*(a0 - 3*x) - 6*a0*x + 3*x^2)*(C[1] + (C[2]*((6*a
- 5*a0)/E^((4*(a - a0))/(a0 + x)) + (x - (8*(a - a0)^2*(6*a + a0 + 7*x))/(8*a^2
- a0^2 - 4*a*(a0 - 3*x) - 6*a0*x + 3*x^2))/E^((4*(a - a0))/(a0 + x)) + 12*a*ExpI
ntegralEi[(-4*(a - a0))/(a0 + x)] - 12*a0*ExpIntegralEi[(-4*(a - a0))/(a0 + x)])
)/9))/(8*a^2 - 4*a*a0 - a0^2)}}
```

Maple raw input

```
dsolve((a0+x)^2*diff(diff(y(x),x),x)-4*(a+x)*diff(y(x),x)+6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -32*(-1/8*a0^2+(-1/2*a-3/4*x)*a0+a^2+3/2*a*x+3/8*x^2)*(a-a0)*_C2*Ei(1,(4*
a-4*a0)/(a0+x))+8*(a0+x)*_C2*(-1/8*a0^2+(-3/4*a-x)*a0+a^2+5/4*a*x+1/8*x^2)*exp((
-4*a+4*a0)/(a0+x))+8/3*_C1*(-1/8*a0^2+(-1/2*a-3/4*x)*a0+a^2+3/2*a*x+3/8*x^2)
```

4.1603 $2x^2y''(x) - xy'(x) + y(x) = x^2$

ODE

$$2x^2y''(x) - xy'(x) + y(x) = x^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0247336 (sec), leaf count = 25

$$\left\{\left\{y(x) \to c_2 x + c_1\sqrt{x} + \frac{x^2}{3}\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 18

$$\left\{y(x) = x\_C2 + \sqrt{x}\_C1 + \frac{x^2}{3}\right\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + 2*x^2*y''[x] == x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2/3 + Sqrt[x]*C[1] + x*C[2]}}
```

Maple raw input

```
dsolve(2*x^2*diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x) = x^2, y(x),'implicit')
```

Maple raw output

```
y(x) = x*_C2+x^(1/2)*_C1+1/3*x^2
```

4.1604 $2x^2y''(x) + xy'(x) - 3y(x) = 0$

ODE

$$2x^2y''(x) + xy'(x) - 3y(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.023615 (sec), leaf count = 20

$$\left\{\left\{y(x) \to \frac{c_1 x^{5/2} + c_2}{x}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 15

$$\left\{y(x) = \frac{1}{x}\left(\_C1\, x^{\frac{5}{2}} + \_C2\right)\right\}$$

Mathematica raw input

```
DSolve[-3*y[x] + x*y'[x] + 2*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(5/2)*C[1] + C[2])/x}}
```

Maple raw input

```
dsolve(2*x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x^(5/2)+_C2)/x
```

4.1605 $2x^2y''(x) - (2x+7)xy'(x) + 2(x+5)y(x) = 0$

ODE

$$2x^2y''(x) - (2x+7)xy'(x) + 2(x+5)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0406546 (sec), leaf count = 46

$$\left\{\left\{y(x) \to c_1 e^x x^{5/2} - 2c_2 x^2\left(\sqrt{\pi} e^x \sqrt{x}\operatorname{erf}\left(\sqrt{x}\right) + 1\right)\right\}\right\}$$

Maple ✓
cpu = 0.108 (sec), leaf count = 33

$$\left\{y(x) = \mathrm{e}^x \left(\_C2\sqrt{\pi}\,Erf\left(\sqrt{x}\right) - \_C2\sqrt{\pi} + \_C1\right) x^{\frac{5}{2}} + \_C2\,x^2\right\}$$

Mathematica raw input

```
DSolve[2*(5 + x)*y[x] - x*(7 + 2*x)*y'[x] + 2*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*x^(5/2)*C[1] - 2*x^2*C[2]*(1 + E^x*Sqrt[Pi]*Sqrt[x]*Erf[Sqrt[x]])}
}
```

Maple raw input

```
dsolve(2*x^2*diff(diff(y(x),x),x)-x*(7+2*x)*diff(y(x),x)+2*(5+x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(x)*(_C2*Pi^(1/2)*erf(x^(1/2))-_C2*Pi^(1/2)+_C1)*x^(5/2)+_C2*x^2
```

4.1606 $2x^2y''(x) - (1-4x)xy'(x) - 2(1-3x)y(x) = 0$

ODE

$$2x^2y''(x) - (1-4x)xy'(x) - 2(1-3x)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0587366 (sec), leaf count = 76

$$\left\{\left\{y(x) \to c_1 e^{-2x}x^2 - \frac{2c_2e^{-2x}\left(e^{2x}\left(16x^2+4x+3\right) - 16\sqrt{2\pi}x^{5/2}\text{erfi}\left(\sqrt{2}\sqrt{x}\right)\right)}{15\sqrt{x}}\right\}\right\}$$

Maple ✓
cpu = 0.13 (sec), leaf count = 51

$$\left\{y(x) = \_C1\, \mathrm{e}^{-2x}x^2 - 16\,\frac{\_C2\left(-x^{5/2}\sqrt{2}\sqrt{\pi}\,erfi\left(\sqrt{2}\sqrt{x}\right)\mathrm{e}^{-2x} + x^2 + x/4 + 3/16\right)}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[-2*(1 - 3*x)*y[x] - (1 - 4*x)*x*y'[x] + 2*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2*C[1])/E^(2*x) - (2*C[2]*(E^(2*x)*(3 + 4*x + 16*x^2) - 16*Sqrt[2*P
i]*x^(5/2)*Erfi[Sqrt[2]*Sqrt[x]]))/(15*E^(2*x)*Sqrt[x])}}
```

Maple raw input

```
dsolve(2*x^2*diff(diff(y(x),x),x)-x*(1-4*x)*diff(y(x),x)-2*(1-3*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-2*x)*x^2-16*_C2/x^(1/2)*(-x^(5/2)*2^(1/2)*Pi^(1/2)*erfi(2^(1/2)*
x^(1/2))*exp(-2*x)+x^2+1/4*x+3/16)
```

4.1607 $2x^2y''(x) - (1-4x)xy'(x) - 2(1-3x)y(x) = x^3(x+1)$

ODE

$$2x^2y''(x) - (1-4x)xy'(x) - 2(1-3x)y(x) = x^3(x+1)$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.1709 (sec), leaf count = 88

$$\left\{\left\{y(x) \to -\frac{2c_2e^{-2x}\left(e^{2x}\left(16x^2+4x+3\right)-16\sqrt{2\pi}x^{5/2}\text{erfi}\left(\sqrt{2}\sqrt{x}\right)\right)}{15\sqrt{x}} + c_1e^{-2x}x^2 + \frac{1}{252}(14x+11)x^2\right\}\right\}$$

Maple ✓
cpu = 0.085 (sec), leaf count = 61

$$\left\{y(x) = \mathrm{e}^{-2x}x^2\_C2 - 16\,\frac{\left(-x^{5/2}\sqrt{2}\sqrt{\pi}\,erfi\left(\sqrt{2}\sqrt{x}\right)\mathrm{e}^{-2x} + x^2 + x/4 + 3/16\right)\_C1}{\sqrt{x}} + \frac{x^3}{18} + \frac{11\,x^2}{252}\right\}$$

Mathematica raw input

```
DSolve[-2*(1 - 3*x)*y[x] - (1 - 4*x)*x*y'[x] + 2*x^2*y''[x] == x^3*(1 + x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2*(11 + 14*x))/252 + (x^2*C[1])/E^(2*x) - (2*C[2]*(E^(2*x)*(3 + 4*x
  + 16*x^2) - 16*Sqrt[2*Pi]*x^(5/2)*Erfi[Sqrt[2]*Sqrt[x]]))/(15*E^(2*x)*Sqrt[x])}
}
```

Maple raw input

```
dsolve(2*x^2*diff(diff(y(x),x),x)-x*(1-4*x)*diff(y(x),x)-2*(1-3*x)*y(x) = x^3*(1+x), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-2*x)*x^2*_C2-16*(-x^(5/2)*2^(1/2)*Pi^(1/2)*erfi(2^(1/2)*x^(1/2))*exp
(-2*x)+x^2+1/4*x+3/16)*_C1/x^(1/2)+1/18*x^3+11/252*x^2
```

4.1608 $(2x^2+1)\,y''(x)+3xy'(x)-3y(x)=0$

ODE

$$(2x^2+1)\,y''(x)+3xy'(x)-3y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0291386 (sec), leaf count = 55

$$\left\{\left\{y(x)\to c_2\sqrt[8]{2x^2+1}Q^{\frac{1}{4}}_{\frac{3}{4}}\left(i\sqrt{2}x\right)+\frac{i2^{3/4}c_1x}{\Gamma\left(\frac{3}{4}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.214 (sec), leaf count = 39

$$\left\{y(x)=\sqrt[8]{2\,x^2+1}\left(LegendreQ\left(\frac{3}{4},\frac{1}{4},i\sqrt{2}x\right)\_C2+LegendreP\left(\frac{3}{4},\frac{1}{4},i\sqrt{2}x\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-3*y[x] + 3*x*y'[x] + (1 + 2*x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (I*2^(3/4)*x*C[1])/Gamma[3/4] + (1 + 2*x^2)^(1/8)*C[2]*LegendreQ[3/4,
1/4, I*Sqrt[2]*x]}}
```

Maple raw input

```
dsolve((2*x^2+1)*diff(diff(y(x),x),x)+3*x*diff(y(x),x)-3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (2*x^2+1)^(1/8)*(LegendreQ(3/4,1/4,I*2^(1/2)*x)*_C2+LegendreP(3/4,1/4,I*2
^(1/2)*x)*_C1)
```

4.1609 $2a^2y(x) + 2(1-x^2)\,y''(x) - xy'(x) = 0$

ODE

$$2a^2y(x) + 2\left(1-x^2\right)y''(x) - xy'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0183003 (sec), leaf count = 66

$$\left\{\left\{y(x) \to \left(x^2-1\right)^{3/8}\left(c_1 P^{\frac{3}{4}}_{\frac{1}{4}\left(\sqrt{16a^2+1}-2\right)}(x) + c_2 Q^{\frac{3}{4}}_{\frac{1}{4}\left(\sqrt{16a^2+1}-2\right)}(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.066 (sec), leaf count = 49

$$\left\{y(x) = \left(x^2-1\right)^{\frac{3}{8}}\left(LegendreQ\left(\frac{1}{4}\sqrt{16\,a^2+1}-\frac{1}{2},\frac{3}{4},x\right)\_C2 + LegendreP\left(\frac{1}{4}\sqrt{16\,a^2+1}-\frac{1}{2},\frac{3}{4},x\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[2*a^2*y[x] - x*y'[x] + 2*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + x^2)^(3/8)*(C[1]*LegendreP[(-2 + Sqrt[1 + 16*a^2])/4, 3/4, x] +
C[2]*LegendreQ[(-2 + Sqrt[1 + 16*a^2])/4, 3/4, x])}}
```

Maple raw input

```
dsolve(2*(-x^2+1)*diff(diff(y(x),x),x)-x*diff(y(x),x)+2*a^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2-1)^(3/8)*(LegendreQ(1/4*(16*a^2+1)^(1/2)-1/2,3/4,x)*_C2+LegendreP(1/
4*(16*a^2+1)^(1/2)-1/2,3/4,x)*_C1)
```

4.1610 $2x(x+1)y''(x)+y'(x)-4y(x)=0$

ODE

$$2x(x+1)y''(x)+y'(x)-4y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.911551 (sec), leaf count = 37

$$\left\{\left\{y(x)\to c_1\sqrt{x}(x+1)^{3/2}-\frac{2}{3}c_2\left(8x^2+12x+3\right)\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 26

$$\left\{y(x)=\_C2\,(1+x)^{\frac{3}{2}}\sqrt{x}-\frac{16\_C1}{3}\left(x^2+\frac{3x}{2}+\frac{3}{8}\right)\right\}$$

Mathematica raw input

```
DSolve[-4*y[x] + y'[x] + 2*x*(1 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*(1 + x)^(3/2)*C[1] - (2*(3 + 12*x + 8*x^2)*C[2])/3}}
```

Maple raw input

```
dsolve(2*x*(1+x)*diff(diff(y(x),x),x)+diff(y(x),x)-4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*(1+x)^(3/2)*x^(1/2)-16/3*(x^2+3/2*x+3/8)*_C1
```

4.1611 $2(1-x)xy''(x)+(x+1)y'(x)-y(x)=0$

ODE

$$2(1-x)xy''(x)+(x+1)y'(x)-y(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0312438 (sec), leaf count = 21

$$\{\{y(x)\to c_1\sqrt{x}-2c_2(x+1)\}\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 14

$$\{y(x)=\sqrt{x}\_C2+\_C1\,x+\_C1\}$$

Mathematica raw input

```
DSolve[-y[x] + (1 + x)*y'[x] + 2*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*C[1] - 2*(1 + x)*C[2]}}
```

Maple raw input

```
dsolve(2*x*(1-x)*diff(diff(y(x),x),x)+(1+x)*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*_C2+_C1*x+_C1
```

4.1612 $2(1-x)xy''(x)+(1-x)y'(x)+y(x)=0$

ODE

$$2(1-x)xy''(x)+(1-x)y'(x)+y(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0523408 (sec), leaf count = 54

$$\left\{\left\{y(x)\to \frac{1}{2}c_2\left(2\sqrt{x}+(x-1)\log\left(1-\sqrt{x}\right)-(x-1)\log\left(\sqrt{x}+1\right)\right)-c_1(x-1)\right\}\right\}$$

Maple ✓
cpu = 0.063 (sec), leaf count = 39

$$\left\{y(x)=\frac{\_C2\,(-1+x)}{2}\ln\left(\sqrt{x}-1\right)-\frac{\_C2\,(-1+x)}{2}\ln\left(\sqrt{x}+1\right)+\sqrt{x}\_C2+\_C1\,(-1+x)\right\}$$

Mathematica raw input

```
DSolve[y[x] + (1 - x)*y'[x] + 2*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-1 + x)*C[1]) + (C[2]*(2*Sqrt[x] + (-1 + x)*Log[1 - Sqrt[x]] - (-1
+ x)*Log[1 + Sqrt[x]]))/2}}
```

Maple raw input

```
dsolve(2*x*(1-x)*diff(diff(y(x),x),x)+(1-x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*_C2*(-1+x)*ln(x^(1/2)-1)-1/2*ln(x^(1/2)+1)*_C2*(-1+x)+x^(1/2)*_C2+_C1
*(-1+x)
```

4.1613 $2(1-x)xy''(x)+(1-2x)y'(x)-2y(x)=0$

ODE

$$2(1-x)xy''(x)+(1-2x)y'(x)-2y(x)=0$$

ODE Classification

[_Jacobi, [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.029353 (sec), leaf count = 46

$$\{\{y(x)\to c_2\sin\left(2\log\left(\sqrt{x-1}+\sqrt{x}\right)\right)+c_1\cos\left(2\log\left(\sqrt{x-1}+\sqrt{x}\right)\right)\}\}$$

Maple ✓
cpu = 0.039 (sec), leaf count = 69

$$\left\{y(x)=\_C1\ \sin\left(1\sqrt{x\left(-1+x\right)}\ln\left(x-\frac{1}{2}+\sqrt{x^2-x}\right)\frac{1}{\sqrt{x}}\frac{1}{\sqrt{-1+x}}\right)+\_C2\ \cos\left(1\sqrt{x\left(-1+x\right)}\ln\left(x-\frac{1}{2}+\sqrt{x^2-x}\right)\right.\right.$$

Mathematica raw input

```
DSolve[-2*y[x] + (1 - 2*x)*y'[x] + 2*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[2*Log[Sqrt[-1 + x] + Sqrt[x]]] + C[2]*Sin[2*Log[Sqrt[-1 + x]
+ Sqrt[x]]]}}
```

Maple raw input

```
dsolve(2*x*(1-x)*diff(diff(y(x),x),x)+(1-2*x)*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin((x*(-1+x))^(1/2)/x^(1/2)/(-1+x)^(1/2)*ln(x-1/2+(x^2-x)^(1/2)))+_C
2*cos((x*(-1+x))^(1/2)/x^(1/2)/(-1+x)^(1/2)*ln(x-1/2+(x^2-x)^(1/2)))
```

4.1614 $2(1-x)xy''(x)+(1-2x)y'(x)+8y(x)=0$

ODE

$$2(1-x)xy''(x)+(1-2x)y'(x)+8y(x)=0$$

ODE Classification

[_Jacobi, [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0804615 (sec), leaf count = 49

$$\left\{\left\{y(x)\to c_1\cosh\left(4\log\left(\sqrt{x-1}+\sqrt{x}\right)\right)+ic_2\sinh\left(4\log\left(\sqrt{x-1}+\sqrt{x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.031 (sec), leaf count = 31

$$\left\{y(x)=\_C1\left(8x^2-8x+1\right)+\_C2\left(-1+2x\right)\sqrt{x\left(-1+x\right)}\right\}$$

Mathematica raw input

```
DSolve[8*y[x] + (1 - 2*x)*y'[x] + 2*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[4*Log[Sqrt[-1 + x] + Sqrt[x]]] + I*C[2]*Sinh[4*Log[Sqrt[-1 +
  x] + Sqrt[x]]]}}
```

Maple raw input

```
dsolve(2*x*(1-x)*diff(diff(y(x),x),x)+(1-2*x)*diff(y(x),x)+8*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(8*x^2-8*x+1)+_C2*(-1+2*x)*(x*(-1+x))^(1/2)
```

4.1615 $ay(x) + 2(1-x)xy''(x) - (1-2x)y'(x) = 0$

ODE

$$ay(x) + 2(1-x)xy''(x) - (1-2x)y'(x) = 0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0641476 (sec), leaf count = 75

$$\left\{\left\{y(x) \to (-(x-1)x)^{3/4}\left(c_1 P^{\frac{3}{2}}_{\frac{\sqrt{a+2}}{\sqrt{2}}-\frac{1}{2}}(2x-1) + c_2 Q^{\frac{3}{2}}_{\frac{\sqrt{a+2}}{\sqrt{2}}-\frac{1}{2}}(2x-1)\right)\right\}\right\}$$

Maple ✓
cpu = 0.118 (sec), leaf count = 66

$$\left\{y(x) = \_C1\ {}_2\mathrm{F}_1(-1-\frac{1}{2}\sqrt{2\,a+4}, -1+\frac{1}{2}\sqrt{2\,a+4};\ -\frac{1}{2};\ x) + \_C2\ x^{\frac{3}{2}}\ {}_2\mathrm{F}_1(\frac{1}{2}-\frac{1}{2}\sqrt{2\,a+4}, \frac{1}{2}+\frac{1}{2}\sqrt{2\,a+4};\ \frac{5}{2};\ x)\right\}$$

Mathematica raw input

```
DSolve[a*y[x] - (1 - 2*x)*y'[x] + 2*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-((-1 + x)*x))^(3/4)*(C[1]*LegendreP[-1/2 + Sqrt[2 + a]/Sqrt[2], 3/2,
  -1 + 2*x] + C[2]*LegendreQ[-1/2 + Sqrt[2 + a]/Sqrt[2], 3/2, -1 + 2*x])}}
```

Maple raw input

```
dsolve(2*x*(1-x)*diff(diff(y(x),x),x)-(1-2*x)*diff(y(x),x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([-1-1/2*(2*a+4)^(1/2), -1+1/2*(2*a+4)^(1/2)],[-1/2],x)+_C2*
x^(3/2)*hypergeom([1/2-1/2*(2*a+4)^(1/2), 1/2+1/2*(2*a+4)^(1/2)],[5/2],x)
```

4.1616 $y(x)(a+bx)+2(1-x)xy''(x)+(1-2x)y'(x)=0$

ODE

$$y(x)(a+bx)+2(1-x)xy''(x)+(1-2x)y'(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✗
cpu = 2.29214 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}(\{y,x\},\{(-a-xb)y(x)+(2x-1)y'(x)+2(x-1)xy''(x)=0,y(2)=c_1,y'(2)=c_2\})(x)\}\}$$

Maple ✓
cpu = 0.146 (sec), leaf count = 35

$$\left\{y(x)=\_C1\,\mathit{MathieuC}\left(b+2\,a,-\frac{b}{2},\arccos\left(\sqrt{x}\right)\right)+\_C2\,\mathit{MathieuS}\left(b+2\,a,-\frac{b}{2},\arccos\left(\sqrt{x}\right)\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x)*y[x] + (1 - 2*x)*y'[x] + 2*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(-a - \[FormalX]*
b)*\[FormalY][\[FormalX]] + (-1 + 2*\[FormalX])*Derivative[1][\[FormalY]][\[Form
alX]] + 2*(-1 + \[FormalX])*\[FormalX]*Derivative[2][\[FormalY]][\[FormalX]] ==
0, \[FormalY][2] == C[1], Derivative[1][\[FormalY]][2] == C[2]}]][x]}}
```

Maple raw input

```
dsolve(2*x*(1-x)*diff(diff(y(x),x),x)+(1-2*x)*diff(y(x),x)+(b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*MathieuC(b+2*a,-1/2*b,arccos(x^(1/2)))+_C2*MathieuS(b+2*a,-1/2*b,arcc
os(x^(1/2)))
```

4.1617 $2a(a+1)y(x)+2(1-x)xy''(x)-(3x+1)y'(x)=0$

ODE

$$2a(a+1)y(x)+2(1-x)xy''(x)-(3x+1)y'(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.121712 (sec), leaf count = 114

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(\frac{1}{4}\left(1-\sqrt{16a^2+16a+1}\right),\frac{1}{4}\left(\sqrt{16a^2+16a+1}+1\right);-\frac{1}{2};x\right)-ic_2x^{3/2}\,{}_2F_1\left(\frac{1}{4}\left(7-\sqrt{16a^2+16a+1}\right)\right.\right.$$

Maple ✓
cpu = 0.106 (sec), leaf count = 86

$$\left\{y(x)=\_C1\,{}_2\mathrm{F}_1(\tfrac{1}{4}-\tfrac{1}{4}\sqrt{16\,a^2+16\,a+1},\tfrac{1}{4}+\tfrac{1}{4}\sqrt{16\,a^2+16\,a+1};-\tfrac{1}{2};x)+\_C2\,x^{\frac{3}{2}}{}_2\mathrm{F}_1(\tfrac{7}{4}+\tfrac{1}{4}\sqrt{16\,a^2+16\,a+1},\tfrac{7}{4}-\right.$$

Mathematica raw input

```
DSolve[2*a*(1 + a)*y[x] - (1 + 3*x)*y'[x] + 2*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[(1 - Sqrt[1 + 16*a + 16*a^2])/4, (1 + Sqrt[1 +
16*a + 16*a^2])/4, -1/2, x] - I*x^(3/2)*C[2]*Hypergeometric2F1[(7 - Sqrt[1 + 16*
a + 16*a^2])/4, (7 + Sqrt[1 + 16*a + 16*a^2])/4, 5/2, x]}}
```

Maple raw input

```
dsolve(2*x*(1-x)*diff(diff(y(x),x),x)-(1+3*x)*diff(y(x),x)+2*a*(1+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([1/4-1/4*(16*a^2+16*a+1)^(1/2), 1/4+1/4*(16*a^2+16*a+1)^(1/
2)],[-1/2],x)+_C2*x^(3/2)*hypergeom([7/4+1/4*(16*a^2+16*a+1)^(1/2), 7/4-1/4*(16*
a^2+16*a+1)^(1/2)],[5/2],x)
```

4.1618 $(1-2x)(1-x)y''(x)+2(1-2x)y'(x)+4y(x)=0$

ODE

$$(1-2x)(1-x)y''(x)+2(1-2x)y'(x)+4y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0413675 (sec), leaf count = 39

$$\left\{\left\{y(x)\to c_1(2x-1)+\frac{1}{4}c_2(2(x-1)x+(1-2x)\log(1-2x))\right\}\right\}$$

Maple ✓
cpu = 0.048 (sec), leaf count = 37

$$\left\{y(x)=\frac{(2-4x)\_C2\ \ln(-1+2x)}{8}+\frac{(4x^2-2x-1)\_C2}{8}-2\_C1\ x+\_C1\right\}$$

Mathematica raw input

```
DSolve[4*y[x] + 2*(1 - 2*x)*y'[x] + (1 - 2*x)*(1 - x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + 2*x)*C[1] + (C[2]*(2*(-1 + x)*x + (1 - 2*x)*Log[1 - 2*x]))/4}}
```

Maple raw input

```
dsolve((1-x)*(1-2*x)*diff(diff(y(x),x),x)+2*(1-2*x)*diff(y(x),x)+4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/8*(2-4*x)*_C2*ln(-1+2*x)+1/8*(4*x^2-2*x-1)*_C2-2*_C1*x+_C1
```

4.1619 $(1-2x)(1-x)y''(x)+2(3-4x)y'(x)+12y(x)=0$

ODE

$$(1-2x)(1-x)y''(x)+2(3-4x)y'(x)+12y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0381852 (sec), leaf count = 31

$$\left\{\left\{y(x)\to \frac{1}{3}c_2\left(12x^2-18x+7\right)-c_1(x-1)^3\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 33

$$\left\{y(x)=\frac{(18\_C1+7\_C2)\,x^3}{3}+\frac{(-18\_C1-9\_C2)\,x^2}{3}+\_C2\,x+\_C1\right\}$$

Mathematica raw input

```
DSolve[12*y[x] + 2*(3 - 4*x)*y'[x] + (1 - 2*x)*(1 - x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-1 + x)^3*C[1]) + ((7 - 18*x + 12*x^2)*C[2])/3}}
```

Maple raw input

```
dsolve((1-x)*(1-2*x)*diff(diff(y(x),x),x)+2*(3-4*x)*diff(y(x),x)+12*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/3*(18*_C1+7*_C2)*x^3+1/3*(-18*_C1-9*_C2)*x^2+_C2*x+_C1
```

4.1620 $2(x+1)^2y''(x)-(x+1)y'(x)+y(x)=0$

ODE

$$2(x+1)^2y''(x)-(x+1)y'(x)+y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0410238 (sec), leaf count = 22

$$\left\{\left\{y(x)\to c_1\sqrt{x+1}+c_2(x+1)\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 16

$$\left\{y(x)=\_C1\sqrt{1+x}+\_C2\,x+\_C2\right\}$$

Mathematica raw input

```
DSolve[y[x] - (1 + x)*y'[x] + 2*(1 + x)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[1 + x]*C[1] + (1 + x)*C[2]}}
```

Maple raw input

```
dsolve(2*(1+x)^2*diff(diff(y(x),x),x)-(1+x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(1+x)^(1/2)+_C2*x+_C2
```

4.1621 $2(x+1)^2y''(x)-(x+1)y'(x)+y(x)=x$

ODE

$$2(x+1)^2y''(x)-(x+1)y'(x)+y(x)=x$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0344311 (sec), leaf count = 33

$$\left\{\left\{y(x)\to c_1\sqrt{x+1}+(c_2-2)\,x+c_2+(x+1)\log(x+1)-3\right\}\right\}$$

Maple ✓
cpu = 0.029 (sec), leaf count = 27

$$\left\{y(x)=\sqrt{1+x}\_C2+(1+x)\ln(1+x)+(\_C1-2)\,x+\_C1-3\right\}$$

Mathematica raw input

```
DSolve[y[x] - (1 + x)*y'[x] + 2*(1 + x)^2*y''[x] == x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -3 + Sqrt[1 + x]*C[1] + x*(-2 + C[2]) + C[2] + (1 + x)*Log[1 + x]}}
```

Maple raw input

```
dsolve(2*(1+x)^2*diff(diff(y(x),x),x)-(1+x)*diff(y(x),x)+y(x) = x, y(x),'implicit')
```

Maple raw output

```
y(x) = (1+x)^(1/2)*_C2+(1+x)*ln(1+x)+(_C1-2)*x+_C1-3
```

4.1622 $4x^2y''(x) + y(x) = 0$

ODE

$$4x^2y''(x) + y(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0115137 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \frac{1}{2}\sqrt{x}(c_2 \log(x) + 2c_1)\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 14

$$\{y(x) = \sqrt{x}(\ln(x)\_C2 + \_C1)\}$$

Mathematica raw input

```
DSolve[y[x] + 4*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[x]*(2*C[1] + C[2]*Log[x]))/2}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(ln(x)*_C2+_C1)
```

4.1623 $4x^2y''(x) + y(x) = \sqrt{x}$

ODE

$$4x^2y''(x) + y(x) = \sqrt{x}$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0148032 (sec), leaf count = 29

$$\left\{\left\{y(x) \to \frac{1}{8}\sqrt{x}\left(4c_2\log(x) + 8c_1 + \log^2(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 22

$$\left\{y(x) = \frac{(\ln(x))^2 + 8\ln(x)\_C1 + 8\_C2}{8}\sqrt{x}\right\}$$

Mathematica raw input

```
DSolve[y[x] + 4*x^2*y''[x] == Sqrt[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[x]*(8*C[1] + 4*C[2]*Log[x] + Log[x]^2))/8}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)+y(x) = x^(1/2), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/8*x^(1/2)*(ln(x)^2+8*ln(x)*_C1+8*_C2)
```

4.1624 $y(x)\left(4kx-4p^2-x^2+1\right)+4x^2y''(x)=0$

ODE

$$y(x)\left(4kx-4p^2-x^2+1\right)+4x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0164031 (sec), leaf count = 20

$$\{\{y(x)\to c_1M_{k,p}(x)+c_2W_{k,p}(x)\}\}$$

Maple ✓
cpu = 0.079 (sec), leaf count = 17

$$\{y(x)=\_C1\,M_{k,p}(x)+\_C2\,W_{k,p}(x)\}$$

Mathematica raw input

```
DSolve[(1 - 4*p^2 + 4*k*x - x^2)*y[x] + 4*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*WhittakerM[k, p, x] + C[2]*WhittakerW[k, p, x]}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)+(4*k*x-4*p^2-x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*WhittakerM(k,p,x)+_C2*WhittakerW(k,p,x)
```

4.1625 $(4a^2x^2+1)\,y(x)+4x^2y''(x)=0$

ODE

$$(4a^2x^2+1)\,y(x)+4x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0116664 (sec), leaf count = 28

$$\{\{y(x)\to \sqrt{x}(c_1 J_0(ax)+c_2 Y_0(ax))\}\}$$

Maple ✓
cpu = 0.032 (sec), leaf count = 23

$$\{y(x)=\sqrt{x}(Y_0(ax)\_C2+J_0(ax)\_C1)\}$$

Mathematica raw input

```
DSolve[(1 + 4*a^2*x^2)*y[x] + 4*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*(BesselJ[0, a*x]*C[1] + BesselY[0, a*x]*C[2])}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)+(4*a^2*x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(BesselY(0,a*x)*_C2+BesselJ(0,a*x)*_C1)
```

4.1626 $-(a^2-x)\,y(x)+4x^2y''(x)+4xy'(x)=0$

ODE

$$-(a^2-x)\,y(x)+4x^2y''(x)+4xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.120159 (sec), leaf count = 38

$$\{\{y(x)\to c_1\Gamma(1-a)J_{-a}(\sqrt{x})+c_2\Gamma(a+1)J_a(\sqrt{x})\}\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 19

$$\{y(x)=\_C1\,J_a(\sqrt{x})+\_C2\,Y_a(\sqrt{x})\}$$

Mathematica raw input

```
DSolve[-((a^2 - x)*y[x]) + 4*x*y'[x] + 4*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselJ[-a, Sqrt[x]]*C[1]*Gamma[1 - a] + BesselJ[a, Sqrt[x]]*C[2]*Gamm
a[1 + a]}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)-(a^2-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselJ(a,x^(1/2))+_C2*BesselY(a,x^(1/2))
```

4.1627 $4x^2y''(x) - (4x^2+1)\,y(x) + 4xy'(x) = 4e^x x^{3/2}$

ODE

$$4x^2y''(x) - (4x^2+1)\,y(x) + 4xy'(x) = 4e^x x^{3/2}$$

ODE Classification

[[_2nd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0538405 (sec), leaf count = 39

$$\left\{\left\{y(x) \to \frac{e^{-x}\left(e^{2x}(2c_2+2x-1)+4c_1\right)}{4\sqrt{x}}\right\}\right\}$$

Maple ✓
cpu = 0.068 (sec), leaf count = 24

$$\left\{y(x) = \frac{x\mathrm{e}^x + 2\cosh(x)\_C1 + 2\sinh(x)\_C2}{2}\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[-((1 + 4*x^2)*y[x]) + 4*x*y'[x] + 4*x^2*y''[x] == 4*E^x*x^(3/2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (4*C[1] + E^(2*x)*(-1 + 2*x + 2*C[2]))/(4*E^x*Sqrt[x])}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)-(4*x^2+1)*y(x) = 4*exp(x)*x^(3/2), y(x),'implicit'
```

Maple raw output

```
y(x) = 1/2*(x*exp(x)+2*cosh(x)*_C1+2*sinh(x)*_C2)/x^(1/2)
```

4.1628 $-((2n+1)^2-4x^2)\,y(x)+4x^2y''(x)+4xy'(x)=0$

ODE

$$-((2n+1)^2-4x^2)\,y(x)+4x^2y''(x)+4xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.340778 (sec), leaf count = 26

$$\left\{\left\{y(x)\to c_1 J_{n+\frac{1}{2}}(x)+c_2 Y_{n+\frac{1}{2}}(x)\right\}\right\}$$

Maple ✓
cpu = 0.031 (sec), leaf count = 19

$$\left\{y(x)=\_C1\,J_{n+\frac{1}{2}}(x)+\_C2\,Y_{n+\frac{1}{2}}(x)\right\}$$

Mathematica raw input

```
DSolve[-(((1 + 2*n)^2 - 4*x^2)*y[x]) + 4*x*y'[x] + 4*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> BesselJ[1/2 + n, x]*C[1] + BesselY[1/2 + n, x]*C[2]}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)-((1+2*n)^2-4*x^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselJ(n+1/2,x)+_C2*BesselY(n+1/2,x)
```

4.1629 $-(a^2x^2+1)\,y(x)+4x^2y''(x)+4xy'(x)=0$

ODE

$$-(a^2x^2+1)\,y(x)+4x^2y''(x)+4xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0485332 (sec), leaf count = 57

$$\left\{\left\{y(x)\to \frac{e^{-\frac{1}{2}\sqrt{a^2}x}\left(c_2e^{\sqrt{a^2}x}+\sqrt{a^2}c_1\right)}{\sqrt{a^2}\sqrt{x}}\right\}\right\}$$

Maple ✓
cpu = 0.117 (sec), leaf count = 23

$$\left\{y(x)=1\left(\_C1\,\sinh\left(\frac{ax}{2}\right)+\_C2\,\cosh\left(\frac{ax}{2}\right)\right)\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[-((1 + a^2*x^2)*y[x]) + 4*x*y'[x] + 4*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[a^2]*C[1] + E^(Sqrt[a^2]*x)*C[2])/(Sqrt[a^2]*E^((Sqrt[a^2]*x)/2)
*Sqrt[x])}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)-(a^2*x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*sinh(1/2*a*x)+_C2*cosh(1/2*a*x))/x^(1/2)
```

4.1630 $4x^2y''(x) - 8xy'(x) + 5y(x) = 0$

ODE

$$4x^2y''(x) - 8xy'(x) + 5y(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0150025 (sec), leaf count = 20

$$\{\{y(x) \to \sqrt{x}(c_2x^2 + c_1)\}\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 15

$$\{y(x) = \sqrt{x}(x^2\_C1 + \_C2)\}$$

Mathematica raw input

```
DSolve[5*y[x] - 8*x*y'[x] + 4*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*(C[1] + x^2*C[2])}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)-8*x*diff(y(x),x)+5*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(_C1*x^2+_C2)
```

4.1631 $4x^2y''(x) - 2(x+2)xy'(x) + (x+3)y(x) = 0$

ODE

$$4x^2y''(x) - 2(x+2)xy'(x) + (x+3)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0164662 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \sqrt{x}\left(2c_2e^{x/2} + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.069 (sec), leaf count = 16

$$\{y(x) = \sqrt{x}(e^{\frac{x}{2}}\_C2 + \_C1)\}$$

Mathematica raw input

```
DSolve[(3 + x)*y[x] - 2*x*(2 + x)*y'[x] + 4*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*(C[1] + 2*E^(x/2)*C[2])}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)-2*x*(2+x)*diff(y(x),x)+(3+x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(exp(1/2*x)*_C2+_C1)
```

4.1632 $4x^2y''(x) - (-4x^2 + 4x + 1)\,y(x) + 4(1 - 2x)xy'(x) = 0$

ODE

$$4x^2y''(x) - (-4x^2 + 4x + 1)\,y(x) + 4(1 - 2x)xy'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0190865 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{e^x(c_2x + c_1)}{\sqrt{x}}\right\}\right\}$$

Maple ✓
cpu = 0.05 (sec), leaf count = 15

$$\left\{y(x) = \mathrm{e}^x(x\_C2 + \_C1)\,\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[-((1 + 4*x - 4*x^2)*y[x]) + 4*(1 - 2*x)*x*y'[x] + 4*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*(C[1] + x*C[2]))/Sqrt[x]}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x*(1-2*x)*diff(y(x),x)-(-4*x^2+4*x+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(x)*(_C2*x+_C1)/x^(1/2)
```

4.1633 $4x^3y'(x) + 4x^2y''(x) - (3 - 2x^2)\,y(x) = 0$

ODE

$$4x^3y'(x) + 4x^2y''(x) - \left(3 - 2x^2\right)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0268472 (sec), leaf count = 26

$$\left\{\left\{y(x) \to \frac{c_1 e^{-\frac{x^2}{2}} + c_2}{\sqrt{x}}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 18

$$\left\{y(x) = 1\left(\mathrm{e}^{-\frac{x^2}{2}} \_C1 + \_C2\right)\frac{1}{\sqrt{x}}\right\}$$

Mathematica raw input

```
DSolve[-((3 - 2*x^2)*y[x]) + 4*x^3*y'[x] + 4*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]/E^(x^2/2) + C[2])/Sqrt[x]}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x^3*diff(y(x),x)-(-2*x^2+3)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (exp(-1/2*x^2)*_C1+_C2)/x^(1/2)
```

4.1634 $4x^3y'(x) + 4x^2y''(x) + (x^4 + 2x^2 + 1)\,y(x) = 0$

ODE

$$4x^3y'(x) + 4x^2y''(x) + \left(x^4 + 2x^2 + 1\right)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0222109 (sec), leaf count = 28

$$\left\{\left\{y(x) \to e^{-\frac{x^2}{4}}\sqrt{x}(c_2\log(x) + c_1)\right\}\right\}$$

Maple ✓
cpu = 0.071 (sec), leaf count = 20

$$\left\{y(x) = \sqrt{x}\mathrm{e}^{-\frac{x^2}{4}}(\ln(x)\_C2 + \_C1)\right\}$$

Mathematica raw input

```
DSolve[(1 + 2*x^2 + x^4)*y[x] + 4*x^3*y'[x] + 4*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[x]*(C[1] + C[2]*Log[x]))/E^(x^2/4)}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x^3*diff(y(x),x)+(x^4+2*x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*exp(-1/4*x^2)*(ln(x)*_C2+_C1)
```

4.1635 $(a + x^4 + 2x^2)\, y(x) + 4x^3 y'(x) + 4x^2 y''(x) = 0$

ODE

$$(a + x^4 + 2x^2)\, y(x) + 4x^3 y'(x) + 4x^2 y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0576426 (sec), leaf count = 70

$$\left\{\left\{y(x) \to \frac{e^{-\frac{x^2}{4}} x^{\frac{1}{2}-\frac{\sqrt{1-a}}{2}} \left(c_2 x^{\sqrt{1-a}} + \sqrt{1-a}\, c_1\right)}{\sqrt{1-a}}\right\}\right\}$$

Maple ✓
cpu = 0.069 (sec), leaf count = 42

$$\left\{y(x) = \mathrm{e}^{-\frac{x^2}{4}} \left(x^{\frac{1}{2}-\frac{1}{2}\sqrt{1-a}} \_C2 + x^{\frac{1}{2}+\frac{1}{2}\sqrt{1-a}} \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(a + 2*x^2 + x^4)*y[x] + 4*x^3*y'[x] + 4*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(1/2 - Sqrt[1 - a]/2)*(Sqrt[1 - a]*C[1] + x^Sqrt[1 - a]*C[2]))/(Sqr
t[1 - a]*E^(x^2/4))}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x^3*diff(y(x),x)+(x^4+2*x^2+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/4*x^2)*(x^(1/2-1/2*(1-a)^(1/2))*_C2+x^(1/2+1/2*(1-a)^(1/2))*_C1)
```

4.1636 $4(1-x^2)\,y''(x)-8xy'(x)-y(x)=0$

ODE

$$4(1-x^2)\,y''(x)-8xy'(x)-y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0117691 (sec), leaf count = 31

$$\left\{\left\{y(x)\to \frac{2c_1K\left(\frac{1-x}{2}\right)}{\pi}+c_2Q_{-\frac{1}{2}}(x)\right\}\right\}$$

Maple ✓
cpu = 0.041 (sec), leaf count = 15

$$\left\{y(x)=\_C1\ LegendreP\left(-\frac{1}{2},x\right)+\_C2\ LegendreQ\left(-\frac{1}{2},x\right)\right\}$$

Mathematica raw input

```
DSolve[-y[x] - 8*x*y'[x] + 4*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*C[1]*EllipticK[(1 - x)/2])/Pi + C[2]*LegendreQ[-1/2, x]}}
```

Maple raw input

```
dsolve(4*(-x^2+1)*diff(diff(y(x),x),x)-8*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*LegendreP(-1/2,x)+_C2*LegendreQ(-1/2,x)
```

4.1637 $-(4p^2+1)\,y(x)+4(1-x^2)\,y''(x)-8xy'(x)=0$

ODE

$$-(4p^2+1)\,y(x)+4(1-x^2)\,y''(x)-8xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0168073 (sec), leaf count = 34

$$\left\{\left\{y(x)\to c_1 P_{ip-\frac{1}{2}}(x)+c_2 Q_{ip-\frac{1}{2}}(x)\right\}\right\}$$

Maple ✓
cpu = 0.101 (sec), leaf count = 25

$$\left\{y(x)=\_C1\ LegendreP\left(ip-\frac{1}{2},x\right)+\_C2\ LegendreQ\left(ip-\frac{1}{2},x\right)\right\}$$

Mathematica raw input

```
DSolve[-((1 + 4*p^2)*y[x]) - 8*x*y'[x] + 4*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*LegendreP[-1/2 + I*p, x] + C[2]*LegendreQ[-1/2 + I*p, x]}}
```

Maple raw input

```
dsolve(4*(-x^2+1)*diff(diff(y(x),x),x)-8*x*diff(y(x),x)-(4*p^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*LegendreP(I*p-1/2,x)+_C2*LegendreQ(I*p-1/2,x)
```

4.1638 $4(x^2+1)\,y''(x) = x^2 + 4xy'(x)$

ODE

$$4(x^2+1)\,y''(x) = x^2 + 4xy'(x)$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0716702 (sec), leaf count = 57

$$\left\{\left\{y(x) \to \frac{1}{16}\left(8c_1\sqrt{x^2+1}x + 8c_1\sinh^{-1}(x) + 16c_2 - 3x^2 + 2\sqrt{x^2+1}x\sinh^{-1}(x) + \sinh^{-1}(x)^2\right)\right\}\right\}$$

Maple ✓
cpu = 0.117 (sec), leaf count = 39

$$\left\{y(x) = \frac{x}{2}\left(\frac{Arcsinh(x)}{4} + \_C1\right)\sqrt{x^2+1} - \frac{3\,x^2}{16} + \frac{\_C1\ Arcsinh(x)}{2} + \frac{(Arcsinh(x))^2}{16} + \_C2 - \frac{1}{16}\right\}$$

Mathematica raw input

```
DSolve[4*(1 + x^2)*y''[x] == x^2 + 4*x*y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-3*x^2 + 2*x*Sqrt[1 + x^2]*ArcSinh[x] + ArcSinh[x]^2 + 8*x*Sqrt[1 + x
^2]*C[1] + 8*ArcSinh[x]*C[1] + 16*C[2])/16}}
```

Maple raw input

```
dsolve(4*(x^2+1)*diff(diff(y(x),x),x) = 4*x*diff(y(x),x)+x^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x*(1/4*arcsinh(x)+_C1)*(x^2+1)^(1/2)-3/16*x^2+1/2*_C1*arcsinh(x)+1/16
*arcsinh(x)^2+_C2-1/16
```

4.1639 $4axy'(x) - a(a+2)y(x) + 4(1-x^2)\,y''(x) = 0$

ODE

$$4axy'(x) - a(a+2)y(x) + 4\left(1-x^2\right)y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.177357 (sec), leaf count = 84

$$\left\{\left\{y(x) \to \frac{\sqrt{1-x^2}\left(x^2-1\right)^{a/4} e^{-\frac{1}{2}\sqrt{(a+2)^2}\tanh^{-1}(x)}\left(c_2 e^{\sqrt{(a+2)^2}\tanh^{-1}(x)} + \sqrt{(a+2)^2}c_1\right)}{\sqrt{(a+2)^2}}\right\}\right\}$$

Maple ✓
cpu = 0.031 (sec), leaf count = 27

$$\left\{y(x) = \_C1\,(1+x)^{\frac{a}{2}+1} + \_C2\,(-1+x)^{\frac{a}{2}+1}\right\}$$

Mathematica raw input

```
DSolve[-(a*(2 + a)*y[x]) + 4*a*x*y'[x] + 4*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[1 - x^2]*(-1 + x^2)^(a/4)*(Sqrt[(2 + a)^2]*C[1] + E^(Sqrt[(2 + a
)^2]*ArcTanh[x])*C[2]))/(Sqrt[(2 + a)^2]*E^((Sqrt[(2 + a)^2]*ArcTanh[x])/2))}}
```

Maple raw input

```
dsolve(4*(-x^2+1)*diff(diff(y(x),x),x)+4*a*x*diff(y(x),x)-a*(a+2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(1+x)^(1/2*a+1)+_C2*(-1+x)^(1/2*a+1)
```

4.1640 $4(1-x)xy''(x)+2(1-x)y'(x)+y(x)=0$

ODE

$$4(1-x)xy''(x)+2(1-x)y'(x)+y(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0616696 (sec), leaf count = 78

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(\frac{1}{4}\left(-1-\sqrt{5}\right),\frac{1}{4}\left(-1+\sqrt{5}\right);\frac{1}{2};x\right)+ic_2\sqrt{x}\,{}_2F_1\left(\frac{1}{4}\left(1-\sqrt{5}\right),\frac{1}{4}\left(1+\sqrt{5}\right);\frac{3}{2};x\right)\right\}\right\}$$

Maple ✓
cpu = 0.078 (sec), leaf count = 54

$$\left\{y(x)=(-1+x)\left(\_C2\,\sqrt{x}{}_2\mathrm{F}_1(\frac{5}{4}+\frac{\sqrt{5}}{4},\frac{5}{4}-\frac{\sqrt{5}}{4};\frac{3}{2};x)+\_C1\,{}_2\mathrm{F}_1(\frac{3}{4}+\frac{\sqrt{5}}{4},\frac{3}{4}-\frac{\sqrt{5}}{4};\frac{1}{2};x)\right)\right\}$$

Mathematica raw input

```
DSolve[y[x] + 2*(1 - x)*y'[x] + 4*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[(-1 - Sqrt[5])/4, (-1 + Sqrt[5])/4, 1/2, x] + I
*Sqrt[x]*C[2]*Hypergeometric2F1[(1 - Sqrt[5])/4, (1 + Sqrt[5])/4, 3/2, x]}}
```

Maple raw input

```
dsolve(4*x*(1-x)*diff(diff(y(x),x),x)+2*(1-x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-1+x)*(_C2*x^(1/2)*hypergeom([5/4+1/4*5^(1/2), 5/4-1/4*5^(1/2)],[3/2],x)
+_C1*hypergeom([3/4+1/4*5^(1/2), 3/4-1/4*5^(1/2)],[1/2],x))
```

4.1641 $y(x)(a+bx)+4(1-x)xy''(x)+2(1-2x)y'(x)=0$

ODE

$$y(x)(a+bx)+4(1-x)xy''(x)+2(1-2x)y'(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✗
cpu = 1.0983 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}(\{y,x\},\{(-a-xb)y(x)+(4x-2)y'(x)+4(x-1)xy''(x)=0,y(2)=c_1,y'(2)=c_2\})(x)\}\}$$

Maple ✓
cpu = 0.142 (sec), leaf count = 35

$$\left\{y(x)=\_C1\ MathieuC\left(\frac{b}{2}+a,-\frac{b}{4},\arccos\left(\sqrt{x}\right)\right)+\_C2\ MathieuS\left(\frac{b}{2}+a,-\frac{b}{4},\arccos\left(\sqrt{x}\right)\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x)*y[x] + 2*(1 - 2*x)*y'[x] + 4*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(-a - \[FormalX]*
b)*\[FormalY][\[FormalX]] + (-2 + 4*\[FormalX])*Derivative[1][\[FormalY]][\[Form
alX]] + 4*(-1 + \[FormalX])*\[FormalX]*Derivative[2][\[FormalY]][\[FormalX]] ==
0, \[FormalY][2] == C[1], Derivative[1][\[FormalY]][2] == C[2]}]][x]}}
```

Maple raw input

```
dsolve(4*x*(1-x)*diff(diff(y(x),x),x)+2*(1-2*x)*diff(y(x),x)+(b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*MathieuC(1/2*b+a,-1/4*b,arccos(x^(1/2)))+_C2*MathieuS(1/2*b+a,-1/4*b,
arccos(x^(1/2)))
```

4.1642 $y(x)\left(a+bx+cx^2\right)+4(1-x)xy''(x)+2(1-2x)y'(x)=0$

ODE

$$y(x)\left(a+bx+cx^2\right)+4(1-x)xy''(x)+2(1-2x)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.68152 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{\left(-cx^2-bx-a\right)y(x)+(4x-2)y'(x)+4(x-1)xy''(x)=0,y(2)=c_1,y'(2)=c_2\right\}\right)(x$$

Maple ✓
cpu = 0.307 (sec), leaf count = 58

$$\left\{y(x)=\mathrm{e}^{\frac{x}{2}\sqrt{c}}\left(\sqrt{x}HeunC\left(\sqrt{c},\frac{1}{2},-\frac{1}{2},-\frac{b}{4}-\frac{c}{4},-\frac{a}{4}+\frac{3}{8},x\right)\_C2+HeunC\left(\sqrt{c},-\frac{1}{2},-\frac{1}{2},-\frac{b}{4}-\frac{c}{4},-\frac{a}{4}+\frac{3}{8},x\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x + c*x^2)*y[x] + 2*(1 - 2*x)*y'[x] + 4*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(-a - \[FormalX]*
b - \[FormalX]^2*c)*\[FormalY][\[FormalX]] + (-2 + 4*\[FormalX])*Derivative[1][\
[FormalY]][\[FormalX]] + 4*(-1 + \[FormalX])*\[FormalX]*Derivative[2][\[FormalY]
][\[FormalX]] == 0, \[FormalY][2] == C[1], Derivative[1][\[FormalY]][2] == C[2]}
]][x]}}
```

Maple raw input

```
dsolve(4*x*(1-x)*diff(diff(y(x),x),x)+2*(1-2*x)*diff(y(x),x)+(c*x^2+b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(1/2*c^(1/2)*x)*(x^(1/2)*HeunC(c^(1/2),1/2,-1/2,-1/4*b-1/4*c,-1/4*a+3/
8,x)*_C2+HeunC(c^(1/2),-1/2,-1/2,-1/4*b-1/4*c,-1/4*a+3/8,x)*_C1)
```

4.1643 $y(x)\left(\sum_{m=0}^{n} a(m)x^m\right) + 4(1-x)xy''(x) + 2(1-2x)y'(x) = 0$

ODE

$$y(x)\left(\sum_{m=0}^{n} a(m)x^m\right) + 4(1-x)xy''(x) + 2(1-2x)y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.27644 (sec), leaf count = 0 , could not solve

```
DSolve[Sum[x^m*a[m], {m, 0, n}]*y[x] + 2*(1 - 2*x)*Derivative[1][y][x] + 4*(1 - x)*x*Derivative[2][y]
```

Maple ✗
cpu = 9.816 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x) = DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x) - \frac{(-2+4x)\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{4x(1-x)} + \frac{\sum_{m=0}^{n} a(m)x^m\_Y(x)}{4x(1-x)}\right\}, \{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[Sum[x^m*a[m], {m, 0, n}]*y[x] + 2*(1 - 2*x)*y'[x] + 4*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[Sum[x^m*a[m], {m, 0, n}]*y[x] + 2*(1 - 2*x)*Derivative[1][y][x] + 4*(1 -
x)*x*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(4*x*(1-x)*diff(diff(y(x),x),x)+2*(1-2*x)*diff(y(x),x)+sum(a(m)*x^m,m = 0 .. n)*y(x) = 0, y(x),
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)-1/4*(-2+4*x)/x/(1-x)*diff(_Y(x),x)+1/4*sum(a
(m)*x^m,m = 0 .. n)/x/(1-x)*_Y(x)},{_Y(x)})
```

4.1644 $-(k-p)(k+p+1)y(x)+2(1-(3-2k)x)y'(x)+4(1-x)xy''(x)=0$

ODE

$$-(k-p)(k+p+1)y(x)+2(1-(3-2k)x)y'(x)+4(1-x)xy''(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✓
cpu = 0.126548 (sec), leaf count = 130

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(\frac{1}{4}\left(-2k-\sqrt{(2p+1)^2-8k}+1\right),\frac{1}{4}\left(-2k+\sqrt{(2p+1)^2-8k}+1\right);\frac{1}{2};x\right)+ic_2\sqrt{x}\,{}_2F_1\left(\frac{1}{4}\left(-2k-\sqrt{(2p\right.\right.\right.$$

Maple ✓
cpu = 0.081 (sec), leaf count = 65

$$\left\{y(x)=(-1+x)^{\frac{k}{2}}\left(LegendreQ\left(\frac{1}{2}\sqrt{4p^2-8k+4p+1}-\frac{1}{2},k,\sqrt{x}\right)\_C2+LegendreP\left(\frac{1}{2}\sqrt{4p^2-8k+4p+1}-\frac{1}{2},k,\sqrt{\right.\right.\right.$$

Mathematica raw input

```
DSolve[-((k - p)*(1 + k + p)*y[x]) + 2*(1 - (3 - 2*k)*x)*y'[x] + 4*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[(1 - 2*k - Sqrt[-8*k + (1 + 2*p)^2])/4, (1 - 2*
k + Sqrt[-8*k + (1 + 2*p)^2])/4, 1/2, x] + I*Sqrt[x]*C[2]*Hypergeometric2F1[(3 -
 2*k - Sqrt[-8*k + (1 + 2*p)^2])/4, (3 - 2*k + Sqrt[-8*k + (1 + 2*p)^2])/4, 3/2,
 x]}}
```

Maple raw input

```
dsolve(4*x*(1-x)*diff(diff(y(x),x),x)+2*(1-(3-2*k)*x)*diff(y(x),x)-(k-p)*(1+k+p)*y(x) = 0, y(x),'impl
```

Maple raw output

```
y(x) = (-1+x)^(1/2*k)*(LegendreQ(1/2*(4*p^2-8*k+4*p+1)^(1/2)-1/2,k,x^(1/2))*_C2+
LegendreP(1/2*(4*p^2-8*k+4*p+1)^(1/2)-1/2,k,x^(1/2))*_C1)
```

4.1645 $2(ax+1)y'(x)+y(x)\left(b+k^2x\right)+4(1-x)xy''(x)=0$

ODE

$$2(ax+1)y'(x)+y(x)\left(b+k^2x\right)+4(1-x)xy''(x)=0$$

ODE Classification

[_Jacobi]

Book solution method
TO DO

Mathematica ✗
cpu = 1.46383 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{\left(-xk^2-b\right)y(x)+(-2xa-2)y'(x)+4(x-1)xy''(x)=0,y(2)=c_1,y'(2)=c_2\right\}\right)(x)\right\}$$

Maple ✓
cpu = 0.198 (sec), leaf count = 66

$$\left\{y(x)=(-1+x)^{\frac{3}{2}+\frac{a}{2}}\left(\sqrt{x}HeunC\left(0,\frac{1}{2},\frac{3}{2}+\frac{a}{2},-\frac{k^2}{4},\frac{a}{8}-\frac{b}{4}+\frac{5}{8},x\right)\_C2+HeunC\left(0,-\frac{1}{2},\frac{3}{2}+\frac{a}{2},-\frac{k^2}{4},\frac{a}{8}-\frac{b}{4}+\frac{5}{8},x\right)\right.\right.$$

Mathematica raw input

```
DSolve[(b + k^2*x)*y[x] + 2*(1 + a*x)*y'[x] + 4*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(-b - \[FormalX]*
k^2)*\[FormalY][\[FormalX]] + (-2 - 2*\[FormalX]*a)*Derivative[1][\[FormalY]][\[
FormalX]] + 4*(-1 + \[FormalX])*\[FormalX]*Derivative[2][\[FormalY]][\[FormalX]]
 == 0, \[FormalY][2] == C[1], Derivative[1][\[FormalY]][2] == C[2]}]][x]}}
```

Maple raw input

```
dsolve(4*x*(1-x)*diff(diff(y(x),x),x)+2*(a*x+1)*diff(y(x),x)+(k^2*x+b)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-1+x)^(3/2+1/2*a)*(x^(1/2)*HeunC(0,1/2,3/2+1/2*a,-1/4*k^2,1/8*a-1/4*b+5/
8,x)*_C2+HeunC(0,-1/2,3/2+1/2*a,-1/4*k^2,1/8*a-1/4*b+5/8,x)*_C1)
```

4.1646 $(2x+1)^2y''(x)-2(2x+1)y'(x)-12y(x)=0$

ODE

$$(2x+1)^2y''(x)-2(2x+1)y'(x)-12y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.040524 (sec), leaf count = 26

$$\left\{\left\{y(x)\to c_1(2x+1)^3+\frac{c_2}{2x+1}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 24

$$\left\{y(x)=\frac{1}{8+16\,x}\left(16\,(1/2+x)^4\_C1+16\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[-12*y[x] - 2*(1 + 2*x)*y'[x] + (1 + 2*x)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + 2*x)^3*C[1] + C[2]/(1 + 2*x)}}
```

Maple raw input

```
dsolve((1+2*x)^2*diff(diff(y(x),x),x)-2*(1+2*x)*diff(y(x),x)-12*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (16*(1/2+x)^4*_C1+16*_C2)/(8+16*x)
```

4.1647 $(2x+1)^2y''(x)-2(2x+1)y'(x)-12y(x)=3x+1$

ODE

$$(2x+1)^2y''(x)-2(2x+1)y'(x)-12y(x)=3x+1$$

ODE Classification

[[_2nd_order, _exact, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0346516 (sec), leaf count = 41

$$\left\{\left\{y(x)\to \frac{192c_1(2x+1)^4+192c_2-72x^2-56x-7}{192(2x+1)}\right\}\right\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 41

$$\left\{y(x)=\frac{\_C1}{1+2\,x}+\left(1+2\,x\right)^3\_C2+\frac{-72\,x^2-56\,x-7}{192+384\,x}\right\}$$

Mathematica raw input

```
DSolve[-12*y[x] - 2*(1 + 2*x)*y'[x] + (1 + 2*x)^2*y''[x] == 1 + 3*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-7 - 56*x - 72*x^2 + 192*(1 + 2*x)^4*C[1] + 192*C[2])/(192*(1 + 2*x))
}}
```

Maple raw input

```
dsolve((1+2*x)^2*diff(diff(y(x),x),x)-2*(1+2*x)*diff(y(x),x)-12*y(x) = 1+3*x, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/(1+2*x)*_C1+(1+2*x)^3*_C2+(-72*x^2-56*x-7)/(192+384*x)
```

4.1648 $(1-3x)^2y''(x)-3(1-3x)y'(x)-9y(x)=0$

ODE

$$(1-3x)^2y''(x)-3(1-3x)y'(x)-9y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0263269 (sec), leaf count = 39

$$\left\{\left\{y(x)\to \frac{c_1\left(-9x^2+6x-2\right)-3ic_2x(3x-2)}{6x-2}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 24

$$\left\{y(x)=\frac{1}{9\,x-3}\left(9\left(x-1/3\right)^2\_C2+9\,\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-9*y[x] - 3*(1 - 3*x)*y'[x] + (1 - 3*x)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-2 + 6*x - 9*x^2)*C[1] - (3*I)*x*(-2 + 3*x)*C[2])/(-2 + 6*x)}}
```

Maple raw input

```
dsolve((1-3*x)^2*diff(diff(y(x),x),x)-3*(1-3*x)*diff(y(x),x)-9*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (9*(x-1/3)^2*_C2+9*_C1)/(9*x-3)
```

4.1649 $16x^2y''(x) + (4x+3)y(x) = 0$

ODE

$$16x^2y''(x) + (4x+3)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0353732 (sec), leaf count = 43

$$\left\{\left\{y(x) \to e^{-i\sqrt{x}}\sqrt[4]{x}\left(c_1 e^{2i\sqrt{x}} + ic_2\right)\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 21

$$\{y(x) = \sqrt[4]{x}(\sin(\sqrt{x})\_C1 + \cos(\sqrt{x})\_C2)\}$$

Mathematica raw input

```
DSolve[(3 + 4*x)*y[x] + 16*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(1/4)*(E^((2*I)*Sqrt[x])*C[1] + I*C[2]))/E^(I*Sqrt[x])}}
```

Maple raw input

```
dsolve(16*x^2*diff(diff(y(x),x),x)+(3+4*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/4)*(sin(x^(1/2))*_C1+cos(x^(1/2))*_C2)
```

4.1650 $16x^2y''(x) + 32xy'(x) - (4x+5)y(x) = 0$

ODE

$$16x^2y''(x) + 32xy'(x) - (4x+5)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0860775 (sec), leaf count = 51

$$\left\{\left\{y(x) \to \frac{e^{-\sqrt{x}}\left(c_2\left(\sqrt{x}+1\right) - c_1 e^{2\sqrt{x}}\left(\sqrt{x}-1\right)\right)}{x^{5/4}}\right\}\right\}$$

Maple ✓
cpu = 0.088 (sec), leaf count = 33

$$\left\{y(x) = 1\left(\_C2\left(\sqrt{x}+1\right)\mathrm{e}^{-\sqrt{x}} + \_C1\,\mathrm{e}^{\sqrt{x}}\left(\sqrt{x}-1\right)\right)x^{-\frac{5}{4}}\right\}$$

Mathematica raw input

```
DSolve[-((5 + 4*x)*y[x]) + 32*x*y'[x] + 16*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(E^(2*Sqrt[x])*(-1 + Sqrt[x])*C[1]) + (1 + Sqrt[x])*C[2])/(E^Sqrt[x]
*x^(5/4))}}
```

Maple raw input

```
dsolve(16*x^2*diff(diff(y(x),x),x)+32*x*diff(y(x),x)-(5+4*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*(x^(1/2)+1)*exp(-x^(1/2))+_C1*exp(x^(1/2))*(x^(1/2)-1))/x^(5/4)
```

4.1651 $(ax^2+1)\,y''(x)+axy'(x)+b^2y(x)=0$

ODE

$$(ax^2+1)\,y''(x)+axy'(x)+b^2y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0327749 (sec), leaf count = 44

$$\left\{\left\{y(x)\to c_2\sin\left(\frac{b\sinh^{-1}\left(\sqrt{a}x\right)}{\sqrt{a}}\right)+c_1\cos\left(\frac{b\sinh^{-1}\left(\sqrt{a}x\right)}{\sqrt{a}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 59

$$\left\{y(x)=1\left(\_C1\left(\left(\sqrt{a}x+\sqrt{ax^2+1}\right)^{ib\frac{1}{\sqrt{a}}}\right)^2+\_C2\right)\left(\left(\sqrt{a}x+\sqrt{ax^2+1}\right)^{ib\frac{1}{\sqrt{a}}}\right)^{-1}\right\}$$

Mathematica raw input

```
DSolve[b^2*y[x] + a*x*y'[x] + (1 + a*x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[(b*ArcSinh[Sqrt[a]*x])/Sqrt[a]] + C[2]*Sin[(b*ArcSinh[Sqrt[a]
*x])/Sqrt[a]]}}
```

Maple raw input

```
dsolve((a*x^2+1)*diff(diff(y(x),x),x)+a*x*diff(y(x),x)+b^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*((a^(1/2)*x+(a*x^2+1)^(1/2))^(I*b/a^(1/2)))^2+_C2)/((a^(1/2)*x+(a*x^
2+1)^(1/2))^(I*b/a^(1/2)))
```

4.1652 $(ax^2+1)\,y''(x)+bxy'(x)+cy(x)=0$

ODE

$$(ax^2+1)\,y''(x)+bxy'(x)+cy(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0774382 (sec), leaf count = 135

$$\left\{\left\{y(x)\to (ax^2+1)^{\frac{1}{2}-\frac{b}{4a}}\left(c_1 P^{\frac{b}{2a}-1}_{\frac{\sqrt{a^2-2(b+2c)a+b^2}-a}{2a}}\left(i\sqrt{a}x\right)+c_2 Q^{\frac{b}{2a}-1}_{\frac{\sqrt{a^2-2(b+2c)a+b^2}-a}{2a}}\left(i\sqrt{a}x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.123 (sec), leaf count = 124

$$\left\{y(x)=(ax^2+1)^{\frac{2a-b}{4a}}\left(LegendreP\left(\frac{1}{2a}\left(\sqrt{a^2+(-2b-4c)a+b^2}-a\right),\frac{2a-b}{2a},\sqrt{-a}x\right)\_C1+LegendreQ\left(\frac{1}{2a}\left(\sqrt{a^2+\right.\right.\right.$$

Mathematica raw input

```
DSolve[c*y[x] + b*x*y'[x] + (1 + a*x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + a*x^2)^(1/2 - b/(4*a))*(C[1]*LegendreP[(-a + Sqrt[a^2 + b^2 - 2*a
*(b + 2*c)])/(2*a), -1 + b/(2*a), I*Sqrt[a]*x] + C[2]*LegendreQ[(-a + Sqrt[a^2 +
  b^2 - 2*a*(b + 2*c)])/(2*a), -1 + b/(2*a), I*Sqrt[a]*x])}}
```

Maple raw input

```
dsolve((a*x^2+1)*diff(diff(y(x),x),x)+b*x*diff(y(x),x)+c*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (a*x^2+1)^(1/4/a*(2*a-b))*(LegendreP(1/2/a*((a^2+(-2*b-4*c)*a+b^2)^(1/2)-
a),1/2/a*(2*a-b),(-a)^(1/2)*x)*_C1+LegendreQ(1/2/a*((a^2+(-2*b-4*c)*a+b^2)^(1/2)
-a),1/2/a*(2*a-b),(-a)^(1/2)*x)*_C2)
```

4.1653 $(1-a^2x^2)\,y''(x)-2a^2xy'(x)=0$

ODE

$$(1-a^2x^2)\,y''(x)-2a^2xy'(x)=0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0177915 (sec), leaf count = 19

$$\left\{\left\{y(x)\to c_2-\frac{c_1\tanh^{-1}(ax)}{a}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 27

$$\left\{y(x)=\_C1-\frac{(-\ln(ax-1)+\ln(ax+1))\,\_C2}{2\,a}\right\}$$

Mathematica raw input

```
DSolve[-2*a^2*x*y'[x] + (1 - a^2*x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((ArcTanh[a*x]*C[1])/a) + C[2]}}
```

Maple raw input

```
dsolve((-a^2*x^2+1)*diff(diff(y(x),x),x)-2*a^2*x*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1-1/2*(-ln(a*x-1)+ln(a*x+1))*_C2/a
```

4.1654 $(1-a^2x^2)\,y''(x)-2a^2xy'(x)+2a^2y(x)=0$

ODE

$$(1-a^2x^2)\,y''(x)-2a^2xy'(x)+2a^2y(x)=0$$

ODE Classification

[_Gegenbauer]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0334776 (sec), leaf count = 39

$$\left\{\left\{y(x)\to ac_1x-\frac{1}{2}c_2(ax\log(1-ax)-ax\log(ax+1)+2)\right\}\right\}$$

Maple ✓
cpu = 0.054 (sec), leaf count = 31

$$\left\{y(x)=\frac{\_C2\,a\ln(ax-1)\,x}{2}-\frac{\_C2\,a\ln(ax+1)\,x}{2}+\_C1\,x+\_C2\right\}$$

Mathematica raw input

```
DSolve[2*a^2*y[x] - 2*a^2*x*y'[x] + (1 - a^2*x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> a*x*C[1] - (C[2]*(2 + a*x*Log[1 - a*x] - a*x*Log[1 + a*x]))/2}}
```

Maple raw input

```
dsolve((-a^2*x^2+1)*diff(diff(y(x),x),x)-2*a^2*x*diff(y(x),x)+2*a^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*_C2*a*ln(a*x-1)*x-1/2*_C2*a*ln(a*x+1)*x+_C1*x+_C2
```

4.1655 $x(a+bx)y''(x)+2ay'(x)-2by(x)=0$

ODE

$$x(a+bx)y''(x)+2ay'(x)-2by(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0346897 (sec), leaf count = 30

$$\left\{\left\{y(x)\to \frac{\frac{c_2(a+bx)^3}{b}+3c_1}{3x}\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 19

$$\left\{y(x)=\frac{\_C1+\_C2\,(bx+a)^3}{x}\right\}$$

Mathematica raw input

```
DSolve[-2*b*y[x] + 2*a*y'[x] + x*(a + b*x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*C[1] + ((a + b*x)^3*C[2])/b)/(3*x)}}
```

Maple raw input

```
dsolve(x*(b*x+a)*diff(diff(y(x),x),x)+2*a*diff(y(x),x)-2*b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1+_C2*(b*x+a)^3)/x
```

4.1656 $y''(x)\left(\mathbf{a0}+\mathbf{b0}x+\mathbf{c0}x^2\right)+(\mathbf{a1}+\mathbf{b1}x)y'(x)+2\mathbf{a2}y(x)=0$

ODE

$$y''(x)\left(\text{a0}+\text{b0}x+\text{c0}x^2\right)+(\text{a1}+\text{b1}x)y'(x)+2\text{a2}y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 16.2114 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{2\text{a2}y(x)+(\text{a1}+x\text{b1})y'(x)+\left(\text{c0}x^2+\text{b0}x+\text{a0}\right)y''(x)=0,y(0)=c_1,y'(0)=c_2\right\}\right)(x)\right\}$$

Maple ✓
cpu = 0.245 (sec), leaf count = 507

$$\left\{y(x)=\_C1\,{}_2\mathrm{F}_1\left(\frac{1}{2\,c0}\left(-c0+b1+\sqrt{c0^2+\left(-8\,a2-2\,b1\right)c0+b1^2}\right),-\frac{1}{2\,c0}\left(c0-b1+\sqrt{c0^2+\left(-8\,a2-2\,b1\right)c0+\right.\right.\right.$$

Mathematica raw input

```
DSolve[2*a2*y[x] + (a1 + b1*x)*y'[x] + (a0 + b0*x + c0*x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {2*a2*\[FormalY][\
[FormalX]] + (a1 + \[FormalX]*b1)*Derivative[1][\[FormalY]][\[FormalX]] + (a0 +
\[FormalX]*b0 + \[FormalX]^2*c0)*Derivative[2][\[FormalY]][\[FormalX]] == 0, \[F
ormalY][0] == C[1], Derivative[1][\[FormalY]][0] == C[2]}]][x]}}
```

Maple raw input

```
dsolve((c0*x^2+b0*x+a0)*diff(diff(y(x),x),x)+(b1*x+a1)*diff(y(x),x)+2*a2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([1/2/c0*(-c0+b1+(c0^2+(-8*a2-2*b1)*c0+b1^2)^(1/2)), -1/2/c0
*(c0-b1+(c0^2+(-8*a2-2*b1)*c0+b1^2)^(1/2))],[1/2*(b1*((-4*a0*c0+b0^2)/c0^2)^(1/2
)*c0-2*c0*a1+b1*b0)/c0^2/((-4*a0*c0+b0^2)/c0^2)^(1/2)],(-2*((-4*a0*c0+b0^2)/c0^2
)^(1/2)*x*c0^2-((-4*a0*c0+b0^2)/c0^2)^(1/2)*b0*c0+4*a0*c0-b0^2)/(8*a0*c0-2*b0^2)
)+_C2*(2*((-4*a0*c0+b0^2)/c0^2)^(1/2)*x*c0^2+((-4*a0*c0+b0^2)/c0^2)^(1/2)*b0*c0-
4*a0*c0+b0^2)^(1/((-4*a0*c0+b0^2)/c0^2)^(1/2)*(-1/2*c0*(b1-2*c0)*((-4*a0*c0+b0^2
)/c0^2)^(1/2)+c0*a1-1/2*b1*b0)/c0^2)*hypergeom([(1/2*c0*(c0-(c0^2+(-8*a2-2*b1)*c
0+b1^2)^(1/2))*((-4*a0*c0+b0^2)/c0^2)^(1/2)+c0*a1-1/2*b1*b0)/((-4*a0*c0+b0^2)/c0
^2)^(1/2)/c0^2, (1/2*c0*(c0+(c0^2+(-8*a2-2*b1)*c0+b1^2)^(1/2))*((-4*a0*c0+b0^2)/
c0^2)^(1/2)+c0*a1-1/2*b1*b0)/((-4*a0*c0+b0^2)/c0^2)^(1/2)/c0^2],[1/((-4*a0*c0+b0
^2)/c0^2)^(1/2)*(-1/2*c0*(b1-4*c0)*((-4*a0*c0+b0^2)/c0^2)^(1/2)+c0*a1-1/2*b1*b0)
/c0^2],(-2*((-4*a0*c0+b0^2)/c0^2)^(1/2)*x*c0^2-((-4*a0*c0+b0^2)/c0^2)^(1/2)*b0*c
0+4*a0*c0-b0^2)/(8*a0*c0-2*b0^2))
```

4.1657 $\mathbf{a1}(a+bx)y'(x)+(a+bx)^2y''(x)+\mathbf{a2}y(x)=0$

ODE

$$\mathrm{a1}(a+bx)y'(x)+(a+bx)^2y''(x)+\mathrm{a2}y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0325461 (sec), leaf count = 95

$$\left\{\left\{y(x)\to (a+bx)^{-\frac{\sqrt{\mathrm{a2}}\sqrt{\frac{\mathrm{a1}^2-2\mathrm{a1}b-4\mathrm{a2}+b^2}{\mathrm{a2}}}+\mathrm{a1}-b}{2b}}\left(c_2(a+bx)^{\frac{\sqrt{\mathrm{a2}}\sqrt{\frac{\mathrm{a1}^2-2\mathrm{a1}b-4\mathrm{a2}+b^2}{\mathrm{a2}}}}{b}}+c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 77

$$\left\{y(x)=\_C1\left(x+\frac{a}{b}\right)^{\frac{1}{2b}\left(-a1+b+\sqrt{a1^2-2\,a1\,b+b^2-4\,a2}\right)}+\_C2\left(x+\frac{a}{b}\right)^{-\frac{1}{2b}\left(a1-b+\sqrt{a1^2-2\,a1\,b+b^2-4\,a2}\right)}\right\}$$

Mathematica raw input

```
DSolve[a2*y[x] + a1*(a + b*x)*y'[x] + (a + b*x)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + (a + b*x)^((Sqrt[a2]*Sqrt[(a1^2 - 4*a2 - 2*a1*b + b^2)/a2])/b)
*C[2])/(a + b*x)^((a1 - b + Sqrt[a2]*Sqrt[(a1^2 - 4*a2 - 2*a1*b + b^2)/a2])/(2*b
))}}
```

Maple raw input

```
dsolve((b*x+a)^2*diff(diff(y(x),x),x)+a1*(b*x+a)*diff(y(x),x)+a2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(x+a/b)^(1/2*(-a1+b+(a1^2-2*a1*b+b^2-4*a2)^(1/2))/b)+_C2*(x+a/b)^(-1/
2*(a1-b+(a1^2-2*a1*b+b^2-4*a2)^(1/2))/b)
```

4.1658 $x^3 y''(x) = a + bx$

ODE

$$x^3 y''(x) = a + bx$$

ODE Classification

[[_2nd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0115816 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{a}{2x} - b\log(x) + c_2 x + c_1\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 20

$$\left\{y(x) = -b\ln(x) + \frac{a}{2x} + \_C1\, x + \_C2\right\}$$

Mathematica raw input

```
DSolve[x^3*y''[x] == a + b*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> a/(2*x) + C[1] + x*C[2] - b*Log[x]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x) = b*x+a, y(x),'implicit')
```

Maple raw output

```
y(x) = -b*ln(x)+1/2/x*a+_C1*x+_C2
```

4.1659 $x^3y''(x) + xy'(x) - y(x) = 0$

ODE

$$x^3y''(x) + xy'(x) - y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0217447 (sec), leaf count = 18

$$\left\{\left\{y(x) \to x\left(c_1 e^{\frac{1}{x}} + c_2\right)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 14

$$\left\{y(x) = x\left(\mathrm{e}^{x^{-1}} \_C1 + \_C2\right)\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + x^3*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(E^x^(-1)*C[1] + C[2])}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(exp(1/x)*_C1+_C2)
```

4.1660 $x^3y''(x) + xy'(x) - 2y(x) = 0$

ODE

$$x^3y''(x) + xy'(x) - 2y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0143923 (sec), leaf count = 32

$$\left\{\left\{y(x) \to c_1 e^{\frac{1}{x}} \text{Ei}\left(-\frac{1}{x}\right) + c_1 x + c_2 e^{\frac{1}{x}}\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 26

$$\left\{y(x) = -\mathrm{e}^{x^{-1}} Ei\left(1, x^{-1}\right) \_C2 + \mathrm{e}^{x^{-1}} \_C1 + \_C2\, x\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + x*y'[x] + x^3*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + E^x^(-1)*C[2] + E^x^(-1)*C[1]*ExpIntegralEi[-x^(-1)]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x)+x*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -exp(1/x)*Ei(1,1/x)*_C2+exp(1/x)*_C1+_C2*x
```

4.1661 $x^3y''(x) + 2xy'(x) - y(x) = 0$

ODE

$$x^3y''(x) + 2xy'(x) - y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.261784 (sec), leaf count = 47

$$\left\{\left\{y(x) \to c_2 G^{2,0}_{1,2}\left(-\frac{2}{x}\middle| \begin{matrix} \frac{1}{2} \\ -1, 0 \end{matrix}\right) + c_1 e^{\frac{1}{x}}\left(I_0\left(\frac{1}{x}\right) - I_1\left(\frac{1}{x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.099 (sec), leaf count = 44

$$\left\{y(x) = \mathrm{e}^{x^{-1}}\left(-\_C2\, K_1\left(-x^{-1}\right) + \_C2\, K_0\left(-x^{-1}\right) + \_C1\, \left(I_0\left(x^{-1}\right) - I_1\left(x^{-1}\right)\right)\right)\right\}$$

Mathematica raw input

```
DSolve[-y[x] + 2*x*y'[x] + x^3*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x^(-1)*(BesselI[0, x^(-1)] - BesselI[1, x^(-1)])*C[1] + C[2]*MeijerG
[{{}, {1/2}}, {{-1, 0}, {}}, -2/x]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(1/x)*(-_C2*BesselK(1,-1/x)+_C2*BesselK(0,-1/x)+_C1*(BesselI(0,1/x)-Be
sselI(1,1/x)))
```

4.1662 $\mathbf{a1}xy'(x)+y(x)(\mathbf{a2}+\mathbf{b2}x)+x^3y''(x)=0$

ODE

$$\mathrm{a1}xy'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)+x^3y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0946935 (sec), leaf count = 190

$$\left\{\left\{y(x)\to -ii^{-\sqrt{1-4\mathrm{b2}}}\mathrm{a1}^{-\frac{1}{2}\sqrt{1-4\mathrm{b2}}-\frac{1}{2}}\left(\frac{1}{x}\right)^{-\frac{1}{2}\sqrt{1-4\mathrm{b2}}-\frac{1}{2}}\left(c_1\,{}_1F_1\left(-\frac{\sqrt{1-4\mathrm{b2}}\mathrm{a1}+\mathrm{a1}+2\mathrm{a2}}{2\mathrm{a1}};1-\sqrt{1-4\mathrm{b2}};\frac{\mathrm{a1}}{x}\right)+i^{2\sqrt{1-4\mathrm{b}}}\right.\right.\right.$$

Maple ✓
cpu = 0.219 (sec), leaf count = 96

$$\left\{y(x)=x^{-\frac{1}{2}\sqrt{1-4\,b2}-\frac{1}{2}}x\left(U\left(\frac{1}{2\,a1}\left(\sqrt{1-4\,b2}a1-a1-2\,a2\right),1+\sqrt{1-4\,b2},\frac{a1}{x}\right)\_C2+M\left(\frac{1}{2\,a1}\left(\sqrt{1-4\,b2}a1-a1-\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a2 + b2*x)*y[x] + a1*x*y'[x] + x^3*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*a1^(-1/2 - Sqrt[1 - 4*b2]/2)*(x^(-1))^(-1/2 - Sqrt[1 - 4*b2]/2)*
(I^(2*Sqrt[1 - 4*b2])*a1^Sqrt[1 - 4*b2]*(x^(-1))^Sqrt[1 - 4*b2]*C[2]*Hypergeomet
ric1F1[(-1 - (2*a2)/a1 + Sqrt[1 - 4*b2])/2, 1 + Sqrt[1 - 4*b2], a1/x] + C[1]*Hyp
ergeometric1F1[-(a1 + 2*a2 + a1*Sqrt[1 - 4*b2])/(2*a1), 1 - Sqrt[1 - 4*b2], a1/x
]))/I^Sqrt[1 - 4*b2]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x)+a1*x*diff(y(x),x)+(b2*x+a2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*(1-4*b2)^(1/2)-1/2)*x*(KummerU(1/2*((1-4*b2)^(1/2)*a1-a1-2*a2)/a1
,1+(1-4*b2)^(1/2),1/x*a1)*_C2+KummerM(1/2*((1-4*b2)^(1/2)*a1-a1-2*a2)/a1,1+(1-4*
b2)^(1/2),1/x*a1)*_C1)
```

4.1663 $y(x)\left(a+bx+cx^2\right)+x^3y''(x)+x^2y'(x)=0$

ODE

$$y(x)\left(a+bx+cx^2\right)+x^3y''(x)+x^2y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.980815 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{y''(x)x^3+y'(x)x^2+\left(cx^2+bx+a\right)y(x)=0,y(1)=c_1,y'(1)=c_2\right\}\right)(x)\right\}\right\}$$

Maple ✓
cpu = 0.322 (sec), leaf count = 93

$$\left\{y(x)=HeunD\left(0,4\,c+4\,b+4\,a,-8\,a+8\,c,4\,a-4\,b+4\,c,\frac{1+x}{-1+x}\right)\left(\int\frac{1}{x}\left(HeunD\left(0,4\,c+4\,b+4\,a,-8\,a+8\,c,4\,a-4\,b\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a + b*x + c*x^2)*y[x] + x^2*y'[x] + x^3*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(a + \[FormalX]*b
 + \[FormalX]^2*c)*\[FormalY][\[FormalX]] + \[FormalX]^2*Derivative[1][\[FormalY
]][\[FormalX]] + \[FormalX]^3*Derivative[2][\[FormalY]][\[FormalX]] == 0, \[Form
alY][1] == C[1], Derivative[1][\[FormalY]][1] == C[2]}][x]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x)+x^2*diff(y(x),x)+(c*x^2+b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = HeunD(0,4*c+4*b+4*a,-8*a+8*c,4*a-4*b+4*c,(1+x)/(-1+x))*(Int(1/x/HeunD(0,4
*c+4*b+4*a,-8*a+8*c,4*a-4*b+4*c,(1+x)/(-1+x))^2,x)*_C2+_C1)
```

4.1664 $x^3y''(x) + 3x^2y'(x) + xy(x) = 0$

ODE

$$x^3y''(x) + 3x^2y'(x) + xy(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.012563 (sec), leaf count = 17

$$\left\{\left\{y(x) \to \frac{c_2 \log(x) + c_1}{x}\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 14

$$\left\{y(x) = \frac{\_C2 \ln(x) + \_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[x*y[x] + 3*x^2*y'[x] + x^3*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + C[2]*Log[x])/x}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x)+3*x^2*diff(y(x),x)+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*ln(x)+_C1)/x
```

4.1665 $x^3y''(x) + 3x^2y'(x) + xy(x) = 1$

ODE

$$x^3y''(x) + 3x^2y'(x) + xy(x) = 1$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0125748 (sec), leaf count = 27

$$\left\{\left\{y(x) \to \frac{2c_2 \log(x) + 2c_1 + \log^2(x)}{2x}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 20

$$\left\{y(x) = \frac{1}{x}\left(\frac{(\ln(x))^2}{2} + \_C1\ \ln(x) + \_C2\right)\right\}$$

Mathematica raw input

```
DSolve[x*y[x] + 3*x^2*y'[x] + x^3*y''[x] == 1,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*C[1] + 2*C[2]*Log[x] + Log[x]^2)/(2*x)}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x)+3*x^2*diff(y(x),x)+x*y(x) = 1, y(x),'implicit')
```

Maple raw output

```
y(x) = (1/2*ln(x)^2+_C1*ln(x)+_C2)/x
```

4.1666 $ax^2y'(x)+y(x)(b+cx)+x^3y''(x)=0$

ODE

$$ax^2y'(x)+y(x)(b+cx)+x^3y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0658637 (sec), leaf count = 133

$$\left\{\left\{y(x)\to b^{\frac{a-1}{2}}\left(\frac{1}{x}\right)^{\frac{a-1}{2}}\left(c_1\Gamma\left(1-\sqrt{a^2-2a-4c+1}\right)J_{-\sqrt{a^2-2a-4c+1}}\left(2\sqrt{b}\sqrt{\frac{1}{x}}\right)+c_2\Gamma\left(\sqrt{a^2-2a-4c+1}+1\right)J_{\sqrt{a^2-}}\right.\right.\right.$$

Maple ✓
cpu = 0.026 (sec), leaf count = 65

$$\left\{y(x)=x^{-\frac{a}{2}+\frac{1}{2}}\left(J_{-\sqrt{a^2-2a-4c+1}}\left(2\frac{\sqrt{b}}{\sqrt{x}}\right)\_C1+Y_{-\sqrt{a^2-2a-4c+1}}\left(2\frac{\sqrt{b}}{\sqrt{x}}\right)\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[(b + c*x)*y[x] + a*x^2*y'[x] + x^3*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> b^((-1 + a)/2)*(x^(-1))^((-1 + a)/2)*(BesselJ[-Sqrt[1 - 2*a + a^2 - 4*
c], 2*Sqrt[b]*Sqrt[x^(-1)]]*C[1]*Gamma[1 - Sqrt[1 - 2*a + a^2 - 4*c]] + BesselJ[
Sqrt[1 - 2*a + a^2 - 4*c], 2*Sqrt[b]*Sqrt[x^(-1)]]*C[2]*Gamma[1 + Sqrt[1 - 2*a +
 a^2 - 4*c]])}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x)+a*x^2*diff(y(x),x)+(c*x+b)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a+1/2)*(BesselJ(-(a^2-2*a-4*c+1)^(1/2),2*b^(1/2)/x^(1/2))*_C1+Bes
selY(-(a^2-2*a-4*c+1)^(1/2),2*b^(1/2)/x^(1/2))*_C2)
```

4.1667 $(\mathbf{a1}+\mathbf{b1}x^2)\,y'(x)+\mathbf{a2}xy(x)+x^3y''(x)=0$

ODE

$$(\mathrm{a1}+\mathrm{b1}x^2)\,y'(x)+\mathrm{a2}xy(x)+x^3y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.102556 (sec), leaf count = 283

$$\left\{\left\{y(x)\to (-1)^{\frac{1}{4}\left(-\sqrt{(\mathrm{b1}-1)^2-4\mathrm{a2}}+\mathrm{b1}+7\right)}2^{\frac{1}{4}\left(-\sqrt{(\mathrm{b1}-1)^2-4\mathrm{a2}}-\mathrm{b1}+1\right)}\mathrm{a1}^{\frac{1}{4}\left(-\sqrt{(\mathrm{b1}-1)^2-4\mathrm{a2}}+\mathrm{b1}-1\right)}\left(\frac{1}{x}\right)^{\frac{1}{2}\left(-\sqrt{(\mathrm{b1}-1)^2-4\mathrm{a2}}+\mathrm{b1}-1\right)}\left(\right.\right.$$

Maple ✓
cpu = 0.255 (sec), leaf count = 120

$$\left\{y(x)=x^{-\frac{b1}{2}+\frac{1}{2}-\frac{1}{2}\sqrt{b1^2-4\,a2-2\,b1+1}}\left(U\left(-\frac{1}{4}+\frac{1}{4}\sqrt{b1^2-4\,a2-2\,b1+1}+\frac{b1}{4},\,1+\frac{1}{2}\sqrt{b1^2-4\,a2-2\,b1+1},\,\frac{a1}{2\,x^2}\right)\_C\right.\right.$$

Mathematica raw input

```
DSolve[a2*x*y[x] + (a1 + b1*x^2)*y'[x] + x^3*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1)^((7 - Sqrt[-4*a2 + (-1 + b1)^2] + b1)/4)*2^((1 - Sqrt[-4*a2 + (-1
 + b1)^2] - b1)/4)*a1^((-1 - Sqrt[-4*a2 + (-1 + b1)^2] + b1)/4)*(x^(-1))^((-1 -
Sqrt[-4*a2 + (-1 + b1)^2] + b1)/2)*(2^(Sqrt[-4*a2 + (-1 + b1)^2]/2)*C[1]*Hyperge
ometric1F1[(-1 - Sqrt[-4*a2 + (-1 + b1)^2] + b1)/4, 1 - Sqrt[-4*a2 + (-1 + b1)^2
]/2, a1/(2*x^2)] + I^Sqrt[-4*a2 + (-1 + b1)^2]*a1^(Sqrt[-4*a2 + (-1 + b1)^2]/2)*
(x^(-1))^Sqrt[-4*a2 + (-1 + b1)^2]*C[2]*Hypergeometric1F1[(-1 + Sqrt[-4*a2 + (-1
 + b1)^2] + b1)/4, (2 + Sqrt[-4*a2 + (-1 + b1)^2])/2, a1/(2*x^2)])}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x)+(b1*x^2+a1)*diff(y(x),x)+a2*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*b1+1/2-1/2*(b1^2-4*a2-2*b1+1)^(1/2))*(KummerU(-1/4+1/4*(b1^2-4*a2
-2*b1+1)^(1/2)+1/4*b1,1+1/2*(b1^2-4*a2-2*b1+1)^(1/2),1/2*a1/x^2)*_C2+KummerM(-1/
4+1/4*(b1^2-4*a2-2*b1+1)^(1/2)+1/4*b1,1+1/2*(b1^2-4*a2-2*b1+1)^(1/2),1/2*a1/x^2)
*_C1)
```

4.1668 $x(\mathbf{a1}+\mathbf{b1}x)y'(x)+\mathbf{a2}y(x)+x^3y''(x)=0$

ODE

$$x(\mathrm{a1}+\mathrm{b1}x)y'(x)+\mathrm{a2}y(x)+x^3y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.102492 (sec), leaf count = 62

$$\left\{\left\{y(x)\to(-1)^{\mathrm{b1}+1}c_2\mathrm{a1}^{\mathrm{b1}-1}\left(\frac{1}{x}\right)^{\mathrm{b1}-1}\,{}_1F_1\left(-\frac{\mathrm{a2}}{\mathrm{a1}}+\mathrm{b1}-1;\mathrm{b1};\frac{\mathrm{a1}}{x}\right)+c_1\,{}_1F_1\left(-\frac{\mathrm{a2}}{\mathrm{a1}};2-\mathrm{b1};\frac{\mathrm{a1}}{x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.163 (sec), leaf count = 57

$$\left\{y(x)=x^{-b1+1}\left(U\left(\frac{a1\,(-1+b1)-a2}{a1},\,b1,\,\frac{a1}{x}\right)\_C2+M\left(\frac{a1\,(-1+b1)-a2}{a1},\,b1,\,\frac{a1}{x}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[a2*y[x] + x*(a1 + b1*x)*y'[x] + x^3*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric1F1[-(a2/a1), 2 - b1, a1/x] + (-1)^(1 + b1)*a1^(-1
+ b1)*(x^(-1))^(-1 + b1)*C[2]*Hypergeometric1F1[-1 - a2/a1 + b1, b1, a1/x]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x)+x*(b1*x+a1)*diff(y(x),x)+a2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-b1+1)*(KummerU((a1*(-1+b1)-a2)/a1,b1,1/x*a1)*_C2+KummerM((a1*(-1+b1)-
a2)/a1,b1,1/x*a1)*_C1)
```

4.1669 $x(\mathbf{a1}+\mathbf{b1}x)y'(x)+y(x)(\mathbf{a2}+\mathbf{b2}x)+x^3y''(x)=0$

ODE

$$x(\mathrm{a1}+\mathrm{b1}x)y'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)+x^3y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.110589 (sec), leaf count = 261

$$\left\{\left\{y(x)\to -i^{-\sqrt{\mathrm{b1}^2-2\mathrm{b1}-4\mathrm{b2}+1}+\mathrm{b1}+1}\mathrm{a1}^{\frac{1}{2}\left(-\sqrt{\mathrm{b1}^2-2\mathrm{b1}-4\mathrm{b2}+1}+\mathrm{b1}-1\right)}\left(\frac{1}{x}\right)^{\frac{1}{2}\left(-\sqrt{\mathrm{b1}^2-2\mathrm{b1}-4\mathrm{b2}+1}+\mathrm{b1}-1\right)}\left(c_1\,{}_1F_1\left(-\frac{-\mathrm{b1a1}+\sqrt{}\right.\right.\right.$$

Maple ✓
cpu = 0.243 (sec), leaf count = 132

$$\left\{y(x)=x^{-\frac{b1}{2}+\frac{1}{2}-\frac{1}{2}\sqrt{b1^2-2\,b1-4\,b2+1}}\left(U\left(\frac{1}{2\,a1}\left(\sqrt{b1^2-2\,b1-4\,b2+1}a1+a1\,(-1+b1)-2\,a2\right),1+\sqrt{b1^2-2\,b1-4\,b\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a2 + b2*x)*y[x] + x*(a1 + b1*x)*y'[x] + x^3*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(I^(1 + b1 - Sqrt[1 - 2*b1 + b1^2 - 4*b2])*a1^((-1 + b1 - Sqrt[1 - 2*
b1 + b1^2 - 4*b2])/2)*(x^(-1))^((-1 + b1 - Sqrt[1 - 2*b1 + b1^2 - 4*b2])/2)*(I^(
2*Sqrt[1 - 2*b1 + b1^2 - 4*b2])*a1^Sqrt[1 - 2*b1 + b1^2 - 4*b2]*(x^(-1))^Sqrt[1
 - 2*b1 + b1^2 - 4*b2]*C[2]*Hypergeometric1F1[(-2*a2 + a1*(-1 + b1 + Sqrt[1 - 2*b
1 + b1^2 - 4*b2]))/(2*a1), 1 + Sqrt[1 - 2*b1 + b1^2 - 4*b2], a1/x] + C[1]*Hyperg
eometric1F1[-(a1 + 2*a2 - a1*b1 + a1*Sqrt[1 - 2*b1 + b1^2 - 4*b2])/(2*a1), 1 - S
qrt[1 - 2*b1 + b1^2 - 4*b2], a1/x])}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x)+x*(b1*x+a1)*diff(y(x),x)+(b2*x+a2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*b1+1/2-1/2*(b1^2-2*b1-4*b2+1)^(1/2))*(KummerU(1/2*((b1^2-2*b1-4*b
2+1)^(1/2)*a1+a1*(-1+b1)-2*a2)/a1,1+(b1^2-2*b1-4*b2+1)^(1/2),1/x*a1)*_C2+KummerM
(1/2*((b1^2-2*b1-4*b2+1)^(1/2)*a1+a1*(-1+b1)-2*a2)/a1,1+(b1^2-2*b1-4*b2+1)^(1/2)
,1/x*a1)*_C1)
```

4.1670 $(1-x^3)\,y''(x)+6xy(x)=0$

ODE

$$(1-x^3)\,y''(x)+6xy(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.115346 (sec), leaf count = 81

$$\left\{\left\{y(x)\to c_1\left(x^3-1\right)+\frac{1}{9}c_2\left(-2\left(x^3-1\right)\log(1-x)+2\sqrt{3}\left(x^3-1\right)\tan^{-1}\left(\frac{2x+1}{\sqrt{3}}\right)-\log\left(x^2+x+1\right)+x^3\log\left(x^2+x+\right.\right.\right.$$

Maple ✓
cpu = 0.018 (sec), leaf count = 66

$$\left\{y(x)=\left(\left(-\frac{2\ln(-1+x)}{9}+\frac{\ln\left(x^2+x+1\right)}{9}+\frac{2\sqrt{3}}{9}\arctan\left(\frac{(1+2x)\sqrt{3}}{3}\right)-\frac{1}{-9+9x}+\frac{-1+x}{9x^2+9x+9}\right)\_C1+\_C2\right.\right.$$

Mathematica raw input

```
DSolve[6*x*y[x] + (1 - x^3)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + x^3)*C[1] + (C[2]*(-3*x + 2*Sqrt[3]*(-1 + x^3)*ArcTan[(1 + 2*x)/
Sqrt[3]] - 2*(-1 + x^3)*Log[1 - x] - Log[1 + x + x^2] + x^3*Log[1 + x + x^2]))/9
}}
```

Maple raw input

```
dsolve((-x^3+1)*diff(diff(y(x),x),x)+6*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ((-2/9*ln(-1+x)+1/9*ln(x^2+x+1)+2/9*3^(1/2)*arctan(1/3*(1+2*x)*3^(1/2))-1
/9/(-1+x)+1/9*(-1+x)/(x^2+x+1))*_C1+_C2)*(x^3-1)
```

4.1671 $x(1-x^2)\,y''(x)-y'(x)=0$

ODE

$$x(1-x^2)\,y''(x)-y'(x)=0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.015015 (sec), leaf count = 23

$$\left\{\left\{y(x)\to c_2-c_1\sqrt{1-x^2}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 15

$$\left\{y(x)=\_C1+\sqrt{x^2-1}\_C2\right\}$$

Mathematica raw input

```
DSolve[-y'[x] + x*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[1 - x^2]*C[1]) + C[2]}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(diff(y(x),x),x)-diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+(x^2-1)^(1/2)*_C2
```

4.1672 $x^3 + (1 - x^2)\, xy''(x) - y'(x) = 0$

ODE

$$x^3 + (1 - x^2)\, xy''(x) - y'(x) = 0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0211616 (sec), leaf count = 30

$$\left\{\left\{y(x) \to -c_1\sqrt{1 - x^2} + c_2 + \frac{x^2}{2}\right\}\right\}$$

Maple ✓
cpu = 0.041 (sec), leaf count = 23

$$\left\{y(x) = \frac{x^2}{2} + \sqrt{-1 + x}\sqrt{1 + x}\_C1 + \_C2\right\}$$

Mathematica raw input

```
DSolve[x^3 - y'[x] + x*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2/2 - Sqrt[1 - x^2]*C[1] + C[2]}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(diff(y(x),x),x)-diff(y(x),x)+x^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x^2+(-1+x)^(1/2)*(1+x)^(1/2)*_C1+_C2
```

4.1673 $ax^3y(x)+(1-x^2)xy''(x)-y'(x)=0$

ODE

$$ax^3y(x)+(1-x^2)xy''(x)-y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0281031 (sec), leaf count = 47

$$\left\{\left\{y(x)\to c_1\cosh\left(\sqrt{a}\sqrt{x^2-1}\right)+ic_2\sinh\left(\sqrt{a}\sqrt{x^2-1}\right)\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 45

$$\left\{y(x)=\_C1\ \sinh\left((-1+x)(1+x)\sqrt{a}\frac{1}{\sqrt{x^2-1}}\right)+\_C2\ \cosh\left((-1+x)(1+x)\sqrt{a}\frac{1}{\sqrt{x^2-1}}\right)\right\}$$

Mathematica raw input

```
DSolve[a*x^3*y[x] - y'[x] + x*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[Sqrt[a]*Sqrt[-1 + x^2]] + I*C[2]*Sinh[Sqrt[a]*Sqrt[-1 + x^2]
]}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(diff(y(x),x),x)-diff(y(x),x)+a*x^3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sinh((-1+x)*(1+x)/(x^2-1)^(1/2)*a^(1/2))+_C2*cosh((-1+x)*(1+x)/(x^2-1
)^(1/2)*a^(1/2))
```

4.1674 $x(1-x^2)\,y''(x)-(x^2+7)\,y'(x)+4xy(x)=0$

ODE

$$x(1-x^2)\,y''(x)-(x^2+7)\,y'(x)+4xy(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0409576 (sec), leaf count = 42

$$\left\{\left\{y(x)\to \frac{-24c_1x^8+6c_2x^4-8c_2x^2+3c_2}{24\left(x^2-1\right)^3}\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 33

$$\left\{y(x)=\frac{\_C1\,x^8+6\,\_C2\,x^4-8\,\_C2\,x^2+3\,\_C2}{\left(x^2-1\right)^3}\right\}$$

Mathematica raw input

```
DSolve[4*x*y[x] - (7 + x^2)*y'[x] + x*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-24*x^8*C[1] + 3*C[2] - 8*x^2*C[2] + 6*x^4*C[2])/(24*(-1 + x^2)^3)}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(diff(y(x),x),x)-(x^2+7)*diff(y(x),x)+4*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x^8+6*_C2*x^4-8*_C2*x^2+3*_C2)/(x^2-1)^3
```

4.1675 $x(x^2+1)\,y''(x)-2(x^2+1)\,y'(x)+2xy(x)=0$

ODE

$$x(x^2+1)\,y''(x)-2(x^2+1)\,y'(x)+2xy(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0357828 (sec), leaf count = 32

$$\left\{\left\{y(x)\to c_1\left(x^2+1\right)+\frac{1}{2}c_2\left(\left(x^2+1\right)\tan^{-1}(x)-x\right)\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 29

$$\left\{y(x)=\left(\left(\frac{\arctan(x)}{2}-\frac{x}{2\,x^2+2}\right)\_C1+\_C2\right)\left(x^2+1\right)\right\}$$

Mathematica raw input

```
DSolve[2*x*y[x] - 2*(1 + x^2)*y'[x] + x*(1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x^2)*C[1] + ((-x + (1 + x^2)*ArcTan[x])*C[2])/2}}
```

Maple raw input

```
dsolve(x*(x^2+1)*diff(diff(y(x),x),x)-2*(x^2+1)*diff(y(x),x)+2*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ((1/2*arctan(x)-1/2*x/(x^2+1))*_C1+_C2)*(x^2+1)
```

4.1676 $x(x^2+1)\,y''(x)-2(1-x^2)\,y'(x)-2xy(x)=0$

ODE

$$x(x^2+1)\,y''(x)-2(1-x^2)\,y'(x)-2xy(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0210836 (sec), leaf count = 26

$$\left\{\left\{y(x)\to \frac{c_2x^3+3c_1}{3x^2+3}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 19

$$\left\{y(x)=\frac{\_C2\,x^3+\_C1}{x^2+1}\right\}$$

Mathematica raw input

```
DSolve[-2*x*y[x] - 2*(1 - x^2)*y'[x] + x*(1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*C[1] + x^3*C[2])/(3 + 3*x^2)}}
```

Maple raw input

```
dsolve(x*(x^2+1)*diff(diff(y(x),x),x)-2*(-x^2+1)*diff(y(x),x)-2*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*x^3+_C1)/(x^2+1)
```

4.1677 $x(1-x^2)\,y''(x)-2(1-x^2)\,y'(x)-2xy(x)=0$

ODE

$$x(1-x^2)\,y''(x)-2(1-x^2)\,y'(x)-2xy(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.041035 (sec), leaf count = 48

$$\left\{\left\{y(x)\to c_1\left(-\left(x^2-1\right)\right)-\frac{1}{4}c_2\left(\left(x^2-1\right)\log(1-x)-\left(x^2-1\right)\log(x+1)-2x\right)\right\}\right\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 46

$$\left\{y(x)=\frac{(\_C1\,x^2-\_C1)\ln(-1+x)}{4}+\frac{(-\_C1\,x^2+\_C1)\ln(1+x)}{4}+\_C2\,x^2-\frac{\_C1\,x}{2}-\_C2\right\}$$

Mathematica raw input

```
DSolve[-2*x*y[x] - 2*(1 - x^2)*y'[x] + x*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-1 + x^2)*C[1]) - (C[2]*(-2*x + (-1 + x^2)*Log[1 - x] - (-1 + x^2)*
Log[1 + x]))/4}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(diff(y(x),x),x)-2*(-x^2+1)*diff(y(x),x)-2*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(_C1*x^2-_C1)*ln(-1+x)+1/4*(-_C1*x^2+_C1)*ln(1+x)+_C2*x^2-1/2*_C1*x-_
C2
```

4.1678 $(a+bx^2)\,y'(x)+cxy(x)+x(x^2+1)\,y''(x)=0$

ODE

$$(a+bx^2)\,y'(x)+cxy(x)+x(x^2+1)\,y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.314027 (sec), leaf count = 145

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(\frac{1}{4}\left(b-\sqrt{b^2-2b-4c+1}-1\right),\frac{1}{4}\left(b+\sqrt{b^2-2b-4c+1}-1\right);\frac{a+1}{2};-x^2\right)+c_2x^{1-a}\,{}_2F_1\left(\frac{1}{4}\left(-2a+b\right.\right.\right.$$

Maple ✓
cpu = 0.136 (sec), leaf count = 143

$$\left\{y(x)=\left(x^2+1\right)^{1+\frac{a}{2}-\frac{b}{2}}\left(x^{1-a}{}_2\mathrm{F}_1(\frac{5}{4}-\frac{b}{4}+\frac{1}{4}\sqrt{b^2-2\,b-4\,c+1},\frac{5}{4}-\frac{b}{4}-\frac{1}{4}\sqrt{b^2-2\,b-4\,c+1};-\frac{a}{2}+\frac{3}{2};-x^2)\_C2+{}_2\mathrm{F}\right.\right.$$

Mathematica raw input

```
DSolve[c*x*y[x] + (a + b*x^2)*y'[x] + x*(1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[(-1 + b - Sqrt[1 - 2*b + b^2 - 4*c])/4, (-1 + b
 + Sqrt[1 - 2*b + b^2 - 4*c])/4, (1 + a)/2, -x^2] + x^(1 - a)*C[2]*Hypergeometri
c2F1[(1 - 2*a + b - Sqrt[1 - 2*b + b^2 - 4*c])/4, (1 - 2*a + b + Sqrt[1 - 2*b +
b^2 - 4*c])/4, (3 - a)/2, -x^2]}}
```

Maple raw input

```
dsolve(x*(x^2+1)*diff(diff(y(x),x),x)+(b*x^2+a)*diff(y(x),x)+c*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2+1)^(1+1/2*a-1/2*b)*(x^(1-a)*hypergeom([5/4-1/4*b+1/4*(b^2-2*b-4*c+1)
^(1/2), 5/4-1/4*b-1/4*(b^2-2*b-4*c+1)^(1/2)],[-1/2*a+3/2],-x^2)*_C2+hypergeom([3
/4+1/2*a-1/4*b+1/4*(b^2-2*b-4*c+1)^(1/2), 3/4+1/2*a-1/4*b-1/4*(b^2-2*b-4*c+1)^(1
/2)],[1/2+1/2*a],-x^2)*_C1)
```

4.1679 $(a+bx^2)\,y'(x)+(a-1)x(a+b)y(x)+x(1-x^2)\,y''(x)=0$

ODE

$$(a+bx^2)\,y'(x)+(a-1)x(a+b)y(x)+x(1-x^2)\,y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.43907 (sec), leaf count = 53

$$\left\{\left\{y(x)\to \frac{c_2\,{}_2F_1\left(\frac{a-1}{2},\frac{1}{2}(-a-b);\frac{a+1}{2};x^2\right)}{a-1}+c_1x^{1-a}\right\}\right\}$$

Maple ✓
cpu = 0.21 (sec), leaf count = 39

$$\left\{y(x)=\_C1\,x^{1-a}+\_C2\,{}_2\mathrm{F}_1(-\frac{a}{2}-\frac{b}{2},\frac{a}{2}-\frac{1}{2};\frac{1}{2}+\frac{a}{2};x^2)\right\}$$

Mathematica raw input

```
DSolve[(-1 + a)*(a + b)*x*y[x] + (a + b*x^2)*y'[x] + x*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^(1 - a)*C[1] + (C[2]*Hypergeometric2F1[(-1 + a)/2, (-a - b)/2, (1 +
a)/2, x^2])/(-1 + a)}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(diff(y(x),x),x)+(b*x^2+a)*diff(y(x),x)+(a+b)*(a-1)*x*y(x) = 0, y(x),'implicit
```

Maple raw output

```
y(x) = _C1*x^(1-a)+_C2*hypergeom([-1/2*a-1/2*b, 1/2*a-1/2],[1/2+1/2*a],x^2)
```

4.1680 $(a+bx^2)\,y'(x)+2(1-b)xy(x)+x(1-x^2)\,y''(x)=0$

ODE

$$(a+bx^2)\,y'(x)+2(1-b)xy(x)+x(1-x^2)\,y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.258774 (sec), leaf count = 106

$$\left\{\left\{y(x)\to \frac{x^{-a}(a+(b-1)x^2+1)\left((a-1)(a+1)^2c_1x^a-c_2xF_1\left(\frac{1-a}{2};\frac{1}{2}(-a-b),2;\frac{3-a}{2};x^2,-\frac{(b-1)x^2}{a+1}\right)\right)}{(a-1)(a+1)^2(a+4b-3)}\right\}\right\}$$

Maple ✓
cpu = 0.329 (sec), leaf count = 50

$$\left\{y(x)=\_C1\,\left(x^2(-1+b)+1+a\right)+\_C2\,x^{1-a}{}_2\mathrm{F}_1(-\frac{1}{2}-\frac{a}{2},1-\frac{b}{2}-\frac{a}{2};-\frac{a}{2}+\frac{3}{2};x^2)\right\}$$

Mathematica raw input

```
DSolve[2*(1 - b)*x*y[x] + (a + b*x^2)*y'[x] + x*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((1 + a + (-1 + b)*x^2)*((-1 + a)*(1 + a)^2*x^a*C[1] - x*AppellF1[(1 -
  a)/2, (-a - b)/2, 2, (3 - a)/2, x^2, -(((-1 + b)*x^2)/(1 + a))]*C[2]))/((-1 + a
)*(1 + a)^2*(-3 + a + 4*b)*x^a)}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(diff(y(x),x),x)+(b*x^2+a)*diff(y(x),x)+2*(1-b)*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(x^2*(-1+b)+1+a)+_C2*x^(1-a)*hypergeom([-1/2-1/2*a, 1-1/2*b-1/2*a],[-
1/2*a+3/2],x^2)
```

4.1681 $(a-(a+1)x^2)\,y'(x)+cxy(x)+x(1-x^2)\,y''(x)=0$

ODE

$$(a-(a+1)x^2)\,y'(x)+cxy(x)+x\left(1-x^2\right)y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.222322 (sec), leaf count = 130

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(\frac{1}{4}\left(a-\sqrt{a^2+4c}\right),\frac{1}{4}\left(a+\sqrt{a^2+4c}\right);\frac{a+1}{2};x^2\right)+i^{1-a}c_2x^{1-a}\,{}_2F_1\left(\frac{1}{4}\left(-a-\sqrt{a^2+4c}+2\right),\frac{1}{4}\left(-a+\right.\right.\right.$$

Maple ✓
cpu = 0.126 (sec), leaf count = 73

$$\left\{y(x)=x^{-\frac{a}{2}+\frac{1}{2}}\left(LegendreQ\left(-\frac{1}{2}+\frac{1}{2}\sqrt{a^2+4\,c},\frac{a}{2}-\frac{1}{2},\sqrt{-x^2+1}\right)\_C2+LegendreP\left(-\frac{1}{2}+\frac{1}{2}\sqrt{a^2+4\,c},\frac{a}{2}-\frac{1}{2},\sqrt{-x^2}\right.\right.\right.$$

Mathematica raw input

```
DSolve[c*x*y[x] + (a - (1 + a)*x^2)*y'[x] + x*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> I^(1 - a)*x^(1 - a)*C[2]*Hypergeometric2F1[(2 - a - Sqrt[a^2 + 4*c])/4
, (2 - a + Sqrt[a^2 + 4*c])/4, (3 - a)/2, x^2] + C[1]*Hypergeometric2F1[(a - Sqr
t[a^2 + 4*c])/4, (a + Sqrt[a^2 + 4*c])/4, (1 + a)/2, x^2]}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(diff(y(x),x),x)+(a-(1+a)*x^2)*diff(y(x),x)+c*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a+1/2)*(LegendreQ(-1/2+1/2*(a^2+4*c)^(1/2),1/2*a-1/2,(-x^2+1)^(1/
2))*_C2+LegendreP(-1/2+1/2*(a^2+4*c)^(1/2),1/2*a-1/2,(-x^2+1)^(1/2))*_C1)
```

4.1682 $(a+bx^2)\,y'(x)+cxy(x)+x(1-x^2)\,y''(x)=0$

ODE

$$(a+bx^2)\,y'(x)+cxy(x)+x(1-x^2)\,y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.244223 (sec), leaf count = 158

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(\frac{1}{4}\left(-b-\sqrt{b^2+2b+4c+1}-1\right),\frac{1}{4}\left(-b+\sqrt{b^2+2b+4c+1}-1\right);\frac{a+1}{2};x^2\right)+i^{1-a}c_2x^{1-a}\,{}_2F_1\left(\frac{1}{4}\left(-\right.\right.\right.$$

Maple ✓
cpu = 0.14 (sec), leaf count = 143

$$\left\{y(x)=\left(x^2-1\right)^{\frac{a}{2}+\frac{b}{2}}\left(x^2-1\right)\left(\_C2\,x^{1-a}{}_2\mathrm{F}_1(\frac{5}{4}+\frac{b}{4}+\frac{1}{4}\sqrt{b^2+2\,b+4\,c+1},\frac{5}{4}+\frac{b}{4}-\frac{1}{4}\sqrt{b^2+2\,b+4\,c+1};-\frac{a}{2}+\frac{3}{2};x^2)\right.\right.$$

Mathematica raw input

```
DSolve[c*x*y[x] + (a + b*x^2)*y'[x] + x*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[(-1 - b - Sqrt[1 + 2*b + b^2 + 4*c])/4, (-1 - b
 + Sqrt[1 + 2*b + b^2 + 4*c])/4, (1 + a)/2, x^2] + I^(1 - a)*x^(1 - a)*C[2]*Hype
rgeometric2F1[(1 - 2*a - b - Sqrt[1 + 2*b + b^2 + 4*c])/4, (1 - 2*a - b + Sqrt[1
 + 2*b + b^2 + 4*c])/4, (3 - a)/2, x^2]}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(diff(y(x),x),x)+(b*x^2+a)*diff(y(x),x)+c*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2-1)^(1/2*a+1/2*b)*(x^2-1)*(_C2*x^(1-a)*hypergeom([5/4+1/4*b+1/4*(b^2+
2*b+4*c+1)^(1/2), 5/4+1/4*b-1/4*(b^2+2*b+4*c+1)^(1/2)],[-1/2*a+3/2],x^2)+_C1*hyp
ergeom([3/4+1/2*a+1/4*b-1/4*(b^2+2*b+4*c+1)^(1/2), 3/4+1/2*a+1/4*b+1/4*(b^2+2*b+
4*c+1)^(1/2)],[1/2+1/2*a],x^2))
```

4.1683 $x(x^2+2)\,y''(x) - y'(x) - 6xy(x) = 0$

ODE

$$x(x^2+2)\,y''(x) - y'(x) - 6xy(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.206294 (sec), leaf count = 100

$$\left\{\left\{y(x) \to \frac{-\sqrt[4]{2}c_2(x^2+2)\,x^2\,{}_2F_1\left(\frac{1}{4},\frac{3}{4};\frac{5}{4};-\frac{x^2}{2}\right) + 3c_1x^{7/2} + 6c_1x^{3/2} - c_2\sqrt[4]{x^2+2}x^2 - c_2\sqrt[4]{x^2+2}}{3\sqrt[4]{x^2+2}}\right\}\right\}$$

Maple ✓
cpu = 0.123 (sec), leaf count = 31

$$\left\{y(x) = (x^2+2)^{\frac{3}{4}}\left(x^{\frac{3}{2}}\_C1 + {}_2\mathrm{F}_1(-\frac{3}{4},\frac{7}{4};\frac{1}{4};-\frac{x^2}{2})\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[-6*x*y[x] - y'[x] + x*(2 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (6*x^(3/2)*C[1] + 3*x^(7/2)*C[1] - (2 + x^2)^(1/4)*C[2] - x^2*(2 + x^2
)^(1/4)*C[2] - 2^(1/4)*x^2*(2 + x^2)*C[2]*Hypergeometric2F1[1/4, 3/4, 5/4, -x^2/
2])/(3*(2 + x^2)^(1/4))}}
```

Maple raw input

```
dsolve(x*(x^2+2)*diff(diff(y(x),x),x)-diff(y(x),x)-6*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2+2)^(3/4)*(x^(3/2)*_C1+hypergeom([-3/4, 7/4],[1/4],-1/2*x^2)*_C2)
```

4.1684 $x(2-x^2)\,y''(x)-(x^2+4x+2)\,y(x)-(-x^3-3x^2+2x+2)\,y'(x)=0$

ODE

$$x(2-x^2)\,y''(x)-(x^2+4x+2)\,y(x)-(-x^3-3x^2+2x+2)\,y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0660435 (sec), leaf count = 21

$$\{\{y(x)\to c_1 e^x x^2+c_2(x-1)\}\}$$

Maple ✓
cpu = 0.047 (sec), leaf count = 17

$$\{y(x)=\_C1\,(-1+x)+\_C2\,x^2e^x\}$$

Mathematica raw input

```
DSolve[-((2 + 4*x + x^2)*y[x]) - (2 + 2*x - 3*x^2 - x^3)*y'[x] + x*(2 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*x^2*C[1] + (-1 + x)*C[2]}}
```

Maple raw input

```
dsolve(x*(-x^2+2)*diff(diff(y(x),x),x)-(-x^3-3*x^2+2*x+2)*diff(y(x),x)-(x^2+4*x+2)*y(x) = 0, y(x),'im
```

Maple raw output

```
y(x) = _C1*(-1+x)+_C2*x^2*exp(x)
```

4.1685 $x(\mathbf{a0}+x^2)\,y''(x)+(\mathbf{a1}+\mathbf{b1}x^2)\,y'(x)+\mathbf{a2}xy(x)=0$

ODE

$$x(\mathrm{a0}+x^2)\,y''(x)+(\mathrm{a1}+\mathrm{b1}x^2)\,y'(x)+\mathrm{a2}xy(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.486691 (sec), leaf count = 177

$$\left\{\left\{y(x)\to c_2\mathrm{a0}^{\frac{1}{2}\left(\frac{\mathrm{a1}}{\mathrm{a0}}-1\right)}x^{1-\frac{\mathrm{a1}}{\mathrm{a0}}}\,{}_2F_1\left(\frac{\mathrm{a0}\left(\mathrm{b1}-\sqrt{(\mathrm{b1}-1)^2-4\mathrm{a2}}+1\right)-2\mathrm{a1}}{4\mathrm{a0}},\frac{\mathrm{a0}\left(\mathrm{b1}+\sqrt{(\mathrm{b1}-1)^2-4\mathrm{a2}}+1\right)-2\mathrm{a1}}{4\mathrm{a0}};\frac{3}{2}-\right.\right.\right.$$

Maple ✓
cpu = 0.192 (sec), leaf count = 184

$$\left\{y(x)=\left(x^2+a0\right)^{\frac{(-b1+2)a0+a1}{2\,a0}}\left({}_2\mathrm{F}_1\left(-\frac{1}{4}\sqrt{b1^{\,2}-4\,a2-2\,b1+1}-\frac{b1}{4}+\frac{5}{4},\frac{1}{4}\sqrt{b1^{\,2}-4\,a2-2\,b1+1}-\frac{b1}{4}+\frac{5}{4};\frac{3\,a0-a1}{2\,a0}\right.\right.\right.$$

Mathematica raw input

```
DSolve[a2*x*y[x] + (a1 + b1*x^2)*y'[x] + x*(a0 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Hypergeometric2F1[(-1 - Sqrt[-4*a2 + (-1 + b1)^2] + b1)/4, (-1 +
Sqrt[-4*a2 + (-1 + b1)^2] + b1)/4, (a0 + a1)/(2*a0), -(x^2/a0)] + a0^((-1 + a1/a
0)/2)*x^(1 - a1/a0)*C[2]*Hypergeometric2F1[(-2*a1 + a0*(1 - Sqrt[-4*a2 + (-1 + b
1)^2] + b1))/(4*a0), (-2*a1 + a0*(1 + Sqrt[-4*a2 + (-1 + b1)^2] + b1))/(4*a0), 3
/2 - a1/(2*a0), -(x^2/a0)]}}
```

Maple raw input

```
dsolve(x*(x^2+a0)*diff(diff(y(x),x),x)+(b1*x^2+a1)*diff(y(x),x)+a2*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^2+a0)^(1/2*((-b1+2)*a0+a1)/a0)*(hypergeom([-1/4*(b1^2-4*a2-2*b1+1)^(1/
2)-1/4*b1+5/4, 1/4*(b1^2-4*a2-2*b1+1)^(1/2)-1/4*b1+5/4],[1/2*(3*a0-a1)/a0],-1/a0
*x^2)*x^((a0-a1)/a0)*_C1+hypergeom([-1/4/a0*((b1^2-4*a2-2*b1+1)^(1/2)*a0+b1*a0-3
*a0-2*a1), 1/4*((b1^2-4*a2-2*b1+1)^(1/2)*a0+(-b1+3)*a0+2*a1)/a0],[1/2/a0*(a0+a1)
],-1/a0*x^2)*_C2)
```

4.1686 $x^2(x+1)y''(x)+xy'(x)+(x+1)^3(-y(x))=0$

ODE

$$x^2(x+1)y''(x)+xy'(x)+(x+1)^3(-y(x))=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0280743 (sec), leaf count = 25

$$\{\{y(x)\to c_1\cosh(x+\log(x))+ic_2\sinh(x+\log(x))\}\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 19

$$\{y(x)=\_C1\ \sinh(x+\ln(x))+\_C2\ \cosh(x+\ln(x))\}$$

Mathematica raw input

```
DSolve[-((1 + x)^3*y[x]) + x*y'[x] + x^2*(1 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[x + Log[x]] + I*C[2]*Sinh[x + Log[x]]}}
```

Maple raw input

```
dsolve(x^2*(1+x)*diff(diff(y(x),x),x)+x*diff(y(x),x)-(1+x)^3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sinh(x+ln(x))+_C2*cosh(x+ln(x))
```

4.1687 $(1-x)x^2y''(x)-(x+1)xy'(x)+y(x)=0$

ODE

$$(1-x)x^2y''(x)-(x+1)xy'(x)+y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0220989 (sec), leaf count = 21

$$\left\{\left\{y(x)\to -\frac{x(c_2\log(x)+c_1)}{x-1}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 17

$$\left\{y(x)=\frac{x(\ln(x)\_C2+\_C1)}{-1+x}\right\}$$

Mathematica raw input

```
DSolve[y[x] - x*(1 + x)*y'[x] + (1 - x)*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x*(C[1] + C[2]*Log[x]))/(-1 + x))}}
```

Maple raw input

```
dsolve(x^2*(1-x)*diff(diff(y(x),x),x)-x*(1+x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(ln(x)*_C2+_C1)/(-1+x)
```

4.1688 $(x+1)x^2y''(x)-(2x+1)xy'(x)+(2x+1)y(x)=0$

ODE

$$(x+1)x^2y''(x)-(2x+1)xy'(x)+(2x+1)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0261937 (sec), leaf count = 17

$$\{\{y(x)\to x(c_2(x+\log(x))+c_1)\}\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 15

$$\{y(x)=x(\ln(x)\_C2+\_C2\,x+\_C1)\}$$

Mathematica raw input

```
DSolve[(1 + 2*x)*y[x] - x*(1 + 2*x)*y'[x] + x^2*(1 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[1] + C[2]*(x + Log[x]))}}
```

Maple raw input

```
dsolve(x^2*(1+x)*diff(diff(y(x),x),x)-x*(1+2*x)*diff(y(x),x)+(1+2*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(ln(x)*_C2+_C2*x+_C1)
```

4.1689 $(1-x)x^2y''(x)+2(2-x)xy'(x)+2(x+1)y(x)=0$

ODE

$$(1-x)x^2y''(x)+2(2-x)xy'(x)+2(x+1)y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.512954 (sec), leaf count = 29

$$\left\{\left\{y(x)\to \frac{c_2x\left(x^2-3x+3\right)+3c_1}{3x^2}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 17

$$\left\{y(x)=\frac{\_C1+\_C2\,(-1+x)^3}{x^2}\right\}$$

Mathematica raw input

```
DSolve[2*(1 + x)*y[x] + 2*(2 - x)*x*y'[x] + (1 - x)*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*C[1] + x*(3 - 3*x + x^2)*C[2])/(3*x^2)}}
```

Maple raw input

```
dsolve(x^2*(1-x)*diff(diff(y(x),x),x)+2*x*(2-x)*diff(y(x),x)+2*(1+x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1+_C2*(-1+x)^3)/x^2
```

4.1690 $(1-x)x^2y''(x)-(4-5x)xy'(x)+(6-9x)y(x)=0$

ODE

$$(1-x)x^2y''(x)-(4-5x)xy'(x)+(6-9x)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0274215 (sec), leaf count = 24

$$\{\{y(x)\to x^2(c_1x-c_2(x\log(x)+1))\}\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 18

$$\{y(x)=x^2(\ln(x)\_C2\,x+\_C1\,x+\_C2)\}$$

Mathematica raw input

```
DSolve[(6 - 9*x)*y[x] - (4 - 5*x)*x*y'[x] + (1 - x)*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2*(x*C[1] - C[2]*(1 + x*Log[x]))}}
```

Maple raw input

```
dsolve(x^2*(1-x)*diff(diff(y(x),x),x)-x*(4-5*x)*diff(y(x),x)+(6-9*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^2*(ln(x)*_C2*x+_C1*x+_C2)
```

4.1691 $(x+1)x^2y''(x)+2(3x+2)xy'(x)+2(3x+1)y(x)=0$

ODE

$$(x+1)x^2y''(x)+2(3x+2)xy'(x)+2(3x+1)y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0251195 (sec), leaf count = 22

$$\left\{\left\{y(x)\to \frac{c_2x+c_1}{x^3+x^2}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 18

$$\left\{y(x)=\frac{\_C1\,x+\_C2}{x^2\,(1+x)}\right\}$$

Mathematica raw input

```
DSolve[2*(1 + 3*x)*y[x] + 2*x*(2 + 3*x)*y'[x] + x^2*(1 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2])/(x^2 + x^3)}}
```

Maple raw input

```
dsolve(x^2*(1+x)*diff(diff(y(x),x),x)+2*x*(2+3*x)*diff(y(x),x)+2*(1+3*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x+_C2)/x^2/(1+x)
```

4.1692 $x(\mathbf{a1}+\mathbf{b1}x)y'(x)+y(x)(\mathbf{a2}+\mathbf{b2}x)+(1-x)x^2y''(x)=0$

ODE

$$x(\text{a1}+\text{b1}x)y'(x)+y(x)(\text{a2}+\text{b2}x)+(1-x)x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.523465 (sec), leaf count = 317

$$\left\{\left\{y(x)\to i^{-\sqrt{\text{a1}^2-2\text{a1}-4\text{a2}+1}-\text{a1}+1}x^{\frac{1}{2}\left(-\sqrt{\text{a1}^2-2\text{a1}-4\text{a2}+1}-\text{a1}+1\right)}\left(c_1\,{}_2F_1\left(\frac{1}{2}\left(-\text{a1}-\text{b1}-\sqrt{\text{a1}^2-2\text{a1}-4\text{a2}+1}-\sqrt{\text{b1}^2+2\text{b}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.159 (sec), leaf count = 241

$$\left\{y(x)=\_C1\,x^{-\frac{a1}{2}+\frac{1}{2}\sqrt{a1^2-2\,a1-4\,a2+1}+\frac{1}{2}}\mathrm{F}_1(-\frac{b1}{2}-\frac{a1}{2}+\frac{1}{2}\sqrt{a1^2-2\,a1-4\,a2+1}+\frac{1}{2}\sqrt{b1^2+2\,b1+4\,b2+1},-\frac{b1}{2}-\right.$$

Mathematica raw input

```
DSolve[(a2 + b2*x)*y[x] + x*(a1 + b1*x)*y'[x] + (1 - x)*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> I^(1 - a1 - Sqrt[1 - 2*a1 + a1^2 - 4*a2])*x^((1 - a1 - Sqrt[1 - 2*a1 +
  a1^2 - 4*a2])/2)*(C[1]*Hypergeometric2F1[(-a1 - Sqrt[1 - 2*a1 + a1^2 - 4*a2] -
b1 - Sqrt[1 + 2*b1 + b1^2 + 4*b2])/2, (-a1 - Sqrt[1 - 2*a1 + a1^2 - 4*a2] - b1 +
  Sqrt[1 + 2*b1 + b1^2 + 4*b2])/2, 1 - Sqrt[1 - 2*a1 + a1^2 - 4*a2], x] + I^(2*Sq
rt[1 - 2*a1 + a1^2 - 4*a2])*x^Sqrt[1 - 2*a1 + a1^2 - 4*a2]*C[2]*Hypergeometric2F
1[(-a1 + Sqrt[1 - 2*a1 + a1^2 - 4*a2] - b1 - Sqrt[1 + 2*b1 + b1^2 + 4*b2])/2, (-
a1 + Sqrt[1 - 2*a1 + a1^2 - 4*a2] - b1 + Sqrt[1 + 2*b1 + b1^2 + 4*b2])/2, 1 + Sq
rt[1 - 2*a1 + a1^2 - 4*a2], x])}}
```

Maple raw input

```
dsolve(x^2*(1-x)*diff(diff(y(x),x),x)+x*(b1*x+a1)*diff(y(x),x)+(b2*x+a2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^(-1/2*a1+1/2*(a1^2-2*a1-4*a2+1)^(1/2)+1/2)*hypergeom([-1/2*b1-1/2*a
1+1/2*(a1^2-2*a1-4*a2+1)^(1/2)+1/2*(b1^2+2*b1+4*b2+1)^(1/2), -1/2*b1-1/2*a1+1/2*
(a1^2-2*a1-4*a2+1)^(1/2)-1/2*(b1^2+2*b1+4*b2+1)^(1/2)],[1+(a1^2-2*a1-4*a2+1)^(1/
2)],x)+_C2*x^(-1/2*a1-1/2*(a1^2-2*a1-4*a2+1)^(1/2)+1/2)*hypergeom([-1/2*b1-1/2*a
1-1/2*(a1^2-2*a1-4*a2+1)^(1/2)+1/2*(b1^2+2*b1+4*b2+1)^(1/2), -1/2*b1-1/2*a1-1/2*
(a1^2-2*a1-4*a2+1)^(1/2)-1/2*(b1^2+2*b1+4*b2+1)^(1/2)],[1-(a1^2-2*a1-4*a2+1)^(1/
2)],x)
```

4.1693 $x^2(\mathbf{a0}+x)y''(x)+x(\mathbf{a1}+\mathbf{b1}x)y'(x)+y(x)(\mathbf{a2}+\mathbf{b2}x)=0$

ODE

$$x^2(\mathrm{a0}+x)y''(x)+x(\mathrm{a1}+\mathrm{b1}x)y'(x)+y(x)(\mathrm{a2}+\mathrm{b2}x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.577661 (sec), leaf count = 391

$$\left\{\left\{y(x)\to \mathrm{a0}^{-\frac{\sqrt{\mathrm{a0}^2-2\mathrm{a0}(\mathrm{a1}+2\mathrm{a2})+\mathrm{a1}^2}+\mathrm{a0}-\mathrm{a1}}{2\mathrm{a0}}}x^{-\frac{\sqrt{\mathrm{a0}^2-2\mathrm{a0}(\mathrm{a1}+2\mathrm{a2})+\mathrm{a1}^2}-\mathrm{a0}+\mathrm{a1}}{2\mathrm{a0}}}\left(c_2x^{\frac{\sqrt{\mathrm{a0}^2-2\mathrm{a0}(\mathrm{a1}+2\mathrm{a2})+\mathrm{a1}^2}}{\mathrm{a0}}}\,{}_2F_1\left(\frac{-\mathrm{a1}+\mathrm{a0}\left(\mathrm{b1}+\sqrt{\mathrm{b1}^2}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.251 (sec), leaf count = 347

$$\left\{y(x)=(a0+x)^{\frac{-b1\,a0+a0+a1}{a0}}\left(x^{\frac{1}{2}\frac{\left(-a1+a0+\sqrt{a0^2+(-2\,a1-4\,a2)a0+a1^2}\right)}{a0}}{}_2\mathrm{F}_1\left(\frac{1}{2\,a0}\left(\sqrt{a0^2+(-2\,a1-4\,a2)\,a0+a1^2}+\sqrt{b1}\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a2 + b2*x)*y[x] + x*(a1 + b1*x)*y'[x] + x^2*(a0 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a0^(Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)]/a0)*C[1]*Hypergeometric2F1[-
(a1 + Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)] - a0*(b1 + Sqrt[1 - 2*b1 + b1^2 - 4*b
2]))/(2*a0), -(a1 + Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)] - a0*b1 + a0*Sqrt[1 - 2
*b1 + b1^2 - 4*b2])/(2*a0), 1 - Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)]/a0, -(x/a0)
] + x^(Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)]/a0)*C[2]*Hypergeometric2F1[(-a1 + Sq
rt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)] + a0*(b1 + Sqrt[1 - 2*b1 + b1^2 - 4*b2]))/(2*
a0), (-a1 + Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)] + a0*b1 - a0*Sqrt[1 - 2*b1 + b1
^2 - 4*b2])/(2*a0), (a0 + Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)])/a0, -(x/a0)])/(a
0^((a0 - a1 + Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)])/(2*a0))*x^((-a0 + a1 + Sqrt[
a0^2 + a1^2 - 2*a0*(a1 + 2*a2)])/(2*a0)))}}
```

Maple raw input

```
dsolve(x^2*(a0+x)*diff(diff(y(x),x),x)+x*(b1*x+a1)*diff(y(x),x)+(b2*x+a2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (a0+x)^((-a0*b1+a0+a1)/a0)*(x^(1/2*(-a1+a0+(a0^2+(-2*a1-4*a2)*a0+a1^2)^(1
/2))/a0)*hypergeom([1/2*((a0^2+(-2*a1-4*a2)*a0+a1^2)^(1/2)+(b1^2-2*b1-4*b2+1)^(1
/2)*a0+(-b1+2)*a0+a1)/a0, 1/2*((a0^2+(-2*a1-4*a2)*a0+a1^2)^(1/2)-(b1^2-2*b1-4*b2
+1)^(1/2)*a0+(-b1+2)*a0+a1)/a0],[1/a0*(a0+(a0^2+(-2*a1-4*a2)*a0+a1^2)^(1/2))],-1
/a0*x)*_C1+x^(1/2*(-a1+a0-(a0^2+(-2*a1-4*a2)*a0+a1^2)^(1/2))/a0)*hypergeom([-1/2
/a0*((b1^2-2*b1-4*b2+1)^(1/2)*a0+b1*a0+(a0^2+(-2*a1-4*a2)*a0+a1^2)^(1/2)-2*a0-a1
), 1/2*(-(a0^2+(-2*a1-4*a2)*a0+a1^2)^(1/2)+(b1^2-2*b1-4*b2+1)^(1/2)*a0+(-b1+2)*a
0+a1)/a0],[(a0-(a0^2+(-2*a1-4*a2)*a0+a1^2)^(1/2))/a0],-1/a0*x)*_C2)
```

4.1694 $(1-x)^2 x y''(x) - 2y(x) = 0$

ODE

$$(1-x)^2 x y''(x) - 2y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0219603 (sec), leaf count = 33

$$\left\{\left\{y(x) \to \frac{-c_2 x^2 - c_1 x + 2c_2 x \log(x) + c_2}{x-1}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 27

$$\left\{y(x) = \frac{2\ln(x)\_C2\,x - \_C2\,x^2 + \_C1\,x + \_C2}{-1+x}\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + (1 - x)^2*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(x*C[1]) + C[2] - x^2*C[2] + 2*x*C[2]*Log[x])/(-1 + x)}}
```

Maple raw input

```
dsolve(x*(1-x)^2*diff(diff(y(x),x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (2*ln(x)*_C2*x-_C2*x^2+_C1*x+_C2)/(-1+x)
```

4.1695 $x(x^2+1)\,y''(x)+x(x+1)y'(x)+y(x)=0$

ODE

$$x(x^2+1)\,y''(x)+x(x+1)y'(x)+y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.36459 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\{y(x)+\left(x^2+x\right)y'(x)+\left(x^3+x\right)y''(x)=0,y(1)=c_1,y'(1)=c_2\}\right)(x)\}\}$$

Maple ✓
cpu = 0.361 (sec), leaf count = 83

$$\left\{y(x)=(1+ix)^{\frac{3}{4}+\frac{i}{4}}\left((x+i)^{\frac{1}{2}-\frac{i}{4}}\,HeunG\left(2,1+i,1,1,\frac{3}{2}-\frac{i}{2},0,1-ix\right)\_C1+(x+i)^{\frac{i}{4}}\,HeunG\left(2,\frac{3i}{2},\frac{1}{2}+\frac{i}{2},\frac{1}{2}+\frac{i}{2},\frac{1}{2}\right.\right.\right.$$

Mathematica raw input

```
DSolve[y[x] + x*(1 + x)*y'[x] + x*(1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {\[FormalY][\[Form
alX]] + (\[FormalX] + \[FormalX]^2)*Derivative[1][\[FormalY]][\[FormalX]] + (\[F
ormalX] + \[FormalX]^3)*Derivative[2][\[FormalY]][\[FormalX]] == 0, \[FormalY][1
] == C[1], Derivative[1][\[FormalY]][1] == C[2]}]][x]}}
```

Maple raw input

```
dsolve(x*(x^2+1)*diff(diff(y(x),x),x)+x*(1+x)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (1+I*x)^(3/4+1/4*I)*exp(-1/2*arctan(x))*((x+I)^(1/2-1/4*I)*HeunG(2,1+I,1,
1,3/2-1/2*I,0,1-I*x)*_C1+(x+I)^(1/4*I)*HeunG(2,3/2*I,1/2+1/2*I,1/2+1/2*I,1/2+1/2
*I,0,1-I*x)*_C2)/(x-I)^(1/4)
```

4.1696 $x(2-x)^2y''(x)+2(2-x)y'(x)+2y(x)=0$

ODE

$$x(2-x)^2y''(x)+2(2-x)y'(x)+2y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.02554 (sec), leaf count = 32

$$\left\{\left\{y(x)\to -\frac{1}{2}(x-2)\left(-c_2\log(2-x)+c_2\log(x)+2c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 21

$$\{y(x)=(x-2)\left(\_C2\ \ln(x-2)-\_C2\ \ln(x)+\_C1\right)\}$$

Mathematica raw input

```
DSolve[2*y[x] + 2*(2 - x)*y'[x] + (2 - x)^2*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-2 + x)*(2*C[1] - C[2]*Log[2 - x] + C[2]*Log[x]))/2}}
```

Maple raw input

```
dsolve(x*(2-x)^2*diff(diff(y(x),x),x)+2*(2-x)*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x-2)*(_C2*ln(x-2)-_C2*ln(x)+_C1)
```

4.1697 $(1-x)x(a-x)y''(x)+y'(x)\left(x^2(\mathbf{a0}+\mathbf{a1}+1)+\mathbf{a0a2}-\mathbf{a0}+\mathbf{a1}+x(\mathbf{a2}+\mathbf{a3})-\mathbf{a3}+1\right)+\mathbf{a0a1}(x-k)y(x)=0$

ODE

$$(1-x)x(a-x)y''(x)+y'(x)\left(x^2(\text{a0}+\text{a1}+1)+\text{a0a2}-\text{a0}+\text{a1}+x(\text{a2}+\text{a3})-\text{a3}+1\right)+\text{a0a1}(x-k)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 9.51155 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\{-\text{a0a1}(k-x)y(x)+\left(\text{a0}x^2+\text{a1}x^2+x^2+\text{a2}x+\text{a3}x-\text{a0}+\text{a1}+\text{a0a2}-\text{a3}+1\right)y'(x)$$

Maple ✓
cpu = 0.778 (sec), leaf count = 393

$$\left\{y(x)=(-1+x)^{\frac{a0\,a2+a+2\,a1+a2+1}{a-1}}\left(HeunG\left(a,\frac{2\,a^4+(a0\,a1\,k+2\,a0+2\,a1+a2+a3)\,a^3+\left((1-a2)\,a0^2+((-k-a2)\,a\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[a0*a1*(-k + x)*y[x] + (1 - a0 + a1 + a0*a2 - a3 + (a2 + a3)*x + (1 + a0 + a1)*x^2)*y'[x] + (1
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {-(a0*a1*(-\[Forma
lX] + k)*\[FormalY][\[FormalX]]) + (1 + \[FormalX]^2 - a0 + \[FormalX]^2*a0 + a1
 + \[FormalX]^2*a1 + \[FormalX]*a2 + a0*a2 - a3 + \[FormalX]*a3)*Derivative[1][\
[FormalY]][\[FormalX]] - (-1 + \[FormalX])*\[FormalX]*(-\[FormalX] + a)*Derivati
ve[2][\[FormalY]][\[FormalX]] == 0, \[FormalY][2] == C[1], Derivative[1][\[Forma
lY]][2] == C[2]}][x]}}
```

Maple raw input

```
dsolve(x*(1-x)*(a-x)*diff(diff(y(x),x),x)+(a0*a2-a0+a1-a3+1+(a2+a3)*x+(a0+a1+1)*x^2)*diff(y(x),x)+a0*
k)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-1+x)^((a0*a2+a+2*a1+a2+1)/(a-1))*(HeunG(a,(2*a^4+(a0*a1*k+2*a0+2*a1+a2+
a3)*a^3+((1-a2)*a0^2+((-k-a2)*a1+a3-1)*a0-a1^2+(a3-1)*a1+a2+a3)*a^2-(a2+a3-1)*((
-1+a2)*a0+a1-a3+1)*a-((-1+a2)*a0+a1-a3+1)^2)/a^2/(a-1),((a0+2)*a^2+(a1+a2+a3-1)*
a+(-1+a2)*a0+a1-a3+1)/a/(a-1),((a1+2)*a^2+(a0+a2+a3-1)*a+(-1+a2)*a0+a1-a3+1)/a/(
a-1),(-a0*a2+2*a+a0-a1+a3-1)/a,(a0*a2+2*a+2*a1+a2)/(a-1),x)*x^((-a0*a2+a+a0-a1+a
3-1)/a)*_C2+HeunG(a,((a2^2-a2)*a0^2+(a2^2+(a+3*a1-a3+1)*a2+(a*k-k-2)*a1-a-1)*a0+
(a1-a3+1)*(a+2*a1+a2+1))/(a-1),((a+a2-1)*a0+a+2*a1+a2+1)/(a-1),(a*a1+a0*a2+a+a1+
a2+1)/(a-1),((-1+a2)*a0+a1-a3+1)/a,(a0*a2+2*a+2*a1+a2)/(a-1),x)*_C1)
```

4.1698

$$(\mathbf{a1}-x)(\mathbf{a2}-x)(\mathbf{a3}-x)y''(x)+y'(x)\left(\mathbf{b0}+\mathbf{b1}x+\mathbf{b2}x^2\right)+y(x)(\mathbf{c0}+\mathbf{c1}x)=0$$

ODE

$$(\mathrm{a1}-x)(\mathrm{a2}-x)(\mathrm{a3}-x)y''(x)+y'(x)\left(\mathrm{b0}+\mathrm{b1}x+\mathrm{b2}x^2\right)+y(x)(\mathrm{c0}+\mathrm{c1}x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 61.6258 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\{(-\mathrm{c0}-x\mathrm{c1})y(x)+\left(-\mathrm{b2}x^2-\mathrm{b1}x-\mathrm{b0}\right)y'(x)-(\mathrm{a1}-x)(\mathrm{a2}-x)(\mathrm{a3}-x)y''(x)=0,y($$

Maple ✓
cpu = 1.22 (sec), leaf count = 1123

$$\left\{y(x)=\_C1\ HeunG\left(\frac{a1-a3}{a1-a2},\frac{-a1\ c1-c0}{a1-a2},-\frac{b2}{2}-\frac{1}{2}+\frac{1}{2}\sqrt{b2^2+2\,b2+4\,c1+1},1\left(((a1\ b2+b2\ a2+b1)\ a3-a1\ a2\right.\right.$$

Mathematica raw input

```
DSolve[(c0 + c1*x)*y[x] + (b0 + b1*x + b2*x^2)*y'[x] + (a1 - x)*(a2 - x)*(a3 - x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(-c0 - \[FormalX]
*c1)*\[FormalY][\[FormalX]] + (-b0 - \[FormalX]*b1 - \[FormalX]^2*b2)*Derivative
[1][\[FormalY]][\[FormalX]] - (-\[FormalX] + a1)*(-\[FormalX] + a2)*(-\[FormalX]
 + a3)*Derivative[2][\[FormalY]][\[FormalX]] == 0, \[FormalY][0] == C[1], Deriva
tive[1][\[FormalY]][0] == C[2]}]][x]}}
```

Maple raw input

```
dsolve((a1-x)*(a2-x)*(a3-x)*diff(diff(y(x),x),x)+(b2*x^2+b1*x+b0)*diff(y(x),x)+(c1*x+c0)*y(x) = 0, y(
```

Maple raw output

```
y(x) = _C1*HeunG((a1-a3)/(a1-a2),(-a1*c1-c0)/(a1-a2),-1/2*b2-1/2+1/2*(b2^2+2*b2+
4*c1+1)^(1/2),(((a1*b2+a2*b2+b1)*a3-a1*a2*b2+b0)*(b2^2+2*b2+4*c1+1)^(1/2)-4*a3^2
*c1+((b2^2+b2+4*c1)*a1+(b2^2+b2+4*c1)*a2+b1*(b2+1))*a3-(b2^2+b2+4*c1)*a2*a1+b0*(
b2+1))/(2*(a2-a3)*(a1-a3)*(b2^2+2*b2+4*c1+1)^(1/2)+(-2*b2-2)*a3^2+(2*a1+2*a2-2*b
1)*a3-2*a1*a2-2*b0),1/(a1-a3)/(a1-a2)*(-a1^2*b2-a1*b1-b0),(a2^2*b2+a2*b1+b0)/(a1
-a2)/(a2-a3),(a1-x)/(a1-a2))+_C2*HeunG((a1-a3)/(a1-a2),(-(a1-a2)*(a1*(a1-2*a2)*b
2-a2*b1-b0+(-a1*c1-c0)*a2+a1^2*c1+c0*a1)*a3^2+(a1^3*(a1-2*a2)*b2^2+a1*(a1*(a1-3*
a2)*b1-2*a2*b0+a1*(a1-a2)*(a1-3*a2))*b2-a1*a2*b1^2-(a1+a2)*(b0+a1*(a1-a2))*b1-b0
^2+(-3*a1^2+4*a1*a2-a2^2)*b0+2*a1*(a1-a2)^2*(a1*c1+c0))*a3+a1^4*a2*b2^2+a1^3*((a
1+a2)*b1+a1*a2-a2^2+2*b0)*b2+a1^3*b1^2+a1*((3*a1-a2)*b0+a1^2*(a1-a2))*b1+(2*a1-a
2)*b0^2+2*(a1-a2)*a1*(a1-1/2*a2)*b0-a1^2*(a1-a2)^2*(a1*c1+c0))/(a1-a2)^3/(a1-a3)
^2,1/2*((a1-a3)*(a1-a2)*(b2^2+2*b2+4*c1+1)^(1/2)+(b2+1)*a1^2+((b2-1)*a2+a3*(b2-1
)+2*b1)*a1-a3*(b2-1)*a2+2*b0)/(a1-a3)/(a1-a2),1/2*(((b2+2)*(a2-a3)*a1^2+(2*a3^2-
b1*a3+(b2-2)*a2^2+2*a2*b1+b0)*a1-2*a2*a3^2+((-b2+2)*a2^2-a2*b1-2*b0)*a3+a2*b0)*(
a1-a3)*(b2^2+2*b2+4*c1+1)^(1/2)-(b2^2+3*b2+4*c1+2)*(a2-a3)*a1^3+((-3*b2^2-5*b2-8
*c1-4)*a3^2+((b2^2+3*b2+4*c1+2)*a2-(b2-1)*b1)*a3+(b2^2+b2+4*c1+2)*a2^2-2*a2*b1-b
0*(b2+1))*a1^2+((2*b2+4*c1+2)*a3^3+((2*b2+4*c1+2)*a2-3*b2*b1-b1)*a3^2+((-2*b2^2-
2*b2-8*c1-4)*a2^2-b1*(b2-3)*a2-b2*b0-2*b1^2+3*b0)*a3-b0*((b2+1)*a2+2*b1))*a1-2*a
2*(b2+2*c1+1)*a3^3+((b2^2+b2+4*c1+2)*a2^2+(b2-1)*b1*a2-2*b0*(b2+1))*a3^2+b0*((b2
+1)*a2-2*b1)*a3-2*b0^2)/(a1-a2)/(a1-a3)/((a2-a3)*(a1-a3)*(b2^2+2*b2+4*c1+1)^(1/2
)+(-b2-1)*a3^2+(a1+a2-b1)*a3-a1*a2-b0),((b2+2)*a1^2+(-2*a2-2*a3+b1)*a1+2*a2*a3+b
0)/(a1-a3)/(a1-a2),(a2^2*b2+a2*b1+b0)/(a1-a2)/(a2-a3),(a1-x)/(a1-a2))*(-a1+x)^((
(b2+1)*a1^2+(-a2-a3+b1)*a1+a2*a3+b0)/(a1-a3)/(a1-a2))
```

4.1699 $(1-2x^3)\,y''(x)+6x^2y'(x)-6xy(x)=0$

ODE

$$(1-2x^3)\,y''(x)+6x^2y'(x)-6xy(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.968556 (sec), leaf count = 19

$$\{\{y(x)\to c_1x-c_2\left(x^3+1\right)\}\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 14

$$\{y(x)=\_C2\,x^3+\_C1\,x+\_C2\}$$

Mathematica raw input

```
DSolve[-6*x*y[x] + 6*x^2*y'[x] + (1 - 2*x^3)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] - (1 + x^3)*C[2]}}
```

Maple raw input

```
dsolve((-2*x^3+1)*diff(diff(y(x),x),x)+6*x^2*diff(y(x),x)-6*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*x^3+_C1*x+_C2
```

4.1700 $2(1-x)x^2y''(x)+(3-5x)xy'(x)-(x+1)y(x)=0$

ODE

$$2(1-x)x^2y''(x)+(3-5x)xy'(x)-(x+1)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0618434 (sec), leaf count = 46

$$\left\{\left\{y(x)\to \frac{-2c_2\sqrt{x}-c_2\log\left(1-\sqrt{x}\right)+c_2\log\left(\sqrt{x}+1\right)+c_1}{x}\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 35

$$\left\{y(x)=\frac{\_C1}{x}+\frac{\_C2}{x}\left(2\sqrt{x}+\ln\left(\sqrt{x}-1\right)-\ln\left(\sqrt{x}+1\right)\right)\right\}$$

Mathematica raw input

```
DSolve[-((1 + x)*y[x]) + (3 - 5*x)*x*y'[x] + 2*(1 - x)*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] - 2*Sqrt[x]*C[2] - C[2]*Log[1 - Sqrt[x]] + C[2]*Log[1 + Sqrt[x]]
)/x}}
```

Maple raw input

```
dsolve(2*x^2*(1-x)*diff(diff(y(x),x),x)+x*(3-5*x)*diff(y(x),x)-(1+x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1/x+_C2/x*(2*x^(1/2)+ln(x^(1/2)-1)-ln(x^(1/2)+1))
```

4.1701 $2(2-x)x^2y''(x)-(4-x)xy'(x)+(3-x)y(x)=0$

ODE

$$2(2-x)x^2y''(x)-(4-x)xy'(x)+(3-x)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0435322 (sec), leaf count = 41

$$\left\{\left\{y(x)\to \frac{\sqrt[4]{x-2}\sqrt{x}\left(2c_2\sqrt{x-2}+c_1\right)}{\sqrt[4]{2-x}}\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 19

$$\left\{y(x)=\_C1\sqrt{x}+\_C2\sqrt{x\left(x-2\right)}\right\}$$

Mathematica raw input

```
DSolve[(3 - x)*y[x] - (4 - x)*x*y'[x] + 2*(2 - x)*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-2 + x)^(1/4)*Sqrt[x]*(C[1] + 2*Sqrt[-2 + x]*C[2]))/(2 - x)^(1/4)}}
```

Maple raw input

```
dsolve(2*x^2*(2-x)*diff(diff(y(x),x),x)-x*(4-x)*diff(y(x),x)+(3-x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^(1/2)+_C2*(x*(x-2))^(1/2)
```

4.1702 $x(3x^2+1)\,y''(x)+2y'(x)-6xy(x)=0$

ODE

$$x\left(3x^2+1\right)y''(x)+2y'(x)-6xy(x)=0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.037903 (sec), leaf count = 20

$$\left\{\left\{y(x)\to c_2x^2+\frac{c_1}{x}+c_2\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 17

$$\left\{y(x)=\frac{\left(x^3+x\right)\_C2+\_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[-6*x*y[x] + 2*y'[x] + x*(1 + 3*x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/x + C[2] + x^2*C[2]}}
```

Maple raw input

```
dsolve(x*(3*x^2+1)*diff(diff(y(x),x),x)+2*diff(y(x),x)-6*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ((x^3+x)*_C2+_C1)/x
```

4.1703 $4(x+1)x^2y''(x) - 4x^2y'(x) + (3x+1)y(x) = 0$

ODE

$$4(x+1)x^2y''(x) - 4x^2y'(x) + (3x+1)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0247269 (sec), leaf count = 21

$$\{\{y(x) \to \sqrt{x}(c_2(x + \log(x)) + c_1)\}\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 17

$$\{y(x) = \sqrt{x}(\_C2 \ln(x) + \_C2\, x + \_C1)\}$$

Mathematica raw input

```
DSolve[(1 + 3*x)*y[x] - 4*x^2*y'[x] + 4*x^2*(1 + x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*(C[1] + C[2]*(x + Log[x]))}}
```

Maple raw input

```
dsolve(4*x^2*(1+x)*diff(diff(y(x),x),x)-4*x^2*diff(y(x),x)+(1+3*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2)*(_C2*ln(x)+_C2*x+_C1)
```

4.1704 $x^2(a+bx)y''(x) - 2x(2a+bx)y'(x) + 2y(x)(3a+bx) = 0$

ODE

$$x^2(a+bx)y''(x) - 2x(2a+bx)y'(x) + 2y(x)(3a+bx) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0362029 (sec), leaf count = 23

$$\left\{\left\{y(x) \to \frac{x^2(c_2 x + c_1)}{a+bx}\right\}\right\}$$

Maple ✓
cpu = 0.032 (sec), leaf count = 20

$$\left\{y(x) = \frac{x^2(\_C2\, x + \_C1)}{bx+a}\right\}$$

Mathematica raw input

```
DSolve[2*(3*a + b*x)*y[x] - 2*x*(2*a + b*x)*y'[x] + x^2*(a + b*x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2*(C[1] + x*C[2]))/(a + b*x)}}
```

Maple raw input

```
dsolve(x^2*(b*x+a)*diff(diff(y(x),x),x)-2*x*(b*x+2*a)*diff(y(x),x)+2*(b*x+3*a)*y(x) = 0, y(x),'implic
```

Maple raw output

```
y(x) = x^2*(_C2*x+_C1)/(b*x+a)
```

4.1705 $y(x)(a+bx)+4(1-x)xy''(x)+2(1-3x)(1-x)y'(x)=0$

ODE

$$y(x)(a+bx)+4(1-x)xy''(x)+2(1-3x)(1-x)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.954187 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}(\{y,x\},\{(-a-xb)y(x)+\left(-6x^2+8x-2\right)y'(x)+4(x-1)xy''(x)=0,y(2)=c_1,y'(2)=c_2\},$$

Maple ✓
cpu = 0.184 (sec), leaf count = 46

$$\left\{y(x)=(-1+x)\left(\_C2\,HeunC\left(-\frac{3}{2},\frac{1}{2},1,\frac{3}{8}-\frac{b}{4},\frac{1}{8}-\frac{a}{4},x\right)\sqrt{x}+\_C1\,HeunC\left(-\frac{3}{2},-\frac{1}{2},1,\frac{3}{8}-\frac{b}{4},\frac{1}{8}-\frac{a}{4},x\right)\right)\right\}$$

Mathematica raw input

```
DSolve[(a + b*x)*y[x] + 2*(1 - 3*x)*(1 - x)*y'[x] + 4*(1 - x)*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(-a - \[FormalX]*
b)*\[FormalY][\[FormalX]] + (-2 + 8*\[FormalX] - 6*\[FormalX]^2)*Derivative[1][\
[FormalY]][\[FormalX]] + 4*(-1 + \[FormalX])*\[FormalX]*Derivative[2][\[FormalY]
][\[FormalX]] == 0, \[FormalY][2] == C[1], Derivative[1][\[FormalY]][2] == C[2]}
], Function[\[FormalX], {{Re[\[FormalX]] <= 0, Im[\[FormalX]] == 0}}]][x]}}
```

Maple raw input

```
dsolve(4*x*(1-x)*diff(diff(y(x),x),x)+2*(1-x)*(1-3*x)*diff(y(x),x)+(b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-1+x)*(_C2*HeunC(-3/2,1/2,1,3/8-1/4*b,1/8-1/4*a,x)*x^(1/2)+_C1*HeunC(-3/
2,-1/2,1,3/8-1/4*b,1/8-1/4*a,x))
```

4.1706 $4(1-x)x(1-ax)y''(x)+y'(x)\left(\mathbf{a0}+\mathbf{a1}x+\mathbf{a2}x^2\right)+y(x)\left(\mathbf{b0}+\mathbf{b1}x^2\right)=0$

ODE

$$4(1-x)x(1-ax)y''(x)+y'(x)\left(\text{a0}+\text{a1}x+\text{a2}x^2\right)+y(x)\left(\text{b0}+\text{b1}x^2\right)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 9.11495 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\{\left(\text{b1}x^2+\text{b0}\right)y(x)+\left(\text{a2}x^2+\text{a1}x+\text{a0}\right)y'(x)+4(x-1)x(xa-1)y''(x)=0,y(2)=c_1,$$

Maple ✗
cpu = 1.031 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)+\frac{\left(a2\,x^2+a1\,x+a0\right)\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{4\,x\,(1-x)\,(-ax+1)}+\frac{\left(b1\,x^2+b0\right)\_Y(x)}{4\,x\,(1-x)\,(-ax+1)}\right\},\{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[(b0 + b1*x^2)*y[x] + (a0 + a1*x + a2*x^2)*y'[x] + 4*(1 - x)*x*(1 - a*x)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(b0 + \[FormalX]^
2*b1)*\[FormalY][\[FormalX]] + (a0 + \[FormalX]*a1 + \[FormalX]^2*a2)*Derivative
[1][\[FormalY]][\[FormalX]] + 4*(-1 + \[FormalX])*\[FormalX]*(-1 + \[FormalX]*a)
*Derivative[2][\[FormalY]][\[FormalX]] == 0, \[FormalY][2] == C[1], Derivative[1
][\[FormalY]][2] == C[2]}][x]}}
```

Maple raw input

```
dsolve(4*x*(1-x)*(-a*x+1)*diff(diff(y(x),x),x)+(a2*x^2+a1*x+a0)*diff(y(x),x)+(b1*x^2+b0)*y(x) = 0, y(
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+1/4*(a2*x^2+a1*x+a0)/x/(1-x)/(-a*x+1)*diff(_
Y(x),x)+1/4*(b1*x^2+b0)/x/(1-x)/(-a*x+1)*_Y(x)},{_Y(x)})
```

4.1707 $a^2 y(x) + x^4 y''(x) = 0$

ODE

$$a^2 y(x) + x^4 y''(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0665238 (sec), leaf count = 57

$$\left\{\left\{y(x) \to c_1 x e^{\frac{\sqrt{-a^2}}{x}} + \frac{c_2 x e^{-\frac{\sqrt{-a^2}}{x}}}{2\sqrt{-a^2}}\right\}\right\}$$

Maple ✓
cpu = 0.033 (sec), leaf count = 23

$$\left\{y(x) = x\left(\cos\left(\frac{a}{x}\right)\_C2 + \sin\left(\frac{a}{x}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[a^2*y[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(Sqrt[-a^2]/x)*x*C[1] + (x*C[2])/(2*Sqrt[-a^2]*E^(Sqrt[-a^2]/x))}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)+a^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(cos(1/x*a)*_C2+sin(1/x*a)*_C1)
```

4.1708 $x^4 y''(x) + (1 - 2x^2)\, y(x) = 0$

ODE

$$x^4 y''(x) + (1 - 2x^2)\, y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0421556 (sec), leaf count = 47

$$\left\{\left\{y(x) \to c_1 e^{i/x} x(x-i) + \frac{1}{2} c_2 e^{-i/x}(1-ix)x\right\}\right\}$$

Maple ✓
cpu = 0.074 (sec), leaf count = 30

$$\{y(x) = x((\_C1\, x + \_C2)\cos(x^{-1}) - \sin(x^{-1})\,(\_C2\, x - \_C1))\}$$

Mathematica raw input

```
DSolve[(1 - 2*x^2)*y[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(I/x)*x*(-I + x)*C[1] + ((1 - I*x)*x*C[2])/(2*E^(I/x))}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)+(-2*x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*((_C1*x+_C2)*cos(1/x)-sin(1/x)*(_C2*x-_C1))
```

4.1709 $x^4 y''(x) - (2x^2+1)\, y(x) = 0$

ODE

$$x^4 y''(x) - (2x^2+1)\, y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0364807 (sec), leaf count = 35

$$\left\{\left\{y(x) \to c_1 e^{\frac{1}{x}}(x-1)x - \frac{1}{2}c_2 e^{-1/x}x(x+1)\right\}\right\}$$

Maple ✓
cpu = 0.061 (sec), leaf count = 27

$$\left\{y(x) = \left(\_C2\,(1+x)\,\mathrm{e}^{-x^{-1}} + \_C1\,\mathrm{e}^{x^{-1}}(-1+x)\right)x\right\}$$

Mathematica raw input

```
DSolve[-((1 + 2*x^2)*y[x]) + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x^(-1)*(-1 + x)*x*C[1] - (x*(1 + x)*C[2])/(2*E^x^(-1))}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)-(2*x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*(1+x)*exp(-1/x)+_C1*exp(1/x)*(-1+x))*x
```

4.1710 $\left(e^{2/x}-a^2\right) y(x)+x^4 y''(x)=0$

ODE

$$\left(e^{2/x}-a^2\right) y(x)+x^4 y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.569911 (sec), leaf count = 100

$$\left\{\left\{y(x)\to \frac{(-1)^{-a} 2^{\frac{3a}{2}+\frac{1}{2}} \left(-e^{2/x}\right)^{-a/2} \left(e^{2/x}\right)^{a/2} \left((-1)^a c_1 I_a\left(\sqrt{-e^{2/x}}\right)+c_2 K_a\left(\sqrt{-e^{2/x}}\right)\right)}{\log\left(e^{2/x}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.074 (sec), leaf count = 23

$$\left\{y(x)=x\left(Y_a\left(\mathrm{e}^{x^{-1}}\right)\_C2+J_a\left(\mathrm{e}^{x^{-1}}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(-a^2 + E^(2/x))*y[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2^(1/2 + (3*a)/2)*(E^(2/x))^(a/2)*((-1)^a*BesselI[a, Sqrt[-E^(2/x)]]*
C[1] + BesselK[a, Sqrt[-E^(2/x)]]*C[2]))/((-1)^a*(-E^(2/x))^(a/2)*Log[E^(2/x)])}
}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)+(exp(2/x)-a^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(BesselY(a,exp(1/x))*_C2+BesselJ(a,exp(1/x))*_C1)
```

4.1711 $x^4y''(x) + xy'(x) - 2y(x) = 0$

ODE

$$x^4y''(x) + xy'(x) - 2y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0398255 (sec), leaf count = 45

$$\left\{\left\{y(x) \to \frac{1}{2}e^{\frac{1}{2x^2}}x\left(2c_1 - \sqrt{2\pi}c_2\text{erf}\left(\frac{1}{\sqrt{2}x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.069 (sec), leaf count = 25

$$\left\{y(x) = xe^{\frac{1}{2x^2}}\left(Erf\left(\frac{\sqrt{2}}{2x}\right)\_C2 + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + x*y'[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(1/(2*x^2))*x*(2*C[1] - Sqrt[2*Pi]*C[2]*Erf[1/(Sqrt[2]*x)]))/2}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)+x*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*exp(1/2/x^2)*(erf(1/2*2^(1/2)/x)*_C2+_C1)
```

4.1712 $x^4y''(x) - 2x^2y'(x) + (2x+1)y(x) = 0$

ODE

$$x^4y''(x) - 2x^2y'(x) + (2x+1)y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0211511 (sec), leaf count = 20

$$\left\{\left\{y(x) \to e^{-1/x}(c_2x + c_1)\right\}\right\}$$

Maple ✓
cpu = 0.045 (sec), leaf count = 16

$$\left\{y(x) = \mathrm{e}^{-x^{-1}}(\_C2\,x + \_C1)\right\}$$

Mathematica raw input

```
DSolve[(1 + 2*x)*y[x] - 2*x^2*y'[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2])/E^x^(-1)}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)-2*x^2*diff(y(x),x)+(1+2*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-1/x)*(_C2*x+_C1)
```

4.1713 $x^4y''(x)+x^3y'(x)+y(x)=0$

ODE

$$x^4y''(x)+x^3y'(x)+y(x)=0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.167661 (sec), leaf count = 31

$$\left\{\left\{y(x)\to c_2 J_0\left(\frac{1}{x}\right)+\frac{c_1 K_0\left(\frac{i}{x}\right)}{\sqrt{\pi}}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 19

$$\{y(x)=\_C1\,J_0\left(x^{-1}\right)+\_C2\,Y_0\left(x^{-1}\right)\}$$

Mathematica raw input

```
DSolve[y[x] + x^3*y'[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (BesselK[0, I/x]*C[1])/Sqrt[Pi] + BesselJ[0, x^(-1)]*C[2]}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)+x^3*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*BesselJ(0,1/x)+_C2*BesselY(0,1/x)
```

4.1714 $x^4y''(x)+x^3y'(x)-(x+1)y(x)=0$

ODE

$$x^4y''(x)+x^3y'(x)-(x+1)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.027042 (sec), leaf count = 24

$$\left\{\left\{y(x)\to e^{\frac{1}{x}}\left(c_1-c_2\text{Ei}\left(-\frac{2}{x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 20

$$\left\{y(x)=\mathrm{e}^{x^{-1}}\left(Ei\left(1,2\,x^{-1}\right)\_C2+\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-((1 + x)*y[x]) + x^3*y'[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x^(-1)*(C[1] - C[2]*ExpIntegralEi[-2/x])}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)+x^3*diff(y(x),x)-(1+x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(1/x)*(Ei(1,2/x)*_C2+_C1)
```

4.1715 $y(x)\left(a+bx^2+cx^4\right)+x^4y''(x)+x^3y'(x)=0$

ODE

$$y(x)\left(a+bx^2+cx^4\right)+x^4y''(x)+x^3y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.29744 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{y''(x)x^4+y'(x)x^3+\left(cx^4+bx^2+a\right)y(x)=0,y(1)=c_1,y'(1)=c_2\right\}\right)(x)\right\}\right\}$$

Maple ✓
cpu = 0.319 (sec), leaf count = 81

$$\left\{y(x)=HeunD\left(0,a+b+c,-2\,a+2\,c,a-b+c,\frac{x^2+1}{x^2-1}\right)\left(\int\frac{1}{x}\left(HeunD\left(0,a+b+c,-2\,a+2\,c,a-b+c,\frac{x^2+1}{x^2-1}\right)\right)^{-2}\right.\right.$$

Mathematica raw input

```
DSolve[(a + b*x^2 + c*x^4)*y[x] + x^3*y'[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(a + \[FormalX]^2
*b + \[FormalX]^4*c)*\[FormalY][\[FormalX]] + \[FormalX]^3*Derivative[1][\[Forma
lY]][\[FormalX]] + \[FormalX]^4*Derivative[2][\[FormalY]][\[FormalX]] == 0, \[Fo
rmalY][1] == C[1], Derivative[1][\[FormalY]][1] == C[2]}][x]}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)+x^3*diff(y(x),x)+(c*x^4+b*x^2+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = HeunD(0,a+b+c,-2*a+2*c,a-b+c,(x^2+1)/(x^2-1))*(Int(1/x/HeunD(0,a+b+c,-2*a
+2*c,a-b+c,(x^2+1)/(x^2-1))^2,x)*_C2+_C1)
```

4.1716 $x^4 y''(x) + (x^2+1)\, x y'(x) + y(x) = 0$

ODE

$$x^4 y''(x) + (x^2+1)\, x y'(x) + y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.138812 (sec), leaf count = 73

$$\left\{\left\{y(x) \to c_2 G^{2,0}_{1,2}\left(-\frac{1}{2x^2}\middle| \begin{matrix}\frac{3}{2} \\ 0,0\end{matrix}\right) + \frac{c_1 e^{\frac{1}{4x^2}}\left(\left(2x^2-1\right) I_0\left(\frac{1}{4x^2}\right) + I_1\left(\frac{1}{4x^2}\right)\right)}{2x^2}\right\}\right\}$$

Maple ✓
cpu = 0.115 (sec), leaf count = 85

$$\left\{y(x) = \frac{\_C1}{x^2} e^{\frac{1}{4x^2}}\left(2\, I_0(1/4\, x^{-2}) x^2 - I_0\left(\frac{1}{4\,x^2}\right) + I_1\left(\frac{1}{4\,x^2}\right)\right) + \frac{\_C2}{x^2} e^{\frac{1}{4x^2}}\left(2\, K_0(-1/4\, x^{-2}) x^2 - K_0\left(-\frac{1}{4\,x^2}\right) + K_1\left(-\right.\right.\right.$$

Mathematica raw input

```
DSolve[y[x] + x*(1 + x^2)*y'[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(1/(4*x^2))*((-1 + 2*x^2)*BesselI[0, 1/(4*x^2)] + BesselI[1, 1/(4*x
^2)])*C[1])/(2*x^2) + C[2]*MeijerG[{{}, {3/2}}, {{0, 0}, {}}, -1/(2*x^2)]}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)+x*(x^2+1)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(1/4/x^2)*(2*BesselI(0,1/4/x^2)*x^2-BesselI(0,1/4/x^2)+BesselI(1,1
/4/x^2))/x^2+_C2*exp(1/4/x^2)*(2*BesselK(0,-1/4/x^2)*x^2-BesselK(0,-1/4/x^2)+Bes
selK(1,-1/4/x^2))/x^2
```

4.1717 $x^4 y''(x) - (1-x^2)\, xy'(x) + (1-x^2)\, y(x) = 0$

ODE

$$x^4 y''(x) - (1-x^2)\, xy'(x) + (1-x^2)\, y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0266868 (sec), leaf count = 22

$$\left\{\left\{y(x) \to x\left(c_2 e^{-\frac{1}{2x^2}} + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.059 (sec), leaf count = 16

$$\left\{y(x) = x\left(\mathrm{e}^{-\frac{1}{2x^2}} \_C2 + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(1 - x^2)*y[x] - x*(1 - x^2)*y'[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[1] + C[2]/E^(1/(2*x^2)))}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)-x*(-x^2+1)*diff(y(x),x)+(-x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(exp(-1/2/x^2)*_C2+_C1)
```

4.1718 $a^2 y(x) + x^4 y''(x) + 2x^3 y'(x) = 0$

ODE

$$a^2 y(x) + x^4 y''(x) + 2x^3 y'(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0118228 (sec), leaf count = 25

$$\left\{\left\{y(x) \to c_1 \cos\left(\frac{a}{x}\right) - c_2 \sin\left(\frac{a}{x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 21

$$\left\{y(x) = \_C1 \sin\left(\frac{a}{x}\right) + \_C2 \cos\left(\frac{a}{x}\right)\right\}$$

Mathematica raw input

```
DSolve[a^2*y[x] + 2*x^3*y'[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[a/x] - C[2]*Sin[a/x]}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)+2*x^3*diff(y(x),x)+a^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(1/x*a)+_C2*cos(1/x*a)
```

4.1719 $x^4 y''(x) + (2x^2+1)\, xy'(x) - y(x) = 0$

ODE

$$x^4 y''(x) + (2x^2+1)\, xy'(x) - y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0286864 (sec), leaf count = 44

$$\left\{\left\{y(x) \to \frac{1}{2} e^{\frac{1}{2x^2}} \left(2c_1 - \sqrt{2\pi} c_2 \text{erf}\left(\frac{1}{\sqrt{2}x}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.112 (sec), leaf count = 24

$$\left\{y(x) = \mathrm{e}^{\frac{1}{2\,x^2}} \left(Erf\left(\frac{\sqrt{2}}{2\,x}\right) \_C2 + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*(1 + 2*x^2)*y'[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(1/(2*x^2))*(2*C[1] - Sqrt[2*Pi]*C[2]*Erf[1/(Sqrt[2]*x)]))/2}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)+x*(2*x^2+1)*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(1/2/x^2)*(erf(1/2*2^(1/2)/x)*_C2+_C1)
```

4.1720 $2x^2(a+x)y'(x)+by(x)+x^4y''(x)=0$

ODE

$$2x^2(a+x)y'(x)+by(x)+x^4y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0159766 (sec), leaf count = 51

$$\left\{\left\{y(x)\to e^{\frac{a-\sqrt{a^2-b}}{x}}\left(c_1 e^{\frac{2\sqrt{a^2-b}}{x}}+c_2\right)\right\}\right\}$$

Maple ✓
cpu = 0.06 (sec), leaf count = 43

$$\left\{y(x)=\_C1\, \mathrm{e}^{\frac{1}{x}\left(a-\sqrt{a^2-b}\right)}+\_C2\, \mathrm{e}^{\frac{1}{x}\left(a+\sqrt{a^2-b}\right)}\right\}$$

Mathematica raw input

```
DSolve[b*y[x] + 2*x^2*(a + x)*y'[x] + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^((a - Sqrt[a^2 - b])/x)*(E^((2*Sqrt[a^2 - b])/x)*C[1] + C[2])}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)+2*x^2*(a+x)*diff(y(x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp((a-(a^2-b)^(1/2))/x)+_C2*exp(1/x*(a+(a^2-b)^(1/2)))
```

4.1721 $(x^3+1)\,xy''(x)-(1-x^3)\,y'(x)+x^2(-y(x))=0$

ODE

$$(x^3+1)\,xy''(x)-(1-x^3)\,y'(x)+x^2(-y(x))=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.303765 (sec), leaf count = 57

$$\left\{\left\{y(x)\to -\frac{1}{2}c_2\sqrt[3]{x^3+1}x^2\,{}_2F_1\left(\frac{1}{3},\frac{2}{3};\frac{5}{3};-x^3\right)+c_1\sqrt[3]{x^3+1}+c_2x^2\right\}\right\}$$

Maple ✓
cpu = 0.151 (sec), leaf count = 30

$$\left\{y(x)=\sqrt[3]{x^3+1}\left({}_2\mathrm{F}_1(\frac{2}{3},\frac{4}{3};\frac{5}{3};-x^3)\_C1\,x^2+\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[-(x^2*y[x]) - (1 - x^3)*y'[x] + x*(1 + x^3)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x^3)^(1/3)*C[1] + x^2*C[2] - (x^2*(1 + x^3)^(1/3)*C[2]*Hypergeome
tric2F1[1/3, 2/3, 5/3, -x^3])/2}}
```

Maple raw input

```
dsolve(x*(x^3+1)*diff(diff(y(x),x),x)-(-x^3+1)*diff(y(x),x)-x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x^3+1)^(1/3)*(hypergeom([2/3, 4/3],[5/3],-x^3)*_C1*x^2+_C2)
```

4.1722 $x^3(-y'(x)) + (1-x^2)\,x^2 y''(x) - 2y(x) = 0$

ODE

$$x^3(-y'(x)) + (1-x^2)\,x^2 y''(x) - 2y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0892921 (sec), leaf count = 65

$$\left\{\left\{y(x) \to \frac{\sqrt[4]{1-x^2}\left(c_1\sqrt{1-x^2} - c_2\sqrt{1-x^2}\sin^{-1}(x) + c_2 x\right)}{x\sqrt[4]{x^2-1}}\right\}\right\}$$

Maple ✓
cpu = 0.109 (sec), leaf count = 61

$$\left\{y(x) = \frac{1}{x}\left(\_C2\,(-1+x)^2(1+x)^2\ln\left(x+\sqrt{x^2-1}\right) - \left(x^2-1\right)^{\frac{3}{2}}\_C2\,x + (-1+x)^2(1+x)^2\_C1\right)\left(x^2-1\right)^{-\frac{3}{2}}\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] - x^3*y'[x] + x^2*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((1 - x^2)^(1/4)*(Sqrt[1 - x^2]*C[1] + x*C[2] - Sqrt[1 - x^2]*ArcSin[x
]*C[2]))/(x*(-1 + x^2)^(1/4))}}
```

Maple raw input

```
dsolve(x^2*(-x^2+1)*diff(diff(y(x),x),x)-x^3*diff(y(x),x)-2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/(x^2-1)^(3/2)*(_C2*(-1+x)^2*(1+x)^2*ln(x+(x^2-1)^(1/2))-(x^2-1)^(3/2)*_
C2*x+(-1+x)^2*(1+x)^2*_C1)/x
```

4.1723 $(1-x^2)\,x^2y''(x)-(2-x^2)\,xy'(x)+(2-x^2)\,y(x)=0$

ODE

$$(1-x^2)\,x^2y''(x)-(2-x^2)\,xy'(x)+(2-x^2)\,y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0587328 (sec), leaf count = 45

$$\left\{\left\{y(x)\to \frac{x\sqrt[4]{x^2-1}\left(c_2\log\left(\sqrt{x^2-1}+x\right)+c_1\right)}{\sqrt[4]{1-x^2}}\right\}\right\}$$

Maple ✓
cpu = 0.041 (sec), leaf count = 20

$$\left\{y(x)=x\left(\ln\left(x+\sqrt{x^2-1}\right)\_C2+\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(2 - x^2)*y[x] - x*(2 - x^2)*y'[x] + x^2*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(-1 + x^2)^(1/4)*(C[1] + C[2]*Log[x + Sqrt[-1 + x^2]]))/(1 - x^2)^(
1/4)}}
```

Maple raw input

```
dsolve(x^2*(-x^2+1)*diff(diff(y(x),x),x)-x*(-x^2+2)*diff(y(x),x)+(-x^2+2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(ln(x+(x^2-1)^(1/2))*_C2+_C1)
```

4.1724 $a(a+1)y(x) - 2x^3y'(x) + (1-x^2)\,x^2y''(x) = 0$

ODE

$$a(a+1)y(x) - 2x^3y'(x) + (1-x^2)\,x^2y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.217608 (sec), leaf count = 227

$$\left\{\left\{y(x) \to (-1)^{\frac{1}{4}\left(1-\sqrt{-4a^2-4a+1}\right)} x^{\frac{1}{2}-\frac{1}{2}\sqrt{-4a^2-4a+1}}\left(c_1\, {}_2F_1\left(\frac{1}{4}-\frac{1}{4}\sqrt{-4a^2-4a+1}, \frac{3}{4}-\frac{1}{4}\sqrt{-4a^2-4a+1}; 1-\frac{1}{2}\sqrt{-4a^2-\right.\right.\right.$$

Maple ✓
cpu = 0.166 (sec), leaf count = 153

$$\left\{y(x) = \_C1\ {}_2\mathrm{F}_1\left(\frac{3}{4}-\frac{1}{4}\sqrt{-4\,a^2-4\,a+1}, \frac{1}{4}-\frac{1}{4}\sqrt{-4\,a^2-4\,a+1}; 1-\frac{1}{2}\sqrt{-4\,a^2-4\,a+1}; x^2\right) x^{\frac{1}{2}-\frac{1}{2}\sqrt{-4\,a^2-4\,a+1}} + \_C2\right.$$

Mathematica raw input

```
DSolve[a*(1 + a)*y[x] - 2*x^3*y'[x] + x^2*(1 - x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1)^((1 - Sqrt[1 - 4*a - 4*a^2])/4)*x^(1/2 - Sqrt[1 - 4*a - 4*a^2]/2)
*(C[1]*Hypergeometric2F1[1/4 - Sqrt[1 - 4*a - 4*a^2]/4, 3/4 - Sqrt[1 - 4*a - 4*a
^2]/4, 1 - Sqrt[1 - 4*a - 4*a^2]/2, x^2] + I^Sqrt[1 - 4*a - 4*a^2]*x^Sqrt[1 - 4*
a - 4*a^2]*C[2]*Hypergeometric2F1[(1 + Sqrt[1 - 4*a - 4*a^2])/4, (3 + Sqrt[1 - 4
*a - 4*a^2])/4, (2 + Sqrt[1 - 4*a - 4*a^2])/2, x^2])}}
```

Maple raw input

```
dsolve(x^2*(-x^2+1)*diff(diff(y(x),x),x)-2*x^3*diff(y(x),x)+a*(1+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([3/4-1/4*(-4*a^2-4*a+1)^(1/2), 1/4-1/4*(-4*a^2-4*a+1)^(1/2)
],[1-1/2*(-4*a^2-4*a+1)^(1/2)],x^2)*x^(1/2-1/2*(-4*a^2-4*a+1)^(1/2))+_C2*hyperge
```

```
om([3/4+1/4*(-4*a^2-4*a+1)^(1/2), 1/4+1/4*(-4*a^2-4*a+1)^(1/2)],[1+1/2*(-4*a^2-4
*a+1)^(1/2)],x^2)*x^(1/2+1/2*(-4*a^2-4*a+1)^(1/2))
```

4.1725 $(x^2+1)^2 y''(x) + 2x(x^2+1) y'(x) + y(x) = 0$

ODE

$$(x^2+1)^2 y''(x) + 2x(x^2+1) y'(x) + y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0260597 (sec), leaf count = 22

$$\left\{\left\{y(x) \to \frac{c_2 x + c_1}{\sqrt{x^2+1}}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 17

$$\left\{y(x) = (\_C1\, x + \_C2)\frac{1}{\sqrt{x^2+1}}\right\}$$

Mathematica raw input

```
DSolve[y[x] + 2*x*(1 + x^2)*y'[x] + (1 + x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2])/Sqrt[1 + x^2]}}
```

Maple raw input

```
dsolve((x^2+1)^2*diff(diff(y(x),x),x)+2*x*(x^2+1)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1*x+_C2)/(x^2+1)^(1/2)
```

4.1726 $(x^2+1)^2 y''(x) + 2x(x^2+1) y'(x) + 4y(x) = 0$

ODE

$$(x^2+1)^2 y''(x) + 2x(x^2+1) y'(x) + 4y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0172354 (sec), leaf count = 22

$$\{\{y(x) \to c_2 \sin\left(2\tan^{-1}(x)\right) + c_1 \cos\left(2\tan^{-1}(x)\right)\}\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 19

$$\{y(x) = \_C1 \sin(2\arctan(x)) + \_C2 \cos(2\arctan(x))\}$$

Mathematica raw input

```
DSolve[4*y[x] + 2*x*(1 + x^2)*y'[x] + (1 + x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[2*ArcTan[x]] + C[2]*Sin[2*ArcTan[x]]}}
```

Maple raw input

```
dsolve((x^2+1)^2*diff(diff(y(x),x),x)+2*x*(x^2+1)*diff(y(x),x)+4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(2*arctan(x))+_C2*cos(2*arctan(x))
```

4.1727 $a^2(-y(x)) + (x^2+1)^2 y''(x) - 2x(1-x^2) y'(x) = 0$

ODE

$$a^2(-y(x)) + (x^2+1)^2 y''(x) - 2x(1-x^2) y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 7.16434 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x) \to \text{DifferentialRoot}\left(\{y,x\}, \left\{y''(x)\left(x^2+1\right)^2 - a^2 y(x) + \left(2x^3-2x\right) y'(x) = 0, y(0) = c_1, y'(0) = c_2\right\}\right)(x)\right\}\right\}$$

Maple ✓
cpu = 0.325 (sec), leaf count = 54

$$\left\{y(x) = \_C1\, HeunC\left(2, -\frac{1}{2}, -\frac{1}{2}, -1, \frac{7}{8}+\frac{a^2}{4}, \left(x^2+1\right)^{-1}\right) + \_C2\, HeunC\left(2, \frac{1}{2}, -\frac{1}{2}, -1, \frac{7}{8}+\frac{a^2}{4}, \left(x^2+1\right)^{-1}\right) \frac{1}{\sqrt{x^2+1}}\right\}$$

Mathematica raw input

```
DSolve[-(a^2*y[x]) - 2*x*(1 - x^2)*y'[x] + (1 + x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {-(a^2*\[FormalY][
\[FormalX]]) + (-2*\[FormalX] + 2*\[FormalX]^3)*Derivative[1][\[FormalY]][\[Form
alX]] + (1 + \[FormalX]^2)^2*Derivative[2][\[FormalY]][\[FormalX]] == 0, \[Forma
lY][0] == C[1], Derivative[1][\[FormalY]][0] == C[2]}]][x]}}
```

Maple raw input

```
dsolve((x^2+1)^2*diff(diff(y(x),x),x)-2*x*(-x^2+1)*diff(y(x),x)-a^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*HeunC(2,-1/2,-1/2,-1,7/8+1/4*a^2,1/(x^2+1))+_C2*HeunC(2,1/2,-1/2,-1,7
/8+1/4*a^2,1/(x^2+1))/(x^2+1)^(1/2)
```

4.1728 $-y(x)\left(m^2-n(n+1)\left(1-x^2\right)\right)+\left(1-x^2\right)^2 y''(x)-2x(1-x^2)\,y'(x)=0$

ODE

$$-y(x)\left(m^2-n(n+1)\left(1-x^2\right)\right)+\left(1-x^2\right)^2 y''(x)-2x\left(1-x^2\right)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.036624 (sec), leaf count = 20

$$\{\{y(x)\to c_1 P_n^m(x)+c_2 Q_n^m(x)\}\}$$

Maple ✓
cpu = 0.062 (sec), leaf count = 17

$$\{y(x)=\_C1\ LegendreP(n,m,x)+\_C2\ LegendreQ(n,m,x)\}$$

Mathematica raw input

```
DSolve[-((m^2 - n*(1 + n)*(1 - x^2))*y[x]) - 2*x*(1 - x^2)*y'[x] + (1 - x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*LegendreP[n, m, x] + C[2]*LegendreQ[n, m, x]}}
```

Maple raw input

```
dsolve((-x^2+1)^2*diff(diff(y(x),x),x)-2*x*(-x^2+1)*diff(y(x),x)-(m^2-n*(n+1)*(-x^2+1))*y(x) = 0, y(x
```

Maple raw output

```
y(x) = _C1*LegendreP(n,m,x)+_C2*LegendreQ(n,m,x)
```

4.1729 $-y(x)\left(k^2-p(p+1)\left(1-x^2\right)\right)+\left(1-x^2\right)^2y''(x)-2x(1-x^2)\,y'(x)=0$

ODE

$$-y(x)\left(k^2-p(p+1)\left(1-x^2\right)\right)+\left(1-x^2\right)^2y''(x)-2x(1-x^2)\,y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0290496 (sec), leaf count = 20

$$\left\{\left\{y(x)\to c_1P_p^k(x)+c_2Q_p^k(x)\right\}\right\}$$

Maple ✓
cpu = 0.056 (sec), leaf count = 17

$$\{y(x)=\_C1\ LegendreP(p,k,x)+\_C2\ LegendreQ(p,k,x)\}$$

Mathematica raw input

```
DSolve[-((k^2 - p*(1 + p)*(1 - x^2))*y[x]) - 2*x*(1 - x^2)*y'[x] + (1 - x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*LegendreP[p, k, x] + C[2]*LegendreQ[p, k, x]}}
```

Maple raw input

```
dsolve((-x^2+1)^2*diff(diff(y(x),x),x)-2*x*(-x^2+1)*diff(y(x),x)-(k^2-p*(p+1)*(-x^2+1))*y(x) = 0, y(x
```

Maple raw output

```
y(x) = _C1*LegendreP(p,k,x)+_C2*LegendreQ(p,k,x)
```

4.1730 $-y(x)\left(a^2-k\left(1-x^2\right)\right)+\left(1-x^2\right)^2y''(x)-2x\left(1-x^2\right)y'(x)=0$

ODE

$$-y(x)\left(a^2-k\left(1-x^2\right)\right)+\left(1-x^2\right)^2y''(x)-2x\left(1-x^2\right)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0243445 (sec), leaf count = 48

$$\left\{\left\{y(x)\to c_1P^a_{\frac{1}{2}\left(\sqrt{4k+1}-1\right)}(x)+c_2Q^a_{\frac{1}{2}\left(\sqrt{4k+1}-1\right)}(x)\right\}\right\}$$

Maple ✓
cpu = 0.058 (sec), leaf count = 37

$$\left\{y(x)=\_C1\ LegendreP\left(\frac{1}{2}\sqrt{1+4\,k}-\frac{1}{2},a,x\right)+\_C2\ LegendreQ\left(\frac{1}{2}\sqrt{1+4\,k}-\frac{1}{2},a,x\right)\right\}$$

Mathematica raw input

```
DSolve[-((a^2 - k*(1 - x^2))*y[x]) - 2*x*(1 - x^2)*y'[x] + (1 - x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*LegendreP[(-1 + Sqrt[1 + 4*k])/2, a, x] + C[2]*LegendreQ[(-1 + Sq
rt[1 + 4*k])/2, a, x]}}
```

Maple raw input

```
dsolve((-x^2+1)^2*diff(diff(y(x),x),x)-2*x*(-x^2+1)*diff(y(x),x)-(a^2-k*(-x^2+1))*y(x) = 0, y(x),'imp
```

Maple raw output

```
y(x) = _C1*LegendreP(1/2*(1+4*k)^(1/2)-1/2,a,x)+_C2*LegendreQ(1/2*(1+4*k)^(1/2)-
1/2,a,x)
```

4.1731 $y(x)\left(\mathbf{a0}+\mathbf{a2}x^2+\mathbf{a4}x^4\right)+\left(1-x^2\right)^2y''(x)-2x(1-x^2)\,y'(x)=0$

ODE

$$y(x)\left(\mathrm{a0}+\mathrm{a2}x^2+\mathrm{a4}x^4\right)+\left(1-x^2\right)^2y''(x)-2x\left(1-x^2\right)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 3.24676 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\{\left(\mathrm{a4}x^4+\mathrm{a2}x^2+\mathrm{a0}\right)y(x)+\left(2x^3-2x\right)y'(x)+\left(x^4-2x^2+1\right)y''(x)=0,y(0)=c_1,y'(0\right)$$

Maple ✓
cpu = 0.265 (sec), leaf count = 83

$$\left\{y(x)=\left(x^2-1\right)^{\frac{1}{2}\sqrt{-a0-a4-a2}}\left(HeunC\left(0,\frac{1}{2},\sqrt{-a0-a4-a2},\frac{a4}{4},\frac{1}{4}-\frac{a0}{4},x^2\right)\_C2\,x+HeunC\left(0,-\frac{1}{2},\sqrt{-a0-a4-\right.\right.$$

Mathematica raw input

```
DSolve[(a0 + a2*x^2 + a4*x^4)*y[x] - 2*x*(1 - x^2)*y'[x] + (1 - x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(a0 + \[FormalX]^
2*a2 + \[FormalX]^4*a4)*\[FormalY][\[FormalX]] + (-2*\[FormalX] + 2*\[FormalX]^3
)*Derivative[1][\[FormalY]][\[FormalX]] + (1 - 2*\[FormalX]^2 + \[FormalX]^4)*De
rivative[2][\[FormalY]][\[FormalX]] == 0, \[FormalY][0] == C[1], Derivative[1][\
[FormalY]][0] == C[2]}]][x]}}
```

Maple raw input

```
dsolve((-x^2+1)^2*diff(diff(y(x),x),x)-2*x*(-x^2+1)*diff(y(x),x)+(a4*x^4+a2*x^2+a0)*y(x) = 0, y(x),'i
```

Maple raw output

```
y(x) = (x^2-1)^(1/2*(-a0-a4-a2)^(1/2))*(HeunC(0,1/2,(-a0-a4-a2)^(1/2),1/4*a4,1/4
-1/4*a0,x^2)*_C2*x+HeunC(0,-1/2,(-a0-a4-a2)^(1/2),1/4*a4,1/4-1/4*a0,x^2)*_C1)
```

4.1732 $y(x)\left(\sum_{m=0}^{n} a(m)x^m\right)+\left(1-x^2\right)^2 y''(x)-2x\left(1-x^2\right)y'(x)=0$

ODE

$$y(x)\left(\sum_{m=0}^{n} a(m)x^m\right)+\left(1-x^2\right)^2 y''(x)-2x\left(1-x^2\right)y'(x)=0$$

ODE Classification

```
[[_2nd_order, _with_linear_symmetries]]
```

Book solution method
TO DO

Mathematica ✗
cpu = 4.78176 (sec), leaf count = 0 , could not solve

```
DSolve[Sum[x^m*a[m], {m, 0, n}]*y[x] - 2*x*(1 - x^2)*Derivative[1][y][x] + (1 - x^2)^2*Derivative[2]
```

Maple ✗
cpu = 4.512 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)-2\,\frac{x\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{-x^2+1}+\frac{\sum_{m=0}^{n} a(m)\,x^m\_Y(x)}{\left(-x^2+1\right)^2}\right\},\{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[Sum[x^m*a[m], {m, 0, n}]*y[x] - 2*x*(1 - x^2)*y'[x] + (1 - x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[Sum[x^m*a[m], {m, 0, n}]*y[x] - 2*x*(1 - x^2)*Derivative[1][y][x] + (1 -
x^2)^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve((-x^2+1)^2*diff(diff(y(x),x),x)-2*x*(-x^2+1)*diff(y(x),x)+sum(a(m)*x^m,m = 0 .. n)*y(x) = 0, y
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)-2*x/(-x^2+1)*diff(_Y(x),x)+sum(a(m)*x^m,m =
0 .. n)/(-x^2+1)^2*_Y(x)},{_Y(x)})
```

4.1733 $ax(1-x^2)\,y'(x)+by(x)+(x^2+1)^2\,y''(x)=0$

ODE

$$ax(1-x^2)\,y'(x)+by(x)+(x^2+1)^2\,y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.92653 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{y''(x)\,(x^2+1)^2+by(x)+(xa-x^3a)\,y'(x)=0,y(0)=c_1,y'(0)=c_2\right\}\right)(x)\right\}\right\}$$

Maple ✓
cpu = 0.344 (sec), leaf count = 101

$$\left\{y(x)=\mathrm{e}^{\frac{a}{x^2+1}}\left(HeunC\left(a,-\frac{1}{2}-\frac{a}{2},-\frac{1}{2},a+\frac{a^2}{4},-\frac{7\,a}{8}-\frac{a^2}{4}+\frac{1}{8}-\frac{b}{4},\left(x^2+1\right)^{-1}\right)(x^2+1)^{\frac{1}{2}+\frac{a}{2}}\_C2+HeunC\left(a,\frac{1}{2}+\frac{a}{2},\right.\right.\right.$$

Mathematica raw input

```
DSolve[b*y[x] + a*x*(1 - x^2)*y'[x] + (1 + x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {b*\[FormalY][\[Fo
rmalX]] + (\[FormalX]*a - \[FormalX]^3*a)*Derivative[1][\[FormalY]][\[FormalX]]
+ (1 + \[FormalX]^2)^2*Derivative[2][\[FormalY]][\[FormalX]] == 0, \[FormalY][0]
  == C[1], Derivative[1][\[FormalY]][0] == C[2]}]][x]}}
```

Maple raw input

```
dsolve((x^2+1)^2*diff(diff(y(x),x),x)+a*x*(-x^2+1)*diff(y(x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(a/(x^2+1))*(HeunC(a,-1/2-1/2*a,-1/2,a+1/4*a^2,-7/8*a-1/4*a^2+1/8-1/4*
b,1/(x^2+1))*(x^2+1)^(1/2+1/2*a)*_C2+HeunC(a,1/2+1/2*a,-1/2,a+1/4*a^2,-7/8*a-1/4
*a^2+1/8-1/4*b,1/(x^2+1))*_C1)
```

4.1734 $\mathbf{a1}x(1-x^2)\,y'(x)+y(x)\,(\mathbf{a2}+\mathbf{b2}x+\mathbf{c2}x^2)+(1-x^2)^2\,y''(x)=0$

ODE

$$\mathrm{a1}x(1-x^2)\,y'(x)+y(x)\,(\mathrm{a2}+\mathrm{b2}x+\mathrm{c2}x^2)+(1-x^2)^2\,y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 57.2602 (sec), leaf count = 1

$Aborted

Maple ✓
cpu = 0.165 (sec), leaf count = 404

$$\left\{y(x)=(x^2-1)^{\frac{a1}{4}}\left(-\frac{1}{2}+\frac{x}{2}\right)^{\frac{1}{2}+\frac{1}{4}\sqrt{a1^2+4\,a1-4\,a2-4\,b2-4\,c2+4}}\left(\left(\frac{1}{2}+\frac{x}{2}\right)^{\frac{1}{2}+\frac{1}{4}\sqrt{a1^2+4\,a1-4\,a2+4\,b2-4\,c2+4}}\,{}_2\mathrm{F}_1\left(\frac{1}{4}\sqrt{a1^2+4\,a1-4\,a2-4\,b2-4\,c2+4}+\frac{1}{2}\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a2 + b2*x + c2*x^2)*y[x] + a1*x*(1 - x^2)*y'[x] + (1 - x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((-x^2+1)^2*diff(diff(y(x),x),x)+a1*x*(-x^2+1)*diff(y(x),x)+(c2*x^2+b2*x+a2)*y(x) = 0, y(x),'im
```

Maple raw output

```
y(x) = (x^2-1)^(1/4*a1)*(-1/2+1/2*x)^(1/2+1/4*(a1^2+4*a1-4*a2-4*b2-4*c2+4)^(1/2)
)*((1/2+1/2*x)^(1/2+1/4*(a1^2+4*a1-4*a2+4*b2-4*c2+4)^(1/2))*hypergeom([1/4*(a1^2
+4*a1-4*a2-4*b2-4*c2+4)^(1/2)+1/2*(a1^2+2*a1-4*c2+1)^(1/2)+1/4*(a1^2+4*a1-4*a2+4
*b2-4*c2+4)^(1/2)+1/2, 1/4*(a1^2+4*a1-4*a2-4*b2-4*c2+4)^(1/2)-1/2*(a1^2+2*a1-4*c
2+1)^(1/2)+1/4*(a1^2+4*a1-4*a2+4*b2-4*c2+4)^(1/2)+1/2],[1+1/2*(a1^2+4*a1-4*a2+4*
b2-4*c2+4)^(1/2)],1/2+1/2*x)*_C2+(1/2+1/2*x)^(1/2-1/4*(a1^2+4*a1-4*a2+4*b2-4*c2+
```

```
4)^(1/2))*hypergeom([1/4*(a1^2+4*a1-4*a2-4*b2-4*c2+4)^(1/2)-1/2*(a1^2+2*a1-4*c2+
1)^(1/2)-1/4*(a1^2+4*a1-4*a2+4*b2-4*c2+4)^(1/2)+1/2, 1/4*(a1^2+4*a1-4*a2-4*b2-4*
c2+4)^(1/2)+1/2*(a1^2+2*a1-4*c2+1)^(1/2)-1/4*(a1^2+4*a1-4*a2+4*b2-4*c2+4)^(1/2)+
1/2],[1-1/2*(a1^2+4*a1-4*a2+4*b2-4*c2+4)^(1/2)],1/2+1/2*x)*_C1)
```

4.1735 $x^2(a^2+x^2)^2 y''(x)+x(a^2+2x^2)y'(x)+b^2y(x)=0$

ODE

$$x^2\left(a^2+x^2\right)^2 y''(x)+x\left(a^2+2x^2\right)y'(x)+b^2y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 9.06684 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{x^2y''(x)\left(x^2+a^2\right)^2+b^2y(x)+\left(2x^3+a^2x\right)y'(x)=0,y(1)=c_1,y'(1)=c_2\right\}\right)(x)\right\}\right\}$$

Maple ✓
cpu = 0.494 (sec), leaf count = 253

$$\left\{y(x)=x^{\frac{-1}{2\,a^2}\left(a^2+\sqrt{a^4-2\,a^2-4\,b^2+1}-1\right)}\mathrm{e}^{\left(2\,a^2+2\,x^2\right)^{-1}}\left(HeunC\left(\frac{1}{2\,a^2},\frac{1}{2},\frac{1}{2\,a^2}\sqrt{a^4-2\,a^2-4\,b^2+1},\frac{4\,a^2+1}{8\,a^4},\frac{a^2-6}{8\,a^2},\frac{a^2}{a^2+x^2}\right)\right.\right.$$

Mathematica raw input

```
DSolve[b^2*y[x] + x*(a^2 + 2*x^2)*y'[x] + x^2*(a^2 + x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {b^2*\[FormalY][\[
FormalX]] + (2*\[FormalX]^3 + \[FormalX]*a^2)*Derivative[1][\[FormalY]][\[Formal
X]] + \[FormalX]^2*(\[FormalX]^2 + a^2)^2*Derivative[2][\[FormalY]][\[FormalX]]
== 0, \[FormalY][1] == C[1], Derivative[1][\[FormalY]][1] == C[2]}]][x]}}
```

Maple raw input

```
dsolve(x^2*(a^2+x^2)^2*diff(diff(y(x),x),x)+x*(a^2+2*x^2)*diff(y(x),x)+b^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(1/2*(a^2+(a^4-2*a^2-4*b^2+1)^(1/2)-1)/a^2)*exp(1/(2*a^2+2*x^2))*(HeunC
(1/2/a^2,1/2,1/2*(a^4-2*a^2-4*b^2+1)^(1/2)/a^2,1/8/a^4*(4*a^2+1),1/8/a^2*(a^2-6)
```

```
,a^2/(a^2+x^2))*(a^2+x^2)^(-1/4*(a^2+(a^4-2*a^2-4*b^2+1)^(1/2)-1)/a^2)*_C2+HeunC
(1/2/a^2,-1/2,1/2*(a^4-2*a^2-4*b^2+1)^(1/2)/a^2,1/8/a^4*(4*a^2+1),1/8/a^2*(a^2-6
),a^2/(a^2+x^2))*(a^2+x^2)^(-1/4*(-a^2+(a^4-2*a^2-4*b^2+1)^(1/2)-1)/a^2)*_C1)
```

4.1736 $\left(a^2+x^2\right)^2 y''(x)+2x\left(a^2+2x^2\right) y'(x)-y(x)\left(\mathbf{a0}+\mathbf{a2}x^2+\mathbf{a4}x^4\right)=0$

ODE

$$\left(a^2+x^2\right)^2 y''(x)+2x\left(a^2+2x^2\right) y'(x)-y(x)\left(\text{a0}+\text{a2}x^2+\text{a4}x^4\right)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 4.97949 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{y''(x)\left(x^2+a^2\right)^2+\left(-\text{a4}x^4-\text{a2}x^2-\text{a0}\right)y(x)+\left(4x^3+2a^2x\right)y'(x)=0,y(0)=c_1,y'(\right.\right.\right.$$

Maple ✗
cpu = 0.772 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)+2\,\frac{x\left(a^2+2\,x^2\right)\,\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{\left(a^2+x^2\right)^2}-\frac{\left(a4\,x^4+a2\,x^2+a0\right)\,\_Y(x)}{\left(a^2+x^2\right)^2}\right\},\{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[-((a0 + a2*x^2 + a4*x^4)*y[x]) + 2*x*(a^2 + 2*x^2)*y'[x] + (a^2 + x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(-a0 - \[FormalX]
^2*a2 - \[FormalX]^4*a4)*\[FormalY][\[FormalX]] + (4*\[FormalX]^3 + 2*\[FormalX]
*a^2)*Derivative[1][\[FormalY]][\[FormalX]] + (\[FormalX]^2 + a^2)^2*Derivative[
2][\[FormalY]][\[FormalX]] == 0, \[FormalY][0] == C[1], Derivative[1][\[FormalY]
][0] == C[2]}]][x]}}
```

Maple raw input

```
dsolve((a^2+x^2)^2*diff(diff(y(x),x),x)+2*x*(a^2+2*x^2)*diff(y(x),x)-(a4*x^4+a2*x^2+a0)*y(x) = 0, y(x
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+2*x*(a^2+2*x^2)/(a^2+x^2)^2*diff(_Y(x),x)-(a
4*x^4+a2*x^2+a0)/(a^2+x^2)^2*_Y(x)},{_Y(x)})
```

4.1737 $\left(a^2-x^2\right)^2 y''(x)-2x\left(a^2-x^2\right) y'(x)+y(x)\left(\mathbf{a0}+\mathbf{a2}x^2+\mathbf{a4}x^4\right)=0$

ODE

$$\left(a^2-x^2\right)^2 y''(x)-2x\left(a^2-x^2\right) y'(x)+y(x)\left(\text{a0}+\text{a2}x^2+\text{a4}x^4\right)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 5.33723 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{(a-x)^2y''(x)(x+a)^2-2x(a-x)y'(x)(x+a)+\left(\text{a4}x^4+\text{a2}x^2+\text{a0}\right)y(x)=0,y(0)=\right.\right.$$

Maple ✓
cpu = 0.306 (sec), leaf count = 144

$$\left\{y(x)=\left((a-x)(a+x)\right)^{\frac{1}{2a}\sqrt{-a4\,a^4-a2\,a^2-a0}}\left(HeunC\left(0,\frac{1}{2},\frac{1}{a}\sqrt{-a4\,a^4-a2\,a^2-a0},\frac{a^2a4}{4},\frac{a^2-a0}{4a^2},\frac{x^2}{a^2}\right)\_C2\,x+Heu\right.\right.$$

Mathematica raw input

```
DSolve[(a0 + a2*x^2 + a4*x^4)*y[x] - 2*x*(a^2 - x^2)*y'[x] + (a^2 - x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(a0 + \[FormalX]^
2*a2 + \[FormalX]^4*a4)*\[FormalY][\[FormalX]] - 2*\[FormalX]*(-\[FormalX] + a)*
(\[FormalX] + a)*Derivative[1][\[FormalY]][\[FormalX]] + (-\[FormalX] + a)^2*(\[
FormalX] + a)^2*Derivative[2][\[FormalY]][\[FormalX]] == 0, \[FormalY][0] == C[1
], Derivative[1][\[FormalY]][0] == C[2]}]][x]}}
```

Maple raw input

```
dsolve((a^2-x^2)^2*diff(diff(y(x),x),x)-2*x*(a^2-x^2)*diff(y(x),x)+(a4*x^4+a2*x^2+a0)*y(x) = 0, y(x),
```

Maple raw output

```
y(x) = ((a-x)*(a+x))^(1/2*(-a^4*a4-a^2*a2-a0)^(1/2)/a)*(HeunC(0,1/2,(-a^4*a4-a^2
*a2-a0)^(1/2)/a,1/4*a^2*a4,1/4/a^2*(a^2-a0),x^2/a^2)*_C2*x+HeunC(0,-1/2,(-a^4*a4
-a^2*a2-a0)^(1/2)/a,1/4*a^2*a4,1/4/a^2*(a^2-a0),x^2/a^2)*_C1)
```

4.1738 $\left(a^2+x^2\right)^2\left(b^2+x^2\right)y''(x)+x(\mathbf{a0}+\mathbf{b0}x^2)\,y'(x)+y(x)\left(\mathbf{a1}+\mathbf{b1}x^2\right)=0$

ODE

$$\left(a^2+x^2\right)^2\left(b^2+x^2\right)y''(x)+x\left(\mathrm{a0}+\mathrm{b0}x^2\right)y'(x)+y(x)\left(\mathrm{a1}+\mathrm{b1}x^2\right)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 139.621 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{\left(x^2+b^2\right)y''(x)\left(x^2+a^2\right)^2+\left(\mathrm{b1}x^2+\mathrm{a1}\right)y(x)+\left(\mathrm{b0}x^3+\mathrm{a0}x\right)y'(x)=0,y(0)=c_1,y'\right.\right.\right.$$

Maple ✗
cpu = 1.707 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)+\frac{x\left(x^2 b0+a0\right)\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{\left(a^2+x^2\right)^2\left(b^2+x^2\right)}+\frac{\left(b1\,x^2+a1\right)\_Y(x)}{\left(a^2+x^2\right)^2\left(b^2+x^2\right)}\right\},\{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[(a1 + b1*x^2)*y[x] + x*(a0 + b0*x^2)*y'[x] + (a^2 + x^2)^2*(b^2 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(a1 + \[FormalX]^
2*b1)*\[FormalY][\[FormalX]] + (\[FormalX]*a0 + \[FormalX]^3*b0)*Derivative[1][\
[FormalY]][\[FormalX]] + (\[FormalX]^2 + a^2)^2*(\[FormalX]^2 + b^2)*Derivative[
2][\[FormalY]][\[FormalX]] == 0, \[FormalY][0] == C[1], Derivative[1][\[FormalY]
][0] == C[2]}]][x]}}
```

Maple raw input

```
dsolve((a^2+x^2)^2*(b^2+x^2)*diff(diff(y(x),x),x)+x*(b0*x^2+a0)*diff(y(x),x)+(b1*x^2+a1)*y(x) = 0, y(
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+x*(b0*x^2+a0)/(a^2+x^2)^2/(b^2+x^2)*diff(_Y(
x),x)+(b1*x^2+a1)/(a^2+x^2)^2/(b^2+x^2)*_Y(x)},{_Y(x)})
```

4.1739

$$\left(a^2-x^2\right)^2\left(b^2-x^2\right)y''(x)+x(\mathbf{a0}+\mathbf{b0}x^2)\,y'(x)+y(x)\left(\mathbf{a1}+\mathbf{b1}x^2+\mathbf{c1}x^4\right)=0$$

ODE

$$\left(a^2-x^2\right)^2\left(b^2-x^2\right)y''(x)+x\left(\mathrm{a0}+\mathrm{b0}x^2\right)y'(x)+y(x)\left(\mathrm{a1}+\mathrm{b1}x^2+\mathrm{c1}x^4\right)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 122.993 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\{-(a-x)^2(b-x)(x+b)y''(x)(x+a)^2+\left(-\mathrm{c1}x^4-\mathrm{b1}x^2-\mathrm{a1}\right)y(x)-x\left(\mathrm{b0}x^2+\mathrm{a0}\right)y'($$

Maple ✗
cpu = 2.188 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)+\frac{x\left(x^2b0+a0\right)\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{\left(a^2-x^2\right)^2\left(b^2-x^2\right)}+\frac{\left(c1\,x^4+b1\,x^2+a1\right)\_Y(x)}{\left(a^2-x^2\right)^2\left(b^2-x^2\right)}\right\},\{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[(a1 + b1*x^2 + c1*x^4)*y[x] + x*(a0 + b0*x^2)*y'[x] + (a^2 - x^2)^2*(b^2 - x^2)*y''[x] == 0,y
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(-a1 - \[FormalX]
^2*b1 - \[FormalX]^4*c1)*\[FormalY][\[FormalX]] - \[FormalX]*(a0 + \[FormalX]^2*
b0)*Derivative[1][\[FormalY]][\[FormalX]] - (-\[FormalX] + a)^2*(\[FormalX] + a)
^2*(-\[FormalX] + b)*(\[FormalX] + b)*Derivative[2][\[FormalY]][\[FormalX]] == 0
, \[FormalY][0] == C[1], Derivative[1][\[FormalY]][0] == C[2]}]][x]}}
```

Maple raw input

```
dsolve((a^2-x^2)^2*(b^2-x^2)*diff(diff(y(x),x),x)+x*(b0*x^2+a0)*diff(y(x),x)+(c1*x^4+b1*x^2+a1)*y(x)
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+x*(b0*x^2+a0)/(a^2-x^2)^2/(b^2-x^2)*diff(_Y(
x),x)+(c1*x^4+b1*x^2+a1)/(a^2-x^2)^2/(b^2-x^2)*_Y(x)},{_Y(x)})
```

4.1740 $(1-x)x(x+1)^2y''(x)+2(3-x)x(x+1)y'(x)-2(1-x)y(x)=0$

ODE

$$(1-x)x(x+1)^2y''(x)+2(3-x)x(x+1)y'(x)-2(1-x)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0359469 (sec), leaf count = 33

$$\left\{\left\{y(x)\to \frac{c_2x^2+c_1x-2c_2x\log(x)-c_2}{(x+1)^2}\right\}\right\}$$

Maple ✓
cpu = 0.027 (sec), leaf count = 28

$$\left\{y(x)=\frac{-2\ln(x)\_C2\,x+\_C2\,x^2+\_C1\,x-\_C2}{(1+x)^2}\right\}$$

Mathematica raw input

```
DSolve[-2*(1 - x)*y[x] + 2*(3 - x)*x*(1 + x)*y'[x] + (1 - x)*x*(1 + x)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*C[1] - C[2] + x^2*C[2] - 2*x*C[2]*Log[x])/(1 + x)^2}}
```

Maple raw input

```
dsolve(x*(1-x)*(1+x)^2*diff(diff(y(x),x),x)+2*x*(1+x)*(3-x)*diff(y(x),x)-2*(1-x)*y(x) = 0, y(x),'impl
```

Maple raw output

```
y(x) = (-2*ln(x)*_C2*x+_C2*x^2+_C1*x-_C2)/(1+x)^2
```

4.1741 $y(x)\left(a+bx+cx^2\right)+(1-x)^2x^2y''(x)=0$

ODE

$$y(x)\left(a+bx+cx^2\right)+(1-x)^2x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 9.72974 (sec), leaf count = 1

$Aborted

Maple ✓
cpu = 0.119 (sec), leaf count = 225

$$\left\{y(x)=(-1+x)^{-\frac{1}{2}\sqrt{1-4a-4b-4c}+\frac{1}{2}}\left(x^{-\frac{1}{2}\sqrt{1-4a}+\frac{1}{2}}{}_2\mathrm{F}_1(-\frac{1}{2}\sqrt{1-4a-4b-4c}-\frac{1}{2}\sqrt{1-4a}+\frac{1}{2}+\frac{1}{2}\sqrt{1-4c},-\frac{1}{2}\sqrt{1-4}\right.\right.$$

Mathematica raw input

```
DSolve[(a + b*x + c*x^2)*y[x] + (1 - x)^2*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x^2*(1-x)^2*diff(diff(y(x),x),x)+(c*x^2+b*x+a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-1+x)^(-1/2*(1-4*a-4*b-4*c)^(1/2)+1/2)*(x^(-1/2*(1-4*a)^(1/2)+1/2)*hyper
geom([-1/2*(1-4*a-4*b-4*c)^(1/2)-1/2*(1-4*a)^(1/2)+1/2+1/2*(1-4*c)^(1/2), -1/2*(
1-4*a-4*b-4*c)^(1/2)-1/2*(1-4*a)^(1/2)+1/2-1/2*(1-4*c)^(1/2)],[1-(1-4*a)^(1/2)],
x)*_C2+x^(1/2*(1-4*a)^(1/2)+1/2)*hypergeom([-1/2*(1-4*a-4*b-4*c)^(1/2)+1/2*(1-4*
a)^(1/2)+1/2+1/2*(1-4*c)^(1/2), -1/2*(1-4*a-4*b-4*c)^(1/2)+1/2*(1-4*a)^(1/2)+1/2
-1/2*(1-4*c)^(1/2)],[(1-4*a)^(1/2)+1],x)*_C1)
```

4.1742 $(1-x)^2x^2y''(x)+(1-2x)(1-x)xy'(x)-y(x)=0$

ODE

$$(1-x)^2x^2y''(x)+(1-2x)(1-x)xy'(x)-y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0318517 (sec), leaf count = 39

$$\{\{y(x)\to c_1\cosh(\log(1-x)-\log(x))+ic_2\sinh(\log(1-x)-\log(x))\}\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 29

$$\{y(x)=\_C1\ \sinh(-\ln(-1+x)+\ln(x))+\_C2\ \cosh(-\ln(-1+x)+\ln(x))\}$$

Mathematica raw input

```
DSolve[-y[x] + (1 - 2*x)*(1 - x)*x*y'[x] + (1 - x)^2*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[Log[1 - x] - Log[x]] + I*C[2]*Sinh[Log[1 - x] - Log[x]]}}
```

Maple raw input

```
dsolve(x^2*(1-x)^2*diff(diff(y(x),x),x)+x*(1-x)*(1-2*x)*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sinh(-ln(-1+x)+ln(x))+_C2*cosh(-ln(-1+x)+ln(x))
```

4.1743 $(1-x)x(\mathbf{a1}+\mathbf{b2}x)y'(x)+y(x)\left(\mathbf{a2}+\mathbf{b2}x+\mathbf{c2}x^2\right)+(1-x)^2x^2y''(x)=0$

ODE

$$(1-x)x(\mathrm{a1}+\mathrm{b2}x)y'(x)+y(x)\left(\mathrm{a2}+\mathrm{b2}x+\mathrm{c2}x^2\right)+(1-x)^2x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 170.067 (sec), leaf count = 1

$Aborted

Maple ✓
cpu = 0.252 (sec), leaf count = 374

$$\left\{y(x)=(-1+x)^{\frac{a1}{2}+\frac{b2}{2}-\frac{1}{2}\sqrt{a1^2+(2\,b2+2)a1+b2^2-4\,a2-2\,b2-4\,c2+1}+\frac{1}{2}}\left({}_2\mathrm{F}_1(-\frac{1}{2}\sqrt{a1^2+(2\,b2+2)\,a1+b2^2-4\,a2-2\,b2-4}\right.\right.$$

Mathematica raw input

```
DSolve[(a2 + b2*x + c2*x^2)*y[x] + (1 - x)*x*(a1 + b2*x)*y'[x] + (1 - x)^2*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x^2*(1-x)^2*diff(diff(y(x),x),x)+x*(1-x)*(b2*x+a1)*diff(y(x),x)+(c2*x^2+b2*x+a2)*y(x) = 0, y(x
```

Maple raw output

```
y(x) = (-1+x)^(1/2*a1+1/2*b2-1/2*(a1^2+(2*b2+2)*a1+b2^2-4*a2-2*b2-4*c2+1)^(1/2)+
1/2)*(hypergeom([-1/2*(a1^2+(2*b2+2)*a1+b2^2-4*a2-2*b2-4*c2+1)^(1/2)+1/2+1/2*(a1
^2-2*a1-4*a2+1)^(1/2)+1/2*(b2^2+2*b2-4*c2+1)^(1/2), -1/2*(a1^2+(2*b2+2)*a1+b2^2-
4*a2-2*b2-4*c2+1)^(1/2)+1/2+1/2*(a1^2-2*a1-4*a2+1)^(1/2)-1/2*(b2^2+2*b2-4*c2+1)^
(1/2)],[1+(a1^2-2*a1-4*a2+1)^(1/2)],x)*x^(-1/2*a1+1/2*(a1^2-2*a1-4*a2+1)^(1/2)+1
/2)*_C1+hypergeom([-1/2*(a1^2+(2*b2+2)*a1+b2^2-4*a2-2*b2-4*c2+1)^(1/2)+1/2-1/2*(
a1^2-2*a1-4*a2+1)^(1/2)-1/2*(b2^2+2*b2-4*c2+1)^(1/2), -1/2*(a1^2+(2*b2+2)*a1+b2^
```

```
2-4*a2-2*b2-4*c2+1)^(1/2)+1/2-1/2*(a1^2-2*a1-4*a2+1)^(1/2)+1/2*(b2^2+2*b2-4*c2+1
)^(1/2)],[1-(a1^2-2*a1-4*a2+1)^(1/2)],x)*x^(-1/2*a1-1/2*(a1^2-2*a1-4*a2+1)^(1/2)
+1/2)*_C2)
```

4.1744 $y(x)\left(\sum_{m=0}^{n} a(m)x^m\right)+(1-x)^2x^2y''(x)+(1-2x)(1-x)xy'(x)=0$

ODE

$$y(x)\left(\sum_{m=0}^{n} a(m)x^m\right)+(1-x)^2x^2y''(x)+(1-2x)(1-x)xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 4.97725 (sec), leaf count = 0 , could not solve

```
DSolve[Sum[x^m*a[m], {m, 0, n}]*y[x] + (1 - 2*x)*(1 - x)*x*Derivative[1][y][x] + (1 - x)^2*x^2*Deriva
```

Maple ✗
cpu = 5.888 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)+\frac{(1-2x)\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{x(1-x)}+\frac{\sum_{m=0}^{n}a(m)x^m\_Y(x)}{x^2(1-x)^2}\right\},\{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[Sum[x^m*a[m], {m, 0, n}]*y[x] + (1 - 2*x)*(1 - x)*x*y'[x] + (1 - x)^2*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[Sum[x^m*a[m], {m, 0, n}]*y[x] + (1 - 2*x)*(1 - x)*x*Derivative[1][y][x] +
 (1 - x)^2*x^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x^2*(1-x)^2*diff(diff(y(x),x),x)+x*(1-x)*(1-2*x)*diff(y(x),x)+sum(a(m)*x^m,m = 0 .. n)*y(x) =
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+1/x/(1-x)*(1-2*x)*diff(_Y(x),x)+sum(a(m)*x^m
,m = 0 .. n)/x^2/(1-x)^2*_Y(x)},{_Y(x)})
```

4.1745 $x^2(a-x)^2y''(x)+by(x)=0$

ODE

$$x^2(a-x)^2y''(x)+by(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.319527 (sec), leaf count = 121

$$\left\{\left\{y(x)\to \frac{x^{\frac{1}{2}-\frac{1}{2}\sqrt{1-\frac{4b}{a^2}}}(x-a)^{\frac{1}{2}-\frac{1}{2}\sqrt{1-\frac{4b}{a^2}}}\left(ac_1\sqrt{1-\frac{4b}{a^2}}x^{\sqrt{1-\frac{4b}{a^2}}}+c_2(x-a)^{\sqrt{1-\frac{4b}{a^2}}}\right)}{a\sqrt{1-\frac{4b}{a^2}}}\right\}\right\}$$

Maple ✓
cpu = 0.087 (sec), leaf count = 67

$$\left\{y(x)=\sqrt{x\,(a-x)}\left(\left(\frac{x}{a-x}\right)^{\frac{1}{2\,a}\sqrt{a^2-4\,b}}\_C2+\left(\frac{a-x}{x}\right)^{\frac{1}{2\,a}\sqrt{a^2-4\,b}}\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[b*y[x] + (a - x)^2*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(1/2 - Sqrt[1 - (4*b)/a^2]/2)*(-a + x)^(1/2 - Sqrt[1 - (4*b)/a^2]/2
)*(a*Sqrt[1 - (4*b)/a^2]*x^Sqrt[1 - (4*b)/a^2]*C[1] + (-a + x)^Sqrt[1 - (4*b)/a^
2]*C[2]))/(a*Sqrt[1 - (4*b)/a^2])}}
```

Maple raw input

```
dsolve(x^2*(a-x)^2*diff(diff(y(x),x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (x*(a-x))^(1/2)*((x/(a-x))^(1/2*(a^2-4*b)^(1/2)/a)*_C2+(1/x*(a-x))^(1/2*(
a^2-4*b)^(1/2)/a)*_C1)
```

4.1746 $(a-x)^2(b-x)^2y''(x)=k^2y(x)$

ODE

$$(a-x)^2(b-x)^2y''(x)=k^2y(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.715449 (sec), leaf count = 151

$$\left\{\left\{y(x)\to (x-a)^{\frac{1}{2}\left(1-\sqrt{\frac{4k^2}{(a-b)^2}+1}\right)}(x-b)^{\frac{1}{2}\left(1-\sqrt{\frac{4k^2}{(a-b)^2}+1}\right)}\left(c_1(x-a)^{\sqrt{\frac{4k^2}{(a-b)^2}+1}}-\frac{c_2(x-b)^{\sqrt{\frac{4k^2}{(a-b)^2}+1}}}{(a-b)\sqrt{\frac{4k^2}{(a-b)^2}+1}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.132 (sec), leaf count = 108

$$\left\{y(x)=\sqrt{(a-x)\,(b-x)}\left(\left(\frac{a-x}{b-x}\right)^{\frac{1}{2\,a-2\,b}\sqrt{a^2-2\,ab+b^2+4\,k^2}}\_C1+\left(\frac{a-x}{b-x}\right)^{-\frac{1}{2\,a-2\,b}\sqrt{a^2-2\,ab+b^2+4\,k^2}}\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[(a - x)^2*(b - x)^2*y''[x] == k^2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-a + x)^((1 - Sqrt[1 + (4*k^2)/(a - b)^2])/2)*(-b + x)^((1 - Sqrt[1 +
  (4*k^2)/(a - b)^2])/2)*((-a + x)^Sqrt[1 + (4*k^2)/(a - b)^2]*C[1] - ((-b + x)^S
qrt[1 + (4*k^2)/(a - b)^2]*C[2])/((a - b)*Sqrt[1 + (4*k^2)/(a - b)^2]))}}
```

Maple raw input

```
dsolve((a-x)^2*(b-x)^2*diff(diff(y(x),x),x) = k^2*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = ((a-x)*(b-x))^(1/2)*((1/(b-x)*(a-x))^((a^2-2*a*b+b^2+4*k^2)^(1/2)/(2*a-2*
b))*_C1+(1/(b-x)*(a-x))^(-(a^2-2*a*b+b^2+4*k^2)^(1/2)/(2*a-2*b))*_C2)
```

4.1747 $(a-x)(A+2x)(b-x)y'(x)+(a-x)^2(b-x)^2y''(x)+By(x)=0$

ODE

$$(a-x)(A+2x)(b-x)y'(x)+(a-x)^2(b-x)^2y''(x)+By(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.100065 (sec), leaf count = 156

$$\left\{\left\{y(x)\to e^{-\frac{(a+A+b)(\log(x-a)-\log(x-b))}{a-b}}\left(c_1\exp\left(\frac{\left(\sqrt{B}\sqrt{\frac{(a+A+b)^2-4B}{B}}+a+A+b\right)(\log(x-a)-\log(x-b))}{2(a-b)}\right)+c_2\exp\left(\right.\right.\right.\right.$$

Maple ✓
cpu = 0.186 (sec), leaf count = 143

$$\left\{y(x)=\left(\frac{b-x}{a-x}\right)^{\frac{b+a+A}{2a-2b}}\left(\left(\frac{a-x}{b-x}\right)^{\frac{1}{2a-2b}\sqrt{A^2+(2a+2b)A+a^2+2ab+b^2-4B}}\_C1+\left(\frac{a-x}{b-x}\right)^{-\frac{1}{2a-2b}\sqrt{A^2+(2a+2b)A+a^2+2ab+b^2-}}\right.\right.$$

Mathematica raw input

```
DSolve[B*y[x] + (a - x)*(b - x)*(A + 2*x)*y'[x] + (a - x)^2*(b - x)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(((a + A + b + Sqrt[((a + A + b)^2 - 4*B)/B]*Sqrt[B])*(Log[-a + x]
- Log[-b + x]))/(2*(a - b)))*C[1] + E^(((a + A + b - Sqrt[((a + A + b)^2 - 4*B)/
B]*Sqrt[B])*(Log[-a + x] - Log[-b + x]))/(2*(a - b)))*C[2])/E^(((a + A + b)*(Log
[-a + x] - Log[-b + x]))/(a - b))}}
```

Maple raw input

```
dsolve((a-x)^2*(b-x)^2*diff(diff(y(x),x),x)+(a-x)*(b-x)*(A+2*x)*diff(y(x),x)+B*y(x) = 0, y(x),'implic
```

Maple raw output

```
y(x) = ((b-x)/(a-x))^((b+a+A)/(2*a-2*b))*((1/(b-x)*(a-x))^((A^2+(2*a+2*b)*A+a^2+
2*a*b+b^2-4*B)^(1/2)/(2*a-2*b))*_C1+(1/(b-x)*(a-x))^(-(A^2+(2*a+2*b)*A+a^2+2*a*b
+b^2-4*B)^(1/2)/(2*a-2*b))*_C2)
```

4.1748 $(a-x)^4 y''(x) - 2(a-x)^3 y'(x) - y(x) = 0$

ODE

$$(a-x)^4 y''(x) - 2(a-x)^3 y'(x) - y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0285268 (sec), leaf count = 31

$$\left\{\left\{y(x) \to c_1 \cosh\left(\frac{1}{a-x}\right) + i c_2 \sinh\left(\frac{1}{a-x}\right)\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 25

$$\left\{y(x) = \_C1 \sinh\left((a-x)^{-1}\right) + \_C2 \cosh\left((a-x)^{-1}\right)\right\}$$

Mathematica raw input

```
DSolve[-y[x] - 2*(a - x)^3*y'[x] + (a - x)^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cosh[(a - x)^(-1)] + I*C[2]*Sinh[(a - x)^(-1)]}}
```

Maple raw input

```
dsolve((a-x)^4*diff(diff(y(x),x),x)-2*(a-x)^3*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sinh(1/(a-x))+_C2*cosh(1/(a-x))
```

4.1749 $(1-2x)(1-x)x^2y''(x)+2(2-3x)xy'(x)+2(3x+1)y(x)=0$

ODE

$$(1-2x)(1-x)x^2y''(x)+2(2-3x)xy'(x)+2(3x+1)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0626712 (sec), leaf count = 35

$$\left\{\left\{y(x)\to \frac{c_2\left(12x^2-18x+7\right)-3c_1(x-1)^3}{3x^2}\right\}\right\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 36

$$\left\{y(x)=\frac{(7\_C1+6\_C2)\,x^3+(-9\_C1-6\_C2)\,x^2+3\_C1\,x+\_C2}{x^2}\right\}$$

Mathematica raw input

```
DSolve[2*(1 + 3*x)*y[x] + 2*(2 - 3*x)*x*y'[x] + (1 - 2*x)*(1 - x)*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-3*(-1 + x)^3*C[1] + (7 - 18*x + 12*x^2)*C[2])/(3*x^2)}}
```

Maple raw input

```
dsolve(x^2*(1-x)*(1-2*x)*diff(diff(y(x),x),x)+2*x*(2-3*x)*diff(y(x),x)+2*(1+3*x)*y(x) = 0, y(x),'impl
```

Maple raw output

```
y(x) = ((7*_C1+6*_C2)*x^3+(-9*_C1-6*_C2)*x^2+3*_C1*x+_C2)/x^2
```

4.1750 $(1-2x)(1-x)x^2y''(x)+2(1-2x)(2-x)xy'(x)+2(1-x)y(x)=0$

ODE

$$(1-2x)(1-x)x^2y''(x)+2(1-2x)(2-x)xy'(x)+2(1-x)y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0539122 (sec), leaf count = 43

$$\left\{\left\{y(x)\to \frac{c_1(4-8x)-2c_2(x-1)x+c_2(2x-1)\log(1-2x)}{4x^2}\right\}\right\}$$

Maple ✓
cpu = 0.029 (sec), leaf count = 41

$$\left\{y(x)=\frac{(-4x+2)\_C2\ln(-1+2x)+(4x^2-2x-1)\_C2+2\_C1x-\_C1}{x^2}\right\}$$

Mathematica raw input

```
DSolve[2*(1 - x)*y[x] + 2*(1 - 2*x)*(2 - x)*x*y'[x] + (1 - 2*x)*(1 - x)*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((4 - 8*x)*C[1] - 2*(-1 + x)*x*C[2] + (-1 + 2*x)*C[2]*Log[1 - 2*x])/(4
*x^2)}}
```

Maple raw input

```
dsolve(x^2*(1-x)*(1-2*x)*diff(diff(y(x),x),x)+2*x*(2-x)*(1-2*x)*diff(y(x),x)+2*(1-x)*y(x) = 0, y(x),
```

Maple raw output

```
y(x) = ((-4*x+2)*_C2*ln(-1+2*x)+(4*x^2-2*x-1)*_C2+2*_C1*x-_C1)/x^2
```

4.1751 $-y(x)\left(4k^2+\left(4p^2+1\right)\left(1-x^2\right)\right)+4\left(1-x^2\right)^2y''(x)-8x\left(1-x^2\right)y'(x)=0$

ODE

$$-y(x)\left(4k^2+\left(4p^2+1\right)\left(1-x^2\right)\right)+4\left(1-x^2\right)^2y''(x)-8x\left(1-x^2\right)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0296534 (sec), leaf count = 36

$$\left\{\left\{y(x)\to c_1P^k_{ip-\frac{1}{2}}(x)+c_2Q^k_{ip-\frac{1}{2}}(x)\right\}\right\}$$

Maple ✓
cpu = 0.062 (sec), leaf count = 27

$$\left\{y(x)=\_C1\ LegendreP\left(ip-\frac{1}{2},k,x\right)+\_C2\ LegendreQ\left(ip-\frac{1}{2},k,x\right)\right\}$$

Mathematica raw input

```
DSolve[-((4*k^2 + (1 + 4*p^2)*(1 - x^2))*y[x]) - 8*x*(1 - x^2)*y'[x] + 4*(1 - x^2)^2*y''[x] == 0,y[x]
```

Mathematica raw output

```
{{y[x] -> C[1]*LegendreP[-1/2 + I*p, k, x] + C[2]*LegendreQ[-1/2 + I*p, k, x]}}
```

Maple raw input

```
dsolve(4*(-x^2+1)^2*diff(diff(y(x),x),x)-8*x*(-x^2+1)*diff(y(x),x)-(4*k^2+(4*p^2+1)*(-
x^2+1))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*LegendreP(I*p-1/2,k,x)+_C2*LegendreQ(I*p-1/2,k,x)
```

4.1752 $-y(x)\left(4k^2+\left(1-4p^2\right)\left(1-x^2\right)\right)+4\left(1-x^2\right)^2y''(x)-8x\left(1-x^2\right)y'(x)=0$

ODE

$$-y(x)\left(4k^2+\left(1-4p^2\right)\left(1-x^2\right)\right)+4\left(1-x^2\right)^2y''(x)-8x\left(1-x^2\right)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.02868 (sec), leaf count = 28

$$\left\{\left\{y(x)\to c_1P^k_{p-\frac{1}{2}}(x)+c_2Q^k_{p-\frac{1}{2}}(x)\right\}\right\}$$

Maple ✓
cpu = 0.054 (sec), leaf count = 21

$$\left\{y(x)=\_C1\ LegendreP\left(p-\frac{1}{2},k,x\right)+\_C2\ LegendreQ\left(p-\frac{1}{2},k,x\right)\right\}$$

Mathematica raw input

```
DSolve[-((4*k^2 + (1 - 4*p^2)*(1 - x^2))*y[x]) - 8*x*(1 - x^2)*y'[x] + 4*(1 - x^2)^2*y''[x] == 0,y[x]
```

Mathematica raw output

```
{{y[x] -> C[1]*LegendreP[-1/2 + p, k, x] + C[2]*LegendreQ[-1/2 + p, k, x]}}
```

Maple raw input

```
dsolve(4*(-x^2+1)^2*diff(diff(y(x),x),x)-8*x*(-x^2+1)*diff(y(x),x)-(4*k^2+(-4*p^2+1)*(-
x^2+1))*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*LegendreP(p-1/2,k,x)+_C2*LegendreQ(p-1/2,k,x)
```

4.1753

$$-y(x)\left(a(a+1)(1-x)+b^2x\right)+4\left(1-x^2\right)x^2y''(x)+2(1-3x)(1-x)xy'(x)=0$$

ODE

$$-y(x)\left(a(a+1)(1-x)+b^2x\right)+4\left(1-x^2\right)x^2y''(x)+2(1-3x)(1-x)xy'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.88493 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\{\left(-xa^2+a^2-xa+a+xb^2\right)y(x)-2(x-1)x(3x-1)y'(x)+\left(4x^4-4x^2\right)y''(x)=0,y$$

Maple ✓
cpu = 0.347 (sec), leaf count = 93

$$\left\{y(x)=(1+x)^3\left(\_C2\,HeunG\left(-1,\frac{a^2}{4}-\frac{b^2}{4}+\frac{9\,a}{4}+\frac{7}{2},\frac{a}{2}+1,\frac{a}{2}+\frac{7}{2},\frac{3}{2}+a,0,x\right)x^{\frac{1}{2}+\frac{a}{2}}+\_C1\,HeunG\left(-1,\frac{a^2}{4}-\frac{b^2}{4}-\right.\right.\right.$$

Mathematica raw input

```
DSolve[-((a*(1 + a)*(1 - x) + b^2*x)*y[x]) + 2*(1 - 3*x)*(1 - x)*x*y'[x] + 4*x^2*(1 - x^2)*y''[x] ==
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(a - \[FormalX]*a
 + a^2 - \[FormalX]*a^2 + \[FormalX]*b^2)*\[FormalY][\[FormalX]] - 2*(-1 + \[For
malX])*\[FormalX]*(-1 + 3*\[FormalX])*Derivative[1][\[FormalY]][\[FormalX]] + (-
4*\[FormalX]^2 + 4*\[FormalX]^4)*Derivative[2][\[FormalY]][\[FormalX]] == 0, \[F
ormalY][2] == C[1], Derivative[1][\[FormalY]][2] == C[2]}][x]}}
```

Maple raw input

```
dsolve(4*x^2*(-x^2+1)*diff(diff(y(x),x),x)+2*x*(1-x)*(1-3*x)*diff(y(x),x)-(a*(1+a)*(1-
x)+b^2*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (1+x)^3*(_C2*HeunG(-1,1/4*a^2-1/4*b^2+9/4*a+7/2,1/2*a+1,1/2*a+7/2,3/2+a,0
,x)*x^(1/2+1/2*a)+_C1*HeunG(-1,1/4*a^2-1/4*b^2-7/4*a+3/2,-1/2*a+3,-1/2*a+1/2,1/2
-a,0,x)*x^(-1/2*a))
```

4.1754 $(a+bx)^4 y''(x)+y(x)=0$

ODE

$$(a+bx)^4 y''(x)+y(x)=0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.170791 (sec), leaf count = 76

$$\left\{\left\{y(x)\to \frac{1}{2}e^{-\frac{\sqrt{-\frac{1}{b^4}}b}{a+bx}}(a+bx)\left(2c_1 e^{\frac{2\sqrt{-\frac{1}{b^4}}b}{a+bx}}+\left(-\frac{1}{b^4}\right)^{3/2}b^6 c_2\right)\right\}\right\}$$

Maple ✓
cpu = 0.08 (sec), leaf count = 39

$$\left\{y(x)=(bx+a)\left(\_C2\cos\left(\frac{1}{b\,(bx+a)}\right)+\_C1\sin\left(\frac{1}{b\,(bx+a)}\right)\right)\right\}$$

Mathematica raw input

```
DSolve[y[x] + (a + b*x)^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((a + b*x)*(2*E^((2*Sqrt[-b^(-4)]*b)/(a + b*x))*C[1] + (-b^(-4))^(3/2)
*b^6*C[2]))/(2*E^((Sqrt[-b^(-4)]*b)/(a + b*x)))}}
```

Maple raw input

```
dsolve((b*x+a)^4*diff(diff(y(x),x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (b*x+a)*(_C2*cos(1/b/(b*x+a))+_C1*sin(1/b/(b*x+a)))
```

4.1755 $y''(x)\left(a+bx+cx^2\right)^2+Ay(x)=0$

ODE

$$y''(x)\left(a+bx+cx^2\right)^2+Ay(x)=0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.46083 (sec), leaf count = 199

$$\left\{\left\{y(x)\to \sqrt{a+x(b+cx)}\exp\left(-\frac{\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\tan^{-1}\left(\frac{b+2cx}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)\left(c_1\exp\left(\frac{2\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\tan^{-1}\left(\right.\right.\right.\right.\right.$$

Maple ✓
cpu = 0.148 (sec), leaf count = 178

$$\left\{y(x)=\sqrt{cx^2+bx+a}\left(\left(1\left(i\sqrt{4\,ac-b^2}-2\,cx-b\right)\left(2\,cx+b+i\sqrt{4\,ac-b^2}\right)^{-1}\right)^{-\frac{c}{2}\sqrt{\frac{-4\,ac+b^2-4\,A}{c^2}}\frac{1}{\sqrt{-4\,ac+b^2}}}\_C2+\left(1\left(i\sqrt{}\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[A*y[x] + (a + b*x + c*x^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[a + x*(b + c*x)]*(E^((2*Sqrt[-b^2 + 4*a*c]*Sqrt[1 - (4*A)/(b^2 -
  4*a*c)]*ArcTan[(b + 2*c*x)/Sqrt[-b^2 + 4*a*c]])/Sqrt[b^2 - 4*a*c])*C[1] + C[2]/
(Sqrt[b^2 - 4*a*c]*Sqrt[1 - (4*A)/(b^2 - 4*a*c)])))/E^((Sqrt[-b^2 + 4*a*c]*Sqrt[
1 - (4*A)/(b^2 - 4*a*c)]*ArcTan[(b + 2*c*x)/Sqrt[-b^2 + 4*a*c]])/Sqrt[b^2 - 4*a*
c])}}
```

Maple raw input

```
dsolve((c*x^2+b*x+a)^2*diff(diff(y(x),x),x)+A*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (c*x^2+b*x+a)^(1/2)*(((I*(4*a*c-b^2)^(1/2)-2*c*x-b)/(2*c*x+b+I*(4*a*c-b^2
)^(1/2)))^(-1/2*c/(-4*a*c+b^2)^(1/2)*((-4*a*c+b^2-4*A)/c^2)^(1/2))*_C2+((I*(4*a*
c-b^2)^(1/2)-2*c*x-b)/(2*c*x+b+I*(4*a*c-b^2)^(1/2)))^(1/2*c/(-4*a*c+b^2)^(1/2)*(
(-4*a*c+b^2-4*A)/c^2)^(1/2))*_C1)
```

4.1756 $x^5 y''(x) + x y'(x) - y(x) = 0$

ODE

$$x^5 y''(x) + x y'(x) - y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0314527 (sec), leaf count = 38

$$\left\{\left\{y(x) \to \frac{c_2 \Gamma\left(\frac{1}{3}, -\frac{1}{3x^3}\right)}{3^{2/3}\sqrt[3]{-\frac{1}{x^3}}} + c_1 x\right\}\right\}$$

Maple ✓
cpu = 0.085 (sec), leaf count = 27

$$\left\{y(x) = x\left(-\Gamma\left(\frac{2}{3}\right)\Gamma\left(\frac{1}{3}, -\frac{1}{3\,x^3}\right)\sqrt{3}\_C2 + 2\,\pi\,\_C2 + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + x^5*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + (C[2]*Gamma[1/3, -1/(3*x^3)])/(3^(2/3)*(-x^(-3))^(1/3))}}
```

Maple raw input

```
dsolve(x^5*diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(-GAMMA(2/3)*GAMMA(1/3,-1/3/x^3)*3^(1/2)*_C2+2*Pi*_C2+_C1)
```

4.1757 $x^5 y''(x) - (1 - 2x^3)\, x y'(x) + (1 - 2x^3)\, y(x) = 0$

ODE

$$x^5 y''(x) - (1 - 2x^3)\, x y'(x) + (1 - 2x^3)\, y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0297923 (sec), leaf count = 22

$$\left\{\left\{y(x) \to x\left(c_2 e^{-\frac{1}{3x^3}} + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.042 (sec), leaf count = 16

$$\left\{y(x) = x\left(\mathrm{e}^{-\frac{1}{3x^3}} \_C2 + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[(1 - 2*x^3)*y[x] - x*(1 - 2*x^3)*y'[x] + x^5*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[1] + C[2]/E^(1/(3*x^3)))}}
```

Maple raw input

```
dsolve(x^5*diff(diff(y(x),x),x)-x*(-2*x^3+1)*diff(y(x),x)+(-2*x^3+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(exp(-1/3/x^3)*_C2+_C1)
```

4.1758

$$x(a^2-x^2)\left(b^2-x^2\right)y''(x)+(\mathbf{a0}+\mathbf{b0}x^4)\,y'(x)+x^3y(x)\left(\mathbf{a1}+\mathbf{b1}x^2+\mathbf{c1}x^4\right)=0$$

ODE

$$x(a^2-x^2)\left(b^2-x^2\right)y''(x)+\left(\mathrm{a0}+\mathrm{b0}x^4\right)y'(x)+x^3y(x)\left(\mathrm{a1}+\mathrm{b1}x^2+\mathrm{c1}x^4\right)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 96.9451 (sec), leaf count = 0 , DifferentialRoot result

$$\{\{y(x)\to \text{DifferentialRoot}\left(\{y,x\},\left\{\left(\mathrm{c1}x^7+\mathrm{b1}x^5+\mathrm{a1}x^3\right)y(x)+\left(\mathrm{b0}x^4+\mathrm{a0}\right)y'(x)+x(a-x)(x+a)(b-x)(x+b)y''(x)=\right.\right.$$

Maple ✗
cpu = 1.983 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)+\frac{(b0\,x^4+a0)\,\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)}{x\left(a^2-x^2\right)\left(b^2-x^2\right)}+\frac{x^2\left(c1\,x^4+b1\,x^2+a1\right)\_Y(x)}{\left(a^2-x^2\right)\left(b^2-x^2\right)}\right\},\{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[x^3*(a1 + b1*x^2 + c1*x^4)*y[x] + (a0 + b0*x^4)*y'[x] + x*(a^2 - x^2)*(b^2 - x^2)*y''[x] == 0,
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(\[FormalX]^3*a1
+ \[FormalX]^5*b1 + \[FormalX]^7*c1)*\[FormalY][\[FormalX]] + (a0 + \[FormalX]^4
*b0)*Derivative[1][\[FormalY]][\[FormalX]] + \[FormalX]*(-\[FormalX] + a)*(\[For
malX] + a)*(-\[FormalX] + b)*(\[FormalX] + b)*Derivative[2][\[FormalY]][\[Formal
X]] == 0, \[FormalY][1] == C[1], Derivative[1][\[FormalY]][1] == C[2]}]][x]}}
```

Maple raw input

```
dsolve(x*(a^2-x^2)*(b^2-x^2)*diff(diff(y(x),x),x)+(b0*x^4+a0)*diff(y(x),x)+x^3*(c1*x^4+b1*x^2+a1)*y(x
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+(b0*x^4+a0)/x/(a^2-x^2)/(b^2-x^2)*diff(_Y(x)
,x)+x^2*(c1*x^4+b1*x^2+a1)/(a^2-x^2)/(b^2-x^2)*_Y(x)},{_Y(x)})
```

4.1759 $ay(x) + x^6 y''(x) - x^5 y'(x) = 0$

ODE

$$ay(x) + x^6 y''(x) - x^5 y'(x) = 0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0588438 (sec), leaf count = 56

$$\left\{\left\{y(x) \to \frac{1}{2}x^2 e^{-\frac{\sqrt{-a}}{2x^2}}\left(2c_1 e^{\frac{\sqrt{-a}}{x^2}} + \frac{c_2}{\sqrt{-a}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.047 (sec), leaf count = 35

$$\left\{y(x) = x^2\left(\cosh\left(\frac{1}{2\,x^2}\sqrt{-a}\right)\_C2 + \sinh\left(\frac{1}{2\,x^2}\sqrt{-a}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[a*y[x] - x^5*y'[x] + x^6*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2*(2*E^(Sqrt[-a]/x^2)*C[1] + C[2]/Sqrt[-a]))/(2*E^(Sqrt[-a]/(2*x^2)
))}}
```

Maple raw input

```
dsolve(x^6*diff(diff(y(x),x),x)-x^5*diff(y(x),x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^2*(cosh(1/2*(-a)^(1/2)/x^2)*_C2+sinh(1/2*(-a)^(1/2)/x^2)*_C1)
```

4.1760 $x^6 y''(x) + 3x^5 y'(x) + y(x) = 0$

ODE

$$x^6 y''(x) + 3x^5 y'(x) + y(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0176002 (sec), leaf count = 29

$$\left\{\left\{y(x) \to c_1 \cos\left(\frac{1}{2x^2}\right) - c_2 \sin\left(\frac{1}{2x^2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 21

$$\left\{y(x) = \_C1 \sin\left(\frac{1}{2\,x^2}\right) + \_C2 \cos\left(\frac{1}{2\,x^2}\right)\right\}$$

Mathematica raw input

```
DSolve[y[x] + 3*x^5*y'[x] + x^6*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[1/(2*x^2)] - C[2]*Sin[1/(2*x^2)]}}
```

Maple raw input

```
dsolve(x^6*diff(diff(y(x),x),x)+3*x^5*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(1/2/x^2)+_C2*cos(1/2/x^2)
```

4.1761 $x^3(a+3x^2)\,y'(x)+x^6y''(x)+y(x)=0$

ODE

$$x^3(a+3x^2)\,y'(x)+x^6y''(x)+y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0141491 (sec), leaf count = 52

$$\left\{\left\{y(x)\to e^{\frac{a-\sqrt{a^2-4}}{4x^2}}\left(c_1e^{\frac{\sqrt{a^2-4}}{2x^2}}+c_2\right)\right\}\right\}$$

Maple ✓
cpu = 0.063 (sec), leaf count = 41

$$\left\{y(x)=\_C1\,\mathrm{e}^{-\frac{1}{4x^2}\left(-a+\sqrt{a^2-4}\right)}+\_C2\,\mathrm{e}^{\frac{1}{4x^2}\left(a+\sqrt{a^2-4}\right)}\right\}$$

Mathematica raw input

```
DSolve[y[x] + x^3*(a + 3*x^2)*y'[x] + x^6*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^((a - Sqrt[-4 + a^2])/(4*x^2))*(E^(Sqrt[-4 + a^2]/(2*x^2))*C[1] + C[
2])}}
```

Maple raw input

```
dsolve(x^6*diff(diff(y(x),x),x)+x^3*(3*x^2+a)*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-1/4/x^2*(-a+(a^2-4)^(1/2)))+_C2*exp(1/4/x^2*(a+(a^2-4)^(1/2)))
```

4.1762 $(a-x)(b-x)(c-x)y'(x)\left(\mathbf{a1}+\mathbf{b1}x+\mathbf{c1}x^2\right)+(a-x)^2(b-x)^2(c-x)^2y''(x)+y(x)\left(\mathbf{a2}+\mathbf{b2}x+\mathbf{c2}x^2\right)=0$

ODE

$$(a-x)(b-x)(c-x)y'(x)\left(\text{a1}+\text{b1}x+\text{c1}x^2\right)+(a-x)^2(b-x)^2(c-x)^2y''(x)+y(x)\left(\text{a2}+\text{b2}x+\text{c2}x^2\right)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 600.005 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 21.024 (sec), leaf count = 10487

Too large to display

Mathematica raw input

```
DSolve[(a2 + b2*x + c2*x^2)*y[x] + (a - x)*(b - x)*(c - x)*(a1 + b1*x + c1*x^2)*y'[x] + (a - x)^2*(b
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((a-x)^2*(b-x)^2*(c-x)^2*diff(diff(y(x),x),x)+(a-x)*(b-x)*(c-x)*(c1*x^2+b1*x+a1)*diff(y(x),x)+(
```

Maple raw output

```
y(x) = (x-b)^(1/2*(((c1+1)^2*b^4-2*(c1+1)*(a+c-b1)*b^3+(a^2+(-2*b1+(2*c1+4)*c)*a
+c^2-2*b1*c+(2*c1+2)*a1+b1^2-4*c2)*b^2+(-2*a^2*c+(2*b1*c-2*c^2-2*a1)*a-2*a1*c+2*
a1*b1-4*b2)*b+a^2*c^2+2*a*a1*c+a1^2-4*a2)^(1/2)+(-1-c1)*b^2+(a+c-b1)*b-a*c-a1)/(
b-c)/(a-b))*(-c+x)^(1/2*(((c1+1)*c^2+(-a-b+b1)*c+a*b+a1)*(2*(c1+1)*(b-c)*(a-c)*(
(c1+1)^2*c^4-2*(c1+1)*(a+b-b1)*c^3+(a^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b1+(2*c1+2)*
a1+b1^2-4*c2)*c^2+(-2*b*a^2+(-2*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^
2+2*a*a1*b+a1^2-4*a2)^(1/2)+2*(c1+1)^2*c^4-2*((c1+2)*a+(c1+2)*b-b1)*(c1+1)*c^3+(
(c1^2+2*c1+2)*a^2+((4*c1^2+10*c1+8)*b-2*b1)*a+(c1^2+2*c1+2)*b^2-2*b*b1+2*a1*c1+b
1^2+2*a1-4*c2)*c^2+(-2*b*(c1^2+2*c1+2)*a^2+((-2*c1^2-4*c1-4)*b^2+2*b*b1-2*a1)*a-
```

```
2*a1*b+2*a1*b1-4*b2)*c+(c1^2+2*c1+2)*b^2*a^2+2*a*a1*b+a1^2-4*a2)^(1/2)+(c1+1)*(b
-c)*(a-c)*((c1+1)^2*c^4-2*(c1+1)*(a+b-b1)*c^3+(a^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b
1+(2*c1+2)*a1+b1^2-4*c2)*c^2+(-2*b*a^2+(-2*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b
2)*c+a^2*b^2+2*a*a1*b+a1^2-4*a2)^(1/2)+(c1+1)^2*c^4-2*(c1+1)*(a+b-b1)*c^3+(a^2+(
(2*c1+4)*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*a^2+(-2*b^2+2*b*
b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^2+2*a*a1*b+a1^2-4*a2)/(2*(c1+1)*(b-c)*(a
-c)*((c1+1)^2*c^4-2*(c1+1)*(a+b-b1)*c^3+(a^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b1+(2*c
1+2)*a1+b1^2-4*c2)*c^2+(-2*b*a^2+(-2*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a
^2*b^2+2*a*a1*b+a1^2-4*a2)^(1/2)+2*(c1+1)^2*c^4-2*((c1+2)*a+(c1+2)*b-b1)*(c1+1)*
c^3+((c1^2+2*c1+2)*a^2+((4*c1^2+10*c1+8)*b-2*b1)*a+(c1^2+2*c1+2)*b^2-2*b*b1+2*a1
*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*(c1^2+2*c1+2)*a^2+((-2*c1^2-4*c1-4)*b^2+2*b*b1-2*a
1)*a-2*a1*b+2*a1*b1-4*b2)*c+(c1^2+2*c1+2)*b^2*a^2+2*a*a1*b+a1^2-4*a2)^(1/2)/(b-c
)/(a-c))*(HeunG((a-c)/(a-b),1/4*(2*(((a-c)*((c1+1)^2*b^4-2*(c1+1)*(a+c-b1)*b^3+(
a^2+(-2*b1+(2*c1+4)*c)*a+c^2-2*b1*c+(2*c1+2)*a1+b1^2-4*c2)*b^2+(-2*a^2*c+(2*b1*c
-2*c^2-2*a1)*a-2*a1*c+2*a1*b1-4*b2)*b+a^2*c^2+2*a*a1*c+a1^2-4*a2)^(1/2)+(a-b)*(-
b-c+2*a)*(b-c))*(a-c)*((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2)*a1+b^2+(-2*b
1+(2*c1+4)*c)*b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-2*a1)*b-2*a1*c
+2*a1*b1-4*b2)*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2)+(a-c)^3*(a-b)*((c1+1)^2*b^4-2
*(c1+1)*(a+c-b1)*b^3+(a^2+(-2*b1+(2*c1+4)*c)*a+c^2-2*b1*c+(2*c1+2)*a1+b1^2-4*c2)
*b^2+(-2*a^2*c+(2*b1*c-2*c^2-2*a1)*a-2*a1*c+2*a1*b1-4*b2)*b+a^2*c^2+2*a*a1*c+a1^
2-4*a2)^(1/2)+(2*a^5+((c1^2-5)*c+c1^2*b+b1*c1-5*b)*a^4+(4*c^2+(-2*b*c1^2+b1*c1+1
2*b)*c+b1^2-4*c2+2*a1*c1+c1*b1*b+4*b^2)*a^3+(-c^3-9*b*c^2-3*(b1*c1+3*b)*b*c-6*b2
+3*a1*b1-b^3)*a^2+(2*b*c^3+6*b^2*c^2+(2*b^3+(-2*a1*c1-b1^2+4*c2)*b+2*b2-a1*b1)*c
+(-a1*b1+2*b2)*b+2*a1^2-8*a2)*a-b^2*c^3-b^3*c^2+((-a1*b1+2*b2)*b+4*a2-a1^2)*c-b*
(a1^2-4*a2))*(b-c))*(2*(b-c)*(a-c)*((c1+1)^2*(a-b)^4*((c1+1)^2*c^4-2*(c1+1)*(a+b
-b1)*c^3+(a^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*a
^2+(-2*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^2+2*a*a1*b+a1^2-4*a2))^(1
/2)+(a-b)^2*(2*(c1+1)^2*c^4-2*((c1+2)*a+(c1+2)*b-b1)*(c1+1)*c^3+((c1^2+2*c1+2)*a
^2+((4*c1^2+10*c1+8)*b-2*b1)*a+(c1^2+2*c1+2)*b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*
c^2+(-2*b*(c1^2+2*c1+2)*a^2+((-2*c1^2-4*c1-4)*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-
4*b2)*c+(c1^2+2*c1+2)*b^2*a^2+2*a*a1*b+a1^2-4*a2))^(1/2)+(a-b)*(2*(a-c)*(a^2-a*b
-a*c+c*b+((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2)*a1+b^2+(-2*b1+(2*c1+4)*c)
*b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-2*a1)*b-2*a1*c+2*a1*b1-4*b2
)*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2))*(b-c)*((c1+1)^2*(a-b)^4*((c1+1)^2*c^4-2*(
c1+1)*(a+b-b1)*c^3+(a^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c
^2+(-2*b*a^2+(-2*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^2+2*a*a1*b+a1^2
-4*a2))^(1/2)+(-(c1^2+2*c1-1)*(b-c)^2*a^4+2*((c1+1)*c^2+b1*(c1+3)*c+(c1-1)*b^2-b
1*(c1+1)*b+2*a1)*(b-c)*a^3+((2*c1^2+4*c1+1)*c^4+2*((c1+1)*b+2*b1*c1+3*b1)*c^3+(2
*(-3-2*c1)*b^2+2*b*b1+b1^2+2*a1-4*c2+2*a1*c1)*c^2+2*((-c1+1)*b^3-5*b^2*b1+(2*a1*
c1+b1^2+4*a1-4*c2)*b+2*a1*b1-4*b2)*c+b^4+2*b^3*b1+(-2*a1*c1-b1^2-10*a1+4*c2)*b^2
+2*a1^2-8*a2)*a^2+2*(-b*(2*c1^2+4*c1+1)*c^4+((2*c1+1)*b^2+(-4*b1*c1-5*b1)*b+a1)*
c^3+((2*c1+1)*b^3+4*b^2*b1+(-4*a1*c1-2*b1^2-5*a1+8*c2)*b-a1*b1+2*b2)*c^2-b*(b^3-
b^2*b1-a1*b+2*a1*b1-4*b2)*c+3*a1*b^3+(-a1*b1+2*b2)*b^2+(-2*a1^2+8*a2)*b)*a+b^2*(
2*c1^2+4*c1+1)*c^4-2*((2*c1+1)*b^2-2*b1*(c1+1)*b+a1)*b*c^3+(b^4-4*b^3*b1+2*(2*a1
*c1+b1^2+4*a1-4*c2)*b^2+4*a2-a1^2)*c^2+2*(-3*a1*b^3+(2*a1*b1-4*b2)*b^2+b*(a1^2-4
*a2))*c+b^2*(a1^2-4*a2))*((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2)*a1+b^2+(-
2*b1+(2*c1+4)*c)*b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-2*a1)*b-2*a
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1*c+2*a1*b1-4*b2)*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2)+(b-c)^2*((c1+1)^2*a^4-2*(c
1+1)*(b+c-b1)*a^3+((2*c1+2)*a1+b^2+(-2*b1+(2*c1+4)*c)*b+b1^2-2*b1*c+c^2-4*c2)*a^
2+(-2*b^2*c+(2*b1*c-2*c^2-2*a1)*b-2*a1*c+2*a1*b1-4*b2)*a+b^2*c^2+2*a1*b*c+a1^2-4
*a2)^(3/2)+2*(a-b)^3*(a-c)*((b-c)^2*a^2-2*((-1-c1)*c^2+(b-b1)*c-a1)*(b-c)*a+(c1+
1)^2*c^4-2*(c1+1)*(b-b1)*c^3+(2*a1*c1+b^2-2*b*b1+b1^2+2*a1-4*c2)*c^2+(-2*a1*b+2*
a1*b1-4*b2)*c+a1^2-4*a2)))/(2*(b-c)*(a-c)*((c1+1)^2*(a-b)^4*((c1+1)^2*c^4-2*(c1+
1)*(a+b-b1)*c^3+(a^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c^2+
(-2*b*a^2+(-2*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^2+2*a*a1*b+a1^2-4*
a2))^(1/2)+(a-b)^2*(2*(c1+1)^2*c^4-2*((c1+2)*a+(c1+2)*b-b1)*(c1+1)*c^3+((c1^2+2*
c1+2)*a^2+((4*c1^2+10*c1+8)*b-2*b1)*a+(c1^2+2*c1+2)*b^2-2*b*b1+2*a1*c1+b1^2+2*a1
-4*c2)*c^2+(-2*b*(c1^2+2*c1+2)*a^2+((-2*c1^2-4*c1-4)*b^2+2*b*b1-2*a1)*a-2*a1*b+2
*a1*b1-4*b2)*c+(c1^2+2*c1+2)*b^2*a^2+2*a*a1*b+a1^2-4*a2))^(1/2)/(b-c)/(a-c)^2/(a
-b)^3,1/2*((2*(b-c)*(a-c)*((c1+1)^2*(a-b)^4*((c1+1)^2*c^4-2*(c1+1)*(a+b-b1)*c^3+
(a^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*a^2+(-2*b^
2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^2+2*a*a1*b+a1^2-4*a2))^(1/2)+(a-b)
^2*(2*(c1+1)^2*c^4-2*((c1+2)*a+(c1+2)*b-b1)*(c1+1)*c^3+((c1^2+2*c1+2)*a^2+((4*c1
^2+10*c1+8)*b-2*b1)*a+(c1^2+2*c1+2)*b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b
*(c1^2+2*c1+2)*a^2+((-2*c1^2-4*c1-4)*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+(
c1^2+2*c1+2)*b^2*a^2+2*a*a1*b+a1^2-4*a2))^(1/2)+(a-c)*((c1+1)^2*b^4-2*(c1+1)*(a+
c-b1)*b^3+(a^2+(-2*b1+(2*c1+4)*c)*a+c^2-2*b1*c+(2*c1+2)*a1+b1^2-4*c2)*b^2+(-2*a^
2*c+(2*b1*c-2*c^2-2*a1)*a-2*a1*c+2*a1*b1-4*b2)*b+a^2*c^2+2*a*a1*c+a1^2-4*a2)^(1/
2)+(b-c)*((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2)*a1+b^2+(-2*b1+(2*c1+4)*c)
*b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-2*a1)*b-2*a1*c+2*a1*b1-4*b2
)*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2)+(2*a-2*b)*c^2+(-2*a^2+2*b^2)*c+2*b*a^2-2*a
*b^2)/(b-c)/(a-c)/(a-b),-1/2*(((-a+c)*((c1+1)^2*b^4-2*(c1+1)*(a+c-b1)*b^3+(a^2+(
-2*b1+(2*c1+4)*c)*a+c^2-2*b1*c+(2*c1+2)*a1+b1^2-4*c2)*b^2+(-2*a^2*c+(2*b1*c-2*c^
2-2*a1)*a-2*a1*c+2*a1*b1-4*b2)*b+a^2*c^2+2*a*a1*c+a1^2-4*a2)^(1/2)-2*(1/2*((c1+1
)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2)*a1+b^2+(-2*b1+(2*c1+4)*c)*b+b1^2-2*b1*c+
c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-2*a1)*b-2*a1*c+2*a1*b1-4*b2)*a+b^2*c^2+2*a
1*b*c+a1^2-4*a2)^(1/2)+(a-b)*(a-c))*(b-c))*(2*(b-c)*(a-c)*((c1+1)^2*(a-b)^4*((c1
+1)^2*c^4-2*(c1+1)*(a+b-b1)*c^3+(a^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b1^2
+2*a1-4*c2)*c^2+(-2*b*a^2+(-2*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^2+
2*a*a1*b+a1^2-4*a2))^(1/2)+(a-b)^2*(2*(c1+1)^2*c^4-2*((c1+2)*a+(c1+2)*b-b1)*(c1+
1)*c^3+((c1^2+2*c1+2)*a^2+((4*c1^2+10*c1+8)*b-2*b1)*a+(c1^2+2*c1+2)*b^2-2*b*b1+2
*a1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*(c1^2+2*c1+2)*a^2+((-2*c1^2-4*c1-4)*b^2+2*b*b1-
2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+(c1^2+2*c1+2)*b^2*a^2+2*a*a1*b+a1^2-4*a2))^(1/2)+
(a-b)^2*(((a-c)*b-a*c)*((a-c)*b-c*(a-2*c))*c1^2+(2*(a-c)^2*b^2-4*(a-c)*(a-1/2*c)
*c*b+2*c^2*(a^2-a*c-b1*c-a1))*c1-2*(b1*c+a1)*(a-c)*b+(2*b1*c^2+2*a1*c)*a-2*b1*c^
3+(-b1^2-2*a1+4*c2)*c^2+(-2*a1*b1+4*b2)*c-a1^2+4*a2))/(2*(b-c)*(a-c)*((c1+1)^2*(
a-b)^4*((c1+1)^2*c^4-2*(c1+1)*(a+b-b1)*c^3+(a^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b1+2
*a1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*a^2+(-2*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)
*c+a^2*b^2+2*a*a1*b+a1^2-4*a2))^(1/2)+(a-b)^2*(2*(c1+1)^2*c^4-2*((c1+2)*a+(c1+2)
*b-b1)*(c1+1)*c^3+((c1^2+2*c1+2)*a^2+((4*c1^2+10*c1+8)*b-2*b1)*a+(c1^2+2*c1+2)*b
^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*(c1^2+2*c1+2)*a^2+((-2*c1^2-4*c1-4)*
b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+(c1^2+2*c1+2)*b^2*a^2+2*a*a1*b+a1^2-4*
a2))^(1/2)/(b-c)/(a-c)/(a-b),(((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2)*a1+b
^2+(-2*b1+(2*c1+4)*c)*b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-2*a1)*
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b-2*a1*c+2*a1*b1-4*b2)*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2)+a^2+(-b-c)*a+c*b)/(a-
c)/(a-b),(((c1+1)^2*b^4-2*(c1+1)*(a+c-b1)*b^3+(a^2+(-2*b1+(2*c1+4)*c)*a+c^2-2*b1
*c+(2*c1+2)*a1+b1^2-4*c2)*b^2+(-2*a^2*c+(2*b1*c-2*c^2-2*a1)*a-2*a1*c+2*a1*b1-4*b
2)*b+a^2*c^2+2*a*a1*c+a1^2-4*a2)^(1/2)-b^2+(a+c)*b-a*c)/(b-c)/(a-b),(a-x)/(a-b))
*(x-a)^(1/2*(((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2)*a1+b^2+(-2*b1+(2*c1+4
)*c)*b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-2*a1)*b-2*a1*c+2*a1*b1-
4*b2)*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2)+(c1+1)*a^2+(-b-c+b1)*a+c*b+a1)/(a-c)/(
a-b))*_C1+(x-a)^(1/2*(-((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2)*a1+b^2+(-2*
b1+(2*c1+4)*c)*b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-2*a1)*b-2*a1*
c+2*a1*b1-4*b2)*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2)+(c1+1)*a^2+(-b-c+b1)*a+c*b+a
1)/(a-c)/(a-b))*HeunG((a-c)/(a-b),1/2*((-2*((1/2*a-1/2*c)*((c1+1)^2*b^4-2*(c1+1)
*(a+c-b1)*b^3+(a^2+(-2*b1+(2*c1+4)*c)*a+c^2-2*b1*c+(2*c1+2)*a1+b1^2-4*c2)*b^2+(-
2*a^2*c+(2*b1*c-2*c^2-2*a1)*a-2*a1*c+2*a1*b1-4*b2)*b+a^2*c^2+2*a*a1*c+a1^2-4*a2)
^(1/2)+(a-b)*(a-1/2*b-1/2*c)*(b-c))*(a-c)*((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((
2*c1+2)*a1+b^2+(-2*b1+(2*c1+4)*c)*b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-
2*c^2-2*a1)*b-2*a1*c+2*a1*b1-4*b2)*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2)+(a-c)^3*(
a-b)*((c1+1)^2*b^4-2*(c1+1)*(a+c-b1)*b^3+(a^2+(-2*b1+(2*c1+4)*c)*a+c^2-2*b1*c+(2
*c1+2)*a1+b1^2-4*c2)*b^2+(-2*a^2*c+(2*b1*c-2*c^2-2*a1)*a-2*a1*c+2*a1*b1-4*b2)*b+
a^2*c^2+2*a*a1*c+a1^2-4*a2)^(1/2)+2*(-1/2*(a-b)^2*c^3+2*(a-b)^2*(a-1/4*b)*c^2+((
1/2*c1^2-5/2)*a^4+(-c1^2*b+1/2*b1*c1+6*b)*a^3-9/2*(1/3*b1*c1+b)*b*a^2+(b2-c1*b*a
1-1/2*b1^2*b+2*c2*b-1/2*a1*b1+b^3)*a+2*a2-1/2*a1^2+b*b2-1/2*a1*b*b1)*c+a^5+(1/2*
c1^2*b+1/2*b1*c1-5/2*b)*a^4+((a1+1/2*b*b1)*c1+1/2*b1^2-2*c2+2*b^2)*a^3+(-3*b2+3/
2*a1*b1-1/2*b^3)*a^2+(a1^2-4*a2+b*b2-1/2*a1*b*b1)*a-1/2*b*(a1^2-4*a2))*(b-c))*(2
*(b-c)*(a-c)*((c1+1)^2*(a-b)^4*((c1+1)^2*c^4-2*(c1+1)*(a+b-b1)*c^3+(a^2+((2*c1+4
)*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*a^2+(-2*b^2+2*b*b1-2*a1
)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^2+2*a*a1*b+a1^2-4*a2))^(1/2)+(a-b)^2*(2*(c1+1)^
2*c^4-2*((c1+2)*a+(c1+2)*b-b1)*(c1+1)*c^3+((c1^2+2*c1+2)*a^2+((4*c1^2+10*c1+8)*b
-2*b1)*a+(c1^2+2*c1+2)*b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*(c1^2+2*c1+2
)*a^2+((-2*c1^2-4*c1-4)*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+(c1^2+2*c1+2)*
b^2*a^2+2*a*a1*b+a1^2-4*a2))^(1/2)+(a-b)*((-((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+
((2*c1+2)*a1+b^2+(-2*b1+(2*c1+4)*c)*b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*
c-2*c^2-2*a1)*b-2*a1*c+2*a1*b1-4*b2)*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2)+(a-b)*(
a-c))*(a-c)*(b-c)*((c1+1)^2*(a-b)^4*((c1+1)^2*c^4-2*(c1+1)*(a+b-b1)*c^3+(a^2+((2
*c1+4)*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*a^2+(-2*b^2+2*b*b1
-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^2+2*a*a1*b+a1^2-4*a2))^(1/2)+1/2*(b-c)^2*(
(c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2)*a1+b^2+(-2*b1+(2*c1+4)*c)*b+b1^2-2*
b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-2*a1)*b-2*a1*c+2*a1*b1-4*b2)*a+b^2*c^
2+2*a1*b*c+a1^2-4*a2)^(3/2)+(-(c1^2+2*c1+3/2)*(a-b)^2*c^4+3*(a-b)*((c1+1)*a^2-2/
3*b1*(c1+1/2)*a-2/3*b*(b-b1)*c1-b^2+2/3*b*b1+1/3*a1)*c^3+((-3/2-c1-1/2*c1^2)*a^4
+((-3*b-b1)*c1-3*b+b1)*a^3+((6*b^2-3*a1)*c1-3*b*b1-3/2*b1^2-3*a1+6*c2+9*b^2)*a^2
+((-2*b^3+4*a1*b)*c1+(3*b-b1)*a1-3*b^3+2*b1^2*b-8*c2*b+2*b2)*a-1/2*a1^2+2*a2-3/2
*b^4-2*a1*b^2*c1+2*b^3*b1-b^2*b1^2+4*b^2*c2)*c^2+(b*(c1^2+2*c1+3)*a^4+(-b*(b-2*b
1)*c1-3*b^2+2*a1)*a^3+((-b^3+2*a1*b)*c1-3*b^3+3*b^2*b1+b1^2*b-4*c2*b-2*a1*b1+4*b
2)*a^2+3*((-b+2*b1)*a1+b^3-b^2*b1-4*b2)*b*a+(a1^2+b*(b-2*b1)*a1+4*b*b2-4*a2)*b)*
c-1/2*b^2*(c1^2+2*c1+3)*a^4+b*(b*(b-b1)*c1+3*b^2-b*b1-2*a1)*a^3+(-a1*b^2*c1+b^3*
b1+4*a2-3/2*b^4-a1^2+3*a1*b^2-1/2*b^2*b1^2+2*b^2*c2)*a^2-(-2*a1^2+b*(b+b1)*a1-2*
b*b2+8*a2)*b*a-3/2*b^2*(a1^2-4*a2))*((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2
```

```
)*a1+b^2+(-2*b1+(2*c1+4)*c)*b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-
2*a1)*b-2*a1*c+2*a1*b1-4*b2)*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2)+(a-b)^3*(a-c)*(
(c1+1)^2*c^4-2*(c1+1)*(a+b-b1)*c^3+(a^2+(2*b*c1+4*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b
1^2+2*a1-4*c2)*c^2+(-2*b*a^2+(-2*b^2+2*b*b1-2*a1)*a+(-2*b+2*b1)*a1-4*b2)*c+a^2*b
^2+2*a*a1*b+a1^2-4*a2)))/(2*(b-c)*(a-c)*((c1+1)^2*(a-b)^4*((c1+1)^2*c^4-2*(c1+1)
*(a+b-b1)*c^3+(a^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c^2+(-
2*b*a^2+(-2*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^2+2*a*a1*b+a1^2-4*a2
))^(1/2)+(a-b)^2*(2*(c1+1)^2*c^4-2*((c1+2)*a+(c1+2)*b-b1)*(c1+1)*c^3+((c1^2+2*c1
+2)*a^2+((4*c1^2+10*c1+8)*b-2*b1)*a+(c1^2+2*c1+2)*b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4
*c2)*c^2+(-2*b*(c1^2+2*c1+2)*a^2+((-2*c1^2-4*c1-4)*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a
1*b1-4*b2)*c+(c1^2+2*c1+2)*b^2*a^2+2*a*a1*b+a1^2-4*a2))^(1/2)/(b-c)/(a-c)^2/(a-b
)^3,1/2*((2*(b-c)*(a-c)*((c1+1)^2*(a-b)^4*((c1+1)^2*c^4-2*(c1+1)*(a+b-b1)*c^3+(a
^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*a^2+(-2*b^2+
2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^2+2*a*a1*b+a1^2-4*a2))^(1/2)+(a-b)^2
*(2*(c1+1)^2*c^4-2*((c1+2)*a+(c1+2)*b-b1)*(c1+1)*c^3+((c1^2+2*c1+2)*a^2+((4*c1^2
+10*c1+8)*b-2*b1)*a+(c1^2+2*c1+2)*b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*(
c1^2+2*c1+2)*a^2+((-2*c1^2-4*c1-4)*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+(c1
^2+2*c1+2)*b^2*a^2+2*a*a1*b+a1^2-4*a2))^(1/2)+(a-c)*((c1+1)^2*b^4-2*(c1+1)*(a+c-
b1)*b^3+(a^2+(-2*b1+(2*c1+4)*c)*a+c^2-2*b1*c+(2*c1+2)*a1+b1^2-4*c2)*b^2+(-2*a^2*
c+(2*b1*c-2*c^2-2*a1)*a-2*a1*c+2*a1*b1-4*b2)*b+a^2*c^2+2*a*a1*c+a1^2-4*a2)^(1/2)
+(-b+c)*((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2)*a1+b^2+(-2*b1+(2*c1+4)*c)*
b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-2*a1)*b-2*a1*c+2*a1*b1-4*b2)
*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2)+(2*a-2*b)*c^2+(-2*a^2+2*b^2)*c+2*b*a^2-2*a*
b^2)/(b-c)/(a-c)/(a-b),-1/2*(((b-c)*((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2
)*a1+b^2+(-2*b1+(2*c1+4)*c)*b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-
2*a1)*b-2*a1*c+2*a1*b1-4*b2)*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2)-2*(1/2*((c1+1)^
2*b^4-2*(c1+1)*(a+c-b1)*b^3+(a^2+(-2*b1+(2*c1+4)*c)*a+c^2-2*b1*c+(2*c1+2)*a1+b1^
2-4*c2)*b^2+(-2*a^2*c+(2*b1*c-2*c^2-2*a1)*a-2*a1*c+2*a1*b1-4*b2)*b+a^2*c^2+2*a*a
1*c+a1^2-4*a2)^(1/2)+(b-c)*(a-b))*(a-c))*(2*(b-c)*(a-c)*((c1+1)^2*(a-b)^4*((c1+1
)^2*c^4-2*(c1+1)*(a+b-b1)*c^3+(a^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b1^2+2
*a1-4*c2)*c^2+(-2*b*a^2+(-2*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^2+2*
a*a1*b+a1^2-4*a2))^(1/2)+(a-b)^2*(2*(c1+1)^2*c^4-2*((c1+2)*a+(c1+2)*b-b1)*(c1+1)
*c^3+((c1^2+2*c1+2)*a^2+((4*c1^2+10*c1+8)*b-2*b1)*a+(c1^2+2*c1+2)*b^2-2*b*b1+2*a
1*c1+b1^2+2*a1-4*c2)*c^2+(-2*b*(c1^2+2*c1+2)*a^2+((-2*c1^2-4*c1-4)*b^2+2*b*b1-2*
a1)*a-2*a1*b+2*a1*b1-4*b2)*c+(c1^2+2*c1+2)*b^2*a^2+2*a*a1*b+a1^2-4*a2))^(1/2)+(a
-b)^2*(c1*(b-c)^2*(c1+2)*a^2-2*((-c1^2-c1)*c^2+(b*c1^2+2*b*c1+b1)*c+a1)*(b-c)*a-
2*(c1+1)*(b*c1+b1)*c^3+(b^2*c1^2+(2*b^2-2*a1)*c1+2*b*b1-b1^2-2*a1+4*c2)*c^2+(2*a
1*b-2*a1*b1+4*b2)*c-a1^2+4*a2))/(2*(b-c)*(a-c)*((c1+1)^2*(a-b)^4*((c1+1)^2*c^4-2
*(c1+1)*(a+b-b1)*c^3+(a^2+((2*c1+4)*b-2*b1)*a+b^2-2*b*b1+2*a1*c1+b1^2+2*a1-4*c2)
*c^2+(-2*b*a^2+(-2*b^2+2*b*b1-2*a1)*a-2*a1*b+2*a1*b1-4*b2)*c+a^2*b^2+2*a*a1*b+a1
^2-4*a2))^(1/2)+(a-b)^2*(2*(c1+1)^2*c^4-2*((c1+2)*a+(c1+2)*b-b1)*(c1+1)*c^3+((c1
^2+2*c1+2)*a^2+((4*c1^2+10*c1+8)*b-2*b1)*a+(c1^2+2*c1+2)*b^2-2*b*b1+2*a1*c1+b1^2
+2*a1-4*c2)*c^2+(-2*b*(c1^2+2*c1+2)*a^2+((-2*c1^2-4*c1-4)*b^2+2*b*b1-2*a1)*a-2*a
1*b+2*a1*b1-4*b2)*c+(c1^2+2*c1+2)*b^2*a^2+2*a*a1*b+a1^2-4*a2))^(1/2)/(b-c)/(a-c)
/(a-b),(-((c1+1)^2*a^4-2*(c1+1)*(b+c-b1)*a^3+((2*c1+2)*a1+b^2+(-2*b1+(2*c1+4)*c)
*b+b1^2-2*b1*c+c^2-4*c2)*a^2+(-2*b^2*c+(2*b1*c-2*c^2-2*a1)*b-2*a1*c+2*a1*b1-4*b2
)*a+b^2*c^2+2*a1*b*c+a1^2-4*a2)^(1/2)+a^2+(-b-c)*a+c*b)/(a-c)/(a-b),(((c1+1)^2*b
```

```
^4-2*(c1+1)*(a+c-b1)*b^3+(a^2+(-2*b1+(2*c1+4)*c)*a+c^2-2*b1*c+(2*c1+2)*a1+b1^2-4
*c2)*b^2+(-2*a^2*c+(2*b1*c-2*c^2-2*a1)*a-2*a1*c+2*a1*b1-4*b2)*b+a^2*c^2+2*a*a1*c
+a1^2-4*a2)^(1/2)-b^2+(a+c)*b-a*c)/(b-c)/(a-b),(a-x)/(a-b))*_C2)
```

4.1763 $4x^6y''(x) + (1-2x^2)\,y(x) + 4(2x^2+1)\,x^3y'(x) = 0$

ODE

$$4x^6y''(x) + \left(1-2x^2\right)y(x) + 4\left(2x^2+1\right)x^3y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0271307 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{e^{\frac{1}{4x^2}}\left(c_2x + c_1\right)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.049 (sec), leaf count = 19

$$\left\{y(x) = \frac{\_C1\,x + \_C2}{x}e^{\frac{1}{4\,x^2}}\right\}$$

Mathematica raw input

```
DSolve[(1 - 2*x^2)*y[x] + 4*x^3*(1 + 2*x^2)*y'[x] + 4*x^6*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(1/(4*x^2))*(C[1] + x*C[2]))/x}}
```

Maple raw input

```
dsolve(4*x^6*diff(diff(y(x),x),x)+4*x^3*(2*x^2+1)*diff(y(x),x)+(-2*x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(1/4/x^2)*(_C1*x+_C2)/x
```

4.1764 $4x^6y''(x) + (8x^4 + 10x^2 + 1)\,y(x) - 4(2x^2 + 1)\,x^3y'(x) = 0$

ODE

$$4x^6y''(x) + (8x^4 + 10x^2 + 1)\,y(x) - 4(2x^2 + 1)\,x^3y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0289315 (sec), leaf count = 23

$$\left\{\left\{y(x) \to e^{-\frac{1}{4x^2}}x(c_2x + c_1)\right\}\right\}$$

Maple ✓
cpu = 0.048 (sec), leaf count = 17

$$\left\{y(x) = x\mathrm{e}^{-\frac{1}{4x^2}}(\_C2\,x + \_C1)\right\}$$

Mathematica raw input

```
DSolve[(1 + 10*x^2 + 8*x^4)*y[x] - 4*x^3*(1 + 2*x^2)*y'[x] + 4*x^6*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(C[1] + x*C[2]))/E^(1/(4*x^2))}}
```

Maple raw input

```
dsolve(4*x^6*diff(diff(y(x),x),x)-4*x^3*(2*x^2+1)*diff(y(x),x)+(8*x^4+10*x^2+1)*y(x) = 0, y(x),'impli
```

Maple raw output

```
y(x) = x*exp(-1/4/x^2)*(_C2*x+_C1)
```

4.1765 $(4b-a^2)\,y(x)+4x^6y''(x)+12x^5y'(x)=0$

ODE

$$(4b-a^2)\,y(x)+4x^6y''(x)+12x^5y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]

Book solution method
TO DO

Mathematica ✓
cpu = 0.02276 (sec), leaf count = 55

$$\left\{\left\{y(x)\to c_1\cos\left(\frac{\sqrt{4b-a^2}}{4x^2}\right)-c_2\sin\left(\frac{\sqrt{4b-a^2}}{4x^2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 43

$$\left\{y(x)=\_C1\,\sin\left(\frac{1}{4\,x^2}\sqrt{-a^2+4\,b}\right)+\_C2\,\cos\left(\frac{1}{4\,x^2}\sqrt{-a^2+4\,b}\right)\right\}$$

Mathematica raw input

```
DSolve[(-a^2 + 4*b)*y[x] + 12*x^5*y'[x] + 4*x^6*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[Sqrt[-a^2 + 4*b]/(4*x^2)] - C[2]*Sin[Sqrt[-a^2 + 4*b]/(4*x^2)
]}}
```

Maple raw input

```
dsolve(4*x^6*diff(diff(y(x),x),x)+12*x^5*diff(y(x),x)+(-a^2+4*b)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(1/4*(-a^2+4*b)^(1/2)/x^2)+_C2*cos(1/4*(-a^2+4*b)^(1/2)/x^2)
```

4.1766 $x^{2a}y''(x) + ax^{2a-1}y'(x) + (1-a)^2 y(x) = 0$

ODE

$$x^{2a}y''(x) + ax^{2a-1}y'(x) + (1-a)^2 y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _linear, `_with_symmetry_[0,F(x)]`]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0329595 (sec), leaf count = 29

$$\{\{y(x) \to c_1 \cos\left(x^{1-a}\right) - c_2 \sin\left(x^{1-a}\right)\}\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 30

$$\{y(x) = \sin\left(x^{1-a}\right) \_C1 + \_C2 \cos\left(x^{1-a} csgn(a-1)\right)\}$$

Mathematica raw input

```
DSolve[(1 - a)^2*y[x] + a*x^(-1 + 2*a)*y'[x] + x^(2*a)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[x^(1 - a)] - C[2]*Sin[x^(1 - a)]}}
```

Maple raw input

```
dsolve(x^(2*a)*diff(diff(y(x),x),x)+a*x^(2*a-1)*diff(y(x),x)+(1-a)^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = sin(x^(1-a))*_C1+_C2*cos(x^(1-a)*csgn(a-1))
```

4.1767 $a^2x^{a-1}y(x)+x^{a+1}y''(x)+(1-2a)x^ay'(x)=0$

ODE

$$a^2x^{a-1}y(x)+x^{a+1}y''(x)+(1-2a)x^ay'(x)=0$$

ODE Classification

[[_Emden, _Fowler]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0163222 (sec), leaf count = 18

$$\{\{y(x)\to x^a(ac_2\log(x)+c_1)\}\}$$

Maple ✓
cpu = 0.031 (sec), leaf count = 14

$$\{y(x)=x^a(\ln(x)\_C2+\_C1)\}$$

Mathematica raw input

```
DSolve[a^2*x^(-1 + a)*y[x] + (1 - 2*a)*x^a*y'[x] + x^(1 + a)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^a*(C[1] + a*C[2]*Log[x])}}
```

Maple raw input

```
dsolve(x^(1+a)*diff(diff(y(x),x),x)+(1-2*a)*x^a*diff(y(x),x)+a^2*x^(a-1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^a*(ln(x)*_C2+_C1)
```

4.1768 $x^2 y''(x) \left(\mathbf{a0} + \mathbf{b0} x^k\right) + x y'(x) \left(\mathbf{a1} + \mathbf{b1} x^k\right) + y(x) \left(\mathbf{a2} + \mathbf{b2} x^k\right) = 0$

ODE

$$x^2 y''(x) \left(\text{a0} + \text{b0} x^k\right) + x y'(x) \left(\text{a1} + \text{b1} x^k\right) + y(x) \left(\text{a2} + \text{b2} x^k\right) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.151316 (sec), leaf count = 540

$$\left\{\left\{y(x) \to \text{a0}^{-\frac{\sqrt{\text{a0}^2-2\text{a0}(\text{a1}+2\text{a2})+\text{a1}^2}+\text{a0}-\text{a1}}{2\text{a0}k}} \text{b0}^{-\frac{\sqrt{\text{a0}^2-2\text{a0}(\text{a1}+2\text{a2})+\text{a1}^2}-\text{a0}+\text{a1}}{2\text{a0}k}} \left(x^k\right)^{-\frac{\sqrt{\text{a0}^2-2\text{a0}(\text{a1}+2\text{a2})+\text{a1}^2}-\text{a0}+\text{a1}}{2\text{a0}k}} \left(c_2 \text{b0}^{\frac{\sqrt{\text{a0}^2-2\text{a0}(\text{a1}+2\right.\right.\right.$$

Maple ✓
cpu = 0.392 (sec), leaf count = 391

$$\left\{y(x) = \_C1 \, {}_2\mathrm{F}_1\left(\frac{1}{2\,b0\,a0\,k}\left(\sqrt{a0^2 + (-2\,a1 - 4\,a2)\,a0 + a1^2}\,b0 + \sqrt{b0^2 + (-2\,b1 - 4\,b2)\,b0 + b1^2}\,a0 + b1\,a0 - a1\,b0\right)\right.\right.$$

Mathematica raw input

```
DSolve[(a2 + b2*x^k)*y[x] + x*(a1 + b1*x^k)*y'[x] + x^2*(a0 + b0*x^k)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (b0^(Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)]/(a0*k))*(x^k)^(Sqrt[a0^2 + a
1^2 - 2*a0*(a1 + 2*a2)]/(a0*k))*C[2]*Hypergeometric2F1[(-(a1*b0) + Sqrt[a0^2 + a
1^2 - 2*a0*(a1 + 2*a2)]*b0 + a0*b1 - a0*Sqrt[b0^2 + b1^2 - 2*b0*(b1 + 2*b2)])/(2
*a0*b0*k), (-(a1*b0) + Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)]*b0 + a0*b1 + a0*Sqrt
[b0^2 + b1^2 - 2*b0*(b1 + 2*b2)])/(2*a0*b0*k), 1 + Sqrt[a0^2 + a1^2 - 2*a0*(a1 +
 2*a2)]/(a0*k), -((b0*x^k)/a0)] + a0^(Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)]/(a0*k
))*C[1]*Hypergeometric2F1[-(a1*b0 + Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)]*b0 - a0
*b1 + a0*Sqrt[b0^2 + b1^2 - 2*b0*(b1 + 2*b2)])/(2*a0*b0*k), (-(a1*b0) - Sqrt[a0^
2 + a1^2 - 2*a0*(a1 + 2*a2)]*b0 + a0*b1 + a0*Sqrt[b0^2 + b1^2 - 2*b0*(b1 + 2*b2)
])/(2*a0*b0*k), 1 - Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)]/(a0*k), -((b0*x^k)/a0)]
)/(a0^((a0 - a1 + Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)])/(2*a0*k))*b0^((-a0 + a1
+ Sqrt[a0^2 + a1^2 - 2*a0*(a1 + 2*a2)])/(2*a0*k))*(x^k)^((-a0 + a1 + Sqrt[a0^2 +
 a1^2 - 2*a0*(a1 + 2*a2)])/(2*a0*k)))}}
```

Maple raw input

```
dsolve(x^2*(a0+b0*x^k)*diff(diff(y(x),x),x)+x*(a1+b1*x^k)*diff(y(x),x)+(a2+b2*x^k)*y(x) = 0, y(x),'im
```

Maple raw output

```
y(x) = _C1*hypergeom([1/2/b0/a0/k*((a0^2+(-2*a1-4*a2)*a0+a1^2)^(1/2)*b0+(b0^2+(-
2*b1-4*b2)*b0+b1^2)^(1/2)*a0+b1*a0-a1*b0), 1/2/b0/a0/k*((a0^2+(-2*a1-4*a2)*a0+a1
^2)^(1/2)*b0-(b0^2+(-2*b1-4*b2)*b0+b1^2)^(1/2)*a0+b1*a0-a1*b0)],[(k*a0+(a0^2+(-2
*a1-4*a2)*a0+a1^2)^(1/2))/k/a0],-1/a0*b0*x^k)*x^(1/2*(-a1+(a0^2+(-2*a1-4*a2)*a0+
a1^2)^(1/2)+a0)/a0)+_C2*hypergeom([-1/2/b0/a0/k*((a0^2+(-2*a1-4*a2)*a0+a1^2)^(1/
2)*b0-(b0^2+(-2*b1-4*b2)*b0+b1^2)^(1/2)*a0-b1*a0+a1*b0), -1/2/b0/a0/k*((a0^2+(-2
*a1-4*a2)*a0+a1^2)^(1/2)*b0+(b0^2+(-2*b1-4*b2)*b0+b1^2)^(1/2)*a0-b1*a0+a1*b0)],[
(k*a0-(a0^2+(-2*a1-4*a2)*a0+a1^2)^(1/2))/k/a0],-1/a0*b0*x^k)*x^(-1/2*(a1+(a0^2+(
-2*a1-4*a2)*a0+a1^2)^(1/2)-a0)/a0)
```

4.1769 $(1-a^2\cos^2(x))\,y''(x)+a^2\sin(x)\cos(x)y'(x)+y(x)\,(\mathbf{a0}+\mathbf{a1}\cos^2(x))=0$

ODE

$$(1-a^2\cos^2(x))\,y''(x)+a^2\sin(x)\cos(x)y'(x)+y(x)\,(\mathrm{a0}+\mathrm{a1}\cos^2(x))=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 14.5543 (sec), leaf count = 0 , could not solve

```
DSolve[(a0 + a1*Cos[x]^2)*y[x] + a^2*Cos[x]*Sin[x]*Derivative[1][y][x] + (1 - a^2*Cos[x]^2)*Derivativ
```

Maple ✓
cpu = 0.863 (sec), leaf count = 217

$$\left\{y(x)=1\sqrt{a^2\cos(2x)+a^2-2}\left(\sqrt[4]{-2\cos(2x)+2}\,HeunG\left(a^{-2},\frac{4a^2-a0+1}{4a^2},\frac{1}{4a}\left(5a+\sqrt{a^2-4a1}\right),\frac{1}{a}\left(\sqrt{a^2-4a1}a\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[(a0 + a1*Cos[x]^2)*y[x] + a^2*Cos[x]*Sin[x]*y'[x] + (1 - a^2*Cos[x]^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[(a0 + a1*Cos[x]^2)*y[x] + a^2*Cos[x]*Sin[x]*Derivative[1][y][x] + (1 - a^
2*Cos[x]^2)*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve((1-a^2*cos(x)^2)*diff(diff(y(x),x),x)+a^2*diff(y(x),x)*cos(x)*sin(x)+(a0+a1*cos(x)^2)*y(x) = (
```

Maple raw output

```
y(x) = (a^2*cos(2*x)+a^2-2)^(1/2)*((-2*cos(2*x)+2)^(1/4)*HeunG(1/a^2,1/4*(4*a^2-
a0+1)/a^2,1/4/a*(5*a+(a^2-4*a1)^(1/2)),1/a/(a+(a^2-4*a1)^(1/2))*((a^2-4*a1)^(1/2
)*a+a^2+a1),3/2,1/2,1/2*cos(2*x)+1/2)*(2*cos(2*x)+2)^(3/4)*_C2+HeunG(1/a^2,1/4/a
^2*(a^2-a0),1/4*(3*a+(a^2-4*a1)^(1/2))/a,1/2/a/(a+(a^2-4*a1)^(1/2))*((a^2-4*a1)^
(1/2)*a+a^2+2*a1),1/2,1/2,1/2*cos(2*x)+1/2)*sin(2*x)^(1/2)*_C1)/sin(2*x)^(1/2)
```

4.1770

$$-y(x)\left(4k^2-\left(1-p^2\right)\sinh^2(x)\right)+4\sinh^2(x)y''(x)+4\sinh(x)\cosh(x)y'(x)=0$$

ODE

$$-y(x)\left(4k^2-\left(1-p^2\right)\sinh^2(x)\right)+4\sinh^2(x)y''(x)+4\sinh(x)\cosh(x)y'(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.51321 (sec), leaf count = 123

$$\left\{\left\{y(x)\to \frac{(-1)^{-k}\tanh(x)\tanh^2(x)^{\frac{1}{2}(-k-1)}\left(-\text{sech}^2(x)\right)^{\frac{p+2}{4}}\left(c_1(-1)^k\tanh^2(x)^k\,{}_2F_1\left(\frac{1}{4}(2k+p+1),\frac{1}{4}(2k+p+3);k+1;t\right.\right.\right.}{\sqrt[4]{\text{sech}^2(x)}}$$

Maple ✓
cpu = 0.294 (sec), leaf count = 92

$$\left\{y(x)=(\sinh(x))^k\left(\sinh(2x)\,{}_2\mathrm{F}_1\left(\frac{3}{4}-\frac{p}{4}+\frac{k}{2},\frac{3}{4}+\frac{p}{4}+\frac{k}{2};\frac{3}{2};\frac{\cosh(2x)}{2}+\frac{1}{2}\right)\_C1+{}_2\mathrm{F}_1\left(-\frac{p}{4}+\frac{1}{4}+\frac{k}{2},\frac{p}{4}+\frac{1}{4}+\frac{k}{2};\frac{1}{2};\right.\right.\right.$$

Mathematica raw input

```
DSolve[-((4*k^2 - (1 - p^2)*Sinh[x]^2)*y[x]) + 4*Cosh[x]*Sinh[x]*y'[x] + 4*Sinh[x]^2*y''[x] == 0,y[x]
```

Mathematica raw output

```
{{y[x] -> ((-Sech[x]^2)^((2 + p)/4)*Tanh[x]*(Tanh[x]^2)^((-1 - k)/2)*(C[2]*Hyper
geometric2F1[(1 - 2*k + p)/4, (3 - 2*k + p)/4, 1 - k, Tanh[x]^2] + (-1)^k*C[1]*H
ypergeometric2F1[(1 + 2*k + p)/4, (3 + 2*k + p)/4, 1 + k, Tanh[x]^2]*(Tanh[x]^2)
^k))/((-1)^k*(Sech[x]^2)^(1/4))}}
```

Maple raw input

```
dsolve(4*diff(diff(y(x),x),x)*sinh(x)^2+4*diff(y(x),x)*cosh(x)*sinh(x)-(4*k^2-(-p^2+1)*sinh(x)^2)*y(x
```

Maple raw output

```
y(x) = sinh(x)^k*(sinh(2*x)*hypergeom([3/4-1/4*p+1/2*k, 3/4+1/4*p+1/2*k],[3/2],1
/2*cosh(2*x)+1/2)*_C1+hypergeom([-1/4*p+1/4+1/2*k, 1/4*p+1/4+1/2*k],[1/2],1/2*co
sh(2*x)+1/2)*(-2+2*cosh(2*x))^(1/2)*_C2)/(-1+cosh(2*x))^(1/2)
```

4.1771 $y''(x) = 0$

ODE

$$y''(x) = 0$$

ODE Classification

[[_2nd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.016543 (sec), leaf count = 12

$$\{\{y(x) \to c_2 x + c_1\}\}$$

Maple ✓
cpu = 0.003 (sec), leaf count = 9

$$\{y(x) = \_C1\, x + \_C2\}$$

Mathematica raw input

```
DSolve[y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x+_C2
```

4.1772 $y''(x) = ay(x)$

ODE

$$y''(x) = ay(x)$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00753055 (sec), leaf count = 31

$$\left\{\left\{y(x) \to c_1 e^{\sqrt{a}x} + c_2 e^{-\sqrt{a}x}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 22

$$\left\{y(x) = \_C1\, \mathrm{e}^{\sqrt{a}x} + \_C2\, \mathrm{e}^{-\sqrt{a}x}\right\}$$

Mathematica raw input

```
DSolve[y''[x] == a*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(Sqrt[a]*x)*C[1] + C[2]/E^(Sqrt[a]*x)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(a^(1/2)*x)+_C2*exp(-a^(1/2)*x)
```

4.1773 $y''(x) = 6y(x)^2$

ODE

$$y''(x) = 6y(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0328223 (sec), leaf count = 14

$$\{\{y(x) \to \wp(x + c_1; 0, c_2)\}\}$$

Maple ✓
cpu = 0.1 (sec), leaf count = 10

$$\{y(x) = \mathit{WeierstrassP}(x + \_C1, 0, \_C2)\}$$

Mathematica raw input

```
DSolve[y''[x] == 6*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> WeierstrassP[x + C[1], {0, C[2]}]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = 6*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = WeierstrassP(x+_C1,0,_C2)
```

4.1774 $y''(x) = 6y(x)^2 + x$

ODE

$$y''(x) = 6y(x)^2 + x$$

ODE Classification

[[_Painleve, `1st`]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.162205 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == x + 6*y[x]^2, y[x], x]
```

Maple ✗
cpu = 0.464 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x) = x+6*y(x)^2, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y''[x] == x + 6*y[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == x + 6*y[x]^2, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = x+6*y(x)^2, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x) = x+6*y(x)^2, y(x),'implicit')
```

4.1775 $y''(x) = a + bx + cy(x)^2$

ODE

$$y''(x) = a + bx + cy(x)^2$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 0.321689 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == a + b*x + c*y[x]^2, y[x], x]
```

Maple ✗
cpu = 0.217 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x) = a+b*x+c*y(x)^2, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y''[x] == a + b*x + c*y[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == a + b*x + c*y[x]^2, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a+b*x+c*y(x)^2, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x) = a+b*x+c*y(x)^2, y(x),'implicit')
```

4.1776 $y''(x) = 2y(x)^3$

ODE

$$y''(x) = 2y(x)^3$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.338771 (sec), leaf count = 95

$$\left\{\left\{y(x) \to -\frac{i\,\text{sn}\left((-1)^{3/4}\sqrt{\sqrt{c_1}\,(x+c_2)^2}\middle|-1\right)}{\sqrt{\frac{i}{\sqrt{c_1}}}}\right\},\left\{y(x) \to \frac{i\,\text{sn}\left((-1)^{3/4}\sqrt{\sqrt{c_1}\,(x+c_2)^2}\middle|-1\right)}{\sqrt{\frac{i}{\sqrt{c_1}}}}\right\}\right\}$$

Maple ✓
cpu = 0.027 (sec), leaf count = 17

$$\{y(x) = \_C2\ JacobiSN((ix + \_C1)\,\_C2, i)\}$$

Mathematica raw input

```
DSolve[y''[x] == 2*y[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*JacobiSN[(-1)^(3/4)*Sqrt[Sqrt[C[1]]*(x + C[2])^2], -1])/Sqrt[I/S
qrt[C[1]]]}, {y[x] -> (I*JacobiSN[(-1)^(3/4)*Sqrt[Sqrt[C[1]]*(x + C[2])^2], -1])
/Sqrt[I/Sqrt[C[1]]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = 2*y(x)^3, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*JacobiSN((I*x+_C1)*_C2,I)
```

4.1777 $y''(x) = a + by(x) + 2y(x)^3$

ODE

$$y''(x) = a + by(x) + 2y(x)^3$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.44497 (sec), leaf count = 570

$$\text{Solve}\left[\frac{4\left(\text{Root}\left[\#1^4+\#1^2 b+2\#1 a+c_1\&,1\right]-y(x)\right)\left(\text{Root}\left[\#1^4+\#1^2 b+2\#1 a+c_1\&,2\right]-y(x)\right)\left(\text{Root}\left[\#1^4+\#1^2 b+2\right.\right.\right.}{}$$

Maple ✓
cpu = 0.12 (sec), leaf count = 63

$$\left\{\int^{y(x)} \frac{1}{\sqrt{\_a^4+b\_a^2+2\_a\,a+\_C1}}d\_a - x - \_C2 = 0, \int^{y(x)} -\frac{1}{\sqrt{\_a^4+b\_a^2+2\_a\,a+\_C1}}d\_a - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y''[x] == a + b*y[x] + 2*y[x]^3,y[x],x]
```

Mathematica raw output

```
Solve[(4*EllipticF[ArcSin[Sqrt[((Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 2] - Roo
t[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 4])*(Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & ,
1] - y[x]))/((Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 1] - Root[C[1] + 2*a*#1 + b
*#1^2 + #1^4 & , 4])*(Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 2] - y[x]))]], ((Ro
ot[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 2] - Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & ,
 3])*(Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 1] - Root[C[1] + 2*a*#1 + b*#1^2 +
#1^4 & , 4]))/((Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 1] - Root[C[1] + 2*a*#1 +
 b*#1^2 + #1^4 & , 3])*(Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 2] - Root[C[1] +
2*a*#1 + b*#1^2 + #1^4 & , 4]))]^2*(Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 1] -
y[x])*(Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 2] - y[x])*(Root[C[1] + 2*a*#1 + b
*#1^2 + #1^4 & , 3] - y[x])*(Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 4] - y[x]))/
```

```
((Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 1] - Root[C[1] + 2*a*#1 + b*#1^2 + #1^4
 & , 3])*(Root[C[1] + 2*a*#1 + b*#1^2 + #1^4 & , 2] - Root[C[1] + 2*a*#1 + b*#1^
2 + #1^4 & , 4])*(C[1] + 2*a*y[x] + b*y[x]^2 + y[x]^4)) == (x + C[2])^2, y[x]]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a+b*y(x)+2*y(x)^3, y(x),'implicit')
```

Maple raw output

```
Intat(1/(_a^4+_a^2*b+2*_a*a+_C1)^(1/2),_a = y(x))-x-_C2 = 0, Intat(-1/(_a^4+_a^2
*b+2*_a*a+_C1)^(1/2),_a = y(x))-x-_C2 = 0
```

4.1778 $y''(x) = a + 2y(x)^3 + xy(x)$

ODE

$$y''(x) = a + 2y(x)^3 + xy(x)$$

ODE Classification

[[_Painleve, `2nd`]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.10058 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == a + x*y[x] + 2*y[x]^3, y[x], x]
```

Maple ✗
cpu = 0.313 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x) = a+x*y(x)+2*y(x)^3, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y''[x] == a + x*y[x] + 2*y[x]^3,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == a + x*y[x] + 2*y[x]^3, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a+x*y(x)+2*y(x)^3, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x) = a+x*y(x)+2*y(x)^3, y(x),'implicit')
```

4.1779 $y''(x) = f(x) + g(x)y(x) + 2y(x)^3$

ODE

$$y''(x) = f(x) + g(x)y(x) + 2y(x)^3$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 2.0844 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == f[x] + g[x]*y[x] + 2*y[x]^3, y[x], x]
```

Maple ✗
cpu = 0.428 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x) = f(x)+g(x)*y(x)+2*y(x)^3, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y''[x] == f[x] + g[x]*y[x] + 2*y[x]^3,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == f[x] + g[x]*y[x] + 2*y[x]^3, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = f(x)+g(x)*y(x)+2*y(x)^3, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x) = f(x)+g(x)*y(x)+2*y(x)^3, y(x),'implicit')
```

4.1780 $y''(x) = -2abxy(x) + a + 2b^2y(x)^3$

ODE

$$y''(x) = -2abxy(x) + a + 2b^2y(x)^3$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 3.52682 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == a - 2*a*b*x*y[x] + 2*b^2*y[x]^3, y[x], x]
```

Maple ✗
cpu = 0.402 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x) = a-2*a*b*x*y(x)+2*b^2*y(x)^3, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y''[x] == a - 2*a*b*x*y[x] + 2*b^2*y[x]^3,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == a - 2*a*b*x*y[x] + 2*b^2*y[x]^3, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a-2*a*b*x*y(x)+2*b^2*y(x)^3, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x) = a-2*a*b*x*y(x)+2*b^2*y(x)^3, y(x),'implicit')
```

4.1781 $y''(x) = \mathbf{a0} + \mathbf{a1}xy(x) + \mathbf{a2}y(x) + \mathbf{a3}y(x)^3$

ODE

$$y''(x) = \mathrm{a0} + \mathrm{a1}xy(x) + \mathrm{a2}y(x) + \mathrm{a3}y(x)^3$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 3.08908 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == a0 + a2*y[x] + a1*x*y[x] + a3*y[x]^3, y[x], x]
```

Maple ✗
cpu = 0.406 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x) = a0+a1*x*y(x)+a2*y(x)+a3*y(x)^3, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y''[x] == a0 + a2*y[x] + a1*x*y[x] + a3*y[x]^3,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == a0 + a2*y[x] + a1*x*y[x] + a3*y[x]^3, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a0+a1*x*y(x)+a2*y(x)+a3*y(x)^3, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x) = a0+a1*x*y(x)+a2*y(x)+a3*y(x)^3, y(x),'implicit')
```

4.1782 $y''(x) = \mathbf{a0} + \mathbf{a1}y(x) + \mathbf{a2}y(x)^2 + \mathbf{a3}y(x)^3$

ODE

$$y''(x) = \mathrm{a0} + \mathrm{a1}y(x) + \mathrm{a2}y(x)^2 + \mathrm{a3}y(x)^3$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.62597 (sec), leaf count = 869

$$\text{Solve}\left[\left\{24F\left(\sin^{-1}\left(\sqrt{\frac{(\text{Root}\left[3\text{a3}\#1^4+4\text{a2}\#1^3+6\text{a1}\#1^2+12\text{a0}\#1+6c_1\&,2\right]-\text{Root}\left[3\text{a3}\#1^4+4\text{a2}\#1^3+6\text{a1}\#1^2+12\text{a0}\#1+6c_1\&,4\right])(\right.\right.\right.$$
$$\left.\left.\left.\frac{(\text{Root}\left[3\text{a3}\#1^4+4\text{a2}\#1^3+6\text{a1}\#1^2+12\text{a0}\#1+6c_1\&,1\right]-\text{Root}\left[3\text{a3}\#1^4+4\text{a2}\#1^3+6\text{a1}\#1^2+12\text{a0}\#1+6c_1\&,4\right])(}\right.\right.\right.$$

Maple ✓
cpu = 0.087 (sec), leaf count = 89

$$\left\{\int^{y(x)} -6\,\frac{1}{\sqrt{18\,a3\,\_a^4+24\,a2\,\_a^3+36\,a1\,\_a^2+72\,a0\,\_a+36\,\_C1}}d\_a-x-\_C2=0,\int^{y(x)} 6\,\frac{}{\sqrt{18\,a3\,\_a^4+24\,a2\,\_}}\right.$$

Mathematica raw input

```
DSolve[y''[x] == a0 + a1*y[x] + a2*y[x]^2 + a3*y[x]^3,y[x],x]
```

Mathematica raw output

```
Solve[(24*EllipticF[ArcSin[Sqrt[((Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^3
 + 3*a3*#1^4 & , 2] - Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4
 & , 4])*(Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 1] - y[
x]))/((Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 1] - Root[
6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 4])*(Root[6*C[1] + 12*
a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 2] - y[x]))]], ((Root[6*C[1] + 12*
a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 2] - Root[6*C[1] + 12*a0*#1 + 6*a1
*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 3])*(Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2
*#1^3 + 3*a3*#1^4 & , 1] - Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3
*#1^4 & , 4]))/((Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & ,
1] - Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 3])*(Root[6*
```

```
C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 2] - Root[6*C[1] + 12*a0
*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 4])]^2*(Root[6*C[1] + 12*a0*#1 + 6*
a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 1] - y[x])*(Root[6*C[1] + 12*a0*#1 + 6*a1*#1
^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 2] - y[x])*(Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 +
4*a2*#1^3 + 3*a3*#1^4 & , 3] - y[x])*(Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*
#1^3 + 3*a3*#1^4 & , 4] - y[x]))/((Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^
3 + 3*a3*#1^4 & , 1] - Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^
4 & , 3])*(Root[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 2] - R
oot[6*C[1] + 12*a0*#1 + 6*a1*#1^2 + 4*a2*#1^3 + 3*a3*#1^4 & , 4])*(6*C[1] + 12*a
0*y[x] + 6*a1*y[x]^2 + 4*a2*y[x]^3 + 3*a3*y[x]^4)) == (x + C[2])^2, y[x]]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a0+a1*y(x)+a2*y(x)^2+a3*y(x)^3, y(x),'implicit')
```

Maple raw output

```
Intat(-6/(18*_a^4*a3+24*_a^3*a2+36*_a^2*a1+72*_a*a0+36*_C1)^(1/2),_a = y(x))-x-_
C2 = 0, Intat(6/(18*_a^4*a3+24*_a^3*a2+36*_a^2*a1+72*_a*a0+36*_C1)^(1/2),_a = y(
x))-x-_C2 = 0
```

4.1783 $ax^r y(x)^s + y''(x) = 0$

ODE

$$ax^r y(x)^s + y''(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0366374 (sec), leaf count = 0 , could not solve

```
DSolve[a*x^r*y[x]^s + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 3.106 (sec), leaf count = 151

$$\left\{ y(x) = ODESolStruc\left(\_a\, e^{\int \_b(\_a)\, d\_a + \_C1}, \left[\left\{ \frac{d}{d\_a}\_b(\_a) = \frac{(\_b(\_a))^2 \left(a \_b(\_a) (s-1)^2 \_a^s + (\_a (r+1+s) \_b($$

Mathematica raw input

```
DSolve[a*x^r*y[x]^s + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a*x^r*y[x]^s + Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*x^r*y(x)^s = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a*exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = _b(_a)^2*(a*_b
(_a)*(s-1)^2*_a^s+(_a*(r+1+s)*_b(_a)+2*r+s+3)*(r+2))/(r+2)^2}, {_a = y(x)*x^(1/(
s-1)*(r+2)), _b(_a) = (-r-2)/(x*(s-1)*diff(y(x),x)+y(x)*(r+2))/(x^(1/(s-1)*(r+2)
))}, {x = exp(-(Int(_b(_a),_a)+_C1)*(s-1)/(r+2)), y(x) = _a*exp(Int(_b(_a),_a)+_
C1)}])
```

4.1784 $a \sin(y(x)) + y''(x) = 0$

ODE

$$a \sin(y(x)) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0716378 (sec), leaf count = 79

$$\left\{\left\{y(x) \to -2\text{am}\left(\frac{1}{2}\sqrt{(2a+c_1)\,(x+c_2)^{\,2}}|\frac{4a}{2a+c_1}\right)\right\}, \left\{y(x) \to 2\text{am}\left(\frac{1}{2}\sqrt{(2a+c_1)\,(x+c_2)^{\,2}}|\frac{4a}{2a+c_1}\right)\right\}\right\}$$

Maple ✓
cpu = 0.107 (sec), leaf count = 49

$$\left\{\int^{y(x)} \frac{1}{\sqrt{2\,\cos(\_a)\,a + \_C1}} d\_a - x - \_C2 = 0, \int^{y(x)} -\frac{1}{\sqrt{2\,\cos(\_a)\,a + \_C1}} d\_a - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[a*Sin[y[x]] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -2*JacobiAmplitude[Sqrt[(2*a + C[1])*(x + C[2])^2]/2, (4*a)/(2*a + C[1
])]}, {y[x] -> 2*JacobiAmplitude[Sqrt[(2*a + C[1])*(x + C[2])^2]/2, (4*a)/(2*a +
 C[1])]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*sin(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/(2*cos(_a)*a+_C1)^(1/2),_a = y(x))-x-_C2 = 0, Intat(-1/(2*cos(_a)*a+_C1)
^(1/2),_a = y(x))-x-_C2 = 0
```

4.1785 $ae^{y(x)} + y''(x) = 0$

ODE

$$ae^{y(x)} + y''(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0792714 (sec), leaf count = 35

$$\left\{\left\{y(x) \to \log\left(\frac{c_1 \operatorname{sech}^2\left(\frac{1}{2}\sqrt{c_1\,(c_2+x)^{\,2}}\right)}{2a}\right)\right\}\right\}$$

Maple ✓
cpu = 0.097 (sec), leaf count = 55

$$\left\{-2\,\_C1\,\mathit{Artanh}\left(\sqrt{-2\,a e^{y(x)} + \_C1^{\,-2}}\,\_C1\right) - x - \_C2 = 0, 2\,\_C1\,\mathit{Artanh}\left(\sqrt{-2\,a e^{y(x)} + \_C1^{\,-2}}\,\_C1\right) - x - \_C2 =\right.$$

Mathematica raw input

```
DSolve[a*E^y[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Log[(C[1]*Sech[Sqrt[C[1]*(x + C[2])^2]/2]^2)/(2*a)]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*exp(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
-2*_C1*arctanh((-2*a*exp(y(x))+1/_C1^2)^(1/2)*_C1)-x-_C2 = 0, 2*_C1*arctanh((-2*
a*exp(y(x))+1/_C1^2)^(1/2)*_C1)-x-_C2 = 0
```

4.1786 $y''(x) = f(y(x))$

ODE

$$y''(x) = f(y(x))$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.905141 (sec), leaf count = 38

$$\text{Solve}\left[(c_2+x)^2 = \left(\int_1^{y(x)} \frac{1}{\sqrt{2\int_1^{K[2]} f(K[1])\,dK[1]+c_1}}\,dK[2]\right)^2, y(x)\right]$$

Maple ✓
cpu = 0.083 (sec), leaf count = 51

$$\left\{\int^{y(x)} \frac{1}{\sqrt{2\int f(\_b)\,\mathrm{d}\_b+\_C1}}d\_b-x-\_C2=0, \int^{y(x)} -\frac{1}{\sqrt{2\int f(\_b)\,\mathrm{d}\_b+\_C1}}d\_b-x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[y''[x] == f[y[x]],y[x],x]
```

Mathematica raw output

```
Solve[(x + C[2])^2 == Integrate[1/Sqrt[C[1] + 2*Integrate[f[K[1]], {K[1], 1, K[2
]}]], {K[2], 1, y[x]}]^2, y[x]]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = f(y(x)), y(x),'implicit')
```

Maple raw output

```
Intat(1/(2*Int(f(_b),_b)+_C1)^(1/2),_b = y(x))-x-_C2 = 0, Intat(-1/(2*Int(f(_b),
_b)+_C1)^(1/2),_b = y(x))-x-_C2 = 0
```

4.1787 $y(x)\left(f'(x)+2f(x)^2\right)+3f(x)y'(x)+y''(x)=2y(x)^3$

ODE

$$y(x)\left(f'(x)+2f(x)^2\right)+3f(x)y'(x)+y''(x)=2y(x)^3$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 4.63901 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*(2*f[x]^2 + Derivative[1][f][x]) + 3*f[x]*Derivative[1][y][x] + Derivative[2][y][x] == 2*
```

Maple ✗
cpu = 2.683 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x)+3*f(x)*diff(y(x),x)+(diff(f(x),x)+2*f(x)^2)*y(x) = 2*y(x)^3, y(x),'implic
```

Mathematica raw input

```
DSolve[y[x]*(2*f[x]^2 + f'[x]) + 3*f[x]*y'[x] + y''[x] == 2*y[x]^3,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]*(2*f[x]^2 + Derivative[1][f][x]) + 3*f[x]*Derivative[1][y][x] + Deri
vative[2][y][x] == 2*y[x]^3, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+3*f(x)*diff(y(x),x)+(diff(f(x),x)+2*f(x)^2)*y(x) = 2*y(x)^3, y(x),'implic
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x)+3*f(x)*diff(y(x),x)+(diff(f(x),x)+2*f(x)^2)*y(x) = 2
*y(x)^3, y(x),'implicit')
```

4.1788 $y''(x) + y(x)y'(x) = 0$

ODE

$$y''(x) + y(x)y'(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _exact, _nonlinear], _Lagerstrom, [_2nd_order, _

Book solution method
TO DO

Mathematica ✓
cpu = 0.101989 (sec), leaf count = 34

$$\left\{\left\{y(x) \to \sqrt{2}\sqrt{c_1}\tanh\left(\frac{\sqrt{c_1}(c_2+x)}{\sqrt{2}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.07 (sec), leaf count = 24

$$\left\{\sqrt{2}\_C1\ Artanh\left(\frac{y(x)\sqrt{2}\_C1}{2}\right) - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[2]*Sqrt[C[1]]*Tanh[(Sqrt[C[1]]*(x + C[2]))/Sqrt[2]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
2^(1/2)*_C1*arctanh(1/2*y(x)*2^(1/2)*_C1)-x-_C2 = 0
```

4.1789 $y''(x)+y(x)y'(x)=y(x)^3$

ODE

$$y''(x)+y(x)y'(x)=y(x)^3$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 122.766 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*Derivative[1][y][x] + Derivative[2][y][x] == y[x]^3, y[x], x]
```

Maple ✓
cpu = 0.105 (sec), leaf count = 253

$$\left\{\int^{y(x)}\left(\frac{\_a^2}{2}+\frac{1}{2}\left(\sqrt[3]{\_C1+\sqrt{\_a^6+\_C1^2}}-\_a^2\frac{1}{\sqrt[3]{\_C1+\sqrt{\_a^6+\_C1^2}}}\right)^2\right)^{-1}d\_a-x-\_C2=0,\int^{y(x)}\left(\frac{\_a^2}{2}-\right.\right.$$

Mathematica raw input

```
DSolve[y[x]*y'[x] + y''[x] == y[x]^3,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]*Derivative[1][y][x] + Derivative[2][y][x] == y[x]^3, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x)*diff(y(x),x) = y(x)^3, y(x),'implicit')
```

Maple raw output

```
Intat(1/(1/2*_a^2+1/2*((_C1+(_a^6+_C1^2)^(1/2))^(1/3)-_a^2/(_C1+(_a^6+_C1^2)^(1/
2))^(1/3))^2),_a = y(x))-x-_C2 = 0, Intat(1/(1/2*_a^2+1/2*(-1/2*(_C1+(_a^6+_C1^2
)^(1/2))^(1/3)+1/2*_a^2/(_C1+(_a^6+_C1^2)^(1/2))^(1/3)-1/2*I*3^(1/2)*((_C1+(_a^6
+_C1^2)^(1/2))^(1/3)+_a^2/(_C1+(_a^6+_C1^2)^(1/2))^(1/3)))^2),_a = y(x))-x-_C2 =
 0, Intat(1/(1/2*_a^2+1/2*(-1/2*(_C1+(_a^6+_C1^2)^(1/2))^(1/3)+1/2*_a^2/(_C1+(_a
^6+_C1^2)^(1/2))^(1/3)+1/2*I*3^(1/2)*((_C1+(_a^6+_C1^2)^(1/2))^(1/3)+_a^2/(_C1+(
_a^6+_C1^2)^(1/2))^(1/3)))^2),_a = y(x))-x-_C2 = 0
```

4.1790 $ay(x) + y''(x) + y(x)y'(x) = y(x)^3$

ODE

$$ay(x) + y''(x) + y(x)y'(x) = y(x)^3$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 100.127 (sec), leaf count = 0 , could not solve

```
DSolve[a*y[x] + y[x]*Derivative[1][y][x] + Derivative[2][y][x] == y[x]^3, y[x], x]
```

Maple ✓
cpu = 1.344 (sec), leaf count = 1088

$$\left\{ \int^{y(x)} \frac{1}{-63\_a^2 + 63a} \left(\frac{\left(-\frac{1}{2} + \frac{i}{2}\sqrt{3}\right)^3}{2} \left(126 \frac{1}{-\_a^6 + 3a\_a^4 - 3\_a^2 a^2 + 80\_C1^3 + a^3} \sqrt[3]{-4 \left(\_C1\sqrt{5}\sqrt{\frac{}{-\_a^6 + 3a\_}} \right.} \right. \right. \right.$$

Mathematica raw input

```
DSolve[a*y[x] + y[x]*y'[x] + y''[x] == y[x]^3,y[x],x]
```

Mathematica raw output

```
DSolve[a*y[x] + y[x]*Derivative[1][y][x] + Derivative[2][y][x] == y[x]^3, y[x],
x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)+a*y(x) = y(x)^3, y(x),'implicit')
```

Maple raw output

```
Intat(((-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)*(-_a^2+a)^3/(-4*(_C1*5^(1/2)*(_C
1/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3))^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a^2*a^
2+80*_C1^3+a^3)^2*(-_a^2+a)^3)^(1/3)+(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_a^4*a-3*_a^
```

```
2*a^2+80*_C1^3+a^3))^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)^2*(-_a^
2+a)^3)^(1/3))/(-_a^2+a)/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3),_a = y(x))-x-_
C2 = 0, Intat(1/2*((I*3^(1/2)-1)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)*(-_a^2
+a)^3/(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3))^(1/2)+1/4)
*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)^2*(-_a^2+a)^3)^(1/3)+(-I*3^(1/2)-1)*(-
4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3))^(1/2)+1/4)*(-_a^6+
3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)^2*(-_a^2+a)^3)^(1/3))/(-_a^2+a)/(-_a^6+3*_a^4*
a-3*_a^2*a^2+80*_C1^3+a^3),_a = y(x))-x-_C2 = 0, Intat(1/2*(-(I*3^(1/2)+1)*(-_a^
6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)*(-_a^2+a)^3/(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_
a^4*a-3*_a^2*a^2+80*_C1^3+a^3))^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a
^3)^2*(-_a^2+a)^3)^(1/3)+(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1
^3+a^3))^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)^2*(-_a^2+a)^3)^(1/3
)*(I*3^(1/2)-1))/(-_a^2+a)/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3),_a = y(x))-x
-_C2 = 0, Intat(1/(-63*_a^2+63*a)*(1/2*(-1/2+1/2*I*3^(1/2))^3*(126/(-_a^6+3*_a^4
*a-3*_a^2*a^2+80*_C1^3+a^3)*(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*
_C1^3+a^3))^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)^2*(-_a^2+a)^3)^(
1/3)-126*(_a^6-3*_a^4*a+3*_a^2*a^2-a^3)/(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_a^4*a-3*
_a^2*a^2+80*_C1^3+a^3))^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)^2*(-
_a^2+a)^3)^(1/3)-126)+63),_a = y(x))-x-_C2 = 0, Intat(1/2*((I*3^(1/2)-1)*(-_a^6+
3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)*(-_a^2+a)^3/(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_a^
4*a-3*_a^2*a^2+80*_C1^3+a^3))^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3
)^2*(-_a^2+a)^3)^(1/3)+(-I*3^(1/2)-1)*(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_a^4*a-3*_a
^2*a^2+80*_C1^3+a^3))^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)^2*(-_a
^2+a)^3)^(1/3))/(-_a^2+a)/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3),_a = y(x))-x-
_C2 = 0, Intat(1/2*(-(I*3^(1/2)+1)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)*(-_a
^2+a)^3/(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3))^(1/2)+1/
4)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)^2*(-_a^2+a)^3)^(1/3)+(-4*(_C1*5^(1/2
)*(_C1/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3))^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a
^2*a^2+80*_C1^3+a^3)^2*(-_a^2+a)^3)^(1/3)*(I*3^(1/2)-1))/(-_a^2+a)/(-_a^6+3*_a^4
*a-3*_a^2*a^2+80*_C1^3+a^3),_a = y(x))-x-_C2 = 0, Intat(((-_a^6+3*_a^4*a-3*_a^2*
a^2+80*_C1^3+a^3)*(-_a^2+a)^3/(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_a^4*a-3*_a^2*a^2+8
0*_C1^3+a^3))^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)^2*(-_a^2+a)^3)
^(1/3)+(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3))^(1/2)+1/4
)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)^2*(-_a^2+a)^3)^(1/3))/(-_a^2+a)/(-_a^
6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3),_a = y(x))-x-_C2 = 0, Intat(1/2*((I*3^(1/2)-
1)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)*(-_a^2+a)^3/(-4*(_C1*5^(1/2)*(_C1/(-
_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3))^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80
*_C1^3+a^3)^2*(-_a^2+a)^3)^(1/3)+(-I*3^(1/2)-1)*(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_
a^4*a-3*_a^2*a^2+80*_C1^3+a^3))^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a
^3)^2*(-_a^2+a)^3)^(1/3))/(-_a^2+a)/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3),_a
= y(x))-x-_C2 = 0, Intat(1/2*(-(I*3^(1/2)+1)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3
+a^3)*(-_a^2+a)^3/(-4*(_C1*5^(1/2)*(_C1/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)
)^(1/2)+1/4)*(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3)^2*(-_a^2+a)^3)^(1/3)+(-4*(
_C1*5^(1/2)*(_C1/(-_a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3))^(1/2)+1/4)*(-_a^6+3*_
a^4*a-3*_a^2*a^2+80*_C1^3+a^3)^2*(-_a^2+a)^3)^(1/3)*(I*3^(1/2)-1))/(-_a^2+a)/(-_
a^6+3*_a^4*a-3*_a^2*a^2+80*_C1^3+a^3),_a = y(x))-x-_C2 = 0
```

4.1791 $y''(x)+y(x)y'(x)=12f'(x)-12f(x)y(x)+y(x)^3$

ODE

$$y''(x)+y(x)y'(x)=12f'(x)-12f(x)y(x)+y(x)^3$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 2.39128 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*Derivative[1][y][x] + Derivative[2][y][x] == -12*f[x]*y[x] + y[x]^3 + 12*Derivative[1][f]
```

Maple ✗
cpu = 0.497 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x)+y(x)*diff(y(x),x) = 12*diff(f(x),x)-12*f(x)*y(x)+y(x)^3, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y[x]*y'[x] + y''[x] == -12*f[x]*y[x] + y[x]^3 + 12*f'[x],y[x],x]
```

Mathematica raw output

```
DSolve[y[x]*Derivative[1][y][x] + Derivative[2][y][x] == -12*f[x]*y[x] + y[x]^3
+ 12*Derivative[1][f][x], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x)*diff(y(x),x) = 12*diff(f(x),x)-12*f(x)*y(x)+y(x)^3, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x)+y(x)*diff(y(x),x) = 12*diff(f(x),x)-12*f(x)*y(x)+y(x
)^3, y(x),'implicit')
```

4.1792 $2a^2y(x) + (3a + y(x))y'(x) + ay(x)^2 + y''(x) = y(x)^3$

ODE

$$2a^2y(x) + (3a + y(x))y'(x) + ay(x)^2 + y''(x) = y(x)^3$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 26.101 (sec), leaf count = 0 , could not solve

```
DSolve[2*a^2*y[x] + a*y[x]^2 + (3*a + y[x])*Derivative[1][y][x] + Derivative[2][y][x] == y[x]^3, y[x]
```

Maple ✓
cpu = 0.293 (sec), leaf count = 358

$$\left\{ \frac{1}{a}\left(-\mathrm{e}^{-ax} + \left(-\int^{y(x)\mathrm{e}^{ax}} \frac{1}{2\_f^6 - 2\_C1}\left(-\_f^2\left(i\sqrt{3}-1\right)\left(\_f^6 - \_C1\right) \frac{1}{\sqrt[3]{\left(\_f^6 - \_C1\right)^2\left(-1+\sqrt{\frac{\_C1}{-\_f^6+\_C1}}\right)}} + \right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[2*a^2*y[x] + a*y[x]^2 + (3*a + y[x])*y'[x] + y''[x] == y[x]^3,y[x],x]
```

Mathematica raw output

```
DSolve[2*a^2*y[x] + a*y[x]^2 + (3*a + y[x])*Derivative[1][y][x] + Derivative[2][
y][x] == y[x]^3, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(3*a+y(x))*diff(y(x),x)+2*a^2*y(x)+a*y(x)^2 = y(x)^3, y(x),'implicit')
```

Maple raw output

```
(-exp(-a*x)+(-Intat(1/(-_f^6+_C1)*((_f^6-_C1)^2*(-1+(_C1/(-_f^6+_C1))^(1/2)))^(1
/3)-_f^2/((_f^6-_C1)^2*(-1+(_C1/(-_f^6+_C1))^(1/2)))^(1/3),_f = y(x)*exp(a*x))-_
C2)*a)/a = 0, (-exp(-a*x)+(-Intat((-_f^2*(I*3^(1/2)-1)*(_f^6-_C1)/((_f^6-_C1)^2*
```

```
(-1+(_C1/(-_f^6+_C1))^(1/2)))^(1/3)+((_f^6-_C1)^2*(-1+(_C1/(-_f^6+_C1))^(1/2)))^
(1/3)*(I*3^(1/2)+1))/(2*_f^6-2*_C1),_f = y(x)*exp(a*x))-_C2)*a)/a = 0, (-exp(-a*
x)+(-Intat((_f^2*(I*3^(1/2)+1)*(_f^6-_C1)/((_f^6-_C1)^2*(-1+(_C1/(-_f^6+_C1))^(1
/2)))^(1/3)+(-I*3^(1/2)+1)*((_f^6-_C1)^2*(-1+(_C1/(-_f^6+_C1))^(1/2)))^(1/3))/(2
*_f^6-2*_C1),_f = y(x)*exp(a*x))-_C2)*a)/a = 0
```

4.1793 $y''(x) = y(x)\left(f'(x) - 2f(x)^2\right) + (3f(x) - y(x))y'(x) + f(x)y(x)^2 + y(x)^3$

ODE

$$y''(x) = y(x)\left(f'(x) - 2f(x)^2\right) + (3f(x) - y(x))y'(x) + f(x)y(x)^2 + y(x)^3$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.455828 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == f[x]*y[x]^2 + y[x]^3 + y[x]*(-2*f[x]^2 + Derivative[1][f][x]) + (3*f[x]
```

Maple ✓
cpu = 0.783 (sec), leaf count = 442

$$\left\{ \int e^{\int f(x)\,dx}\,dx - \int^{y(x)e^{-\int f(x)\,dx}} \frac{1}{2\_f^6 - 2\_C1} \left(-\_f^2\left(i\sqrt{3} - 1\right)\left(\_f^6 - \_C1\right) \frac{1}{\sqrt[3]{\left(\_f^6 - \_C1\right)^2\left(-1 + \sqrt{\frac{\_C1}{-\_f^6 + \_C1}}\right.}}\right.\right.$$

Mathematica raw input

```
DSolve[y''[x] == f[x]*y[x]^2 + y[x]^3 + y[x]*(-2*f[x]^2 + f'[x]) + (3*f[x] - y[x])*y'[x],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == f[x]*y[x]^2 + y[x]^3 + y[x]*(-2*f[x]^2 + Derivativ
e[1][f][x]) + (3*f[x] - y[x])*Derivative[1][y][x], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = (3*f(x)-y(x))*diff(y(x),x)+(diff(f(x),x)-2*f(x)^2)*y(x)+f(x)*y(x)^2+y(x
```

Maple raw output

```
y(x) = 0, y(x) = 1/2*(-1-(5+4*exp(Int(f(x),x))*exp(-Int(f(x),x)))^(1/2))/exp(-In
t(f(x),x))/(Int(exp(Int(f(x),x)),x)+_C3), y(x) = 1/2*(-1+(5+4*exp(Int(f(x),x))*e
xp(-Int(f(x),x)))^(1/2))/exp(-Int(f(x),x))/(Int(exp(Int(f(x),x)),x)+_C3), Int(ex
```

```
p(Int(f(x),x)),x)-Intat(1/(-_f^6+_C1)*((_f^6-_C1)^2*(-1+(_C1/(-_f^6+_C1))^(1/2))
)^(1/3)-_f^2/((_f^6-_C1)^2*(-1+(_C1/(-_f^6+_C1))^(1/2)))^(1/3),_f = y(x)*exp(-In
t(f(x),x)))-_C2 = 0, Int(exp(Int(f(x),x)),x)-Intat((-_f^2*(I*3^(1/2)-1)*(_f^6-_C
1)/((_f^6-_C1)^2*(-1+(_C1/(-_f^6+_C1))^(1/2)))^(1/3)+((_f^6-_C1)^2*(-1+(_C1/(-_f
^6+_C1))^(1/2)))^(1/3)*(I*3^(1/2)+1))/(2*_f^6-2*_C1),_f = y(x)*exp(-Int(f(x),x))
)-_C2 = 0, Int(exp(Int(f(x),x)),x)-Intat((_f^2*(I*3^(1/2)+1)*(_f^6-_C1)/((_f^6-_
C1)^2*(-1+(_C1/(-_f^6+_C1))^(1/2)))^(1/3)+(-I*3^(1/2)+1)*((_f^6-_C1)^2*(-1+(_C1/
(-_f^6+_C1))^(1/2)))^(1/3))/(2*_f^6-2*_C1),_f = y(x)*exp(-Int(f(x),x)))-_C2 = 0
```

4.1794 $y''(x) = (3\mathbf{f1}(x) - y(x))y'(x) + \mathbf{f1}(x)y(x)^2 + \mathbf{f2}(x) + \mathbf{f3}(x)y(x) + y(x)^3$

ODE

$$y''(x) = (3\mathrm{f1}(x) - y(x))y'(x) + \mathrm{f1}(x)y(x)^2 + \mathrm{f2}(x) + \mathrm{f3}(x)y(x) + y(x)^3$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 0.403089 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == f2[x] + f3[x]*y[x] + f1[x]*y[x]^2 + y[x]^3 + (3*f1[x] - y[x])*Derivativ
```

Maple ✗
cpu = 0.371 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x) = (3*f1(x)-y(x))*diff(y(x),x)+f2(x)+f3(x)*y(x)+f1(x)*y(x)^2+y(x)^3, y(x),
```

Mathematica raw input

```
DSolve[y''[x] == f2[x] + f3[x]*y[x] + f1[x]*y[x]^2 + y[x]^3 + (3*f1[x] - y[x])*y'[x],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == f2[x] + f3[x]*y[x] + f1[x]*y[x]^2 + y[x]^3 + (3*f1
[x] - y[x])*Derivative[1][y][x], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = (3*f1(x)-y(x))*diff(y(x),x)+f2(x)+f3(x)*y(x)+f1(x)*y(x)^2+y(x)^3, y(x),
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x) = (3*f1(x)-y(x))*diff(y(x),x)+f2(x)+f3(x)*y(x)+f1(x)
*y(x)^2+y(x)^3, y(x),'implicit')
```

4.1795

$$y''(x) = y'(x)(\mathbf{f0}(x)y(x)+\mathbf{f1}(x))+\mathbf{g0}(x)y(x)^3+\mathbf{g1}(x)y(x)^2+\mathbf{g2}(x)y(x)+\mathbf{g3}(x)$$

ODE

$$y''(x) = y'(x)(\text{f0}(x)y(x) + \text{f1}(x)) + \text{g0}(x)y(x)^3 + \text{g1}(x)y(x)^2 + \text{g2}(x)y(x) + \text{g3}(x)$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 0.60001 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == g3[x] + g2[x]*y[x] + g1[x]*y[x]^2 + g0[x]*y[x]^3 + (f1[x] + f0[x]*y[x])
```

Maple ✗
cpu = 1.124 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x) = (f0(x)*y(x)+f1(x))*diff(y(x),x)+g0(x)*y(x)^3+g1(x)*y(x)^2+g2(x)*y(x)+g3
```

Mathematica raw input

```
DSolve[y''[x] == g3[x] + g2[x]*y[x] + g1[x]*y[x]^2 + g0[x]*y[x]^3 + (f1[x] + f0[x]*y[x])*y'[x],y[x],x
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == g3[x] + g2[x]*y[x] + g1[x]*y[x]^2 + g0[x]*y[x]^3 +
 (f1[x] + f0[x]*y[x])*Derivative[1][y][x], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = (f0(x)*y(x)+f1(x))*diff(y(x),x)+g0(x)*y(x)^3+g1(x)*y(x)^2+g2(x)*y(x)+g3
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x) = (f0(x)*y(x)+f1(x))*diff(y(x),x)+g0(x)*y(x)^3+g1(x)
*y(x)^2+g2(x)*y(x)+g3(x), y(x),'implicit')
```

4.1796 $y''(x) = y(x)f'(x) + (f(x) - 2y(x))y'(x)$

ODE

$$y''(x) = y(x)f'(x) + (f(x) - 2y(x))y'(x)$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 39.6725 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == y[x]*Derivative[1][f][x] + (f[x] - 2*y[x])*Derivative[1][y][x], y[x], x
```

Maple ✓
cpu = 0.227 (sec), leaf count = 47

$$\left\{y(x) = ODESolStruc\left(\_b(\_a), [\left\{\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a) = -(\_b(\_a))^2 + f(\_a)\,\_b(\_a) - \_C1\right\}, \{\_a = x, \_b(\_a) = y(x)\}, \{x\right.\right.$$

Mathematica raw input

```
DSolve[y''[x] == y[x]*f'[x] + (f[x] - 2*y[x])*y'[x],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == y[x]*Derivative[1][f][x] + (f[x] - 2*y[x])*Derivat
ive[1][y][x], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = (f(x)-2*y(x))*diff(y(x),x)+diff(f(x),x)*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_b(_a),[{diff(_b(_a),_a) = -_b(_a)^2+f(_a)*_b(_a)-_C1}, {_a =
 x, _b(_a) = y(x)}, {x = _a, y(x) = _b(_a)}])
```

4.1797 $y''(x) = (f(x) - 2y(x))y'(x) + f(x)y(x)^2 + g(x)$

ODE

$$y''(x) = (f(x) - 2y(x))y'(x) + f(x)y(x)^2 + g(x)$$

ODE Classification

[[_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.306519 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == g[x] + f[x]*y[x]^2 + (f[x] - 2*y[x])*Derivative[1][y][x], y[x], x]
```

Maple ✓
cpu = 0.631 (sec), leaf count = 72

$$\left\{y(x) = ODESolStruc\left(\_b(\_a), [\left\{\frac{1}{e^{\int f(\_a)\,d\_a}}\left(\_C1\, e^{\int f(\_a)\,d\_a} + (\_b(\_a))^2 - \int \frac{g(\_a)}{e^{\int f(\_a)\,d\_a}}\,d\_a e^{\int f(\_a)\,d\_a} + \frac{d}{d\_a}\_b\right.\right.\right.$$

Mathematica raw input

```
DSolve[y''[x] == g[x] + f[x]*y[x]^2 + (f[x] - 2*y[x])*y'[x],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == g[x] + f[x]*y[x]^2 + (f[x] - 2*y[x])*Derivative[1]
[y][x], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = (f(x)-2*y(x))*diff(y(x),x)+g(x)+f(x)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_b(_a),[{(_C1*exp(Int(f(_a),_a))+_b(_a)^2-Int(1/exp(Int(f(_a)
,_a))*g(_a),_a)*exp(Int(f(_a),_a))+diff(_b(_a),_a))/exp(Int(f(_a),_a)) = 0}, {_a
 = x, _b(_a) = y(x)}, {x = _a, y(x) = _b(_a)}])
```

4.1798 $y''(x) = (\mathbf{f1}(x) - 2y(x))y'(x) + \mathbf{f2}(x)y(x)^2 + \mathbf{f3}(x)$

ODE

$$y''(x) = (\mathrm{f1}(x) - 2y(x))y'(x) + \mathrm{f2}(x)y(x)^2 + \mathrm{f3}(x)$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 0.349268 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == f3[x] + f2[x]*y[x]^2 + (f1[x] - 2*y[x])*Derivative[1][y][x], y[x], x]
```

Maple ✗
cpu = 0.327 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x) = (f1(x)-2*y(x))*diff(y(x),x)+f2(x)*y(x)^2+f3(x), y(x),'implicit')
```

Mathematica raw input

```
DSolve[y''[x] == f3[x] + f2[x]*y[x]^2 + (f1[x] - 2*y[x])*y'[x],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == f3[x] + f2[x]*y[x]^2 + (f1[x] - 2*y[x])*Derivative
[1][y][x], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = (f1(x)-2*y(x))*diff(y(x),x)+f2(x)*y(x)^2+f3(x), y(x),'implicit')
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x) = (f1(x)-2*y(x))*diff(y(x),x)+f2(x)*y(x)^2+f3(x), y(
x),'implicit')
```

4.1799 $y''(x) = (\mathbf{f1}(x) - 2y(x))y'(x) + \mathbf{f2}(x)y(x)^2 + \mathbf{f3}(x)y(x) + \mathbf{f4}(x)$

ODE

$$y''(x) = (\mathrm{f1}(x) - 2y(x))y'(x) + \mathrm{f2}(x)y(x)^2 + \mathrm{f3}(x)y(x) + \mathrm{f4}(x)$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 0.348023 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == f4[x] + f3[x]*y[x] + f2[x]*y[x]^2 + (f1[x] - 2*y[x])*Derivative[1][y][x
```

Maple ✗
cpu = 0.428 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x) = (f1(x)-2*y(x))*diff(y(x),x)+f2(x)*y(x)^2+f3(x)*y(x)+f4(x), y(x),'implic
```

Mathematica raw input

```
DSolve[y''[x] == f4[x] + f3[x]*y[x] + f2[x]*y[x]^2 + (f1[x] - 2*y[x])*y'[x],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == f4[x] + f3[x]*y[x] + f2[x]*y[x]^2 + (f1[x] - 2*y[x
])*Derivative[1][y][x], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = (f1(x)-2*y(x))*diff(y(x),x)+f2(x)*y(x)^2+f3(x)*y(x)+f4(x), y(x),'implic
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x) = (f1(x)-2*y(x))*diff(y(x),x)+f2(x)*y(x)^2+f3(x)*y(x
)+f4(x), y(x),'implicit')
```

4.1800 $y''(x) = a + 4b^2 y(x) + 3by(x)^2 + 3y(x)y'(x)$

ODE

$$y''(x) = a + 4b^2 y(x) + 3by(x)^2 + 3y(x)y'(x)$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducible,

Book solution method
TO DO

Mathematica ✓
cpu = 10.979 (sec), leaf count = 2742

$$\left\{\left\{y(x) \to \frac{-i\,2^{\frac{\sqrt{4b^3-3a}}{b^{3/2}}}\,3^{\frac{3\left(b^3+\sqrt{4b^6-3ab^3}\right)}{2b^3}}\,a^{\frac{\sqrt{4b^3-3a}}{2b^{3/2}}}\,b^{\frac{\sqrt{4b^6-3ab^3}}{b^3}+3}\left(\frac{e^{-2bx}}{a}\right)^{\frac{\sqrt{4b^3-3a}}{2b^{3/2}}} I_{\frac{\sqrt{4b^6-3ab^3}}{2b^3}}\left(\frac{\sqrt{\frac{3}{2}}\sqrt{a}\sqrt{\frac{e^{-2bx}}{a}}\sqrt{c_1}}{b}\right)\Gamma\left(\frac{\sqrt{4b^6-}\right.\right.\right.$$

Maple ✓
cpu = 0.646 (sec), leaf count = 849

$$\left\{\int^{y(x)} -2\,b^2\left(-4\_a\,b^3 - 3\,b^2\_a^2 + \left(RootOf\left(6\,K_{1/2\,\frac{-4\,b^3+3\,a}{\sqrt{4\,b^4-3\,abb}}}\left(-1/2\,\frac{\sqrt{3}\_Z}{b^2}\right)\_C1\,b^2 + 9\,K_{1/2\,\frac{-4\,b^3+3\,a}{\sqrt{4\,b^4-3\,abb}}}\left(-1/2\,\frac{\sqrt{3}\_Z}{b^2}\right.\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[y''[x] == a + 4*b^2*y[x] + 3*b*y[x]^2 + 3*y[x]*y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2^(1/2 + (3*Sqrt[-3*a + 4*b^3])/(2*b^(3/2)))*3^(Sqrt[-3*a*b^3 + 4*b^6
]/(2*b^3))*a^(Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3))*b^(Sqrt[-3*a + 4*b^3]/b^(3/2))*(-2
*b^3 - b^(3/2)*Sqrt[-3*a + 4*b^3] + Sqrt[-3*a*b^3 + 4*b^6])*(1/(a*E^(2*b*x)))^(S
qrt[-3*a*b^3 + 4*b^6]/(2*b^3))*BesselI[-Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3), (Sqrt[3/
2]*Sqrt[a]*Sqrt[1/(a*E^(2*b*x))]*Sqrt[C[1]])/b]*C[1]^(Sqrt[-3*a*b^3 + 4*b^6]/(2*
b^3))*C[2]*Gamma[1 - Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3)] + 2^((3*Sqrt[-3*a + 4*b^3])
/(2*b^(3/2)))*3^((b^3 + Sqrt[-3*a*b^3 + 4*b^6])/(2*b^3))*a^((b^3 + Sqrt[-3*a*b^3
 + 4*b^6])/(2*b^3))*b^(2 + Sqrt[-3*a + 4*b^3]/b^(3/2))*(1/(a*E^(2*b*x)))^((b^3 +
 Sqrt[-3*a*b^3 + 4*b^6])/(2*b^3))*BesselI[-1 - Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3), (
```

```
Sqrt[3/2]*Sqrt[a]*Sqrt[1/(a*E^(2*b*x))]*Sqrt[C[1]])/b]*C[1]^((b^3 + Sqrt[-3*a*b^
3 + 4*b^6])/(2*b^3))*C[2]*Gamma[1 - Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3)] + 2^((3*Sqrt
[-3*a + 4*b^3])/(2*b^(3/2)))*3^((b^3 + Sqrt[-3*a*b^3 + 4*b^6])/(2*b^3))*a^((b^3
+ Sqrt[-3*a*b^3 + 4*b^6])/(2*b^3))*b^(2 + Sqrt[-3*a + 4*b^3]/b^(3/2))*(1/(a*E^(2
*b*x)))^((b^3 + Sqrt[-3*a*b^3 + 4*b^6])/(2*b^3))*BesselI[1 - Sqrt[-3*a*b^3 + 4*b
^6]/(2*b^3), (Sqrt[3/2]*Sqrt[a]*Sqrt[1/(a*E^(2*b*x))]*Sqrt[C[1]])/b]*C[1]^((b^3
+ Sqrt[-3*a*b^3 + 4*b^6])/(2*b^3))*C[2]*Gamma[1 - Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3)
] - I^(Sqrt[-3*a + 4*b^3]/b^(3/2))*2^((3*(b^3 + Sqrt[-3*a*b^3 + 4*b^6]))/(2*b^3)
)*3^(Sqrt[-3*a + 4*b^3]/(2*b^(3/2)))*a^(Sqrt[-3*a + 4*b^3]/(2*b^(3/2)))*b^(3 + S
qrt[-3*a*b^3 + 4*b^6]/b^3)*(1/(a*E^(2*b*x)))^(Sqrt[-3*a + 4*b^3]/(2*b^(3/2)))*Be
sselI[Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3), (Sqrt[3/2]*Sqrt[a]*Sqrt[1/(a*E^(2*b*x))]*S
qrt[C[1]])/b]*C[1]^(Sqrt[-3*a + 4*b^3]/(2*b^(3/2)))*Gamma[1 + Sqrt[-3*a*b^3 + 4*
b^6]/(2*b^3)] + I^(Sqrt[-3*a + 4*b^3]/b^(3/2))*2^(1/2 + (3*Sqrt[-3*a*b^3 + 4*b^6
])/(2*b^3))*3^(Sqrt[-3*a + 4*b^3]/(2*b^(3/2)))*a^(Sqrt[-3*a + 4*b^3]/(2*b^(3/2))
)*b^(3/2 + Sqrt[-3*a*b^3 + 4*b^6]/b^3)*Sqrt[-3*a + 4*b^3]*(1/(a*E^(2*b*x)))^(Sqr
t[-3*a + 4*b^3]/(2*b^(3/2)))*BesselI[Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3), (Sqrt[3/2]*
Sqrt[a]*Sqrt[1/(a*E^(2*b*x))]*Sqrt[C[1]])/b]*C[1]^(Sqrt[-3*a + 4*b^3]/(2*b^(3/2)
))*Gamma[1 + Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3)] - I^(Sqrt[-3*a + 4*b^3]/b^(3/2))*2^
(1/2 + (3*Sqrt[-3*a*b^3 + 4*b^6])/(2*b^3))*3^(Sqrt[-3*a + 4*b^3]/(2*b^(3/2)))*a^
(Sqrt[-3*a + 4*b^3]/(2*b^(3/2)))*b^(Sqrt[-3*a*b^3 + 4*b^6]/b^3)*Sqrt[-3*a*b^3 +
4*b^6]*(1/(a*E^(2*b*x)))^(Sqrt[-3*a + 4*b^3]/(2*b^(3/2)))*BesselI[Sqrt[-3*a*b^3
+ 4*b^6]/(2*b^3), (Sqrt[3/2]*Sqrt[a]*Sqrt[1/(a*E^(2*b*x))]*Sqrt[C[1]])/b]*C[1]^(
Sqrt[-3*a + 4*b^3]/(2*b^(3/2)))*Gamma[1 + Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3)] + I^(S
qrt[-3*a + 4*b^3]/b^(3/2))*2^((3*Sqrt[-3*a*b^3 + 4*b^6])/(2*b^3))*3^((1 + Sqrt[-
3*a + 4*b^3]/b^(3/2))/2)*a^((1 + Sqrt[-3*a + 4*b^3]/b^(3/2))/2)*b^(2 + Sqrt[-3*a
*b^3 + 4*b^6]/b^3)*(1/(a*E^(2*b*x)))^((1 + Sqrt[-3*a + 4*b^3]/b^(3/2))/2)*Bessel
I[-1 + Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3), (Sqrt[3/2]*Sqrt[a]*Sqrt[1/(a*E^(2*b*x))]*
Sqrt[C[1]])/b]*C[1]^((1 + Sqrt[-3*a + 4*b^3]/b^(3/2))/2)*Gamma[1 + Sqrt[-3*a*b^3
 + 4*b^6]/(2*b^3)] + I^(Sqrt[-3*a + 4*b^3]/b^(3/2))*2^((3*Sqrt[-3*a*b^3 + 4*b^6]
)/(2*b^3))*3^((1 + Sqrt[-3*a + 4*b^3]/b^(3/2))/2)*a^((1 + Sqrt[-3*a + 4*b^3]/b^(
3/2))/2)*b^(2 + Sqrt[-3*a*b^3 + 4*b^6]/b^3)*(1/(a*E^(2*b*x)))^((1 + Sqrt[-3*a +
4*b^3]/b^(3/2))/2)*BesselI[1 + Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3), (Sqrt[3/2]*Sqrt[a
]*Sqrt[1/(a*E^(2*b*x))]*Sqrt[C[1]])/b]*C[1]^((1 + Sqrt[-3*a + 4*b^3]/b^(3/2))/2)
*Gamma[1 + Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3)])/(3*Sqrt[2]*b^2*(2^((3*Sqrt[-3*a + 4*
b^3])/(2*b^(3/2)))*3^(Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3))*a^(Sqrt[-3*a*b^3 + 4*b^6]/
(2*b^3))*b^(Sqrt[-3*a + 4*b^3]/b^(3/2))*(1/(a*E^(2*b*x)))^(Sqrt[-3*a*b^3 + 4*b^6
]/(2*b^3))*BesselI[-Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3), (Sqrt[3/2]*Sqrt[a]*Sqrt[1/(a
*E^(2*b*x))]*Sqrt[C[1]])/b]*C[1]^(Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3))*C[2]*Gamma[1 -
 Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3)] + I^(Sqrt[-3*a + 4*b^3]/b^(3/2))*2^((3*Sqrt[-3*
a*b^3 + 4*b^6])/(2*b^3))*3^(Sqrt[-3*a + 4*b^3]/(2*b^(3/2)))*a^(Sqrt[-3*a + 4*b^3
]/(2*b^(3/2)))*b^(Sqrt[-3*a*b^3 + 4*b^6]/b^3)*(1/(a*E^(2*b*x)))^(Sqrt[-3*a + 4*b
^3]/(2*b^(3/2)))*BesselI[Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3), (Sqrt[3/2]*Sqrt[a]*Sqrt
[1/(a*E^(2*b*x))]*Sqrt[C[1]])/b]*C[1]^(Sqrt[-3*a + 4*b^3]/(2*b^(3/2)))*Gamma[1 +
 Sqrt[-3*a*b^3 + 4*b^6]/(2*b^3)])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = 3*y(x)*diff(y(x),x)+a+4*b^2*y(x)+3*b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
Intat(-2/(-4*_a*b^3-3*b^2*_a^2+RootOf(6*BesselK(1/2*(-4*b^3+3*a)/(4*b^4-3*a*b)^(
1/2)/b,-1/2/b^2*3^(1/2)*_Z)*_C1*b^2+9*BesselK(1/2*(-4*b^3+3*a)/(4*b^4-3*a*b)^(1/
2)/b,-1/2/b^2*3^(1/2)*_Z)*_C1*b*_a-3*(4*b^4-3*a*b)^(1/2)*BesselK(1/2*(-4*b^3+3*a
)/(4*b^4-3*a*b)^(1/2)/b,-1/2/b^2*3^(1/2)*_Z)*_C1+3*BesselK(1/2*(4*b^3+2*(4*b^4-3
*a*b)^(1/2)*b-3*a)/(4*b^4-3*a*b)^(1/2)/b,-1/2/b^2*3^(1/2)*_Z)*3^(1/2)*_C1*_Z+6*B
esselI(-1/2*(-4*b^3+3*a)/(4*b^4-3*a*b)^(1/2)/b,-1/2/b^2*3^(1/2)*_Z)*b^2+9*Bessel
I(-1/2*(-4*b^3+3*a)/(4*b^4-3*a*b)^(1/2)/b,-1/2/b^2*3^(1/2)*_Z)*b*_a-3*BesselI(1/
2*(4*b^3+2*(4*b^4-3*a*b)^(1/2)*b-3*a)/(4*b^4-3*a*b)^(1/2)/b,-1/2/b^2*3^(1/2)*_Z)
*3^(1/2)*_Z-3*(4*b^4-3*a*b)^(1/2)*BesselI(-1/2*(-4*b^3+3*a)/(4*b^4-3*a*b)^(1/2)/
b,-1/2/b^2*3^(1/2)*_Z))^2-a*b)*b^2,_a = y(x))-x-_C2 = 0, Intat(-2/(-4*_a*b^3-3*b
^2*_a^2+RootOf(6*BesselK(1/2*(-4*b^3+3*a)/(4*b^4-3*a*b)^(1/2)/b,1/2/b^2*3^(1/2)*
_Z)*_C1*b^2+9*BesselK(1/2*(-4*b^3+3*a)/(4*b^4-3*a*b)^(1/2)/b,1/2/b^2*3^(1/2)*_Z)
*_C1*b*_a-3*(4*b^4-3*a*b)^(1/2)*BesselK(1/2*(-4*b^3+3*a)/(4*b^4-3*a*b)^(1/2)/b,1
/2/b^2*3^(1/2)*_Z)*_C1+3*BesselK(1/2*(4*b^3+2*(4*b^4-3*a*b)^(1/2)*b-3*a)/(4*b^4-
3*a*b)^(1/2)/b,1/2/b^2*3^(1/2)*_Z)*3^(1/2)*_C1*_Z+6*BesselI(-1/2*(-4*b^3+3*a)/(4
*b^4-3*a*b)^(1/2)/b,1/2/b^2*3^(1/2)*_Z)*b^2+9*BesselI(-1/2*(-4*b^3+3*a)/(4*b^4-3
*a*b)^(1/2)/b,1/2/b^2*3^(1/2)*_Z)*b*_a-3*BesselI(1/2*(4*b^3+2*(4*b^4-3*a*b)^(1/2
)*b-3*a)/(4*b^4-3*a*b)^(1/2)/b,1/2/b^2*3^(1/2)*_Z)*3^(1/2)*_Z-3*(4*b^4-3*a*b)^(1
/2)*BesselI(-1/2*(-4*b^3+3*a)/(4*b^4-3*a*b)^(1/2)/b,1/2/b^2*3^(1/2)*_Z))^2-a*b)*
b^2,_a = y(x))-x-_C2 = 0
```

4.1801 $y''(x) + 3y(x)y'(x) = f(x) + g(x)y(x) - y(x)^3$

ODE

$$y''(x) + 3y(x)y'(x) = f(x) + g(x)y(x) - y(x)^3$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 4.8446 (sec), leaf count = 0 , could not solve

```
DSolve[3*y[x]*Derivative[1][y][x] + Derivative[2][y][x] == f[x] + g[x]*y[x] - y[x]^3, y[x], x]
```

Maple ✗
cpu = 0.009 (sec), leaf count = 0 , result contains DESol

$$\left\{ y(x) = \frac{\frac{\mathrm{d}}{\mathrm{d}x} DESol\left(\left\{-f(x)\_Y(x) - g(x)\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x) + \frac{\mathrm{d}^3}{\mathrm{d}x^3}\_Y(x)\right\}, \{\_Y(x)\}\right)}{DESol\left(\left\{-f(x)\_Y(x) - g(x)\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x) + \frac{\mathrm{d}^3}{\mathrm{d}x^3}\_Y(x)\right\}, \{\_Y(x)\}\right)} \right\}$$

Mathematica raw input

```
DSolve[3*y[x]*y'[x] + y''[x] == f[x] + g[x]*y[x] - y[x]^3,y[x],x]
```

Mathematica raw output

```
DSolve[3*y[x]*Derivative[1][y][x] + Derivative[2][y][x] == f[x] + g[x]*y[x] - y[
x]^3, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+3*y(x)*diff(y(x),x) = f(x)+g(x)*y(x)-y(x)^3, y(x),'implicit')
```

Maple raw output

```
y(x) = diff(DESol({-f(x)*_Y(x)-g(x)*diff(_Y(x),x)+diff(diff(diff(_Y(x),x),x),x)}
,{_Y(x)}),x)/DESol({-f(x)*_Y(x)-g(x)*diff(_Y(x),x)+diff(diff(diff(_Y(x),x),x),x)
},{_Y(x)})
```

4.1802 $y''(x) = (f(x) - 3y(x))y'(x) + f(x)y(x)^2 - y(x)^3$

ODE

$$y''(x) = (f(x) - 3y(x))y'(x) + f(x)y(x)^2 - y(x)^3$$

ODE Classification

[[_2nd_order, _with_potential_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0389145 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == f[x]*y[x]^2 - y[x]^3 + (f[x] - 3*y[x])*Derivative[1][y][x], y[x], x]
```

Maple ✓
cpu = 0.07 (sec), leaf count = 40

$$\left\{ y(x) + \frac{-\int \_C1\, e^{\int f(x)\,dx}\,dx - \_C2}{\iint \_C1\, e^{\int f(x)\,dx}\,dx\,dx + \_C2\, x + 1} = 0 \right\}$$

Mathematica raw input

```
DSolve[y''[x] == f[x]*y[x]^2 - y[x]^3 + (f[x] - 3*y[x])*y'[x],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == f[x]*y[x]^2 - y[x]^3 + (f[x] - 3*y[x])*Derivative[
1][y][x], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = (f(x)-3*y(x))*diff(y(x),x)+f(x)*y(x)^2-y(x)^3, y(x),'implicit')
```

Maple raw output

```
y(x)+(-Int(_C1*exp(Int(f(x),x)),x)-_C2)/(Int(Int(_C1*exp(Int(f(x),x)),x),x)+_C2*
x+1) = 0
```

4.1803 $y''(x) = a(2y(x)y'(x) + 1)$

ODE

$$y''(x) = a(2y(x)y'(x) + 1)$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _m

Book solution method
TO DO

Mathematica ✓
cpu = 0.276474 (sec), leaf count = 102

$$\left\{\left\{y(x) \to \frac{a\left(c_2 \text{Ai}'\left(\frac{a(c_1-ax)}{(-a^2)^{2/3}}\right)+\text{Bi}'\left(\frac{a(c_1-ax)}{(-a^2)^{2/3}}\right)\right)}{(-a^2)^{2/3}\left(c_2 \text{Ai}\left(\frac{a(c_1-ax)}{(-a^2)^{2/3}}\right)+\text{Bi}\left(\frac{a(c_1-ax)}{(-a^2)^{2/3}}\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.189 (sec), leaf count = 58

$$\left\{\int^{y(x)} \left(\_a^2 a + RootOf\left(\sqrt[3]{-a}\text{Bi}(\_Z)\_C1\ \_a + \text{Ai}(\_Z)\sqrt[3]{-a}\_a + \text{Bi}^{(1)}(\_Z)\_C1 + \text{Ai}^{(1)}(\_Z)\right)\sqrt[3]{-a}\right)^{-1} d\_a - x - \_C$$

Mathematica raw input

```
DSolve[y''[x] == a*(1 + 2*y[x]*y'[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a*(AiryBiPrime[(a*(-(a*x) + C[1]))/(-a^2)^(2/3)] + AiryAiPrime[(a*(-(
a*x) + C[1]))/(-a^2)^(2/3)]*C[2]))/((-a^2)^(2/3)*(AiryBi[(a*(-(a*x) + C[1]))/(-a
^2)^(2/3)] + AiryAi[(a*(-(a*x) + C[1]))/(-a^2)^(2/3)]*C[2]))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a*(1+2*y(x)*diff(y(x),x)), y(x),'implicit')
```

Maple raw output

```
Intat(1/(_a^2*a+RootOf((-a)^(1/3)*AiryBi(_Z)*_C1*_a+AiryAi(_Z)*(-a)^(1/3)*_a+Air
yBi(1,_Z)*_C1+AiryAi(1,_Z))*(-a)^(1/3)),_a = y(x))-x-_C2 = 0
```

4.1804 $a(y(x)^2-1)\,y'(x)+by(x)+y''(x)=0$

ODE

$$a(y(x)^2-1)\,y'(x)+by(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 32.9431 (sec), leaf count = 0 , could not solve

```
DSolve[b*y[x] + a*(-1 + y[x]^2)*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 1.026 (sec), leaf count = 60

$$\left\{y(x)=ODESolStruc\left(\_a,[\left\{\left(\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a)\right)\_b(\_a)+\left(\_a^2a-a\right)\_b(\_a)+b\_a=0\right\},\left\{\_a=y(x),\_b(\_a)=\frac{\mathrm{d}}{\mathrm{d}x}y(x\right.\right.$$

Mathematica raw input

```
DSolve[b*y[x] + a*(-1 + y[x]^2)*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[b*y[x] + a*(-1 + y[x]^2)*Derivative[1][y][x] + Derivative[2][y][x] == 0,
y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*(y(x)^2-1)*diff(y(x),x)+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a,[{diff(_b(_a),_a)*_b(_a)+(_a^2*a-a)*_b(_a)+b*_a = 0}, {_a
= y(x), _b(_a) = diff(y(x),x)}, {x = Int(1/_b(_a),_a)+_C1, y(x) = _a}])
```

4.1805 $y'(x)f(x,y(x))+g(x,y(x))+y''(x)=0$

ODE

$$y'(x)f(x,y(x))+g(x,y(x))+y''(x)=0$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 0.584661 (sec), leaf count = 0 , could not solve

```
DSolve[g[x, y[x]] + f[x, y[x]]*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✗
cpu = 0.004 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(y(x),x),x)+f(x,y(x))*diff(y(x),x)+g(x,y(x)) = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[g[x, y[x]] + f[x, y[x]]*y'[x] + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[g[x, y[x]] + f[x, y[x]]*Derivative[1][y][x] + Derivative[2][y][x] == 0, y
[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+f(x,y(x))*diff(y(x),x)+g(x,y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
dsolve(diff(diff(y(x),x),x)+f(x,y(x))*diff(y(x),x)+g(x,y(x)) = 0, y(x),'implicit
')
```

4.1806 $y''(x) = (x^2 - y'(x))^2 + 2x$

ODE

$$y''(x) = (x^2 - y'(x))^2 + 2x$$

ODE Classification

[[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.014807 (sec), leaf count = 24

$$\left\{\left\{y(x) \to -\log(c_1 - x) + c_2 + \frac{x^3}{3}\right\}\right\}$$

Maple ✓
cpu = 0.069 (sec), leaf count = 27

$$\left\{\frac{1}{x}\left(\_C2\, x - \mathrm{e}^{\frac{x^3}{3} - y(x)} - \_C1\right) = 0\right\}$$

Mathematica raw input

```
DSolve[y''[x] == 2*x + (x^2 - y'[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^3/3 + C[2] - Log[-x + C[1]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = 2*x+(x^2-diff(y(x),x))^2, y(x),'implicit')
```

Maple raw output

```
(_C2*x-exp(1/3*x^3-y(x))-_C1)/x = 0
```

4.1807 $y''(x) + 2y'(x)^2 \tan(y(x)) + 2\cot(x)y'(x) = 0$

ODE

$$y''(x) + 2y'(x)^2 \tan(y(x)) + 2\cot(x)y'(x) = 0$$

ODE Classification

[_Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.440884 (sec), leaf count = 14

$$\{\{y(x) \to \tan^{-1}(c_1 \cot(x) + c_2)\}\}$$

Maple ✓
cpu = 0.044 (sec), leaf count = 24

$$\left\{\frac{\sin(y(x))}{\cos(y(x))} + \frac{\_C1\ \cos(x)}{\sin(x)} - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[2*Cot[x]*y'[x] + 2*Tan[y[x]]*y'[x]^2 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ArcTan[C[2] + C[1]*Cot[x]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*diff(y(x),x)^2*tan(y(x))+2*cot(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
1/cos(y(x))*sin(y(x))+_C1/sin(x)*cos(x)-_C2 = 0
```

4.1808 $y''(x) = ay'(x)^2$

ODE

$$y''(x) = ay'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0284116 (sec), leaf count = 20

$$\left\{\left\{y(x) \to c_2 - \frac{\log(ax + c_1)}{a}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 22

$$\left\{-\frac{e^{-ay(x)}}{a} - \_C1\, x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y''[x] == a*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] - Log[a*x + C[1]]/a}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
-1/a*exp(-a*y(x))-_C1*x-_C2 = 0
```

4.1809 $y''(x) = a^2 + b^2 y'(x)^2$

ODE

$$y''(x) = a^2 + b^2 y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.067127 (sec), leaf count = 22

$$\left\{\left\{y(x) \to c_2 - \frac{\log\left(\cos\left(ab(c_1 + x)\right)\right)}{b^2}\right\}\right\}$$

Maple ✓
cpu = 0.053 (sec), leaf count = 29

$$\left\{-\_C1 \sin(abx) + \_C2 \cos(abx) + \mathrm{e}^{-b^2 y(x)} a = 0\right\}$$

Mathematica raw input

```
DSolve[y''[x] == a^2 + b^2*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] - Log[Cos[a*b*(x + C[1])]]/b^2}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a^2+b^2*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
-_C1*sin(a*b*x)+_C2*cos(a*b*x)+exp(-b^2*y(x))*a = 0
```

4.1810 $ay'(x)^2 + by(x) + y''(x) = 0$

ODE

$$ay'(x)^2 + by(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 101.668 (sec), leaf count = 0 , could not solve

```
DSolve[b*y[x] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.168 (sec), leaf count = 79

$$\left\{\int^{y(x)} -2\frac{a}{\sqrt{4\,\mathrm{e}^{-2\_a\,a}\_C1\,a^2-4\,b\_a\,a+2\,b}}d\_a-x-\_C2=0,\int^{y(x)}2\frac{a}{\sqrt{4\,\mathrm{e}^{-2\_a\,a}\_C1\,a^2-4\,b\_a\,a+2\,b}}d\_a-x-\_\right.$$

Mathematica raw input

```
DSolve[b*y[x] + a*y'[x]^2 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[b*y[x] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)^2+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
Intat(-2/(4*exp(-2*_a*a)*_C1*a^2-4*b*_a*a+2*b)^(1/2)*a,_a = y(x))-x-_C2 = 0, Int
at(2/(4*exp(-2*_a*a)*_C1*a^2-4*b*_a*a+2*b)^(1/2)*a,_a = y(x))-x-_C2 = 0
```

4.1811 $ay'(x)^2 + b\sin(y(x)) + y''(x) = 0$

ODE

$$ay'(x)^2 + b\sin(y(x)) + y''(x) = 0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 100.106 (sec), leaf count = 0 , could not solve

```
DSolve[b*Sin[y[x]] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.173 (sec), leaf count = 115

$$\left\{\int^{y(x)} (-4a^2-1)\frac{1}{\sqrt{16\_C1\ (a^2+1/4)^2\,\mathrm{e}^{-2\_a\,a} - 16\ (a\sin(\_a) - 1/2\cos(\_a))\,(a^2+1/4)\,b}}d\_a - x - \_C2 = 0, \int^{y(x)}\right.$$

Mathematica raw input

```
DSolve[b*Sin[y[x]] + a*y'[x]^2 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[b*Sin[y[x]] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0, y[x], x
]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)^2+b*sin(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
Intat((4*a^2+1)/(16*_C1*(a^2+1/4)^2*exp(-2*_a*a)-16*(a*sin(_a)-1/2*cos(_a))*(a^2
+1/4)*b)^(1/2),_a = y(x))-x-_C2 = 0, Intat((-4*a^2-1)/(16*_C1*(a^2+1/4)^2*exp(-2
*_a*a)-16*(a*sin(_a)-1/2*cos(_a))*(a^2+1/4)*b)^(1/2),_a = y(x))-x-_C2 = 0
```

4.1812 $ay'(x)^2 + by'(x) + cy(x) + y''(x) = 0$

ODE

$$ay'(x)^2 + by'(x) + cy(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 29.0765 (sec), leaf count = 0 , could not solve

```
DSolve[c*y[x] + b*Derivative[1][y][x] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.557 (sec), leaf count = 58

$$\left\{y(x) = ODESolStruc\left(\_a, [\left\{\left(\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a)\right)\_b(\_a) + a(\_b(\_a))^2 + \_b(\_a)\,b + c\_a = 0\right\}, \left\{\_a = y(x), \_b(\_a) = \frac{\mathrm{d}}{\mathrm{d}x}\right.\right.$$

Mathematica raw input

```
DSolve[c*y[x] + b*y'[x] + a*y'[x]^2 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[c*y[x] + b*Derivative[1][y][x] + a*Derivative[1][y][x]^2 + Derivative[2][
y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)^2+b*diff(y(x),x)+c*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a,[{diff(_b(_a),_a)*_b(_a)+a*_b(_a)^2+_b(_a)*b+c*_a = 0}, {_
a = y(x), _b(_a) = diff(y(x),x)}, {x = Int(1/_b(_a),_a)+_C1, y(x) = _a}])
```

4.1813 $y''(x) = e^x y'(x)^2$

ODE

$$y''(x) = e^x y'(x)^2$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0150912 (sec), leaf count = 26

$$\left\{\left\{y(x) \to \frac{\log(c_1 + e^x) + c_1 c_2 - x}{c_1}\right\}\right\}$$

Maple ✓
cpu = 0.098 (sec), leaf count = 24

$$\left\{y(x) = \frac{\_C2\,\_C1 - \ln(e^x - \_C1) + \ln(e^x)}{\_C1}\right\}$$

Mathematica raw input

```
DSolve[y''[x] == E^x*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-x + C[1]*C[2] + Log[E^x + C[1]])/C[1]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = exp(x)*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*_C1-ln(exp(x)-_C1)+ln(exp(x)))/_C1
```

4.1814 $f(x)y'(x) + g(x)y'(x)^2 + y''(x) = 0$

ODE

$$f(x)y'(x) + g(x)y'(x)^2 + y''(x) = 0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 9.9327 (sec), leaf count = 62

$$\left\{\left\{y(x) \to \int_1^x \frac{e^{\int_1^{K[3]} -f(K[1])\,dK[1]}}{c_1 - \int_1^{K[3]} g(K[2]) \left(-e^{\int_1^{K[2]} -f(K[1])\,dK[1]}\right) dK[2]}\, dK[3] + c_2\right\}\right\}$$

Maple ✓
cpu = 0.11 (sec), leaf count = 32

$$\left\{y(x) = \int \frac{\mathrm{e}^{-\int f(x)\,\mathrm{d}x}}{\int \mathrm{e}^{-\int f(x)\,\mathrm{d}x} g\left(x\right)\,\mathrm{d}x + \_C1}\,\mathrm{d}x + \_C2\right\}$$

Mathematica raw input

```
DSolve[f[x]*y'[x] + g[x]*y'[x]^2 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + Integrate[E^Integrate[-f[K[1]], {K[1], 1, K[3]}]/(C[1] - Integr
ate[-(E^Integrate[-f[K[1]], {K[1], 1, K[2]}]*g[K[2]]), {K[2], 1, K[3]}]), {K[3],
 1, x}]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+f(x)*diff(y(x),x)+g(x)*diff(y(x),x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(exp(-Int(f(x),x))/(Int(exp(-Int(f(x),x))*g(x),x)+_C1),x)+_C2
```

4.1815 $ay(x)y'(x)^2+by(x)+y''(x)=0$

ODE

$$ay(x)y'(x)^2+by(x)+y''(x)=0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✗
cpu = 200.27 (sec), leaf count = 0 , could not solve

```
DSolve[b*y[x] + a*y[x]*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.167 (sec), leaf count = 70

$$\left\{\int^{y(x)} a\frac{1}{\sqrt{a\left(\mathrm{e}^{-a^2a}\_C1\,a-b\right)}}d\_a-x-\_C2=0,\int^{y(x)}-a\frac{1}{\sqrt{a\left(\mathrm{e}^{-a^2a}\_C1\,a-b\right)}}d\_a-x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[b*y[x] + a*y[x]*y'[x]^2 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[b*y[x] + a*y[x]*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0, y[x], x
]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*y(x)*diff(y(x),x)^2+b*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
Intat(a/(a*(exp(-_a^2*a)*_C1*a-b))^(1/2),_a = y(x))-x-_C2 = 0, Intat(-a/(a*(exp(
-_a^2*a)*_C1*a-b))^(1/2),_a = y(x))-x-_C2 = 0
```

4.1816 $f(y(x))y'(x)^2+g(y(x))+y''(x)=0$

ODE

$$f(y(x))y'(x)^2+g(y(x))+y''(x)=0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 90.464 (sec), leaf count = 144

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}-\frac{e^{-\int_1^{K[3]}-f(K[1])\,dK[1]}}{\sqrt{2\int_1^{K[3]}g(K[2])\left(-e^{-2\int_1^{K[2]}-f(K[1])\,dK[1]}\right)\,dK[2]+c_1}}dK[3]\&\right][c_2+x]\right\},\left\{y(x)\to\right.$$

Maple ✓
cpu = 0.231 (sec), leaf count = 98

$$\left\{\int^{y(x)}\mathrm{e}^{2\int f(\_f)\,\mathrm{d}\_f}\frac{1}{\sqrt{\mathrm{e}^{2\int f(\_f)\,\mathrm{d}\_f}\left(-2\int\left(\mathrm{e}^{\int f(\_f)\,\mathrm{d}\_f}\right)^2 g(\_f)\,\mathrm{d}\_f+\_C1\right)}}d\_f-x-\_C2=0,\int^{y(x)}-\mathrm{e}^{2\int f(\_f)\,\mathrm{d}\_f}\frac{}{\sqrt{\mathrm{e}^{2}}}\right.$$

Mathematica raw input

```
DSolve[g[y[x]] + f[y[x]]*y'[x]^2 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Integrate[-(1/(E^Integrate[-f[K[1]], {K[1], 1, K[3]}]*
Sqrt[C[1] + 2*Integrate[-(g[K[2]]/E^(2*Integrate[-f[K[1]], {K[1], 1, K[2]}])), {
K[2], 1, K[3]}]])), {K[3], 1, #1}] & ][x + C[2]]}, {y[x] -> InverseFunction[Inte
grate[1/(E^Integrate[-f[K[1]], {K[1], 1, K[4]}]*Sqrt[C[1] + 2*Integrate[-(g[K[2]
]/E^(2*Integrate[-f[K[1]], {K[1], 1, K[2]}])), {K[2], 1, K[4]}]]), {K[4], 1, #1}
] & ][x + C[2]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+f(y(x))*diff(y(x),x)^2+g(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
Intat(exp(2*Int(f(_f),_f))/(exp(2*Int(f(_f),_f))*(-2*Int(exp(Int(f(_f),_f))^2*g(
_f),_f)+_C1))^(1/2),_f = y(x))-x-_C2 = 0, Intat(-exp(2*Int(f(_f),_f))/(exp(2*Int
(f(_f),_f))*(-2*Int(exp(Int(f(_f),_f))^2*g(_f),_f)+_C1))^(1/2),_f = y(x))-x-_C2
= 0
```

4.1817 $f(x)y'(x)+g(y(x))y'(x)^2+y''(x)=0$

ODE

$$f(x)y'(x)+g(y(x))y'(x)^2+y''(x)=0$$

ODE Classification

[_Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.97088 (sec), leaf count = 57

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1} e^{-\int_1^{K[4]} -g(K[1])\,dK[1]}\,dK[4]\&\right]\left[\int_1^x c_1\left(-e^{-\int_1^{K[5]} f(K[2])\,dK[2]}\right)\,dK[5]+c_2\right]\right\}\right\}$$

Maple ✓
cpu = 0.029 (sec), leaf count = 29

$$\left\{\int^{y(x)} \mathrm{e}^{\int g(\_b)\,\mathrm{d}\_b} d\_b-\_C1\int \mathrm{e}^{-\int f(x)\,\mathrm{d}x}\,\mathrm{d}x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[f[x]*y'[x] + g[y[x]]*y'[x]^2 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Integrate[E^(-Integrate[-g[K[1]], {K[1], 1, K[4]}]), {
K[4], 1, #1}] & ][C[2] + Integrate[-(C[1]/E^Integrate[f[K[2]], {K[2], 1, K[5]}])
, {K[5], 1, x}]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+g(y(x))*diff(y(x),x)^2+f(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
Intat(exp(Int(g(_b),_b)),_b = y(x))-_C1*Int(exp(-Int(f(x),x)),x)-_C2 = 0
```

4.1818 $f(y(x))y'(x) + g(y(x))y'(x)^2 + y''(x) = 0$

ODE

$$f(y(x))y'(x) + g(y(x))y'(x)^2 + y''(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 45.286 (sec), leaf count = 81

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{c_1 e^{\int_1^{K[3]} -g(K[1])\,dK[1]} + e^{\int_1^{K[3]} -g(K[1])\,dK[1]} \int_1^{K[3]} f(K[2])\left(-e^{-\int_1^{K[2]} -g(K[1])\,dK[1]}\right) dK[2]}\right.\right.$$

Maple ✓
cpu = 0.173 (sec), leaf count = 44

$$\left\{\int^{y(x)} \frac{1}{\left(\int -f(\_g)\, e^{\int g(\_g)\,d\_g}\, d\_g + \_C1\right) e^{\int -g(\_g)\,d\_g}} d\_g - x - \_C2 = 0, y(x) = \_C1\right\}$$

Mathematica raw input

```
DSolve[f[y[x]]*y'[x] + g[y[x]]*y'[x]^2 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Integrate[(E^Integrate[-g[K[1]], {K[1], 1, K[3]}]*C[1]
 + E^Integrate[-g[K[1]], {K[1], 1, K[3]}]*Integrate[-(f[K[2]]/E^Integrate[-g[K[1
]], {K[1], 1, K[2]}]), {K[2], 1, K[3]}])^(-1), {K[3], 1, #1}] & ][x + C[2]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+g(y(x))*diff(y(x),x)^2+f(y(x))*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1, Intat(1/(Int(-f(_g)*exp(Int(g(_g),_g)),_g)+_C1)/exp(Int(-g(_g),_g)),
_g = y(x))-x-_C2 = 0
```

4.1819 $f(y(x))y'(x) + g(y(x))y'(x)^2 + h(y(x)) + y''(x) = 0$

ODE

$$f(y(x))y'(x) + g(y(x))y'(x)^2 + h(y(x)) + y''(x) = 0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 50.4879 (sec), leaf count = 0 , could not solve

```
DSolve[h[y[x]] + f[y[x]]*Derivative[1][y][x] + g[y[x]]*Derivative[1][y][x]^2 + Derivative[2][y][x] ==
```

Maple ✓
cpu = 0.559 (sec), leaf count = 59

$$\left\{y(x) = ODESolStruc\left(\_a, [\left\{\left(\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a)\right)\_b(\_a) + g(\_a)\left(\_b(\_a)\right)^2 + f(\_a)\_b(\_a) + h(\_a) = 0\right\}, \left\{\_a = y(x), \_\right.\right.$$

Mathematica raw input

```
DSolve[h[y[x]] + f[y[x]]*y'[x] + g[y[x]]*y'[x]^2 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[h[y[x]] + f[y[x]]*Derivative[1][y][x] + g[y[x]]*Derivative[1][y][x]^2 + D
erivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+g(y(x))*diff(y(x),x)^2+f(y(x))*diff(y(x),x)+h(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a,[{diff(_b(_a),_a)*_b(_a)+g(_a)*_b(_a)^2+f(_a)*_b(_a)+h(_a)
 = 0}, {_a = y(x), _b(_a) = diff(y(x),x)}, {x = Int(1/_b(_a),_a)+_C1, y(x) = _a}
])
```

4.1820 $y''(x)+y'(x)^3+y'(x)=0$

ODE

$$y''(x)+y'(x)^3+y'(x)=0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0633521 (sec), leaf count = 69

$$\left\{\left\{y(x)\to c_2-\tan^{-1}\left(e^{-c_1}\sqrt{e^{2x}-e^{2c_1}}\right)\right\},\left\{y(x)\to \tan^{-1}\left(e^{-c_1}\sqrt{e^{2x}-e^{2c_1}}\right)+c_2\right\}\right\}$$

Maple ✓
cpu = 0.237 (sec), leaf count = 35

$$\left\{y(x)=-\arctan\left(\sqrt{\mathrm{e}^{2x}\_C1-1}\right)+\_C2,y(x)=\arctan\left(\sqrt{\mathrm{e}^{2x}\_C1-1}\right)+\_C2\right\}$$

Mathematica raw input

```
DSolve[y'[x] + y'[x]^3 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ArcTan[Sqrt[E^(2*x) - E^(2*C[1])]/E^C[1]] + C[2]}, {y[x] -> ArcTan[Sq
rt[E^(2*x) - E^(2*C[1])]/E^C[1]] + C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)+diff(y(x),x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = arctan((exp(2*x)*_C1-1)^(1/2))+_C2, y(x) = -arctan((exp(2*x)*_C1-1)^(1/2)
)+_C2
```

4.1821 $y''(x) = (a-x)y'(x)^3$

ODE

$$y''(x) = (a-x)y'(x)^3$$

ODE Classification

[[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0390364 (sec), leaf count = 61

$$\left\{\left\{y(x) \to c_2 - \log\left(\sqrt{-2ax - 2c_1 + x^2} - a + x\right)\right\}, \left\{y(x) \to \log\left(\sqrt{-2ax - 2c_1 + x^2} - a + x\right) + c_2\right\}\right\}$$

Maple ✓
cpu = 0.111 (sec), leaf count = 57

$$\left\{y(x) = -\ln\left(x - a + \sqrt{a^2 - 2\,ax + x^2 - \_C1}\right) + \_C2, y(x) = \ln\left(x - a + \sqrt{a^2 - 2\,ax + x^2 - \_C1}\right) + \_C2\right\}$$

Mathematica raw input

```
DSolve[y''[x] == (a - x)*y'[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] - Log[-a + x + Sqrt[-2*a*x + x^2 - 2*C[1]]]}, {y[x] -> C[2] + Log
[-a + x + Sqrt[-2*a*x + x^2 - 2*C[1]]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = (a-x)*diff(y(x),x)^3, y(x),'implicit')
```

Maple raw output

```
y(x) = ln(x-a+(a^2-2*a*x+x^2-_C1)^(1/2))+_C2, y(x) = -ln(x-a+(a^2-2*a*x+x^2-_C1)
^(1/2))+_C2
```

4.1822 $y''(x) + \left(e^{2y(x)} + x\right) y'(x)^3 = 0$

ODE

$$y''(x) + \left(e^{2y(x)} + x\right) y'(x)^3 = 0$$

ODE Classification

[[_2nd_order, _with_exponential_symmetries], [_2nd_order, _with_linear_symmetries], [_2n

Book solution method
TO DO

Mathematica ✗
cpu = 2.03804 (sec), leaf count = 0 , could not solve

```
DSolve[(E^(2*y[x]) + x)*Derivative[1][y][x]^3 + Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.165 (sec), leaf count = 26

$$\left\{\frac{2\,\mathrm{e}^{3\,y(x)}}{3} - 2\,x\mathrm{e}^{y(x)} + \_C1 - \_C2\,\mathrm{e}^{2\,y(x)} = 0\right\}$$

Mathematica raw input

```
DSolve[(E^(2*y[x]) + x)*y'[x]^3 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[(E^(2*y[x]) + x)*Derivative[1][y][x]^3 + Derivative[2][y][x] == 0, y[x],
x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(x+exp(2*y(x)))*diff(y(x),x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
2/3*exp(3*y(x))-2*x*exp(y(x))+_C1-_C2*exp(2*y(x)) = 0
```

4.1823 $y''(x) + 4y'(x)^3 + 2y'(x) = 0$

ODE

$$y''(x) + 4y'(x)^3 + 2y'(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0729568 (sec), leaf count = 95

$$\left\{\left\{y(x) \to c_2 - \frac{\tan^{-1}\left(\frac{e^{-c_1}\sqrt{e^{4x}-2e^{2c_1}}}{\sqrt{2}}\right)}{2\sqrt{2}}\right\}, \left\{y(x) \to \frac{\tan^{-1}\left(\frac{e^{-c_1}\sqrt{e^{4x}-2e^{2c_1}}}{\sqrt{2}}\right)}{2\sqrt{2}} + c_2\right\}\right\}$$

Maple ✓
cpu = 0.245 (sec), leaf count = 49

$$\left\{y(x) = -\frac{\sqrt{2}}{4}\arctan\left(\frac{1}{2}\sqrt{2\,\mathrm{e}^{4x}\_C1 - 4}\right) + \_C2, y(x) = \frac{\sqrt{2}}{4}\arctan\left(\frac{1}{2}\sqrt{2\,\mathrm{e}^{4x}\_C1 - 4}\right) + \_C2\right\}$$

Mathematica raw input

```
DSolve[2*y'[x] + 4*y'[x]^3 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -ArcTan[Sqrt[E^(4*x) - 2*E^(2*C[1])]/(Sqrt[2]*E^C[1])]/(2*Sqrt[2]) + C
[2]}, {y[x] -> ArcTan[Sqrt[E^(4*x) - 2*E^(2*C[1])]/(Sqrt[2]*E^C[1])]/(2*Sqrt[2])
 + C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+2*diff(y(x),x)+4*diff(y(x),x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*2^(1/2)*arctan(1/2*(2*exp(4*x)*_C1-4)^(1/2))+_C2, y(x) = -1/4*2^(1/2)
*arctan(1/2*(2*exp(4*x)*_C1-4)^(1/2))+_C2
```

4.1824 $ay'(x)^3 + y''(x) = 0$

ODE

$$ay'(x)^3 + y''(x) = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_y_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0223869 (sec), leaf count = 50

$$\left\{\left\{y(x) \to c_2 - \frac{\sqrt{2ax - 2c_1}}{a}\right\}, \left\{y(x) \to \frac{\sqrt{2ax - 2c_1}}{a} + c_2\right\}\right\}$$

Maple ✓
cpu = 0.078 (sec), leaf count = 40

$$\left\{y(x) = -(\_C1 + x)\sqrt{2}\frac{1}{\sqrt{a(\_C1 + x)}} + \_C2, y(x) = (\_C1 + x)\sqrt{2}\frac{1}{\sqrt{a(\_C1 + x)}} + \_C2\right\}$$

Mathematica raw input

```
DSolve[a*y'[x]^3 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2*a*x - 2*C[1]]/a) + C[2]}, {y[x] -> Sqrt[2*a*x - 2*C[1]]/a + C
[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1+x)*2^(1/2)/(a*(_C1+x))^(1/2)+_C2, y(x) = -(_C1+x)*2^(1/2)/(a*(_C1+x)
)^(1/2)+_C2
```

4.1825 $y''(x) = xy'(x)^3$

ODE

$$y''(x) = xy'(x)^3$$

ODE Classification

[[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0287546 (sec), leaf count = 51

$$\left\{\left\{y(x) \to \tan^{-1}\left(\frac{x}{\sqrt{-2c_1 - x^2}}\right) + c_2\right\}, \left\{y(x) \to c_2 - \tan^{-1}\left(\frac{x}{\sqrt{-2c_1 - x^2}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.078 (sec), leaf count = 37

$$\left\{y(x) = -\arctan\left(x\frac{1}{\sqrt{-x^2 + \_C1}}\right) + \_C2, y(x) = \arctan\left(x\frac{1}{\sqrt{-x^2 + \_C1}}\right) + \_C2\right\}$$

Mathematica raw input

```
DSolve[y''[x] == x*y'[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ArcTan[x/Sqrt[-x^2 - 2*C[1]]] + C[2]}, {y[x] -> -ArcTan[x/Sqrt[-x^2 -
2*C[1]]] + C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = x*diff(y(x),x)^3, y(x),'implicit')
```

Maple raw output

```
y(x) = arctan(x/(-x^2+_C1)^(1/2))+_C2, y(x) = -arctan(x/(-x^2+_C1)^(1/2))+_C2
```

4.1826 $y'(x)^3(ax+by(x))+y''(x)=0$

ODE

$$y'(x)^3(ax+by(x))+y''(x)=0$$

ODE Classification

[[_2nd_order, _with_exponential_symmetries], [_2nd_order, _with_linear_symmetries], [_2n

Book solution method
TO DO

Mathematica ✓
cpu = 1.87669 (sec), leaf count = 154

$$\left\{\text{Solve}\left[\frac{b\log\left(a^2x+\sqrt{a}\sqrt{a^3x^2+2a^2bxy(x)+b^2\left(-2ac_1+ay(x)^2+1\right)}+aby(x)\right)}{\sqrt{a}}+ac_2+by(x)=0,y(x)\right],\text{Solve}\left[ac_2+\right.\right.$$

Maple ✓
cpu = 0.123 (sec), leaf count = 44

$$\left\{-2\sqrt{a}\mathrm{e}^{\sqrt{a}y(x)}x-2\frac{\mathrm{e}^{\sqrt{a}y(x)}by(x)}{\sqrt{a}}-\mathrm{e}^{2\sqrt{a}y(x)}\_C2+\_C1=0\right\}$$

Mathematica raw input

```
DSolve[(a*x + b*y[x])*y'[x]^3 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{Solve[a*C[2] + (b*Log[a^2*x + a*b*y[x] + Sqrt[a]*Sqrt[a^3*x^2 + 2*a^2*b*x*y[x]
+ b^2*(1 - 2*a*C[1] + a*y[x]^2)]])/Sqrt[a] + b*y[x] == 0, y[x]], Solve[a*C[2] +
b*y[x] == (b*Log[a^2*x + a*b*y[x] + Sqrt[a]*Sqrt[a^3*x^2 + 2*a^2*b*x*y[x] + b^2*
(1 - 2*a*C[1] + a*y[x]^2)]])/Sqrt[a], y[x]]}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+(a*x+b*y(x))*diff(y(x),x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
-2*a^(1/2)*exp(a^(1/2)*y(x))*x-2/a^(1/2)*exp(a^(1/2)*y(x))*b*y(x)-exp(2*a^(1/2)*
y(x))*_C2+_C1 = 0
```

4.1827 $ay(x)\left(y'(x)^2+1\right)^2+y''(x)=0$

ODE

$$ay(x)\left(y'(x)^2+1\right)^2+y''(x)=0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 10.739 (sec), leaf count = 262

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt{\frac{\#1^2(-a)+2c_1+1}{2c_1+1}}\sqrt{2\#1^2a-4c_1}E\left(\sin^{-1}\left(\sqrt{\frac{a}{2c_1+1}}\#1\right)|1+\frac{1}{2c_1}\right)}{\sqrt{\frac{a}{2c_1+1}}\sqrt{\#1^2(-a)+2c_1+1}\sqrt{2-\frac{\#1^2a}{c_1}}}\&\right][c_2+x]\right\},\left\{y(x)\to \text{In}\right.$$

Maple ✓
cpu = 0.148 (sec), leaf count = 94

$$\left\{\int^{y(x)}a(\_a^2+2\_C1)\frac{1}{\sqrt{-a\left(-1+a\left(\_a^2+2\_C1\right)\right)\left(\_a^2+2\_C1\right)}}d\_a-x-\_C2=0,\int^{y(x)}-a(\_a^2+2\_C1)\frac{}{\sqrt{-a}}\right.$$

Mathematica raw input

```
DSolve[a*y[x]*(1 + y'[x]^2)^2 + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-((EllipticE[ArcSin[Sqrt[a/(1 + 2*C[1])]*#1], 1 + 1/(2
*C[1])]*Sqrt[(1 + 2*C[1] - a*#1^2)/(1 + 2*C[1])]*Sqrt[-4*C[1] + 2*a*#1^2])/(Sqrt
[a/(1 + 2*C[1])]*Sqrt[1 + 2*C[1] - a*#1^2]*Sqrt[2 - (a*#1^2)/C[1]])) & ][x + C[2
]]}, {y[x] -> InverseFunction[(EllipticE[ArcSin[Sqrt[a/(1 + 2*C[1])]*#1], 1 + 1/
(2*C[1])]*Sqrt[(1 + 2*C[1] - a*#1^2)/(1 + 2*C[1])]*Sqrt[-4*C[1] + 2*a*#1^2])/(Sq
rt[a/(1 + 2*C[1])]*Sqrt[1 + 2*C[1] - a*#1^2]*Sqrt[2 - (a*#1^2)/C[1]]) & ][x + C[
2]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+a*y(x)*(1+diff(y(x),x)^2)^2 = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/(-a*(-1+a*(_a^2+2*_C1))*(_a^2+2*_C1))^(1/2)*a*(_a^2+2*_C1),_a = y(x))-x-
_C2 = 0, Intat(-1/(-a*(-1+a*(_a^2+2*_C1))*(_a^2+2*_C1))^(1/2)*a*(_a^2+2*_C1),_a
= y(x))-x-_C2 = 0
```

4.1828 $y''(x) = a(xy'(x) - y(x))^k$

ODE

$$y''(x) = a(xy'(x) - y(x))^k$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 58.9088 (sec), leaf count = 59

$$\left\{\left\{y(x) \to x\left(\int_1^x \left(\frac{1}{2}aK[2]^{2k} - \frac{1}{2}akK[2]^{2k} + c_1K[2]^{2k-2}\right)^{\frac{1}{1-k}} dK[2] + c_2\right)\right\}\right\}$$

Maple ✓
cpu = 1.187 (sec), leaf count = 69

$$\left\{\frac{1}{x}\left(-\_C2\,x - \int -\frac{x^2(k-1)\,a - \_C1}{2\,x^2}\left(-\left(x^2(k-1)\,a - \_C1\right)^{-1}\right)^{\frac{k}{k-1}} 2^{\frac{k}{k-1}}\,\mathrm{d}x x + y(x)\right) = 0\right\}$$

Mathematica raw input

```
DSolve[y''[x] == a*(-y[x] + x*y'[x])^k,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[2] + Integrate[((a*K[2]^(2*k))/2 - (a*k*K[2]^(2*k))/2 + C[1]*K[2]
^(-2 + 2*k))^(1 - k)^(-1), {K[2], 1, x}])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a*(x*diff(y(x),x)-y(x))^k, y(x),'implicit')
```

Maple raw output

```
(-_C2*x-Int(-1/2*(-1/(x^2*(k-1)*a-_C1))^(k/(k-1))*(x^2*(k-1)*a-_C1)*2^(k/(k-1))/
x^2,x)*x+y(x))/x = 0
```

4.1829 $f(x)y'(x)^k + g(x)y'(x) + y''(x) = 0$

ODE

$$f(x)y'(x)^k + g(x)y'(x) + y''(x) = 0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 25.6333 (sec), leaf count = 80

$$\left\{\left\{y(x) \to \int_1^x \left(\exp\left(-(k-1)\int_1^{K[3]} -g(K[1])\,dK[1]\right)\left(c_1 - (k-1)\int_1^{K[3]} f(K[2])\left(-e^{(k-1)\int_1^{K[2]} -g(K[1])\,dK[1]}\right)\,dK[2]\right)\right.\right.$$

Maple ✓
cpu = 0.243 (sec), leaf count = 45

$$\left\{y(x) = \int \left((k-1)\int f(x)\,\mathrm{e}^{-\int g(x)\,\mathrm{d}x(k-1)}\,\mathrm{d}x + \_C1\right)^{-(k-1)^{-1}} \mathrm{e}^{-\int g(x)\,\mathrm{d}x}\,\mathrm{d}x + \_C2\right\}$$

Mathematica raw input

```
DSolve[g[x]*y'[x] + f[x]*y'[x]^k + y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + Integrate[((C[1] - (-1 + k)*Integrate[-(E^((-1 + k)*Integrate[-
g[K[1]], {K[1], 1, K[2]}])*f[K[2]]), {K[2], 1, K[3]}])/E^((-1 + k)*Integrate[-g[
K[1]], {K[1], 1, K[3]}]))^(1 - k)^(-1), {K[3], 1, x}]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+f(x)*diff(y(x),x)^k+g(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(((k-1)*Int(f(x)*exp(-Int(g(x),x)*(k-1)),x)+_C1)^(-1/(k-1))*exp(-Int(g
(x),x)),x)+_C2
```

4.1830 $y''(x) = Ax^a y(x)^b y'(x)^c$

ODE

$$y''(x) = Ax^a y(x)^b y'(x)^c$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0888083 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == A*x^a*y[x]^b*Derivative[1][y][x]^c, y[x], x]
```

Maple ✓
cpu = 2.429 (sec), leaf count = 206

$$\left\{y(x) = ODESolStruc\left(\_a\, e^{\int -b(\_a)\, d\_a + \_C1}, [\left\{\frac{d}{d\_a}\_b(\_a) = -\frac{(\_b(\_a))^2}{(a-c+2)^2}\left(A\_a^b\_b(\_a)\,(b+c-1)^2\left(-\frac{(a-c+2)(}{\_b(\_a}\right.\right.\right.$$

Mathematica raw input

```
DSolve[y''[x] == A*x^a*y[x]^b*y'[x]^c,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == A*x^a*y[x]^b*Derivative[1][y][x]^c, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = A*x^a*y(x)^b*diff(y(x),x)^c, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a*exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = -(A*_a^b*_b(_a
)*(b+c-1)^2*(-(a-c+2)*(_b(_a)*_a+1)/_b(_a)/(b+c-1))^c-(_a*(1+a+b)*_b(_a)+2*a+b-c
+3)*(a-c+2))*_b(_a)^2/(a-c+2)^2}, {_a = y(x)*x^(1/(b+c-1)*(a-c+2)), _b(_a) = (-a
+c-2)/(diff(y(x),x)*x*(b+c-1)+y(x)*(a-c+2))/(x^(1/(b+c-1)*(a-c+2)))}, {x = exp(-
(Int(_b(_a),_a)+_C1)*(b+c-1)/(a-c+2)), y(x) = _a*exp(Int(_b(_a),_a)+_C1)}])
```

4.1831 $y''(x) = a\sqrt{y'(x)^2+1}$

ODE

$$y''(x) = a\sqrt{y'(x)^2+1}$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0332994 (sec), leaf count = 19

$$\left\{\left\{y(x) \to \frac{\cosh(ax+c_1)}{a} + c_2\right\}\right\}$$

Maple ✓
cpu = 0.384 (sec), leaf count = 16

$$\left\{y(x) = \frac{\cosh(a(\_C1+x))}{a} + \_C2\right\}$$

Mathematica raw input

```
DSolve[y''[x] == a*Sqrt[1 + y'[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + Cosh[a*x + C[1]]/a}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a*(1+diff(y(x),x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/a*cosh(a*(_C1+x))+_C2
```

4.1832 $y''(x) = a\sqrt{by(x)^2 + y'(x)^2}$

ODE

$$y''(x) = a\sqrt{by(x)^2 + y'(x)^2}$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.723433 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == a*Sqrt[b*y[x]^2 + Derivative[1][y][x]^2], y[x], x]
```

Maple ✓
cpu = 0.314 (sec), leaf count = 41

$$\left\{\ln(y(x)) - \int RootOf\left(x - \int^{\_Z}\left(a\sqrt{\_f^2 + b} - \_f^2\right)^{-1} d\_f + \_C1\right) dx - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y''[x] == a*Sqrt[b*y[x]^2 + y'[x]^2],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == a*Sqrt[b*y[x]^2 + Derivative[1][y][x]^2], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a*(b*y(x)^2+diff(y(x),x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
ln(y(x))-Int(RootOf(x-Intat(1/(a*(_f^2+b)^(1/2)-_f^2),_f = _Z)+_C1),x)-_C2 = 0
```

4.1833 $y''(x) = a(y'(x)^2+1)^{3/2}$

ODE

$$y''(x) = a\left(y'(x)^2+1\right)^{3/2}$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.06417 (sec), leaf count = 75

$$\left\{\left\{y(x)\to c_2-\frac{i\sqrt{a^2x^2+2ac_1x+c_1^2-1}}{a}\right\},\left\{y(x)\to c_2+\frac{i\sqrt{a^2x^2+2ac_1x+c_1^2-1}}{a}\right\}\right\}$$

Maple ✓
cpu = 0.134 (sec), leaf count = 41

$$\left\{y(x)=\frac{1}{a}\left(\left(-1+\left(\_C1+x\right)^2a^2\right)\sqrt{-\left(-1+\left(\_C1+x\right)^2a^2\right)^{-1}}+\_C2\,a\right)\right\}$$

Mathematica raw input

```
DSolve[y''[x] == a*(1 + y'[x]^2)^(3/2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*Sqrt[-1 + a^2*x^2 + 2*a*x*C[1] + C[1]^2])/a + C[2]}, {y[x] -> (I
*Sqrt[-1 + a^2*x^2 + 2*a*x*C[1] + C[1]^2])/a + C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a*(1+diff(y(x),x)^2)^(3/2), y(x),'implicit')
```

Maple raw output

```
y(x) = ((-1+(_C1+x)^2*a^2)*(-1/(-1+(_C1+x)^2*a^2))^(1/2)+_C2*a)/a
```

4.1834 $y''(x) = ax(y'(x)^2+1)^{3/2}$

ODE

$$y''(x) = ax\left(y'(x)^2+1\right)^{3/2}$$

ODE Classification

[[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.342094 (sec), leaf count = 332

$$\left\{\left\{y(x)\to c_2-\frac{\sqrt{\frac{ax^2+2c_1-2}{c_1-1}}\sqrt{\frac{ax^2+2c_1+2}{c_1+1}}\left(F\left(i\sinh^{-1}\left(x\sqrt{\frac{a}{2c_1+2}}\right)|\frac{c_1+1}{c_1-1}\right)+(c_1-1)\,E\left(i\sinh^{-1}\left(x\sqrt{\frac{a}{2c_1+2}}\right)|\frac{c_1+1}{c_1-1}\right)\right)}{\sqrt{\frac{a}{2c_1+2}}\sqrt{a^2x^4+4ac_1x^2+4c_1^2-4}}\right\},\left\{\right.$$

Maple ✓
cpu = 0.164 (sec), leaf count = 38

$$\left\{y(x)=\int\sqrt{-\left(-4+\left(x^2+2\_C1\right)^2a^2\right)^{-1}}a\left(x^2+2\_C1\right)\,\mathrm{d}x+\_C2\right\}$$

Mathematica raw input

```
DSolve[y''[x] == a*x*(1 + y'[x]^2)^(3/2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] - (Sqrt[(-2 + a*x^2 + 2*C[1])/(-1 + C[1])]*Sqrt[(2 + a*x^2 + 2*C[
1])/(1 + C[1])]*((-1 + C[1])*EllipticE[I*ArcSinh[x*Sqrt[a/(2 + 2*C[1])]], (1 + C
[1])/(-1 + C[1])] + EllipticF[I*ArcSinh[x*Sqrt[a/(2 + 2*C[1])]], (1 + C[1])/(-1
+ C[1])]))/(Sqrt[a/(2 + 2*C[1])]*Sqrt[-4 + a^2*x^4 + 4*a*x^2*C[1] + 4*C[1]^2])},
 {y[x] -> C[2] + (Sqrt[(-2 + a*x^2 + 2*C[1])/(-1 + C[1])]*Sqrt[(2 + a*x^2 + 2*C[
1])/(1 + C[1])]*((-1 + C[1])*EllipticE[I*ArcSinh[x*Sqrt[a/(2 + 2*C[1])]], (1 + C
[1])/(-1 + C[1])] + EllipticF[I*ArcSinh[x*Sqrt[a/(2 + 2*C[1])]], (1 + C[1])/(-1
+ C[1])]))/(Sqrt[a/(2 + 2*C[1])]*Sqrt[-4 + a^2*x^4 + 4*a*x^2*C[1] + 4*C[1]^2])}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a*x*(1+diff(y(x),x)^2)^(3/2), y(x),'implicit')
```

Maple raw output

```
y(x) = Int((-1/(-4+(x^2+2*_C1)^2*a^2))^(1/2)*a*(x^2+2*_C1),x)+_C2
```

4.1835 $y''(x) = ay(x)\left(y'(x)^2+1\right)^{3/2}$

ODE

$$y''(x) = ay(x)\left(y'(x)^2+1\right)^{3/2}$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.826251 (sec), leaf count = 350

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt{\frac{\#1^2 a+2c_1-2}{c_1-1}}\sqrt{\frac{\#1^2 a+2c_1+2}{c_1+1}}\left(F\left(i\sinh^{-1}\left(\sqrt{\frac{a}{2c_1+2}}\#1\right)|\frac{c_1+1}{c_1-1}\right)+(c_1-1)\,E\left(i\sinh^{-1}\left(\sqrt{\frac{2c}{\sqrt{\frac{a}{2c_1+2}}\sqrt{\#1^4 a^2+4\#1^2 a c_1+4c_1^2-4}}\right.\right.\right.\right.\right.\right.\right.\right.$$

Maple ✓
cpu = 0.178 (sec), leaf count = 84

$$\left\{\int^{y(x)} a(\_a^2+2\_C1)\frac{1}{\sqrt{4-a^2(\_a^2+2\_C1)^2}}d\_a - x - \_C2 = 0, \int^{y(x)} -a(\_a^2+2\_C1)\frac{1}{\sqrt{4-a^2(\_a^2+2\_C1)^2}}\right.$$

Mathematica raw input

```
DSolve[y''[x] == a*y[x]*(1 + y'[x]^2)^(3/2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-((((-1 + C[1])*EllipticE[I*ArcSinh[Sqrt[a/(2 + 2*C[1]
)]*#1], (1 + C[1])/(-1 + C[1])] + EllipticF[I*ArcSinh[Sqrt[a/(2 + 2*C[1])]*#1],
(1 + C[1])/(-1 + C[1])])*Sqrt[(-2 + 2*C[1] + a*#1^2)/(-1 + C[1])]*Sqrt[(2 + 2*C[
1] + a*#1^2)/(1 + C[1])])/(Sqrt[a/(2 + 2*C[1])]*Sqrt[-4 + 4*C[1]^2 + 4*a*C[1]*#1
^2 + a^2*#1^4])) & ][x + C[2]]}, {y[x] -> InverseFunction[(((-1 + C[1])*Elliptic
E[I*ArcSinh[Sqrt[a/(2 + 2*C[1])]*#1], (1 + C[1])/(-1 + C[1])] + EllipticF[I*ArcS
inh[Sqrt[a/(2 + 2*C[1])]*#1], (1 + C[1])/(-1 + C[1])])*Sqrt[(-2 + 2*C[1] + a*#1^
2)/(-1 + C[1])]*Sqrt[(2 + 2*C[1] + a*#1^2)/(1 + C[1])])/(Sqrt[a/(2 + 2*C[1])]*Sq
rt[-4 + 4*C[1]^2 + 4*a*C[1]*#1^2 + a^2*#1^4]) & ][x + C[2]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a*y(x)*(1+diff(y(x),x)^2)^(3/2), y(x),'implicit')
```

Maple raw output

```
Intat(1/(4-a^2*(_a^2+2*_C1)^2)^(1/2)*(_a^2+2*_C1)*a,_a = y(x))-x-_C2 = 0, Intat(
-1/(4-a^2*(_a^2+2*_C1)^2)^(1/2)*(_a^2+2*_C1)*a,_a = y(x))-x-_C2 = 0
```

4.1836 $y''(x) = ay(x)\left((b-y'(x))^2+1\right)^{3/2}$

ODE

$$y''(x) = ay(x)\left((b-y'(x))^2+1\right)^{3/2}$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 17.9734 (sec), leaf count = 1391

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{i\left(\sqrt{a^2\left(b^2+1\right)}-ac_1\right)\sqrt{\frac{-2a^2\#1^2-4ac_1+4\sqrt{a^2\left(b^2+1\right)}}{\sqrt{a^2\left(b^2+1\right)}-ac_1}}\sqrt{\frac{a^2\#1^2+2ac_1+2\sqrt{a^2\left(b^2+1\right)}}{ac_1+\sqrt{a^2\left(b^2+1\right)}}}\sqrt{-\left(a\#1^2+2\right.}\right.\right.\right.$$

Maple ✓
cpu = 0.247 (sec), leaf count = 198

$$\left\{\int^{y(x)}\left(\left(\_a^2+2\_C1\right)^2ba^2-4b^3\right)\left(-\left(\_a^2+2\_C1\right)a\sqrt{-b^2\left(a^2\left(\_a^2+2\_C1\right)^2-4b^2-4\right)}+b^2\left(a^2\left(\_a^2+2\_C1\right)^2-\right.\right.\right.$$

Mathematica raw input

```
DSolve[y''[x] == a*y[x]*(1 + (b - y'[x])^2)^(3/2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-((-(a*b*Sqrt[a^2/(Sqrt[a^2*(1 + b^2)] + a*C[1])]*#1*(
2*C[1] + a*#1^2)*(-4 - 4*b^2 + 4*C[1]^2 + 4*a*C[1]*#1^2 + a^2*#1^4)) + I*(Sqrt[a
^2*(1 + b^2)] - a*C[1])*EllipticE[I*ArcSinh[Sqrt[a^2/(2*Sqrt[a^2*(1 + b^2)] + 2*
a*C[1])]*#1], -((Sqrt[a^2*(1 + b^2)] + a*C[1])/(Sqrt[a^2*(1 + b^2)] - a*C[1]))]*
Sqrt[(4*Sqrt[a^2*(1 + b^2)] - 4*a*C[1] - 2*a^2*#1^2)/(Sqrt[a^2*(1 + b^2)] - a*C[
1])]*Sqrt[(2*Sqrt[a^2*(1 + b^2)] + 2*a*C[1] + a^2*#1^2)/(Sqrt[a^2*(1 + b^2)] + a
*C[1])]*Sqrt[-((2*C[1] + a*#1^2)^2*(-4 - 4*b^2 + 4*C[1]^2 + 4*a*C[1]*#1^2 + a^2*
#1^4))] - I*Sqrt[2]*Sqrt[a^2*(1 + b^2)]*EllipticF[I*ArcSinh[Sqrt[a^2/(2*Sqrt[a^2
*(1 + b^2)] + 2*a*C[1])]*#1], -((Sqrt[a^2*(1 + b^2)] + a*C[1])/(Sqrt[a^2*(1 + b^
2)] - a*C[1]))]*Sqrt[(2*Sqrt[a^2*(1 + b^2)] - 2*a*C[1] - a^2*#1^2)/(Sqrt[a^2*(1
+ b^2)] - a*C[1])]*Sqrt[(2*Sqrt[a^2*(1 + b^2)] + 2*a*C[1] + a^2*#1^2)/(Sqrt[a^2*
```

```
(1 + b^2)] + a*C[1])]*Sqrt[-((2*C[1] + a*#1^2)^2*(-4 - 4*b^2 + 4*C[1]^2 + 4*a*C[
1]*#1^2 + a^2*#1^4))])/(a*(1 + b^2)*Sqrt[a^2/(Sqrt[a^2*(1 + b^2)] + a*C[1])]*(2*
C[1] + a*#1^2)*(-4 - 4*b^2 + 4*C[1]^2 + 4*a*C[1]*#1^2 + a^2*#1^4))) & ][x + C[2]
]}, {y[x] -> InverseFunction[(a*b*Sqrt[a^2/(Sqrt[a^2*(1 + b^2)] + a*C[1])]*#1*(2
*C[1] + a*#1^2)*(-4 - 4*b^2 + 4*C[1]^2 + 4*a*C[1]*#1^2 + a^2*#1^4) + I*(Sqrt[a^2
*(1 + b^2)] - a*C[1])*EllipticE[I*ArcSinh[Sqrt[a^2/(2*Sqrt[a^2*(1 + b^2)] + 2*a*
C[1])]*#1], -((Sqrt[a^2*(1 + b^2)] + a*C[1])/(Sqrt[a^2*(1 + b^2)] - a*C[1]))]*Sq
rt[(4*Sqrt[a^2*(1 + b^2)] - 4*a*C[1] - 2*a^2*#1^2)/(Sqrt[a^2*(1 + b^2)] - a*C[1]
)]*Sqrt[(2*Sqrt[a^2*(1 + b^2)] + 2*a*C[1] + a^2*#1^2)/(Sqrt[a^2*(1 + b^2)] + a*C
[1])]*Sqrt[-((2*C[1] + a*#1^2)^2*(-4 - 4*b^2 + 4*C[1]^2 + 4*a*C[1]*#1^2 + a^2*#1
^4))] - I*Sqrt[2]*Sqrt[a^2*(1 + b^2)]*EllipticF[I*ArcSinh[Sqrt[a^2/(2*Sqrt[a^2*(
1 + b^2)] + 2*a*C[1])]*#1], -((Sqrt[a^2*(1 + b^2)] + a*C[1])/(Sqrt[a^2*(1 + b^2)
] - a*C[1]))]*Sqrt[(2*Sqrt[a^2*(1 + b^2)] - 2*a*C[1] - a^2*#1^2)/(Sqrt[a^2*(1 +
b^2)] - a*C[1])]*Sqrt[(2*Sqrt[a^2*(1 + b^2)] + 2*a*C[1] + a^2*#1^2)/(Sqrt[a^2*(1
 + b^2)] + a*C[1])]*Sqrt[-((2*C[1] + a*#1^2)^2*(-4 - 4*b^2 + 4*C[1]^2 + 4*a*C[1]
*#1^2 + a^2*#1^4))])/(a*(1 + b^2)*Sqrt[a^2/(Sqrt[a^2*(1 + b^2)] + a*C[1])]*(2*C[
1] + a*#1^2)*(-4 - 4*b^2 + 4*C[1]^2 + 4*a*C[1]*#1^2 + a^2*#1^4)) & ][x + C[2]]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a*y(x)*(1+(b-diff(y(x),x))^2)^(3/2), y(x),'implicit')
```

Maple raw output

```
Intat(((_a^2+2*_C1)^2*b*a^2-4*b^3)/((_a^2+2*_C1)*a*(-b^2*(a^2*(_a^2+2*_C1)^2-4*b
^2-4))^(1/2)+b^2*(a^2*(_a^2+2*_C1)^2-4*b^2-4)),_a = y(x))-x-_C2 = 0, Intat(((_a^
2+2*_C1)^2*b*a^2-4*b^3)/(-(_a^2+2*_C1)*a*(-b^2*(a^2*(_a^2+2*_C1)^2-4*b^2-4))^(1/
2)+b^2*(a^2*(_a^2+2*_C1)^2-4*b^2-4)),_a = y(x))-x-_C2 = 0
```

4.1837 $y''(x) = a(y'(x)^2+1)^{3/2}(b+cx+y(x))$

ODE

$$y''(x) = a(y'(x)^2+1)^{3/2}(b+cx+y(x))$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✗
cpu = 100.3 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == a*(b + c*x + y[x])*(1 + Derivative[1][y][x]^2)^(3/2), y[x], x]
```

Maple ✓
cpu = 0.695 (sec), leaf count = 271

$$\left\{x - \int^{cx+y(x)} \frac{1}{(4c^2+4)c}\left(-2\left(\_f\,b + 1/2\,\_f^2 - \_C1\right)a\sqrt{-4c^2\left(\left(\_f\,b+1/2\,\_f^2-\_C1\right)^2a^2-c^2-1\right)} + 4c^2\left(\left(\_f\,b+\right.\right.\right.$$

Mathematica raw input

```
DSolve[y''[x] == a*(b + c*x + y[x])*(1 + y'[x]^2)^(3/2),y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == a*(b + c*x + y[x])*(1 + Derivative[1][y][x]^2)^(3/
2), y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = a*(b+c*x+y(x))*(1+diff(y(x),x)^2)^(3/2), y(x),'implicit')
```

Maple raw output

```
x-Intat(1/4*(-2*(_f*b+1/2*_f^2-_C1)*a*(-4*c^2*((_f*b+1/2*_f^2-_C1)^2*a^2-c^2-1))
^(1/2)+4*c^2*((_f*b+1/2*_f^2-_C1)^2*a^2-c^2-1))/(c^2+1)/c/((_f*b+1/2*_f^2-_C1)^2
*a^2-c^2-1),_f = c*x+y(x))-_C2 = 0, x-Intat(1/4*(2*(_f*b+1/2*_f^2-_C1)*a*(-4*c^2
*((_f*b+1/2*_f^2-_C1)^2*a^2-c^2-1))^(1/2)+4*c^2*((_f*b+1/2*_f^2-_C1)^2*a^2-c^2-1
))/(c^2+1)/c/((_f*b+1/2*_f^2-_C1)^2*a^2-c^2-1),_f = c*x+y(x))-_C2 = 0
```

4.1838 $y''(x) + y(x)^3 y'(x) = y(x) y'(x) \sqrt{4y'(x) + y(x)^4}$

ODE

$$y''(x) + y(x)^3 y'(x) = y(x) y'(x) \sqrt{4y'(x) + y(x)^4}$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.36341 (sec), leaf count = 33

$$\left\{\left\{y(x) \to \sqrt{2} e^{c_1} \tan\left(2\sqrt{2} e^{3c_1}(c_2 + x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.194 (sec), leaf count = 41

$$\left\{Artanh(y(x)\_C1)\left(\_C1^{-2}\right)^{-\frac{3}{2}} - x - \_C2 = 0, \arctan\left(y(x)\_C1\right)\left(\_C1^{-2}\right)^{-\frac{3}{2}} - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]^3*y'[x] + y''[x] == y[x]*y'[x]*Sqrt[y[x]^4 + 4*y'[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[2]*E^C[1]*Tan[2*Sqrt[2]*E^(3*C[1])*(x + C[2])]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)+y(x)^3*diff(y(x),x) = y(x)*diff(y(x),x)*(y(x)^4+4*diff(y(x),x))^(1/2), y(
```

Maple raw output

```
1/(1/_C1^2)^(3/2)*arctan(y(x)*_C1)-x-_C2 = 0, 1/(1/_C1^2)^(3/2)*arctanh(y(x)*_C1
)-x-_C2 = 0
```

4.1839 $y''(x) = f(y'(x))$

ODE

$$y''(x) = f(y'(x))$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.103086 (sec), leaf count = 33

$$\left\{\left\{y(x) \to \int_1^x \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{f(K[1])}\, dK[1]\&\right][K[2]+c_1]\, dK[2]+c_2\right\}\right\}$$

Maple ✓
cpu = 0.041 (sec), leaf count = 22

$$\left\{y(x) = \int RootOf\left(x - \int^{\_Z} (f(\_f))^{-1}\, d\_f + \_C1\right) \mathrm{d}x + \_C2\right\}$$

Mathematica raw input

```
DSolve[y''[x] == f[y'[x]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + Integrate[InverseFunction[Integrate[f[K[1]]^(-1), {K[1], 1, #1}
] & ][C[1] + K[2]], {K[2], 1, x}]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = f(diff(y(x),x)), y(x),'implicit')
```

Maple raw output

```
y(x) = Int(RootOf(x-Intat(1/f(_f),_f = _Z)+_C1),x)+_C2
```

4.1840 $y''(x) = f(ax + by(x), y'(x))$

ODE

$$y''(x) = f(ax + by(x), y'(x))$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.132383 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == f[a*x + b*y[x], Derivative[1][y][x]], y[x], x]
```

Maple ✓
cpu = 0.132 (sec), leaf count = 115

$$\left\{y(x) = ODESolStruc\left(-\frac{a\left(\int \_b(\_a)\,\mathrm{d}\_a + \_C1\right) - \_a\,b}{b}, [\left\{\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a) = -f\left(\_a\,b, \frac{-a\_b(\_a)+b}{\_b(\_a)\,b}\right)(\_b(\_a))^3\right\}, \left\{\right.\right.$$

Mathematica raw input

```
DSolve[y''[x] == f[a*x + b*y[x], y'[x]],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == f[a*x + b*y[x], Derivative[1][y][x]], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = f(a*x+b*y(x),diff(y(x),x)), y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(-(a*(Int(_b(_a),_a)+_C1)-_a*b)/b,[{diff(_b(_a),_a) = -f(_a*b,
(-a*_b(_a)+b)/b/_b(_a))*_b(_a)^3}, {_a = (a*x+b*y(x))/b, _b(_a) = 1/(a+b*diff(y(
x),x))*b}, {x = Int(_b(_a),_a)+_C1, y(x) = -(a*(Int(_b(_a),_a)+_C1)-_a*b)/b}])
```

4.1841 $y''(x) = y(x) f\left(x, \frac{y'(x)}{y(x)}\right)$

ODE

$$y''(x) = y(x) f\left(x, \frac{y'(x)}{y(x)}\right)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 9.80311 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == f[x, Derivative[1][y][x]/y[x]]*y[x], y[x], x]
```

Maple ✓
cpu = 0.081 (sec), leaf count = 60

$$\left\{y(x) = ODESolStruc\left(e^{\int \_b(\_a)\, d\_a + \_C1}, [\left\{\frac{d}{d\_a}\_b(\_a) = -(\_b(\_a))^2 + f(\_a, \_b(\_a))\right\}, \left\{\_a = x, \_b(\_a) = \frac{\frac{d}{dx}y(x}{y(x)}\right.\right.$$

Mathematica raw input

```
DSolve[y''[x] == f[x, y'[x]/y[x]]*y[x],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == f[x, Derivative[1][y][x]/y[x]]*y[x], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = y(x)*f(x,diff(y(x),x)/y(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = -_b(_a)^2+f(_a,_b
(_a))}, {_a = x, _b(_a) = diff(y(x),x)/y(x)}, {x = _a, y(x) = exp(Int(_b(_a),_a)
+_C1)}])
```

4.1842 $y''(x) = x^{n-2} f(x^{-n} y(x), x^{1-n} y'(x))$

ODE

$$y''(x) = x^{n-2} f\left(x^{-n} y(x), x^{1-n} y'(x)\right)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 7.7034 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2][y][x] == x^(-2 + n)*f[y[x]/x^n, x^(1 - n)*Derivative[1][y][x]], y[x], x]
```

Maple ✓
cpu = 0.938 (sec), leaf count = 125

$$\left\{y(x) = ODESolStruc\left(\frac{\_a}{e^{-(\int \_b(\_a)\, d\_a + \_C1)n}}, [\left\{\frac{d}{d\_a}\_b(\_a) = \left(-\_b(\_a)\, f\left(\_a, \frac{\_a\, \_b(\_a)\, n + 1}{\_b(\_a)}\right) + n\_a\,(n-1)\,\_b\right.\right.\right.$$

Mathematica raw input

```
DSolve[y''[x] == x^(-2 + n)*f[y[x]/x^n, x^(1 - n)*y'[x]],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2][y][x] == x^(-2 + n)*f[y[x]/x^n, x^(1 - n)*Derivative[1][y][
x]], y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x) = x^(n-2)*f(y(x)/(x^n),diff(y(x),x)/(x^(n-1))), y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a/exp(-(Int(_b(_a),_a)+_C1)*n),[{diff(_b(_a),_a) = (-_b(_a)*
f(_a,(_a*_b(_a)*n+1)/_b(_a))+n*_a*(n-1)*_b(_a)+2*n-1)*_b(_a)^2}, {_a = y(x)*x^(-
n), _b(_a) = 1/(x^(-n))/(x*diff(y(x),x)-n*y(x))}, {x = exp(Int(_b(_a),_a)+_C1),
y(x) = _a/exp(-(Int(_b(_a),_a)+_C1)*n)}])
```

4.1843 $2y''(x) = 12y(x)^2 + 1$

ODE

$$2y''(x) = 12y(x)^2 + 1$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0489943 (sec), leaf count = 14

$$\{\{y(x) \to \wp(x + c_1; -1, c_2)\}\}$$

Maple ✓
cpu = 0.175 (sec), leaf count = 10

$$\{y(x) = \mathit{WeierstrassP}(\_C1 + x, -1, \_C2)\}$$

Mathematica raw input

```
DSolve[2*y''[x] == 1 + 12*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> WeierstrassP[x + C[1], {-1, C[2]}]}}
```

Maple raw input

```
dsolve(2*diff(diff(y(x),x),x) = 1+12*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = WeierstrassP(_C1+x,-1,_C2)
```

4.1844 $2y''(x) = y(x)\left(a - y(x)^2\right)$

ODE

$$2y''(x) = y(x)\left(a - y(x)^2\right)$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.391399 (sec), leaf count = 189

$$\left\{\left\{y(x) \to -\frac{i\,\text{sn}\left(\frac{1}{2}\sqrt{-\left(a+\sqrt{a^2+4c_1}\right)(x+c_2)^2}\middle|\frac{a-\sqrt{a^2+4c_1}}{a+\sqrt{a^2+4c_1}}\right)}{\sqrt{\frac{1}{\sqrt{a^2+4c_1}-a}}}\right\},\left\{y(x) \to \frac{i\,\text{sn}\left(\frac{1}{2}\sqrt{-\left(a+\sqrt{a^2+4c_1}\right)(x+c_2)^2}\middle|\frac{a-\sqrt{a^2-}}{a+\sqrt{a^2-}}\right.\right.$$

Maple ✓
cpu = 0.221 (sec), leaf count = 63

$$\left\{y(x) = \_C2\,\sqrt{2}\sqrt{\frac{a}{\_C2^2+2a-1}}\,JacobiSN\left(\left(\frac{x}{2}\sqrt{1-2a}+\_C1\right)\sqrt{2}\sqrt{\frac{a}{\_C2^2+2a-1}},\_C2\frac{1}{\sqrt{2a-1}}\right)\right\}$$

Mathematica raw input

```
DSolve[2*y''[x] == y[x]*(a - y[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*JacobiSN[Sqrt[-((a + Sqrt[a^2 + 4*C[1]])*(x + C[2])^2)]/2, (a -
Sqrt[a^2 + 4*C[1]])/(a + Sqrt[a^2 + 4*C[1]])]/Sqrt[(-a + Sqrt[a^2 + 4*C[1]])^(-
1)]}, {y[x] -> (I*JacobiSN[Sqrt[-((a + Sqrt[a^2 + 4*C[1]])*(x + C[2])^2)]/2, (a
- Sqrt[a^2 + 4*C[1]])/(a + Sqrt[a^2 + 4*C[1]])]/Sqrt[(-a + Sqrt[a^2 + 4*C[1]])^
(-1)]}}
```

Maple raw input

```
dsolve(2*diff(diff(y(x),x),x) = y(x)*(a-y(x)^2), y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*2^(1/2)*(a/(_C2^2+2*a-1))^(1/2)*JacobiSN((1/2*(1-2*a)^(1/2)*x+_C1)*2^
(1/2)*(a/(_C2^2+2*a-1))^(1/2),_C2/(2*a-1)^(1/2))
```

4.1845 $8y''(x)+9y'(x)^4=0$

ODE

$$8y''(x)+9y'(x)^4=0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0323541 (sec), leaf count = 90

$$\left\{\left\{y(x)\to c_2-\frac{1}{3}\sqrt[3]{-\frac{1}{3}}(9x-8c_1)^{2/3}\right\},\left\{y(x)\to\frac{(9x-8c_1)^{2/3}}{3\sqrt[3]{3}}+c_2\right\},\left\{y(x)\to\frac{1}{9}\left((-3)^{2/3}(9x-8c_1)^{2/3}+9c_2\right)\right\}\right\}$$

Maple ✓
cpu = 0.239 (sec), leaf count = 51

$$\left\{y(x)=(\_C1+x)^{\frac{2}{3}}+\_C2,y(x)=\frac{i\sqrt{3}-1}{2}(\_C1+x)^{\frac{2}{3}}+\_C2,y(x)=-\frac{i\sqrt{3}+1}{2}(\_C1+x)^{\frac{2}{3}}+\_C2\right\}$$

Mathematica raw input

```
DSolve[9*y'[x]^4 + 8*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((-1/3)^(1/3)*(9*x - 8*C[1])^(2/3))/3 + C[2]}, {y[x] -> (9*x - 8*C[1]
)^(2/3)/(3*3^(1/3)) + C[2]}, {y[x] -> ((-3)^(2/3)*(9*x - 8*C[1])^(2/3) + 9*C[2])
/9}}
```

Maple raw input

```
dsolve(8*diff(diff(y(x),x),x)+9*diff(y(x),x)^4 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1+x)^(2/3)+_C2, y(x) = -1/2*(_C1+x)^(2/3)*(I*3^(1/2)+1)+_C2, y(x) = 1/
2*(_C1+x)^(2/3)*(I*3^(1/2)-1)+_C2
```

4.1846 $axe^{y(x)} + xy''(x) + y'(x) = 0$

ODE

$$axe^{y(x)} + xy''(x) + y'(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.26248 (sec), leaf count = 190

$$\left\{\left\{y(x) \to \log\left(\frac{4e^{c_2\sqrt{2ac_1+4}}(ac_1+2)^2 x^{\sqrt{2ac_1+4}-2}}{\left(a^2c_1e^{c_2\sqrt{2ac_1+4}} + x^{\sqrt{2ac_1+4}} + 2ae^{c_2\sqrt{2ac_1+4}}\right)^2}\right)\right\}, \left\{y(x) \to \log\left(\frac{4e^{c_2\sqrt{2ac_1+4}}(ac_1+2)^2 x^{\sqrt{2ac_1+4}-2}}{\left(a\left(ac_1+2\right)x^{\sqrt{2ac_1+4}} + e^{c_2\sqrt{2ac_1+4}}\right)^2}\right)\right.$$

Maple ✓
cpu = 0.458 (sec), leaf count = 77

$$\left\{-2\frac{1}{\sqrt{\_C1-4}}\arctan\left(\frac{\sqrt{4-2\,\mathrm{e}^{y(x)}ax^2-\_C1}}{\sqrt{\_C1-4}}\right) + \ln(x) - \_C2 = 0, 2\frac{1}{\sqrt{\_C1-4}}\arctan\left(\frac{\sqrt{4-2\,\mathrm{e}^{y(x)}ax^2-\_C1}}{\sqrt{\_C1-4}}\right)\right.$$

Mathematica raw input

```
DSolve[a*E^y[x]*x + y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Log[(4*E^(Sqrt[4 + 2*a*C[1]]*C[2])*x^(-2 + Sqrt[4 + 2*a*C[1]])*(2 + a*
C[1])^2)/(2*a*E^(Sqrt[4 + 2*a*C[1]]*C[2]) + x^Sqrt[4 + 2*a*C[1]] + a^2*E^(Sqrt[4
 + 2*a*C[1]]*C[2])*C[1])^2]}, {y[x] -> Log[(4*E^(Sqrt[4 + 2*a*C[1]]*C[2])*x^(-2
+ Sqrt[4 + 2*a*C[1]])*(2 + a*C[1])^2)/(E^(Sqrt[4 + 2*a*C[1]]*C[2]) + a*x^Sqrt[4
+ 2*a*C[1]]*(2 + a*C[1]))^2]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)+a*x*exp(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
2/(_C1-4)^(1/2)*arctan((4-2*exp(y(x))*a*x^2-_C1)^(1/2)/(_C1-4)^(1/2))+ln(x)-_C2
= 0, -2/(_C1-4)^(1/2)*arctan((4-2*exp(y(x))*a*x^2-_C1)^(1/2)/(_C1-4)^(1/2))+ln(x
)-_C2 = 0
```

4.1847 $xy''(x) + 2y'(x) + xy(x)^5 = 0$

ODE

$$xy''(x) + 2y'(x) + xy(x)^5 = 0$$

ODE Classification

[_Emden, [_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 57.8507 (sec), leaf count = 11689

$$\left\{-\frac{\ln(x)}{2} - 3\int^{y(x)\sqrt{x}} \frac{1}{\sqrt{-12\_f^6 + 9\_f^2 + 9\_C1}} d\_f - \_C2 = 0, -\frac{\ln(x)}{2} + 3\int^{y(x)\sqrt{x}} \frac{1}{\sqrt{-12\_f^6 + 9\_f^2 + 9\_C1}} d\_f\right.$$

Mathematica raw input

```
DSolve[x*y[x]^5 + 2*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{Solve[(2*Sqrt[3]*Sqrt[x]*EllipticF[ArcSin[Sqrt[((Root[-12*C[1] - 3*x*#1 + 4*x^3
*#1^3 & , 1] - Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 3])*y[x]^2)/(Root[-12*C[1
] - 3*x*#1 + 4*x^3*#1^3 & , 3]*(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1] - y[x
]^2))]], ((Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1] - Root[-12*C[1] - 3*x*#1 +
 4*x^3*#1^3 & , 2])*Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 3])/(Root[-12*C[1] -
 3*x*#1 + 4*x^3*#1^3 & , 2]*(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1] - Root[-
12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 3]))]*y[x]*Sqrt[(Root[-12*C[1] - 3*x*#1 + 4*x^
3*#1^3 & , 1]*(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 2] - y[x]^2))/(Root[-12*C
[1] - 3*x*#1 + 4*x^3*#1^3 & , 2]*(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1] - y
[x]^2))]*(-Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 3] + y[x]^2))/(Root[-12*C[1]
```

```
- 3*x*#1 + 4*x^3*#1^3 & , 3]*Sqrt[(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1]*(R
oot[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1] - Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3
& , 3])*y[x]^2*(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 3] - y[x]^2))/(Root[-12*
C[1] - 3*x*#1 + 4*x^3*#1^3 & , 3]^2*(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1]
- y[x]^2)^2)]*Sqrt[12*C[1] + 3*x*y[x]^2 - 4*x^3*y[x]^6]) == C[2] + Integrate[-((
9*C[1]*EllipticF[ArcSin[Sqrt[((Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]
- Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3])*y[x]^2)/(Root[-12*C[1] - 3*K
[2]*#1 + 4*K[2]^3*#1^3 & , 3]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]
- y[x]^2))]], ((Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1]
 - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2])*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 &
 , 3])/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[2]
*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]))]
*K[2]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*Root[-12*C[1] - 3*K[2]*#1
 + 4*K[2]^3*#1^3 & , 3]*(3 - 4*K[2]^2*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3
& , 2]^2 + 4*K[2]^2*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*Root[-12*C[
1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3])*y[x]*Sqrt[(Root[-12*C[1] - 3*K[2]*#1 + 4*
K[2]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*
C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3])*y[x]^2*(Root[-12*C[1] - 3*K[2]*#1 + 4*K
[2]^3*#1^3 & , 3] - y[x]^2))/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]^2
*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - y[x]^2)^2)] - 72*C[1]*Ellip
ticF[ArcSin[Sqrt[((Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C
[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3])*y[x]^2)/(Root[-12*C[1] - 3*K[2]*#1 + 4*K
[2]^3*#1^3 & , 3]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - y[x]^2))]]
, ((Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[2]*#1
 + 4*K[2]^3*#1^3 & , 2])*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3])/(Root
[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]
^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]))]*(3*C[1] + K
[2]^3*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]^2*Root[-12*C[1] - 3*K[2]*
#1 + 4*K[2]^3*#1^3 & , 3] + K[2]^3*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & ,
 1]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]^2)*y[x]^3*Sqrt[(Root[-12*C[
1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3
 & , 1] - Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3])*y[x]^2*(Root[-12*C[1
] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3] - y[x]^2))/(Root[-12*C[1] - 3*K[2]*#1 + 4*K
[2]^3*#1^3 & , 3]^2*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - y[x]^2)^
2)] - 9*EllipticF[ArcSin[Sqrt[((Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]
 - Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3])*y[x]^2)/(Root[-12*C[1] - 3*
K[2]*#1 + 4*K[2]^3*#1^3 & , 3]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]
 - y[x]^2))]], ((Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1
] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2])*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3
& , 3])/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[2
]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]))
]*K[2]*(3*C[1] + K[2]^2*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*Root[-1
2*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]*(-12*C[1] + K[2]*Root[-12*C[1] - 3*K[2
]*#1 + 4*K[2]^3*#1^3 & , 3]) + K[2]^3*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3
& , 1]^2*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]*(1 + 4*K[2]^2*Root[-12
*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1
^3 & , 3]))*y[x]^5*Sqrt[(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*(Root[
```

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-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]
^3*#1^3 & , 3])*y[x]^2*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3] - y[x]^
2))/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]^2*(Root[-12*C[1] - 3*K[2]*
#1 + 4*K[2]^3*#1^3 & , 1] - y[x]^2)^2)] + 6*EllipticF[ArcSin[Sqrt[((Root[-12*C[1
] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3
 & , 3])*y[x]^2)/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]*(Root[-12*C[1
] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - y[x]^2))]], ((Root[-12*C[1] - 3*K[2]*#1 +
 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2])*Root[-
12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3])/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^
3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1]
- 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]))]*K[2]^4*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^
3*#1^3 & , 1]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]*(3 - 4*K[2]^2*Roo
t[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]^2 + 4*K[2]^2*Root[-12*C[1] - 3*K[2
]*#1 + 4*K[2]^3*#1^3 & , 1]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3])*y[
x]^7*Sqrt[(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K
[2]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]
)*y[x]^2*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3] - y[x]^2))/(Root[-12*
C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]^2*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*
#1^3 & , 1] - y[x]^2)^2)] - 12*EllipticF[ArcSin[Sqrt[((Root[-12*C[1] - 3*K[2]*#1
 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3])*y[x]
^2)/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]*(Root[-12*C[1] - 3*K[2]*#1
 + 4*K[2]^3*#1^3 & , 1] - y[x]^2))]], ((Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^
3 & , 1] - Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2])*Root[-12*C[1] - 3*K
[2]*#1 + 4*K[2]^3*#1^3 & , 3])/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]
*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[2]*#1 +
 4*K[2]^3*#1^3 & , 3]))]*K[2]^3*(3*C[1] + K[2]^3*Root[-12*C[1] - 3*K[2]*#1 + 4*K
[2]^3*#1^3 & , 1]^2*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3] + K[2]^3*Ro
ot[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2
]^3*#1^3 & , 3]^2)*y[x]^9*Sqrt[(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]
*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[2]*#1 +
 4*K[2]^3*#1^3 & , 3])*y[x]^2*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]
- y[x]^2))/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]^2*(Root[-12*C[1] -
3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - y[x]^2)^2)] + 12*Sqrt[3]*C[1]*K[2]^(5/2)*Root
[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^
3*#1^3 & , 2]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]*(Root[-12*C[1] -
3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2] + 2*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 &
 , 3])*Sqrt[(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*(Root[-12*C[1] - 3
*K[2]*#1 + 4*K[2]^3*#1^3 & , 2] - y[x]^2))/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3
*#1^3 & , 2]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - y[x]^2))]*Sqrt[
12*C[1] + 3*K[2]*y[x]^2 - 4*K[2]^3*y[x]^6] - (3*Sqrt[3]*(4*C[1]*K[2]^3*Root[-12*
C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]^2*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#
1^3 & , 3] + 4*C[1]*(12*C[1] + K[2]^3*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3
& , 2]^2*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3] + K[2]^3*Root[-12*C[1]
 - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 &
, 3]^2) + K[2]^3*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*(4*C[1]*Root[-
12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]^2 - 2*K[2]*Root[-12*C[1] - 3*K[2]*#1
+ 4*K[2]^3*#1^3 & , 2]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]^2 + Root
```

```
[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]^2*(4*C[1] - K[2]*Root[-12*C[1] - 3*
K[2]*#1 + 4*K[2]^3*#1^3 & , 3]))*y[x]^2*Sqrt[(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2
]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2] - y[x]^2))/(Ro
ot[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[
2]^3*#1^3 & , 1] - y[x]^2))]*Sqrt[12*C[1] + 3*K[2]*y[x]^2 - 4*K[2]^3*y[x]^6])/Sq
rt[K[2]] - 3*Sqrt[3]*Sqrt[K[2]]*(12*C[1] + K[2]^3*Root[-12*C[1] - 3*K[2]*#1 + 4*
K[2]^3*#1^3 & , 1]^2*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3] + K[2]^3*R
oot[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]^2*Root[-12*C[1] - 3*K[2]*#1 + 4*
K[2]^3*#1^3 & , 3] + K[2]^3*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]*Roo
t[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]^2 + K[2]^3*Root[-12*C[1] - 3*K[2]*
#1 + 4*K[2]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]^2 +
Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]^2))*y[x]^4*Sqrt[(Root[-12*C[1]
- 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 &
, 2] - y[x]^2))/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]*(Root[-12*C[1]
 - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - y[x]^2))]*Sqrt[12*C[1] + 3*K[2]*y[x]^2 - 4
*K[2]^3*y[x]^6] - 4*Sqrt[3]*K[2]^(11/2)*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^
3 & , 1]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]*Root[-12*C[1] - 3*K[2]
*#1 + 4*K[2]^3*#1^3 & , 3]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2] + 2
*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3])*y[x]^6*Sqrt[(Root[-12*C[1] -
3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & ,
2] - y[x]^2))/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]*(Root[-12*C[1] -
 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - y[x]^2))]*Sqrt[12*C[1] + 3*K[2]*y[x]^2 - 4*K
[2]^3*y[x]^6] + 4*Sqrt[3]*K[2]^(5/2)*(12*C[1] + K[2]^3*Root[-12*C[1] - 3*K[2]*#1
 + 4*K[2]^3*#1^3 & , 1]^2*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3] + K[2
]^3*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]^2*Root[-12*C[1] - 3*K[2]*#1
 + 4*K[2]^3*#1^3 & , 3] + K[2]^3*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2
]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]^2 + K[2]^3*Root[-12*C[1] - 3*
K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]
^2 + Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]^2))*y[x]^8*Sqrt[(Root[-12*
C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1
^3 & , 2] - y[x]^2))/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]*(Root[-12
*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - y[x]^2))]*Sqrt[12*C[1] + 3*K[2]*y[x]^
2 - 4*K[2]^3*y[x]^6])/(Sqrt[3]*K[2]^(7/2)*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#
1^3 & , 1]*Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K
[2]*#1 + 4*K[2]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3]
)*Sqrt[(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[2]
*#1 + 4*K[2]^3*#1^3 & , 2] - y[x]^2))/(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3
 & , 2]*(Root[-12*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 1] - y[x]^2))]*(-Root[-12
*C[1] - 3*K[2]*#1 + 4*K[2]^3*#1^3 & , 3] + y[x]^2)*(12*C[1] + 3*K[2]*y[x]^2 - 4*
K[2]^3*y[x]^6)^(3/2))), {K[2], 1, x}], y[x]], Solve[(2*Sqrt[3]*Sqrt[x]*EllipticF
[ArcSin[Sqrt[((Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1] - Root[-12*C[1] - 3*x*
#1 + 4*x^3*#1^3 & , 3])*y[x]^2)/(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 3]*(Roo
t[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1] - y[x]^2))]], ((Root[-12*C[1] - 3*x*#1 +
 4*x^3*#1^3 & , 1] - Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 2])*Root[-12*C[1] -
 3*x*#1 + 4*x^3*#1^3 & , 3])/(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 2]*(Root[-
12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1] - Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 3
]))]*y[x]*Sqrt[(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1]*(Root[-12*C[1] - 3*x*
```

```
#1 + 4*x^3*#1^3 & , 2] - y[x]^2))/(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 2]*(R
oot[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1] - y[x]^2))]*(Root[-12*C[1] - 3*x*#1 +
4*x^3*#1^3 & , 3] - y[x]^2))/(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 3]*Sqrt[(R
oot[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1]*(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 &
 , 1] - Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 3])*y[x]^2*(Root[-12*C[1] - 3*x*
#1 + 4*x^3*#1^3 & , 3] - y[x]^2))/(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 3]^2*
(Root[-12*C[1] - 3*x*#1 + 4*x^3*#1^3 & , 1] - y[x]^2)^2)]*Sqrt[12*C[1] + 3*x*y[x
]^2 - 4*x^3*y[x]^6]) == C[2] + Integrate[-((-9*C[1]*EllipticF[ArcSin[Sqrt[((Root
[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[1]*#1 + 4*K[1
]^3*#1^3 & , 3])*y[x]^2)/(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]*(Root
[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - y[x]^2))]], ((Root[-12*C[1] - 3*K
[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]
)*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])/(Root[-12*C[1] - 3*K[1]*#1 +
 4*K[1]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-
12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]))]*K[1]*Root[-12*C[1] - 3*K[1]*#1 + 4
*K[1]^3*#1^3 & , 1]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]*(3 - 4*K[1]
^2*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]^2 + 4*K[1]^2*Root[-12*C[1] -
 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & ,
3])*y[x]*Sqrt[(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*(Root[-12*C[1] -
 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 &
, 3])*y[x]^2*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3] - y[x]^2))/(Root[
-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]^2*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1
]^3*#1^3 & , 1] - y[x]^2)^2)] + 72*C[1]*EllipticF[ArcSin[Sqrt[((Root[-12*C[1] -
3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & ,
 3])*y[x]^2)/(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]*(Root[-12*C[1] -
3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - y[x]^2))]], ((Root[-12*C[1] - 3*K[1]*#1 + 4*K
[1]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2])*Root[-12*C
[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])/(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1
^3 & , 2]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-12*C[1] - 3*
K[1]*#1 + 4*K[1]^3*#1^3 & , 3]))]*(3*C[1] + K[1]^3*Root[-12*C[1] - 3*K[1]*#1 + 4
*K[1]^3*#1^3 & , 1]^2*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3] + K[1]^3*
Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*Root[-12*C[1] - 3*K[1]*#1 + 4*K
[1]^3*#1^3 & , 3]^2)*y[x]^3*Sqrt[(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & ,
1]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[1]*#1
 + 4*K[1]^3*#1^3 & , 3])*y[x]^2*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3
] - y[x]^2))/(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]^2*(Root[-12*C[1]
- 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - y[x]^2)^2)] + 9*EllipticF[ArcSin[Sqrt[((Roo
t[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[1]*#1 + 4*K[
1]^3*#1^3 & , 3])*y[x]^2)/(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]*(Roo
t[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - y[x]^2))]], ((Root[-12*C[1] - 3*
K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2
])*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])/(Root[-12*C[1] - 3*K[1]*#1
+ 4*K[1]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[
-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]))]*K[1]*(3*C[1] + K[1]^2*Root[-12*C[
1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3
& , 3]*(-12*C[1] + K[1]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]) + K[1]
^3*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]^2*Root[-12*C[1] - 3*K[1]*#1
```

```
+ 4*K[1]^3*#1^3 & , 3]*(1 + 4*K[1]^2*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 &
  , 2]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]))*y[x]^5*Sqrt[(Root[-12*C
[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^
3 & , 1] - Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])*y[x]^2*(Root[-12*C[
1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3] - y[x]^2))/(Root[-12*C[1] - 3*K[1]*#1 + 4*
K[1]^3*#1^3 & , 3]^2*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - y[x]^2)
^2)] - 6*EllipticF[ArcSin[Sqrt[((Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1
] - Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])*y[x]^2)/(Root[-12*C[1] - 3
*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1
] - y[x]^2))]], ((Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-12*C[
1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2])*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3
 & , 3])/(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[
1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])
)]*K[1]^4*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*Root[-12*C[1] - 3*K[1
]*#1 + 4*K[1]^3*#1^3 & , 3]*(3 - 4*K[1]^2*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#
1^3 & , 2]^2 + 4*K[1]^2*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*Root[-1
2*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])*y[x]^7*Sqrt[(Root[-12*C[1] - 3*K[1]*#
1 + 4*K[1]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Roo
t[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])*y[x]^2*(Root[-12*C[1] - 3*K[1]*#1
 + 4*K[1]^3*#1^3 & , 3] - y[x]^2))/(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 &
 , 3]^2*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - y[x]^2)^2)] + 12*Elli
pticF[ArcSin[Sqrt[((Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-12*
C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])*y[x]^2)/(Root[-12*C[1] - 3*K[1]*#1 + 4*
K[1]^3*#1^3 & , 3]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - y[x]^2))]
], ((Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[1]*#
1 + 4*K[1]^3*#1^3 & , 2])*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])/(Roo
t[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1
]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]))]*K[1]^3*(3*
C[1] + K[1]^3*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]^2*Root[-12*C[1] -
 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3] + K[1]^3*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*
#1^3 & , 1]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]^2)*y[x]^9*Sqrt[(Roo
t[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1
]^3*#1^3 & , 1] - Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])*y[x]^2*(Root
[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3] - y[x]^2))/(Root[-12*C[1] - 3*K[1]*
#1 + 4*K[1]^3*#1^3 & , 3]^2*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] -
 y[x]^2)^2)] + 12*Sqrt[3]*C[1]*K[1]^(5/2)*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1
^3 & , 1]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]*Root[-12*C[1] - 3*K[1
]*#1 + 4*K[1]^3*#1^3 & , 3]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2] +
2*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])*Sqrt[(Root[-12*C[1] - 3*K[1]
*#1 + 4*K[1]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2] - y
[x]^2))/(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[1
]*#1 + 4*K[1]^3*#1^3 & , 1] - y[x]^2))]*Sqrt[12*C[1] + 3*K[1]*y[x]^2 - 4*K[1]^3*
y[x]^6] - (3*Sqrt[3]*(4*C[1]*K[1]^3*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 &
, 1]^2*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3] + 4*C[1]*(12*C[1] + K[1]
^3*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]^2*Root[-12*C[1] - 3*K[1]*#1
+ 4*K[1]^3*#1^3 & , 3] + K[1]^3*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]
*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]^2) + K[1]^3*Root[-12*C[1] - 3*
```

```
K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*(4*C[1]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3
 & , 3]^2 - 2*K[1]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]*Root[-12*C[1
] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]^2 + Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1
^3 & , 2]^2*(4*C[1] - K[1]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])))*y
[x]^2*Sqrt[(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*
K[1]*#1 + 4*K[1]^3*#1^3 & , 2] - y[x]^2))/(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*
#1^3 & , 2]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - y[x]^2))]*Sqrt[1
2*C[1] + 3*K[1]*y[x]^2 - 4*K[1]^3*y[x]^6]/Sqrt[K[1]] - 3*Sqrt[3]*Sqrt[K[1]]*(12
*C[1] + K[1]^3*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]^2*Root[-12*C[1]
- 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3] + K[1]^3*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3
*#1^3 & , 2]^2*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3] + K[1]^3*Root[-1
2*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#
1^3 & , 3]^2 + K[1]^3*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*(Root[-12
*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]^2 + Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^
3*#1^3 & , 3]^2))*y[x]^4*Sqrt[(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*
(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2] - y[x]^2))/(Root[-12*C[1] - 3*
K[1]*#1 + 4*K[1]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]
 - y[x]^2))]*Sqrt[12*C[1] + 3*K[1]*y[x]^2 - 4*K[1]^3*y[x]^6] - 4*Sqrt[3]*K[1]^(1
1/2)*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*Root[-12*C[1] - 3*K[1]*#1
+ 4*K[1]^3*#1^3 & , 2]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3]*(Root[-1
2*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2] + 2*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]
^3*#1^3 & , 3])*y[x]^6*Sqrt[(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*(R
oot[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2] - y[x]^2))/(Root[-12*C[1] - 3*K[
1]*#1 + 4*K[1]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] -
 y[x]^2))]*Sqrt[12*C[1] + 3*K[1]*y[x]^2 - 4*K[1]^3*y[x]^6] + 4*Sqrt[3]*K[1]^(5/2
)*(12*C[1] + K[1]^3*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]^2*Root[-12*
C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3] + K[1]^3*Root[-12*C[1] - 3*K[1]*#1 + 4*K
[1]^3*#1^3 & , 2]^2*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3] + K[1]^3*Ro
ot[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1
]^3*#1^3 & , 3]^2 + K[1]^3*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*(Roo
t[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]^2 + Root[-12*C[1] - 3*K[1]*#1 + 4*
K[1]^3*#1^3 & , 3]^2))*y[x]^8*Sqrt[(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 &
 , 1]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2] - y[x]^2))/(Root[-12*C[1]
 - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 &
 , 1] - y[x]^2))]*Sqrt[12*C[1] + 3*K[1]*y[x]^2 - 4*K[1]^3*y[x]^6])/(Sqrt[3]*K[1]
^(7/2)*Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1]*Root[-12*C[1] - 3*K[1]*#
1 + 4*K[1]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 1] - Roo
t[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 3])*Sqrt[(Root[-12*C[1] - 3*K[1]*#1 +
 4*K[1]^3*#1^3 & , 1]*(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2] - y[x]^2
))/(Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 & , 2]*(Root[-12*C[1] - 3*K[1]*#1
+ 4*K[1]^3*#1^3 & , 1] - y[x]^2))]*(-Root[-12*C[1] - 3*K[1]*#1 + 4*K[1]^3*#1^3 &
 , 3] + y[x]^2)*(12*C[1] + 3*K[1]*y[x]^2 - 4*K[1]^3*y[x]^6)^(3/2))), {K[1], 1, x
}], y[x]]}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+x*y(x)^5 = 0, y(x),'implicit')
```

Maple raw output

```
-1/2*ln(x)+3*Intat(1/(-12*_f^6+9*_f^2+9*_C1)^(1/2),_f = y(x)*x^(1/2))-_C2 = 0, -
1/2*ln(x)-3*Intat(1/(-12*_f^6+9*_f^2+9*_C1)^(1/2),_f = y(x)*x^(1/2))-_C2 = 0
```

4.1848 $xy(x)^n + xy''(x) + 2y'(x) = 0$

ODE

$$xy(x)^n + xy''(x) + 2y'(x) = 0$$

ODE Classification

[_Emden, [_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0624734 (sec), leaf count = 0 , could not solve

```
DSolve[x*y[x]^n + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 1.078 (sec), leaf count = 125

$$\left\{ y(x) = ODESolStruc\left(\_a\, e^{\int \_b(\_a)\, d\_a + \_C1}, \left[\left\{ \frac{d}{d\_a}\_b(\_a) = \frac{\left(\_b(\_a)\,(n-1)^2\,\_a^n - 2\,\_a\,(n-3)\,\_b(\_a) - 2n + 10\right.}{4} \right.\right.\right.$$

Mathematica raw input

```
DSolve[x*y[x]^n + 2*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[x*y[x]^n + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+x*y(x)^n = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a*exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = 1/4*(_b(_a)*(n
-1)^2*_a^n-2*_a*(n-3)*_b(_a)-2*n+10)*_b(_a)^2}, {_a = y(x)*x^(2/(n-1)), _b(_a) =
 -2/((n-1)*x*diff(y(x),x)+2*y(x))/(x^(2/(n-1)))}, {x = exp(-1/2*(Int(_b(_a),_a)+
_C1)*(n-1)), y(x) = _a*exp(Int(_b(_a),_a)+_C1)}])
```

4.1849 $x^m y(x)^n + xy''(x) + 2y'(x) = 0$

ODE

$$x^m y(x)^n + xy''(x) + 2y'(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.955467 (sec), leaf count = 0 , could not solve

```
DSolve[x^m*y[x]^n + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 4.423 (sec), leaf count = 154

$$\left\{ y(x) = \mathit{ODESolStruc}\left(\_a \, \mathrm{e}^{\int \_b(\_a) \, \mathrm{d}\_a + \_C1}, \left[\left\{ \frac{\mathrm{d}}{\mathrm{d}\_a} \_b(\_a) = \frac{(\_b(\_a))^2 \left(\_b(\_a) (n-1)^2 \_a^n + (\_a (m-n+2) \_b($$

Mathematica raw input

```
DSolve[x^m*y[x]^n + 2*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[x^m*y[x]^n + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+x^m*y(x)^n = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a*exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = _b(_a)^2*(_b(_
a)*(n-1)^2*_a^n+(_a*(m-n+2)*_b(_a)+2*m-n+3)*(m+1))/(m+1)^2}, {_a = y(x)*x^(1/(n-
1)*(m+1)), _b(_a) = (-m-1)/(x^(1/(n-1)*(m+1)))/((n-1)*x*diff(y(x),x)+y(x)*(m+1))
}, {x = exp(-(Int(_b(_a),_a)+_C1)*(n-1)/(m+1)), y(x) = _a*exp(Int(_b(_a),_a)+_C1
)}])
```

4.1850 $ax^m y(x)^n + xy''(x) + 2y'(x) = 0$

ODE

$$ax^m y(x)^n + xy''(x) + 2y'(x) = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.979485 (sec), leaf count = 0 , could not solve

```
DSolve[a*x^m*y[x]^n + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 4.763 (sec), leaf count = 155

$$\left\{ y(x) = ODESolStruc\left(\_a\, e^{\int \_b(\_a)\, d\_a + \_C1}, \left[\left\{ \frac{d}{d\_a}\_b(\_a) = \frac{(\_b(\_a))^2 \left(a \_b(\_a) (n-1)^2 \_a^n + (\_a (m-n+2) \_b \right.\right.\right.\right.$$
$$\left.\left.\left.\left. (m+1)^2 \right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[a*x^m*y[x]^n + 2*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a*x^m*y[x]^n + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x],
x]
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+a*x^m*y(x)^n = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a*exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = _b(_a)^2*(a*_b
(_a)*(n-1)^2*_a^n+(_a*(m-n+2)*_b(_a)+2*m-n+3)*(m+1))/(m+1)^2}, {_a = y(x)*x^(1/(
n-1)*(m+1)), _b(_a) = (-m-1)/(x^(1/(n-1)*(m+1)))/((n-1)*x*diff(y(x),x)+y(x)*(m+1
))}, {x = exp(-(Int(_b(_a),_a)+_C1)*(n-1)/(m+1)), y(x) = _a*exp(Int(_b(_a),_a)+_
C1)}])
```

4.1851 $ay'(x) + bxe^{y(x)} + xy''(x) = 0$

ODE

$$ay'(x) + bxe^{y(x)} + xy''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.603581 (sec), leaf count = 0 , could not solve

```
DSolve[b*E^y[x]*x + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.916 (sec), leaf count = 93

$$\left\{y(x) = ODESolStruc\left(\_a - 2\int \_b(\_a)\,\mathrm{d}\_a - 2\_C1, [\left\{\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a) = (b\mathrm{e}^{-a} - 2a + 2)(\_b(\_a))^3 + (a-1)(\_b(\_a))\right.\right.$$

Mathematica raw input

```
DSolve[b*E^y[x]*x + a*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[b*E^y[x]*x + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x)+b*x*exp(y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a-2*Int(_b(_a),_a)-2*_C1,[{diff(_b(_a),_a) = (b*exp(_a)-2*a+
2)*_b(_a)^3+(a-1)*_b(_a)^2}, {_a = y(x)+2*ln(x), _b(_a) = 1/(x*diff(y(x),x)+2)},
 {x = exp(Int(_b(_a),_a)+_C1), y(x) = _a-2*Int(_b(_a),_a)-2*_C1}])
```

4.1852 $(2-ax^2)\,y'(x)+xy''(x)=0$

ODE

$$(2-ax^2)\,y'(x)+xy''(x)=0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0352141 (sec), leaf count = 55

$$\left\{\left\{y(x)\to \sqrt{\frac{\pi}{2}}\sqrt{a}c_1\text{erfi}\left(\frac{\sqrt{a}x}{\sqrt{2}}\right)-\frac{c_1e^{\frac{ax^2}{2}}}{x}+c_2\right\}\right\}$$

Maple ✓
cpu = 0.079 (sec), leaf count = 43

$$\left\{y(x)=\frac{1}{x}\left(-\sqrt{-2\,a}e^{\frac{ax^2}{2}}\_C2+x\left(a\_C2\,\sqrt{\pi}Erf\left(\frac{x}{2}\sqrt{-2\,a}\right)+\_C1\right)\right)\right\}$$

Mathematica raw input

```
DSolve[(2 - a*x^2)*y'[x] + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((E^((a*x^2)/2)*C[1])/x) + C[2] + Sqrt[a]*Sqrt[Pi/2]*C[1]*Erfi[(Sqrt[
a]*x)/Sqrt[2]]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(-a*x^2+2)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-(-2*a)^(1/2)*exp(1/2*a*x^2)*_C2+x*(a*_C2*Pi^(1/2)*erf(1/2*(-2*a)^(1/2)*
x)+_C1))/x
```

4.1853 $xy''(x) = (1 - y(x))y'(x)$

ODE

$$xy''(x) = (1 - y(x))y'(x)$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetries], [_2nd_order, _

Book solution method
TO DO

Mathematica ✓
cpu = 0.0717102 (sec), leaf count = 46

$$\left\{\left\{y(x) \to 2 - \sqrt{2}\sqrt{c_1 + 2}\tanh\left(\frac{\sqrt{c_1 + 2}(2c_2 - \log(x))}{\sqrt{2}}\right)\right\}\right\}$$

Maple ✓
cpu = 0.314 (sec), leaf count = 19

$$\{\ln(x) - 2\_C1\ Artanh((y(x) - 2)\_C1) - \_C2 = 0\}$$

Mathematica raw input

```
DSolve[x*y''[x] == (1 - y[x])*y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2 - Sqrt[2]*Sqrt[2 + C[1]]*Tanh[(Sqrt[2 + C[1]]*(2*C[2] - Log[x]))/Sqr
t[2]]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x) = (1-y(x))*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
ln(x)-2*_C1*arctanh((y(x)-2)*_C1)-_C2 = 0
```

4.1854 $xy''(x) + xy'(x)^2 = y'(x)$

ODE

$$xy''(x) + xy'(x)^2 = y'(x)$$

ODE Classification

[[_2nd_order, _missing_y], _Liouville, [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0149203 (sec), leaf count = 17

$$\{\{y(x) \to \log\left(2c_1 + x^2\right) + c_2\}\}$$

Maple ✓
cpu = 0.214 (sec), leaf count = 15

$$\left\{\_C1\, x^2 - \_C2 + \mathrm{e}^{y(x)} = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x]^2 + x*y''[x] == y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + Log[x^2 + 2*C[1]]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+x*diff(y(x),x)^2 = diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
_C1*x^2-_C2+exp(y(x)) = 0
```

4.1855 $xy''(x) = xy'(x)^2 + y'(x)$

ODE

$$xy''(x) = xy'(x)^2 + y'(x)$$

ODE Classification

[[_2nd_order, _missing_y], _Liouville, [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0152275 (sec), leaf count = 19

$$\{\{y(x) \to c_2 - \log\left(x^2 - 2c_1\right)\}\}$$

Maple ✓
cpu = 0.214 (sec), leaf count = 19

$$\left\{\_C1\, x^2 - \_C2 - \mathrm{e}^{-y(x)} = 0\right\}$$

Mathematica raw input

```
DSolve[x*y''[x] == y'[x] + x*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] - Log[x^2 - 2*C[1]]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x) = x*diff(y(x),x)^2+diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
_C1*x^2-_C2-exp(-y(x)) = 0
```

4.1856 $xy''(x) + 2xy'(x)^2 - 2y'(x) = 0$

ODE

$$xy''(x) + 2xy'(x)^2 - 2y'(x) = 0$$

ODE Classification

[[_2nd_order, _missing_y], _Liouville, [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.017444 (sec), leaf count = 23

$$\left\{\left\{y(x) \to \frac{1}{2}\log\left(3c_1 + 2x^3\right) + c_2\right\}\right\}$$

Maple ✓
cpu = 0.214 (sec), leaf count = 19

$$\left\{\_C1\, x^3 - \_C2 + \frac{\mathrm{e}^{2\,y(x)}}{2} = 0\right\}$$

Mathematica raw input

```
DSolve[-2*y'[x] + 2*x*y'[x]^2 + x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + Log[2*x^3 + 3*C[1]]/2}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+2*x*diff(y(x),x)^2-2*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
_C1*x^3-_C2+1/2*exp(2*y(x)) = 0
```

4.1857 $xy''(x) = x^2y'(x)^2 - 2y'(x) - y(x)^2$

ODE

$$xy''(x) = x^2y'(x)^2 - 2y'(x) - y(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 124.833 (sec), leaf count = 74

$$\text{Solve}\left[\int_1^x -\frac{c_1e^{K[2]} + K[2] + 1}{c_1e^{K[2]}K[2] + 2K[2]^2 + K[2]}\,dK[2] + c_2 = \int_1^{y(x)} -\frac{x}{c_1e^{xK[1]} + 2xK[1] + 1}\,dK[1], y(x)\right]$$

Maple ✓
cpu = 0.273 (sec), leaf count = 37

$$\left\{\ln(x) - \_C2 + \int^{xy(x)} -\left(\mathrm{e}^{-\_f}\mathrm{e}^{\_f}(\_f + 1) - \mathrm{e}^{\_f}\_C1 + \_f\right)^{-1} d\_f = 0\right\}$$

Mathematica raw input

```
DSolve[x*y''[x] == -y[x]^2 - 2*y'[x] + x^2*y'[x]^2,y[x],x]
```

Mathematica raw output

```
Solve[C[2] + Integrate[-((1 + E^K[2]*C[1] + K[2])/(K[2] + E^K[2]*C[1]*K[2] + 2*K
[2]^2)), {K[2], 1, x}] == Integrate[-(x/(1 + E^(x*K[1])*C[1] + 2*x*K[1])), {K[1]
, 1, y[x]}], y[x]]
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x) = x^2*diff(y(x),x)^2-2*diff(y(x),x)-y(x)^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C2+Intat(-1/(exp(-_f)*exp(_f)*(_f+1)-exp(_f)*_C1+_f),_f = x*y(x)) = 0
```

4.1858 $ax^2y'(x)^2+xy''(x)+2y'(x)=b$

ODE

$$ax^2y'(x)^2+xy''(x)+2y'(x)=b$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 51.0929 (sec), leaf count = 115

$$\left\{\left\{y(x)\to c_2+\int_1^x \frac{i\sqrt{b}\left(Y_1\left(-i\sqrt{a}\sqrt{b}K[1]\right)-c_1J_1\left(i\sqrt{a}\sqrt{b}K[1]\right)\right)}{\sqrt{a}K[1]\left(c_1J_0\left(i\sqrt{a}\sqrt{b}K[1]\right)+Y_0\left(-i\sqrt{a}\sqrt{b}K[1]\right)\right)}\,dK[1]\right\}\right\}$$

Maple ✓
cpu = 0.813 (sec), leaf count = 70

$$\left\{y(x)=\int -\frac{1}{ax}\sqrt{-ab}\left(Y_1\left(\sqrt{-ab}x\right)\_C1+J_1\left(\sqrt{-ab}x\right)\right)\left(\_C1\,Y_0\left(\sqrt{-ab}x\right)+J_0\left(\sqrt{-ab}x\right)\right)^{-1}\mathrm{d}x+\_C2\right\}$$

Mathematica raw input

```
DSolve[2*y'[x] + a*x^2*y'[x]^2 + x*y''[x] == b,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + Integrate[(I*Sqrt[b]*(BesselY[1, (-I)*Sqrt[a]*Sqrt[b]*K[1]] - B
esselJ[1, I*Sqrt[a]*Sqrt[b]*K[1]]*C[1]))/(Sqrt[a]*(BesselY[0, (-I)*Sqrt[a]*Sqrt[
b]*K[1]] + BesselJ[0, I*Sqrt[a]*Sqrt[b]*K[1]]*C[1])*K[1]), {K[1], 1, x}]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+a*x^2*diff(y(x),x)^2+2*diff(y(x),x) = b, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(-(-a*b)^(1/2)*(BesselY(1,(-a*b)^(1/2)*x)*_C1+BesselJ(1,(-a*b)^(1/2)*x
))/x/a/(_C1*BesselY(0,(-a*b)^(1/2)*x)+BesselJ(0,(-a*b)^(1/2)*x)),x)+_C2
```

4.1859 $(axy'(x) - y(x))^2 + xy''(x) = b$

ODE

$$(axy'(x) - y(x))^2 + xy''(x) = b$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 60.1321 (sec), leaf count = 0 , could not solve

```
DSolve[(-y[x] + a*x*Derivative[1][y][x])^2 + x*Derivative[2][y][x] == b, y[x], x]
```

Maple ✗
cpu = 0.525 (sec), leaf count = 0 , could not solve

```
dsolve(x*diff(diff(y(x),x),x)+(a*x*diff(y(x),x)-y(x))^2 = b, y(x),'implicit')
```

Mathematica raw input

```
DSolve[(-y[x] + a*x*y'[x])^2 + x*y''[x] == b,y[x],x]
```

Mathematica raw output

```
DSolve[(-y[x] + a*x*Derivative[1][y][x])^2 + x*Derivative[2][y][x] == b, y[x], x
]
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+(a*x*diff(y(x),x)-y(x))^2 = b, y(x),'implicit')
```

Maple raw output

```
dsolve(x*diff(diff(y(x),x),x)+(a*x*diff(y(x),x)-y(x))^2 = b, y(x),'implicit')
```

4.1860 $xy''(x) = y'(x)^3 + y'(x)$

ODE

$$xy''(x) = y'(x)^3 + y'(x)$$

ODE Classification

[[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0418983 (sec), leaf count = 67

$$\left\{\left\{y(x) \to c_2 - ie^{-c_1}\sqrt{e^{2c_1}x^2 - 1}\right\}, \left\{y(x) \to c_2 + ie^{-c_1}\sqrt{e^{2c_1}x^2 - 1}\right\}\right\}$$

Maple ✓
cpu = 0.281 (sec), leaf count = 31

$$\left\{y(x) = -\sqrt{-x^2 + \_C1} + \_C2, y(x) = \sqrt{-x^2 + \_C1} + \_C2\right\}$$

Mathematica raw input

```
DSolve[x*y''[x] == y'[x] + y'[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*Sqrt[-1 + E^(2*C[1])*x^2])/E^C[1] + C[2]}, {y[x] -> (I*Sqrt[-1 +
  E^(2*C[1])*x^2])/E^C[1] + C[2]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x) = diff(y(x),x)^3+diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
y(x) = -(-x^2+_C1)^(1/2)+_C2, y(x) = (-x^2+_C1)^(1/2)+_C2
```

4.1861 $xy''(x) + 2y'(x) = ax^{2k}y'(x)^k$

ODE

$$xy''(x) + 2y'(x) = ax^{2k}y'(x)^k$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 56.3344 (sec), leaf count = 57

$$\left\{\left\{y(x) \to \int_1^x \left(\frac{1}{2}aK[1]^{2k} - \frac{1}{2}akK[1]^{2k} + c_1K[1]^{2k-2}\right)^{\frac{1}{1-k}} dK[1] + c_2\right\}\right\}$$

Maple ✓
cpu = 0.32 (sec), leaf count = 47

$$\left\{y(x) = \int 2^{(k-1)^{-1}}\left(\frac{x^{-2\,k+2}}{a\,(k-1)\,(-x^2+\_C1)}\right)^{(k-1)^{-1}} \mathrm{d}x + \_C2\right\}$$

Mathematica raw input

```
DSolve[2*y'[x] + x*y''[x] == a*x^(2*k)*y'[x]^k,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + Integrate[((a*K[1]^(2*k))/2 - (a*k*K[1]^(2*k))/2 + C[1]*K[1]^(-
2 + 2*k))^(1 - k)^(-1), {K[1], 1, x}]}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x) = a*x^(2*k)*diff(y(x),x)^k, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(2^(1/(k-1))*(x^(-2*k+2)/a/(k-1)/(-x^2+_C1))^(1/(k-1)),x)+_C2
```

4.1862 $2xy''(x) + y'(x)^3 + y'(x) = 0$

ODE

$$2xy''(x) + y'(x)^3 + y'(x) = 0$$

ODE Classification

[[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0357044 (sec), leaf count = 59

$$\left\{\left\{y(x) \to c_2 - 2ie^{c_1}\sqrt{e^{2c_1} - x}\right\}, \left\{y(x) \to c_2 + 2ie^{c_1}\sqrt{e^{2c_1} - x}\right\}\right\}$$

Maple ✓
cpu = 0.271 (sec), leaf count = 35

$$\left\{y(x) = -2\frac{\sqrt{\_C1\,x - 1}}{\_C1} + \_C2, y(x) = 2\frac{\sqrt{\_C1\,x - 1}}{\_C1} + \_C2\right\}$$

Mathematica raw input

```
DSolve[y'[x] + y'[x]^3 + 2*x*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*I)*E^C[1]*Sqrt[E^(2*C[1]) - x] + C[2]}, {y[x] -> (2*I)*E^C[1]*Sqrt
[E^(2*C[1]) - x] + C[2]}}
```

Maple raw input

```
dsolve(2*x*diff(diff(y(x),x),x)+diff(y(x),x)^3+diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 2*(_C1*x-1)^(1/2)/_C1+_C2, y(x) = -2*(_C1*x-1)^(1/2)/_C1+_C2
```

4.1863 $ay(x)\left(1-y(x)^n\right)+x^2y''(x)=0$

ODE

$$ay(x)\left(1-y(x)^n\right)+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 33.6338 (sec), leaf count = 0 , could not solve

```
DSolve[a*y[x]*(1 - y[x]^n) + x^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 1.322 (sec), leaf count = 67

$$\left\{y(x)=ODESolStruc\left(\_a,\left[\left\{\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a)=(\_b(\_a))^2\left(\_b(\_a)\,\_a\,a-\_a^{n+1}\_b(\_a)\,a-1\right)\right\},\left\{\_a=y(x),\_b(\_a)=\right.\right.\right.$$

Mathematica raw input

```
DSolve[a*y[x]*(1 - y[x]^n) + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a*y[x]*(1 - y[x]^n) + x^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a*y(x)*(1-y(x)^n) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a,[{diff(_b(_a),_a) = _b(_a)^2*(_b(_a)*_a*a-_a^(n+1)*_b(_a)*
a-1)}, {_a = y(x), _b(_a) = 1/x/diff(y(x),x)}, {x = exp(Int(_b(_a),_a)+_C1), y(x
) = _a}])
```

4.1864 $ae^{y(x)-1} + x^2 y''(x) = 0$

ODE

$$ae^{y(x)-1} + x^2 y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 8.6259 (sec), leaf count = 0 , could not solve

```
DSolve[a*E^(-1 + y[x]) + x^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.779 (sec), leaf count = 60

$$\left\{y(x) = ODESolStruc\left(\_a, \left[\left\{\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a) = (\_b(\_a))^2\left(\mathrm{e}^{-a-1}\_b(\_a)\,a - 1\right)\right\}, \left\{\_a = y(x), \_b(\_a) = \frac{1}{x\frac{\mathrm{d}}{\mathrm{d}x}y(x)}\right\}, \{x\right.\right.$$

Mathematica raw input

```
DSolve[a*E^(-1 + y[x]) + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a*E^(-1 + y[x]) + x^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a*exp(y(x)-1) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a,[{diff(_b(_a),_a) = _b(_a)^2*(exp(_a-1)*_b(_a)*a-1)}, {_a
= y(x), _b(_a) = 1/x/diff(y(x),x)}, {x = exp(Int(_b(_a),_a)+_C1), y(x) = _a}])
```

4.1865 $(a+1)xy'(x)+x^2y''(x)=x^k f\left(x^k y(x), ky(x)+xy'(x)\right)$

ODE

$$(a+1)xy'(x)+x^2y''(x)=x^k f\left(x^k y(x), ky(x)+xy'(x)\right)$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 3.41429 (sec), leaf count = 0 , could not solve

```
DSolve[(1 + a)*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == x^k*f[x^k*y[x], k*y[x] + x*Derivati
```

Maple ✗
cpu = 2.769 (sec), leaf count = 0 , could not solve

```
dsolve(x^2*diff(diff(y(x),x),x)+(1+a)*x*diff(y(x),x) = x^k*f(x^k*y(x),x*diff(y(x),x)+k*y(x)), y(x),'i
```

Mathematica raw input

```
DSolve[(1 + a)*x*y'[x] + x^2*y''[x] == x^k*f[x^k*y[x], k*y[x] + x*y'[x]],y[x],x]
```

Mathematica raw output

```
DSolve[(1 + a)*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == x^k*f[x^k*y[x]
, k*y[x] + x*Derivative[1][y][x]], y[x], x]
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+(1+a)*x*diff(y(x),x) = x^k*f(x^k*y(x),x*diff(y(x),x)+k*y(x)), y(x),'i
```

Maple raw output

```
dsolve(x^2*diff(diff(y(x),x),x)+(1+a)*x*diff(y(x),x) = x^k*f(x^k*y(x),x*diff(y(x
),x)+k*y(x)), y(x),'implicit')
```

4.1866 $x^2y''(x) + y'(x)^2 = 0$

ODE

$$x^2y''(x) + y'(x)^2 = 0$$

ODE Classification

[[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0150918 (sec), leaf count = 27

$$\left\{\left\{y(x) \to -\frac{x}{c_1} + \frac{\log(c_1 x + 1)}{c_1^2} + c_2\right\}\right\}$$

Maple ✓
cpu = 0.3 (sec), leaf count = 21

$$\left\{y(x) = \frac{x}{\_C1} + \frac{\ln(\_C1\, x - 1)}{\_C1^{\,2}} + \_C2\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x/C[1]) + C[2] + Log[1 + x*C[1]]/C[1]^2}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+diff(y(x),x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/_C1*x+1/_C1^2*ln(_C1*x-1)+_C2
```

4.1867 $x^2y''(x) = (3x - 2y'(x))\,y'(x)$

ODE

$$x^2y''(x) = (3x - 2y'(x))\,y'(x)$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.018197 (sec), leaf count = 28

$$\left\{\left\{y(x) \to \frac{1}{2}\left(-c_1 \log\left(c_1 + x^2\right) + 2c_2 + x^2\right)\right\}\right\}$$

Maple ✓
cpu = 0.297 (sec), leaf count = 22

$$\left\{y(x) = \frac{x^2}{2} + \frac{\_C1\,\ln\left(x^2 - \_C1\right)}{2} + \_C2\right\}$$

Mathematica raw input

```
DSolve[x^2*y''[x] == (3*x - 2*y'[x])*y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2 + 2*C[2] - C[1]*Log[x^2 + C[1]])/2}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x) = (3*x-2*diff(y(x),x))*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x^2+1/2*_C1*ln(x^2-_C1)+_C2
```

4.1868 $x^2y''(x) + x^2y'(x)^2 + 4xy'(x) + 2 = 0$

ODE

$$x^2y''(x) + x^2y'(x)^2 + 4xy'(x) + 2 = 0$$

ODE Classification

[[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0168895 (sec), leaf count = 17

$$\{\{y(x) \to \log(c_1 + x) + c_2 - 2\log(x)\}\}$$

Maple ✓
cpu = 0.26 (sec), leaf count = 16

$$\left\{xe^{y(x)} + \_C2 - \frac{\_C1}{x} = 0\right\}$$

Mathematica raw input

```
DSolve[2 + 4*x*y'[x] + x^2*y'[x]^2 + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] - 2*Log[x] + Log[x + C[1]]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+x^2*diff(y(x),x)^2+4*x*diff(y(x),x)+2 = 0, y(x),'implicit')
```

Maple raw output

```
x*exp(y(x))+_C2-1/x*_C1 = 0
```

4.1869 $x^2y''(x) = x^4y'(x)^2 - 4x^2y(x)^2 + 6y(x)$

ODE

$$x^2y''(x) = x^4y'(x)^2 - 4x^2y(x)^2 + 6y(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 157.135 (sec), leaf count = 89

$$\text{Solve}\left[\int_1^x -\frac{c_1e^{K[3]^2} + 2K[3]^2 - 1}{K[3]\left(c_1e^{K[3]^2} + 4K[3]^2 - 1\right)}\,dK[3] + c_2 = \int_1^{y(x)} -\frac{x^2}{c_1e^{x^2K[2]} + 4x^2K[2] - 1}\,dK[2], y(x)\right]$$

Maple ✓
cpu = 0.32 (sec), leaf count = 39

$$\left\{\ln(x) - \_C2 + \int^{x^2y(x)} -\frac{1}{2}\left(\mathrm{e}^{\_f}\left(\_f - \frac{1}{2}\right)\mathrm{e}^{-\_f} - \frac{\mathrm{e}^{\_f}\_C1}{2} + \_f\right)^{-1} d\_f = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y''[x] == 6*y[x] - 4*x^2*y[x]^2 + x^4*y'[x]^2,y[x],x]
```

Mathematica raw output

```
Solve[C[2] + Integrate[-((-1 + E^K[3]^2*C[1] + 2*K[3]^2)/(K[3]*(-1 + E^K[3]^2*C[
1] + 4*K[3]^2))), {K[3], 1, x}] == Integrate[-(x^2/(-1 + E^(x^2*K[2])*C[1] + 4*x
^2*K[2])), {K[2], 1, y[x]}], y[x]]
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x) = x^4*diff(y(x),x)^2+6*y(x)-4*x^2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C2+Intat(-1/2/(exp(_f)*(_f-1/2)*exp(-_f)-1/2*exp(_f)*_C1+_f),_f = x^2*y(x
)) = 0
```

4.1870 $a(xy'(x)-y(x))^2+x^2y''(x)=bx^2$

ODE

$$a(xy'(x)-y(x))^2+x^2y''(x)=bx^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 49.7453 (sec), leaf count = 117

$$\left\{\left\{y(x)\to x\left(c_2+\int_1^x\frac{i\sqrt{b}\left(Y_1\left(-i\sqrt{a}\sqrt{b}K[2]\right)-c_1J_1\left(i\sqrt{a}\sqrt{b}K[2]\right)\right)}{\sqrt{a}K[2]\left(c_1J_0\left(i\sqrt{a}\sqrt{b}K[2]\right)+Y_0\left(-i\sqrt{a}\sqrt{b}K[2]\right)\right)}dK[2]\right)\right\}\right\}$$

Maple ✓
cpu = 0.408 (sec), leaf count = 79

$$\left\{\frac{y(x)}{x}-\int-\frac{1}{ax}\sqrt{-ab}\left(Y_1\left(\sqrt{-abx}\right)\_C1+J_1\left(\sqrt{-abx}\right)\right)\left(\_C1\,Y_0\left(\sqrt{-abx}\right)+J_0\left(\sqrt{-abx}\right)\right)^{-1}\mathrm{d}x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[a*(-y[x] + x*y'[x])^2 + x^2*y''[x] == b*x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[2] + Integrate[(I*Sqrt[b]*(BesselY[1, (-I)*Sqrt[a]*Sqrt[b]*K[2]]
- BesselJ[1, I*Sqrt[a]*Sqrt[b]*K[2]]*C[1]))/(Sqrt[a]*(BesselY[0, (-I)*Sqrt[a]*Sq
rt[b]*K[2]] + BesselJ[0, I*Sqrt[a]*Sqrt[b]*K[2]]*C[1])*K[2]), {K[2], 1, x}])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a*(x*diff(y(x),x)-y(x))^2 = b*x^2, y(x),'implicit')
```

Maple raw output

```
y(x)/x-Int(-(-a*b)^(1/2)*(BesselY(1,(-a*b)^(1/2)*x)*_C1+BesselJ(1,(-a*b)^(1/2)*x
))/x/a/(_C1*BesselY(0,(-a*b)^(1/2)*x)+BesselJ(0,(-a*b)^(1/2)*x)),x)-_C2 = 0
```

4.1871 $ax^4y'(x)^2+x^2y''(x)+2xy(x)=b$

ODE

$$ax^4y'(x)^2+x^2y''(x)+2xy(x)=b$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 3.27307 (sec), leaf count = 0 , could not solve

```
DSolve[2*x*y[x] + a*x^4*Derivative[1][y][x]^2 + x^2*Derivative[2][y][x] == b, y[x], x]
```

Maple ✗
cpu = 0.484 (sec), leaf count = 0 , could not solve

```
dsolve(x^2*diff(diff(y(x),x),x)+a*x^4*diff(y(x),x)^2+2*x*y(x) = b, y(x),'implicit')
```

Mathematica raw input

```
DSolve[2*x*y[x] + a*x^4*y'[x]^2 + x^2*y''[x] == b,y[x],x]
```

Mathematica raw output

```
DSolve[2*x*y[x] + a*x^4*Derivative[1][y][x]^2 + x^2*Derivative[2][y][x] == b, y[
x], x]
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a*x^4*diff(y(x),x)^2+2*x*y(x) = b, y(x),'implicit')
```

Maple raw output

```
dsolve(x^2*diff(diff(y(x),x),x)+a*x^4*diff(y(x),x)^2+2*x*y(x) = b, y(x),'implici
t')
```

4.1872 $ay(x)y'(x)^2+bx+x^2y''(x)=0$

ODE

$$ay(x)y'(x)^2+bx+x^2y''(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 208.267 (sec), leaf count = 0 , could not solve

```
DSolve[b*x + a*y[x]*Derivative[1][y][x]^2 + x^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 2.577 (sec), leaf count = 101

$$\left\{y(x)=ODESolStruc\left(\_a\,e^{\int -\_b(\_a)\,d\_a+\_C1},[\left\{\frac{d}{d\_a}\_b(\_a)=\left(\_a^3a+b\right)\left(\_b(\_a)\right)^3+\left(2\_a^2a+1\right)\left(\_b(\_a)\right)^2+\_b(\_\right.\right.$$

Mathematica raw input

```
DSolve[b*x + a*y[x]*y'[x]^2 + x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[b*x + a*y[x]*Derivative[1][y][x]^2 + x^2*Derivative[2][y][x] == 0, y[x],
x]
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x)+a*y(x)*diff(y(x),x)^2+b*x = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a*exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = (_a^3*a+b)*_b(
_a)^3+(2*_a^2*a+1)*_b(_a)^2+_b(_a)*a*_a}, {_a = y(x)/x, _b(_a) = x/(x*diff(y(x),
x)-y(x))}, {x = exp(Int(_b(_a),_a)+_C1), y(x) = _a*exp(Int(_b(_a),_a)+_C1)}])
```

4.1873 $x^2y''(x) = \sqrt{ax^2y'(x)^2 + by(x)^2}$

ODE

$$x^2y''(x) = \sqrt{ax^2y'(x)^2 + by(x)^2}$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.3289 (sec), leaf count = 0 , could not solve

```
DSolve[x^2*Derivative[2][y][x] == Sqrt[b*y[x]^2 + a*x^2*Derivative[1][y][x]^2], y[x], x]
```

Maple ✓
cpu = 0.289 (sec), leaf count = 60

$$\left\{y(x) - e^{\int^{\ln(x)} RootOf\left(\int^{-Z} -y(x)\left(\_a^2y(x) - \_a\,y(x) - \sqrt{(y(x))^2(\_a^2a+b)}\right)^{-1} d\_a - \_b + \_C1\right) d\_b + \_C2} = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y''[x] == Sqrt[b*y[x]^2 + a*x^2*y'[x]^2],y[x],x]
```

Mathematica raw output

```
DSolve[x^2*Derivative[2][y][x] == Sqrt[b*y[x]^2 + a*x^2*Derivative[1][y][x]^2],
y[x], x]
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x) = (a*x^2*diff(y(x),x)^2+b*y(x)^2)^(1/2), y(x),'implicit')
```

Maple raw output

```
y(x)-exp(Intat(RootOf(Intat(-y(x)/(_a^2*y(x)-_a*y(x)-(y(x)^2*(_a^2*a+b))^(1/2)),
_a = _Z)-_b+_C1),_b = ln(x))+_C2) = 0
```

4.1874 $x^2y''(x) = y(x)f\left(\frac{xy'(x)}{y(x)}\right)$

ODE

$$x^2y''(x) = y(x)f\left(\frac{xy'(x)}{y(x)}\right)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 419.83 (sec), leaf count = 0 , could not solve

```
DSolve[x^2*Derivative[2][y][x] == f[(x*Derivative[1][y][x])/y[x]]*y[x], y[x], x]
```

Maple ✓
cpu = 0.048 (sec), leaf count = 33

$$\left\{y(x) = e^{\int \ln(x) RootOf\left(\int -\frac{Z}{(\_a - \_a^2 + f(\_a))^{-1}} d\_a - \_b + \_C1\right) d\_b + \_C2}\right\}$$

Mathematica raw input

```
DSolve[x^2*y''[x] == f[(x*y'[x])/y[x]]*y[x],y[x],x]
```

Mathematica raw output

```
DSolve[x^2*Derivative[2][y][x] == f[(x*Derivative[1][y][x])/y[x]]*y[x], y[x], x]
```

Maple raw input

```
dsolve(x^2*diff(diff(y(x),x),x) = y(x)*f(x*diff(y(x),x)/y(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = exp(Intat(RootOf(Intat(1/(_a-_a^2+f(_a)),_a = _Z)-_b+_C1),_b = ln(x))+_C2
)
```

4.1875 $(x^2+1)\,y''(x)+y'(x)^2+1=0$

ODE

$$(x^2+1)\,y''(x)+y'(x)^2+1=0$$

ODE Classification

[[_2nd_order, _missing_y], [_2nd_order, _reducible, _mu_y_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0798301 (sec), leaf count = 33

$$\{\{y(x)\to -x\cot(c_1)+\csc^2(c_1)\log(-x\sin(c_1)-\cos(c_1))+c_2\}\}$$

Maple ✓
cpu = 0.224 (sec), leaf count = 27

$$\left\{y(x)=\frac{x}{\_C1}+\ln(x\_C1-1)+\frac{\ln(x\_C1-1)}{\_C1^2}+\_C2\right\}$$

Mathematica raw input

```
DSolve[1 + y'[x]^2 + (1 + x^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] - x*Cot[C[1]] + Csc[C[1]]^2*Log[-Cos[C[1]] - x*Sin[C[1]]]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+diff(y(x),x)^2+1 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/_C1*x+ln(_C1*x-1)+1/_C1^2*ln(_C1*x-1)+_C2
```

4.1876 $ay(x)^3 + 9x^2y''(x) + 2y(x) = 0$

ODE

$$ay(x)^3 + 9x^2y''(x) + 2y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 3.24699 (sec), leaf count = 0 , could not solve

```
DSolve[2*y[x] + a*y[x]^3 + 9*x^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.101 (sec), leaf count = 31

$$\left\{y(x) = \_C2\ JacobiSN\left(\left(\frac{\sqrt{2}}{2\,x^3}\sqrt{x^{\frac{20}{3}}a} + \_C1\right)\_C2, i\right)\sqrt[3]{x}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + a*y[x]^3 + 9*x^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[2*y[x] + a*y[x]^3 + 9*x^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(9*x^2*diff(diff(y(x),x),x)+a*y(x)^3+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*JacobiSN((1/2/x^3*2^(1/2)*(x^(20/3)*a)^(1/2)+_C1)*_C2,I)*x^(1/3)
```

4.1877 $x^3y''(x) - x^2y'(x) = 3 - x^2$

ODE

$$x^3y''(x) - x^2y'(x) = 3 - x^2$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0139757 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{c_1 x^2}{2} + c_2 + x + \frac{1}{x}\right\}\right\}$$

Maple ✓
cpu = 0.022 (sec), leaf count = 16

$$\left\{y(x) = \frac{\_C1\, x^2}{2} + x^{-1} + x + \_C2\right\}$$

Mathematica raw input

```
DSolve[-(x^2*y'[x]) + x^3*y''[x] == 3 - x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^(-1) + x + (x^2*C[1])/2 + C[2]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x)-x^2*diff(y(x),x) = -x^2+3, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*_C1*x^2+1/x+x+_C2
```

4.1878 $x^3(y''(x)+y(x)y'(x)-y(x)^3)+12xy(x)+24=0$

ODE

$$x^3(y''(x)+y(x)y'(x)-y(x)^3)+12xy(x)+24=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 22.4883 (sec), leaf count = 0 , could not solve

```
DSolve[24 + 12*x*y[x] + x^3*(-y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x]) == 0, y[x], x]
```

Maple ✓
cpu = 0.931 (sec), leaf count = 94

$$\left\{y(x)=ODESolStruc\left(\_a\,e^{\int -\_b(\_a)\,d\_a+\_C1},[\left\{\frac{d}{d\_a}\_b(\_a)=-\left(\left(\_a^3+\_a^2-14\,\_a-24\right)\_b(\_a)+\_a-3\right)(\_b(\_a)\right.\right.$$

Mathematica raw input

```
DSolve[24 + 12*x*y[x] + x^3*(-y[x]^3 + y[x]*y'[x] + y''[x]) == 0,y[x],x]
```

Mathematica raw output

```
DSolve[24 + 12*x*y[x] + x^3*(-y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][
y][x]) == 0, y[x], x]
```

Maple raw input

```
dsolve(x^3*(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3)+12*x*y(x)+24 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a*exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = -((_a^3+_a^2-1
4*_a-24)*_b(_a)+_a-3)*_b(_a)^2}, {_a = x*y(x), _b(_a) = -1/x/(x*diff(y(x),x)+y(x
))}, {x = 1/exp(Int(_b(_a),_a)+_C1), y(x) = _a*exp(Int(_b(_a),_a)+_C1)}])
```

4.1879 $x^3y''(x) = a(xy'(x) - y(x))^2$

ODE

$$x^3y''(x) = a(xy'(x) - y(x))^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0932135 (sec), leaf count = 25

$$\left\{\left\{y(x) \to -\frac{x \log\left(-\frac{a(c_2 x + c_1)}{x}\right)}{a}\right\}\right\}$$

Maple ✓
cpu = 0.041 (sec), leaf count = 23

$$\left\{-x\_C1 + \frac{x}{a} e^{-\frac{a y(x)}{x}} + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[x^3*y''[x] == a*(-y[x] + x*y'[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x*Log[-((a*(C[1] + x*C[2]))/x)])/a)}}
```

Maple raw input

```
dsolve(x^3*diff(diff(y(x),x),x) = a*(x*diff(y(x),x)-y(x))^2, y(x),'implicit')
```

Maple raw output

```
-x*_C1+1/a*exp(-a/x*y(x))*x+_C2 = 0
```

4.1880

$$2x^3y''(x) + x^2(2xy(x) + 9)y'(x) + xy(x)\left(-2x^2y(x)^2 + 3xy(x) + 12\right) - 6 = 0$$

ODE

$$2x^3y''(x) + x^2(2xy(x) + 9)y'(x) + xy(x)\left(-2x^2y(x)^2 + 3xy(x) + 12\right) - 6 = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 25.1892 (sec), leaf count = 0 , could not solve

```
DSolve[-6 + x*y[x]*(12 + 3*x*y[x] - 2*x^2*y[x]^2) + x^2*(9 + 2*x*y[x])*Derivative[1][y][x] + 2*x^3*De
```

Maple ✓
cpu = 0.809 (sec), leaf count = 96

$$\left\{y(x) = ODESolStruc\left(\_a\, e^{\int -\_b(\_a)\, d\_a + \_C1}, [\left\{\frac{d}{d\_a}\_b(\_a) = -(\_b(\_a))^2\left(\left(\_a^3 - \frac{\_a^2}{2} - \frac{7\_a}{2} + 3\right)\_b(\_a) + \_a +\right.\right.\right.$$

Mathematica raw input

```
DSolve[-6 + x*y[x]*(12 + 3*x*y[x] - 2*x^2*y[x]^2) + x^2*(9 + 2*x*y[x])*y'[x] + 2*x^3*y''[x] == 0,y[x]
```

Mathematica raw output

```
DSolve[-6 + x*y[x]*(12 + 3*x*y[x] - 2*x^2*y[x]^2) + x^2*(9 + 2*x*y[x])*Derivativ
e[1][y][x] + 2*x^3*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(2*x^3*diff(diff(y(x),x),x)+x^2*(9+2*x*y(x))*diff(y(x),x)-6+x*y(x)*(12+3*x*y(x)-
2*x^2*y(x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a*exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = -_b(_a)^2*((_a
^3-1/2*_a^2-7/2*_a+3)*_b(_a)+_a+3/2)}, {_a = x*y(x), _b(_a) = -1/x/(x*diff(y(x),
x)+y(x))}, {x = 1/exp(Int(_b(_a),_a)+_C1), y(x) = _a*exp(Int(_b(_a),_a)+_C1)}])
```

4.1881 $x^4 y''(x) = x(x^2 + 2y(x))\, y'(x) - 4y(x)^2$

ODE

$$x^4 y''(x) = x\left(x^2 + 2y(x)\right) y'(x) - 4y(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0702465 (sec), leaf count = 83

$$\left\{\left\{y(x) \to \frac{x^2\left(\left(1 - i\sqrt{-c_1 - 1}\right) x^{2i\sqrt{-c_1-1}} + \left(1 + i\sqrt{-c_1 - 1}\right) c_2\right)}{c_2 + x^{2i\sqrt{-c_1-1}}}\right\}\right\}$$

Maple ✓
cpu = 0.058 (sec), leaf count = 26

$$\left\{\ln(x) - \_C2 - \_C1\, Artanh\left(\frac{\left(x^2 - y(x)\right) \_C1}{x^2}\right) = 0\right\}$$

Mathematica raw input

```
DSolve[x^4*y''[x] == -4*y[x]^2 + x*(x^2 + 2*y[x])*y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2*(x^((2*I)*Sqrt[-1 - C[1]])*(1 - I*Sqrt[-1 - C[1]]) + (1 + I*Sqrt[
-1 - C[1]])*C[2]))/(x^((2*I)*Sqrt[-1 - C[1]]) + C[2])}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x) = x*(x^2+2*y(x))*diff(y(x),x)-4*y(x)^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C2-_C1*arctanh((x^2-y(x))/x^2*_C1) = 0
```

4.1882 $x^4 y''(x) = x^2 y'(x)\left(y'(x)+x\right) - 4y(x)^2$

ODE

$$x^4 y''(x) = x^2 y'(x)\left(y'(x)+x\right) - 4y(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 297.41 (sec), leaf count = 89

$$\text{Solve}\left[\int_1^x \frac{K[2]^2\left(2-c_1 e^{\frac{1}{K[2]^2}}\right)+2}{K[2]\left(K[2]^2\left(c_1 e^{\frac{1}{K[2]^2}}-2\right)-4\right)}\,dK[2] + c_2 = \int_1^{y(x)} \frac{1}{x^2\left(2-c_1 e^{\frac{K[1]}{x^2}}\right)+4K[1]}\,dK[1], y(x)\right]$$

Maple ✓
cpu = 0.081 (sec), leaf count = 29

$$\left\{\ln(x) - \_C2 + \int^{\frac{y(x)}{x^2}} \left(e^{-\_f}\_C1 + 4\_f + 2\right)^{-1} d\_f = 0\right\}$$

Mathematica raw input

```
DSolve[x^4*y''[x] == -4*y[x]^2 + x^2*y'[x]*(x + y'[x]),y[x],x]
```

Mathematica raw output

```
Solve[C[2] + Integrate[(2 + (2 - E^K[2]^(-2)*C[1])*K[2]^2)/(K[2]*(-4 + (-2 + E^K
[2]^(-2)*C[1])*K[2]^2)), {K[2], 1, x}] == Integrate[(x^2*(2 - E^(K[1]/x^2)*C[1])
 + 4*K[1])^(-1), {K[1], 1, y[x]}], y[x]]
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x) = x^2*(x+diff(y(x),x))*diff(y(x),x)-4*y(x)^2, y(x),'implicit')
```

Maple raw output

```
ln(x)-_C2+Intat(1/(exp(_f)*_C1+4*_f+2),_f = 1/x^2*y(x)) = 0
```

4.1883 $x^4 y''(x) + (xy'(x) - y(x))^3 = 0$

ODE

$$x^4 y''(x) + (xy'(x) - y(x))^3 = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.66764 (sec), leaf count = 259

$$\left\{\left\{y(x) \to -ix \log\left(-\frac{\sqrt{-8ic_1x^2 - \sinh(2c_2) - \cosh(2c_2)} + i\sinh(c_2) + i\cosh(c_2)}{4c_1 x}\right)\right\}, \left\{y(x) \to -ix \log\left(\frac{-\sqrt{-8ic_1x^2 -}\right.\right.$$

Maple ✓
cpu = 0.151 (sec), leaf count = 47

$$\left\{\frac{y(x)}{x} - \arctan\left(\frac{1}{\sqrt{\_C1\,x^2 - 1}}\right) - \_C2 = 0, \frac{y(x)}{x} + \arctan\left(\frac{1}{\sqrt{\_C1\,x^2 - 1}}\right) - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[(-y[x] + x*y'[x])^3 + x^4*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-I)*x*Log[-(I*Cosh[C[2]] + I*Sinh[C[2]] + Sqrt[(-8*I)*x^2*C[1] - Cosh
[2*C[2]] - Sinh[2*C[2]]])/(4*x*C[1])]}, {y[x] -> (-I)*x*Log[(I*Cosh[C[2]] + I*Si
nh[C[2]] - Sqrt[(-8*I)*x^2*C[1] - Cosh[2*C[2]] - Sinh[2*C[2]]])/(4*x*C[1])]}, {y
[x] -> (-I)*x*Log[((-I)*Cosh[C[2]] - I*Sinh[C[2]] + Sqrt[(-8*I)*x^2*C[1] - Cosh[
2*C[2]] - Sinh[2*C[2]]])/(4*x*C[1])]}, {y[x] -> (-I)*x*Log[(I*Cosh[C[2]] + I*Sin
h[C[2]] + Sqrt[(-8*I)*x^2*C[1] - Cosh[2*C[2]] - Sinh[2*C[2]]])/(4*x*C[1])]}}
```

Maple raw input

```
dsolve(x^4*diff(diff(y(x),x),x)+(x*diff(y(x),x)-y(x))^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x)/x+arctan(1/(_C1*x^2-1)^(1/2))-_C2 = 0, y(x)/x-arctan(1/(_C1*x^2-1)^(1/2))-_
C2 = 0
```

4.1884 $x^a y''(x) + y(x)^b = 0$

ODE

$$x^a y''(x) + y(x)^b = 0$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0445981 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]^b + x^a*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 4.556 (sec), leaf count = 158

$$\left\{ y(x) = ODESolStruc\left(\_a\, e^{\int \_b(\_a)\, d\_a + \_C1}, [\left\{ \frac{d}{d\_a}\_b(\_a) = \frac{\left(\_b(\_a)\,(b-1)^2\,\_a^b + (\_a\,(a-1-b)\,\_b(\_a) + 2\,a - \right.\right.\right.}{(a-2)^2}$$

Mathematica raw input

```
DSolve[y[x]^b + x^a*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]^b + x^a*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x^a*diff(diff(y(x),x),x)+y(x)^b = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a*exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = (_b(_a)*(b-1)^
2*_a^b+(_a*(a-1-b)*_b(_a)+2*a-b-3)*(a-2))*_b(_a)^2/(a-2)^2}, {_a = y(x)*x^((2-a)
/(b-1)), _b(_a) = (2-a)/(x^((2-a)/(b-1)))/(-x*(b-1)*diff(y(x),x)+y(x)*(a-2))}, {
x = exp((Int(_b(_a),_a)+_C1)*(b-1)/(a-2)), y(x) = _a*exp(Int(_b(_a),_a)+_C1)}])
```

4.1885 $(1-12x^2)\left(3y'(x)+y(x)^2\right)+2x(1-4x^2)\left(y''(x)+y(x)y'(x)-y(x)^3\right)-48xy(x)+24=0$

ODE

$$(1-12x^2)\left(3y'(x)+y(x)^2\right)+2x(1-4x^2)\left(y''(x)+y(x)y'(x)-y(x)^3\right)-48xy(x)+24=0$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 1.36119 (sec), leaf count = 0 , could not solve

```
DSolve[24 - 48*x*y[x] + (1 - 12*x^2)*(y[x]^2 + 3*Derivative[1][y][x]) + 2*x*(1 - 4*x^2)*(-
y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x]) == 0, y[x], x]
```

Maple ✗
cpu = 0.619 (sec), leaf count = 0 , could not solve

```
dsolve(2*x*(-4*x^2+1)*(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3)+(-12*x^2+1)*(3*diff(y(x),x)+y(x
48*x*y(x)+24 = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[24 - 48*x*y[x] + (1 - 12*x^2)*(y[x]^2 + 3*y'[x]) + 2*x*(1 - 4*x^2)*(-y[x]^3 + y[x]*y'[x] + y'
```

Mathematica raw output

```
DSolve[24 - 48*x*y[x] + (1 - 12*x^2)*(y[x]^2 + 3*Derivative[1][y][x]) + 2*x*(1 -
 4*x^2)*(-y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x]) == 0, y[x], x
]
```

Maple raw input

```
dsolve(2*x*(-4*x^2+1)*(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3)+(-12*x^2+1)*(3*diff(y(x),x)+y(x
48*x*y(x)+24 = 0, y(x),'implicit')
```

Maple raw output

```
dsolve(2*x*(-4*x^2+1)*(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3)+(-12*x^2+1
)*(3*diff(y(x),x)+y(x)^2)-48*x*y(x)+24 = 0, y(x),'implicit')
```

4.1886 $axy(x)+b-\left(kx^{k-1}-12x^2\right)\left(3y'(x)+y(x)^2\right)+2\left(x^k-4x^3\right)\left(y''(x)+y(x)y'(x)-y(x)^3\right)=0$

ODE

$$axy(x)+b-\left(kx^{k-1}-12x^2\right)\left(3y'(x)+y(x)^2\right)+2\left(x^k-4x^3\right)\left(y''(x)+y(x)y'(x)-y(x)^3\right)=0$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 5.158 (sec), leaf count = 0 , could not solve

```
DSolve[b + a*x*y[x] - (-12*x^2 + k*x^(-1 + k))*(y[x]^2 + 3*Derivative[1][y][x]) + 2*(-
4*x^3 + x^k)*(-y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x]) == 0, y[x], x]
```

Maple ✗
cpu = 3.817 (sec), leaf count = 0 , could not solve

```
dsolve(2*(x^k-4*x^3)*(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3)-(k*x^(k-1)-12*x^2)*(3*diff(y(x),
```

Mathematica raw input

```
DSolve[b + a*x*y[x] - (-12*x^2 + k*x^(-1 + k))*(y[x]^2 + 3*y'[x]) + 2*(-4*x^3 + x^k)*(-
y[x]^3 + y[x]*y'[x] + y''[x]) == 0,y[x],x]
```

Mathematica raw output

```
DSolve[b + a*x*y[x] - (-12*x^2 + k*x^(-1 + k))*(y[x]^2 + 3*Derivative[1][y][x])
+ 2*(-4*x^3 + x^k)*(-y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x]) ==
 0, y[x], x]
```

Maple raw input

```
dsolve(2*(x^k-4*x^3)*(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3)-(k*x^(k-1)-12*x^2)*(3*diff(y(x),
```

Maple raw output

```
dsolve(2*(x^k-4*x^3)*(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3)-(k*x^(k-1)-
12*x^2)*(3*diff(y(x),x)+y(x)^2)+a*x*y(x)+b = 0, y(x),'implicit')
```

4.1887 $\sqrt{x}y''(x) = y(x)^{3/2}$

ODE

$$\sqrt{x}y''(x) = y(x)^{3/2}$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 22.3749 (sec), leaf count = 0 , could not solve

```
DSolve[Sqrt[x]*Derivative[2][y][x] == y[x]^(3/2), y[x], x]
```

Maple ✓
cpu = 0.661 (sec), leaf count = 99

$$\left\{y(x) = ODESolStruc\left(\frac{\_a}{\left(e^{\int \_b(\_a)\,d\_a+\_C1}\right)^3}, [\left\{\frac{d}{d\_a}\_b(\_a) = -(\_b(\_a))^3 \_a^{\frac{3}{2}} + 12(\_b(\_a))^3 \_a - 7(\_b(\_a))^2\right\}, \left\{-\right.\right.$$

Mathematica raw input

```
DSolve[Sqrt[x]*y''[x] == y[x]^(3/2),y[x],x]
```

Mathematica raw output

```
DSolve[Sqrt[x]*Derivative[2][y][x] == y[x]^(3/2), y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)*x^(1/2) = y(x)^(3/2), y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a/exp(Int(_b(_a),_a)+_C1)^3,[{diff(_b(_a),_a) = -_b(_a)^3*_a
^(3/2)+12*_b(_a)^3*_a-7*_b(_a)^2}, {_a = x^3*y(x), _b(_a) = 1/x^3/(x*diff(y(x),x
)+3*y(x))}, {x = exp(Int(_b(_a),_a)+_C1), y(x) = _a/exp(Int(_b(_a),_a)+_C1)^3}])
```

4.1888 $x^{3/2}y''(x) = f\left(\frac{y(x)}{\sqrt{x}}\right)$

ODE

$$x^{3/2}y''(x) = f\left(\frac{y(x)}{\sqrt{x}}\right)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 600.311 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.199 (sec), leaf count = 84

$$\left\{\frac{\ln(x)}{2} - \int^{y(x)\frac{1}{\sqrt{x}}} \frac{1}{\sqrt{\_C1 + 8\int f(\_g)\,\mathrm{d}\_g + \_g^2}} d\_g - \_C2 = 0, \frac{\ln(x)}{2} + \int^{y(x)\frac{1}{\sqrt{x}}} \frac{1}{\sqrt{\_C1 + 8\int f(\_g)\,\mathrm{d}\_g + \_g^2}} d\_\right.$$

Mathematica raw input

```
DSolve[x^(3/2)*y''[x] == f[y[x]/Sqrt[x]],y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x^(3/2)*diff(diff(y(x),x),x) = f(y(x)/x^(1/2)), y(x),'implicit')
```

Maple raw output

```
y(x) = RootOf(4*f(_Z/x^(1/2))*x^(1/2)+_Z), 1/2*ln(x)-Intat(1/(_C1+8*Int(f(_g),_g
)+_g^2)^(1/2),_g = y(x)/x^(1/2))-_C2 = 0, 1/2*ln(x)+Intat(1/(_C1+8*Int(f(_g),_g)
+_g^2)^(1/2),_g = y(x)/x^(1/2))-_C2 = 0
```

4.1889 $y''(x)\left(a+2bx+cx^2\right)^{3/2}=f\left(\frac{x}{\sqrt{a+2bx+cx^2}}\right)$

ODE

$$y''(x)\left(a+2bx+cx^2\right)^{3/2}=f\left(\frac{x}{\sqrt{a+2bx+cx^2}}\right)$$

ODE Classification

[[_2nd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 2.38103 (sec), leaf count = 64

$$\left\{\left\{y(x)\to\int_1^x\left(\int_1^{K[2]}\frac{f\left(\frac{K[1]}{\sqrt{2bK[1]+cK[1]^2+a}}\right)}{(K[1](cK[1]+2b)+a)^{3/2}}\,dK[1]\right)\,dK[2]+c_2x+c_1\right\}\right\}$$

Maple ✓
cpu = 0.115 (sec), leaf count = 43

$$\left\{y(x)=\iint 1f\left(x\frac{1}{\sqrt{cx^2+2\,bx+a}}\right)\left(cx^2+2\,bx+a\right)^{-\frac{3}{2}}\,\mathrm{d}x\,\mathrm{d}x+x\_C1+\_C2\right\}$$

Mathematica raw input

```
DSolve[(a + 2*b*x + c*x^2)^(3/2)*y''[x] == f[x/Sqrt[a + 2*b*x + c*x^2]],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*C[2] + Integrate[Integrate[f[K[1]/Sqrt[a + 2*b*K[1] + c*K[1]^
2]]/(a + K[1]*(2*b + c*K[1]))^(3/2), {K[1], 1, K[2]}], {K[2], 1, x}]}}
```

Maple raw input

```
dsolve((c*x^2+2*b*x+a)^(3/2)*diff(diff(y(x),x),x) = f(x/(c*x^2+2*b*x+a)^(1/2)), y(x),'implicit')
```

Maple raw output

```
y(x) = Int(Int(f(x/(c*x^2+2*b*x+a)^(1/2))/(c*x^2+2*b*x+a)^(3/2),x),x)+x*_C1+_C2
```

4.1890 $f(x)f'(x)y'(x) + f(x)^2y''(x) = g(y(x), f(x)y'(x))$

ODE

$$f(x)f'(x)y'(x) + f(x)^2y''(x) = g(y(x), f(x)y'(x))$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.973163 (sec), leaf count = 0 , could not solve

```
DSolve[f[x]*Derivative[1][f][x]*Derivative[1][y][x] + f[x]^2*Derivative[2][y][x] == g[y[x], f[x]*Deri
```

Maple ✓
cpu = 0.319 (sec), leaf count = 68

$$\left\{y(x) = ODESolStruc\left(\_a, [\left\{\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a) = -g\left(\_a, (\_b(\_a))^{-1}\right)(\_b(\_a))^3\right\}, \left\{\_a = y(x), \_b(\_a) = \frac{1}{f(x)\frac{\mathrm{d}}{\mathrm{d}x}y(x)}\right\}\right.\right.$$

Mathematica raw input

```
DSolve[f[x]*f'[x]*y'[x] + f[x]^2*y''[x] == g[y[x], f[x]*y'[x]],y[x],x]
```

Mathematica raw output

```
DSolve[f[x]*Derivative[1][f][x]*Derivative[1][y][x] + f[x]^2*Derivative[2][y][x]
 == g[y[x], f[x]*Derivative[1][y][x]], y[x], x]
```

Maple raw input

```
dsolve(f(x)^2*diff(diff(y(x),x),x)+f(x)*diff(f(x),x)*diff(y(x),x) = g(y(x),f(x)*diff(y(x),x)), y(x),
```

Maple raw output

```
y(x) = ODESolStruc(_a,[{diff(_b(_a),_a) = -g(_a,1/_b(_a))*_b(_a)^3}, {_a = y(x),
 _b(_a) = 1/f(x)/diff(y(x),x)}, {x = RootOf(Int(_b(_a),_a)+_C1-Intat(1/f(_f),_f
= _Z)), y(x) = _a}])
```

4.1891 $f(x)^2 y''(x) = y'(x)\left(3f(x)f'(x) - f(x)^2 y(x) + 3f(x)^3\right) - 24f(x)^4$

ODE

$$f(x)^2 y''(x) = y'(x)\left(3f(x)f'(x) - f(x)^2 y(x) + 3f(x)^3\right) - 24f(x)^4$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 8.19603 (sec), leaf count = 0 , could not solve

```
DSolve[f[x]^2*Derivative[2][y][x] == -24*f[x]^4 + (3*f[x]^3 - f[x]^2*y[x] + 3*f[x]*Derivative[1][f][x
```

Maple ✗
cpu = 0.367 (sec), leaf count = 0 , could not solve

```
dsolve(f(x)^2*diff(diff(y(x),x),x) = (3*f(x)^3+3*f(x)*diff(f(x),x)-f(x)^2*y(x))*diff(y(x),x)-
24*f(x)^4, y(x),'implicit')
```

Mathematica raw input

```
DSolve[f[x]^2*y''[x] == -24*f[x]^4 + (3*f[x]^3 - f[x]^2*y[x] + 3*f[x]*f'[x])*y'[x],y[x],x]
```

Mathematica raw output

```
DSolve[f[x]^2*Derivative[2][y][x] == -24*f[x]^4 + (3*f[x]^3 - f[x]^2*y[x] + 3*f[
x]*Derivative[1][f][x])*Derivative[1][y][x], y[x], x]
```

Maple raw input

```
dsolve(f(x)^2*diff(diff(y(x),x),x) = (3*f(x)^3+3*f(x)*diff(f(x),x)-f(x)^2*y(x))*diff(y(x),x)-
24*f(x)^4, y(x),'implicit')
```

Maple raw output

```
dsolve(f(x)^2*diff(diff(y(x),x),x) = (3*f(x)^3+3*f(x)*diff(f(x),x)-f(x)^2*y(x))*
diff(y(x),x)-24*f(x)^4, y(x),'implicit')
```

4.1892 $f(x)^2 y''(x) = -af(x)^5 + 3f(x)f'(x) - f(x)^2 y(x) + 3f(x)^3$

ODE

$$f(x)^2 y''(x) = -af(x)^5 + 3f(x)f'(x) - f(x)^2 y(x) + 3f(x)^3$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✓
cpu = 1.21559 (sec), leaf count = 97

$$\left\{\left\{y(x) \to \cos(x)\left(\int_1^x \frac{\sin(K[1])\left(af(K[1])^4 - 3f'(K[1]) - 3f(K[1])^2\right)}{f(K[1])}\,dK[1]\right) + \sin(x)\left(\int_1^x -\frac{\cos(K[2])\left(af(K[2])^4 - 3f\right.\right.\right.$$

Maple ✓
cpu = 0.129 (sec), leaf count = 76

$$\left\{y(x) = \sin(x)\_C2 + \cos(x)\_C1 - \int \frac{\cos(x)\left((f(x))^4 a - 3(f(x))^2 - 3\frac{\mathrm{d}}{\mathrm{d}x}f(x)\right)}{f(x)}\,\mathrm{d}x \sin(x) + \int \frac{\sin(x)\left((f(x))^4 a - 3(f\right.}{f(x)}$$

Mathematica raw input

```
DSolve[f[x]^2*y''[x] == 3*f[x]^3 - a*f[x]^5 - f[x]^2*y[x] + 3*f[x]*f'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*Cos[x] + Cos[x]*Integrate[(Sin[K[1]]*(-3*f[K[1]]^2 + a*f[K[1]]^4
- 3*Derivative[1][f][K[1]]))/f[K[1]], {K[1], 1, x}] + C[2]*Sin[x] + Integrate[-(
(Cos[K[2]]*(-3*f[K[2]]^2 + a*f[K[2]]^4 - 3*Derivative[1][f][K[2]]))/f[K[2]]), {K
[2], 1, x}]*Sin[x]}}
```

Maple raw input

```
dsolve(f(x)^2*diff(diff(y(x),x),x) = 3*f(x)^3+3*f(x)*diff(f(x),x)-f(x)^2*y(x)-a*f(x)^5, y(x),'implici
```

Maple raw output

```
y(x) = sin(x)*_C2+cos(x)*_C1-Int(cos(x)/f(x)*(f(x)^4*a-3*f(x)^2-3*diff(f(x),x)),
x)*sin(x)+Int(sin(x)/f(x)*(f(x)^4*a-3*f(x)^2-3*diff(f(x),x)),x)*cos(x)
```

4.1893 $2f(x)^2y''(x) = f(x)y'(x)\left(3f'(x) - 2f(x)y(x)\right) + f(x)y(x)^2f'(x) + y(x)\left(f(x)f''(x) - 2f'(x)^2 - 2f(x)^3\right) + 2f(x)^2y(x)^3$

ODE

$$2f(x)^2y''(x) = f(x)y'(x)\left(3f'(x) - 2f(x)y(x)\right) + f(x)y(x)^2f'(x) + y(x)\left(f(x)f''(x) - 2f'(x)^2 - 2f(x)^3\right) + 2f(x)^2y(x)^3$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.984603 (sec), leaf count = 0 , could not solve

```
DSolve[2*f[x]^2*Derivative[2][y][x] == 2*f[x]^2*y[x]^3 + f[x]*y[x]^2*Derivative[1][f][x] + f[x]*(-
2*f[x]*y[x] + 3*Derivative[1][f][x])*Derivative[1][y][x] + y[x]*(-2*f[x]^3 - 2*Derivative[1][f][x]^2
```

Maple ✓
cpu = 2.31 (sec), leaf count = 761

$$\left\{ \int \sqrt{f(x)}\,dx - \int^{y(x)\frac{1}{\sqrt{f(x)}}} \frac{1}{2\_f^8 - 8\_f^6 + 12\_f^4 + \left(-160\_C1^3 - 8\right)\_f^2 + 160\_C1^3 + 2} \left(-\frac{(\_f-1)^3\left(i\sqrt{3}+1\right)(\_f^{6}}{} \right.\right.$$

Mathematica raw input

```
DSolve[2*f[x]^2*y''[x] == 2*f[x]^2*y[x]^3 + f[x]*y[x]^2*f'[x] + f[x]*(-2*f[x]*y[x] + 3*f'[x])*y'[x] +
2*f[x]^3 - 2*f'[x]^2 + f[x]*f''[x]),y[x],x]
```

Mathematica raw output

```
DSolve[2*f[x]^2*Derivative[2][y][x] == 2*f[x]^2*y[x]^3 + f[x]*y[x]^2*Derivative[
1][f][x] + f[x]*(-2*f[x]*y[x] + 3*Derivative[1][f][x])*Derivative[1][y][x] + y[x
]*(-2*f[x]^3 - 2*Derivative[1][f][x]^2 + f[x]*Derivative[2][f][x]), y[x], x]
```

Maple raw input

```
dsolve(2*f(x)^2*diff(diff(y(x),x),x) = f(x)*(3*diff(f(x),x)-2*f(x)*y(x))*diff(y(x),x)+(f(x)*diff(diff
2*diff(f(x),x)^2-2*f(x)^3)*y(x)+f(x)*diff(f(x),x)*y(x)^2+2*f(x)^2*y(x)^3, y(x),'implicit')
```

Maple raw output

```
y(x) = 0, y(x) = f(x)^(1/2), y(x) = -f(x)^(1/2), Int(f(x)^(1/2),x)-Intat((1/4*(_
f-1)^3*(_f+1)^3*(_f^6-3*_f^4-80*_C1^3+3*_f^2-1)*4^(2/3)/((_f-1)^3*(5^(1/2)*_C1*(
-_C1/(_f^6-3*_f^4-80*_C1^3+3*_f^2-1))^(1/2)+1/4)*(_f^6-3*_f^4-80*_C1^3+3*_f^2-1)
^2*(_f+1)^3)^(1/3)+4^(1/3)*((_f-1)^3*(5^(1/2)*_C1*(-_C1/(_f^6-3*_f^4-80*_C1^3+3*
_f^2-1))^(1/2)+1/4)*(_f^6-3*_f^4-80*_C1^3+3*_f^2-1)^2*(_f+1)^3)^(1/3))/(_f^2-1)/
(_f^6-3*_f^4-80*_C1^3+3*_f^2-1),_f = y(x)/f(x)^(1/2))-_C2 = 0, Int(f(x)^(1/2),x)
-Intat((-1/4*(_f-1)^3*(I*3^(1/2)+1)*(_f^6-3*_f^4-80*_C1^3+3*_f^2-1)*(_f+1)^3*4^(
2/3)/((_f-1)^3*(5^(1/2)*_C1*(-_C1/(_f^6-3*_f^4-80*_C1^3+3*_f^2-1))^(1/2)+1/4)*(_
f^6-3*_f^4-80*_C1^3+3*_f^2-1)^2*(_f+1)^3)^(1/3)+(I*3^(1/2)-1)*4^(1/3)*((_f-1)^3*
(5^(1/2)*_C1*(-_C1/(_f^6-3*_f^4-80*_C1^3+3*_f^2-1))^(1/2)+1/4)*(_f^6-3*_f^4-80*_
C1^3+3*_f^2-1)^2*(_f+1)^3)^(1/3))/(2*_f^8-8*_f^6+12*_f^4+(-160*_C1^3-8)*_f^2+160
*_C1^3+2),_f = y(x)/f(x)^(1/2))-_C2 = 0, Int(f(x)^(1/2),x)-Intat((1/4*(I*3^(1/2)
-1)*(_f-1)^3*(_f^6-3*_f^4-80*_C1^3+3*_f^2-1)*(_f+1)^3*4^(2/3)/((_f-1)^3*(5^(1/2)
*_C1*(-_C1/(_f^6-3*_f^4-80*_C1^3+3*_f^2-1))^(1/2)+1/4)*(_f^6-3*_f^4-80*_C1^3+3*_
f^2-1)^2*(_f+1)^3)^(1/3)+(-I*3^(1/2)-1)*4^(1/3)*((_f-1)^3*(5^(1/2)*_C1*(-_C1/(_f
^6-3*_f^4-80*_C1^3+3*_f^2-1))^(1/2)+1/4)*(_f^6-3*_f^4-80*_C1^3+3*_f^2-1)^2*(_f+1
)^3)^(1/3))/(2*_f^8-8*_f^6+12*_f^4+(-160*_C1^3-8)*_f^2+160*_C1^3+2),_f = y(x)/f(
x)^(1/2))-_C2 = 0
```

4.1894 $y(x)y''(x) = a$

ODE

$$y(x)y''(x) = a$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.209895 (sec), leaf count = 111

$$\left\{\left\{y(x) \to \exp\left(-\frac{c_1 + 2a\text{erf}^{-1}\left(-i\sqrt{\frac{2}{\pi}}\sqrt{ae^{\frac{c_1}{a}}(c_2+x)^2}\right)^2}{2a}\right)\right\}, \left\{y(x) \to \exp\left(-\frac{c_1 + 2a\text{erf}^{-1}\left(i\sqrt{\frac{2}{\pi}}\sqrt{ae^{\frac{c_1}{a}}(c_2+x)^2}\right)\right.}{2a}\right.\right.$$

Maple ✓
cpu = 0.389 (sec), leaf count = 54

$$\left\{\int^{y(x)} \frac{1}{\sqrt{2\,a\ln(\_a) - 2\,\_C1\,a}} d\_a - x - \_C2 = 0, \int^{y(x)} -\frac{1}{\sqrt{-2\,a\,(\_C1 - \ln(\_a))}} d\_a - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == a,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(-(C[1] + 2*a*InverseErf[(-I)*Sqrt[2/Pi]*Sqrt[a*E^(C[1]/a)*(x + C[2]
)^2]]^2)/(2*a))}, {y[x] -> E^(-(C[1] + 2*a*InverseErf[I*Sqrt[2/Pi]*Sqrt[a*E^(C[1
]/a)*(x + C[2])^2]]^2)/(2*a))}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = a, y(x),'implicit')
```

Maple raw output

```
Intat(1/(2*a*ln(_a)-2*_C1*a)^(1/2),_a = y(x))-x-_C2 = 0, Intat(-1/(-2*a*(_C1-ln(
_a)))^(1/2),_a = y(x))-x-_C2 = 0
```

4.1895 $y(x)y''(x) = y'(x)^2$

ODE

$$y(x)y''(x) = y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0353146 (sec), leaf count = 14

$$\{\{y(x) \to c_2 e^{c_1 x}\}\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 14

$$\{\ln(y(x)) - \_C1\, x - \_C2 = 0\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x*C[1])*C[2]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
ln(y(x))-_C1*x-_C2 = 0
```

4.1896 $y(x)y''(x) + y'(x)^2 = 0$

ODE

$$y(x)y''(x) + y'(x)^2 = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _exact, _nonlinear], _Liouville, [_2nd_order, _

Book solution method
TO DO

Mathematica ✓
cpu = 0.0253791 (sec), leaf count = 20

$$\{\{y(x) \to c_2\sqrt{2x - c_1}\}\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 17

$$\left\{\frac{(y(x))^2}{2} - \_C1\, x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 + y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[2*x - C[1]]*C[2]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x)+diff(y(x),x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
1/2*y(x)^2-_C1*x-_C2 = 0
```

4.1897 $y(x)y''(x) = y'(x)^2 - a^2$

ODE

$$y(x)y''(x) = y'(x)^2 - a^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.183456 (sec), leaf count = 88

$$\left\{\left\{y(x) \to \frac{1}{2}e^{-e^{c_1}(c_2+x)}\left(e^{2e^{c_1}(c_2+x)-2c_1} - a^2\right)\right\}, \left\{y(x) \to \frac{1}{2}e^{-e^{c_1}(c_2+x)-2c_1} - \frac{1}{2}a^2 e^{e^{c_1}(c_2+x)}\right\}\right\}$$

Maple ✓
cpu = 0.102 (sec), leaf count = 68

$$\left\{-\ln\left(\frac{y(x)}{\_C1} + \sqrt{\frac{(y(x))^2}{\_C1^2} + a^2}\right) \_C1 - x - \_C2 = 0, \ln\left(\frac{y(x)}{\_C1} + \sqrt{\frac{(y(x))^2}{\_C1^2} + a^2}\right) \_C1 - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == -a^2 + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-a^2 + E^(-2*C[1] + 2*E^C[1]*(x + C[2])))/(2*E^(E^C[1]*(x + C[2])))},
 {y[x] -> -(a^2*E^(E^C[1]*(x + C[2])))/2 + E^(-2*C[1] - E^C[1]*(x + C[2]))/2}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-a^2, y(x),'implicit')
```

Maple raw output

```
-ln(y(x)/_C1+(y(x)^2/_C1^2+a^2)^(1/2))*_C1-x-_C2 = 0, ln(y(x)/_C1+(y(x)^2/_C1^2+
a^2)^(1/2))*_C1-x-_C2 = 0
```

4.1898 $y(x)y''(x) + y'(x)^2 = a^2$

ODE

$$y(x)y''(x) + y'(x)^2 = a^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _m

Book solution method
TO DO

Mathematica ✓
cpu = 0.0622942 (sec), leaf count = 64

$$\left\{\left\{y(x) \to -\frac{\sqrt{a^4 (c_2 + x)^2 - e^{2c_1}}}{a}\right\}, \left\{y(x) \to \frac{\sqrt{a^4 (c_2 + x)^2 - e^{2c_1}}}{a}\right\}\right\}$$

Maple ✓
cpu = 0.048 (sec), leaf count = 23

$$\left\{-\frac{(y(x))^2}{2} + \frac{a^2 x^2}{2} - \_C1\, x + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 + y[x]*y''[x] == a^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-E^(2*C[1]) + a^4*(x + C[2])^2]/a)}, {y[x] -> Sqrt[-E^(2*C[1])
+ a^4*(x + C[2])^2]/a}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x)+diff(y(x),x)^2 = a^2, y(x),'implicit')
```

Maple raw output

```
-1/2*y(x)^2+1/2*a^2*x^2-_C1*x+_C2 = 0
```

4.1899 $y(x)y''(x) + y'(x)^2 + y(x)^2 = 0$

ODE

$$y(x)y''(x) + y'(x)^2 + y(x)^2 = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.118438 (sec), leaf count = 25

$$\left\{\left\{y(x) \to c_2\sqrt{\cos\left(\sqrt{2}\,(x - c_1)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.05 (sec), leaf count = 28

$$\left\{\_C1\,\sin\left(\sqrt{2}x\right) + \_C2\,\cos\left(\sqrt{2}x\right) + \sqrt{2}(y(x))^2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]^2 + y'[x]^2 + y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]*Sqrt[Cos[Sqrt[2]*(x - C[1])]]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x)+diff(y(x),x)^2+y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
_C1*sin(2^(1/2)*x)+_C2*cos(2^(1/2)*x)+2^(1/2)*y(x)^2 = 0
```

4.1900 $2a^2y(x)^2 + y(x)y''(x) + y'(x)^2 = 0$

ODE

$$2a^2y(x)^2 + y(x)y''(x) + y'(x)^2 = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.125994 (sec), leaf count = 23

$$\left\{\left\{y(x) \to c_2\sqrt{\cos\left(a\left(2x - c_1\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.064 (sec), leaf count = 26

$$\left\{-a(y(x))^2 - \_C1\ \sin\left(2\,ax\right) + \_C2\ \cos\left(2\,ax\right) = 0\right\}$$

Mathematica raw input

```
DSolve[2*a^2*y[x]^2 + y'[x]^2 + y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]*Sqrt[Cos[a*(2*x - C[1])]]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x)+diff(y(x),x)^2+2*a^2*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-a*y(x)^2-_C1*sin(2*a*x)+_C2*cos(2*a*x) = 0
```

4.1901 $y(x)y''(x) = \mathbf{a0} + \mathbf{a1}y(x) + y(x)^3(\mathbf{a2} + \mathbf{a3}y(x)) + y'(x)^2$

ODE

$$y(x)y''(x) = \text{a0} + \text{a1}y(x) + y(x)^3(\text{a2} + \text{a3}y(x)) + y'(x)^2$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 4.93952 (sec), leaf count = 2633

$$\left\{ \text{Solve}\left[-\frac{2F\left(\sin^{-1}\left(\sqrt{\frac{\left(\text{Root}\left[\text{a3}\#1^4+2\text{a2}\#1^3+c_1\#1^2-2\text{a1}\#1-\text{a0}\&,2\right]-\text{Root}\left[\text{a3}\#1^4+2\text{a2}\#1^3+c_1\#1^2-2\text{a1}\#1-\text{a0}\&,4\right]\right)\left(\text{Root}\right.\right.\right.}{\left(\text{Root}\left[\text{a3}\#1^4+2\text{a2}\#1^3+c_1\#1^2-2\text{a1}\#1-\text{a0}\&,1\right]-\text{Root}\left[\text{a3}\#1^4+2\text{a2}\#1^3+c_1\#1^2-2\text{a1}\#1-\text{a0}\&,4\right]\right)\left(\text{Root}\right.}\right.\right.\right.$$

Maple ✓
cpu = 0.125 (sec), leaf count = 83

$$\left\{ \int^{y(x)} \frac{1}{\sqrt{a3\_a^4 + 2\_a^3 a2 + \_a^2 \_C1 - 2\,a1\,\_a - a0}} d\_a - x - \_C2 = 0, \int^{y(x)} -\frac{1}{\sqrt{a3\_a^4 + 2\_a^3 a2 + \_a^2 \_C1 - 2}}\right.$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == a0 + a1*y[x] + y[x]^3*(a2 + a3*y[x]) + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{Solve[(-2*EllipticF[ArcSin[Sqrt[((Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 +
a3*#1^4 & , 2] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 4])*(R
oot[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] - y[x]))/((Root[-a0 -
 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] - Root[-a0 - 2*a1*#1 + C[1]*#1
^2 + 2*a2*#1^3 + a3*#1^4 & , 4])*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a
3*#1^4 & , 2] - y[x]))]], ((Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4
 & , 2] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 3])*(Root[-a0
 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] - Root[-a0 - 2*a1*#1 + C[1]*
#1^2 + 2*a2*#1^3 + a3*#1^4 & , 4]))/((Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3
 + a3*#1^4 & , 1] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 3])
*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2] - Root[-a0 - 2*a1*
```

```
#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 4]))]*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 +
 2*a2*#1^3 + a3*#1^4 & , 1] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1
^4 & , 4])*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2] - y[x])^
2*Sqrt[((Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] - Root[-a0
- 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2])*(Root[-a0 - 2*a1*#1 + C[1]*#
1^2 + 2*a2*#1^3 + a3*#1^4 & , 3] - y[x]))/((Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a
2*#1^3 + a3*#1^4 & , 1] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 &
 , 3])*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2] - y[x]))]*Sq
rt[((Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] - Root[-a0 - 2*
a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2])*(Root[-a0 - 2*a1*#1 + C[1]*#1^2
+ 2*a2*#1^3 + a3*#1^4 & , 2] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#
1^4 & , 4])*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] - y[x])
*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 4] - y[x]))/((Root[-a
0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] - Root[-a0 - 2*a1*#1 + C[1]
*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 4])^2*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^
3 + a3*#1^4 & , 2] - y[x])^2)])/((-Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 +
a3*#1^4 & , 1] + Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2])*(R
oot[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2] - Root[-a0 - 2*a1*#1
+ C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 4])*Sqrt[-a0 + y[x]*(-2*a1 + y[x]*(C[1] +
2*a2*y[x] + a3*y[x]^2))]) == x + C[2], y[x]], Solve[(2*EllipticF[ArcSin[Sqrt[((R
oot[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2] - Root[-a0 - 2*a1*#1
+ C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 4])*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2
*#1^3 + a3*#1^4 & , 1] - y[x]))/((Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a
3*#1^4 & , 1] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 4])*(Ro
ot[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2] - y[x]))]], ((Root[-a0
 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2] - Root[-a0 - 2*a1*#1 + C[1]*
#1^2 + 2*a2*#1^3 + a3*#1^4 & , 3])*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 +
 a3*#1^4 & , 1] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 4]))/
((Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] - Root[-a0 - 2*a1*
#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 3])*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2
*a2*#1^3 + a3*#1^4 & , 2] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4
 & , 4]))]*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] - Root[-
a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 4])*(Root[-a0 - 2*a1*#1 + C[1
]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2] - y[x])^2*Sqrt[((Root[-a0 - 2*a1*#1 + C[1]*#
1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 +
a3*#1^4 & , 2])*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 3] - y
[x]))/((Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] - Root[-a0 -
 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 3])*(Root[-a0 - 2*a1*#1 + C[1]*#1
^2 + 2*a2*#1^3 + a3*#1^4 & , 2] - y[x]))]*Sqrt[((Root[-a0 - 2*a1*#1 + C[1]*#1^2
+ 2*a2*#1^3 + a3*#1^4 & , 1] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#
1^4 & , 2])*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2] - Root[
-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 4])*(Root[-a0 - 2*a1*#1 + C[
1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] - y[x])*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2
*a2*#1^3 + a3*#1^4 & , 4] - y[x]))/((Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3
+ a3*#1^4 & , 1] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 4])^
2*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2] - y[x])^2)])/((-R
oot[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 1] + Root[-a0 - 2*a1*#1
```

```
+ C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 & , 2])*(Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2
*#1^3 + a3*#1^4 & , 2] - Root[-a0 - 2*a1*#1 + C[1]*#1^2 + 2*a2*#1^3 + a3*#1^4 &
, 4])*Sqrt[-a0 + y[x]*(-2*a1 + y[x]*(C[1] + 2*a2*y[x] + a3*y[x]^2))]) == x + C[2
], y[x]]}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+a0+a1*y(x)+(a2+a3*y(x))*y(x)^3, y(x),'implicit')
```

Maple raw output

```
Intat(1/(_a^4*a3+2*_a^3*a2+_C1*_a^2-2*_a*a1-a0)^(1/2),_a = y(x))-x-_C2 = 0, Inta
t(-1/(_a^4*a3+2*_a^3*a2+_C1*_a^2-2*_a*a1-a0)^(1/2),_a = y(x))-x-_C2 = 0
```

4.1902 $y(x)y''(x) = \mathbf{a0} + \mathbf{a1}y(x) + \mathbf{a2}y(x)^2 + \mathbf{a3}y(x)^3 + \mathbf{a4}y(x)^4 + y'(x)^2$

ODE

$$y(x)y''(x) = \mathrm{a0} + \mathrm{a1}y(x) + \mathrm{a2}y(x)^2 + \mathrm{a3}y(x)^3 + \mathrm{a4}y(x)^4 + y'(x)^2$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 103.101 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*Derivative[2][y][x] == a0 + a1*y[x] + a2*y[x]^2 + a3*y[x]^3 + a4*y[x]^4 + Derivative[1][y
```

Maple ✓
cpu = 0.172 (sec), leaf count = 99

$$\left\{ \int^{y(x)} \frac{1}{\sqrt{a4\,_a^4 + 2\,_a^2 \ln(_a)\,a2 + 2\,_a^3 a3 + _a^2 _C1 - 2\,a1\,_a - a0}} d_a - x - _C2 = 0, \int^{y(x)} -\frac{1}{\sqrt{a4\,_a^4 + 2\,_a^2}}
$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == a0 + a1*y[x] + a2*y[x]^2 + a3*y[x]^3 + a4*y[x]^4 + y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]*Derivative[2][y][x] == a0 + a1*y[x] + a2*y[x]^2 + a3*y[x]^3 + a4*y[x
]^4 + Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+a0+a1*y(x)+a2*y(x)^2+a3*y(x)^3+a4*y(x)^4, y(x),'imp
```

Maple raw output

```
Intat(1/(a4*_a^4+2*_a^2*ln(_a)*a2+2*_a^3*a3+_a^2*_C1-2*a1*_a-a0)^(1/2),_a = y(x)
)-x-_C2 = 0, Intat(-1/(a4*_a^4+2*_a^2*ln(_a)*a2+2*_a^3*a3+_a^2*_C1-2*a1*_a-a0)^(
1/2),_a = y(x))-x-_C2 = 0
```

4.1903 $y(x)y''(x) = y'(x)^2 + y(x)y'(x)$

ODE

$$y(x)y''(x) = y'(x)^2 + y(x)y'(x)$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0250834 (sec), leaf count = 16

$$\left\{\left\{y(x) \to c_2 e^{c_1 e^x}\right\}\right\}$$

Maple ✓
cpu = 0.092 (sec), leaf count = 15

$$\{\ln(y(x)) - \_C1\, \mathrm{e}^x - \_C2 = 0\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == y[x]*y'[x] + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(E^x*C[1])*C[2]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+y(x)*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
ln(y(x))-_C1*exp(x)-_C2 = 0
```

4.1904 $y(x)y''(x) = e^x y(x)\left(\mathbf{a0} + \mathbf{a1}y(x)^2\right) + e^{2x}(\mathbf{a2} + \mathbf{a3}y(x)^4) + y'(x)^2$

ODE

$$y(x)y''(x) = e^x y(x)\left(\text{a0} + \text{a1}y(x)^2\right) + e^{2x}(\text{a2} + \text{a3}y(x)^4) + y'(x)^2$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 5.62937 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*Derivative[2][y][x] == E^x*y[x]*(a0 + a1*y[x]^2) + E^(2*x)*(a2 + a3*y[x]^4) + Derivative[
```

Maple ✗
cpu = 4.024 (sec), leaf count = 0 , could not solve

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+exp(x)*y(x)*(a0+a1*y(x)^2)+exp(2*x)*(a2+a3*y(x)^4),
```

Mathematica raw input

```
DSolve[y[x]*y''[x] == E^x*y[x]*(a0 + a1*y[x]^2) + E^(2*x)*(a2 + a3*y[x]^4) + y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]*Derivative[2][y][x] == E^x*y[x]*(a0 + a1*y[x]^2) + E^(2*x)*(a2 + a3*
y[x]^4) + Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+exp(x)*y(x)*(a0+a1*y(x)^2)+exp(2*x)*(a2+a3*y(x)^4),
```

Maple raw output

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+exp(x)*y(x)*(a0+a1*y(x)^2)+exp
(2*x)*(a2+a3*y(x)^4), y(x),'implicit')
```

4.1905 $y(x)y''(x) = y'(x)^2 + y(x)^2 \log(y(x))$

ODE

$$y(x)y''(x) = y'(x)^2 + y(x)^2 \log(y(x))$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0898975 (sec), leaf count = 63

$$\left\{\left\{y(x) \to e^{\frac{1}{2}\left(e^{c_2+x}-c_1 e^{-c_2-x}\right)}\right\}, \left\{y(x) \to e^{\frac{1}{2}\left(e^{-c_2-x}-c_1 e^{c_2+x}\right)}\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 19

$$\left\{-\mathrm{e}^{2x}\_C1 - 2\,\mathrm{e}^{x}\ln\left(y(x)\right) + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == Log[y[x]]*y[x]^2 + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^((E^(x + C[2]) - E^(-x - C[2])*C[1])/2)}, {y[x] -> E^((E^(-x - C[2])
 - E^(x + C[2])*C[1])/2)}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+y(x)^2*ln(y(x)), y(x),'implicit')
```

Maple raw output

```
-exp(2*x)*_C1-2*exp(x)*ln(y(x))+_C2 = 0
```

4.1906 $y(x)y''(x) = -x^2y(x)^2 + y'(x)^2 + y(x)^2\log(y(x))$

ODE

$$y(x)y''(x) = -x^2y(x)^2 + y'(x)^2 + y(x)^2\log(y(x))$$

ODE Classification

[[_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.168172 (sec), leaf count = 30

$$\left\{\left\{y(x) \to e^{-\frac{c_1 e^x}{2} - c_2 e^{-x} + x^2 + 2}\right\}\right\}$$

Maple ✓
cpu = 0.03 (sec), leaf count = 30

$$\left\{-\mathrm{e}^{2x}\_C1 + 2x^2\mathrm{e}^x - 2\mathrm{e}^x\ln(y(x)) + 4\mathrm{e}^x + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == -(x^2*y[x]^2) + Log[y[x]]*y[x]^2 + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(2 + x^2 - (E^x*C[1])/2 - C[2]/E^x)}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+y(x)^2*ln(y(x))-x^2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-exp(2*x)*_C1+2*x^2*exp(x)-2*exp(x)*ln(y(x))+4*exp(x)+_C2 = 0
```

4.1907 $y(x)y''(x)+y'(x)^2=y'(x)$

ODE

$$y(x)y''(x)+y'(x)^2=y'(x)$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _m

Book solution method
TO DO

Mathematica ✓
cpu = 0.0388741 (sec), leaf count = 32

$$\left\{\left\{y(x)\to -c_1\left(W\left(-\frac{e^{-\frac{c_1+c_2+x}{c_1}}}{c_1}\right)+1\right)\right\}\right\}$$

Maple ✓
cpu = 0.065 (sec), leaf count = 20

$$\{y(x)-\_C1\ \ln(y(x)+\_C1)-x-\_C2=0\}$$

Mathematica raw input

```
DSolve[y'[x]^2 + y[x]*y''[x] == y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(C[1]*(1 + ProductLog[-(1/(E^((x + C[1] + C[2])/C[1])*C[1]))]))}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x)+diff(y(x),x)^2 = diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
y(x)-_C1*ln(y(x)+_C1)-x-_C2 = 0
```

4.1908 $y(x)y''(x) = y'(x)^2 - y'(x)$

ODE

$$y(x)y''(x) = y'(x)^2 - y'(x)$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducible,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0271559 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{e^{c_1(c_2+x)} - 1}{c_1}\right\}\right\}$$

Maple ✓
cpu = 0.051 (sec), leaf count = 21

$$\left\{\frac{\ln(\_C1\, y(x) + 1)}{\_C1} - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == -y'[x] + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + E^(C[1]*(x + C[2])))/C[1]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
ln(_C1*y(x)+1)/_C1-x-_C2 = 0
```

4.1909 $y(x)y''(x) = y(x)^2 (f(x)y(x) + g'(x)) + y'(x)^2 + y'(x)$

ODE

$$y(x)y''(x) = y(x)^2 (f(x)y(x) + g'(x)) + y'(x)^2 + y'(x)$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 5.63177 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*Derivative[2][y][x] == y[x]^2*(f[x]*y[x] + Derivative[1][g][x]) + Derivative[1][y][x] + D
```

Maple ✗
cpu = 0.423 (sec), leaf count = 0 , could not solve

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+diff(y(x),x)+y(x)^2*(f(x)*y(x)+diff(g(x),x)), y(x),
```

Mathematica raw input

```
DSolve[y[x]*y''[x] == y[x]^2*(f[x]*y[x] + g'[x]) + y'[x] + y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]*Derivative[2][y][x] == y[x]^2*(f[x]*y[x] + Derivative[1][g][x]) + De
rivative[1][y][x] + Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+diff(y(x),x)+y(x)^2*(f(x)*y(x)+diff(g(x),x)), y(x),
```

Maple raw output

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+diff(y(x),x)+y(x)^2*(f(x)*y(x)
+diff(g(x),x)), y(x),'implicit')
```

4.1910 $y(x)y''(x) = y'(x)^2 - 2y'(x)$

ODE

$$y(x)y''(x) = y'(x)^2 - 2y'(x)$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducible,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0274094 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{e^{c_1(c_2+x)} - 2}{c_1}\right\}\right\}$$

Maple ✓
cpu = 0.051 (sec), leaf count = 21

$$\left\{\frac{\ln(\_C1\, y(x) + 2)}{\_C1} - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == -2*y'[x] + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2 + E^(C[1]*(x + C[2])))/C[1]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-2*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
ln(_C1*y(x)+2)/_C1-x-_C2 = 0
```

4.1911 $y(x)y''(x) + y'(x)^2 - xy'(x) + y(x) = 0$

ODE

$$y(x)y''(x) + y'(x)^2 - xy'(x) + y(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 37.6507 (sec), leaf count = 0 , could not solve

```
DSolve[y[x] - x*Derivative[1][y][x] + Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.707 (sec), leaf count = 97

$$\left\{ y(x) = ODESolStruc\left(\_a \left(e^{\int \_b(\_a)\, d\_a + \_C1} \right)^2, [\left\{ \frac{d}{d\_a} \_b(\_a) = 6 \frac{(\_b(\_a)\, \_a + 1)\, \_b(\_a)\, (1/6 + (\_a - 1/6)\, \_b(\_a)}{\_a} \right.\right.$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + y'[x]^2 + y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[y[x] - x*Derivative[1][y][x] + Derivative[1][y][x]^2 + y[x]*Derivative[2]
[y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x)+diff(y(x),x)^2-x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a*exp(Int(_b(_a),_a)+_C1)^2,[{diff(_b(_a),_a) = 6*(_b(_a)*_a
+1)*_b(_a)*(1/6+(_a-1/6)*_b(_a))/_a}, {_a = 1/x^2*y(x), _b(_a) = x^2/(x*diff(y(x
),x)-2*y(x))}, {x = exp(Int(_b(_a),_a)+_C1), y(x) = _a*exp(Int(_b(_a),_a)+_C1)^2
}])
```

4.1912 $axy'(x) + y(x)y''(x) + y'(x)^2 = 0$

ODE

$$axy'(x) + y(x)y''(x) + y'(x)^2 = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 46.9385 (sec), leaf count = 0 , could not solve

```
DSolve[a*x*Derivative[1][y][x] + Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.541 (sec), leaf count = 110

$$\left\{ y(x) = ODESolStruc\left(\_a \left(e^{\int \_b(\_a)\, d\_a + \_C1} \right)^2, [\left\{ \frac{d}{d\_a}\_b(\_a) = \frac{\_b(\_a)\left(6\,(\_b(\_a))^2\,\_a^2 + 2\,(\_b(\_a))^2\,\_a\,a + 7\,\_\right.}{\_a} \right.\right.$$

Mathematica raw input

```
DSolve[a*x*y'[x] + y'[x]^2 + y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a*x*Derivative[1][y][x] + Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x
] == 0, y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x)+diff(y(x),x)^2+a*x*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a*exp(Int(_b(_a),_a)+_C1)^2,[{diff(_b(_a),_a) = _b(_a)*(6*_b
(_a)^2*_a^2+2*_b(_a)^2*_a*a+7*_b(_a)*_a+_b(_a)*a+1)/_a}, {_a = 1/x^2*y(x), _b(_a
) = x^2/(x*diff(y(x),x)-2*y(x))}, {x = exp(Int(_b(_a),_a)+_C1), y(x) = _a*exp(In
t(_b(_a),_a)+_C1)^2}])
```

4.1913 $y(x)y''(x) = -y(x)f'(x) + f(x)y'(x) + y'(x)^2 + y(x)^3$

ODE

$$y(x)y''(x) = -y(x)f'(x) + f(x)y'(x) + y'(x)^2 + y(x)^3$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.229892 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*Derivative[2][y][x] == y[x]^3 - y[x]*Derivative[1][f][x] + f[x]*Derivative[1][y][x] + Der
```

Maple ✗
cpu = 0.477 (sec), leaf count = 0 , could not solve

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+f(x)*diff(y(x),x)-diff(f(x),x)*y(x)+y(x)^3, y(x),'i
```

Mathematica raw input

```
DSolve[y[x]*y''[x] == y[x]^3 - y[x]*f'[x] + f[x]*y'[x] + y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]*Derivative[2][y][x] == y[x]^3 - y[x]*Derivative[1][f][x] + f[x]*Deri
vative[1][y][x] + Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+f(x)*diff(y(x),x)-diff(f(x),x)*y(x)+y(x)^3, y(x),'i
```

Maple raw output

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+f(x)*diff(y(x),x)-diff(f(x),x)
*y(x)+y(x)^3, y(x),'implicit')
```

4.1914 $y(x)y''(x) = y(x)f''(x) - f(x)y'(x) - f(x)y(x)^3 + y'(x)^2 + y(x)^4$

ODE

$$y(x)y''(x) = y(x)f''(x) - f(x)y'(x) - f(x)y(x)^3 + y'(x)^2 + y(x)^4$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.496746 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*Derivative[2][y][x] == -(f[x]*y[x]^3) + y[x]^4 - f[x]*Derivative[1][y][x] + Derivative[1]
```

Maple ✗
cpu = 0.717 (sec), leaf count = 0 , could not solve

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-f(x)*diff(y(x),x)+diff(diff(f(x),x),x)*y(x)-
f(x)*y(x)^3+y(x)^4, y(x),'implicit')
```

Mathematica raw input

```
DSolve[y[x]*y''[x] == -(f[x]*y[x]^3) + y[x]^4 - f[x]*y'[x] + y'[x]^2 + y[x]*f''[x],y[x],x]
```

Mathematica raw output

```
DSolve[y[x]*Derivative[2][y][x] == -(f[x]*y[x]^3) + y[x]^4 - f[x]*Derivative[1][
y][x] + Derivative[1][y][x]^2 + y[x]*Derivative[2][f][x], y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-f(x)*diff(y(x),x)+diff(diff(f(x),x),x)*y(x)-
f(x)*y(x)^3+y(x)^4, y(x),'implicit')
```

Maple raw output

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-f(x)*diff(y(x),x)+diff(diff(f(
x),x),x)*y(x)-f(x)*y(x)^3+y(x)^4, y(x),'implicit')
```

4.1915 $y(x)y''(x) = -ay(x)y'(x) - by(x)^2 + y'(x)^2$

ODE

$$y(x)y''(x) = -ay(x)y'(x) - by(x)^2 + y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0733805 (sec), leaf count = 28

$$\left\{\left\{y(x) \to c_2 e^{-\frac{c_1 e^{-ax}+bx}{a}}\right\}\right\}$$

Maple ✓
cpu = 0.038 (sec), leaf count = 27

$$\left\{-\mathrm{e}^{-ax}\_C1 + bx + a\ln(y(x)) + \_C2 - \frac{b}{a} = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == -(b*y[x]^2) - a*y[x]*y'[x] + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]/E^((b*x + C[1]/E^(a*x))/a)}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-a*y(x)*diff(y(x),x)-b*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-exp(-a*x)*_C1+b*x+a*ln(y(x))+_C2-1/a*b = 0
```

4.1916 $y(x)y''(x) = ay(x)y'(x) + by(x)^2 + y'(x)^2 + y(x)^3$

ODE

$$y(x)y''(x) = ay(x)y'(x) + by(x)^2 + y'(x)^2 + y(x)^3$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 47.8136 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*Derivative[2][y][x] == b*y[x]^2 + y[x]^3 + a*y[x]*Derivative[1][y][x] + Derivative[1][y]
```

Maple ✓
cpu = 1.509 (sec), leaf count = 68

$$\left\{y(x) = ODESolStruc\left(\_a, [\left\{\left(\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a)\right)\_b(\_a) - \frac{(\_b(\_a))^2 + a\_a\,\_b(\_a) + b\_a^2 + \_a^3}{\_a} = 0\right\}, \left\{\_a = y(x), \_\right.\right.$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == b*y[x]^2 + y[x]^3 + a*y[x]*y'[x] + y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]*Derivative[2][y][x] == b*y[x]^2 + y[x]^3 + a*y[x]*Derivative[1][y][x
] + Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+a*y(x)*diff(y(x),x)+b*y(x)^2+y(x)^3, y(x),'implicit
```

Maple raw output

```
y(x) = ODESolStruc(_a,[{diff(_b(_a),_a)*_b(_a)-(_b(_a)^2+a*_a*_b(_a)+b*_a^2+_a^3
)/_a = 0}, {_a = y(x), _b(_a) = diff(y(x),x)}, {x = Int(1/_b(_a),_a)+_C1, y(x) =
 _a}])
```

4.1917 $y(x)y''(x) = y(x)^2y'(x) + y'(x)^2$

ODE

$$y(x)y''(x) = y(x)^2y'(x) + y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _with_potential_symmetries], [_2nd_order, _reduc

Book solution method
TO DO

Mathematica ✓
cpu = 0.0802794 (sec), leaf count = 31

$$\left\{\left\{y(x) \to -\frac{c_1 e^{c_1(c_2+x)}}{e^{c_1(c_2+x)}-1}\right\}\right\}$$

Maple ✓
cpu = 0.067 (sec), leaf count = 25

$$\left\{-x - \_C2 + \frac{-\ln(y(x)+\_C1)+\ln(y(x))}{\_C1} = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == y[x]^2*y'[x] + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((E^(C[1]*(x + C[2]))*C[1])/(-1 + E^(C[1]*(x + C[2]))))}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+y(x)^2*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
-x-_C2+(-ln(y(x)+_C1)+ln(y(x)))/_C1 = 0
```

4.1918 $y(x)y''(x) = f(x)y(x)y'(x) + g(x)y(x)^2 + y'(x)^2$

ODE

$$y(x)y''(x) = f(x)y(x)y'(x) + g(x)y(x)^2 + y'(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 9.98744 (sec), leaf count = 57

$$\left\{\left\{y(x) \to c_2 \exp\left(\int_1^x e^{\int_1^{K[3]} f(K[1])\,dK[1]}\left(\int_1^{K[3]} g(K[2])e^{-\int_1^{K[2]} f(K[1])\,dK[1]}\,dK[2] + c_1\right)\,dK[3]\right)\right\}\right\}$$

Maple ✓
cpu = 0.135 (sec), leaf count = 61

$$\left\{\int e^{\int f(x)\,dx}\,dx \int e^{-\int f(x)\,dx} g(x)\,dx - \_C1 \int e^{\int f(x)\,dx}\,dx - \ln(y(x)) - \int\int e^{\int f(x)\,dx}\,dx e^{-\int f(x)\,dx} g(x)\,dx + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == g[x]*y[x]^2 + f[x]*y[x]*y'[x] + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^Integrate[E^Integrate[f[K[1]], {K[1], 1, K[3]}]*(C[1] + Integrate[g[
K[2]]/E^Integrate[f[K[1]], {K[1], 1, K[2]}], {K[2], 1, K[3]}]), {K[3], 1, x}]*C[
2]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+f(x)*y(x)*diff(y(x),x)+g(x)*y(x)^2, y(x),'implicit
```

Maple raw output

```
Int(exp(Int(f(x),x)),x)*Int(exp(-Int(f(x),x))*g(x),x)-_C1*Int(exp(Int(f(x),x)),x
)-ln(y(x))-Int(Int(exp(Int(f(x),x)),x)*exp(-Int(f(x),x))*g(x),x)+_C2 = 0
```

4.1919

$$y(x)y''(x) = -y(x)\left(f'(x) - y(x)^2 g'(x)\right) + y'(x)\left(f(x) + g(x)y(x)^2\right) + y'(x)^2$$

ODE

$$y(x)y''(x) = -y(x)\left(f'(x) - y(x)^2 g'(x)\right) + y'(x)\left(f(x) + g(x)y(x)^2\right) + y'(x)^2$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 21.005 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*Derivative[2][y][x] == -(y[x]*(Derivative[1][f][x] - y[x]^2*Derivative[1][g][x])) + (f[x]
```

Maple ✓
cpu = 0.319 (sec), leaf count = 53

$$\left\{y(x) = ODESolStruc\left(\_b(\_a), \left[\left\{\frac{-g(\_a)\left(\_b(\_a)\right)^2 + \_C1\ \_b(\_a) + \frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a) + f(\_a)}{\_b(\_a)} = 0\right\}, \{\_a = x, \_b(\_a) =\right.\right.$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == -(y[x]*(f'[x] - y[x]^2*g'[x])) + (f[x] + g[x]*y[x]^2)*y'[x] + y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]*Derivative[2][y][x] == -(y[x]*(Derivative[1][f][x] - y[x]^2*Derivati
ve[1][g][x])) + (f[x] + g[x]*y[x]^2)*Derivative[1][y][x] + Derivative[1][y][x]^2
, y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+(f(x)+g(x)*y(x)^2)*diff(y(x),x)-y(x)*(diff(f(x),x)-
diff(g(x),x)*y(x)^2), y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_b(_a),[{(-g(_a)*_b(_a)^2+_C1*_b(_a)+diff(_b(_a),_a)+f(_a))/_
b(_a) = 0}, {_a = x, _b(_a) = y(x)}, {x = _a, y(x) = _b(_a)}])
```

4.1920 $y(x)y''(x) = 2y'(x)^2 + y(x)^2$

ODE

$$y(x)y''(x) = 2y'(x)^2 + y(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0791582 (sec), leaf count = 13

$$\{\{y(x) \to c_2 \sec(c_1 + x)\}\}$$

Maple ✓
cpu = 0.041 (sec), leaf count = 17

$$\left\{-\_C1 \sin(x) + \_C2 \cos(x) + (y(x))^{-1} = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == y[x]^2 + 2*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]*Sec[x + C[1]]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = 2*diff(y(x),x)^2+y(x)^2, y(x),'implicit')
```

Maple raw output

```
-_C1*sin(x)+_C2*cos(x)+1/y(x) = 0
```

4.1921 $y(x)y''(x) = 2(y'(x)^2 - y(x)^2)$

ODE

$$y(x)y''(x) = 2(y'(x)^2 - y(x)^2)$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.110461 (sec), leaf count = 34

$$\left\{\left\{y(x) \to \frac{c_2 e^{\sqrt{2}x}}{e^{2\sqrt{2}(c_1+x)}+1}\right\}\right\}$$

Maple ✓
cpu = 0.039 (sec), leaf count = 30

$$\left\{-\mathrm{e}^{2\sqrt{2}x}\_C1 + 2\frac{\sqrt{2}\mathrm{e}^{\sqrt{2}x}}{y(x)} + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == 2*(-y[x]^2 + y'[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(Sqrt[2]*x)*C[2])/(1 + E^(2*Sqrt[2]*(x + C[1])))}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = 2*diff(y(x),x)^2-2*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-exp(2*2^(1/2)*x)*_C1+2*2^(1/2)*exp(2^(1/2)*x)/y(x)+_C2 = 0
```

4.1922 $y(x)y''(x) = -3y(x)y'(x) + 3y'(x)^2 + y(x)^2$

ODE

$$y(x)y''(x) = -3y(x)y'(x) + 3y'(x)^2 + y(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0646049 (sec), leaf count = 25

$$\left\{\left\{y(x) \to \frac{c_2 e^x}{\sqrt{1 - 2e^{c_1+x}}}\right\}\right\}$$

Maple ✓
cpu = 0.039 (sec), leaf count = 20

$$\left\{-\mathrm{e}^{-x}\_C1 + \_C2 - \frac{\mathrm{e}^x}{2\,(y(x))^2} = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == y[x]^2 - 3*y[x]*y'[x] + 3*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*C[2])/Sqrt[1 - 2*E^(x + C[1])]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = 3*diff(y(x),x)^2-3*y(x)*diff(y(x),x)+y(x)^2, y(x),'implicit')
```

Maple raw output

```
-exp(-x)*_C1+_C2-1/2/y(x)^2*exp(x) = 0
```

4.1923 $y(x)y''(x) = ay'(x)^2$

ODE

$$y(x)y''(x) = ay'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0354637 (sec), leaf count = 26

$$\left\{\left\{y(x) \to c_2(-ax - c_1 + x)^{\frac{1}{1-a}}\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 26

$$\left\{-\frac{y(x)}{(a-1)\left(y\left(x\right)\right)^{a}} - \_C1\, x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == a*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - a*x - C[1])^(1 - a)^(-1)*C[2]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = a*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
-y(x)/(a-1)/(y(x)^a)-_C1*x-_C2 = 0
```

4.1924 $y(x)y''(x) = ay'(x)^2 + b$

ODE

$$y(x)y''(x) = ay'(x)^2 + b$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.613567 (sec), leaf count = 206

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{\#1\sqrt{a}\sqrt{\frac{b-\#1^{2a}e^{2ac_1}}{b}}\,{}_2F_1\left(\frac{1}{2},\frac{1}{2a};1+\frac{1}{2a};\frac{e^{2ac_1}\#1^{2a}}{b}\right)}{\sqrt{\#1^{2a}e^{2ac_1}-b}}\&\right][c_2+x]\right\},\left\{y(x) \to \text{InverseFunctio}\right.\right.$$

Maple ✓
cpu = 0.162 (sec), leaf count = 64

$$\left\{\int^{y(x)} a\frac{1}{\sqrt{-a\left(-\_C1\,\_a^{2\,a}+b\right)}}d\_a - x - \_C2 = 0, \int^{y(x)} -a\frac{1}{\sqrt{-a\left(-\_C1\,\_a^{2\,a}+b\right)}}d\_a - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == b + a*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-((Sqrt[a]*Hypergeometric2F1[1/2, 1/(2*a), 1 + 1/(2*a)
, (E^(2*a*C[1])*#1^(2*a))/b]*#1*Sqrt[(b - E^(2*a*C[1])*#1^(2*a))/b])/Sqrt[-b + E
^(2*a*C[1])*#1^(2*a)]) & ][x + C[2]]}, {y[x] -> InverseFunction[(Sqrt[a]*Hyperge
ometric2F1[1/2, 1/(2*a), 1 + 1/(2*a), (E^(2*a*C[1])*#1^(2*a))/b]*#1*Sqrt[(b - E^
(2*a*C[1])*#1^(2*a))/b])/Sqrt[-b + E^(2*a*C[1])*#1^(2*a)] & ][x + C[2]]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = a*diff(y(x),x)^2+b, y(x),'implicit')
```

Maple raw output

```
Intat(a/(-a*(-_C1*_a^(2*a)+b))^(1/2),_a = y(x))-x-_C2 = 0, Intat(-a/(-a*(-_C1*_a
^(2*a)+b))^(1/2),_a = y(x))-x-_C2 = 0
```

4.1925 $y(x)y''(x) = ay'(x)^2 + by(x)^3$

ODE

$$y(x)y''(x) = ay'(x)^2 + by(x)^3$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 2.17783 (sec), leaf count = 264

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{\#1\sqrt{2a-3}\sqrt{1-\frac{2b\#1^{3-2a}}{(2a-3)c_1}}\,{}_2F_1\left(\frac{1}{2},\frac{a-1}{2a-3};\frac{a-1}{2a-3}+1;\frac{2b\#1^{3-2a}}{(2a-3)c_1}\right)}{(a-1)\sqrt{(2a-3)c_1\#1^{2a}-2\#1^3 b}}\&\right][c_2+x]\right\},\left\{y(x)\to \text{Inve}\right.\right.$$

Maple ✓
cpu = 0.173 (sec), leaf count = 85

$$\left\{\int^{y(x)}(-2a+3)\frac{1}{\sqrt{(2a-3)\left(-2b\_a^3+\_C1\,\_a^{2a}\right)}}d\_a-x-\_C2=0,\int^{y(x)}(2a-3)\frac{1}{\sqrt{(2a-3)\left(-2b\_a^3+\_C1\,\_a^{2}\right.}}\right.$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == b*y[x]^3 + a*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-((Sqrt[-3 + 2*a]*Hypergeometric2F1[1/2, (-1 + a)/(-3
+ 2*a), 1 + (-1 + a)/(-3 + 2*a), (2*b*#1^(3 - 2*a))/((-3 + 2*a)*C[1])]*#1*Sqrt[1
 - (2*b*#1^(3 - 2*a))/((-3 + 2*a)*C[1])])/((-1 + a)*Sqrt[-2*b*#1^3 + (-3 + 2*a)*
C[1]*#1^(2*a)])) & ][x + C[2]]}, {y[x] -> InverseFunction[(Sqrt[-3 + 2*a]*Hyperg
eometric2F1[1/2, (-1 + a)/(-3 + 2*a), 1 + (-1 + a)/(-3 + 2*a), (2*b*#1^(3 - 2*a)
)/((-3 + 2*a)*C[1])]*#1*Sqrt[1 - (2*b*#1^(3 - 2*a))/((-3 + 2*a)*C[1])])/((-1 + a
)*Sqrt[-2*b*#1^3 + (-3 + 2*a)*C[1]*#1^(2*a)]) & ][x + C[2]]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = a*diff(y(x),x)^2+b*y(x)^3, y(x),'implicit')
```

Maple raw output

```
Intat((2*a-3)/((2*a-3)*(-2*b*_a^3+_C1*_a^(2*a)))^(1/2),_a = y(x))-x-_C2 = 0, Int
at((-2*a+3)/((2*a-3)*(-2*b*_a^3+_C1*_a^(2*a)))^(1/2),_a = y(x))-x-_C2 = 0
```

4.1926

$$y(x)y''(x) = ay'(x)^2 + \mathbf{a0} + \mathbf{a1}y(x) + \mathbf{a2}y(x)^2 + \mathbf{a3}y(x)^3 + \mathbf{a3}y(x)^2 + \mathbf{a4}y(x)^4$$

ODE

$$y(x)y''(x) = ay'(x)^2 + \mathrm{a0} + \mathrm{a1}y(x) + \mathrm{a2}y(x)^2 + \mathrm{a3}y(x)^3 + \mathrm{a3}y(x)^2 + \mathrm{a4}y(x)^4$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 103.826 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*Derivative[2][y][x] == a0 + a1*y[x] + a2*y[x]^2 + a3*y[x]^2 + a3*y[x]^3 + a4*y[x]^4 + a*D
```

Maple ✓
cpu = 0.19 (sec), leaf count = 313

$$\left\{ \int^{y(x)} -\frac{\sqrt{16}a\left(4a^4 - 20a^3 + 35a^2 - 25a + 6\right)}{16} \frac{}{\sqrt{\left(a-\frac{1}{2}\right)(a-1)\left(a-\frac{3}{2}\right)(a-2)a\left(\left(a-\frac{1}{2}\right)(a-1)\left(a-\frac{3}{2}\right)(a-2)a_C1\right.}}
$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == a0 + a1*y[x] + a2*y[x]^2 + a3*y[x]^2 + a3*y[x]^3 + a4*y[x]^4 + a*y'[x]^2,y[x],x
```

Mathematica raw output

```
DSolve[y[x]*Derivative[2][y][x] == a0 + a1*y[x] + a2*y[x]^2 + a3*y[x]^2 + a3*y[x
]^3 + a4*y[x]^4 + a*Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = a*diff(y(x),x)^2+a0+a1*y(x)+a2*y(x)^2+a3*y(x)^2+a3*y(x)^3+a4*y(x)^
```

Maple raw output

```
Intat(1/16*16^(1/2)/((a-1/2)*(a-1)*(a-3/2)*(a-2)*a*((a-1/2)*(a-1)*(a-3/2)*(a-2)*
a*_C1*_a^(2*a)-(a-1/2)*(a-1)*(a-3/2)*a4*a*_a^4-(a-1/2)*(a-1)*(a-2)*a3*a*_a^3-(a-
1/2)*(a2+a3)*(a-3/2)*(a-2)*a*_a^2-(a-1)*(a-3/2)*(a-2)*a1*a*_a-(a-1/2)*(a-1)*a0*(
a-3/2)*(a-2)))^(1/2)*a*(4*a^4-20*a^3+35*a^2-25*a+6),_a = y(x))-x-_C2 = 0, Intat(
-1/16*16^(1/2)/((a-1/2)*(a-1)*(a-3/2)*(a-2)*a*((a-1/2)*(a-1)*(a-3/2)*(a-2)*a*_C1
```

```
*_a^(2*a)-(a-1/2)*(a-1)*(a-3/2)*a4*a*_a^4-(a-1/2)*(a-1)*(a-2)*a3*a*_a^3-(a-1/2)*
(a2+a3)*(a-3/2)*(a-2)*a*_a^2-(a-1)*(a-3/2)*(a-2)*a1*a*_a-(a-1/2)*(a-1)*a0*(a-3/2
)*(a-2)))^(1/2)*a*(4*a^4-20*a^3+35*a^2-25*a+6),_a = y(x))-x-_C2 = 0
```

4.1927 $y(x)y''(x) = ay'(x)^2 + by(x)y'(x) + cy(x)^2$

ODE

$$y(x)y''(x) = ay'(x)^2 + by(x)y'(x) + cy(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.346277 (sec), leaf count = 51

$$\left\{\left\{y(x) \to c_2 \exp\left(-\frac{2\log\left(\cos\left(\frac{1}{2}(c_1+x)\sqrt{4(a-1)c-b^2}\right)\right)+bx}{2(a-1)}\right)\right\}\right\}$$

Maple ✓
cpu = 0.13 (sec), leaf count = 70

$$\left\{(y(x))^{1-a}\,\mathrm{e}^{\frac{x}{2}\left(-b+\sqrt{(-4a+4)c+b^2}\right)}\sqrt{(-4a+4)c+b^2} - \_C1\,(a-1)\,\mathrm{e}^{x\sqrt{(-4a+4)c+b^2}} + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == c*y[x]^2 + b*y[x]*y'[x] + a*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]/E^((b*x + 2*Log[Cos[(Sqrt[-b^2 + 4*(-1 + a)*c]*(x + C[1]))/2]])/(
2*(-1 + a)))}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = a*diff(y(x),x)^2+b*y(x)*diff(y(x),x)+c*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x)^(1-a)*exp(1/2*(-b+((-4*a+4)*c+b^2)^(1/2))*x)*((-4*a+4)*c+b^2)^(1/2)-_C1*(a-
1)*exp(x*((-4*a+4)*c+b^2)^(1/2))+_C2 = 0
```

4.1928 $y(x)y''(x) = \mathbf{a3}y(x)^{a+1} + ay'(x)^2 + \mathbf{a1}y(x)y'(x) + \mathbf{a2}y(x)^2$

ODE

$$y(x)y''(x) = \mathrm{a3}y(x)^{a+1} + ay'(x)^2 + \mathrm{a1}y(x)y'(x) + \mathrm{a2}y(x)^2$$

ODE Classification

```
[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]
```

Book solution method
TO DO

Mathematica ✓
cpu = 1.6153 (sec), leaf count = 370

$$\left\{\left\{y(x)\to\left(\frac{e^{-\frac{2(a-1)\mathrm{a2}x}{\sqrt{-4a\mathrm{a2}+\mathrm{a1}^2+4\mathrm{a2}}-\mathrm{a1}}}\left(\mathrm{a1}\left(\mathrm{a2}\left(c_2\sqrt{-4a\mathrm{a2}+\mathrm{a1}^2+4\mathrm{a2}}-(a-1)c_1\exp\left(\frac{x\left(\mathrm{a1}\sqrt{-4a\mathrm{a2}+\mathrm{a1}^2+4\mathrm{a2}}+4(a-1)\mathrm{a2}-\mathrm{a1}^2\right.}{\sqrt{-4a\mathrm{a2}+\mathrm{a1}^2+4\mathrm{a2}}-\mathrm{a1}}\right.\right.\right.\right.}{}\right.\right.\right.$$

Maple ✓
cpu = 1.279 (sec), leaf count = 75

$$\left\{\sqrt{(-4a+4)\,a2+a1^2}\left(a2\,(y(x))^{1-a}+a3\right)\mathrm{e}^{\frac{x}{2}\left(-a1+\sqrt{(-4a+4)a2+a1^2}\right)}-a2\,_C1\,(a-1)\,\mathrm{e}^{x\sqrt{(-4a+4)a2+a1^2}}+_C2=0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == a2*y[x]^2 + a3*y[x]^(1 + a) + a1*y[x]*y'[x] + a*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((a1^2*(a3*E^((2*(-1 + a)*a2*x)/(-a1 + Sqrt[a1^2 + 4*a2 - 4*a*a2])) -
a2*C[2]) + (-1 + a)*a2*(-4*a3*E^((2*(-1 + a)*a2*x)/(-a1 + Sqrt[a1^2 + 4*a2 - 4*a
*a2])) + Sqrt[a1^2 + 4*a2 - 4*a*a2]*E^(((-a1^2 + 4*(-1 + a)*a2 + a1*Sqrt[a1^2 +
4*a2 - 4*a*a2])*x)/(-a1 + Sqrt[a1^2 + 4*a2 - 4*a*a2]))*C[1] + 4*a2*C[2]) + a1*(-
(Sqrt[a1^2 + 4*a2 - 4*a*a2]*a3*E^((2*(-1 + a)*a2*x)/(-a1 + Sqrt[a1^2 + 4*a2 - 4*
a*a2]))) + a2*(-((-1 + a)*E^(((-a1^2 + 4*(-1 + a)*a2 + a1*Sqrt[a1^2 + 4*a2 - 4*a
*a2])*x)/(-a1 + Sqrt[a1^2 + 4*a2 - 4*a*a2]))*C[1]) + Sqrt[a1^2 + 4*a2 - 4*a*a2]*
C[2])))/(a2*(-a1^2 + 4*(-1 + a)*a2 + a1*Sqrt[a1^2 + 4*a2 - 4*a*a2])*E^((2*(-1 +
a)*a2*x)/(-a1 + Sqrt[a1^2 + 4*a2 - 4*a*a2]))))^(1 - a)^(-1)}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = a*diff(y(x),x)^2+a1*y(x)*diff(y(x),x)+a2*y(x)^2+a3*y(x)^(1+a), y(x
```

Maple raw output

```
((-4*a+4)*a2+a1^2)^(1/2)*(a2*y(x)^(1-a)+a3)*exp(1/2*(-a1+((-4*a+4)*a2+a1^2)^(1/2
))*x)-a2*_C1*(a-1)*exp(x*((-4*a+4)*a2+a1^2)^(1/2))+_C2 = 0
```

4.1929 $ay'(x)^2 + f(x)y(x)y'(x) + g(x)y(x)^2 + y(x)y''(x) = 0$

ODE

$$ay'(x)^2 + f(x)y(x)y'(x) + g(x)y(x)^2 + y(x)y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 41.8484 (sec), leaf count = 0 , could not solve

```
DSolve[g[x]*y[x]^2 + f[x]*y[x]*Derivative[1][y][x] + a*Derivative[1][y][x]^2 + y[x]*Derivative[2][y]
```

Maple ✓
cpu = 2.915 (sec), leaf count = 70

$$\left\{y(x) = ODESolStruc\left(e^{\int \_b(\_a)\,d\_a+\_C1}, [\left\{\frac{d}{d\_a}\_b(\_a) = (-1-a)\,(\_b(\_a))^2 - f(\_a)\,\_b(\_a) - g(\_a)\right\}, \left\{\_a = x, \_\right.\right.$$

Mathematica raw input

```
DSolve[g[x]*y[x]^2 + f[x]*y[x]*y'[x] + a*y'[x]^2 + y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[g[x]*y[x]^2 + f[x]*y[x]*Derivative[1][y][x] + a*Derivative[1][y][x]^2 + y
[x]*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x)+a*diff(y(x),x)^2+f(x)*y(x)*diff(y(x),x)+g(x)*y(x)^2 = 0, y(x),'impli
```

Maple raw output

```
y(x) = ODESolStruc(exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = (-1-a)*_b(_a)^2-f
(_a)*_b(_a)-g(_a)}, {_a = x, _b(_a) = diff(y(x),x)/y(x)}, {x = _a, y(x) = exp(In
t(_b(_a),_a)+_C1)}])
```

4.1930 $y(x)y''(x) + y'(x)^3 = 0$

ODE

$$y(x)y''(x) + y'(x)^3 = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducible,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0591286 (sec), leaf count = 26

$$\left\{\left\{y(x) \to \frac{c_2 + x}{W\left(e^{-c_1-1}\left(c_2 + x\right)\right)}\right\}\right\}$$

Maple ✓
cpu = 0.197 (sec), leaf count = 26

$$\{y(x)\ln(y(x)) + (\_C1 - 1)\,y(x) - x - \_C2 = 0, y(x) = \_C1\}$$

Mathematica raw input

```
DSolve[y'[x]^3 + y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x + C[2])/ProductLog[E^(-1 - C[1])*(x + C[2])]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x)+diff(y(x),x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1, y(x)*ln(y(x))+(_C1-1)*y(x)-x-_C2 = 0
```

4.1931 $y(x)y''(x) + y'(x)^3 - y'(x)^2 = 0$

ODE

$$y(x)y''(x) + y'(x)^3 - y'(x)^2 = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducible,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0663936 (sec), leaf count = 32

$$\left\{\left\{y(x) \to e^{c_1} W\left(e^{e^{-c_1}(-e^{c_1}c_1+c_2+x)}\right)\right\}\right\}$$

Maple ✓
cpu = 0.08 (sec), leaf count = 21

$$\{y(x) + \_C1\ \ln(y(x)) - x - \_C2 = 0, y(x) = \_C1\}$$

Mathematica raw input

```
DSolve[-y'[x]^2 + y'[x]^3 + y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^C[1]*ProductLog[E^((x - E^C[1]*C[1] + C[2])/E^C[1])]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x)+diff(y(x),x)^3-diff(y(x),x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1, y(x)+_C1*ln(y(x))-x-_C2 = 0
```

4.1932 $y(x)y''(x) = y'(x)^2\left(y'(x)(-\sin(y(x))) - y(x)y'(x)\cos(y(x)) + 1\right)$

ODE

$$y(x)y''(x) = y'(x)^2\left(y'(x)(-\sin(y(x))) - y(x)y'(x)\cos(y(x)) + 1\right)$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_y_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.073791 (sec), leaf count = 23

$$\{\{y(x) \to \text{InverseFunction}[c_1 \log(\#1) - \cos(\#1)\&][c_2 + x]\}\}$$

Maple ✓
cpu = 0.119 (sec), leaf count = 24

$$\{-\cos(y(x)) + \_C1 \ln(y(x)) - x - \_C2 = 0, y(x) = \_C1\}$$

Mathematica raw input

```
DSolve[y[x]*y''[x] == y'[x]^2*(1 - Sin[y[x]]*y'[x] - Cos[y[x]]*y[x]*y'[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[-Cos[#1] + C[1]*Log[#1] & ][x + C[2]]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2*(1-diff(y(x),x)*sin(y(x))-y(x)*diff(y(x),x)*cos(y(x
```

Maple raw output

```
y(x) = _C1, -cos(y(x))+_C1*ln(y(x))-x-_C2 = 0
```

4.1933 $(1-y(x))y''(x)+2y'(x)^2=0$

ODE

$$(1-y(x))y''(x)+2y'(x)^2=0$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0386025 (sec), leaf count = 27

$$\left\{\left\{y(x)\to \frac{c_1 x+c_2 c_1-1}{c_1\,(c_2+x)}\right\}\right\}$$

Maple ✓
cpu = 0.027 (sec), leaf count = 19

$$\left\{-(y(x)-1)^{-1}-\_C1\,x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[2*y'[x]^2 + (1 - y[x])*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + x*C[1] + C[1]*C[2])/(C[1]*(x + C[2]))}}
```

Maple raw input

```
dsolve((1-y(x))*diff(diff(y(x),x),x)+2*diff(y(x),x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-1/(y(x)-1)-_C1*x-_C2 = 0
```

4.1934 $(a+y(x))y''(x) = y'(x)^2$

ODE

$$(a+y(x))y''(x) = y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0338641 (sec), leaf count = 18

$$\left\{\left\{y(x) \to e^{c_1(c_2+x)} - a\right\}\right\}$$

Maple ✓
cpu = 0.028 (sec), leaf count = 16

$$\{\ln(a+y(x)) - \_C1\, x - \_C2 = 0\}$$

Mathematica raw input

```
DSolve[(a + y[x])*y''[x] == y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -a + E^(C[1]*(x + C[2]))}}
```

Maple raw input

```
dsolve((a+y(x))*diff(diff(y(x),x),x) = diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
ln(a+y(x))-_C1*x-_C2 = 0
```

4.1935 $(a+y(x))y''(x)+y'(x)^2=b$

ODE

$$(a+y(x))y''(x)+y'(x)^2=b$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _m

Book solution method
TO DO

Mathematica ✓
cpu = 0.138605 (sec), leaf count = 75

$$\left\{\left\{y(x)\to -\frac{ab+\sqrt{b^3\left(c_2+x\right)^2-be^{2c_1}}}{b}\right\},\left\{y(x)\to \frac{\sqrt{b^3\left(c_2+x\right)^2-be^{2c_1}}-ab}{b}\right\}\right\}$$

Maple ✓
cpu = 0.04 (sec), leaf count = 26

$$\left\{\frac{bx^2}{2}-\_C1\,x-ay(x)-\frac{\left(y(x)\right)^2}{2}+\_C2=0\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 + (a + y[x])*y''[x] == b,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a*b + Sqrt[-(b*E^(2*C[1])) + b^3*(x + C[2])^2])/b)}, {y[x] -> (-(a*
b) + Sqrt[-(b*E^(2*C[1])) + b^3*(x + C[2])^2])/b}}
```

Maple raw input

```
dsolve((a+y(x))*diff(diff(y(x),x),x)+diff(y(x),x)^2 = b, y(x),'implicit')
```

Maple raw output

```
1/2*b*x^2-_C1*x-a*y(x)-1/2*y(x)^2+_C2 = 0
```

4.1936 $(a+y(x))y''(x)+by'(x)^2=0$

ODE

$$(a+y(x))y''(x)+by'(x)^2=0$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0494846 (sec), leaf count = 25

$$\left\{\left\{y(x)\to ((b+1)c_1(c_2+x))^{\frac{1}{b+1}}-a\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 27

$$\left\{\frac{(a+y(x))\,(a+y(x))^b}{b+1}-\_C1\,x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[b*y'[x]^2 + (a + y[x])*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -a + ((1 + b)*C[1]*(x + C[2]))^(1 + b)^(-1)}}
```

Maple raw input

```
dsolve((a+y(x))*diff(diff(y(x),x),x)+b*diff(y(x),x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
(a+y(x))/(b+1)*(a+y(x))^b-_C1*x-_C2 = 0
```

4.1937 $(y(x)+x)y''(x)+y'(x)^2-y'(x)=0$

ODE

$$(y(x)+x)y''(x)+y'(x)^2-y'(x)=0$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetries], [_2nd_order, _

Book solution method
TO DO

Mathematica ✓
cpu = 0.8231 (sec), leaf count = 227

$$\left\{\left\{y(x)\to -\frac{e^{-2c_1}\sqrt{e^{2c_1}\left(4e^{c_1}(x-c_2)+1\right)}}{\sqrt{2}}+\frac{e^{-c_1}}{2}-2c_2+x\right\},\left\{y(x)\to \frac{e^{-2c_1}\sqrt{e^{2c_1}\left(4e^{c_1}(x-c_2)+1\right)}}{\sqrt{2}}+\frac{e^{-c_1}}{2}-2c_2+\right.\right.$$

Maple ✓
cpu = 0.164 (sec), leaf count = 16

$$\left\{y(x)=\sqrt{\_C1+2\,x}\_C2+\_C1+x\right\}$$

Mathematica raw input

```
DSolve[-y'[x] + y'[x]^2 + (x + y[x])*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 1/(2*E^C[1]) + x - Sqrt[E^(2*C[1])*(1 + 4*E^C[1]*(x - C[2]))]/(Sqrt[2]
*E^(2*C[1])) - 2*C[2]}, {y[x] -> 1/(2*E^C[1]) + x + Sqrt[E^(2*C[1])*(1 + 4*E^C[1
]*(x - C[2]))]/(Sqrt[2]*E^(2*C[1])) - 2*C[2]}, {y[x] -> 1/(2*E^C[1]) + x + 2*C[2
] - Sqrt[E^(2*C[1])*(1 + 4*E^C[1]*(x + C[2]))]/(Sqrt[2]*E^(2*C[1]))}, {y[x] -> 1
/(2*E^C[1]) + x + 2*C[2] + Sqrt[E^(2*C[1])*(1 + 4*E^C[1]*(x + C[2]))]/(Sqrt[2]*E
^(2*C[1]))}}
```

Maple raw input

```
dsolve((x+y(x))*diff(diff(y(x),x),x)+diff(y(x),x)^2-diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C1+2*x)^(1/2)*_C2+_C1+x
```

4.1938 $(x - y(x))y''(x) + 2y'(x)\,(y'(x) + 1) = 0$

ODE

$$(x - y(x))y''(x) + 2y'(x)\,(y'(x) + 1) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.225421 (sec), leaf count = 27

$$\left\{\left\{y(x) \to -\frac{c_2(c_2 + x) + e^{-c_1}}{c_2 + x}\right\}\right\}$$

Maple ✓
cpu = 1.368 (sec), leaf count = 63

$$\left\{-\_C2 + x + y(x) - \sqrt{(x - y(x) - 2\_C1)\,(x - y(x) + 2\_C1)} = 0, -\_C2 + x + y(x) + \sqrt{(x - y(x) - 2\_C1)\,(x - y(x)\right.$$

Mathematica raw input

```
DSolve[2*y'[x]*(1 + y'[x]) + (x - y[x])*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((E^(-C[1]) + C[2]*(x + C[2]))/(x + C[2]))}}
```

Maple raw input

```
dsolve((x-y(x))*diff(diff(y(x),x),x)+2*diff(y(x),x)*(1+diff(y(x),x)) = 0, y(x),'implicit')
```

Maple raw output

```
-_C2+x+y(x)-((x-y(x)-2*_C1)*(x-y(x)+2*_C1))^(1/2) = 0, -_C2+x+y(x)+((x-y(x)-2*_C
1)*(x-y(x)+2*_C1))^(1/2) = 0
```

4.1939 $(x - y(x))y''(x) = (y'(x) + 1)\left(y'(x)^2 + 1\right)$

ODE

$$(x - y(x))y''(x) = (y'(x) + 1)\left(y'(x)^2 + 1\right)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.353271 (sec), leaf count = 59

$$\left\{\left\{y(x) \to -\sqrt{e^{2c_1} - (c_2 + x)^2} - c_2\right\}, \left\{y(x) \to \sqrt{e^{2c_1} - (c_2 + x)^2} - c_2\right\}\right\}$$

Maple ✓
cpu = 0.572 (sec), leaf count = 120

$$\left\{x - \int^{y(x)-x} (-e^{2\_C1}\_f^2 + 1)\left(e^{2\_C1}\_f^2 - e^{\_C1}\sqrt{-e^{2\_C1}\_f^2 + 2}\_f - 2\right)^{-1} d\_f - \_C2 = 0, x - \int^{y(x)-x} (-e^{2\_C1}\_\right.$$

Mathematica raw input

```
DSolve[(x - y[x])*y''[x] == (1 + y'[x])*(1 + y'[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -C[2] - Sqrt[E^(2*C[1]) - (x + C[2])^2]}, {y[x] -> -C[2] + Sqrt[E^(2*C
[1]) - (x + C[2])^2]}}
```

Maple raw input

```
dsolve((x-y(x))*diff(diff(y(x),x),x) = (1+diff(y(x),x))*(1+diff(y(x),x)^2), y(x),'implicit')
```

Maple raw output

```
x-Intat((-exp(2*_C1)*_f^2+1)/(exp(2*_C1)*_f^2+exp(_C1)*(-exp(2*_C1)*_f^2+2)^(1/2
)*_f-2),_f = y(x)-x)-_C2 = 0, x-Intat((-exp(2*_C1)*_f^2+1)/(exp(2*_C1)*_f^2-exp(
_C1)*(-exp(2*_C1)*_f^2+2)^(1/2)*_f-2),_f = y(x)-x)-_C2 = 0
```

4.1940 $(x - y(x))y''(x) = f(y'(x))$

ODE

$$(x - y(x))y''(x) = f(y'(x))$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.845814 (sec), leaf count = 73

$$\text{Solve}\left[\left\{x = \int \frac{\exp\left(-\int_1^{\text{K\$310978}} \frac{K[3]-1}{f(K[3])}\, dK[3] - c_1\right)}{f(\text{K\$310978})}\, d\text{K\$310978} + c_2, x = \exp\left(-\int_1^{\text{K\$310978}} \frac{K[3]-1}{f(K[3])}\, dK[3] - c_1\right) + y(x)\right.$$

Maple ✓
cpu = 0.152 (sec), leaf count = 42

$$\left\{x - \int^{y(x)-x} \left(-1 + RootOf\left(\int^{\_Z} \frac{\_a - 1}{f(\_a)} d\_a + \ln(-\_g) + \_C1\right)\right)^{-1} d\_g - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[(x - y[x])*y''[x] == f[y'[x]],y[x],x]
```

Mathematica raw output

```
Solve[{x == C[2] + Integrate[E^(-C[1] - Integrate[(-1 + K[3])/f[K[3]], {K[3], 1,
 K$310978}])/f[K$310978], K$310978], x == E^(-C[1] - Integrate[(-1 + K[3])/f[K[3
]], {K[3], 1, K$310978}]) + y[x]}, {y[x], K$310978}]
```

Maple raw input

```
dsolve((x-y(x))*diff(diff(y(x),x),x) = f(diff(y(x),x)), y(x),'implicit')
```

Maple raw output

```
x-Intat(1/(-1+RootOf(Intat(1/f(_a)*(_a-1),_a = _Z)+ln(-_g)+_C1)),_g = y(x)-x)-_C
2 = 0
```

4.1941 $2y(x)y''(x) = y'(x)^2$

ODE

$$2y(x)y''(x) = y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.00837532 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \frac{(c_1 x + 2c_2)^2}{4c_2}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 17

$$\left\{2\sqrt{y(x)} - \_C1\, x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*C[1] + 2*C[2])^2/(4*C[2])}}
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
2*y(x)^(1/2)-_C1*x-_C2 = 0
```

4.1942 $2y(x)y''(x) + y'(x)^2 + 1 = 0$

ODE

$$2y(x)y''(x) + y'(x)^2 + 1 = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.195785 (sec), leaf count = 129

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[e^{2c_1}\tan^{-1}\left(\frac{\sqrt{\#1}}{\sqrt{e^{2c_1}-\#1}}\right) - \sqrt{\#1}\sqrt{e^{2c_1}-\#1}\&\right][c_2+x]\right\}, \left\{y(x) \to \text{InverseFunction}\left[\sqrt{\#1}\right.\right.\right.$$

Maple ✓
cpu = 0.108 (sec), leaf count = 87

$$\left\{-\sqrt{y(x)\,(\_C1-y(x))} + \frac{\_C1}{2}\arctan\left(1\left(y(x)-\frac{\_C1}{2}\right)\frac{1}{\sqrt{y(x)\,(\_C1-y(x))}}\right) - x - \_C2 = 0, \sqrt{y(x)\,(\_C1-y(x)\right.\right.$$

Mathematica raw input

```
DSolve[1 + y'[x]^2 + 2*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[E^(2*C[1])*ArcTan[Sqrt[#1]/Sqrt[E^(2*C[1]) - #1]] - Sq
rt[E^(2*C[1]) - #1]*Sqrt[#1] & ][x + C[2]]}, {y[x] -> InverseFunction[-(E^(2*C[1
])*ArcTan[Sqrt[#1]/Sqrt[E^(2*C[1]) - #1]]) + Sqrt[E^(2*C[1]) - #1]*Sqrt[#1] & ][
x + C[2]]}}
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x)+diff(y(x),x)^2+1 = 0, y(x),'implicit')
```

Maple raw output

```
-(y(x)*(_C1-y(x)))^(1/2)+1/2*_C1*arctan((y(x)-1/2*_C1)/(y(x)*(_C1-y(x)))^(1/2))-
x-_C2 = 0, (y(x)*(_C1-y(x)))^(1/2)-1/2*_C1*arctan((y(x)-1/2*_C1)/(y(x)*(_C1-y(x)
))^(1/2))-x-_C2 = 0
```

4.1943 $2y(x)y''(x) = a + y'(x)^2$

ODE

$$2y(x)y''(x) = a + y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00851739 (sec), leaf count = 29

$$\left\{\left\{y(x) \to \frac{x^2\left(a + c_1^2\right)}{4c_2} + c_1 x + c_2\right\}\right\}$$

Maple ✓
cpu = 0.123 (sec), leaf count = 22

$$\left\{y(x) = \frac{\left(\_C1^{\,2} + a\right)x^2}{4\_C2} + \_C1\,x + \_C2\right\}$$

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == a + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + (x^2*(a + C[1]^2))/(4*C[2]) + C[2]}}
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = a+diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(_C1^2+a)/_C2*x^2+_C1*x+_C2
```

4.1944 $2y(x)y''(x) = y'(x)^2 + 8y(x)^3$

ODE

$$2y(x)y''(x) = y'(x)^2 + 8y(x)^3$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.453775 (sec), leaf count = 77

$$\left\{\left\{y(x) \to -\frac{1}{2}i\sqrt{c_1}\,\text{ns}\left(\left(-\frac{1}{2}+\frac{i}{2}\right)\sqrt[4]{c_1}(x+c_2)\middle|-1\right)^2\right\},\left\{y(x) \to -\frac{1}{2}i\sqrt{c_1}\,\text{ns}\left(\left(-\frac{1}{2}+\frac{i}{2}\right)\sqrt[4]{c_1}(x+c_2)\middle|-1\right)^2\right\}\right\}$$

Maple ✓
cpu = 0.072 (sec), leaf count = 53

$$\left\{\int^{y(x)} \frac{1}{\sqrt{4\_a^3+\_C1\,\_a}}d\_a - x - \_C2 = 0, \int^{y(x)} -\frac{1}{\sqrt{4\_a^3+\_C1\,\_a}}d\_a - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == 8*y[x]^3 + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-I/2)*Sqrt[C[1]]*JacobiNS[(-1/2 + I/2)*C[1]^(1/4)*(x + C[2]), -1]^2},
 {y[x] -> (-I/2)*Sqrt[C[1]]*JacobiNS[(-1/2 + I/2)*C[1]^(1/4)*(x + C[2]), -1]^2}}
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = 8*y(x)^3+diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
Intat(1/(4*_a^3+_C1*_a)^(1/2),_a = y(x))-x-_C2 = 0, Intat(-1/(4*_a^3+_C1*_a)^(1/
2),_a = y(x))-x-_C2 = 0
```

4.1945 $2y(x)y''(x) = y'(x)^2 + 8y(x)^3 + 4y(x)^2$

ODE

$$2y(x)y''(x) = y'(x)^2 + 8y(x)^3 + 4y(x)^2$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.18291 (sec), leaf count = 359

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{2i\#1\sqrt{\frac{c_1}{\#1(2-2\sqrt{1-c_1})}+1}\sqrt{\frac{c_1}{\#1(2\sqrt{1-c_1}+2)}+1}F\left(i\sinh^{-1}\left(\frac{\sqrt{\frac{c_1}{2\sqrt{1-c_1}+2}}}{\sqrt{\#1}}\right)|\frac{\sqrt{1-c_1}+1}{1-\sqrt{1-c_1}}\right)}{\sqrt{\frac{c_1}{2\sqrt{1-c_1}+2}}\sqrt{4\#1^2+4\#1+c_1}}\&\right][c_2\right.\right.$$

Maple ✓
cpu = 0.075 (sec), leaf count = 61

$$\left\{\int^{y(x)}\frac{1}{\sqrt{4\_a^3+\_a\_C1+4\_a^2}}d\_a-x-\_C2=0,\int^{y(x)}-\frac{1}{\sqrt{(4\_a^2+\_C1+4\_a)\_a}}d\_a-x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == 4*y[x]^2 + 8*y[x]^3 + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[((-2*I)*EllipticF[I*ArcSinh[Sqrt[C[1]/(2 + 2*Sqrt[1 -
C[1]])]/Sqrt[#1]], (1 + Sqrt[1 - C[1]])/(1 - Sqrt[1 - C[1]])]*Sqrt[1 + C[1]/((2
- 2*Sqrt[1 - C[1]])*#1)]*Sqrt[1 + C[1]/((2 + 2*Sqrt[1 - C[1]])*#1)]*#1)/(Sqrt[C[
1]/(2 + 2*Sqrt[1 - C[1]])]*Sqrt[C[1] + 4*#1 + 4*#1^2]) & ][x + C[2]]}, {y[x] ->
InverseFunction[((2*I)*EllipticF[I*ArcSinh[Sqrt[C[1]/(2 + 2*Sqrt[1 - C[1]])]/Sqr
t[#1]], (1 + Sqrt[1 - C[1]])/(1 - Sqrt[1 - C[1]])]*Sqrt[1 + C[1]/((2 - 2*Sqrt[1
- C[1]])*#1)]*Sqrt[1 + C[1]/((2 + 2*Sqrt[1 - C[1]])*#1)]*#1)/(Sqrt[C[1]/(2 + 2*S
qrt[1 - C[1]])]*Sqrt[C[1] + 4*#1 + 4*#1^2]) & ][x + C[2]]}}
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+4*y(x)^2+8*y(x)^3, y(x),'implicit')
```

Maple raw output

```
Intat(1/(4*_a^3+_C1*_a+4*_a^2)^(1/2),_a = y(x))-x-_C2 = 0, Intat(-1/((4*_a^2+_C1
+4*_a)*_a)^(1/2),_a = y(x))-x-_C2 = 0
```

4.1946 $2y(x)y''(x) = y'(x)^2 + 4(2y(x) + x)y(x)^2$

ODE

$$2y(x)y''(x) = y'(x)^2 + 4(2y(x) + x)y(x)^2$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 1.47049 (sec), leaf count = 0 , could not solve

```
DSolve[2*y[x]*Derivative[2][y][x] == 4*y[x]^2*(x + 2*y[x]) + Derivative[1][y][x]^2, y[x], x]
```

Maple ✗
cpu = 0.227 (sec), leaf count = 0 , could not solve

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+4*(x+2*y(x))*y(x)^2, y(x),'implicit')
```

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == 4*y[x]^2*(x + 2*y[x]) + y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[2*y[x]*Derivative[2][y][x] == 4*y[x]^2*(x + 2*y[x]) + Derivative[1][y][x]
^2, y[x], x]
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+4*(x+2*y(x))*y(x)^2, y(x),'implicit')
```

Maple raw output

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+4*(x+2*y(x))*y(x)^2, y(x),'i
mplicit')
```

4.1947 $2y(x)y''(x) = y(x)^2(a + by(x)) + y'(x)^2$

ODE

$$2y(x)y''(x) = y(x)^2(a + by(x)) + y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.74576 (sec), leaf count = 443

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{2i\sqrt{2}\#1\sqrt{\frac{\frac{2c_1}{\#1}+\sqrt{a^2-2bc_1}+a}{\sqrt{a^2-2bc_1}+a}}\sqrt{\frac{2c_1}{\#1(a-\sqrt{a^2-2bc_1})}+1}F\left(i\sinh^{-1}\left(\frac{\sqrt{2}\sqrt{\frac{c_1}{a+\sqrt{a^2-2bc_1}}}}{\sqrt{\#1}}\right)\middle|\frac{a+\sqrt{a^2-2b}}{a-\sqrt{a^2-2b}}\right.\right.\right.\right.$$
$$\left.\left.\left.\left.\frac{}{\sqrt{\frac{c_1}{\sqrt{a^2-2bc_1}+a}}\sqrt{2\#1^2b+4(\#1a+c_1)}}\right]\right\}\right\}$$

Maple ✓
cpu = 0.292 (sec), leaf count = 69

$$\left\{\int^{y(x)} -\frac{\sqrt{4}}{2}\frac{1}{\sqrt{\left(-\frac{a^2b}{2}+\_a\,a+\_C1\right)\_a}}d\_a - x - \_C2 = 0, \int^{y(x)} \frac{\sqrt{4}}{2}\frac{1}{\sqrt{\left(-\frac{a^2b}{2}+\_a\,a+\_C1\right)\_a}}d\_a - x - \_C2 =\right.$$

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == y[x]^2*(a + b*y[x]) + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[((-2*I)*Sqrt[2]*EllipticF[I*ArcSinh[(Sqrt[2]*Sqrt[C[1]
/(a + Sqrt[a^2 - 2*b*C[1]])])/Sqrt[#1]], (a + Sqrt[a^2 - 2*b*C[1]])/(a - Sqrt[a^
2 - 2*b*C[1]])]*Sqrt[(a + Sqrt[a^2 - 2*b*C[1]] + (2*C[1])/#1)/(a + Sqrt[a^2 - 2*
b*C[1]])]*Sqrt[1 + (2*C[1])/((a - Sqrt[a^2 - 2*b*C[1]])*#1)]*#1)/(Sqrt[C[1]/(a +
  Sqrt[a^2 - 2*b*C[1]])]*Sqrt[2*b*#1^2 + 4*(C[1] + a*#1)]) & ][x + C[2]]}, {y[x]
-> InverseFunction[((2*I)*Sqrt[2]*EllipticF[I*ArcSinh[(Sqrt[2]*Sqrt[C[1]/(a + Sq
rt[a^2 - 2*b*C[1]])])/Sqrt[#1]], (a + Sqrt[a^2 - 2*b*C[1]])/(a - Sqrt[a^2 - 2*b*
C[1]])]*Sqrt[(a + Sqrt[a^2 - 2*b*C[1]] + (2*C[1])/#1)/(a + Sqrt[a^2 - 2*b*C[1]])
]*Sqrt[1 + (2*C[1])/((a - Sqrt[a^2 - 2*b*C[1]])*#1)]*#1)/(Sqrt[C[1]/(a + Sqrt[a^
```

```
2 - 2*b*C[1]])]*Sqrt[2*b*#1^2 + 4*(C[1] + a*#1)]) & ][x + C[2]]}}
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+(a+b*y(x))*y(x)^2, y(x),'implicit')
```

Maple raw output

```
Intat(-1/2*4^(1/2)/((1/2*_a^2*b+_a*a+_C1)*_a)^(1/2),_a = y(x))-x-_C2 = 0, Intat(
1/2*4^(1/2)/((1/2*_a^2*b+_a*a+_C1)*_a)^(1/2),_a = y(x))-x-_C2 = 0
```

4.1948 $2y(x)y''(x) = ay(x)^3 + y'(x)^2 - 2xy(x)^2 - 1$

ODE

$$2y(x)y''(x) = ay(x)^3 + y'(x)^2 - 2xy(x)^2 - 1$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 1.4012 (sec), leaf count = 0 , could not solve

```
DSolve[2*y[x]*Derivative[2][y][x] == -1 - 2*x*y[x]^2 + a*y[x]^3 + Derivative[1][y][x]^2, y[x], x]
```

Maple ✗
cpu = 0.244 (sec), leaf count = 0 , could not solve

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-1-2*x*y(x)^2+a*y(x)^3, y(x),'implicit')
```

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == -1 - 2*x*y[x]^2 + a*y[x]^3 + y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[2*y[x]*Derivative[2][y][x] == -1 - 2*x*y[x]^2 + a*y[x]^3 + Derivative[1][
y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-1-2*x*y(x)^2+a*y(x)^3, y(x),'implicit')
```

Maple raw output

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-1-2*x*y(x)^2+a*y(x)^3, y(x),
'implicit')
```

4.1949 $2y(x)y''(x) = y(x)^2(ax + by(x)) + y'(x)^2$

ODE

$$2y(x)y''(x) = y(x)^2(ax + by(x)) + y'(x)^2$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 1.24628 (sec), leaf count = 0 , could not solve

```
DSolve[2*y[x]*Derivative[2][y][x] == y[x]^2*(a*x + b*y[x]) + Derivative[1][y][x]^2, y[x], x]
```

Maple ✗
cpu = 0.198 (sec), leaf count = 0 , could not solve

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+(a*x+b*y(x))*y(x)^2, y(x),'implicit')
```

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == y[x]^2*(a*x + b*y[x]) + y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[2*y[x]*Derivative[2][y][x] == y[x]^2*(a*x + b*y[x]) + Derivative[1][y][x]
^2, y[x], x]
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+(a*x+b*y(x))*y(x)^2, y(x),'implicit')
```

Maple raw output

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+(a*x+b*y(x))*y(x)^2, y(x),'i
mplicit')
```

4.1950 $2y(x)y''(x) = y'(x)^2 + 3y(x)^4$

ODE

$$2y(x)y''(x) = y'(x)^2 + 3y(x)^4$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 8.60131 (sec), leaf count = 285

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{2i\#1^{3/2}\sqrt{(-1)^{5/6}\left(\frac{\sqrt[3]{-c_1}}{\#1}-1\right)}\sqrt{\frac{(-c_1)^{2/3}}{\#1^2}+\frac{\sqrt[3]{-c_1}}{\#1}+1}F\left(\sin^{-1}\left(\frac{\sqrt{-\frac{i\sqrt[3]{-c_1}}{\#1}-(-1)^{5/6}}}{\sqrt[4]{3}}\right)\right.\right.\right.$$

Maple ✓
cpu = 0.075 (sec), leaf count = 49

$$\left\{\int^{y(x)} \frac{1}{\sqrt{\_a^4+\_a\,\_C1}}d\_a - x - \_C2 = 0, \int^{y(x)} -\frac{1}{\sqrt{\_a^4+\_a\,\_C1}}d\_a - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == 3*y[x]^4 + y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[((-2*I)*EllipticF[ArcSin[Sqrt[-(-1)^(5/6) - (I*(-C[1])
^(1/3))/#1]/3^(1/4)], (-1)^(1/3)]*Sqrt[(-1)^(5/6)*(-1 + (-C[1])^(1/3)/#1)]*Sqrt[
1 + (-C[1])^(2/3)/#1^2 + (-C[1])^(1/3)/#1]*#1^(3/2))/(3^(1/4)*(-C[1])^(1/3)*Sqrt
[C[1] + #1^3]) & ][x + C[2]]}, {y[x] -> InverseFunction[((2*I)*EllipticF[ArcSin[
Sqrt[-(-1)^(5/6) - (I*(-C[1])^(1/3))/#1]/3^(1/4)], (-1)^(1/3)]*Sqrt[(-1)^(5/6)*(
-1 + (-C[1])^(1/3)/#1)]*Sqrt[1 + (-C[1])^(2/3)/#1^2 + (-C[1])^(1/3)/#1]*#1^(3/2)
)/(3^(1/4)*(-C[1])^(1/3)*Sqrt[C[1] + #1^3]) & ][x + C[2]]}}
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2+3*y(x)^4, y(x),'implicit')
```

Maple raw output

```
Intat(1/(_a^4+_C1*_a)^(1/2),_a = y(x))-x-_C2 = 0, Intat(-1/(_a^4+_C1*_a)^(1/2),_
a = y(x))-x-_C2 = 0
```

4.1951 $2y(x)y''(x) = -a^2 - 4(b - x^2)\,y(x)^2 + y'(x)^2 + 3y(x)^4 + 8xy(x)^3$

ODE

$$2y(x)y''(x) = -a^2 - 4\left(b - x^2\right)y(x)^2 + y'(x)^2 + 3y(x)^4 + 8xy(x)^3$$

ODE Classification

[[_Painleve, `4th`]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.32384 (sec), leaf count = 0 , could not solve

```
DSolve[2*y[x]*Derivative[2][y][x] == -a^2 - 4*(b - x^2)*y[x]^2 + 8*x*y[x]^3 + 3*y[x]^4 + Derivative[1
```

Maple ✗
cpu = 0.371 (sec), leaf count = 0 , could not solve

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-a^2-4*(-x^2+b)*y(x)^2+8*x*y(x)^3+3*y(x)^4, y(x),
```

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == -a^2 - 4*(b - x^2)*y[x]^2 + 8*x*y[x]^3 + 3*y[x]^4 + y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[2*y[x]*Derivative[2][y][x] == -a^2 - 4*(b - x^2)*y[x]^2 + 8*x*y[x]^3 + 3*
y[x]^4 + Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-a^2-4*(-x^2+b)*y(x)^2+8*x*y(x)^3+3*y(x)^4, y(x),
```

Maple raw output

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-a^2-4*(-x^2+b)*y(x)^2+8*x*y(
x)^3+3*y(x)^4, y(x),'implicit')
```

4.1952 $2y(x)y''(x) = -2y(x)^2\left(f'(x) + f(x)^2\right) - 3f(x)y(x)y'(x) + y'(x)^2 + 8y(x)^3$

ODE

$$2y(x)y''(x) = -2y(x)^2\left(f'(x) + f(x)^2\right) - 3f(x)y(x)y'(x) + y'(x)^2 + 8y(x)^3$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.513298 (sec), leaf count = 0 , could not solve

```
DSolve[2*y[x]*Derivative[2][y][x] == 8*y[x]^3 - 2*y[x]^2*(f[x]^2 + Derivative[1][f][x]) - 3*f[x]*y[x]
```

Maple ✗
cpu = 2.203 (sec), leaf count = 0 , could not solve

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-3*f(x)*y(x)*diff(y(x),x)-2*(diff(f(x),x)+f(x)^2)*
```

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == 8*y[x]^3 - 2*y[x]^2*(f[x]^2 + f'[x]) - 3*f[x]*y[x]*y'[x] + y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[2*y[x]*Derivative[2][y][x] == 8*y[x]^3 - 2*y[x]^2*(f[x]^2 + Derivative[1]
[f][x]) - 3*f[x]*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-3*f(x)*y(x)*diff(y(x),x)-2*(diff(f(x),x)+f(x)^2)*
```

Maple raw output

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-3*f(x)*y(x)*diff(y(x),x)-2*(
diff(f(x),x)+f(x)^2)*y(x)^2+8*y(x)^3, y(x),'implicit')
```

4.1953 $2y(x)y''(x) = 2xf(x)y(x)^2 - 4y(x)^2y'(x) + y'(x)^2 - y(x)^4 - 1$

ODE

$$2y(x)y''(x) = 2xf(x)y(x)^2 - 4y(x)^2y'(x) + y'(x)^2 - y(x)^4 - 1$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0443155 (sec), leaf count = 0 , could not solve

```
DSolve[2*y[x]*Derivative[2][y][x] == -1 + 2*x*f[x]*y[x]^2 - y[x]^4 - 4*y[x]^2*Derivative[1][y][x] + D
```

Maple ✗
cpu = 0.386 (sec), leaf count = 0 , could not solve

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-4*y(x)^2*diff(y(x),x)-1+2*f(x)*x*y(x)^2-
y(x)^4, y(x),'implicit')
```

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == -1 + 2*x*f[x]*y[x]^2 - y[x]^4 - 4*y[x]^2*y'[x] + y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[2*y[x]*Derivative[2][y][x] == -1 + 2*x*f[x]*y[x]^2 - y[x]^4 - 4*y[x]^2*De
rivative[1][y][x] + Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-4*y(x)^2*diff(y(x),x)-1+2*f(x)*x*y(x)^2-
y(x)^4, y(x),'implicit')
```

Maple raw output

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2-4*y(x)^2*diff(y(x),x)-1+2*f(
x)*x*y(x)^2-y(x)^4, y(x),'implicit')
```

4.1954 $2y(x)y''(x) = 3y'(x)^2$

ODE

$$2y(x)y''(x) = 3y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0288087 (sec), leaf count = 16

$$\left\{\left\{y(x) \to \frac{c_2}{(2c_1 + x)^2}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 17

$$\left\{-2\frac{1}{\sqrt{y(x)}} - \_C1\, x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == 3*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]/(x + 2*C[1])^2}}
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = 3*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
-2/y(x)^(1/2)-_C1*x-_C2 = 0
```

4.1955 $2y(x)y''(x) = 3y'(x)^2 + 4y(x)^2$

ODE

$$2y(x)y''(x) = 3y'(x)^2 + 4y(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0932977 (sec), leaf count = 17

$$\{\{y(x) \to c_2 \sec^2(2c_1 + x)\}\}$$

Maple ✓
cpu = 0.042 (sec), leaf count = 19

$$\left\{ -\_C1 \sin(x) + \_C2 \cos(x) + 2\frac{1}{\sqrt{y(x)}} = 0 \right\}$$

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == 4*y[x]^2 + 3*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]*Sec[x + 2*C[1]]^2}}
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = 3*diff(y(x),x)^2+4*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-_C1*sin(x)+_C2*cos(x)+2/y(x)^(1/2) = 0
```

4.1956 $2y(x)y''(x) = f(x)y(x)^2 + 3y'(x)^2$

ODE

$$2y(x)y''(x) = f(x)y(x)^2 + 3y'(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 10.7537 (sec), leaf count = 0 , could not solve

```
DSolve[2*y[x]*Derivative[2][y][x] == f[x]*y[x]^2 + 3*Derivative[1][y][x]^2, y[x], x]
```

Maple ✓
cpu = 0.202 (sec), leaf count = 60

$$\left\{y(x) = ODESolStruc\left(e^{\int \_b(\_a)\,d\_a + \_C1}, [\left\{\frac{d}{d\_a}\_b(\_a) = \frac{(\_b(\_a))^2}{2} + \frac{f(\_a)}{2}\right\}, \left\{\_a = x, \_b(\_a) = \frac{\frac{d}{dx}y(x)}{y(x)}\right\}, \{x =\right.\right.$$

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == f[x]*y[x]^2 + 3*y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[2*y[x]*Derivative[2][y][x] == f[x]*y[x]^2 + 3*Derivative[1][y][x]^2, y[x]
, x]
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = 3*diff(y(x),x)^2+f(x)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = 1/2*_b(_a)^2+1/2*
f(_a)}, {_a = x, _b(_a) = diff(y(x),x)/y(x)}, {x = _a, y(x) = exp(Int(_b(_a),_a)
+_C1)}])
```

4.1957 $2y(x)y''(x) = 6y'(x)^2 + (1 - 3y(x)^2)\, y(x)^2$

ODE

$$2y(x)y''(x) = 6y'(x)^2 + (1 - 3y(x)^2)\, y(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.27632 (sec), leaf count = 217

$$\left\{\left\{y(x) \to -\frac{2ie^{\frac{1}{2}i(c_2+x)}}{\sqrt{-12e^{i(c_2+x)} + e^{2i(c_2+x)} + 16c_1 + 36}}\right\}, \left\{y(x) \to \frac{2ie^{\frac{1}{2}i(c_2+x)}}{\sqrt{-12e^{i(c_2+x)} + e^{2i(c_2+x)} + 16c_1 + 36}}\right\}, \left\{y(x) \to -\frac{}{\sqrt{4($$

Maple ✓
cpu = 0.041 (sec), leaf count = 25

$$\left\{\frac{1 + (\_C1\ \sin(x) + \_C2\ \cos(x) - 3)\,(y(x))^2}{(y(x))^2} = 0\right\}$$

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == y[x]^2*(1 - 3*y[x]^2) + 6*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-2*I)*E^((I/2)*(x + C[2])))/Sqrt[36 - 12*E^(I*(x + C[2])) + E^((2*I)
*(x + C[2])) + 16*C[1]]}, {y[x] -> ((2*I)*E^((I/2)*(x + C[2])))/Sqrt[36 - 12*E^(
I*(x + C[2])) + E^((2*I)*(x + C[2])) + 16*C[1]]}, {y[x] -> ((-2*I)*E^((I/2)*(x +
 C[2])))/Sqrt[1 - 12*E^(I*(x + C[2])) + 4*E^((2*I)*(x + C[2]))*(9 + 4*C[1])]}, {
y[x] -> ((2*I)*E^((I/2)*(x + C[2])))/Sqrt[1 - 12*E^(I*(x + C[2])) + 4*E^((2*I)*(
x + C[2]))*(9 + 4*C[1])]}}
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = 6*diff(y(x),x)^2+(1-3*y(x)^2)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
(1+(_C1*sin(x)+_C2*cos(x)-3)*y(x)^2)/y(x)^2 = 0
```

4.1958 $2y(x)y''(x) = 6y'(x)^2 - y(x)^2\left(ay(x)^3 + 1\right)$

ODE

$$2y(x)y''(x) = 6y'(x)^2 - y(x)^2\left(ay(x)^3 + 1\right)$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 22.4606 (sec), leaf count = 2761

$$\left\{\text{Solve}\left[\frac{4\left(F\left(\sin^{-1}\left(\sqrt{\frac{\left(\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,2\right]-\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,4\right]\right)\left(\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,1\right]-y(x)\right)}{\left(\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,1\right]-\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,4\right]\right)\left(\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,2\right]-y(x)\right)}}\right)\right|-\frac{(\text{F}}{(\text{F}}\right.}{}\right.\right.$$

Maple ✓
cpu = 0.084 (sec), leaf count = 71

$$\left\{\int^{y(x)} -2\frac{1}{\sqrt{4_C1_a^4 + 4_a^3a + 1_a}}d_a - x - _C2 = 0, \int^{y(x)} 2\frac{1}{\sqrt{4_C1_a^4 + 4_a^3a + 1_a}}d_a - x - _C2 = 0\right\}$$

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == -(y[x]^2*(1 + a*y[x]^3)) + 6*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{Solve[(4*(EllipticF[ArcSin[Sqrt[((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] - Root
[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - y[
x]))/((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4
& , 4])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] - y[x]))]], -(((Root[1 + 4*a*#1^
3 + 4*C[1]*#1^4 & , 2] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 3])*(Root[1 + 4*a*#
1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4]))/((-Root[1 +
4*a*#1^3 + 4*C[1]*#1^4 & , 1] + Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 3])*(Root[1
+ 4*a*#1^3 + 4*C[1]*#1^4 & , 2] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4])))]*Roo
t[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] + EllipticPi[(Root[1 + 4*a*#1^3 + 4*C[1]*#1^
4 & , 2]*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*C[1]*#1
^4 & , 4]))/(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1]*(Root[1 + 4*a*#1^3 + 4*C[1]*
```

```
#1^4 & , 2] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4])), ArcSin[Sqrt[((Root[1 + 4
*a*#1^3 + 4*C[1]*#1^4 & , 2] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4])*(Root[1 +
 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - y[x]))/((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1]
 - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & ,
2] - y[x]))]], -(((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] - Root[1 + 4*a*#1^3 +
4*C[1]*#1^4 & , 3])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3
+ 4*C[1]*#1^4 & , 4]))/((-Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] + Root[1 + 4*a*
#1^3 + 4*C[1]*#1^4 & , 3])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] - Root[1 + 4*
a*#1^3 + 4*C[1]*#1^4 & , 4])))]*(-Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] + Root[
1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2]))*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - y[
x])*Sqrt[((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*C[1]*#
1^4 & , 2])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 3] - y[x]))/((Root[1 + 4*a*#1^3
 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 3])*(Root[1 + 4*a*#1
^3 + 4*C[1]*#1^4 & , 2] - y[x]))]*y[x]*(-Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4]
+ y[x]))/(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1]*Root[1 + 4*a*#1^3 + 4*C[1]*#1^4
 & , 2]*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^
4 & , 4])*Sqrt[((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*
C[1]*#1^4 & , 2])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] - Root[1 + 4*a*#1^3 +
4*C[1]*#1^4 & , 4])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - y[x])*(Root[1 + 4*
a*#1^3 + 4*C[1]*#1^4 & , 4] - y[x]))/((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] -
Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4])^2*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2
] - y[x])^2)]*Sqrt[y[x]^2 + 4*a*y[x]^5 + 4*C[1]*y[x]^6]) == x + C[2], y[x]], Sol
ve[(4*(EllipticF[ArcSin[Sqrt[((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] - Root[1 +
 4*a*#1^3 + 4*C[1]*#1^4 & , 4])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - y[x]))
/((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & ,
4])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] - y[x]))]], -(((Root[1 + 4*a*#1^3 +
4*C[1]*#1^4 & , 2] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 3])*(Root[1 + 4*a*#1^3
+ 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4]))/((-Root[1 + 4*a*
#1^3 + 4*C[1]*#1^4 & , 1] + Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 3])*(Root[1 + 4*
a*#1^3 + 4*C[1]*#1^4 & , 2] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4])))]*Root[1
+ 4*a*#1^3 + 4*C[1]*#1^4 & , 1] + EllipticPi[(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 &
, 2]*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 &
 , 4]))/(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1]*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4
 & , 2] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4])), ArcSin[Sqrt[((Root[1 + 4*a*#
1^3 + 4*C[1]*#1^4 & , 2] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4])*(Root[1 + 4*a
*#1^3 + 4*C[1]*#1^4 & , 1] - y[x]))/((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - R
oot[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] -
 y[x]))]], -(((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] - Root[1 + 4*a*#1^3 + 4*C[
1]*#1^4 & , 3])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*
C[1]*#1^4 & , 4]))/((-Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] + Root[1 + 4*a*#1^3
 + 4*C[1]*#1^4 & , 3])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] - Root[1 + 4*a*#1
^3 + 4*C[1]*#1^4 & , 4])))]*(-Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] + Root[1 +
4*a*#1^3 + 4*C[1]*#1^4 & , 2]))*Sqrt[((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] -
Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 3]
- y[x]))/((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*C[1]*#
1^4 & , 3])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] - y[x]))]*y[x]*(-Root[1 + 4*
a*#1^3 + 4*C[1]*#1^4 & , 1] + y[x])*(-Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4] + y
```

```
[x]))/(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1]*Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 &
, 2]*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 &
 , 4])*Sqrt[((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Root[1 + 4*a*#1^3 + 4*C[1
]*#1^4 & , 2])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] - Root[1 + 4*a*#1^3 + 4*C
[1]*#1^4 & , 4])*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - y[x])*(Root[1 + 4*a*#
1^3 + 4*C[1]*#1^4 & , 4] - y[x]))/((Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 1] - Roo
t[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 4])^2*(Root[1 + 4*a*#1^3 + 4*C[1]*#1^4 & , 2] -
 y[x])^2)]*Sqrt[y[x]^2 + 4*a*y[x]^5 + 4*C[1]*y[x]^6]) == x + C[2], y[x]]}
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = 6*diff(y(x),x)^2-(1+a*y(x)^3)*y(x)^2, y(x),'implicit')
```

Maple raw output

```
Intat(-2/(4*_C1*_a^4+4*_a^3*a+1)^(1/2)/_a,_a = y(x))-x-_C2 = 0, Intat(2/(4*_C1*_
a^4+4*_a^3*a+1)^(1/2)/_a,_a = y(x))-x-_C2 = 0
```

4.1959 $2y(x)y''(x) = y'(x)^2\left(y'(x)^2+1\right)$

ODE

$$2y(x)y''(x) = y'(x)^2\left(y'(x)^2+1\right)$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.908026 (sec), leaf count = 173

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-ie^{-c_1}\left(\sqrt{\#1}\sqrt{\#1e^{2c_1}-1}-e^{-c_1}\log\left(\sqrt{\#1}e^{2c_1}+e^{c_1}\sqrt{\#1e^{2c_1}-1}\right)\right)\&\right][c_2+x]\right\},\left\{y(x)\to\right.$$

Maple ✓
cpu = 0.078 (sec), leaf count = 87

$$\left\{-\frac{\_C1}{2}\arctan\left(1\left(y(x)-\frac{\_C1}{2}\right)\frac{1}{\sqrt{y(x)\left(\_C1-y(x)\right)}}\right)-\sqrt{y(x)\left(\_C1-y(x)\right)}-x-\_C2=0,\frac{\_C1}{2}\arctan\left(1\left(y(x\right.\right.$$

Mathematica raw input

```
DSolve[2*y[x]*y''[x] == y'[x]^2*(1 + y'[x]^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[((-I)*(-(Log[E^(2*C[1])*Sqrt[#1] + E^C[1]*Sqrt[-1 + E^
(2*C[1])*#1]]/E^C[1]) + Sqrt[#1]*Sqrt[-1 + E^(2*C[1])*#1]))/E^C[1] & ][x + C[2]]
}, {y[x] -> InverseFunction[(I*(-(Log[E^(2*C[1])*Sqrt[#1] + E^C[1]*Sqrt[-1 + E^(
2*C[1])*#1]]/E^C[1]) + Sqrt[#1]*Sqrt[-1 + E^(2*C[1])*#1]))/E^C[1] & ][x + C[2]]}
}
```

Maple raw input

```
dsolve(2*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2*(1+diff(y(x),x)^2), y(x),'implicit')
```

Maple raw output

```
-1/2*_C1*arctan((y(x)-1/2*_C1)/(y(x)*(_C1-y(x)))^(1/2))-(y(x)*(_C1-y(x)))^(1/2)-
x-_C2 = 0, 1/2*_C1*arctan((y(x)-1/2*_C1)/(y(x)*(_C1-y(x)))^(1/2))+(y(x)*(_C1-y(x
)))^(1/2)-x-_C2 = 0
```

4.1960 $3y(x)y''(x) = 2y'(x)^2 + 36y(x)^2$

ODE

$$3y(x)y''(x) = 2y'(x)^2 + 36y(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0720055 (sec), leaf count = 27

$$\left\{\left\{y(x) \to c_2 e^{-6x}\left(e^{12c_1} + e^{4x}\right)^3\right\}\right\}$$

Maple ✓
cpu = 0.04 (sec), leaf count = 22

$$\left\{-\mathrm{e}^{4x}\_C1 - 12\,\mathrm{e}^{2x}\sqrt[3]{y(x)} + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[3*y[x]*y''[x] == 36*y[x]^2 + 2*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((E^(4*x) + E^(12*C[1]))^3*C[2])/E^(6*x)}}
```

Maple raw input

```
dsolve(3*y(x)*diff(diff(y(x),x),x) = 2*diff(y(x),x)^2+36*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-exp(4*x)*_C1-12*exp(2*x)*y(x)^(1/3)+_C2 = 0
```

4.1961 $3y(x)y''(x) = 5y'(x)^2$

ODE

$$3y(x)y''(x) = 5y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0307311 (sec), leaf count = 20

$$\left\{\left\{y(x) \to \frac{c_2}{(3c_1 + 2x)^{3/2}}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 17

$$\left\{-\frac{3}{2}(y(x))^{-\frac{2}{3}} - \_C1\, x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[3*y[x]*y''[x] == 5*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]/(2*x + 3*C[1])^(3/2)}}
```

Maple raw input

```
dsolve(3*y(x)*diff(diff(y(x),x),x) = 5*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
-3/2/y(x)^(2/3)-_C1*x-_C2 = 0
```

4.1962 $4y(x)y''(x) = 3y'(x)^2 - 4y(x)$

ODE

$$4y(x)y''(x) = 3y'(x)^2 - 4y(x)$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0998619 (sec), leaf count = 43

$$\left\{\left\{y(x) \to \frac{\left(c_1^2x^2 + 2c_2c_1^2x + c_2^2c_1^2 - 64\right)^2}{256c_1^2}\right\}\right\}$$

Maple ✓
cpu = 0.151 (sec), leaf count = 67

$$\left\{-4\,\frac{\sqrt{\_C1\,\left(y\left(x\right)\right)^{3/2}+4\,y\left(x\right)}}{\sqrt{y\left(x\right)}\_C1}-x-\_C2=0,4\,\frac{\sqrt{\_C1\,\left(y\left(x\right)\right)^{3/2}+4\,y\left(x\right)}}{\sqrt{y\left(x\right)}\_C1}-x-\_C2=0,y(x)=0\right\}$$

Mathematica raw input

```
DSolve[4*y[x]*y''[x] == -4*y[x] + 3*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-64 + x^2*C[1]^2 + 2*x*C[1]^2*C[2] + C[1]^2*C[2]^2)^2/(256*C[1]^2)}}
```

Maple raw input

```
dsolve(4*y(x)*diff(diff(y(x),x),x) = 3*diff(y(x),x)^2-4*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 0, -4*(_C1*y(x)^(3/2)+4*y(x))^(1/2)/y(x)^(1/2)/_C1-x-_C2 = 0, 4*(_C1*y(x)
^(3/2)+4*y(x))^(1/2)/y(x)^(1/2)/_C1-x-_C2 = 0
```

4.1963 $4y(x)y''(x) = 3y'(x)^2 + 12y(x)^2$

ODE

$$4y(x)y''(x) = 3y'(x)^2 + 12y(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.134065 (sec), leaf count = 41

$$\left\{\left\{y(x) \to c_2 e^{-2\sqrt{3}x}\left(e^{4\sqrt{3}c_1} + e^{\sqrt{3}x}\right)^4\right\}\right\}$$

Maple ✓
cpu = 0.284 (sec), leaf count = 30

$$\left\{-e^{\sqrt{3}x}\_C1 - 4\sqrt[4]{y(x)}e^{1/2\sqrt{3}x}\sqrt{3} + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[4*y[x]*y''[x] == 12*y[x]^2 + 3*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((E^(Sqrt[3]*x) + E^(4*Sqrt[3]*C[1]))^4*C[2])/E^(2*Sqrt[3]*x)}}
```

Maple raw input

```
dsolve(4*y(x)*diff(diff(y(x),x),x) = 3*diff(y(x),x)^2+12*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-exp(3^(1/2)*x)*_C1-4*y(x)^(1/4)*exp(1/2*3^(1/2)*x)*3^(1/2)+_C2 = 0
```

4.1964 $4y(x)y''(x) = ay(x) + by(x)^2 + cy(x)^3 + 3y'(x)^2$

ODE

$$4y(x)y''(x) = ay(x) + by(x)^2 + cy(x)^3 + 3y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 4.46683 (sec), leaf count = 2281

$$\left\{\text{Solve}\left[-\frac{4F\left(\sin^{-1}\left(\sqrt{\frac{\left(\text{Root}\left[c\#1^4+3b\#1^2+3c_1\#1-3a\&,2\right]-\text{Root}\left[c\#1^4+3b\#1^2+3c_1\#1-3a\&,4\right]\right)\left(\text{Root}\left[c\#1^4+3b\#1^2+3c_1\#1-3\right.\right.}{\left(\text{Root}\left[c\#1^4+3b\#1^2+3c_1\#1-3a\&,1\right]-\text{Root}\left[c\#1^4+3b\#1^2+3c_1\#1-3a\&,4\right]\right)\left(\text{Root}\left[c\#1^4+3b\#1^2+3c_1\#1-3\right.\right.}}\right.\right.}{}\right.\right.$$

Maple ✓
cpu = 0.53 (sec), leaf count = 87

$$\left\{\int^{y(x)} -3\,\frac{1}{\sqrt{9\_C1\,\_a^{3/2}+3\,c\_a^3+9\,\_a^2b-9\,\_a\,a}}d\_a-x-\_C2=0,\int^{y(x)} 3\,\frac{1}{\sqrt{9\_C1\,\_a^{3/2}+3\,c\_a^3+9\,\_a^2b-9\,\_}}\right.$$

Mathematica raw input

```
DSolve[4*y[x]*y''[x] == a*y[x] + b*y[x]^2 + c*y[x]^3 + 3*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{Solve[(-4*EllipticF[ArcSin[Sqrt[((Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & ,
 2] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 4])*(Root[-3*a + 3*C[1]*#1 +
 3*b*#1^2 + c*#1^4 & , 1] - Sqrt[y[x]]))/((Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*
#1^4 & , 1] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 4])*(Root[-3*a + 3*C
[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2] - Sqrt[y[x]]))]], ((Root[-3*a + 3*C[1]*#1 + 3*
b*#1^2 + c*#1^4 & , 2] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 3])*(Root
[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2
+ c*#1^4 & , 4]))/((Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Root[-3*a
 + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 3])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#
1^4 & , 2] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 4]))]*(Root[-3*a + 3*
C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 &
```

```
 , 4])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2] - Sqrt[y[x]])^2*Sqrt[((
Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Root[-3*a + 3*C[1]*#1 + 3*b*#
1^2 + c*#1^4 & , 2])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 3] - Sqrt[y[
x]]))/((Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Root[-3*a + 3*C[1]*#1
 + 3*b*#1^2 + c*#1^4 & , 3])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2] -
 Sqrt[y[x]]))]*Sqrt[((Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Root[-3
*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c
*#1^4 & , 2] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 4])*(Root[-3*a + 3*
C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Sqrt[y[x]])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1
^2 + c*#1^4 & , 4] - Sqrt[y[x]]))/((Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 &
, 1] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 4])^2*(Root[-3*a + 3*C[1]*#
1 + 3*b*#1^2 + c*#1^4 & , 2] - Sqrt[y[x]])^2)]*Sqrt[y[x]])/((-Root[-3*a + 3*C[1]
*#1 + 3*b*#1^2 + c*#1^4 & , 1] + Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2
])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2] - Root[-3*a + 3*C[1]*#1 + 3
*b*#1^2 + c*#1^4 & , 4])*Sqrt[-(a*y[x]) + C[1]*y[x]^(3/2) + b*y[x]^2 + (c*y[x]^3
)/3]) == x + C[2], y[x]], Solve[(4*EllipticF[ArcSin[Sqrt[((Root[-3*a + 3*C[1]*#1
 + 3*b*#1^2 + c*#1^4 & , 2] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 4])*
(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Sqrt[y[x]]))/((Root[-3*a + 3
*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4
& , 4])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2] - Sqrt[y[x]]))]], ((Ro
ot[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^
2 + c*#1^4 & , 3])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Root[-3*a
 + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 4]))/((Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c
*#1^4 & , 1] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 3])*(Root[-3*a + 3*
C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 &
 , 4]))]*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Root[-3*a + 3*C[1]*
#1 + 3*b*#1^2 + c*#1^4 & , 4])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2]
 - Sqrt[y[x]])^2*Sqrt[((Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Root[
-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 +
 c*#1^4 & , 3] - Sqrt[y[x]]))/((Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1]
 - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 3])*(Root[-3*a + 3*C[1]*#1 + 3*
b*#1^2 + c*#1^4 & , 2] - Sqrt[y[x]]))]*Sqrt[((Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 +
 c*#1^4 & , 1] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2])*(Root[-3*a +
3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4
 & , 4])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] - Sqrt[y[x]])*(Root[-
3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 4] - Sqrt[y[x]]))/((Root[-3*a + 3*C[1]*#
1 + 3*b*#1^2 + c*#1^4 & , 1] - Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 4])
^2*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2] - Sqrt[y[x]])^2)]*Sqrt[y[x]
])/((-Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 1] + Root[-3*a + 3*C[1]*#1 +
 3*b*#1^2 + c*#1^4 & , 2])*(Root[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 2] - R
oot[-3*a + 3*C[1]*#1 + 3*b*#1^2 + c*#1^4 & , 4])*Sqrt[-(a*y[x]) + C[1]*y[x]^(3/2
) + b*y[x]^2 + (c*y[x]^3)/3]) == x + C[2], y[x]]}
```

Maple raw input

```
dsolve(4*y(x)*diff(diff(y(x),x),x) = 3*diff(y(x),x)^2+a*y(x)+b*y(x)^2+c*y(x)^3, y(x),'implicit')
```

Maple raw output

```
y(x) = 0, Intat(-3/(9*_C1*_a^(3/2)+3*c*_a^3+9*_a^2*b-9*_a*a)^(1/2),_a = y(x))-x-
_C2 = 0, Intat(3/(9*_C1*_a^(3/2)+3*c*_a^3+9*_a^2*b-9*_a*a)^(1/2),_a = y(x))-x-_C
2 = 0
```

4.1965 $5y(x)y''(x) = y'(x)^2$

ODE

$$5y(x)y''(x) = y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0296704 (sec), leaf count = 20

$$\left\{\left\{y(x) \to c_2(4x - 5c_1)^{5/4}\right\}\right\}$$

Maple ✓
cpu = 0.073 (sec), leaf count = 17

$$\left\{\frac{5}{4}(y(x))^{\frac{4}{5}} - \_C1\, x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[5*y[x]*y''[x] == y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (4*x - 5*C[1])^(5/4)*C[2]}}
```

Maple raw input

```
dsolve(5*y(x)*diff(diff(y(x),x),x) = diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
5/4*y(x)^(4/5)-_C1*x-_C2 = 0
```

4.1966 $12y(x)y''(x) = 15y'(x)^2 - 8y(x)^3$

ODE

$$12y(x)y''(x) = 15y'(x)^2 - 8y(x)^3$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.320734 (sec), leaf count = 43

$$\left\{\left\{y(x) \to \frac{2304c_1^2}{\left(3c_1^2x^2 + 6c_2c_1^2x + 3c_2^2c_1^2 + 128\right)^2}\right\}\right\}$$

Maple ✓
cpu = 0.305 (sec), leaf count = 147

$$\left\{-12\,\frac{y(x)\left(8\sqrt{y(x)} - \_C1\right)\sqrt{8\,y(x) - \_C1\sqrt{y(x)}}}{\sqrt{-24\,(y(x))^3 + 3\,\_C1\,(y(x))^{5/2}}\,\_C1\sqrt{\sqrt{y(x)}\left(8\sqrt{y(x)} - \_C1\right)}} - x - \_C2 = 0, 12\,\frac{y(x)\left(8\sqrt{y(x)} -\right.}{\sqrt{-24\,(y(x))^3 + 3\,\_C1\,(y}}\right.$$

Mathematica raw input

```
DSolve[12*y[x]*y''[x] == -8*y[x]^3 + 15*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2304*C[1]^2)/(128 + 3*x^2*C[1]^2 + 6*x*C[1]^2*C[2] + 3*C[1]^2*C[2]^2)
^2}}
```

Maple raw input

```
dsolve(12*y(x)*diff(diff(y(x),x),x) = 15*diff(y(x),x)^2-8*y(x)^3, y(x),'implicit')
```

Maple raw output

```
-12/(-24*y(x)^3+3*_C1*y(x)^(5/2))^(1/2)*y(x)*(8*y(x)^(1/2)-_C1)*(8*y(x)-_C1*y(x)
^(1/2))^(1/2)/_C1/(y(x)^(1/2)*(8*y(x)^(1/2)-_C1))^(1/2)-x-_C2 = 0, 12/(-24*y(x)^
3+3*_C1*y(x)^(5/2))^(1/2)*y(x)*(8*y(x)^(1/2)-_C1)*(8*y(x)-_C1*y(x)^(1/2))^(1/2)/
_C1/(y(x)^(1/2)*(8*y(x)^(1/2)-_C1))^(1/2)-x-_C2 = 0
```

4.1967 $ay(x)y''(x) = (a-1)y'(x)^2$

ODE

$$ay(x)y''(x) = (a-1)y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0357162 (sec), leaf count = 17

$$\{\{y(x) \to c_2(x - ac_1)^{\,a}\}\}$$

Maple ✓
cpu = 0.08 (sec), leaf count = 19

$$\left\{a\sqrt[a]{y(x)} - \_C1\,x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[a*y[x]*y''[x] == (-1 + a)*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x - a*C[1])^a*C[2]}}
```

Maple raw input

```
dsolve(a*y(x)*diff(diff(y(x),x),x) = (a-1)*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
a*y(x)^(1/a)-_C1*x-_C2 = 0
```

4.1968 $a(a+2)^2y(x)y''(x) = a^2(a+2)y(x)^3f'(x) - a^2f(x)^2y(x)^4 + a(a+2)^2f(x)y(x)^2y'(x) + (a-1)(a+2)^2y'(x)^2$

ODE

$$a(a+2)^2y(x)y''(x) = a^2(a+2)y(x)^3f'(x)-a^2f(x)^2y(x)^4+a(a+2)^2f(x)y(x)^2y'(x)+(a-1)(a+2)^2y'(x)^2$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.960022 (sec), leaf count = 0 , could not solve

```
DSolve[a*(2 + a)^2*y[x]*Derivative[2][y][x] == -(a^2*f[x]^2*y[x]^4) + a^2*(2 + a)*y[x]^3*Derivative[1
1 + a)*(2 + a)^2*Derivative[1][y][x]^2, y[x], x]
```

Maple ✗
cpu = 2.858 (sec), leaf count = 0 , could not solve

```
dsolve(a*(a+2)^2*y(x)*diff(diff(y(x),x),x) = (a-1)*(a+2)^2*diff(y(x),x)^2+a*(a+2)^2*f(x)*y(x)^2*diff(
a^2*f(x)^2*y(x)^4, y(x),'implicit')
```

Mathematica raw input

```
DSolve[a*(2 + a)^2*y[x]*y''[x] == -(a^2*f[x]^2*y[x]^4) + a^2*(2 + a)*y[x]^3*f'[x] + a*(2 + a)^2*f[x]*
1 + a)*(2 + a)^2*y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[a*(2 + a)^2*y[x]*Derivative[2][y][x] == -(a^2*f[x]^2*y[x]^4) + a^2*(2 + a
)*y[x]^3*Derivative[1][f][x] + a*(2 + a)^2*f[x]*y[x]^2*Derivative[1][y][x] + (-1
 + a)*(2 + a)^2*Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(a*(a+2)^2*y(x)*diff(diff(y(x),x),x) = (a-1)*(a+2)^2*diff(y(x),x)^2+a*(a+2)^2*f(x)*y(x)^2*diff(
a^2*f(x)^2*y(x)^4, y(x),'implicit')
```

Maple raw output

```
dsolve(a*(a+2)^2*y(x)*diff(diff(y(x),x),x) = (a-1)*(a+2)^2*diff(y(x),x)^2+a*(a+2
)^2*f(x)*y(x)^2*diff(y(x),x)+a^2*(a+2)*diff(f(x),x)*y(x)^3-a^2*f(x)^2*y(x)^4, y(
x),'implicit')
```

4.1969 $xy(x)y''(x) + xy'(x)^2 + y(x)y'(x) = 0$

ODE

$$xy(x)y''(x) + xy'(x)^2 + y(x)y'(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], _Liouville, [_2nd_order, _with_linear_symmetries], [_

Book solution method
TO DO

Mathematica ✓
cpu = 0.0457343 (sec), leaf count = 19

$$\left\{\left\{y(x) \to c_2\sqrt{c_1 + 2\log(x)}\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 18

$$\left\{\frac{(y(x))^2}{2} - \_C1\ \ln(x) - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x] + x*y'[x]^2 + x*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]*Sqrt[C[1] + 2*Log[x]]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x)+x*diff(y(x),x)^2+y(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
1/2*y(x)^2-_C1*ln(x)-_C2 = 0
```

4.1970 $xy(x)y''(x) + xy'(x)^2 = y(x)y'(x)$

ODE

$$xy(x)y''(x) + xy'(x)^2 = y(x)y'(x)$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], _Liouville, [_2nd_order, _with_linear_symmetries], [_

Book solution method
TO DO

Mathematica ✓
cpu = 0.040053 (sec), leaf count = 18

$$\left\{\left\{y(x) \to c_2\sqrt{c_1 + x^2}\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 18

$$\left\{\_C1\, x^2 - \_C2 + \frac{(y(x))^2}{2} = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x]^2 + x*y[x]*y''[x] == y[x]*y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x^2 + C[1]]*C[2]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x)+x*diff(y(x),x)^2 = y(x)*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
_C1*x^2-_C2+1/2*y(x)^2 = 0
```

4.1971 $xy(x)y''(x) = xy'(x)^2 - y(x)y'(x)$

ODE

$$xy(x)y''(x) = xy'(x)^2 - y(x)y'(x)$$

ODE Classification

[_Liouville, [_Painleve, `3rd`], [_2nd_order, _with_linear_symmetries], [_2nd_order, _re

Book solution method
TO DO

Mathematica ✓
cpu = 0.0325922 (sec), leaf count = 12

$$\{\{y(x) \to c_2 x^{c_1}\}\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 15

$$\{\ln(y(x)) - \_C1 \ln(x) - \_C2 = 0\}$$

Mathematica raw input

```
DSolve[x*y[x]*y''[x] == -(y[x]*y'[x]) + x*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^C[1]*C[2]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x) = x*diff(y(x),x)^2-y(x)*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
ln(y(x))-_C1*ln(x)-_C2 = 0
```

4.1972

$$xy(x)y''(x) = x(\mathbf{a0} + \mathbf{a1}y(x)^4) + y(x)\left(\mathbf{a2} + \mathbf{a3}y(x)^2\right) + xy'(x)^2 - y(x)y'(x)$$

ODE

$$xy(x)y''(x) = x(\mathrm{a0} + \mathrm{a1}y(x)^4) + y(x)\left(\mathrm{a2} + \mathrm{a3}y(x)^2\right) + xy'(x)^2 - y(x)y'(x)$$

ODE Classification

```
[[_Painleve, `3rd`]]
```

Book solution method
TO DO

Mathematica ✗
cpu = 1.57506 (sec), leaf count = 0 , could not solve

```
DSolve[x*y[x]*Derivative[2][y][x] == y[x]*(a2 + a3*y[x]^2) + x*(a0 + a1*y[x]^4) - y[x]*Derivative[1]
```

Maple ✗
cpu = 0.762 (sec), leaf count = 0 , could not solve

```
dsolve(x*y(x)*diff(diff(y(x),x),x) = x*diff(y(x),x)^2-y(x)*diff(y(x),x)+x*(a0+a1*y(x)^4)+y(x)*(a2+a3*
```

Mathematica raw input

```
DSolve[x*y[x]*y''[x] == y[x]*(a2 + a3*y[x]^2) + x*(a0 + a1*y[x]^4) - y[x]*y'[x] + x*y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[x*y[x]*Derivative[2][y][x] == y[x]*(a2 + a3*y[x]^2) + x*(a0 + a1*y[x]^4)
- y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x) = x*diff(y(x),x)^2-y(x)*diff(y(x),x)+x*(a0+a1*y(x)^4)+y(x)*(a2+a3*
```

Maple raw output

```
dsolve(x*y(x)*diff(diff(y(x),x),x) = x*diff(y(x),x)^2-y(x)*diff(y(x),x)+x*(a0+a1
*y(x)^4)+y(x)*(a2+a3*y(x)^2), y(x),'implicit')
```

4.1973 $xy(x)y''(x) + xy'(x)^2 + 2y(x)y'(x) = 0$

ODE

$$xy(x)y''(x) + xy'(x)^2 + 2y(x)y'(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], _Liouville, [_2nd_order, _with_linear_symmetries], [_

Book solution method
TO DO

Mathematica ✓
cpu = 0.0446592 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \frac{c_2\sqrt{2 - c_1 x}}{\sqrt{x}}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 18

$$\left\{\frac{(y(x))^2}{2} + \frac{\_C1}{x} - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[2*y[x]*y'[x] + x*y'[x]^2 + x*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[2 - x*C[1]]*C[2])/Sqrt[x]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x)+x*diff(y(x),x)^2+2*y(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
1/2*y(x)^2+_C1/x-_C2 = 0
```

4.1974 $xy(x)y''(x) + xy'(x)^2 = 3y(x)y'(x)$

ODE

$$xy(x)y''(x) + xy'(x)^2 = 3y(x)y'(x)$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], _Liouville, [_2nd_order, _with_linear_symmetries], [_

Book solution method
TO DO

Mathematica ✓
cpu = 0.0405918 (sec), leaf count = 20

$$\left\{\left\{y(x) \to c_2\sqrt{2c_1 + x^4}\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 18

$$\left\{\_C1\, x^4 - \_C2 + \frac{(y(x))^2}{2} = 0\right\}$$

Mathematica raw input

```
DSolve[x*y'[x]^2 + x*y[x]*y''[x] == 3*y[x]*y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x^4 + 2*C[1]]*C[2]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x)+x*diff(y(x),x)^2 = 3*y(x)*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
_C1*x^4-_C2+1/2*y(x)^2 = 0
```

4.1975 $ay(x)y'(x) + f(x) + xy(x)y''(x) + xy'(x)^2 = 0$

ODE

$$ay(x)y'(x) + f(x) + xy(x)y''(x) + xy'(x)^2 = 0$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 320.582 (sec), leaf count = 104

$$\left\{\left\{y(x) \to -\sqrt{2}\sqrt{\int_1^x K[3]^{-a}\left(\int_1^{K[3]} K[2]^{a-1}(-f(K[2]))\,dK[2] + c_1\right)\,dK[3] + c_2}\right\}, \left\{y(x) \to \sqrt{2}\sqrt{\int_1^x K[3]^{-a}\left(\int_1^{K[3]}\right.\right.\right.$$

Maple ✓
cpu = 0.049 (sec), leaf count = 43

$$\left\{\frac{\left(-2\int x^{a-1}f(x)\,\mathrm{d}x - 2\_C1\right)x^{1-a}}{2} + \frac{(a-1)\left(y(x)\right)^2}{2} + \int f(x)\,\mathrm{d}x + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[f[x] + a*y[x]*y'[x] + x*y'[x]^2 + x*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2]*Sqrt[C[2] + Integrate[(C[1] + Integrate[-(f[K[2]]*K[2]^(-1 +
  a)), {K[2], 1, K[3]}])/K[3]^a, {K[3], 1, x}]])}, {y[x] -> Sqrt[2]*Sqrt[C[2] + I
ntegrate[(C[1] + Integrate[-(f[K[2]]*K[2]^(-1 + a)), {K[2], 1, K[3]}])/K[3]^a, {
K[3], 1, x}]]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x)+x*diff(y(x),x)^2+a*y(x)*diff(y(x),x)+f(x) = 0, y(x),'implicit')
```

Maple raw output

```
1/2*(-2*Int(x^(a-1)*f(x),x)-2*_C1)*x^(1-a)+1/2*(a-1)*y(x)^2+Int(f(x),x)+_C2 = 0
```

4.1976 $xy(x)y''(x) = ay(x)y'(x) + xy'(x)^2 + xy(x)^3$

ODE

$$xy(x)y''(x) = ay(x)y'(x) + xy'(x)^2 + xy(x)^3$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 51.8477 (sec), leaf count = 0 , could not solve

```
DSolve[x*y[x]*Derivative[2][y][x] == x*y[x]^3 + a*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2,
```

Maple ✓
cpu = 1.152 (sec), leaf count = 107

$$\left\{ y(x) = ODESolStruc\left(\frac{\_a}{\left(e^{\int \_b(\_a)\, d\_a + \_C1}\right)^2}, [\left\{ \frac{d}{d\_a}\_b(\_a) = 2\, \frac{\_b(\_a)\left(-1/2 + \_a^2(a - \_a/2 + 1)\,(\_b(\_a))^2 - 1/2\right.}{\_a} \right.\right.$$

Mathematica raw input

```
DSolve[x*y[x]*y''[x] == x*y[x]^3 + a*y[x]*y'[x] + x*y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[x*y[x]*Derivative[2][y][x] == x*y[x]^3 + a*y[x]*Derivative[1][y][x] + x*D
erivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x) = x*diff(y(x),x)^2+a*y(x)*diff(y(x),x)+x*y(x)^3, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a/exp(Int(_b(_a),_a)+_C1)^2,[{diff(_b(_a),_a) = 2*_b(_a)*(-1
/2+_a^2*(a-1/2*_a+1)*_b(_a)^2-1/2*_a*(1+a)*_b(_a))/_a}, {_a = x^2*y(x), _b(_a) =
 1/x^2/(x*diff(y(x),x)+2*y(x))}, {x = exp(Int(_b(_a),_a)+_C1), y(x) = _a/exp(Int
(_b(_a),_a)+_C1)^2}])
```

4.1977 $xy(x)y''(x) = ay(x)y'(x) + b^2xy(x)^3 + xy'(x)^2$

ODE

$$xy(x)y''(x) = ay(x)y'(x) + b^2xy(x)^3 + xy'(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 58.9603 (sec), leaf count = 0 , could not solve

```
DSolve[x*y[x]*Derivative[2][y][x] == b^2*x*y[x]^3 + a*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x
```

Maple ✓
cpu = 0.838 (sec), leaf count = 110

$$\left\{ y(x) = ODESolStruc\left(\frac{\_a}{\left(e^{\int \_b(\_a)\, d\_a + \_C1}\right)^2}, [\left\{ \frac{d}{d\_a}\_b(\_a) = 2\, \frac{\left(-1/2 + \_a^2\left(-1/2\, \_a\, b^2 + a + 1\right)(\_b(\_a))^2 - 1/2\, \_\right.\right.\right.$$

Mathematica raw input

```
DSolve[x*y[x]*y''[x] == b^2*x*y[x]^3 + a*y[x]*y'[x] + x*y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[x*y[x]*Derivative[2][y][x] == b^2*x*y[x]^3 + a*y[x]*Derivative[1][y][x] +
 x*Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x) = x*diff(y(x),x)^2+a*y(x)*diff(y(x),x)+b^2*x*y(x)^3, y(x),'implici
```

Maple raw output

```
y(x) = ODESolStruc(_a/exp(Int(_b(_a),_a)+_C1)^2,[{diff(_b(_a),_a) = 2*(-1/2+_a^2
*(-1/2*_a*b^2+a+1)*_b(_a)^2-1/2*_a*(1+a)*_b(_a))*_b(_a)/_a}, {_a = x^2*y(x), _b(
_a) = 1/x^2/(x*diff(y(x),x)+2*y(x))}, {x = exp(Int(_b(_a),_a)+_C1), y(x) = _a/ex
p(Int(_b(_a),_a)+_C1)^2}])
```

4.1978 $xy(x)y''(x) + 2xy'(x)^2 + y(x)y'(x) = 0$

ODE

$$xy(x)y''(x) + 2xy'(x)^2 + y(x)y'(x) = 0$$

ODE Classification

[_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1],

Book solution method
TO DO

Mathematica ✓
cpu = 0.0463029 (sec), leaf count = 19

$$\left\{\left\{y(x) \to c_2 \sqrt[3]{c_1 + 3\log(x)}\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 18

$$\left\{\frac{(y(x))^3}{3} - \_C1\ \ln(x) - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x] + 2*x*y'[x]^2 + x*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]*(C[1] + 3*Log[x])^(1/3)}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)^2+y(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
1/3*y(x)^3-_C1*ln(x)-_C2 = 0
```

4.1979 $xy(x)y''(x) - 2xy'(x)^2 + y(x)y'(x) = 0$

ODE

$$xy(x)y''(x) - 2xy'(x)^2 + y(x)y'(x) = 0$$

ODE Classification

[_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1],

Book solution method
TO DO

Mathematica ✓
cpu = 0.044608 (sec), leaf count = 17

$$\left\{\left\{y(x) \to \frac{c_2}{c_1 - \log(x)}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 18

$$\left\{-(y(x))^{-1} - \_C1 \ln(x) - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]*y'[x] - 2*x*y'[x]^2 + x*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]/(C[1] - Log[x])}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x)-2*x*diff(y(x),x)^2+y(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
-1/y(x)-_C1*ln(x)-_C2 = 0
```

4.1980 $xy(x)y''(x) - 2xy'(x)^2 - y(x)y'(x) = 0$

ODE

$$xy(x)y''(x) - 2xy'(x)^2 - y(x)y'(x) = 0$$

ODE Classification

[_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1],

Book solution method
TO DO

Mathematica ✓
cpu = 0.044136 (sec), leaf count = 18

$$\left\{\left\{y(x) \to \frac{c_2}{x^2 - 2c_1}\right\}\right\}$$

Maple ✓
cpu = 0.016 (sec), leaf count = 18

$$\left\{\_C1\, x^2 - \_C2 - (y(x))^{-1} = 0\right\}$$

Mathematica raw input

```
DSolve[-(y[x]*y'[x]) - 2*x*y'[x]^2 + x*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]/(x^2 - 2*C[1])}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x)-2*x*diff(y(x),x)^2-y(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
_C1*x^2-_C2-1/y(x) = 0
```

4.1981 $xy(x)y''(x) = 2xy'(x)^2 - (y(x)+1)y'(x)$

ODE

$$xy(x)y''(x) = 2xy'(x)^2 - (y(x)+1)y'(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0655917 (sec), leaf count = 37

$$\left\{\left\{y(x) \to \frac{\tan\left(\frac{\sqrt{c_1}(\log(x)-c_2)}{\sqrt{2}}\right)}{\sqrt{2}\sqrt{c_1}}\right\}\right\}$$

Maple ✓
cpu = 0.167 (sec), leaf count = 19

$$\left\{\ln(x) - 2\_C1\ Artanh\left(\frac{y(x)}{\_C1}\right) - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y[x]*y''[x] == -((1 + y[x])*y'[x]) + 2*x*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Tan[(Sqrt[C[1]]*(-C[2] + Log[x]))/Sqrt[2]]/(Sqrt[2]*Sqrt[C[1]])}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x) = 2*x*diff(y(x),x)^2-(1+y(x))*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
ln(x)-2*_C1*arctanh(1/_C1*y(x))-_C2 = 0
```

4.1982 $ay(x)y'(x) + xy(x)y''(x) + 2xy'(x)^2 = 0$

ODE

$$ay(x)y'(x) + xy(x)y''(x) + 2xy'(x)^2 = 0$$

ODE Classification

[_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1],

Book solution method
TO DO

Mathematica ✓
cpu = 0.146685 (sec), leaf count = 33

$$\left\{\left\{y(x) \to c_2 x^{-a/3} \sqrt[3]{3x - (a-1)c_1 x^a}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 21

$$\left\{\frac{\_C1\, x}{x^a} - \_C2 + \frac{(y(x))^3}{3} = 0\right\}$$

Mathematica raw input

```
DSolve[a*y[x]*y'[x] + 2*x*y'[x]^2 + x*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((3*x - (-1 + a)*x^a*C[1])^(1/3)*C[2])/x^(a/3)}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)^2+a*y(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
_C1*x/(x^a)-_C2+1/3*y(x)^3 = 0
```

4.1983 $ay(x)y'(x) + xy(x)y''(x) - 2xy'(x)^2 = 0$

ODE

$$ay(x)y'(x) + xy(x)y''(x) - 2xy'(x)^2 = 0$$

ODE Classification

[_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1],

Book solution method
TO DO

Mathematica ✓
cpu = 0.138317 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \frac{c_2 x^a}{(a-1)c_1 x^a + x}\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 21

$$\left\{\frac{\_C1\, x}{x^a} - \_C2 - (y(x))^{-1} = 0\right\}$$

Mathematica raw input

```
DSolve[a*y[x]*y'[x] - 2*x*y'[x]^2 + x*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^a*C[2])/(x + (-1 + a)*x^a*C[1])}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x)-2*x*diff(y(x),x)^2+a*y(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
_C1*x/(x^a)-_C2-1/y(x) = 0
```

4.1984 $xy(x)y''(x) - 4xy'(x)^2 + 4y(x)y'(x) = 0$

ODE

$$xy(x)y''(x) - 4xy'(x)^2 + 4y(x)y'(x) = 0$$

ODE Classification

[_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1],

Book solution method
TO DO

Mathematica ✓
cpu = 0.0534294 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{c_2 x}{\sqrt[3]{c_1 x^3 + 1}}\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 18

$$\left\{\frac{\_C1}{x^3} - \_C2 - \frac{1}{3\,(y(x))^3} = 0\right\}$$

Mathematica raw input

```
DSolve[4*y[x]*y'[x] - 4*x*y'[x]^2 + x*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*C[2])/(1 + x^3*C[1])^(1/3)}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x)-4*x*diff(y(x),x)^2+4*y(x)*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
_C1/x^3-_C2-1/3/y(x)^3 = 0
```

4.1985 $ay'(x)\left(xy'(x)-y(x)\right)+xy(x)y''(x)=0$

ODE

$$ay'(x)\left(xy'(x)-y(x)\right)+xy(x)y''(x)=0$$

ODE Classification

[_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1],

Book solution method
TO DO

Mathematica ✓
cpu = 0.151031 (sec), leaf count = 22

$$\left\{\left\{y(x)\to c_2\left(x^{a+1}+c_1\right)^{\frac{1}{a+1}}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 26

$$\left\{-\_C1\,xx^a-\_C2+\frac{y(x)\left(y(x)\right)^a}{1+a}=0\right\}$$

Mathematica raw input

```
DSolve[a*y'[x]*(-y[x] + x*y'[x]) + x*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(1 + a) + C[1])^(1 + a)^(-1)*C[2]}}
```

Maple raw input

```
dsolve(x*y(x)*diff(diff(y(x),x),x)+a*diff(y(x),x)*(x*diff(y(x),x)-y(x)) = 0, y(x),'implicit')
```

Maple raw output

```
-_C1*x*x^a-_C2+y(x)/(1+a)*y(x)^a = 0
```

4.1986 $x(y(x)+x)y''(x)+xy'(x)^2+(x-y(x))y'(x)=y(x)$

ODE

$$x(y(x)+x)y''(x)+xy'(x)^2+(x-y(x))y'(x)=y(x)$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetries], [_2nd_order, _

Book solution method
TO DO

Mathematica ✓
cpu = 0.118935 (sec), leaf count = 79

$$\left\{\left\{y(x)\to -x-\sqrt{-e^{2c_2}\left(x^2-1\right)+\left(1-2ic_1\right)x^2}\right\},\left\{y(x)\to -x+\sqrt{-e^{2c_2}\left(x^2-1\right)+\left(1-2ic_1\right)x^2}\right\}\right\}$$

Maple ✓
cpu = 1.314 (sec), leaf count = 26

$$\left\{\_C2+2\,\frac{y(x)}{x}+\frac{(y(x))^2}{x^2}-\frac{\_C1}{x^2}=0\right\}$$

Mathematica raw input

```
DSolve[(x - y[x])*y'[x] + x*y'[x]^2 + x*(x + y[x])*y''[x] == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x - Sqrt[-(E^(2*C[2])*(-1 + x^2)) + x^2*(1 - (2*I)*C[1])]}, {y[x] ->
-x + Sqrt[-(E^(2*C[2])*(-1 + x^2)) + x^2*(1 - (2*I)*C[1])]}}
```

Maple raw input

```
dsolve(x*(x+y(x))*diff(diff(y(x),x),x)+x*diff(y(x),x)^2+(x-y(x))*diff(y(x),x) = y(x), y(x),'implicit'
```

Maple raw output

```
_C2+2*y(x)/x+1/x^2*y(x)^2-1/x^2*_C1 = 0
```

4.1987 $2xy(x)y''(x) = xy'(x)^2 - y(x)y'(x)$

ODE

$$2xy(x)y''(x) = xy'(x)^2 - y(x)y'(x)$$

ODE Classification

[_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1],

Book solution method
TO DO

Mathematica ✓
cpu = 0.0484686 (sec), leaf count = 18

$$\{\{y(x) \to c_2 (c_1 + \sqrt{x})^2\}\}$$

Maple ✓
cpu = 0.141 (sec), leaf count = 17

$$\left\{-\_C2 - \_C1\sqrt{x} + \sqrt{y(x)} = 0\right\}$$

Mathematica raw input

```
DSolve[2*x*y[x]*y''[x] == -(y[x]*y'[x]) + x*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[x] + C[1])^2*C[2]}}
```

Maple raw input

```
dsolve(2*x*y(x)*diff(diff(y(x),x),x) = x*diff(y(x),x)^2-y(x)*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
-_C2-_C1*x^(1/2)+y(x)^(1/2) = 0
```

4.1988 $x^2 + x(2y(x) + x)y''(x) + 2xy'(x)^2 + 4(y(x) + x)y'(x) + 2y(x) = 0$

ODE

$$x^2 + x(2y(x) + x)y''(x) + 2xy'(x)^2 + 4(y(x) + x)y'(x) + 2y(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0835132 (sec), leaf count = 104

$$\left\{\left\{y(x) \to \frac{1}{6}\left(-\sqrt{3}\sqrt{\frac{1}{x^2}}\sqrt{x\left(12c_2x + 12c_1 - x^4 + 3x^3\right)} - 3x\right)\right\}, \left\{y(x) \to \frac{1}{6}\left(\sqrt{3}\sqrt{\frac{1}{x^2}}\sqrt{x\left(12c_2x + 12c_1 - x^4 + 3x^3\right)} - 3\right.\right.$$

Maple ✓
cpu = 0.044 (sec), leaf count = 28

$$\left\{-\frac{x^4}{12} - x^2y(x) - x(y(x))^2 - \_C1\,x + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2 + 2*y[x] + 4*(x + y[x])*y'[x] + 2*x*y'[x]^2 + x*(x + 2*y[x])*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-3*x - Sqrt[3]*Sqrt[x^(-2)]*Sqrt[x*(3*x^3 - x^4 + 12*C[1] + 12*x*C[2]
)])/6}, {y[x] -> (-3*x + Sqrt[3]*Sqrt[x^(-2)]*Sqrt[x*(3*x^3 - x^4 + 12*C[1] + 12
*x*C[2])])/6}}
```

Maple raw input

```
dsolve(x*(x+2*y(x))*diff(diff(y(x),x),x)+2*x*diff(y(x),x)^2+4*(x+y(x))*diff(y(x),x)+x^2+2*y(x) = 0, y
```

Maple raw output

```
-1/12*x^4-x^2*y(x)-x*y(x)^2-_C1*x+_C2 = 0
```

4.1989 $x^2 y(x) y''(x) + (x y'(x) - y(x))^2 = 0$

ODE

$$x^2 y(x) y''(x) + (x y'(x) - y(x))^2 = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_y_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0379801 (sec), leaf count = 23

$$\{\{y(x) \to c_2 \sqrt{x} \sqrt{c_1 + 2x}\}\}$$

Maple ✓
cpu = 0.069 (sec), leaf count = 18

$$\left\{ -\_C1\, x + \_C2 - \frac{(y(x))^2}{2x} = 0 \right\}$$

Mathematica raw input

```
DSolve[(-y[x] + x*y'[x])^2 + x^2*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Sqrt[x]*Sqrt[2*x + C[1]]*C[2]}}
```

Maple raw input

```
dsolve(x^2*y(x)*diff(diff(y(x),x),x)+(x*diff(y(x),x)-y(x))^2 = 0, y(x),'implicit')
```

Maple raw output

```
-_C1*x+_C2-1/2*y(x)^2/x = 0
```

4.1990 $x^2 y(x) y''(x) + (x y'(x) - y(x))^2 = 3 y(x)^2$

ODE

$$x^2 y(x) y''(x) + (x y'(x) - y(x))^2 = 3 y(x)^2$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetries], [_2nd_order, _

Book solution method
TO DO

Mathematica ✓
cpu = 0.0539772 (sec), leaf count = 23

$$\left\{\left\{y(x) \to \frac{c_2 \sqrt{c_1 + x^5}}{\sqrt{x}}\right\}\right\}$$

Maple ✓
cpu = 0.036 (sec), leaf count = 18

$$\left\{-\_C1\, x^5 - \frac{5\, x (y(x))^2}{2} + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[(-y[x] + x*y'[x])^2 + x^2*y[x]*y''[x] == 3*y[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Sqrt[x^5 + C[1]]*C[2])/Sqrt[x]}}
```

Maple raw input

```
dsolve(x^2*y(x)*diff(diff(y(x),x),x)+(x*diff(y(x),x)-y(x))^2 = 3*y(x)^2, y(x),'implicit')
```

Maple raw output

```
-_C1*x^5-5/2*x*y(x)^2+_C2 = 0
```

4.1991 $x^2y(x)y''(x) = axy(x)y'(x) + ay(x)^2 + 2x^2y'(x)^2$

ODE

$$x^2y(x)y''(x) = axy(x)y'(x) + ay(x)^2 + 2x^2y'(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_y_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.244613 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{c_2}{(a-1)c_1x + x^a}\right\}\right\}$$

Maple ✓
cpu = 0.064 (sec), leaf count = 31

$$\left\{\frac{a}{xy(x)} - \frac{1}{xy(x)} - x^{a-1}\_C1 + \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y[x]*y''[x] == a*y[x]^2 + a*x*y[x]*y'[x] + 2*x^2*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]/(x^a + (-1 + a)*x*C[1])}}
```

Maple raw input

```
dsolve(x^2*y(x)*diff(diff(y(x),x),x) = 2*x^2*diff(y(x),x)^2+a*x*y(x)*diff(y(x),x)+a*y(x)^2, y(x),'imp
```

Maple raw output

```
1/x*a/y(x)-1/x/y(x)-x^(a-1)*_C1+_C2 = 0
```

4.1992 $ax^2y'(x)^2+bxy(x)y'(x)+cy(x)^2+x^2y(x)y''(x)$

ODE

$$ax^2y'(x)^2+bxy(x)y'(x)+cy(x)^2+x^2y(x)y''(x)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.00628933 (sec), leaf count = 0 , could not solve

```
DSolve[c*y[x]^2 + b*x*y[x]*Derivative[1][y][x] + a*x^2*Derivative[1][y][x]^2 + x^2*y[x]*Derivative[2]
```

Maple ✓
cpu = 0.381 (sec), leaf count = 79

$$\left\{(y(x))^{1+a}\,x^{\frac{b}{2}-\frac{1}{2}+\frac{1}{2}\sqrt{b^2-2b+1+(-4a-4)c}}\sqrt{b^2-2b+1+(-4a-4)c}+\_C1\,(1+a)\,x^{\sqrt{b^2-2b+1+(-4a-4)c}}+\_C2=0\right\}$$

Mathematica raw input

```
DSolve[c*y[x]^2 + b*x*y[x]*y'[x] + a*x^2*y'[x]^2 + x^2*y[x]*y''[x],y[x],x]
```

Mathematica raw output

```
DSolve[c*y[x]^2 + b*x*y[x]*Derivative[1][y][x] + a*x^2*Derivative[1][y][x]^2 + x
^2*y[x]*Derivative[2][y][x], y[x], x]
```

Maple raw input

```
dsolve(x^2*y(x)*diff(diff(y(x),x),x)+a*x^2*diff(y(x),x)^2+b*x*y(x)*diff(y(x),x)+c*y(x)^2, y(x),'impli
```

Maple raw output

```
y(x)^(1+a)*x^(1/2*b-1/2+1/2*(b^2-2*b+1+(-4*a-4)*c)^(1/2))*(b^2-2*b+1+(-4*a-4)*c)
^(1/2)+_C1*(1+a)*x^((b^2-2*b+1+(-4*a-4)*c)^(1/2))+_C2 = 0
```

4.1993 $x^2(1-y(x))y''(x)+2x^2y'(x)^2-2x(1-y(x))y'(x)+2(1-y(x))^2y(x)=0$

ODE

$$x^2(1-y(x))y''(x)+2x^2y'(x)^2-2x(1-y(x))y'(x)+2(1-y(x))^2y(x)=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_y_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.793437 (sec), leaf count = 22

$$\left\{\left\{y(x)\to \frac{1}{c_2x^2-c_1x-1}+1\right\}\right\}$$

Maple ✓
cpu = 0.051 (sec), leaf count = 34

$$\left\{\frac{(\_C1\,x^2-\_C2\,x-1)\,y(x)-\_C1\,x^2+\_C2\,x}{y(x)-1}=0\right\}$$

Mathematica raw input

```
DSolve[2*(1 - y[x])^2*y[x] - 2*x*(1 - y[x])*y'[x] + 2*x^2*y'[x]^2 + x^2*(1 - y[x])*y''[x] == 0,y[x],x
```

Mathematica raw output

```
{{y[x] -> 1 + (-1 - x*C[1] + x^2*C[2])^(-1)}}
```

Maple raw input

```
dsolve(x^2*(1-y(x))*diff(diff(y(x),x),x)+2*x^2*diff(y(x),x)^2-2*x*(1-y(x))*diff(y(x),x)+2*y(x)*(1-
y(x))^2 = 0, y(x),'implicit')
```

Maple raw output

```
((_C1*x^2-_C2*x-1)*y(x)-_C1*x^2+_C2*x)/(y(x)-1) = 0
```

4.1994 $x^2(x-y(x))y''(x) = (xy'(x)-y(x))^2$

ODE

$$x^2(x-y(x))y''(x) = (xy'(x)-y(x))^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0696101 (sec), leaf count = 56

$$\left\{\left\{y(x) \to x - \sqrt{x}\sqrt{2c_2x - 2c_1 + x}\right\}, \left\{y(x) \to \sqrt{x}\sqrt{2c_2x - 2c_1 + x} + x\right\}\right\}$$

Maple ✓
cpu = 0.039 (sec), leaf count = 21

$$\left\{x\_C1 + \_C2 - y(x) + \frac{(y(x))^2}{2x} = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*(x - y[x])*y''[x] == (-y[x] + x*y'[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x - Sqrt[x]*Sqrt[x - 2*C[1] + 2*x*C[2]]}, {y[x] -> x + Sqrt[x]*Sqrt[x
- 2*C[1] + 2*x*C[2]]}}
```

Maple raw input

```
dsolve(x^2*(x-y(x))*diff(diff(y(x),x),x) = (x*diff(y(x),x)-y(x))^2, y(x),'implicit')
```

Maple raw output

```
x*_C1+_C2-y(x)+1/2*y(x)^2/x = 0
```

4.1995 $x^2(x-y(x))y''(x)+(xy'(x)-y(x))^2=0$

ODE

$$x^2(x-y(x))y''(x)+(xy'(x)-y(x))^2=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0934945 (sec), leaf count = 19

$$\left\{\left\{y(x)\to c_2 x e^{\frac{c_1}{x}}+x\right\}\right\}$$

Maple ✓
cpu = 0.074 (sec), leaf count = 26

$$\{-\ln(y(x)-x)\,x+x\ln(x)+(-\_C1-1)\,x+\_C2=0\}$$

Mathematica raw input

```
DSolve[(-y[x] + x*y'[x])^2 + x^2*(x - y[x])*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x + E^(C[1]/x)*x*C[2]}}
```

Maple raw input

```
dsolve(x^2*(x-y(x))*diff(diff(y(x),x),x)+(x*diff(y(x),x)-y(x))^2 = 0, y(x),'implicit')
```

Maple raw output

```
-ln(y(x)-x)*x+x*ln(x)+(-_C1-1)*x+_C2 = 0
```

4.1996 $x^2(x-y(x))y''(x) = a(xy'(x)-y(x))^2$

ODE

$$x^2(x-y(x))y''(x) = a(xy'(x)-y(x))^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.866326 (sec), leaf count = 37

$$\left\{\left\{y(x) \to x\left(\left(\frac{(-1)^{-a}(a+1)\left((-1)^a c_2 x + c_1\right)}{x}\right)^{\frac{1}{a+1}} + 1\right)\right\}\right\}$$

Maple ✓
cpu = 0.078 (sec), leaf count = 38

$$\left\{\left(y(x)\,x^{-a} - x^{1-a}\right)(x-y(x))^a + x(1+a)\_C2 + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*(x - y[x])*y''[x] == a*(-y[x] + x*y'[x])^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(1 + (((1 + a)*(C[1] + (-1)^a*x*C[2]))/((-1)^a*x))^(1 + a)^(-1))}}
```

Maple raw input

```
dsolve(x^2*(x-y(x))*diff(diff(y(x),x),x) = a*(x*diff(y(x),x)-y(x))^2, y(x),'implicit')
```

Maple raw output

```
(y(x)*x^(-a)-x^(1-a))*(x-y(x))^a+x*(1+a)*_C2+_C1 = 0
```

4.1997 $2x^2y(x)y''(x) = x^2y'(x)^2 - y(x)^2$

ODE

$$2x^2y(x)y''(x) = x^2y'(x)^2 - y(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0578231 (sec), leaf count = 9

$$\{\{y(x) \to c_2 x\}\}$$

Maple ✓
cpu = 0.083 (sec), leaf count = 19

$$\left\{y(x) = \frac{x(2\_C2\ \ln(x) + \_C1)^2}{4\_C2}\right\}$$

Mathematica raw input

```
DSolve[2*x^2*y[x]*y''[x] == -y[x]^2 + x^2*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[2]}}
```

Maple raw input

```
dsolve(2*x^2*y(x)*diff(diff(y(x),x),x) = x^2*diff(y(x),x)^2-y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*x*(2*_C2*ln(x)+_C1)^2/_C2
```

4.1998 $2x^2y(x)y''(x) = x^2y'(x)^2 + 2xy(x)y'(x) - 4y(x)^2$

ODE

$$2x^2y(x)y''(x) = x^2y'(x)^2 + 2xy(x)y'(x) - 4y(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_y_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0675388 (sec), leaf count = 20

$$\{\{y(x) \to c_2x^2(\log(x) - 2c_1)^2\}\}$$

Maple ✓
cpu = 0.045 (sec), leaf count = 21

$$\left\{y(x) = \frac{x^2(2\_C2\ \ln(x) + \_C1)^2}{4\_C2}\right\}$$

Mathematica raw input

```
DSolve[2*x^2*y[x]*y''[x] == -4*y[x]^2 + 2*x*y[x]*y'[x] + x^2*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2*C[2]*(-2*C[1] + Log[x])^2}}
```

Maple raw input

```
dsolve(2*x^2*y(x)*diff(diff(y(x),x),x) = x^2*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)-4*y(x)^2, y(x),'imp
```

Maple raw output

```
y(x) = 1/4*x^2*(2*_C2*ln(x)+_C1)^2/_C2
```

4.1999 $x^3y(x)y''(x)+x^3y'(x)^2+6x^2y(x)y'(x)+3xy(x)^2=a$

ODE

$$x^3y(x)y''(x)+x^3y'(x)^2+6x^2y(x)y'(x)+3xy(x)^2=a$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetries], [_2nd_order, _

Book solution method
TO DO

Mathematica ✓
cpu = 0.0891561 (sec), leaf count = 58

$$\left\{\left\{y(x)\to -\frac{\sqrt{ax^2+c_2x+2c_1}}{x^{3/2}}\right\},\left\{y(x)\to \frac{\sqrt{ax^2+c_2x+2c_1}}{x^{3/2}}\right\}\right\}$$

Maple ✓
cpu = 0.035 (sec), leaf count = 24

$$\left\{-\frac{ax}{2}+\frac{x^2(y(x))^2}{2}+\_C2-\frac{\_C1}{x}=0\right\}$$

Mathematica raw input

```
DSolve[3*x*y[x]^2 + 6*x^2*y[x]*y'[x] + x^3*y'[x]^2 + x^3*y[x]*y''[x] == a,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[a*x^2 + 2*C[1] + x*C[2]]/x^(3/2))}, {y[x] -> Sqrt[a*x^2 + 2*C[1
] + x*C[2]]/x^(3/2)}}
```

Maple raw input

```
dsolve(x^3*y(x)*diff(diff(y(x),x),x)+x^3*diff(y(x),x)^2+6*x^2*y(x)*diff(y(x),x)+3*x*y(x)^2 = a, y(x),
```

Maple raw output

```
-1/2*a*x+1/2*x^2*y(x)^2+_C2-1/x*_C1 = 0
```

4.2000

$$x(x+1)^2y(x)y''(x) = a(x+2)y(x)^2 - 2(x^2+1)\,y(x)y'(x) + x(x+1)^2y'(x)^2$$

ODE

$$x(x+1)^2y(x)y''(x) = a(x+2)y(x)^2 - 2\left(x^2+1\right)y(x)y'(x) + x(x+1)^2y'(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 1.267 (sec), leaf count = 168

$$\left\{-16\,\mathrm{e}^{4\,(1+x)^{-1}}\int\frac{(2+x)\,x}{(1+x)^2}\,Ei\left(1,-4\,\frac{x}{1+x}\right)\mathrm{e}^{-4\,\frac{x}{1+x}}\,\mathrm{d}xax + 16\,Ei\left(1,-4\,\frac{x}{1+x}\right)a(x+5/4)\,x\mathrm{e}^{\frac{4-4\,x}{1+x}} + 64\,\mathrm{e}^{-4\,\frac{x}{1+x}}x\left(aEi\left(1,\right.\right.\right.$$

Mathematica raw input

```
DSolve[x*(1 + x)^2*y[x]*y''[x] == a*(2 + x)*y[x]^2 - 2*(1 + x^2)*y[x]*y'[x] + x*(1 + x)^2*y'[x]^2,y[x
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(x*(1+x)^2*y(x)*diff(diff(y(x),x),x) = x*(1+x)^2*diff(y(x),x)^2-2*(x^2+1)*y(x)*diff(y(x),x)+a*(
```

Maple raw output

```
-16*exp(4/(1+x))*Int(Ei(1,-4*x/(1+x))*exp(-4*x/(1+x))*x*(2+x)/(1+x)^2,x)*a*x+16*
Ei(1,-4*x/(1+x))*a*(x+5/4)*x*exp((4-4*x)/(1+x))+64*exp(-4*x/(1+x))*x*(a*Ei(1,-4/
(1+x))-1/4*_C2)*Ei(1,-4*x/(1+x))+16*a*(1+x)*Ei(1,-4/(1+x))+(-4*a*ln(1+x)*x+4*x*l
n(y(x))+(9*a+_C1)*x+5*a)*exp(4/(1+x))-4*_C2*(1+x) = 0
```

4.2001 $8(1-x^3)\,y(x)y''(x)+4(1-x^3)\,y'(x)^2-12x^2y(x)y'(x)+3xy(x)^2=0$

ODE

$$8(1-x^3)\,y(x)y''(x)+4(1-x^3)\,y'(x)^2-12x^2y(x)y'(x)+3xy(x)^2=0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.797 (sec), leaf count = 162

$$\left\{\left((y(x))^{\frac{3}{2}}(-1+x)\left(x^2+x+1\right)\left(\sqrt{10}+1\right)\mathit{LegendreQ}\left(\frac{1}{2}+\frac{\sqrt{10}}{6},\frac{1}{3},\sqrt{-x^3+1}\right)+\_C1\sqrt{x}\sqrt{-x^3+1}\sqrt{x^3-1}\right)\mathit{Legen}\right.$$

Mathematica raw input

```
DSolve[3*x*y[x]^2 - 12*x^2*y[x]*y'[x] + 4*(1 - x^3)*y'[x]^2 + 8*(1 - x^3)*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(8*(-x^3+1)*y(x)*diff(diff(y(x),x),x)+4*(-x^3+1)*diff(y(x),x)^2-12*x^2*y(x)*diff(y(x),x)+3*x*y(
```

Maple raw output

```
(y(x)^(3/2)*(-1+x)*(x^2+x+1)*(10^(1/2)+1)*LegendreQ(1/2+1/6*10^(1/2),1/3,(-x^3+1
)^(1/2))+_C1*x^(1/2)*(-x^3+1)^(1/2)*(x^3-1)^(1/2))*LegendreP(-1/2+1/6*10^(1/2),1
/3,(-x^3+1)^(1/2))-(y(x)^(3/2)*(-1+x)*(x^2+x+1)*(10^(1/2)+1)*LegendreP(1/2+1/6*1
0^(1/2),1/3,(-x^3+1)^(1/2))-_C2*(x^3-1)^(1/2)*(-x^3+1)^(1/2)*x^(1/2))*LegendreQ(
-1/2+1/6*10^(1/2),1/3,(-x^3+1)^(1/2)) = 0
```

4.2002 $\sqrt{a^2+x^2}(by'(x)^2+y(x)y''(x))=y(x)y'(x)$

ODE

$$\sqrt{a^2+x^2}(by'(x)^2+y(x)y''(x))=y(x)y'(x)$$

ODE Classification

[_Liouville, [_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1],

Book solution method
TO DO

Mathematica ✓
cpu = 0.214429 (sec), leaf count = 63

$$\left\{\left\{y(x)\to c_2\left((b+1)x\sqrt{a^2+x^2}+a^2(b+1)\log\left(\sqrt{a^2+x^2}+x\right)+(b+1)x^2+2c_1\right)^{\frac{1}{b+1}}\right\}\right\}$$

Maple ✓
cpu = 0.087 (sec), leaf count = 52

$$\left\{\frac{y(x)\left(y(x)\right)^b}{b+1}-\frac{\_C1}{2}\left(a^2\ln\left(x+\sqrt{a^2+x^2}\right)+x\left(x+\sqrt{a^2+x^2}\right)\right)-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[Sqrt[a^2 + x^2]*(b*y'[x]^2 + y[x]*y''[x]) == y[x]*y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]*((1 + b)*x^2 + (1 + b)*x*Sqrt[a^2 + x^2] + 2*C[1] + a^2*(1 + b)*L
og[x + Sqrt[a^2 + x^2]])^(1 + b)^(-1)}}
```

Maple raw input

```
dsolve((a^2+x^2)^(1/2)*(y(x)*diff(diff(y(x),x),x)+b*diff(y(x),x)^2) = y(x)*diff(y(x),x), y(x),'implic
```

Maple raw output

```
y(x)/(b+1)*y(x)^b-1/2*(a^2*ln(x+(a^2+x^2)^(1/2))+x*(x+(a^2+x^2)^(1/2)))*_C1-_C2
= 0
```

4.2003 $\sqrt{a^2-x^2}(xy(x)y''(x)-xy'(x)^2-y(x)y'(x))=bxy'(x)^2$

ODE

$$\sqrt{a^2-x^2}(xy(x)y''(x)-xy'(x)^2-y(x)y'(x))=bxy'(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0748367 (sec), leaf count = 53

$$\left\{\left\{y(x)\to c_2 e^{-\frac{\sqrt{a^2-x^2}}{b}}\left(b\sqrt{a^2-x^2}+c_1\right)^{\frac{c_1}{b^2}}\right\}\right\}$$

Maple ✓
cpu = 0.564 (sec), leaf count = 50

$$\left\{y(x)=\_C2\, \mathrm{e}^{\int x\sqrt{a^2-x^2}\left(ba^2-bx^2-\_C1\sqrt{a^2-x^2}\right)^{-1}\mathrm{d}x}\right\}$$

Mathematica raw input

```
DSolve[Sqrt[a^2 - x^2]*(-(y[x]*y'[x]) - x*y'[x]^2 + x*y[x]*y''[x]) == b*x*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((b*Sqrt[a^2 - x^2] + C[1])^(C[1]/b^2)*C[2])/E^(Sqrt[a^2 - x^2]/b)}}
```

Maple raw input

```
dsolve((a^2-x^2)^(1/2)*(x*y(x)*diff(diff(y(x),x),x)-x*diff(y(x),x)^2-y(x)*diff(y(x),x)) = b*x*diff(y(
```

Maple raw output

```
y(x) = _C2*exp(Int(x*(a^2-x^2)^(1/2)/(b*a^2-b*x^2-_C1*(a^2-x^2)^(1/2)),x))
```

4.2004 $\mathbf{f0}(x)y(x)y''(x) + \mathbf{f1}(x)y'(x)^2 + \mathbf{f2}(x)y(x)y'(x) + \mathbf{f3}(x)y(x)^2 = 0$

ODE

$$\mathrm{f0}(x)y(x)y''(x) + \mathrm{f1}(x)y'(x)^2 + \mathrm{f2}(x)y(x)y'(x) + \mathrm{f3}(x)y(x)^2 = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 48.9433 (sec), leaf count = 0 , could not solve

```
DSolve[f3[x]*y[x]^2 + f2[x]*y[x]*Derivative[1][y][x] + f1[x]*Derivative[1][y][x]^2 + f0[x]*y[x]*Deriv
```

Maple ✓
cpu = 0.897 (sec), leaf count = 79

$$\left\{ y(x) = ODESolStruc\left(e^{\int \_b(\_a)\, d\_a + \_C1}, \left[\left\{ \frac{d}{d\_a}\_b(\_a) = \frac{(-f0(\_a) - f1(\_a))\,(\_b(\_a))^2 - f2(\_a)\,\_b(\_a) - f3(\_a)}{f0\,(\_a)} \right.\right.\right.$$

Mathematica raw input

```
DSolve[f3[x]*y[x]^2 + f2[x]*y[x]*y'[x] + f1[x]*y'[x]^2 + f0[x]*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f3[x]*y[x]^2 + f2[x]*y[x]*Derivative[1][y][x] + f1[x]*Derivative[1][y][x]
^2 + f0[x]*y[x]*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(f0(x)*y(x)*diff(diff(y(x),x),x)+f1(x)*diff(y(x),x)^2+f2(x)*y(x)*diff(y(x),x)+f3(x)*y(x)^2 = 0,
```

Maple raw output

```
y(x) = ODESolStruc(exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = ((-f0(_a)-f1(_a))
*_b(_a)^2-f2(_a)*_b(_a)-f3(_a))/f0(_a)}, {_a = x, _b(_a) = diff(y(x),x)/y(x)}, {
x = _a, y(x) = exp(Int(_b(_a),_a)+_C1)}])
```

4.2005 $4f(x)y(x)y''(x) = y'(x)\left(2f'(x) - 6f(x)y(x)^2\right) + 2y(x)^3 f'(x) + 3f(x)g(x)y(x)^2 + 3f(x)y'(x)^2 - f(x)y(x)^4 + 4f(x)^2 y(x)$

ODE

$$4f(x)y(x)y''(x) = y'(x)\left(2f'(x) - 6f(x)y(x)^2\right) + 2y(x)^3 f'(x) + 3f(x)g(x)y(x)^2 + 3f(x)y'(x)^2 - f(x)y(x)^4 + 4f(x)^2 y(x)$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 1.46515 (sec), leaf count = 0 , could not solve

```
DSolve[4*f[x]*y[x]*Derivative[2][y][x] == 4*f[x]^2*y[x] + 3*f[x]*g[x]*y[x]^2 - f[x]*y[x]^4 + 2*y[x]^3
6*f[x]*y[x]^2 + 2*Derivative[1][f][x])*Derivative[1][y][x] + 3*f[x]*Derivative[1][y][x]^2, y[x], x]
```

Maple ✗
cpu = 6.927 (sec), leaf count = 0 , could not solve

```
dsolve(4*f(x)*y(x)*diff(diff(y(x),x),x) = 3*f(x)*diff(y(x),x)^2+(2*diff(f(x),x)-6*f(x)*y(x)^2)*diff(y
f(x)*y(x)^4, y(x),'implicit')
```

Mathematica raw input

```
DSolve[4*f[x]*y[x]*y''[x] == 4*f[x]^2*y[x] + 3*f[x]*g[x]*y[x]^2 - f[x]*y[x]^4 + 2*y[x]^3*f'[x] + (-
6*f[x]*y[x]^2 + 2*f'[x])*y'[x] + 3*f[x]*y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[4*f[x]*y[x]*Derivative[2][y][x] == 4*f[x]^2*y[x] + 3*f[x]*g[x]*y[x]^2 - f
[x]*y[x]^4 + 2*y[x]^3*Derivative[1][f][x] + (-6*f[x]*y[x]^2 + 2*Derivative[1][f]
[x])*Derivative[1][y][x] + 3*f[x]*Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(4*f(x)*y(x)*diff(diff(y(x),x),x) = 3*f(x)*diff(y(x),x)^2+(2*diff(f(x),x)-6*f(x)*y(x)^2)*diff(y
f(x)*y(x)^4, y(x),'implicit')
```

Maple raw output

```
dsolve(4*f(x)*y(x)*diff(diff(y(x),x),x) = 3*f(x)*diff(y(x),x)^2+(2*diff(f(x),x)-
6*f(x)*y(x)^2)*diff(y(x),x)+4*f(x)^2*y(x)+3*f(x)*g(x)*y(x)^2+2*diff(f(x),x)*y(x)
^3-f(x)*y(x)^4, y(x),'implicit')
```

4.2006 $y(x)^2 y''(x) = a$

ODE

$$y(x)^2 y''(x) = a$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.883822 (sec), leaf count = 75

$$\text{Solve}\left[\frac{\left(\sqrt{c_1}y(x)\sqrt{c_1-\frac{2a}{y(x)}}+a\log\left(y(x)\left(\sqrt{c_1}\sqrt{c_1-\frac{2a}{y(x)}}+c_1\right)-a\right)\right)^2}{c_1^3}=(c_2+x)^2,y(x)\right]$$

Maple ✓
cpu = 0.145 (sec), leaf count = 135

$$\left\{-\_C1^2\sqrt{\frac{(y(x))^2}{\_C1^2}-2ay(x)}-a\ln\left(\left(\frac{y(x)}{\_C1^2}-a\right)\_C1+\sqrt{\frac{(y(x))^2}{\_C1^2}-2ay(x)}\right)(\_C1^{-2})^{-\frac{3}{2}}-x-\_C2=0,\_C1^2\sqrt{\right.$$

Mathematica raw input

```
DSolve[y[x]^2*y''[x] == a,y[x],x]
```

Mathematica raw output

```
Solve[(a*Log[-a + (C[1] + Sqrt[C[1]]*Sqrt[C[1] - (2*a)/y[x]])*y[x]] + Sqrt[C[1]]
*Sqrt[C[1] - (2*a)/y[x]]*y[x])^2/C[1]^3 == (x + C[2])^2, y[x]]
```

Maple raw input

```
dsolve(y(x)^2*diff(diff(y(x),x),x) = a, y(x),'implicit')
```

Maple raw output

```
-_C1^2*(1/_C1^2*y(x)^2-2*a*y(x))^(1/2)-a/(1/_C1^2)^(3/2)*ln((1/_C1^2*y(x)-a)*_C1
+(1/_C1^2*y(x)^2-2*a*y(x))^(1/2))-x-_C2 = 0, _C1^2*(1/_C1^2*y(x)^2-2*a*y(x))^(1/
2)+a/(1/_C1^2)^(3/2)*ln((1/_C1^2*y(x)-a)*_C1+(1/_C1^2*y(x)^2-2*a*y(x))^(1/2))-x-
_C2 = 0
```

4.2007 $ax + y(x)^2 y''(x) + y(x) y'(x)^2 = 0$

ODE

$$ax + y(x)^2 y''(x) + y(x) y'(x)^2 = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 4.06422 (sec), leaf count = 0 , could not solve

```
DSolve[a*x + y[x]*Derivative[1][y][x]^2 + y[x]^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 1.274 (sec), leaf count = 112

$$\left\{ \ln(x) - \int^{\frac{y(x)}{x}} \frac{\_g^2}{2\_g^3 + 2a} \left(\sqrt[3]{\frac{a}{\_g^3}} \sqrt{3} \tan\left(RootOf\left(-2\_Z\sqrt{3} + \ln\left(\frac{(\tan(\_Z))^2 + 1}{3 + 2\sqrt{3}\tan(\_Z) + (\tan(\_Z))^2} \right) + 6\_C1 + 6 \right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[a*x + y[x]*y'[x]^2 + y[x]^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a*x + y[x]*Derivative[1][y][x]^2 + y[x]^2*Derivative[2][y][x] == 0, y[x],
 x]
```

Maple raw input

```
dsolve(y(x)^2*diff(diff(y(x),x),x)+y(x)*diff(y(x),x)^2+a*x = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-Intat(_g^2*((1/_g^3*a)^(1/3)*3^(1/2)*tan(RootOf(-2*_Z*3^(1/2)+ln((tan(_Z)^
2+1)/(3+2*3^(1/2)*tan(_Z)+tan(_Z)^2))+6*_C1+6*Int((1/_g^3*a)^(2/3)/(_g^3+a)*_g^2
,_g)))+(1/_g^3*a)^(1/3)-2)/(2*_g^3+2*a),_g = y(x)/x)-_C2 = 0
```

4.2008 $y(x)^2 y''(x) + y(x) y'(x)^2 = a + bx$

ODE

$$y(x)^2 y''(x) + y(x) y'(x)^2 = a + bx$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.497191 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*Derivative[1][y][x]^2 + y[x]^2*Derivative[2][y][x] == a + b*x, y[x], x]
```

Maple ✓
cpu = 0.494 (sec), leaf count = 158

$$\left\{ \frac{a \ln(bx+a)}{b} - \int^{\frac{y(x)}{bx+a}} \frac{\_g^2 a \sqrt{3}}{6\,\_g^3 b^2 - 6} \left(3a \tan\left(RootOf\left(6a^2 \int \frac{\_g^2}{\_g^3 b^2 - 1} \left(-\frac{b}{\_g^3 a^3} \right)^{2/3} d\_g - 2\_Z\sqrt{3} + \ln\left(\frac{(ta \right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[y[x]*y'[x]^2 + y[x]^2*y''[x] == a + b*x,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]*Derivative[1][y][x]^2 + y[x]^2*Derivative[2][y][x] == a + b*x, y[x],
 x]
```

Maple raw input

```
dsolve(y(x)^2*diff(diff(y(x),x),x)+y(x)*diff(y(x),x)^2 = b*x+a, y(x),'implicit')
```

Maple raw output

```
a*ln(b*x+a)/b-Intat(a*_g^2*(3*a*tan(RootOf(6*a^2*Int((-1/_g^3/a^3*b)^(2/3)/(_g^3
*b^2-1)*_g^2,_g)-2*_Z*3^(1/2)+ln((tan(_Z)^2+1)/(3+2*3^(1/2)*tan(_Z)+tan(_Z)^2))+
6*_C1))*(-1/_g^3/a^3*b)^(1/3)+3^(1/2)*(-1/_g^3/a^3*b)^(1/3)*a-2*3^(1/2)*b)*3^(1/
2)/(6*_g^3*b^2-6),_g = y(x)/(b*x+a))-_C2 = 0
```

4.2009 $(y(x)^2+1)\,y''(x)+(1-2y(x))y'(x)^2=0$

ODE

$$(y(x)^2+1)\,y''(x)+(1-2y(x))y'(x)^2=0$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.08824 (sec), leaf count = 14

$$\{\{y(x)\to \tan(\log(c_1(c_2+x)))\}\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 15

$$\left\{e^{\arctan(y(x))}-\_C1\,x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[(1 - 2*y[x])*y'[x]^2 + (1 + y[x]^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Tan[Log[C[1]*(x + C[2])]]}}
```

Maple raw input

```
dsolve((1+y(x)^2)*diff(diff(y(x),x),x)+(1-2*y(x))*diff(y(x),x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
exp(arctan(y(x)))-_C1*x-_C2 = 0
```

4.2010 $(y(x)^2+1)\,y''(x) = 3y(x)y'(x)^2$

ODE

$$(y(x)^2+1)\,y''(x) = 3y(x)y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.0904146 (sec), leaf count = 93

$$\left\{\left\{y(x)\to -\frac{ic_1(c_2+x)}{\sqrt{c_1^2x^2+2c_2c_1^2x+c_2^2c_1^2-1}}\right\},\left\{y(x)\to \frac{ic_1(c_2+x)}{\sqrt{c_1^2x^2+2c_2c_1^2x+c_2^2c_1^2-1}}\right\}\right\}$$

Maple ✓
cpu = 0.019 (sec), leaf count = 22

$$\left\{y(x)\,\frac{1}{\sqrt{1+\left(y\left(x\right)\right)^2}}-\_C1\,x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[(1 + y[x]^2)*y''[x] == 3*y[x]*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*C[1]*(x + C[2]))/Sqrt[-1 + x^2*C[1]^2 + 2*x*C[1]^2*C[2] + C[1]^2
*C[2]^2]}, {y[x] -> (I*C[1]*(x + C[2]))/Sqrt[-1 + x^2*C[1]^2 + 2*x*C[1]^2*C[2] +
 C[1]^2*C[2]^2]}}
```

Maple raw input

```
dsolve((1+y(x)^2)*diff(diff(y(x),x),x) = 3*y(x)*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
1/(1+y(x)^2)^(1/2)*y(x)-_C1*x-_C2 = 0
```

4.2011 $(y(x)^2+1)\,y''(x) = (a+3y(x))y'(x)^2$

ODE

$$(y(x)^2+1)\,y''(x) = (a+3y(x))y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.034 (sec), leaf count = 41

$$\left\{\frac{y(x)-a}{e^{a\arctan(y(x))}\,(a^2+1)}\,\frac{1}{\sqrt{1+(y(x))^2}}-\_C1\,x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[(1 + y[x]^2)*y''[x] == (a + 3*y[x])*y'[x]^2,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((1+y(x)^2)*diff(diff(y(x),x),x) = (a+3*y(x))*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
1/(1+y(x)^2)^(1/2)*(y(x)-a)/exp(a*arctan(y(x)))/(a^2+1)-_C1*x-_C2 = 0
```

4.2012 $(y(x)^2+1)\,y''(x)+y'(x)\,(y'(x)^2+1)=0$

ODE

$$(y(x)^2+1)\,y''(x)+y'(x)\,(y'(x)^2+1)=0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.192275 (sec), leaf count = 42

$$\left\{\left\{y(x)\to \csc(c_1)\sec(c_1)\,W\left(\sin(c_1)\,e^{-(c_2+x)\cos^2(c_1)-\sin^2(c_1)}\right)+\tan(c_1)\right\}\right\}$$

Maple ✓
cpu = 0.469 (sec), leaf count = 56

$$\left\{\frac{-4\_C1\,\ln((-1-\_C1)\,y(x)+i\_C1-i)-(1+\_C1)\,((i\_C1-i)\,y(x)+(1+\_C1)\,(x+\_C2))}{(1+\_C1)^2}=0, y(x)=\_C1\right\}$$

Mathematica raw input

```
DSolve[y'[x]*(1 + y'[x]^2) + (1 + y[x]^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Csc[C[1]]*ProductLog[E^(-((x + C[2])*Cos[C[1]]^2) - Sin[C[1]]^2)*Sin[C
[1]]]*Sec[C[1]] + Tan[C[1]]}}
```

Maple raw input

```
dsolve((1+y(x)^2)*diff(diff(y(x),x),x)+diff(y(x),x)*(1+diff(y(x),x)^2) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1, (-4*_C1*ln((-1-_C1)*y(x)+I*_C1-I)-(1+_C1)*((I*_C1-I)*y(x)+(1+_C1)*(x
+_C2)))/(1+_C1)^2 = 0
```

4.2013 $(y(x)^2+x)\,y''(x)+2y(x)y'(x)^2+2y'(x)=a$

ODE

$$(y(x)^2+x)\,y''(x)+2y(x)y'(x)^2+2y'(x)=a$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0887001 (sec), leaf count = 441

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{2}\left(\sqrt{\left(3ax^2+c_2x+6c_1\right)^2+16x^3}+3ax^2+c_2x+6c_1\right)^{2/3}-2\,2^{2/3}x}{2\sqrt[3]{\sqrt{\left(3ax^2+c_2x+6c_1\right)^2+16x^3}+3ax^2+c_2x+6c_1}}\right\},\left\{y(x)\to \frac{i(\sqrt{3}+i)\left(\sqrt{9a^2x^4+2x^3}\right.\right.\right.$$

Maple ✓
cpu = 0.042 (sec), leaf count = 26

$$\left\{\frac{ax^2}{2}-\frac{(y(x))^3}{3}-\_C1\,x-xy(x)+\_C2=0\right\}$$

Mathematica raw input

```
DSolve[2*y'[x] + 2*y[x]*y'[x]^2 + (x + y[x]^2)*y''[x] == a,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*2^(2/3)*x + 2^(1/3)*(3*a*x^2 + 6*C[1] + x*C[2] + Sqrt[16*x^3 + (3*
a*x^2 + 6*C[1] + x*C[2])^2])^(2/3))/(2*(3*a*x^2 + 6*C[1] + x*C[2] + Sqrt[16*x^3
 + (3*a*x^2 + 6*C[1] + x*C[2])^2])^(1/3))}, {y[x] -> (2*2^(1/3)*(1 + I*Sqrt[3])*x
  + I*(I + Sqrt[3])*(3*a*x^2 + 6*C[1] + x*C[2] + Sqrt[9*a^2*x^4 + 36*C[1]^2 + 12*
x*C[1]*C[2] + 2*x^3*(8 + 3*a*C[2]) + x^2*(36*a*C[1] + C[2]^2)])^(2/3))/(2*2^(2/3
)*(3*a*x^2 + 6*C[1] + x*C[2] + Sqrt[16*x^3 + (3*a*x^2 + 6*C[1] + x*C[2])^2])^(1/
3))}, {y[x] -> (2*2^(1/3)*(1 - I*Sqrt[3])*x + (-1 - I*Sqrt[3])*(3*a*x^2 + 6*C[1]
 + x*C[2] + Sqrt[9*a^2*x^4 + 36*C[1]^2 + 12*x*C[1]*C[2] + 2*x^3*(8 + 3*a*C[2]) +
 x^2*(36*a*C[1] + C[2]^2)])^(2/3))/(2*2^(2/3)*(3*a*x^2 + 6*C[1] + x*C[2] + Sqrt[
16*x^3 + (3*a*x^2 + 6*C[1] + x*C[2])^2])^(1/3))}}
```

Maple raw input

```
dsolve((x+y(x)^2)*diff(diff(y(x),x),x)+2*y(x)*diff(y(x),x)^2+2*diff(y(x),x) = a, y(x),'implicit')
```

Maple raw output

```
1/2*a*x^2-1/3*y(x)^3-_C1*x-x*y(x)+_C2 = 0
```

4.2014 $(y(x)^2+x)\,y''(x) = 2(x-y(x)^2)\,y'(x)^3 - y'(x)\,(4y(x)y'(x)+1)$

ODE

$$(y(x)^2+x)\,y''(x) = 2(x-y(x)^2)\,y'(x)^3 - y'(x)\,(4y(x)y'(x)+1)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_y_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.39674 (sec), leaf count = 24

$$\text{Solve}\left[y(x)^2+x = c_2 e^{e^{-c_1}y(x)}, y(x)\right]$$

Maple ✓
cpu = 0.154 (sec), leaf count = 23

$$\left\{\frac{-\_C1\,y(x)+\ln\left(x+(y(x))^2\right)+\_C2+2}{y(x)} = 0\right\}$$

Mathematica raw input

```
DSolve[(x + y[x]^2)*y''[x] == 2*(x - y[x]^2)*y'[x]^3 - y'[x]*(1 + 4*y[x]*y'[x]),y[x],x]
```

Mathematica raw output

```
Solve[x + y[x]^2 == E^(y[x]/E^C[1])*C[2], y[x]]
```

Maple raw input

```
dsolve((x+y(x)^2)*diff(diff(y(x),x),x) = 2*(x-y(x)^2)*diff(y(x),x)^3-diff(y(x),x)*(1+4*y(x)*diff(y(x)
```

Maple raw output

```
1/y(x)*(-_C1*y(x)+ln(x+y(x)^2)+_C2+2) = 0
```

4.2015 $\left(x^2+y(x)^2\right)y''(x)=\left(y(x)^2+1\right)\left(xy'(x)-y(x)\right)$

ODE

$$\left(x^2+y(x)^2\right)y''(x)=\left(y(x)^2+1\right)\left(xy'(x)-y(x)\right)$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 1.06297 (sec), leaf count = 0 , could not solve

```
DSolve[(x^2 + y[x]^2)*Derivative[2][y][x] == (1 + y[x]^2)*(-y[x] + x*Derivative[1][y][x]), y[x], x]
```

Maple ✗
cpu = 0.664 (sec), leaf count = 0 , could not solve

```
dsolve((x^2+y(x)^2)*diff(diff(y(x),x),x) = (1+y(x)^2)*(x*diff(y(x),x)-y(x)), y(x),'implicit')
```

Mathematica raw input

```
DSolve[(x^2 + y[x]^2)*y''[x] == (1 + y[x]^2)*(-y[x] + x*y'[x]),y[x],x]
```

Mathematica raw output

```
DSolve[(x^2 + y[x]^2)*Derivative[2][y][x] == (1 + y[x]^2)*(-y[x] + x*Derivative[
1][y][x]), y[x], x]
```

Maple raw input

```
dsolve((x^2+y(x)^2)*diff(diff(y(x),x),x) = (1+y(x)^2)*(x*diff(y(x),x)-y(x)), y(x),'implicit')
```

Maple raw output

```
dsolve((x^2+y(x)^2)*diff(diff(y(x),x),x) = (1+y(x)^2)*(x*diff(y(x),x)-y(x)), y(x
),'implicit')
```

4.2016 $\left(x^2+y(x)^2\right)y''(x)=2\left(y(x)^2+1\right)\left(xy'(x)-y(x)\right)$

ODE

$$\left(x^2+y(x)^2\right)y''(x)=2\left(y(x)^2+1\right)\left(xy'(x)-y(x)\right)$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 1.17473 (sec), leaf count = 0 , could not solve

```
DSolve[(x^2 + y[x]^2)*Derivative[2][y][x] == 2*(1 + y[x]^2)*(-y[x] + x*Derivative[1][y][x]), y[x], x]
```

Maple ✗
cpu = 0.644 (sec), leaf count = 0 , could not solve

```
dsolve((x^2+y(x)^2)*diff(diff(y(x),x),x) = 2*(1+y(x)^2)*(x*diff(y(x),x)-y(x)), y(x),'implicit')
```

Mathematica raw input

```
DSolve[(x^2 + y[x]^2)*y''[x] == 2*(1 + y[x]^2)*(-y[x] + x*y'[x]),y[x],x]
```

Mathematica raw output

```
DSolve[(x^2 + y[x]^2)*Derivative[2][y][x] == 2*(1 + y[x]^2)*(-y[x] + x*Derivativ
e[1][y][x]), y[x], x]
```

Maple raw input

```
dsolve((x^2+y(x)^2)*diff(diff(y(x),x),x) = 2*(1+y(x)^2)*(x*diff(y(x),x)-y(x)), y(x),'implicit')
```

Maple raw output

```
dsolve((x^2+y(x)^2)*diff(diff(y(x),x),x) = 2*(1+y(x)^2)*(x*diff(y(x),x)-y(x)), y
(x),'implicit')
```

4.2017 $2(1-y(x))y(x)y''(x) = (1-2y(x))y'(x)^2$

ODE

$$2(1-y(x))y(x)y''(x) = (1-2y(x))y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.247544 (sec), leaf count = 37

$$\left\{\left\{y(x) \to \frac{1}{4}e^{-ic_1(c_2+x)}\left(1+e^{ic_1(c_2+x)}\right)^2\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 27

$$\left\{\ln\left(-\frac{1}{2}+y(x)+\sqrt{(y(x))^2-y(x)}\right)-\_C1\,x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[2*(1 - y[x])*y[x]*y''[x] == (1 - 2*y[x])*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + E^(I*C[1]*(x + C[2])))^2/(4*E^(I*C[1]*(x + C[2])))}}
```

Maple raw input

```
dsolve(2*y(x)*(1-y(x))*diff(diff(y(x),x),x) = (1-2*y(x))*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
ln(-1/2+y(x)+(y(x)^2-y(x))^(1/2))-_C1*x-_C2 = 0
```

4.2018 $2(1-y(x))y(x)y''(x) = f(x)(1-y(x))y(x)y'(x) + (1-2y(x))y'(x)^2$

ODE

$$2(1-y(x))y(x)y''(x) = f(x)(1-y(x))y(x)y'(x) + (1-2y(x))y'(x)^2$$

ODE Classification

[_Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.0418 (sec), leaf count = 87

$$\left\{\left\{y(x)\to \frac{1}{4}\exp\left(-i\left(\int_1^x c_1\left(-e^{-\int_1^{K[3]}-\frac{1}{2}f(K[1])\,dK[1]}\right)\,dK[3]+c_2\right)\right)\left(1+\exp\left(i\left(\int_1^x c_1\left(-e^{-\int_1^{K[3]}-\frac{1}{2}f(K[1])\,dK[1]}\right)\,dK[3\right.\right.\right.\right.$$

Maple ✓
cpu = 0.053 (sec), leaf count = 37

$$\left\{\ln\left(-\frac{1}{2}+y(x)+\sqrt{(y(x))^2-y(x)}\right)-\_C1\int e^{-\int-\frac{f(x)}{2}\,dx}\,dx-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[2*(1 - y[x])*y[x]*y''[x] == f[x]*(1 - y[x])*y[x]*y'[x] + (1 - 2*y[x])*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + E^(I*(C[2] + Integrate[-(C[1]/E^Integrate[-f[K[1]]/2, {K[1], 1, K
[3]}]), {K[3], 1, x}])))^2/(4*E^(I*(C[2] + Integrate[-(C[1]/E^Integrate[-f[K[1]]
/2, {K[1], 1, K[3]}]), {K[3], 1, x}])))}}
```

Maple raw input

```
dsolve(2*y(x)*(1-y(x))*diff(diff(y(x),x),x) = (1-2*y(x))*diff(y(x),x)^2+y(x)*(1-y(x))*diff(y(x),x)*f(
```

Maple raw output

```
ln(-1/2+y(x)+(y(x)^2-y(x))^(1/2))-_C1*Int(exp(-Int(-1/2*f(x),x)),x)-_C2 = 0
```

4.2019 $2(1-y(x))y(x)y''(x) = (1-3y(x))y'(x)^2$

ODE

$$2(1-y(x))y(x)y''(x) = (1-3y(x))y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.113353 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \frac{\left(e^{c_1(c_2+x)}-1\right)^2}{\left(e^{c_1(c_2+x)}+1\right)^2}\right\}\right\}$$

Maple ✓
cpu = 0.054 (sec), leaf count = 18

$$\left\{-2\,Artanh\left(\sqrt{y(x)}\right) - \_C1\,x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[2*(1 - y[x])*y[x]*y''[x] == (1 - 3*y[x])*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + E^(C[1]*(x + C[2])))^2/(1 + E^(C[1]*(x + C[2])))^2}}
```

Maple raw input

```
dsolve(2*y(x)*(1-y(x))*diff(diff(y(x),x),x) = (1-3*y(x))*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
-2*arctanh(y(x)^(1/2))-_C1*x-_C2 = 0
```

4.2020 $2(1-y(x))y(x)y''(x) = 4y(x)y'(x)(f(x)+g(x)y(x)) + (1-3y(x))y'(x)^2$

ODE

$$2(1-y(x))y(x)y''(x) = 4y(x)y'(x)(f(x)+g(x)y(x)) + (1-3y(x))y'(x)^2$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 0.492019 (sec), leaf count = 0 , could not solve

```
DSolve[2*(1 - y[x])*y[x]*Derivative[2][y][x] == 4*y[x]*(f[x] + g[x]*y[x])*Derivative[1][y][x] + (1 -
```

Maple ✗
cpu = 0.623 (sec), leaf count = 0 , could not solve

```
dsolve(2*y(x)*(1-y(x))*diff(diff(y(x),x),x) = (1-3*y(x))*diff(y(x),x)^2+4*y(x)*(f(x)+g(x)*y(x))*diff(
```

Mathematica raw input

```
DSolve[2*(1 - y[x])*y[x]*y''[x] == 4*y[x]*(f[x] + g[x]*y[x])*y'[x] + (1 - 3*y[x])*y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[2*(1 - y[x])*y[x]*Derivative[2][y][x] == 4*y[x]*(f[x] + g[x]*y[x])*Deriva
tive[1][y][x] + (1 - 3*y[x])*Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(2*y(x)*(1-y(x))*diff(diff(y(x),x),x) = (1-3*y(x))*diff(y(x),x)^2+4*y(x)*(f(x)+g(x)*y(x))*diff(
```

Maple raw output

```
dsolve(2*y(x)*(1-y(x))*diff(diff(y(x),x),x) = (1-3*y(x))*diff(y(x),x)^2+4*y(x)*(
f(x)+g(x)*y(x))*diff(y(x),x), y(x),'implicit')
```

4.2021 $2(1-y(x))y(x)y''(x) = -4y(x)^2(1-y(x))\left(f'(x)+f(x)^2+g'(x)-g(x)^2\right)-4y(x)y'(x)(f(x)+g(x)y(x))+(1-y(x))^3\left(-(\mathbf{F0}(x)^2-\mathbf{G0}(x)^2y(x)^2)\right)+(1-3y(x))y'(x)^2$

ODE

$$2(1-y(x))y(x)y''(x) = -4y(x)^2(1-y(x))\left(f'(x)+f(x)^2+g'(x)-g(x)^2\right)-4y(x)y'(x)(f(x)+g(x)y(x))+(1-y(x))^3\left(-(\mathrm{F0}(x$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 10.4889 (sec), leaf count = 0 , could not solve

```
DSolve[2*(1 - y[x])*y[x]*Derivative[2][y][x] == -((1 - y[x])^3*(F0[x]^2 - G0[x]^2*y[x]^2)) - 4*(1 - y
```

Maple ✗
cpu = 12.776 (sec), leaf count = 0 , could not solve

```
dsolve(2*y(x)*(1-y(x))*diff(diff(y(x),x),x) = (1-3*y(x))*diff(y(x),x)^2-4*y(x)*(f(x)+g(x)*y(x))*diff(
(1-y(x))^3*(F0(x)^2-G0(x)^2*y(x)^2)-4*(1-y(x))*y(x)^2*(f(x)^2+diff(f(x),x)-g(x)^2+diff(g(x),x)), y(x)
```

Mathematica raw input

```
DSolve[2*(1 - y[x])*y[x]*y''[x] == -((1 - y[x])^3*(F0[x]^2 - G0[x]^2*y[x]^2)) - 4*(1 - y[x])*y[x]^2*(
```

Mathematica raw output

```
DSolve[2*(1 - y[x])*y[x]*Derivative[2][y][x] == -((1 - y[x])^3*(F0[x]^2 - G0[x]^
2*y[x]^2)) - 4*(1 - y[x])*y[x]^2*(f[x]^2 - g[x]^2 + Derivative[1][f][x] + Deriva
tive[1][g][x]) - 4*y[x]*(f[x] + g[x]*y[x])*Derivative[1][y][x] + (1 - 3*y[x])*De
rivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(2*y(x)*(1-y(x))*diff(diff(y(x),x),x) = (1-3*y(x))*diff(y(x),x)^2-4*y(x)*(f(x)+g(x)*y(x))*diff(
(1-y(x))^3*(F0(x)^2-G0(x)^2*y(x)^2)-4*(1-y(x))*y(x)^2*(f(x)^2+diff(f(x),x)-g(x)^2+diff(g(x),x)), y(x)
```

Maple raw output

```
dsolve(2*y(x)*(1-y(x))*diff(diff(y(x),x),x) = (1-3*y(x))*diff(y(x),x)^2-4*y(x)*(
f(x)+g(x)*y(x))*diff(y(x),x)-(1-y(x))^3*(F0(x)^2-G0(x)^2*y(x)^2)-4*(1-y(x))*y(x)
^2*(f(x)^2+diff(f(x),x)-g(x)^2+diff(g(x),x)), y(x),'implicit')
```

4.2022 $3(1-y(x))y(x)y''(x) = 2(1-2y(x))y'(x)^2$

ODE

$$3(1-y(x))y(x)y''(x) = 2(1-2y(x))y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.335769 (sec), leaf count = 53

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{3(1-\#1)^{2/3}\#1\,{}_2F_1\left(\frac{1}{3},\frac{2}{3};\frac{4}{3};\#1\right)}{(-(\#1-1)\#1)^{2/3}c_1}\&\right][c_2+x]\right\}\right\}$$

Maple ✓
cpu = 0.191 (sec), leaf count = 41

$$\left\{3\,\frac{(-signum(y(x)-1))^{2/3}\,\sqrt[3]{y(x)}\,{}_2\mathrm{F}_1(1/3,2/3;\,4/3;\,y(x))}{(signum\,(y(x)-1))^{2/3}} - \_C1\,x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[3*(1 - y[x])*y[x]*y''[x] == 2*(1 - 2*y[x])*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(3*Hypergeometric2F1[1/3, 2/3, 4/3, #1]*(1 - #1)^(2/3)
*#1)/(C[1]*(-((-1 + #1)*#1))^(2/3)) & ][x + C[2]]}}
```

Maple raw input

```
dsolve(3*y(x)*(1-y(x))*diff(diff(y(x),x),x) = 2*(1-2*y(x))*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
3/signum(y(x)-1)^(2/3)*(-signum(y(x)-1))^(2/3)*y(x)^(1/3)*hypergeom([1/3, 2/3],[
4/3],y(x))-_C1*x-_C2 = 0
```

4.2023 $4(1-y(x))y(x)y''(x) = 3(1-2y(x))y'(x)^2$

ODE

$$4(1-y(x))y(x)y''(x) = 3(1-2y(x))y'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.319485 (sec), leaf count = 53

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{4(1-\#1)^{3/4}\#1\,{}_2F_1\left(\frac{1}{4},\frac{3}{4};\frac{5}{4};\#1\right)}{(-(\#1-1)\#1)^{3/4}c_1}\&\right][c_2+x]\right\}\right\}$$

Maple ✓
cpu = 0.046 (sec), leaf count = 41

$$\left\{4\,\frac{(-signum(y(x)-1))^{3/4}\,\sqrt[4]{y(x)}\,{}_2\mathrm{F}_1(1/4,3/4;\,5/4;\,y(x))}{(signum\,(y(x)-1))^{3/4}} - \_C1\,x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[4*(1 - y[x])*y[x]*y''[x] == 3*(1 - 2*y[x])*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[(4*Hypergeometric2F1[1/4, 3/4, 5/4, #1]*(1 - #1)^(3/4)
*#1)/(C[1]*(-((-1 + #1)*#1))^(3/4)) & ][x + C[2]]}}
```

Maple raw input

```
dsolve(4*y(x)*(1-y(x))*diff(diff(y(x),x),x) = 3*(1-2*y(x))*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
4/signum(y(x)-1)^(3/4)*(-signum(y(x)-1))^(3/4)*y(x)^(1/4)*hypergeom([1/4, 3/4],[
5/4],y(x))-_C1*x-_C2 = 0
```

4.2024 $xy(x)^2y''(x) = a$

ODE

$$xy(x)^2y''(x) = a$$

ODE Classification

[[_Emden, _Fowler], [_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.322733 (sec), leaf count = 103

$$\text{Solve}\left[2\sqrt{2}\sqrt{-\frac{y(x)\,(ax+c_1y(x))}{x^2}}+\frac{\sqrt{2}a\tan^{-1}\left(\frac{ax+2c_1y(x)}{2\sqrt{c_1}x\sqrt{-\frac{y(x)(ax+c_1y(x))}{x^2}}}\right)}{\sqrt{c_1}}+\frac{4c_1}{x}+4c_1c_2=0,y(x)\right]$$

Maple ✓
cpu = 0.268 (sec), leaf count = 209

$$\left\{\frac{1}{x}\left(9\,a\ln\left(\left(\frac{1}{\_C1^2}\left(\frac{y(x)}{x}-18\,a\_C1^2\right)+9\,a\right)\_C1+\sqrt{\frac{-18\,a\_C1^2xy\,(x)+(y\,(x))^2}{x^2\_C1^2}}\right)x+\left(\_C1^{-2}\right)^{\frac{3}{2}}\left(\_C1^2\sqrt{\frac{-18\right.\right.\right.$$

Mathematica raw input

```
DSolve[x*y[x]^2*y''[x] == a,y[x],x]
```

Mathematica raw output

```
Solve[(Sqrt[2]*a*ArcTan[(a*x + 2*C[1]*y[x])/(2*x*Sqrt[C[1]]*Sqrt[-((y[x]*(a*x +
C[1]*y[x]))/x^2)])])/Sqrt[C[1]] + (4*C[1])/x + 4*C[1]*C[2] + 2*Sqrt[2]*Sqrt[-((y
[x]*(a*x + C[1]*y[x]))/x^2)] == 0, y[x]]
```

Maple raw input

```
dsolve(x*y(x)^2*diff(diff(y(x),x),x) = a, y(x),'implicit')
```

Maple raw output

```
-1/(1/_C1^2)^(3/2)*(9*a*ln(((y(x)/x-18*a*_C1^2)/_C1^2+9*a)*_C1+((-18*a*_C1^2*x*y
(x)+y(x)^2)/x^2/_C1^2)^(1/2))*x+(1/_C1^2)^(3/2)*(_C1^2*((-18*a*_C1^2*x*y(x)+y(x)
^2)/x^2/_C1^2)^(1/2)*x+_C2*x+1/3))/x = 0, 1/(1/_C1^2)^(3/2)*(9*a*ln(((y(x)/x-18*
a*_C1^2)/_C1^2+9*a)*_C1+((-18*a*_C1^2*x*y(x)+y(x)^2)/x^2/_C1^2)^(1/2))*x+(1/_C1^
2)^(3/2)*(_C1^2*((-18*a*_C1^2*x*y(x)+y(x)^2)/x^2/_C1^2)^(1/2)*x-_C2*x-1/3))/x =
0
```

4.2025 $xy(x)^2y''(x) = (a - y(x)^2)\,y'(x) + xy(x)y'(x)^2$

ODE

$$xy(x)^2y''(x) = (a - y(x)^2)\,y'(x) + xy(x)y'(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 60.1673 (sec), leaf count = 72

$$\left\{\left\{y(x) \to -\frac{\sqrt{a + e^{-2c_1(c_2 - \log(x))}}}{\sqrt{2}\sqrt{c_1}}\right\}, \left\{y(x) \to \frac{\sqrt{a + e^{-2c_1(c_2 - \log(x))}}}{\sqrt{2}\sqrt{c_1}}\right\}\right\}$$

Maple ✓
cpu = 0.162 (sec), leaf count = 25

$$\left\{\ln(x) - \frac{\ln\left(\_C1\,(y(x))^2 - a\right)}{\_C1} - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[x*y[x]^2*y''[x] == (a - y[x]^2)*y'[x] + x*y[x]*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[a + E^(-2*C[1]*(C[2] - Log[x]))]/(Sqrt[2]*Sqrt[C[1]]))}, {y[x]
-> Sqrt[a + E^(-2*C[1]*(C[2] - Log[x]))]/(Sqrt[2]*Sqrt[C[1]])}}
```

Maple raw input

```
dsolve(x*y(x)^2*diff(diff(y(x),x),x) = x*y(x)*diff(y(x),x)^2+(a-y(x)^2)*diff(y(x),x), y(x),'implicit'
```

Maple raw output

```
ln(x)-1/_C1*ln(_C1*y(x)^2-a)-_C2 = 0
```

4.2026 $x^2 y(x)^2 y''(x) = (x^2 + y(x)^2)(x y'(x) - y(x))$

ODE

$$x^2 y(x)^2 y''(x) = (x^2 + y(x)^2)(x y'(x) - y(x))$$

ODE Classification

[[_2nd_order, _with_linear_symmetries], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 1.06124 (sec), leaf count = 35

$$\left\{\left\{y(x) \to -\frac{x\left(W\left(-e^{-c_2 c_1^2 - 1} x^{c_1^2}\right) + 1\right)}{c_1}\right\}\right\}$$

Maple ✓
cpu = 0.067 (sec), leaf count = 36

$$\left\{\frac{1}{\_C1^2}\ln\left(\frac{\_C1\, y(x) + x}{x}\right) - \frac{y(x)}{\_C1\, x} - \ln(x) - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[x^2*y[x]^2*y''[x] == (x^2 + y[x]^2)*(-y[x] + x*y'[x]),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x*(1 + ProductLog[-(E^(-1 - C[1]^2*C[2])*x^C[1]^2)]))/C[1])}}
```

Maple raw input

```
dsolve(x^2*y(x)^2*diff(diff(y(x),x),x) = (x^2+y(x)^2)*(x*diff(y(x),x)-y(x)), y(x),'implicit')
```

Maple raw output

```
1/_C1^2*ln((_C1*y(x)+x)/x)-1/_C1*y(x)/x-ln(x)-_C2 = 0
```

4.2027 $(a^2-x^2)\left(a^2-y(x)^2\right)y''(x)+(a^2-x^2)\,y(x)y'(x)^2=x(a^2-y(x)^2)\,y'(x)$

ODE

$$(a^2-x^2)\left(a^2-y(x)^2\right)y''(x)+(a^2-x^2)\,y(x)y'(x)^2=x\left(a^2-y(x)^2\right)y'(x)$$

ODE Classification

[_Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _reducible, _mu_xy]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.321694 (sec), leaf count = 65

$$\left\{\left\{y(x)\to \frac{1}{2}e^{c_2}\left(\sqrt{x^2-a^2}+x\right)^{-c_1}+\frac{1}{2}a^2e^{-c_2}\left(\sqrt{x^2-a^2}+x\right)^{c_1}\right\}\right\}$$

Maple ✓
cpu = 0.034 (sec), leaf count = 40

$$\left\{\ln\left(y(x)+\sqrt{(y(x))^2-a^2}\right)-\_C1\ln\left(x+\sqrt{-a^2+x^2}\right)-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[(a^2 - x^2)*y[x]*y'[x]^2 + (a^2 - x^2)*(a^2 - y[x]^2)*y''[x] == x*(a^2 - y[x]^2)*y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^C[2]/(2*(x + Sqrt[-a^2 + x^2])^C[1]) + (a^2*(x + Sqrt[-a^2 + x^2])^C
[1])/(2*E^C[2])}}
```

Maple raw input

```
dsolve((a^2-x^2)*(a^2-y(x)^2)*diff(diff(y(x),x),x)+(a^2-x^2)*y(x)*diff(y(x),x)^2 = x*(a^2-
y(x)^2)*diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
ln(y(x)+(y(x)^2-a^2)^(1/2))-_C1*ln(x+(-a^2+x^2)^(1/2))-_C2 = 0
```

4.2028 $(1-y(x))^3\left(\mathbf{a0}+\mathbf{a1}y(x)^2\right)+\mathbf{a2}x(1-y(x))y(x)^2+\mathbf{a3}x^3y(x)^2(y(x)+1)+2x^2(1-y(x))y(x)y''(x)-x^2(1-3y(x))y'(x)^2+2x(1-y(x))y(x)y'(x)=0$

ODE

$(1-y(x))^3\left(\mathrm{a0}+\mathrm{a1}y(x)^2\right)+\mathrm{a2}x(1-y(x))y(x)^2+\mathrm{a3}x^3y(x)^2(y(x)+1)+2x^2(1-y(x))y(x)y''(x)-x^2(1-3y(x))y'(x)^2+2x(1-y(x$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 23.0005 (sec), leaf count = 0 , could not solve

```
DSolve[a2*x*(1 - y[x])*y[x]^2 + a3*x^3*y[x]^2*(1 + y[x]) + (1 - y[x])^3*(a0 + a1*y[x]^2) + 2*x*(1 - y
```

Maple ✗
cpu = 5.595 (sec), leaf count = 0 , could not solve

```
dsolve(2*x^2*y(x)*(1-y(x))*diff(diff(y(x),x),x)-x^2*(1-3*y(x))*diff(y(x),x)^2+2*x*y(x)*(1-
y(x))*diff(y(x),x)+(a0+a1*y(x)^2)*(1-y(x))^3+a2*x*y(x)^2*(1-y(x))+a3*x^3*y(x)^2*(1+y(x)) = 0, y(x),'i
```

Mathematica raw input

```
DSolve[a2*x*(1 - y[x])*y[x]^2 + a3*x^3*y[x]^2*(1 + y[x]) + (1 - y[x])^3*(a0 + a1*y[x]^2) + 2*x*(1 - y
```

Mathematica raw output

```
DSolve[a2*x*(1 - y[x])*y[x]^2 + a3*x^3*y[x]^2*(1 + y[x]) + (1 - y[x])^3*(a0 + a1
*y[x]^2) + 2*x*(1 - y[x])*y[x]*Derivative[1][y][x] - x^2*(1 - 3*y[x])*Derivative
[1][y][x]^2 + 2*x^2*(1 - y[x])*y[x]*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(2*x^2*y(x)*(1-y(x))*diff(diff(y(x),x),x)-x^2*(1-3*y(x))*diff(y(x),x)^2+2*x*y(x)*(1-
y(x))*diff(y(x),x)+(a0+a1*y(x)^2)*(1-y(x))^3+a2*x*y(x)^2*(1-y(x))+a3*x^3*y(x)^2*(1+y(x)) = 0, y(x),'i
```

Maple raw output

```
dsolve(2*x^2*y(x)*(1-y(x))*diff(diff(y(x),x),x)-x^2*(1-3*y(x))*diff(y(x),x)^2+2*
x*y(x)*(1-y(x))*diff(y(x),x)+(a0+a1*y(x)^2)*(1-y(x))^3+a2*x*y(x)^2*(1-y(x))+a3*x
^3*y(x)^2*(1+y(x)) = 0, y(x),'implicit')
```

4.2029 $x^3 y(x)^2 y''(x) + (y(x)+x)\left(xy'(x) - y(x)\right)^3 = 0$

ODE

$$x^3 y(x)^2 y''(x) + (y(x)+x)\left(xy'(x) - y(x)\right)^3 = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 38.0563 (sec), leaf count = 0 , could not solve

```
DSolve[(x + y[x])*(-y[x] + x*Derivative[1][y][x])^3 + x^3*y[x]^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.235 (sec), leaf count = 131

$$\left\{\ln(x) - \int^{\frac{y(x)}{x}} \frac{1}{2\_f}\left(2\sqrt{\_f}J_{i\sqrt{3}+1}\left(2\sqrt{\_f}\right) + 2\sqrt{\_f}\_C1\,Y_{i\sqrt{3}+1}\left(2\sqrt{\_f}\right) - \left(i\sqrt{3}+1\right)\left(Y_{i\sqrt{3}}\left(2\sqrt{\_f}\right)\_C1 + J_{i\sqrt{3}}\left(2\sqrt{\right.\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[(x + y[x])*(-y[x] + x*y'[x])^3 + x^3*y[x]^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[(x + y[x])*(-y[x] + x*Derivative[1][y][x])^3 + x^3*y[x]^2*Derivative[2][y
][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x^3*y(x)^2*diff(diff(y(x),x),x)+(x+y(x))*(x*diff(y(x),x)-y(x))^3 = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)-Intat(1/2*(2*_f^(1/2)*BesselJ(I*3^(1/2)+1,2*_f^(1/2))+2*_f^(1/2)*_C1*Besse
lY(I*3^(1/2)+1,2*_f^(1/2))-(I*3^(1/2)+1)*(BesselY(I*3^(1/2),2*_f^(1/2))*_C1+Bess
elJ(I*3^(1/2),2*_f^(1/2))))/_f/(BesselY(I*3^(1/2),2*_f^(1/2))*_C1+BesselJ(I*3^(1
/2),2*_f^(1/2))),_f = y(x)/x)-_C2 = 0
```

4.2030 $y(x)^3 y''(x) = a^2$

ODE

$$y(x)^3 y''(x) = a^2$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 2.49055 (sec), leaf count = 62

$$\left\{\left\{y(x) \to -\frac{\sqrt{a^2 + c_1^2 (c_2 + x)^2}}{\sqrt{c_1}}\right\}, \left\{y(x) \to \frac{\sqrt{a^2 + c_1^2 (c_2 + x)^2}}{\sqrt{c_1}}\right\}\right\}$$

Maple ✓
cpu = 2.174 (sec), leaf count = 56

$$\left\{-\frac{1}{\_C1}\sqrt{\_C1\ (y(x))^2 - a^2} - x - \_C2 = 0, \frac{1}{\_C1}\sqrt{\_C1\ (y(x))^2 - a^2} - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]^3*y''[x] == a^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[a^2 + C[1]^2*(x + C[2])^2]/Sqrt[C[1]])}, {y[x] -> Sqrt[a^2 + C[
1]^2*(x + C[2])^2]/Sqrt[C[1]]}}
```

Maple raw input

```
dsolve(y(x)^3*diff(diff(y(x),x),x) = a^2, y(x),'implicit')
```

Maple raw output

```
-1/_C1*(_C1*y(x)^2-a^2)^(1/2)-x-_C2 = 0, 1/_C1*(_C1*y(x)^2-a^2)^(1/2)-x-_C2 = 0
```

4.2031 $y(x)\left(y(x)^2+1\right)y''(x)+\left(1-3y(x)^2\right)y'(x)^2=0$

ODE

$$y(x)\left(y(x)^2+1\right)y''(x)+\left(1-3y(x)^2\right)y'(x)^2=0$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✓
cpu = 0.618433 (sec), leaf count = 78

$$\left\{\left\{y(x)\to -\frac{\sqrt{-2c_1x-2c_2c_1-1}}{\sqrt{2}\sqrt{c_1\left(c_2+x\right)}}\right\},\left\{y(x)\to \frac{\sqrt{-2c_1x-2c_2c_1-1}}{\sqrt{2}\sqrt{c_1\left(c_2+x\right)}}\right\}\right\}$$

Maple ✓
cpu = 0.13 (sec), leaf count = 23

$$\left\{-\left(2\left(y(x)\right)^2+2\right)^{-1}-\_C1\,x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[(1 - 3*y[x]^2)*y'[x]^2 + y[x]*(1 + y[x]^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[-1 - 2*x*C[1] - 2*C[1]*C[2]]/(Sqrt[2]*Sqrt[C[1]*(x + C[2])]))},
 {y[x] -> Sqrt[-1 - 2*x*C[1] - 2*C[1]*C[2]]/(Sqrt[2]*Sqrt[C[1]*(x + C[2])])}}
```

Maple raw input

```
dsolve(y(x)*(1+y(x)^2)*diff(diff(y(x),x),x)+(1-3*y(x)^2)*diff(y(x),x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-1/(2*y(x)^2+2)-_C1*x-_C2 = 0
```

4.2032 $2y(x)^3y''(x) + y(x)^2y'(x)^2 = 2$

ODE

$$2y(x)^3y''(x) + y(x)^2y'(x)^2 = 2$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.664688 (sec), leaf count = 721

$$\left\{\left\{y(x) \to \frac{c_1^2\left(3\sqrt{\frac{(c_2+x)^2(9c_1^4x^2+18c_2c_1^4x+9c_2^2c_1^4+128)}{c_1^2}} + 9c_1(c_2+x)^2 + \frac{64}{c_1^3}\right)^{2/3} - 4c_1\sqrt[3]{3\sqrt{\frac{(c_2+x)^2(9c_1^4x^2+18c_2c_1^4x+9c_2^2c_1^4+128)}{c_1^2}} + 9c_1(c_2+x)^2 + \frac{64}{c_1^3}}}{2c_1^2\sqrt[3]{3\sqrt{\frac{(c_2+x)^2(9c_1^4x^2+18c_2c_1^4x+9c_2^2c_1^4+128)}{c_1^2}} + 9c_1(c_2+x)^2 + \frac{64}{c_1^3}}}\right\}\right\}$$

Maple ✓
cpu = 0.084 (sec), leaf count = 57

$$\left\{-\frac{2\_C1\,y(x)+8}{3\_C1^2}\sqrt{\_C1\,y(x)-2} - x - \_C2 = 0, \frac{2\_C1\,y(x)+8}{3\_C1^2}\sqrt{\_C1\,y(x)-2} - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[y[x]^2*y'[x]^2 + 2*y[x]^3*y''[x] == 2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (16 - 4*C[1]*(64/C[1]^3 + 9*C[1]*(x + C[2])^2 + 3*Sqrt[((x + C[2])^2*(
128 + 9*x^2*C[1]^4 + 18*x*C[1]^4*C[2] + 9*C[1]^4*C[2]^2))/C[1]^2])^(1/3) + C[1]^
2*(64/C[1]^3 + 9*C[1]*(x + C[2])^2 + 3*Sqrt[((x + C[2])^2*(128 + 9*x^2*C[1]^4 +
18*x*C[1]^4*C[2] + 9*C[1]^4*C[2]^2))/C[1]^2])^(2/3))/(2*C[1]^2*(64/C[1]^3 + 9*C[
1]*(x + C[2])^2 + 3*Sqrt[((x + C[2])^2*(128 + 9*x^2*C[1]^4 + 18*x*C[1]^4*C[2] +
9*C[1]^4*C[2]^2))/C[1]^2])^(1/3))}, {y[x] -> ((I/4)*(4 + C[1]*(64/C[1]^3 + 9*C[1
]*(x + C[2])^2 + 3*Sqrt[((x + C[2])^2*(128 + 9*x^2*C[1]^4 + 18*x*C[1]^4*C[2] + 9
*C[1]^4*C[2]^2))/C[1]^2])^(1/3))*(4*I - 4*Sqrt[3] + (I + Sqrt[3])*C[1]*(64/C[1]^
3 + 9*C[1]*(x + C[2])^2 + 3*Sqrt[((x + C[2])^2*(128 + 9*x^2*C[1]^4 + 18*x*C[1]^4
*C[2] + 9*C[1]^4*C[2]^2))/C[1]^2])^(1/3)))/(C[1]^2*(64/C[1]^3 + 9*C[1]*(x + C[2]
```

```
)^2 + 3*Sqrt[((x + C[2])^2*(128 + 9*x^2*C[1]^4 + 18*x*C[1]^4*C[2] + 9*C[1]^4*C[2
]^2))/C[1]^2])^(1/3))}, {y[x] -> ((-I/4)*(4 + C[1]*(64/C[1]^3 + 9*C[1]*(x + C[2]
)^2 + 3*Sqrt[((x + C[2])^2*(128 + 9*x^2*C[1]^4 + 18*x*C[1]^4*C[2] + 9*C[1]^4*C[2
]^2))/C[1]^2])^(1/3))*(-4*(I + Sqrt[3]) + (-I + Sqrt[3])*C[1]*(64/C[1]^3 + 9*C[1
]*(x + C[2])^2 + 3*Sqrt[((x + C[2])^2*(128 + 9*x^2*C[1]^4 + 18*x*C[1]^4*C[2] + 9
*C[1]^4*C[2]^2))/C[1]^2])^(1/3)))/(C[1]^2*(64/C[1]^3 + 9*C[1]*(x + C[2])^2 + 3*S
qrt[((x + C[2])^2*(128 + 9*x^2*C[1]^4 + 18*x*C[1]^4*C[2] + 9*C[1]^4*C[2]^2))/C[1
]^2])^(1/3))}}
```

Maple raw input

```
dsolve(2*y(x)^3*diff(diff(y(x),x),x)+y(x)^2*diff(y(x),x)^2 = 2, y(x),'implicit')
```

Maple raw output

```
-2/3*(_C1*y(x)-2)^(1/2)*(_C1*y(x)+4)/_C1^2-x-_C2 = 0, 2/3*(_C1*y(x)-2)^(1/2)*(_C
1*y(x)+4)/_C1^2-x-_C2 = 0
```

4.2033 $2(1-y(x))y(x)(a-y(x))y''(x)+(-(1-y(x))(a-y(x))+y(x)(a-y(x))+(1-y(x))y(x))y'(x)^2 = \mathbf{a0}y(x)^2\left(1-y(x)^2\right)(a-y(x))^2+\mathbf{a2}y(x)^2(a-y(x))^2+\mathbf{a3}(1-y(x))^2(a-y(x))^2+\mathbf{a1}(1-y(x))^2y(x)^2$

ODE

$$2(1-y(x))y(x)(a-y(x))y''(x)+(-(1-y(x))(a-y(x))+y(x)(a-y(x))+(1-y(x))y(x))y'(x)^2 = \mathrm{a0}y(x)^2\left(1-y(x)^2\right)(a-y(x))^2$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 111.201 (sec), leaf count = 0 , could not solve

```
DSolve[(-((1 - y[x])*(a - y[x])) + (1 - y[x])*y[x] + (a - y[x])*y[x])*Derivative[1][y][x]^2 + 2*(1 -
```

Maple ✓
cpu = 0.661 (sec), leaf count = 232

$$\left\{\int^{y(x)} \frac{}{\sqrt{-2\ln(-1+\_a)\_a^3 a0+2\ln(-1+\_a)\_a^2 aa0-\_a^4 a0+\_a^3 aa0+2\ln(-1+\_a)\_a^2 a0-2\ln(-1+\_a}}\right.$$

Mathematica raw input

```
DSolve[(-((1 - y[x])*(a - y[x])) + (1 - y[x])*y[x] + (a - y[x])*y[x])*y'[x]^2 + 2*(1 - y[x])*(a - y[x
```

Mathematica raw output

```
DSolve[(-((1 - y[x])*(a - y[x])) + (1 - y[x])*y[x] + (a - y[x])*y[x])*Derivative
[1][y][x]^2 + 2*(1 - y[x])*(a - y[x])*y[x]*Derivative[2][y][x] == a3*(1 - y[x])^
2*(a - y[x])^2 + a1*(1 - y[x])^2*y[x]^2 + a2*(a - y[x])^2*y[x]^2 + a0*(a - y[x])
^2*y[x]^2*(1 - y[x]^2), y[x], x]
```

Maple raw input

```
dsolve(2*y(x)*(1-y(x))*(a-y(x))*diff(diff(y(x),x),x)+(y(x)*(1-y(x))+y(x)*(a-y(x))-(1-
y(x))*(a-y(x)))*diff(y(x),x)^2 = a0*y(x)^2*(1-y(x)^2)*(a-y(x))^2+a1*y(x)^2*(1-y(x))^2+a2*y(x)^2*(a-
y(x))^2+a3*(1-y(x))^2*(a-y(x))^2, y(x),'implicit')
```

Maple raw output

```
Intat(1/(-2*ln(-1+_a)*_a^3*a0+2*ln(-1+_a)*_a^2*a*a0-_a^4*a0+_a^3*a*a0+2*ln(-1+_a
)*_a^2*a0-2*ln(-1+_a)*_a*a*a0+_a^3*_C1-_C1*_a^2*a+_a^3*a0-_a^2*a*a0-_C1*_a^2+_C1
*_a*a-a1*_a^2-a2*_a^2-_a^2*a3+a2*_a*a+_a*a*a3+_a*a1+_a*a3-a*a3)^(1/2),_a = y(x))
-x-_C2 = 0, Intat(-1/(2*_a*a0*(-1+_a)*(a-_a)*ln(-1+_a)-_a^4*a0+(a*a0+_C1+a0)*_a^
3+((-a0-_C1)*a-a1-a2-a3-_C1)*_a^2+((a2+a3+_C1)*a+a1+a3)*_a-a*a3)^(1/2),_a = y(x)
)-x-_C2 = 0
```

4.2034 $2(a-y(x))(b-y(x))(c-y(x))y''(x)+y'(x)^2((a-y(x))(b-y(x))+(a-y(x))(c-y(x))+(b-y(x))(c-y(x)))=\mathbf{a0}(a-y(x))^2(b-y(x))^2(c-y(x))^2+2\mathbf{a2}(a-y(x))^2(c-y(x))^2+\mathbf{a3}(a-y(x))^2(b-y(x))^2+\mathbf{a1}(b-y(x))^2(c-y(x))^2$

ODE

$2(a-y(x))(b-y(x))(c-y(x))y''(x)+y'(x)^2((a-y(x))(b-y(x))+(a-y(x))(c-y(x))+(b-y(x))(c-y(x)))=\mathrm{a0}(a-y(x))^2(b-y($

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 20.6728 (sec), leaf count = 10112

$$\left\{\text{Solve}\left[\frac{2F\left(\sin^{-1}\left(\sqrt{\frac{(\text{Root}[\text{a0}\#1^4+(-a\text{a0}-b\text{a0}-c\text{a0}-c_1)\#1^3+(-\text{a1}-2\text{a2}-\text{a3}+a\text{a0}b+a\text{a0}c+\text{a0}bc+ac_1+bc_1+cc_1)\#1^2+(2a\text{a2}+2c\text{a2}-}{(\text{Root}[\text{a0}\#1^4+(-a\text{a0}-b\text{a0}-c\text{a0}-c_1)\#1^3+(-\text{a1}-2\text{a2}-\text{a3}+a\text{a0}b+a\text{a0}c+\text{a0}bc+ac_1+bc_1+cc_1)\#1^2+(2a\text{a2}+2c\text{a2}-}}\right.\right.\right.}{}\right.\right.$$

Maple ✓
cpu = 1.74 (sec), leaf count = 115637

result too large to display

Mathematica raw input

```
DSolve[((a - y[x])*(b - y[x]) + (a - y[x])*(c - y[x]) + (b - y[x])*(c - y[x]))*y'[x]^2 + 2*(a - y[x])
```

Mathematica raw output

```
{Solve[(2*EllipticF[ArcSin[Sqrt[((Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1
] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1
] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1]
 + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 2] - Root[-(
a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c +
 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a
0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c
- C[1])*#1^3 + a0*#1^4 & , 4])*(Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1]
+ (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1]
- b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] +
 c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 1] - y[x]))/((
```

```
Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b +
  a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a
 3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b
 - a0*c - C[1])*#1^3 + a0*#1^4 & , 1] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*
 c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*
 c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b
 *C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4])*(Ro
 ot[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a
 1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3
 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b -
 a0*c - C[1])*#1^3 + a0*#1^4 & , 2] - y[x]))]], ((Root[-(a*a3*b) - 2*a*a2*c - a1*
 b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b
 *C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c +
 a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 &
  , 2] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b
 + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 -
 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0)
  - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 3])*(Root[-(a*a3*b) - 2*a*a2*c - a1*b*
 c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C
 [1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*
 C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & ,
  1] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b +
 a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*
 a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) -
  a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4]))/((Root[-(a*a3*b) - 2*a*a2*c - a1*b*
 c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C
 [1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*
 C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & ,
  1] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b +
 a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*
 a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) -
  a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 3])*(Root[-(a*a3*b) - 2*a*a2*c - a1*b*c
 + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1
 ] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[
 1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 2
 ] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3
 *b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2
  - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a
 0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4]))]*(Root[-(a*a3*b) - 2*a*a2*c - a1*b*c
 + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1
 ] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[
 1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 1
 ] - y[x])*Sqrt[((Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a
 3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1
 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 +
  (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 1] - Root[-(a*a3*b) - 2*a*a2*
 c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*
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c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0
*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0
*#1^4 & , 2])*(Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3
+ a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 +
(-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (
-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 3] - y[x]))/((Root[-(a*a3*b) -
2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c -
a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0
*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1
^3 + a0*#1^4 & , 1] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2
+ a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1]
)*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#
1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 3])*(Root[-(a*a3*b) - 2*
a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*
a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c
 + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3
 + a0*#1^4 & , 2] - y[x]))]*(Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (
2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b
*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*
C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4] - y[x]))/((Roo
t[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1
*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 +
 a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a
0*c - C[1])*#1^3 + a0*#1^4 & , 1] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C
[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C
[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[
1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4])*Sqrt[(
(Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b
+ a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 -
a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b
 - a0*c - C[1])*#1^3 + a0*#1^4 & , 1] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b
*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a
*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] +
b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 2])*(R
oot[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b +
a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3
 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b -
 a0*c - C[1])*#1^3 + a0*#1^4 & , 2] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c
*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c
*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*
C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4])*(Roo
t[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1
*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 +
 a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a
0*c - C[1])*#1^3 + a0*#1^4 & , 1] - y[x])*(Root[-(a*a3*b) - 2*a*a2*c - a1*b*c +
a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1]
- a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1]
```

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 + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4]
- y[x]))/((Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1
*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1
 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*
a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 1] - Root[-(a*a3*b) - 2*a*a2*c - a1
*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*
b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c +
 a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4
& , 4])^2*(Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1
*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1
 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*
a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 2] - y[x])^2)]*Sqrt[a1*(b - y[x])*(
c - y[x]) + a*(a3*(b - y[x]) + (c - y[x])*(2*a2 + (b - y[x])*(-C[1] + a0*y[x])))
 + y[x]*(a3*(-b + y[x]) + (c - y[x])*(-2*a2 + (-b + y[x])*(-C[1] + a0*y[x])))])
== x + C[2], y[x]], Solve[(2*EllipticF[ArcSin[Sqrt[((Root[-(a*a3*b) - 2*a*a2*c -
 a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c -
 a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*
c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1
^4 & , 2] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a
1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a
1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a
*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4])*(Root[-(a*a3*b) - 2*a*a2*c - a
1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a
*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c
+ a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4
 & , 1] - y[x]))/((Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a
*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#
1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2
 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 1] - Root[-(a*a3*b) - 2*a*a
2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*
b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c +
a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 +
a0*#1^4 & , 4])*(Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a
3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1
+ (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 +
 (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 2] - y[x]))]], ((Root[-(a*a3*
b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2
*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b +
 a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1
])*#1^3 + a0*#1^4 & , 2] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*
a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c
*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[
1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 3])*(Root[-(a*a3*b)
 - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c
 - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a
*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])
*#1^3 + a0*#1^4 & , 1] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*
```

```
a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C
[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1]
)*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4]))/((Root[-(a*a3*b)
 - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c
 - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a
*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])
*#1^3 + a0*#1^4 & , 1] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*
a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C
[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1]
)*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 3])*(Root[-(a*a3*b) -
 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c -
 a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a
0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#
1^3 + a0*#1^4 & , 2] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2
 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1
])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*
#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4])*(Root[-(a*a3*b) - 2
*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a
*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*
c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^
3 + a0*#1^4 & , 2] - y[x])^2*Sqrt[((Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C
[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C
[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[
1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 1] - Root[
-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c
 + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a
*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*
c - C[1])*#1^3 + a0*#1^4 & , 2])*(Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1
] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1
] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1]
 + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 3] - y[x]))/
((Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b
 + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 -
 a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*
b - a0*c - C[1])*#1^3 + a0*#1^4 & , 1] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*
b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] -
a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] +
 b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 3])*(
Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b +
 a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a
```

```
3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b
- a0*c - C[1])*#1^3 + a0*#1^4 & , 2] - y[x]))]*Sqrt[((Root[-(a*a3*b) - 2*a*a2*c
- a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c
- a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b
*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#
1^4 & , 1] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 +
a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-
a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(
a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 2])*(Root[-(a*a3*b) - 2*a*a2*c -
a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c -
a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c
 + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^
4 & , 2] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1
*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1
 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*
a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4])*(Root[-(a*a3*b) - 2*a*a2*c - a1
*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*
b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c +
 a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4
& , 1] - y[x])*(Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3
 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 +
 (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 +
(-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4] - y[x]))/((Root[-(a*a3*b) -
 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c -
 a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a
0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#
1^3 + a0*#1^4 & , 1] - Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2
 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1
])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*
#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 4])^2*(Root[-(a*a3*b) -
 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c -
 a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a
0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#
1^3 + a0*#1^4 & , 2] - y[x])^2)])/((-Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*
C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*
C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C
[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 1] + Root
[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*
c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 +
a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0
*c - C[1])*#1^3 + a0*#1^4 & , 2])*(Root[-(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[
1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c + 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[
1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1
] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c - C[1])*#1^3 + a0*#1^4 & , 2] - Root[-
(a*a3*b) - 2*a*a2*c - a1*b*c + a*b*c*C[1] + (2*a*a2 + a*a3 + a1*b + a3*b + a1*c
+ 2*a2*c - a*a0*b*c - a*b*C[1] - a*c*C[1] - b*c*C[1])*#1 + (-a1 - 2*a2 - a3 + a*
a0*b + a*a0*c + a0*b*c + a*C[1] + b*C[1] + c*C[1])*#1^2 + (-(a*a0) - a0*b - a0*c
```

```
 - C[1])*#1^3 + a0*#1^4 & , 4])*Sqrt[a1*(b - y[x])*(c - y[x]) + a*(a3*(b - y[x])
 + (c - y[x])*(2*a2 + (b - y[x])*(-C[1] + a0*y[x]))) + y[x]*(a3*(-b + y[x]) + (c
 - y[x])*(-2*a2 + (-b + y[x])*(-C[1] + a0*y[x])))]) == x + C[2], y[x]]}
```

Maple raw input

```
dsolve(2*(a-y(x))*(b-y(x))*(c-y(x))*diff(diff(y(x),x),x)+((a-y(x))*(b-y(x))+(a-y(x))*(c-
y(x))+(b-y(x))*(c-y(x)))*diff(y(x),x)^2 = a0*(a-y(x))^2*(b-y(x))^2*(c-y(x))^2+a1*(b-y(x))^2*(c-
y(x))^2+2*a2*(a-y(x))^2*(c-y(x))^2+a3*(a-y(x))^2*(b-y(x))^2, y(x),'implicit')
```

Maple raw output

```
Intat(1/(-_a*a*a0*b*(_a-a^6/(a-c)^2/(a-b)^2/(-a+_a)-b^6/(b-c)^2/(a-b)^2/(-b+_a)+
2*a^7/(a-c)^3/(a-b)^3*ln(-a+_a)-4*a^6/(a-c)^3/(a-b)^3*ln(-a+_a)*b-4*a^6/(a-c)^3/
(a-b)^3*ln(-a+_a)*c+6*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^6/(b-c)^2/(a-c)^2/(-c+
_a)+4*b^6/(b-c)^3/(a-b)^3*ln(-b+_a)*a-6*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-2*b^7/
(b-c)^3/(a-b)^3*ln(-b+_a)+4*b^6/(b-c)^3/(a-b)^3*ln(-b+_a)*c+6*c^5/(b-c)^3/(a-c)^
3*ln(-c+_a)*a*b-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a)*a-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a
)*b+2*c^7/(b-c)^3/(a-c)^3*ln(-c+_a))+_a^2*a^2*a3*b^3*(-1/(a-c)^2/(a-b)^2/(-a+_a)
-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*l
n(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-
b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(
b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_
a))+_a^2*a1*b^3*c^2*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/
(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+
_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^
3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c
)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a1*b^2*c^3*(-1/(a-c)^2/(
a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-
c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b
-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*l
n(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2
/(a-b)^2/(-b+_a))-2*_a*a^3*a2*c^3*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*
ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^
2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/
(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-
c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))-_a*a^3*a3*b^3*(
-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a
+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3
*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)
^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)
*a-1/(b-c)^2/(a-b)^2/(-b+_a))-_a*a1*b^3*c^3*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^
3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*
b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-
b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a
```

-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))+2*a^3
*a2*b*c^3*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a
-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c
)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a
)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^
3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))+a^3*a3*b^3*c*(-1/(a-c)^2/(a-b)^2/(-a+_a
)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*
ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a
-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/
(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+
_a))+a*a1*b^3*c^3*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a
-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a
)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*
ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^
3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))+a^3*a0*b^3*c^3*(-1/(a-c)^2/(a-b
)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^
3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/
(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-
c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a
-b)^2/(-b+_a))-2*_a^3*a^2*a2*c^2*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*l
n(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2
/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(
b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c
+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))-_a^3*a^2*a3*b^2*
(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-
a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^
3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c
)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a
)*a-1/(b-c)^2/(a-b)^2/(-b+_a))-_a^3*a1*b^2*c^2*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-
c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_
a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*l
n(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3
/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))+2*
_a^2*a^3*a2*c^2*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c
)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+
4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln
(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/
(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a^3*a3*b^2*(-1/(a-c)^2/(a-b)
^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3
/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(
b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c
+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-
b)^2/(-b+_a))+2*_a^2*a^2*a2*c^3*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln
(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/
(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b
-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+
_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))+4*_a^3*a*a2*(-a^3

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/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a
+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b
-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3
*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b
^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-
c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2
/(-b+_a))+2*_a^3*a*a3*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*
a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^
3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+
_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/
(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a
-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+
_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^3*a1*b*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1
/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)
^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_
a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)
^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(
-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3
*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^3*a1*c*(-a^
3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-
a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*
b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^
3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*
b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b
-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^
2/(-b+_a))+4*_a^3*a2*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)
*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)
^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b
+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1
/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(
a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c
+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^3*a3*b*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-
1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b
)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+
_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c
)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln
(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^
3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^2*a^2*a2*(
-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*l
n(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2
*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-
b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_
a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1
/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-
b)^2/(-b+_a))-2*_a^2*a^2*a3*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-
a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/
(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*
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ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*
b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c
)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*
ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a1*b^2*(-a^3/(a-c)^2/(a-b)^2/(
-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)
^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)
^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a
+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-
c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c
+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a
1*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a
-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+
_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c
)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*
ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*
c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c
)^2/(a-b)^2/(-b+_a))-4*_a^2*a2*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)
^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a
^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(
a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(
-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b
-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(
a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a3*b^2*(-a^3/(a-c)^2/(a
-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-
1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^
2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*
b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c
)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^
3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-_
a^3*a^2*a0*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4
/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-
c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c
*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(
b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2
/(-b+_a))-_a^3*a0*b^2*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+
_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/
(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*
ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*
a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c
)^2/(a-b)^2/(-b+_a))-_a^3*a0*c^2*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-
b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_
a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)
^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3
*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)
*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a^3*a0*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/
(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b
)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-
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4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c
)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^
3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a0*b^3*(-a^4/(a-c)^2/(a-b)^2/(-a
+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(
a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*l
n(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c
+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-
c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a0*c^3*(-a^4/(a-c)^2/
(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a
)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^
3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*
ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*
a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a*a1*(-a^4
/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3
*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b
^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3
/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*l
n(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^2
*a*a2*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c
)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/
(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*
b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^
3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+
_a))+_a^2*a*a3*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2
*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2
/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_
a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c
^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-
b)^2/(-b+_a))+_a^2*a1*b*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-
a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^
4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^
3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a
)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b
-c)^2/(a-b)^2/(-b+_a))+_a^2*a1*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-
b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_
a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)
^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3
*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)
*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^2*a2*b*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/
(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b
)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-
4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c
)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^
3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^2*a2*c*(-a^4/(a-c)^2/(a-b)^2/(-a
+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(
a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*l
n(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c
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+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-
c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a3*b*(-a^4/(a-c)^2/(a
-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*
c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/
(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln
(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-
2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a3*c*(-a^4/(
a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*l
n(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4
/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(
a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(
-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^3*a
*a0*(-a^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/(a-b)^
3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c+
5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c)^3/(a
-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*ln(-b+
_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-3*c^5/
(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/(a-c)^
3*ln(-c+_a))+2*_a^3*a0*b*(-a^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^2/(-b+_
a)+a^6/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/(a-c)^3
/(a-b)^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c)^2/(-c
+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-b^6/(
b-c)^3/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/(a-c)^3
*ln(-c+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)
*b+c^6/(b-c)^3/(a-c)^3*ln(-c+_a))+2*_a^3*a0*c*(-a^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/
(b-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-
a+_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^
5/(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^
3*ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+
5*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c
)^3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c+_a))-2*_a^2*a^2*a0*(-a^5/(a-c)
^2/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a
^5/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(
a-b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)
*a-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)
^3/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3
*ln(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c+_a))-2*
_a^2*a0*b^2*(-a^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^
3/(a-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-
a+_a)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b
-c)^3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^
3*ln(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*
b-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^
3/(a-c)^3*ln(-c+_a))-2*_a^2*a0*c^2*(-a^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-
b)^2/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a
^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(
a-c)^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)
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*c*a-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)
^3/(a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3
*ln(-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c+_a))-_a*a*a1*c*(-a^4/(a-c)^2/(a-b)^2/(-a+
_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a
-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln
(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+
4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c
)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-2*_a*a*a2*b*(-a^4/(a-c)^2/(
a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)
*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3
/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*l
n(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a
-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-2*_a*a*a2*c*(-a^
4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^
3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*
b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^
3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*
ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-_a*a*
a3*b*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)
^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(
-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b
^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3
/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_
a))-_a*a*a3*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*
a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/
(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a
)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^
4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b
)^2/(-b+_a))-_a*a1*b*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a
+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4
/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3
*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)
*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-
c)^2/(a-b)^2/(-b+_a))-2*_a*a2*b*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a
-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+
_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c
)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^
3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a
)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-_a*a3*b*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(
a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)
^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4
*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)
^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3
*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+a*a1*b*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)
-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)
^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b
+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c
```

^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3
/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+2*a*a2*b*c*(-a^4/(a-c)^2/(a-b)
^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4
*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-
b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b
+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c
^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+a*a3*b*c*(-a^4/(a-c)
^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a
+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-
c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)
^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_
a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-_a*a0*b^3*c*
(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a
-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a
)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b
-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c
)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-4
*_a*a0*b^2*c^2*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2
*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2
/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_
a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c
^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-
b)^2/(-b+_a))-_a*a0*b*c^3*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln
(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-
c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b
)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+
_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/
(b-c)^2/(a-b)^2/(-b+_a))+a^3*a0*b*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/
(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-
a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b
-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c
)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+
_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+4*a^2*a0*b^2*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-
2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^
3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+
_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^
3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/
(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+4*a^2*a0*b*c^2*(-a^4/(a-c)^2/(a
-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*
c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/
(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln
(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-
2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+a*a0*b^3*c*(-a^4/
(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*
ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^
4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/
(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln

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(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+4*a*a0*
b^2*c^2*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a
-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^
2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+
2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c
)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-
b+_a))+a*a0*b*c^3*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*
b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c
)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-
b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-
2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/
(a-b)^2/(-b+_a))-4*_a^3*a*a0*b*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)
^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)
*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3
/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*l
n(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b
-b^4/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^3*a*a0*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/
(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b
)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-
4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c
)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^
3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^3*a0*b*c*(-a^4/(a-c)^2/(a-b)^2/(
-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3
/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3
*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)
*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(
b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+5*_a^2*a^2*a0*b*(-a^4/(a
-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln
(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/
(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a
-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-
c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+5*_a^2*a^
2*a0*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-
c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2
/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2
*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)
^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b
+_a))+5*_a^2*a*a0*b^2*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+
_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/
(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*
ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*
a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c
)^2/(a-b)^2/(-b+_a))+5*_a^2*a*a0*c^2*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3
/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(
-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(
b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-
c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c
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+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+5*_a^2*a0*b^2*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a
)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c
)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-
b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*
c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^
3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))+5*_a^2*a0*b*c^2*(-a^4/(a-c)^2
/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_
a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)
^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3
*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)
*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-_a*a^3*a0*b*(-
a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b
)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+
2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c
)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^
3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-_a*
a^3*a0*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(
a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)
^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a
+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-
c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(
-b+_a))-4*_a*a^2*a0*b^2*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-
a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^
4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^
3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a
)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b
-c)^2/(a-b)^2/(-b+_a))-4*_a*a^2*a0*c^2*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)
^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*l
n(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3
/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(
a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(
-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-_a*a*a0*b^3*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-
2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^
3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+
_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^
3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/
(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-_a*a*a0*c^3*(-a^4/(a-c)^2/(a-b)
^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4
*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-
b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b
+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c
^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-_a*a*a1*b*(-a^4/(a-c
)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-
a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b
-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b
)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+
_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a^3*
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a3*b*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)
^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b
-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(
-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-
c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(
-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-8*_a^2*a^2
*a2*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a
-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*
c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*
ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/
(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*
ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^2*
a^2*a3*b^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3
/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_
a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)
^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b
+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)
^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-4*_a
^2*a*a2*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^
3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+
_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b
)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*
b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c
)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-2*_
a^2*a*a3*b^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)
^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a
+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-
b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c
*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-
c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-2*
_a^2*a1*b^3*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c
)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-
a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a
-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*
c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a
-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-4
*_a^2*a1*b^2*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(
a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*l
n(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3
/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_
a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3
/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a)
)-2*_a^2*a1*b*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/
(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*
ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^
3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+
_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^
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3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a
))+4*_a*a^3*a2*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1
/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3
*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)
^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b
+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)
^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_
a))+2*_a*a^3*a3*b^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+
1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^
3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c
)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-
b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c
)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+
_a))+4*_a*a^2*a2*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2
+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)
^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-
c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(
-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-
c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b
+_a))+2*_a*a^2*a3*b^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^
2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b
)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b
-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln
(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b
-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-
b+_a))+2*_a*a1*b^3*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a
^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-
b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(
b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*l
n(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(
b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(
-b+_a))+2*_a*a1*b^2*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*
a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a
-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/
(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*
ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/
(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/
(-b+_a))-4*a^3*a2*b*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*
a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a
-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/
(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*
ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/
(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/
(-b+_a))-2*a^3*a3*b^2*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*
a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a
-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/
(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*
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ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/
(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/
(-b+_a))-2*a^3*a0*b^3*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a
)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/
(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-
1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^
3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+
1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^
2/(-b+_a))-2*a^3*a0*b^2*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+
_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^
3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*
b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b
)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*
a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b
)^2/(-b+_a))-2*a^2*a0*b^3*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-
a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c
)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*
a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a
-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*
c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a
-b)^2/(-b+_a))-4*a^2*a2*b*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-
a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c
)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*
a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a
-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*
c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a
-b)^2/(-b+_a))-2*a^2*a3*b^3*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-
a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c
)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*
a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a
-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*
c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a
-b)^2/(-b+_a))-2*a*a1*b^3*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-
a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c
)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*
a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a
-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*
c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a
-b)^2/(-b+_a))-2*a*a1*b^2*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-
a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c
)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*
a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a
-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*
c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a
-b)^2/(-b+_a))+4*_a^3*a^2*a2*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(
-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-
c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)
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*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(
a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)
*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(
a-b)^2/(-b+_a))+2*_a^3*a^2*a3*b*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln
(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a
-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a
)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/
(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a
)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/
(a-b)^2/(-b+_a))+4*_a^3*a*a2*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*l
n(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(
a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_
a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3
/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_
a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2
/(a-b)^2/(-b+_a))+2*_a^3*a*a3*b^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*
ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/
(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+
_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^
3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+
_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^
2/(a-b)^2/(-b+_a))+2*_a^3*a1*b^2*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3
*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1
/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b
+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)
^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c
+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)
^2/(a-b)^2/(-b+_a))+2*_a^3*a1*b*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^
3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+
1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-
b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c
)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-
c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c
)^2/(a-b)^2/(-b+_a))-4*_a^2*a^3*a2*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)
^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a
+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(
-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-
c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(
-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-
c)^2/(a-b)^2/(-b+_a))-_a*a*a0*c*(_a-a^6/(a-c)^2/(a-b)^2/(-a+_a)-b^6/(b-c)^2/(a-b
)^2/(-b+_a)+2*a^7/(a-c)^3/(a-b)^3*ln(-a+_a)-4*a^6/(a-c)^3/(a-b)^3*ln(-a+_a)*b-4*
a^6/(a-c)^3/(a-b)^3*ln(-a+_a)*c+6*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^6/(b-c)^2/
(a-c)^2/(-c+_a)+4*b^6/(b-c)^3/(a-b)^3*ln(-b+_a)*a-6*b^5/(b-c)^3/(a-b)^3*ln(-b+_a
)*c*a-2*b^7/(b-c)^3/(a-b)^3*ln(-b+_a)+4*b^6/(b-c)^3/(a-b)^3*ln(-b+_a)*c+6*c^5/(b
-c)^3/(a-c)^3*ln(-c+_a)*a*b-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a)*a-4*c^6/(b-c)^3/(a-c
)^3*ln(-c+_a)*b+2*c^7/(b-c)^3/(a-c)^3*ln(-c+_a))-_a*a0*b*c*(_a-a^6/(a-c)^2/(a-b)
^2/(-a+_a)-b^6/(b-c)^2/(a-b)^2/(-b+_a)+2*a^7/(a-c)^3/(a-b)^3*ln(-a+_a)-4*a^6/(a-
```

c)^3/(a-b)^3*ln(-a+_a)*b-4*a^6/(a-c)^3/(a-b)^3*ln(-a+_a)*c+6*a^5/(a-c)^3/(a-b)^3
*ln(-a+_a)*c*b-c^6/(b-c)^2/(a-c)^2/(-c+_a)+4*b^6/(b-c)^3/(a-b)^3*ln(-b+_a)*a-6*b
^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-2*b^7/(b-c)^3/(a-b)^3*ln(-b+_a)+4*b^6/(b-c)^3/(
a-b)^3*ln(-b+_a)*c+6*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-4*c^6/(b-c)^3/(a-c)^3*ln(
-c+_a)*a-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a)*b+2*c^7/(b-c)^3/(a-c)^3*ln(-c+_a))+a*a0
*b*c*(_a-a^6/(a-c)^2/(a-b)^2/(-a+_a)-b^6/(b-c)^2/(a-b)^2/(-b+_a)+2*a^7/(a-c)^3/(
a-b)^3*ln(-a+_a)-4*a^6/(a-c)^3/(a-b)^3*ln(-a+_a)*b-4*a^6/(a-c)^3/(a-b)^3*ln(-a+_
a)*c+6*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^6/(b-c)^2/(a-c)^2/(-c+_a)+4*b^6/(b-c)
^3/(a-b)^3*ln(-b+_a)*a-6*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-2*b^7/(b-c)^3/(a-b)^3
*ln(-b+_a)+4*b^6/(b-c)^3/(a-b)^3*ln(-b+_a)*c+6*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b
-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a)*a-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a)*b+2*c^7/(b-c)
^3/(a-c)^3*ln(-c+_a))-_C1*_a^2*a+_a^3*_C1+5*_a^2*a1*b^2*c*(-a^2/(a-c)^2/(a-b)^2/
(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b
-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+
_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b
-c)^2/(a-b)^2/(-b+_a))+5*_a^2*a1*b*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(
a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_
a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(
a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_
a))+2*_a^2*a2*b*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^
3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^
3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*
a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a3*b^2*c*(
-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*l
n(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(
b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3
*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-2*_a*a^3*a2*b*(-a^2/(a-c)^2/(a-b)^2/
(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b
-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+
_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b
-c)^2/(a-b)^2/(-b+_a))-2*_a*a^3*a2*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-
b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)
-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-
c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a)
)-_a*a^3*a3*b*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a
-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-
b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/
(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-_a*a^3*a3*c*(-a^2/(a-
c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)
*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(
a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_
a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-8*_a*a^2*a2*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a
)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/
(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^
3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/
(a-b)^2/(-b+_a))-4*_a*a^2*a3*b^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3
*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(

b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3
*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-_a
*a*a1*b^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^
3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a
)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c
)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-_a*a*a1*c^3*(-a^2/(a-c)^2
/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c
*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)
^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c
^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-_a^3*a^2*a0*b^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/
(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c
)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/
(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b
)^2/(-b+_a))-_a^3*a^2*a0*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(
-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)
^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(
-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-_a^3*a
0*b^2*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^
3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a
)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c
)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a^3*a0*b^2*(-a^2/(a-
c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)
*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(
a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_
a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a^3*a0*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a
)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/
(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^
3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/
(a-b)^2/(-b+_a))+_a^2*a^2*a0*b^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3
*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(
b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3
*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+_a
^2*a^2*a0*c^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a
-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-
b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/
(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a0*b^3*c^2*(-a^2
/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a
+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)
^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(
-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a0*b^2*c^3*(-a^2/(a-c)^2/(a-b)^2/(-
a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c
)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a
)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c
)^2/(a-b)^2/(-b+_a))-_a*a^3*a0*b^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)
^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2
/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)
^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-

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_a*a^3*a0*c^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a
-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-
b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/
(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-_a*a0*b^3*c^3*(-a^2/(
a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_
a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3
/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c
+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+a^3*a0*b^3*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)
-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(
a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3
+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(
a-b)^2/(-b+_a))+4*a^3*a0*b^2*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3
*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(
b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3
*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+a^
3*a0*b*c^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)
^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_
a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-
c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+4*a^2*a0*b^3*c^2*(-a^2/(
a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_
a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3
/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c
+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+4*a^2*a0*b^2*c^3*(-a^2/(a-c)^2/(a-b)^2/(-a
+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)
^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)
*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)
^2/(a-b)^2/(-b+_a))+a*a0*b^3*c^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3
*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(
b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3
*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-2*
_a*a*a2*c^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c
)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+
_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b
-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-_a*a*a3*b^3*(-a^2/(a-c)
^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a
*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-
b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)
*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-_a*a1*b^3*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a
-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^
2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b
-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^
2/(-b+_a))-4*_a*a1*b^2*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a
+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3
/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c
+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-_a*a1*b*
c^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b
)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*
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a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a
-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-2*_a*a2*b*c^3*(-a^2/(a-c)^2/(a-
b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c
^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*l
n(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b
^2/(b-c)^2/(a-b)^2/(-b+_a))-_a*a3*b^3*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/
(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+
_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/
(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+
_a))+2*a^3*a2*b*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+
2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*
ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*
b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+a^3*a3*b*c*(-a^2/
(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+
_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^
3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-
c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+8*a^2*a2*b*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+
_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^
2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*
b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^
2/(a-b)^2/(-b+_a))+4*a^2*a3*b^2*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^
3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/
(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^
3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+a
*a1*b^3*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^
3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a
)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c
)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+4*a*a1*b^2*c^2*(-a^2/(a-c
)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*
a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a
-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a
)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+a*a1*b*c^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a
-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^
2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b
-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^
2/(-b+_a))+2*a*a2*b*c^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a
)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a
-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a
)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+a*a3*b^3*c*
(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*
ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/
(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^
3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-8*_a^3*a*a2*c*(-a^2/(a-c)^2/(a-b)^2
/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(
b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b
+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(
b-c)^2/(a-b)^2/(-b+_a))-4*_a^3*a*a3*b*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a
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-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a
)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a
-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a
))-4*_a^3*a1*b*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2
/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*l
n(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b
-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^2*a^2*a2*b*(-
a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln
(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b
-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*
ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+10*_a^2*a^2*a2*c*(-a^2/(a-c)^2/(a-b)^
2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/
(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-
b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/
(b-c)^2/(a-b)^2/(-b+_a))+5*_a^2*a^2*a3*b*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3
/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c
+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3
/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b
+_a))+_a^2*a^2*a3*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^
3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^
3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*
a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a*a1*b^2*(
-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*l
n(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(
b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3
*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a*a1*c^2*(-a^2/(a-c)^2/(a-b)^2/
(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b
-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+
_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b
-c)^2/(a-b)^2/(-b+_a))+10*_a^2*a*a2*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/
(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+
_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/
(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+
_a))+5*_a^2*a*a3*b^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a
^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)
^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c
*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^3*a*a0*b*
c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b
)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*
a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a
-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+4*_a^2*a^3*a0*b*c*(-a^2/(a-c)^2
/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c
*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)
^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c
^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+9*_a^2*a^2*a0*b^2*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a
)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/
(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^

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3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/
(a-b)^2/(-b+_a))+9*_a^2*a^2*a0*b*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-
b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)
-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-
c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a)
)+4*_a^2*a*a0*b^3*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^
3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^
3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*
a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+9*_a^2*a*a0*b^2
*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-
b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c
*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(
a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+4*_a^2*a*a0*b*c^3*(-a^2/(a-c)^
2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*
c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b
)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*
c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-5*_a*a^3*a0*b^2*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)
-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(
a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3
+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(
a-b)^2/(-b+_a))-5*_a*a^3*a0*b*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^
3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/
(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^
3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-5
*_a*a^2*a0*b^3*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2
/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*l
n(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b
-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-12*_a*a^2*a0*b^2*c
^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)
^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a
+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-
c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-5*_a*a^2*a0*b*c^3*(-a^2/(a-c)^2/
(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*
b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^
3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^
3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-5*_a*a*a0*b^3*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2
/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-
c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2
/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-
b)^2/(-b+_a))-5*_a*a*a0*b^2*c^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*
ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b
-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*
ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+4*_
a^2*a*a1*b*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-
c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b
+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(
b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+8*_a^2*a*a2*b*c*(-a^2/
```

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(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+
_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^
3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-
c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+4*_a^2*a*a3*b*c*(-a^2/(a-c)^2/(a-b)^2/(-a
+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)
^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)
*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)
^2/(a-b)^2/(-b+_a))-10*_a*a^2*a2*b*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-
b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)
-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-
c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a)
)-5*_a*a^2*a3*b*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+
2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*
ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*
b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-5*_a*a*a1*b^2*c*(
-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*l
n(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(
b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3
*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-5*_a*a*a1*b*c^2*(-a^2/(a-c)^2/(a-b)^
2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/
(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-
b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/
(b-c)^2/(a-b)^2/(-b+_a))-10*_a*a*a2*b*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^
3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-
c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^
3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-
b+_a))-5*_a*a*a3*b^2*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)
*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-
b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)
*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^3*a^2*a
0*b*c*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a
-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*
c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/
(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^3*a*a0*b^2*c*(-a^2/(a-c)
^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a
*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-
b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)
*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+8*_a^3*a*a0*b*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-
1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b
)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+
_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c
)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln
(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^
3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-12*_a^2*a^2*a0*
b*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b
)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a
)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^
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3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln
(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^
3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^
2/(a-b)^2/(-b+_a))-12*_a^2*a*a0*b^2*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a
-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a
)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^
3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*
ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*
a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^
3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-12*_a^2*a*a0*b*c^2*(-a^3/(a
-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a
)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^
3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln
(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*
c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^
3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-
b+_a))+4*_a*a^3*a0*b*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)
*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)
^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b
+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1
/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(
a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c
+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+12*_a*a^2*a0*b^2*c*(-a^3/(a-c)^2/(a-b)^2/(
-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)
^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)
^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a
+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-
c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c
+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+12*_a*a^
2*a0*b*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)
^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*l
n(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3
/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-
b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c
+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3
/(b-c)^2/(a-b)^2/(-b+_a))+4*_a*a*a0*b^3*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^
3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-
a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b
-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b
)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*
c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b
-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+12*_a*a*a0*b^2*c^2*(-a^
3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-
a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*
b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^
3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*
b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b
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-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^
2/(-b+_a))+4*_a*a*a0*b*c^3*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a
+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(
a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*l
n(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b
^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)
^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*l
n(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+4*_a*a*a1*b*c*(-a^3/(a-c)^2/(a-b)^2/(-
a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^
3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^
2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+
1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c
)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+
_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+8*_a*a*a2
*b*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-
b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_
a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)
^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*l
n(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c
^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)
^2/(a-b)^2/(-b+_a))+4*_a*a*a3*b*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^
3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^
3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a
-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-
b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-
1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a
-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+12*_a^2*a*a0*b*c*(-a^4/(a-c)^2/
(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a
)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^
3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*
ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*
a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-9*_a*a^2*a0*b*c
*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(
a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_
a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(
b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-
c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-
9*_a*a*a0*b^2*c*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-
2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^
2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+
_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*
c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a
-b)^2/(-b+_a))-9*_a*a*a0*b*c^2*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)
^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)
*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3
/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*l
n(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b
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-b^4/(b-c)^2/(a-b)^2/(-b+_a))+6*_a*a*a0*b*c*(-a^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b
-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+
_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/
(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*
ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*
c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^
3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c+_a))+2*_a*a0*b^2*c*(-a^5/(a-c)^2
/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a^5
/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(a-
b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*a
-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)^3
/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3*l
n(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c+_a))+2*_a
*a0*b*c^2*(-a^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/
(a-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+
_a)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c
)^3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*
ln(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-
3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/
(a-c)^3*ln(-c+_a))-2*a^2*a0*b*c*(-a^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^
2/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/
(a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c
)^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*
a-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/
(a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln
(-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c+_a))-2*a*a0*b^2*c*(-a^5/(a-c)^2/(a-b)^2/(-a+
_a)-b^5/(b-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b
)^3*ln(-a+_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a
)*c*b-c^5/(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^
3/(a-b)^3*ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-
b+_a)*c+5*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*
c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c+_a))-2*a*a0*b*c^2*(-a^
5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a+
_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(a
-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*ln
(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b^
5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3/
(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c+
_a))-4*_a^2*a*a0*b*(-a^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^2/(-b+_a)+a^6
/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/(a-c)^3/(a-b)
^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c)^2/(-c+_a)+3
*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-b^6/(b-c)^3
/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/(a-c)^3*ln(-c
+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*b+c^6
/(b-c)^3/(a-c)^3*ln(-c+_a))-4*_a^2*a*a0*c*(-a^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b-c
)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a
)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/(b
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-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*ln
(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*c^
4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^3/
(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c+_a))-4*_a^2*a0*b*c*(-a^5/(a-c)^2/(
a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a^5/(
a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(a-b)
^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*a-5
*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)^3/(
a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3*ln(
-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c+_a))+2*_a*a
^2*a0*b*(-a^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/(a
-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a
)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c)^
3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*ln
(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-3*
c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/(a
-c)^3*ln(-c+_a))+2*_a*a^2*a0*c*(-a^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^2
/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/(
a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c)
^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a
-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/(
a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln(
-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c+_a))+2*_a*a*a0*b^2*(-a^5/(a-c)^2/(a-b)^2/(-a+
_a)-b^5/(b-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a+_a)-3*a^5/(a-c)^3/(a-b
)^3*ln(-a+_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(a-c)^3/(a-b)^3*ln(-a+_a
)*c*b-c^5/(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*a-5*b^4/(b-c)^
3/(a-b)^3*ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b^5/(b-c)^3/(a-b)^3*ln(-
b+_a)*c+5*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a-3*
c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c+_a))+2*_a*a*a0*c^2*(-a
^5/(a-c)^2/(a-b)^2/(-a+_a)-b^5/(b-c)^2/(a-b)^2/(-b+_a)+a^6/(a-c)^3/(a-b)^3*ln(-a
+_a)-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*b-3*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c+5*a^4/(
a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^5/(b-c)^2/(a-c)^2/(-c+_a)+3*b^5/(b-c)^3/(a-b)^3*l
n(-b+_a)*a-5*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-b^6/(b-c)^3/(a-b)^3*ln(-b+_a)+3*b
^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c+5*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-3*c^5/(b-c)^3
/(a-c)^3*ln(-c+_a)*a-3*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*b+c^6/(b-c)^3/(a-c)^3*ln(-c
+_a))-2*_a^3*a^2*a2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^
3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^
3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*
a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-_a^3*a^2*a3*(-a
^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(
-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-
c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*l
n(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-_a^3*a1*b^2*(-a^2/(a-c)^2/(a-b)^2/(-a+
_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^
2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*
b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^
2/(a-b)^2/(-b+_a))-_a^3*a1*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*l
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n(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-
c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*l
n(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-2*_a
^3*a2*c^2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^
3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a
)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c
)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))-_a^3*a3*b^2*(-a^2/(a-c)^2
/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c
*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)
^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c
^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^2*a^3*a2*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a
-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^
2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b
-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^
2/(-b+_a))+_a^2*a^3*a3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)
*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-
b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)
*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a1*b^3*
(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*
ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/
(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^
3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a1*c^3*(-a^2/(a-c)^2/(a-b)^2/(
-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-
c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_
a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-
c)^2/(a-b)^2/(-b+_a))+2*_a^2*a2*c^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b
)^3*ln(-a+_a)*a^3+2/(a-c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-
2/(b-c)^3/(a-b)^3*ln(-b+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c
)^3*ln(-c+_a)*c*a*b-2/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))
+_a^2*a3*b^3*(-a^2/(a-c)^2/(a-b)^2/(-a+_a)-2/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3+2/(a-
c)^3/(a-b)^3*ln(-a+_a)*a*c*b-c^2/(b-c)^2/(a-c)^2/(-c+_a)-2/(b-c)^3/(a-b)^3*ln(-b
+_a)*b*c*a+2/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3+2/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a*b-2/(
b-c)^3/(a-c)^3*ln(-c+_a)*c^3-b^2/(b-c)^2/(a-b)^2/(-b+_a))+4*_a*a^2*a2*c*(-a^3/(a
-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a
)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^
3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln
(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*
c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^
3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-
b+_a))+2*_a*a^2*a3*b*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a
^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3
/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_
a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(
b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-
c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_
a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*a^2*a3*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-
1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b
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)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+
_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c
)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln
(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^
3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*a*a1*b^2*(
-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*l
n(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2
*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-
b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_
a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1
/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-
b)^2/(-b+_a))-8*a^2*a0*b^2*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*l
n(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c
+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)
^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_
a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(
b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)
^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*a^2*a0*b*c^3*(-a^3/(a-c)^2/(a-b)
^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(
a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(
a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2
*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3
/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*l
n(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*a*
a0*b^3*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)
^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*l
n(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3
/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-
b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c
+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3
/(b-c)^2/(a-b)^2/(-b+_a))-2*a*a0*b^2*c^3*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3
/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a
+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-
c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)
^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c
^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-
c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^3*a^2*a0*c*(-a^3/(a
-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a
)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^
3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln
(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*
c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^
3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-
b+_a))+2*_a^3*a*a0*b^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)
*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)
^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b
+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1

/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(
a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c
+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^3*a*a0*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+
_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/
(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/
(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/
(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^
3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a
)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^3*a0*b
^2*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-
b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_
a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)
^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*l
n(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c
^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)
^2/(a-b)^2/(-b+_a))+2*_a^3*a0*b*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b
)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*
a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/
(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln
(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*
b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/
(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a^3*a0*b*(-a^3/(a-c)^2
/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3
*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-
c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_
a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(
b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-
c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a)
)-2*_a^2*a^3*a0*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-
1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a
-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*
b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c
)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^
3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*
c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^2*a^2*a0*b^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)
-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-
b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c
+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-
c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*l
n(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c
^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^2*a^2*a0*
c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b
)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a
)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^
3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln
(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^
3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^

2/(a-b)^2/(-b+_a))-2*_a^2*a*a0*b^3*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)
^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a
^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(
a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(
-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b
-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(
a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a*a0*c^3*(-a^3/(a-c)^2/
(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*
b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c
)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a
)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b
-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c
)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))
-2*_a^2*a0*b^3*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1
/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-
b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b
^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)
^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3
*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c
^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^2*a0*b^2*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-
1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b
)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+
_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c
)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln
(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^
3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a0*b*c^3
*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3
*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a
^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(
a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b
+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a
-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(
a-b)^2/(-b+_a))+2*_a*a^3*a0*b^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*
ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*
c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b
)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+
_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/
(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c
)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*a^3*a0*c^2*(-a^3/(a-c)^2/(a-
b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1
/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2
/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b
^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)
^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3
*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*
_a*a^2*a0*b^3*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a
-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^

3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*
a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/
(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln
(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-
b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*a^2*a0*c^3*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-
c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*l
n(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1
/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(
a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_
a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1
/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*a0*b^3*c^2*(-a^
3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-
a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*
b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^
3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*
b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b
-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^
2/(-b+_a))+2*_a*a0*b^2*c^3*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a
+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(
a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*l
n(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b
^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)
^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*l
n(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*a^3*a0*b^2*c*(-a^3/(a-c)^2/(a-b)^2/(
-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)
^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)
^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a
+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-
c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c
+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*a^3*a0
*b*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(
a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a
+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-
c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3
*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)
*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-
c)^2/(a-b)^2/(-b+_a))-2*a^2*a0*b^3*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-
b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)
*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3
/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*l
n(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a
*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3
/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^3*a^2*a0*b*(-a^3/(a-c)^
2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^
3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b
-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+
_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/

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(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a
-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a
))+2*_a*a*a1*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1
/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-
b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b
^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)
^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3
*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c
^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+4*_a*a*a2*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a
-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*
ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+
1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/
(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+
_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-
1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*a*a3*b^2*(-a^3
/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a
+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b
-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3
*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b
^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-
c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2
/(-b+_a))+2*_a*a1*b^2*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a
)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c
)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-
b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+
1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/
(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-
c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*a1*b*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_
a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(
a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(
-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(
b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3
*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)
*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+4*_a*a2*b*c^
2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^
3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*
a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/
(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-
b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*
a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/
(a-b)^2/(-b+_a))+2*_a*a3*b^2*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*l
n(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c
+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)
^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_
a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(
b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)
^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-4*a^2*a2*b*c*(-a^3/(a-c)^2/(a-b)^2
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/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-
c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-
c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c
*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(
a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(
-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*a^2*
a3*b*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(
a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a
+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-
c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3
*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)
*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-
c)^2/(a-b)^2/(-b+_a))-2*a*a1*b^2*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)
^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a
^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(
a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(
-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b
-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(
a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*a*a1*b*c^2*(-a^3/(a-c)^2/(a-
b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1
/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2
/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b
^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)
^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3
*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-4*
a*a2*b*c^2*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)
^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*l
n(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3
/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-
b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c
+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3
/(b-c)^2/(a-b)^2/(-b+_a))-2*a*a3*b^2*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(
a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_
a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)
^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3
*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2
*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)
^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a*a1*b*(-a^3/(a-c)^
2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^
3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b
-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+
_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/
(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a
-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a
))-2*_a^2*a*a1*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1
/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-
b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b
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^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)
^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3
*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c
^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^2*a*a2*b*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a
-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*
ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+
1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/
(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+
_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-
1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a^2*a0*b^2*c^3
*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(
-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)
^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-
c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_
a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))-_a*a^3*a0*b^3*c^2*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/
(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-
a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^
3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c
)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))
-_a*a^3*a0*b^2*c^3*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(
a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_
a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3
*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)
^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))-_a*a^2*a0*b^3*c^3*(-1/(a-c)^2/
(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a
-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*
b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*
ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^
2/(a-b)^2/(-b+_a))+2*_a^2*a^2*a2*b*c^2*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-
b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(
b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)
*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3
*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a^2*a
3*b^2*c*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b
)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^
3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*
a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*
ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a*a1*b^2*c^2*(-1/(a-c)^2/(a-b)^2/(-a
+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)
^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3
/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b
-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(
-b+_a))-2*_a*a^3*a2*b*c^2*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a
)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^
2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/
(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+
2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))-_a*a^3*a3*b^2*c*(-1/(a-

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c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c
+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b
+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-
c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(
b-c)^2/(a-b)^2/(-b+_a))-2*_a*a^2*a2*b*c^3*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/
(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-
1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+
_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c
)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))-_a*a^2*
a3*b^3*c*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-
b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)
^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)
*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3
*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))-_a*a*a1*b^3*c^2*(-1/(a-c)^2/(a-b)^2/(-a+
_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^
3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/
(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-
4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-
b+_a))-_a*a*a1*b^2*c^3*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a
+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(
-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-
b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(
b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))-_a^3*a^2*a0*b^2*c^2*(-1/(a
-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*
c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-
b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a
-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/
(b-c)^2/(a-b)^2/(-b+_a))+_a^2*a^3*a0*b^2*c^2*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)
^3/(a-b)^3*ln(-a+_a)*a+2/(a-c)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)
*b-1/(b-c)^2/(a-c)^2/(-c+_a)+4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(
-b+_a)*c-2/(b-c)^3/(a-b)^3*ln(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(
a-c)^3*ln(-c+_a)*c+2/(b-c)^3/(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))+_a^2
*a^2*a0*b^3*c^2*(-1/(a-c)^2/(a-b)^2/(-a+_a)-4/(a-c)^3/(a-b)^3*ln(-a+_a)*a+2/(a-c
)^3/(a-b)^3*ln(-a+_a)*c+2/(a-c)^3/(a-b)^3*ln(-a+_a)*b-1/(b-c)^2/(a-c)^2/(-c+_a)+
4/(b-c)^3/(a-b)^3*ln(-b+_a)*b-2/(b-c)^3/(a-b)^3*ln(-b+_a)*c-2/(b-c)^3/(a-b)^3*ln
(-b+_a)*a+2/(b-c)^3/(a-c)^3*ln(-c+_a)*b-4/(b-c)^3/(a-c)^3*ln(-c+_a)*c+2/(b-c)^3/
(a-c)^3*ln(-c+_a)*a-1/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^3*a^2*a0*b^2*c*(-a/(a-c)^2/(
a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1
/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2
/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)
^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c
+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)
^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^3*a^2*a0*b*c^2*(-a/(a-c
)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*
a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a
-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/
(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*
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ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/
(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+2*_a^3*a*a0*b^2*c^2*(-a
/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a
+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)
^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c
*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-
c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c
*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a^3*a0*b^2*
c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*
ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/
(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+
_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^
3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+
_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a^3*a0
*b*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-
b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c
*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*l
n(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(
b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*l
n(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a
^2*a0*b^3*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^
3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+
_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b
)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*
b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c
)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-6*_
a^2*a^2*a0*b^2*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1
/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3
*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)
^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b
+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)
^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_
a))-2*_a^2*a^2*a0*b*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*
a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a
-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/
(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*
ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/
(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/
(-b+_a))-2*_a^2*a*a0*b^3*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a
+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)
^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a
*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-
b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c
*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-
b)^2/(-b+_a))-2*_a^2*a*a0*b^2*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*
ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/
(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+
```

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_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^
3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+
_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^
2/(a-b)^2/(-b+_a))+2*_a*a^3*a0*b^3*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)
^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a
+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(
-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-
c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(
-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-
c)^2/(a-b)^2/(-b+_a))+4*_a*a^3*a0*b^2*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/
(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a
)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^
3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-
1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^
3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-
b/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*a^3*a0*b*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)
^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a
+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-
b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b
^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-
c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c
^2-b/(b-c)^2/(a-b)^2/(-b+_a))+4*_a*a^2*a0*b^3*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/
(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*
ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^
3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+
_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^
3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+
_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+4*_a*a^2*a0*b^2*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_
a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-
b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(
b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*l
n(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(
b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*l
n(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*a*a0*b^3*c^3*(-a/(a-c)^2/(a-b)^2/(-
a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/
(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-
1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^
3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+
1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^
3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^2*a^2*a2*b*c*(-a/(a-c)^2/(a-b)^2
/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)
^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_
a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-
b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a
*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-
c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a^2*a3*b*c*(-a/(a-c)^2/(a-b
)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a
```

-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a*a1*b^2*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a*a1*b*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^2*a*a2*b*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a*a3*b^2*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+4*_a*a^3*a2*b*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*a^3*a3*b*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+8*_a*a^2*a2*b*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+4*_a*a^2*a3*b^

```
2*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)^
3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-
c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(-
b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-c
)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(-
c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*a*a1*b
^3*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a-b)
^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b
-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*ln(
-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/(b-
c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*ln(
-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+4*_a*a*a1*
b^2*c^2*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(a
-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)*
c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3*
ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1/
(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3*
ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*a*
a1*b*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/(
a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a)
*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^3
*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+1
/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^3
*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+4*_a*a
*a2*b*c^3*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3/
(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_a
)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)^
3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b+
1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)^
3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+2*_a*
a*a3*b^3*c*(-a/(a-c)^2/(a-b)^2/(-a+_a)-3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2+1/(a-c)^3
/(a-b)^3*ln(-a+_a)*a*b+1/(a-c)^3/(a-b)^3*ln(-a+_a)*c*a+1/(a-c)^3/(a-b)^3*ln(-a+_
a)*c*b-c/(b-c)^2/(a-c)^2/(-c+_a)-1/(b-c)^3/(a-b)^3*ln(-b+_a)*a*b-1/(b-c)^3/(a-b)
^3*ln(-b+_a)*c*a+3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2-1/(b-c)^3/(a-b)^3*ln(-b+_a)*c*b
+1/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b+1/(b-c)^3/(a-c)^3*ln(-c+_a)*c*a+1/(b-c)^3/(a-c)
^3*ln(-c+_a)*c*b-3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2-b/(b-c)^2/(a-b)^2/(-b+_a))+_a^2
*a*a0*(_a-a^6/(a-c)^2/(a-b)^2/(-a+_a)-b^6/(b-c)^2/(a-b)^2/(-b+_a)+2*a^7/(a-c)^3/
(a-b)^3*ln(-a+_a)-4*a^6/(a-c)^3/(a-b)^3*ln(-a+_a)*b-4*a^6/(a-c)^3/(a-b)^3*ln(-a+
_a)*c+6*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^6/(b-c)^2/(a-c)^2/(-c+_a)+4*b^6/(b-c
)^3/(a-b)^3*ln(-b+_a)*a-6*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-2*b^7/(b-c)^3/(a-b)^
3*ln(-b+_a)+4*b^6/(b-c)^3/(a-b)^3*ln(-b+_a)*c+6*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a*
b-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a)*a-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a)*b+2*c^7/(b-c
)^3/(a-c)^3*ln(-c+_a))+_a^2*a0*b*(_a-a^6/(a-c)^2/(a-b)^2/(-a+_a)-b^6/(b-c)^2/(a-
b)^2/(-b+_a)+2*a^7/(a-c)^3/(a-b)^3*ln(-a+_a)-4*a^6/(a-c)^3/(a-b)^3*ln(-a+_a)*b-4
*a^6/(a-c)^3/(a-b)^3*ln(-a+_a)*c+6*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^6/(b-c)^2
/(a-c)^2/(-c+_a)+4*b^6/(b-c)^3/(a-b)^3*ln(-b+_a)*a-6*b^5/(b-c)^3/(a-b)^3*ln(-b+_
a)*c*a-2*b^7/(b-c)^3/(a-b)^3*ln(-b+_a)+4*b^6/(b-c)^3/(a-b)^3*ln(-b+_a)*c+6*c^5/(
```

b-c)^3/(a-c)^3*ln(-c+_a)*a*b-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a)*a-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a)*b+2*c^7/(b-c)^3/(a-c)^3*ln(-c+_a))+_a^2*a0*c*(_a-a^6/(a-c)^2/(a-b)^2/(-a+_a)-b^6/(b-c)^2/(a-b)^2/(-b+_a)+2*a^7/(a-c)^3/(a-b)^3*ln(-a+_a)-4*a^6/(a-c)^3/(a-b)^3*ln(-a+_a)*b-4*a^6/(a-c)^3/(a-b)^3*ln(-a+_a)*c+6*a^5/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^6/(b-c)^2/(a-c)^2/(-c+_a)+4*b^6/(b-c)^3/(a-b)^3*ln(-b+_a)*a-6*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-2*b^7/(b-c)^3/(a-b)^3*ln(-b+_a)+4*b^6/(b-c)^3/(a-b)^3*ln(-b+_a)*c+6*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a)*a-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a)*b+2*c^7/(b-c)^3/(a-c)^3*ln(-c+_a))-8*_a^2*a*a2*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^2*a*a3*b*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a*a3*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-4*_a^2*a1*b*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a2*b*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^2*a3*b*c*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))+4*_a*a^2*a2*b*(-a^3/(a-c)^2/(a-b)^2/(-a+_a)-1/(a-c)^3/(a-b)^3*ln(-a+_

```
a)*a^4-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*b-1/(a-c)^3/(a-b)^3*ln(-a+_a)*a^3*c+3/(a-
c)^3/(a-b)^3*ln(-a+_a)*a^2*c*b-c^3/(b-c)^2/(a-c)^2/(-c+_a)+1/(b-c)^3/(a-b)^3*ln(
-b+_a)*b^3*a-3/(b-c)^3/(a-b)^3*ln(-b+_a)*b^2*c*a+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^4
+1/(b-c)^3/(a-b)^3*ln(-b+_a)*b^3*c+3/(b-c)^3/(a-c)^3*ln(-c+_a)*c^2*a*b-1/(b-c)^3
/(a-c)^3*ln(-c+_a)*c^3*a-1/(b-c)^3/(a-c)^3*ln(-c+_a)*c^3*b-1/(b-c)^3/(a-c)^3*ln(
-c+_a)*c^4-b^3/(b-c)^2/(a-b)^2/(-b+_a))-2*_a^3*a2*(-a^4/(a-c)^2/(a-b)^2/(-a+_a)-
2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3/(a-c)^
3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3*ln(-b+
_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)*c+4*c^
3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(b-c)^3/
(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-_a^3*a3*(-a^4/(a-c)^2/(a-b)^2/(
-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*c+4*a^3
/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/(a-b)^3
*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln(-b+_a)
*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-2*c^4/(
b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-_a^3*a1*(-a^4/(a-c)^2/(a
-b)^2/(-a+_a)-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*b-2*a^4/(a-c)^3/(a-b)^3*ln(-a+_a)*
c+4*a^3/(a-c)^3/(a-b)^3*ln(-a+_a)*c*b-c^4/(b-c)^2/(a-c)^2/(-c+_a)+2*b^4/(b-c)^3/
(a-b)^3*ln(-b+_a)*a-4*b^3/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a+2*b^4/(b-c)^3/(a-b)^3*ln
(-b+_a)*c+4*c^3/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*a-
2*c^4/(b-c)^3/(a-c)^3*ln(-c+_a)*b-b^4/(b-c)^2/(a-b)^2/(-b+_a))-_a^3*a0*(_a-a^6/(
a-c)^2/(a-b)^2/(-a+_a)-b^6/(b-c)^2/(a-b)^2/(-b+_a)+2*a^7/(a-c)^3/(a-b)^3*ln(-a+_
a)-4*a^6/(a-c)^3/(a-b)^3*ln(-a+_a)*b-4*a^6/(a-c)^3/(a-b)^3*ln(-a+_a)*c+6*a^5/(a-
c)^3/(a-b)^3*ln(-a+_a)*c*b-c^6/(b-c)^2/(a-c)^2/(-c+_a)+4*b^6/(b-c)^3/(a-b)^3*ln(
-b+_a)*a-6*b^5/(b-c)^3/(a-b)^3*ln(-b+_a)*c*a-2*b^7/(b-c)^3/(a-b)^3*ln(-b+_a)+4*b
^6/(b-c)^3/(a-b)^3*ln(-b+_a)*c+6*c^5/(b-c)^3/(a-c)^3*ln(-c+_a)*a*b-4*c^6/(b-c)^3
/(a-c)^3*ln(-c+_a)*a-4*c^6/(b-c)^3/(a-c)^3*ln(-c+_a)*b+2*c^7/(b-c)^3/(a-c)^3*ln(
-c+_a))-_a^2*_C1*b-_a^2*_C1*c+_C1*_a*a*b+_C1*_a*a*c+_C1*_a*b*c-_C1*a*b*c)^(1/2),
_a = y(x))-x-_C2 = 0, Intat(-1/(-_a^4*a0+(_C1+a0*(a+b+c))*_a^3+((-a-b-c)*_C1+((-
a-b)*c-a*b)*a0+a1+2*a2+a3)*_a^2+(((a+b)*c+a*b)*_C1+a*a0*b*c+(-b-c)*a1+(-2*a-2*c)
*a2-a3*(a+b))*_a-_C1*a*b*c+b*c*a1+a*(2*a2*c+a3*b))^(1/2),_a = y(x))-x-_C2 = 0
```

4.2035 $2(1-x)x(1-y(x))(x-y(x))y(x)y''(x) = 2(1-y(x))\left(x^2-2xy(x)+y(x)\right)y(x)y'(x)+(1-x)x(3y(x)^2-2xy(x)-2y(x)+x)y'(x)^2-(1-y(x)^2)y(x)^2$

ODE

$$2(1-x)x(1-y(x))(x-y(x))y(x)y''(x) = 2(1-y(x))\left(x^2-2xy(x)+y(x)\right)y(x)y'(x)+(1-x)x\left(3y(x)^2-2xy(x)-2y(x)+x\right)$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 6.95114 (sec), leaf count = 0 , could not solve

```
DSolve[2*(1 - x)*x*(1 - y[x])*(x - y[x])*y[x]*Derivative[2][y][x] == -(y[x]^2*(1 - y[x]^2)) + 2*(1 -
```

Maple ✓
cpu = 2.211 (sec), leaf count = 5

$$\{y(x) = 1\}$$

Mathematica raw input

```
DSolve[2*(1 - x)*x*(1 - y[x])*(x - y[x])*y[x]*y''[x] == -(y[x]^2*(1 - y[x]^2)) + 2*(1 - y[x])*y[x]*(x
```

Mathematica raw output

```
DSolve[2*(1 - x)*x*(1 - y[x])*(x - y[x])*y[x]*Derivative[2][y][x] == -(y[x]^2*(1
 - y[x]^2)) + 2*(1 - y[x])*y[x]*(x^2 + y[x] - 2*x*y[x])*Derivative[1][y][x] + (1
 - x)*x*(x - 2*y[x] - 2*x*y[x] + 3*y[x]^2)*Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(2*x*y(x)*(1-x)*(1-y(x))*(x-y(x))*diff(diff(y(x),x),x) = x*(1-x)*(x-2*x*y(x)-2*y(x)+3*y(x)^2)*d
y(x))*(x^2+y(x)-2*x*y(x))*diff(y(x),x)-y(x)^2*(1-y(x)^2), y(x),'implicit')
```

Maple raw output

```
y(x) = 1
```

4.2036 $2(1-x)x(1-y(x))(x-y(x))y(x)y''(x) = f(x)((1-y(x))(x-y(x))y(x))^{3/2}+2(1-y(x))\left(x^2-2xy(x)+y(x)\right)y(x)y'(x)+(1-x)x(3y(x)^2-2xy(x)-2y(x)+x)\,y'(x)^2-(1-y(x)^2)\,y(x)^2$

ODE

$2(1-x)x(1-y(x))(x-y(x))y(x)y''(x) = f(x)((1-y(x))(x-y(x))y(x))^{3/2}+2(1-y(x))\left(x^2-2xy(x)+y(x)\right)y(x)y'(x)+(1-x$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 153.004 (sec), leaf count = 0 , could not solve

```
DSolve[2*(1 - x)*x*(1 - y[x])*(x - y[x])*y[x]*Derivative[2][y][x] == f[x]*((1 - y[x])*(x - y[x])*y[x]
```

Maple ✗
cpu = 2.211 (sec), leaf count = 0 , exception

```
time expired
```

Mathematica raw input

```
DSolve[2*(1 - x)*x*(1 - y[x])*(x - y[x])*y[x]*y''[x] == f[x]*((1 - y[x])*(x - y[x])*y[x])^(3/2) - y[x
```

Mathematica raw output

```
DSolve[2*(1 - x)*x*(1 - y[x])*(x - y[x])*y[x]*Derivative[2][y][x] == f[x]*((1 -
y[x])*(x - y[x])*y[x])^(3/2) - y[x]^2*(1 - y[x]^2) + 2*(1 - y[x])*y[x]*(x^2 + y[
x] - 2*x*y[x])*Derivative[1][y][x] + (1 - x)*x*(x - 2*y[x] - 2*x*y[x] + 3*y[x]^2
)*Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(2*x*y(x)*(1-x)*(1-y(x))*(x-y(x))*diff(diff(y(x),x),x) = x*(1-x)*(x-2*x*y(x)-2*y(x)+3*y(x)^2)*d
y(x))*(x^2+y(x)-2*x*y(x))*diff(y(x),x)-y(x)^2*(1-y(x)^2)+f(x)*(y(x)*(1-y(x))*(x-y(x)))^(3/2), y(x),'i
```

Maple raw output

```
time expired
```

4.2037 $2(1-x)^2x^2(1-y(x))(x-y(x))y(x)y''(x) = \mathbf{a0}x(x-y(x))^2(1-y(x))^2+\mathbf{a1}(1-x)(x-y(x))^2y(x)^2+(\mathbf{a2}-1)(1-x)xy(x)^2(1-y(x))^2+\mathbf{a3}(x-y(x))^2y(x)^2(1-y(x))^2+2(1-x)xy(x)\left(x^2-2xy(x)+y(x)\right)(1-y(x))^2y'(x)+(1-x)^2x^2(3y(x)^2-2xy(x)-2y(x)+x)\,y'(x)^2$

ODE

$2(1-x)^2x^2(1-y(x))(x-y(x))y(x)y''(x) = \mathrm{a0}x(x-y(x))^2(1-y(x))^2+\mathrm{a1}(1-x)(x-y(x))^2y(x)^2+(\mathrm{a2}-1)(1-x)xy(x)^2(1-y(x)$

ODE Classification

[NONE]

Book solution method

TO DO

Mathematica ✗

cpu = 27.7066 (sec), leaf count = 0 , could not solve

```
DSolve[2*(1 - x)^2*x^2*(1 - y[x])*(x - y[x])*y[x]*Derivative[2][y][x] == a0*x*(1 - y[x])^2*(x - y[x])
1 + a2)*(1 - x)*x*(1 - y[x])^2*y[x]^2 + a1*(1 - x)*(x - y[x])^2*y[x]^2 + a3*(1 - y[x])^2*(x - y[x])^2
```

Maple ✗

cpu = 0. (sec), leaf count = 0 , hanged

```
dsolve(2*x^2*y(x)*(1-x)^2*(1-y(x))*(x-y(x))*diff(diff(y(x),x),x) = x^2*(1-x)^2*(x-2*x*y(x)-
2*y(x)+3*y(x)^2)*diff(y(x),x)^2+2*x*y(x)*(1-x)*(1-y(x))^2*(x^2+y(x)-2*x*y(x))*diff(y(x),x)+a0*x*(1-
y(x))^2*(x-y(x))^2+a1*(1-x)*y(x)^2*(x-y(x))^2+(a2-1)*x*y(x)^2*(1-x)*(1-y(x))^2+a3*y(x)^2*(x-
y(x))^2*(1-y(x))^2, y(x),'implicit')
```

Mathematica raw input

```
DSolve[2*(1 - x)^2*x^2*(1 - y[x])*(x - y[x])*y[x]*y''[x] == a0*x*(1 - y[x])^2*(x - y[x])^2 + (-
1 + a2)*(1 - x)*x*(1 - y[x])^2*y[x]^2 + a1*(1 - x)*(x - y[x])^2*y[x]^2 + a3*(1 - y[x])^2*(x - y[x])^2
```

Mathematica raw output

```
DSolve[2*(1 - x)^2*x^2*(1 - y[x])*(x - y[x])*y[x]*Derivative[2][y][x] == a0*x*(1
 - y[x])^2*(x - y[x])^2 + (-1 + a2)*(1 - x)*x*(1 - y[x])^2*y[x]^2 + a1*(1 - x)*(
x - y[x])^2*y[x]^2 + a3*(1 - y[x])^2*(x - y[x])^2*y[x]^2 + 2*(1 - x)*x*(1 - y[x]
)^2*y[x]*(x^2 + y[x] - 2*x*y[x])*Derivative[1][y][x] + (1 - x)^2*x^2*(x - 2*y[x]
 - 2*x*y[x] + 3*y[x]^2)*Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(2*x^2*y(x)*(1-x)^2*(1-y(x))*(x-y(x))*diff(diff(y(x),x),x) = x^2*(1-x)^2*(x-2*x*y(x)-
2*y(x)+3*y(x)^2)*diff(y(x),x)^2+2*x*y(x)*(1-x)*(1-y(x))^2*(x^2+y(x)-2*x*y(x))*diff(y(x),x)+a0*x*(1-
y(x))^2*(x-y(x))^2+a1*(1-x)*y(x)^2*(x-y(x))^2+(a2-1)*x*y(x)^2*(1-x)*(1-y(x))^2+a3*y(x)^2*(x-
y(x))^2*(1-y(x))^2, y(x),'implicit')
```

Maple raw output

```
dsolve(2*x^2*y(x)*(1-x)^2*(1-y(x))*(x-y(x))*diff(diff(y(x),x),x) = x^2*(1-x)^2*(
x-2*x*y(x)-2*y(x)+3*y(x)^2)*diff(y(x),x)^2+2*x*y(x)*(1-x)*(1-y(x))^2*(x^2+y(x)-2
*x*y(x))*diff(y(x),x)+a0*x*(1-y(x))^2*(x-y(x))^2+a1*(1-x)*y(x)^2*(x-y(x))^2+(a2-
1)*x*y(x)^2*(1-x)*(1-y(x))^2+a3*y(x)^2*(x-y(x))^2*(1-y(x))^2, y(x),'implicit')
```

4.2038 $b\sqrt{(1-y(x)^2)\,(1-a^2y(x)^2)}y'(x)^2+(1-y(x)^2)\,(1-a^2y(x)^2)\,y''(x)+y(x)\,(-2a^2y(x)^2+a^2+1)=0$

ODE

$$b\sqrt{(1-y(x)^2)\,(1-a^2y(x)^2)}y'(x)^2+(1-y(x)^2)\,(1-a^2y(x)^2)\,y''(x)+y(x)\,(-2a^2y(x)^2+a^2+1)=0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 600.002 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 5.438 (sec), leaf count = 532

$$\left\{\int^{y(x)}1e^{2b\int\frac{1}{\sqrt{\_g^4a^2-a^2\_g^2-\_g^2+1}}d\_g}\Big/\sqrt{e^{2b\int\frac{1}{\sqrt{\_g^4a^2-a^2\_g^2-\_g^2+1}}d\_g}\left(4a^2\int\frac{\left(e^{b\int\frac{1}{\sqrt{\_g^4a^2-a^2\_g^2-\_g^2+1}}d\_g}\right)^2\_g^3}{1+\_g^4a^2+(-a^2-1)\_g^2}d\_g-2a^2\int\right.\right.$$

Mathematica raw input

```
DSolve[y[x]*(1 + a^2 - 2*a^2*y[x]^2) + b*Sqrt[(1 - y[x]^2)*(1 - a^2*y[x]^2)]*y'[x]^2 + (1 - y[x]^2)*(
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((1-y(x)^2)*(1-a^2*y(x)^2)*diff(diff(y(x),x),x)+b*((1-y(x)^2)*(1-a^2*y(x)^2))^(1/2)*diff(y(x),x
2*a^2*y(x)^2)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
Intat(exp(2*b*Int(1/(_g^4*a^2-_g^2*a^2-_g^2+1)^(1/2),_g))/(exp(2*b*Int(1/(_g^4*a
^2-_g^2*a^2-_g^2+1)^(1/2),_g))*(4*a^2*Int(exp(b*Int(1/(_g^4*a^2-_g^2*a^2-_g^2+1)
^(1/2),_g))^2*_g^3/(1+_g^4*a^2+(-a^2-1)*_g^2),_g)-2*a^2*Int(exp(b*Int(1/(_g^4*a^
2-_g^2*a^2-_g^2+1)^(1/2),_g))^2*_g/(1+_g^4*a^2+(-a^2-1)*_g^2),_g)+_C1-2*Int(exp(
b*Int(1/(_g^4*a^2-_g^2*a^2-_g^2+1)^(1/2),_g))^2*_g/(1+_g^4*a^2+(-a^2-1)*_g^2),_g
)))^(1/2),_g = y(x))-x-_C2 = 0, Intat(-exp(2*b*Int(1/(_g^4*a^2-_g^2*a^2-_g^2+1)^
(1/2),_g))/(exp(2*b*Int(1/(_g^4*a^2-_g^2*a^2-_g^2+1)^(1/2),_g))*(4*a^2*Int(exp(b
*Int(1/(_g^4*a^2-_g^2*a^2-_g^2+1)^(1/2),_g))^2*_g^3/(1+_g^4*a^2+(-a^2-1)*_g^2),_
g)-2*a^2*Int(exp(b*Int(1/(_g^4*a^2-_g^2*a^2-_g^2+1)^(1/2),_g))^2*_g/(1+_g^4*a^2+
(-a^2-1)*_g^2),_g)+_C1-2*Int(exp(b*Int(1/(_g^4*a^2-_g^2*a^2-_g^2+1)^(1/2),_g))^2
*_g/(1+_g^4*a^2+(-a^2-1)*_g^2),_g)))^(1/2),_g = y(x))-x-_C2 = 0
```

4.2039 $a^2 y(x) + \left(x^2 + y(x)^2\right)^2 y''(x) = 0$

ODE

$$a^2 y(x) + \left(x^2 + y(x)^2\right)^2 y''(x) = 0$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 15.4326 (sec), leaf count = 0 , could not solve

```
DSolve[a^2*y[x] + (x^2 + y[x]^2)^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.538 (sec), leaf count = 109

$$\left\{\frac{1}{x}\left(-\_C2\,x + \int^{\frac{y(x)}{x}} \frac{1}{\_C1\,\_f^2 + a^2 + \_C1}\sqrt{(\_f^2+1)\,(\_C1\,\_f^2 + a^2 + \_C1)}\,d\_f x - 1\right) = 0, \frac{1}{x}\left(-\_C2\,x + \int^{\frac{y(x)}{x}} \frac{}{\_C}\right.\right.$$

Mathematica raw input

```
DSolve[a^2*y[x] + (x^2 + y[x]^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a^2*y[x] + (x^2 + y[x]^2)^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve((x^2+y(x)^2)^2*diff(diff(y(x),x),x)+a^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
(-_C2*x+Intat(1/(_C1*_f^2+a^2+_C1)*((_f^2+1)*(_C1*_f^2+a^2+_C1))^(1/2),_f = y(x)
/x)*x+1)/x = 0, (-_C2*x+Intat(1/(_C1*_f^2+a^2+_C1)*((_f^2+1)*(_C1*_f^2+a^2+_C1))
^(1/2),_f = y(x)/x)*x-1)/x = 0
```

4.2040 $y''(x)\left(a+2bx+cx^2+y(x)^2\right)^2+Ay(x)=0$

ODE

$$y''(x)\left(a+2bx+cx^2+y(x)^2\right)^2+Ay(x)=0$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 44.8224 (sec), leaf count = 0 , could not solve

```
DSolve[A*y[x] + (a + 2*b*x + c*x^2 + y[x]^2)^2*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 1.051 (sec), leaf count = 334

$$\left\{1\left(c\arctan\left((cx+b)\frac{1}{\sqrt{ac-b^2}}\right)+\int^{y(x)}\frac{1}{\sqrt{cx^2+2\,bx+a}}\frac{c}{(-ac+b^2)\_f^4+(\_C1\,c^2-ac+b^2)\_f^2+\_C1\,c^2+A}\sqrt{(\_f^2+1)}\right.\right.$$

Mathematica raw input

```
DSolve[A*y[x] + (a + 2*b*x + c*x^2 + y[x]^2)^2*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[A*y[x] + (a + 2*b*x + c*x^2 + y[x]^2)^2*Derivative[2][y][x] == 0, y[x], x
]
```

Maple raw input

```
dsolve((a+2*b*x+c*x^2+y(x)^2)^2*diff(diff(y(x),x),x)+A*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
-(Intat(((_f^2+1)*(_C1*(_f^2+1)*c^2-a*_f^2*(_f^2+1)*c+_f^4*b^2+_f^2*b^2+A))^(1/2
)*c/((-a*c+b^2)*_f^4+(_C1*c^2-a*c+b^2)*_f^2+_C1*c^2+A),_f = y(x)/(c*x^2+2*b*x+a)
^(1/2))*(a*c-b^2)^(1/2)+_C2*(a*c-b^2)^(1/2)-c*arctan((c*x+b)/(a*c-b^2)^(1/2)))/(
a*c-b^2)^(1/2) = 0, (c*arctan((c*x+b)/(a*c-b^2)^(1/2))+Intat(((_f^2+1)*(_C1*(_f^
2+1)*c^2-a*_f^2*(_f^2+1)*c+_f^4*b^2+_f^2*b^2+A))^(1/2)*c/((-a*c+b^2)*_f^4+(_C1*c
^2-a*c+b^2)*_f^2+_C1*c^2+A),_f = y(x)/(c*x^2+2*b*x+a)^(1/2))*(a*c-b^2)^(1/2)-_C2
*(a*c-b^2)^(1/2))/(a*c-b^2)^(1/2) = 0
```

4.2041 $\mathbf{f0}(y(x))y''(x) + \mathbf{f1}(y(x))y'(x)^2 + \mathbf{f2}(y(x))y'(x) + \mathbf{f3}(y(x)) = 0$

ODE

$$\mathrm{f0}(y(x))y''(x) + \mathrm{f1}(y(x))y'(x)^2 + \mathrm{f2}(y(x))y'(x) + \mathrm{f3}(y(x)) = 0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 101.26 (sec), leaf count = 0 , could not solve

```
DSolve[f3[y[x]] + f2[y[x]]*Derivative[1][y][x] + f1[y[x]]*Derivative[1][y][x]^2 + f0[y[x]]*Derivative
```

Maple ✓
cpu = 1.207 (sec), leaf count = 65

$$\left\{y(x) = ODESolStruc\left(\_a, \left[\left\{\left(\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a)\right)\_b(\_a) + \frac{f1(\_a)\,(\_b(\_a))^2 + f2(\_a)\,\_b(\_a) + f3(\_a)}{f0\,(\_a)} = 0\right\}, \left\{\_a = y(\right.\right.\right.$$

Mathematica raw input

```
DSolve[f3[y[x]] + f2[y[x]]*y'[x] + f1[y[x]]*y'[x]^2 + f0[y[x]]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f3[y[x]] + f2[y[x]]*Derivative[1][y][x] + f1[y[x]]*Derivative[1][y][x]^2
+ f0[y[x]]*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(f0(y(x))*diff(diff(y(x),x),x)+f1(y(x))*diff(y(x),x)^2+f2(y(x))*diff(y(x),x)+f3(y(x)) = 0, y(x)
```

Maple raw output

```
y(x) = ODESolStruc(_a,[{diff(_b(_a),_a)*_b(_a)+(f1(_a)*_b(_a)^2+f2(_a)*_b(_a)+f3
(_a))/f0(_a) = 0}, {_a = y(x), _b(_a) = diff(y(x),x)}, {x = Int(1/_b(_a),_a)+_C1
, y(x) = _a}])
```

4.2042 $\sqrt{y(x)}y''(x) = a$

ODE

$$\sqrt{y(x)}y''(x) = a$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.101042 (sec), leaf count = 1881

$$\left\{\left\{y(x) \to \frac{288c_1c_2^2a^4 + 288x^2c_1a^4 + 576xc_1c_2a^4 + \left(\frac{10368x^4a^8+10368c_2^4a^8+41472xc_2^3a^8+62208x^2c_2^2a^8+41472x^3c_2a^8+48\sqrt{\frac{(x+c_2)^2\left(36a^4(}{a^6}}}{16a^4\sqrt[3]{10368x^4a^8+103}}\right.\right.\right.$$

Maple ✓
cpu = 0.295 (sec), leaf count = 91

$$\left\{\frac{1}{12a^2}\left(-3\_C1\sqrt{4a\sqrt{y(x)}-\_C1}-\left(4a\sqrt{y(x)}-\_C1\right)^{\frac{3}{2}}\right)-x-\_C2=0,\frac{1}{12a^2}\left(3\_C1\sqrt{4a\sqrt{y(x)}-\_C1}+\left(4a\right.\right.\right.$$

Mathematica raw input

```
DSolve[Sqrt[y[x]]*y''[x] == a,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (288*a^4*x^2*C[1] + C[1]^4 + 576*a^4*x*C[1]*C[2] + 288*a^4*C[1]*C[2]^2
 + 3*a^2*C[1]^2*((10368*a^8*x^4 + 720*a^4*x^2*C[1]^3 - C[1]^6 + 41472*a^8*x^3*C[
2] + 1440*a^4*x*C[1]^3*C[2] + 62208*a^8*x^2*C[2]^2 + 720*a^4*C[1]^3*C[2]^2 + 414
72*a^8*x*C[2]^3 + 10368*a^8*C[2]^4 + 48*a^6*Sqrt[((x + C[2])^2*(-C[1]^3 + 36*a^4
*(x + C[2])^2)^3)/a^8])/a^6)^(1/3) + a^4*((10368*a^8*x^4 + 720*a^4*x^2*C[1]^3 -
C[1]^6 + 41472*a^8*x^3*C[2] + 1440*a^4*x*C[1]^3*C[2] + 62208*a^8*x^2*C[2]^2 + 72
0*a^4*C[1]^3*C[2]^2 + 41472*a^8*x*C[2]^3 + 10368*a^8*C[2]^4 + 48*a^6*Sqrt[((x +
C[2])^2*(-C[1]^3 + 36*a^4*(x + C[2])^2)^3)/a^8])/a^6)^(2/3))/(16*a^4*((10368*a^8
*x^4 + 720*a^4*x^2*C[1]^3 - C[1]^6 + 41472*a^8*x^3*C[2] + 1440*a^4*x*C[1]^3*C[2]
 + 62208*a^8*x^2*C[2]^2 + 720*a^4*C[1]^3*C[2]^2 + 41472*a^8*x*C[2]^3 + 10368*a^8
```

```
*C[2]^4 + 48*a^6*Sqrt[((x + C[2])^2*(-C[1]^3 + 36*a^4*(x + C[2])^2)^3)/a^8])/a^6
)^(1/3))}, {y[x] -> (-288*a^4*x^2*C[1] - (288*I)*Sqrt[3]*a^4*x^2*C[1] - C[1]^4 -
 I*Sqrt[3]*C[1]^4 - 576*a^4*x*C[1]*C[2] - (576*I)*Sqrt[3]*a^4*x*C[1]*C[2] - 288*
a^4*C[1]*C[2]^2 - (288*I)*Sqrt[3]*a^4*C[1]*C[2]^2 + 6*a^2*C[1]^2*((10368*a^8*x^4
 + 720*a^4*x^2*C[1]^3 - C[1]^6 + 41472*a^8*x^3*C[2] + 1440*a^4*x*C[1]^3*C[2] + 6
2208*a^8*x^2*C[2]^2 + 720*a^4*C[1]^3*C[2]^2 + 41472*a^8*x*C[2]^3 + 10368*a^8*C[2
]^4 + 48*a^6*Sqrt[((x + C[2])^2*(-C[1]^3 + 36*a^4*(x + C[2])^2)^3)/a^8])/a^6)^(1
/3) - a^4*((10368*a^8*x^4 + 720*a^4*x^2*C[1]^3 - C[1]^6 + 41472*a^8*x^3*C[2] + 1
440*a^4*x*C[1]^3*C[2] + 62208*a^8*x^2*C[2]^2 + 720*a^4*C[1]^3*C[2]^2 + 41472*a^8
*x*C[2]^3 + 10368*a^8*C[2]^4 + 48*a^6*Sqrt[((x + C[2])^2*(-C[1]^3 + 36*a^4*(x +
C[2])^2)^3)/a^8])/a^6)^(2/3) + I*Sqrt[3]*a^4*((10368*a^8*x^4 + 720*a^4*x^2*C[1]^
3 - C[1]^6 + 41472*a^8*x^3*C[2] + 1440*a^4*x*C[1]^3*C[2] + 62208*a^8*x^2*C[2]^2
+ 720*a^4*C[1]^3*C[2]^2 + 41472*a^8*x*C[2]^3 + 10368*a^8*C[2]^4 + 48*a^6*Sqrt[((
x + C[2])^2*(-C[1]^3 + 36*a^4*(x + C[2])^2)^3)/a^8])/a^6)^(2/3))/(32*a^4*((10368
*a^8*x^4 + 720*a^4*x^2*C[1]^3 - C[1]^6 + 41472*a^8*x^3*C[2] + 1440*a^4*x*C[1]^3*
C[2] + 62208*a^8*x^2*C[2]^2 + 720*a^4*C[1]^3*C[2]^2 + 41472*a^8*x*C[2]^3 + 10368
*a^8*C[2]^4 + 48*a^6*Sqrt[((x + C[2])^2*(-C[1]^3 + 36*a^4*(x + C[2])^2)^3)/a^8])
/a^6)^(1/3))}, {y[x] -> (-288*a^4*x^2*C[1] + (288*I)*Sqrt[3]*a^4*x^2*C[1] - C[1]
^4 + I*Sqrt[3]*C[1]^4 - 576*a^4*x*C[1]*C[2] + (576*I)*Sqrt[3]*a^4*x*C[1]*C[2] -
288*a^4*C[1]*C[2]^2 + (288*I)*Sqrt[3]*a^4*C[1]*C[2]^2 + 6*a^2*C[1]^2*((10368*a^8
*x^4 + 720*a^4*x^2*C[1]^3 - C[1]^6 + 41472*a^8*x^3*C[2] + 1440*a^4*x*C[1]^3*C[2]
 + 62208*a^8*x^2*C[2]^2 + 720*a^4*C[1]^3*C[2]^2 + 41472*a^8*x*C[2]^3 + 10368*a^8
*C[2]^4 + 48*a^6*Sqrt[((x + C[2])^2*(-C[1]^3 + 36*a^4*(x + C[2])^2)^3)/a^8])/a^6
)^(1/3) - a^4*((10368*a^8*x^4 + 720*a^4*x^2*C[1]^3 - C[1]^6 + 41472*a^8*x^3*C[2]
 + 1440*a^4*x*C[1]^3*C[2] + 62208*a^8*x^2*C[2]^2 + 720*a^4*C[1]^3*C[2]^2 + 41472
*a^8*x*C[2]^3 + 10368*a^8*C[2]^4 + 48*a^6*Sqrt[((x + C[2])^2*(-C[1]^3 + 36*a^4*(
x + C[2])^2)^3)/a^8])/a^6)^(2/3) - I*Sqrt[3]*a^4*((10368*a^8*x^4 + 720*a^4*x^2*C
[1]^3 - C[1]^6 + 41472*a^8*x^3*C[2] + 1440*a^4*x*C[1]^3*C[2] + 62208*a^8*x^2*C[2
]^2 + 720*a^4*C[1]^3*C[2]^2 + 41472*a^8*x*C[2]^3 + 10368*a^8*C[2]^4 + 48*a^6*Sqr
t[((x + C[2])^2*(-C[1]^3 + 36*a^4*(x + C[2])^2)^3)/a^8])/a^6)^(2/3))/(32*a^4*((1
0368*a^8*x^4 + 720*a^4*x^2*C[1]^3 - C[1]^6 + 41472*a^8*x^3*C[2] + 1440*a^4*x*C[1
]^3*C[2] + 62208*a^8*x^2*C[2]^2 + 720*a^4*C[1]^3*C[2]^2 + 41472*a^8*x*C[2]^3 + 1
0368*a^8*C[2]^4 + 48*a^6*Sqrt[((x + C[2])^2*(-C[1]^3 + 36*a^4*(x + C[2])^2)^3)/a
^8])/a^6)^(1/3))}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)*y(x)^(1/2) = a, y(x),'implicit')
```

Maple raw output

```
1/12*(-3*_C1*(4*a*y(x)^(1/2)-_C1)^(1/2)-(4*a*y(x)^(1/2)-_C1)^(3/2))/a^2-x-_C2 =
0, 1/12*(3*_C1*(4*a*y(x)^(1/2)-_C1)^(1/2)+(4*a*y(x)^(1/2)-_C1)^(3/2))/a^2-x-_C2
= 0
```

4.2043 $\sqrt{y(x)}y''(x) = 2(a+bx)$

ODE

$$\sqrt{y(x)}y''(x) = 2(a+bx)$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.388484 (sec), leaf count = 0 , could not solve

```
DSolve[Sqrt[y[x]]*Derivative[2][y][x] == 2*(a + b*x), y[x], x]
```

Maple ✓
cpu = 7.823 (sec), leaf count = 257

$$\left\{ \ln(bx+a) - \int^{\frac{y(x)}{(bx+a)^2}} -b^2\sqrt{3}\left(\sqrt{3}\left(\sqrt[3]{-\frac{a+b}{\_g\,b^2}\frac{1}{\sqrt{\_g\,(a+b)^2}}}-2\right)+3\sqrt[3]{-\frac{a+b}{\sqrt{\_g\,(a+b)^2}\,\_g\,b^2}}\tan\left(\mathit{RootOf}\left(12\,b^2\int -\right.\right.\right.$$

Mathematica raw input

```
DSolve[Sqrt[y[x]]*y''[x] == 2*(a + b*x),y[x],x]
```

Mathematica raw output

```
DSolve[Sqrt[y[x]]*Derivative[2][y][x] == 2*(a + b*x), y[x], x]
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)*y(x)^(1/2) = 2*b*x+2*a, y(x),'implicit')
```

Maple raw output

```
ln(b*x+a)-Intat(-b^2*3^(1/2)*(3^(1/2)*((-(a+b)/(_g*(a+b)^2)^(1/2)/_g/b^2)^(1/3)-
2)+3*(-(a+b)/(_g*(a+b)^2)^(1/2)/_g/b^2)^(1/3)*tan(RootOf(12*b^2*Int((-(a+b)/(_g*
(a+b)^2)^(1/2)/_g/b^2)^(2/3)*(_g*(a+b)^2)^(1/2)/((_g*(a+b)^2)^(1/2)*_g*b^2-a-b),
_g)-8*_Z*3^(1/2)-ln(_g*(a+b)^2)+2*ln((tan(_Z)^2+1)^2*(_g*(a+b)^2)^(1/2)/(tan(_Z)
^4+4*3^(1/2)*tan(_Z)^3+18*tan(_Z)^2+12*tan(_Z)*3^(1/2)+9))+24*_C1)))*(_g*(a+b)^2
)^(1/2)/(-12*(_g*(a+b)^2)^(1/2)*_g*b^2+12*a+12*b),_g = y(x)/(b*x+a)^2)-_C2 = 0
```

4.2044 $y''(x)X(x,y(x))^3 = 1$

ODE

$$y''(x)X(x,y(x))^3 = 1$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 44.8491 (sec), leaf count = 0 , could not solve

```
DSolve[X[x, y[x]]^3*Derivative[2][y][x] == 1, y[x], x]
```

Maple ✗
cpu = 0.003 (sec), leaf count = 0 , could not solve

```
dsolve(X(x,y(x))^3*diff(diff(y(x),x),x) = 1, y(x),'implicit')
```

Mathematica raw input

```
DSolve[X[x, y[x]]^3*y''[x] == 1,y[x],x]
```

Mathematica raw output

```
DSolve[X[x, y[x]]^3*Derivative[2][y][x] == 1, y[x], x]
```

Maple raw input

```
dsolve(X(x,y(x))^3*diff(diff(y(x),x),x) = 1, y(x),'implicit')
```

Maple raw output

```
dsolve(X(x,y(x))^3*diff(diff(y(x),x),x) = 1, y(x),'implicit')
```

4.2045 $y''(x)\left(\mathbf{a0}+\mathbf{a1}\sin^2(y(x))\right)+\mathbf{a2}y(x)\left(\mathbf{a1}\sin^2(y(x))+\mathbf{a3}\right)+\mathbf{a1}y'(x)^2+\mathbf{a1}y'(x)^2\sin(y(x))\cos(y(x))=0$

ODE

$$y''(x)\left(\mathrm{a0}+\mathrm{a1}\sin^2(y(x))\right)+\mathrm{a2}y(x)\left(\mathrm{a1}\sin^2(y(x))+\mathrm{a3}\right)+\mathrm{a1}y'(x)^2+\mathrm{a1}y'(x)^2\sin(y(x))\cos(y(x))=0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 600. (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 3.671 (sec), leaf count = 818

$$\left\{\int^{y(x)}\frac{((a0+a1)(\tan(\_h))^2+a0)\mathrm{e}^{a1\arctan\left((a0+a1)\tan(\_h)\frac{1}{\sqrt{a0\,(a0+a1)}}\right)\frac{1}{\sqrt{a0\,(a0+a1)}}}}{\sqrt{-2\left(\left(\left(\int\frac{(\tan(\_h))^2(\sin(\_h))^2\_h}{((\tan(\_h))^2+1)(a0+a1\,(\sin(\_h)}\right.\right.\right.}}$$

Mathematica raw input

```
DSolve[a2*(a3 + a1*Sin[y[x]]^2)*y[x] + a1*y'[x]^2 + a1*Cos[y[x]]*Sin[y[x]]*y'[x]^2 + (a0 + a1*Sin[y[x
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((a0+a1*sin(y(x))^2)*diff(diff(y(x),x),x)+a1*diff(y(x),x)^2+a1*diff(y(x),x)^2*cos(y(x))*sin(y(x
```

Maple raw output

```
Intat(exp(a1/(a0*(a0+a1))^(1/2)*arctan((a0+a1)*tan(_h)/(a0*(a0+a1))^(1/2)))/(-2*
(((Int(1/(tan(_h)^2+1)*exp(a1/(a0*(a0+a1))^(1/2)*arctan((a0+a1)*tan(_h)/(a0*(a0+
a1))^(1/2)))^2*tan(_h)^2/(a0+a1*sin(_h)^2)*sin(_h)^2*_h,_h)+Int(1/(tan(_h)^2+1)*
```

```
exp(a1/(a0*(a0+a1))^(1/2)*arctan((a0+a1)*tan(_h)/(a0*(a0+a1))^(1/2)))^2/(a0+a1*s
in(_h)^2)*sin(_h)^2*_h,_h))*a1+(Int(1/(tan(_h)^2+1)*exp(a1/(a0*(a0+a1))^(1/2)*ar
ctan((a0+a1)*tan(_h)/(a0*(a0+a1))^(1/2)))^2*tan(_h)^2/(a0+a1*sin(_h)^2)*_h,_h)+I
nt(1/(tan(_h)^2+1)*exp(a1/(a0*(a0+a1))^(1/2)*arctan((a0+a1)*tan(_h)/(a0*(a0+a1))
^(1/2)))^2/(a0+a1*sin(_h)^2)*_h,_h))*a3)*a2*a0+a1^2*a2*Int(1/(tan(_h)^2+1)*exp(a
1/(a0*(a0+a1))^(1/2)*arctan((a0+a1)*tan(_h)/(a0*(a0+a1))^(1/2)))^2*tan(_h)^2/(a0
+a1*sin(_h)^2)*sin(_h)^2*_h,_h)+a1*a2*a3*Int(1/(tan(_h)^2+1)*exp(a1/(a0*(a0+a1))
^(1/2)*arctan((a0+a1)*tan(_h)/(a0*(a0+a1))^(1/2)))^2*tan(_h)^2/(a0+a1*sin(_h)^2)
*_h,_h)-1/2*_C1)*(tan(_h)^2+1)*((a0+a1)*tan(_h)^2+a0))^(1/2)*((a0+a1)*tan(_h)^2+
a0),_h = y(x))-x-_C2 = 0, Intat(-exp(a1/(a0*(a0+a1))^(1/2)*arctan((a0+a1)*tan(_h
)/(a0*(a0+a1))^(1/2)))/(-2*(((Int(1/(tan(_h)^2+1)*exp(a1/(a0*(a0+a1))^(1/2)*arct
an((a0+a1)*tan(_h)/(a0*(a0+a1))^(1/2)))^2*tan(_h)^2/(a0+a1*sin(_h)^2)*sin(_h)^2*
_h,_h)+Int(1/(tan(_h)^2+1)*exp(a1/(a0*(a0+a1))^(1/2)*arctan((a0+a1)*tan(_h)/(a0*
(a0+a1))^(1/2)))^2/(a0+a1*sin(_h)^2)*sin(_h)^2*_h,_h))*a1+(Int(1/(tan(_h)^2+1)*e
xp(a1/(a0*(a0+a1))^(1/2)*arctan((a0+a1)*tan(_h)/(a0*(a0+a1))^(1/2)))^2*tan(_h)^2
/(a0+a1*sin(_h)^2)*_h,_h)+Int(1/(tan(_h)^2+1)*exp(a1/(a0*(a0+a1))^(1/2)*arctan((
a0+a1)*tan(_h)/(a0*(a0+a1))^(1/2)))^2/(a0+a1*sin(_h)^2)*_h,_h))*a3)*a2*a0+a1^2*a
2*Int(1/(tan(_h)^2+1)*exp(a1/(a0*(a0+a1))^(1/2)*arctan((a0+a1)*tan(_h)/(a0*(a0+a
1))^(1/2)))^2*tan(_h)^2/(a0+a1*sin(_h)^2)*sin(_h)^2*_h,_h)+a1*a2*a3*Int(1/(tan(_
h)^2+1)*exp(a1/(a0*(a0+a1))^(1/2)*arctan((a0+a1)*tan(_h)/(a0*(a0+a1))^(1/2)))^2*
tan(_h)^2/(a0+a1*sin(_h)^2)*_h,_h)-1/2*_C1)*(tan(_h)^2+1)*((a0+a1)*tan(_h)^2+a0)
)^(1/2)*((a0+a1)*tan(_h)^2+a0),_h = y(x))-x-_C2 = 0
```

4.2046 $y(x)y''(x)(1-\log(y(x)))+y'(x)^2(\log(y(x))+1)=0$

ODE

$$y(x)y''(x)(1-\log(y(x)))+y'(x)^2(\log(y(x))+1)=0$$

ODE Classification

[[_2nd_order, _missing_x], _Liouville, [_2nd_order, _reducible, _mu_x_y1], [_2nd_order,

Book solution method
TO DO

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.059 (sec), leaf count = 20

$$\left\{-(-1+\ln(y(x)))^{-1}-\_C1\,x-\_C2=0\right\}$$

Mathematica raw input

```
DSolve[(1 + log[y[x]])*y'[x]^2 + (1 - Log[y[x]])*y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(y(x)*(1-ln(y(x)))*diff(diff(y(x),x),x)+(1+ln(y(x)))*diff(y(x),x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
-1/(-1+ln(y(x)))-_C1*x-_C2 = 0
```

4.2047 $f(y(x))y''(x) = y'(x)^2 f'(y(x)) - g(x)f(y(x))y'(x) - h(x)f(y(x))^2$

ODE

$$f(y(x))y''(x) = y'(x)^2 f'(y(x)) - g(x)f(y(x))y'(x) - h(x)f(y(x))^2$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✓
cpu = 10.406 (sec), leaf count = 70

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{f(K[4])}\,dK[4]\&\right]\left[\int_1^x -e^{-\int_1^{K[5]} g(K[1])\,dK[1]}\left(\int_1^{K[5]} h(K[3])e^{\int_1^{K[3]} g(K[1])\,dK[1]}\,dK[3] + c_1\right.\right.\right.$$

Maple ✗
cpu = 0.059 (sec), leaf count = 0 , exception

```
unable to handle composite functions containing y(x) or diff(y(x),x) as in eval(diff(f(u),u),{u = y(x
```

Mathematica raw input

```
DSolve[f[y[x]]*y''[x] == -(f[y[x]]^2*h[x]) - f[y[x]]*g[x]*y'[x] + f'[y[x]]*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Integrate[f[K[4]]^(-1), {K[4], 1, #1}] & ][C[2] + Inte
grate[-((C[1] + Integrate[E^Integrate[g[K[1]], {K[1], 1, K[3]}]*h[K[3]], {K[3],
1, K[5]}])/E^Integrate[g[K[1]], {K[1], 1, K[5]}]), {K[5], 1, x}]]}}
```

Maple raw input

```
dsolve(f(y(x))*diff(diff(y(x),x),x) = eval(diff(f(u),u),{u = y(x)})*diff(y(x),x)^2-g(x)*f(y(x))*diff(
h(x)*f(y(x))^2, y(x),'implicit')
```

Maple raw output

```
unable to handle composite functions containing y(x) or diff(y(x),x) as in eval(
diff(f(u),u),{u = y(x)})
```

4.2048 $f(y(x))y''(x) = f(y(x))^2\mathbf{F0}\left(x, \frac{y'(x)}{f(y(x))}\right) + y'(x)^2 f'(y(x))$

ODE

$$f(y(x))y''(x) = f(y(x))^2 \mathrm{F0}\left(x, \frac{y'(x)}{f(y(x))}\right) + y'(x)^2 f'(y(x))$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 2.72382 (sec), leaf count = 0 , could not solve

```
DSolve[f[y[x]]*Derivative[2][y][x] == f[y[x]]^2*F0[x, Derivative[1][y][x]/f[y[x]]] + Derivative[1][f]
```

Maple ✗
cpu = 0.059 (sec), leaf count = 0 , exception

```
unable to handle composite functions containing y(x) or diff(y(x),x) as in eval(diff(f(u),u),{u = y(x
```

Mathematica raw input

```
DSolve[f[y[x]]*y''[x] == f[y[x]]^2*F0[x, y'[x]/f[y[x]]] + f'[y[x]]*y'[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[f[y[x]]*Derivative[2][y][x] == f[y[x]]^2*F0[x, Derivative[1][y][x]/f[y[x]
]] + Derivative[1][f][y[x]]*Derivative[1][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(f(y(x))*diff(diff(y(x),x),x) = eval(diff(f(u),u),{u = y(x)})*diff(y(x),x)^2+f(y(x))^2*F0(x,dif
```

Maple raw output

```
unable to handle composite functions containing y(x) or diff(y(x),x) as in eval(
diff(f(u),u),{u = y(x)})
```

4.2049 $ay'(x)^2 f'(y(x)) + f(y(x))y''(x) + g(y(x)) = 0$

ODE

$$ay'(x)^2 f'(y(x)) + f(y(x))y''(x) + g(y(x)) = 0$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✓
cpu = 10.9666 (sec), leaf count = 108

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} -\frac{f(K[2])^a}{\sqrt{2\int_1^{K[2]} g(K[1])\left(-f(K[1])^{2a-1}\right)\,dK[1] + c_1}}\,dK[2]\&\right][c_2 + x]\right\}, \left\{y(x) \to \text{InverseFu}\right.$$

Maple ✗
cpu = 0.059 (sec), leaf count = 0 , exception

```
unable to handle composite functions containing y(x) or diff(y(x),x) as in eval(diff(f(u),u),{u = y(x
```

Mathematica raw input

```
DSolve[g[y[x]] + a*f'[y[x]]*y'[x]^2 + f[y[x]]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[Integrate[-(f[K[2]]^a/Sqrt[C[1] + 2*Integrate[-(f[K[1]
]^(-1 + 2*a)*g[K[1]]), {K[1], 1, K[2]}]]), {K[2], 1, #1}] & ][x + C[2]]}, {y[x]
-> InverseFunction[Integrate[f[K[3]]^a/Sqrt[C[1] + 2*Integrate[-(f[K[1]]^(-1 + 2
*a)*g[K[1]]), {K[1], 1, K[3]}]], {K[3], 1, #1}] & ][x + C[2]]}}
```

Maple raw input

```
dsolve(f(y(x))*diff(diff(y(x),x),x)+a*eval(diff(f(u),u),{u = y(x)})*diff(y(x),x)^2+g(y(x)) = 0, y(x),
```

Maple raw output

```
unable to handle composite functions containing y(x) or diff(y(x),x) as in eval(
diff(f(u),u),{u = y(x)})
```

4.2050 $y'(x)y''(x) = a^2 x$

ODE

$$y'(x)y''(x) = a^2 x$$

ODE Classification

[[_2nd_order, _missing_y], [_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _n

Book solution method
TO DO

Mathematica ✓
cpu = 0.0540693 (sec), leaf count = 116

$$\left\{\left\{y(x) \to -\frac{1}{2}x\sqrt{a^2x^2+2c_1} - \frac{c_1 \log\left(a\left(\sqrt{a^2x^2+2c_1}+ax\right)\right)}{a} + c_2\right\}, \left\{y(x) \to \frac{1}{2}x\sqrt{a^2x^2+2c_1} + \frac{c_1 \log\left(a\left(\sqrt{a^2x^2+2c_1}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.167 (sec), leaf count = 101

$$\left\{y(x) = -\frac{x}{2}\sqrt{a^2x^2+\_C1} - \frac{\_C1}{2}\ln\left(a^2x\frac{1}{\sqrt{a^2}} + \sqrt{a^2x^2+\_C1}\right)\frac{1}{\sqrt{a^2}} + \_C2, y(x) = \frac{x}{2}\sqrt{a^2x^2+\_C1} + \frac{\_C1}{2}\ln\left(a^2x\right.\right.$$

Mathematica raw input

```
DSolve[y'[x]*y''[x] == a^2*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x*Sqrt[a^2*x^2 + 2*C[1]])/2 + C[2] - (C[1]*Log[a*(a*x + Sqrt[a^2*x^2
 + 2*C[1]])])/a}, {y[x] -> (x*Sqrt[a^2*x^2 + 2*C[1]])/2 + C[2] + (C[1]*Log[a*(a*
x + Sqrt[a^2*x^2 + 2*C[1]])])/a}}
```

Maple raw input

```
dsolve(diff(y(x),x)*diff(diff(y(x),x),x) = a^2*x, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x*(a^2*x^2+_C1)^(1/2)+1/2*_C1*ln(a^2*x/(a^2)^(1/2)+(a^2*x^2+_C1)^(1/2
))/(a^2)^(1/2)+_C2, y(x) = -1/2*x*(a^2*x^2+_C1)^(1/2)-1/2*_C1*ln(a^2*x/(a^2)^(1/
2)+(a^2*x^2+_C1)^(1/2))/(a^2)^(1/2)+_C2
```

4.2051 $y'(x)y''(x) = x^2y(x)y'(x) + xy(x)^2$

ODE

$$y'(x)y''(x) = x^2y(x)y'(x) + xy(x)^2$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetries], [_2nd_order, _

Book solution method
TO DO

Mathematica ✗
cpu = 61.5678 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x]*Derivative[2][y][x] == x*y[x]^2 + x^2*y[x]*Derivative[1][y][x], y[x], x]
```

Maple ✓
cpu = 1.967 (sec), leaf count = 46

$$\left\{y(x) = ODESolStruc\left(\_b(\_a), [\left\{-\_a^2(\_b(\_a))^2 + \left(\frac{d}{d\_a}\_b(\_a)\right)^2 + \_C1 = 0\right\}, \{\_a = x, \_b(\_a) = y(x)\}, \{x = \_\right.\right.$$

Mathematica raw input

```
DSolve[y'[x]*y''[x] == x*y[x]^2 + x^2*y[x]*y'[x],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x]*Derivative[2][y][x] == x*y[x]^2 + x^2*y[x]*Derivative
[1][y][x], y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)*diff(diff(y(x),x),x) = x^2*y(x)*diff(y(x),x)+x*y(x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_b(_a),[{-_a^2*_b(_a)^2+diff(_b(_a),_a)^2+_C1 = 0}, {_a = x,
_b(_a) = y(x)}, {x = _a, y(x) = _b(_a)}])
```

4.2052 $(2x^2y'(x)+y(x)^2)\,y''(x)+2(y(x)+x)y'(x)^2+xy'(x)+y(x)=0$

ODE

$$(2x^2y'(x)+y(x)^2)\,y''(x)+2(y(x)+x)y'(x)^2+xy'(x)+y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetries], [_2nd_order, _

Book solution method
TO DO

Mathematica ✗
cpu = 42.0799 (sec), leaf count = 0 , could not solve

```
DSolve[y[x] + x*Derivative[1][y][x] + 2*(x + y[x])*Derivative[1][y][x]^2 + (y[x]^2 + 2*x^2*Derivative
```

Maple ✓
cpu = 1.422 (sec), leaf count = 54

$$\left\{y(x)=ODESolStruc\left(\_b(\_a),\left[\left\{\_a^2\left(\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a)\right)^2+(\_b(\_a))^2\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a)+\_a\,\_b(\_a)+\_C1=0\right\}\right],\{\_a=x,\right.\right.$$

Mathematica raw input

```
DSolve[y[x] + x*y'[x] + 2*(x + y[x])*y'[x]^2 + (y[x]^2 + 2*x^2*y'[x])*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[y[x] + x*Derivative[1][y][x] + 2*(x + y[x])*Derivative[1][y][x]^2 + (y[x]
^2 + 2*x^2*Derivative[1][y][x])*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve((y(x)^2+2*x^2*diff(y(x),x))*diff(diff(y(x),x),x)+2*(x+y(x))*diff(y(x),x)^2+x*diff(y(x),x)+y(x)
```

Maple raw output

```
y(x) = ODESolStruc(_b(_a),[{_a^2*diff(_b(_a),_a)^2+_b(_a)^2*diff(_b(_a),_a)+_a*_
b(_a)+_C1 = 0}, {_a = x, _b(_a) = y(x)}, {x = _a, y(x) = _b(_a)}])
```

4.2053 $ay(x)^2 + x^3 y'(x) y''(x) = 0$

ODE

$$ay(x)^2 + x^3 y'(x) y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 90.6311 (sec), leaf count = 0 , could not solve

```
DSolve[a*y[x]^2 + x^3*Derivative[1][y][x]*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.173 (sec), leaf count = 38

$$\left\{ y(x) = e^{\int^{\ln(x)} RootOf\left(-\int^{-Z} \frac{\_a}{\_a^3 - \_a^2 + a} d\_a - \_b + \_C1\right) d\_b + \_C2} \right\}$$

Mathematica raw input

```
DSolve[a*y[x]^2 + x^3*y'[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a*y[x]^2 + x^3*Derivative[1][y][x]*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x^3*diff(y(x),x)*diff(diff(y(x),x),x)+a*y(x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(Intat(RootOf(-Intat(_a/(_a^3-_a^2+a),_a = _Z)-_b+_C1),_b = ln(x))+_C2
)
```

4.2054 $\mathbf{f1}y'(x)y''(x) + \mathbf{f2}y(x)y''(x) + \mathbf{f3}y'(x)^2 + \mathbf{f4}y(x)y'(x) + \mathbf{f5}y(x)^2 = 0$

ODE

$$\mathrm{f1}y'(x)y''(x) + \mathrm{f2}y(x)y''(x) + \mathrm{f3}y'(x)^2 + \mathrm{f4}y(x)y'(x) + \mathrm{f5}y(x)^2 = 0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.287738 (sec), leaf count = 0 , could not solve

```
DSolve[f5*y[x]^2 + f4*y[x]*Derivative[1][y][x] + f3*Derivative[1][y][x]^2 + f2*y[x]*Derivative[2][y]
```

Maple ✓
cpu = 0.112 (sec), leaf count = 50

$$\left\{\ln(y(x)) - \int RootOf\left(x + \int^{\_Z} \frac{\_f\, f1 + f2}{\_f^3 f1 + \_f^2 f2 + \_f^2 f3 + \_f\, f4 + f5} d\_f + \_C1\right) \mathrm{d}x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[f5*y[x]^2 + f4*y[x]*y'[x] + f3*y'[x]^2 + f2*y[x]*y''[x] + f1*y'[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f5*y[x]^2 + f4*y[x]*Derivative[1][y][x] + f3*Derivative[1][y][x]^2 + f2*y
[x]*Derivative[2][y][x] + f1*Derivative[1][y][x]*Derivative[2][y][x] == 0, y[x],
 x]
```

Maple raw input

```
dsolve(f1*diff(y(x),x)*diff(diff(y(x),x),x)+f2*y(x)*diff(diff(y(x),x),x)+f3*diff(y(x),x)^2+f4*y(x)*di
```

Maple raw output

```
ln(y(x))-Int(RootOf(x+Intat(1/(_f^3*f1+_f^2*f2+_f^2*f3+_f*f4+f5)*(_f*f1+f2),_f =
 _Z)+_C1),x)-_C2 = 0
```

4.2055 $3y(x)y'(x)y''(x) = y'(x)^3 - 1$

ODE

$$3y(x)y'(x)y''(x) = y'(x)^3 - 1$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.246352 (sec), leaf count = 153

$$\left\{\left\{y(x) \to \frac{1}{9}e^{-3c_1}\left(2\sqrt{6}\left(e^{3c_1}(c_2+x)\right)^{3/2} - 9\right)\right\}, \left\{y(x) \to \frac{1}{9}e^{-3c_1}\left(-9 - (-1)^{2/3}\sqrt{2}\left(\sqrt{3}+3i\right)\left(-\sqrt[3]{-1}e^{3c_1}(c_2+x)\right)^{3/2}\right)\right\}\right.$$

Maple ✓
cpu = 0.085 (sec), leaf count = 87

$$\left\{\frac{3}{2\_C1}(\_C1\,y(x)+1)^{\frac{2}{3}} - x - \_C2 = 0, 3\,\frac{(\_C1\,y(x)+1)^{2/3}}{\_C1\ \left(i\sqrt{3}-1\right)} - x - \_C2 = 0, -3\,\frac{(\_C1\,y(x)+1)^{2/3}}{\_C1\ \left(i\sqrt{3}+1\right)} - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[3*y[x]*y'[x]*y''[x] == -1 + y'[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-9 + 2*Sqrt[6]*(E^(3*C[1])*(x + C[2]))^(3/2))/(9*E^(3*C[1]))}, {y[x]
-> (-9 - (-1)^(2/3)*Sqrt[2]*(3*I + Sqrt[3])*(-((-1)^(1/3)*E^(3*C[1])*(x + C[2]))
)^(3/2))/(9*E^(3*C[1]))}, {y[x] -> (-9 + (-1)^(1/3)*Sqrt[2]*(-3*I + Sqrt[3])*((-
1)^(2/3)*E^(3*C[1])*(x + C[2]))^(3/2))/(9*E^(3*C[1]))}}
```

Maple raw input

```
dsolve(3*y(x)*diff(y(x),x)*diff(diff(y(x),x),x) = diff(y(x),x)^3-1, y(x),'implicit')
```

Maple raw output

```
3/2*(_C1*y(x)+1)^(2/3)/_C1-x-_C2 = 0, 3*(_C1*y(x)+1)^(2/3)/_C1/(I*3^(1/2)-1)-x-_
C2 = 0, -3*(_C1*y(x)+1)^(2/3)/_C1/(I*3^(1/2)+1)-x-_C2 = 0
```

4.2056 $(x^2+2y(x)^2y'(x))\,y''(x)+2y(x)y'(x)^3+3xy'(x)+y(x)=0$

ODE

$$(x^2+2y(x)^2y'(x))\,y''(x)+2y(x)y'(x)^3+3xy'(x)+y(x)=0$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], [_2nd_order, _with_linear_symmetries], [_2nd_order, _

Book solution method
TO DO

Mathematica ✗
cpu = 42.367 (sec), leaf count = 0 , could not solve

```
DSolve[y[x] + 3*x*Derivative[1][y][x] + 2*y[x]*Derivative[1][y][x]^3 + (x^2 + 2*y[x]^2*Derivative[1]|
```

Maple ✓
cpu = 2.223 (sec), leaf count = 54

$$\left\{y(x)=ODESolStruc\left(\_b(\_a),\left[\left\{(\_b(\_a))^2\left(\frac{d}{d\_a}\_b(\_a)\right)^2+\_a^2\frac{d}{d\_a}\_b(\_a)+\_a\,\_b(\_a)+\_C1=0\right\},\{\_a=x,\right.\right.\right.$$

Mathematica raw input

```
DSolve[y[x] + 3*x*y'[x] + 2*y[x]*y'[x]^3 + (x^2 + 2*y[x]^2*y'[x])*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[y[x] + 3*x*Derivative[1][y][x] + 2*y[x]*Derivative[1][y][x]^3 + (x^2 + 2*
y[x]^2*Derivative[1][y][x])*Derivative[2][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve((x^2+2*y(x)^2*diff(y(x),x))*diff(diff(y(x),x),x)+2*y(x)*diff(y(x),x)^3+3*x*diff(y(x),x)+y(x) =
```

Maple raw output

```
y(x) = ODESolStruc(_b(_a),[{_b(_a)^2*diff(_b(_a),_a)^2+_a^2*diff(_b(_a),_a)+_a*_
b(_a)+_C1 = 0}, {_a = x, _b(_a) = y(x)}, {x = _a, y(x) = _b(_a)}])
```

4.2057 $(x - y'(x)^2)\, y''(x) = x^2 - y'(x)$

ODE

$$(x - y'(x)^2)\, y''(x) = x^2 - y'(x)$$

ODE Classification

[[_2nd_order, _missing_y], [_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _n

Book solution method
TO DO

Mathematica ✗
cpu = 599.997 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.14 (sec), leaf count = 330

$$\left\{ y(x) = \int \frac{1}{2}\left(\left(-4x^3 + 12\_C1 + 4\sqrt{x^6 + (-6\_C1 - 4)x^3 + 9\_C1^2}\right)^{\frac{2}{3}} + 4x\right) \frac{1}{\sqrt[3]{-4x^3 + 12\_C1 + 4\sqrt{x^6 + (-6\_C}}}$$

Mathematica raw input

```
DSolve[(x - y'[x]^2)*y''[x] == x^2 - y'[x],y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((x-diff(y(x),x)^2)*diff(diff(y(x),x),x) = x^2-diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
y(x) = Int(1/2*((-4*x^3+12*_C1+4*(x^6+(-6*_C1-4)*x^3+9*_C1^2)^(1/2))^(2/3)+4*x)/
(-4*x^3+12*_C1+4*(x^6+(-6*_C1-4)*x^3+9*_C1^2)^(1/2))^(1/3),x)+_C2, y(x) = Int(-1
/4*(I*3^(1/2)*(-4*x^3+12*_C1+4*(x^6+(-6*_C1-4)*x^3+9*_C1^2)^(1/2))^(2/3)-4*I*3^(
1/2)*x+(-4*x^3+12*_C1+4*(x^6+(-6*_C1-4)*x^3+9*_C1^2)^(1/2))^(2/3)+4*x)/(-4*x^3+1
2*_C1+4*(x^6+(-6*_C1-4)*x^3+9*_C1^2)^(1/2))^(1/3),x)+_C2, y(x) = Int(-1/4*(-I*3^
(1/2)*(-4*x^3+12*_C1+4*(x^6+(-6*_C1-4)*x^3+9*_C1^2)^(1/2))^(2/3)+4*I*3^(1/2)*x+(
-4*x^3+12*_C1+4*(x^6+(-6*_C1-4)*x^3+9*_C1^2)^(1/2))^(2/3)+4*x)/(-4*x^3+12*_C1+4*
(x^6+(-6*_C1-4)*x^3+9*_C1^2)^(1/2))^(1/3),x)+_C2
```

4.2058 $\left(y'(x)^2+y(x)^2\right)y''(x)+y(x)^3=0$

ODE

$$\left(y'(x)^2+y(x)^2\right)y''(x)+y(x)^3=0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.10345 (sec), leaf count = 369

$$\left\{\left\{y(x)\to \frac{c_2 \exp\left(-\tan^{-1}\left(\frac{{}_{1+2}\text{InverseFunction}\left[\frac{\left(\sqrt{3}-i\right)\tan^{-1}\left(\frac{\#1}{\sqrt{\frac{1}{2}\left(1-i\sqrt{}\right.}}\right.}{\sqrt{6\left(1-i\sqrt{3}\right)}}\right.\right.}{\sqrt{3}}\right.\right.}{2\sqrt{3}}\right.\right.}{\sqrt[4]{\text{InverseFunction}\left[\frac{\left(\sqrt{3}-i\right)\tan^{-1}\left(\frac{\#1}{\sqrt{\frac{1}{2}\left(1-i\sqrt{3}\right)}}\right)}{\sqrt{6\left(1-i\sqrt{3}\right)}}+\frac{\left(\sqrt{3}+i\right)\tan^{-1}\left(\frac{\#1}{\sqrt{\frac{1}{2}\left(1+i\sqrt{3}\right)}}\right)}{\sqrt{6\left(1+i\sqrt{3}\right)}}\&\right][c_1-x]^4+\text{InverseF}}}\right\}\right\}$$

Maple ✓
cpu = 0.326 (sec), leaf count = 159

$$\left\{\ln\left(y(x)\right)-\int\frac{1}{2\_C1+2\tan\left(\sqrt{3}x\right)}\left(-\sqrt{3}\tan\left(\sqrt{3}x\right)\_C1+\sqrt{3}-\sqrt{\left(3\_C1^{2}+4\right)\left(\tan\left(\sqrt{3}x\right)\right)^{2}+2\_C1\ \tan\left(\sqrt{3}x\right)}\right.\right.$$

Mathematica raw input

```
DSolve[y[x]^3 + (y[x]^2 + y'[x]^2)*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]/(E^(ArcTan[(1 + 2*InverseFunction[((-I + Sqrt[3])*ArcTan[#1/Sqrt[
(1 - I*Sqrt[3])/2]])/Sqrt[6*(1 - I*Sqrt[3])] + ((I + Sqrt[3])*ArcTan[#1/Sqrt[(1
+ I*Sqrt[3])/2]])/Sqrt[6*(1 + I*Sqrt[3])] & ][-x + C[1]]^2)/Sqrt[3]]/(2*Sqrt[3])
)*(1 + InverseFunction[((-I + Sqrt[3])*ArcTan[#1/Sqrt[(1 - I*Sqrt[3])/2]])/Sqrt[
6*(1 - I*Sqrt[3])] + ((I + Sqrt[3])*ArcTan[#1/Sqrt[(1 + I*Sqrt[3])/2]])/Sqrt[6*(
1 + I*Sqrt[3])] & ][-x + C[1]]^2 + InverseFunction[((-I + Sqrt[3])*ArcTan[#1/Sqr
t[(1 - I*Sqrt[3])/2]])/Sqrt[6*(1 - I*Sqrt[3])] + ((I + Sqrt[3])*ArcTan[#1/Sqrt[(
1 + I*Sqrt[3])/2]])/Sqrt[6*(1 + I*Sqrt[3])] & ][-x + C[1]]^4)^(1/4))}}
```

Maple raw input

```
dsolve((y(x)^2+diff(y(x),x)^2)*diff(diff(y(x),x),x)+y(x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
ln(y(x))-Int((-3^(1/2)*tan(3^(1/2)*x)*_C1+3^(1/2)-((3*_C1^2+4)*tan(3^(1/2)*x)^2+
2*_C1*tan(3^(1/2)*x)+4*_C1^2+3)^(1/2))/(2*_C1+2*tan(3^(1/2)*x)),x)-_C2 = 0, ln(y
(x))-Int((-3^(1/2)*tan(3^(1/2)*x)*_C1+3^(1/2)+((3*_C1^2+4)*tan(3^(1/2)*x)^2+2*_C
1*tan(3^(1/2)*x)+4*_C1^2+3)^(1/2))/(2*_C1+2*tan(3^(1/2)*x)),x)-_C2 = 0
```

4.2059 $y''(x)\left(a(xy'(x)-y(x))+y'(x)^2\right)=b$

ODE

$$y''(x)\left(a(xy'(x)-y(x))+y'(x)^2\right)=b$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.169849 (sec), leaf count = 0 , could not solve

```
DSolve[(Derivative[1][y][x]^2 + a*(-y[x] + x*Derivative[1][y][x]))*Derivative[2][y][x] == b, y[x], x]
```

Maple ✓
cpu = 0.358 (sec), leaf count = 285

$$\left\{x-\int^{y(x)+\frac{ax^2}{4}}\frac{1}{\_f^2a^2-4\_fb+2\_C1}\sqrt{\left(\_fa-\sqrt{4\_fb-2\_C1}\right)\left(\_f^2a^2-4\_fb+2\_C1\right)}d\_f-\_C2=0,x+\int^{y}$$

Mathematica raw input

```
DSolve[(y'[x]^2 + a*(-y[x] + x*y'[x]))*y''[x] == b,y[x],x]
```

Mathematica raw output

```
DSolve[(Derivative[1][y][x]^2 + a*(-y[x] + x*Derivative[1][y][x]))*Derivative[2]
[y][x] == b, y[x], x]
```

Maple raw input

```
dsolve((diff(y(x),x)^2+a*(x*diff(y(x),x)-y(x)))*diff(diff(y(x),x),x) = b, y(x),'implicit')
```

Maple raw output

```
x-Intat(1/(_f^2*a^2-4*_f*b+2*_C1)*((_f*a+(4*_f*b-2*_C1)^(1/2))*(_f^2*a^2-4*_f*b+
2*_C1))^(1/2),_f = y(x)+1/4*a*x^2)-_C2 = 0, x-Intat(1/(_f^2*a^2-4*_f*b+2*_C1)*((
_f*a-(4*_f*b-2*_C1)^(1/2))*(_f^2*a^2-4*_f*b+2*_C1))^(1/2),_f = y(x)+1/4*a*x^2)-_
C2 = 0, x+Intat(1/(_f^2*a^2-4*_f*b+2*_C1)*((_f*a+(4*_f*b-2*_C1)^(1/2))*(_f^2*a^2
-4*_f*b+2*_C1))^(1/2),_f = y(x)+1/4*a*x^2)-_C2 = 0, x+Intat(1/(_f^2*a^2-4*_f*b+2
*_C1)*((_f*a-(4*_f*b-2*_C1)^(1/2))*(_f^2*a^2-4*_f*b+2*_C1))^(1/2),_f = y(x)+1/4*
a*x^2)-_C2 = 0
```

4.2060 $4y(x)y'(x)^2y''(x) = y'(x)^4 + 3$

ODE

$$4y(x)y'(x)^2y''(x) = y'(x)^4 + 3$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.860343 (sec), leaf count = 157

$$\left\{\left\{y(x) \to -\frac{3}{8}e^{-4c_1}\left(-\sqrt[3]{6}\left(-e^{4c_1}(c_2+x)\right)^{4/3} - 8\right)\right\}, \left\{y(x) \to \frac{3}{8}e^{-4c_1}\left(8 + \sqrt[3]{6}\left(-ie^{4c_1}(c_2+x)\right)^{4/3}\right)\right\}, \left\{y(x) \to \frac{3}{8}e^{-4c_1}\left(\right.\right.\right.$$

Maple ✓
cpu = 0.073 (sec), leaf count = 91

$$\left\{-\frac{4}{3\_C1}(\_C1\,y(x)-3)^{\frac{3}{4}} - x - \_C2 = 0, \frac{4}{3\_C1}(\_C1\,y(x)-3)^{\frac{3}{4}} - x - \_C2 = 0, \frac{-\frac{4i}{3}}{\_C1}(\_C1\,y(x)-3)^{\frac{3}{4}} - x - \_C2 =\right.$$

Mathematica raw input

```
DSolve[4*y[x]*y'[x]^2*y''[x] == 3 + y'[x]^4,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-3*(-8 - 6^(1/3)*(-(E^(4*C[1])*(x + C[2])))^(4/3)))/(8*E^(4*C[1]))},
{y[x] -> (3*(8 + 6^(1/3)*((-I)*E^(4*C[1])*(x + C[2]))^(4/3)))/(8*E^(4*C[1]))}, {
y[x] -> (3*(8 + 6^(1/3)*(I*E^(4*C[1])*(x + C[2]))^(4/3)))/(8*E^(4*C[1]))}, {y[x]
 -> (3*(8 + 6^(1/3)*(E^(4*C[1])*(x + C[2]))^(4/3)))/(8*E^(4*C[1]))}}
```

Maple raw input

```
dsolve(4*y(x)*diff(y(x),x)^2*diff(diff(y(x),x),x) = diff(y(x),x)^4+3, y(x),'implicit')
```

Maple raw output

```
-4/3*(_C1*y(x)-3)^(3/4)/_C1-x-_C2 = 0, 4/3*(_C1*y(x)-3)^(3/4)/_C1-x-_C2 = 0, -4/
3*I*(_C1*y(x)-3)^(3/4)/_C1-x-_C2 = 0, 4/3*I*(_C1*y(x)-3)^(3/4)/_C1-x-_C2 = 0
```

4.2061 $y''(x)f(y'(x)) + g(y(x))y'(x) + h(x) = 0$

ODE

$$y''(x)f(y'(x)) + g(y(x))y'(x) + h(x) = 0$$

ODE Classification

[[_2nd_order, _exact, _nonlinear], [_2nd_order, _reducible, _mu_x_y1], [_2nd_order, _red

Book solution method
TO DO

Mathematica ✗
cpu = 0.047685 (sec), leaf count = 0 , could not solve

```
DSolve[h[x] + g[y[x]]*Derivative[1][y][x] + f[Derivative[1][y][x]]*Derivative[2][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 6.507 (sec), leaf count = 51

$$\left\{y(x) = ODESolStruc\left(\_f(\_b), [\left\{\int^{\_f(\_b)} g(\_a)\,d\_a + \int^{\frac{\mathrm{d}}{\mathrm{d}\_b}\_f(\_b)} f(\_a)\,d\_a + \int h(\_b)\ \mathrm{d}\_b + \_C1 = 0\right\}, \{\_b = x, \_\right.$$

Mathematica raw input

```
DSolve[h[x] + g[y[x]]*y'[x] + f[y'[x]]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[h[x] + g[y[x]]*Derivative[1][y][x] + f[Derivative[1][y][x]]*Derivative[2]
[y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(f(diff(y(x),x))*diff(diff(y(x),x),x)+g(y(x))*diff(y(x),x)+h(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_f(_b),[{Intat(g(_a),_a = _f(_b))+Intat(f(_a),_a = diff(_f(_b
),_b))+Int(h(_b),_b)+_C1 = 0}, {_b = x, _f(_b) = y(x)}, {x = _b, y(x) = _f(_b)}]
)
```

4.2062 $y''(x)^2 = a + by(x)$

ODE

$$y''(x)^2 = a + by(x)$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.850654 (sec), leaf count = 119

$$\left\{\text{Solve}\left[\frac{(a+by(x))^2\,{}_2F_1\left(\frac{1}{2},\frac{2}{3};\frac{5}{3};-\frac{4(a+by(x))^{3/2}}{3bc_1}\right)^2}{b^2c_1} = (c_2+x)^2, y(x)\right], \text{Solve}\left[\frac{(a+by(x))^2\,{}_2F_1\left(\frac{1}{2},\frac{2}{3};\frac{5}{3};\frac{4(a+by(x))^{3/2}}{3bc_1}\right)^2}{b^2c_1} =\right.\right.$$

Maple ✓
cpu = 0.441 (sec), leaf count = 173

$$\left\{\int^{y(x)} b\sqrt{3}\frac{1}{\sqrt{b\left(4\_a\sqrt{b\_a+a}b+4a\sqrt{b\_a+a}-\_C1\right)}}d\_a - x - \_C2 = 0, \int^{y(x)} -3\frac{b}{\sqrt{-12b\left((b\_a+a)^{3/2}-\_C1/4\right)}}\right.$$

Mathematica raw input

```
DSolve[y''[x]^2 == a + b*y[x],y[x],x]
```

Mathematica raw output

```
{Solve[(Hypergeometric2F1[1/2, 2/3, 5/3, (-4*(a + b*y[x])^(3/2))/(3*b*C[1])]^2*(
a + b*y[x])^2)/(b^2*C[1]) == (x + C[2])^2, y[x]], Solve[(Hypergeometric2F1[1/2,
2/3, 5/3, (4*(a + b*y[x])^(3/2))/(3*b*C[1])]^2*(a + b*y[x])^2)/(b^2*C[1]) == (x
+ C[2])^2, y[x]]}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)^2 = a+b*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -a/b, Intat(b*3^(1/2)/(b*(4*_a*(_a*b+a)^(1/2)*b+4*a*(_a*b+a)^(1/2)-_C1))^
(1/2),_a = y(x))-x-_C2 = 0, Intat(-b*3^(1/2)/(b*(4*_a*(_a*b+a)^(1/2)*b+4*a*(_a*b
+a)^(1/2)-_C1))^(1/2),_a = y(x))-x-_C2 = 0, Intat(-3*b/(-12*b*((_a*b+a)^(3/2)-1/
4*_C1))^(1/2),_a = y(x))-x-_C2 = 0, Intat(3*b/(-12*b*((_a*b+a)^(3/2)-1/4*_C1))^(
1/2),_a = y(x))-x-_C2 = 0
```

4.2063 $y''(x)^2 = a + by'(x)^2$

ODE

$$y''(x)^2 = a + by'(x)^2$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.155287 (sec), leaf count = 101

$$\left\{\left\{y(x) \to c_2 - \frac{e^{-\sqrt{b}(c_1+x)}\left(abe^{2\sqrt{b}x} + e^{2\sqrt{b}c_1}\right)}{2b^{3/2}}\right\}, \left\{y(x) \to \frac{e^{-\sqrt{b}(c_1+x)}\left(ab + e^{2\sqrt{b}(c_1+x)}\right)}{2b^{3/2}} + c_2\right\}\right\}$$

Maple ✓
cpu = 0.293 (sec), leaf count = 92

$$\left\{y(x) = -\frac{x}{b}\sqrt{-ab} + \_C1, y(x) = \frac{x}{b}\sqrt{-ab} + \_C1, y(x) = \_C1 + \_C2\,\mathrm{e}^{\sqrt{b}x} + \frac{a}{4b^2\_C2}\mathrm{e}^{-\sqrt{b}x}, y(x) = \_C1 + \frac{a}{4b^2\_C2}\mathrm{e}^{\sqrt{}}\right.$$

Mathematica raw input

```
DSolve[y''[x]^2 == a + b*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(a*b*E^(2*Sqrt[b]*x) + E^(2*Sqrt[b]*C[1]))/(2*b^(3/2)*E^(Sqrt[b]*(x +
  C[1]))) + C[2]}, {y[x] -> (a*b + E^(2*Sqrt[b]*(x + C[1])))/(2*b^(3/2)*E^(Sqrt[b
]*(x + C[1]))) + C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)^2 = a+b*diff(y(x),x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/b*(-a*b)^(1/2)*x+_C1, y(x) = 1/b*(-a*b)^(1/2)*x+_C1, y(x) = _C1+_C2*ex
p(b^(1/2)*x)+1/4*a/b^2/_C2*exp(-b^(1/2)*x), y(x) = _C1+1/4*a/b^2/_C2*exp(b^(1/2)
*x)+_C2*exp(-b^(1/2)*x)
```

4.2064 $y''(x)^2 - xy''(x) + y'(x) = 0$

ODE

$$y''(x)^2 - xy''(x) + y'(x) = 0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00793341 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{1}{2}c_1 x(x - 2c_1) + c_2\right\}\right\}$$

Maple ✓
cpu = 0.092 (sec), leaf count = 28

$$\left\{y(x) = \frac{x^3}{12} + \_C1, y(x) = \frac{\_C1\, x^2}{2} - \_C1^2 x + \_C2\right\}$$

Mathematica raw input

```
DSolve[y'[x] - x*y''[x] + y''[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(x - 2*C[1])*C[1])/2 + C[2]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)^2-x*diff(diff(y(x),x),x)+diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/12*x^3+_C1, y(x) = 1/2*_C1*x^2-_C1^2*x+_C2
```

4.2065 $a^2 y''(x)^2 = \left(y'(x)^2+1\right)^3$

ODE

$$a^2 y''(x)^2 = \left(y'(x)^2+1\right)^3$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.132494 (sec), leaf count = 141

$$\left\{\left\{y(x)\to c_2-i\sqrt{a^2\left(c_1^2-1\right)-2ac_1x+x^2}\right\},\left\{y(x)\to c_2+i\sqrt{a^2\left(c_1^2-1\right)-2ac_1x+x^2}\right\},\left\{y(x)\to c_2-i\sqrt{a^2\left(c_1^2-1\right)+\right.\right.$$

Maple ✓
cpu = 0.191 (sec), leaf count = 78

$$\left\{y(x)=-(x+\_C1+a)(-x-\_C1+a)\frac{1}{\sqrt{-\_C1^2-2\_C1\,x+a^2-x^2}}+\_C2, y(x)=(x+\_C1+a)(-x-\_C1+a\right.$$

Mathematica raw input

```
DSolve[a^2*y''[x]^2 == (1 + y'[x]^2)^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-I)*Sqrt[x^2 - 2*a*x*C[1] + a^2*(-1 + C[1]^2)] + C[2]}, {y[x] -> I*Sq
rt[x^2 - 2*a*x*C[1] + a^2*(-1 + C[1]^2)] + C[2]}, {y[x] -> (-I)*Sqrt[x^2 + 2*a*x
*C[1] + a^2*(-1 + C[1]^2)] + C[2]}, {y[x] -> I*Sqrt[x^2 + 2*a*x*C[1] + a^2*(-1 +
 C[1]^2)] + C[2]}}
```

Maple raw input

```
dsolve(a^2*diff(diff(y(x),x),x)^2 = (1+diff(y(x),x)^2)^3, y(x),'implicit')
```

Maple raw output

```
y(x) = -(x+_C1+a)*(-x-_C1+a)/(-_C1^2-2*_C1*x+a^2-x^2)^(1/2)+_C2, y(x) = (x+_C1+a
)*(-x-_C1+a)/(-_C1^2-2*_C1*x+a^2-x^2)^(1/2)+_C2
```

4.2066 $ax + xy''(x)^2 - 2y'(x)y''(x) = 0$

ODE

$$ax + xy''(x)^2 - 2y'(x)y''(x) = 0$$

ODE Classification

[[_2nd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.351783 (sec), leaf count = 261

$$\left\{\left\{y(x) \to c_2 - \frac{\sqrt{a}x \sec(c_1 - i\log(x))\left((x^2+3)\sin(c_1) - i(x^2-3)\cos(c_1)\right)}{6\sqrt{\sec^2(c_1 - i\log(x))}}\right\}, \left\{y(x) \to c_2 + \frac{\sqrt{a}x \sec(c_1 - i\log(x))\left((x^2\right.}{6\sqrt{\sec^2}}\right.$$

Maple ✓
cpu = 0.194 (sec), leaf count = 44

$$\left\{y(x) = -\frac{x^2}{2}\sqrt{a} + _C1, y(x) = \frac{x^2}{2}\sqrt{a} + _C1, y(x) = _C2\, x^3 + \frac{ax}{12_C2} + _C1\right\}$$

Mathematica raw input

```
DSolve[a*x - 2*y'[x]*y''[x] + x*y''[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] - (Sqrt[a]*x*Sec[C[1] - I*Log[x]]*((-I)*(-3 + x^2)*Cos[C[1]] + (3
 + x^2)*Sin[C[1]]))/(6*Sqrt[Sec[C[1] - I*Log[x]]^2])}, {y[x] -> C[2] + (Sqrt[a]*
x*Sec[C[1] - I*Log[x]]*((-I)*(-3 + x^2)*Cos[C[1]] + (3 + x^2)*Sin[C[1]]))/(6*Sqr
t[Sec[C[1] - I*Log[x]]^2])}, {y[x] -> C[2] - (Sqrt[a]*x*Sec[C[1] + I*Log[x]]*(I*
(-3 + x^2)*Cos[C[1]] + (3 + x^2)*Sin[C[1]]))/(6*Sqrt[Sec[C[1] + I*Log[x]]^2])},
{y[x] -> C[2] + (Sqrt[a]*x*Sec[C[1] + I*Log[x]]*(I*(-3 + x^2)*Cos[C[1]] + (3 + x
^2)*Sin[C[1]]))/(6*Sqrt[Sec[C[1] + I*Log[x]]^2])}}
```

Maple raw input

```
dsolve(x*diff(diff(y(x),x),x)^2-2*diff(y(x),x)*diff(diff(y(x),x),x)+a*x = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*a^(1/2)*x^2+_C1, y(x) = -1/2*a^(1/2)*x^2+_C1, y(x) = _C2*x^3+1/12*a/_
C2*x+_C1
```

4.2067 $(xy''(x) - y'(x))^2 = y''(x)^2 + 1$

ODE

$$(xy''(x) - y'(x))^2 = y''(x)^2 + 1$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✗
cpu = 604.432 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.173 (sec), leaf count = 63

$$\left\{y(x) = -\frac{x}{2}\sqrt{-x^2+1} - \frac{\arcsin(x)}{2} + \_C1, y(x) = \frac{x}{2}\sqrt{-x^2+1} + \frac{\arcsin(x)}{2} + \_C1, y(x) = \frac{x^2}{2}\sqrt{\_C1^2 - 1} + \_C1\, x + \_\right.$$

Mathematica raw input

```
DSolve[(-y'[x] + x*y''[x])^2 == 1 + y''[x]^2,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((x*diff(diff(y(x),x),x)-diff(y(x),x))^2 = 1+diff(diff(y(x),x),x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*x*(-x^2+1)^(1/2)+1/2*arcsin(x)+_C1, y(x) = -1/2*x*(-x^2+1)^(1/2)-1/2*
arcsin(x)+_C1, y(x) = 1/2*(_C1^2-1)^(1/2)*x^2+_C1*x+_C2
```

4.2068 $2(x^2+1)\,y''(x)^2+2(x-y'(x))\,y'(x)-x(4y'(x)+x)\,y''(x)=2y(x)$

ODE

$$2(x^2+1)\,y''(x)^2+2(x-y'(x))\,y'(x)-x(4y'(x)+x)\,y''(x)=2y(x)$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 3.26987 (sec), leaf count = 0 , could not solve

```
DSolve[2*(x - Derivative[1][y][x])*Derivative[1][y][x] - x*(x + 4*Derivative[1][y][x])*Derivative[2]|
```

Maple ✗
cpu = 3.143 (sec), leaf count = 0 , could not solve

```
dsolve(2*(x^2+1)*diff(diff(y(x),x),x)^2-x*diff(diff(y(x),x),x)*(x+4*diff(y(x),x))+2*(x-
diff(y(x),x))*diff(y(x),x) = 2*y(x), y(x),'implicit')
```

Mathematica raw input

```
DSolve[2*(x - y'[x])*y'[x] - x*(x + 4*y'[x])*y''[x] + 2*(1 + x^2)*y''[x]^2 == 2*y[x],y[x],x]
```

Mathematica raw output

```
DSolve[2*(x - Derivative[1][y][x])*Derivative[1][y][x] - x*(x + 4*Derivative[1][
y][x])*Derivative[2][y][x] + 2*(1 + x^2)*Derivative[2][y][x]^2 == 2*y[x], y[x],
x]
```

Maple raw input

```
dsolve(2*(x^2+1)*diff(diff(y(x),x),x)^2-x*diff(diff(y(x),x),x)*(x+4*diff(y(x),x))+2*(x-
diff(y(x),x))*diff(y(x),x) = 2*y(x), y(x),'implicit')
```

Maple raw output

```
dsolve(2*(x^2+1)*diff(diff(y(x),x),x)^2-x*diff(diff(y(x),x),x)*(x+4*diff(y(x),x)
)+2*(x-diff(y(x),x))*diff(y(x),x) = 2*y(x), y(x),'implicit')
```

4.2069 $3x^2y''(x)^2 + 4y'(x)^2 - 2(3xy'(x) + y(x))\,y''(x) = 0$

ODE

$$3x^2y''(x)^2 + 4y'(x)^2 - 2(3xy'(x) + y(x))\,y''(x) = 0$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00891545 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \frac{c_1^2x^2}{c_2} + c_1x + c_2\right\}\right\}$$

Maple ✓
cpu = 0.241 (sec), leaf count = 41

$$\left\{\frac{\sqrt{3}}{2}\ln\left(\frac{y(x)}{x}\right) - \ln(x) - \_C1 = 0, y(x) = \frac{\_C1^2x^2}{\_C2} + \_C1\,x + \_C2\right\}$$

Mathematica raw input

```
DSolve[4*y'[x]^2 - 2*(y[x] + 3*x*y'[x])*y''[x] + 3*x^2*y''[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + (x^2*C[1]^2)/C[2] + C[2]}}
```

Maple raw input

```
dsolve(3*x^2*diff(diff(y(x),x),x)^2-2*(3*x*diff(y(x),x)+y(x))*diff(diff(y(x),x),x)+4*diff(y(x),x)^2 =
```

Maple raw output

```
1/2*3^(1/2)*ln(y(x)/x)-ln(x)-_C1 = 0, y(x) = _C1^2/_C2*x^2+_C1*x+_C2
```

4.2070 $(2-9x)x^2y''(x)^2+6y(x)y''(x)-6(1-6x)xy'(x)y''(x)=36xy'(x)^2$

ODE

$$(2-9x)x^2y''(x)^2+6y(x)y''(x)-6(1-6x)xy'(x)y''(x)=36xy'(x)^2$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0301113 (sec), leaf count = 24

$$\left\{\left\{y(x)\to \frac{c_1^2x^3}{c_2}+c_1x+c_2\right\}\right\}$$

Maple ✓
cpu = 0.516 (sec), leaf count = 311

$$\left\{ \_C1\,x\left((9\,x-1)\sqrt{9}+9\sqrt{9\,x^2-2\,x}\right)^{\frac{2\sqrt{9}}{9}}\left((9\,x-1)\sqrt{9}+9\sqrt{x\,(9\,x-2)}\right)^{\frac{5\sqrt{9}}{18}}\sqrt{4\,x-1}\mathrm{e}^{-2\sqrt{9\,x^2-2\,x}+\frac{\sqrt{16}}{2}\sqrt{x(9\,x-2)}}\Big/\sqrt{1\left(\tfrac{\sqrt{}}{}\right.}\right.$$

Mathematica raw input

```
DSolve[6*y[x]*y''[x] - 6*(1 - 6*x)*x*y'[x]*y''[x] + (2 - 9*x)*x^2*y''[x]^2 == 36*x*y'[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + (x^3*C[1]^2)/C[2] + C[2]}}
```

Maple raw input

```
dsolve(x^2*(2-9*x)*diff(diff(y(x),x),x)^2-6*x*(1-6*x)*diff(y(x),x)*diff(diff(y(x),x),x)+6*y(x)*diff(d
```

Maple raw output

```
1/4*_C1*((9*x-1)*9^(1/2)+9*(9*x^2-2*x)^(1/2))^(-2/9*9^(1/2))*((9*x-1)*9^(1/2)+9*
(9*x^2-2*x)^(1/2))^(-5/18*9^(1/2))*5^(1/2)*4^(1/2)*(1/(-(4*x-1)^2/(9*x^2-2*x))^(
1/2)*(4/5+16^(1/2)*(x-1/5)/(9*x^2-2*x)^(1/2)))^(1/2)*x*(4*x-1)^(1/2)*exp(-1/2*(9
*x^2-2*x)^(1/2)*(-4+16^(1/2)))+y(x) = 0, _C1*((9*x-1)*9^(1/2)+9*(9*x^2-2*x)^(1/2
```

```
))^(2/9*9^(1/2))*((9*x-1)*9^(1/2)+9*(x*(9*x-2))^(1/2))^(5/18*9^(1/2))/((1/2*(-1/
2+5/2*x)*16^(1/2)/(x*(9*x-2))^(1/2)+1)/((-16*x^2+8*x-1)/x/(9*x-2))^(1/2))^(1/2)*
x*(4*x-1)^(1/2)*exp(-2*(9*x^2-2*x)^(1/2)+1/2*16^(1/2)*(x*(9*x-2))^(1/2))+y(x) =
0, y(x) = _C2*x^3+_C1*x+_C1^2/_C2
```

4.2071

$$\mathbf{f0}y''(x)^2+\mathbf{f1}y'(x)y''(x)+\mathbf{f2}y(x)y''(x)+\mathbf{g0}y'(x)^2+\mathbf{g1}y(x)y'(x)+hy(x)^2=0$$

ODE

$$\mathrm{f0}y''(x)^2+\mathrm{f1}y'(x)y''(x)+\mathrm{f2}y(x)y''(x)+\mathrm{g0}y'(x)^2+\mathrm{g1}y(x)y'(x)+hy(x)^2=0$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 600.078 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 2.148 (sec), leaf count = 148

$$\left\{\ln(y(x))-\int RootOf\left(x-2\int^{\_Z}\frac{f0}{-2\,f0\,\_f^2-\_f\,f1+\sqrt{-4\,\_f^2 f0\,g0+\_f^2 f1^2-4\,\_f\,f0\,g1+2\,\_f\,f1\,f2-4\,f0\,h+f2^2}}\right.\right.$$

Mathematica raw input

```
DSolve[h*y[x]^2 + g1*y[x]*y'[x] + g0*y'[x]^2 + f2*y[x]*y''[x] + f1*y'[x]*y''[x] + f0*y''[x]^2 == 0,y
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(f0*diff(diff(y(x),x),x)^2+f1*diff(y(x),x)*diff(diff(y(x),x),x)+f2*y(x)*diff(diff(y(x),x),x)+g0
```

Maple raw output

```
ln(y(x))-Int(RootOf(x-2*Intat(1/(-2*f0*_f^2-_f*f1+(-4*_f^2*f0*g0+_f^2*f1^2-4*_f*
f0*g1+2*_f*f1*f2-4*f0*h+f2^2)^(1/2)-f2)*f0,_f = _Z)+_C1),x)-_C2 = 0, ln(y(x))-In
t(RootOf(x+2*Intat(1/(2*f0*_f^2+_f*f1+(-4*_f^2*f0*g0+_f^2*f1^2-4*_f*f0*g1+2*_f*f
1*f2-4*f0*h+f2^2)^(1/2)+f2)*f0,_f = _Z)+_C1),x)-_C2 = 0
```

4.2072 $y(x)y''(x) + 4y(x)y'(x)^3 - y'(x)^2 = 0$

ODE

$$y(x)y''(x) + 4y(x)y'(x)^3 - y'(x)^2 = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_y_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.235022 (sec), leaf count = 80

$$\left\{\left\{y(x) \to -\frac{\sqrt{c_1}\sqrt{W\left(\frac{2e^{\frac{2(c_2+x)}{c_1}}}{c_1}\right)}}{\sqrt{2}}\right\}, \left\{y(x) \to \frac{\sqrt{c_1}\sqrt{W\left(\frac{2e^{\frac{2(c_2+x)}{c_1}}}{c_1}\right)}}{\sqrt{2}}\right\}\right\}$$

Maple ✓
cpu = 0.051 (sec), leaf count = 23

$$\left\{(y(x))^2 + \_C1\ \ln(y(x)) - x - \_C2 = 0, y(x) = \_C1\right\}$$

Mathematica raw input

```
DSolve[-y'[x]^2 + 4*y[x]*y'[x]^3 + y[x]*y''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((Sqrt[C[1]]*Sqrt[ProductLog[(2*E^((2*(x + C[2]))/C[1]))/C[1]]])/Sqrt
[2])}, {y[x] -> (Sqrt[C[1]]*Sqrt[ProductLog[(2*E^((2*(x + C[2]))/C[1]))/C[1]]])/
Sqrt[2]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(y(x),x),x)-diff(y(x),x)^2+4*y(x)*diff(y(x),x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1, y(x)^2+_C1*ln(y(x))-x-_C2 = 0
```

4.2073 $(y(x)y''(x)+y'(x)^2+1)^2=(y'(x)^2+1)^3$

ODE

$$(y(x)y''(x)+y'(x)^2+1)^2=(y'(x)^2+1)^3$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 11.6813 (sec), leaf count = 270

$$\left\{\left\{y(x)\to -\sqrt{e^{-2c_1}\left(1-e^{2c_1}\left(c_2+x\right)^2\right)}-e^{-c_1}\right\},\left\{y(x)\to \sqrt{e^{-2c_1}\left(1-e^{2c_1}\left(c_2+x\right)^2\right)}-e^{-c_1}\right\},\left\{y(x)\to -\sqrt{e^{2c_1}-(c_2+\right.\right.$$

Maple ✓
cpu = 1.691 (sec), leaf count = 129

$$\left\{-\_C2+y(x)\left(2\_C1-y(x)\right)\frac{1}{\sqrt{2\_C1\,y(x)-\left(y(x)\right)^2}}+x=0,-\_C2+y(x)\left(2\_C1+y(x)\right)\frac{1}{\sqrt{-2\_C1\,y(x)-\left(y(x)\right)^2}}\right.$$

Mathematica raw input

```
DSolve[(1 + y'[x]^2 + y[x]*y''[x])^2 == (1 + y'[x]^2)^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -E^(-C[1]) - Sqrt[(1 - E^(2*C[1])*(x + C[2])^2)/E^(2*C[1])]}, {y[x] ->
  -E^(-C[1]) + Sqrt[(1 - E^(2*C[1])*(x + C[2])^2)/E^(2*C[1])]}, {y[x] -> -E^C[1]
- Sqrt[E^(2*C[1]) - (x + C[2])^2]}, {y[x] -> E^C[1] - Sqrt[E^(2*C[1]) - (x + C[2
])^2]}, {y[x] -> -E^C[1] + Sqrt[E^(2*C[1]) - (x + C[2])^2]}, {y[x] -> E^C[1] + S
qrt[E^(2*C[1]) - (x + C[2])^2]}, {y[x] -> -((-1 + Sqrt[1 - E^(2*C[1])*(x + C[2])
^2])/E^C[1])}, {y[x] -> (1 + Sqrt[1 - E^(2*C[1])*(x + C[2])^2])/E^C[1]}}
```

Maple raw input

```
dsolve((1+diff(y(x),x)^2+y(x)*diff(diff(y(x),x),x))^2 = (1+diff(y(x),x)^2)^3, y(x),'implicit')
```

Maple raw output

```
-_C2+y(x)*(2*_C1-y(x))/(2*_C1*y(x)-y(x)^2)^(1/2)+x = 0, -_C2+y(x)*(2*_C1+y(x))/(
-2*_C1*y(x)-y(x)^2)^(1/2)+x = 0, y(x)*(2*_C1-y(x))/(2*_C1*y(x)-y(x)^2)^(1/2)-x-_
C2 = 0, y(x)*(2*_C1+y(x))/(-2*_C1*y(x)-y(x)^2)^(1/2)-x-_C2 = 0
```

4.2074 $y''(x)^2\left(a^2-b^2y(x)^2\right)+y'(x)^2\left(1-b^2y'(x)^2\right)+2b^2y(x)y'(x)^2y''(x)=0$

ODE

$$y''(x)^2\left(a^2-b^2y(x)^2\right)+y'(x)^2\left(1-b^2y'(x)^2\right)+2b^2y(x)y'(x)^2y''(x)=0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 600.135 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 3.543 (sec), leaf count = 126

$$\left\{x-ab\arctan\left(y(x)\sqrt{b^2}\frac{1}{\sqrt{a^2-b^2\left(y\left(x\right)\right)^2}}\right)\frac{1}{\sqrt{b^2}}-\_C1=0,x+ab\arctan\left(y(x)\sqrt{b^2}\frac{1}{\sqrt{a^2-b^2\left(y\left(x\right)\right)^2}}\right)\frac{1}{\sqrt{b^2}}-\_C1=\right.$$

Mathematica raw input

```
DSolve[y'[x]^2*(1 - b^2*y'[x]^2) + 2*b^2*y[x]*y'[x]^2*y''[x] + (a^2 - b^2*y[x]^2)*y''[x]^2 == 0,y[x],
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((a^2-b^2*y(x)^2)*diff(diff(y(x),x),x)^2+2*b^2*y(x)*diff(y(x),x)^2*diff(diff(y(x),x),x)+(1-
b^2*diff(y(x),x)^2)*diff(y(x),x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
x-a*b/(b^2)^(1/2)*arctan((b^2)^(1/2)*y(x)/(a^2-b^2*y(x)^2)^(1/2))-_C1 = 0, x+a*b
/(b^2)^(1/2)*arctan((b^2)^(1/2)*y(x)/(a^2-b^2*y(x)^2)^(1/2))-_C1 = 0, y(x) = _C1
, ln((_C1^2*b^2-1)^(1/2)/a*y(x)+_C1)/(_C1^2*b^2-1)^(1/2)*a-x-_C2 = 0
```

4.2075 $\left(x^2 y(x) y''(x) + x^2(-y'(x)^2) + y(x)^2\right)^2 = 4xy(x)\left(xy'(x) - y(x)\right)^3$

ODE

$$\left(x^2 y(x) y''(x) + x^2(-y'(x)^2) + y(x)^2\right)^2 = 4xy(x)\left(xy'(x) - y(x)\right)^3$$

ODE Classification

[[_2nd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 16.1333 (sec), leaf count = 0 , could not solve

```
DSolve[(y[x]^2 - x^2*Derivative[1][y][x]^2 + x^2*y[x]*Derivative[2][y][x])^2 == 4*x*y[x]*(-
y[x] + x*Derivative[1][y][x])^3, y[x], x]
```

Maple ✓
cpu = 0.466 (sec), leaf count = 82

$$\left\{y(x) = ODESolStruc\left(e^{\int \_b(\_a)\,d\_a + \_C1}, [\left\{\frac{d}{d\_a}\_b(\_a) = \frac{1}{\_a^2}\left(2\sqrt{\_a\,(\_a\,\_b(\_a)-1)}\,\_b(\_a)\,\_a - 2\sqrt{\_a\,(\_a\,\_b($$

Mathematica raw input

```
DSolve[(y[x]^2 - x^2*y'[x]^2 + x^2*y[x]*y''[x])^2 == 4*x*y[x]*(-y[x] + x*y'[x])^3,y[x],x]
```

Mathematica raw output

```
DSolve[(y[x]^2 - x^2*Derivative[1][y][x]^2 + x^2*y[x]*Derivative[2][y][x])^2 ==
4*x*y[x]*(-y[x] + x*Derivative[1][y][x])^3, y[x], x]
```

Maple raw input

```
dsolve((y(x)^2-x^2*diff(y(x),x)^2+x^2*y(x)*diff(diff(y(x),x),x))^2 = 4*x*y(x)*(x*diff(y(x),x)-
y(x))^3, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(exp(Int(_b(_a),_a)+_C1),[{diff(_b(_a),_a) = (2*(_a*(_a*_b(_a)
-1))^(1/2)*_b(_a)*_a-2*(_a*(_a*_b(_a)-1))^(1/2)-1)/_a^2}, {_a = x, _b(_a) = diff
(y(x),x)/y(x)}, {x = _a, y(x) = exp(Int(_b(_a),_a)+_C1)}])
```

4.2076 $y''(x)^3 = 12y'(x)\left(xy''(x) - 2y'(x)\right)$

ODE

$$y''(x)^3 = 12y'(x)\left(xy''(x) - 2y'(x)\right)$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✗
cpu = 604.874 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 15.168 (sec), leaf count = 169

$$\left\{y(x) = \frac{x^4}{9} + \_C1, y(x) = \int RootOf\left(-6\ln(x) + \int^{\_Z} -\frac{1}{\_f\left(9\_f - 4\right)}\left(3\sqrt{\frac{1}{\_f\left(9\_f-4\right)}}\_f\sqrt[3]{2}\sqrt[3]{\left(3\sqrt{\frac{1}{\_f\left(9\_f-4\right.}\right.}\right.\right.$$

Mathematica raw input

```
DSolve[y''[x]^3 == 12*y'[x]*(-2*y'[x] + x*y''[x]),y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)^3 = 12*diff(y(x),x)*(x*diff(diff(y(x),x),x)-2*diff(y(x),x)), y(x),'implic
```

Maple raw output

```
y(x) = 1/9*x^4+_C1, y(x) = Int(RootOf(-6*ln(x)+Intat(-(3*(1/_f/(9*_f-4))^(1/2)*_
f*2^(1/3)*((3*(1/_f/(9*_f-4))^(1/2)*_f+1)^2*(9*_f-4)^4)^(1/3)-2*2^(2/3)*((3*(1/_
f/(9*_f-4))^(1/2)*_f+1)*(9*_f-4)^2)^(1/3)-2^(1/3)*((3*(1/_f/(9*_f-4))^(1/2)*_f+1
)^2*(9*_f-4)^4)^(1/3)+18*_f-8)/_f/(9*_f-4),_f = _Z)+6*_C1)*x^3,x)+_C2
```

4.2077 $32y''(x)\left(xy''(x)-y'(x)\right)^3+\left(2y(x)y''(x)-y'(x)^2\right)^3=0$

ODE

$$32y''(x)\left(xy''(x)-y'(x)\right)^3+\left(2y(x)y''(x)-y'(x)^2\right)^3=0$$

ODE Classification

type_of_ode

Book solution method
TO DO

Mathematica ✓
cpu = 0.117534 (sec), leaf count = 135

$$\left\{\left\{y(x)\to\frac{1}{4}\left(\left(-\frac{8c_1^3}{\sqrt[3]{3\sqrt{3}\sqrt{c_1^9c_2^9\left(27c_1c_2-64\right)}-27c_1^5c_2^5}}+\frac{c_1^2}{c_2}-\frac{2\sqrt[3]{\sqrt{3}\sqrt{c_1^9c_2^9\left(27c_1c_2-64\right)}-9c_1^5c_2^5}}{3^{2/3}c_2^3}\right)x^2+4c_1x+4c_2\right)\right\}\right\}$$

Maple ✗
cpu = 0. (sec), leaf count = 0 , hanged

```
dsolve((2*y(x)*diff(diff(y(x),x),x)-diff(y(x),x)^2)^3+32*diff(diff(y(x),x),x)*(x*diff(diff(y(x),x),x)
diff(y(x),x))^3 = 0, y(x),'implicit')
```

Mathematica raw input

```
DSolve[32*y''[x]*(-y'[x] + x*y''[x])^3 + (-y'[x]^2 + 2*y[x]*y''[x])^3 == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (4*x*C[1] + 4*C[2] + x^2*(C[1]^2/C[2] - (2*(-9*C[1]^5*C[2]^5 + Sqrt[3]
*Sqrt[C[1]^9*C[2]^9*(-64 + 27*C[1]*C[2])])^(1/3))/(3^(2/3)*C[2]^3) - (8*C[1]^3)/
(-27*C[1]^5*C[2]^5 + 3*Sqrt[3]*Sqrt[C[1]^9*C[2]^9*(-64 + 27*C[1]*C[2])])^(1/3)))
/4}}
```

Maple raw input

```
dsolve((2*y(x)*diff(diff(y(x),x),x)-diff(y(x),x)^2)^3+32*diff(diff(y(x),x),x)*(x*diff(diff(y(x),x),x)
diff(y(x),x))^3 = 0, y(x),'implicit')
```

Maple raw output

```
dsolve((2*y(x)*diff(diff(y(x),x),x)-diff(y(x),x)^2)^3+32*diff(diff(y(x),x),x)*(x
*diff(diff(y(x),x),x)-diff(y(x),x))^3 = 0, y(x),'implicit')
```

4.2078 $f(y''(x)) + xy''(x) = y'(x)$

ODE

$$f(y''(x)) + xy''(x) = y'(x)$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.015016 (sec), leaf count = 22

$$\left\{\left\{y(x) \to xf(c_1) + \frac{c_1 x^2}{2} + c_2\right\}\right\}$$

Maple ✓
cpu = 0.167 (sec), leaf count = 24

$$\left\{-f\left(\frac{-2\_C1\,x - 2\_C2 + 2\,y(x)}{x^2}\right) + \_C1 = 0\right\}$$

Mathematica raw input

```
DSolve[f[y''[x]] + x*y''[x] == y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2*C[1])/2 + C[2] + x*f[C[1]]}}
```

Maple raw input

```
dsolve(f(diff(diff(y(x),x),x))+x*diff(diff(y(x),x),x) = diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
-f((-2*_C1*x-2*_C2+2*y(x))/x^2)+_C1 = 0
```

4.2079 $y'(x)f\left(\frac{y''(x)}{y'(x)}\right) = y'(x)^2 - y(x)y''(x)$

ODE

$$y'(x)f\left(\frac{y''(x)}{y'(x)}\right) = y'(x)^2 - y(x)y''(x)$$

ODE Classification

[[_2nd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0126855 (sec), leaf count = 0 , could not solve

```
DSolve[f[Derivative[2][y][x]/Derivative[1][y][x]]*Derivative[1][y][x] == Derivative[1][y][x]^2 - y[x]
```

Maple ✓
cpu = 0.259 (sec), leaf count = 17

$$\left\{\frac{\ln(y(x))}{\_C1} - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[f[y''[x]/y'[x]]*y'[x] == y'[x]^2 - y[x]*y''[x],y[x],x]
```

Mathematica raw output

```
DSolve[f[Derivative[2][y][x]/Derivative[1][y][x]]*Derivative[1][y][x] == Derivat
ive[1][y][x]^2 - y[x]*Derivative[2][y][x], y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)*f(diff(diff(y(x),x),x)/diff(y(x),x)) = diff(y(x),x)^2-y(x)*diff(diff(y(x),x),x),
```

Maple raw output

```
1/_C1*ln(y(x))-x-_C2 = 0
```

4.2080 $f\left(y''(x), y'(x) - xy''(x), \frac{1}{2}x^2y''(x) - xy'(x) + y(x)\right) = 0$

ODE

$$f\left(y''(x), y'(x) - xy''(x), \frac{1}{2}x^2y''(x) - xy'(x) + y(x)\right) = 0$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 0.00977717 (sec), leaf count = 0 , could not solve

```
DSolve[f[Derivative[2][y][x], Derivative[1][y][x] - x*Derivative[2][y][x], y[x] - x*Derivative[1][y]
```

Maple ✓
cpu = 0.053 (sec), leaf count = 22

$$\left\{f\left(\frac{-2\_C1\,x - 2\_C2 + 2\,y(x)}{x^2}, \_C1, \_C2\right) = 0\right\}$$

Mathematica raw input

```
DSolve[f[y''[x], y'[x] - x*y''[x], y[x] - x*y'[x] + (x^2*y''[x])/2] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f[Derivative[2][y][x], Derivative[1][y][x] - x*Derivative[2][y][x], y[x]
- x*Derivative[1][y][x] + (x^2*Derivative[2][y][x])/2] == 0, y[x], x]
```

Maple raw input

```
dsolve(f(diff(diff(y(x),x),x),diff(y(x),x)-x*diff(diff(y(x),x),x),y(x)-x*diff(y(x),x)+1/2*x^2*diff(di
```

Maple raw output

```
f((-2*_C1*x-2*_C2+2*y(x))/x^2,_C1,_C2) = 0
```

4.2081 $f(x, y''(x)) = 0$

ODE

$$f(x, y''(x)) = 0$$

ODE Classification

[[_2nd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 3.24072 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \int_1^x \left(\int_1^{K[2]} \text{InverseFunction}[f, 2, 2][K[1], 0]\, dK[1]\right) dK[2] + c_2 x + c_1\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 17

$$\left\{y(x) = \iint RootOf(f(x, \_Z))\, \mathrm{d}x\, \mathrm{d}x + \_C1\, x + \_C2\right\}$$

Mathematica raw input

```
DSolve[f[x, y''[x]] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*C[2] + Integrate[Integrate[InverseFunction[f, 2, 2][K[1], 0],
  {K[1], 1, K[2]}], {K[2], 1, x}]}}
```

Maple raw input

```
dsolve(f(x,diff(diff(y(x),x),x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(Int(RootOf(f(x,_Z)),x),x)+_C1*x+_C2
```

4.2082 $f(y(x), y''(x)) = 0$

ODE

$$f(y(x), y''(x)) = 0$$

ODE Classification

[[_2nd_order, _missing_x], [_2nd_order, _reducible, _mu_x_y1]]

Book solution method
TO DO

Mathematica ✓
cpu = 8.75089 (sec), leaf count = 42

$$\text{Solve}\left[(c_2+x)^2 = \left(\int_1^{y(x)} \frac{1}{\sqrt{2\int_1^{K[2]} \text{InverseFunction}[f,2,2][K[1],0]\,dK[1] + c_1}}\,dK[2]\right)^2, y(x)\right]$$

Maple ✓
cpu = 0.086 (sec), leaf count = 33

$$\left\{\int^{y(x)} \left(RootOf\left(\_Z^2 - \_C1 - 2\int RootOf(f(\_b,\_Z))\,\mathrm{d}\_b\right)\right)^{-1} d\_b - x - \_C2 = 0\right\}$$

Mathematica raw input

```
DSolve[f[y[x], y''[x]] == 0,y[x],x]
```

Mathematica raw output

```
Solve[(x + C[2])^2 == Integrate[1/Sqrt[C[1] + 2*Integrate[InverseFunction[f, 2,
2][K[1], 0], {K[1], 1, K[2]}]], {K[2], 1, y[x]}]^2, y[x]]
```

Maple raw input

```
dsolve(f(y(x),diff(diff(y(x),x),x)) = 0, y(x),'implicit')
```

Maple raw output

```
Intat(1/RootOf(_Z^2-_C1-2*Int(RootOf(f(_b,_Z)),_b)),_b = y(x))-x-_C2 = 0
```

4.2083 $f(y'(x), y''(x)) = 0$

ODE

$$f(y'(x), y''(x)) = 0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.11781 (sec), leaf count = 37

$$\left\{\left\{y(x) \to \int_1^x \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{\text{InverseFunction}[f,2,2][K[1],0]}\, dK[1]\&\right][K[2]+c_1]\, dK[2]+c_2\right\}\right\}$$

Maple ✓
cpu = 0.091 (sec), leaf count = 24

$$\left\{y(x) = \int RootOf\left(x - \int^{\_Z} (RootOf(f(\_f,\_Z)))^{-1}\, d\_f + \_C1\right) \mathrm{d}x + \_C2\right\}$$

Mathematica raw input

```
DSolve[f[y'[x], y''[x]] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + Integrate[InverseFunction[Integrate[InverseFunction[f, 2, 2][K[
1], 0]^(-1), {K[1], 1, #1}] & ][C[1] + K[2]], {K[2], 1, x}]}}
```

Maple raw input

```
dsolve(f(diff(y(x),x),diff(diff(y(x),x),x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = Int(RootOf(x-Intat(1/RootOf(f(_f,_Z)),_f = _Z)+_C1),x)+_C2
```

4.2084 $f(x, y'(x), y''(x)) = 0$

ODE

$$f(x, y'(x), y''(x)) = 0$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✗
cpu = 1.32168 (sec), leaf count = 0 , could not solve

```
DSolve[f[x, Derivative[1][y][x], Derivative[2][y][x]] == 0, y[x], x]
```

Maple ✓
cpu = 0.132 (sec), leaf count = 48

$$\left\{y(x) = ODESolStruc\left(\int \_b(\_a)\, \mathrm{d}\_a + \_C1, \left[\left\{\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a) = RootOf(f(\_a, \_b(\_a), \_Z))\right\}, \left\{\_a = x, \_b(\_a) = \frac{\mathrm{d}}{\mathrm{d}x}\right.\right.\right.$$

Mathematica raw input

```
DSolve[f[x, y'[x], y''[x]] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f[x, Derivative[1][y][x], Derivative[2][y][x]] == 0, y[x], x]
```

Maple raw input

```
dsolve(f(x,diff(y(x),x),diff(diff(y(x),x),x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(Int(_b(_a),_a)+_C1,[{diff(_b(_a),_a) = RootOf(f(_a,_b(_a),_Z)
)}, {_a = x, _b(_a) = diff(y(x),x)}, {x = _a, y(x) = Int(_b(_a),_a)+_C1}])
```

4.2085 $f(y(x), y'(x), y''(x)) = 0$

ODE

$$f(y(x), y'(x), y''(x)) = 0$$

ODE Classification

[[_2nd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✗
cpu = 6.29472 (sec), leaf count = 0 , could not solve

```
DSolve[f[y[x], Derivative[1][y][x], Derivative[2][y][x]] == 0, y[x], x]
```

Maple ✓
cpu = 0.152 (sec), leaf count = 53

$$\left\{y(x) = ODESolStruc\left(\_a, [\left\{\left(\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a)\right)\_b(\_a) - RootOf(f(\_a, \_b(\_a), \_Z)) = 0\right\}, \left\{\_a = y(x), \_b(\_a) = \frac{\mathrm{d}}{\mathrm{d}x}\right.\right.$$

Mathematica raw input

```
DSolve[f[y[x], y'[x], y''[x]] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f[y[x], Derivative[1][y][x], Derivative[2][y][x]] == 0, y[x], x]
```

Maple raw input

```
dsolve(f(y(x),diff(y(x),x),diff(diff(y(x),x),x)) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a,[{diff(_b(_a),_a)*_b(_a)-RootOf(f(_a,_b(_a),_Z)) = 0}, {_a
 = y(x), _b(_a) = diff(y(x),x)}, {x = Int(1/_b(_a),_a)+_C1, y(x) = _a}])
```

4.2086 $y'''(x) = 0$

ODE

$$y'''(x) = 0$$

ODE Classification

[[_3rd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0142119 (sec), leaf count = 17

$$\{\{y(x) \to x(c_3 x + c_2) + c_1\}\}$$

Maple ✓
cpu = 0.002 (sec), leaf count = 15

$$\left\{y(x) = \frac{\_C1\, x^2}{2} + \_C2\, x + \_C3\right\}$$

Mathematica raw input

```
DSolve[y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*(C[2] + x*C[3])}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*_C1*x^2+_C2*x+_C3
```

4.2087 $y'''(x) = \cos(x) + 1$

ODE

$$y'''(x) = \cos(x) + 1$$

ODE Classification

[[_3rd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0319679 (sec), leaf count = 29

$$\left\{\left\{y(x) \to c_3 x^2 + c_2 x + c_1 + \frac{x^3}{6} - \sin(x)\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 24

$$\left\{y(x) = \frac{x^3}{6} - \sin(x) + \frac{\_C1\, x^2}{2} + \_C2\, x + \_C3\right\}$$

Mathematica raw input

```
DSolve[y'''[x] == 1 + Cos[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^3/6 + C[1] + x*C[2] + x^2*C[3] - Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x) = 1+cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/6*x^3-sin(x)+1/2*_C1*x^2+_C2*x+_C3
```

4.2088 $y'''(x) + \sin(x) = 0$

ODE

$$y'''(x) + \sin(x) = 0$$

ODE Classification

[[_3rd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0150115 (sec), leaf count = 21

$$\{\{y(x) \to x(c_3 x + c_2) + c_1 - \cos(x)\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 19

$$\left\{y(x) = -\cos(x) + \frac{\_C1\, x^2}{2} + \_C2\, x + \_C3\right\}$$

Mathematica raw input

```
DSolve[Sin[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*(C[2] + x*C[3]) - Cos[x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+sin(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -cos(x)+1/2*_C1*x^2+_C2*x+_C3
```

4.2089 $y'''(x) = \sin^3(x)$

ODE

$$y'''(x) = \sin^3(x)$$

ODE Classification

[[_3rd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0335125 (sec), leaf count = 32

$$\left\{\left\{y(x) \to c_3 x^2 + c_2 x + c_1 + \frac{3\cos(x)}{4} - \frac{1}{108}\cos(3x)\right\}\right\}$$

Maple ✓
cpu = 0.253 (sec), leaf count = 25

$$\left\{y(x) = \frac{3\cos(x)}{4} - \frac{\cos(3x)}{108} + \frac{\_C1\, x^2}{2} + \_C2\, x + \_C3\right\}$$

Mathematica raw input

```
DSolve[y'''[x] == Sin[x]^3,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*C[2] + x^2*C[3] + (3*Cos[x])/4 - Cos[3*x]/108}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x) = sin(x)^3, y(x),'implicit')
```

Maple raw output

```
y(x) = 3/4*cos(x)-1/108*cos(3*x)+1/2*_C1*x^2+_C2*x+_C3
```

4.2090 $y'''(x) = y(x)$

ODE

$$y'''(x) = y(x)$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0154985 (sec), leaf count = 52

$$\left\{\left\{y(x) \to e^{-x/2}\left(c_1 e^{3x/2} + c_3 \sin\left(\frac{\sqrt{3}x}{2}\right) + c_2 \cos\left(\frac{\sqrt{3}x}{2}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 35

$$\left\{y(x) = \_C1\, \mathrm{e}^{x} + \_C2\, \mathrm{e}^{-\frac{x}{2}} \sin\left(\frac{\sqrt{3}x}{2}\right) + \_C3\, \mathrm{e}^{-\frac{x}{2}} \cos\left(\frac{\sqrt{3}x}{2}\right)\right\}$$

Mathematica raw input

```
DSolve[y'''[x] == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^((3*x)/2)*C[1] + C[2]*Cos[(Sqrt[3]*x)/2] + C[3]*Sin[(Sqrt[3]*x)/2])
/E^(x/2)}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(x)+_C2*exp(-1/2*x)*sin(1/2*3^(1/2)*x)+_C3*exp(-1/2*x)*cos(1/2*3^(
1/2)*x)
```

4.2091 $y'''(x) = x^2 + y(x)$

ODE

$$y'''(x) = x^2 + y(x)$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00995989 (sec), leaf count = 59

$$\left\{\left\{y(x) \to c_1 e^x + c_3 e^{-x/2} \sin\left(\frac{\sqrt{3}x}{2}\right) + c_2 e^{-x/2} \cos\left(\frac{\sqrt{3}x}{2}\right) - x^2\right\}\right\}$$

Maple ✓
cpu = 0.121 (sec), leaf count = 40

$$\left\{y(x) = -x^2 + \_C1\, \mathrm{e}^x + \_C2\, \mathrm{e}^{-\frac{x}{2}} \cos\left(\frac{\sqrt{3}x}{2}\right) + \_C3\, \mathrm{e}^{-\frac{x}{2}} \sin\left(\frac{\sqrt{3}x}{2}\right)\right\}$$

Mathematica raw input

```
DSolve[y'''[x] == x^2 + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x^2 + E^x*C[1] + (C[2]*Cos[(Sqrt[3]*x)/2])/E^(x/2) + (C[3]*Sin[(Sqrt[
3]*x)/2])/E^(x/2)}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x) = x^2+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -x^2+_C1*exp(x)+_C2*exp(-1/2*x)*cos(1/2*3^(1/2)*x)+_C3*exp(-1/2*x)*sin(1/
2*3^(1/2)*x)
```

4.2092 $y'''(x) = y(x) + e^x x + \cos^2(x)$

ODE

$$y'''(x) = y(x) + e^x x + \cos^2(x)$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 1.44949 (sec), leaf count = 98

$$\left\{\left\{y(x) \to c_1 e^x + c_3 e^{-x/2} \sin\left(\frac{\sqrt{3}x}{2}\right) + c_2 e^{-x/2} \cos\left(\frac{\sqrt{3}x}{2}\right) + \frac{e^x x^2}{6} - \frac{e^x x}{3} + \frac{2e^x}{9} - \frac{4}{65}\sin(2x) - \frac{1}{130}\cos(2x) - \frac{1}{2}\right\}\right\}$$

Maple ✓
cpu = 0.336 (sec), leaf count = 61

$$\left\{y(x) = \_C2\, \mathrm{e}^{-\frac{x}{2}} \cos\left(\frac{\sqrt{3}x}{2}\right) + \_C3\, \mathrm{e}^{-\frac{x}{2}} \sin\left(\frac{\sqrt{3}x}{2}\right) - \frac{\cos(2x)}{130} - \frac{4\sin(2x)}{65} - \frac{1}{2} + \frac{(195x^2 + 1170\_C1 - 390x + 260}{1170}\right.$$

Mathematica raw input

```
DSolve[y'''[x] == E^x*x + Cos[x]^2 + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1/2 + (2*E^x)/9 - (E^x*x)/3 + (E^x*x^2)/6 + E^x*C[1] - Cos[2*x]/130 +
  (C[2]*Cos[(Sqrt[3]*x)/2])/E^(x/2) - (4*Sin[2*x])/65 + (C[3]*Sin[(Sqrt[3]*x)/2])
/E^(x/2)}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x) = x*exp(x)+cos(x)^2+y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*exp(-1/2*x)*cos(1/2*3^(1/2)*x)+_C3*exp(-1/2*x)*sin(1/2*3^(1/2)*x)-1/1
30*cos(2*x)-4/65*sin(2*x)-1/2+1/1170*(195*x^2+1170*_C1-390*x+260)*exp(x)
```

4.2093 $y'''(x) + ay(x) = 0$

ODE

$$y'''(x) + ay(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00774462 (sec), leaf count = 54

$$\left\{\left\{y(x) \to c_1 e^{-(-1)^{2/3}\sqrt[3]{a}x} + c_2 e^{\sqrt[3]{-1}\sqrt[3]{a}x} + c_3 e^{-\sqrt[3]{a}x}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 53

$$\left\{y(x) = \_C1\, \mathrm{e}^{\frac{\left(i\sqrt{3}-1\right)x}{2}\sqrt[3]{-a}} + \_C2\, \mathrm{e}^{-\frac{\left(i\sqrt{3}+1\right)x}{2}\sqrt[3]{-a}} + \_C3\, \mathrm{e}^{\sqrt[3]{-a}x}\right\}$$

Mathematica raw input

```
DSolve[a*y[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^((-1)^(2/3)*a^(1/3)*x) + E^((-1)^(1/3)*a^(1/3)*x)*C[2] + C[3]/E
^(a^(1/3)*x)}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(1/2*(-a)^(1/3)*(I*3^(1/2)-1)*x)+_C2*exp(-1/2*(-a)^(1/3)*(I*3^(1/2
)+1)*x)+_C3*exp((-a)^(1/3)*x)
```

4.2094 $y'''(x) = xy(x)$

ODE

$$y'''(x) = xy(x)$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0367222 (sec), leaf count = 78

$$\left\{\left\{y(x) \to \frac{1}{8}\left(8c_1\,{}_0F_2\left(;\frac{1}{2},\frac{3}{4};\frac{x^4}{64}\right)+x\left((2+2i)c_2\,{}_0F_2\left(;\frac{3}{4},\frac{5}{4};\frac{x^4}{64}\right)+ic_3x\,{}_0F_2\left(;\frac{5}{4},\frac{3}{2};\frac{x^4}{64}\right)\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.159 (sec), leaf count = 45

$$\left\{y(x) = \_C1\,{}_0\mathrm{F}_2(\,;\,\frac{1}{2},\frac{3}{4};\,\frac{x^4}{64}) + \_C2\,x\,{}_0\mathrm{F}_2(\,;\,\frac{3}{4},\frac{5}{4};\,\frac{x^4}{64}) + \_C3\,x^2\,{}_0\mathrm{F}_2(\,;\,\frac{5}{4},\frac{3}{2};\,\frac{x^4}{64})\right\}$$

Mathematica raw input

```
DSolve[y'''[x] == x*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (8*C[1]*HypergeometricPFQ[{}, {1/2, 3/4}, x^4/64] + x*((2 + 2*I)*C[2]*
HypergeometricPFQ[{}, {3/4, 5/4}, x^4/64] + I*x*C[3]*HypergeometricPFQ[{}, {5/4,
 3/2}, x^4/64]))/8}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x) = x*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([],[1/2, 3/4],1/64*x^4)+_C2*x*hypergeom([],[3/4, 5/4],1/64*
x^4)+_C3*x^2*hypergeom([],[5/4, 3/2],1/64*x^4)
```

4.2095 $y'''(x) + y'(x) = 0$

ODE

$$y'''(x) + y'(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0163954 (sec), leaf count = 19

$$\{\{y(x) \to c_1 \sin(x) - c_2 \cos(x) + c_3\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 14

$$\{y(x) = \_C1 + \_C2 \sin(x) + \_C3 \cos(x)\}$$

Mathematica raw input

```
DSolve[y'[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3] - C[2]*Cos[x] + C[1]*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*sin(x)+_C3*cos(x)
```

4.2096 $y'''(x) = y'(x)$

ODE

$$y'''(x) = y'(x)$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0168271 (sec), leaf count = 23

$$\{\{y(x) \to c_1 e^x - c_2 e^{-x} + c_3\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 16

$$\{y(x) = \_C1 + \_C2\, \mathrm{e}^x + \_C3\, \mathrm{e}^{-x}\}$$

Mathematica raw input

```
DSolve[y'''[x] == y'[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1] - C[2]/E^x + C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x) = diff(y(x),x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*exp(x)+_C3*exp(-x)
```

4.2097 $y'''(x) + y'(x) = x^3 + \cos(x)$

ODE

$$y'''(x) + y'(x) = x^3 + \cos(x)$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.113436 (sec), leaf count = 39

$$\left\{\left\{y(x) \to (c_1+1)\sin(x) - \frac{1}{2}(2c_2+x)\cos(x) + c_3 + \frac{x^4}{4} - 3x^2\right\}\right\}$$

Maple ✓
cpu = 0.063 (sec), leaf count = 36

$$\left\{y(x) = \frac{(-2\,x - 4\,\_C2)\cos(x)}{4} + \frac{(4\,\_C1 + 4)\sin(x)}{4} + \frac{x^4}{4} - 3\,x^2 + \_C3\right\}$$

Mathematica raw input

```
DSolve[y'[x] + y'''[x] == x^3 + Cos[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -3*x^2 + x^4/4 + C[3] - ((x + 2*C[2])*Cos[x])/2 + (1 + C[1])*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+diff(y(x),x) = x^3+cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*(-2*x-4*_C2)*cos(x)+1/4*(4*_C1+4)*sin(x)+1/4*x^4-3*x^2+_C3
```

4.2098 $y'''(x) - 2y'(x) + 4y(x) = 0$

ODE

$$y'''(x) - 2y'(x) + 4y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00839355 (sec), leaf count = 30

$$\{\{y(x) \to c_3 e^{-2x} + c_1 e^x \sin(x) + c_2 e^x \cos(x)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 23

$$\{y(x) = \_C1\, \mathrm{e}^{-2x} + \_C2\, \mathrm{e}^{x} \sin(x) + \_C3\, \mathrm{e}^{x} \cos(x)\}$$

Mathematica raw input

```
DSolve[4*y[x] - 2*y'[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3]/E^(2*x) + E^x*C[2]*Cos[x] + E^x*C[1]*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-2*diff(y(x),x)+4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-2*x)+_C2*exp(x)*sin(x)+_C3*exp(x)*cos(x)
```

4.2099 $y'''(x) - 2y'(x) + 4y(x) = e^x \cos(x)$

ODE

$$y'''(x) - 2y'(x) + 4y(x) = e^x \cos(x)$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0513872 (sec), leaf count = 57

$$\left\{\left\{y(x) \to \frac{1}{100} e^{-2x} \left(e^{3x}(100c_1 + 15x + 1)\sin(x) - e^{3x}(5x - 2(50c_2 + 9))\cos(x) + 100c_3\right)\right\}\right\}$$

Maple ✓
cpu = 0.087 (sec), leaf count = 35

$$\left\{y(x) = \_C1\, \mathrm{e}^{-2x} - \frac{\mathrm{e}^x}{20}\left(\left(x - 20\,\_C2 - \frac{18}{5}\right)\cos(x) - 3\sin(x)\left(x + \frac{20\,\_C3}{3} + 1/15\right)\right)\right\}$$

Mathematica raw input

```
DSolve[4*y[x] - 2*y'[x] + y'''[x] == E^x*Cos[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (100*C[3] - E^(3*x)*(5*x - 2*(9 + 50*C[2]))*Cos[x] + E^(3*x)*(1 + 15*x
 + 100*C[1])*Sin[x])/(100*E^(2*x))}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-2*diff(y(x),x)+4*y(x) = exp(x)*cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-2*x)-1/20*exp(x)*((x-20*_C2-18/5)*cos(x)-3*sin(x)*(x+20/3*_C3+1/
15))
```

4.2100 $y'''(x) - 3y'(x) + 2y(x) = 0$

ODE

$$y'''(x) - 3y'(x) + 2y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00780734 (sec), leaf count = 25

$$\{\{y(x) \to c_1 e^{-2x} + e^x(c_3 x + c_2)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 19

$$\{y(x) = \_C1\, \mathrm{e}^{-2x} + \mathrm{e}^x(\_C3\, x + \_C2)\}$$

Mathematica raw input

```
DSolve[2*y[x] - 3*y'[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(2*x) + E^x*(C[2] + x*C[3])}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-3*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-2*x)+exp(x)*(_C3*x+_C2)
```

4.2101 $y'''(x) - 3y'(x) + 2y(x) = 3e^x$

ODE

$$y'''(x) - 3y'(x) + 2y(x) = 3e^x$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0164162 (sec), leaf count = 39

$$\left\{\left\{y(x) \to e^x\left(\left(c_3 - \frac{1}{3}\right)x + c_2 + \frac{x^2}{2} + \frac{1}{9}\right) + c_1 e^{-2x}\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 26

$$\left\{y(x) = \_C2\, \mathrm{e}^{-2x} + \frac{\mathrm{e}^x\left(2\,\_C3\, x + x^2 + 2\,\_C1\right)}{2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 3*y'[x] + y'''[x] == 3*E^x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(2*x) + E^x*(1/9 + x^2/2 + C[2] + x*(-1/3 + C[3]))}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-3*diff(y(x),x)+2*y(x) = 3*exp(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*exp(-2*x)+1/2*exp(x)*(2*_C3*x+x^2+2*_C1)
```

4.2102 $y'''(x) - 3y'(x) + 2y(x) = e^x x^2$

ODE

$$y'''(x) - 3y'(x) + 2y(x) = e^x x^2$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0205005 (sec), leaf count = 51

$$\left\{\left\{y(x) \to \frac{1}{972}e^x\left(12(81c_3 - 2)x + 972c_2 + 27x^4 - 36x^3 + 36x^2 + 8\right) + c_1 e^{-2x}\right\}\right\}$$

Maple ✓
cpu = 0.042 (sec), leaf count = 36

$$\left\{y(x) = \_C2\, \mathrm{e}^{-2x} + \frac{\mathrm{e}^x}{36}\left(x^4 - \frac{4x^3}{3} + \frac{4x^2}{3} + 36x\_C3 + 36\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 3*y'[x] + y'''[x] == E^x*x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(2*x) + (E^x*(8 + 36*x^2 - 36*x^3 + 27*x^4 + 972*C[2] + 12*x*(-
2 + 81*C[3])))/972}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-3*diff(y(x),x)+2*y(x) = x^2*exp(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*exp(-2*x)+1/36*exp(x)*(x^4-4/3*x^3+4/3*x^2+36*x*_C3+36*_C1)
```

4.2103 $y'''(x) - 4y'(x) = x^2 - 3e^{2x}$

ODE

$$y'''(x) - 4y'(x) = x^2 - 3e^{2x}$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0915032 (sec), leaf count = 49

$$\left\{\left\{y(x) \to \frac{1}{32}e^{2x}(16c_1 - 12x + 9) - \frac{1}{2}c_2e^{-2x} + c_3 - \frac{x^3}{12} - \frac{x}{8}\right\}\right\}$$

Maple ✓
cpu = 0.041 (sec), leaf count = 35

$$\left\{y(x) = \frac{(-36\,x + 48\,\_C2 + 27)\,\mathrm{e}^{2\,x}}{96} - \frac{x^3}{12} - \frac{\mathrm{e}^{-2\,x}\,\_C1}{2} - \frac{x}{8} + \_C3\right\}$$

Mathematica raw input

```
DSolve[-4*y'[x] + y'''[x] == -3*E^(2*x) + x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -x/8 - x^3/12 + (E^(2*x)*(9 - 12*x + 16*C[1]))/32 - C[2]/(2*E^(2*x)) +
  C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-4*diff(y(x),x) = x^2-3*exp(2*x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/96*(-36*x+48*_C2+27)*exp(2*x)-1/12*x^3-1/2*exp(-2*x)*_C1-1/8*x+_C3
```

4.2104 $y'''(x) - 7y'(x) + 6y(x) = 0$

ODE

$$y'''(x) - 7y'(x) + 6y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00898009 (sec), leaf count = 28

$$\{\{y(x) \to c_1 e^{-3x} + c_2 e^{x} + c_3 e^{2x}\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 21

$$\{y(x) = \_C1\, \mathrm{e}^{2x} + \_C2\, \mathrm{e}^{x} + \_C3\, \mathrm{e}^{-3x}\}$$

Mathematica raw input

```
DSolve[6*y[x] - 7*y'[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(3*x) + E^x*C[2] + E^(2*x)*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-7*diff(y(x),x)+6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(2*x)+_C2*exp(x)+_C3*exp(-3*x)
```

4.2105 $y'''(x) = a^2 y(x)$

ODE

$$y'''(x) = a^2 y(x)$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00904729 (sec), leaf count = 53

$$\left\{\left\{y(x) \to c_1 e^{(-1)^{2/3} a^{2/3} x} + c_2 e^{-\sqrt[3]{-1} a^{2/3} x} + c_3 e^{a^{2/3} x}\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 47

$$\left\{y(x) = \_C1\, \mathrm{e}^{-\frac{\left(i\sqrt{3}+1\right)x}{2} a^{\frac{2}{3}}} + \_C2\, \mathrm{e}^{\frac{\left(i\sqrt{3}-1\right)x}{2} a^{\frac{2}{3}}} + \_C3\, \mathrm{e}^{a^{\frac{2}{3}} x}\right\}$$

Mathematica raw input

```
DSolve[y'''[x] == a^2*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^((-1)^(2/3)*a^(2/3)*x)*C[1] + C[2]/E^((-1)^(1/3)*a^(2/3)*x) + E^(a^(
2/3)*x)*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x) = a^2*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-1/2*a^(2/3)*(I*3^(1/2)+1)*x)+_C2*exp(1/2*a^(2/3)*(I*3^(1/2)-1)*x
)+_C3*exp(a^(2/3)*x)
```

4.2106 $y'''(x) + 2xy'(x) + y(x) = 0$

ODE

$$y'''(x) + 2xy'(x) + y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0119249 (sec), leaf count = 59

$$\left\{\left\{y(x) \to c_1 \text{Ai}\left(\sqrt[3]{-\frac{1}{2}}x\right)^2 + c_3 \text{Bi}\left(\sqrt[3]{-\frac{1}{2}}x\right)^2 + c_2 \text{Ai}\left(\sqrt[3]{-\frac{1}{2}}x\right) \text{Bi}\left(\sqrt[3]{-\frac{1}{2}}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.081 (sec), leaf count = 43

$$\left\{y(x) = \_C1 \left(\text{Ai}\left(-\frac{2^{\frac{2}{3}}x}{2}\right)\right)^2 + \_C2 \left(\text{Bi}\left(-\frac{2^{\frac{2}{3}}x}{2}\right)\right)^2 + \_C3 \, \text{Ai}\left(-\frac{2^{\frac{2}{3}}x}{2}\right) \text{Bi}\left(-\frac{2^{\frac{2}{3}}x}{2}\right)\right\}$$

Mathematica raw input

```
DSolve[y[x] + 2*x*y'[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> AiryAi[(-1/2)^(1/3)*x]^2*C[1] + AiryAi[(-1/2)^(1/3)*x]*AiryBi[(-1/2)^(
1/3)*x]*C[2] + AiryBi[(-1/2)^(1/3)*x]^2*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+2*x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*AiryAi(-1/2*2^(2/3)*x)^2+_C2*AiryBi(-1/2*2^(2/3)*x)^2+_C3*AiryAi(-1/2
*2^(2/3)*x)*AiryBi(-1/2*2^(2/3)*x)
```

4.2107 $y'''(x) + 2axy'(x) + ay(x) = 0$

ODE

$$y'''(x) + 2axy'(x) + ay(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0135751 (sec), leaf count = 79

$$\left\{\left\{y(x) \to c_1 \text{Ai}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}x\right)^2 + c_3 \text{Bi}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}x\right)^2 + c_2 \text{Ai}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}x\right)\text{Bi}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.037 (sec), leaf count = 55

$$\left\{y(x) = \_C1\left(\text{Ai}\left(-\frac{2^{\frac{2}{3}}x}{2}\sqrt[3]{a}\right)\right)^2 + \_C2\left(\text{Bi}\left(-\frac{2^{\frac{2}{3}}x}{2}\sqrt[3]{a}\right)\right)^2 + \_C3\,\text{Ai}\left(-\frac{2^{\frac{2}{3}}x}{2}\sqrt[3]{a}\right)\text{Bi}\left(-\frac{2^{\frac{2}{3}}x}{2}\sqrt[3]{a}\right)\right\}$$

Mathematica raw input

```
DSolve[a*y[x] + 2*a*x*y'[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> AiryAi[(-1/2)^(1/3)*a^(1/3)*x]^2*C[1] + AiryAi[(-1/2)^(1/3)*a^(1/3)*x]
*AiryBi[(-1/2)^(1/3)*a^(1/3)*x]*C[2] + AiryBi[(-1/2)^(1/3)*a^(1/3)*x]^2*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+2*a*x*diff(y(x),x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*AiryAi(-1/2*2^(2/3)*a^(1/3)*x)^2+_C2*AiryBi(-1/2*2^(2/3)*a^(1/3)*x)^2
+_C3*AiryAi(-1/2*2^(2/3)*a^(1/3)*x)*AiryBi(-1/2*2^(2/3)*a^(1/3)*x)
```

4.2108 $y'''(x)+y(x)f'(x)+2f(x)y'(x)=0$

ODE

$$y'''(x)+y(x)f'(x)+2f(x)y'(x)=0$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.125296 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]*Derivative[1][f][x] + 2*f[x]*Derivative[1][y][x] + Derivative[3][y][x] == 0, y[x], x]
```

Maple ✗
cpu = 0.114 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=\left(DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)+\frac{f(x)\_Y(x)}{2}\right\},\{\_Y(x)\}\right)\right)^2\right\}$$

Mathematica raw input

```
DSolve[y[x]*f'[x] + 2*f[x]*y'[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]*Derivative[1][f][x] + 2*f[x]*Derivative[1][y][x] + Derivative[3][y][
x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+2*f(x)*diff(y(x),x)+diff(f(x),x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+1/2*f(x)*_Y(x)},{_Y(x)})^2
```

4.2109 $y'''(x) - y''(x) + y'(x) = 0$

ODE

$$y'''(x) - y''(x) + y'(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.124316 (sec), leaf count = 75

$$\left\{\left\{y(x) \to \frac{e^{x/2}\left((3c_1 + \sqrt{3}c_2)\sin\left(\frac{\sqrt{3}x}{2}\right) + (\sqrt{3}c_1 - 3c_2)\cos\left(\frac{\sqrt{3}x}{2}\right)\right)}{2\sqrt{3}} + c_3\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 32

$$\left\{y(x) = \_C1 + \_C2\,\sin\left(\frac{\sqrt{3}x}{2}\right)e^{\frac{x}{2}} + \_C3\,\cos\left(\frac{\sqrt{3}x}{2}\right)e^{\frac{x}{2}}\right\}$$

Mathematica raw input

```
DSolve[y'[x] - y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3] + (E^(x/2)*((Sqrt[3]*C[1] - 3*C[2])*Cos[(Sqrt[3]*x)/2] + (3*C[1]
+ Sqrt[3]*C[2])*Sin[(Sqrt[3]*x)/2]))/(2*Sqrt[3])}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-diff(diff(y(x),x),x)+diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*sin(1/2*3^(1/2)*x)*exp(1/2*x)+_C3*cos(1/2*3^(1/2)*x)*exp(1/2*x)
```

4.2110 $y'''(x) - y''(x) + y'(x) + y(x) = 0$

ODE

$$y'''(x) - y''(x) + y'(x) + y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00804701 (sec), leaf count = 81

$$\left\{\left\{y(x) \to c_1 e^{x\text{Root}\left[\#1^3-\#1^2+\#1+1\&,1\right]} + c_2 e^{x\text{Root}\left[\#1^3-\#1^2+\#1+1\&,2\right]} + c_3 e^{x\text{Root}\left[\#1^3-\#1^2+\#1+1\&,3\right]}\right\}\right\}$$

Maple ✓
cpu = 0.032 (sec), leaf count = 170

$$\left\{ y(x) = \_C1\, \mathrm{e}^{-\frac{\left(\left(17+3\sqrt{33}\right)^{\frac{2}{3}} - \sqrt[3]{17+3\sqrt{33}} - 2\right)x}{3\sqrt[3]{17+3\sqrt{33}}}} + \_C2\, \mathrm{e}^{\frac{\left(\left(17+3\sqrt{33}\right)^{\frac{2}{3}} + 2\sqrt[3]{17+3\sqrt{33}} - 2\right)x}{6\sqrt[3]{17+3\sqrt{33}}}} \sin\left(\frac{\sqrt{3}\left(\left(17+3\sqrt{33}\right)^{\frac{2}{3}}+2\right)x}{6\sqrt[3]{17+3\sqrt{33}}}\right) + \_C3 \right.$$

Mathematica raw input

```
DSolve[y[x] + y'[x] - y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x*Root[1 + #1 - #1^2 + #1^3 & , 1, 0])*C[1] + E^(x*Root[1 + #1 - #1
^2 + #1^3 & , 2, 0])*C[2] + E^(x*Root[1 + #1 - #1^2 + #1^3 & , 3, 0])*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-diff(diff(y(x),x),x)+diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-1/3*((17+3*33^(1/2))^(2/3)-(17+3*33^(1/2))^(1/3)-2)/(17+3*33^(1/
2))^(1/3)*x)+_C2*exp(1/6/(17+3*33^(1/2))^(1/3)*((17+3*33^(1/2))^(2/3)+2*(17+3*33
^(1/2))^(1/3)-2)*x)*sin(1/6/(17+3*33^(1/2))^(1/3)*3^(1/2)*((17+3*33^(1/2))^(2/3)
+2)*x)+_C3*exp(1/6/(17+3*33^(1/2))^(1/3)*((17+3*33^(1/2))^(2/3)+2*(17+3*33^(1/2)
)^(1/3)-2)*x)*cos(1/6/(17+3*33^(1/2))^(1/3)*3^(1/2)*((17+3*33^(1/2))^(2/3)+2)*x)
```

4.2111 $y'''(x)+y''(x)+y'(x)-3y(x)=0$

ODE

$$y'''(x)+y''(x)+y'(x)-3y(x)=0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00952375 (sec), leaf count = 42

$$\left\{\left\{y(x)\to e^{-x}\left(c_3e^{2x}+c_1\sin\left(\sqrt{2}x\right)+c_2\cos\left(\sqrt{2}x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 33

$$\left\{y(x)=\_C1\,\mathrm{e}^{x}+\_C2\,\mathrm{e}^{-x}\sin\left(\sqrt{2}x\right)+\_C3\,\mathrm{e}^{-x}\cos\left(\sqrt{2}x\right)\right\}$$

Mathematica raw input

```
DSolve[-3*y[x] + y'[x] + y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(2*x)*C[3] + C[2]*Cos[Sqrt[2]*x] + C[1]*Sin[Sqrt[2]*x])/E^x}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+diff(diff(y(x),x),x)+diff(y(x),x)-3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(x)+_C2*exp(-x)*sin(2^(1/2)*x)+_C3*exp(-x)*cos(2^(1/2)*x)
```

4.2112 $y'''(x) - y''(x) - 2y'(x) = 0$

ODE

$$y'''(x) - y''(x) - 2y'(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0170805 (sec), leaf count = 28

$$\left\{\left\{y(x) \to c_1\left(-e^{-x}\right) + \frac{1}{2}c_2 e^{2x} + c_3\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 18

$$\{y(x) = \_C1 + \mathrm{e}^{2x}\_C2 + \_C3\,\mathrm{e}^{-x}\}$$

Mathematica raw input

```
DSolve[-2*y'[x] - y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(C[1]/E^x) + (E^(2*x)*C[2])/2 + C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-diff(diff(y(x),x),x)-2*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+exp(2*x)*_C2+_C3*exp(-x)
```

4.2113 $y'''(x) - y''(x) - 2y'(x) = e^{-x}$

ODE

$$y'''(x) - y''(x) - 2y'(x) = e^{-x}$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0490091 (sec), leaf count = 37

$$\left\{\left\{y(x) \to \frac{1}{9}e^{-x}(-9c_1 + 3x + 4) + \frac{1}{2}c_2 e^{2x} + c_3\right\}\right\}$$

Maple ✓
cpu = 0.025 (sec), leaf count = 27

$$\left\{y(x) = \frac{(2x - 6\_C2 + 2)\,\mathrm{e}^{-x}}{6} + \frac{\mathrm{e}^{2x}\_C1}{2} + \_C3\right\}$$

Mathematica raw input

```
DSolve[-2*y'[x] - y''[x] + y'''[x] == E^(-x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (4 + 3*x - 9*C[1])/(9*E^x) + (E^(2*x)*C[2])/2 + C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-diff(diff(y(x),x),x)-2*diff(y(x),x) = exp(-x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/6*(2*x-6*_C2+2)*exp(-x)+1/2*exp(2*x)*_C1+_C3
```

4.2114 $y'''(x) + y''(x) + 4y'(x) + 4y(x) = 0$

ODE

$$y'''(x) + y''(x) + 4y'(x) + 4y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00994133 (sec), leaf count = 28

$$\{\{y(x) \to c_3 e^{-x} + c_2 \sin(2x) + c_1 \cos(2x)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 23

$$\{y(x) = \_C1\, \mathrm{e}^{-x} + \_C2\, \sin(2\,x) + \_C3\, \cos(2\,x)\}$$

Mathematica raw input

```
DSolve[4*y[x] + 4*y'[x] + y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3]/E^x + C[1]*Cos[2*x] + C[2]*Sin[2*x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+diff(diff(y(x),x),x)+4*diff(y(x),x)+4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-x)+_C2*sin(2*x)+_C3*cos(2*x)
```

4.2115 $y'''(x) + y''(x) + 2y'(x) + 4y(x) = \sin(2x)$

ODE

$$y'''(x) + y''(x) + 2y'(x) + 4y(x) = \sin(2x)$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.291977 (sec), leaf count = 1185

$$\left\{\left\{y(x) \to e^{x\text{Root}\left[\#1^3+\#1^2+2\#1+4\&,1\right]}c_1 + e^{x\text{Root}\left[\#1^3+\#1^2+2\#1+4\&,2\right]}c_2 + e^{x\text{Root}\left[\#1^3+\#1^2+2\#1+4\&,3\right]}c_3 + \frac{8\left(\text{Root}\left[\#1^3+\#\right.\right.\right.$$

Maple ✓
cpu = 0.714 (sec), leaf count = 1277

$$\left\{y(x) = \frac{1}{207500\sqrt[3]{46+3\sqrt{3}\sqrt{83}} + \left(-24900\sqrt{3}\sqrt{83}+485550\right)\left(46+3\sqrt{3}\sqrt{83}\right)^{\frac{2}{3}} + 2801250 + \left(-45816\sqrt{3}\sqrt{83}+723262\right)}\right.$$

Mathematica raw input

```
DSolve[4*y[x] + 2*y'[x] + y''[x] + y'''[x] == Sin[2*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x*Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0])*C[1] + E^(x*Root[4 + 2*#1
+ #1^2 + #1^3 & , 2, 0])*C[2] + E^(x*Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0])*C[3]
 + (8*Cos[2*x]*(Root[4 + 2*#1 + #1^2 + #1^3 & , 2, 0]*Root[4 + 2*#1 + #1^2 + #1^
3 & , 3, 0]*(-252 + (-70 + 26*Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0] + Root[4 + 2
*#1 + #1^2 + #1^3 & , 1, 0]^2)*Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0]) + 2*(166 -
 (64 + 118*Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0] + 3*Root[4 + 2*#1 + #1^2 + #1^3
 & , 1, 0]^2)*Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0] + (-84 - 15*Root[4 + 2*#1 +
#1^2 + #1^3 & , 1, 0] + 5*Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0]^2)*Root[4 + 2*#1
 + #1^2 + #1^3 & , 3, 0]^2) + 2*Root[4 + 2*#1 + #1^2 + #1^3 & , 2, 0]^2*(-26 - 3
*Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0] + 18*Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0
]^2 + Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0]*(10 + 25*Root[4 + 2*#1 + #1^2 + #1^3
```

```
 & , 3, 0] + 8*Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0]^2))) + (Root[4 + 2*#1 + #1^
2 + #1^3 & , 2, 0]*(128 + 24*Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0] - 5*(-24 - 50
*Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0] + 3*Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0]
^2)*Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0]^2) + 4*(24 + (116 - 30*Root[4 + 2*#1 +
 #1^2 + #1^3 & , 1, 0] + 23*Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0]^2)*Root[4 + 2*
#1 + #1^2 + #1^3 & , 3, 0] + (36 + 6*Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0] + 11*
Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0]^2)*Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0]^2
) + Root[4 + 2*#1 + #1^2 + #1^3 & , 2, 0]^2*(Root[4 + 2*#1 + #1^2 + #1^3 & , 1,
0]*(-88 + 96*Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0] + 25*Root[4 + 2*#1 + #1^2 + #
1^3 & , 3, 0]^2) + 4*(52 + 25*Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0] + 51*Root[4
+ 2*#1 + #1^2 + #1^3 & , 3, 0]^2)))*Sin[2*x])/(Root[4 + 2*#1 + #1^2 + #1^3 & , 1
, 0]^2*(Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0] - Root[4 + 2*#1 + #1^2 + #1^3 & ,
2, 0])*Root[4 + 2*#1 + #1^2 + #1^3 & , 2, 0]*(4 + Root[4 + 2*#1 + #1^2 + #1^3 &
, 2, 0]^2)*(Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0] - Root[4 + 2*#1 + #1^2 + #1^3
& , 3, 0])*(Root[4 + 2*#1 + #1^2 + #1^3 & , 2, 0] - Root[4 + 2*#1 + #1^2 + #1^3
& , 3, 0])*((1 - 2*I) + Root[4 + 2*#1 + #1^2 + #1^3 & , 2, 0] + Root[4 + 2*#1 +
#1^2 + #1^3 & , 3, 0])*((1 + 2*I) + Root[4 + 2*#1 + #1^2 + #1^3 & , 2, 0] + Root
[4 + 2*#1 + #1^2 + #1^3 & , 3, 0])*(-2 + Root[4 + 2*#1 + #1^2 + #1^3 & , 2, 0]^2
 + 2*Root[4 + 2*#1 + #1^2 + #1^3 & , 1, 0]*Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0]
)*(4 + Root[4 + 2*#1 + #1^2 + #1^3 & , 3, 0]^2))}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+diff(diff(y(x),x),x)+2*diff(y(x),x)+4*y(x) = sin(2*x), y(x),'impl
```

Maple raw output

```
y(x) = (-207500*exp(-1/150*(3*249^(1/2)*(46+3*249^(1/2))^(2/3)-46*(46+3*249^(1/2
))^(2/3)-25*(46+3*249^(1/2))^(1/3)+50)*x)*cos(23/75*(46+3*3^(1/2)*83^(1/2))^(1/3
)*x*((3^(1/2)-9/46*83^(1/2))*(46+3*3^(1/2)*83^(1/2))^(1/3)-25/46*3^(1/2)))*((46+
3*3^(1/2)*83^(1/2))^(1/3)+(-3/25*3^(1/2)*83^(1/2)+117/50)*(46+3*3^(1/2)*83^(1/2)
)^(2/3)+27/2+(-138/625*3^(1/2)*83^(1/2)+4357/1250)*(46+3*3^(1/2)*83^(1/2))^(4/3)
)*Int(3/4150*83^(1/2)*((25/9*3^(1/2)*(46+3*3^(1/2)*83^(1/2))^(1/3)-46/9*(3^(1/2)
-9/46*83^(1/2))*(46+3*3^(1/2)*83^(1/2))^(2/3))*cos(23/75*(46+3*3^(1/2)*83^(1/2))
^(1/3)*x*((3^(1/2)-9/46*83^(1/2))*(46+3*3^(1/2)*83^(1/2))^(1/3)-25/46*3^(1/2)))+
((249^(1/2)-46/3)*(46+3*249^(1/2))^(2/3)-25/3*(46+3*249^(1/2))^(1/3))*sin(23/75*
(46+3*3^(1/2)*83^(1/2))^(1/3)*x*((3^(1/2)-9/46*83^(1/2))*(46+3*3^(1/2)*83^(1/2))
^(1/3)-25/46*3^(1/2))))*sin(2*x)*exp(1/150*(3*249^(1/2)*(46+3*249^(1/2))^(2/3)-4
6*(46+3*249^(1/2))^(2/3)-25*(46+3*249^(1/2))^(1/3)+50)*x),x)-207500*exp(-1/150*(
3*249^(1/2)*(46+3*249^(1/2))^(2/3)-46*(46+3*249^(1/2))^(2/3)-25*(46+3*249^(1/2))
^(1/3)+50)*x)*sin(23/75*(46+3*3^(1/2)*83^(1/2))^(1/3)*x*((3^(1/2)-9/46*83^(1/2))
*(46+3*3^(1/2)*83^(1/2))^(1/3)-25/46*3^(1/2)))*((46+3*3^(1/2)*83^(1/2))^(1/3)+(-
3/25*3^(1/2)*83^(1/2)+117/50)*(46+3*3^(1/2)*83^(1/2))^(2/3)+27/2+(-138/625*3^(1/
2)*83^(1/2)+4357/1250)*(46+3*3^(1/2)*83^(1/2))^(4/3))*Int(1/498*83^(1/2)*sin(2*x
)*exp(1/150*(3*249^(1/2)*(46+3*249^(1/2))^(2/3)-46*(46+3*249^(1/2))^(2/3)-25*(46
```

```
+3*249^(1/2))^(1/3)+50)*x)*(((-9/25*249^(1/2)+138/25)*(46+3*249^(1/2))^(2/3)+3*(
46+3*249^(1/2))^(1/3))*cos(23/75*(46+3*3^(1/2)*83^(1/2))^(1/3)*x*((3^(1/2)-9/46*
83^(1/2))*(46+3*3^(1/2)*83^(1/2))^(1/3)-25/46*3^(1/2)))+sin(23/75*(46+3*3^(1/2)*
83^(1/2))^(1/3)*x*((3^(1/2)-9/46*83^(1/2))*(46+3*3^(1/2)*83^(1/2))^(1/3)-25/46*3
^(1/2)))*(3^(1/2)*(46+3*3^(1/2)*83^(1/2))^(1/3)-46/25*(3^(1/2)-9/46*83^(1/2))*(4
6+3*3^(1/2)*83^(1/2))^(2/3))),x)+(-3750*83^(1/2)*3^(1/2)*(cos(2*x)-1/6*sin(2*x))
*(46+3*3^(1/2)*83^(1/2))^(1/3)+(6900*3^(1/2)*83^(1/2)*cos(2*x)-525*3^(1/2)*83^(1
/2)*sin(2*x)-112050*cos(2*x)+18675*sin(2*x))*(46+3*3^(1/2)*83^(1/2))^(2/3)-4357*
sin(2*x)*(3^(1/2)*83^(1/2)-68724/4357)*(46+3*3^(1/2)*83^(1/2))^(4/3))*exp(-1/75*
x*(3*3^(1/2)*83^(1/2)*(46+3*3^(1/2)*83^(1/2))^(2/3)-3*249^(1/2)*(46+3*249^(1/2))
^(2/3)-46*(46+3*3^(1/2)*83^(1/2))^(2/3)+46*(46+3*249^(1/2))^(2/3)-25*(46+3*3^(1/
2)*83^(1/2))^(1/3)+25*(46+3*249^(1/2))^(1/3)))+207500*(_C2*exp(-1/150*(3*249^(1/
2)*(46+3*249^(1/2))^(2/3)-46*(46+3*249^(1/2))^(2/3)-25*(46+3*249^(1/2))^(1/3)+50
)*x)*cos(1/150*(46*3^(1/2)-9*83^(1/2))*x*(46+3*3^(1/2)*83^(1/2))^(2/3)-1/6*(46+3
*3^(1/2)*83^(1/2))^(1/3)*3^(1/2)*x)+_C3*exp(-1/150*(3*249^(1/2)*(46+3*249^(1/2))
^(2/3)-46*(46+3*249^(1/2))^(2/3)-25*(46+3*249^(1/2))^(1/3)+50)*x)*sin(1/150*(46*
3^(1/2)-9*83^(1/2))*x*(46+3*3^(1/2)*83^(1/2))^(2/3)-1/6*(46+3*3^(1/2)*83^(1/2))^
(1/3)*3^(1/2)*x)+_C1*exp(1/75*(3*249^(1/2)*(46+3*249^(1/2))^(2/3)-46*(46+3*249^(
1/2))^(2/3)-25*(46+3*249^(1/2))^(1/3)-25)*x))*((46+3*3^(1/2)*83^(1/2))^(1/3)+(-3
/25*3^(1/2)*83^(1/2)+117/50)*(46+3*3^(1/2)*83^(1/2))^(2/3)+27/2+(-138/625*3^(1/2
)*83^(1/2)+4357/1250)*(46+3*3^(1/2)*83^(1/2))^(4/3)))/(207500*(46+3*3^(1/2)*83^(
1/2))^(1/3)+(-24900*3^(1/2)*83^(1/2)+485550)*(46+3*3^(1/2)*83^(1/2))^(2/3)+28012
50+(-45816*3^(1/2)*83^(1/2)+723262)*(46+3*3^(1/2)*83^(1/2))^(4/3))
```

4.2116 $y'''(x) + y''(x) - 7y'(x) - 15y(x) = 0$

ODE

$$y'''(x) + y''(x) - 7y'(x) - 15y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0100837 (sec), leaf count = 30

$$\{\{y(x) \to e^{-2x}\left(c_3 e^{5x} + c_1 \sin(x) + c_2 \cos(x)\right)\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 27

$$\{y(x) = \_C1\, \mathrm{e}^{3x} + \_C2\, \mathrm{e}^{-2x} \sin(x) + \_C3\, \mathrm{e}^{-2x} \cos(x)\}$$

Mathematica raw input

```
DSolve[-15*y[x] - 7*y'[x] + y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(5*x)*C[3] + C[2]*Cos[x] + C[1]*Sin[x])/E^(2*x)}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+diff(diff(y(x),x),x)-7*diff(y(x),x)-15*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(3*x)+_C2*exp(-2*x)*sin(x)+_C3*exp(-2*x)*cos(x)
```

4.2117 $y'''(x) + 2y''(x) + y'(x) = 0$

ODE

$$y'''(x) + 2y''(x) + y'(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0152765 (sec), leaf count = 24

$$\{\{y(x) \to c_3 - e^{-x}(c_2(x+1) + c_1)\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 16

$$\{y(x) = \mathrm{e}^{-x}(\_C3\, x + \_C2) + \_C1\}$$

Mathematica raw input

```
DSolve[y'[x] + 2*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((C[1] + (1 + x)*C[2])/E^x) + C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+2*diff(diff(y(x),x),x)+diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x)*(_C3*x+_C2)+_C1
```

4.2118 $y'''(x)+2y''(x)+y'(x)=(x-1)x$

ODE

$$y'''(x)+2y''(x)+y'(x)=(x-1)x$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0311906 (sec), leaf count = 41

$$\left\{\left\{y(x)\to -e^{-x}(c_2(x+1)+c_1)+c_3+\frac{x^3}{3}-\frac{5x^2}{2}+8x\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 36

$$\left\{y(x)=\frac{(-6\_C1\,x-6\_C1-6\_C2)\,\mathrm{e}^{-x}}{6}+\frac{x^3}{3}-\frac{5\,x^2}{2}+8\,x+\_C3\right\}$$

Mathematica raw input

```
DSolve[y'[x] + 2*y''[x] + y'''[x] == (-1 + x)*x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 8*x - (5*x^2)/2 + x^3/3 - (C[1] + (1 + x)*C[2])/E^x + C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+2*diff(diff(y(x),x),x)+diff(y(x),x) = x*(x-1), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/6*(-6*_C1*x-6*_C1-6*_C2)*exp(-x)+1/3*x^3-5/2*x^2+8*x+_C3
```

4.2119 $y'''(x) - 2y''(x) + y'(x) = e^x$

ODE

$$y'''(x) - 2y''(x) + y'(x) = e^x$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0232767 (sec), leaf count = 33

$$\left\{\left\{y(x) \to e^x\left((c_2 - 1)\,x + c_1 - c_2 + \frac{x^2}{2} + 1\right) + c_3\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 28

$$\left\{y(x) = \frac{\left(x^2 + (2\_C1 - 2)\,x - 2\_C1 + 2\_C2 + 2\right)\mathrm{e}^x}{2} + \_C3\right\}$$

Mathematica raw input

```
DSolve[y'[x] - 2*y''[x] + y'''[x] == E^x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(1 + x^2/2 + C[1] + x*(-1 + C[2]) - C[2]) + C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-2*diff(diff(y(x),x),x)+diff(y(x),x) = exp(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*(x^2+(2*_C1-2)*x-2*_C1+2*_C2+2)*exp(x)+_C3
```

4.2120 $y'''(x) - 2y''(x) - y'(x) + 2y(x) = \sinh(x)$

ODE

$$y'''(x) - 2y''(x) - y'(x) + 2y(x) = \sinh(x)$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.03871 (sec), leaf count = 48

$$\left\{\left\{y(x) \to \frac{1}{72}e^{-x}\left(-9e^{2x}(-8c_2 + 2x + 1) + 72c_3e^{3x} + 72c_1 - 6x - 5\right)\right\}\right\}$$

Maple ✓
cpu = 0.06 (sec), leaf count = 82

$$\left\{y(x) = \frac{(-6\,x + 3\,\cosh(2\,x) + 3\,\sinh(2\,x) + 72\,\_C2 + 3)\,\mathrm{e}^{-x}}{72} + \frac{(4\,\cosh(3\,x) - 4\,\sinh(3\,x) + 72\,\_C3 - 12\,\cosh(x) + 12}{72}\right.$$

Mathematica raw input

```
DSolve[2*y[x] - y'[x] - 2*y''[x] + y'''[x] == Sinh[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-5 - 6*x + 72*C[1] - 9*E^(2*x)*(1 + 2*x - 8*C[2]) + 72*E^(3*x)*C[3])/
(72*E^x)}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-2*diff(diff(y(x),x),x)-diff(y(x),x)+2*y(x) = sinh(x), y(x),'impli
```

Maple raw output

```
y(x) = 1/72*(-6*x+3*cosh(2*x)+3*sinh(2*x)+72*_C2+3)*exp(-x)+1/72*(4*cosh(3*x)-4*
sinh(3*x)+72*_C3-12*cosh(x)+12*sinh(x))*exp(2*x)-1/4*(x+1/2*cosh(2*x)-1/2*sinh(2
*x)-4*_C1)*exp(x)
```

4.2121 $y'''(x) - 2y''(x) - 3y'(x) = 0$

ODE

$$y'''(x) - 2y''(x) - 3y'(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0192347 (sec), leaf count = 28

$$\left\{\left\{y(x) \to c_1\left(-e^{-x}\right) + \frac{1}{3}c_2 e^{3x} + c_3\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 18

$$\{y(x) = \_C1 + \_C2\, \mathrm{e}^{3\,x} + \_C3\, \mathrm{e}^{-x}\}$$

Mathematica raw input

```
DSolve[-3*y'[x] - 2*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(C[1]/E^x) + (E^(3*x)*C[2])/3 + C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-2*diff(diff(y(x),x),x)-3*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*exp(3*x)+_C3*exp(-x)
```

4.2122 $y'''(x) - 2y''(x) - 3y'(x) = 3x^2 + \sin(x)$

ODE

$$y'''(x) - 2y''(x) - 3y'(x) = 3x^2 + \sin(x)$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.260187 (sec), leaf count = 58

$$\left\{\left\{y(x) \to \frac{1}{9}\left(-9c_1 e^{-x} + 3c_2 e^{3x} + 9c_3 - 3x^3 + 6x^2 - 14x\right) + \frac{\sin(x)}{10} + \frac{\cos(x)}{5}\right\}\right\}$$

Maple ✓
cpu = 0.053 (sec), leaf count = 41

$$\left\{y(x) = -\mathrm{e}^{-x}\_C2 + \frac{\mathrm{e}^{3x}\_C1}{3} - \frac{x^3}{3} + \frac{\cos(x)}{5} + \frac{\sin(x)}{10} + \frac{2x^2}{3} - \frac{14x}{9} + \_C3\right\}$$

Mathematica raw input

```
DSolve[-3*y'[x] - 2*y''[x] + y'''[x] == 3*x^2 + Sin[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-14*x + 6*x^2 - 3*x^3 - (9*C[1])/E^x + 3*E^(3*x)*C[2] + 9*C[3])/9 + C
os[x]/5 + Sin[x]/10}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-2*diff(diff(y(x),x),x)-3*diff(y(x),x) = 3*x^2+sin(x), y(x),'impli
```

Maple raw output

```
y(x) = -exp(-x)*_C2+1/3*exp(3*x)*_C1-1/3*x^3+1/5*cos(x)+1/10*sin(x)+2/3*x^2-14/9
*x+_C3
```

4.2123 $y'''(x) - 2y''(x) - 3y'(x) = 3x^2 + e^{-x}$

ODE

$$y'''(x) - 2y''(x) - 3y'(x) = 3x^2 + e^{-x}$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0807453 (sec), leaf count = 51

$$\left\{\left\{y(x) \to \frac{1}{144}\left(9e^{-x}(-16c_1 + 4x + 5) + 48c_2e^{3x} - 16x\left(3x^2 - 6x + 14\right)\right) + c_3\right\}\right\}$$

Maple ✓
cpu = 0.036 (sec), leaf count = 40

$$\left\{y(x) = \frac{(36\,x - 144\,\_C2 + 45)\,\mathrm{e}^{-x}}{144} - \frac{x^3}{3} + \frac{2\,x^2}{3} + \frac{\mathrm{e}^{3\,x}\,\_C1}{3} - \frac{14\,x}{9} + \_C3\right\}$$

Mathematica raw input

```
DSolve[-3*y'[x] - 2*y''[x] + y'''[x] == E^(-x) + 3*x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-16*x*(14 - 6*x + 3*x^2) + (9*(5 + 4*x - 16*C[1]))/E^x + 48*E^(3*x)*C
[2])/144 + C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-2*diff(diff(y(x),x),x)-3*diff(y(x),x) = 3*x^2+exp(-
x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/144*(36*x-144*_C2+45)*exp(-x)-1/3*x^3+2/3*x^2+1/3*exp(3*x)*_C1-14/9*x+_
C3
```

4.2124 $y'''(x) - 2y''(x) + 3y'(x) + 10y(x) = 0$

ODE

$$y'''(x) - 2y''(x) + 3y'(x) + 10y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00936375 (sec), leaf count = 87

$$\left\{\left\{y(x) \to c_1 e^{x\text{Root}\left[\#1^3-2\#1^2+3\#1+10\&,1\right]} + c_2 e^{x\text{Root}\left[\#1^3-2\#1^2+3\#1+10\&,2\right]} + c_3 e^{x\text{Root}\left[\#1^3-2\#1^2+3\#1+10\&,3\right]}\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 170

$$\left\{ y(x) = \_C1\, \mathrm{e}^{-\frac{\left(\left(154+3\sqrt{2649}\right)^{\frac{2}{3}}-2\sqrt[3]{154+3\sqrt{2649}}-5\right)x}{3\sqrt[3]{154+3\sqrt{2649}}}} + \_C2\, \mathrm{e}^{\frac{\left(\left(154+3\sqrt{2649}\right)^{\frac{2}{3}}+4\sqrt[3]{154+3\sqrt{2649}}-5\right)x}{6\sqrt[3]{154+3\sqrt{2649}}}} \sin\left(\frac{\sqrt{3}\left(\left(154+3\sqrt{2649}\right)^{\frac{2}{3}}+\right.}{6\sqrt[3]{154+3\sqrt{2649}}}\right.$$

Mathematica raw input

```
DSolve[10*y[x] + 3*y'[x] - 2*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x*Root[10 + 3*#1 - 2*#1^2 + #1^3 & , 1, 0])*C[1] + E^(x*Root[10 + 3
*#1 - 2*#1^2 + #1^3 & , 2, 0])*C[2] + E^(x*Root[10 + 3*#1 - 2*#1^2 + #1^3 & , 3,
 0])*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-2*diff(diff(y(x),x),x)+3*diff(y(x),x)+10*y(x) = 0, y(x),'implicit
```

Maple raw output

```
y(x) = _C1*exp(-1/3*((154+3*2649^(1/2))^(2/3)-2*(154+3*2649^(1/2))^(1/3)-5)/(154
+3*2649^(1/2))^(1/3)*x)+_C2*exp(1/6/(154+3*2649^(1/2))^(1/3)*((154+3*2649^(1/2))
```

```
^(2/3)+4*(154+3*2649^(1/2))^(1/3)-5)*x)*sin(1/6/(154+3*2649^(1/2))^(1/3)*3^(1/2)
*((154+3*2649^(1/2))^(2/3)+5)*x)+_C3*exp(1/6/(154+3*2649^(1/2))^(1/3)*((154+3*26
49^(1/2))^(2/3)+4*(154+3*2649^(1/2))^(1/3)-5)*x)*cos(1/6/(154+3*2649^(1/2))^(1/3
)*3^(1/2)*((154+3*2649^(1/2))^(2/3)+5)*x)
```

4.2125 $y'''(x) - a^2 y'(x) + 2a^2 y(x) - 2y''(x) = 0$

ODE

$$y'''(x) - a^2 y'(x) + 2a^2 y(x) - 2y''(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0087241 (sec), leaf count = 31

$$\{\{y(x) \to c_1 e^{-ax} + c_3 e^{ax} + c_2 e^{2x}\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 24

$$\{y(x) = \mathrm{e}^{2x} \_C1 + \_C2\, \mathrm{e}^{-ax} + \_C3\, \mathrm{e}^{ax}\}$$

Mathematica raw input

```
DSolve[2*a^2*y[x] - a^2*y'[x] - 2*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(a*x) + E^(2*x)*C[2] + E^(a*x)*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-2*diff(diff(y(x),x),x)-a^2*diff(y(x),x)+2*a^2*y(x) = 0, y(x),'imp
```

Maple raw output

```
y(x) = exp(2*x)*_C1+_C2*exp(-a*x)+_C3*exp(a*x)
```

4.2126 $y'''(x) - a^2 y'(x) + 2a^2 y(x) - 2y''(x) = \sinh(x)$

ODE

$$y'''(x) - a^2 y'(x) + 2a^2 y(x) - 2y''(x) = \sinh(x)$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0943293 (sec), leaf count = 52

$$\left\{\left\{y(x) \to \frac{e^{-x} - 3e^{x}}{6 - 6a^2} + c_1 e^{-ax} + c_3 e^{ax} + c_2 e^{2x}\right\}\right\}$$

Maple ✓
cpu = 0.057 (sec), leaf count = 214

$$\left\{y(x) = \frac{1}{12\,a^5 - 60\,a^3 + 48\,a}\left(3\left(\left(a-2\right)\mathrm{e}^{-ax} + \mathrm{e}^{ax}\left(a+2\right)\right)\left(a-1\right)\cosh\left(\left(1+a\right)x\right) - 3\left(\left(a-2\right)\mathrm{e}^{-ax} + \mathrm{e}^{ax}\left(a+2\right)\right)\left(1+a\right)c\right.\right.$$

Mathematica raw input

```
DSolve[2*a^2*y[x] - a^2*y'[x] - 2*y''[x] + y'''[x] == Sinh[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(-x) - 3*E^x)/(6 - 6*a^2) + C[1]/E^(a*x) + E^(2*x)*C[2] + E^(a*x)*C
[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-2*diff(diff(y(x),x),x)-a^2*diff(y(x),x)+2*a^2*y(x) = sinh(x), y(x
```

Maple raw output

```
y(x) = (3*((a-2)*exp(-a*x)+exp(a*x)*(a+2))*(a-1)*cosh((1+a)*x)-3*((a-2)*exp(-a*x
)+exp(a*x)*(a+2))*(1+a)*cosh((a-1)*x)-3*((2-a)*exp(-a*x)+exp(a*x)*(a+2))*(a-1)*s
inh((1+a)*x)+12*(1+a)*(((-1/4*a+1/2)*exp(-a*x)+1/4*exp(a*x)*(a+2))*sinh((a-1)*x)
+a*(a-1)*((_C3*a^2-4*_C3)*exp(-a*x)+(_C2*a^2-4*_C2)*exp(a*x)+exp(2*x)*(a^2*_C1+1
/6*sinh(3*x)-4*_C1+1/2*cosh(x)-1/2*sinh(x)-1/6*cosh(3*x)))))/(12*a^5-60*a^3+48*a
)
```

4.2127 $y'''(x) - 3y''(x) + 4y(x) = 0$

ODE

$$y'''(x) - 3y''(x) + 4y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00973078 (sec), leaf count = 27

$$\{\{y(x) \to e^{-x}\left(e^{3x}(c_3 x + c_2) + c_1\right)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 21

$$\{y(x) = (\_C3\, x + \_C2)\, \mathrm{e}^{2x} + \_C1\, \mathrm{e}^{-x}\}$$

Mathematica raw input

```
DSolve[4*y[x] - 3*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + E^(3*x)*(C[2] + x*C[3]))/E^x}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-3*diff(diff(y(x),x),x)+4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C3*x+_C2)*exp(2*x)+_C1*exp(-x)
```

4.2128 $y'''(x) + 3y''(x) - y'(x) - 3y(x) = 0$

ODE

$$y'''(x) + 3y''(x) - y'(x) - 3y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.010134 (sec), leaf count = 28

$$\{\{y(x) \to c_1 e^{-3x} + c_2 e^{-x} + c_3 e^{x}\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 21

$$\{y(x) = \_C1\, \mathrm{e}^{-3x} + \mathrm{e}^{x} \_C2 + \_C3\, \mathrm{e}^{-x}\}$$

Mathematica raw input

```
DSolve[-3*y[x] - y'[x] + 3*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/E^(3*x) + C[2]/E^x + E^x*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+3*diff(diff(y(x),x),x)-diff(y(x),x)-3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-3*x)+exp(x)*_C2+_C3*exp(-x)
```

4.2129 $y'''(x) - 3y''(x) - y'(x) + 3y(x) = x^2$

ODE

$$y'''(x) - 3y''(x) - y'(x) + 3y(x) = x^2$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0121764 (sec), leaf count = 42

$$\left\{\left\{y(x) \to c_1 e^{-x} + c_2 e^{x} + c_3 e^{3x} + \frac{1}{27}\left(9x^2 + 6x + 20\right)\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 30

$$\left\{y(x) = \frac{x^2}{3} + \frac{2\,x}{9} + \frac{20}{27} + \_C1\,\mathrm{e}^{x} + \mathrm{e}^{-x}\_C2 + \_C3\,\mathrm{e}^{3\,x}\right\}$$

Mathematica raw input

```
DSolve[3*y[x] - y'[x] - 3*y''[x] + y'''[x] == x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (20 + 6*x + 9*x^2)/27 + C[1]/E^x + E^x*C[2] + E^(3*x)*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-3*diff(diff(y(x),x),x)-diff(y(x),x)+3*y(x) = x^2, y(x),'implicit'
```

Maple raw output

```
y(x) = 1/3*x^2+2/9*x+20/27+_C1*exp(x)+exp(-x)*_C2+_C3*exp(3*x)
```

4.2130 $y'''(x) + 3y''(x) - y'(x) - 3y(x) = \cosh(x)$

ODE

$$y'''(x) + 3y''(x) - y'(x) - 3y(x) = \cosh(x)$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0475135 (sec), leaf count = 47

$$\left\{\left\{y(x) \to \frac{1}{64}e^{-3x}\left(-8e^{2x}(x - 8c_2) + e^{4x}(64c_3 + 4x - 3) + 64c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.039 (sec), leaf count = 82

$$\left\{y(x) = \frac{(2\sinh(2x) + \sinh(4x) + 64\_C2 + 2\cosh(2x) + \cosh(4x))\,\mathrm{e}^{-3x}}{64} + \frac{(-8x - 4\sinh(2x) + 64\_C3 - 4\cosh(2x$$

Mathematica raw input

```
DSolve[-3*y[x] - y'[x] + 3*y''[x] + y'''[x] == Cosh[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (64*C[1] - 8*E^(2*x)*(x - 8*C[2]) + E^(4*x)*(-3 + 4*x + 64*C[3]))/(64*
E^(3*x))}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+3*diff(diff(y(x),x),x)-diff(y(x),x)-3*y(x) = cosh(x), y(x),'impli
```

Maple raw output

```
y(x) = 1/64*(2*sinh(2*x)+sinh(4*x)+64*_C2+2*cosh(2*x)+cosh(4*x))*exp(-3*x)+1/64*
(-8*x-4*sinh(2*x)+64*_C3-4*cosh(2*x)-4)*exp(-x)+1/16*(x+1/2*sinh(2*x)+16*_C1-1/2
*cosh(2*x))*exp(x)
```

4.2131 $y'''(x) + 3y''(x) + 3y'(x) + y(x) = 0$

ODE

$$y'''(x) + 3y''(x) + 3y'(x) + y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0136493 (sec), leaf count = 23

$$\{\{y(x) \to e^{-x}(x(c_3 x + c_2) + c_1)\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 19

$$\{y(x) = \mathrm{e}^{-x}(\_C3\, x^2 + \_C2\, x + \_C1)\}$$

Mathematica raw input

```
DSolve[y[x] + 3*y'[x] + 3*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*(C[2] + x*C[3]))/E^x}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+3*diff(diff(y(x),x),x)+3*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x)*(_C3*x^2+_C2*x+_C1)
```

4.2132 $y'''(x)+3y''(x)+3y'(x)+y(x)=e^{-x}x$

ODE

$$y'''(x)+3y''(x)+3y'(x)+y(x)=e^{-x}x$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0229776 (sec), leaf count = 34

$$\left\{\left\{y(x)\to \frac{1}{24}e^{-x}\left(24c_3x^2+24c_2x+24c_1+x^4\right)\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 32

$$\left\{y(x)=\frac{24\,\mathrm{e}^{x}\left(\_C3\,x^2+\_C2\,x+\_C1\right)\mathrm{e}^{-x}+x^4}{24\,\mathrm{e}^{x}}\right\}$$

Mathematica raw input

```
DSolve[y[x] + 3*y'[x] + 3*y''[x] + y'''[x] == x/E^x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^4 + 24*C[1] + 24*x*C[2] + 24*x^2*C[3])/(24*E^x)}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+3*diff(diff(y(x),x),x)+3*diff(y(x),x)+y(x) = x*exp(-
x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/24*(24*exp(x)*(_C3*x^2+_C2*x+_C1)*exp(-x)+x^4)/exp(x)
```

4.2133 $y'''(x) - 3y''(x) + 3y'(x) - y(x) = x(1 - e^x x^2)$

ODE

$$y'''(x) - 3y''(x) + 3y'(x) - y(x) = x\left(1 - e^x x^2\right)$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0607558 (sec), leaf count = 42

$$\left\{\left\{y(x) \to c_3 e^x x^2 + x(c_2 e^x - 1) + c_1 e^x - \frac{1}{120} e^x x^6 - 3\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 32

$$\left\{y(x) = \frac{\left(-x^6 + 120\_C3\, x^2 + 120\_C2\, x + 120\_C1\right) \mathrm{e}^x}{120} - x - 3\right\}$$

Mathematica raw input

```
DSolve[-y[x] + 3*y'[x] - 3*y''[x] + y'''[x] == x*(1 - E^x*x^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> -3 - (E^x*x^6)/120 + E^x*C[1] + x*(-1 + E^x*C[2]) + E^x*x^2*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-3*diff(diff(y(x),x),x)+3*diff(y(x),x)-y(x) = x*(1-
x^2*exp(x)), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/120*(-x^6+120*_C3*x^2+120*_C2*x+120*_C1)*exp(x)-x-3
```

4.2134 $y'''(x)+3y''(x)+3y'(x)+y(x)=e^{-x}(2-x^2)$

ODE

$$y'''(x)+3y''(x)+3y'(x)+y(x)=e^{-x}(2-x^2)$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0303744 (sec), leaf count = 41

$$\left\{\left\{y(x)\to \frac{1}{60}e^{-x}\left(60c_3x^2+60c_2x+60c_1-x^5+20x^3\right)\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 39

$$\left\{y(x)=\frac{60\,\mathrm{e}^{x}\left(\_C3\,x^2+\_C2\,x+\_C1\right)\mathrm{e}^{-x}-x^5+20\,x^3}{60\,\mathrm{e}^{x}}\right\}$$

Mathematica raw input

```
DSolve[y[x] + 3*y'[x] + 3*y''[x] + y'''[x] == (2 - x^2)/E^x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (20*x^3 - x^5 + 60*C[1] + 60*x*C[2] + 60*x^2*C[3])/(60*E^x)}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+3*diff(diff(y(x),x),x)+3*diff(y(x),x)+y(x) = exp(-
x)*(-x^2+2), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/60*(60*exp(x)*(_C3*x^2+_C2*x+_C1)*exp(-x)-x^5+20*x^3)/exp(x)
```

4.2135 $y'''(x) - 3y''(x) + 4y'(x) - 2y(x) = 0$

ODE

$$y'''(x) - 3y''(x) + 4y'(x) - 2y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0133649 (sec), leaf count = 22

$$\{\{y(x) \to e^x(c_1 \sin(x) + c_2 \cos(x) + c_3)\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 17

$$\{y(x) = \mathrm{e}^x(\sin(x)\_C2 + \cos(x)\_C3 + \_C1)\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 4*y'[x] - 3*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(C[3] + C[2]*Cos[x] + C[1]*Sin[x])}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-3*diff(diff(y(x),x),x)+4*diff(y(x),x)-2*y(x) = 0, y(x),'implicit
```

Maple raw output

```
y(x) = exp(x)*(sin(x)*_C2+cos(x)*_C3+_C1)
```

4.2136 $y'''(x) - 3y''(x) + 4y'(x) - 2y(x) = e^x + \cos(x)$

ODE

$$y'''(x) - 3y''(x) + 4y'(x) - 2y(x) = e^x + \cos(x)$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.118278 (sec), leaf count = 40

$$\left\{\left\{y(x) \to e^x(c_3 + x) + \left(c_1 e^x + \frac{3}{10}\right)\sin(x) + \left(c_2 e^x + \frac{1}{10}\right)\cos(x)\right\}\right\}$$

Maple ✓
cpu = 0.065 (sec), leaf count = 34

$$\left\{y(x) = \frac{(10\cos(x)\_C2 + 10\_C3\sin(x) + 10x + 10\_C1)\,e^x}{10} + \frac{\cos(x)}{10} + \frac{3\sin(x)}{10}\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 4*y'[x] - 3*y''[x] + y'''[x] == E^x + Cos[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(x + C[3]) + (1/10 + E^x*C[2])*Cos[x] + (3/10 + E^x*C[1])*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-3*diff(diff(y(x),x),x)+4*diff(y(x),x)-2*y(x) = exp(x)+cos(x), y(x
```

Maple raw output

```
y(x) = 1/10*(10*cos(x)*_C2+10*_C3*sin(x)+10*x+10*_C1)*exp(x)+1/10*cos(x)+3/10*si
n(x)
```

4.2137 $y'''(x) - 4y''(x) + 5y'(x) - 2y(x) = 0$

ODE

$$y'''(x) - 4y''(x) + 5y'(x) - 2y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0091068 (sec), leaf count = 22

$$\{\{y(x) \to e^x(c_2 x + c_3 e^x + c_1)\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 19

$$\{y(x) = \mathrm{e}^{2x}\_C1 + \mathrm{e}^x(\_C3\, x + \_C2)\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 5*y'[x] - 4*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(C[1] + x*C[2] + E^x*C[3])}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-4*diff(diff(y(x),x),x)+5*diff(y(x),x)-2*y(x) = 0, y(x),'implicit
```

Maple raw output

```
y(x) = exp(2*x)*_C1+exp(x)*(_C3*x+_C2)
```

4.2138 $y'''(x) - 4y''(x) + 5y'(x) - 2y(x) = x$

ODE

$$y'''(x) - 4y''(x) + 5y'(x) - 2y(x) = x$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0105896 (sec), leaf count = 35

$$\left\{\left\{y(x) \to c_1 e^x + x\left(c_2 e^x - \frac{1}{2}\right) + c_3 e^{2x} - \frac{5}{4}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 24

$$\left\{y(x) = -\frac{x}{2} - \frac{5}{4} + \_C1\, \mathrm{e}^x + \mathrm{e}^{2x} \_C2 + \_C3\, x \mathrm{e}^x\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 5*y'[x] - 4*y''[x] + y'''[x] == x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -5/4 + E^x*C[1] + x*(-1/2 + E^x*C[2]) + E^(2*x)*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-4*diff(diff(y(x),x),x)+5*diff(y(x),x)-2*y(x) = x, y(x),'implicit
```

Maple raw output

```
y(x) = -1/2*x-5/4+_C1*exp(x)+exp(2*x)*_C2+_C3*x*exp(x)
```

4.2139 $y'''(x) - 4y''(x) + 6y'(x) - 4y(x) = 0$

ODE

$$y'''(x) - 4y''(x) + 6y'(x) - 4y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0126561 (sec), leaf count = 26

$$\{\{y(x) \to e^x(c_3 e^x + c_1 \sin(x) + c_2 \cos(x))\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 23

$$\{y(x) = \mathrm{e}^{2\,x}\_C1 + \_C2\,\mathrm{e}^{x}\sin(x) + \_C3\,\mathrm{e}^{x}\cos(x)\}$$

Mathematica raw input

```
DSolve[-4*y[x] + 6*y'[x] - 4*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(E^x*C[3] + C[2]*Cos[x] + C[1]*Sin[x])}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-4*diff(diff(y(x),x),x)+6*diff(y(x),x)-4*y(x) = 0, y(x),'implicit
```

Maple raw output

```
y(x) = exp(2*x)*_C1+_C2*exp(x)*sin(x)+_C3*exp(x)*cos(x)
```

4.2140 $y'''(x) - 6y''(x) + 9y'(x) = 0$

ODE

$$y'''(x) - 6y''(x) + 9y'(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0220954 (sec), leaf count = 30

$$\left\{\left\{y(x) \to \frac{1}{9}e^{3x}(c_2(3x-1)+3c_1)+c_3\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 16

$$\{y(x) = \mathrm{e}^{3x}(\_C3\,x + \_C2) + \_C1\}$$

Mathematica raw input

```
DSolve[9*y'[x] - 6*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(3*x)*(3*C[1] + (-1 + 3*x)*C[2]))/9 + C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-6*diff(diff(y(x),x),x)+9*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(3*x)*(_C3*x+_C2)+_C1
```

4.2141 $y'''(x) - 6y''(x) + 12y'(x) - 8y(x) = e^{2x}x^2$

ODE

$$y'''(x) - 6y''(x) + 12y'(x) - 8y(x) = e^{2x}x^2$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0239945 (sec), leaf count = 34

$$\left\{\left\{y(x) \to \frac{1}{60}e^{2x}\left(60c_3x^2 + 60c_2x + 60c_1 + x^5\right)\right\}\right\}$$

Maple ✓
cpu = 0.017 (sec), leaf count = 36

$$\left\{y(x) = \frac{x^5(\mathrm{e}^x)^2}{60} + \mathrm{e}^{2\,x}\_C1 + \_C2\,x^2\mathrm{e}^{2\,x} + \_C3\,\mathrm{e}^{2\,x}x\right\}$$

Mathematica raw input

```
DSolve[-8*y[x] + 12*y'[x] - 6*y''[x] + y'''[x] == E^(2*x)*x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(2*x)*(x^5 + 60*C[1] + 60*x*C[2] + 60*x^2*C[3]))/60}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-6*diff(diff(y(x),x),x)+12*diff(y(x),x)-8*y(x) = x^2*exp(2*x), y(x
```

Maple raw output

```
y(x) = 1/60*x^5*exp(x)^2+exp(2*x)*_C1+_C2*x^2*exp(2*x)+_C3*exp(2*x)*x
```

4.2142 $y'''(x) + a^3(-y(x)) + 3a^2y'(x) - 3ay''(x) = 0$

ODE

$$y'''(x) + a^3(-y(x)) + 3a^2y'(x) - 3ay''(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0117832 (sec), leaf count = 23

$$\{\{y(x) \to e^{ax}(x(c_3x + c_2) + c_1)\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 19

$$\{y(x) = \mathrm{e}^{ax}(\_C3\,x^2 + \_C2\,x + \_C1)\}$$

Mathematica raw input

```
DSolve[-(a^3*y[x]) + 3*a^2*y'[x] - 3*a*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(a*x)*(C[1] + x*(C[2] + x*C[3]))}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-3*a*diff(diff(y(x),x),x)+3*a^2*diff(y(x),x)-a^3*y(x) = 0, y(x),'i
```

Maple raw output

```
y(x) = exp(a*x)*(_C3*x^2+_C2*x+_C1)
```

4.2143 $y'''(x) + a^3(-y(x)) + 3a^2y'(x) - 3ay''(x) = e^{ax}$

ODE

$$y'''(x) + a^3(-y(x)) + 3a^2y'(x) - 3ay''(x) = e^{ax}$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0221347 (sec), leaf count = 34

$$\left\{\left\{y(x) \to \frac{1}{6}e^{ax}\left(6c_3x^2 + 6c_2x + 6c_1 + x^3\right)\right\}\right\}$$

Maple ✓
cpu = 0.015 (sec), leaf count = 27

$$\left\{y(x) = \frac{\mathrm{e}^{ax}\left(6\_C3\,x^2 + x^3 + 6\_C2\,x + 6\_C1\right)}{6}\right\}$$

Mathematica raw input

```
DSolve[-(a^3*y[x]) + 3*a^2*y'[x] - 3*a*y''[x] + y'''[x] == E^(a*x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(a*x)*(x^3 + 6*C[1] + 6*x*C[2] + 6*x^2*C[3]))/6}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-3*a*diff(diff(y(x),x),x)+3*a^2*diff(y(x),x)-a^3*y(x) = exp(a*x),
```

Maple raw output

```
y(x) = 1/6*exp(a*x)*(6*_C3*x^2+x^3+6*_C2*x+6*_C1)
```

4.2144 $y'''(x) = ay''(x)$

ODE

$$y'''(x) = ay''(x)$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0156643 (sec), leaf count = 23

$$\left\{\left\{y(x) \to \frac{c_1 e^{ax}}{a^2} + c_3 x + c_2\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 15

$$\{y(x) = \_C1 + \_C2\, x + \_C3\, \mathrm{e}^{ax}\}$$

Mathematica raw input

```
DSolve[y'''[x] == a*y''[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(a*x)*C[1])/a^2 + C[2] + x*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x) = a*diff(diff(y(x),x),x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*x+_C3*exp(a*x)
```

4.2145 $y'''(x) + \mathbf{a1} y''(x) + \mathbf{a2} y'(x) + \mathbf{a3} y(x) = 0$

ODE

$$y'''(x) + \mathrm{a1} y''(x) + \mathrm{a2} y'(x) + \mathrm{a3} y(x) = 0$$

ODE Classification

[[_3rd_order , _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.009094 (sec), leaf count = 84

$$\left\{\left\{y(x) \to c_1 e^{x\text{Root}\left[\#1^3+\#1^2\mathrm{a1}+\#1\mathrm{a2}+\mathrm{a3}\&,1\right]} + c_2 e^{x\text{Root}\left[\#1^3+\#1^2\mathrm{a1}+\#1\mathrm{a2}+\mathrm{a3}\&,2\right]} + c_3 e^{x\text{Root}\left[\#1^3+\#1^2\mathrm{a1}+\#1\mathrm{a2}+\mathrm{a3}\&,3\right]}\right\}\right\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 542

$$\left\{ y(x) = \_C3\, \mathrm{e}^{\frac{x}{6}\left(\left(36\,a2\,a1-108\,a3-8\,a1^3+12\sqrt{81\,a3^2+(12\,a1^3-54\,a2\,a1)a3-3\,a2^2a1^2+12\,a2^3}\right)^{\frac{2}{3}}-2\,a1\,\sqrt[3]{36\,a2\,a1-108\,a3-8\,a1^3+12\sqrt{81\,a3}\right.}\right.} \right\}$$

Mathematica raw input

```
DSolve[a3*y[x] + a2*y'[x] + a1*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(x*Root[a3 + a2*#1 + a1*#1^2 + #1^3 & , 1])*C[1] + E^(x*Root[a3 + a2
*#1 + a1*#1^2 + #1^3 & , 2])*C[2] + E^(x*Root[a3 + a2*#1 + a1*#1^2 + #1^3 & , 3]
)*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+a1*diff(diff(y(x),x),x)+a2*diff(y(x),x)+a3*y(x) = 0, y(x),'implic
```

Maple raw output

```
y(x) = _C3*exp(1/6*((36*a2*a1-108*a3-8*a1^3+12*(81*a3^2+(12*a1^3-54*a1*a2)*a3-3*
a2^2*a1^2+12*a2^3)^(1/2))^(2/3)-2*a1*(36*a2*a1-108*a3-8*a1^3+12*(81*a3^2+(12*a1^
```

```
3-54*a1*a2)*a3-3*a2^2*a1^2+12*a2^3)^(1/2))^(1/3)+4*a1^2-12*a2)/(36*a2*a1-108*a3-
8*a1^3+12*(81*a3^2+(12*a1^3-54*a1*a2)*a3-3*a2^2*a1^2+12*a2^3)^(1/2))^(1/3)*x)+_C
2*exp(-1/3*((-1/4*I*3^(1/2)+1/4)*(36*a2*a1-108*a3-8*a1^3+12*(81*a3^2+(12*a1^3-54
*a1*a2)*a3-3*a2^2*a1^2+12*a2^3)^(1/2))^(2/3)+a1*(36*a2*a1-108*a3-8*a1^3+12*(81*a
3^2+(12*a1^3-54*a1*a2)*a3-3*a2^2*a1^2+12*a2^3)^(1/2))^(1/3)+(a1^2-3*a2)*(I*3^(1/
2)+1))*x/(36*a2*a1-108*a3-8*a1^3+12*(81*a3^2+(12*a1^3-54*a1*a2)*a3-3*a2^2*a1^2+1
2*a2^3)^(1/2))^(1/3))+_C1*exp(1/3*((-1/4*I*3^(1/2)-1/4)*(36*a2*a1-108*a3-8*a1^3+
12*(81*a3^2+(12*a1^3-54*a1*a2)*a3-3*a2^2*a1^2+12*a2^3)^(1/2))^(2/3)-a1*(36*a2*a1
-108*a3-8*a1^3+12*(81*a3^2+(12*a1^3-54*a1*a2)*a3-3*a2^2*a1^2+12*a2^3)^(1/2))^(1/
3)+(a1^2-3*a2)*(I*3^(1/2)-1))*x/(36*a2*a1-108*a3-8*a1^3+12*(81*a3^2+(12*a1^3-54*
a1*a2)*a3-3*a2^2*a1^2+12*a2^3)^(1/2))^(1/3))
```

4.2146 $y'''(x) - 2(-2a - 4x^2 + 1)\, y'(x) - 8axy(x) - 6xy''(x) = 0$

ODE

$$y'''(x) - 2\left(-2a - 4x^2 + 1\right) y'(x) - 8axy(x) - 6xy''(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.101859 (sec), leaf count = 57

$$\left\{\left\{y(x) \to c_2 H_{\frac{a}{2}}(x)\, {}_1F_1\left(-\frac{a}{4}; \frac{1}{2}; x^2\right) + c_1 H_{\frac{a}{2}}(x)^2 + c_3\, {}_1F_1\left(-\frac{a}{4}; \frac{1}{2}; x^2\right)^2\right\}\right\}$$

Maple ✓
cpu = 0.23 (sec), leaf count = 59

$$\left\{y(x) = x^2\left(\left(U\left(\frac{1}{2} - \frac{a}{4}, \frac{3}{2}, x^2\right)\right)^2 \_C2 + U\left(\frac{1}{2} - \frac{a}{4}, \frac{3}{2}, x^2\right) M\left(\frac{1}{2} - \frac{a}{4}, \frac{3}{2}, x^2\right) \_C3 + \left(M\left(\frac{1}{2} - \frac{a}{4}, \frac{3}{2}, x^2\right)\right)^2 \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-8*a*x*y[x] - 2*(1 - 2*a - 4*x^2)*y'[x] - 6*x*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*HermiteH[a/2, x]^2 + C[2]*HermiteH[a/2, x]*Hypergeometric1F1[-a/4
, 1/2, x^2] + C[3]*Hypergeometric1F1[-a/4, 1/2, x^2]^2}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-6*x*diff(diff(y(x),x),x)-2*(-4*x^2-2*a+1)*diff(y(x),x)-
8*a*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^2*(KummerU(1/2-1/4*a,3/2,x^2)^2*_C2+KummerU(1/2-1/4*a,3/2,x^2)*KummerM(
1/2-1/4*a,3/2,x^2)*_C3+KummerM(1/2-1/4*a,3/2,x^2)^2*_C1)
```

4.2147 $y'''(x) + a^3x^3y(x) + 3a^2x^2y'(x) + 3axy''(x) = 0$

ODE

$$y'''(x) + a^3x^3y(x) + 3a^2x^2y'(x) + 3axy''(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0319237 (sec), leaf count = 68

$$\left\{\left\{y(x) \to e^{-\frac{ax^2}{2}-\sqrt{3}\sqrt{a}x}\left(c_1 e^{\sqrt{3}\sqrt{a}x} + c_3 e^{2\sqrt{3}\sqrt{a}x} + c_2\right)\right\}\right\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 43

$$\left\{\left(-\_C2\, \mathrm{e}^{\sqrt{3}\sqrt{a}x} - \_C3\, \mathrm{e}^{-\sqrt{3}\sqrt{a}x} - \_C1\right) \mathrm{e}^{-\frac{ax^2}{2}} + y(x) = 0\right\}$$

Mathematica raw input

```
DSolve[a^3*x^3*y[x] + 3*a^2*x^2*y'[x] + 3*a*x*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(-(Sqrt[3]*Sqrt[a]*x) - (a*x^2)/2)*(E^(Sqrt[3]*Sqrt[a]*x)*C[1] + C[2
] + E^(2*Sqrt[3]*Sqrt[a]*x)*C[3])}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+3*a*x*diff(diff(y(x),x),x)+3*a^2*x^2*diff(y(x),x)+a^3*x^3*y(x) =
```

Maple raw output

```
(-_C2*exp(3^(1/2)*a^(1/2)*x)-_C3*exp(-3^(1/2)*a^(1/2)*x)-_C1)*exp(-1/2*a*x^2)+y(
x) = 0
```

4.2148 $y'''(x) + x^2(-y''(x)) + 2xy'(x) - 2y(x) = 0$

ODE

$$y'''(x) + x^2(-y''(x)) + 2xy'(x) - 2y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.167059 (sec), leaf count = 90

$$\left\{\left\{y(x) \to \frac{1}{12}c_3\left(3e^{\frac{x^3}{3}} + \sqrt[3]{3}\left(-x^3\right)^{2/3}\Gamma\left(\frac{1}{3}, -\frac{x^3}{3}\right) - 2\,3^{2/3}\sqrt[3]{-x^3}\Gamma\left(\frac{2}{3}, -\frac{x^3}{3}\right)\right) + \frac{c_2x^2}{2} + c_1x\right\}\right\}$$

Maple ✓
cpu = 0.209 (sec), leaf count = 104

$$\left\{y(x) = 3\,\frac{\left(-3\,\Gamma(2/3)\,\mathrm{e}^{1/3\,x^3}\_C3 + 1/3\,x(\_C2\,x + \_C1)\right)\left(-x^3\right)^{2/3} + \_C3\,x^3\left(\sqrt[3]{3}\Gamma(2/3)\,\sqrt[3]{-x^3}\Gamma\left(1/3, -1/3\,x^3\right) - 2/3\,\sqrt[3]{}\right.}{\left(-x^3\right)^{2/3}}\right.$$

Mathematica raw input

```
DSolve[-2*y[x] + 2*x*y'[x] - x^2*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + (x^2*C[2])/2 + (C[3]*(3*E^(x^3/3) + 3^(1/3)*(-x^3)^(2/3)*Gamm
a[1/3, -x^3/3] - 2*3^(2/3)*(-x^3)^(1/3)*Gamma[2/3, -x^3/3]))/12}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-2*y(x) = 0, y(x),'impli
```

Maple raw output

```
y(x) = 3*((-3*GAMMA(2/3)*exp(1/3*x^3)*_C3+1/3*x*(_C2*x+_C1))*(-x^3)^(2/3)+_C3*x^
3*(3^(1/3)*GAMMA(2/3)*(-x^3)^(1/3)*GAMMA(1/3,-1/3*x^3)-2/3*(-x^3)^(1/3)*3^(5/6)*
Pi-2*3^(2/3)*GAMMA(2/3)*GAMMA(2/3,-1/3*x^3)+2*3^(2/3)*GAMMA(2/3)^2))/(-x^3)^(2/3
)
```

4.2149 $y'''(x) + y''(x)(2\cot(x) + \csc(x)) - y'(x) = \cot(x)$

ODE

$$y'''(x) + y''(x)(2\cot(x) + \csc(x)) - y'(x) = \cot(x)$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.680945 (sec), leaf count = 56

$$\left\{\left\{y(x) \to -\frac{c_2 x}{\sqrt{2}} - \frac{\cot\left(\frac{x}{2}\right)(c_2 \log(2(\cos(x)+1)) + 2c_1)}{\sqrt{2}} + c_3 + \cot\left(\frac{x}{2}\right)\sin^{-1}(\cos(x))\right\}\right\}$$

Maple ✓
cpu = 28.87 (sec), leaf count = 276

$$\left\{y(x) = \frac{-\_C1\,\pi\left(csgn\left(i\mathrm{e}^{-ix}\left(\mathrm{e}^{ix}+1\right)^2\right)\right)^3 + \_C1\,\pi\left(csgn\left(i\mathrm{e}^{-ix}\right) + csgn\left(i\left(\mathrm{e}^{ix}+1\right)^2\right)\right)\left(csgn\left(i\mathrm{e}^{-ix}\left(\mathrm{e}^{ix}+1\right)^2\right)\right)^2 - \_C\right.$$

Mathematica raw input

```
DSolve[-y'[x] + (2*Cot[x] + Csc[x])*y''[x] + y'''[x] == Cot[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((x*C[2])/Sqrt[2]) + C[3] + ArcSin[Cos[x]]*Cot[x/2] - (Cot[x/2]*(2*C[
1] + C[2]*Log[2*(1 + Cos[x])]))/Sqrt[2]}}
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+(2*cot(x)+csc(x))*diff(diff(y(x),x),x)-diff(y(x),x) = cot(x), y(x
```

Maple raw output

```
y(x) = (-_C1*Pi*csgn(I*exp(-I*x)*(exp(I*x)+1)^2)^3+_C1*Pi*(csgn(I*exp(-I*x))+csg
n(I*(exp(I*x)+1)^2))*csgn(I*exp(-I*x)*(exp(I*x)+1)^2)^2-_C1*Pi*csgn(I*(exp(I*x)+
1)^2)*csgn(I*exp(-I*x))*csgn(I*exp(-I*x)*(exp(I*x)+1)^2)-_C1*Pi*csgn(I*(exp(I*x)
```

```
+1)^2)^3+2*_C1*Pi*csgn(I+I*exp(I*x))*csgn(I*(exp(I*x)+1)^2)^2-_C1*Pi*csgn(I+I*ex
p(I*x))^2*csgn(I*(exp(I*x)+1)^2)-2*I*_C1*(exp(I*x)+1)*ln(exp(I*x)+1)+2*I*_C1*ln(
exp(I*x))+(-I*x-2*_C1*x+_C3)*exp(I*x)+2*I*ln(2)*_C1-I*x-2*I*_C2+2*_C1*x-_C3)/(ex
p(I*x)-1)
```

4.2150 $y'''(x) - \sin(x)y''(x) - 2\cos(x)y'(x) + y(x)\sin(x) = \log(x)$

ODE

$$y'''(x) - \sin(x)y''(x) - 2\cos(x)y'(x) + y(x)\sin(x) = \log(x)$$

ODE Classification

[[_3rd_order, _fully, _exact, _linear]]

Book solution method
TO DO

Mathematica ✗
cpu = 599.998 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.084 (sec), leaf count = 36

$$\left\{y(x) = \left(\_C3 + \int \left(2\_C1\, x + \_C2 + \frac{x^2 \ln(x)}{2} - \frac{3x^2}{4}\right) e^{\cos(x)}\, dx\right) e^{-\cos(x)}\right\}$$

Mathematica raw input

```
DSolve[Sin[x]*y[x] - 2*Cos[x]*y'[x] - Sin[x]*y''[x] + y'''[x] == Log[x],y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-diff(diff(y(x),x),x)*sin(x)-2*diff(y(x),x)*cos(x)+y(x)*sin(x) = l
```

Maple raw output

```
y(x) = (_C3+Int((2*_C1*x+_C2+1/2*x^2*ln(x)-3/4*x^2)*exp(cos(x)),x))*exp(-cos(x))
```

4.2151 $y'''(x)+y'(x)\left(2f'(x)^2+f'(x)+4g(x)\right)+2y(x)\left(2f(x)g(x)+g'(x)\right)+3f(x)y''(x)=0$

ODE

$$y'''(x)+y'(x)\left(2f'(x)^2+f'(x)+4g(x)\right)+2y(x)\left(2f(x)g(x)+g'(x)\right)+3f(x)y''(x)=0$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.0230963 (sec), leaf count = 0 , could not solve

```
DSolve[2*y[x]*(2*f[x]*g[x] + Derivative[1][g][x]) + (4*g[x] + Derivative[1][f][x] + 2*Derivative[1][f
```

Maple ✗
cpu = 0.093 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{\frac{\mathrm{d}^3}{\mathrm{d}x^3}\_Y(x)+3\,f(x)\,\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)+\left(\frac{\mathrm{d}}{\mathrm{d}x}f(x)+2\left(\frac{\mathrm{d}}{\mathrm{d}x}f(x)\right)^2+4\,g(x)\right)\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)+\left(4\,f(x)\,g(x)+2\,\frac{\mathrm{d}}{\mathrm{d}}\right.\right.\right.$$

Mathematica raw input

```
DSolve[2*y[x]*(2*f[x]*g[x] + g'[x]) + (4*g[x] + f'[x] + 2*f'[x]^2)*y'[x] + 3*f[x]*y''[x] + y'''[x] ==
```

Mathematica raw output

```
DSolve[2*y[x]*(2*f[x]*g[x] + Derivative[1][g][x]) + (4*g[x] + Derivative[1][f][x
] + 2*Derivative[1][f][x]^2)*Derivative[1][y][x] + 3*f[x]*Derivative[2][y][x] +
Derivative[3][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+3*f(x)*diff(diff(y(x),x),x)+(diff(f(x),x)+2*diff(f(x),x)^2+4*g(x)
```

Maple raw output

```
y(x) = DESol({diff(diff(diff(_Y(x),x),x),x)+3*f(x)*diff(diff(_Y(x),x),x)+(diff(f
(x),x)+2*diff(f(x),x)^2+4*g(x))*diff(_Y(x),x)+(4*f(x)*g(x)+2*diff(g(x),x))*_Y(x)
},{_Y(x)})
```

4.2152 $y'''(x) + f(x)y''(x) + f(x)y(x) + y'(x) = 0$

ODE

$$y'''(x) + f(x)y''(x) + f(x)y(x) + y'(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0933995 (sec), leaf count = 0 , could not solve

```
DSolve[f[x]*y[x] + Derivative[1][y][x] + f[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0, y[x], x
```

Maple ✓
cpu = 0.2 (sec), leaf count = 36

$$\left\{y(x) = \mathrm{e}^{ix}\left(\int \mathrm{e}^{-2\,ix}\left(\int \_C3\,\mathrm{e}^{\int -f(x)+i\,\mathrm{d}x}\,\mathrm{d}x + \_C2\right)\,\mathrm{d}x + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[f[x]*y[x] + y'[x] + f[x]*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f[x]*y[x] + Derivative[1][y][x] + f[x]*Derivative[2][y][x] + Derivative[3
][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+f(x)*diff(diff(y(x),x),x)+diff(y(x),x)+f(x)*y(x) = 0, y(x),'impli
```

Maple raw output

```
y(x) = exp(I*x)*(Int(exp(-2*I*x)*(Int(_C3*exp(Int(-f(x)+I,x)),x)+_C2),x)+_C1)
```

4.2153 $4y'''(x) - 3y'(x) + y(x) = 0$

ODE

$$4y'''(x) - 3y'(x) + y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.008271 (sec), leaf count = 29

$$\left\{\left\{y(x) \to e^{-x}\left(e^{3x/2}(c_2 x + c_1) + c_3\right)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 21

$$\{y(x) = (\_C3\, x + \_C2)\, \mathrm{e}^{\frac{x}{2}} + \_C1\, \mathrm{e}^{-x}\}$$

Mathematica raw input

```
DSolve[y[x] - 3*y'[x] + 4*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^((3*x)/2)*(C[1] + x*C[2]) + C[3])/E^x}}
```

Maple raw input

```
dsolve(4*diff(diff(diff(y(x),x),x),x)-3*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C3*x+_C2)*exp(1/2*x)+_C1*exp(-x)
```

4.2154 $4y'''(x) - 8y''(x) - 11y'(x) - 3y(x) = 0$

ODE

$$4y'''(x) - 8y''(x) - 11y'(x) - 3y(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00858395 (sec), leaf count = 30

$$\left\{\left\{y(x) \to e^{-x/2}\left(c_2 x + c_3 e^{7x/2} + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 21

$$\{y(x) = (\_C3\, x + \_C2)\, \mathrm{e}^{-\frac{x}{2}} + \mathrm{e}^{3x}\_C1\}$$

Mathematica raw input

```
DSolve[-3*y[x] - 11*y'[x] - 8*y''[x] + 4*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2] + E^((7*x)/2)*C[3])/E^(x/2)}}
```

Maple raw input

```
dsolve(4*diff(diff(diff(y(x),x),x),x)-8*diff(diff(y(x),x),x)-11*diff(y(x),x)-3*y(x) = 0, y(x),'implic
```

Maple raw output

```
y(x) = (_C3*x+_C2)*exp(-1/2*x)+exp(3*x)*_C1
```

4.2155 $4y'''(x) - 8y''(x) - 11y'(x) - 3y(x) + 18e^x = 0$

ODE

$$4y'''(x) - 8y''(x) - 11y'(x) - 3y(x) + 18e^x = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0261675 (sec), leaf count = 37

$$\left\{\left\{y(x) \to e^{-x/2}\left(c_2 x + c_3 e^{7x/2} + c_1 + e^{3x/2}\right)\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 23

$$\{y(x) = (\_C3\, x + \_C2)\, \mathrm{e}^{-\frac{x}{2}} + \mathrm{e}^{3x}\_C1 + \mathrm{e}^{x}\}$$

Mathematica raw input

```
DSolve[18*E^x - 3*y[x] - 11*y'[x] - 8*y''[x] + 4*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^((3*x)/2) + C[1] + x*C[2] + E^((7*x)/2)*C[3])/E^(x/2)}}
```

Maple raw input

```
dsolve(4*diff(diff(diff(y(x),x),x),x)-8*diff(diff(y(x),x),x)-11*diff(y(x),x)-3*y(x)+18*exp(x) = 0, y(
```

Maple raw output

```
y(x) = (_C3*x+_C2)*exp(-1/2*x)+exp(3*x)*_C1+exp(x)
```

4.2156 $xy'''(x) = 2$

ODE

$$xy'''(x) = 2$$

ODE Classification

[[_3rd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00948951 (sec), leaf count = 28

$$\left\{\left\{y(x) \to \left(c_3 - \frac{3}{2}\right)x^2 + c_2 x + c_1 + x^2 \log(x)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 23

$$\left\{y(x) = x^2 \ln(x) + \frac{(\_C1 - 3)\,x^2}{2} + \_C2\,x + \_C3\right\}$$

Mathematica raw input

```
DSolve[x*y'''[x] == 2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*C[2] + x^2*(-3/2 + C[3]) + x^2*Log[x]}}
```

Maple raw input

```
dsolve(x*diff(diff(diff(y(x),x),x),x) = 2, y(x),'implicit')
```

Maple raw output

```
y(x) = x^2*ln(x)+1/2*(_C1-3)*x^2+_C2*x+_C3
```

4.2157 $xy'''(x)+3y'(x)+xy(x)=0$

ODE

$$xy'''(x)+3y'(x)+xy(x)=0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 19.1912 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left[\{y,x\},\left\{xy^{\text{Symbol[StringJoin[ConstantArray['',3]]]}}(x)+3y'(x)+xy(x)=0,y(1)=c_1,y'(1)=c_2,y''(1\right.\right.\right.$$

Maple ✓
cpu = 0.635 (sec), leaf count = 121

$$\left\{y(x)=\mathrm{e}^{-x}(1+x)\left(\_C2\int\frac{x}{(1+x)^2}HeunC\left(i\sqrt{3},1,-2,-\frac{3}{2},\frac{7}{2},-x\right)\mathrm{e}^{-\frac{x\left(i\sqrt{3}-3\right)}{2}}\,\mathrm{d}x+\_C3\int\frac{x}{(1+x)^2}HeunC\left(i\sqrt{3},1,-\right.\right.\right.$$

Mathematica raw input

```
DSolve[x*y[x] + 3*y'[x] + x*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {\[FormalX]*\[Form
alY][\[FormalX]] + 3*Derivative[1][\[FormalY]][\[FormalX]] + \[FormalX]*Derivati
ve[3][\[FormalY]][\[FormalX]] == 0, \[FormalY][1] == C[1], Derivative[1][\[Forma
lY]][1] == C[2], Derivative[2][\[FormalY]][1] == C[3]}]][x]}}
```

Maple raw input

```
dsolve(x*diff(diff(diff(y(x),x),x),x)+3*diff(y(x),x)+x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x)*(1+x)*(_C2*Int(x*HeunC(I*3^(1/2),1,-2,-3/2,7/2,-x)*exp(-1/2*x*(I*
3^(1/2)-3))/(1+x)^2,x)+_C3*Int(x*HeunC(I*3^(1/2),1,-2,-3/2,7/2,-x)*exp(-1/2*x*(I
*3^(1/2)-3))*Int((1+x)/x^2/HeunC(I*3^(1/2),1,-2,-3/2,7/2,-x)^2*exp(I*3^(1/2)*x),
x)/(1+x)^2,x)+_C1)
```

4.2158 $xy'''(x) - y''(x) + xy'(x) - y(x) = 0$

ODE

$$xy'''(x) - y''(x) + xy'(x) - y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0699656 (sec), leaf count = 21

$$\{\{y(x) \to c_1 x - c_2 \sin(x) + c_3 \cos(x)\}\}$$

Maple ✓
cpu = 0.093 (sec), leaf count = 16

$$\{y(x) = \_C1\, x + \cos(x)\, \_C2 + \_C3\, \sin(x)\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] - y''[x] + x*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + C[3]*Cos[x] - C[2]*Sin[x]}}
```

Maple raw input

```
dsolve(x*diff(diff(diff(y(x),x),x),x)-diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x+cos(x)*_C2+_C3*sin(x)
```

4.2159 $xy'''(x) - y''(x) - xy'(x) + y(x) = 0$

ODE

$$xy'''(x) - y''(x) - xy'(x) + y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0575287 (sec), leaf count = 24

$$\{\{y(x) \to c_1 x + ic_3 \sinh(x) - c_2 \cosh(x)\}\}$$

Maple ✓
cpu = 0.087 (sec), leaf count = 18

$$\{y(x) = \_C1\, x + \_C2\, e^{x} + \_C3\, e^{-x}\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] - y''[x] + x*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] - C[2]*Cosh[x] + I*C[3]*Sinh[x]}}
```

Maple raw input

```
dsolve(x*diff(diff(diff(y(x),x),x),x)-diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x+_C2*exp(x)+_C3*exp(-x)
```

4.2160 $xy'''(x) - y''(x) - xy'(x) + y(x) = 1 - x^2$

ODE

$$xy'''(x) - y''(x) - xy'(x) + y(x) = 1 - x^2$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0808538 (sec), leaf count = 28

$$\{\{y(x) \to c_1 x + ic_3 \sinh(x) - c_2 \cosh(x) + x^2 + 3\}\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 22

$$\{y(x) = x^2 + 3 + \_C1\, x + \_C2\, e^x + \_C3\, e^{-x}\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] - y''[x] + x*y'''[x] == 1 - x^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 3 + x^2 + x*C[1] - C[2]*Cosh[x] + I*C[3]*Sinh[x]}}
```

Maple raw input

```
dsolve(x*diff(diff(diff(y(x),x),x),x)-diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x) = -x^2+1, y(x),'implic
```

Maple raw output

```
y(x) = x^2+3+_C1*x+_C2*exp(x)+_C3*exp(-x)
```

4.2161 $xy'''(x)+x^2(-y(x))+3y''(x)=0$

ODE

$$xy'''(x)+x^2(-y(x))+3y''(x)=0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.03381 (sec), leaf count = 77

$$\left\{\left\{y(x)\to \frac{(2-2i)c_1\,{}_0F_2\left(;\frac{1}{2},\frac{3}{4};\frac{x^4}{64}\right)}{x}+c_2\,{}_0F_2\left(;\frac{3}{4},\frac{5}{4};\frac{x^4}{64}\right)+\left(\frac{1}{4}+\frac{i}{4}\right)c_3x\,{}_0F_2\left(;\frac{5}{4},\frac{3}{2};\frac{x^4}{64}\right)\right\}\right\}$$

Maple ✓
cpu = 0.093 (sec), leaf count = 45

$$\left\{y(x)=\_C1\,{}_0\mathrm{F}_2(\ ;\frac{3}{4},\frac{5}{4};\frac{x^4}{64})+\frac{\_C2}{x}{}_0\mathrm{F}_2(\ ;\frac{1}{2},\frac{3}{4};\frac{x^4}{64})+\_C3\,x\,{}_0\mathrm{F}_2(\ ;\frac{5}{4},\frac{3}{2};\frac{x^4}{64})\right\}$$

Mathematica raw input

```
DSolve[-(x^2*y[x]) + 3*y''[x] + x*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((2 - 2*I)*C[1]*HypergeometricPFQ[{}, {1/2, 3/4}, x^4/64])/x + C[2]*Hy
pergeometricPFQ[{}, {3/4, 5/4}, x^4/64] + (1/4 + I/4)*x*C[3]*HypergeometricPFQ[{
}, {5/4, 3/2}, x^4/64]}}
```

Maple raw input

```
dsolve(x*diff(diff(diff(y(x),x),x),x)+3*diff(diff(y(x),x),x)-x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([],[3/4, 5/4],1/64*x^4)+_C2/x*hypergeom([],[1/2, 3/4],1/64*
x^4)+_C3*x*hypergeom([],[5/4, 3/2],1/64*x^4)
```

4.2162 $xy'''(x) - (3 - x^2)\, y''(x) + 4xy'(x) + 2y(x) = 0$

ODE

$$xy'''(x) - (3 - x^2)\, y''(x) + 4xy'(x) + 2y(x) = 0$$

ODE Classification

[[_3rd_order, _fully, _exact, _linear]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.136741 (sec), leaf count = 111

$$\left\{\left\{y(x) \to \frac{1}{240}\left(8\sqrt{2\pi}c_2 e^{-\frac{x^2}{2}} x^5 \text{erfi}\left(\frac{x}{\sqrt{2}}\right) + 15c_3 e^{-\frac{x^2}{2}} x^5 \text{Ei}\left(\frac{x^2}{2}\right) - 16c_2 x^4 - 30c_3 x^3 - 16c_2 x^2 + 240c_1 e^{-\frac{x^2}{2}} x^5 - 60c_3 x - 4\right.\right.$$

Maple ✓
cpu = 0.043 (sec), leaf count = 81

$$\left\{y(x) = \mathrm{e}^{-\frac{x^2}{2}} x^5 \_C1\, Ei\left(1, -\frac{x^2}{2}\right) - \frac{\left(iErf\left(\frac{i}{2}\sqrt{2}x\right) \_C2\, \sqrt{2}\sqrt{\pi} - 30\_C3\right) x^5}{30} \mathrm{e}^{-\frac{x^2}{2}} - \frac{x^4 \_C2}{15} + 2x^3 \_C1 - \frac{x^2 \_C2}{15} + 4\_\right.$$

Mathematica raw input

```
DSolve[2*y[x] + 4*x*y'[x] - (3 - x^2)*y''[x] + x*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((240*x^5*C[1])/E^(x^2/2) - 48*C[2] - 16*x^2*C[2] - 16*x^4*C[2] - 60*x
*C[3] - 30*x^3*C[3] + (8*Sqrt[2*Pi]*x^5*C[2]*Erfi[x/Sqrt[2]])/E^(x^2/2) + (15*x^
5*C[3]*ExpIntegralEi[x^2/2])/E^(x^2/2))/240}}
```

Maple raw input

```
dsolve(x*diff(diff(diff(y(x),x),x),x)-(-x^2+3)*diff(diff(y(x),x),x)+4*x*diff(y(x),x)+2*y(x) = 0, y(x)
```

Maple raw output

```
y(x) = exp(-1/2*x^2)*x^5*_C1*Ei(1,-1/2*x^2)-1/30*(I*erf(1/2*I*2^(1/2)*x)*_C2*2^(
1/2)*Pi^(1/2)-30*_C3)*x^5*exp(-1/2*x^2)-1/15*x^4*_C2+2*x^3*_C1-1/15*x^2*_C2+4*_C
1*x-1/5*_C2
```

4.2163 $(1-2x)y'''(x)-(x+4)y''(x)-2y'(x)=0$

ODE

$$(1-2x)y'''(x)-(x+4)y''(x)-2y'(x)=0$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✗
cpu = 600.603 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.117 (sec), leaf count = 45

$$\left\{y(x)=1\left(\_C3+\int\frac{2\_C1\,x+\_C2}{1-2\,x}\mathrm{e}^{\frac{x}{2}}\sqrt[4]{-1+2\,x}\,\mathrm{d}x\right)\mathrm{e}^{-\frac{x}{2}}\frac{1}{\sqrt[4]{-1+2\,x}}\right\}$$

Mathematica raw input

```
DSolve[-2*y'[x] - (4 + x)*y''[x] + (1 - 2*x)*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((1-2*x)*diff(diff(diff(y(x),x),x),x)-(4+x)*diff(diff(y(x),x),x)-2*diff(y(x),x) = 0, y(x),'impl
```

Maple raw output

```
y(x) = (_C3+Int((2*_C1*x+_C2)*exp(1/2*x)*(-1+2*x)^(1/4)/(1-2*x),x))*exp(-1/2*x)/
(-1+2*x)^(1/4)
```

4.2164 $x^2y'''(x) + ax^2y(x) - 6y'(x) = 0$

ODE

$$x^2y'''(x) + ax^2y(x) - 6y'(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.553604 (sec), leaf count = 97

$$\left\{\left\{y(x) \to \frac{c_1 e^{-\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2\right) + c_2 e^{\sqrt[3]{-1}\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2(-1)^{2/3}\right) + c_3 e^{-(-1)^{2/3}\sqrt[3]{a}x}\left(\sqrt[3]{a}x-2\sqrt[3]{-1}\right)}{x}\right\}\right\}$$

Maple ✓
cpu = 0.556 (sec), leaf count = 135

$$\left\{y(x) = \frac{1}{x}\left(-\_C2\left(\left(-i-\sqrt{3}\right)\left(-a^4\right)^{\frac{2}{3}} + ia^3x\right)e^{\frac{\frac{i}{2}\left(-\sqrt{3}+i\right)x}{a}\sqrt[3]{-a^4}} - \_C3\left(\left(-i+\sqrt{3}\right)\left(-a^4\right)^{\frac{2}{3}} + ia^3x\right)e^{\frac{\frac{i}{2}\left(\sqrt{3}+i\right)x}{a}\sqrt[3]{-a^4}} + \_\right.\right.$$

Mathematica raw input

```
DSolve[a*x^2*y[x] - 6*y'[x] + x^2*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (((2 + a^(1/3)*x)*C[1])/E^(a^(1/3)*x) + E^((-1)^(1/3)*a^(1/3)*x)*(2*(-
1)^(2/3) + a^(1/3)*x)*C[2] + ((-2*(-1)^(1/3) + a^(1/3)*x)*C[3])/E^((-1)^(2/3)*a^
(1/3)*x))/x}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-6*diff(y(x),x)+a*x^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (-_C2*((-I-3^(1/2))*(-a^4)^(2/3)+I*a^3*x)*exp(1/2*I*(-3^(1/2)+I)*(-a^4)^(
1/3)*x/a)-_C3*((-I+3^(1/2))*(-a^4)^(2/3)+I*a^3*x)*exp(1/2*I*(3^(1/2)+I)*(-a^4)^(
1/3)*x/a)+_C1*exp((-a^4)^(1/3)/a*x)*(a^3*x+2*(-a^4)^(2/3)))/x
```

4.2165 $x^2y'''(x)+2xy''(x)=a$

ODE

$$x^2y'''(x)+2xy''(x)=a$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0142653 (sec), leaf count = 27

$$\{\{y(x)\to \log(x)\,(ax-c_1)-ax+c_3x+c_2\}\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 23

$$\{y(x)=(ax-\_C1)\ln(x)+(-a+\_C2)\,x+\_C3\}$$

Mathematica raw input

```
DSolve[2*x*y''[x] + x^2*y'''[x] == a,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(a*x) + C[2] + x*C[3] + (a*x - C[1])*Log[x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)+2*x*diff(diff(y(x),x),x) = a, y(x),'implicit')
```

Maple raw output

```
y(x) = (a*x-_C1)*ln(x)+(-a+_C2)*x+_C3
```

4.2166 $x^2y'''(x)+(x^2+2)\,y'(x)+4xy''(x)+3xy(x)=f(x)$

ODE

$$x^2y'''(x)+(x^2+2)\,y'(x)+4xy''(x)+3xy(x)=f(x)$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 6.79624 (sec), leaf count = 872

$$\left\{\left\{y(x)\to \frac{x\left(J_0(x)c_1+2Y_0(x)c_2+J_0(x)\int_1^x -\frac{}{K[1](2(8(J_1(K[1])Y_0(K[1])-J_0(K[1])Y_1(K[1]))\,{}_1F_2(3;\frac{5}{2},\frac{5}{2};-\frac{1}{4}K[1]^2)K[1]^2+9\,{}_1F_2(2;\frac{3}{2},\frac{3}{2};-\frac{}{}\right.\right.\right.$$

Maple ✓
cpu = 0.34 (sec), leaf count = 1033

$$\left\{y(x)=\frac{1}{x}\left(\int 18\,\frac{}{((-18\,x^2J_0\left(x\right)-72\,xJ_1\left(x\right)+54\,J_0\left(x\right))\,{}_1\mathrm{F}_2(1;\,1/2,1/2;\,-1/4\,x^2)+8\,\left(9/4\,J_0\left(x\right)\left(x^2+9\right)\,{}_1\mathrm{F}_2(2;\,3/2,3/\right.\right.\right.$$

Mathematica raw input

```
DSolve[3*x*y[x] + (2 + x^2)*y'[x] + 4*x*y''[x] + x^2*y'''[x] == f[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(BesselJ[0, x]*C[1] + 2*BesselY[0, x]*C[2] + BesselJ[0, x]*Integrat
e[(-18*f[K[1]]*(2*BesselY[0, K[1]]*HypergeometricPFQ[{2}, {3/2, 3/2}, -K[1]^2/4]
*K[1]^2 + HypergeometricPFQ[{1}, {1/2, 1/2}, -K[1]^2/4]*(BesselY[0, K[1]] - Bess
elY[1, K[1]]*K[1])))/(K[1]*(2*K[1]^2*(8*(BesselJ[1, K[1]]*BesselY[0, K[1]] - Bes
selJ[0, K[1]]*BesselY[1, K[1]])*HypergeometricPFQ[{3}, {5/2, 5/2}, -K[1]^2/4]*K[
1]^2 + 9*HypergeometricPFQ[{2}, {3/2, 3/2}, -K[1]^2/4]*(2*BesselJ[1, K[1]]*Besse
lY[0, K[1]] - BesselJ[2, K[1]]*BesselY[0, K[1]]*K[1] + BesselJ[0, K[1]]*(-2*Bess
elY[1, K[1]] + BesselY[2, K[1]]*K[1]))) + 9*HypergeometricPFQ[{1}, {1/2, 1/2}, -
K[1]^2/4]*(BesselJ[2, K[1]]*K[1]*(-BesselY[0, K[1]] + BesselY[1, K[1]]*K[1]) + B
esselJ[1, K[1]]*(-(BesselY[2, K[1]]*K[1]^2) + BesselY[0, K[1]]*(4 + K[1]^2)) + B
esselJ[0, K[1]]*(BesselY[2, K[1]]*K[1] - BesselY[1, K[1]]*(4 + K[1]^2))))), {K[1
], 1, x}] + 2*BesselY[0, x]*Integrate[(9*f[K[2]]*(2*BesselJ[0, K[2]]*Hypergeomet
```

```
ricPFQ[{2}, {3/2, 3/2}, -K[2]^2/4]*K[2]^2 + HypergeometricPFQ[{1}, {1/2, 1/2}, -
K[2]^2/4]*(BesselJ[0, K[2]] - BesselJ[1, K[2]]*K[2])))/(K[2]*(2*K[2]^2*(8*(Besse
lJ[1, K[2]]*BesselY[0, K[2]] - BesselJ[0, K[2]]*BesselY[1, K[2]])*Hypergeometric
PFQ[{3}, {5/2, 5/2}, -K[2]^2/4]*K[2]^2 + 9*HypergeometricPFQ[{2}, {3/2, 3/2}, -K
[2]^2/4]*(2*BesselJ[1, K[2]]*BesselY[0, K[2]] - BesselJ[2, K[2]]*BesselY[0, K[2]
]*K[2] + BesselJ[0, K[2]]*(-2*BesselY[1, K[2]] + BesselY[2, K[2]]*K[2]))) + 9*Hy
pergeometricPFQ[{1}, {1/2, 1/2}, -K[2]^2/4]*(BesselJ[2, K[2]]*K[2]*(-BesselY[0,
K[2]] + BesselY[1, K[2]]*K[2]) + BesselJ[1, K[2]]*(-(BesselY[2, K[2]]*K[2]^2) +
BesselY[0, K[2]]*(4 + K[2]^2)) + BesselJ[0, K[2]]*(BesselY[2, K[2]]*K[2] - Besse
lY[1, K[2]]*(4 + K[2]^2))))), {K[2], 1, x}]) + 2*HypergeometricPFQ[{1}, {1/2, 1/
2}, -x^2/4]*(C[3] + Integrate[(9*(BesselJ[1, K[3]]*BesselY[0, K[3]] - BesselJ[0,
 K[3]]*BesselY[1, K[3]])*f[K[3]]*K[3])/(2*K[3]^2*(8*(BesselJ[1, K[3]]*BesselY[0,
 K[3]] - BesselJ[0, K[3]]*BesselY[1, K[3]])*HypergeometricPFQ[{3}, {5/2, 5/2}, -
K[3]^2/4]*K[3]^2 + 9*HypergeometricPFQ[{2}, {3/2, 3/2}, -K[3]^2/4]*(2*BesselJ[1,
 K[3]]*BesselY[0, K[3]] - BesselJ[2, K[3]]*BesselY[0, K[3]]*K[3] + BesselJ[0, K[
3]]*(-2*BesselY[1, K[3]] + BesselY[2, K[3]]*K[3]))) + 9*HypergeometricPFQ[{1}, {
1/2, 1/2}, -K[3]^2/4]*(BesselJ[2, K[3]]*K[3]*(-BesselY[0, K[3]] + BesselY[1, K[3
]]*K[3]) + BesselJ[1, K[3]]*(-(BesselY[2, K[3]]*K[3]^2) + BesselY[0, K[3]]*(4 +
K[3]^2)) + BesselJ[0, K[3]]*(BesselY[2, K[3]]*K[3] - BesselY[1, K[3]]*(4 + K[3]^
2)))), {K[3], 1, x}]))/x}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(y(x),x),x)+4*x*diff(diff(y(x),x),x)+(x^2+2)*diff(y(x),x)+3*x*y(x) = f(x)
```

Maple raw output

```
y(x) = (Int(18*f(x)*((-1/2*x*BesselJ(1,x)+1/2*BesselJ(0,x))*hypergeom([1],[1/2,
1/2],-1/4*x^2)+hypergeom([2],[3/2, 3/2],-1/4*x^2)*BesselJ(0,x)*x^2)/(((-18*x^2*B
esselJ(0,x)-72*x*BesselJ(1,x)+54*BesselJ(0,x))*hypergeom([1],[1/2, 1/2],-1/4*x^2
)+8*(9/4*BesselJ(0,x)*(x^2+9)*hypergeom([2],[3/2, 3/2],-1/4*x^2)+x^2*hypergeom([
3],[5/2, 5/2],-1/4*x^2)*(x*BesselJ(1,x)-3*BesselJ(0,x)))*x^2)*MeijerG([[-1/2], [
]],[[0, 0, -1/2], []],1/4*x^2)+((18*x^2*BesselJ(0,x)+144*x*BesselJ(1,x)-126*Bess
elJ(0,x))*hypergeom([1],[1/2, 1/2],-1/4*x^2)+16*x^2*BesselJ(0,x)*(x^2*hypergeom(
[3],[5/2, 5/2],-1/4*x^2)-18*hypergeom([2],[3/2, 3/2],-1/4*x^2)))*MeijerG([[-3/2]
, []],[[0, 0, -1/2], []],1/4*x^2)+72*MeijerG([[-5/2], []],[[0, 0, -1/2], []],1/4
*x^2)*((-1/2*x*BesselJ(1,x)+1/2*BesselJ(0,x))*hypergeom([1],[1/2, 1/2],-1/4*x^2)
+hypergeom([2],[3/2, 3/2],-1/4*x^2)*BesselJ(0,x)*x^2),x)*MeijerG([[-1/2], []],[
[0, 0, -1/2], []],1/4*x^2)*x+_C3*MeijerG([[-1/2], []],[[0, 0, -1/2], []],1/4*x^2
)*x-Int(9*f(x)*((x^2*hypergeom([2],[3/2, 3/2],-1/4*x^2)-hypergeom([1],[1/2, 1/2]
,-1/4*x^2))*MeijerG([[-1/2], []],[[0, 0, -1/2], []],1/4*x^2)+hypergeom([1],[1/2,
 1/2],-1/4*x^2)*MeijerG([[-3/2], []],[[0, 0, -1/2], []],1/4*x^2))/(((-9*x^2*Bess
elJ(0,x)-36*x*BesselJ(1,x)+27*BesselJ(0,x))*hypergeom([1],[1/2, 1/2],-1/4*x^2)+4
*(9/4*BesselJ(0,x)*(x^2+9)*hypergeom([2],[3/2, 3/2],-1/4*x^2)+x^2*hypergeom([3],
[5/2, 5/2],-1/4*x^2)*(x*BesselJ(1,x)-3*BesselJ(0,x)))*x^2)*MeijerG([[-1/2], []],
```

```
[[0, 0, -1/2], []],1/4*x^2)+((9*x^2*BesselJ(0,x)+72*x*BesselJ(1,x)-63*BesselJ(0,
x))*hypergeom([1],[1/2, 1/2],-1/4*x^2)+8*x^2*BesselJ(0,x)*(x^2*hypergeom([3],[5/
2, 5/2],-1/4*x^2)-18*hypergeom([2],[3/2, 3/2],-1/4*x^2)))*MeijerG([[-3/2], []],[
[0, 0, -1/2], []],1/4*x^2)+36*MeijerG([[-5/2], []],[[0, 0, -1/2], []],1/4*x^2)*(
(-1/2*x*BesselJ(1,x)+1/2*BesselJ(0,x))*hypergeom([1],[1/2, 1/2],-1/4*x^2)+hyperg
eom([2],[3/2, 3/2],-1/4*x^2)*BesselJ(0,x)*x^2)),x)*BesselJ(0,x)*x+_C1*BesselJ(0,
x)*x-Int(-9*f(x)*x*((x*BesselJ(1,x)-3*BesselJ(0,x))*MeijerG([[-1/2], []],[[0, 0,
 -1/2], []],1/4*x^2)+2*MeijerG([[-3/2], []],[[0, 0, -1/2], []],1/4*x^2)*BesselJ(
0,x))/(((-18*x^2*BesselJ(0,x)-72*x*BesselJ(1,x)+54*BesselJ(0,x))*hypergeom([1],[
1/2, 1/2],-1/4*x^2)+8*(9/4*BesselJ(0,x)*(x^2+9)*hypergeom([2],[3/2, 3/2],-1/4*x^
2)+x^2*hypergeom([3],[5/2, 5/2],-1/4*x^2)*(x*BesselJ(1,x)-3*BesselJ(0,x)))*x^2)*
MeijerG([[-1/2], []],[[0, 0, -1/2], []],1/4*x^2)+((18*x^2*BesselJ(0,x)+144*x*Bes
selJ(1,x)-126*BesselJ(0,x))*hypergeom([1],[1/2, 1/2],-1/4*x^2)+16*x^2*BesselJ(0,
x)*(x^2*hypergeom([3],[5/2, 5/2],-1/4*x^2)-18*hypergeom([2],[3/2, 3/2],-1/4*x^2)
))*MeijerG([[-3/2], []],[[0, 0, -1/2], []],1/4*x^2)+72*MeijerG([[-5/2], []],[[0,
 0, -1/2], []],1/4*x^2)*((-1/2*x*BesselJ(1,x)+1/2*BesselJ(0,x))*hypergeom([1],[1
/2, 1/2],-1/4*x^2)+hypergeom([2],[3/2, 3/2],-1/4*x^2)*BesselJ(0,x)*x^2)),x)*hype
rgeom([1],[1/2, 1/2],-1/4*x^2)+_C2*hypergeom([1],[1/2, 1/2],-1/4*x^2))/x
```

4.2167 $x^2y'''(x)+5xy''(x)+4y'(x)=\log(x)$

ODE

$$x^2y'''(x)+5xy''(x)+4y'(x)=\log(x)$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0332715 (sec), leaf count = 43

$$\left\{\left\{y(x)\to \frac{\left(x^2-8c_2\right)\log(x)-2\left(-2c_3x+2c_1+4c_2+x^2\right)}{4x}\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 32

$$\left\{y(x)=\frac{\left(x^2+4\_C2\right)\ln(x)-2\,x^2+4\_C1\,x+4\_C3}{4\,x}\right\}$$

Mathematica raw input

```
DSolve[4*y'[x] + 5*x*y''[x] + x^2*y'''[x] == Log[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*(x^2 + 2*C[1] + 4*C[2] - 2*x*C[3]) + (x^2 - 8*C[2])*Log[x])/(4*x)}
}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)+5*x*diff(diff(y(x),x),x)+4*diff(y(x),x) = ln(x), y(x),'implic
```

Maple raw output

```
y(x) = 1/4*((x^2+4*_C2)*ln(x)-2*x^2+4*_C1*x+4*_C3)/x
```

4.2168 $x^2y'''(x)+6xy''(x)+6y'(x)=0$

ODE

$$x^2y'''(x)+6xy''(x)+6y'(x)=0$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0215898 (sec), leaf count = 24

$$\left\{\left\{y(x)\to -\frac{c_2}{2x^2}-\frac{c_1}{x}+c_3\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 16

$$\left\{y(x)=\_C1+\frac{\_C2}{x}+\frac{\_C3}{x^2}\right\}$$

Mathematica raw input

```
DSolve[6*y'[x] + 6*x*y''[x] + x^2*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(C[1]/x) - C[2]/(2*x^2) + C[3]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)+6*x*diff(diff(y(x),x),x)+6*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2/x+_C3/x^2
```

4.2169 $x^2y'''(x) + ax^2y(x) + 6xy''(x) + 6y'(x) = 0$

ODE

$$x^2y'''(x) + ax^2y(x) + 6xy''(x) + 6y'(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.270551 (sec), leaf count = 58

$$\left\{\left\{y(x) \to \frac{c_1 e^{-\sqrt[3]{a}x} + c_2 e^{\sqrt[3]{-1}\sqrt[3]{a}x} + c_3 e^{-(-1)^{2/3}\sqrt[3]{a}x}}{x^2}\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 62

$$\left\{y(x) + \frac{1}{x^2}\left(-\_C1\, \mathrm{e}^{\frac{\left(i\sqrt{3}-1\right)x}{2}\sqrt[3]{-a}} - \_C2\, \mathrm{e}^{-\frac{\left(i\sqrt{3}+1\right)x}{2}\sqrt[3]{-a}} - \_C3\, \mathrm{e}^{\sqrt[3]{-a}x}\right) = 0\right\}$$

Mathematica raw input

```
DSolve[a*x^2*y[x] + 6*y'[x] + 6*x*y''[x] + x^2*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]/E^(a^(1/3)*x) + E^((-1)^(1/3)*a^(1/3)*x)*C[2] + C[3]/E^((-1)^(2/
3)*a^(1/3)*x))/x^2}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)+6*x*diff(diff(y(x),x),x)+6*diff(y(x),x)+a*x^2*y(x) = 0, y(x),
```

Maple raw output

```
y(x)+(-_C1*exp(1/2*(-a)^(1/3)*(I*3^(1/2)-1)*x)-_C2*exp(-1/2*(-a)^(1/3)*(I*3^(1/2
)+1)*x)-_C3*exp((-a)^(1/3)*x))/x^2 = 0
```

4.2170 $x^2y'''(x) - 2(n+1)xy''(x) + 6ny'(x) = 0$

ODE

$$x^2y'''(x) - 2(n+1)xy''(x) + 6ny'(x) = 0$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0433888 (sec), leaf count = 34

$$\left\{\left\{y(x) \to \frac{c_1 x^{2n+1}}{2n+1} + \frac{c_2 x^4}{4} + c_3\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 20

$$\{y(x) = \_C1 + \_C2\, x^4 + \_C3\, x^{1+2\,n}\}$$

Mathematica raw input

```
DSolve[6*n*y'[x] - 2*(1 + n)*x*y''[x] + x^2*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^(1 + 2*n)*C[1])/(1 + 2*n) + (x^4*C[2])/4 + C[3]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-2*(n+1)*x*diff(diff(y(x),x),x)+6*n*diff(y(x),x) = 0, y(x),'in
```

Maple raw output

```
y(x) = _C1+_C2*x^4+_C3*x^(1+2*n)
```

4.2171 $x^2y'''(x)+(6-2x^3)\,y'(x)+2x^3y(x)+(6-x^2)\,xy''(x)=0$

ODE

$$x^2y'''(x)+(6-2x^3)\,y'(x)+2x^3y(x)+(6-x^2)\,xy''(x)=0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 61.346 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left[\{y,x\},\left\{x^2y^{\text{Symbol[StringJoin[ConstantArray[}\prime\text{,3]]]}}(x)+(6-2x^3)\,y'(x)+2x^3y(x)-(x^2-6)\,xy''(x)\right.\right.\right.$$

Maple ✗
cpu = 0.289 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=DESol\left(\left\{2\,x^3\_Y(x)+(-2\,x^3+6)\,\frac{\mathrm{d}}{\mathrm{d}x}\_Y(x)+(-x^3+6\,x)\,\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)+x^2\,\frac{\mathrm{d}^3}{\mathrm{d}x^3}\_Y(x)\right\},\{\_Y(x)\}\right)\right\}$$

Mathematica raw input

```
DSolve[2*x^3*y[x] + (6 - 2*x^3)*y'[x] + x*(6 - x^2)*y''[x] + x^2*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {2*\[FormalX]^3*\[
FormalY][\[FormalX]] + (6 - 2*\[FormalX]^3)*Derivative[1][\[FormalY]][\[FormalX]
] - \[FormalX]*(-6 + \[FormalX]^2)*Derivative[2][\[FormalY]][\[FormalX]] + \[For
malX]^2*Derivative[3][\[FormalY]][\[FormalX]] == 0, \[FormalY][1] == C[1], Deriv
ative[1][\[FormalY]][1] == C[2], Derivative[2][\[FormalY]][1] == C[3]}]][x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)+x*(-x^2+6)*diff(diff(y(x),x),x)+(-2*x^3+6)*diff(y(x),x)+2*x^3
```

Maple raw output

```
y(x) = DESol({2*x^3*_Y(x)+(-2*x^3+6)*diff(_Y(x),x)+(-x^3+6*x)*diff(diff(_Y(x),x)
,x)+x^2*diff(diff(diff(_Y(x),x),x),x)},{_Y(x)})
```

4.2172 $(x^2+1)\,y'''(x)+8xy'(x)+10y'(x)=0$

ODE

$$(x^2+1)\,y'''(x)+8xy'(x)+10y'(x)=0$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.751424 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left[\{y,x\},\left\{(x^2+1)\,y^{\text{Symbol[StringJoin[ConstantArray['',3]]]}}(x)+(8x+10)y'(x)=0,y(0)=c_1,y'(0)=\right.\right.\right.$$

Maple ✓
cpu = 0.162 (sec), leaf count = 80

$$\left\{y(x)=\_C1+\_C2\int(x+i)\,HeunC\left(0,1,-1,16\,i,\frac{21}{2}-8\,i,\frac{1}{2}-\frac{i}{2}x\right)\,dx+\_C3\int(x+i)\,HeunC\left(0,1,-1,16\,i,\frac{21}{2}-8\right.\right.$$

Mathematica raw input

```
DSolve[10*y'[x] + 8*x*y'[x] + (1 + x^2)*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {(10 + 8*\[FormalX
])*Derivative[1][\[FormalY]][\[FormalX]] + (1 + \[FormalX]^2)*Derivative[3][\[Fo
rmalY]][\[FormalX]] == 0, \[FormalY][0] == C[1], Derivative[1][\[FormalY]][0] ==
 C[2], Derivative[2][\[FormalY]][0] == C[3]}]][x]}}
```

Maple raw input

```
dsolve((x^2+1)*diff(diff(diff(y(x),x),x),x)+8*x*diff(y(x),x)+10*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*Int((x+I)*HeunC(0,1,-1,16*I,21/2-8*I,1/2-1/2*I*x),x)+_C3*Int((x+I
)*HeunC(0,1,-1,16*I,21/2-8*I,1/2-1/2*I*x)*Int(1/(x+I)^2/HeunC(0,1,-1,16*I,21/2-8
*I,1/2-1/2*I*x)^2,x),x)
```

4.2173 $(x^2+2)\,y'''(x)+(x^2+2)\,y'(x)-2xy''(x)-2xy(x)=0$

ODE

$$(x^2+2)\,y'''(x)+(x^2+2)\,y'(x)-2xy''(x)-2xy(x)=0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.114606 (sec), leaf count = 41

$$\left\{\left\{y(x)\to \frac{1}{4}\left(2c_1x^2+2ic_2e^{-ix}-c_3e^{ix}\right)\right\}\right\}$$

Maple ✓
cpu = 0.103 (sec), leaf count = 18

$$\{y(x)=\_C1\,x^2+\_C2\,\cos(x)+\_C3\,\sin(x)\}$$

Mathematica raw input

```
DSolve[-2*x*y[x] + (2 + x^2)*y'[x] - 2*x*y''[x] + (2 + x^2)*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x^2*C[1] + ((2*I)*C[2])/E^(I*x) - E^(I*x)*C[3])/4}}
```

Maple raw input

```
dsolve((x^2+2)*diff(diff(diff(y(x),x),x),x)-2*x*diff(diff(y(x),x),x)+(x^2+2)*diff(y(x),x)-
2*x*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^2+_C2*cos(x)+_C3*sin(x)
```

4.2174 $(x^2-2x+2)\,y'''(x)+x^2(-y''(x))+2xy'(x)-2y(x)=0$

ODE

$$(x^2-2x+2)\,y'''(x)+x^2(-y''(x))+2xy'(x)-2y(x)=0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0506906 (sec), leaf count = 27

$$\left\{\left\{y(x)\to \frac{1}{2}\left(c_2x^2+2c_1x+c_3e^x\right)\right\}\right\}$$

Maple ✓
cpu = 0.078 (sec), leaf count = 17

$$\{y(x) = \_C1\,x+\_C2\,x^2+\_C3\,\mathrm{e}^x\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 2*x*y'[x] - x^2*y''[x] + (2 - 2*x + x^2)*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x*C[1] + x^2*C[2] + E^x*C[3])/2}}
```

Maple raw input

```
dsolve((x^2-2*x+2)*diff(diff(diff(y(x),x),x),x)-x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-
2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x+_C2*x^2+_C3*exp(x)
```

4.2175 $(x+2)^2 y'''(x) + (x+2) y''(x) + y'(x) = 0$

ODE

$$(x+2)^2 y'''(x) + (x+2) y''(x) + y'(x) = 0$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0539455 (sec), leaf count = 40

$$\left\{\left\{y(x) \to \frac{1}{2}(x+2)\left((c_1+c_2)\sin(\log(x+2)) + (c_1-c_2)\cos(\log(x+2))\right) + c_3\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 26

$$\{y(x) = \_C1 + \_C2\,(2+x)\sin(\ln(2+x)) + \_C3\,(2+x)\cos(\ln(2+x))\}$$

Mathematica raw input

```
DSolve[y'[x] + (2 + x)*y''[x] + (2 + x)^2*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3] + ((2 + x)*((C[1] - C[2])*Cos[Log[2 + x]] + (C[1] + C[2])*Sin[Log
[2 + x]]))/2}}
```

Maple raw input

```
dsolve((2+x)^2*diff(diff(diff(y(x),x),x),x)+(2+x)*diff(diff(y(x),x),x)+diff(y(x),x) = 0, y(x),'implic
```

Maple raw output

```
y(x) = _C1+_C2*(2+x)*sin(ln(2+x))+_C3*(2+x)*cos(ln(2+x))
```

4.2176 $4x^2y'''(x) + 8xy''(x) + y'(x) = 0$

ODE

$$4x^2y'''(x) + 8xy''(x) + y'(x) = 0$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0232838 (sec), leaf count = 28

$$\{\{y(x) \to \sqrt{x}(c_2 \log(x) + 2c_1 - 2c_2) + c_3\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 16

$$\{y(x) = (\_C3 \ln(x) + \_C2)\sqrt{x} + \_C1\}$$

Mathematica raw input

```
DSolve[y'[x] + 8*x*y''[x] + 4*x^2*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3] + Sqrt[x]*(2*C[1] - 2*C[2] + C[2]*Log[x])}}
```

Maple raw input

```
dsolve(4*x^2*diff(diff(diff(y(x),x),x),x)+8*x*diff(diff(y(x),x),x)+diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C3*ln(x)+_C2)*x^(1/2)+_C1
```

4.2177 $x(\mathbf{a0}+\mathbf{b0}x)y'''(x)+(\mathbf{a1}+\mathbf{b1}x)y''(x)+xy'(x)+y(x)=f(x)$

ODE

$$x(\mathrm{a0}+\mathrm{b0}x)y'''(x)+(\mathrm{a1}+\mathrm{b1}x)y''(x)+xy'(x)+y(x)=f(x)$$

ODE Classification

[[_3rd_order, _exact, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✗
cpu = 2.38252 (sec), leaf count = 0 , could not solve

```
DSolve[y[x] + x*Derivative[1][y][x] + (a1 + b1*x)*Derivative[2][y][x] + x*(a0 + b0*x)*Derivative[3][y
```

Maple ✓
cpu = 0.614 (sec), leaf count = 1221

$$\left\{y(x)=\left(-HeunC\left(0,\frac{2\,a0-a1}{a0},\frac{a0\,(-b1+2\,b0)+a1\,b0}{a0\,b0},-\frac{a0}{b0^2},\frac{(4\,b0-b1)\,a0^2-a1\,b1\,a0+a1^2b0}{2\,a0^2b0},-\frac{b0\,x}{a0}\right)\left(\int(\_\right.\right.$$

Mathematica raw input

```
DSolve[y[x] + x*y'[x] + (a1 + b1*x)*y''[x] + x*(a0 + b0*x)*y'''[x] == f[x],y[x],x]
```

Mathematica raw output

```
DSolve[y[x] + x*Derivative[1][y][x] + (a1 + b1*x)*Derivative[2][y][x] + x*(a0 +
b0*x)*Derivative[3][y][x] == f[x], y[x], x]
```

Maple raw input

```
dsolve(x*(b0*x+a0)*diff(diff(diff(y(x),x),x),x)+(b1*x+a1)*diff(diff(y(x),x),x)+x*diff(y(x),x)+y(x) =
```

Maple raw output

```
y(x) = (-HeunC(0,(2*a0-a1)/a0,(a0*(-b1+2*b0)+a1*b0)/a0/b0,-1/b0^2*a0,1/2*((4*b0-
b1)*a0^2-a1*b1*a0+a1^2*b0)/a0^2/b0,-b0/a0*x)*(Int(HeunC(0,(-2*a0+a1)/a0,(a0*(-b1
+2*b0)+a1*b0)/a0/b0,-1/b0^2*a0,1/2*((4*b0-b1)*a0^2-a1*b1*a0+a1^2*b0)/a0^2/b0,-b0
/a0*x)*(b0*x+a0)^(((-3*b0+b1)*a0-a1*b0)/a0/b0)*(_C1+Int(f(x),x))*x^((-2*a0+a1)/a
0)/(((-2*a0+a1)*HeunC(0,(-2*a0+a1)/a0,(a0*(-b1+2*b0)+a1*b0)/a0/b0,-1/b0^2*a0,1/2
*((4*b0-b1)*a0^2-a1*b1*a0+a1^2*b0)/a0^2/b0,-b0/a0*x)-x*HeunCPrime(0,(-2*a0+a1)/a
```

```
0,(a0*(-b1+2*b0)+a1*b0)/a0/b0,-1/b0^2*a0,1/2*((4*b0-b1)*a0^2-a1*b1*a0+a1^2*b0)/a
0^2/b0,-b0/a0*x)*b0)*HeunC(0,(2*a0-a1)/a0,(a0*(-b1+2*b0)+a1*b0)/a0/b0,-1/b0^2*a0
,1/2*((4*b0-b1)*a0^2-a1*b1*a0+a1^2*b0)/a0^2/b0,-b0/a0*x)+HeunCPrime(0,(2*a0-a1)/
a0,(a0*(-b1+2*b0)+a1*b0)/a0/b0,-1/b0^2*a0,1/2*((4*b0-b1)*a0^2-a1*b1*a0+a1^2*b0)/
a0^2/b0,-b0/a0*x)*HeunC(0,(-2*a0+a1)/a0,(a0*(-b1+2*b0)+a1*b0)/a0/b0,-1/b0^2*a0,1
/2*((4*b0-b1)*a0^2-a1*b1*a0+a1^2*b0)/a0^2/b0,-b0/a0*x)*x*b0),x)*a0-_C2)*x^((2*a0
-a1)/a0)+HeunC(0,(-2*a0+a1)/a0,(a0*(-b1+2*b0)+a1*b0)/a0/b0,-1/b0^2*a0,1/2*((4*b0
-b1)*a0^2-a1*b1*a0+a1^2*b0)/a0^2/b0,-b0/a0*x)*(Int(HeunC(0,(2*a0-a1)/a0,(a0*(-b1
+2*b0)+a1*b0)/a0/b0,-1/b0^2*a0,1/2*((4*b0-b1)*a0^2-a1*b1*a0+a1^2*b0)/a0^2/b0,-b0
/a0*x)*(b0*x+a0)^(((-3*b0+b1)*a0-a1*b0)/a0/b0)*(_C1+Int(f(x),x))/(((-2*a0+a1)*He
unC(0,(-2*a0+a1)/a0,(a0*(-b1+2*b0)+a1*b0)/a0/b0,-1/b0^2*a0,1/2*((4*b0-b1)*a0^2-a
1*b1*a0+a1^2*b0)/a0^2/b0,-b0/a0*x)-x*HeunCPrime(0,(-2*a0+a1)/a0,(a0*(-b1+2*b0)+a
1*b0)/a0/b0,-1/b0^2*a0,1/2*((4*b0-b1)*a0^2-a1*b1*a0+a1^2*b0)/a0^2/b0,-b0/a0*x)*b
0)*HeunC(0,(2*a0-a1)/a0,(a0*(-b1+2*b0)+a1*b0)/a0/b0,-1/b0^2*a0,1/2*((4*b0-b1)*a0
^2-a1*b1*a0+a1^2*b0)/a0^2/b0,-b0/a0*x)+HeunCPrime(0,(2*a0-a1)/a0,(a0*(-b1+2*b0)+
a1*b0)/a0/b0,-1/b0^2*a0,1/2*((4*b0-b1)*a0^2-a1*b1*a0+a1^2*b0)/a0^2/b0,-b0/a0*x)*
HeunC(0,(-2*a0+a1)/a0,(a0*(-b1+2*b0)+a1*b0)/a0/b0,-1/b0^2*a0,1/2*((4*b0-b1)*a0^2
-a1*b1*a0+a1^2*b0)/a0^2/b0,-b0/a0*x)*x*b0),x)*a0+_C3))*(b0*x+a0)^((a0*(-b1+2*b0)
+a1*b0)/a0/b0)
```

4.2178 $x^3 y'''(x) = a$

ODE

$$x^3 y'''(x) = a$$

ODE Classification

[[_3rd_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00815229 (sec), leaf count = 24

$$\left\{\left\{y(x) \to \frac{1}{2} a \log(x) + x(c_3 x + c_2) + c_1\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 20

$$\left\{y(x) = \frac{a \ln(x)}{2} + \frac{\_C1\, x^2}{2} + \_C2\, x + \_C3\right\}$$

Mathematica raw input

```
DSolve[x^3*y'''[x] == a,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*(C[2] + x*C[3]) + (a*Log[x])/2}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x) = a, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*a*ln(x)+1/2*_C1*x^2+_C2*x+_C3
```

4.2179 $x^3y'''(x) + xy'(x) - y(x) = 0$

ODE

$$x^3y'''(x) + xy'(x) - y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00989205 (sec), leaf count = 22

$$\{\{y(x) \to x(c_3 \log^2(x) + c_2 \log(x) + c_1)\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 18

$$\left\{y(x) = x\left((\ln(x))^2 \_C3 + \_C2 \ln(x) + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[1] + C[2]*Log[x] + C[3]*Log[x]^2)}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(ln(x)^2*_C3+_C2*ln(x)+_C1)
```

4.2180 $x^3y'''(x) + xy'(x) - y(x) = x\log(x)$

ODE

$$x^3y'''(x) + xy'(x) - y(x) = x\log(x)$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0158627 (sec), leaf count = 33

$$\left\{\left\{y(x) \to c_1 x + c_3 x\log^2(x) + c_2 x\log(x) + \frac{1}{24}x\log^4(x)\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 27

$$\left\{y(x) = \frac{x\left(\left(\ln(x)\right)^4 + 24\left(\ln(x)\right)^2 \_C3 + 24\_C2\ \ln(x) + 24\_C1\right)}{24}\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + x^3*y'''[x] == x*Log[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[1] + x*C[2]*Log[x] + x*C[3]*Log[x]^2 + (x*Log[x]^4)/24}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+x*diff(y(x),x)-y(x) = x*ln(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/24*x*(ln(x)^4+24*ln(x)^2*_C3+24*_C2*ln(x)+24*_C1)
```

4.2181 $x^3y'''(x) - x^2y''(x) + 2xy'(x) - 2y(x) = 0$

ODE

$$x^3y'''(x) - x^2y''(x) + 2xy'(x) - 2y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0107365 (sec), leaf count = 19

$$\{\{y(x) \to x(c_3x + c_2\log(x) + c_1)\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 15

$$\{y(x) = x(\ln(x)\_C3 + \_C1\,x + \_C2)\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 2*x*y'[x] - x^2*y''[x] + x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[1] + x*C[3] + C[2]*Log[x])}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)-x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-2*y(x) = 0, y(x),'i
```

Maple raw output

```
y(x) = x*(ln(x)*_C3+_C1*x+_C2)
```

4.2182 $x^3y'''(x) - x^2y''(x) + 2xy'(x) - 2y(x) = x(x^2+3)$

ODE

$$x^3y'''(x) - x^2y''(x) + 2xy'(x) - 2y(x) = x\left(x^2+3\right)$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0204605 (sec), leaf count = 39

$$\left\{\left\{y(x) \to \frac{1}{4}x\left(4c_3x + 4(c_2-3)\log(x) + 4(c_1-3) + x^2 - 6\log^2(x)\right)\right\}\right\}$$

Maple ✓
cpu = 0.027 (sec), leaf count = 33

$$\left\{y(x) = \frac{\left(-6\left(\ln(x)\right)^2 + (4\_C3 - 12)\ln(x) + x^2 + 4\_C2\,x + 4\_C1 - 12\right)x}{4}\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 2*x*y'[x] - x^2*y''[x] + x^3*y'''[x] == x*(3 + x^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(x^2 + 4*(-3 + C[1]) + 4*x*C[3] + 4*(-3 + C[2])*Log[x] - 6*Log[x]^2
))/4}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)-x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-2*y(x) = x*(x^2+3),
```

Maple raw output

```
y(x) = 1/4*(-6*ln(x)^2+(4*_C3-12)*ln(x)+x^2+4*_C2*x+4*_C1-12)*x
```

4.2183 $x^3y'''(x)+x^2y''(x)+3xy'(x)-8y(x)=0$

ODE

$$x^3y'''(x)+x^2y''(x)+3xy'(x)-8y(x)=0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0107701 (sec), leaf count = 28

$$\{\{y(x)\to c_3x^2+c_2\sin(2\log(x))+c_1\cos(2\log(x))\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 24

$$\{y(x)=\_C1\,x^2+\_C2\,\sin(2\,\ln(x))+\_C3\,\cos(2\,\ln(x))\}$$

Mathematica raw input

```
DSolve[-8*y[x] + 3*x*y'[x] + x^2*y''[x] + x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2*C[3] + C[1]*Cos[2*Log[x]] + C[2]*Sin[2*Log[x]]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+x^2*diff(diff(y(x),x),x)+3*x*diff(y(x),x)-8*y(x) = 0, y(x),'i
```

Maple raw output

```
y(x) = _C1*x^2+_C2*sin(2*ln(x))+_C3*cos(2*ln(x))
```

4.2184 $x^3y'''(x) - x^2y''(x) + xy'(x) = 0$

ODE

$$x^3y'''(x) - x^2y''(x) + xy'(x) = 0$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.016303 (sec), leaf count = 36

$$\left\{\left\{y(x) \to \frac{1}{4}\left((2c_1 - c_2)\,x^2 + 2c_2x^2\log(x) + 4c_3\right)\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 18

$$\{y(x) = \_C1 + \_C2\,x^2 + \_C3\,x^2\ln(x)\}$$

Mathematica raw input

```
DSolve[x*y'[x] - x^2*y''[x] + x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^2*(2*C[1] - C[2]) + 4*C[3] + 2*x^2*C[2]*Log[x])/4}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)-x^2*diff(diff(y(x),x),x)+x*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*x^2+_C3*x^2*ln(x)
```

4.2185 $x^3y'''(x)+2x^2y''(x)+2y(x)=0$

ODE

$$x^3y'''(x)+2x^2y''(x)+2y(x)=0$$

ODE Classification

[[_3rd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.010477 (sec), leaf count = 26

$$\left\{\left\{y(x)\to \frac{c_3}{x}+c_1 x \sin(\log(x))+c_2 x \cos(\log(x))\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 26

$$\left\{y(x)=\frac{\_C2\, x^2 \sin\left(\ln\left(x\right)\right)+\_C3\, x^2 \cos\left(\ln\left(x\right)\right)+\_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + 2*x^2*y''[x] + x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3]/x + x*C[2]*Cos[Log[x]] + x*C[1]*Sin[Log[x]]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+2*x^2*diff(diff(y(x),x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*x^2*sin(ln(x))+_C3*x^2*cos(ln(x))+_C1)/x
```

4.2186 $x^3y'''(x) + 2x^2y''(x) - xy'(x) + y(x) = 0$

ODE

$$x^3y'''(x) + 2x^2y''(x) - xy'(x) + y(x) = 0$$

ODE Classification

[[_3rd_order, _exact, _linear, _homogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0101637 (sec), leaf count = 22

$$\left\{\left\{y(x) \to \frac{c_1}{x} + c_2x + c_3x\log(x)\right\}\right\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 22

$$\left\{y(x) = \frac{\_C3\,x^2\ln(x) + \_C2\,x^2 + \_C1}{x}\right\}$$

Mathematica raw input

```
DSolve[y[x] - x*y'[x] + 2*x^2*y''[x] + x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/x + x*C[2] + x*C[3]*Log[x]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+2*x^2*diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x) = 0, y(x),'imp
```

Maple raw output

```
y(x) = (_C3*x^2*ln(x)+_C2*x^2+_C1)/x
```

4.2187 $x^3y'''(x)+3x^2y''(x)=a$

ODE

$$x^3y'''(x)+3x^2y''(x)=a$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0160316 (sec), leaf count = 26

$$\left\{\left\{y(x)\to -a\log(x)+\frac{c_1}{2x}+c_3x+c_2\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 20

$$\left\{y(x)=\frac{\_C1}{2\,x}-a\ln\left(x\right)+\_C2\,x+\_C3\right\}$$

Mathematica raw input

```
DSolve[3*x^2*y''[x] + x^3*y'''[x] == a,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/(2*x) + C[2] + x*C[3] - a*Log[x]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+3*x^2*diff(diff(y(x),x),x) = a, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2*_C1/x-a*ln(x)+_C2*x+_C3
```

4.2188 $x^3y'''(x) + 3x^2y''(x) - 2xy'(x) + 2y(x) = 0$

ODE

$$x^3y'''(x) + 3x^2y''(x) - 2xy'(x) + 2y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0102037 (sec), leaf count = 22

$$\left\{\left\{y(x) \to \frac{c_1}{x^2} + c_2x + c_3x\log(x)\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 22

$$\left\{y(x) = \frac{\_C3\,x^3\ln(x) + \_C2\,x^3 + \_C1}{x^2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] - 2*x*y'[x] + 3*x^2*y''[x] + x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/x^2 + x*C[2] + x*C[3]*Log[x]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+3*x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+2*y(x) = 0, y(x),
```

Maple raw output

```
y(x) = (_C3*x^3*ln(x)+_C2*x^3+_C1)/x^2
```

4.2189 $x^3y'''(x) - 3x^2y''(x) + 7xy'(x) - 8y(x) = 0$

ODE

$$x^3y'''(x) - 3x^2y''(x) + 7xy'(x) - 8y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0102482 (sec), leaf count = 24

$$\{\{y(x) \to x^2\left(c_3 \log^2(x) + c_2 \log(x) + c_1\right)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 20

$$\left\{y(x) = x^2\left(\left(\ln(x)\right)^2 \_C3 + \_C2 \ln(x) + \_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-8*y[x] + 7*x*y'[x] - 3*x^2*y''[x] + x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^2*(C[1] + C[2]*Log[x] + C[3]*Log[x]^2)}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)-3*x^2*diff(diff(y(x),x),x)+7*x*diff(y(x),x)-8*y(x) = 0, y(x),
```

Maple raw output

```
y(x) = x^2*(ln(x)^2*_C3+_C2*ln(x)+_C1)
```

4.2190 $x^3y'''(x)+\left(1-a^2\right)xy'(x)+3x^2y''(x)=0$

ODE

$$x^3y'''(x)+\left(1-a^2\right)xy'(x)+3x^2y''(x)=0$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0417486 (sec), leaf count = 29

$$\left\{\left\{y(x)\to \frac{-c_1x^{-a}+c_2x^a+ac_3}{a}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 18

$$\left\{y(x)=\_C1+\_C2\,x^a+\_C3\,x^{-a}\right\}$$

Mathematica raw input

```
DSolve[(1 - a^2)*x*y'[x] + 3*x^2*y''[x] + x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-(C[1]/x^a) + x^a*C[2] + a*C[3])/a}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+3*x^2*diff(diff(y(x),x),x)+(-a^2+1)*x*diff(y(x),x) = 0, y(x),
```

Maple raw output

```
y(x) = _C1+_C2*x^a+_C3*x^(-a)
```

4.2191 $x^3y'''(x)+4x^2y''(x)-8xy'(x)+8y(x)=0$

ODE

$$x^3y'''(x)+4x^2y''(x)-8xy'(x)+8y(x)=0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0108917 (sec), leaf count = 22

$$\left\{\left\{y(x)\to \frac{c_1}{x^4}+c_3x^2+c_2x\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 20

$$\left\{y(x)=\frac{\_C2\,x^6+\_C1\,x^5+\_C3}{x^4}\right\}$$

Mathematica raw input

```
DSolve[8*y[x] - 8*x*y'[x] + 4*x^2*y''[x] + x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/x^4 + x*C[2] + x^2*C[3]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+4*x^2*diff(diff(y(x),x),x)-8*x*diff(y(x),x)+8*y(x) = 0, y(x),
```

Maple raw output

```
y(x) = (_C2*x^6+_C1*x^5+_C3)/x^4
```

4.2192 $x^3y'''(x) - 4x^2y''(x) + (x^2+8)\,xy'(x) - 2(x^2+4)\,y(x) = 0$

ODE

$$x^3y'''(x) - 4x^2y''(x) + \left(x^2+8\right)xy'(x) - 2\left(x^2+4\right)y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0431472 (sec), leaf count = 23

$$\{\{y(x) \to x(c_1x - c_2\sin(x) + c_3\cos(x))\}\}$$

Maple ✓
cpu = 0.118 (sec), leaf count = 18

$$\{y(x) = x(\sin(x)\_C3 + \cos(x)\_C2 + \_C1\,x)\}$$

Mathematica raw input

```
DSolve[-2*(4 + x^2)*y[x] + x*(8 + x^2)*y'[x] - 4*x^2*y''[x] + x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(x*C[1] + C[3]*Cos[x] - C[2]*Sin[x])}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)-4*x^2*diff(diff(y(x),x),x)+x*(x^2+8)*diff(y(x),x)-
2*(x^2+4)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(sin(x)*_C3+cos(x)*_C2+_C1*x)
```

4.2193 $x^3 y'''(x) - (12 - a x^3)\, y(x) + 6x^2 y''(x) = 0$

ODE

$$x^3 y'''(x) - (12 - a x^3)\, y(x) + 6x^2 y''(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.66616 (sec), leaf count = 97

$$\left\{\left\{y(x) \to \frac{c_1 e^{-\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2\right) + c_2 e^{\sqrt[3]{-1}\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2(-1)^{2/3}\right) + c_3 e^{-(-1)^{2/3}\sqrt[3]{a}x}\left(\sqrt[3]{a}x-2\sqrt[3]{-1}\right)}{x^3}\right\}\right\}$$

Maple ✓
cpu = 0.371 (sec), leaf count = 134

$$\left\{y(x) = \frac{1}{x^3}\left(-\_C2\left(\left(-i-\sqrt{3}\right)\left(-a^4\right)^{\frac{2}{3}} + ia^3x\right)e^{\frac{i}{2}\left(-\sqrt{3}+i\right)x\sqrt[3]{-a^4}} + \_C3\left(\left(-i+\sqrt{3}\right)\left(-a^4\right)^{\frac{2}{3}} + ia^3x\right)e^{\frac{i}{2}\left(\sqrt{3}+i\right)x\sqrt[3]{-a^4}} + \_\right.\right.$$

Mathematica raw input

```
DSolve[-((12 - a*x^3)*y[x]) + 6*x^2*y''[x] + x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (((2 + a^(1/3)*x)*C[1])/E^(a^(1/3)*x) + E^((-1)^(1/3)*a^(1/3)*x)*(2*(-
1)^(2/3) + a^(1/3)*x)*C[2] + ((-2*(-1)^(1/3) + a^(1/3)*x)*C[3])/E^((-1)^(2/3)*a^
(1/3)*x))/x^3}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+6*x^2*diff(diff(y(x),x),x)-(-a*x^3+12)*y(x) = 0, y(x),'implic
```

Maple raw output

```
y(x) = (-_C2*((-I-3^(1/2))*(-a^4)^(2/3)+I*a^3*x)*exp(1/2*I*(-3^(1/2)+I)*(-a^4)^(
1/3)*x/a)+_C3*((-I+3^(1/2))*(-a^4)^(2/3)+I*a^3*x)*exp(1/2*I*(3^(1/2)+I)*(-a^4)^(
1/3)*x/a)+_C1*exp((-a^4)^(1/3)/a*x)*(a^3*x+2*(-a^4)^(2/3)))/x^3
```

4.2194 $x^3y'''(x) + x^2\log(x)y''(x) + 2xy'(x) - y(x) = 2x^3$

ODE

$$x^3y'''(x) + x^2\log(x)y''(x) + 2xy'(x) - y(x) = 2x^3$$

ODE Classification

[[_3rd_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0143274 (sec), leaf count = 0 , could not solve

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + x^2*Log[x]*Derivative[2][y][x] + x^3*Derivative[3][y][x] ==
```

Maple ✓
cpu = 0.365 (sec), leaf count = 141

$$\left\{y(x) = \frac{x^2}{3}e^{-\frac{(\ln(x))^2}{2}}\left(-3\int ix\sqrt{2}e^{1/2\,(\ln(x))^2}\left(xErf\left(i/2\sqrt{2}(\ln(x)-2)\right)e^{1/2} - Erf\left(i/2\sqrt{2}(-1+\ln(x))\right)e^2\right)\sqrt{\pi}e^{-1/2\,(\ln(x)}\right.$$

Mathematica raw input

```
DSolve[-y[x] + 2*x*y'[x] + x^2*Log[x]*y''[x] + x^3*y'''[x] == 2*x^3,y[x],x]
```

Mathematica raw output

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + x^2*Log[x]*Derivative[2][y][x] + x^3*De
rivative[3][y][x] == 2*x^3, y[x], x]
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+x^2*diff(diff(y(x),x),x)*ln(x)+2*x*diff(y(x),x)-
y(x) = 2*x^3, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/3*exp(-1/2*ln(x)^2)*(-3*Int(I*x*2^(1/2)*exp(1/2*ln(x)^2)*(x*erf(1/2*I*2
^(1/2)*(ln(x)-2))*exp(1/2)-erf(1/2*I*2^(1/2)*(-1+ln(x)))*exp(2))*Pi^(1/2)*exp(-1
/2*ln(x)^2)*exp(-5/2),x)+(-3/2*I*x^2*2^(1/2)*Pi^(1/2)*exp(-1/2)+3*_C2)*erf(1/2*I
*2^(1/2)*(-1+ln(x)))+(I*x^3*2^(1/2)*Pi^(1/2)*exp(-2)+3*_C3)*erf(1/2*I*2^(1/2)*(l
n(x)-2))+3*_C1)*x^2
```

4.2195 $(x^3+1)\,y'''(x)+9x^2y''(x)+18xy'(x)+6y(x)=0$

ODE

$$(x^3+1)\,y'''(x)+9x^2y''(x)+18xy'(x)+6y(x)=0$$

ODE Classification

[[_3rd_order, _fully, _exact, _linear]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0209876 (sec), leaf count = 31

$$\left\{\left\{y(x)\to \frac{c_3x^2+2c_2x+2c_1}{2x^3+2}\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 30

$$\left\{y(x)=\frac{\_C1\,x^2+\_C2\,x+\_C3}{(1+x)\,(x^2-x+1)}\right\}$$

Mathematica raw input

```
DSolve[6*y[x] + 18*x*y'[x] + 9*x^2*y''[x] + (1 + x^3)*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*C[1] + 2*x*C[2] + x^2*C[3])/(2 + 2*x^3)}}
```

Maple raw input

```
dsolve((x^3+1)*diff(diff(diff(y(x),x),x),x)+9*x^2*diff(diff(y(x),x),x)+18*x*diff(y(x),x)+6*y(x) = 0,
```

Maple raw output

```
y(x) = (_C1*x^2+_C2*x+_C3)/(1+x)/(x^2-x+1)
```

4.2196 $x(x^2+1)\,y'''(x)+3(2x^2+1)\,y''(x)-12y(x)=0$

ODE

$$x(x^2+1)\,y'''(x)+3(2x^2+1)\,y''(x)-12y(x)=0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.252613 (sec), leaf count = 96

$$\left\{\left\{y(x)\to \frac{4c_1x^3+2c_2\sqrt{x^2+1}x^2+3c_3x^2+3c_3\sqrt{x^2+1}x^2\log(x)-3c_3\sqrt{x^2+1}x^2\log\left(\sqrt{x^2+1}+1\right)+2c_1x+c_3}{6x}\right\}\right\}$$

Maple ✓
cpu = 0.251 (sec), leaf count = 60

$$\left\{y(x)=\frac{1}{x}\left(3\,Artanh\left(\frac{1}{\sqrt{x^2+1}}\right)\sqrt{x^2+1}\_C2\,x^2+\_C1\,x^2\sqrt{x^2+1}+2\_C3\,x^3-3\_C2\,x^2+\_C3\,x-\_C2\right)\right\}$$

Mathematica raw input

```
DSolve[-12*y[x] + 3*(1 + 2*x^2)*y''[x] + x*(1 + x^2)*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*x*C[1] + 4*x^3*C[1] + 2*x^2*Sqrt[1 + x^2]*C[2] + C[3] + 3*x^2*C[3]
+ 3*x^2*Sqrt[1 + x^2]*C[3]*Log[x] - 3*x^2*Sqrt[1 + x^2]*C[3]*Log[1 + Sqrt[1 + x^
2]])/(6*x)}}
```

Maple raw input

```
dsolve(x*(x^2+1)*diff(diff(diff(y(x),x),x),x)+3*(2*x^2+1)*diff(diff(y(x),x),x)-12*y(x) = 0, y(x),'imp
```

Maple raw output

```
y(x) = (3*arctanh(1/(x^2+1)^(1/2))*(x^2+1)^(1/2)*_C2*x^2+_C1*x^2*(x^2+1)^(1/2)+2
*_C3*x^3-3*_C2*x^2+_C3*x-_C2)/x
```

4.2197 $x(1-x^2)\,y'''(x)+(3-8x^2)\,y''(x)-14xy'(x)-4y(x)=0$

ODE

$$x(1-x^2)\,y'''(x)+(3-8x^2)\,y''(x)-14xy'(x)-4y(x)=0$$

ODE Classification

[[_3rd_order, _fully, _exact, _linear]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.108507 (sec), leaf count = 50

$$\left\{\left\{y(x)\to \frac{-\frac{c_2}{\sqrt{x^2-1}}-\frac{c_3\log\left(\sqrt{x^2-1}+x\right)}{\sqrt{x^2-1}}+c_1}{x}\right\}\right\}$$

Maple ✓
cpu = 0.043 (sec), leaf count = 47

$$\left\{y(x)=\frac{\_C3}{x}\frac{1}{\sqrt{1+x}}\frac{1}{\sqrt{x-1}}+\frac{\_C1}{x}+\frac{\_C2}{x}\ln\left(x+\sqrt{x^2-1}\right)\frac{1}{\sqrt{x^2-1}}\right\}$$

Mathematica raw input

```
DSolve[-4*y[x] - 14*x*y'[x] + (3 - 8*x^2)*y''[x] + x*(1 - x^2)*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] - C[2]/Sqrt[-1 + x^2] - (C[3]*Log[x + Sqrt[-1 + x^2]])/Sqrt[-1 +
  x^2])/x}}
```

Maple raw input

```
dsolve(x*(-x^2+1)*diff(diff(diff(y(x),x),x),x)+(-8*x^2+3)*diff(diff(y(x),x),x)-14*x*diff(y(x),x)-
4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/x/(1+x)^(1/2)/(x-1)^(1/2)*_C3+_C1/x+1/x/(x^2-1)^(1/2)*_C2*ln(x+(x^2-1)^
(1/2))
```

4.2198 $x(x^2-2x+2)\,y'''(x)+(-x^3+3x^2-6x+6)\,y''(x)=0$

ODE

$$x(x^2-2x+2)\,y'''(x)+(-x^3+3x^2-6x+6)\,y''(x)=0$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0310918 (sec), leaf count = 21

$$\left\{\left\{y(x)\to \frac{c_1 e^x}{x}+c_3 x+c_2\right\}\right\}$$

Maple ✓
cpu = 0.028 (sec), leaf count = 16

$$\left\{y(x)=\frac{\mathrm{e}^x \_C1}{x}+\_C2\,x+\_C3\right\}$$

Mathematica raw input

```
DSolve[(6 - 6*x + 3*x^2 - x^3)*y''[x] + x*(2 - 2*x + x^2)*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^x*C[1])/x + C[2] + x*C[3]}}
```

Maple raw input

```
dsolve(x*(x^2-2*x+2)*diff(diff(diff(y(x),x),x),x)+(-x^3+3*x^2-6*x+6)*diff(diff(y(x),x),x) = 0, y(x),
```

Maple raw output

```
y(x) = exp(x)/x*_C1+_C2*x+_C3
```

4.2199 $(x+1)^3 y'''(x) + (x+1)^2 y''(x) + 3(x+1)y'(x) - 8y(x) = 0$

ODE

$$(x+1)^3 y'''(x) + (x+1)^2 y''(x) + 3(x+1)y'(x) - 8y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0129671 (sec), leaf count = 34

$$\{\{y(x) \to c_3(x+1)^2 + c_2 \sin(2\log(x+1)) + c_1 \cos(2\log(x+1))\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 30

$$\left\{y(x) = \_C1\,(1+x)^2 + \_C2\,\sin(2\,\ln(1+x)) + \_C3\,\cos(2\,\ln(1+x))\right\}$$

Mathematica raw input

```
DSolve[-8*y[x] + 3*(1 + x)*y'[x] + (1 + x)^2*y''[x] + (1 + x)^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (1 + x)^2*C[3] + C[1]*Cos[2*Log[1 + x]] + C[2]*Sin[2*Log[1 + x]]}}
```

Maple raw input

```
dsolve((1+x)^3*diff(diff(diff(y(x),x),x),x)+(1+x)^2*diff(diff(y(x),x),x)+3*(1+x)*diff(y(x),x)-
8*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*(1+x)^2+_C2*sin(2*ln(1+x))+_C3*cos(2*ln(1+x))
```

4.2200 $x^2(y(x)+3)y'''(x)-3(x+2)xy''(x)+6(x+1)y'(x)-6y(x)=0$

ODE

$$x^2(y(x)+3)y'''(x)-3(x+2)xy''(x)+6(x+1)y'(x)-6y(x)=0$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 0.224527 (sec), leaf count = 0 , could not solve

```
DSolve[-6*y[x] + 6*(1 + x)*Derivative[1][y][x] - 3*x*(2 + x)*Derivative[2][y][x] + x^2*(3 + y[x])*Der
```

Maple ✓
cpu = 0.946 (sec), leaf count = 76

$$\left\{ y(x) = ODESolStruc\left(\_b(\_a), \left[\left\{ (3+\_b(\_a))\frac{\mathrm{d}^2}{\mathrm{d}\_a^2}\_b(\_a) - \frac{\_a\left(\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a)\right)^2 + 6\,\_a\,\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a) - 2\,\_C1\,\_a + }{2\,\_a} \right.\right.\right.$$

Mathematica raw input

```
DSolve[-6*y[x] + 6*(1 + x)*y'[x] - 3*x*(2 + x)*y''[x] + x^2*(3 + y[x])*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[-6*y[x] + 6*(1 + x)*Derivative[1][y][x] - 3*x*(2 + x)*Derivative[2][y][x]
 + x^2*(3 + y[x])*Derivative[3][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(x^2*(3+y(x))*diff(diff(diff(y(x),x),x),x)-3*x*(2+x)*diff(diff(y(x),x),x)+6*(1+x)*diff(y(x),x)-
6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_b(_a),[{(3+_b(_a))*diff(diff(_b(_a),_a),_a)-1/2*(_a*diff(_b(
_a),_a)^2+6*_a*diff(_b(_a),_a)-2*_C1*_a+12*diff(_b(_a),_a)-12*_b(_a))/_a = 0}, {
_a = x, _b(_a) = y(x)}, {x = _a, y(x) = _b(_a)}])
```

4.2201 $4x^3y'''(x) + xy'(x) - y(x) = 0$

ODE

$$4x^3y'''(x) + xy'(x) - y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0133121 (sec), leaf count = 38

$$\left\{\left\{y(x) \to x\left(c_1 x^{-\frac{\sqrt{3}}{2}} + c_2 x^{\frac{\sqrt{3}}{2}} + c_3\right)\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 30

$$\left\{y(x) = \_C1\, x + \_C2\, x^{1+\frac{\sqrt{3}}{2}} + \_C3\, x^{1-\frac{\sqrt{3}}{2}}\right\}$$

Mathematica raw input

```
DSolve[-y[x] + x*y'[x] + 4*x^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*(C[1]/x^(Sqrt[3]/2) + x^(Sqrt[3]/2)*C[2] + C[3])}}
```

Maple raw input

```
dsolve(4*x^3*diff(diff(diff(y(x),x),x),x)+x*diff(y(x),x)-y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x+_C2*x^(1+1/2*3^(1/2))+_C3*x^(1-1/2*3^(1/2))
```

4.2202 $(1-2x)^3 y'''(x) + (1-2x) y'(x) + 2y(x) = 0$

ODE

$$(1-2x)^3 y'''(x) + (1-2x) y'(x) + 2y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0133037 (sec), leaf count = 50

$$\left\{\left\{y(x) \to (2x-1)\left(c_2(2x-1)^{\frac{\sqrt{3}}{2}} + c_1(2x-1)^{-\frac{\sqrt{3}}{2}} + c_3\right)\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 37

$$\left\{y(x) = \_C2\left(x-\frac{1}{2}\right)^{1+\frac{\sqrt{3}}{2}} + \_C3\left(x-\frac{1}{2}\right)^{1-\frac{\sqrt{3}}{2}} + \_C1\, x - \frac{\_C1}{2}\right\}$$

Mathematica raw input

```
DSolve[2*y[x] + (1 - 2*x)*y'[x] + (1 - 2*x)^3*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-1 + 2*x)*(C[1]/(-1 + 2*x)^(Sqrt[3]/2) + (-1 + 2*x)^(Sqrt[3]/2)*C[2]
+ C[3])}}
```

Maple raw input

```
dsolve((1-2*x)^3*diff(diff(diff(y(x),x),x),x)+(1-2*x)*diff(y(x),x)+2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C2*(x-1/2)^(1+1/2*3^(1/2))+_C3*(x-1/2)^(1-1/2*3^(1/2))+_C1*x-1/2*_C1
```

4.2203 $x^4y'''(x)+2x^3y''(x)+2xy(x)=10(x^2+1)$

ODE

$$x^4y'''(x)+2x^3y''(x)+2xy(x)=10(x^2+1)$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0605516 (sec), leaf count = 42

$$\left\{\left\{y(x)\to \frac{5c_3+25x^2+10\log(x)+8}{5x}+c_1x\sin(\log(x))+c_2x\cos(\log(x))\right\}\right\}$$

Maple ✓
cpu = 0.161 (sec), leaf count = 143

$$\left\{y(x)=\frac{1}{5\,x}\left(\left(\left(5\_C2\,x^2-8\right)\cos\left(\ln\left(x\right)\right)+5\,\_C3\,x^2\sin\left(\ln\left(x\right)\right)+5\,x^2+5\,\_C1+10\,\ln\left(x\right)+6\,\sin\left(\ln\left(x\right)\right)\right)\left(\tan\left(\frac{\ln\left(x\right)}{2}\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[2*x*y[x] + 2*x^3*y''[x] + x^4*y'''[x] == 10*(1 + x^2),y[x],x]
```

Mathematica raw output

```
{{y[x] -> x*C[2]*Cos[Log[x]] + (8 + 25*x^2 + 5*C[3] + 10*Log[x])/(5*x) + x*C[1]*
Sin[Log[x]]}}
```

Maple raw input

```
dsolve(x^4*diff(diff(diff(y(x),x),x),x)+2*x^3*diff(diff(y(x),x),x)+2*x*y(x) = 10*x^2+10, y(x),'implic
```

Maple raw output

```
y(x) = 1/5*(((5*_C2*x^2-8)*cos(ln(x))+5*_C3*x^2*sin(ln(x))+5*x^2+5*_C1+10*ln(x)+
6*sin(ln(x)))*tan(1/2*ln(x))^2+(-20*x^2*cos(ln(x))+40*x^2*sin(ln(x))+12*cos(ln(x
))+16*sin(ln(x)))*tan(1/2*ln(x))+(8+(5*_C2+40)*x^2)*cos(ln(x))+(-6+(5*_C3+20)*x^
2)*sin(ln(x))+5*x^2+5*_C1+10*ln(x))/(1+tan(1/2*ln(x))^2)/x
```

4.2204 $x^4y'''(x)+2x^3y''(x)-x^2y'(x)+xy(x)=1$

ODE

$$x^4y'''(x)+2x^3y''(x)-x^2y'(x)+xy(x)=1$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0174024 (sec), leaf count = 33

$$\left\{\left\{y(x)\to \frac{c_1}{x}+c_2x+c_3x\log(x)+\frac{\log(x)+1}{4x}\right\}\right\}$$

Maple ✓
cpu = 0.021 (sec), leaf count = 30

$$\left\{y(x)=\frac{4\_C3\,x^2\ln(x)+4\_C1\,x^2+\ln(x)+4\_C2+1}{4\,x}\right\}$$

Mathematica raw input

```
DSolve[x*y[x] - x^2*y'[x] + 2*x^3*y''[x] + x^4*y'''[x] == 1,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]/x + x*C[2] + x*C[3]*Log[x] + (1 + Log[x])/(4*x)}}
```

Maple raw input

```
dsolve(x^4*diff(diff(diff(y(x),x),x),x)+2*x^3*diff(diff(y(x),x),x)-x^2*diff(y(x),x)+x*y(x) = 1, y(x),
```

Maple raw output

```
y(x) = 1/4*(4*_C3*x^2*ln(x)+4*_C1*x^2+ln(x)+4*_C2+1)/x
```

4.2205 $(x^2+1)\,x^2y'''(x)+8x^3y''(x)+10x^2y'(x)=3x^2+2x^2\log(x)-1$

ODE

$$(x^2+1)\,x^2y'''(x)+8x^3y''(x)+10x^2y'(x)=3x^2+2x^2\log(x)-1$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.115352 (sec), leaf count = 62

$$\left\{\left\{y(x)\to c_3-\frac{100(3c_2-1)\,x^3+900c_2x+225c_1+36x^5-60\left(3x^4+10x^2+15\right)x\log(x)}{900\left(x^2+1\right)^2}\right\}\right\}$$

Maple ✓
cpu = 0.18 (sec), leaf count = 67

$$\left\{y(x)=\frac{\left(180\,x^5+600\,x^3+900\,x\right)\ln(x)-36\,x^5+900\,\_C3\,x^4+\left(-900\,\_C1+100\right)x^3+1800\,\_C3\,x^2-2700\,\_C1\,x-22}{900\,\left(x^2+1\right)^2}\right.$$

Mathematica raw input

```
DSolve[10*x^2*y'[x] + 8*x^3*y''[x] + x^2*(1 + x^2)*y'''[x] == -1 + 3*x^2 + 2*x^2*Log[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3] - (36*x^5 + 225*C[1] + 900*x*C[2] + 100*x^3*(-1 + 3*C[2]) - 60*x*
(15 + 10*x^2 + 3*x^4)*Log[x])/(900*(1 + x^2)^2)}}
```

Maple raw input

```
dsolve(x^2*(x^2+1)*diff(diff(diff(y(x),x),x),x)+8*x^3*diff(diff(y(x),x),x)+10*x^2*diff(y(x),x) = 2*x^
1+3*x^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/900*((180*x^5+600*x^3+900*x)*ln(x)-36*x^5+900*_C3*x^4+(-900*_C1+100)*x^
3+1800*_C3*x^2-2700*_C1*x-225*_C2+900*_C3)/(x^2+1)^2
```

4.2206 $(x+1)x^3y'''(x) - 2(2x+1)x^2y''(x) + 2(5x+2)xy'(x) - 4(3x+1)y(x) = 0$

ODE

$$(x+1)x^3y'''(x) - 2(2x+1)x^2y''(x) + 2(5x+2)xy'(x) - 4(3x+1)y(x) = 0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0659271 (sec), leaf count = 29

$$\left\{\left\{y(x) \to x^2\left(c_3\left(x + \frac{1}{x} + \log^2(x)\right) + c_2\log(x) + c_1\right)\right\}\right\}$$

Maple ✓
cpu = 0.229 (sec), leaf count = 28

$$\left\{y(x) = x\left(\left(\ln(x)\right)^2 \_C3\, x + \_C2\, x\ln(x) + \_C3\, x^2 + \_C1\, x + \_C3\right)\right\}$$

Mathematica raw input

```
DSolve[-4*(1 + 3*x)*y[x] + 2*x*(2 + 5*x)*y'[x] - 2*x^2*(1 + 2*x)*y''[x] + x^3*(1 + x)*y'''[x] == 0,y
```

Mathematica raw output

```
{{y[x] -> x^2*(C[1] + C[2]*Log[x] + C[3]*(x^(-1) + x + Log[x]^2))}}
```

Maple raw input

```
dsolve(x^3*(1+x)*diff(diff(diff(y(x),x),x),x)-2*x^2*(1+2*x)*diff(diff(y(x),x),x)+2*x*(2+5*x)*diff(y(x
4*(1+3*x)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(ln(x)^2*_C3*x+_C2*x*ln(x)+_C3*x^2+_C1*x+_C3)
```

4.2207 $4x^4y'''(x) - 4x^3y''(x) + 4x^2y'(x) = 1$

ODE

$$4x^4y'''(x) - 4x^3y''(x) + 4x^2y'(x) = 1$$

ODE Classification

[[_3rd_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0235126 (sec), leaf count = 42

$$\left\{\left\{y(x) \to \frac{1}{4}(2c_1 - c_2)\,x^2 + \frac{1}{2}c_2x^2\log(x) + c_3 - \frac{1}{36x}\right\}\right\}$$

Maple ✓
cpu = 0.029 (sec), leaf count = 34

$$\left\{y(x) = \frac{18\,x^3\_C1\,\ln(x) - 1 + (-9\,\_C1 + 18\,\_C2)\,x^3 + 36\,\_C3\,x}{36\,x}\right\}$$

Mathematica raw input

```
DSolve[4*x^2*y'[x] - 4*x^3*y''[x] + 4*x^4*y'''[x] == 1,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -1/(36*x) + (x^2*(2*C[1] - C[2]))/4 + C[3] + (x^2*C[2]*Log[x])/2}}
```

Maple raw input

```
dsolve(4*x^4*diff(diff(diff(y(x),x),x),x)-4*x^3*diff(diff(y(x),x),x)+4*x^2*diff(y(x),x) = 1, y(x),'im
```

Maple raw output

```
y(x) = 1/36*(18*x^3*_C1*ln(x)-1+(-9*_C1+18*_C2)*x^3+36*_C3*x)/x
```

4.2208

$$(x^2+1)\,x^3y'''(x)-2(2x^2+1)\,x^2y''(x)+2(5x^2+2)\,xy'(x)-4(3x^2+1)\,y(x)=0$$

ODE

$$(x^2+1)\,x^3y'''(x)-2(2x^2+1)\,x^2y''(x)+2(5x^2+2)\,xy'(x)-4(3x^2+1)\,y(x)=0$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.121642 (sec), leaf count = 46

$$\left\{\left\{y(x)\to \frac{1}{2}x\left(c_2x^2-2c_1\left(x^2-3x+1\right)-2c_2x+c_3x+c_3x\log(x)+c_2\right)\right\}\right\}$$

Maple ✓
cpu = 0.246 (sec), leaf count = 23

$$\{y(x)=x\left(\ln(x)\_C2\,x+\_C3\,x^2+(\_C1+\_C2)\,x+\_C3\right)\}$$

Mathematica raw input

```
DSolve[-4*(1 + 3*x^2)*y[x] + 2*x*(2 + 5*x^2)*y'[x] - 2*x^2*(1 + 2*x^2)*y''[x] + x^3*(1 + x^2)*y'''[x]
```

Mathematica raw output

```
{{y[x] -> (x*(-2*(1 - 3*x + x^2)*C[1] + C[2] - 2*x*C[2] + x^2*C[2] + x*C[3] + x*
C[3]*Log[x]))/2}}
```

Maple raw input

```
dsolve(x^3*(x^2+1)*diff(diff(diff(y(x),x),x),x)-2*x^2*(2*x^2+1)*diff(diff(y(x),x),x)+2*x*(5*x^2+2)*di
4*(3*x^2+1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x*(ln(x)*_C2*x+_C3*x^2+(_C1+_C2)*x+_C3)
```

4.2209 $(a-x)^3(b-x)^3y'''(x)=cy(x)$

ODE

$$(a-x)^3(b-x)^3y'''(x)=cy(x)$$

ODE Classification

[[_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 135.011 (sec), leaf count = 0 , DifferentialRoot result

$$\left\{\left\{y(x)\to \text{DifferentialRoot}\left[\{y,x\},\left\{(a-x)^3(b-x)^3y^{\text{Symbol[StringJoin[ConstantArray[\prime,3]]]}}(x)-cy(x)=0,y(0)=c_1,y'(0)=c_2\right.\right.\right.$$

Maple ✓
cpu = 0.437 (sec), leaf count = 437

$$\left\{y(x)=(x-b)^{2\frac{a}{a-b}}(x-a)^{-2\frac{b}{a-b}}\left((b-x)^{-\frac{\text{RootOf}\left(\_Z^3+(-3a-3b)\_Z^2+\left(2a^2+8ab+2b^2\right)\_Z-4a^2b-4ab^2-c,\text{index}=3\right)}{a-b}}(a-x)^{\frac{\text{RootOf}\left(\_Z^3+(-3a-\right.}\right.\right.$$

Mathematica raw input

```
DSolve[(a - x)^3*(b - x)^3*y'''[x] == c*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> DifferentialRoot[Function[{\[FormalY], \[FormalX]}, {-(c*\[FormalY][\[
FormalX]]) + (-\[FormalX] + a)^3*(-\[FormalX] + b)^3*Derivative[3][\[FormalY]][\
[FormalX]] == 0, \[FormalY][0] == C[1], Derivative[1][\[FormalY]][0] == C[2], De
rivative[2][\[FormalY]][0] == C[3]}]][x]}}
```

Maple raw input

```
dsolve((a-x)^3*(b-x)^3*diff(diff(diff(y(x),x),x),x) = c*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (x-b)^(2/(a-b)*a)*(x-a)^(-2/(a-b)*b)*((b-x)^(-1/(a-b)*RootOf(_Z^3+(-3*a-3
*b)*_Z^2+(2*a^2+8*a*b+2*b^2)*_Z-4*a^2*b-4*a*b^2-c,index = 3))*(a-x)^(1/(a-b)*Roo
```

```
tOf(_Z^3+(-3*a-3*b)*_Z^2+(2*a^2+8*a*b+2*b^2)*_Z-4*a^2*b-4*a*b^2-c,index = 3))*_C
3+(b-x)^(-1/(a-b)*RootOf(_Z^3+(-3*a-3*b)*_Z^2+(2*a^2+8*a*b+2*b^2)*_Z-4*a^2*b-4*a
*b^2-c,index = 2))*(a-x)^(1/(a-b)*RootOf(_Z^3+(-3*a-3*b)*_Z^2+(2*a^2+8*a*b+2*b^2
)*_Z-4*a^2*b-4*a*b^2-c,index = 2))*_C2+(b-x)^(-1/(a-b)*RootOf(_Z^3+(-3*a-3*b)*_Z
^2+(2*a^2+8*a*b+2*b^2)*_Z-4*a^2*b-4*a*b^2-c,index = 1))*(a-x)^(1/(a-b)*RootOf(_Z
^3+(-3*a-3*b)*_Z^2+(2*a^2+8*a*b+2*b^2)*_Z-4*a^2*b-4*a*b^2-c,index = 1))*_C1)
```

4.2210

$$(x+\sin(x))y'''(x)+3(\cos(x)+1)y''(x)-3\sin(x)y'(x)-y(x)\cos(x)+\sin(x)=0$$

ODE

$$(x+\sin(x))y'''(x)+3(\cos(x)+1)y''(x)-3\sin(x)y'(x)-y(x)\cos(x)+\sin(x)=0$$

ODE Classification

```
[[_3rd_order, _fully, _exact, _linear]]
```

Book solution method
TO DO

Mathematica ✗
cpu = 0.0795421 (sec), leaf count = 0 , could not solve

```
DSolve[Sin[x] - Cos[x]*y[x] - 3*Sin[x]*Derivative[1][y][x] + 3*(1 + Cos[x])*Derivative[2][y][x] + (x
```

Maple ✓
cpu = 0.066 (sec), leaf count = 25

$$\left\{y(x)=\frac{\_C3+x^2\_C1+x\_C2-\cos(x)}{x+\sin(x)}\right\}$$

Mathematica raw input

```
DSolve[Sin[x] - Cos[x]*y[x] - 3*Sin[x]*y'[x] + 3*(1 + Cos[x])*y''[x] + (x + Sin[x])*y'''[x] == 0,y[x]
```

Mathematica raw output

```
DSolve[Sin[x] - Cos[x]*y[x] - 3*Sin[x]*Derivative[1][y][x] + 3*(1 + Cos[x])*Deri
vative[2][y][x] + (x + Sin[x])*Derivative[3][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve((x+sin(x))*diff(diff(diff(y(x),x),x),x)+3*(1+cos(x))*diff(diff(y(x),x),x)-3*diff(y(x),x)*sin(x
y(x)*cos(x)+sin(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C3+x^2*_C1+x*_C2-cos(x))/(x+sin(x))
```

4.2211 $y''''(x) = 0$

ODE

$$y''''(x) = 0$$

ODE Classification

[[_high_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00635236 (sec), leaf count = 22

$$\{\{y(x) \to x(x(c_4 x + c_3) + c_2) + c_1\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 21

$$\left\{y(x) = \frac{x^3 \_C1}{6} + \frac{x^2 \_C2}{2} + \_C3\, x + \_C4\right\}$$

Mathematica raw input

```
DSolve[y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*(C[2] + x*(C[3] + x*C[4]))}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/6*x^3*_C1+1/2*x^2*_C2+_C3*x+_C4
```

4.2212 $y''''(x) = x\cos(x)$

ODE

$$y''''(x) = x\cos(x)$$

ODE Classification

[[_high_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0351655 (sec), leaf count = 32

$$\{\{y(x) \to c_4 x^3 + c_3 x^2 + c_2 x + c_1 - 4\sin(x) + x\cos(x)\}\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 29

$$\left\{y(x) = -4\sin(x) + x\cos(x) + \frac{x^3 \_C1}{6} + \frac{x^2 \_C2}{2} + \_C3\, x + \_C4\right\}$$

Mathematica raw input

```
DSolve[y''''[x] == x*Cos[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*C[2] + x^2*C[3] + x^3*C[4] + x*Cos[x] - 4*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x) = x*cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -4*sin(x)+x*cos(x)+1/6*x^3*_C1+1/2*x^2*_C2+_C3*x+_C4
```

4.2213 $y''''(x) + 4e^{-x}\cos(x) = 0$

ODE

$$y''''(x) + 4e^{-x}\cos(x) = 0$$

ODE Classification

[[_high_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0504503 (sec), leaf count = 30

$$\{\{y(x) \to x(x(c_4 x + c_3) + c_2) + c_1 + e^{-x}\cos(x)\}\}$$

Maple ✓
cpu = 0.023 (sec), leaf count = 28

$$\left\{y(x) = \mathrm{e}^{-x}\cos(x) + \frac{x^3 \_C1}{6} + \frac{x^2 \_C2}{2} + \_C3\, x + \_C4\right\}$$

Mathematica raw input

```
DSolve[(4*Cos[x])/E^x + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*(C[2] + x*(C[3] + x*C[4])) + Cos[x]/E^x}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+4*exp(-x)*cos(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(-x)*cos(x)+1/6*x^3*_C1+1/2*x^2*_C2+_C3*x+_C4
```

4.2214 $y''''(x) = y(x) + \cos(x)$

ODE

$$y''''(x) = y(x) + \cos(x)$$

ODE Classification

[[_high_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0412753 (sec), leaf count = 40

$$\left\{\left\{y(x) \to c_1 e^x + c_3 e^{-x} + \left(c_4 - \frac{x}{4}\right)\sin(x) + \left(c_2 - \frac{1}{2}\right)\cos(x)\right\}\right\}$$

Maple ✓
cpu = 0.063 (sec), leaf count = 35

$$\left\{y(x) = \_C4\, \mathrm{e}^{-x} + \frac{(4\_C1 - 1)\cos(x)}{4} + \frac{(-x + 4\_C3)\sin(x)}{4} + \_C2\, \mathrm{e}^{x}\right\}$$

Mathematica raw input

```
DSolve[y''''[x] == Cos[x] + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1] + C[3]/E^x + (-1/2 + C[2])*Cos[x] + (-x/4 + C[4])*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x) = y(x)+cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C4*exp(-x)+1/4*(4*_C1-1)*cos(x)+1/4*(-x+4*_C3)*sin(x)+_C2*exp(x)
```

4.2215 $y''''(x) = y(x) + e^x \cos(x)$

ODE

$$y''''(x) = y(x) + e^x \cos(x)$$

ODE Classification

[[_high_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.066143 (sec), leaf count = 38

$$\left\{\left\{y(x) \to c_1 e^x + c_3 e^{-x} + c_4 \sin(x) + \left(c_2 - \frac{e^x}{5}\right)\cos(x)\right\}\right\}$$

Maple ✓
cpu = 0.096 (sec), leaf count = 31

$$\left\{y(x) = \_C4\, \mathrm{e}^{-x} + \frac{(5\,\_C1 - \mathrm{e}^x)\cos(x)}{5} + \_C2\, \mathrm{e}^x + \_C3\, \sin(x)\right\}$$

Mathematica raw input

```
DSolve[y''''[x] == E^x*Cos[x] + y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1] + C[3]/E^x + (-E^x/5 + C[2])*Cos[x] + C[4]*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x) = y(x)+exp(x)*cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C4*exp(-x)+1/5*(5*_C1-exp(x))*cos(x)+_C2*exp(x)+_C3*sin(x)
```

4.2216 $y''''(x) + ay(x) = 0$

ODE

$$y''''(x) + ay(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00750143 (sec), leaf count = 76

$$\left\{\left\{y(x) \to c_1 e^{(-1)^{3/4}\sqrt[4]{a}x} + c_2 e^{-\sqrt[4]{-1}\sqrt[4]{a}x} + c_3 e^{-(-1)^{3/4}\sqrt[4]{a}x} + c_4 e^{\sqrt[4]{-1}\sqrt[4]{a}x}\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 50

$$\left\{y(x) = \_C1\, \mathrm{e}^{-i\sqrt[4]{-a}x} + \_C2\, \mathrm{e}^{i\sqrt[4]{-a}x} + \_C3\, \mathrm{e}^{-\sqrt[4]{-a}x} + \_C4\, \mathrm{e}^{\sqrt[4]{-a}x}\right\}$$

Mathematica raw input

```
DSolve[a*y[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^((-1)^(3/4)*a^(1/4)*x)*C[1] + C[2]/E^((-1)^(1/4)*a^(1/4)*x) + C[3]/E
^((-1)^(3/4)*a^(1/4)*x) + E^((-1)^(1/4)*a^(1/4)*x)*C[4]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-I*(-a)^(1/4)*x)+_C2*exp(I*(-a)^(1/4)*x)+_C3*exp(-(-a)^(1/4)*x)+_
C4*exp((-a)^(1/4)*x)
```

4.2217 $y''''(x) = a^4 y(x) + x^3$

ODE

$$y''''(x) = a^4 y(x) + x^3$$

ODE Classification

[[_high_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00844123 (sec), leaf count = 45

$$\left\{\left\{y(x) \to -\frac{x^3}{a^4} + c_2 e^{-ax} + c_4 e^{ax} + c_3 \sin(ax) + c_1 \cos(ax)\right\}\right\}$$

Maple ✓
cpu = 0.026 (sec), leaf count = 38

$$\left\{y(x) = -\frac{x^3}{a^4} + \_C1 \cos(ax) + \_C2\, \mathrm{e}^{ax} + \_C3 \sin(ax) + \_C4\, \mathrm{e}^{-ax}\right\}$$

Mathematica raw input

```
DSolve[y''''[x] == x^3 + a^4*y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(x^3/a^4) + C[2]/E^(a*x) + E^(a*x)*C[4] + C[1]*Cos[a*x] + C[3]*Sin[a*
x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x) = x^3+a^4*y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = -1/a^4*x^3+_C1*cos(a*x)+_C2*exp(a*x)+_C3*sin(a*x)+_C4*exp(-a*x)
```

4.2218 $y''''(x)+y''(x)+y(x)=0$

ODE

$$y''''(x)+y''(x)+y(x)=0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00933399 (sec), leaf count = 56

$$\left\{\left\{y(x)\to e^{-x/2}\left((c_3e^x+c_1)\sin\left(\frac{\sqrt{3}x}{2}\right)+(c_2e^x+c_4)\cos\left(\frac{\sqrt{3}x}{2}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 47

$$\left\{y(x)=(\_C2\,\mathrm{e}^{\frac{x}{2}}+\_C4\,\mathrm{e}^{-\frac{x}{2}})\cos\left(\frac{\sqrt{3}x}{2}\right)+\sin\left(\frac{\sqrt{3}x}{2}\right)(\_C1\,\mathrm{e}^{\frac{x}{2}}+\_C3\,\mathrm{e}^{-\frac{x}{2}})\right\}$$

Mathematica raw input

```
DSolve[y[x] + y''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((E^x*C[2] + C[4])*Cos[(Sqrt[3]*x)/2] + (C[1] + E^x*C[3])*Sin[(Sqrt[3]
*x)/2])/E^(x/2)}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+diff(diff(y(x),x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*exp(1/2*x)+_C4*exp(-1/2*x))*cos(1/2*3^(1/2)*x)+sin(1/2*3^(1/2)*x)*(_
C1*exp(1/2*x)+_C3*exp(-1/2*x))
```

4.2219 $y''''(x) + 2y''(x) + y(x) = 0$

ODE

$$y''''(x) + 2y''(x) + y(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00805373 (sec), leaf count = 26

$$\{\{y(x) \to (c_4 x + c_3)\sin(x) + (c_2 x + c_1)\cos(x)\}\}$$

Maple ✓
cpu = 0.004 (sec), leaf count = 21

$$\{y(x) = (\_C4\ x + \_C2)\cos(x) + \sin(x)\,(\_C3\ x + \_C1)\}$$

Mathematica raw input

```
DSolve[y[x] + 2*y''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2])*Cos[x] + (C[3] + x*C[4])*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+2*diff(diff(y(x),x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C4*x+_C2)*cos(x)+sin(x)*(_C3*x+_C1)
```

4.2220 $y''''(x) - 2y''(x) + y(x) = 0$

ODE

$$y''''(x) - 2y''(x) + y(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00803325 (sec), leaf count = 35

$$\{\{y(x) \to e^{-x}\left(c_3 e^{2x} + x\left(c_4 e^{2x} + c_2\right) + c_1\right)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 23

$$\{y(x) = (x\_C2 + \_C1)\,\mathrm{e}^{-x} + \mathrm{e}^{x}(\_C4\,x + \_C3)\}$$

Mathematica raw input

```
DSolve[y[x] - 2*y''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + E^(2*x)*C[3] + x*(C[2] + E^(2*x)*C[4]))/E^x}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-2*diff(diff(y(x),x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*x+_C1)*exp(-x)+exp(x)*(_C4*x+_C3)
```

4.2221 $y''''(x) + 2y''(x) + y(x) = \cos(x)$

ODE

$$y''''(x) + 2y''(x) + y(x) = \cos(x)$$

ODE Classification

[[_high_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0580983 (sec), leaf count = 43

$$\left\{\left\{y(x) \to \left(c_2 x + c_1 - \frac{x^2}{8} + \frac{5}{16}\right)\cos(x) + \frac{1}{4}(4c_4 x + 4c_3 + x)\sin(x)\right\}\right\}$$

Maple ✓
cpu = 0.164 (sec), leaf count = 33

$$\left\{y(x) = \frac{(8\_C3\,x - x^2 + 8\_C1 + 2)\cos(x)}{8} + \sin(x)\left(\left(\_C4 + \frac{3}{8}\right)x + \_C2\right)\right\}$$

Mathematica raw input

```
DSolve[y[x] + 2*y''[x] + y''''[x] == Cos[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (5/16 - x^2/8 + C[1] + x*C[2])*Cos[x] + ((x + 4*C[3] + 4*x*C[4])*Sin[x
])/4}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+2*diff(diff(y(x),x),x)+y(x) = cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/8*(8*_C3*x-x^2+8*_C1+2)*cos(x)+sin(x)*((_C4+3/8)*x+_C2)
```

4.2222 $y''''(x) - 2y''(x) + y(x) = \cos(x)$

ODE

$$y''''(x) - 2y''(x) + y(x) = \cos(x)$$

ODE Classification

[[_high_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0979871 (sec), leaf count = 42

$$\left\{\left\{y(x) \to e^{-x}\left(c_2 x + c_3 e^{2x} + c_4 e^{2x} x + c_1\right) + \frac{\cos(x)}{4}\right\}\right\}$$

Maple ✓
cpu = 0.028 (sec), leaf count = 31

$$\left\{y(x) = \frac{\cos(x)}{4} + \_C1\, \mathrm{e}^{x} + \_C2\, \mathrm{e}^{-x} + \_C3\, x\mathrm{e}^{x} + \_C4\, x\mathrm{e}^{-x}\right\}$$

Mathematica raw input

```
DSolve[y[x] - 2*y''[x] + y''''[x] == Cos[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2] + E^(2*x)*C[3] + E^(2*x)*x*C[4])/E^x + Cos[x]/4}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-2*diff(diff(y(x),x),x)+y(x) = cos(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/4*cos(x)+_C1*exp(x)+_C2*exp(-x)+_C3*x*exp(x)+_C4*x*exp(-x)
```

4.2223 $y''''(x)+2y''(x)+y(x)=24x\sin(x)$

ODE

$$y''''(x)+2y''(x)+y(x)=24x\sin(x)$$

ODE Classification

[[_high_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.117397 (sec), leaf count = 46

$$\left\{\left\{y(x)\to \frac{1}{2}\left((2c_4+9)\,x+2c_3-2x^3\right)\sin(x)+\left(c_2x+c_1-3x^2+3\right)\cos(x)\right\}\right\}$$

Maple ✓
cpu = 0.151 (sec), leaf count = 41

$$\left\{y(x)=\frac{\left(2\_C3\,x-6\,x^2+2\_C1+3\right)\cos\left(x\right)}{2}-\left(x^3+\left(-\_C4-3\right)x-\_C2\right)\sin\left(x\right)\right\}$$

Mathematica raw input

```
DSolve[y[x] + 2*y''[x] + y''''[x] == 24*x*Sin[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3 - 3*x^2 + C[1] + x*C[2])*Cos[x] + ((-2*x^3 + 2*C[3] + x*(9 + 2*C[4]
))*Sin[x])/2}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+2*diff(diff(y(x),x),x)+y(x) = 24*x*sin(x), y(x),'implicit
```

Maple raw output

```
y(x) = 1/2*(2*_C3*x-6*x^2+2*_C1+3)*cos(x)-(x^3+(-_C4-3)*x-_C2)*sin(x)
```

4.2224 $y''''(x) - 2y''(x) + y(x) = e^x + 4$

ODE

$$y''''(x) - 2y''(x) + y(x) = e^x + 4$$

ODE Classification

[[_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0528111 (sec), leaf count = 55

$$\left\{\left\{y(x) \to \frac{1}{16}e^{-x}\left(e^{2x}\left(4(4c_4-1)\,x + 16c_3 + 2x^2 + 3\right) + 16(c_2 x + c_1) + 64e^x\right)\right\}\right\}$$

Maple ✓
cpu = 0.024 (sec), leaf count = 41

$$\left\{y(x) = \frac{(16\_C4\,x + 16\_C2)\,\mathrm{e}^{-x}}{16} + 4 + \frac{\left(2x^2 + (16\_C3 - 4)\,x + 16\_C1 + 3\right)\mathrm{e}^x}{16}\right\}$$

Mathematica raw input

```
DSolve[y[x] - 2*y''[x] + y''''[x] == 4 + E^x,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (64*E^x + 16*(C[1] + x*C[2]) + E^(2*x)*(3 + 2*x^2 + 16*C[3] + 4*x*(-1
+ 4*C[4])))/(16*E^x)}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-2*diff(diff(y(x),x),x)+y(x) = 4+exp(x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/16*(16*_C4*x+16*_C2)*exp(-x)+4+1/16*(2*x^2+(16*_C3-4)*x+16*_C1+3)*exp(x
)
```

4.2225 $y''''(x) - 2y''(x) - 8y(x) = 0$

ODE

$$y''''(x) - 2y''(x) - 8y(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00941015 (sec), leaf count = 44

$$\left\{\left\{y(x) \to c_3 e^{-2x} + c_4 e^{2x} + c_2 \sin\left(\sqrt{2}x\right) + c_1 \cos\left(\sqrt{2}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 33

$$\left\{y(x) = \_C1\, \mathrm{e}^{2x} + \_C2\, \mathrm{e}^{-2x} + \_C3\, \sin\left(\sqrt{2}x\right) + \_C4\, \cos\left(\sqrt{2}x\right)\right\}$$

Mathematica raw input

```
DSolve[-8*y[x] - 2*y''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3]/E^(2*x) + E^(2*x)*C[4] + C[1]*Cos[Sqrt[2]*x] + C[2]*Sin[Sqrt[2]*x
]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-2*diff(diff(y(x),x),x)-8*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(2*x)+_C2*exp(-2*x)+_C3*sin(2^(1/2)*x)+_C4*cos(2^(1/2)*x)
```

4.2226 $y''''(x) + 3y''(x) - 4y(x) = 0$

ODE

$$y''''(x) + 3y''(x) - 4y(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00871098 (sec), leaf count = 34

$$\{\{y(x) \to c_3 e^{-x} + c_4 e^{x} + c_2 \sin(2x) + c_1 \cos(2x)\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 27

$$\{y(x) = \_C1\, \mathrm{e}^{-x} + \_C2\, \mathrm{e}^{x} + \_C3\, \sin(2\,x) + \_C4\, \cos(2\,x)\}$$

Mathematica raw input

```
DSolve[-4*y[x] + 3*y''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3]/E^x + E^x*C[4] + C[1]*Cos[2*x] + C[2]*Sin[2*x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+3*diff(diff(y(x),x),x)-4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-x)+_C2*exp(x)+_C3*sin(2*x)+_C4*cos(2*x)
```

4.2227 $y''''(x) + 5y''(x) + 6y(x) = 0$

ODE

$$y''''(x) + 5y''(x) + 6y(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00952887 (sec), leaf count = 50

$$\left\{\left\{y(x) \to c_4 \sin\left(\sqrt{2}x\right) + c_2 \sin\left(\sqrt{3}x\right) + c_3 \cos\left(\sqrt{2}x\right) + c_1 \cos\left(\sqrt{3}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 37

$$\left\{y(x) = \_C1 \sin\left(\sqrt{3}x\right) + \_C2 \cos\left(\sqrt{3}x\right) + \_C3 \sin\left(\sqrt{2}x\right) + \_C4 \cos\left(\sqrt{2}x\right)\right\}$$

Mathematica raw input

```
DSolve[6*y[x] + 5*y''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3]*Cos[Sqrt[2]*x] + C[1]*Cos[Sqrt[3]*x] + C[4]*Sin[Sqrt[2]*x] + C[2]
*Sin[Sqrt[3]*x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+5*diff(diff(y(x),x),x)+6*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*sin(3^(1/2)*x)+_C2*cos(3^(1/2)*x)+_C3*sin(2^(1/2)*x)+_C4*cos(2^(1/2)*
x)
```

4.2228 $y''''(x) - 12y''(x) + 27y(x) = 0$

ODE

$$y''''(x) - 12y''(x) + 27y(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00979765 (sec), leaf count = 47

$$\left\{\left\{y(x) \to c_1 e^{\sqrt{3}x} + c_2 e^{-\sqrt{3}x} + c_3 e^{-3x} + c_4 e^{3x}\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 34

$$\left\{y(x) = \_C1\, \mathrm{e}^{3x} + \_C2\, \mathrm{e}^{-3x} + \_C3\, \mathrm{e}^{\sqrt{3}x} + \_C4\, \mathrm{e}^{-\sqrt{3}x}\right\}$$

Mathematica raw input

```
DSolve[27*y[x] - 12*y''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(Sqrt[3]*x)*C[1] + C[2]/E^(Sqrt[3]*x) + C[3]/E^(3*x) + E^(3*x)*C[4]}
}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-12*diff(diff(y(x),x),x)+27*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(3*x)+_C2*exp(-3*x)+_C3*exp(3^(1/2)*x)+_C4*exp(-3^(1/2)*x)
```

4.2229 $y''''(x) + a^2 y''(x) = 0$

ODE

$$y''''(x) + a^2 y''(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0268292 (sec), leaf count = 34

$$\left\{\left\{y(x) \to -\frac{c_2 \sin(ax)}{a^2} - \frac{c_1 \cos(ax)}{a^2} + c_4 x + c_3\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 21

$$\{y(x) = \_C1 + x\_C2 + \_C3 \sin(ax) + \_C4 \cos(ax)\}$$

Mathematica raw input

```
DSolve[a^2*y''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3] + x*C[4] - (C[1]*Cos[a*x])/a^2 - (C[2]*Sin[a*x])/a^2}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+a^2*diff(diff(y(x),x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+x*_C2+_C3*sin(a*x)+_C4*cos(a*x)
```

4.2230 $y''''(x) + a^4 y(x) + 2a^2 y''(x) = 0$

ODE

$$y''''(x) + a^4 y(x) + 2a^2 y''(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00831964 (sec), leaf count = 30

$$\{\{y(x) \to (c_4 x + c_3)\sin(ax) + (c_2 x + c_1)\cos(ax)\}\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 25

$$\{y(x) = (\_C4\, x + \_C2)\cos(ax) + \sin(ax)\,(\_C3\, x + \_C1)\}$$

Mathematica raw input

```
DSolve[a^4*y[x] + 2*a^2*y''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2])*Cos[a*x] + (C[3] + x*C[4])*Sin[a*x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+2*a^2*diff(diff(y(x),x),x)+a^4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C4*x+_C2)*cos(a*x)+sin(a*x)*(_C3*x+_C1)
```

4.2231 $y''''(x) + a^4 y(x) + 2a^2 y''(x) = \cosh(ax)$

ODE

$$y''''(x) + a^4 y(x) + 2a^2 y''(x) = \cosh(ax)$$

ODE Classification

[[_high_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.251201 (sec), leaf count = 47

$$\left\{\left\{y(x) \to \frac{4a^4((c_4 x + c_3)\sin(ax) + (c_2 x + c_1)\cos(ax)) + \cosh(ax)}{4a^4}\right\}\right\}$$

Maple ✓
cpu = 0.496 (sec), leaf count = 51

$$\left\{y(x) = \frac{\mathrm{e}^{-ax} + (8\_C3\, x + 8\_C1)\, a^4 \cos(ax) + (8\_C4\, x + 8\_C2)\, a^4 \sin(ax) + \mathrm{e}^{ax}}{8\, a^4}\right\}$$

Mathematica raw input

```
DSolve[a^4*y[x] + 2*a^2*y''[x] + y''''[x] == Cosh[a*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (Cosh[a*x] + 4*a^4*((C[1] + x*C[2])*Cos[a*x] + (C[3] + x*C[4])*Sin[a*x
]))/(4*a^4)}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+2*a^2*diff(diff(y(x),x),x)+a^4*y(x) = cosh(a*x), y(x),'in
```

Maple raw output

```
y(x) = 1/8*(exp(-a*x)+(8*_C3*x+8*_C1)*a^4*cos(a*x)+(8*_C4*x+8*_C2)*a^4*sin(a*x)+
exp(a*x))/a^4
```

4.2232 $y''''(x) + (a^2 + b^2)\, y''(x) + a^2 b^2 y(x) = 0$

ODE

$$y''''(x) + (a^2 + b^2)\, y''(x) + a^2 b^2 y(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0086521 (sec), leaf count = 34

$$\{\{y(x) \to c_4 \sin(ax) + c_3 \cos(ax) + c_2 \sin(bx) + c_1 \cos(bx)\}\}$$

Maple ✓
cpu = 0.02 (sec), leaf count = 29

$$\{y(x) = \_C1 \sin(ax) + \_C2 \cos(ax) + \_C3 \sin(bx) + \_C4 \cos(bx)\}$$

Mathematica raw input

```
DSolve[a^2*b^2*y[x] + (a^2 + b^2)*y''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3]*Cos[a*x] + C[1]*Cos[b*x] + C[4]*Sin[a*x] + C[2]*Sin[b*x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+(a^2+b^2)*diff(diff(y(x),x),x)+a^2*b^2*y(x) = 0, y(x),'in
```

Maple raw output

```
y(x) = _C1*sin(a*x)+_C2*cos(a*x)+_C3*sin(b*x)+_C4*cos(b*x)
```

4.2233 $y''''(x)+3y(x)\left(f''(x)+3f(x)^2\right)+10f'(x)y'(x)+10f(x)y''(x)=0$

ODE

$$y''''(x)+3y(x)\left(f''(x)+3f(x)^2\right)+10f'(x)y'(x)+10f(x)y''(x)=0$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.0186606 (sec), leaf count = 0 , could not solve

```
DSolve[10*Derivative[1][f][x]*Derivative[1][y][x] + 3*y[x]*(3*f[x]^2 + Derivative[2][f][x]) + 10*f[x]
```

Maple ✗
cpu = 0.113 (sec), leaf count = 0 , result contains DESol

$$\left\{y(x)=\left(DESol\left(\left\{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\_Y(x)+f(x)\_Y(x)\right\},\{\_Y(x)\}\right)\right)^3\right\}$$

Mathematica raw input

```
DSolve[10*f'[x]*y'[x] + 3*y[x]*(3*f[x]^2 + f''[x]) + 10*f[x]*y''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[10*Derivative[1][f][x]*Derivative[1][y][x] + 3*y[x]*(3*f[x]^2 + Derivativ
e[2][f][x]) + 10*f[x]*Derivative[2][y][x] + Derivative[4][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+10*f(x)*diff(diff(y(x),x),x)+10*diff(f(x),x)*diff(y(x),x)
```

Maple raw output

```
y(x) = DESol({diff(diff(_Y(x),x),x)+f(x)*_Y(x)},{_Y(x)})^3
```

4.2234 $-y'''(x)+y''''(x)-3y''(x)+5y'(x)-2y(x)=0$

ODE

$$-y'''(x)+y''''(x)-3y''(x)+5y'(x)-2y(x)=0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00883226 (sec), leaf count = 32

$$\{\{y(x)\to e^{-2x}\left(e^{3x}(x(c_4x+c_3)+c_2)+c_1\right)\}\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 24

$$\{y(x)=\_C1\,\mathrm{e}^{-2x}+\mathrm{e}^{x}\left(\_C4\,x^2+\_C3\,x+\_C2\right)\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 5*y'[x] - 3*y''[x] - y'''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + E^(3*x)*(C[2] + x*(C[3] + x*C[4])))/E^(2*x)}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-diff(diff(diff(y(x),x),x),x)-3*diff(diff(y(x),x),x)+5*dif
2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-2*x)+exp(x)*(_C4*x^2+_C3*x+_C2)
```

4.2235 $-y'''(x)+y''''(x)-3y''(x)+5y'(x)-2y(x)=e^{3x}$

ODE

$$-y'''(x)+y''''(x)-3y''(x)+5y'(x)-2y(x)=e^{3x}$$

ODE Classification

[[_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0345105 (sec), leaf count = 39

$$\left\{\left\{y(x)\to c_1e^{-2x}+e^x(x(c_4x+c_3)+c_2)+\frac{e^{3x}}{40}\right\}\right\}$$

Maple ✓
cpu = 0.018 (sec), leaf count = 33

$$\left\{y(x)=\frac{\mathrm{e}^{3\,x}}{40}+\_C1\,\mathrm{e}^{x}+\_C2\,\mathrm{e}^{-2\,x}+\_C3\,x\mathrm{e}^{x}+\_C4\,x^{2}\mathrm{e}^{x}\right\}$$

Mathematica raw input

```
DSolve[-2*y[x] + 5*y'[x] - 3*y''[x] - y'''[x] + y''''[x] == E^(3*x),y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^(3*x)/40 + C[1]/E^(2*x) + E^x*(C[2] + x*(C[3] + x*C[4]))}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-diff(diff(diff(y(x),x),x),x)-3*diff(diff(y(x),x),x)+5*dif
2*y(x) = exp(3*x), y(x),'implicit')
```

Maple raw output

```
y(x) = 1/40*exp(3*x)+_C1*exp(x)+_C2*exp(-2*x)+_C3*x*exp(x)+_C4*x^2*exp(x)
```

4.2236 $-2y'''(x)+y''''(x)+y(x)^2=0$

ODE

$$-2y'''(x)+y''''(x)+y(x)^2=0$$

ODE Classification

[[_high_order, _missing_x], [_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.024828 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]^2 - 2*Derivative[3][y][x] + Derivative[4][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 0.904 (sec), leaf count = 91

$$\left\{y(x)=ODESolStruc\left(\_a,[\left\{\left(\frac{d^3}{d\_a^3}\_b(\_a)\right)(\_b(\_a))^3+4\left(\frac{d}{d\_a}\_b(\_a)-1/2\right)(\_b(\_a))^2\frac{d^2}{d\_a^2}\_b(\_a)+\left(\frac{d}{d\_a}\_\right.\right.\right.$$

Mathematica raw input

```
DSolve[y[x]^2 - 2*y'''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]^2 - 2*Derivative[3][y][x] + Derivative[4][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-2*diff(diff(diff(y(x),x),x),x)+y(x)^2 = 0, y(x),'implicit
```

Maple raw output

```
y(x) = ODESolStruc(_a,[{diff(diff(diff(_b(_a),_a),_a),_a)*_b(_a)^3+4*(diff(_b(_a
),_a)-1/2)*_b(_a)^2*diff(diff(_b(_a),_a),_a)+diff(_b(_a),_a)^3*_b(_a)-2*diff(_b(
_a),_a)^2*_b(_a)+_a^2 = 0}, {_a = y(x), _b(_a) = diff(y(x),x)}, {x = Int(1/_b(_a
),_a)+_C1, y(x) = _a}])
```

4.2237 $-2y'''(x)+y''''(x)+y(x)^2=x^3$

ODE

$$-2y'''(x)+y''''(x)+y(x)^2=x^3$$

ODE Classification

[NONE]

Book solution method
TO DO

Mathematica ✗
cpu = 0.031278 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]^2 - 2*Derivative[3][y][x] + Derivative[4][y][x] == x^3, y[x], x]
```

Maple ✗
cpu = 0.495 (sec), leaf count = 0 , could not solve

```
dsolve(diff(diff(diff(diff(y(x),x),x),x)-2*diff(diff(diff(y(x),x),x),x)+y(x)^2 = x^3, y(x),'implic
```

Mathematica raw input

```
DSolve[y[x]^2 - 2*y'''[x] + y''''[x] == x^3,y[x],x]
```

Mathematica raw output

```
DSolve[y[x]^2 - 2*Derivative[3][y][x] + Derivative[4][y][x] == x^3, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x)-2*diff(diff(diff(y(x),x),x),x)+y(x)^2 = x^3, y(x),'implic
```

Maple raw output

```
dsolve(diff(diff(diff(diff(y(x),x),x),x)-2*diff(diff(diff(y(x),x),x),x)+y(x)^
2 = x^3, y(x),'implicit')
```

4.2238 $2y'''(x) + y''''(x) - 2y'(x) - y(x) = 0$

ODE

$$2y'''(x) + y''''(x) - 2y'(x) - y(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00860763 (sec), leaf count = 32

$$\{\{y(x) \to e^{-x}\left(c_3 x^2 + c_2 x + c_4 e^{2x} + c_1\right)\}\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 24

$$\{y(x) = \left(\_C4\, x^2 + \_C3\, x + \_C2\right) \mathrm{e}^{-x} + \_C1\, \mathrm{e}^{x}\}$$

Mathematica raw input

```
DSolve[-y[x] - 2*y'[x] + 2*y'''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + x*C[2] + x^2*C[3] + E^(2*x)*C[4])/E^x}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+2*diff(diff(diff(y(x),x),x),x)-2*diff(y(x),x)-
y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C4*x^2+_C3*x+_C2)*exp(-x)+_C1*exp(x)
```

4.2239 $-2y'''(x)+y''''(x)+2y''(x)-2y'(x)+y(x)=0$

ODE

$$-2y'''(x)+y''''(x)+2y''(x)-2y'(x)+y(x)=0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00870298 (sec), leaf count = 27

$$\{\{y(x)\to e^x(c_4x+c_3)+c_2\sin(x)+c_1\cos(x)\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 21

$$\{y(x)=(\_C2\,x+\_C1)\,\mathrm{e}^x+\_C3\,\sin(x)+\_C4\,\cos(x)\}$$

Mathematica raw input

```
DSolve[y[x] - 2*y'[x] + 2*y''[x] - 2*y'''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(C[3] + x*C[4]) + C[1]*Cos[x] + C[2]*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-2*diff(diff(diff(y(x),x),x),x)+2*diff(diff(y(x),x),x)-
2*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C2*x+_C1)*exp(x)+_C3*sin(x)+_C4*cos(x)
```

4.2240 $2y'''(x) + y''''(x) + 3y''(x) + 2y'(x) + y(x) = 0$

ODE

$$2y'''(x) + y''''(x) + 3y''(x) + 2y'(x) + y(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0103851 (sec), leaf count = 52

$$\left\{\left\{y(x) \to e^{-x/2}\left((c_2 x + c_1)\sin\left(\frac{\sqrt{3}x}{2}\right) + (c_4 x + c_3)\cos\left(\frac{\sqrt{3}x}{2}\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 36

$$\left\{y(x) = \left((\_C4\, x + \_C2)\cos\left(\frac{\sqrt{3}x}{2}\right) + \sin\left(\frac{\sqrt{3}x}{2}\right)(\_C3\, x + \_C1)\right)\mathrm{e}^{-\frac{x}{2}}\right\}$$

Mathematica raw input

```
DSolve[y[x] + 2*y'[x] + 3*y''[x] + 2*y'''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((C[3] + x*C[4])*Cos[(Sqrt[3]*x)/2] + (C[1] + x*C[2])*Sin[(Sqrt[3]*x)/
2])/E^(x/2)}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x)+2*diff(diff(diff(y(x),x),x),x)+3*diff(diff(y(x),x),x)+2*d
```

Maple raw output

```
y(x) = ((_C4*x+_C2)*cos(1/2*3^(1/2)*x)+sin(1/2*3^(1/2)*x)*(_C3*x+_C1))*exp(-1/2*
x)
```

4.2241 $2y'''(x) + y''''(x) - 3y''(x) - 4y'(x) + 4y(x) = 0$

ODE

$$2y'''(x) + y''''(x) - 3y''(x) - 4y'(x) + 4y(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00909112 (sec), leaf count = 35

$$\{\{y(x) \to e^{-2x}\left(c_3 e^{3x} + x\left(c_4 e^{3x} + c_2\right) + c_1\right)\}\}$$

Maple ✓
cpu = 0.008 (sec), leaf count = 23

$$\{y(x) = (\_C4\, x + \_C3)\, \mathrm{e}^{-2x} + \mathrm{e}^{x}(\_C2\, x + \_C1)\}$$

Mathematica raw input

```
DSolve[4*y[x] - 4*y'[x] - 3*y''[x] + 2*y'''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + E^(3*x)*C[3] + x*(C[2] + E^(3*x)*C[4]))/E^(2*x)}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+2*diff(diff(diff(y(x),x),x),x)-3*diff(diff(y(x),x),x)-
4*diff(y(x),x)+4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C4*x+_C3)*exp(-2*x)+exp(x)*(_C2*x+_C1)
```

4.2242 $-3y'''(x)+y''''(x)+y''(x)-y'(x)=0$

ODE

$$-3y'''(x)+y''''(x)+y''(x)-y'(x)=0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0394146 (sec), leaf count = 143

$$\left\{\left\{y(x)\to \frac{c_1 e^{x\text{Root}\left[\#1^3-3\#1^2+\#1-1\&,1\right]}}{\text{Root}\left[\#1^3-3\#1^2+\#1-1\&,1\right]}+\frac{c_3 e^{x\text{Root}\left[\#1^3-3\#1^2+\#1-1\&,3\right]}}{\text{Root}\left[\#1^3-3\#1^2+\#1-1\&,3\right]}+\frac{c_2 e^{x\text{Root}\left[\#1^3-3\#1^2+\#1-1\&,2\right]}}{\text{Root}\left[\#1^3-3\#1^2+\#1-1\&,2\right]}+\right.\right.$$

Maple ✓
cpu = 0.035 (sec), leaf count = 172

$$\left\{y(x)=\_C1+\_C2\,\mathrm{e}^{\frac{\left(\left(27+3\sqrt{57}\right)^{\frac{2}{3}}+3\sqrt[3]{27+3\sqrt{57}}+6\right)x}{3\sqrt[3]{27+3\sqrt{57}}}}-\_C3\,\mathrm{e}^{-\frac{\left(\left(27+3\sqrt{57}\right)^{\frac{2}{3}}-6\sqrt[3]{27+3\sqrt{57}}+6\right)x}{6\sqrt[3]{27+3\sqrt{57}}}}\sin\left(\frac{\sqrt{3}\left(\left(27+3\sqrt{57}\right)^{\frac{2}{3}}-6\right)x}{6\sqrt[3]{27+3\sqrt{57}}}\right.\right.$$

Mathematica raw input

```
DSolve[-y'[x] + y''[x] - 3*y'''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[4] + (E^(x*Root[-1 + #1 - 3*#1^2 + #1^3 & , 1, 0])*C[1])/Root[-1 + #
1 - 3*#1^2 + #1^3 & , 1, 0] + (E^(x*Root[-1 + #1 - 3*#1^2 + #1^3 & , 2, 0])*C[2]
)/Root[-1 + #1 - 3*#1^2 + #1^3 & , 2, 0] + (E^(x*Root[-1 + #1 - 3*#1^2 + #1^3 &
, 3, 0])*C[3])/Root[-1 + #1 - 3*#1^2 + #1^3 & , 3, 0]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-3*diff(diff(diff(y(x),x),x),x)+diff(diff(y(x),x),x)-
diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*exp(1/3*((27+3*57^(1/2))^(2/3)+3*(27+3*57^(1/2))^(1/3)+6)/(27+3*5
7^(1/2))^(1/3)*x)-_C3*exp(-1/6/(27+3*57^(1/2))^(1/3)*((27+3*57^(1/2))^(2/3)-6*(2
7+3*57^(1/2))^(1/3)+6)*x)*sin(1/6/(27+3*57^(1/2))^(1/3)*3^(1/2)*((27+3*57^(1/2))
^(2/3)-6)*x)+_C4*exp(-1/6/(27+3*57^(1/2))^(1/3)*((27+3*57^(1/2))^(2/3)-6*(27+3*5
7^(1/2))^(1/3)+6)*x)*cos(1/6/(27+3*57^(1/2))^(1/3)*3^(1/2)*((27+3*57^(1/2))^(2/3
)-6)*x)
```

4.2243 $-4y'''(x)+y''''(x)+6y''(x)-4y'(x)+y(x)=0$

ODE

$$-4y'''(x)+y''''(x)+6y''(x)-4y'(x)+y(x)=0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00887705 (sec), leaf count = 26

$$\{\{y(x)\to e^x(x(x(c_4x+c_3)+c_2)+c_1)\}\}$$

Maple ✓
cpu = 0.006 (sec), leaf count = 22

$$\{y(x)=\mathrm{e}^x(\_C4\,x^3+\_C3\,x^2+\_C2\,x+\_C1)\}$$

Mathematica raw input

```
DSolve[y[x] - 4*y'[x] + 6*y''[x] - 4*y'''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*(C[1] + x*(C[2] + x*(C[3] + x*C[4])))}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-4*diff(diff(diff(y(x),x),x),x)+6*diff(diff(y(x),x),x)-
4*diff(y(x),x)+y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = exp(x)*(_C4*x^3+_C3*x^2+_C2*x+_C1)
```

4.2244 $-4y'''(x)+y''''(x)+12y''(x)-16y'(x)+16y(x)=0$

ODE

$$-4y'''(x)+y''''(x)+12y''(x)-16y'(x)+16y(x)=0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0110894 (sec), leaf count = 42

$$\left\{\left\{y(x)\to e^x\left((c_2x+c_1)\sin\left(\sqrt{3}x\right)+(c_4x+c_3)\cos\left(\sqrt{3}x\right)\right)\right\}\right\}$$

Maple ✓
cpu = 0.004 (sec), leaf count = 32

$$\left\{y(x)=\left((\_C4\,x+\_C2)\cos\left(\sqrt{3}x\right)+\sin\left(\sqrt{3}x\right)(\_C3\,x+\_C1)\right)\mathrm{e}^x\right\}$$

Mathematica raw input

```
DSolve[16*y[x] - 16*y'[x] + 12*y''[x] - 4*y'''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*((C[3] + x*C[4])*Cos[Sqrt[3]*x] + (C[1] + x*C[2])*Sin[Sqrt[3]*x])}
}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-4*diff(diff(diff(y(x),x),x),x)+12*diff(diff(y(x),x),x)-
16*diff(y(x),x)+16*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ((_C4*x+_C2)*cos(3^(1/2)*x)+sin(3^(1/2)*x)*(_C3*x+_C1))*exp(x)
```

4.2245 $4axy'''(x)+y''''(x)+a^4x^4y(x)+4a^3x^3y'(x)+6a^2x^2y''(x)=0$

ODE

$$4axy'''(x)+y''''(x)+a^4x^4y(x)+4a^3x^3y'(x)+6a^2x^2y''(x)=0$$

ODE Classification

[[_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.721502 (sec), leaf count = 148

$$\left\{\left\{y(x)\to \frac{e^{-\frac{1}{2}x\left(ax+2\sqrt{-\left(\sqrt{6}-3\right)a}\right)}\left(6\sqrt{a}\left(c_2e^{2\sqrt{-\left(\sqrt{6}-3\right)ax}}+c_1\right)+\sqrt{18-6\sqrt{6}}e^{-\frac{\left(-3+\sqrt{3}+\sqrt{6}\right)ax}{\sqrt{-\left(\sqrt{6}-3\right)a}}}\left(c_4e^{\frac{2ax}{\sqrt{a-\sqrt{\frac{2}{3}}a}}}+c_3\right)\right)}{6\sqrt{a}}\right\}\right\}$$

Maple ✓
cpu = 0.046 (sec), leaf count = 84

$$\left\{y(x)-\mathrm{e}^{-\frac{ax^2}{2}}\left(\_C1\,\mathrm{e}^{-\sqrt{-a\sqrt{6}+3\,a}x}+\_C2\,\mathrm{e}^{\sqrt{-a\sqrt{6}+3\,a}x}+\_C3\,\mathrm{e}^{-\sqrt{a\sqrt{6}+3\,a}x}+\_C4\,\mathrm{e}^{\sqrt{a\sqrt{6}+3\,a}x}\right)=0\right\}$$

Mathematica raw input

```
DSolve[a^4*x^4*y[x] + 4*a^3*x^3*y'[x] + 6*a^2*x^2*y''[x] + 4*a*x*y'''[x] + y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (6*Sqrt[a]*(C[1] + E^(2*Sqrt[-((-3 + Sqrt[6])*a)]*x)*C[2]) + (Sqrt[18
- 6*Sqrt[6]]*(C[3] + E^((2*a*x)/Sqrt[a - Sqrt[2/3]*a])*C[4]))/E^(((-3 + Sqrt[3]
+ Sqrt[6])*a*x)/Sqrt[-((-3 + Sqrt[6])*a)]))/(6*Sqrt[a]*E^((x*(2*Sqrt[-((-3 + Sqr
t[6])*a)] + a*x))/2))}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+4*a*x*diff(diff(diff(y(x),x),x),x)+6*a^2*x^2*diff(diff(y
```

Maple raw output

```
y(x)-exp(-1/2*a*x^2)*(_C1*exp(-(-a*6^(1/2)+3*a)^(1/2)*x)+_C2*exp((-a*6^(1/2)+3*a
)^(1/2)*x)+_C3*exp(-(a*6^(1/2)+3*a)^(1/2)*x)+_C4*exp((a*6^(1/2)+3*a)^(1/2)*x)) =
 0
```

4.2246 $2(y''''(x)+(a^2+b^2)y''(x)+a^2b^2y(x))=\cos(ax)+\cos(bx)$

ODE

$$2(y''''(x)+(a^2+b^2)y''(x)+a^2b^2y(x))=\cos(ax)+\cos(bx)$$

ODE Classification

[[_high_order, _linear, _nonhomogeneous]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.908916 (sec), leaf count = 173

$$\left\{\left\{y(x)\to \frac{a\left(2b\left(b^2-a^2\right)\left(b\sin(ax)\left(4ac_4\left(b^2-a^2\right)+x\right)-a\sin(bx)\left(4bc_2\left(a^2-b^2\right)+x\right)\right)+a\left(8a^4b^2c_1-16a^2b^4c_1+a^2+8b\right.\right.\right.}{8a^2b^2(a-b)^2(a+b)^2}$$

Maple ✓
cpu = 0.307 (sec), leaf count = 130

$$\left\{y(x)=\frac{\left(-5\,a^2+b^2\right)\cos\left(ax\right)}{8\,a^2\left(-a+b\right)^2\left(a+b\right)^2}+\frac{\left(a^2-5\,b^2\right)\cos\left(bx\right)}{8\,b^2\left(-a+b\right)^2\left(a+b\right)^2}-\frac{x\sin\left(ax\right)}{4\,a^3-4\,b^2a}+\frac{x\sin\left(bx\right)}{4\,a^2b-4\,b^3}+\_C1\,\cos\left(ax\right)+\_C2\,\cos\left(bx\right)+\right.$$

Mathematica raw input

```
DSolve[2*(a^2*b^2*y[x] + (a^2 + b^2)*y''[x] + y''''[x]) == Cos[a*x] + Cos[b*x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (b^2*(b^2 + 8*a^6*C[3] - 16*a^4*b^2*C[3] + a^2*(-5 + 8*b^4*C[3]))*Cos[
a*x] + a*(a*(a^2 - 5*b^2 + 8*a^4*b^2*C[1] - 16*a^2*b^4*C[1] + 8*b^6*C[1])*Cos[b*
x] + 2*b*(-a^2 + b^2)*(b*(x + 4*a*(-a^2 + b^2)*C[4])*Sin[a*x] - a*(x + 4*b*(a^2
- b^2)*C[2])*Sin[b*x])))/(8*a^2*(a - b)^2*b^2*(a + b)^2)}}
```

Maple raw input

```
dsolve(2*diff(diff(diff(diff(y(x),x),x),x),x)+2*(a^2+b^2)*diff(diff(y(x),x),x)+2*a^2*b^2*y(x) = cos(a
```

Maple raw output

```
y(x) = 1/8*(-5*a^2+b^2)*cos(a*x)/a^2/(-a+b)^2/(a+b)^2+1/8*(a^2-5*b^2)*cos(b*x)/b
^2/(-a+b)^2/(a+b)^2-x*sin(a*x)/(4*a^3-4*a*b^2)+x*sin(b*x)/(4*a^2*b-4*b^3)+_C1*co
s(a*x)+_C2*cos(b*x)+_C3*sin(a*x)+_C4*sin(b*x)
```

4.2247 $-12y'''(x)+4y''''(x)+11y''(x)-3y'(x)=0$

ODE

$$-12y'''(x)+4y''''(x)+11y''(x)-3y'(x)=0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0215341 (sec), leaf count = 38

$$\left\{\left\{y(x)\to 2c_1e^{x/2}+\frac{2}{3}c_2e^{3x/2}+c_3e^x+c_4\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 22

$$\left\{y(x)=\_C1+\_C2\,\mathrm{e}^{\frac{x}{2}}+\_C3\,\mathrm{e}^{x}+\_C4\,\mathrm{e}^{\frac{3x}{2}}\right\}$$

Mathematica raw input

```
DSolve[-3*y'[x] + 11*y''[x] - 12*y'''[x] + 4*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> 2*E^(x/2)*C[1] + (2*E^((3*x)/2)*C[2])/3 + E^x*C[3] + C[4]}}
```

Maple raw input

```
dsolve(4*diff(diff(diff(diff(y(x),x),x),x),x)-12*diff(diff(diff(y(x),x),x),x)+11*diff(diff(y(x),x),x)
3*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*exp(1/2*x)+_C3*exp(x)+_C4*exp(3/2*x)
```

4.2248 $3y'''(x) + xy''''(x) = 0$

ODE

$$3y'''(x) + xy''''(x) = 0$$

ODE Classification

[[_high_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00885721 (sec), leaf count = 25

$$\left\{\left\{y(x) \to x(c_4 x + c_3) + \frac{1}{2}c_1 \log(x) + c_2\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 18

$$\{y(x) = \_C1 + \_C2 \ln(x) + \_C3\, x + \_C4\, x^2\}$$

Mathematica raw input

```
DSolve[3*y'''[x] + x*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2] + x*(C[3] + x*C[4]) + (C[1]*Log[x])/2}}
```

Maple raw input

```
dsolve(x*diff(diff(diff(diff(y(x),x),x),x),x)+3*diff(diff(diff(y(x),x),x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*ln(x)+_C3*x+_C4*x^2
```

4.2249 $5y'''(x) + xy''''(x) = 0$

ODE

$$5y'''(x) + xy''''(x) = 0$$

ODE Classification

[[_high_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00903929 (sec), leaf count = 27

$$\left\{\left\{y(x) \to c_4 x^2 - \frac{c_1}{24x^2} + c_3 x + c_2\right\}\right\}$$

Maple ✓
cpu = 0.011 (sec), leaf count = 19

$$\left\{y(x) = \_C1 + \_C2\, x + \_C3\, x^2 + \frac{\_C4}{x^2}\right\}$$

Mathematica raw input

```
DSolve[5*y'''[x] + x*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -C[1]/(24*x^2) + C[2] + x*C[3] + x^2*C[4]}}
```

Maple raw input

```
dsolve(x*diff(diff(diff(diff(y(x),x),x),x),x)+5*diff(diff(diff(y(x),x),x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*x+_C3*x^2+_C4/x^2
```

4.2250 $x^2 y''''(x) = 2y'''(x)$

ODE

$$x^2 y''''(x) = 2y'''(x)$$

ODE Classification

[[_high_order , _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0609586 (sec), leaf count = 62

$$\left\{\left\{y(x) \to \frac{1}{3}c_1\left(3x^2+6x+2\right)\operatorname{Ei}\left(-\frac{2}{x}\right)+c_4x^2+\frac{1}{6}c_1e^{-2/x}\left(x^2+5x+2\right)x+c_3x+c_2\right\}\right\}$$

Maple ✓
cpu = 0.138 (sec), leaf count = 51

$$\left\{y(x) = -\_C1\left(x^2+2x+\frac{2}{3}\right)Ei\left(1,2x^{-1}\right)+\frac{x\_C1\left(x^2+5x+2\right)}{6}\mathrm{e}^{-2x^{-1}}+\frac{\_C2\,x^2}{2}+\_C3\,x+\_C4\right\}$$

Mathematica raw input

```
DSolve[x^2*y''''[x] == 2*y'''[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x*(2 + 5*x + x^2)*C[1])/(6*E^(2/x)) + C[2] + x*C[3] + x^2*C[4] + ((2
+ 6*x + 3*x^2)*C[1]*ExpIntegralEi[-2/x])/3}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(diff(y(x),x),x),x),x) = 2*diff(diff(diff(y(x),x),x),x), y(x),'implicit')
```

Maple raw output

```
y(x) = -_C1*(x^2+2*x+2/3)*Ei(1,2/x)+1/6*x*_C1*(x^2+5*x+2)*exp(-2/x)+1/2*_C2*x^2+
_C3*x+_C4
```

4.2251 $x^2 y''''(x) = 2y''(x)$

ODE

$$x^2 y''''(x) = 2y''(x)$$

ODE Classification

[[_high_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0267233 (sec), leaf count = 32

$$\left\{\left\{y(x) \to \frac{c_1 x^4}{12} + (c_4 - c_2)\, x + c_2 x \log(x) + c_3\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 19

$$\{y(x) = \_C1 + \_C2\, x^4 + \_C3\, x + \_C4\, x \ln(x)\}$$

Mathematica raw input

```
DSolve[x^2*y''''[x] == 2*y''[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^4*C[1])/12 + C[3] + x*(-C[2] + C[4]) + x*C[2]*Log[x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(diff(y(x),x),x),x),x) = 2*diff(diff(y(x),x),x), y(x),'implicit')
```

Maple raw output

```
y(x) = _C1+_C2*x^4+_C3*x+_C4*x*ln(x)
```

4.2252 $x^2y''''(x)+4xy'''(x)+2y''(x)=0$

ODE

$$x^2y''''(x)+4xy'''(x)+2y''(x)=0$$

ODE Classification

[[_high_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0252559 (sec), leaf count = 29

$$\{\{y(x)\to (c_4-c_1)\,x+(c_1x-c_2)\log(x)+c_3\}\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 17

$$\{y(x)=(\_C2\,x+\_C4)\ln(x)+\_C1\,x+\_C3\}$$

Mathematica raw input

```
DSolve[2*y''[x] + 4*x*y'''[x] + x^2*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3] + x*(-C[1] + C[4]) + (x*C[1] - C[2])*Log[x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(diff(y(x),x),x),x),x)+4*x*diff(diff(diff(y(x),x),x),x)+2*diff(diff(y(x),x),
```

Maple raw output

```
y(x) = (_C2*x+_C4)*ln(x)+_C1*x+_C3
```

4.2253 $x^2y''''(x)+6xy'''(x)+6y''(x)=0$

ODE

$$x^2y''''(x)+6xy'''(x)+6y''(x)=0$$

ODE Classification

[[_high_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0247416 (sec), leaf count = 27

$$\left\{\left\{y(x)\to \frac{c_2}{2x}+c_4x-c_1\log(x)+c_3\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 18

$$\left\{y(x)=\_C1+\_C2\,\ln(x)+\frac{\_C3}{x}+\_C4\,x\right\}$$

Mathematica raw input

```
DSolve[6*y''[x] + 6*x*y'''[x] + x^2*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]/(2*x) + C[3] + x*C[4] - C[1]*Log[x]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(diff(y(x),x),x),x),x)+6*x*diff(diff(diff(y(x),x),x),x)+6*diff(diff(y(x),x),
```

Maple raw output

```
y(x) = _C1+_C2*ln(x)+_C3/x+_C4*x
```

4.2254 $x^2y''''(x)+8xy'''(x)+12y''(x)=0$

ODE

$$x^2y''''(x)+8xy'''(x)+12y''(x)=0$$

ODE Classification

[[_high_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0246149 (sec), leaf count = 27

$$\left\{\left\{y(x)\to \frac{3c_2x+c_1}{6x^2}+c_4x+c_3\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 19

$$\left\{y(x)=\_C1+\frac{\_C2}{x}+\_C3\,x+\frac{\_C4}{x^2}\right\}$$

Mathematica raw input

```
DSolve[12*y''[x] + 8*x*y'''[x] + x^2*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + 3*x*C[2])/(6*x^2) + C[3] + x*C[4]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(diff(y(x),x),x),x),x)+8*x*diff(diff(diff(y(x),x),x),x)+12*diff(diff(y(x),x)
```

Maple raw output

```
y(x) = _C1+_C2/x+_C3*x+_C4/x^2
```

4.2255 $x^2y''''(x)+8xy'''(x)+a^2(-y(x))+12y''(x)=0$

ODE

$$x^2y''''(x)+8xy'''(x)+a^2(-y(x))+12y''(x)=0$$

ODE Classification

[[_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0730083 (sec), leaf count = 146

$$\left\{\left\{y(x)\to c_4 G^{2,0}_{0,4}\left(\frac{a^2x^2}{16}\middle|\begin{matrix}\\ -1,0,-\frac{1}{2},\frac{1}{2}\end{matrix}\right)+c_2 G^{2,0}_{0,4}\left(\frac{a^2x^2}{16}\middle|\begin{matrix}\\ -\frac{1}{2},\frac{1}{2},-1,0\end{matrix}\right)-\frac{3ic_1\left(I_2\left(2\sqrt{a}\sqrt{x}\right)-J_2\left(2\sqrt{a}\sqrt{x}\right)\right)}{4ax}-\frac{c_3\left(J_2\left(2\sqrt{}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.092 (sec), leaf count = 61

$$\left\{y(x)=\frac{1}{x}\left(\_C4\,Y_2\left(2\sqrt{-a}\sqrt{x}\right)+\_C2\,Y_2\left(2\sqrt{a}\sqrt{x}\right)+\_C1\,J_2\left(2\sqrt{a}\sqrt{x}\right)+\_C3\,J_2\left(2\sqrt{-a}\sqrt{x}\right)\right)\right\}$$

Mathematica raw input

```
DSolve[-(a^2*y[x]) + 12*y''[x] + 8*x*y'''[x] + x^2*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (((-3*I)/4)*(BesselI[2, 2*Sqrt[a]*Sqrt[x]] - BesselJ[2, 2*Sqrt[a]*Sqrt
[x]])*C[1])/(a*x) - ((BesselI[2, 2*Sqrt[a]*Sqrt[x]] + BesselJ[2, 2*Sqrt[a]*Sqrt[
x]])*C[3])/(a*x) + C[4]*MeijerG[{{}, {}}, {{-1, 0}, {-1/2, 1/2}}, (a^2*x^2)/16]
+ C[2]*MeijerG[{{}, {}}, {{-1/2, 1/2}, {-1, 0}}, (a^2*x^2)/16]}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(diff(y(x),x),x),x),x)+8*x*diff(diff(diff(y(x),x),x),x)+12*diff(diff(y(x),x)
a^2*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = (_C4*BesselY(2,2*(-a)^(1/2)*x^(1/2))+_C2*BesselY(2,2*a^(1/2)*x^(1/2))+_C1
*BesselJ(2,2*a^(1/2)*x^(1/2))+_C3*BesselJ(2,2*(-a)^(1/2)*x^(1/2)))/x
```

4.2256 $(a+x)^2 y''''(x) = 1$

ODE

$$(a+x)^2 y''''(x) = 1$$

ODE Classification

[[_high_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0197524 (sec), leaf count = 50

$$\left\{\left\{y(x) \to \frac{ax}{2} - \frac{1}{2}(a+x)^2 \log(a+x) + c_4 x^3 + c_3 x^2 + c_2 x + c_1 + \frac{3x^2}{4}\right\}\right\}$$

Maple ✓
cpu = 0.014 (sec), leaf count = 48

$$\left\{y(x) = -\frac{\ln(a+x)(a+x)^2}{2} + \frac{\_C1\, x^3}{6} + \frac{(6\_C2+9)x^2}{12} + \frac{(18a+12\_C3)x}{12} + \frac{a^2}{4} + \_C4\right\}$$

Mathematica raw input

```
DSolve[(a + x)^2*y''''[x] == 1,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a*x)/2 + (3*x^2)/4 + C[1] + x*C[2] + x^2*C[3] + x^3*C[4] - ((a + x)^2
*Log[a + x])/2}}
```

Maple raw input

```
dsolve((a+x)^2*diff(diff(diff(diff(y(x),x),x),x),x) = 1, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/2*ln(a+x)*(a+x)^2+1/6*_C1*x^3+1/12*(6*_C2+9)*x^2+1/12*(18*a+12*_C3)*x+
1/4*a^2+_C4
```

4.2257

$$32x(a-b+2)y'''(x)+16x^2y''''(x)+16(a-b+1)(a-b+2)y''(x)+c^4(-y(x))=0$$

ODE

$$32x(a-b+2)y'''(x)+16x^2y''''(x)+16(a-b+1)(a-b+2)y''(x)+c^4(-y(x))=0$$

ODE Classification

[[_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.16448 (sec), leaf count = 222

$$\left\{\left\{y(x)\to i^{-a}2^{a-3b-3}c^{b-a}x^{\frac{b-a}{2}}\left(i^a4^b(4c_1\Gamma(a-b+1)-ic_2\Gamma(a-b+2))\,J_{a-b}\left(c\sqrt{x}\right)+i^a4^b(4c_1\Gamma(a-b+1)+ic_2\Gamma(a-b+\right.\right.\right.$$

Maple ✓
cpu = 0.078 (sec), leaf count = 67

$$\left\{y(x)=x^{-\frac{a}{2}+\frac{b}{2}}\left(Y_{a-b}\left(c\sqrt{x}\right)\_C4+J_{a-b}\left(c\sqrt{x}\right)\_C2+K_{a-b}\left(c\sqrt{x}\right)\_C3+I_{a-b}\left(c\sqrt{x}\right)\_C1\right)\right\}$$

Mathematica raw input

```
DSolve[-(c^4*y[x]) + 16*(1 + a - b)*(2 + a - b)*y''[x] + 32*(2 + a - b)*x*y'''[x] + 16*x^2*y''''[x] =
```

Mathematica raw output

```
{{y[x] -> (2^(-3 + a - 3*b)*c^(-a + b)*x^((-a + b)/2)*(I^a*4^b*BesselJ[a - b, c*
Sqrt[x]]*(4*C[1]*Gamma[1 + a - b] - I*C[2]*Gamma[2 + a - b]) + I^a*4^b*BesselI[a
 - b, c*Sqrt[x]]*(4*C[1]*Gamma[1 + a - b] + I*C[2]*Gamma[2 + a - b]) + I^b*4^a*(
BesselJ[-a + b, c*Sqrt[x]]*(4*C[3]*Gamma[1 - a + b] - I*C[4]*Gamma[2 - a + b]) +
 BesselI[-a + b, c*Sqrt[x]]*(4*C[3]*Gamma[1 - a + b] + I*C[4]*Gamma[2 - a + b]))
))/I^a}}
```

Maple raw input

```
dsolve(16*x^2*diff(diff(diff(diff(y(x),x),x),x),x)+32*(2+a-b)*x*diff(diff(diff(y(x),x),x),x)+16*(1+a-
b)*(2+a-b)*diff(diff(y(x),x),x)-c^4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = x^(-1/2*a+1/2*b)*(BesselY(a-b,c*x^(1/2))*_C4+BesselJ(a-b,c*x^(1/2))*_C2+B
esselK(a-b,c*x^(1/2))*_C3+BesselI(a-b,c*x^(1/2))*_C1)
```

4.2258 $x^3 y''''(x) + 2x^2 y'''(x) + a^4(-x^3)\, y(x) - x y''(x) = 0$

ODE

$$x^3 y''''(x) + 2x^2 y'''(x) + a^4(-x^3)\, y(x) - x y''(x) = 0$$

ODE Classification

[[_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.839093 (sec), leaf count = 310

$$\left\{\left\{y(x) \to c_1\, {}_0F_3\left(;\frac{3}{4},\frac{5}{8}-\frac{\sqrt{5}}{8},\frac{5}{8}+\frac{\sqrt{5}}{8};\frac{a^4x^4}{256}\right)+2^{-3-\sqrt{5}}\left((-1)^{\frac{1}{8}\left(3-\sqrt{5}\right)}a^{\frac{3}{2}-\frac{\sqrt{5}}{2}}x^{\frac{3}{2}-\frac{\sqrt{5}}{2}}\left(4^{\sqrt{5}}c_3\, {}_0F_3\left(;1-\frac{\sqrt{5}}{4},\frac{9}{8}-\frac{\sqrt{5}}{8},\frac{11}{8}\right.\right.\right.\right.$$

Maple ✓
cpu = 0.215 (sec), leaf count = 148

$$\left\{y(x) = \_C1\ {}_0\mathrm{F}_3(\ ;\ \frac{3}{4},\frac{5}{8}+\frac{\sqrt{5}}{8},\frac{5}{8}-\frac{\sqrt{5}}{8};\ \frac{a^4x^4}{256}) + \_C2\ x\, {}_0\mathrm{F}_3(\ ;\ \frac{5}{4},\frac{7}{8}+\frac{\sqrt{5}}{8},\frac{7}{8}-\frac{\sqrt{5}}{8};\ \frac{a^4x^4}{256}) + \_C3\ x^{\frac{3}{2}-\frac{\sqrt{5}}{2}}\, {}_0\mathrm{F}_3(\ ;\ 1-\frac{\sqrt{5}}{4}\right.$$

Mathematica raw input

```
DSolve[-(a^4*x^3*y[x]) - x*y''[x] + 2*x^2*y'''[x] + x^3*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1]*HypergeometricPFQ[{}, {3/4, 5/8 - Sqrt[5]/8, 5/8 + Sqrt[5]/8}, (a
^4*x^4)/256] + 2^(-3 - Sqrt[5])*((1 + I)*2^(1/2 + Sqrt[5])*a*x*C[2]*Hypergeometr
icPFQ[{}, {5/4, 7/8 - Sqrt[5]/8, 7/8 + Sqrt[5]/8}, (a^4*x^4)/256] + (-1)^((3 - S
qrt[5])/8)*a^(3/2 - Sqrt[5]/2)*x^(3/2 - Sqrt[5]/2)*(4^Sqrt[5]*C[3]*Hypergeometri
cPFQ[{}, {1 - Sqrt[5]/4, 9/8 - Sqrt[5]/8, 11/8 - Sqrt[5]/8}, (a^4*x^4)/256] + (-
1)^(Sqrt[5]/4)*a^Sqrt[5]*x^Sqrt[5]*C[4]*HypergeometricPFQ[{}, {9/8 + Sqrt[5]/8,
11/8 + Sqrt[5]/8, 1 + Sqrt[5]/4}, (a^4*x^4)/256]))}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(diff(y(x),x),x),x),x)+2*x^2*diff(diff(diff(y(x),x),x),x)-x*diff(diff(y(x),x
a^4*x^3*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([],[3/4, 5/8+1/8*5^(1/2), 5/8-1/8*5^(1/2)],1/256*a^4*x^4)+_
C2*x*hypergeom([],[5/4, 7/8+1/8*5^(1/2), 7/8-1/8*5^(1/2)],1/256*a^4*x^4)+_C3*x^(
3/2-1/2*5^(1/2))*hypergeom([],[1-1/4*5^(1/2), 9/8-1/8*5^(1/2), 11/8-1/8*5^(1/2)]
,1/256*a^4*x^4)+_C4*x^(3/2+1/2*5^(1/2))*hypergeom([],[1+1/4*5^(1/2), 9/8+1/8*5^(
1/2), 11/8+1/8*5^(1/2)],1/256*a^4*x^4)
```

4.2259 $x^3 y''''(x) + 6x^2 y'''(x) + 6xy''(x) = 0$

ODE

$$x^3 y''''(x) + 6x^2 y'''(x) + 6xy''(x) = 0$$

ODE Classification

[[_high_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0275706 (sec), leaf count = 27

$$\left\{\left\{y(x) \to \frac{c_2}{2x} + c_4 x - c_1 \log(x) + c_3\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 18

$$\left\{y(x) = \_C1 + \_C2 \ln(x) + \frac{\_C3}{x} + \_C4\, x\right\}$$

Mathematica raw input

```
DSolve[6*x*y''[x] + 6*x^2*y'''[x] + x^3*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[2]/(2*x) + C[3] + x*C[4] - C[1]*Log[x]}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(diff(y(x),x),x),x),x)+6*x^2*diff(diff(diff(y(x),x),x),x)+6*x*diff(diff(y(x)
```

Maple raw output

```
y(x) = _C1+_C2*ln(x)+_C3/x+_C4*x
```

4.2260 $x^2(a+b+c+3)y'''(x)+x^3y''''(x)+x(ab+ac+a+bc+b+c+1)y''(x)-y'(x)(x-abc)-ky(x)=0$

ODE

$$x^2(a+b+c+3)y'''(x)+x^3y''''(x)+x(ab+ac+a+bc+b+c+1)y''(x)-y'(x)(x-abc)-ky(x)=0$$

ODE Classification

[[_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.208939 (sec), leaf count = 146

$$\{\{y(x)\to x((-1)^{1-a}c_2x^{-a}\,{}_1F_3(-a+k+1;2-a,-a+b+1,-a+c+1;x)+(-1)^{1-b}c_3x^{-b}\,{}_1F_3(-b+k+1;2-b,a-b-$$

Maple ✓
cpu = 0.07 (sec), leaf count = 123

$$\{y(x)=\_C1\,{}_1\mathrm{F}_3(k;\,a,b,c;\,x)+\_C2\,x^{1-a}{}_1\mathrm{F}_3(1-a+k;\,2-a,1-a+c,1-a+b;\,x)+\_C3\,x^{1-b}{}_1\mathrm{F}_3(1-b+k;\,2-b,1$$

Mathematica raw input

```
DSolve[-(k*y[x]) - (-(a*b*c) + x)*y'[x] + (1 + a + b + a*b + c + a*c + b*c)*x*y''[x] + (3 + a + b + c
```

Mathematica raw output

```
{{y[x] -> C[1]*HypergeometricPFQ[{k}, {a, b, c}, x] + x*(((-1)^(1 - a)*C[2]*Hype
rgeometricPFQ[{1 - a + k}, {2 - a, 1 - a + b, 1 - a + c}, x])/x^a + ((-1)^(1 - b
)*C[3]*HypergeometricPFQ[{1 - b + k}, {2 - b, 1 + a - b, 1 - b + c}, x])/x^b + (
(-1)^(1 - c)*C[4]*HypergeometricPFQ[{1 - c + k}, {2 - c, 1 + a - c, 1 + b - c},
x])/x^c)}}
```

Maple raw input

```
dsolve(x^3*diff(diff(diff(diff(y(x),x),x),x),x)+(3+a+b+c)*x^2*diff(diff(diff(y(x),x),x),x)+(a*b+a*c+b
(-a*b*c+x)*diff(y(x),x)-k*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([k],[a, b, c],x)+_C2*x^(1-a)*hypergeom([1-a+k],[2-a, 1-a+c,
 1-a+b],x)+_C3*x^(1-b)*hypergeom([1-b+k],[2-b, 1+a-b, 1-b+c],x)+_C4*x^(-c+1)*hyp
ergeom([1-c+k],[2-c, 1-c+b, 1-c+a],x)
```

4.2261 $x^4 y''''(x) + 6x^3 y'''(x) + 4x^2 y''(x) - 2xy'(x) - 4y(x) = 0$

ODE

$$x^4 y''''(x) + 6x^3 y'''(x) + 4x^2 y''(x) - 2xy'(x) - 4y(x) = 0$$

ODE Classification

[[_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0128049 (sec), leaf count = 30

$$\left\{\left\{y(x) \to c_4 x^2 + \frac{c_3}{x^2} + c_2 \sin(\log(x)) + c_1 \cos(\log(x))\right\}\right\}$$

Maple ✓
cpu = 0.01 (sec), leaf count = 25

$$\left\{y(x) = \_C1\, x^2 + \frac{\_C2}{x^2} + \_C3\, \sin(\ln(x)) + \_C4\, \cos(\ln(x))\right\}$$

Mathematica raw input

```
DSolve[-4*y[x] - 2*x*y'[x] + 4*x^2*y''[x] + 6*x^3*y'''[x] + x^4*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[3]/x^2 + x^2*C[4] + C[1]*Cos[Log[x]] + C[2]*Sin[Log[x]]}}
```

Maple raw input

```
dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)+6*x^3*diff(diff(diff(y(x),x),x),x)+4*x^2*diff(diff(y(
2*x*diff(y(x),x)-4*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*x^2+_C2/x^2+_C3*sin(ln(x))+_C4*cos(ln(x))
```

4.2262 $x^4 y''''(x) + 6x^3 y'''(x) + 9x^2 y''(x) + 3xy'(x) + y(x) = 0$

ODE

$$x^4 y''''(x) + 6x^3 y'''(x) + 9x^2 y''(x) + 3xy'(x) + y(x) = 0$$

ODE Classification

[[_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0123044 (sec), leaf count = 30

$$\{\{y(x) \to (c_4 \log(x) + c_3)\sin(\log(x)) + (c_2 \log(x) + c_1)\cos(\log(x))\}\}$$

Maple ✓
cpu = 0.005 (sec), leaf count = 25

$$\{y(x) = (\_C4\ \ln(x) + \_C2)\cos(\ln(x)) + \sin(\ln(x))\,(\_C3\ \ln(x) + \_C1)\}$$

Mathematica raw input

```
DSolve[y[x] + 3*x*y'[x] + 9*x^2*y''[x] + 6*x^3*y'''[x] + x^4*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> Cos[Log[x]]*(C[1] + C[2]*Log[x]) + (C[3] + C[4]*Log[x])*Sin[Log[x]]}}
```

Maple raw input

```
dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)+6*x^3*diff(diff(diff(y(x),x),x),x)+9*x^2*diff(diff(y(
```

Maple raw output

```
y(x) = (_C4*ln(x)+_C2)*cos(ln(x))+sin(ln(x))*(_C3*ln(x)+_C1)
```

4.2263 $x^4 y''''(x) + 8x^3 y'''(x) + 12x^2 y''(x) = 0$

ODE

$$x^4 y''''(x) + 8x^3 y'''(x) + 12x^2 y''(x) = 0$$

ODE Classification

[[_high_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0268161 (sec), leaf count = 27

$$\left\{\left\{y(x) \to \frac{3c_2 x + c_1}{6x^2} + c_4 x + c_3\right\}\right\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 19

$$\left\{y(x) = \_C1 + \frac{\_C2}{x} + \_C3\, x + \frac{\_C4}{x^2}\right\}$$

Mathematica raw input

```
DSolve[12*x^2*y''[x] + 8*x^3*y'''[x] + x^4*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1] + 3*x*C[2])/(6*x^2) + C[3] + x*C[4]}}
```

Maple raw input

```
dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)+8*x^3*diff(diff(diff(y(x),x),x),x)+12*x^2*diff(diff(y
```

Maple raw output

```
y(x) = _C1+_C2/x+_C3*x+_C4/x^2
```

4.2264 $x^4 y''''(x) + 8x^3 y'''(x) + a y(x) + 12x^2 y''(x) = 0$

ODE

$$x^4 y''''(x) + 8x^3 y'''(x) + a y(x) + 12x^2 y''(x) = 0$$

ODE Classification

[[_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0145875 (sec), leaf count = 116

$$\left\{\left\{y(x) \to \frac{c_1 x^{-\frac{1}{2}\sqrt{5-4\sqrt{1-a}}} + c_2 x^{\frac{1}{2}\sqrt{5-4\sqrt{1-a}}} + c_3 x^{-\frac{1}{2}\sqrt{4\sqrt{1-a}+5}} + c_4 x^{\frac{1}{2}\sqrt{4\sqrt{1-a}+5}}}{\sqrt{x}}\right\}\right\}$$

Maple ✓
cpu = 0.027 (sec), leaf count = 89

$$\left\{y(x) = \_C1\, x^{-\frac{1}{2}-\frac{1}{2}\sqrt{5-4\sqrt{1-a}}} + \_C2\, x^{-\frac{1}{2}+\frac{1}{2}\sqrt{5-4\sqrt{1-a}}} + \_C3\, x^{-\frac{1}{2}-\frac{1}{2}\sqrt{5+4\sqrt{1-a}}} + \_C4\, x^{-\frac{1}{2}+\frac{1}{2}\sqrt{5+4\sqrt{1-a}}}\right\}$$

Mathematica raw input

```
DSolve[a*y[x] + 12*x^2*y''[x] + 8*x^3*y'''[x] + x^4*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[1]/x^(Sqrt[5 - 4*Sqrt[1 - a]]/2) + x^(Sqrt[5 - 4*Sqrt[1 - a]]/2)*C[
2] + C[3]/x^(Sqrt[5 + 4*Sqrt[1 - a]]/2) + x^(Sqrt[5 + 4*Sqrt[1 - a]]/2)*C[4])/Sq
rt[x]}}
```

Maple raw input

```
dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)+8*x^3*diff(diff(diff(y(x),x),x),x)+12*x^2*diff(diff(y
```

Maple raw output

```
y(x) = _C1*x^(-1/2-1/2*(5-4*(1-a)^(1/2))^(1/2))+_C2*x^(-1/2+1/2*(5-4*(1-a)^(1/2)
)^(1/2))+_C3*x^(-1/2-1/2*(5+4*(1-a)^(1/2))^(1/2))+_C4*x^(-1/2+1/2*(5+4*(1-a)^(1/
2))^(1/2))
```

4.2265 $\mathbf{A1}x^3y'''(x)+x^4y''''(x)+\mathbf{A2}x^2y''(x)+\mathbf{A3}xy'(x)+\mathbf{A4}y(x)=0$

ODE

$$\mathrm{A1}x^3y'''(x)+x^4y''''(x)+\mathrm{A2}x^2y''(x)+\mathrm{A3}xy'(x)+\mathrm{A4}y(x)=0$$

ODE Classification

[[_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0140151 (sec), leaf count = 186

$$\left\{\left\{y(x)\to c_1x^{\text{Root}\left[\#1^4+\#1^3(\mathrm{A1}-6)+\#1^2(-3\mathrm{A1}+\mathrm{A2}+11)+\#1(2\mathrm{A1}-\mathrm{A2}+\mathrm{A3}-6)+\mathrm{A4}\&,1\right]}+c_2x^{\text{Root}\left[\#1^4+\#1^3(\mathrm{A1}-6)+\#1^2(-3\mathrm{A1}+\mathrm{A2}+11)+\#\right.}\right.$$

Maple ✓
cpu = 0.018 (sec), leaf count = 51

$$\left\{y(x)=\sum_{\_a=1}^{4}x^{RootOf\left(\_Z^4+(A1-6)\_Z^3+(A2-3\,A1+11)\_Z^2+(A3-A2+2\,A1-6)\_Z+A4,index=\_a\right)}\_C_{\_a}\right\}$$

Mathematica raw input

```
DSolve[A4*y[x] + A3*x*y'[x] + A2*x^2*y''[x] + A1*x^3*y'''[x] + x^4*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> x^Root[A4 + (-6 + 2*A1 - A2 + A3)*#1 + (11 - 3*A1 + A2)*#1^2 + (-6 + A
1)*#1^3 + #1^4 & , 1]*C[1] + x^Root[A4 + (-6 + 2*A1 - A2 + A3)*#1 + (11 - 3*A1 +
 A2)*#1^2 + (-6 + A1)*#1^3 + #1^4 & , 2]*C[2] + x^Root[A4 + (-6 + 2*A1 - A2 + A3
)*#1 + (11 - 3*A1 + A2)*#1^2 + (-6 + A1)*#1^3 + #1^4 & , 3]*C[3] + x^Root[A4 + (
-6 + 2*A1 - A2 + A3)*#1 + (11 - 3*A1 + A2)*#1^2 + (-6 + A1)*#1^3 + #1^4 & , 4]*C
[4]}}
```

Maple raw input

```
dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)+A1*x^3*diff(diff(diff(y(x),x),x),x)+A2*x^2*diff(diff(
```

Maple raw output

```
y(x) = Sum(x^RootOf(_Z^4+(A1-6)*_Z^3+(A2-3*A1+11)*_Z^2+(A3-A2+2*A1-6)*_Z+A4,inde
x = _a)*_C[_a],_a = 1 .. 4)
```

4.2266

$$16a^4x^4y''''(x)-32(1-2a)a^2x^3y'''(x)+16(1-2a)(1-a)a^2x^2y''(x)-b^4x^{2/a}y(x)=0$$

ODE

$$16a^4x^4y''''(x) - 32(1 - 2a)a^2x^3y'''(x) + 16(1 - 2a)(1 - a)a^2x^2y''(x) - b^4x^{2/a}y(x) = 0$$

ODE Classification

[[_high_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.13453 (sec), leaf count = 860

$$\left\{\left\{y(x)\to \left(\frac{i}{16}\right)^a b^{2a}c_2\,{}_0F_3\left(;\frac{a}{2}+1,-\frac{3a}{4}+2-\frac{\sqrt{-7a^4+4a^3+16a^2-16a+4}}{4a}-\frac{1}{2a},-\frac{3a}{4}+2+\frac{\sqrt{-7a^4+4a^3+16a^2}}{4a}\right.\right.\right.$$

Maple ✓
cpu = 0.218 (sec), leaf count = 508

$$\left\{y(x)=\_C1\,{}_0\mathrm{F}_3\left(\,;1-\frac{a}{2},-\frac{1}{4\,a}\left(5\,a^2+\sqrt{-7\,a^4+4\,a^3+16\,a^2-16\,a+4}-8\,a+2\right),\frac{1}{4\,a}\left(-5\,a^2+\sqrt{-7\,a^4+4\,a^3+16\,a^2}\right.\right.\right.$$

Mathematica raw input

```
DSolve[-(b^4*x^(2/a)*y[x]) + 16*(1 - 2*a)*(1 - a)*a^2*x^2*y''[x] - 32*(1 - 2*a)*a^2*x^3*y'''[x] + 16*
```

Mathematica raw output

```
{{y[x] -> C[1]*HypergeometricPFQ[{}, {1 - a/2, 2 - 1/(2*a) - (5*a)/4 - Sqrt[4 -
16*a + 16*a^2 + 4*a^3 - 7*a^4]/(4*a), 2 - 1/(2*a) - (5*a)/4 + Sqrt[4 - 16*a + 16
*a^2 + 4*a^3 - 7*a^4]/(4*a)}, (b^4*x^(2/a))/256] + (I/16)^a*b^(2*a)*(x^(2/a))^(a
/2)*C[2]*HypergeometricPFQ[{}, {1 + a/2, 2 - 1/(2*a) - (3*a)/4 - Sqrt[4 - 16*a +
 16*a^2 + 4*a^3 - 7*a^4]/(4*a), 2 - 1/(2*a) - (3*a)/4 + Sqrt[4 - 16*a + 16*a^2 +
 4*a^3 - 7*a^4]/(4*a)}, (b^4*x^(2/a))/256] + ((-1)^(1 + (5*a)/4 - Sqrt[4 - 16*a
+ 16*a^2 + 4*a^3 - 7*a^4]/(4*a))*I^a^(-1)*b^((2 - 4*a + 5*a^2 - Sqrt[4 - 16*a +
16*a^2 + 4*a^3 - 7*a^4])/a)*(16^(Sqrt[4 - 16*a + 16*a^2 + 4*a^3 - 7*a^4]/a)*C[3]
*HypergeometricPFQ[{}, {1 - Sqrt[4 - 16*a + 16*a^2 + 4*a^3 - 7*a^4]/(2*a), 1/(2*
a) + (3*a)/4 - Sqrt[4 - 16*a + 16*a^2 + 4*a^3 - 7*a^4]/(4*a), 1/(2*a) + (5*a)/4
- Sqrt[4 - 16*a + 16*a^2 + 4*a^3 - 7*a^4]/(4*a)}, (b^4*x^(2/a))/256] + I^(Sqrt[4
```

```
 - 16*a + 16*a^2 + 4*a^3 - 7*a^4]/a)*b^((2*Sqrt[4 - 16*a + 16*a^2 + 4*a^3 - 7*a^
4])/a)*(x^(2/a))^(Sqrt[4 - 16*a + 16*a^2 + 4*a^3 - 7*a^4]/(2*a))*C[4]*Hypergeome
tricPFQ[{}, {1/(2*a) + (3*a)/4 + Sqrt[4 - 16*a + 16*a^2 + 4*a^3 - 7*a^4]/(4*a),
1/(2*a) + (5*a)/4 + Sqrt[4 - 16*a + 16*a^2 + 4*a^3 - 7*a^4]/(4*a), 1 + Sqrt[4 -
16*a + 16*a^2 + 4*a^3 - 7*a^4]/(2*a)}, (b^4*x^(2/a))/256]))/(4^((2 - 4*a + 5*a^2
 + Sqrt[4 - 16*a + 16*a^2 + 4*a^3 - 7*a^4])/a)*(x^(2/a))^((-2 + 4*a - 5*a^2 + Sq
rt[4 - 16*a + 16*a^2 + 4*a^3 - 7*a^4])/(4*a)))}}
```

Maple raw input

```
dsolve(16*a^4*x^4*diff(diff(diff(diff(y(x),x),x),x),x)-32*a^2*x^3*(1-2*a)*diff(diff(diff(y(x),x),x),x
a)*(1-2*a)*diff(diff(y(x),x),x)-b^4*x^(2/a)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*hypergeom([],[1-1/2*a, -1/4*(5*a^2+(-7*a^4+4*a^3+16*a^2-16*a+4)^(1/2)
-8*a+2)/a, 1/4*(-5*a^2+(-7*a^4+4*a^3+16*a^2-16*a+4)^(1/2)+8*a-2)/a],1/256*b^4*x^
(2/a))+_C2*x*hypergeom([],[1+1/2*a, -1/4*(3*a^2+(-7*a^4+4*a^3+16*a^2-16*a+4)^(1/
2)-8*a+2)/a, 1/4*(-3*a^2+(-7*a^4+4*a^3+16*a^2-16*a+4)^(1/2)+8*a-2)/a],1/256*b^4*
x^(2/a))+_C3*x^(1/2/a^2*(5*a^2-4*a+2+(-7*a^4+4*a^3+16*a^2-16*a+4)^(1/2)))*hyperg
eom([],[1/2*(2*a+(-7*a^4+4*a^3+16*a^2-16*a+4)^(1/2))/a, 1/4*(3*a^2+(-7*a^4+4*a^3
+16*a^2-16*a+4)^(1/2)+2)/a, 1/4*(5*a^2+(-7*a^4+4*a^3+16*a^2-16*a+4)^(1/2)+2)/a],
1/256*b^4*x^(2/a))+_C4*x^(-1/2*(-5*a^2+(-7*a^4+4*a^3+16*a^2-16*a+4)^(1/2)+4*a-2)
/a^2)*hypergeom([],[-1/2*(-2*a+(-7*a^4+4*a^3+16*a^2-16*a+4)^(1/2))/a, -1/4*(-5*a
^2+(-7*a^4+4*a^3+16*a^2-16*a+4)^(1/2)-2)/a, -1/4*(-3*a^2+(-7*a^4+4*a^3+16*a^2-16
*a+4)^(1/2)-2)/a],1/256*b^4*x^(2/a))
```

4.2267 $4(e^x+2)\,y'''(x)+(2x+e^x)\,y''''(x)+6e^x y''(x)+4e^x y'(x)+e^x y(x)=0$

ODE

$$4(e^x+2)\,y'''(x)+(2x+e^x)\,y''''(x)+6e^x y''(x)+4e^x y'(x)+e^x y(x)=0$$

ODE Classification

[[_high_order, _fully, _exact, _linear]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0519453 (sec), leaf count = 0 , could not solve

```
DSolve[E^x*y[x] + 4*E^x*Derivative[1][y][x] + 6*E^x*Derivative[2][y][x] + 4*(2 + E^x)*Derivative[3][y
```

Maple ✓
cpu = 0.017 (sec), leaf count = 28

$$\left\{y(x)=\frac{\_C1\,x^3+\_C2\,x^2+\_C3\,x+\_C4}{2\,x+\mathrm{e}^x}\right\}$$

Mathematica raw input

```
DSolve[E^x*y[x] + 4*E^x*y'[x] + 6*E^x*y''[x] + 4*(2 + E^x)*y'''[x] + (E^x + 2*x)*y''''[x] == 0,y[x],x
```

Mathematica raw output

```
DSolve[E^x*y[x] + 4*E^x*Derivative[1][y][x] + 6*E^x*Derivative[2][y][x] + 4*(2 +
 E^x)*Derivative[3][y][x] + (E^x + 2*x)*Derivative[4][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve((2*x+exp(x))*diff(diff(diff(diff(y(x),x),x),x),x)+4*(2+exp(x))*diff(diff(diff(y(x),x),x),x)+6*
```

Maple raw output

```
y(x) = (_C1*x^3+_C2*x^2+_C3*x+_C4)/(2*x+exp(x))
```

4.2268 $-y'''(x)+y''''(x)-2y''(x)+2y'(x)=0$

ODE

$$-y'''(x)+y''''(x)-2y''(x)+2y'(x)=0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.136413 (sec), leaf count = 53

$$\left\{\left\{y(x)\to \frac{1}{2}e^{-x}\left(2e^{2x}(c_4(x-1)+c_3)+(c_2-c_1)\sin(x)-(c_1+c_2)\cos(x)\right)+c_5\right\}\right\}$$

Maple ✓
cpu = 0.009 (sec), leaf count = 28

$$\{y(x) = (\_C4\ \sin(x)+\_C5\ \cos(x))\,\mathrm{e}^{-x}+(\_C3\,x+\_C2)\,\mathrm{e}^{x}+\_C1\}$$

Mathematica raw input

```
DSolve[2*y'[x] - 2*y''[x] - y'''[x] + y'''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[5] + (2*E^(2*x)*(C[3] + (-1 + x)*C[4]) - (C[1] + C[2])*Cos[x] + (-C[
1] + C[2])*Sin[x])/(2*E^x)}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(diff(y(x),x),x),x),x),x)-diff(diff(diff(y(x),x),x),x)-2*diff(diff(y(x),x),
```

Maple raw output

```
y(x) = (_C4*sin(x)+_C5*cos(x))*exp(-x)+(_C3*x+_C2)*exp(x)+_C1
```

4.2269 $2y'''(x) + y''''(x) + y'(x) = 0$

ODE

$$2y'''(x) + y''''(x) + y'(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.031045 (sec), leaf count = 35

$$\{\{y(x) \to (c_2 x + c_1 + c_4)\sin(x) + (-c_4 x + c_2 - c_3)\cos(x) + c_5\}\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 22

$$\{y(x) = (\_C5\, x + \_C3)\cos(x) + (\_C4\, x + \_C2)\sin(x) + \_C1\}$$

Mathematica raw input

```
DSolve[y'[x] + 2*y'''[x] + y'''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[5] + (C[2] - C[3] - x*C[4])*Cos[x] + (C[1] + x*C[2] + C[4])*Sin[x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(diff(y(x),x),x),x),x)+2*diff(diff(diff(y(x),x),x),x)+diff(y(x),x) = 0,
```

Maple raw output

```
y(x) = (_C5*x+_C3)*cos(x)+(_C4*x+_C2)*sin(x)+_C1
```

4.2270 $2y'''(x) + y'''''(x) + y'(x) = ax + b\cos(x) + c\sin(x)$

ODE

$$2y'''(x) + y'''''(x) + y'(x) = ax + b\cos(x) + c\sin(x)$$

ODE Classification

[[_high_order, _missing_y]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.6732 (sec), leaf count = 80

$$\left\{\left\{y(x) \to \frac{ax^2}{2} + \sin(x)\left(-\frac{bx^2}{8} + \frac{13b}{16} - \frac{3cx}{8} + c_2x + c_1 + c_4\right) + \cos(x)\left(-\frac{5bx}{8} + \frac{1}{16}c\left(2x^2 - 9\right) - c_4x + c_2 - c_3\right) + c_5\right\}\right\}$$

Maple ✓
cpu = 0.412 (sec), leaf count = 69

$$\left\{y(x) = \frac{\left(cx^2 + \left(-4b - 8\_C4\right)x - 6c - 8\_C2 + 8\_C3\right)\cos(x)}{8} + \frac{\left(-bx^2 + \left(-4c + 8\_C3\right)x + 6b + 8\_C1 + 8\_C4\right)\text{si}}{8}\right.$$

Mathematica raw input

```
DSolve[y'[x] + 2*y'''[x] + y'''''[x] == a*x + b*Cos[x] + c*Sin[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (a*x^2)/2 + C[5] + ((-5*b*x)/8 + (c*(-9 + 2*x^2))/16 + C[2] - C[3] - x
*C[4])*Cos[x] + ((13*b)/16 - (3*c*x)/8 - (b*x^2)/8 + C[1] + x*C[2] + C[4])*Sin[x
]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(diff(y(x),x),x),x),x)+2*diff(diff(diff(y(x),x),x),x)+diff(y(x),x) = a*x
```

Maple raw output

```
y(x) = 1/8*(c*x^2+(-4*b-8*_C4)*x-6*c-8*_C2+8*_C3)*cos(x)+1/8*(-b*x^2+(-4*c+8*_C3
)*x+6*b+8*_C1+8*_C4)*sin(x)+1/2*a*x^2+_C5
```

4.2271 $y''''''(x) = 0$

ODE

$$y''''''(x) = 0$$

ODE Classification

[[_high_order, _quadrature]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00716993 (sec), leaf count = 32

$$\{\{y(x) \to x(x(x(x(c_6 x + c_5) + c_4) + c_3) + c_2) + c_1\}\}$$

Maple ✓
cpu = 0.012 (sec), leaf count = 33

$$\left\{y(x) = \frac{\_C1\, x^5}{120} + \frac{\_C2\, x^4}{24} + \frac{\_C3\, x^3}{6} + \frac{\_C4\, x^2}{2} + \_C5\, x + \_C6\right\}$$

Mathematica raw input

```
DSolve[y''''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> C[1] + x*(C[2] + x*(C[3] + x*(C[4] + x*(C[5] + x*C[6]))))}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(diff(diff(y(x),x),x),x),x),x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/120*_C1*x^5+1/24*_C2*x^4+1/6*_C3*x^3+1/2*_C4*x^2+_C5*x+_C6
```

4.2272 $y''''''(x) + ay(x) = 0$

ODE

$$y''''''(x) + ay(x) = 0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0083526 (sec), leaf count = 98

$$\left\{\left\{y(x) \to c_2 e^{(-1)^{5/6}\sqrt[6]{a}x} + c_3 e^{-\sqrt[6]{-1}\sqrt[6]{a}x} + c_5 e^{-(-1)^{5/6}\sqrt[6]{a}x} + c_6 e^{\sqrt[6]{-1}\sqrt[6]{a}x} + c_4 \sin\left(\sqrt[6]{a}x\right) + c_1 \cos\left(\sqrt[6]{a}x\right)\right\}\right\}$$

Maple ✓
cpu = 0.013 (sec), leaf count = 102

$$\left\{y(x) = \_C1\, \mathrm{e}^{-\frac{\left(i\sqrt{3}-1\right)x}{2}\sqrt[6]{-a}} + \_C2\, \mathrm{e}^{-\frac{\left(i\sqrt{3}+1\right)x}{2}\sqrt[6]{-a}} + \_C3\, \mathrm{e}^{\frac{\left(i\sqrt{3}-1\right)x}{2}\sqrt[6]{-a}} + \_C4\, \mathrm{e}^{\frac{\left(i\sqrt{3}+1\right)x}{2}\sqrt[6]{-a}} + \_C5\, \mathrm{e}^{-\sqrt[6]{-a}x} + \_C6\, \mathrm{e}^{\sqrt[6]{-a}x}\right.$$

Mathematica raw input

```
DSolve[a*y[x] + y''''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^((-1)^(5/6)*a^(1/6)*x)*C[2] + C[3]/E^((-1)^(1/6)*a^(1/6)*x) + C[5]/E
^((-1)^(5/6)*a^(1/6)*x) + E^((-1)^(1/6)*a^(1/6)*x)*C[6] + C[1]*Cos[a^(1/6)*x] +
C[4]*Sin[a^(1/6)*x]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(diff(diff(y(x),x),x),x),x),x),x)+a*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = _C1*exp(-1/2*(I*3^(1/2)-1)*(-a)^(1/6)*x)+_C2*exp(-1/2*(I*3^(1/2)+1)*(-a)^
(1/6)*x)+_C3*exp(1/2*(I*3^(1/2)-1)*(-a)^(1/6)*x)+_C4*exp(1/2*(I*3^(1/2)+1)*(-a)^
(1/6)*x)+_C5*exp(-(-a)^(1/6)*x)+_C6*exp((-a)^(1/6)*x)
```

4.2273 $2y'''(x)+y'''''(x)+y(x)=0$

ODE

$$2y'''(x)+y'''''(x)+y(x)=0$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.00993461 (sec), leaf count = 70

$$\left\{\left\{y(x)\to e^{-x}\left(c_6x+e^{3x/2}(c_4x+c_3)\sin\left(\frac{\sqrt{3}x}{2}\right)+e^{3x/2}(c_2x+c_1)\cos\left(\frac{\sqrt{3}x}{2}\right)+c_5\right)\right\}\right\}$$

Maple ✓
cpu = 0.007 (sec), leaf count = 49

$$\left\{y(x)=\mathrm{e}^{\frac{x}{2}}(\_C6\,x+\_C4)\cos\left(\frac{\sqrt{3}x}{2}\right)+\mathrm{e}^{\frac{x}{2}}(\_C5\,x+\_C3)\sin\left(\frac{\sqrt{3}x}{2}\right)+\mathrm{e}^{-x}(\_C2\,x+\_C1)\right\}$$

Mathematica raw input

```
DSolve[y[x] + 2*y'''[x] + y''''''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (C[5] + x*C[6] + E^((3*x)/2)*(C[1] + x*C[2])*Cos[(Sqrt[3]*x)/2] + E^((
3*x)/2)*(C[3] + x*C[4])*Sin[(Sqrt[3]*x)/2])/E^x}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(diff(diff(y(x),x),x),x),x),x)+2*diff(diff(diff(y(x),x),x),x)+y(x) = 0,
```

Maple raw output

```
y(x) = exp(1/2*x)*(_C6*x+_C4)*cos(1/2*3^(1/2)*x)+exp(1/2*x)*(_C5*x+_C3)*sin(1/2*
3^(1/2)*x)+exp(-x)*(_C2*x+_C1)
```

4.2274 $y''''''''(x) = y(x)$

ODE

$$y''''''''(x) = y(x)$$

ODE Classification

[[_high_order, _missing_x]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.0100168 (sec), leaf count = 105

$$\left\{\left\{y(x) \to c_1 e^x + c_5 e^{-x} + c_7 \sin(x) + c_6 e^{-\frac{x}{\sqrt{2}}} \sin\left(\frac{x}{\sqrt{2}}\right) + c_8 e^{\frac{x}{\sqrt{2}}} \sin\left(\frac{x}{\sqrt{2}}\right) + c_3 \cos(x) + e^{-\frac{x}{\sqrt{2}}}\left(c_2 e^{\sqrt{2}x} + c_4\right) \cos\left(\frac{x}{\sqrt{2}}\right)\right\}\right.$$

Maple ✓
cpu = 0.034 (sec), leaf count = 84

$$\left\{y(x) = \left(-\_C5\, \mathrm{e}^{-\frac{\sqrt{2}x}{2}} - \_C6\, \mathrm{e}^{\frac{\sqrt{2}x}{2}}\right) \sin\left(\frac{\sqrt{2}x}{2}\right) + \_C7\, \mathrm{e}^{-\frac{\sqrt{2}x}{2}} \cos\left(\frac{\sqrt{2}x}{2}\right) + \_C8\, \mathrm{e}^{\frac{\sqrt{2}x}{2}} \cos\left(\frac{\sqrt{2}x}{2}\right) + \_C4\, \cos(x) + \_\right.$$

Mathematica raw input

```
DSolve[y''''''''[x] == y[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> E^x*C[1] + C[5]/E^x + C[3]*Cos[x] + ((E^(Sqrt[2]*x)*C[2] + C[4])*Cos[x
/Sqrt[2]])/E^(x/Sqrt[2]) + C[7]*Sin[x] + (C[6]*Sin[x/Sqrt[2]])/E^(x/Sqrt[2]) + E
^(x/Sqrt[2])*C[8]*Sin[x/Sqrt[2]]}}
```

Maple raw input

```
dsolve(diff(diff(diff(diff(diff(diff(diff(diff(y(x),x),x),x),x),x),x),x),x) = y(x), y(x),'implicit')
```

Maple raw output

```
y(x) = (-_C5*exp(-1/2*2^(1/2)*x)-_C6*exp(1/2*2^(1/2)*x))*sin(1/2*2^(1/2)*x)+_C7*
exp(-1/2*2^(1/2)*x)*cos(1/2*2^(1/2)*x)+_C8*exp(1/2*2^(1/2)*x)*cos(1/2*2^(1/2)*x)
+_C4*cos(x)+_C2*exp(x)+_C3*sin(x)+_C1*exp(-x)
```

4.2275 $y''''''''(x) - 2y'''' + y(x) = 0$

ODE

$$y''''''''(x) - 2y'''' + y(x) = 0$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.00751775 (sec), leaf count = 0 , could not solve

```
DSolve[y[x] - 2*Derivative[4][y] + Derivative[8][y][x] == 0, y[x], x]
```

Maple ✗
cpu = 0.034 (sec), leaf count = 0 , exception

```
y(x) and y cannot both appear in the given ODE.
```

Mathematica raw input

```
DSolve[y[x] - 2*y'''' + y''''''''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[y[x] - 2*Derivative[4][y] + Derivative[8][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(diff(diff(diff(diff(diff(diff(y(x),x),x),x),x),x),x),x),x)-2*D[1,1,1,1](y)*y(x) = 0,
```

Maple raw output

```
y(x) and y cannot both appear in the given ODE.
```

4.2276 $y^{(2n)}(x) = a^{2n} y(x)$

ODE

$$y^{(2n)}(x) = a^{2n} y(x)$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.00857435 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[2*n][y][x] == a^(2*n)*y[x], y[x], x]
```

Maple ✗
cpu = 0.034 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[Derivative[2*n][y][x] == a^(2*n)*y[x],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[2*n][y][x] == a^(2*n)*y[x], y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),[`$`(x,2*n)]) = a^(2*n)*y(x), y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```

4.2277 $x^n y^{(2n)}(x) = y(x)$

ODE

$$x^n y^{(2n)}(x) = y(x)$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.00486123 (sec), leaf count = 0 , could not solve

```
DSolve[x^n*Derivative[2*n][y][x] == y[x], y[x], x]
```

Maple ✗
cpu = 0.034 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[x^n*Derivative[2*n][y][x] == y[x],y[x],x]
```

Mathematica raw output

```
DSolve[x^n*Derivative[2*n][y][x] == y[x], y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),[`$`(x,2*n)])*x^n = y(x), y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```

4.2278 $x^{n+\frac{1}{2}} y^{(2n+1)}(x) = y(x)$

ODE

$$x^{n+\frac{1}{2}} y^{(2n+1)}(x) = y(x)$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.0051665 (sec), leaf count = 0 , could not solve

```
DSolve[x^(1/2 + n)*Derivative[1 + 2*n][y][x] == y[x], y[x], x]
```

Maple ✗
cpu = 0.034 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[x^(1/2 + n)*Derivative[1 + 2*n][y][x] == y[x],y[x],x]
```

Mathematica raw output

```
DSolve[x^(1/2 + n)*Derivative[1 + 2*n][y][x] == y[x], y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),[`$`(x,1+2*n)])*x^(n+1/2) = y(x), y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```

4.2279 $y^{(n)}(x) = e^x x$

ODE

$$y^{(n)}(x) = e^x x$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.00496266 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[n][y][x] == E^x*x, y[x], x]
```

Maple ✗
cpu = 0.034 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[Derivative[n][y][x] == E^x*x,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[n][y][x] == E^x*x, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),[`$`(x,n)]) = x*exp(x), y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```

4.2280 $amx^{m-1}y(x)+ax^m y'(x)+y^{(n)}(x)=0$

ODE

$$amx^{m-1}y(x)+ax^m y'(x)+y^{(n)}(x)=0$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.00617477 (sec), leaf count = 0 , could not solve

```
DSolve[a*m*x^(-1 + m)*y[x] + a*x^m*Derivative[1][y][x] + Derivative[n][y][x] == 0, y[x], x]
```

Maple ✗
cpu = 0.034 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[a*m*x^(-1 + m)*y[x] + a*x^m*y'[x] + Derivative[n][y][x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a*m*x^(-1 + m)*y[x] + a*x^m*Derivative[1][y][x] + Derivative[n][y][x] ==
0, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),[`$`(x,n)])+a*x^m*diff(y(x),x)+a*m*x^(m-1)*y(x) = 0, y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```

4.2281 $(a-x)^n(b-x)^n y^{(n)}(x) = cy(x)$

ODE

$$(a-x)^n(b-x)^n y^{(n)}(x) = cy(x)$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.00554888 (sec), leaf count = 0 , could not solve

```
DSolve[(a - x)^n*(b - x)^n*Derivative[n][y][x] == c*y[x], y[x], x]
```

Maple ✗
cpu = 0.034 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[(a - x)^n*(b - x)^n*Derivative[n][y][x] == c*y[x],y[x],x]
```

Mathematica raw output

```
DSolve[(a - x)^n*(b - x)^n*Derivative[n][y][x] == c*y[x], y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),[`$`(x,n)])*(a-x)^n*(b-x)^n = c*y(x), y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```

4.2282 $y'''(x) = y'(x)\,(y'(x)+1)$

ODE

$$y'''(x) = y'(x)\,(y'(x)+1)$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _with_linear_symmetrie

Book solution method
TO DO

Mathematica ✗
cpu = 1.25765 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[3][y][x] == Derivative[1][y][x]*(1 + Derivative[1][y][x]), y[x], x]
```

Maple ✓
cpu = 2.727 (sec), leaf count = 67

$$\left\{y(x) = \int RootOf\left(-3\int^{\_Z}\frac{1}{\sqrt{6\_f^3+9\_f^2+9\_C1}}d\_f + x + \_C2\right)\mathrm{d}x + \_C3, y(x) = \int RootOf\left(3\int^{\_Z}\frac{}{\sqrt{6\_f^3+}}\right.\right.$$

Mathematica raw input

```
DSolve[y'''[x] == y'[x]*(1 + y'[x]),y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[3][y][x] == Derivative[1][y][x]*(1 + Derivative[1][y][x]), y[x
], x]
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x) = diff(y(x),x)*(1+diff(y(x),x)), y(x),'implicit')
```

Maple raw output

```
y(x) = Int(RootOf(3*Intat(1/(6*_f^3+9*_f^2+9*_C1)^(1/2),_f = _Z)+x+_C2),x)+_C3,
y(x) = Int(RootOf(-3*Intat(1/(6*_f^3+9*_f^2+9*_C1)^(1/2),_f = _Z)+x+_C2),x)+_C3
```

4.2283 $y'''(x) + y'(x)^2 - y(x)y'(x) = 0$

ODE

$$y'''(x) + y'(x)^2 - y(x)y'(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0349194 (sec), leaf count = 0 , could not solve

```
DSolve[-(y[x]*Derivative[1][y][x]) + Derivative[1][y][x]^2 + Derivative[3][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 1.373 (sec), leaf count = 65

$$\left\{y(x) = ODESolStruc\left(\_a, [\left\{-\_b(\_a)\left(-\left(\frac{d^2}{d\_a^2}\_b(\_a)\right)\_b(\_a) - \left(\frac{d}{d\_a}\_b(\_a)\right)^2 + \_a - \_b(\_a)\right) = 0\right\}, \left\{\_a =\right.\right.$$

Mathematica raw input

```
DSolve[-(y[x]*y'[x]) + y'[x]^2 + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[-(y[x]*Derivative[1][y][x]) + Derivative[1][y][x]^2 + Derivative[3][y][x]
 == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)-y(x)*diff(y(x),x)+diff(y(x),x)^2 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(_a,[{-_b(_a)*(-diff(diff(_b(_a),_a),_a)*_b(_a)-diff(_b(_a),_a
)^2+_a-_b(_a)) = 0}, {_a = y(x), _b(_a) = diff(y(x),x)}, {x = Int(1/_b(_a),_a)+_
C1, y(x) = _a}])
```

4.2284 $y'''(x) + ay(x)y''(x) = 0$

ODE

$$y'''(x) + ay(x)y''(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0388649 (sec), leaf count = 0 , could not solve

```
DSolve[a*y[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0, y[x], x]
```

Maple ✓
cpu = 1.77 (sec), leaf count = 129

$$\left\{ y(x) = ODESolStruc\left(e^{\int \_g(\_f)\,d\_f + \_C2}, \left[\left\{ \frac{d}{d\_f}\_g(\_f) = \frac{\_g(\_f)\left(6\,(\_g(\_f))^2\,\_f^2 + 2\,(\_g(\_f))^2\,\_f\,a + 7\,\_g(\_f)\,\_f\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[a*y[x]*y''[x] + y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[a*y[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(diff(diff(diff(y(x),x),x),x)+a*y(x)*diff(diff(y(x),x),x) = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(exp(Int(_g(_f),_f)+_C2),[{diff(_g(_f),_f) = _g(_f)*(6*_g(_f)^
2*_f^2+2*_g(_f)^2*_f*a+7*_g(_f)*_f+_g(_f)*a+1)/_f}, {_f = diff(y(x),x)/y(x)^2, _
g(_f) = y(x)^2*diff(y(x),x)/(y(x)*diff(diff(y(x),x),x)-2*diff(y(x),x)^2)}, {x =
Int(1/_f/exp(Int(_g(_f),_f)+_C2)*_g(_f),_f)+_C1, y(x) = exp(Int(_g(_f),_f)+_C2)}
])
```

4.2285 $x^2y'''(x)+xy''(x)-(1-2xy(x))y'(x)+y(x)^2=f(x)$

ODE

$$x^2y'''(x)+xy''(x)-(1-2xy(x))y'(x)+y(x)^2=f(x)$$

ODE Classification

[[_3rd_order, _exact, _nonlinear]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0857774 (sec), leaf count = 0 , could not solve

```
DSolve[y[x]^2 - (1 - 2*x*y[x])*Derivative[1][y][x] + x*Derivative[2][y][x] + x^2*Derivative[3][y][x]
```

Maple ✓
cpu = 0.755 (sec), leaf count = 60

$$\left\{y(x)=ODESolStruc\left(\_b(\_a),\left[\left\{\_a^2\frac{\mathrm{d}^2}{\mathrm{d}\_a^2}\_b(\_a)+\_a\left(\_b(\_a)\right)^2-\left(\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a)\right)\_a-\int f(\_a)\,\mathrm{d}\_a+\_C1=0\right\}\right.\right.$$

Mathematica raw input

```
DSolve[y[x]^2 - (1 - 2*x*y[x])*y'[x] + x*y''[x] + x^2*y'''[x] == f[x],y[x],x]
```

Mathematica raw output

```
DSolve[y[x]^2 - (1 - 2*x*y[x])*Derivative[1][y][x] + x*Derivative[2][y][x] + x^2
*Derivative[3][y][x] == f[x], y[x], x]
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)+x*diff(diff(y(x),x),x)-(1-2*x*y(x))*diff(y(x),x)+y(x)^2 = f(x
```

Maple raw output

```
y(x) = ODESolStruc(_b(_a),[{_a^2*diff(diff(_b(_a),_a),_a)+_a*_b(_a)^2-diff(_b(_a
),_a)*_a-Int(f(_a),_a)+_C1 = 0}, {_a = x, _b(_a) = y(x)}, {x = _a, y(x) = _b(_a)
}])
```

4.2286 $x^2y'''(x) - x(1-y(x))y''(x) + xy'(x)^2 + (1-y(x))y'(x) = 0$

ODE

$$x^2y'''(x) - x(1-y(x))y''(x) + xy'(x)^2 + (1-y(x))y'(x) = 0$$

ODE Classification

[[_3rd_order, _exact, _nonlinear], [_3rd_order, _with_linear_symmetries], [_3rd_order, _

Book solution method
TO DO

Mathematica ✓
cpu = 0.181587 (sec), leaf count = 282

$$\left\{\left\{y(x) \to \frac{2\left(c_3\left(J_{\frac{\sqrt{c_2+2}}{\sqrt{2}}}\left(-\frac{1}{2}ix\sqrt{c_1}\right) - \frac{1}{4}i\sqrt{c_1}x\left(J_{\frac{\sqrt{c_2+2}}{\sqrt{2}}-1}\left(-\frac{1}{2}ix\sqrt{c_1}\right) - J_{\frac{\sqrt{c_2+2}}{\sqrt{2}}+1}\left(-\frac{1}{2}ix\sqrt{c_1}\right)\right)\right) + Y_{\frac{\sqrt{c_2+2}}{\sqrt{2}}}\left(-\frac{1}{2}ix\sqrt{c_1}\right) - \frac{1}{4}\right.\right.\right.$$

$$\left.\left.\left.c_3 J_{\frac{\sqrt{c_2+2}}{\sqrt{2}}}\left(-\frac{1}{2}ix\sqrt{c_1}\right) + Y_{\frac{\sqrt{c_2+2}}{\sqrt{2}}}\left(-\frac{1}{2}ix\sqrt{c_1}\right)\right.\right.\right.$$

Maple ✓
cpu = 1.217 (sec), leaf count = 190

$$\left\{\ln(x) + 2\int^{y(x)}\left(2\left(RootOf\left(-2\sqrt{4+\_C1}\,Y_{1/2\sqrt{4+\_C1}}\left(1/2\sqrt{2}\_Z\right)\_C2 + 2\,Y_{1/2\sqrt{4+\_C1}}\left(1/2\sqrt{2}\_Z\right)\_C2\,\_h - 4\,Y_{1/}\right.\right.\right.\right.$$

Mathematica raw input

```
DSolve[(1 - y[x])*y'[x] + x*y'[x]^2 - x*(1 - y[x])*y''[x] + x^2*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (2*(BesselY[Sqrt[2 + C[2]]/Sqrt[2], (-I/2)*x*Sqrt[C[1]]] - (I/4)*x*(Be
sselY[-1 + Sqrt[2 + C[2]]/Sqrt[2], (-I/2)*x*Sqrt[C[1]]] - BesselY[1 + Sqrt[2 + C
[2]]/Sqrt[2], (-I/2)*x*Sqrt[C[1]]])*Sqrt[C[1]] + (BesselJ[Sqrt[2 + C[2]]/Sqrt[2]
, (-I/2)*x*Sqrt[C[1]]] - (I/4)*x*(BesselJ[-1 + Sqrt[2 + C[2]]/Sqrt[2], (-I/2)*x*
Sqrt[C[1]]] - BesselJ[1 + Sqrt[2 + C[2]]/Sqrt[2], (-I/2)*x*Sqrt[C[1]]])*Sqrt[C[1
]])*C[3]))/(BesselY[Sqrt[2 + C[2]]/Sqrt[2], (-I/2)*x*Sqrt[C[1]]] + BesselJ[Sqrt[
2 + C[2]]/Sqrt[2], (-I/2)*x*Sqrt[C[1]]]*C[3])}}
```

Maple raw input

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-(1-y(x))*x*diff(diff(y(x),x),x)+x*diff(y(x),x)^2+(1-
y(x))*diff(y(x),x) = 0, y(x),'implicit')
```

Maple raw output

```
ln(x)+2*Intat(1/(2*RootOf(-2*(4+_C1)^(1/2)*BesselY(1/2*(4+_C1)^(1/2),1/2*2^(1/2)
*_Z)*_C2+2*BesselY(1/2*(4+_C1)^(1/2),1/2*2^(1/2)*_Z)*_C2*_h-4*BesselY(1/2*(4+_C1
)^(1/2),1/2*2^(1/2)*_Z)*_C2+2*2^(1/2)*BesselY(1/2*(4+_C1)^(1/2)+1,1/2*2^(1/2)*_Z
)*_C2*_Z+2*2^(1/2)*BesselJ(1/2*(4+_C1)^(1/2)+1,1/2*2^(1/2)*_Z)*_Z-2*BesselJ(1/2*
(4+_C1)^(1/2),1/2*2^(1/2)*_Z)*(4+_C1)^(1/2)+2*BesselJ(1/2*(4+_C1)^(1/2),1/2*2^(1
/2)*_Z)*_h-4*BesselJ(1/2*(4+_C1)^(1/2),1/2*2^(1/2)*_Z))^2+_h^2-_C1-4*_h),_h = y(
x))-_C3 = 0
```

4.2287 $y(x)y'''(x)+y(x)^3y'(x)-y'(x)y''(x)=0$

ODE

$$y(x)y'''(x)+y(x)^3y'(x)-y'(x)y''(x)=0$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _exact, _nonlinear], [_3rd_order, _with_linear_s

Book solution method
TO DO

Mathematica ✓
cpu = 2.7443 (sec), leaf count = 409

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{2i\sqrt{\frac{\#1^2}{2\left(\sqrt{c_2^2-c_1}-c_2\right)}+1}\sqrt{1-\frac{\#1^2}{2\left(c_2+\sqrt{c_2^2-c_1}\right)}}F\left(i\sinh^{-1}\left(\frac{\sqrt{\frac{1}{\sqrt{c_2^2-c_1}-c_2}}\#1}{\sqrt{2}}\right)|\frac{c_2-\sqrt{c_2^2-c_1}}{c_2+\sqrt{c_2^2-c_1}}\right)}{\sqrt{\frac{1}{\sqrt{c_2^2-c_1}-c_2}}\sqrt{-\frac{\#1^4}{2}+2\#1^2c_2-2c_1}}\&\right]\right\}\right\}$$

Maple ✓
cpu = 0.309 (sec), leaf count = 77

$$\left\{\int^{y(x)}-2\frac{1}{\sqrt{-\_a^4+4\_C2\,\_a^2-4\_C2^2+4\_C1}}d\_a-x-\_C3=0,\int^{y(x)}2\frac{1}{\sqrt{-\_a^4+4\_C2\,\_a^2-4\_C2^2+4\_C}}\right.$$

Mathematica raw input

```
DSolve[y[x]^3*y'[x] - y'[x]*y''[x] + y[x]*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> InverseFunction[((-2*I)*EllipticF[I*ArcSinh[(Sqrt[(-C[2] + Sqrt[-C[1]
+ C[2]^2])^(-1)]*#1)/Sqrt[2]], (C[2] - Sqrt[-C[1] + C[2]^2])/(C[2] + Sqrt[-C[1]
+ C[2]^2])]*Sqrt[1 + #1^2/(2*(-C[2] + Sqrt[-C[1] + C[2]^2]))]*Sqrt[1 - #1^2/(2*(
C[2] + Sqrt[-C[1] + C[2]^2]))])/(Sqrt[(-C[2] + Sqrt[-C[1] + C[2]^2])^(-1)]*Sqrt[
-2*C[1] + 2*C[2]*#1^2 - #1^4/2]) & ][x + C[3]]}, {y[x] -> InverseFunction[((2*I)
*EllipticF[I*ArcSinh[(Sqrt[(-C[2] + Sqrt[-C[1] + C[2]^2])^(-1)]*#1)/Sqrt[2]], (C
[2] - Sqrt[-C[1] + C[2]^2])/(C[2] + Sqrt[-C[1] + C[2]^2])]*Sqrt[1 + #1^2/(2*(-C[
2] + Sqrt[-C[1] + C[2]^2]))]*Sqrt[1 - #1^2/(2*(C[2] + Sqrt[-C[1] + C[2]^2]))])/(
Sqrt[(-C[2] + Sqrt[-C[1] + C[2]^2])^(-1)]*Sqrt[-2*C[1] + 2*C[2]*#1^2 - #1^4/2])
& ][x + C[3]]}}
```

Maple raw input

```
dsolve(y(x)*diff(diff(diff(y(x),x),x),x)-diff(y(x),x)*diff(diff(y(x),x),x)+y(x)^3*diff(y(x),x) = 0, y
```

Maple raw output

```
Intat(-2/(-_a^4+4*_C2*_a^2-4*_C2^2+4*_C1)^(1/2),_a = y(x))-x-_C3 = 0, Intat(2/(-
_a^4+4*_C2*_a^2-4*_C2^2+4*_C1)^(1/2),_a = y(x))-x-_C3 = 0
```

4.2288 $(a+y(x))y'''(x)+3y'(x)y''(x)=0$

ODE

$$(a+y(x))y'''(x)+3y'(x)y''(x)=0$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _exact, _nonlinear], [_3rd_order, _with_linear_s

Book solution method
TO DO

Mathematica ✓
cpu = 0.198287 (sec), leaf count = 83

$$\left\{\left\{y(x)\to -\frac{ac_1+\sqrt{c_1^3\left(c_3+x\right)^2-e^{2c_2}c_1}}{c_1}\right\},\left\{y(x)\to \frac{\sqrt{c_1^3\left(c_3+x\right)^2-e^{2c_2}c_1}-ac_1}{c_1}\right\}\right\}$$

Maple ✓
cpu = 0.296 (sec), leaf count = 95

$$\left\{\ln\left(a+y(x)\right)-\int RootOf\left(-2\int^{-Z}\frac{\_C1}{-4\_C1\,\_h^2+1+\sqrt{-4\_C1\,\_h^2+1}}d\_h+x+\_C2\right)\mathrm{d}x-\_C3=0,\ln\left(a+y(x\right.\right.$$

Mathematica raw input

```
DSolve[3*y'[x]*y''[x] + (a + y[x])*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -((a*C[1] + Sqrt[-(E^(2*C[2])*C[1]) + C[1]^3*(x + C[3])^2])/C[1])}, {y
[x] -> (-(a*C[1]) + Sqrt[-(E^(2*C[2])*C[1]) + C[1]^3*(x + C[3])^2])/C[1]}}
```

Maple raw input

```
dsolve((a+y(x))*diff(diff(diff(y(x),x),x),x)+3*diff(y(x),x)*diff(diff(y(x),x),x) = 0, y(x),'implicit
```

Maple raw output

```
ln(a+y(x))-Int(RootOf(-2*Intat(_C1/(-4*_C1*_h^2+1+(-4*_C1*_h^2+1)^(1/2)),_h = _Z
)+x+_C2),x)-_C3 = 0, ln(a+y(x))-Int(RootOf(2*Intat(1/(4*_C1*_h^2+(-4*_C1*_h^2+1)
^(1/2)-1)*_C1,_h = _Z)+x+_C2),x)-_C3 = 0
```

4.2289 $x^3y(x)y'''(x)+3x^3y'(x)y''(x)+9x^2y(x)y''(x)+9x^2y'(x)^2+18xy(x)y'(x)+3y(x)^2=0$

ODE

$$x^3y(x)y'''(x)+3x^3y'(x)y''(x)+9x^2y(x)y''(x)+9x^2y'(x)^2+18xy(x)y'(x)+3y(x)^2=0$$

ODE Classification

[[_3rd_order, _exact, _nonlinear], [_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.23246 (sec), leaf count = 60

$$\left\{\left\{y(x)\to -\frac{\sqrt{c_1x^2+c_3x+2c_2}}{x^{3/2}}\right\},\left\{y(x)\to \frac{\sqrt{c_1x^2+c_3x+2c_2}}{x^{3/2}}\right\}\right\}$$

Maple ✓
cpu = 0.128 (sec), leaf count = 24

$$\left\{\frac{\_C1\,x}{2}+\frac{x^2(y(x))^2}{2}+\_C3-\frac{\_C2}{x}=0\right\}$$

Mathematica raw input

```
DSolve[3*y[x]^2 + 18*x*y[x]*y'[x] + 9*x^2*y'[x]^2 + 9*x^2*y[x]*y''[x] + 3*x^3*y'[x]*y''[x] + x^3*y[x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[x^2*C[1] + 2*C[2] + x*C[3]]/x^(3/2))}, {y[x] -> Sqrt[x^2*C[1] +
  2*C[2] + x*C[3]]/x^(3/2)}}
```

Maple raw input

```
dsolve(x^3*y(x)*diff(diff(diff(y(x),x),x),x)+3*x^3*diff(y(x),x)*diff(diff(y(x),x),x)+9*x^2*y(x)*diff(
```

Maple raw output

```
1/2*_C1*x+1/2*x^2*y(x)^2+_C3-1/x*_C2 = 0
```

4.2290 $(y(x)^2+x)\,y'''(x)+3y''(x)+2y'(x)^3+6y(x)y'(x)y''(x)=0$

ODE

$$(y(x)^2+x)\,y'''(x)+3y''(x)+2y'(x)^3+6y(x)y'(x)y''(x)=0$$

ODE Classification

[[_3rd_order, _exact, _nonlinear], [_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✓
cpu = 0.309779 (sec), leaf count = 457

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{2}\left(3c_1x^2+\sqrt{(3c_1x^2+c_3x+6c_2)^2+16x^3}+c_3x+6c_2\right)^{2/3}-2\,2^{2/3}x}{2\sqrt[3]{3c_1x^2+\sqrt{(3c_1x^2+c_3x+6c_2)^2+16x^3}+c_3x+6c_2}}\right\},\left\{y(x)\to \frac{i(\sqrt{3}+i)\left(3c_1x^2+\sqrt{9c_1^2}\right.\right.\right.$$

Maple ✓
cpu = 0.049 (sec), leaf count = 26

$$\left\{-\frac{\_C1\,x^2}{2}-\frac{(y(x))^3}{3}-\_C2\,x-xy(x)+\_C3=0\right\}$$

Mathematica raw input

```
DSolve[2*y'[x]^3 + 3*y''[x] + 6*y[x]*y'[x]*y''[x] + (x + y[x]^2)*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-2*2^(2/3)*x + 2^(1/3)*(3*x^2*C[1] + 6*C[2] + x*C[3] + Sqrt[16*x^3 +
(3*x^2*C[1] + 6*C[2] + x*C[3])^2])^(2/3))/(2*(3*x^2*C[1] + 6*C[2] + x*C[3] + Sqr
t[16*x^3 + (3*x^2*C[1] + 6*C[2] + x*C[3])^2])^(1/3))}, {y[x] -> (2*2^(1/3)*(1 +
I*Sqrt[3])*x + I*(I + Sqrt[3])*(3*x^2*C[1] + 6*C[2] + x*C[3] + Sqrt[9*x^4*C[1]^2
 + 36*C[2]^2 + 12*x*C[2]*C[3] + 2*x^3*(8 + 3*C[1]*C[3]) + x^2*(36*C[1]*C[2] + C[
3]^2)])^(2/3))/(2*2^(2/3)*(3*x^2*C[1] + 6*C[2] + x*C[3] + Sqrt[16*x^3 + (3*x^2*C
[1] + 6*C[2] + x*C[3])^2])^(1/3))}, {y[x] -> (2*2^(1/3)*(1 - I*Sqrt[3])*x + (-1
- I*Sqrt[3])*(3*x^2*C[1] + 6*C[2] + x*C[3] + Sqrt[9*x^4*C[1]^2 + 36*C[2]^2 + 12*
x*C[2]*C[3] + 2*x^3*(8 + 3*C[1]*C[3]) + x^2*(36*C[1]*C[2] + C[3]^2)])^(2/3))/(2*
2^(2/3)*(3*x^2*C[1] + 6*C[2] + x*C[3] + Sqrt[16*x^3 + (3*x^2*C[1] + 6*C[2] + x*C
[3])^2])^(1/3))}}
```

Maple raw input

```
dsolve((x+y(x)^2)*diff(diff(diff(y(x),x),x),x)+6*y(x)*diff(y(x),x)*diff(diff(y(x),x),x)+3*diff(diff(y
```

Maple raw output

```
-1/2*_C1*x^2-1/3*y(x)^3-_C2*x-x*y(x)+_C3 = 0
```

4.2291 $4y(x)^2y'''(x) + 15y'(x)^3 - 18y(x)y'(x)y''(x) = 0$

ODE

$$4y(x)^2y'''(x) + 15y'(x)^3 - 18y(x)y'(x)y''(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0700174 (sec), leaf count = 0 , could not solve

```
DSolve[15*Derivative[1][y][x]^3 - 18*y[x]*Derivative[1][y][x]*Derivative[2][y][x] + 4*y[x]^2*Derivati
```

Maple ✓
cpu = 0.195 (sec), leaf count = 27

$$\{\ln(y(x)) + 2\ln(\_C2^2 + 2\_C2\,x + x^2 - 4\_C1) - \_C3 = 0\}$$

Mathematica raw input

```
DSolve[15*y'[x]^3 - 18*y[x]*y'[x]*y''[x] + 4*y[x]^2*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[15*Derivative[1][y][x]^3 - 18*y[x]*Derivative[1][y][x]*Derivative[2][y][x
] + 4*y[x]^2*Derivative[3][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(4*y(x)^2*diff(diff(diff(y(x),x),x),x)-18*y(x)*diff(y(x),x)*diff(diff(y(x),x),x)+15*diff(y(x),x
```

Maple raw output

```
ln(y(x))+2*ln(_C2^2+2*_C2*x+x^2-4*_C1)-_C3 = 0
```

4.2292 $9y(x)^2y'''(x) + 40y'(x)^3 - 45y(x)y'(x)y''(x) = 0$

ODE

$$9y(x)^2y'''(x) + 40y'(x)^3 - 45y(x)y'(x)y''(x) = 0$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 0.0706203 (sec), leaf count = 0 , could not solve

```
DSolve[40*Derivative[1][y][x]^3 - 45*y[x]*Derivative[1][y][x]*Derivative[2][y][x] + 9*y[x]^2*Derivati
```

Maple ✓
cpu = 0.302 (sec), leaf count = 22

$$\left\{ \ln(y(x)) + \frac{3\ln\left(-9 + (x + \_C2)^2 \_C1\right)}{2} - \_C3 = 0 \right\}$$

Mathematica raw input

```
DSolve[40*y'[x]^3 - 45*y[x]*y'[x]*y''[x] + 9*y[x]^2*y'''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[40*Derivative[1][y][x]^3 - 45*y[x]*Derivative[1][y][x]*Derivative[2][y][x
] + 9*y[x]^2*Derivative[3][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(9*y(x)^2*diff(diff(diff(y(x),x),x),x)-45*y(x)*diff(y(x),x)*diff(diff(y(x),x),x)+40*diff(y(x),x
```

Maple raw output

```
ln(y(x))+3/2*ln(-9+(x+_C2)^2*_C1)-_C3 = 0
```

4.2293 $y'(x)y'''(x) + y'(x)^2 = 2y''(x)^2$

ODE

$$y'(x)y'''(x) + y'(x)^2 = 2y''(x)^2$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _with_linear_symmetrie

Book solution method
TO DO

Mathematica ✓
cpu = 0.0936004 (sec), leaf count = 24

$$\{\{y(x) \to e^{-c_1} c_2 \tan^{-1}\left(e^{c_1+x}\right) + c_3\}\}$$

Maple ✓
cpu = 0.453 (sec), leaf count = 53

$$\left\{-2\,Artanh\left(e^{\frac{-C2}{-C1}} e^{\frac{y(x)}{-C1}}\right) - x - \_C3 = 0, 2\,Artanh\left(e^{\frac{-C2}{-C1}} e^{\frac{y(x)}{-C1}}\right) - x - \_C3 = 0\right\}$$

Mathematica raw input

```
DSolve[y'[x]^2 + y'[x]*y'''[x] == 2*y''[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (ArcTan[E^(x + C[1])]*C[2])/E^C[1] + C[3]}}
```

Maple raw input

```
dsolve(diff(y(x),x)*diff(diff(diff(y(x),x),x),x)+diff(y(x),x)^2 = 2*diff(diff(y(x),x),x)^2, y(x),'imp
```

Maple raw output

```
-2*arctanh(exp(1/_C1*_C2)*exp(1/_C1*y(x)))-x-_C3 = 0, 2*arctanh(exp(1/_C1*_C2)*e
xp(1/_C1*y(x)))-x-_C3 = 0
```

4.2294 $y'(x)y''(x) = axy'(x)^5 + 3y''(x)^2$

ODE

$$y'(x)y''(x) = axy'(x)^5 + 3y''(x)^2$$

ODE Classification

[[_2nd_order , _missing_y]]

Book solution method
TO DO

Mathematica ✗
cpu = 9.60746 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[1][y][x]*Derivative[2][y][x] == a*x*Derivative[1][y][x]^5 + 3*Derivative[2][y][x]^2
```

Maple ✓
cpu = 0.726 (sec), leaf count = 60

$$\left\{y(x) = ODESolStruc\left(\int \_b(\_a)\ \mathrm{d}\_a + \_C1, [\left\{\frac{\mathrm{d}}{\mathrm{d}\_a}\_b(\_a) = -\frac{\_b(\_a)}{6}\left(-1 + \sqrt{1 - 12\,a\_a\ (\_b\,(\_a))^3}\right)\right\}, \left\{\_a = x\right.\right.$$

Mathematica raw input

```
DSolve[y'[x]*y''[x] == a*x*y'[x]^5 + 3*y''[x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[1][y][x]*Derivative[2][y][x] == a*x*Derivative[1][y][x]^5 + 3*
Derivative[2][y][x]^2, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),x)*diff(diff(y(x),x),x) = a*x*diff(y(x),x)^5+3*diff(diff(y(x),x),x)^2, y(x),'implici
```

Maple raw output

```
y(x) = ODESolStruc(Int(_b(_a),_a)+_C1,[{diff(_b(_a),_a) = -1/6*(-1+(1-12*a*_a*_b
(_a)^3)^(1/2))*_b(_a)}, {_a = x, _b(_a) = diff(y(x),x)}, {x = _a, y(x) = Int(_b(
_a),_a)+_C1}])
```

4.2295 $2y'(x)y'''(x) = 2y''(x)^2$

ODE

$$2y'(x)y'''(x) = 2y''(x)^2$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _with_linear_symmetrie

Book solution method
TO DO

Mathematica ✓
cpu = 0.0247698 (sec), leaf count = 21

$$\left\{\left\{y(x) \to \frac{c_2 e^{c_1 x}}{c_1} + c_3\right\}\right\}$$

Maple ✓
cpu = 0.114 (sec), leaf count = 18

$$\left\{y(x) = \frac{\mathrm{e}^{\_C2\,\_C1}\mathrm{e}^{-\_C1\,x}}{\_C1} + \_C3\right\}$$

Mathematica raw input

```
DSolve[2*y'[x]*y'''[x] == 2*y''[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (E^(x*C[1])*C[2])/C[1] + C[3]}}
```

Maple raw input

```
dsolve(2*diff(y(x),x)*diff(diff(diff(y(x),x),x),x) = 2*diff(diff(y(x),x),x)^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/_C1*exp(_C2*_C1)*exp(_C1*x)+_C3
```

4.2296 $(y'(x)^2+1)\,y'''(x)=3y'(x)y''(x)^2$

ODE

$$(y'(x)^2+1)\,y'''(x)=3y'(x)y''(x)^2$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _with_linear_symmetrie

Book solution method
TO DO

Mathematica ✓
cpu = 0.120954 (sec), leaf count = 95

$$\left\{\left\{y(x)\to c_3-\frac{i\sqrt{c_1^2x^2+2c_2c_1^2x+c_2^2c_1^2-1}}{c_1}\right\},\left\{y(x)\to c_3+\frac{i\sqrt{c_1^2x^2+2c_2c_1^2x+c_2^2c_1^2-1}}{c_1}\right\}\right\}$$

Maple ✓
cpu = 0.222 (sec), leaf count = 49

$$\left\{y(x)=-\sqrt{-\_C2^2-2\_C2\,x-x^2+\_C1}+\_C3,y(x)=\sqrt{-\_C2^2-2\_C2\,x-x^2+\_C1}+\_C3\right\}$$

Mathematica raw input

```
DSolve[(1 + y'[x]^2)*y'''[x] == 3*y'[x]*y''[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> ((-I)*Sqrt[-1 + x^2*C[1]^2 + 2*x*C[1]^2*C[2] + C[1]^2*C[2]^2])/C[1] +
C[3]}, {y[x] -> (I*Sqrt[-1 + x^2*C[1]^2 + 2*x*C[1]^2*C[2] + C[1]^2*C[2]^2])/C[1]
 + C[3]}}
```

Maple raw input

```
dsolve((1+diff(y(x),x)^2)*diff(diff(diff(y(x),x),x),x) = 3*diff(y(x),x)*diff(diff(y(x),x),x)^2, y(x),
```

Maple raw output

```
y(x) = -(-_C2^2-2*_C2*x-x^2+_C1)^(1/2)+_C3, y(x) = (-_C2^2-2*_C2*x-x^2+_C1)^(1/2
)+_C3
```

4.2297 $(y'(x)^2+1)\,y'''(x) = y''(x)^2\,(a+3y'(x))$

ODE

$$(y'(x)^2+1)\,y'''(x) = y''(x)^2\,(a+3y'(x))$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _with_linear_symmetrie

Book solution method
TO DO

Mathematica ✗
cpu = 599.996 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 1.585 (sec), leaf count = 789

$$\left\{ y(x) = \int \frac{\sin\left(RootOf\left(e^{2\,a\_Z}\_C1^2\_C2^2a^4 + 2\,e^{2\,a\_Z}\_C1^2\_C2\,a^4x + e^{2\,a\_Z}\_C1^2a^4x^2 + 2\,e^{2\,a\_Z}\_C1^2\_C2^2a^2 + 4\,e^{2}\right.\right.}{\cos\left(RootOf\left(e^{2\,a\_Z}\_C1^2\_C2^2a^4 + 2\,e^{2\,a\_Z}\_C1^2\_C2\,a^4x + e^{2\,a\_Z}\_C1^2a^4x^2 + 2\,e^{2\,a\_Z}\_C1^2\_C2^2a^2 + 4\,e^{2}\right.\right.}$$

Mathematica raw input

```
DSolve[(1 + y'[x]^2)*y'''[x] == (a + 3*y'[x])*y''[x]^2,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((1+diff(y(x),x)^2)*diff(diff(diff(y(x),x),x),x) = (a+3*diff(y(x),x))*diff(diff(y(x),x),x)^2, y
```

Maple raw output

```
y(x) = Int(sin(RootOf(exp(2*a*_Z)*_C1^2*_C2^2*a^4+2*exp(2*a*_Z)*_C1^2*_C2*a^4*x+
exp(2*a*_Z)*_C1^2*a^4*x^2+2*exp(2*a*_Z)*_C1^2*_C2^2*a^2+4*exp(2*a*_Z)*_C1^2*_C2*
a^2*x+2*exp(2*a*_Z)*_C1^2*a^2*x^2-2*exp(a*_Z)*cos(_Z)*_C1*_C2*a^3-2*exp(a*_Z)*co
s(_Z)*_C1*a^3*x+exp(2*a*_Z)*_C1^2*_C2^2+2*exp(2*a*_Z)*_C1^2*_C2*x+exp(2*a*_Z)*_C
1^2*x^2-2*exp(a*_Z)*cos(_Z)*_C1*_C2*a-2*exp(a*_Z)*cos(_Z)*_C1*a*x+cos(_Z)^2*a^2+
cos(_Z)^2-1))/cos(RootOf(exp(2*a*_Z)*_C1^2*_C2^2*a^4+2*exp(2*a*_Z)*_C1^2*_C2*a^4
*x+exp(2*a*_Z)*_C1^2*a^4*x^2+2*exp(2*a*_Z)*_C1^2*_C2^2*a^2+4*exp(2*a*_Z)*_C1^2*_
```

```
C2*a^2*x+2*exp(2*a*_Z)*_C1^2*a^2*x^2-2*exp(a*_Z)*cos(_Z)*_C1*_C2*a^3-2*exp(a*_Z)
*cos(_Z)*_C1*a^3*x+exp(2*a*_Z)*_C1^2*_C2^2+2*exp(2*a*_Z)*_C1^2*_C2*x+exp(2*a*_Z)
*_C1^2*x^2-2*exp(a*_Z)*cos(_Z)*_C1*_C2*a-2*exp(a*_Z)*cos(_Z)*_C1*a*x+cos(_Z)^2*a
^2+cos(_Z)^2-1)),x)+_C3, y(x) = Int(sin(RootOf(exp(2*a*_Z)*_C1^2*_C2^2*a^4+2*exp
(2*a*_Z)*_C1^2*_C2*a^4*x+exp(2*a*_Z)*_C1^2*a^4*x^2+2*exp(2*a*_Z)*_C1^2*_C2^2*a^2
+4*exp(2*a*_Z)*_C1^2*_C2*a^2*x+2*exp(2*a*_Z)*_C1^2*a^2*x^2+2*exp(a*_Z)*cos(_Z)*_
C1*_C2*a^3+2*exp(a*_Z)*cos(_Z)*_C1*a^3*x+exp(2*a*_Z)*_C1^2*_C2^2+2*exp(2*a*_Z)*_
C1^2*_C2*x+exp(2*a*_Z)*_C1^2*x^2+2*exp(a*_Z)*cos(_Z)*_C1*_C2*a+2*exp(a*_Z)*cos(_
Z)*_C1*a*x+cos(_Z)^2*a^2+cos(_Z)^2-1))/cos(RootOf(exp(2*a*_Z)*_C1^2*_C2^2*a^4+2*
exp(2*a*_Z)*_C1^2*_C2*a^4*x+exp(2*a*_Z)*_C1^2*a^4*x^2+2*exp(2*a*_Z)*_C1^2*_C2^2*
a^2+4*exp(2*a*_Z)*_C1^2*_C2*a^2*x+2*exp(2*a*_Z)*_C1^2*a^2*x^2+2*exp(a*_Z)*cos(_Z
)*_C1*_C2*a^3+2*exp(a*_Z)*cos(_Z)*_C1*a^3*x+exp(2*a*_Z)*_C1^2*_C2^2+2*exp(2*a*_Z
)*_C1^2*_C2*x+exp(2*a*_Z)*_C1^2*x^2+2*exp(a*_Z)*cos(_Z)*_C1*_C2*a+2*exp(a*_Z)*co
s(_Z)*_C1*a*x+cos(_Z)^2*a^2+cos(_Z)^2-1)),x)+_C3
```

4.2298 $y'(x)^3 y'''(x) = 1$

ODE

$$y'(x)^3 y'''(x) = 1$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _with_linear_symmetrie

Book solution method
TO DO

Mathematica ✓
cpu = 1.88752 (sec), leaf count = 131

$$\left\{\left\{y(x) \to c_3 - \frac{c_1(c_2+x)\sqrt{c_1^2x^2+2c_2c_1^2x+c_2^2c_1^2+1}+\sinh^{-1}(c_1(c_2+x))}{2c_1^{3/2}}\right\}, \left\{y(x) \to \frac{c_1(c_2+x)\sqrt{c_1^2x^2+2c_2c_1^2x+c_2^2c}\right.\right.$$

Maple ✓
cpu = 0.166 (sec), leaf count = 151

$$\left\{y(x) = -\frac{1}{2\_C1}\left(\ln\left(\sqrt{\_C1\left(1+(x+\_C2)^2\,\_C1^2\right)}+(x+\_C2)\,\_C1^3\frac{1}{\sqrt{\_C1^3}}\right)\_C1+\sqrt{\_C1^3}\left((x+\_C2)\sqrt{\_C\right.\right.$$

Mathematica raw input

```
DSolve[y'[x]^3*y'''[x] == 1,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(ArcSinh[C[1]*(x + C[2])] + C[1]*(x + C[2])*Sqrt[1 + x^2*C[1]^2 + 2*x
*C[1]^2*C[2] + C[1]^2*C[2]^2])/(2*C[1]^(3/2)) + C[3]}, {y[x] -> (ArcSinh[C[1]*(x
 + C[2])] + C[1]*(x + C[2])*Sqrt[1 + x^2*C[1]^2 + 2*x*C[1]^2*C[2] + C[1]^2*C[2]^
2])/(2*C[1]^(3/2)) + C[3]}}
```

Maple raw input

```
dsolve(diff(y(x),x)^3*diff(diff(diff(y(x),x),x),x) = 1, y(x),'implicit')
```

Maple raw output

```
y(x) = 1/2/(_C1^3)^(1/2)*(ln((_C1*(1+(x+_C2)^2*_C1^2))^(1/2)+(x+_C2)*_C1^3/(_C1^
3)^(1/2))*_C1+(_C1^3)^(1/2)*((x+_C2)*(_C1*(1+(x+_C2)^2*_C1^2))^(1/2)+2*_C1*_C3))
```

```
/_C1, y(x) = -1/2/(_C1^3)^(1/2)*(ln((_C1*(1+(x+_C2)^2*_C1^2))^(1/2)+(x+_C2)*_C1^
3/(_C1^3)^(1/2))*_C1+(_C1^3)^(1/2)*((x+_C2)*(_C1*(1+(x+_C2)^2*_C1^2))^(1/2)-2*_C
1*_C3))/_C1
```

4.2299 $y''(x)y'''(x) = 2$

ODE

$$y''(x)y'''(x) = 2$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _exact, _nonlinear], [

Book solution method
TO DO

Mathematica ✓
cpu = 0.0255832 (sec), leaf count = 61

$$\left\{\left\{y(x) \to -\frac{1}{15}\sqrt{2}(c_1+2x)^{5/2} + c_3 x + c_2\right\}, \left\{y(x) \to \frac{1}{15}\sqrt{2}(c_1+2x)^{5/2} + c_3 x + c_2\right\}\right\}$$

Maple ✓
cpu = 0.105 (sec), leaf count = 31

$$\left\{y(x) = -\frac{8}{15}(\_C1+x)^{\frac{5}{2}} + \_C2\,x + \_C3, y(x) = \frac{8}{15}(\_C1+x)^{\frac{5}{2}} + \_C2\,x + \_C3\right\}$$

Mathematica raw input

```
DSolve[y''[x]*y'''[x] == 2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2]*(2*x + C[1])^(5/2))/15 + C[2] + x*C[3]}, {y[x] -> (Sqrt[2]*(
2*x + C[1])^(5/2))/15 + C[2] + x*C[3]}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)*diff(diff(diff(y(x),x),x),x) = 2, y(x),'implicit')
```

Maple raw output

```
y(x) = -8/15*(_C1+x)^(5/2)+_C2*x+_C3, y(x) = 8/15*(_C1+x)^(5/2)+_C2*x+_C3
```

4.2300 $y''(x)y'''(x) = a\sqrt{b^2y''(x)^2+1}$

ODE

$$y''(x)y'''(x) = a\sqrt{b^2y''(x)^2+1}$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _with_linear_symmetrie

Book solution method
TO DO

Mathematica ✓
cpu = 0.531415 (sec), leaf count = 415

$$\left\{\left\{y(x)\to \frac{6a^2b^5c_3x+6a^2b^5c_2+\left(a^2b^4x^2+2ab^4c_1x+b^4c_1^2-1\right)^{3/2}+3\sqrt{a^2b^4x^2+2ab^4c_1x+b^4c_1^2-1}-3b^2c_1\log\left(\sqrt{a^2b^4}\right.\right.\right.}{6a^2b^5}$$

Maple ✓
cpu = 0.192 (sec), leaf count = 197

$$\left\{y(x)=\_C2\,x+\int\frac{1}{2\,b}\left(-1\ln\left(\sqrt{\left(-1+b^2\left(\_C1+x\right)a\right)\left(1+b^2\left(\_C1+x\right)a\right)}+\left(\_C1+x\right)b^4a^2\frac{1}{\sqrt{a^2b^4}}\right)\frac{1}{\sqrt{a^2b^4}}+\sqrt{(-1\right.\right.$$

Mathematica raw input

```
DSolve[y''[x]*y'''[x] == a*Sqrt[1 + b^2*y''[x]^2],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (3*Sqrt[-1 + a^2*b^4*x^2 + 2*a*b^4*x*C[1] + b^4*C[1]^2] + (-1 + a^2*b^
4*x^2 + 2*a*b^4*x*C[1] + b^4*C[1]^2)^(3/2) + 6*a^2*b^5*C[2] + 6*a^2*b^5*x*C[3] -
  3*b^2*C[1]*Log[a*b^2*x + b^2*C[1] + Sqrt[-1 + a^2*b^4*x^2 + 2*a*b^4*x*C[1] + b^
4*C[1]^2]] - 3*a*b^2*x*Log[b^2*(a*b^2*x + b^2*C[1] + Sqrt[-1 + a^2*b^4*x^2 + 2*a
*b^4*x*C[1] + b^4*C[1]^2])])/(6*a^2*b^5)}, {y[x] -> C[2] + x*C[3] + (-(Sqrt[-1 +
  a^2*b^4*x^2 + 2*a*b^4*x*C[1] + b^4*C[1]^2]*(2 + a^2*b^4*x^2 + 2*a*b^4*x*C[1] +
b^4*C[1]^2)) + 3*b^2*C[1]*Log[a*b^2*x + b^2*C[1] + Sqrt[-1 + a^2*b^4*x^2 + 2*a*b
^4*x*C[1] + b^4*C[1]^2]] + 3*a*b^2*x*Log[b^2*(a*b^2*x + b^2*C[1] + Sqrt[-1 + a^2
*b^4*x^2 + 2*a*b^4*x*C[1] + b^4*C[1]^2])])/(6*a^2*b^5)}}
```

Maple raw input

```
dsolve(diff(diff(y(x),x),x)*diff(diff(diff(y(x),x),x),x) = a*(1+b^2*diff(diff(y(x),x),x)^2)^(1/2), y(
```

Maple raw output

```
y(x) = _C2*x+Int(1/2*(-ln(((-1+b^2*(_C1+x)*a)*(1+b^2*(_C1+x)*a))^(1/2)+(_C1+x)*b
^4*a^2/(a^2*b^4)^(1/2))/(a^2*b^4)^(1/2)+((-1+b^2*(_C1+x)*a)*(1+b^2*(_C1+x)*a))^(
1/2)*(_C1+x))/b,x)+_C3, y(x) = _C2*x+Int(1/2*(ln(((-1+b^2*(_C1+x)*a)*(1+b^2*(_C1
+x)*a))^(1/2)+(_C1+x)*b^4*a^2/(a^2*b^4)^(1/2))/(a^2*b^4)^(1/2)-((-1+b^2*(_C1+x)*
a)*(1+b^2*(_C1+x)*a))^(1/2)*(_C1+x))/b,x)+_C3
```

4.2301 $2xy''(x)y'''(x) = y''(x)^2 - a^2$

ODE

$$2xy''(x)y'''(x) = y''(x)^2 - a^2$$

ODE Classification

[[_3rd_order, _missing_y], [_3rd_order, _with_linear_symmetries], [_3rd_order, _reducibl

Book solution method
TO DO

Mathematica ✓
cpu = 0.0643706 (sec), leaf count = 75

$$\left\{\left\{y(x) \to -\frac{4}{15}e^{-4c_1}\left(a^2 + e^{2c_1}x\right)^{5/2} + c_3x + c_2\right\}, \left\{y(x) \to \frac{4}{15}e^{-4c_1}\left(a^2 + e^{2c_1}x\right)^{5/2} + c_3x + c_2\right\}\right\}$$

Maple ✓
cpu = 0.119 (sec), leaf count = 45

$$\left\{y(x) = -\frac{4}{15\_C1^2}\left(\_C1\,x + a^2\right)^{\frac{5}{2}} + \_C2\,x + \_C3, y(x) = \frac{4}{15\_C1^2}\left(\_C1\,x + a^2\right)^{\frac{5}{2}} + \_C2\,x + \_C3\right\}$$

Mathematica raw input

```
DSolve[2*x*y''[x]*y'''[x] == -a^2 + y''[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> (-4*(a^2 + E^(2*C[1])*x)^(5/2))/(15*E^(4*C[1])) + C[2] + x*C[3]}, {y[x
] -> (4*(a^2 + E^(2*C[1])*x)^(5/2))/(15*E^(4*C[1])) + C[2] + x*C[3]}}
```

Maple raw input

```
dsolve(2*x*diff(diff(y(x),x),x)*diff(diff(diff(y(x),x),x),x) = diff(diff(y(x),x),x)^2-
a^2, y(x),'implicit')
```

Maple raw output

```
y(x) = 4/15*(_C1*x+a^2)^(5/2)/_C1^2+_C2*x+_C3, y(x) = -4/15*(_C1*x+a^2)^(5/2)/_C
1^2+_C2*x+_C3
```

4.2302 $(1-x^2)\left(y'''(x)\right)^2+2xy''(x)y'''(x)-y''(x)^2+1=0$

ODE

$$(1-x^2)\left(y'''(x)\right)^2+2xy''(x)y'''(x)-y''(x)^2+1=0$$

ODE Classification

[[_3rd_order, _missing_y], [_3rd_order, _with_linear_symmetries]]

Book solution method
TO DO

Mathematica ✗
cpu = 602.145 (sec), leaf count = 0 , timed out

```
$Aborted
```

Maple ✓
cpu = 0.202 (sec), leaf count = 97

$$\left\{y(x)=\frac{x^3}{6}\sqrt{\_C1^2-1}+\frac{\_C1\,x^2}{2}+\_C2\,x+\_C3, y(x)=-\frac{1}{6}\left(-x^2+1\right)^{\frac{3}{2}}+\frac{x\arcsin(x)}{2}+\frac{1}{2}\sqrt{-x^2+1}+\_C1\,x+\_C2\right.$$

Mathematica raw input

```
DSolve[1 - y''[x]^2 + 2*x*y''[x]*y'''[x] + (1 - x^2)*y'''[x]^2 == 0,y[x],x]
```

Mathematica raw output

```
$Aborted
```

Maple raw input

```
dsolve((-x^2+1)*diff(diff(diff(y(x),x),x)^2+2*x*diff(diff(y(x),x),x)*diff(diff(diff(y(x),x),x),x)-
diff(diff(y(x),x),x)^2+1 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = -1/6*(-x^2+1)^(3/2)+1/2*x*arcsin(x)+1/2*(-x^2+1)^(1/2)+_C1*x+_C2, y(x) =
1/6*(-x^2+1)^(3/2)-1/2*x*arcsin(x)-1/2*(-x^2+1)^(1/2)+_C1*x+_C2, y(x) = 1/6*(_C1
^2-1)^(1/2)*x^3+1/2*_C1*x^2+_C2*x+_C3
```

4.2303 $\sqrt{y''(x)^2+1}(1-y'''(x)) = y''(x)y'''(x)$

ODE

$$\sqrt{y''(x)^2+1}(1-y'''(x)) = y''(x)y'''(x)$$

ODE Classification

[[_3rd_order, _missing_x], [_3rd_order, _missing_y], [_3rd_order, _with_linear_symmetrie

Book solution method
TO DO

Mathematica ✓
cpu = 0.0444144 (sec), leaf count = 48

$$\left\{\left\{y(x) \to \frac{1}{12}\left(3c_1x^2+3\left(c_1^2+4c_3+2\right)x-6(c_1+x)\log(c_1+x)+12c_2+x^3\right)\right\}\right\}$$

Maple ✓
cpu = 0.202 (sec), leaf count = 41

$$\left\{y(x) = \frac{(-6x-6\_C1)\ln(\_C1+x)}{12}+\frac{x^3}{12}+\frac{\_C1\,x^2}{4}+\frac{(12\_C2+6)x}{12}+\frac{\_C1}{2}+\_C3\right\}$$

Mathematica raw input

```
DSolve[Sqrt[1 + y''[x]^2]*(1 - y'''[x]) == y''[x]*y'''[x],y[x],x]
```

Mathematica raw output

```
{{y[x] -> (x^3 + 3*x^2*C[1] + 12*C[2] + 3*x*(2 + C[1]^2 + 4*C[3]) - 6*(x + C[1])
*Log[x + C[1]])/12}}
```

Maple raw input

```
dsolve((1-diff(diff(diff(y(x),x),x),x))*(1+diff(diff(y(x),x),x)^2)^(1/2) = diff(diff(y(x),x),x)*diff(
```

Maple raw output

```
y(x) = 1/12*(-6*x-6*_C1)*ln(_C1+x)+1/12*x^3+1/4*_C1*x^2+1/12*(12*_C2+6)*x+1/2*_C
1+_C3
```

4.2304 $3y''(x)y''''(x) = 5(y'''(x))^2$

ODE

$$3y''(x)y''''(x) = 5(y'''(x))^2$$

ODE Classification

[[_high_order, _missing_x], [_high_order, _missing_y], [_high_order, _with_linear_symme

Book solution method
TO DO

Mathematica ✓
cpu = 0.0315989 (sec), leaf count = 28

$$\{\{y(x) \to c_2\left(-\sqrt{3c_1+2x}\right)+c_4x+c_3\}\}$$

Maple ✓
cpu = 0.291 (sec), leaf count = 30

$$\left\{y(x) = 3\left(x+\_C2\right)\sqrt{6}\_C1^2\sqrt{-\frac{\_C1}{x+\_C2}}+\_C3\,x+\_C4\right\}$$

Mathematica raw input

```
DSolve[3*y''[x]*y''''[x] == 5*y'''[x]^2,y[x],x]
```

Mathematica raw output

```
{{y[x] -> -(Sqrt[2*x + 3*C[1]]*C[2]) + C[3] + x*C[4]}}
```

Maple raw input

```
dsolve(3*diff(diff(y(x),x),x)*diff(diff(diff(diff(y(x),x),x),x),x) = 5*diff(diff(diff(y(x),x),x),x)^2
```

Maple raw output

```
y(x) = 3*(x+_C2)*6^(1/2)*_C1^2*(-_C1/(x+_C2))^(1/2)+_C3*x+_C4
```

4.2305 $-4y'(x)\left(y'''(x)\right)^2+3y'(x)y''(x)y''''(x)-3y''(x)^3=0$

ODE

$$-4y'(x)\left(y'''(x)\right)^2+3y'(x)y''(x)y''''(x)-3y''(x)^3=0$$

ODE Classification

[[_high_order, _missing_x], [_high_order, _missing_y], [_high_order, _with_linear_symme

Book solution method
TO DO

Mathematica ✗
cpu = 0.100309 (sec), leaf count = 0 , could not solve

```
DSolve[-3*Derivative[2][y][x]^3 - 4*Derivative[1][y][x]*Derivative[3][y][x]^2 + 3*Derivative[1][y][x]
```

Maple ✓
cpu = 0.854 (sec), leaf count = 142

$$\left\{y(x)=ODESolStruc\left(\int\frac{\_j(\_h)\,\mathrm{e}^{\int\_j(\_h)\,\mathrm{d}\_h+\_C2}}{\_h}\,\mathrm{d}\_h+\_C3,[\left\{\frac{\mathrm{d}}{\mathrm{d}\_h}\_j(\_h)=\left(-\frac{\_h}{3}-1\right)(\_j(\_h))^3+\frac{(\_j(\_h))^2}{3}\right.\right.$$

Mathematica raw input

```
DSolve[-3*y''[x]^3 - 4*y'[x]*y'''[x]^2 + 3*y'[x]*y''[x]*y''''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[-3*Derivative[2][y][x]^3 - 4*Derivative[1][y][x]*Derivative[3][y][x]^2 +
3*Derivative[1][y][x]*Derivative[2][y][x]*Derivative[4][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(3*diff(y(x),x)*diff(diff(y(x),x),x)*diff(diff(diff(diff(y(x),x),x),x),x)-4*diff(y(x),x)*diff(d
3*diff(diff(y(x),x),x)^3 = 0, y(x),'implicit')
```

Maple raw output

```
y(x) = ODESolStruc(Int(1/_h*_j(_h)*exp(Int(_j(_h),_h)+_C2),_h)+_C3,[{diff(_j(_h)
,_h) = (-1/3*_h-1)*_j(_h)^3+1/3*_j(_h)^2-1/3/_h*_j(_h)}, {_h = diff(diff(y(x),x)
,x)/diff(y(x),x), _j(_h) = diff(y(x),x)*diff(diff(y(x),x),x)/(diff(y(x),x)*diff(
diff(diff(y(x),x),x),x)-diff(diff(y(x),x),x)^2)}, {x = Int(1/_h*_j(_h),_h)+_C1,
y(x) = Int(1/_h*_j(_h)*exp(Int(_j(_h),_h)+_C2),_h)+_C3}])
```

4.2306 $-45y''(x)y'''(x)y''''(x) + 9y''(x)^2y'''''(x) + 40(y'''(x))^3 = 0$

ODE

$$-45y''(x)y'''(x)y''''(x) + 9y''(x)^2y'''''(x) + 40(y'''(x))^3 = 0$$

ODE Classification

[[_high_order, _missing_x], [_high_order, _missing_y], [_high_order, _with_linear_symme

Book solution method
TO DO

Mathematica ✗
cpu = 0.0723137 (sec), leaf count = 0 , could not solve

```
DSolve[40*Derivative[3][y][x]^3 - 45*Derivative[2][y][x]*Derivative[3][y][x]*Derivative[4][y][x] + 9*
```

Maple ✓
cpu = 0.479 (sec), leaf count = 105

$$\left\{ y(x) = \int\int RootOf\left(-\int^{\_Z} 1\left(RootOf\left(-\ln(\_f) - 6\int^{\_Z} \frac{\_k}{\sqrt{\_k^4 - \_C1}} d\_k + \_C2 \right) \right)^{-1} \_f^{-\frac{3}{2}} d\_f + x + \_C3 \right) dx$$

Mathematica raw input

```
DSolve[40*y'''[x]^3 - 45*y''[x]*y'''[x]*y''''[x] + 9*y''[x]^2*y'''''[x] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[40*Derivative[3][y][x]^3 - 45*Derivative[2][y][x]*Derivative[3][y][x]*Der
ivative[4][y][x] + 9*Derivative[2][y][x]^2*Derivative[5][y][x] == 0, y[x], x]
```

Maple raw input

```
dsolve(9*diff(diff(y(x),x),x)^2*diff(diff(diff(diff(diff(y(x),x),x),x),x),x)-45*diff(diff(y(x),x),x)*
```

Maple raw output

```
y(x) = Int(Int(RootOf(-Intat(1/RootOf(-ln(_f)-6*Intat(1/(_k^4-_C1)^(1/2)*_k,_k =
 _Z)+_C2)/_f^(3/2),_f = _Z)+x+_C3),x),x)+_C4*x+_C5, y(x) = Int(Int(RootOf(-Intat
(1/RootOf(-ln(_f)+6*Intat(1/(_k^4-_C1)^(1/2)*_k,_k = _Z)+_C2)/_f^(3/2),_f = _Z)+
x+_C3),x),x)+_C4*x+_C5
```

4.2307 $y^{(n)}(x) = f(x)$

ODE

$$y^{(n)}(x) = f(x)$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.0108389 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[n][y][x] == f[x], y[x], x]
```

Maple ✗
cpu = 0.479 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[Derivative[n][y][x] == f[x],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[n][y][x] == f[x], y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),[`$`(x,n)]) = f(x), y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```

4.2308 $y^{(n)}(x) = f\left(y^{(n-2)}(x)\right)$

ODE

$$y^{(n)}(x) = f\left(y^{(n-2)}(x)\right)$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.00515178 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[n][y][x] == f[Derivative[-2 + n][y][x]], y[x], x]
```

Maple ✗
cpu = 0.479 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[Derivative[n][y][x] == f[Derivative[-2 + n][y][x]],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[n][y][x] == f[Derivative[-2 + n][y][x]], y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),[`$`(x,n)]) = f(diff(y(x),[`$`(x,n-2)])), y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```

4.2309 $y^{(n)}(x) = f\left(y^{(n-1)}(x)\right)$

ODE

$$y^{(n)}(x) = f\left(y^{(n-1)}(x)\right)$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.00508682 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[n][y][x] == f[Derivative[-1 + n][y][x]], y[x], x]
```

Maple ✗
cpu = 0.479 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[Derivative[n][y][x] == f[Derivative[-1 + n][y][x]],y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[n][y][x] == f[Derivative[-1 + n][y][x]], y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),[`$`(x,n)]) = f(diff(y(x),[`$`(x,n-1)])), y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```

4.2310 $y^{(n-2)}(x)y^{(n)}(x) = y^{(n-1)}(x)^2$

ODE

$$y^{(n-2)}(x)y^{(n)}(x) = y^{(n-1)}(x)^2$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.00511658 (sec), leaf count = 0 , could not solve

```
DSolve[Derivative[-2 + n][y][x]*Derivative[n][y][x] == Derivative[-1 + n][y][x]^2, y[x], x]
```

Maple ✗
cpu = 0.479 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[Derivative[-2 + n][y][x]*Derivative[n][y][x] == Derivative[-1 + n][y][x]^2,y[x],x]
```

Mathematica raw output

```
DSolve[Derivative[-2 + n][y][x]*Derivative[n][y][x] == Derivative[-1 + n][y][x]^
2, y[x], x]
```

Maple raw input

```
dsolve(diff(y(x),[`$`(x,n-2)])*diff(y(x),[`$`(x,n)]) = diff(y(x),[`$`(x,n-1)])^2, y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```

4.2311 $f\left(x, y^{(n)}(x)\right) = 0$

ODE

$$f\left(x, y^{(n)}(x)\right) = 0$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.00598534 (sec), leaf count = 0 , could not solve

```
DSolve[f[x, Derivative[n][y][x]] == 0, y[x], x]
```

Maple ✗
cpu = 0.479 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[f[x, Derivative[n][y][x]] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f[x, Derivative[n][y][x]] == 0, y[x], x]
```

Maple raw input

```
dsolve(f(x,diff(y(x),[`$`(x,n)])) = 0, y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```

4.2312 $f\left(x, y^{(n-1)}(x), y^{(n)}(x)\right) = 0$

ODE

$$f\left(x, y^{(n-1)}(x), y^{(n)}(x)\right) = 0$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.00570855 (sec), leaf count = 0 , could not solve

```
DSolve[f[x, Derivative[-1 + n][y][x], Derivative[n][y][x]] == 0, y[x], x]
```

Maple ✗
cpu = 0.479 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[f[x, Derivative[-1 + n][y][x], Derivative[n][y][x]] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f[x, Derivative[-1 + n][y][x], Derivative[n][y][x]] == 0, y[x], x]
```

Maple raw input

```
dsolve(f(x,diff(y(x),[`$`(x,n-1)]),diff(y(x),[`$`(x,n)])) = 0, y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```

4.2313 $f\left(y^{(n-2)}(x), y^{(n-1)}(x), y^{(n)}(x)\right) = 0$

ODE

$$f\left(y^{(n-2)}(x), y^{(n-1)}(x), y^{(n)}(x)\right) = 0$$

ODE Classification

(ODEtools/info) missing specification of intermediate function

Book solution method
TO DO

Mathematica ✗
cpu = 0.00565703 (sec), leaf count = 0 , could not solve

```
DSolve[f[Derivative[-2 + n][y][x], Derivative[-1 + n][y][x], Derivative[n][y][x]] == 0, y[x], x]
```

Maple ✗
cpu = 0.479 (sec), leaf count = 0 , exception

```
unable to handle ODEs of undefined differential order
```

Mathematica raw input

```
DSolve[f[Derivative[-2 + n][y][x], Derivative[-1 + n][y][x], Derivative[n][y][x]] == 0,y[x],x]
```

Mathematica raw output

```
DSolve[f[Derivative[-2 + n][y][x], Derivative[-1 + n][y][x], Derivative[n][y][x]
] == 0, y[x], x]
```

Maple raw input

```
dsolve(f(diff(y(x),[`$`(x,n-2)]),diff(y(x),[`$`(x,n-1)]),diff(y(x),[`$`(x,n)])) = 0, y(x),'implicit')
```

Maple raw output

```
unable to handle ODEs of undefined differential order
```