Kamke differential equations. Mathematica 12.3.1 and Maple 2021.1

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1 Introduction and summary of results

This report gives the result of solving the 1,940 differential equations from Kamke book in Mathematica 12.3.1 and Maple 2021.1 on windows 10, 64 bit OS. PC with 64 GB RAM, using Intel I7-8086K at 4GHz.

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 := 5*60;
result_of_solve := timelimit(timeOut,dsolve(ode[i]));
cpu_time := time[real]()-t0:
```

Both Maple and Mathematica had a CPU time limit of 5 minutes to complete each problem else the problem is considered not solved and marked as timed out.

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

Table 1 below summarizes the performance of each CAS system

system	% solved	mean CPU (sec)	result mean leaf size	total CPU (minutes)	total leaf si
Mathematica	88.04	2.3	2587.02	65.37	4418635
Maple	88.66	1.55	321.85	44.32	553576

Table 1: Summary of final results

Table 2 summarizes the Kamke equations used

book chapter	kamke equation numbers	This report numbers
Chapter 1, linear first order	1.1—1.576	1—576
Additional non-linear first order	N/A	577—1000
Chapter 2, linear second order	2.1—2.448	1001—1448
Chapter 3, linear third order	3.1—3.85	1449—1533
Chapter 4, linear fourth order	4.1—4.44	1534—1577
Chapter 5, linear fifth and higher order	5.1—5.13	1578—1590
Chapter 6, non-linear second order	6.1—6.246	1591—1836
Chapter 7, non-linear third and higher order	7.1—7.19	1837—1855
Chapter 8, system of ode, first order	8.1—8.57	1856—1912
Chapter 9, system of ode, higher order	9.1—9.28	1913–1940

Table 2: Kamke equation numbering

The following summarizes which equations are solved by each system

Not solved by Mathematica 47, 48, 49, 50, 55, 56, 74, 79, 82, 87, 110, 121, 188, 202, 203, 205, 206, 219, 234, 237, 250, 253, 265, 269, 331, 340, 367, 370, 395, 460, 461, 480, 482, 489, 503, 506, 507, 510, 531, 572, 575, 576, 835, 837, 862, 885, 894, 1015, 1019, 1026, 1028, 1030, 1031, 1032, 1038, 1072, 1073, 1074, 1075, 1076, 1077, 1081, 1082, 1083, 1099, 1126, 1157, 1205, 1212, 1216, 1236, 1278, 1306, 1323, 1362, 1408, 1419, 1439, 1440, 1441, 1443, 1444, 1457, 1458, 1459, 1460, 1461, 1462, 1463, 1473, 1474, 1476, 1484, 1489, 1500, 1515, 1531, 1540, 1541, 1542, 1543, 1544, 1547, 1552, 1569, 1572, 1576, 1581, 1586, 1593, 1595, 1596, 1598, 1599, 1601, 1603, 1605, 1606, 1608, 1609, 1611, 1612, 1615, 1616, 1617, 1618, 1619, 1623, 1624, 1625, 1626, 1627, 1628, 1634, 1636, 1637, 1639, 1642, 1643, 1644, 1645, 1648, 1649, 1658, 1659, 1660, 1662, 1663, 1664, 1665, 1666, 1667, 1672, 1673, 1675, 1677, 1678, 1680, 1684, 1685, 1686, 1690, 1692, 1693, 1695, 1696, 1702, 1704, 1708, 1710, 1713, 1719, 1729, 1732, 1734, 1735, 1737, 1738, 1739, 1742, 1751, 1757, 1761, 1762, 1777, 1779, 1780, 1788, 1789, 1797, 1801, 1802, 1806, 1807, 1811, 1815, 1816, 1818, 1819, 1820, 1821, 1825, 1827, 1831, 1832, 1836, 1838, 1839, 1840, 1841, 1850, 1851, 1854, 1855, 1890, 1905, 1915, 1918, 1919, 1920, 1921, 1922, 1927, 1928, 1929, 1932, 1933, 1934, 1935, 1936, 1937, 1940

Not solved by Maple 47, 48, 49, 50, 55, 56, 74, 79, 82, 87, 110, 121, 202, 203, 205, 206, 219, 234, 237, 250, 253, 265, 269, 340, 367, 368, 370, 383, 395, 448, 452, 460, 461, 480, 482, 485, 503, 506, 507, 510, 531, 543, 572, 575, 576, 733, 789, 790, 835, 837, 885, 894, 912, 920, 1015, 1019, 1026, 1028, 1030, 1031, 1038, 1072, 1073, 1075, 1076, 1077, 1081, 1157, 1205, 1212, 1216, 1234, 1236, 1278, 1408, 1439, 1440, 1441, 1443, 1457, 1458, 1459, 1460, 1461, 1462, 1463, 1473, 1474, 1476, 1484, 1489, 1510, 1515, 1531, 1540, 1541, 1542, 1543, 1582, 1586, 1590, 1593, 1595, 1596, 1598, 1599, 1601, 1605, 1606, 1608, 1609, 1611, 1612, 1615, 1616, 1617, 1618, 1619, 1623, 1624, 1625, 1626, 1627, 1628, 1634, 1636, 1637, 1639, 1642, 1643, 1644, 1645, 1648, 1649, 1658, 1659, 1660, 1662, 1663, 1664, 1665, 1666, 1667, 1672, 1673, 1675, 1677, 1680, 1682, 1684, 1685, 1686, 1690, 1692, 1693, 1695, 1696, 1698, 1702, 1704, 1705, 1706, 1708, 1709, 1710, 1713, 1719, 1721, 1729, 1732, 1734, 1735, 1737, 1738, 1739, 1742, 1751, 1757, 1761, 1762, 1777, 1788, 1789, 1797, 1801, 1802, 1807, 1811, 1816, 1820, 1821, 1831, 1832, 1834, 1835, 1836, 1838, 1839, 1840, 1841, 1850, 1851, 1854, 1855, 1890, 1905, 1915, 1918, 1919, 1920, 1921, 1922, 1927, 1928, 1929, 1932, 1934, 1935, 1937, 1940

Solved by Mathematica but not by Maple 368, 383, 448, 452, 485, 543, 733, 789, 790, 912, 920, 1234, 1510, 1582, 1590, 1682, 1698, 1705, 1706, 1709, 1721, 1834, 1835

Solved by Maple but not by Mathematica 188, 331, 489, 862, 1032, 1074, 1082, 1083, 1099, 1126, 1306, 1323, 1362, 1419, 1444, 1500, 1544, 1547, 1552, 1569, 1572, 1576, 1581, 1603, 1678, 1779, 1780, 1806, 1815, 1818, 1819, 1825, 1827, 1933, 1936

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, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 51, 52, 53, 54, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 75, 76, 77, 78, 80, 81, 83, 84, 85, 86, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133,

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Both systems unable to solve 47, 48, 49, 50, 55, 56, 74, 79, 82, 87, 110, 121, 202, 203, 205, 206, 219, 234, 237, 250, 253, 265, 269, 340, 367, 370, 395, 460, 461, 480, 482, 503, 506, 507, 510, 531, 572, 575, 576, 835, 837, 885, 894, 1015, 1019, 1026, 1028, 1030, 1031, 1038, 1072, 1073, 1075, 1076, 1077, 1081, 1157, 1205, 1212, 1216, 1236, 1278, 1408, 1439, 1440, 1441, 1443, 1457, 1458, 1459, 1460, 1461, 1462, 1463, 1473, 1474, 1476, 1484, 1489, 1515, 1531, 1540, 1541, 1542, 1543, 1586, 1593, 1595, 1596, 1598, 1599, 1601, 1605, 1606, 1608, 1609, 1611, 1612, 1615, 1616, 1617, 1618, 1619, 1623, 1624, 1625, 1626, 1627, 1628, 1634, 1636, 1637, 1639, 1642, 1643, 1644, 1645, 1648, 1649, 1658, 1659, 1660, 1662, 1663, 1664, 1665, 1666, 1667, 1672, 1673, 1675, 1677, 1680, 1684, 1685, 1686, 1690, 1692, 1693, 1695, 1696, 1702, 1704, 1708, 1710, 1713, 1719, 1729, 1732, 1734, 1735, 1737, 1738, 1739, 1742, 1751, 1757, 1761, 1762, 1777, 1788, 1789, 1797, 1801, 1802, 1807, 1811, 1816, 1820, 1821, 1831, 1832, 1836, 1838, 1839, 1840, 1841, 1850, 1851, 1854, 1855, 1890, 1905, 1915, 1918, 1919, 1920, 1921, 1922, 1927, 1928, 1929, 1932, 1934, 1935, 1937, 1940

2 Problems table lookup

Final conclusion table for each equation is given by table 3 below. Clicking on the problem opens a new page that shows the result and links to download each problem as well.

Table 3: Breakdown of results for each Kamke differential equation

	Mathematica			Maple			
#	solved	cpu	leaf	solved	cpu	leaf	note on solution
Kamke 1	✓	0.44	1117	✓	0.055	1089	Linear first order, To Do
Kamke 2	✓	0.063	34	✓	0.021	25	Linear first order, integrating factor $y'(x) + ay(x) = f(x)$
Kamke 3	✓	0.067	40	✓	0.041	38	Linear first order, integrating factor $y'(x) + ay(x) = f(x)$
Kamke 4	✓	0.039	30	✓	0.007	18	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 5	✓	0.401	39	✓	0.13	21	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 6	✓	0.028	18	✓	0.036	15	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 7	✓	0.088	23	✓	0.008	13	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 8	✓	0.03	17	✓	0.023	13	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 9	✓	0.028	19	✓	0.025	14	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 10	✓	0.024	18	✓	0.022	15	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$

Continued on next page

Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 11	✓	0.029	66	✓	0.028	24	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 12	✓	0.087	34	✓	0.051	8	Non-linear first order, Riccati, separable $y'(x) + y^2(x) = 1$
Kamke 13	✓	0.091	79	✓	0.194	79	Non-linear first order, Riccati, transform to second order Airy ODE using $y = -\frac{u'(x)}{uR(x)}$
Kamke 14	✓	0.105	254	✓	0.129	187	Non-linear first order, Riccati, transform to second order Airy ODE using $y = -\frac{u'(x)}{uR(x)}$
Kamke 15	✓	0.079	25	✓	0.181	35	Non-linear first order, Riccati, transform to separable first order
Kamke 16	✓	0.079	186	✓	0.104	49	Non-linear first order, Riccati, transform to first order separable using $y = y_p + \frac{1}{u}$
Kamke 17	✓	0.067	34	✓	0.12	24	Non-linear first order, Riccati, transform to second order standard ODE using $y = -\frac{u'(x)}{uR(x)}$
Kamke 18	✓	0.092	50	✓	0.079	39	Non-linear first order, Riccati, transform to first order ODE solved using integrating factor using transformtion $y = y_p + \frac{1}{u}$
Kamke 19	✓	0.07	14	✓	0.044	16	Non-linear first order, Riccati, transform to first order separable

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 20	✓	0.091	49	✓	0.09	34	Non-linear first order, Riccati, transform to Bernoulli first order non-linear first order then solve Bernoulli
Kamke 21	✓	0.336	7	✓	0.171	25	Non-linear first order, Riccati, transform to first order ODE solved using integrating factor using transformtion $y = y_p + \frac{1}{u}$
Kamke 22	✓	0.509	113	✓	0.748	128	Non-linear first order, Riccati, transform to first order ODE solved using integrating factor using transformtion $y = y_p + \frac{1}{u}$
Kamke 23	✓	0.075	43	✓	0.043	23	Non-linear first order, Riccati, Separable
Kamke 24	✓	0.123	277	✓	0.067	214	Non-linear first order, Riccati, transform to second order Emden-Fowler ODE using $y = -\frac{u'(x)}{uR(x)}$ solution in terms of Bessel functions
Kamke 25	✓	0.365	1835	✓	0.319	348	Non-linear first order, Riccati. To do
Kamke 26	✓	0.194	68	✓	0.277	45	Non-Linear first order, Riccati, transform to second order standard ODE using $y = -\frac{u'(x)}{uR(x)}$
Kamke 27	✓	0.247	120	✓	0.216	72	Non-linear first order, Riccati, transform to Bernoulli first order non-linear first order then solve Bernoulli

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	Mathematica			Maple			
#	solved	cpu	leaf	solved	cpu	leaf	note on solution
Kamke 28	✓	0.128	96	✓	0.088	51	Non-linear first order, Riccati, transform to Bernoulli first order non-linear first order then solve Bernoulli
Kamke 29	✓	0.084	39	✓	0.014	19	Non-linear first order, Bernoulli
Kamke 30	✓	0.184	230	✓	0.087	54	Non-Linear first order, Riccati, transform to second order Bessel like ODE using $y = -\frac{u'(x)}{uR(x)}$, solution uses Bessel functions
Kamke 31	✓	0.179	21	✓	0.058	23	Non-Linear first order, Riccati, separable
Kamke 32	✓	0.328	34	✓	0.26	28	Non-Linear first order, Riccati, has particular solution, solution using $y = y_p + \frac{1}{u}$ leads to first order solved using integrating factor
Kamke 33	✓	0.402	160	✓	0.427	58	Non-Linear first order, Riccati. Complicated algebra, will do later
Kamke 34	✓	0.102	54	✓	0.03	28	Non-Linear first order, Bernoulli. Standard method.
Kamke 35	✓	0.124	61	✓	0.046	35	Non-Linear first order, Riccati. Transform to second order ODE using $y(x) = -\frac{u'(x)}{u(x)R(x)}$

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 36	✓	0.325	195	✓	0.085	62	Non-Linear first order of Abel first kind with None constant invariant. Transform to a reverse Riccati then Solve the resulting second order Airy ODE, and transform solution back. Lots of algebra involved. Hardest ODE so far
Kamke 37	✓	0.934	78	✓	0.09	50	To Do
Kamke 38	✓	0.189	99	✓	0.025	34	Non-Linear first order. smart transformation makes it proper Abel first kind
Kamke 39	✓	0.139	54	✓	0.016	30	To Do
Kamke 40	✓	0.439	185	✓	0.061	48	To Do
Kamke 41	✓	0.251	103	✓	0.304	103	To Do
Kamke 42	✓	1.058	485	✓	0.023	40	To Do
Kamke 43	✓	6.251	490	✓	1.645	373	To Do
Kamke 44	✓	0.083	72	✓	0.019	53	Non-Linear first order Bernoulli. Solved using standard method of solving Bernoulli.
Kamke 45	✓	0.607	133	✓	0.15	123	To Do
Kamke 46	✓	0.291	228	✓	0.103	956	To Do
Kamke 47	✗	0	0	✗	0	0	To Do
Kamke 48	✗	0	0	✗	0	0	To Do
Kamke 49	✗	0	0	✗	0	0	To Do
Kamke 50	✗	0	0	✗	0	0	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 51	✓	1.894	355	✓	0.382	237	To Do
Kamke 52	✓	0.276	117	✓	0.432	61	To Do
Kamke 53	✓	0.514	96	✓	0.178	281	To Do
Kamke 54	✓	0.406	74	✓	0.181	38	To Do
Kamke 55	✗	0	0	✗	0	0	To Do
Kamke 56	✗	0	0	✗	0	0	To Do
Kamke 57	✓	0.063	26	✓	0.09	31	To Do
Kamke 58	✓	0.317	118	✓	0.073	68	To Do
Kamke 59	✓	0.24	96	✓	0.057	26	To Do
Kamke 60	✓	0.135	173	✓	0.02	29	Non-Linear first order, separable.
Kamke 61	✓	0.207	75	✓	0.015	50	To Do
Kamke 62	✓	2.569	44	✓	0.384	34	Non-Linear first order, special transformation makes it exact differential.
Kamke 63	✓	0.146	48	✓	5.703	35	To Do
Kamke 64	✓	0.339	269	✓	0.098	124	To Do
Kamke 65	✓	0.967	312	✓	0.057	47	To Do
Kamke 66	✓	0.175	67	✓	0.233	40	To Do
Kamke 67	✓	0.185	14	✓	0.02	51	To Do
Kamke 68	✓	0.741	373	✓	0.073	77	To Do
Kamke 69	✓	8.165	1163	✓	0.177	111	To Do
Kamke 70	✓	12.794	81	✓	0.174	113	To Do
Kamke 71	✓	3.41	2237	✓	0.121	113	To Do
Kamke 72	✓	0.188	89	✓	0.02	64	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 73	✓	1.492	733	✓	0.469	91	To Do
Kamke 74	✗	0	0	✗	0	0	To Do
Kamke 75	✓	0.176	20	✓	0.155	20	Non-Linear first order, Separable
Kamke 76	✓	0.204	116	✓	0.054	41	Non-Linear first order, Separable, integral requires the tangent half-angle substitution (Weierstrass substitution)
Kamke 77	✓	0.314	124	✓	0.08	54	Non-Linear first order, transform to Separable, becomes same as problem 76 above. Transform back after soluion.
Kamke 78	✓	0.687	1317	✓	0.109	89	Non-Linear first order, transform to Separable, integral requires the tangent half-angle substitution (Weierstrass substitution). Kamke calls this d'Alembertsche differential equation
Kamke 79	✗	0	0	✗	0	0	To Do
Kamke 80	✓	0.067	72	✓	1.389	41	To Do
Kamke 81	✓	1.589	220	✓	1.573	78	To Do
Kamke 82	✗	0	0	✗	0	0	To Do
Kamke 83	✓	0.389	69	✓	0.374	44	To Do
Kamke 84	✓	0.212	248	✓	0.044	37	To Do
Kamke 85	✓	0.394	238	✓	0.46	153	To Do
Kamke 86	✓	0.486	184	✓	0.497	52	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 87	✗	0	0	✗	0	0	To Do
Kamke 88	✓	0.504	2831	✓	0.252	256	Non-Linear first order, Riccati, Solved using $y = -\frac{u'}{uR(x)}$ substitution. Convert to second order Bessel ODE
Kamke 89	✓	0.013	42	✓	0.022	56	Linear first order, separable. Integration tricky. requires tangent half-angle substitution
Kamke 90	✓	0.022	24	✓	0.021	17	Linear first order, separable. integrating factor
Kamke 91	✓	0.023	15	✓	0.007	11	To Do
Kamke 92	✓	0.022	15	✓	0.007	12	Linear first order, separable. integrating factor
Kamke 93	✓	0.045	16	✓	0.027	12	To Do
Kamke 94	✓	0.039	25	✓	0.018	23	Linear first order, separable. integrating factor
Kamke 95	✓	0.077	32	✓	0.079	27	Non-Linear first order, Riccati, conversion to second order linear Lienard ODE using $y = \frac{u'}{uR}$. Solution in terms of Bessel functions
Kamke 96	✓	0.069	33	✓	0.037	11	Non-Linear first order, Riccati, but it is separable, so easy to solve by direct integration

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 97	✓	0.113	46	✓	0.037	25	Non-Linear first order, Riccati, smart substitution transfer it to separable first order, so easy to solve by direct integration
Kamke 98	✓	0.19	442	✓	0.062	38	To Do
Kamke 99	✓	0.18	244	✓	0.102	171	To Do
Kamke 100	✓	0.084	157	✓	0.097	59	Non-Linear first order, Riccati, conversion to second order linear Lienard ODE using $y = \frac{u'}{uR}$. Solution in terms of Bessel functions
Kamke 101	✓	0.083	18	✓	0.013	16	Non-Linear first order, Bernoulli, standard method of solving Bernoulli
Kamke 102	✓	0.088	36	✓	0.045	22	Non-Linear first order, Riccati, but transformed using smart substitution $y = xv$ to separable first order which is easily solved
Kamke 103	✓	0.161	90	✓	0.034	29	Non-Linear first order, Riccati, conversion to second order linear Sturm-Lioville ODE using $y = \frac{u'}{uR}$, then smart substitution $t = \frac{x^2}{2}$ is used to solve Sturm-Lioville by converting it to constant coefficients second order ODE

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 104	✓	0.119	43	✓	0.066	63	Non-Linear first order, Riccati, conversion using smart transformation to separable first order
Kamke 105	✓	0.221	473	✓	0.241	844	To Do
Kamke 106	✓	0.214	40	✓	0.062	41	To Do
Kamke 107	✓	0.347	1415	✓	0.233	174	To Do
Kamke 108	✓	0.074	15	✓	0.02	13	Non-Linear first order, Bernoulli, standard method of solving Bernoulli, leads to first order separable
Kamke 109	✓	0.075	17	✓	0.019	15	Non-Linear first order, Bernoulli, standard method of solving Bernoulli, leads to first order separable
Kamke 110	✗	0	0	✗	0	0	Non-Linear first order, Riccati, has known particular solution. Using $y = y_p + \frac{1}{u}$ convert it to first order separable ODE
Kamke 111	✓	0.464	55	✓	0.119	54	To Do
Kamke 112	✓	0.111	13	✓	0.045	27	Non-Linear first order, smart transformation $y(x) = xv(x)$ makes it separable
Kamke 113	✓	0.118	16	✓	0.039	33	Non-Linear first order, very similar to 112. Smart transformation $y(x) = xv(x)$ makes it separable

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 114	✓	0.11	12	✓	3.156	28	Non-Linear first order, very similar to 113. Smart transformation $y(x) = xv(x)$ makes it separable
Kamke 115	✓	0.289	221	✓	0.209	49	Non-Linear first order, Smart transformation $y(x) = xv(x)$ makes it separable
Kamke 116	✓	0.548	121	✓	0.229	86	To Do
Kamke 117	✓	0.18	21	✓	0.106	20	To Do
Kamke 118	✓	0.076	13	✓	0.08	8	To Do
Kamke 119	✓	0.102	17	✓	0.062	14	To Do
Kamke 120	✓	0.112	20	✓	0.18	17	To Do
Kamke 121	✗	0	0	✗	0	0	To Do
Kamke 122	✓	0.3	21	✓	0.495	16	To Do
Kamke 123	✓	0.127	19	✓	0.081	44	To Do
Kamke 124	✓	0.102	16	✓	0.036	12	To Do
Kamke 125	✓	0.19	16	✓	0.069	14	To Do
Kamke 126	✓	0.182	115	✓	0.028	29	To Do
Kamke 127	✓	0.277	186	✓	0.12	39	To Do
Kamke 128	✓	3.051	41	✓	0.285	33	To Do
Kamke 129	✓	0.193	44	✓	0.044	33	To Do
Kamke 130	✓	0.019	21	✓	0.009	15	To Do
Kamke 131	✓	0.214	21	✓	0.185	31	To Do
Kamke 132	✓	0.09	115	✓	0.042	153	To Do
Kamke 133	✓	0.017	27	✓	0.018	16	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 134	✓	0.045	27	✓	0.008	17	To Do
Kamke 135	✓	0.018	14	✓	0.008	11	To Do
Kamke 136	✓	0.081	28	✓	0.018	18	To Do
Kamke 137	✓	0.083	16	✓	0.014	14	To Do
Kamke 138	✓	0.078	13	✓	0.035	11	To Do
Kamke 139	✓	0.231	821	✓	0.129	219	To Do
Kamke 140	✓	0.092	17	✓	0.095	20	To Do
Kamke 141	✓	0.132	67	✓	0.059	51	To Do
Kamke 142	✓	0.2	122	✓	0.102	52	To Do
Kamke 143	✓	0.099	51	✓	0.053	41	To Do
Kamke 144	✓	0.25	1787	✓	0.11	219	To Do
Kamke 145	✓	0.638	267	✓	0.106	117	To Do
Kamke 146	✓	0.85	78	✓	0.138	84	To Do
Kamke 147	✓	0.852	343	✓	0.183	178	To Do
Kamke 148	✓	0.022	30	✓	0.011	16	To Do
Kamke 149	✓	0.022	27	✓	0.01	20	To Do
Kamke 150	✓	0.021	30	✓	0.007	23	To Do
Kamke 151	✓	0.6	203	✓	0.048	85	To Do
Kamke 152	✓	0.388	40	✓	0.904	159	To Do
Kamke 153	✓	0.024	21	✓	0.021	20	To Do
Kamke 154	✓	0.025	26	✓	0.01	19	To Do
Kamke 155	✓	0.146	46	✓	0.126	14	To Do
Kamke 156	✓	0.092	21	✓	0.019	20	To Do
Kamke 157	✓	0.212	158	✓	0.265	231	To Do
Kamke 158	✓	0.154	31	✓	0.017	22	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 159	✓	0.103	22	✓	0.118	13	To Do
Kamke 160	✓	0.135	27	✓	0.032	21	To Do
Kamke 161	✓	0.028	53	✓	0.018	27	To Do
Kamke 162	✓	0.5	133	✓	0.181	58	To Do
Kamke 163	✓	0.111	43	✓	0.063	27	To Do
Kamke 164	✓	0.143	131	✓	0.201	100	To Do
Kamke 165	✓	0.129	22	✓	0.022	17	To Do
Kamke 166	✓	0.156	71	✓	0.146	97	To Do
Kamke 167	✓	0.093	35	✓	0.034	20	To Do
Kamke 168	✓	0.204	234	✓	0.171	140	To Do
Kamke 169	✓	2.112	149	✓	0.136	153	To Do
Kamke 170	✓	0.085	43	✓	0.018	23	To Do
Kamke 171	✓	0.077	17	✓	0.014	15	To Do
Kamke 172	✓	0.09	35	✓	0.314	26	To Do
Kamke 173	✓	0.099	29	✓	0.102	27	To Do
Kamke 174	✓	0.018	17	✓	0.005	13	To Do
Kamke 175	✓	0.031	24	✓	0.019	20	To Do
Kamke 176	✓	0.194	82	✓	0.095	30	To Do
Kamke 177	✓	0.117	22	✓	0.024	17	To Do
Kamke 178	✓	0.161	49	✓	0.109	61	To Do
Kamke 179	✓	0.609	2833	✓	0.162	112	To Do
Kamke 180	✓	0.373	132	✓	0.064	58	To Do
Kamke 181	✓	0.097	347	✓	0.108	28	To Do
Kamke 182	✓	0.222	96	✓	0.136	18	To Do
Kamke 183	✓	0.025	22	✓	0.016	18	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 184	✓	1.139	704	✓	0.396	493	To Do
Kamke 185	✓	0.44	123	✓	0.036	63	To Do
Kamke 186	✓	0.245	19	✓	0.044	17	To Do
Kamke 187	✓	0.233	328	✓	0.066	60	To Do
Kamke 188	✗	0	0	✓	0.029	32	To Do
Kamke 189	✓	0.454	91	✓	0.321	60	To Do
Kamke 190	✓	0.078	173	✓	0.007	29	To Do
Kamke 191	✓	0.136	39	✓	0.024	16	To Do
Kamke 192	✓	0.699	168	✓	0.019	36	To Do
Kamke 193	✓	0.028	16	✓	0.008	14	To Do
Kamke 194	✓	0.185	98	✓	0.031	23	To Do
Kamke 195	✓	0.167	27	✓	0.108	28	To Do
Kamke 196	✓	0.219	53	✓	0.153	29	To Do
Kamke 197	✓	0.121	98	✓	0.123	237	To Do
Kamke 198	✓	0.031	15	✓	0.028	13	To Do
Kamke 199	✓	0.216	15	✓	0.187	105	To Do
Kamke 200	✓	0.129	77	✓	0.094	53	To Do
Kamke 201	✓	0.149	39	✓	0.049	23	To Do
Kamke 202	✗	0	0	✗	0	0	To Do
Kamke 203	✗	0	0	✗	0	0	To Do
Kamke 204	✓	0.125	70	✓	0.325	92	To Do
Kamke 205	✗	0	0	✗	0	0	To Do
Kamke 206	✗	0	0	✗	0	0	To Do
Kamke 207	✓	0.095	47	✓	0.027	37	To Do
Kamke 208	✓	0.219	118	✓	0.083	106	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 209	✓	0.122	84	✓	0.015	21	To Do
Kamke 210	✓	0.09	47	✓	0.028	33	To Do
Kamke 211	✓	0.238	41	✓	0.049	31	To Do
Kamke 212	✓	0.36	95	✓	0.136	30	To Do
Kamke 213	✓	0.138	71	✓	0.789	66	To Do
Kamke 214	✓	0.159	78	✓	0.164	48	To Do
Kamke 215	✓	0.158	80	✓	0.202	51	To Do
Kamke 216	✓	0.143	82	✓	0.176	51	To Do
Kamke 217	✓	0.026	29	✓	0.037	23	To Do
Kamke 218	✓	0.141	257	✓	0.162	57	To Do
Kamke 219	✗	0	0	✗	0	0	To Do
Kamke 220	✓	0.082	57	✓	0.031	43	To Do
Kamke 221	✓	0.026	35	✓	0.09	21	To Do
Kamke 222	✓	0.083	65	✓	0.096	32	To Do
Kamke 223	✓	0.032	55	✓	0.155	51	To Do
Kamke 224	✓	0.026	29	✓	0.107	35	To Do
Kamke 225	✓	0.025	33	✓	0.079	20	To Do
Kamke 226	✓	0.025	35	✓	0.074	21	To Do
Kamke 227	✓	0.022	107	✓	0.165	33	To Do
Kamke 228	✓	0.261	3357	✓	0.387	271	To Do
Kamke 229	✓	0.025	121	✓	0.164	32	To Do
Kamke 230	✓	0.173	98	✓	0.053	100	To Do
Kamke 231	✓	2.46	252	✓	0.237	178	To Do
Kamke 232	✓	0.079	56	✓	0.024	39	To Do
Kamke 233	✓	0.148	38	✓	0.032	30	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 234	✗	0	0	✗	0	0	To Do
Kamke 235	✓	0.108	40	✓	0.055	30	To Do
Kamke 236	✓	0.127	114	✓	0.063	141	To Do
Kamke 237	✗	0	0	✗	0	0	To Do
Kamke 238	✓	0.254	192	✓	0.072	93	To Do
Kamke 239	✓	0.119	54	✓	0.166	59	To Do
Kamke 240	✓	0.101	41	✓	0.03	34	To Do
Kamke 241	✓	0.097	41	✓	0.018	33	To Do
Kamke 242	✓	0.084	60	✓	0.021	39	To Do
Kamke 243	✓	8.871	487	✓	0.117	391	To Do
Kamke 244	✓	8.995	484	✓	0.1	391	To Do
Kamke 245	✓	0.416	1453	✓	1.314	31	To Do
Kamke 246	✓	0.137	80	✓	0.066	63	To Do
Kamke 247	✓	8.775	693	✓	0.201	517	To Do
Kamke 248	✓	0.192	110	✓	0.02	75	To Do
Kamke 249	✓	3.485	115	✓	0.25	202	To Do
Kamke 250	✗	0	0	✗	0	0	To Do
Kamke 251	✓	0.139	60	✓	0.017	51	To Do
Kamke 252	✓	8.681	819	✓	0.654	1338	To Do
Kamke 253	✗	0	0	✗	0	0	To Do
Kamke 254	✓	0.139	99	✓	0.027	59	To Do
Kamke 255	✓	5.025	30	✓	0.194	74	To Do
Kamke 256	✓	0.031	21	✓	0.133	31	To Do
Kamke 257	✓	0.392	39	✓	0.122	98	To Do
Kamke 258	✓	0.112	43	✓	0.027	33	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 259	✓	0.266	50	✓	0.036	51	To Do
Kamke 260	✓	0.13	80	✓	0.03	59	To Do
Kamke 261	✓	0.655	32	✓	0.119	18	To Do
Kamke 262	✓	0.17	101	✓	0.222	65	To Do
Kamke 263	✓	0.099	181	✓	0.148	173	To Do
Kamke 264	✓	0.399	680	✓	0.864	78	To Do
Kamke 265	✗	0	0	✗	0	0	To Do
Kamke 266	✓	1.893	69	✓	2.161	65	To Do
Kamke 267	✓	0.275	36	✓	0.039	32	To Do
Kamke 268	✓	0.172	146	✓	0.074	118	To Do
Kamke 269	✗	0	0	✗	0	0	To Do
Kamke 270	✓	0.148	327	✓	0.027	319	To Do
Kamke 271	✓	0.27	370	✓	0.184	352	To Do
Kamke 272	✓	0.154	42	✓	0.149	43	To Do
Kamke 273	✓	0.175	297	✓	0.027	401	To Do
Kamke 274	✓	0.175	411	✓	0.039	657	To Do
Kamke 275	✓	0.122	18	✓	0.071	30	To Do
Kamke 276	✓	0.143	61	✓	0.047	47	To Do
Kamke 277	✓	0.114	53	✓	0.277	41	To Do
Kamke 278	✓	0.222	39	✓	0.065	28	To Do
Kamke 279	✓	0.541	107	✓	0.176	116	To Do
Kamke 280	✓	0.139	21	✓	0.063	24	To Do
Kamke 281	✓	0.196	75	✓	0.048	55	To Do
Kamke 282	✓	0.23	2129	✓	0.328	71	To Do
Kamke 283	✓	0.348	477	✓	0.074	407	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 284	✓	0.112	59	✓	0.116	21	To Do
Kamke 285	✓	0.167	402	✓	0.077	432	To Do
Kamke 286	✓	0.258	3501	✓	1.237	1337	To Do
Kamke 287	✓	2.586	77	✓	0.066	56	To Do
Kamke 288	✓	0.234	534	✓	0.036	579	To Do
Kamke 289	✓	0.188	115	✓	0.04	115	To Do
Kamke 290	✓	0.458	831	✓	0.132	1388	To Do
Kamke 291	✓	1.131	39	✓	0.16	50	To Do
Kamke 292	✓	45.776	1716	✓	0.042	115	To Do
Kamke 293	✓	0.182	661	✓	0.283	35	To Do
Kamke 294	✓	0.244	71	✓	0.115	112	To Do
Kamke 295	✓	0.231	31	✓	0.261	29	To Do
Kamke 296	✓	0.447	102	✓	0.592	135	To Do
Kamke 297	✓	0.164	216	✓	0.288	29	To Do
Kamke 298	✓	0.099	72	✓	0.024	73	To Do
Kamke 299	✓	0.12	371	✓	0.204	276	To Do
Kamke 300	✓	0.094	99	✓	0.025	83	To Do
Kamke 301	✓	0.14	64	✓	0.202	25	To Do
Kamke 302	✓	0.106	70	✓	0.125	133	To Do
Kamke 303	✓	0.147	25	✓	0.235	34	To Do
Kamke 304	✓	0.42	44	✓	0.251	44	To Do
Kamke 305	✓	0.188	1277	✓	0.022	21	To Do
Kamke 306	✓	0.142	201	✓	0.233	231	To Do
Kamke 307	✓	0.233	149	✓	0.047	125	To Do
Kamke 308	✓	0.016	55	✓	0.018	37	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 309	✓	0.103	151	✓	0.04	113	To Do
Kamke 310	✓	0.175	159	✓	0.183	125	To Do
Kamke 311	✓	0.229	2201	✓	0.103	50	To Do
Kamke 312	✓	0.685	204	✓	2.367	240	To Do
Kamke 313	✓	0.349	537	✓	0.176	748	To Do
Kamke 314	✓	0.153	188	✓	0.067	158	To Do
Kamke 315	✓	0.312	368	✓	0.071	376	To Do
Kamke 316	✓	0.17	48	✓	0.055	53	To Do
Kamke 317	✓	0.306	23	✓	0.183	29	To Do
Kamke 318	✓	0.242	4284	✓	0.022	28	To Do
Kamke 319	✓	0.163	302	✓	0.033	35	To Do
Kamke 320	✓	0.119	76	✓	0.101	78	To Do
Kamke 321	✓	0.452	47	✓	0.254	42	To Do
Kamke 322	✓	0.29	2077	✓	0.028	29	To Do
Kamke 323	✓	0.252	463	✓	0.108	630	To Do
Kamke 324	✓	0.121	723	✓	0.129	815	To Do
Kamke 325	✓	0.194	139	✓	0.669	124	To Do
Kamke 326	✓	2.943	13289	✓	0.514	160	To Do
Kamke 327	✓	0.302	669	✓	0.155	583	To Do
Kamke 328	✓	0.279	42	✓	0.215	33	To Do
Kamke 329	✓	0.741	102	✓	0.443	71	To Do
Kamke 330	✓	0.113	52	✓	0.035	22	To Do
Kamke 331	✗	0	0	✓	0.232	78	To Do
Kamke 332	✓	0.277	34	✓	0.016	33	To Do
Kamke 333	✓	0.424	72	✓	0.097	32	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 334	✓	0.119	39	✓	0.028	19	To Do
Kamke 335	✓	0.149	75	✓	0.008	50	To Do
Kamke 336	✓	0.282	53	✓	0.039	41	To Do
Kamke 337	✓	0.226	161	✓	0.079	28	To Do
Kamke 338	✓	61.416	17681	✓	0.857	127	To Do
Kamke 339	✓	0.355	27	✓	0.204	27	To Do
Kamke 340	✗	0	0	✗	0	0	To Do
Kamke 341	✓	0.248	33	✓	0.065	33	To Do
Kamke 342	✓	0.545	163	✓	0.048	17	To Do
Kamke 343	✓	0.157	35	✓	0.117	27	To Do
Kamke 344	✓	0.181	23	✓	0.059	19	To Do
Kamke 345	✓	0.204	35	✓	0.098	36	To Do
Kamke 346	✓	0.395	24	✓	0.312	19	To Do
Kamke 347	✓	0.301	32	✓	0.149	12	To Do
Kamke 348	✓	0.186	17	✓	0.107	15	To Do
Kamke 349	✓	0.232	15	✓	0.046	17	To Do
Kamke 350	✓	0.579	53	✓	1.043	226	To Do
Kamke 351	✓	0.489	61	✓	0.534	55	To Do
Kamke 352	✓	0.551	43	✓	0.521	33	To Do
Kamke 353	✓	0.082	14	✓	0.078	12	To Do
Kamke 354	✓	0.171	145	✓	0.073	108	To Do
Kamke 355	✓	0.175	17	✓	0.111	15	To Do
Kamke 356	✓	0.247	21	✓	0.127	19	To Do
Kamke 357	✓	0.524	35	✓	0.696	13	To Do
Kamke 358	✓	0.151	29	✓	0.09	11	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 359	✓	0.318	45	✓	0.072	28	To Do
Kamke 360	✓	4.12	369	✓	0.432	48	To Do
Kamke 361	✓	0.85	31	✓	0.234	22	To Do
Kamke 362	✓	0.354	23	✓	0.232	23	To Do
Kamke 363	✓	0.363	33	✓	0.08	35	To Do
Kamke 364	✓	0.432	31	✓	0.191	23	To Do
Kamke 365	✓	0.357	156	✓	0.337	42	To Do
Kamke 366	✓	0.303	91	✓	0.126	45	To Do
Kamke 367	✗	0	0	✗	0	0	To Do
Kamke 368	✓	1.284	795	✗	0	0	To Do
Kamke 369	✓	0.082	107	✓	0.108	68	To Do
Kamke 370	✗	0	0	✗	0	0	To Do
Kamke 371	✓	0.051	37	✓	0.112	20	To Do
Kamke 372	✓	0.003	27	✓	0.047	232	To Do
Kamke 373	✓	0.291	185	✓	0.226	49	To Do
Kamke 374	✓	0.077	73	✓	0.033	85	To Do
Kamke 375	✓	0.031	71	✓	0.029	49	To Do
Kamke 376	✓	0.228	110	✓	0.734	279	To Do
Kamke 377	✓	0.003	19	✓	0.03	24	To Do
Kamke 378	✓	0.003	18	✓	0.025	20	To Do
Kamke 379	✓	0.003	18	✓	0.022	22	To Do
Kamke 380	✓	0.37	1757	✓	0.04	619	To Do
Kamke 381	✓	0.372	1757	✓	0.036	579	To Do
Kamke 382	✓	0.166	201	✓	0.033	146	To Do
Kamke 383	✓	5.019	1118	✗	0	0	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 384	✓	0.005	24	✓	0.03	50	To Do
Kamke 385	✓	0.628	6217	✓	0.293	169	To Do
Kamke 386	✓	0.175	119	✓	0.784	27	To Do
Kamke 387	✓	1.992	190	✓	0.743	115	To Do
Kamke 388	✓	0.627	61	✓	0.082	223	To Do
Kamke 389	✓	0.074	57	✓	0.75	71	To Do
Kamke 390	✓	1.539	154	✓	0.592	281	To Do
Kamke 391	✓	0.015	29	✓	0.017	22	To Do
Kamke 392	✓	0.203	27	✓	0.662	50	To Do
Kamke 393	✓	0.092	31	✓	0.213	77	To Do
Kamke 394	✓	0.341	89	✓	5.547	109	To Do
Kamke 395	✗	0	0	✗	0	0	To Do
Kamke 396	✓	0.063	29	✓	0.019	20	To Do
Kamke 397	✓	0.644	143	✓	0.376	128	To Do
Kamke 398	✓	1.529	258	✓	2.128	137	To Do
Kamke 399	✓	0.003	20	✓	0.022	22	To Do
Kamke 400	✓	0.429	135	✓	0.199	74	To Do
Kamke 401	✓	0.301	1093	✓	0.044	580	To Do
Kamke 402	✓	5.449	1211	✓	0.156	101	To Do
Kamke 403	✓	0.225	116	✓	1.182	247	To Do
Kamke 404	✓	2.278	795	✓	0.256	389	To Do
Kamke 405	✓	1.119	61	✓	0.201	378	To Do
Kamke 406	✓	0.743	57	✓	0.092	262	To Do
Kamke 407	✓	0.031	51	✓	0.036	39	To Do
Kamke 408	✓	0.255	97	✓	0.07	73	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 409	✓	1.99	50	✓	0.166	63	To Do
Kamke 410	✓	30.724	90	✓	0.177	64	To Do
Kamke 411	✓	0.243	99	✓	0.058	65	To Do
Kamke 412	✓	0.389	3229	✓	0.056	146	To Do
Kamke 413	✓	0.111	673	✓	0.173	269	To Do
Kamke 414	✓	0.129	107	✓	0.177	269	To Do
Kamke 415	✓	0.311	25	✓	0.289	95	To Do
Kamke 416	✓	2.027	383	✓	0.068	136	To Do
Kamke 417	✓	0.004	16	✓	0.04	35	To Do
Kamke 418	✓	0.843	220	✓	0.057	42	To Do
Kamke 419	✓	0.95	9073	✓	0.045	109	To Do
Kamke 420	✓	0.282	777	✓	0.058	689	To Do
Kamke 421	✓	0.047	27	✓	0.051	32	To Do
Kamke 422	✓	0.08	81	✓	0.042	30	To Do
Kamke 423	✓	0.085	59	✓	0.046	44	To Do
Kamke 424	✓	0.769	223	✓	0.124	193	To Do
Kamke 425	✓	0.005	21	✓	0.039	45	To Do
Kamke 426	✓	0.004	28	✓	0.037	51	To Do
Kamke 427	✓	0.005	24	✓	0.042	60	To Do
Kamke 428	✓	0.005	22	✓	0.073	66	To Do
Kamke 429	✓	0.005	30	✓	0.065	72	To Do
Kamke 430	✓	235.303	507	✓	6.387	1602	To Do
Kamke 431	✓	0.054	81	✓	0.258	62	To Do
Kamke 432	✓	1.131	70	✓	11.198	242	To Do
Kamke 433	✓	1.085	22	✓	0.244	34	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 434	✓	0.05	27	✓	0.01	7	To Do
Kamke 435	✓	0.073	61	✓	0.246	22	To Do
Kamke 436	✓	0.064	26	✓	3.914	61	To Do
Kamke 437	✓	0.33	47	✓	0.047	36	To Do
Kamke 438	✓	0.026	21	✓	0.016	17	To Do
Kamke 439	✓	0.047	49	✓	0.065	33	To Do
Kamke 440	✓	0.025	19	✓	0.015	15	To Do
Kamke 441	✓	0.092	65	✓	1.404	137	To Do
Kamke 442	✓	0.03	28	✓	0.035	21	To Do
Kamke 443	✓	2.369	10121	✓	1.949	221	To Do
Kamke 444	✓	0.383	75	✓	1.155	120	To Do
Kamke 445	✓	0.063	49	✓	0.023	35	To Do
Kamke 446	✓	0.039	45	✓	0.052	57	To Do
Kamke 447	✓	0.01	89	✓	0.034	33	To Do
Kamke 448	✓	0.109	349	✗	0	0	To Do
Kamke 449	✓	0.031	27	✓	0.02	23	To Do
Kamke 450	✓	0.305	26	✓	0.924	51	To Do
Kamke 451	✓	0.049	51	✓	0.066	78	To Do
Kamke 452	✓	0.015	23	✗	0	0	To Do
Kamke 453	✓	0.893	327	✓	3.486	229	To Do
Kamke 454	✓	0.377	241	✓	0.148	106	To Do
Kamke 455	✓	0.835	123	✓	0.548	66	To Do
Kamke 456	✓	0.129	421	✓	0.419	33	To Do
Kamke 457	✓	0.379	118	✓	1.25	45	To Do
Kamke 458	✓	0.021	120	✓	0.058	90	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 459	✓	2.755	271	✓	0.726	65	To Do
Kamke 460	✗	0	0	✗	0	0	To Do
Kamke 461	✗	0	0	✗	0	0	To Do
Kamke 462	✓	0.03	43	✓	0.046	27	To Do
Kamke 463	✓	0.047	47	✓	0.125	50	To Do
Kamke 464	✓	0.098	52	✓	0.871	70	To Do
Kamke 465	✓	0.051	107	✓	0.084	210	To Do
Kamke 466	✓	2.951	433	✓	0.821	71	To Do
Kamke 467	✓	0.243	226	✓	0.075	148	To Do
Kamke 468	✓	6.762	753	✓	0.086	181	To Do
Kamke 469	✓	0.362	157	✓	0.152	264	To Do
Kamke 470	✓	0.382	143	✓	0.573	87	To Do
Kamke 471	✓	0.016	47	✓	0.025	33	To Do
Kamke 472	✓	0.519	269	✓	0.57	121	To Do
Kamke 473	✓	0.308	165	✓	0.706	71	To Do
Kamke 474	✓	0.175	135	✓	1.148	152	To Do
Kamke 475	✓	0.109	57	✓	0.892	67	To Do
Kamke 476	✓	0.381	143	✓	0.58	87	To Do
Kamke 477	✓	0.217	146	✓	0.548	622	To Do
Kamke 478	✓	0.31	223	✓	0.108	88	To Do
Kamke 479	✓	6.344	576	✓	0.482	929	To Do
Kamke 480	✗	0	0	✗	0	0	To Do
Kamke 481	✓	0.027	49	✓	0.037	35	To Do
Kamke 482	✗	0	0	✗	0	0	To Do
Kamke 483	✓	0.203	71	✓	0.077	103	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 484	✓	0.173	81	✓	0.09	115	To Do
Kamke 485	✓	0.054	29	✗	0	0	To Do
Kamke 486	✓	0.058	117	✓	0.297	54	To Do
Kamke 487	✓	0.419	157	✓	0.557	100	To Do
Kamke 488	✓	0.306	85	✓	0.607	111	To Do
Kamke 489	✗	0	0	✓	2.416	551	To Do
Kamke 490	✓	0.42	70	✓	0.526	145	To Do
Kamke 491	✓	0.716	79	✓	0.8	195	To Do
Kamke 492	✓	0.089	97	✓	0.685	122	To Do
Kamke 493	✓	6.819	615	✓	1.39	111	To Do
Kamke 494	✓	0.116	49	✓	0.199	161	To Do
Kamke 495	✓	0.212	83	✓	0.881	61	To Do
Kamke 496	✓	20.577	17831	✓	0.256	130	To Do
Kamke 497	✓	0.16	76	✓	0.578	203	To Do
Kamke 498	✓	0.117	155	✓	0.447	99	To Do
Kamke 499	✓	0.367	212	✓	0.211	189	To Do
Kamke 500	✓	0.909	100	✓	1.176	220	To Do
Kamke 501	✓	18.58	975	✓	4.926	215	To Do
Kamke 502	✓	1.091	100	✓	0.371	195	To Do
Kamke 503	✗	0	0	✗	0	0	To Do
Kamke 504	✓	0.068	36	✓	0.839	247	To Do
Kamke 505	✓	0.099	73	✓	0.037	52	To Do
Kamke 506	✗	0	0	✗	0	0	To Do
Kamke 507	✗	0	0	✗	0	0	To Do
Kamke 508	✓	2.073	88	✓	2.641	60	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 509	✓	0.284	34	✓	1.664	212	To Do
Kamke 510	✗	0	0	✗	0	0	To Do
Kamke 511	✓	1.484	229	✓	5.939	199	To Do
Kamke 512	✓	6.211	713	✓	7.271	135	To Do
Kamke 513	✓	0.075	81	✓	2.298	1134	To Do
Kamke 514	✓	8.685	605	✓	0.348	87	To Do
Kamke 515	✓	1.882	1922	✓	1.548	117	To Do
Kamke 516	✓	0.523	253	✓	1.023	70	To Do
Kamke 517	✓	0.543	283	✓	1.093	78	To Do
Kamke 518	✓	0.494	236	✓	0.289	126	To Do
Kamke 519	✓	0.598	353	✓	0.598	197	To Do
Kamke 520	✓	0.024	1115	✓	0.193	249	To Do
Kamke 521	✓	0.003	14	✓	0.049	33	To Do
Kamke 522	✓	0.003	20	✓	0.047	44	To Do
Kamke 523	✓	145.263	392	✓	0.067	231	To Do
Kamke 524	✓	0.017	422	✓	0.068	243	To Do
Kamke 525	✓	0.081	135	✓	0.075	122	To Do
Kamke 526	✓	0.066	45	✓	0.019	32	To Do
Kamke 527	✓	0.015	20	✓	0.854	43	To Do
Kamke 528	✓	0.851	398	✓	0.126	86	To Do
Kamke 529	✓	33.365	1758	✓	0.048	1251	To Do
Kamke 530	✓	7.032	648	✓	0.064	424	To Do
Kamke 531	✗	0	0	✗	0	0	To Do
Kamke 532	✓	0.028	1124	✓	0.182	874	To Do
Kamke 533	✓	0.004	16	✓	0.04	76	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 534	✓	0.058	114	✓	0.06	84	To Do
Kamke 535	✓	0.046	49	✓	0.056	51	To Do
Kamke 536	✓	0.012	64	✓	0.043	52	To Do
Kamke 537	✓	0.033	16	✓	4.368	209	To Do
Kamke 538	✓	7.857	113	✓	1.278	1625	To Do
Kamke 539	✓	0.033	45	✓	0.059	32	To Do
Kamke 540	✓	0.037	69	✓	0.081	109	To Do
Kamke 541	✓	0.029	39	✓	0.554	103	To Do
Kamke 542	✓	0.029	20	✓	0.549	107	To Do
Kamke 543	✓	0.023	55	✗	0	0	To Do
Kamke 544	✓	0.072	22	✓	0.898	4201	To Do
Kamke 545	✓	0.614	323	✓	0.217	144	To Do
Kamke 546	✓	0.039	113	✓	0.104	171	To Do
Kamke 547	✓	2.596	490	✓	0.276	118	To Do
Kamke 548	✓	0.932	479	✓	0.451	250	To Do
Kamke 549	✓	0.231	216	✓	0.818	553	To Do
Kamke 550	✓	0.752	488	✓	0.293	60	To Do
Kamke 551	✓	0.167	86	✓	0.67	55	To Do
Kamke 552	✓	0.05	41	✓	0.099	43	To Do
Kamke 553	✓	0.238	56	✓	0.073	36	To Do
Kamke 554	✓	0.151	54	✓	0.449	32	To Do
Kamke 555	✓	0.006	20	✓	0.033	15	To Do
Kamke 556	✓	4.187	67	✓	0.232	581	To Do
Kamke 557	✓	0.046	39	✓	0.283	74	To Do
Kamke 558	✓	0.912	327	✓	0.386	223	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 559	✓	0.334	212	✓	0.258	215	To Do
Kamke 560	✓	12.452	110	✓	0.976	1120	To Do
Kamke 561	✓	1.796	2138	✓	2.306	50	To Do
Kamke 562	✓	0.125	84	✓	0.184	3306	To Do
Kamke 563	✓	0.207	59	✓	0.239	66	To Do
Kamke 564	✓	0.004	17	✓	0.033	32	To Do
Kamke 565	✓	0.027	25	✓	0.25	17	To Do
Kamke 566	✓	0.04	38	✓	0.043	16	To Do
Kamke 567	✓	0.067	49	✓	0.064	18	To Do
Kamke 568	✓	0.08	34	✓	0.069	32	To Do
Kamke 569	✓	0.1	59	✓	0.39	147	To Do
Kamke 570	✓	1.676	58	✓	0.07	30	To Do
Kamke 571	✓	0.141	124	✓	0.52	169	To Do
Kamke 572	✗	0	0	✗	0	0	To Do
Kamke 573	✓	0.025	42	✓	0.141	24	To Do
Kamke 574	✓	0.034	102	✓	0.141	41	To Do
Kamke 575	✗	0	0	✗	0	0	To Do
Kamke 576	✗	0	0	✗	0	0	To Do
Kamke 577	✓	0.272	243	✓	0.038	28	To Do
Kamke 578	✓	0.187	100	✓	0.054	22	To Do
Kamke 579	✓	0.284	514	✓	0.058	35	To Do
Kamke 580	✓	0.296	203	✓	0.075	31	To Do
Kamke 581	✓	0.253	144	✓	0.312	32	To Do
Kamke 582	✓	0.272	142	✓	0.366	30	To Do
Kamke 583	✓	0.241	126	✓	0.162	31	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 584	✓	0.284	115	✓	0.092	35	To Do
Kamke 585	✓	0.241	205	✓	0.491	120	To Do
Kamke 586	✓	0.615	975	✓	0.286	39	To Do
Kamke 587	✓	0.251	123	✓	0.133	29	To Do
Kamke 588	✓	0.204	109	✓	0.135	53	To Do
Kamke 589	✓	0.251	245	✓	0.167	38	To Do
Kamke 590	✓	0.247	94	✓	0.144	28	To Do
Kamke 591	✓	0.509	253	✓	0.245	108	To Do
Kamke 592	✓	0.55	241	✓	0.182	33	To Do
Kamke 593	✓	0.409	221	✓	0.308	35	To Do
Kamke 594	✓	0.373	236	✓	0.14	67	To Do
Kamke 595	✓	0.338	204	✓	0.181	72	To Do
Kamke 596	✓	0.285	156	✓	0.105	26	To Do
Kamke 597	✓	0.383	130	✓	0.651	37	To Do
Kamke 598	✓	0.175	37	✓	0.025	29	To Do
Kamke 599	✓	0.165	95	✓	0.106	57	To Do
Kamke 600	✓	0.29	246	✓	0.142	38	To Do
Kamke 601	✓	0.255	182	✓	0.13	61	To Do
Kamke 602	✓	0.509	167	✓	0.127	33	To Do
Kamke 603	✓	0.352	117	✓	0.155	27	To Do
Kamke 604	✓	0.393	143	✓	0.176	30	To Do
Kamke 605	✓	0.463	145	✓	0.138	29	To Do
Kamke 606	✓	0.604	361	✓	0.679	34	To Do
Kamke 607	✓	0.233	121	✓	0.11	22	To Do
Kamke 608	✓	0.453	274	✓	0.17	40	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 609	✓	0.285	117	✓	0.269	22	To Do
Kamke 610	✓	0.098	25	✓	0.02	20	To Do
Kamke 611	✓	0.283	191	✓	0.097	28	To Do
Kamke 612	✓	0.383	199	✓	0.142	27	To Do
Kamke 613	✓	0.31	226	✓	0.109	23	To Do
Kamke 614	✓	0.389	177	✓	0.461	60	To Do
Kamke 615	✓	0.267	77	✓	0.142	26	To Do
Kamke 616	✓	0.47	177	✓	0.09	26	To Do
Kamke 617	✓	0.99	615	✓	0.248	47	To Do
Kamke 618	✓	0.21	25	✓	0.549	34	To Do
Kamke 619	✓	0.694	330	✓	0.403	81	To Do
Kamke 620	✓	0.803	205	✓	0.246	37	To Do
Kamke 621	✓	0.065	445	✓	0.246	59	To Do
Kamke 622	✓	0.312	140	✓	0.217	77	To Do
Kamke 623	✓	0.204	77	✓	0.255	49	To Do
Kamke 624	✓	24.663	9837	✓	29.544	46	To Do
Kamke 625	✓	0.308	56	✓	0.271	53	To Do
Kamke 626	✓	0.212	88	✓	0.438	115	To Do
Kamke 627	✓	0.828	25	✓	0.236	35	To Do
Kamke 628	✓	0.171	38	✓	0.308	23	To Do
Kamke 629	✓	0.856	47	✓	0.225	62	To Do
Kamke 630	✓	0.442	101	✓	0.377	98	To Do
Kamke 631	✓	0.195	38	✓	0.275	23	To Do
Kamke 632	✓	0.219	65	✓	0.341	54	To Do
Kamke 633	✓	0.235	85	✓	1.194	52	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 634	✓	0.224	33	✓	0.376	26	To Do
Kamke 635	✓	0.19	33	✓	0.325	22	To Do
Kamke 636	✓	0.112	24	✓	0.234	19	To Do
Kamke 637	✓	9.012	59	✓	0.241	84	To Do
Kamke 638	✓	0.128	41	✓	0.21	35	To Do
Kamke 639	✓	0.169	53	✓	0.285	50	To Do
Kamke 640	✓	0.288	53	✓	0.38	47	To Do
Kamke 641	✓	0.215	35	✓	0.364	26	To Do
Kamke 642	✓	0.17	105	✓	0.332	286	To Do
Kamke 643	✓	0.186	31	✓	0.254	22	To Do
Kamke 644	✓	0.37	34	✓	0.565	27	To Do
Kamke 645	✓	0.088	20	✓	0.157	14	To Do
Kamke 646	✓	0.287	35	✓	0.4	23	To Do
Kamke 647	✓	0.362	115	✓	0.322	460	To Do
Kamke 648	✓	0.521	128	✓	0.906	41	To Do
Kamke 649	✓	0.268	37	✓	0.334	27	To Do
Kamke 650	✓	0.491	109	✓	0.354	28	To Do
Kamke 651	✓	0.103	16	✓	0.128	13	To Do
Kamke 652	✓	1.152	101	✓	0.221	27	To Do
Kamke 653	✓	0.756	94	✓	0.304	24	To Do
Kamke 654	✓	0.285	37	✓	0.396	23	To Do
Kamke 655	✓	11.315	82	✓	0.789	66	To Do
Kamke 656	✓	0.103	20	✓	0.14	15	To Do
Kamke 657	✓	0.26	37	✓	0.287	26	To Do
Kamke 658	✓	0.417	41	✓	0.462	28	To Do

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	Mathematica			Maple			
#	solved	cpu	leaf	solved	cpu	leaf	note on solution
Kamke 659	✓	0.811	164	✓	0.375	41	To Do
Kamke 660	✓	0.496	109	✓	0.317	29	To Do
Kamke 661	✓	0.778	164	✓	0.329	39	To Do
Kamke 662	✓	0.266	37	✓	0.294	26	To Do
Kamke 663	✓	1.433	101	✓	0.187	27	To Do
Kamke 664	✓	0.805	94	✓	0.254	25	To Do
Kamke 665	✓	0.44	41	✓	0.669	28	To Do
Kamke 666	✓	0.147	29	✓	0.252	24	To Do
Kamke 667	✓	1.002	90	✓	0.283	82	To Do
Kamke 668	✓	0.665	78	✓	0.866	58	To Do
Kamke 669	✓	0.712	264	✓	0.19	72	To Do
Kamke 670	✓	0.525	62	✓	0.299	70	To Do
Kamke 671	✓	0.326	192	✓	0.236	237	To Do
Kamke 672	✓	1.849	4512	✓	0.229	36	To Do
Kamke 673	✓	0.305	23	✓	0.56	17	To Do
Kamke 674	✓	0.821	91	✓	0.494	27	To Do
Kamke 675	✓	0.342	48	✓	0.076	37	To Do
Kamke 676	✓	0.434	144	✓	0.644	43	To Do
Kamke 677	✓	0.182	80	✓	0.083	48	To Do
Kamke 678	✓	0.304	101	✓	0.495	37	To Do
Kamke 679	✓	0.167	59	✓	0.065	37	To Do
Kamke 680	✓	1.021	89	✓	0.469	28	To Do
Kamke 681	✓	0.208	84	✓	0.079	45	To Do
Kamke 682	✓	0.295	39	✓	0.475	28	To Do
Kamke 683	✓	1.011	84	✓	0.162	114	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 684	✓	0.123	20	✓	3.691	30	To Do
Kamke 685	✓	0.153	87	✓	0.093	48	To Do
Kamke 686	✓	8.624	68	✓	0.206	85	To Do
Kamke 687	✓	0.166	130	✓	0.125	39	To Do
Kamke 688	✓	0.381	82	✓	0.101	42	To Do
Kamke 689	✓	0.348	60	✓	0.071	25	To Do
Kamke 690	✓	0.508	105	✓	0.533	40	To Do
Kamke 691	✓	0.286	21	✓	0.831	17	To Do
Kamke 692	✓	0.119	20	✓	3.871	30	To Do
Kamke 693	✓	0.37	146	✓	0.111	40	To Do
Kamke 694	✓	0.423	66	✓	0.587	30	To Do
Kamke 695	✓	0.225	34	✓	0.067	39	To Do
Kamke 696	✓	0.951	51	✓	0.075	32	To Do
Kamke 697	✓	0.323	114	✓	0.114	40	To Do
Kamke 698	✓	0.314	108	✓	0.099	34	To Do
Kamke 699	✓	0.343	101	✓	0.504	36	To Do
Kamke 700	✓	0.153	76	✓	0.143	62	To Do
Kamke 701	✓	1.78	88	✓	9.357	71	To Do
Kamke 702	✓	2.401	37	✓	0.095	35	To Do
Kamke 703	✓	0.455	101	✓	0.23	44	To Do
Kamke 704	✓	7.648	66	✓	0.072	38	To Do
Kamke 705	✓	0.148	30	✓	0.211	24	To Do
Kamke 706	✓	33.483	610	✓	0.678	65	To Do
Kamke 707	✓	4.832	1391	✓	0.61	105	To Do
Kamke 708	✓	0.364	89	✓	1095.872	229	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 709	✓	2.556	217	✓	0.312	39	To Do
Kamke 710	✓	1.133	38	✓	3.249	31	To Do
Kamke 711	✓	0.224	28	✓	0.277	31	To Do
Kamke 712	✓	0.453	105	✓	0.538	38	To Do
Kamke 713	✓	0.115	649	✓	0.405	86	To Do
Kamke 714	✓	1.362	162	✓	0.304	96	To Do
Kamke 715	✓	0.474	104	✓	0.501	39	To Do
Kamke 716	✓	2.361	133	✓	0.312	37	To Do
Kamke 717	✓	0.641	106	✓	0.582	33	To Do
Kamke 718	✓	0.339	127	✓	0.08	44	To Do
Kamke 719	✓	0.406	49	✓	0.152	34	To Do
Kamke 720	✓	2.519	314	✓	0.212	48	To Do
Kamke 721	✓	0.12	27	✓	0.1	19	To Do
Kamke 722	✓	23.835	490	✓	0.522	70	To Do
Kamke 723	✓	0.223	663	✓	0.115	856	To Do
Kamke 724	✓	15.448	422	✓	0.068	18	To Do
Kamke 725	✓	0.319	19	✓	1.019	25	To Do
Kamke 726	✓	0.104	625	✓	0.329	83	To Do
Kamke 727	✓	0.461	29	✓	0.3	25	To Do
Kamke 728	✓	0.305	72	✓	0.437	50	To Do
Kamke 729	✓	0.258	327	✓	0.128	404	To Do
Kamke 730	✓	0.309	83	✓	1.582	41	To Do
Kamke 731	✓	0.465	47	✓	0.31	42	To Do
Kamke 732	✓	0.775	116	✓	0.589	43	To Do
Kamke 733	✓	12.374	73	✗	0	0	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 734	✓	0.245	37	✓	0.314	39	To Do
Kamke 735	✓	1.406	573	✓	0.095	78	To Do
Kamke 736	✓	0.209	31	✓	0.19	43	To Do
Kamke 737	✓	0.038	36	✓	0.229	29	To Do
Kamke 738	✓	0.445	1347	✓	1.425	1054	To Do
Kamke 739	✓	0.395	39	✓	0.266	35	To Do
Kamke 740	✓	0.118	74	✓	0.106	72	To Do
Kamke 741	✓	1.532	175	✓	1.172	246	To Do
Kamke 742	✓	2.873	3913	✓	1.87	239	To Do
Kamke 743	✓	0.096	406	✓	0.597	296	To Do
Kamke 744	✓	0.15	510	✓	0.2	621	To Do
Kamke 745	✓	1.241	546	✓	0.09	78	To Do
Kamke 746	✓	0.082	274	✓	0.551	232	To Do
Kamke 747	✓	2.861	88	✓	0.326	75	To Do
Kamke 748	✓	0.269	285	✓	0.123	404	To Do
Kamke 749	✓	0.162	126	✓	0.149	192	To Do
Kamke 750	✓	0.287	72	✓	0.432	49	To Do
Kamke 751	✓	0.176	30	✓	0.208	26	To Do
Kamke 752	✓	0.212	849	✓	2.487	723	To Do
Kamke 753	✓	0.173	41	✓	0.291	38	To Do
Kamke 754	✓	0.122	47	✓	0.029	26	To Do
Kamke 755	✓	0.291	2633	✓	0.116	44	To Do
Kamke 756	✓	0.173	95	✓	0.049	37	To Do
Kamke 757	✓	0.037	36	✓	0.121	26	To Do
Kamke 758	✓	0.733	459	✓	0.315	41	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 759	✓	0.092	498	✓	0.816	305	To Do
Kamke 760	✓	0.877	112	✓	1.296	137	To Do
Kamke 761	✓	0.035	33	✓	0.12	18	To Do
Kamke 762	✓	0.166	26	✓	0.21	22	To Do
Kamke 763	✓	0.153	22	✓	0.247	14	To Do
Kamke 764	✓	0.168	50	✓	0.267	36	To Do
Kamke 765	✓	0.348	138	✓	0.208	106	To Do
Kamke 766	✓	0.313	129	✓	0.202	89	To Do
Kamke 767	✓	0.036	38	✓	0.117	26	To Do
Kamke 768	✓	1.404	66	✓	0.16	26	To Do
Kamke 769	✓	0.092	360	✓	0.617	251	To Do
Kamke 770	✓	0.22	705	✓	0.161	1105	To Do
Kamke 771	✓	0.046	46	✓	0.294	84	To Do
Kamke 772	✓	0.168	21	✓	0.201	18	To Do
Kamke 773	✓	0.197	61	✓	0.285	48	To Do
Kamke 774	✓	0.041	45	✓	0.198	51	To Do
Kamke 775	✓	0.169	943	✓	0.098	44	To Do
Kamke 776	✓	0.378	133	✓	0.246	96	To Do
Kamke 777	✓	0.267	39	✓	0.382	51	To Do
Kamke 778	✓	0.16	95	✓	0.05	37	To Do
Kamke 779	✓	0.166	57	✓	0.088	50	To Do
Kamke 780	✓	0.166	15	✓	0.662	27	To Do
Kamke 781	✓	0.418	82	✓	0.63	61	To Do
Kamke 782	✓	4.031	115	✓	1.714	96	To Do
Kamke 783	✓	3.981	88	✓	0.235	75	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 784	✓	19.85	27	✓	10.138	24	To Do
Kamke 785	✓	7.949	29	✓	58.379	24	To Do
Kamke 786	✓	4.037	61	✓	0.086	33	To Do
Kamke 787	✓	23.492	488	✓	0.994	191	To Do
Kamke 788	✓	24.133	348	✓	0.355	108	To Do
Kamke 789	✓	57.386	120	✗	0	0	To Do
Kamke 790	✓	71.973	127	✗	0	0	To Do
Kamke 791	✓	7.	110	✓	7.334	306	To Do
Kamke 792	✓	2.772	157	✓	0.302	112	To Do
Kamke 793	✓	12.116	399	✓	1.955	32	To Do
Kamke 794	✓	0.207	67	✓	0.543	32	To Do
Kamke 795	✓	0.44	111	✓	0.028	37	To Do
Kamke 796	✓	9.294	102	✓	1.363	143	To Do
Kamke 797	✓	1.824	349	✓	0.549	168	To Do
Kamke 798	✓	0.527	27	✓	0.187	30	To Do
Kamke 799	✓	1.088	126	✓	0.271	147	To Do
Kamke 800	✓	0.423	128	✓	0.021	41	To Do
Kamke 801	✓	0.38	126	✓	0.063	63	To Do
Kamke 802	✓	0.14	101	✓	0.135	27	To Do
Kamke 803	✓	0.409	637	✓	0.41	65	To Do
Kamke 804	✓	0.605	43	✓	1.323	38	To Do
Kamke 805	✓	0.172	37	✓	0.702	42	To Do
Kamke 806	✓	0.426	22	✓	0.692	22	To Do
Kamke 807	✓	0.274	59	✓	0.467	43	To Do
Kamke 808	✓	1.928	149	✓	0.13	45	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 809	✓	0.341	128	✓	0.019	41	To Do
Kamke 810	✓	0.117	40	✓	0.064	16	To Do
Kamke 811	✓	1.679	33	✓	1.766	32	To Do
Kamke 812	✓	0.392	78	✓	0.315	30	To Do
Kamke 813	✓	0.563	93	✓	0.593	40	To Do
Kamke 814	✓	0.135	72	✓	0.034	38	To Do
Kamke 815	✓	9.925	99	✓	0.827	168	To Do
Kamke 816	✓	0.24	74	✓	0.547	190	To Do
Kamke 817	✓	0.595	63	✓	0.97	27	To Do
Kamke 818	✓	0.234	34	✓	0.217	34	To Do
Kamke 819	✓	0.308	65	✓	0.294	30	To Do
Kamke 820	✓	0.5	63	✓	0.874	27	To Do
Kamke 821	✓	0.217	2093	✓	0.134	27	To Do
Kamke 822	✓	0.322	32	✓	0.119	25	To Do
Kamke 823	✓	0.384	39	✓	0.189	38	To Do
Kamke 824	✓	0.243	68	✓	0.314	61	To Do
Kamke 825	✓	0.496	148	✓	0.1	48	To Do
Kamke 826	✓	0.474	70	✓	0.377	51	To Do
Kamke 827	✓	0.278	221	✓	0.192	49	To Do
Kamke 828	✓	0.582	56	✓	0.267	54	To Do
Kamke 829	✓	0.442	74	✓	0.372	34	To Do
Kamke 830	✓	0.427	37	✓	0.197	38	To Do
Kamke 831	✓	2.733	145	✓	0.359	35	To Do
Kamke 832	✓	1.947	2497	✓	0.171	31	To Do
Kamke 833	✓	0.279	221	✓	0.153	49	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 834	✓	0.55	90	✓	0.671	60	To Do
Kamke 835	✗	0	0	✗	0	0	To Do
Kamke 836	✓	11.185	379	✓	0.224	73	To Do
Kamke 837	✗	0	0	✗	0	0	To Do
Kamke 838	✓	0.168	31	✓	0.108	25	To Do
Kamke 839	✓	0.281	28	✓	0.072	19	To Do
Kamke 840	✓	0.29	30	✓	0.07	19	To Do
Kamke 841	✓	0.971	236	✓	0.297	97	To Do
Kamke 842	✓	0.218	186	✓	0.032	43	To Do
Kamke 843	✓	0.208	198	✓	0.029	43	To Do
Kamke 844	✓	11.775	386	✓	0.212	97	To Do
Kamke 845	✓	2.948	266	✓	0.213	44	To Do
Kamke 846	✓	0.776	365	✓	0.223	40	To Do
Kamke 847	✓	1.143	103	✓	0.351	34	To Do
Kamke 848	✓	0.211	157	✓	0.595	27	To Do
Kamke 849	✓	1.028	102	✓	0.333	33	To Do
Kamke 850	✓	0.306	1485	✓	1.173	32	To Do
Kamke 851	✓	0.367	145	✓	0.054	42	To Do
Kamke 852	✓	0.359	145	✓	0.058	42	To Do
Kamke 853	✓	0.17	76	✓	0.038	63	To Do
Kamke 854	✓	0.142	24	✓	0.243	51	To Do
Kamke 855	✓	0.144	24	✓	0.254	51	To Do
Kamke 856	✓	0.56	103	✓	0.301	65	To Do
Kamke 857	✓	0.803	107	✓	0.352	32	To Do
Kamke 858	✓	0.368	145	✓	0.057	42	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 859	✓	0.756	105	✓	0.259	63	To Do
Kamke 860	✓	0.351	33	✓	2.522	29	To Do
Kamke 861	✓	1.247	158	✓	0.156	26	To Do
Kamke 862	✗	0	0	✓	0.193	27	To Do
Kamke 863	✓	0.197	30	✓	13.823	38	To Do
Kamke 864	✓	0.327	137	✓	0.085	162	To Do
Kamke 865	✓	0.333	87	✓	0.184	23	To Do
Kamke 866	✓	0.76	117	✓	0.385	37	To Do
Kamke 867	✓	0.203	77	✓	0.06	30	To Do
Kamke 868	✓	0.172	79	✓	0.054	28	To Do
Kamke 869	✓	0.045	42	✓	0.196	37	To Do
Kamke 870	✓	1.359	35	✓	0.682	30	To Do
Kamke 871	✓	0.302	22	✓	0.09	26	To Do
Kamke 872	✓	0.06	215	✓	0.064	49	To Do
Kamke 873	✓	0.774	53	✓	0.333	50	To Do
Kamke 874	✓	0.236	101	✓	0.048	40	To Do
Kamke 875	✓	0.257	497	✓	0.21	73	To Do
Kamke 876	✓	0.183	135	✓	0.043	41	To Do
Kamke 877	✓	0.154	49	✓	0.039	73	To Do
Kamke 878	✓	0.363	130	✓	12.383	75	To Do
Kamke 879	✓	0.33	239	✓	0.196	55	To Do
Kamke 880	✓	0.421	131	✓	0.073	41	To Do
Kamke 881	✓	0.171	75	✓	0.04	77	To Do
Kamke 882	✓	0.252	119	✓	0.056	41	To Do
Kamke 883	✓	1.091	164	✓	0.642	352	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 884	✓	0.726	71	✓	0.42	107	To Do
Kamke 885	✗	0	0	✗	0	0	To Do
Kamke 886	✓	0.196	82	✓	0.027	42	To Do
Kamke 887	✓	0.242	106	✓	0.047	72	To Do
Kamke 888	✓	0.161	78	✓	0.05	79	To Do
Kamke 889	✓	1.506	68	✓	0.864	49	To Do
Kamke 890	✓	0.193	103	✓	0.633	34	To Do
Kamke 891	✓	0.188	135	✓	0.056	56	To Do
Kamke 892	✓	2.087	1283	✓	0.582	40	To Do
Kamke 893	✓	0.179	80	✓	0.024	41	To Do
Kamke 894	✗	0	0	✗	0	0	To Do
Kamke 895	✓	0.227	81	✓	0.054	79	To Do
Kamke 896	✓	0.274	106	✓	0.48	63	To Do
Kamke 897	✓	0.215	79	✓	0.081	87	To Do
Kamke 898	✓	0.188	106	✓	0.04	87	To Do
Kamke 899	✓	0.214	106	✓	0.029	47	To Do
Kamke 900	✓	0.186	381	✓	0.064	48	To Do
Kamke 901	✓	0.575	33	✓	0.584	30	To Do
Kamke 902	✓	0.209	295	✓	0.211	183	To Do
Kamke 903	✓	0.123	19	✓	0.114	48	To Do
Kamke 904	✓	0.109	23	✓	0.091	64	To Do
Kamke 905	✓	0.243	85	✓	0.037	46	To Do
Kamke 906	✓	0.137	326	✓	0.284	37	To Do
Kamke 907	✓	0.249	22	✓	0.174	20	To Do
Kamke 908	✓	0.903	1269	✓	0.313	1742	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 909	✓	0.147	64	✓	1.779	84	To Do
Kamke 910	✓	0.205	98	✓	0.029	42	To Do
Kamke 911	✓	0.78	106	✓	1.02	30	To Do
Kamke 912	✓	1.08	201	✗	0	0	To Do
Kamke 913	✓	0.759	716	✓	0.189	43	To Do
Kamke 914	✓	1.005	401	✓	5.042	71	To Do
Kamke 915	✓	0.83	724	✓	0.083	43	To Do
Kamke 916	✓	0.205	43	✓	0.389	73	To Do
Kamke 917	✓	0.2	28	✓	0.202	38	To Do
Kamke 918	✓	0.49	720	✓	1.171	41	To Do
Kamke 919	✓	0.303	251	✓	0.195	82	To Do
Kamke 920	✓	0.394	301	✗	0	0	To Do
Kamke 921	✓	0.246	92	✓	0.208	30	To Do
Kamke 922	✓	1.147	882	✓	0.144	47	To Do
Kamke 923	✓	1.356	432	✓	0.402	36	To Do
Kamke 924	✓	0.251	80	✓	0.123	46	To Do
Kamke 925	✓	1.891	228	✓	0.287	38	To Do
Kamke 926	✓	0.194	128	✓	0.056	67	To Do
Kamke 927	✓	0.59	112	✓	0.106	68	To Do
Kamke 928	✓	0.956	23	✓	0.283	20	To Do
Kamke 929	✓	0.757	683	✓	0.037	42	To Do
Kamke 930	✓	1.229	39	✓	0.408	36	To Do
Kamke 931	✓	0.177	80	✓	0.04	73	To Do
Kamke 932	✓	4.36	4323	✓	0.128	54	To Do
Kamke 933	✓	0.24	99	✓	0.054	39	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 934	✓	0.283	102	✓	0.061	39	To Do
Kamke 935	✓	47.401	248	✓	0.193	55	To Do
Kamke 936	✓	0.266	99	✓	0.062	39	To Do
Kamke 937	✓	0.28	124	✓	0.08	79	To Do
Kamke 938	✓	0.237	108	✓	0.034	39	To Do
Kamke 939	✓	0.509	136	✓	0.088	70	To Do
Kamke 940	✓	0.205	80	✓	0.067	63	To Do
Kamke 941	✓	0.456	53	✓	0.051	35	To Do
Kamke 942	✓	4.048	349	✓	0.663	43	To Do
Kamke 943	✓	0.499	53	✓	0.051	40	To Do
Kamke 944	✓	1.587	233	✓	0.069	47	To Do
Kamke 945	✓	1.228	213	✓	0.058	41	To Do
Kamke 946	✓	0.639	150	✓	0.132	85	To Do
Kamke 947	✓	0.372	30	✓	0.313	44	To Do
Kamke 948	✓	0.654	39	✓	0.314	68	To Do
Kamke 949	✓	0.202	76	✓	0.042	81	To Do
Kamke 950	✓	0.489	141	✓	0.076	42	To Do
Kamke 951	✓	0.393	140	✓	0.064	41	To Do
Kamke 952	✓	0.371	341	✓	0.297	62	To Do
Kamke 953	✓	0.246	36	✓	0.371	145	To Do
Kamke 954	✓	0.349	115	✓	0.085	53	To Do
Kamke 955	✓	0.307	112	✓	0.098	101	To Do
Kamke 956	✓	1.173	28	✓	0.148	79	To Do
Kamke 957	✓	1.137	28	✓	0.095	79	To Do
Kamke 958	✓	0.41	82	✓	0.062	40	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 959	✓	0.228	20	✓	0.091	15	To Do
Kamke 960	✓	0.171	14	✓	0.057	11	To Do
Kamke 961	✓	4.733	813	✓	0.4	45	To Do
Kamke 962	✓	3.946	1191	✓	1.407	79	To Do
Kamke 963	✓	0.462	108	✓	0.214	39	To Do
Kamke 964	✓	3.488	264	✓	2.365	80	To Do
Kamke 965	✓	0.278	29	✓	0.069	26	To Do
Kamke 966	✓	0.721	292	✓	0.599	50	To Do
Kamke 967	✓	0.524	151	✓	0.078	91	To Do
Kamke 968	✓	0.355	30	✓	0.088	22	To Do
Kamke 969	✓	0.24	19	✓	0.09	15	To Do
Kamke 970	✓	0.637	66	✓	0.678	181	To Do
Kamke 971	✓	0.287	157	✓	0.279	86	To Do
Kamke 972	✓	0.036	32	✓	0.165	27	To Do
Kamke 973	✓	0.406	146	✓	0.37	134	To Do
Kamke 974	✓	0.084	39	✓	0.039	57	To Do
Kamke 975	✓	0.089	47	✓	0.034	59	To Do
Kamke 976	✓	0.181	101	✓	0.247	57	To Do
Kamke 977	✓	0.386	139	✓	0.195	122	To Do
Kamke 978	✓	0.184	60	✓	0.178	71	To Do
Kamke 979	✓	0.101	37	✓	0.042	57	To Do
Kamke 980	✓	0.119	43	✓	0.016	35	To Do
Kamke 981	✓	0.148	49	✓	0.019	41	To Do
Kamke 982	✓	0.395	132	✓	0.287	145	To Do
Kamke 983	✓	0.682	238	✓	0.495	188	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 984	✓	9.642	428	✓	0.296	40	To Do
Kamke 985	✓	0.344	103	✓	0.035	43	To Do
Kamke 986	✓	0.118	44	✓	0.04	36	To Do
Kamke 987	✓	0.153	41	✓	0.056	22	To Do
Kamke 988	✓	0.203	107	✓	0.042	29	To Do
Kamke 989	✓	0.162	56	✓	0.046	29	To Do
Kamke 990	✓	0.197	58	✓	0.465	44	To Do
Kamke 991	✓	0.182	104	✓	0.035	29	To Do
Kamke 992	✓	0.13	43	✓	0.04	25	To Do
Kamke 993	✓	1.409	73	✓	0.034	35	To Do
Kamke 994	✓	0.209	198	✓	0.032	43	To Do
Kamke 995	✓	0.183	17	✓	0.142	14	To Do
Kamke 996	✓	0.115	17	✓	0.08	15	To Do
Kamke 997	✓	0.11	18	✓	0.078	16	To Do
Kamke 998	✓	0.492	27	✓	0.299	27	To Do
Kamke 999	✓	0.194	24	✓	0.054	36	To Do
Kamke 1000	✓	0.933	351	✓	0.127	19	To Do
Kamke 1001	✓	0.003	12	✓	0.005	9	Linear second order, homogeneous, constant coefficient. First problem. Direct integration
Kamke 1002	✓	0.004	16	✓	0.007	13	Linear second order, homogeneous, constant coefficient. Direct method

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1003	✓	0.096	45	✓	0.064	26	Linear second order, Non-homogeneous, constant coefficient. variation of parameters
Kamke 1004	✓	0.09	47	✓	0.054	27	Linear second order, Non-homogeneous, constant coefficient. variation of parameters
Kamke 1005	✓	0.396	1163	✓	0.129	82	Linear second order, Non-homogeneous, constant coefficient. variation of parameters
Kamke 1006	✓	0.004	20	✓	0.007	15	Linear second order, homogeneous, constant coefficient
Kamke 1007	✓	0.088	135	✓	0.018	26	Linear second order, Non-homogeneous, constant coefficient. variation of parameters
Kamke 1008	✓	0.038	48	✓	0.105	41	To Do
Kamke 1009	✓	0.004	28	✓	0.02	21	To Do
Kamke 1010	✓	0.005	46	✓	0.043	31	Linear second order, homogeneous, variable coefficient. Airy ODE with plus sign, series solution
Kamke 1011	✓	0.006	33	✓	0.032	17	Linear second order, homogeneous, variable coefficient. power series solution
Kamke 1012	✓	0.006	47	✓	0.098	29	To Do
Kamke 1013	✓	0.012	43	✓	0.04	22	To Do
Kamke 1014	✓	0.019	170	✓	0.117	63	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1015	✗	0	0	✗	0	0	To Do
Kamke 1016	✓	0.105	312	✓	0.218	91	To Do
Kamke 1017	✓	0.02	46	✓	0.052	17	To Do
Kamke 1018	✓	0.016	55	✓	0.063	39	To Do
Kamke 1019	✗	0	0	✗	0	0	To Do
Kamke 1020	✓	0.497	180	✓	0.196	58	To Do
Kamke 1021	✓	0.027	44	✓	0.211	39	To Do
Kamke 1022	✓	0.019	28	✓	0.2	21	To Do
Kamke 1023	✓	0.01	44	✓	0.19	29	To Do
Kamke 1024	✓	0.13	84	✓	0.127	30	To Do
Kamke 1025	✓	0.884	615	✓	0.184	102	To Do
Kamke 1026	✗	0	0	✗	0	0	To Do
Kamke 1027	✓	0.768	235	✓	0.332	69	To Do
Kamke 1028	✗	0	0	✗	0	0	To Do
Kamke 1029	✓	0.021	58	✓	0.115	22	To Do
Kamke 1030	✗	0	0	✗	0	0	To Do
Kamke 1031	✗	0	0	✗	0	0	To Do
Kamke 1032	✗	0	0	✓	0.108	48	To Do
Kamke 1033	✓	0.012	37	✓	0.017	27	Linear second order, homogeneous, variable coefficient. smart substitution turns it to second order with constant coefficient

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1034	✓	0.009	20	✓	0.013	15	Linear second order, homogeneous, variable coefficient. smart substitution turns it to second order with constant coefficient
Kamke 1035	✓	0.005	58	✓	0.01	41	To Do
Kamke 1036	✓	0.14	209	✓	0.112	134	To Do
Kamke 1037	✓	0.02	101	✓	0.098	64	To Do
Kamke 1038	✗	0	0	✗	0	0	To Do
Kamke 1039	✓	0.009	47	✓	0.019	25	To Do
Kamke 1040	✓	0.039	53	✓	0.045	33	To Do
Kamke 1041	✓	0.007	55	✓	0.076	41	To Do
Kamke 1042	✓	0.006	61	✓	0.07	41	To Do
Kamke 1043	✓	0.102	69	✓	0.218	39	Linear second order, homogeneous, variable coefficient. power series solution
Kamke 1044	✓	0.006	39	✓	0.07	35	To Do
Kamke 1045	✓	0.037	39	✓	0.015	21	To Do
Kamke 1046	✓	0.006	31	✓	0.08	31	To Do
Kamke 1047	✓	0.01	27	✓	0.027	16	Linear second order, homogeneous, variable coefficient. power series solution
Kamke 1048	✓	0.008	45	✓	0.073	37	To Do
Kamke 1049	✓	0.051	109	✓	0.149	66	To Do
Kamke 1050	✓	0.009	23	✓	0.023	14	To Do
Kamke 1051	✓	0.02	44	✓	0.031	27	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1052	✓	0.015	78	✓	0.083	58	To Do
Kamke 1053	✓	0.023	57	✓	0.048	35	To Do
Kamke 1054	✓	0.034	172	✓	0.044	98	To Do
Kamke 1055	✓	0.118	421	✓	0.248	262	To Do
Kamke 1056	✓	0.04	41	✓	0.097	48	To Do
Kamke 1057	✓	0.048	56	✓	0.148	50	To Do
Kamke 1058	✓	0.053	56	✓	0.122	29	To Do
Kamke 1059	✓	0.051	39	✓	0.076	56	To Do
Kamke 1060	✓	0.026	83	✓	0.162	81	To Do
Kamke 1061	✓	0.059	70	✓	0.084	28	To Do
Kamke 1062	✓	0.019	35	✓	0.022	19	To Do
Kamke 1063	✓	0.043	28	✓	0.291	34	To Do
Kamke 1064	✓	0.439	1400	✓	0.343	134	To Do
Kamke 1065	✓	0.139	114	✓	0.21	60	To Do
Kamke 1066	✓	0.024	18	✓	0.079	15	To Do
Kamke 1067	✓	0.023	21	✓	0.051	17	To Do
Kamke 1068	✓	0.113	20	✓	0.196	45	To Do
Kamke 1069	✓	0.025	19	✓	0.094	15	To Do
Kamke 1070	✓	0.244	143	✓	0.157	60	To Do
Kamke 1071	✓	0.061	44	✓	0.07	24	To Do
Kamke 1072	✗	0	0	✗	0	0	To Do
Kamke 1073	✗	0	0	✗	0	0	To Do
Kamke 1074	✗	0	0	✓	0.034	21	To Do
Kamke 1075	✗	0	0	✗	0	0	To Do
Kamke 1076	✗	0	0	✗	0	0	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1077	✗	0	0	✗	0	0	To Do
Kamke 1078	✓	0.03	76	✓	0.035	33	To Do
Kamke 1079	✓	0.207	315	✓	0.027	37	To Do
Kamke 1080	✓	0.058	49	✓	0.492	74	To Do
Kamke 1081	✗	0	0	✗	0	0	To Do
Kamke 1082	✗	0	0	✓	0.126	74	To Do
Kamke 1083	✗	0	0	✓	0.11	31	To Do
Kamke 1084	✓	0.145	36	✓	0.09	20	To Do
Kamke 1085	✓	0.142	32	✓	0.082	24	To Do
Kamke 1086	✓	0.004	42	✓	0.021	29	To Do
Kamke 1087	✓	0.007	36	✓	0.079	33	To Do
Kamke 1088	✓	0.068	180	✓	0.131	31	To Do
Kamke 1089	✓	0.032	99	✓	0.043	58	To Do
Kamke 1090	✓	0.025	50	✓	0.041	40	To Do
Kamke 1091	✓	0.017	41	✓	0.054	35	To Do
Kamke 1092	✓	0.068	72	✓	0.044	29	To Do
Kamke 1093	✓	0.015	13	✓	0.007	10	To Do
Kamke 1094	✓	0.016	41	✓	0.013	29	To Do
Kamke 1095	✓	0.007	30	✓	0.038	23	To Do
Kamke 1096	✓	0.009	61	✓	0.063	39	To Do
Kamke 1097	✓	0.02	46	✓	0.01	31	To Do
Kamke 1098	✓	0.007	41	✓	0.009	27	To Do
Kamke 1099	✗	0	0	✓	0.054	25	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1100	✓	0.016	44	✓	0.033	23	Linear second order, non-homogeneous, variable coefficient. Singularity, Frobenius series solution and also using smart transformation. Variation of parameters.
Kamke 1101	✓	0.017	52	✓	0.035	29	Linear second order, homogeneous, variable coefficient. Singularity, Frobenius series solution and also using smart transformation
Kamke 1102	✓	0.005	42	✓	0.034	33	Linear second order, homogeneous, variable coefficient. Use smart transformation to convert to Emden-Fowler then use Power series solution
Kamke 1103	✓	0.02	64	✓	0.009	33	To Do
Kamke 1104	✓	0.027	104	✓	0.014	41	To Do
Kamke 1105	✓	0.015	64	✓	0.046	39	To Do
Kamke 1106	✓	0.036	441	✓	0.093	71	To Do
Kamke 1107	✓	0.021	40	✓	0.073	30	To Do
Kamke 1108	✓	0.024	37	✓	0.073	26	To Do
Kamke 1109	✓	0.118	45	✓	0.032	33	To Do
Kamke 1110	✓	0.031	36	✓	0.043	23	To Do
Kamke 1111	✓	0.016	20	✓	0.021	13	Linear second order, homogeneous, variable coefficient. Solved using Laplace transform instead of series method

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1112	✓	0.02	30	✓	0.03	22	To Do
Kamke 1113	✓	0.013	24	✓	0.061	17	To Do
Kamke 1114	✓	0.039	39	✓	0.049	34	To Do
Kamke 1115	✓	0.048	76	✓	0.727	47	To Do
Kamke 1116	✓	0.04	43	✓	0.082	31	To Do
Kamke 1117	✓	0.06	107	✓	0.11	82	To Do
Kamke 1118	✓	0.056	51	✓	0.09	39	To Do
Kamke 1119	✓	0.107	77	✓	0.042	20	To Do
Kamke 1120	✓	0.038	168	✓	0.215	109	To Do
Kamke 1121	✓	0.185	41	✓	0.03	23	To Do
Kamke 1122	✓	0.191	57	✓	0.133	28	To Do
Kamke 1123	✓	0.009	91	✓	0.058	45	To Do
Kamke 1124	✓	0.062	65	✓	0.082	29	To Do
Kamke 1125	✓	0.1	84	✓	0.054	36	To Do
Kamke 1126	✗	0	0	✓	0.034	19	To Do
Kamke 1127	✓	0.028	36	✓	0.025	21	To Do
Kamke 1128	✓	0.02	40	✓	0.195	32	To Do
Kamke 1129	✓	0.056	42	✓	0.03	30	To Do
Kamke 1130	✓	0.009	46	✓	0.019	31	To Do
Kamke 1131	✓	0.009	58	✓	0.078	33	To Do
Kamke 1132	✓	0.008	48	✓	0.079	29	To Do
Kamke 1133	✓	0.048	52	✓	0.093	37	To Do
Kamke 1134	✓	0.07	78	✓	0.039	21	To Do
Kamke 1135	✓	0.007	27	✓	0.011	17	To Do
Kamke 1136	✓	0.018	30	✓	0.028	16	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1137	✓	0.071	74	✓	0.045	25	To Do
Kamke 1138	✓	0.02	38	✓	0.067	26	To Do
Kamke 1139	✓	0.01	74	✓	0.08	37	To Do
Kamke 1140	✓	0.035	190	✓	0.021	66	To Do
Kamke 1141	✓	0.117	79	✓	0.042	55	To Do
Kamke 1142	✓	0.034	108	✓	0.102	53	To Do
Kamke 1143	✓	0.025	93	✓	0.098	57	To Do
Kamke 1144	✓	0.024	88	✓	0.084	60	To Do
Kamke 1145	✓	0.232	386	✓	0.189	248	To Do
Kamke 1146	✓	0.004	18	✓	0.007	15	To Do
Kamke 1147	✓	0.004	18	✓	0.007	15	To Do
Kamke 1148	✓	0.008	77	✓	0.011	35	To Do
Kamke 1149	✓	0.046	212	✓	0.02	45	To Do
Kamke 1150	✓	0.007	53	✓	0.073	27	To Do
Kamke 1151	✓	0.011	129	✓	0.089	43	To Do
Kamke 1152	✓	0.014	114	✓	0.21	53	To Do
Kamke 1153	✓	0.021	56	✓	0.031	31	To Do
Kamke 1154	✓	0.014	88	✓	0.112	57	To Do
Kamke 1155	✓	0.036	225	✓	0.044	67	To Do
Kamke 1156	✓	0.078	32	✓	0.144	71	To Do
Kamke 1157	✗	0	0	✗	0	0	To Do
Kamke 1158	✓	0.169	43	✓	0.201	178	To Do
Kamke 1159	✓	0.006	24	✓	0.015	19	To Do
Kamke 1160	✓	0.007	30	✓	0.015	23	To Do
Kamke 1161	✓	0.036	78	✓	0.012	31	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1162	✓	0.042	18	✓	0.01	15	To Do
Kamke 1163	✓	0.109	72	✓	0.038	49	To Do
Kamke 1164	✓	0.015	30	✓	0.028	23	To Do
Kamke 1165	✓	0.097	26	✓	0.018	19	To Do
Kamke 1166	✓	0.01	23	✓	0.016	21	To Do
Kamke 1167	✓	0.055	326	✓	0.038	63	To Do
Kamke 1168	✓	0.015	15	✓	0.008	11	To Do
Kamke 1169	✓	0.05	236	✓	0.032	49	To Do
Kamke 1170	✓	0.016	58	✓	0.043	43	To Do
Kamke 1171	✓	0.037	142	✓	0.118	49	To Do
Kamke 1172	✓	0.06	158	✓	0.034	47	To Do
Kamke 1173	✓	0.111	74	✓	0.077	37	To Do
Kamke 1174	✓	0.007	33	✓	0.028	25	To Do
Kamke 1175	✓	0.187	38	✓	0.061	29	To Do
Kamke 1176	✓	0.014	33	✓	0.033	15	To Do
Kamke 1177	✓	0.704	141	✓	0.087	34	To Do
Kamke 1178	✓	0.035	74	✓	0.031	23	To Do
Kamke 1179	✓	0.017	38	✓	0.032	19	To Do
Kamke 1180	✓	0.06	75	✓	0.047	49	To Do
Kamke 1181	✓	0.044	37	✓	0.022	25	To Do
Kamke 1182	✓	0.011	24	✓	0.012	20	To Do
Kamke 1183	✓	0.008	27	✓	0.013	22	To Do
Kamke 1184	✓	0.007	38	✓	0.023	25	To Do
Kamke 1185	✓	0.028	67	✓	0.027	33	To Do
Kamke 1186	✓	0.014	42	✓	0.03	36	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1187	✓	0.009	99	✓	0.011	53	To Do
Kamke 1188	✓	0.149	266	✓	0.157	114	To Do
Kamke 1189	✓	0.052	445	✓	0.034	79	To Do
Kamke 1190	✓	0.021	122	✓	0.087	38	To Do
Kamke 1191	✓	0.008	110	✓	0.017	23	To Do
Kamke 1192	✓	0.074	40	✓	0.126	51	To Do
Kamke 1193	✓	0.185	44	✓	0.033	38	To Do
Kamke 1194	✓	0.089	65	✓	0.042	48	To Do
Kamke 1195	✓	0.021	80	✓	0.097	93	To Do
Kamke 1196	✓	0.025	37	✓	0.033	31	To Do
Kamke 1197	✓	0.013	78	✓	0.043	43	To Do
Kamke 1198	✓	0.033	41	✓	0.033	37	To Do
Kamke 1199	✓	0.013	41	✓	0.016	35	To Do
Kamke 1200	✓	0.015	62	✓	0.015	27	To Do
Kamke 1201	✓	0.103	44	✓	0.018	34	To Do
Kamke 1202	✓	0.011	22	✓	0.029	14	To Do
Kamke 1203	✓	0.015	124	✓	0.02	28	To Do
Kamke 1204	✓	0.015	132	✓	0.043	35	To Do
Kamke 1205	✗	0	0	✗	0	0	To Do
Kamke 1206	✓	0.069	120	✓	0.07	76	To Do
Kamke 1207	✓	0.08	294	✓	0.227	110	To Do
Kamke 1208	✓	0.044	59	✓	0.048	35	To Do
Kamke 1209	✓	0.015	67	✓	0.057	41	To Do
Kamke 1210	✓	0.194	252	✓	0.181	81	To Do
Kamke 1211	✓	0.04	68	✓	0.057	36	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1212	✗	0	0	✗	0	0	To Do
Kamke 1213	✓	0.078	54	✓	0.053	53	To Do
Kamke 1214	✓	0.201	260	✓	0.156	71	To Do
Kamke 1215	✓	0.109	664	✓	0.175	148	To Do
Kamke 1216	✗	0	0	✗	0	0	To Do
Kamke 1217	✓	0.106	30	✓	0.045	24	To Do
Kamke 1218	✓	0.108	38	✓	0.044	30	To Do
Kamke 1219	✓	0.104	218	✓	0.092	69	To Do
Kamke 1220	✓	0.044	98	✓	0.021	40	To Do
Kamke 1221	✓	0.023	42	✓	0.027	35	To Do
Kamke 1222	✓	0.014	30	✓	0.016	23	To Do
Kamke 1223	✓	0.013	25	✓	0.018	19	To Do
Kamke 1224	✓	0.013	30	✓	0.014	23	To Do
Kamke 1225	✓	0.02	29	✓	0.039	23	To Do
Kamke 1226	✓	0.011	30	✓	0.041	25	To Do
Kamke 1227	✓	0.024	21	✓	0.011	16	To Do
Kamke 1228	✓	0.011	82	✓	0.093	53	To Do
Kamke 1229	✓	0.028	48	✓	0.016	31	To Do
Kamke 1230	✓	0.018	82	✓	0.102	36	To Do
Kamke 1231	✓	0.054	58	✓	0.045	52	To Do
Kamke 1232	✓	5.98	6628	✓	0.152	409	To Do
Kamke 1233	✓	0.462	6628	✓	0.122	409	To Do
Kamke 1234	✓	0.067	48	✗	0	0	To Do
Kamke 1235	✓	0.034	97	✓	0.033	45	To Do
Kamke 1236	✗	0	0	✗	0	0	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1237	✓	0.021	30	✓	0.019	20	To Do
Kamke 1238	✓	0.027	36	✓	0.024	26	To Do
Kamke 1239	✓	0.01	46	✓	0.048	35	To Do
Kamke 1240	✓	0.013	18	✓	0.035	15	To Do
Kamke 1241	✓	0.011	30	✓	0.044	24	To Do
Kamke 1242	✓	0.193	68	✓	0.058	41	To Do
Kamke 1243	✓	0.023	45	✓	0.036	21	To Do
Kamke 1244	✓	0.02	42	✓	0.059	27	To Do
Kamke 1245	✓	0.018	42	✓	0.049	27	To Do
Kamke 1246	✓	0.014	42	✓	0.125	28	To Do
Kamke 1247	✓	0.157	128	✓	0.035	27	To Do
Kamke 1248	✓	0.25	238	✓	0.177	134	To Do
Kamke 1249	✓	0.113	193	✓	0.058	134	To Do
Kamke 1250	✓	0.036	41	✓	0.021	41	To Do
Kamke 1251	✓	0.026	25	✓	0.023	20	To Do
Kamke 1252	✓	0.106	151	✓	0.048	124	To Do
Kamke 1253	✓	0.019	34	✓	0.007	16	To Do
Kamke 1254	✓	0.132	69	✓	0.062	43	To Do
Kamke 1255	✓	0.622	360	✓	0.016	42	To Do
Kamke 1256	✓	0.017	26	✓	0.085	51	To Do
Kamke 1257	✓	0.04	33	✓	0.184	27	To Do
Kamke 1258	✓	0.108	146	✓	0.039	110	To Do
Kamke 1259	✓	0.099	120	✓	0.054	92	To Do
Kamke 1260	✓	0.221	65	✓	0.485	76	To Do
Kamke 1261	✓	0.407	148	✓	0.174	105	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1262	✓	0.239	88	✓	0.214	53	To Do
Kamke 1263	✓	0.37	276	✓	0.065	52	To Do
Kamke 1264	✓	0.052	23	✓	0.036	19	To Do
Kamke 1265	✓	0.032	64	✓	0.609	93	To Do
Kamke 1266	✓	0.021	22	✓	0.009	19	To Do
Kamke 1267	✓	0.357	166	✓	0.113	41	To Do
Kamke 1268	✓	0.098	50	✓	0.101	39	To Do
Kamke 1269	✓	0.063	60	✓	0.074	40	To Do
Kamke 1270	✓	1.659	58	✓	0.148	46	To Do
Kamke 1271	✓	0.009	27	✓	0.006	14	To Do
Kamke 1272	✓	0.009	32	✓	0.034	23	To Do
Kamke 1273	✓	0.012	20	✓	0.064	17	To Do
Kamke 1274	✓	0.032	38	✓	0.01	19	To Do
Kamke 1275	✓	0.025	120	✓	0.139	53	To Do
Kamke 1276	✓	0.03	55	✓	0.06	31	To Do
Kamke 1277	✓	0.021	51	✓	0.055	27	To Do
Kamke 1278	✗	0	0	✗	0	0	To Do
Kamke 1279	✓	0.104	74	✓	0.149	32	To Do
Kamke 1280	✓	0.043	52	✓	0.048	40	To Do
Kamke 1281	✓	0.015	28	✓	0.043	15	To Do
Kamke 1282	✓	0.016	39	✓	0.034	21	To Do
Kamke 1283	✓	0.061	90	✓	0.119	48	To Do
Kamke 1284	✓	0.029	47	✓	0.016	41	To Do
Kamke 1285	✓	1.058	269	✓	0.094	52	To Do
Kamke 1286	✓	0.086	101	✓	0.018	32	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1287	✓	0.013	83	✓	0.02	27	To Do
Kamke 1288	✓	0.025	47	✓	0.022	21	To Do
Kamke 1289	✓	0.104	53	✓	0.089	33	To Do
Kamke 1290	✓	0.108	103	✓	0.026	29	To Do
Kamke 1291	✓	0.06	92	✓	0.058	50	To Do
Kamke 1292	✓	0.032	42	✓	0.05	31	To Do
Kamke 1293	✓	0.245	44	✓	0.052	33	To Do
Kamke 1294	✓	0.056	44	✓	0.051	33	To Do
Kamke 1295	✓	0.165	310	✓	0.277	106	To Do
Kamke 1296	✓	0.32	356	✓	0.312	150	To Do
Kamke 1297	✓	0.024	52	✓	0.041	63	To Do
Kamke 1298	✓	0.051	162	✓	0.11	124	To Do
Kamke 1299	✓	0.026	19	✓	0.013	27	To Do
Kamke 1300	✓	0.011	41	✓	0.031	31	To Do
Kamke 1301	✓	0.023	31	✓	0.019	19	To Do
Kamke 1302	✓	0.059	243	✓	0.056	98	To Do
Kamke 1303	✓	4.222	498	✓	0.17	501	To Do
Kamke 1304	✓	0.049	50	✓	0.031	38	To Do
Kamke 1305	✓	0.075	47	✓	0.056	44	To Do
Kamke 1306	✗	0	0	✓	0.143	69	To Do
Kamke 1307	✓	0.101	54	✓	0.042	36	To Do
Kamke 1308	✓	0.013	41	✓	0.016	40	To Do
Kamke 1309	✓	0.086	84	✓	0.089	85	To Do
Kamke 1310	✓	0.008	31	✓	0.012	20	To Do
Kamke 1311	✓	0.091	63	✓	0.122	52	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1312	✓	0.016	32	✓	0.014	19	To Do
Kamke 1313	✓	0.15	87	✓	0.078	35	To Do
Kamke 1314	✓	0.137	87	✓	0.064	33	To Do
Kamke 1315	✓	0.019	44	✓	0.018	45	To Do
Kamke 1316	✓	0.066	38	✓	0.034	18	To Do
Kamke 1317	✓	0.074	38	✓	0.034	13	To Do
Kamke 1318	✓	0.195	172	✓	0.101	122	To Do
Kamke 1319	✓	0.046	60	✓	0.09	31	To Do
Kamke 1320	✓	0.064	21	✓	0.036	17	To Do
Kamke 1321	✓	0.019	18	✓	0.018	15	To Do
Kamke 1322	✓	0.037	44	✓	0.019	44	To Do
Kamke 1323	✗	0	0	✓	0.015	17	To Do
Kamke 1324	✓	0.02	25	✓	0.019	18	To Do
Kamke 1325	✓	0.18	52	✓	0.107	86	To Do
Kamke 1326	✓	0.018	29	✓	0.019	22	To Do
Kamke 1327	✓	0.126	104	✓	0.472	81	To Do
Kamke 1328	✓	0.016	36	✓	0.022	27	To Do
Kamke 1329	✓	0.592	67	✓	0.243	64	To Do
Kamke 1330	✓	3.254	1176	✓	0.816	1147	To Do
Kamke 1331	✓	0.031	55	✓	0.02	19	To Do
Kamke 1332	✓	0.018	26	✓	0.015	17	To Do
Kamke 1333	✓	0.076	70	✓	0.062	45	To Do
Kamke 1334	✓	0.148	114	✓	0.072	89	To Do
Kamke 1335	✓	0.225	893	✓	0.056	57	To Do
Kamke 1336	✓	0.037	70	✓	0.033	42	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1337	✓	0.055	62	✓	0.033	27	To Do
Kamke 1338	✓	0.039	40	✓	0.026	27	To Do
Kamke 1339	✓	0.18	66	✓	0.111	76	To Do
Kamke 1340	✓	0.025	32	✓	0.022	20	To Do
Kamke 1341	✓	61.598	2924	✓	0.15	201	To Do
Kamke 1342	✓	0.081	52	✓	0.027	31	To Do
Kamke 1343	✓	0.163	73	✓	0.086	58	To Do
Kamke 1344	✓	0.442	173	✓	0.06	23	To Do
Kamke 1345	✓	0.05	52	✓	0.044	25	To Do
Kamke 1346	✓	0.082	37	✓	0.05	25	To Do
Kamke 1347	✓	0.078	31	✓	0.029	19	To Do
Kamke 1348	✓	0.337	34	✓	0.188	73	To Do
Kamke 1349	✓	0.094	76	✓	0.067	85	To Do
Kamke 1350	✓	0.007	25	✓	0.011	21	To Do
Kamke 1351	✓	0.043	50	✓	0.026	24	To Do
Kamke 1352	✓	0.01	89	✓	0.042	43	To Do
Kamke 1353	✓	0.731	119	✓	0.217	66	To Do
Kamke 1354	✓	0.213	108	✓	0.271	33	To Do
Kamke 1355	✓	0.247	51	✓	0.101	30	To Do
Kamke 1356	✓	0.206	90	✓	0.063	29	To Do
Kamke 1357	✓	0.482	288	✓	0.102	97	To Do
Kamke 1358	✓	0.042	89	✓	0.043	20	To Do
Kamke 1359	✓	0.071	86	✓	0.079	57	To Do
Kamke 1360	✓	0.066	68	✓	0.064	47	To Do
Kamke 1361	✓	0.331	38	✓	0.033	33	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1362	✗	0	0	✓	0.201	109	To Do
Kamke 1363	✓	0.517	236	✓	0.11	161	To Do
Kamke 1364	✓	0.109	42	✓	0.1	25	To Do
Kamke 1365	✓	0.066	104	✓	0.062	59	To Do
Kamke 1366	✓	0.016	31	✓	0.01	17	To Do
Kamke 1367	✓	0.208	229	✓	0.198	88	To Do
Kamke 1368	✓	0.019	106	✓	0.068	71	To Do
Kamke 1369	✓	0.07	106	✓	0.049	55	To Do
Kamke 1370	✓	0.02	53	✓	0.01	19	To Do
Kamke 1371	✓	0.015	48	✓	0.053	37	To Do
Kamke 1372	✓	0.243	202	✓	0.239	110	To Do
Kamke 1373	✓	0.199	113	✓	0.174	84	To Do
Kamke 1374	✓	0.029	32	✓	0.051	23	To Do
Kamke 1375	✓	0.033	54	✓	0.059	29	To Do
Kamke 1376	✓	0.029	69	✓	0.05	73	To Do
Kamke 1377	✓	0.167	163	✓	0.119	83	To Do
Kamke 1378	✓	0.037	65	✓	0.034	48	To Do
Kamke 1379	✓	0.051	99	✓	0.051	60	To Do
Kamke 1380	✓	0.179	132	✓	0.076	67	To Do
Kamke 1381	✓	0.22	589	✓	0.167	175	To Do
Kamke 1382	✓	0.409	154	✓	0.12	104	To Do
Kamke 1383	✓	0.101	50	✓	0.048	39	To Do
Kamke 1384	✓	0.021	110	✓	0.234	73	To Do
Kamke 1385	✓	0.013	78	✓	0.058	55	To Do
Kamke 1386	✓	0.059	108	✓	0.049	58	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1387	✓	0.024	50	✓	0.022	28	To Do
Kamke 1388	✓	0.221	235	✓	0.063	76	To Do
Kamke 1389	✓	0.275	217	✓	0.064	68	To Do
Kamke 1390	✓	0.023	41	✓	0.026	25	To Do
Kamke 1391	✓	0.038	27	✓	0.024	20	To Do
Kamke 1392	✓	50.388	1763961	✓	0.181	561	To Do
Kamke 1393	✓	11.607	413606	✓	0.122	272	To Do
Kamke 1394	✓	0.034	115	✓	0.095	79	To Do
Kamke 1395	✓	0.065	59	✓	0.059	39	To Do
Kamke 1396	✓	0.865	211	✓	0.183	178	To Do
Kamke 1397	✓	0.054	38	✓	0.097	27	To Do
Kamke 1398	✓	0.124	72	✓	0.155	69	To Do
Kamke 1399	✓	0.033	72	✓	0.039	34	To Do
Kamke 1400	✓	0.093	60	✓	0.045	35	To Do
Kamke 1401	✓	0.01	93	✓	0.052	45	To Do
Kamke 1402	✓	0.808	86	✓	0.229	58	To Do
Kamke 1403	✓	14.393	316	✓	0.615	298	To Do
Kamke 1404	✓	0.016	33	✓	0.037	19	To Do
Kamke 1405	✓	0.048	77	✓	0.065	42	To Do
Kamke 1406	✓	1.472	258	✓	0.137	44	To Do
Kamke 1407	✓	84.182	2002	✓	1.764	2607	To Do
Kamke 1408	✗	0	0	✗	0	0	To Do
Kamke 1409	✓	0.018	43	✓	0.016	39	To Do
Kamke 1410	✓	0.087	481	✓	0.239	253	To Do
Kamke 1411	✓	0.285	42	✓	0.024	27	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1412	✓	0.012	29	✓	0.01	23	To Do
Kamke 1413	✓	0.044	16	✓	0.073	12	To Do
Kamke 1414	✓	0.774	231	✓	0.237	97	To Do
Kamke 1415	✓	0.659	273	✓	0.135	36	To Do
Kamke 1416	✓	0.164	46	✓	0.167	26	To Do
Kamke 1417	✓	0.129	52	✓	0.133	31	To Do
Kamke 1418	✓	0.116	15	✓	4.603	59	To Do
Kamke 1419	✗	0	0	✓	0.19	12	To Do
Kamke 1420	✓	0.379	134	✓	0.298	123	To Do
Kamke 1421	✓	0.153	81	✓	0.104	27	To Do
Kamke 1422	✓	0.077	58	✓	0.209	50	To Do
Kamke 1423	✓	0.056	70	✓	0.25	132	To Do
Kamke 1424	✓	0.191	90	✓	0.258	120	To Do
Kamke 1425	✓	0.752	236	✓	0.415	91	To Do
Kamke 1426	✓	4.113	4128	✓	0.515	549	To Do
Kamke 1427	✓	0.716	129	✓	1.224	203	To Do
Kamke 1428	✓	0.341	104	✓	0.284	183	To Do
Kamke 1429	✓	0.039	51	✓	0.04	25	To Do
Kamke 1430	✓	0.371	22	✓	0.27	85	To Do
Kamke 1431	✓	0.147	80	✓	0.183	30	To Do
Kamke 1432	✓	0.064	37	✓	0.042	22	To Do
Kamke 1433	✓	0.141	46	✓	0.104	28	To Do
Kamke 1434	✓	56.956	1596424	✓	0.561	517	To Do
Kamke 1435	✓	0.126	70	✓	0.134	38	To Do
Kamke 1436	✓	0.461	42	✓	0.246	113	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1437	✓	0.238	42	✓	0.167	29	To Do
Kamke 1438	✓	0.851	615	✓	0.171	102	To Do
Kamke 1439	✗	0	0	✗	0	0	To Do
Kamke 1440	✗	0	0	✗	0	0	To Do
Kamke 1441	✗	0	0	✗	0	0	To Do
Kamke 1442	✓	0.052	46	✓	0.065	30	To Do
Kamke 1443	✗	0	0	✗	0	0	To Do
Kamke 1444	✗	0	0	✓	0.02	37	To Do
Kamke 1445	✓	0.149	24	✓	0.27	20	To Do
Kamke 1446	✓	0.04	33	✓	0.048	22	To Do
Kamke 1447	✓	0.039	29	✓	0.051	20	To Do
Kamke 1448	✓	0.195	149	✓	0.102	77	To Do
Kamke 1449	✓	0.007	53	✓	0.025	47	To Do
Kamke 1450	✓	4.076	3595	✓	0.218	1616	To Do
Kamke 1451	✓	0.015	168	✓	0.1	114	To Do
Kamke 1452	✓	0.006	54	✓	0.01	35	To Do
Kamke 1453	✓	1.016	128	✓	0.139	122	To Do
Kamke 1454	✓	0.006	79	✓	0.053	55	To Do
Kamke 1455	✓	0.019	127	✓	0.113	71	To Do
Kamke 1456	✓	0.025	183	✓	0.07	73	To Do
Kamke 1457	✗	0	0	✗	0	0	To Do
Kamke 1458	✗	0	0	✗	0	0	To Do
Kamke 1459	✗	0	0	✗	0	0	To Do
Kamke 1460	✗	0	0	✗	0	0	To Do
Kamke 1461	✗	0	0	✗	0	0	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1462	✗	0	0	✗	0	0	To Do
Kamke 1463	✗	0	0	✗	0	0	To Do
Kamke 1464	✓	0.005	34	✓	0.01	27	To Do
Kamke 1465	✓	0.082	95	✓	0.102	113	To Do
Kamke 1466	✓	0.008	46	✓	0.025	27	To Do
Kamke 1467	✓	0.005	84	✓	0.031	590	To Do
Kamke 1468	✓	0.055	57	✓	0.094	59	To Do
Kamke 1469	✓	0.012	72	✓	0.035	37	To Do
Kamke 1470	✓	2.402	64	✓	0.082	36	To Do
Kamke 1471	✓	0.078	84	✓	0.143	36	To Do
Kamke 1472	✓	0.092	88	✓	0.143	33	To Do
Kamke 1473	✗	0	0	✗	0	0	To Do
Kamke 1474	✗	0	0	✗	0	0	To Do
Kamke 1475	✓	0.024	38	✓	0.024	23	To Do
Kamke 1476	✗	0	0	✗	0	0	To Do
Kamke 1477	✓	0.129	48	✓	0.026	41	To Do
Kamke 1478	✓	0.024	104	✓	0.097	48	To Do
Kamke 1479	✓	0.108	153	✓	0.175	92	To Do
Kamke 1480	✓	0.172	93	✓	0.186	35	To Do
Kamke 1481	✓	0.375	432	✓	0.066	44	To Do
Kamke 1482	✓	6.628	3629	✓	0.286	1616	To Do
Kamke 1483	✓	0.112	112	✓	0.205	37	To Do
Kamke 1484	✗	0	0	✗	0	0	To Do
Kamke 1485	✓	0.16	64	✓	0.278	51	To Do
Kamke 1486	✓	0.283	65	✓	0.188	51	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1487	✓	0.649	87	✓	0.124	38	To Do
Kamke 1488	✓	0.4	102	✓	0.451	135	To Do
Kamke 1489	✗	0	0	✗	0	0	To Do
Kamke 1490	✓	0.026	33	✓	0.056	18	To Do
Kamke 1491	✓	0.032	102	✓	0.076	88	To Do
Kamke 1492	✓	0.272	43	✓	0.104	39	To Do
Kamke 1493	✓	1.012	2585	✓	0.3	1033	To Do
Kamke 1494	✓	0.019	43	✓	0.028	32	To Do
Kamke 1495	✓	0.006	24	✓	0.012	16	To Do
Kamke 1496	✓	0.194	63	✓	0.03	57	To Do
Kamke 1497	✓	0.362	135	✓	0.194	77	To Do
Kamke 1498	✓	8.402	584	✓	0.197	53	To Do
Kamke 1499	✓	0.189	97	✓	0.191	25	To Do
Kamke 1500	✗	0	0	✓	0.162	55	To Do
Kamke 1501	✓	0.157	86	✓	0.168	37	To Do
Kamke 1502	✓	0.071	98	✓	0.366	104	To Do
Kamke 1503	✓	0.393	258	✓	0.033	67	To Do
Kamke 1504	✓	0.103	43	✓	0.169	18	To Do
Kamke 1505	✓	60.286	115	✓	0.144	79	To Do
Kamke 1506	✓	0.271	150	✓	0.159	43	To Do
Kamke 1507	✓	3.623	70099	✓	0.663	1209	To Do
Kamke 1508	✓	0.592	143	✓	0.121	81	To Do
Kamke 1509	✓	0.008	34	✓	0.056	29	To Do
Kamke 1510	✓	0.034	102	✗	0	0	To Do
Kamke 1511	✓	0.045	51	✓	0.034	49	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1512	✓	0.029	29	✓	0.012	18	To Do
Kamke 1513	✓	0.072	25	✓	0.149	18	To Do
Kamke 1514	✓	0.525	102	✓	0.424	135	To Do
Kamke 1515	✗	0	0	✗	0	0	To Do
Kamke 1516	✓	261.508	15142	✓	0.332	188	To Do
Kamke 1517	✓	0.258	30686	✓	0.387	866	To Do
Kamke 1518	✓	0.229	104	✓	0.341	60	To Do
Kamke 1519	✓	0.024	65	✓	0.119	19	To Do
Kamke 1520	✓	4.221	534	✓	0.371	288	To Do
Kamke 1521	✓	0.048	35	✓	0.305	28	To Do
Kamke 1522	✓	0.014	44	✓	0.046	34	To Do
Kamke 1523	✓	0.275	74	✓	0.311	23	To Do
Kamke 1524	✓	0.157	96	✓	0.408	98	To Do
Kamke 1525	✓	0.332	102	✓	0.543	291	To Do
Kamke 1526	✓	130.222	27	✓	0.187	19	To Do
Kamke 1527	✓	130.115	165	✓	0.621	437	To Do
Kamke 1528	✓	0.842	72	✓	0.219	71	To Do
Kamke 1529	✓	0.084	47	✓	0.091	25	To Do
Kamke 1530	✓	0.073	35	✓	0.216	113	To Do
Kamke 1531	✗	0	0	✗	0	0	To Do
Kamke 1532	✓	0.012	103	✓	0.083	58	To Do
Kamke 1533	✓	0.012	113	✓	0.082	58	To Do
Kamke 1534	✓	0.003	24	✓	0.013	21	To Do
Kamke 1535	✓	0.337	223	✓	0.018	36	To Do
Kamke 1536	✓	0.004	76	✓	0.02	50	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1537	✓	0.888	1722	✓	0.125	67	To Do
Kamke 1538	✓	0.16	66	✓	0.649	49	To Do
Kamke 1539	✓	0.005	44	✓	0.032	35	To Do
Kamke 1540	✗	0	0	✗	0	0	To Do
Kamke 1541	✗	0	0	✗	0	0	To Do
Kamke 1542	✗	0	0	✗	0	0	To Do
Kamke 1543	✗	0	0	✗	0	0	To Do
Kamke 1544	✗	0	0	✓	0.016	41	To Do
Kamke 1545	✓	0.589	40	✓	0.111	27	To Do
Kamke 1546	✓	0.46	300	✓	0.053	73	To Do
Kamke 1547	✗	0	0	✓	0.02	87	To Do
Kamke 1548	✓	0.074	50	✓	0.07	32	To Do
Kamke 1549	✓	0.019	34	✓	0.027	26	To Do
Kamke 1550	✓	2.904	270	✓	2.023	157	To Do
Kamke 1551	✓	0.289	110	✓	0.203	62	To Do
Kamke 1552	✗	0	0	✓	0.069	89	To Do
Kamke 1553	✓	0.008	29	✓	0.011	17	To Do
Kamke 1554	✓	0.008	29	✓	0.013	18	To Do
Kamke 1555	✓	0.046	156	✓	0.131	61	To Do
Kamke 1556	✓	0.009	30	✓	0.014	19	To Do
Kamke 1557	✓	0.049	146	✓	0.091	61	To Do
Kamke 1558	✓	0.115	319	✓	0.123	67	To Do
Kamke 1559	✓	0.2	100	✓	0.13	33	To Do
Kamke 1560	✓	0.007	29	✓	0.012	18	To Do
Kamke 1561	✓	2.857	400	✓	0.26	69	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1562	✓	0.807	140	✓	0.315	77	To Do
Kamke 1563	✓	1.481	232	✓	0.217	87	To Do
Kamke 1564	✓	1.007	230	✓	0.203	88	To Do
Kamke 1565	✓	0.38	242	✓	0.301	71	To Do
Kamke 1566	✓	0.449	238	✓	0.272	35	To Do
Kamke 1567	✓	0.007	30	✓	0.014	19	To Do
Kamke 1568	✓	0.009	122	✓	0.033	89	To Do
Kamke 1569	✗	0	0	✓	0.363	63	To Do
Kamke 1570	✓	0.099	470	✓	0.094	49	To Do
Kamke 1571	✓	0.062	390	✓	0.234	143	To Do
Kamke 1572	✗	0	0	✓	0.345	35	To Do
Kamke 1573	✓	0.133	77	✓	0.038	41	To Do
Kamke 1574	✓	0.161	270	✓	0.67	252	To Do
Kamke 1575	✓	7.536	138	✓	0.469	638	To Do
Kamke 1576	✗	0	0	✓	0.02	67	To Do
Kamke 1577	✓	0.061	46	✓	0.014	21	To Do
Kamke 1578	✓	40.757	141	✓	0.398	89	To Do
Kamke 1579	✓	0.822	80	✓	0.419	69	To Do
Kamke 1580	✓	2.094	234	✓	1.096	79	To Do
Kamke 1581	✗	0	0	✓	793.276	207155	To Do
Kamke 1582	✓	0.108	787	✗	0	0	To Do
Kamke 1583	✓	0.097	92	✓	0.039	40	To Do
Kamke 1584	✓	2.069	216	✓	0.271	118	To Do
Kamke 1585	✓	0.149	214	✓	0.037	679	To Do
Kamke 1586	✗	0	0	✗	0	0	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1587	✓	0.266	492	✓	0.462	154	To Do
Kamke 1588	✓	9.392	114	✓	0.147	90	To Do
Kamke 1589	✓	0.031	670	✓	8.096	3977	To Do
Kamke 1590	✓	270.838	331	✗	0	0	To Do
Kamke 1591	✓	0.032	26	✓	0.753	12	To Do
Kamke 1592	✓	0.066	14	✓	0.861	10	To Do
Kamke 1593	✗	0	0	✗	0	0	To Do
Kamke 1594	✓	0.396	373	✓	0.792	59	To Do
Kamke 1595	✗	0	0	✗	0	0	To Do
Kamke 1596	✗	0	0	✗	0	0	To Do
Kamke 1597	✓	1.761	242	✓	0.783	21	To Do
Kamke 1598	✗	0	0	✗	0	0	To Do
Kamke 1599	✗	0	0	✗	0	0	To Do
Kamke 1600	✓	1.831	1017	✓	0.751	89	To Do
Kamke 1601	✗	0	0	✗	0	0	To Do
Kamke 1602	✓	0.136	47	✓	0.257	73	To Do
Kamke 1603	✗	0	0	✓	42.077	8413	To Do
Kamke 1604	✓	0.04	34	✓	0.231	23	To Do
Kamke 1605	✗	0	0	✗	0	0	To Do
Kamke 1606	✗	0	0	✗	0	0	To Do
Kamke 1607	✓	0.08	79	✓	0.163	49	To Do
Kamke 1608	✗	0	0	✗	0	0	To Do
Kamke 1609	✗	0	0	✗	0	0	To Do
Kamke 1610	✓	3.431	754	✓	0.224	92	To Do
Kamke 1611	✗	0	0	✗	0	0	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1612	✗	0	0	✗	0	0	To Do
Kamke 1613	✓	1.182	35	✓	0.844	27	To Do
Kamke 1614	✓	0.866	32	✓	0.903	33	To Do
Kamke 1615	✗	0	0	✗	0	0	To Do
Kamke 1616	✗	0	0	✗	0	0	To Do
Kamke 1617	✗	0	0	✗	0	0	To Do
Kamke 1618	✗	0	0	✗	0	0	To Do
Kamke 1619	✗	0	0	✗	0	0	To Do
Kamke 1620	✓	2.926	492	✓	0.88	291	To Do
Kamke 1621	✓	8.	990	✓	2.071	108	To Do
Kamke 1622	✓	23.661	88	✓	1.063	415	To Do
Kamke 1623	✗	0	0	✗	0	0	To Do
Kamke 1624	✗	0	0	✗	0	0	To Do
Kamke 1625	✗	0	0	✗	0	0	To Do
Kamke 1626	✗	0	0	✗	0	0	To Do
Kamke 1627	✗	0	0	✗	0	0	To Do
Kamke 1628	✗	0	0	✗	0	0	To Do
Kamke 1629	✓	0.06	75	✓	0.044	38	To Do
Kamke 1630	✓	6.732	3227	✓	1.345	783	To Do
Kamke 1631	✓	0.052	75	✓	0.062	38	To Do
Kamke 1632	✓	0.059	46	✓	0.893	23	To Do
Kamke 1633	✓	32.394	92	✓	1.038	97	To Do
Kamke 1634	✗	0	0	✗	0	0	To Do
Kamke 1635	✓	0.531	104	✓	1.043	79	To Do
Kamke 1636	✗	0	0	✗	0	0	To Do

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	Mathematica			Maple			
#	solved	cpu	leaf	solved	cpu	leaf	note on solution
Kamke 1637	✗	0	0	✗	0	0	To Do
Kamke 1638	✓	3.877	146	✓	0.227	115	To Do
Kamke 1639	✗	0	0	✗	0	0	To Do
Kamke 1640	✓	0.452	96	✓	0.987	70	To Do
Kamke 1641	✓	0.053	61	✓	0.043	29	To Do
Kamke 1642	✗	0	0	✗	0	0	To Do
Kamke 1643	✗	0	0	✗	0	0	To Do
Kamke 1644	✗	0	0	✗	0	0	To Do
Kamke 1645	✗	0	0	✗	0	0	To Do
Kamke 1646	✓	10.583	262	✓	0.991	94	To Do
Kamke 1647	✓	0.444	91	✓	0.563	60	To Do
Kamke 1648	✗	0	0	✗	0	0	To Do
Kamke 1649	✗	0	0	✗	0	0	To Do
Kamke 1650	✓	0.109	30	✓	2.038	16	To Do
Kamke 1651	✓	0.319	414	✓	1.779	31	To Do
Kamke 1652	✓	0.43	76	✓	1.95	36	To Do
Kamke 1653	✓	0.154	75	✓	1.751	41	To Do
Kamke 1654	✓	0.447	308	✓	1.818	38	To Do
Kamke 1655	✓	0.779	350	✓	1.878	84	To Do
Kamke 1656	✓	37.091	9706	✓	2.336	771	To Do
Kamke 1657	✓	0.352	192	✓	1.815	35	To Do
Kamke 1658	✗	0	0	✗	0	0	To Do
Kamke 1659	✗	0	0	✗	0	0	To Do
Kamke 1660	✗	0	0	✗	0	0	To Do
Kamke 1661	✓	0.078	92	✓	0.979	51	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1662	✗	0	0	✗	0	0	To Do
Kamke 1663	✗	0	0	✗	0	0	To Do
Kamke 1664	✗	0	0	✗	0	0	To Do
Kamke 1665	✗	0	0	✗	0	0	To Do
Kamke 1666	✗	0	0	✗	0	0	To Do
Kamke 1667	✗	0	0	✗	0	0	To Do
Kamke 1668	✓	0.055	60	✓	0.934	24	To Do
Kamke 1669	✓	0.442	160	✓	0.899	32	To Do
Kamke 1670	✓	6.761	51	✓	1.332	35	To Do
Kamke 1671	✓	0.109	59	✓	0.895	35	To Do
Kamke 1672	✗	0	0	✗	0	0	To Do
Kamke 1673	✗	0	0	✗	0	0	To Do
Kamke 1674	✓	0.043	106	✓	0.077	25	To Do
Kamke 1675	✗	0	0	✗	0	0	To Do
Kamke 1676	✓	0.315	134	✓	1.085	72	To Do
Kamke 1677	✗	0	0	✗	0	0	To Do
Kamke 1678	✗	0	0	✓	1.86	60	To Do
Kamke 1679	✓	0.168	33	✓	1.01	27	To Do
Kamke 1680	✗	0	0	✗	0	0	To Do
Kamke 1681	✓	2.252	41	✓	0.858	31	To Do
Kamke 1682	✓	21.74	41	✗	0	0	To Do
Kamke 1683	✓	0.069	26	✓	0.885	23	To Do
Kamke 1684	✗	0	0	✗	0	0	To Do
Kamke 1685	✗	0	0	✗	0	0	To Do
Kamke 1686	✗	0	0	✗	0	0	To Do

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Table 3 – continued from previous page

	Mathematica			Maple			
#	solved	cpu	leaf	solved	cpu	leaf	note on solution
Kamke 1687	✓	0.072	262	✓	0.906	21	To Do
Kamke 1688	✓	0.516	189	✓	0.926	32	To Do
Kamke 1689	✓	0.27	104	✓	0.949	37	To Do
Kamke 1690	✗	0	0	✗	0	0	To Do
Kamke 1691	✓	60.899	251	✓	0.804	254	To Do
Kamke 1692	✗	0	0	✗	0	0	To Do
Kamke 1693	✗	0	0	✗	0	0	To Do
Kamke 1694	✓	0.118	115	✓	0.963	54	To Do
Kamke 1695	✗	0	0	✗	0	0	To Do
Kamke 1696	✗	0	0	✗	0	0	To Do
Kamke 1697	✓	0.182	94	✓	0.894	39	To Do
Kamke 1698	✓	0.032	72	✗	0	0	To Do
Kamke 1699	✓	0.13	40	✓	0.987	33	To Do
Kamke 1700	✓	0.177	44	✓	1.13	86	To Do
Kamke 1701	✓	0.203	80	✓	1.08	42	To Do
Kamke 1702	✗	0	0	✗	0	0	To Do
Kamke 1703	✓	0.351	77	✓	0.139	21	To Do
Kamke 1704	✗	0	0	✗	0	0	To Do
Kamke 1705	✓	0.28	252	✗	0	0	To Do
Kamke 1706	✓	0.51	308	✗	0	0	To Do
Kamke 1707	✓	0.066	31	✓	1.037	39	To Do
Kamke 1708	✗	0	0	✗	0	0	To Do
Kamke 1709	✓	52.458	543	✗	0	0	To Do
Kamke 1710	✗	0	0	✗	0	0	To Do
Kamke 1711	✓	21.053	9987	✓	0.611	81	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1712	✓	0.067	75	✓	0.189	61	To Do
Kamke 1713	✗	0	0	✗	0	0	To Do
Kamke 1714	✓	0.132	25	✓	0.912	68	To Do
Kamke 1715	✓	0.117	26	✓	0.912	25	To Do
Kamke 1716	✓	0.53	172	✓	1.119	68	To Do
Kamke 1717	✓	50.889	277	✓	1.13	107	To Do
Kamke 1718	✓	1.259	744	✓	0.302	133	To Do
Kamke 1719	✗	0	0	✗	0	0	To Do
Kamke 1720	✓	64.437	105	✓	1.225	173	To Do
Kamke 1721	✓	21.107	41	✗	0	0	To Do
Kamke 1722	✓	1.27	697	✓	2.223	98	To Do
Kamke 1723	✓	0.696	130	✓	0.976	16	To Do
Kamke 1724	✓	0.37	38	✓	1.575	21	To Do
Kamke 1725	✓	1.694	75	✓	1.332	105	To Do
Kamke 1726	✓	0.308	82	✓	0.155	39	To Do
Kamke 1727	✓	0.366	166	✓	1.251	823	To Do
Kamke 1728	✓	0.005	31	✓	0.91	24	To Do
Kamke 1729	✗	0	0	✗	0	0	To Do
Kamke 1730	✓	0.75	135	✓	0.942	53	To Do
Kamke 1731	✓	0.962	351	✓	0.944	61	To Do
Kamke 1732	✗	0	0	✗	0	0	To Do
Kamke 1733	✓	1.777	437	✓	0.932	71	To Do
Kamke 1734	✗	0	0	✗	0	0	To Do
Kamke 1735	✗	0	0	✗	0	0	To Do
Kamke 1736	✓	6.422	129	✓	0.941	49	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1737	✗	0	0	✗	0	0	To Do
Kamke 1738	✗	0	0	✗	0	0	To Do
Kamke 1739	✗	0	0	✗	0	0	To Do
Kamke 1740	✓	0.105	16	✓	0.956	13	To Do
Kamke 1741	✓	0.121	17	✓	0.938	34	To Do
Kamke 1742	✗	0	0	✗	0	0	To Do
Kamke 1743	✓	20.506	2761	✓	0.937	71	To Do
Kamke 1744	✓	0.564	155	✓	1.232	823	To Do
Kamke 1745	✓	0.689	251	✓	1.405	117	To Do
Kamke 1746	✓	0.125	118	✓	1.24	207	To Do
Kamke 1747	✓	0.107	20	✓	0.87	17	To Do
Kamke 1748	✓	0.228	43	✓	0.962	67	To Do
Kamke 1749	✓	0.463	153	✓	1.522	57	To Do
Kamke 1750	✓	3.816	2281	✓	1.436	87	To Do
Kamke 1751	✗	0	0	✗	0	0	To Do
Kamke 1752	✓	0.174	26	✓	1.084	33	To Do
Kamke 1753	✓	0.48	43	✓	1.003	147	To Do
Kamke 1754	✓	0.123	17	✓	0.915	15	To Do
Kamke 1755	✓	5.137	716	✓	1.138	418	To Do
Kamke 1756	✓	0.637	211	✓	1.903	75	To Do
Kamke 1757	✗	0	0	✗	0	0	To Do
Kamke 1758	✓	0.325	36	✓	0.916	42	To Do
Kamke 1759	✓	0.145	18	✓	0.875	31	To Do
Kamke 1760	✓	0.081	108	✓	0.086	114	To Do
Kamke 1761	✗	0	0	✗	0	0	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1762	✗	0	0	✗	0	0	To Do
Kamke 1763	✓	0.235	40	✓	0.938	148	To Do
Kamke 1764	✓	0.063	52	✓	1.043	18	To Do
Kamke 1765	✓	0.254	34	✓	0.915	27	To Do
Kamke 1766	✓	0.159	21	✓	0.919	64	To Do
Kamke 1767	✓	0.302	55	✓	2.059	50	To Do
Kamke 1768	✓	0.045	53	✓	0.925	43	To Do
Kamke 1769	✓	0.15	18	✓	0.989	21	To Do
Kamke 1770	✓	0.672	28	✓	0.939	26	To Do
Kamke 1771	✓	0.106	21	✓	1.038	22	To Do
Kamke 1772	✓	0.611	37	✓	1.042	42	To Do
Kamke 1773	✓	0.378	44	✓	0.916	30	To Do
Kamke 1774	✓	1.189	92	✓	1.184	136	To Do
Kamke 1775	✓	0.165	29	✓	1.096	31	To Do
Kamke 1776	✓	6.633	1743	✓	1.175	49	To Do
Kamke 1777	✗	0	0	✗	0	0	To Do
Kamke 1778	✓	0.238	65	✓	1.525	245	To Do
Kamke 1779	✗	0	0	✓	1.525	117	To Do
Kamke 1780	✗	0	0	✓	1.566	161	To Do
Kamke 1781	✓	0.218	46	✓	0.903	11	To Do
Kamke 1782	✓	0.186	93	✓	0.956	33	To Do
Kamke 1783	✓	1.1	26	✓	1.031	23	To Do
Kamke 1784	✓	0.295	74	✓	1.488	82	To Do
Kamke 1785	✓	0.36	95	✓	1.275	83	To Do
Kamke 1786	✓	0.062	53	✓	0.166	42	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1787	✓	0.846	170	✓	0.263	80	To Do
Kamke 1788	✗	0	0	✗	0	0	To Do
Kamke 1789	✗	0	0	✗	0	0	To Do
Kamke 1790	✓	0.592	186	✓	0.253	119	To Do
Kamke 1791	✓	0.681	168	✓	0.289	90	To Do
Kamke 1792	✓	0.992	226	✓	0.415	194	To Do
Kamke 1793	✓	0.123	83	✓	0.071	40	To Do
Kamke 1794	✓	0.141	69	✓	0.085	46	To Do
Kamke 1795	✓	0.285	116	✓	1.511	529	To Do
Kamke 1796	✓	0.251	363	✓	0.209	51	To Do
Kamke 1797	✗	0	0	✗	0	0	To Do
Kamke 1798	✓	35.234	248	✓	0.21	166	To Do
Kamke 1799	✓	1.484	88	✓	0.298	46	To Do
Kamke 1800	✓	0.519	84	✓	0.052	60	To Do
Kamke 1801	✗	0	0	✗	0	0	To Do
Kamke 1802	✗	0	0	✗	0	0	To Do
Kamke 1803	✓	20.145	10387	✓	1.624	115620	To Do
Kamke 1804	✓	2.538	415	✓	0.038	31	To Do
Kamke 1805	✓	0.394	438	✓	0.055	34	To Do
Kamke 1806	✗	0	0	✓	2.529	733	To Do
Kamke 1807	✗	0	0	✗	0	0	To Do
Kamke 1808	✓	1.017	124	✓	0.123	72	To Do
Kamke 1809	✓	19.838	260	✓	0.419	336	To Do
Kamke 1810	✓	0.074	1677	✓	0.122	91	To Do
Kamke 1811	✗	0	0	✗	0	0	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1812	✓	0.287	29	✓	0.124	19	To Do
Kamke 1813	✓	25.269	176	✓	0.45	133	To Do
Kamke 1814	✓	0.362	120	✓	0.157	87	To Do
Kamke 1815	✗	0	0	✓	0.125	25	To Do
Kamke 1816	✗	0	0	✗	0	0	To Do
Kamke 1817	✓	12.278	41	✓	0.267	40	To Do
Kamke 1818	✗	0	0	✓	0.398	66	To Do
Kamke 1819	✗	0	0	✓	0.071	42	To Do
Kamke 1820	✗	0	0	✗	0	0	To Do
Kamke 1821	✗	0	0	✗	0	0	To Do
Kamke 1822	✓	0.825	371	✓	1.571	293	To Do
Kamke 1823	✓	0.266	281	✓	0.458	289	To Do
Kamke 1824	✓	0.638	347	✓	1.095	96	To Do
Kamke 1825	✗	0	0	✓	0.084	26	To Do
Kamke 1826	✓	0.761	201	✓	0.559	173	To Do
Kamke 1827	✗	0	0	✓	2.88	81	To Do
Kamke 1828	✓	0.008	32	✓	1.013	59	To Do
Kamke 1829	✓	0.005	24	✓	0.589	36	To Do
Kamke 1830	✓	0.024	24	✓	0.772	308	To Do
Kamke 1831	✗	0	0	✗	0	0	To Do
Kamke 1832	✗	0	0	✗	0	0	To Do
Kamke 1833	✓	118.439	451	✓	6.695	162	To Do
Kamke 1834	✓	18.574	19	✗	0	0	To Do
Kamke 1835	✓	0.073	143	✗	0	0	To Do
Kamke 1836	✗	0	0	✗	0	0	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1837	✓	10.193	145	✓	0.479	95	To Do
Kamke 1838	✗	0	0	✗	0	0	To Do
Kamke 1839	✗	0	0	✗	0	0	To Do
Kamke 1840	✗	0	0	✗	0	0	To Do
Kamke 1841	✗	0	0	✗	0	0	To Do
Kamke 1842	✓	0.166	286	✓	0.721	190	To Do
Kamke 1843	✓	2.015	409	✓	0.439	77	To Do
Kamke 1844	✓	0.1	20	✓	0.534	22	To Do
Kamke 1845	✓	0.097	22	✓	0.526	22	To Do
Kamke 1846	✓	0.033	51	✓	0.015	28	To Do
Kamke 1847	✓	0.205	95	✓	0.336	49	To Do
Kamke 1848	✓	0.409	187	✓	1.308	789	To Do
Kamke 1849	✓	0.551	426	✓	0.308	197	To Do
Kamke 1850	✗	0	0	✗	0	0	To Do
Kamke 1851	✗	0	0	✗	0	0	To Do
Kamke 1852	✓	0.115	28	✓	0.341	28	To Do
Kamke 1853	✓	0.124	43	✓	0.921	110	To Do
Kamke 1854	✗	0	0	✗	0	0	To Do
Kamke 1855	✗	0	0	✗	0	0	To Do
Kamke 1856	✓	0.016	22	✓	0.051	19	To Do
Kamke 1857	✓	0.009	39	✓	0.058	35	To Do
Kamke 1858	✓	0.008	182	✓	0.062	64	To Do
Kamke 1859	✓	0.004	51	✓	0.047	37	To Do
Kamke 1860	✓	0.03	696	✓	0.078	177	To Do
Kamke 1861	✓	0.009	183	✓	0.099	152	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1862	✓	0.011	52	✓	0.045	39	To Do
Kamke 1863	✓	0.006	84	✓	0.046	35	To Do
Kamke 1864	✓	0.009	59	✓	0.046	44	To Do
Kamke 1865	✓	0.736	2062	✓	0.109	224	To Do
Kamke 1866	✓	0.037	132	✓	0.046	39	To Do
Kamke 1867	✓	0.082	124	✓	0.044	42	To Do
Kamke 1868	✓	0.078	162	✓	0.083	64	To Do
Kamke 1869	✓	0.091	118	✓	0.071	51	To Do
Kamke 1870	✓	0.134	122	✓	0.13	47	To Do
Kamke 1871	✓	0.306	180	✓	0.098	62	To Do
Kamke 1872	✓	0.11	162	✓	0.078	65	To Do
Kamke 1873	✓	0.088	322	✓	0.074	52	To Do
Kamke 1874	✓	0.008	115	✓	0.457	57	To Do
Kamke 1875	✓	1.473	3181	✓	2.962	2606	To Do
Kamke 1876	✓	0.02	39	✓	0.171	18	To Do
Kamke 1877	✓	0.004	31	✓	0.045	31	To Do
Kamke 1878	✓	0.009	39	✓	0.069	39	To Do
Kamke 1879	✓	0.02	58	✓	0.057	54	To Do
Kamke 1880	✓	0.016	29	✓	0.091	23	To Do
Kamke 1881	✓	0.008	44	✓	0.036	48	To Do
Kamke 1882	✓	1.474	928	✓	0.09	99	To Do
Kamke 1883	✓	0.878	602	✓	0.121	80	To Do
Kamke 1884	✓	0.404	224	✓	0.134	69	To Do
Kamke 1885	✓	0.017	66	✓	0.12	47	To Do
Kamke 1886	✓	0.014	115	✓	0.074	49	To Do

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#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1887	✓	0.312	5748	✓	0.12	360	To Do
Kamke 1888	✓	8.451	15664	✓	0.186	457	To Do
Kamke 1889	✓	0.197	554	✓	0.056	60	To Do
Kamke 1890	✗	0	0	✗	0	0	To Do
Kamke 1891	✓	0.871	742	✓	0.061	64	To Do
Kamke 1892	✓	0.239	4815	✓	0.126	463	To Do
Kamke 1893	✓	0.405	5546	✓	0.855	1579	To Do
Kamke 1894	✓	0.428	3386	✓	0.786	1056	To Do
Kamke 1895	✓	0.207	7517	✓	0.19	1008	To Do
Kamke 1896	✓	0.467	1132	✓	0.069	67	To Do
Kamke 1897	✓	0.211	280	✓	0.28	90	To Do
Kamke 1898	✓	0.025	420	✓	0.079	71	To Do
Kamke 1899	✓	0.008	112	✓	0.098	52	To Do
Kamke 1900	✓	0.007	94	✓	0.103	50	To Do
Kamke 1901	✓	0.008	105	✓	0.085	43	To Do
Kamke 1902	✓	0.017	226	✓	0.081	51	To Do
Kamke 1903	✓	0.067	1304	✓	0.143	299	To Do
Kamke 1904	✓	0.044	1445	✓	0.1	257	To Do
Kamke 1905	✗	0	0	✗	0	0	To Do
Kamke 1906	✓	0.039	278	✓	0.085	120	To Do
Kamke 1907	✓	0.01	179	✓	0.071	66	To Do
Kamke 1908	✓	0.034	551	✓	1.155	1129	To Do
Kamke 1909	✓	0.047	1630	✓	12.424	33085	To Do
Kamke 1910	✓	0.007	39	✓	0.107	37	To Do
Kamke 1911	✓	0.025	1148	✓	0.141	308	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1912	✓	0.01	798	✓	1.161	2788	To Do
Kamke 1913	✓	0.032	64	✓	0.147	57	To Do
Kamke 1914	✓	0.286	204	✓	0.46	92	To Do
Kamke 1915	✗	0	0	✗	0	0	To Do
Kamke 1916	✓	0.343	557	✓	0.527	180	To Do
Kamke 1917	✓	202.221	3406	✓	1.166	108	To Do
Kamke 1918	✗	0	0	✗	0	0	To Do
Kamke 1919	✗	0	0	✗	0	0	To Do
Kamke 1920	✗	0	0	✗	0	0	To Do
Kamke 1921	✗	0	0	✗	0	0	To Do
Kamke 1922	✗	0	0	✗	0	0	To Do
Kamke 1923	✓	0.009	53	✓	0.047	35	To Do
Kamke 1924	✓	0.066	191	✓	0.319	180	To Do
Kamke 1925	✓	0.017	31	✓	0.274	194	To Do
Kamke 1926	✓	0.006	28	✓	0.211	96	To Do
Kamke 1927	✗	0	0	✗	0	0	To Do
Kamke 1928	✗	0	0	✗	0	0	To Do
Kamke 1929	✗	0	0	✗	0	0	To Do
Kamke 1930	✓	0.033	308	✓	0.064	45	To Do
Kamke 1931	✓	3.703	10101	✓	1.096	1117	To Do
Kamke 1932	✗	0	0	✗	0	0	To Do
Kamke 1933	✗	0	0	✓	1.433	4259	To Do
Kamke 1934	✗	0	0	✗	0	0	To Do
Kamke 1935	✗	0	0	✗	0	0	To Do
Kamke 1936	✗	0	0	✓	0.879	710	To Do

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Table 3 – continued from previous page

	Mathematica			Maple			
#	solved	cpu	leaf	solved	cpu	leaf	note on solution
Kamke 1937	✗	0	0	✗	0	0	To Do
Kamke 1938	✓	0.008	137	✓	0.136	101	To Do
Kamke 1939	✓	0.263	2168	✓	1.512	899	To Do
Kamke 1940	✗	0	0	✗	0	0	To Do

ODE No. 1

$$y'(x)-\frac{1}{\sqrt{\text{a0}+\text{a1}x+\text{a2}x^2+\text{a3}x^3+\text{a4}x^4}}=0$$

✓ **Mathematica** : cpu = 0.440483 (sec), leaf count = 1117

```
DSolve[-(1/Sqrt[a0 + a1*x + a2*x^2 + a3*x^3 + a4*x^4]) + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1-\frac{2F\left(\sin^{-1}\left(\sqrt{\frac{\left(x-\text{Root}\left[\text{a4}\#1^4+\text{a3}\#1^3+\text{a2}\#1^2+\text{a1}\#1+\text{a0}\&,1\right]\right)\left(\text{Root}\left[\text{a4}\#1^4+\text{a3}\#1^3+\text{a2}\#1^2\cdots\right.\right.}{\left(x-\text{Root}\left[\text{a4}\#1^4+\text{a3}\#1^3+\text{a2}\#1^2+\text{a1}\#1+\text{a0}\&,2\right]\right)\left(\text{Root}\left[\text{a4}\#1^4+\text{a3}\#1^3+\text{a2}\#1^2\cdots\right.\right.}}\cdots\right.\right.}{\cdots}\right.\right.$$

✓ **Maple** : cpu = 0.055 (sec), leaf count = 1089

```
dsolve(diff(y(x),x)-1/(a4*x^4+a3*x^3+a2*x^2+a1*x+a0)^(1/2) = 0,y(x))
```

Expression too large to display

Hand solution

$$y'-\frac{1}{\sqrt{a_0+a_1x+a_2x^2+a_3x^3+a_4x^4}}=0 \tag{1}$$

To Do.

ODE No. 2

$$ay(x) + c(-e^{bx}) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0632209 (sec), leaf count = 34

```
DSolve[-(c*E^(b*x)) + a*y[x] + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.021 (sec), leaf count = 25

```
dsolve(diff(y(x),x)+a*y(x)-c*exp(b*x) = 0,y(x))
```

$$y(x) = \left(\frac{c\,\mathrm{e}^{(a+b)x}}{a+b} + c_1\right)\mathrm{e}^{-ax}$$

Hand solution

$$\frac{dy}{dx} + ay(x) = ce^{bx} \tag{1}$$

Integrating factor $\mu = e^{\int a dx} = e^{ax}$. Hence (1) becomes

$$\frac{d}{dx}(\mu y(x)) = \mu c e^{bx}$$
$$\mu y(x) = \int \mu c e^{bx} dx + C$$

Replacing μ by e^{ax}

$$\begin{aligned} y(x) &= ce^{-ax} \int e^{(a+b)x} dx + Ce^{-ax} \\ &= ce^{-ax} \frac{e^{(a+b)x}}{a+b} + Ce^{-ax} \\ &= \frac{ce^{(a+b)x-ax}}{a+b} + Ce^{-ax} \end{aligned}$$

Can be reduced to

$$y(x) = c\frac{e^{bx}}{a+b} + Ce^{-ax}$$

ODE No. 3

$$ay(x) - b\sin(cx) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0671842 (sec), leaf count = 40

```
DSolve[-(b*Sin[c*x]) + a*y[x] + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.041 (sec), leaf count = 38

```
dsolve(diff(y(x),x)+a*y(x)-b*sin(c*x) = 0,y(x))
```

$$y(x) = \mathrm{e}^{-ax} c_1 - \frac{b(c\cos(cx) - \sin(cx)\, a)}{a^2 + c^2}$$

Hand solution

$$\frac{dy}{dx} + ay(x) = b\sin(cx) \tag{1}$$

Integrating factor $\mu = e^{\int a dx} = e^{ax}$. Hence (1) becomes

$$\frac{d}{dx}(\mu y(x)) = \mu b \sin(cx)$$
$$\mu y(x) = b\int \mu \sin(cx)\, dx + C$$

Replacing μ by e^{ax}

$$y(x) = be^{-ax}\int e^{ax}\sin(cx)\, dx + Ce^{-ax} \tag{2}$$

Using $\sin(cx) = \frac{e^{icx} - e^{-icx}}{2i}$ then

$$\begin{aligned}
\int e^{ax} \sin(cx)\, dx &= \int \frac{e^{(ic+a)x} - e^{(-ic+a)x}}{2i} dx \\
&= \frac{1}{2i}\left(\frac{e^{(ic+a)x}}{ic+a} - \frac{e^{(-ic+a)x}}{-ic+a}\right) \\
&= \frac{1}{2i} e^{ax}\left(\frac{e^{icx}}{ic+a} - \frac{e^{-icx}}{-ic+a}\right) \\
&= \frac{1}{2i} e^{ax}\left(\frac{e^{icx}(-ic+a) - e^{-icx}(ic+a)}{(ic+a)(-ic+a)}\right) \\
&= \frac{1}{2i} e^{ax}\left(\frac{-ice^{icx} + ae^{icx} - ice^{-icx} - ae^{-icx}}{(c^2+a^2)}\right) \\
&= \frac{1}{2i} e^{ax}\left(\frac{-ic(e^{icx} + e^{-icx}) + a(e^{icx} - e^{-icx})}{(c^2+a^2)}\right) \\
&= \frac{e^{ax}}{(c^2+a^2)}\left(\frac{-ic(e^{icx} + e^{-icx})}{2i} + \frac{a(e^{icx} - e^{-icx})}{2i}\right) \\
&= \frac{e^{ax}}{(c^2+a^2)}(-c\cos cx + a\sin cx)
\end{aligned}$$

Therefore (2) becomes

$$\begin{aligned}
y(x) &= be^{-ax}\left[\frac{e^{ax}}{(c^2+a^2)}(-c\cos cx + a\sin cx)\right] + Ce^{-ax} \\
&= \frac{b}{(c^2+a^2)}(-c\cos cx + a\sin cx) + Ce^{-ax}
\end{aligned}$$

ODE No. 4

$$-e^{-x^2}x + y'(x) + 2xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0389584 (sec), leaf count = 30

```
DSolve[-(x/E^x^2) + 2*x*y[x] + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.007 (sec), leaf count = 18

```
dsolve(diff(y(x),x)+2*x*y(x)-x*exp(-x^2) = 0,y(x))
```

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

Hand solution

$$\frac{dy}{dx} + 2xy(x) = e^{-x^2}x \tag{1}$$

Integrating factor $\mu = e^{\int 2x dx} = e^{x^2}$. Hence (1) becomes

$$\frac{d}{dx}\left(e^{x^2}y(x)\right) = e^{x^2}e^{-x^2}x$$
$$\frac{d}{dx}\left(e^{x^2}y(x)\right) = x$$

Integrating both sides

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

ODE No. 5

$$y'(x) + y(x)\cos(x) - e^{2x} = 0$$

✓ **Mathematica** : cpu = 0.401098 (sec), leaf count = 39

```
DSolve[-E^(2*x) + Cos[x]*y[x] + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to e^{-\sin(x)} \int_1^x e^{2K[1]+\sin(K[1])} dK[1] + c_1 e^{-\sin(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.13 (sec), leaf count = 21

```
dsolve(diff(y(x),x)+y(x)*cos(x)-exp(2*x) = 0,y(x))
```

$$y(x) = \left(\int \mathrm{e}^{2x+\sin(x)} dx + c_1\right) \mathrm{e}^{-\sin(x)}$$

Hand solution

$$\frac{dy}{dx} + y(x)\cos(x) = e^{2x} \tag{1}$$

Integrating factor $\mu = e^{\int \cos(x) dx} = e^{\sin(x)}$. Hence (1) becomes

$$\frac{d}{dx}\left(e^{\sin(x)} y(x)\right) = e^{\sin(x)} e^{2x}$$

Integrating both sides

$$e^{\sin(x)} y(x) = \int e^{\sin(x)} e^{2x} + C$$

$$y(x) = e^{-\sin(x)} \int e^{2x+\sin(x)} + C e^{-\sin(x)}$$

ODE No. 6

$$y'(x) + y(x)\cos(x) - \frac{1}{2}\sin(2x) = 0$$

✓ **Mathematica** : cpu = 0.0282852 (sec), leaf count = 18

```
DSolve[-1/2*Sin[2*x] + Cos[x]*y[x] + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.036 (sec), leaf count = 15

```
dsolve(diff(y(x),x)+y(x)*cos(x)-1/2*sin(2*x) = 0,y(x))
```

$$y(x) = \sin(x) - 1 + \mathrm{e}^{-\sin(x)} c_1$$

Hand solution

$$\frac{dy}{dx} + y(x)\cos(x) = \frac{1}{2}\sin(2x) \tag{1}$$

Integrating factor $\mu = e^{\int \cos dx} = e^{\sin(x)}$. Therefore (1) becomes2

$$\frac{d}{dx}\left(e^{\sin(x)} y(x)\right) = \frac{1}{2} e^{\sin(x)} \sin(2x)$$

Integrating

$$e^{\sin(x)} y(x) = \frac{1}{2}\int e^{\sin(x)} \sin(2x) + C$$

$$y(x) = \frac{e^{-\sin(x)}}{2}\int e^{\sin(x)} \sin(2x) + e^{-\sin(x)} C$$

But $e^{\sin(x)} \sin(2x)$ can be integrated by parts which gives $e^{\sin(x)}(-2 + 2\sin(x))$. Hence the above becomes

$$\begin{aligned} y(x) &= \frac{e^{-\sin(x)}}{2}\left(e^{\sin(x)}(-2 + 2\sin(x))\right) + e^{-\sin(x)} C \\ &= -1 + \sin(x) + e^{-\sin(x)} C \end{aligned}$$

ODE No. 7

$$y'(x) + y(x)\cos(x) - e^{-\sin(x)} = 0$$

✓ **Mathematica** : cpu = 0.0881956 (sec), leaf count = 23

```
DSolve[-E^(-Sin[x]) + Cos[x]*y[x] + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.008 (sec), leaf count = 13

```
dsolve(diff(y(x),x)+y(x)*cos(x)-exp(-sin(x)) = 0,y(x))
```

$$y(x) = (x + c_1)\,\mathrm{e}^{-\sin(x)}$$

Hand solution

$$\frac{dy}{dx} + y(x)\cos(x) = e^{-\sin(x)} \tag{1}$$

Integrating factor $\mu = e^{\int \cos dx} = e^{\sin x}$. Hence (1) becomes

$$\frac{d}{dx}(\mu y(x)) = \mu e^{-\sin(x)}$$

Replacing μ by $e^{\sin x}$ and integrating both sides

$$\begin{aligned} e^{\sin x} y(x) &= \int e^{\sin x} e^{-\sin(x)} dx + C \\ e^{\sin x} y(x) &= \int dx + C \\ e^{\sin x} y(x) &= x + C \\ y(x) &= x e^{-\sin x} + C e^{-\sin(x)} \end{aligned}$$

ODE No. 8

$$y'(x) + y(x)\tan(x) - \sin(2x) = 0$$

✓ **Mathematica** : cpu = 0.029944 (sec), leaf count = 17

```
DSolve[-Sin[2*x] + Tan[x]*y[x] + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.023 (sec), leaf count = 13

```
dsolve(diff(y(x),x)+y(x)*tan(x)-sin(2*x) = 0,y(x))
```

$$y(x) = (-2\cos(x) + c_1)\cos(x)$$

Hand solution

$$\frac{dy}{dx} + y(x)\tan(x) = \sin(2x) \tag{1}$$

Integrating factor $\mu = e^{\int \tan dx} = e^{-\ln(\cos(x))} = \frac{1}{\cos(x)}$. Hence (1) becomes

$$\frac{d}{dx}\left(y(x)\frac{1}{\cos(x)}\right) = \frac{1}{\cos(x)}\sin(2x)$$

Integrating both sides

$$y(x)\frac{1}{\cos(x)} = \int \frac{1}{\cos(x)}\sin(2x)\,dx + C$$
$$y(x) = \cos(x)\int \frac{\sin(2x)}{\cos(x)}dx + C\cos(x)$$

But $\sin(2x) = 2\sin(x)\cos(x)$ hence

$$\begin{aligned} y(x) &= \cos(x)\int \frac{2\sin(x)\cos(x)}{\cos(x)}dx + C\cos(x) \\ &= 2\cos(x)\int \sin(x)\,dx + C\cos(x) \\ &= -2\cos^2(x) + C\cos(x) \end{aligned}$$

ODE No. 9

$$y'(x) - y(x)(a + \sin(\log(x)) + \cos(\log(x))) = 0$$

✓ **Mathematica** : cpu = 0.0278232 (sec), leaf count = 19

```
DSolve[-((a + Cos[Log[x]] + Sin[Log[x]])*y[x]) + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.025 (sec), leaf count = 14

```
dsolve(diff(y(x),x)-(sin(ln(x))+cos(ln(x))+a)*y(x) = 0,y(x))
```

$$y(x) = c_1 \mathrm{e}^{x(\sin(\ln(x))+a)}$$

Hand solution

$$\frac{dy}{dx} - y(x)\left[a + \sin\left(\log\left(x\right)\right) + \cos\left(\log\left(x\right)\right)\right] = 0 \tag{1}$$

Integrating factor $\mu = e^{-\int a - \sin(\log(x)) - \cos(\log(x))dx} = e^{-ax} e^{-\int \sin(\log(x)) + \cos(\log(x))dx}$. To integrate $\int \sin\left(\log\left(x\right)\right) + \cos\left(\log\left(x\right)\right) dx$, let $r = \log\left(x\right)$, $\frac{dr}{dx} = \frac{1}{x}$, then $dx = xdr$, But $x = e^r$, hence the integral becomes

$$\begin{aligned} \int \sin\left(\log\left(x\right)\right) + \cos\left(\log\left(x\right)\right) dx &= \int \left[\sin\left(r\right) + \cos\left(r\right)\right] e^r dr \\ &= \int e^r \sin\left(r\right) dr + \int e^r \cos\left(r\right) dr \end{aligned} \tag{2}$$

Integrating by parts $\int e^r \cos\left(r\right) dr$, $\int udv = uv - \int vdu$, Let $u = e^r \to du = e^r$ and $dv = \cos\left(r\right) \to v = \sin\left(r\right)$, hence (2) becomes

$$\begin{aligned} \int e^r \sin\left(r\right) dr + \int e^r \cos\left(r\right) dr &= \int e^r \sin\left(r\right) dr + e^r \sin\left(r\right) - \int \sin\left(r\right) e^r dr \\ &= e^r \sin\left(r\right) \end{aligned}$$

Therefore, substituting back $r = \log\left(x\right)$ gives

$$\begin{aligned} \int \sin\left(\log\left(x\right)\right) + \cos\left(\log\left(x\right)\right) dx &= e^{\log(x)} \sin\left(\log\left(x\right)\right) \\ &= x \sin\left(\log\left(x\right)\right) \end{aligned}$$

Hence the integration factor is

$$\begin{aligned}\mu &= e^{-ax}e^{-\int \sin(\log(x))+\cos(\log(x))dx} \\ &= e^{-ax}e^{-x\sin(\log(x))}\end{aligned}$$

Therefore (1) becomes

$$\frac{d}{dx}(\mu y(x)) = 0$$

Integrating

$$\begin{aligned}y(x)\, e^{-ax}e^{-x\sin(\log(x))} &= C \\ y(x) &= Ce^{ax}e^{x\sin(\log(x))} \\ &= Ce^{ax+x\sin(\log(x))} \\ &= Ce^{x(a+\sin(\log(x)))}\end{aligned}$$

ODE No. 10

$$y(x)f'(x) - f(x)f'(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.023509 (sec), leaf count = 18

```
DSolve[-(f[x]*Derivative[1][f][x]) + y[x]*Derivative[1][f][x] + Derivative[1][y][x] == 0,y[x]
```

$$\{\{y(x) \to f(x) + c_1 e^{-f(x)} - 1\}\}$$

✓ **Maple** : cpu = 0.022 (sec), leaf count = 15

```
dsolve(diff(y(x),x)+diff(f(x),x)*y(x)-f(x)*diff(f(x),x) = 0,y(x))
```

$$y(x) = f(x) - 1 + \mathrm{e}^{-f(x)} c_1$$

Hand solution

$$\frac{dy}{dx} + y(x)\frac{df}{dx} = f(x)\frac{df}{dx} \tag{1}$$

Integrating factor $\mu = e^{\int \frac{df}{dx} dx} = e^f$. Therefore (1) becomes

$$\frac{d}{dx}\left(e^f y(x)\right) = e^f f(x)\frac{df}{dx}$$

Integrating

$$e^f y(x) = \int e^f f(x)\frac{df}{dx}dx + C$$
$$y(x) = e^{-f}\int e^f f df + e^{-f}C$$

But $\int e^f f df$ is the same as $\int e^x x dx$ which by integration by parts gives $e^x(x-1)$ or in terms of f, gives $e^f(f-1)$. Hence the above becomes

$$\begin{aligned} y(x) &= e^{-f}\left(e^f(f-1)\right) + e^{-f}C \\ &= f - 1 + e^{-f}C \end{aligned}$$

ODE No. 11

$$f(x)y(x) - g(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0288013 (sec), leaf count = 66

```
DSolve[-g[x] + f[x]*y[x] + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \exp\left(\int_1^x -f(K[1])dK[1]\right)\int_1^x \exp\left(-\int_1^{K[2]} -f(K[1])dK[1]\right)g(K[2])dK[2] + c_1 \exp\left(\int_1^x -f\right.\right.$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 24

```
dsolve(diff(y(x),x)+f(x)*y(x)-g(x) = 0,y(x))
```

$$y(x) = \left(\int g(x)\,\mathrm{e}^{\int f(x)dx}dx + c_1\right)\mathrm{e}^{\int -f(x)dx}$$

Hand solution

$$\frac{dy}{dx} + y(x)\,f(x) = g(x) \tag{1}$$

Integrating factor $\mu = e^{\int f(x)dx}$. Therefore (1) becomes

$$\frac{d}{dx}\left(e^{\int f(x)dx}y(x)\right) = e^{\int f(x)dx}g(x)$$

Integrating

$$\begin{aligned} e^{\int f(x)dx}y(x) &= \int e^{\int f(x)dx}g(x)\,dx + C \\ y(x) &= e^{-\int f(x)dx}\int e^{\int f(x)dx}g(x)\,dx + e^{-\int f(x)dx}C \\ &= \left(\int e^{\int f(x)dx}g(x)\,dx + C\right)e^{-\int f(x)dx} \end{aligned}$$

ODE No. 12

$$y'(x) + y(x)^2 - 1 = 0$$

✓ **Mathematica** : cpu = 0.0870792 (sec), leaf count = 34

```
DSolve[-1 + y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.051 (sec), leaf count = 8

```
dsolve(diff(y(x),x)+y(x)^2-1 = 0,y(x))
```

$$y(x) = \tanh\left(x + c_1\right)$$

Hand solution

$$\frac{dy}{dx} + y^2(x) - 1 = 0$$

$$\frac{dy}{dx} = 1 - y^2(x) \tag{1}$$

This is separable. Hence

$$\frac{dy}{dx}\frac{1}{1 - y^2\left(x\right)} = 1$$

$$\frac{dy}{1 - y^2\left(x\right)} = dx$$

Integrating

$$\int \frac{dy}{1 - y^2\left(x\right)} = x + C$$

Using $\int \frac{1}{a+by^2} dy = \frac{\sqrt{-\frac{a}{b}} \tanh^{-1}\left(\frac{y}{\sqrt{-\frac{a}{b}}}\right)}{a}$ and since $a = 1, b = -1$, then $\int \frac{dy}{1-y^2(x)} = \tanh^{-1}\left(y\right)$ and the above becomes

$$\tanh^{-1}\left(y\right) = x + C$$

Therefore

$$y = \tanh(x + C) \tag{2}$$

In terms of exponential, since $\tanh(u) = \frac{e^u - e^{-u}}{e^u + e^{-u}}$ then (2) can also be written as

$$y = \frac{e^{x+C} - e^{-(x+C)}}{e^{x+C} + e^{-(x+C)}} = \frac{e^x e^C - e^{-x} e^{-C}}{e^x e^C + e^{-x} e^{-C}}$$

Multiplying numerator and denominator by $e^{-C} e^x$

$$y = \frac{e^{2x} - e^{-2C}}{e^{2x} + e^{-2C}}$$

To get same answer as Mathematica, since C is constant, let $C_1 = -C$, then

$$y = \frac{e^{2x} - e^{2C_1}}{e^{2x} + e^{2C_1}}$$

ODE No. 13

$$-ax - b + y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0909047 (sec), leaf count = 79

```
DSolve[-b - a*x + y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt[3]{a}\text{Bi}'\left(\frac{b+ax}{a^{2/3}}\right) + \sqrt[3]{a}c_1\text{Ai}'\left(\frac{b+ax}{a^{2/3}}\right)}{-\text{Bi}\left(\frac{b+ax}{a^{2/3}}\right) - c_1\text{Ai}\left(\frac{b+ax}{a^{2/3}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.194 (sec), leaf count = 79

```
dsolve(diff(y(x),x)+y(x)^2-a*x-b = 0,y(x))
```

$$y(x) = -\frac{i(-ia)^{\frac{1}{3}}\left(\text{AiryAi}\left(1, -\frac{ax+b}{(-ia)^{\frac{2}{3}}}\right)c_1 + \text{AiryBi}\left(1, -\frac{ax+b}{(-ia)^{\frac{2}{3}}}\right)\right)}{\text{AiryAi}\left(-\frac{ax+b}{(-ia)^{\frac{2}{3}}}\right)c_1 + \text{AiryBi}\left(-\frac{ax+b}{(-ia)^{\frac{2}{3}}}\right)}$$

Hand solution

$$\begin{aligned} y'(x) + y^2(x) - ax - b &= 0 \\ y'(x) &= b + ax - y^2(x) \end{aligned} \tag{1}$$

This is Riccati first order non-linear ODE of the form

$$y'(x) = P(x) + Q(x)\, y + R(x)\, y^2(x) \tag{2}$$

where in this case $Q(x) = 0, R(x) = -1, P(x) = b + ax$. We can solve this in two ways. If we know one particular solution $y_p(x)$ for (1) then we use the substitution $y = y_p + \frac{1}{u}$ and convert (1) to new associated linear ODE of the form $u' + (Q(x) + 2R(x))\, y_p + R(x) = 0$. If we do not know a particular solution, then we use the standard substitution $y = \frac{-u'}{uR(x)} = \frac{u'}{u}$ since $R(x) = -1$ and this is what we will do here.

Since $u' = yu$ then

$$\begin{aligned} u'' &= yu' + y'u \\ &= y(yu) + \left(b + ax - y^2\right) u \\ &= y^2 u + (b + ax)\, u - y^2 u \\ &= (b + ax)\, u \end{aligned}$$

So we have new second order ODE

$$u'' - (b + ax)\, u = 0 \tag{3}$$

which we solve for u. This ODE is of the form $u'' - q(x)\, u = 0$ which has solutions in terms of Airy function of first $Ai(x)$ and second kind $Bi(x)$, where

$$\begin{aligned} Ai(x) &= \frac{1}{\pi} \int_0^\infty \cos\left(\frac{t^3}{3} + xt\right) dt \\ Bi(x) &= \frac{1}{\pi} \int_0^\infty \exp\left(-\frac{t^3}{3} + xt\right) + \sin\left(\frac{t^3}{3} + xt\right) dt \end{aligned}$$

Therefore the solution to (3) is

$$u(x) = c_1 Ai\left(\frac{b + ax}{a^{\frac{2}{3}}}\right) + c_2 Bi\left(\frac{b + ax}{a^{\frac{2}{3}}}\right)$$

We need to find $u'(x)$ now. Using $Ai'(x)\,, Bi'(x)$ for derivative of Airy functions of first and second kind, then

$$u'(x) = c_1 Ai'\left(\frac{b + ax}{a^{\frac{2}{3}}}\right) a^{\frac{1}{3}} + c_2 Bi'\left(\frac{b + ax}{a^{\frac{2}{3}}}\right) a^{\frac{1}{3}}$$

Therefore since $u' = yu$ then

$$\begin{aligned} y &= \frac{u'}{u} \\ &= \frac{c_1 A'i\left(\frac{b+ax}{a^{\frac{2}{3}}}\right) a^{\frac{1}{3}} + c_2 Bi'\left(\frac{b+ax}{a^{\frac{2}{3}}}\right) a^{\frac{1}{3}}}{c_1 Ai\left(\frac{b+ax}{a^{\frac{2}{3}}}\right) + c_2 Bi\left(\frac{b+ax}{a^{\frac{2}{3}}}\right)} \end{aligned}$$

Let $C_1 = \frac{c_1}{c_2}$ then the above can be written as

$$y = \frac{C_1 A'i\left(\frac{b+ax}{a^{\frac{2}{3}}}\right) a^{\frac{1}{3}} + Bi'\left(\frac{b+ax}{a^{\frac{2}{3}}}\right) a^{\frac{1}{3}}}{C_1 Ai\left(\frac{b+ax}{a^{\frac{2}{3}}}\right) + Bi\left(\frac{b+ax}{a^{\frac{2}{3}}}\right)}$$

Reference: Airy function

ODE No. 14

$$ax^m + y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.105352 (sec), leaf count = 254

```
DSolve[a*x^m + y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{i\sqrt{-a}x^{\frac{m+2}{2}}\left(c_1 J_{\frac{m+1}{m+2}}\left(\frac{2i\sqrt{-a}x^{\frac{m}{2}+1}}{m+2}\right) - 2J_{\frac{1}{m+2}-1}\left(\frac{2i\sqrt{-a}x^{\frac{m+2}{2}}}{m+2}\right) - c_1 J_{-\frac{m+3}{m+2}}\left(\frac{2i\sqrt{-a}x^{\frac{m+2}{2}}}{m+2}\right)\right) - c_1 J_{-}}{2x\left(J_{\frac{1}{m+2}}\left(\frac{2i\sqrt{-a}x^{\frac{m+2}{2}}}{m+2}\right) + c_1 J_{-\frac{1}{m+2}}\left(\frac{2i\sqrt{-a}x^{\frac{m+2}{2}}}{m+2}\right)\right)}\right\}\right.$$

✓ **Maple** : cpu = 0.129 (sec), leaf count = 187

```
dsolve(diff(y(x),x)+y(x)^2+a*x^m = 0,y(x))
```

$$y(x) = \frac{-\operatorname{BesselJ}\left(\frac{3+m}{m+2}, \frac{2\sqrt{a}\,x^{\frac{m}{2}+1}}{m+2}\right)\sqrt{a}\,x^{\frac{m}{2}+1}c_1 - \operatorname{BesselY}\left(\frac{3+m}{m+2}, \frac{2\sqrt{a}\,x^{\frac{m}{2}+1}}{m+2}\right)\sqrt{a}\,x^{\frac{m}{2}+1} + c_1 \operatorname{BesselJ}\left(\frac{1}{m+2}, \frac{2\sqrt{a}}{m}\right.}{x\left(c_1 \operatorname{BesselJ}\left(\frac{1}{m+2}, \frac{2\sqrt{a}\,x^{\frac{m}{2}+1}}{m+2}\right) + \operatorname{BesselY}\left(\frac{1}{m+2}, \frac{2\sqrt{a}\,x^{\frac{m}{2}+1}}{m+2}\right)\right)}$$

Hand solution

$$\begin{aligned} y'(x) + y^2(x) + ax^m &= 0 \\ y'(x) &= -ax^m - y^2(x) \end{aligned} \tag{1}$$

This is Riccati first order non-linear ODE of the form

$$y'(x) = P(x) + Q(x)\,y + R(x)\,y^2(x) \tag{2}$$

where in this case $Q(x) = 0, R(x) = -1, P(x) = -ax^m$. We can solve this in two ways. If we know one particular solution $y_p(x)$ for (1) then we use the substitution $y = y_p + \frac{1}{u}$ and convert (1) to new associated linear ODE of the form $u' + (Q(x) + 2R(x))\,y_p + R(x) = 0$. If we do not know a particular solution, then we use the standard substitution $y = \frac{-u'}{uR(x)} = \frac{u'}{u}$ since $R(x) = -1$ and this is what we will do here.

Since $u' = yu$ then

$$\begin{aligned} u'' &= yu' + y'u \\ &= y(yu) + \left(-ax^m - y^2\right)u \\ &= y^2u - ax^m u - y^2 u \\ &= -ax^m u \end{aligned}$$

So we have new second order ODE

$$u'' + ax^m u = 0 \tag{3}$$

which we solve for u. This is Airy ODE but with a positive sign. Of the form $u'' + q(x)\, u = 0$. Recall that the solution to $u'' - axu = 0$ is

$$u = c_1 Ai\left(a^{\frac{1}{3}} x\right) + c_2 Bi\left(a^{\frac{1}{3}} x\right)$$

When x has power on it (there are restriction on what values the power can take), the solution is written in terms of Bessel functions. The solution to $u'' - ax^m u = 0$ is

$$u = c_1 \sqrt{x}\, BesselI\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) + c_2 \sqrt{x}\, BesselK\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)$$

When the sign is positive, the solution to $u'' + ax^m u = 0$ is

$$u(x) = c_1 \sqrt{x}\, BesselJ\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) + c_2 \sqrt{x}\, BesselY\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) \tag{4}$$

We need to find $u'(x)$ now. From (4)

$$\frac{d}{dx}\left[c_1 \sqrt{x}\, BesselJ\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)\right] = c_1 \frac{BesselJ\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{a}x^{\frac{m+1}{2}} BesselJ\left(\frac{m+3}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)}{\sqrt{x}}$$

And

$$\frac{d}{dx}\left[c_2 \sqrt{x}\, BesselY\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)\right] = c_2 \frac{BesselY\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{a}x^{\frac{m+1}{2}} BesselY\left(\frac{m+3}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)}{\sqrt{x}}$$

Therefore

$$\begin{aligned} u'(x) = c_1 & \frac{BesselJ\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{a}x^{\frac{m+1}{2}} BesselJ\left(\frac{m+3}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)}{\sqrt{x}} \\ + c_2 & \frac{BesselY\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{a}x^{\frac{m+1}{2}} BesselY\left(\frac{m+3}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)}{\sqrt{x}} \end{aligned}$$

Since $u' = yu$ then

$$
\begin{aligned}
y &= \frac{u'}{u} \\
&= \frac{c_1 \frac{BesselJ\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{a}x^{\frac{m+1}{2}} BesselJ\left(\frac{m+3}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)}{\sqrt{x}} + c_2 \frac{BesselY\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{a}x^{\frac{m+1}{2}} BesselY\left(\frac{m+3}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)}{\sqrt{x}}}{c_1\sqrt{x}BesselJ\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) + c_2\sqrt{x}BesselY\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)} \\
&= \frac{c_1\left[BesselJ\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{a}x^{\frac{m+1}{2}} BesselJ\left(\frac{m+3}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)\right] + c_2\left[BesselY\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{a}x^{\frac{m+1}{2}} BesselY\left(\frac{m+3}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)\right]}{\sqrt{x}\left[c_1\sqrt{x}BesselJ\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) + c_2\sqrt{x}BesselY\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)\right]} \\
&= \frac{c_1\left[BesselJ\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{a}x^{\frac{m+1}{2}} BesselJ\left(\frac{m+3}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)\right] + c_2\left[BesselY\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{a}x^{\frac{m+1}{2}} BesselY\left(\frac{m+3}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)\right]}{c_1 x BesselJ\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) + c_2 x BesselY\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)}
\end{aligned}
$$

Let $C_1 = \frac{c_1}{c_2}$ then the above can be written as

$$
y = \frac{1}{x}\frac{C_1\left[BesselJ\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{a}x^{\frac{m+1}{2}} BesselJ\left(\frac{m+3}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)\right] + BesselY\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{a}x^{\frac{m+1}{2}} BesselY\left(\frac{m+3}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)}{C_1 BesselJ\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right) + BesselY\left(\frac{1}{m+2}, \frac{2\sqrt{a}x^{\frac{m+1}{2}}}{m+2}\right)}
$$

ODE No. 15

$$x^4 - 2x^2y(x) + y'(x) + y(x)^2 - 2x - 1 = 0$$

✓ **Mathematica** : cpu = 0.0794561 (sec), leaf count = 25

```
DSolve[-1 - 2*x + x^4 - 2*x^2*y[x] + y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.181 (sec), leaf count = 35

```
dsolve(diff(y(x),x)+y(x)^2-2*x^2*y(x)+x^4-2*x-1 = 0,y(x))
```

$$y(x) = \frac{x^2 e^{2x} - x^2 c_1 + e^{2x} + c_1}{e^{2x} - c_1}$$

Hand solution

$$x^4 - 2x^2y(x) + y'(x) + y^2(x) - 2x - 1 = 0$$

$$y'(x) = -x^4 + 2x + 1 + 2x^2y(x) - y^2(x) \tag{1}$$

This is Riccati first order non-linear ODE of the form

$$y'(x) = P(x) + Q(x)\,y + R(x)\,y^2(x) \tag{2}$$

where in this case $Q(x) = 2x^2, R(x) = -1, P(x) = -x^4 + 2x + 1$.

Let $u = y - x^2$ or $y = u + x^2$ then

$$\begin{aligned}
u' &= y' - 2x \\
&= \left(-x^4 + 2x + 1 + 2x^2y - y^2\right) - 2x \\
&= \left(-x^4 + 2x + 1 + 2x^2\left(u + x^2\right) - \left(u + x^2\right)^2\right) - 2x \\
&= \left(-x^4 + 2x + 1 + 2x^2u + 2x^4 - \left(u^2 + x^4 + 2ux^2\right)\right) - 2x \\
&= -x^4 + 2x + 1 + 2x^2u + 2x^4 - u^2 - x^4 - 2ux^2 - 2x \\
&= 1 - u^2
\end{aligned}$$

Hence

$$u' = 1 - u^2$$

This is separable

$$\begin{aligned}\frac{du}{dx} &= 1-u^2\\ \frac{du}{1-u^2} &= dx\end{aligned}$$

Integrating both sides

$$\begin{aligned}\tanh^{-1}(u) &= x+C\\ u(x) &= \tanh(x+C)\\ &= \frac{e^{x+C}-e^{-x-C}}{e^{x+C}+e^{-x-C}}\\ &= \frac{e^x e^C - e^{-x}e^{-C}}{e^x e^C + e^{-x}e^{-C}}\end{aligned}$$

Multiplying numerator and denominator by $e^{-C}e^x$

$$u(x) = \frac{e^{2x}-e^{-2C}}{e^{2x}+e^{-2C}}$$

Let $e^{-2C}=C_1$

$$u(x) = \frac{e^{2x}-C_1}{e^{2x}+C_1}$$

Since $u=y-x^2$ then

$$\begin{aligned}y &= u+x^2\\ &= \frac{e^{2x}-C_1}{e^{2x}+C_1}+x^2\\ &= \frac{e^{2x}-C_1+x^2e^{2x}+x^2C_1}{e^{2x}+C_1}\end{aligned}$$

To obtain same solution as Maple, we divide by C_1

$$y = \frac{\frac{1}{C_1}e^{2x}-1+\frac{1}{C_1}x^2e^{2x}+x^2}{\frac{1}{C_1}e^{2x}+1}$$

Let $\frac{1}{C_1}=-C$ then

$$\begin{aligned}y &= \frac{-Ce^{2x}-1-Cx^2e^{2x}+x^2}{-Ce^{2x}+1}\\ &= \frac{Ce^{2x}+1+Cx^2e^{2x}-x^2}{Ce^{2x}-1}\end{aligned}$$

Which now agrees with the Maple solution form. Mathematica solution also verified to be correct.

ODE No. 16

$$f(x)(xy(x)-1)+y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.0789155 (sec), leaf count = 186

```
DSolve[y[x]^2 + f[x]*(-1 + x*y[x]) + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\exp\left(\int_1^x \frac{f(K[1])K[1]^2+2}{K[1]}dK[1]\right)\int_1^x \exp\left(-\int_1^{K[2]} \frac{f(K[1])K[1]^2+2}{K[1]}dK[1]\right)dK[2]+c_1 \exp\left(\int_1^x \frac{f(K[1])K[1]}{K[1]}\right.}{x\left(\exp\left(\int_1^x \frac{f(K[1])K[1]^2+2}{K[1]}dK[1]\right)\int_1^x \exp\left(-\int_1^{K[2]} \frac{f(K[1])K[1]^2+2}{K[1]}dK[1]\right)dK[2]+c_1 \exp\left(\int_1^x \frac{f(K[1])K[1]}{K[1]}\right.\right.}\right.$$

✓ **Maple** : cpu = 0.104 (sec), leaf count = 49

```
dsolve(diff(y(x),x)+y(x)^2+(x*y(x)-1)*f(x) = 0,y(x))
```

$$y(x)=\frac{e^{\int \frac{-x^2 f(x)-2}{x}dx}}{-c_1+\int e^{\int \frac{-x^2 f(x)-2}{x}dx}dx}+\frac{1}{x}$$

Hand solution

$$\begin{aligned} y'+y^2+(xy-1)f&=0\\ y'(x)&=(-xy+1)f-y^2 \end{aligned} \tag{1}$$

This is Riccati first order non-linear ODE of the form. We can see a particular solution is $y_p=\frac{1}{x}$, therefore, we use the substitution

$$\begin{aligned} y(x)&=y_p(x)+\frac{1}{u(x)}\\ &=\frac{1}{x}+\frac{1}{u} \end{aligned}$$

Hence

$$\begin{aligned} y'(x)&=y_p'(x)-\frac{u'(x)}{u^2(x)}\\ &=\frac{-1}{x^2}-\frac{u'(x)}{u^2(x)} \end{aligned} \tag{2}$$

Equating (1) and (2) gives

$$\begin{aligned}
(-xy+1)\,f - y^2 &= \frac{-1}{x^2} - \frac{u'}{u^2} \\
\left(-x\left(\frac{1}{x}+\frac{1}{u}\right)+1\right) f - \left(\frac{1}{x}+\frac{1}{u}\right)^2 &= \frac{-1}{x^2} - \frac{u'}{u^2} \\
\left(\left(-1-\frac{x}{u}\right)+1\right) f - \left(\frac{1}{x^2}+\frac{1}{u^2}+\frac{2}{xu}\right) &= \frac{-1}{x^2} - \frac{u'}{u^2} \\
-\frac{x}{u} f - \left(\frac{1}{x^2}+\frac{1}{u^2}+\frac{2}{xu}\right) &= \frac{-1}{x^2} - \frac{u'}{u^2} \\
-\frac{x}{u} f - \frac{1}{x^2} - \frac{1}{u^2} - \frac{2}{xu} &= \frac{-1}{x^2} - \frac{u'}{u^2} \\
-xuf - 1 - \frac{2u}{x} &= -u' \\
u' &= xuf + 1 + \frac{2u}{x}
\end{aligned}$$

Hence

$$u' - \left(xf + \frac{2}{x}\right) u = 1$$

Integrating factor is $\mu = e^{\int \left(xf+\frac{2}{x}\right)dx}$, hence the solution is

$$d(\mu u) = \mu$$

Integrating both sides

$$\begin{aligned}
\mu u &= \int \mu dx + C \\
u &= e^{-\int \left(xf+\frac{2}{x}\right)dx} \int e^{\int \left(xf+\frac{2}{x}\right)dx} dx + Ce^{-\int \left(xf+\frac{2}{x}\right)dx} \\
&= e^{-\int \left(xf+\frac{2}{x}\right)dx} \left(\int e^{\int \left(xf+\frac{2}{x}\right)dx} dx + C\right)
\end{aligned}$$

Hence

$$\begin{aligned}
y &= y_p + \frac{1}{u} \\
&= \frac{1}{x} + \frac{1}{e^{-\int \left(xf+\frac{2}{x}\right)dx} \left(\int e^{\int \left(xf+\frac{2}{x}\right)dx} dx + C\right)}
\end{aligned}$$

Hence

$$y(x) = \frac{1}{x} + e^{\int \left(xf+\frac{2}{x}\right)dx} \left(\int e^{\int \left(xf+\frac{2}{x}\right)dx} dx + C\right)^{-1}$$

ODE No. 17

$$y'(x) - y(x)^2 - 3y(x) + 4 = 0$$

✓ **Mathematica** : cpu = 0.067367 (sec), leaf count = 34

```
DSolve[4 - 3*y[x] - y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{-1 - 4e^{5x+5c_1}}{-1 + e^{5x+5c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.12 (sec), leaf count = 24

```
dsolve(diff(y(x),x)-y(x)^2-3*y(x)+4 = 0,y(x))
```

$$y(x) = \frac{-4\,\mathrm{e}^{5x}c_1 - 1}{-1 + \mathrm{e}^{5x}c_1}$$

Hand solution

$$\begin{aligned} y' - y^2 - 3y + 4 &= 0 \\ y' &= 3y - 4 + y^2 \end{aligned} \tag{1}$$

This is Riccati first order non-linear ODE of the form. The general form is

$$y' = P(x) + Q(x)\,y + R(x)\,y^2$$

Where $P(x) = -4, Q(x) = 3, R(x) = 1$. Using the substitution $y = -\frac{u'}{uR(x)} = \frac{-u'}{u}$ then

$$\begin{aligned} u' &= -yu \\ u'' &= -yu' - y'u \\ &= -y(-yu) - \left(3y - 4 + y^2\right) u \\ &= y^2u - 3\left(-\frac{u'}{u}\right) u + 4u - y^2u \\ &= 3u' + 4u \end{aligned}$$

Hence

$$u'' - 3u' - 4u = 0$$

This is standard second order ODE. The characteristic equation is $\lambda^2 - 3\lambda - 4 = 0$, with roots $\frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{3 \pm \sqrt{9+16}}{2} = \frac{3 \pm 5}{2} = \{4, -1\}$, hence

$$u(x) = c_1 e^{4x} + c_2 e^{-x}$$

And

$$u'(x) = c_1 4e^{4x} - c_2 e^{-x}$$

Since $y = \frac{-u'}{u}$ then

$$\begin{aligned} y(x) &= \frac{-c_1 4e^{4x} + c_2 e^{-x}}{c_1 e^{4x} + c_2 e^{-x}} \\ &= \frac{-\frac{c_1}{c_2} 4e^{4x} + e^{-x}}{\frac{c_1}{c_2} e^{4x} + e^{-x}} \end{aligned}$$

Let $\frac{c_1}{c_2} = C_1$ then

$$y(x) = \frac{-4C_1 e^{4x} + e^{-x}}{C_1 e^{4x} + e^{-x}}$$

Dividing by e^{-x}

$$y(x) = \frac{-4C_1 e^{5x} + 1}{C_1 e^{5x} + 1}$$

This is the same result given by CAS. To see it better, let $C_2 = -C_1$ then the above becomes

$$\begin{aligned} y(x) &= \frac{4C_2 e^{5x} + 1}{-C_2 e^{5x} + 1} \\ &= -\frac{4C_2 e^{5x} + 1}{C_2 e^{5x} - 1} \end{aligned}$$

ODE No. 18

$$y'(x) - y(x)^2 - xy(x) - x + 1 = 0$$

✓ **Mathematica** : cpu = 0.0917731 (sec), leaf count = 50

```
DSolve[1 - x - x*y[x] - y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -1 + \frac{e^{\frac{x^2}{2}-2x}}{-\frac{\sqrt{\frac{\pi}{2}}\operatorname{erfi}\left(\frac{x-2}{\sqrt{2}}\right)}{e^2} + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 39

```
dsolve(diff(y(x),x)-y(x)^2-x*y(x)-x+1 = 0,y(x))
```

$$y(x) = -1 + \frac{\mathrm{e}^{\frac{x(x-4)}{2}}}{c_1 + \frac{i\sqrt{\pi}\,\mathrm{e}^{-2}\sqrt{2}\,\operatorname{erf}\left(\frac{i\sqrt{2}\,(x-2)}{2}\right)}{2}}$$

Hand solution

$$\begin{aligned} y' - y^2 - xy - x + 1 &= 0 \\ y' &= x - 1 + xy + y^2 \end{aligned} \tag{1}$$

This is Riccati first order non-linear ODE of the form. The general form is

$$y' = P(x) + Q(x)\,y + R(x)\,y^2$$

Where $P(x) = x - 1, Q(x) = x, R(x) = 1$. We see that $y_p = -1$ is a particular solution, therefore we use the substitution $y = y_p + \frac{1}{u}$, hence $y' = -\frac{u'}{u^2}$ and equating this to (1) we obtain

$$\begin{aligned} -\frac{u'}{u^2} &= x - 1 + xy + y^2 \\ &= x - 1 + x\left(-1 + \frac{1}{u}\right) + \left(-1 + \frac{1}{u}\right)^2 \\ &= x - 1 - x + \frac{x}{u} + \left(1 + \frac{1}{u^2} - \frac{2}{u}\right) \\ &= \frac{x}{u} + \frac{1}{u^2} - \frac{2}{u} \end{aligned}$$

Hence

$$\begin{aligned} u' &= -u^2\left(\frac{x}{u}+\frac{1}{u^2}-\frac{2}{u}\right) \\ &= -xu-1+2u \\ u'+xu-2u &= -1 \\ u'+u(x-2) &= -1 \end{aligned}$$

Integration factor is $e^{\int (x-2)dx} = e^{\frac{x^2}{2}-2x} = e^{\frac{1}{2}x(x-4)}$, therefore

$$d\left(e^{\frac{1}{2}x(x-4)}u\right) = -e^{\frac{1}{2}x(x-4)}$$

Integrating both sides

$$e^{\frac{1}{2}x(x-4)}u = -\int e^{\frac{1}{2}x(x-4)} + C$$

But

$$\int e^{\frac{1}{2}x(x-4)} = \frac{1}{e^2}\sqrt{\frac{\pi}{2}}\operatorname{erfi}\left(\frac{x-2}{\sqrt{2}}\right)$$

Hence

$$u(x) = e^{\frac{-1}{2}x(x-4)}\left(\frac{-1}{e^2}\sqrt{\frac{\pi}{2}}\operatorname{erfi}\left(\frac{x-2}{\sqrt{2}}\right)+C\right)$$

Since $y = y_p + \frac{1}{u}$ then

$$y = -1 + \frac{1}{e^{\frac{-1}{2}x(x-4)}\left(\frac{-1}{e^2}\sqrt{\frac{\pi}{2}}\operatorname{erfi}\left(\frac{x-2}{\sqrt{2}}\right)+C\right)}$$

Or

$$y = \frac{e^{\frac{1}{2}x(x-4)}}{C-\frac{1}{e^2}\sqrt{\frac{\pi}{2}}\operatorname{erfi}\left(\frac{x-2}{\sqrt{2}}\right)} - 1$$

ODE No. 19

$$y'(x) - (y(x) + x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0701077 (sec), leaf count = 14

```
DSolve[-(x + y[x])^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to -x + \tan(x + c_1)\}\}$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 16

```
dsolve(diff(y(x),x)-(y(x)+x)^2 = 0,y(x))
```

$$y(x) = -x - \tan\left(-x + c_1\right)$$

Hand solution

$$\begin{aligned} y' - (y + x)^2 &= 0 \\ y' &= (y + x)^2 \end{aligned} \tag{1}$$

This is Riccati first order non-linear ODE of the form. Let $u = y + x$, then $u' = y' + 1$ and (1) becomes

$$\begin{aligned} u' - 1 &= u^2 \\ u' &= 1 + u^2 \end{aligned}$$

This is separable

$$\begin{aligned} \frac{du}{dx}\frac{1}{1+u^2} &= 1 \\ \int \frac{du}{1+u^2} &= \int dx \\ \tan^{-1} u &= x + C \\ u &= \tan\left(x + C\right) \end{aligned}$$

Since $u = y + x$ then

$$y = \tan\left(x + C\right) - x$$

ODE No. 20

$$\left(x^2+1\right) y(x)+y'(x)-y(x)^2-2x=0$$

✓ **Mathematica** : cpu = 0.0913241 (sec), leaf count = 49

```
DSolve[-2*x + (1 + x^2)*y[x] - y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{e^{\frac{x^3}{3}+x}}{-\int_1^x e^{\frac{K[1]^3}{3}+K[1]}dK[1]+c_1}+x^2+1\right\}\right\}$$

✓ **Maple** : cpu = 0.09 (sec), leaf count = 34

```
dsolve(diff(y(x),x)-y(x)^2+(x^2+1)*y(x)-2*x = 0,y(x))
```

$$y(x)=x^2+1+\frac{\mathrm{e}^{\frac{1}{3}x^3+x}}{c_1-\left(\int \mathrm{e}^{\frac{1}{3}x^3+x}dx\right)}$$

Hand solution

$$\begin{aligned}\left(x^2+1\right) y+y'-y^2-2x&=0\\ y'&=-\left(x^2+1\right) y+y^2+2x\end{aligned}\tag{1}$$

This is Riccati first order non-linear ODE of the form of the general form $y'=P(x)+Q(x)\,y+R(x)\,y^2$ where $P(x)=2x, Q(x)=-\left(x^2+1\right), R(x)=1$. We can convert this to Bernoulli first order ODE in $u(x)$, which is little easier to solve by using $u=y-x^2-1$. The difference between Bernoulli and Riccati is that the term $P(x)=0$ in Bernoulli. If $P(x)\neq 0$ and $R(x)\neq 0$ then it is called Riccati.

Using $u=y-x^2-1$ gives

$$\begin{aligned}u'&=y'-2x\\ u'&=\left[-\left(x^2+1\right) y+y^2+2x\right]-2x\\ &=-\left(x^2+1\right)\left(u+x^2+1\right)+\left(u+x^2+1\right)^2\\ &=\left(u+x^2+1\right)\left[\left(u+x^2+1\right)-\left(x^2+1\right)\right]\\ &=\left(u+x^2+1\right) u\\ &=u^2+u\left(1+x^2\right)\end{aligned}$$

We see now this is Bernoulli since $P(x)=0$. To solve Bernoulli we always start by dividing by u^2 giving

$$\frac{u'}{u^2}=1+\frac{1}{u}\left(1+x^2\right)$$

Next we let $v = \frac{1}{u}$, hence $v' = -\frac{u'}{u^2}$therefore the above becomes

$$\begin{aligned} -v' &= 1 + v\left(1 + x^2\right) \\ v' + v\left(1 + x^2\right) &= -1 \end{aligned}$$

Integrating factor is $e^{\int (1+x^2)dx} = e^{\left(x + \frac{x^3}{2}\right)}$, therefore

$$d\left(e^{\left(x + \frac{x^3}{2}\right)} v\right) = -e^{\left(x + \frac{x^3}{2}\right)}$$

Integrating

$$\begin{aligned} e^{\left(x + \frac{x^3}{2}\right)} v &= -\int e^{\left(x + \frac{x^3}{2}\right)} dx + C \\ v(x) &= e^{-\left(x + \frac{x^3}{2}\right)} \left(C - \int e^{\left(x + \frac{x^3}{2}\right)} dx\right) \end{aligned}$$

Therefore

$$u = \frac{1}{v} = \frac{e^{\left(x + \frac{x^3}{2}\right)}}{\left(C - \int e^{\left(x + \frac{x^3}{2}\right)} dx\right)}$$

And since $u = y - x^2 - 1$ then

$$\begin{aligned} y(x) &= u + 1 + x^2 \\ &= \frac{e^{\left(x + \frac{x^3}{2}\right)}}{\left(C - \int e^{\left(x + \frac{x^3}{2}\right)} dx\right)} + 1 + x^2 \end{aligned}$$

ODE No. 21

$$y'(x) - y(x)^2 + y(x)\sin(x) - \cos(x) = 0$$

✓ **Mathematica** : cpu = 0.335547 (sec), leaf count = 7

```
DSolve[-Cos[x] + Sin[x]*y[x] - y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.171 (sec), leaf count = 25

```
dsolve(diff(y(x),x)-y(x)^2+y(x)*sin(x)-cos(x) = 0,y(x))
```

$$y(x) = -\frac{\mathrm{e}^{-\cos(x)}}{c_1 + \int \mathrm{e}^{-\cos(x)} dx} + \sin(x)$$

Hand solution

$$y' - y^2 + y\sin(x) - \cos(x) = 0$$
$$y' = y^2 - y\sin(x) + \cos(x) \tag{1}$$

This is Riccati first order non-linear ODE of the form of the general form $y' = P(x) + Q(x)\,y + R(x)\,y^2$ where $P(x) = \cos(x), Q(x) = -\sin(x), R(x) = 1$. It is best to first try to spot a particular solution y_p and use the transformation $y = y_p + \frac{1}{u}$ otherwise we use $y = -\frac{u'}{yR(x)}$ transformation. For this problem

$$y_p = \sin(x)$$

Therefore

$$y = \sin x + \frac{1}{u}$$
$$y' = \cos x - \frac{u'}{u^2}$$

Equating this to (1) gives

$$
\begin{aligned}
y^2 - y\sin(x) + \cos(x) &= \cos x - \frac{u'}{u^2} \\
\left(\sin x + \frac{1}{u}\right)^2 - \left(\sin x + \frac{1}{u}\right)\sin x + \cos x &= \cos x - \frac{u'}{u^2} \\
\sin^2 x + \frac{1}{u^2} + \frac{2}{u}\sin x - \sin^2 x - \frac{1}{u}\sin x &= -\frac{u'}{u^2} \\
\frac{1}{u^2} + \frac{1}{u}\sin x &= -\frac{u'}{u^2} \\
1 + u\sin x &= -u' \\
u' + u\sin x &= -1
\end{aligned}
$$

Integrating factor is $e^{\int \sin x} = e^{-\cos x}$, hence

$$d\left(e^{-\cos x}u\right) = -e^{-\cos x}$$

Integrating both sides

$$
\begin{aligned}
e^{-\cos x}u &= -\int e^{-\cos x}dx + C \\
u &= e^{\cos x}\left(C - \int e^{-\cos x}dx\right)
\end{aligned}
$$

Since $y = \sin x + \frac{1}{u}$ then

$$y = \sin x + \frac{e^{-\cos x}}{C - \int e^{-\cos x}dx}$$

Or letting $C_1 = -C$ to make match Maple form, we obtain

$$y = -\frac{e^{-\cos x}}{C_1 + \int e^{-\cos x}dx} + \sin x$$

ODE No. 22

$$y'(x) - y(x)^2 - y(x)\sin(2x) - \cos(2x) = 0$$

✓ **Mathematica** : cpu = 0.508802 (sec), leaf count = 113

```
DSolve[-Cos[2*x] - Sin[2*x]*y[x] - y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{-\sin(x)\int_1^{\cos(x)} \frac{e^{-K[1]^2}}{K[1]^2\sqrt{K[1]^2-1}}dK[1] - \frac{e^{-\cos^2(x)}\tan(x)}{\sqrt{\cos^2(x)-1}} - c_1\sin(x)}{\cos(x)\int_1^{\cos(x)} \frac{e^{-K[1]^2}}{K[1]^2\sqrt{K[1]^2-1}}dK[1] + c_1\cos(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.748 (sec), leaf count = 128

```
dsolve(diff(y(x),x)-y(x)^2-y(x)*sin(2*x)-cos(2*x) = 0,y(x))
```

$$y(x) = \frac{2\sin(2x)\left(c_1(\cos(2x)+1)\,\text{HeunCPrime}\left(1,\frac{1}{2},-\frac{1}{2},-1,\frac{7}{8},\frac{\cos(2x)}{2}+\frac{1}{2}\right) + \text{HeunC}\left(1,\frac{1}{2},-\frac{1}{2},-1,\frac{7}{8},\frac{\cos}{}\right.\right.}{\sqrt{2\cos(2x)+2}\left(c_1\,\text{HeunC}\left(1,\frac{1}{2},-\frac{1}{2},-1,\frac{7}{8},\frac{\cos(2x)}{2}+\frac{1}{2}\right)\sqrt{2\cos(2x)+2}+\text{He}\right.}$$

Hand solution

$$y' - y^2 - y\sin(2x) - \cos(2x) = 0$$

$$y' = y^2 + y\sin(2x) + \cos(2x) \tag{1}$$

This is Riccati first order non-linear ODE of the form of the general form $y' = P(x) + Q(x)\,y + R(x)\,y^2$ where $P(x) = \cos(2x), Q(x) = \sin(2x), R(x) = 1$. It is best to first try to spot a particular solution y_p and use the transformation $y = y_p + \frac{1}{u}$ otherwise we use $y = -\frac{u'}{yR(x)}$ transformation. For this problem

$$y_p = \tan(x)$$

To verify, since $y_p' = \frac{1}{\cos^2 x}$ then plugging this particular in (1) gives

$$\frac{1}{\cos^2 x} - \tan^2(x) - \tan(x)\sin(2x) - \cos(2x) = 0$$

But $\cos(2x) = \cos^2 x - \sin^2 x$ and $\sin(2x) = 2\sin x\cos x$ and $\tan(x) = \frac{\sin x}{\cos x}$ therefore the above becomes

$$\begin{aligned}
\frac{1}{\cos^2 x} - \frac{\sin^2 x}{\cos^2 x} - \frac{\sin x}{\cos x}(2\sin x \cos x) - \left(\cos^2 x - \sin^2 x\right) &= 0 \\
\frac{1}{\cos^2 x} - \frac{\sin^2 x}{\cos^2 x} - 2\sin^2 x - \cos^2 x + \sin^2 x &= 0 \\
\frac{1}{\cos^2 x} - \frac{\sin^2 x}{\cos^2 x} - \sin^2 x - \cos^2 x &= 0 \\
\frac{1}{\cos^2 x} - \frac{\sin^2 x}{\cos^2 x} - 1 &= 0 \\
\frac{1 - \sin^2 x}{\cos^2 x} - 1 &= 0 \\
\frac{\cos^2 x}{\cos^2 x} - 1 &= 0 \\
1 - 1 &= 0 \\
0 &= 0
\end{aligned}$$

Therefore we, we can use $y = y_p + \frac{1}{u}$

$$\begin{aligned}
y &= \tan x + \frac{1}{u} \\
y' &= \frac{1}{\cos^2 x} - \frac{u'}{u^2}
\end{aligned}$$

Equating this to (1) gives

$$\begin{aligned}
-\frac{u'}{u^2} &= y^2 + y\sin(2x) + \cos(2x) \\
-\frac{u'}{u^2} &= -\frac{1}{\cos^2 x} + \left(\tan x + \frac{1}{u}\right)^2 + \left(\tan x + \frac{1}{u}\right)\sin(2x) + \cos(2x)
\end{aligned}$$

Using $\sin(2x) = 2\sin x \cos x$ and $\cos 2x = \cos^2 x - \sin^2 x$ then above becomes

$$
\begin{aligned}
-\frac{u'}{u^2} &= -\frac{1}{\cos^2 x} + \left(\tan^2 x + \frac{1}{u^2} + \frac{2}{u}\tan x\right) + \left(\frac{\sin x}{\cos x} + \frac{1}{u}\right) 2\sin x\cos x + \left(\cos^2 x - \sin^2 x\right) \\
u' &= \frac{u^2}{\cos^2 x} - \left(u^2\frac{\sin^2 x}{\cos^2 x} + 1 + 2u\frac{\sin x}{\cos x}\right) - \left(u^2\frac{\sin x}{\cos x} + u\right) 2\sin x\cos x - u^2\cos^2 x + u^2\sin^2 x \\
&= \frac{u^2}{\cos^2 x} - u^2\frac{\sin^2 x}{\cos^2 x} - 1 - 2u\frac{\sin x}{\cos x} - 2u^2\frac{\sin x}{\cos x}\sin x\cos x - 2u\sin x\cos x - u^2\cos^2 x + u^2\sin^2 x \\
&= \frac{u^2}{\cos^2 x} - u^2\frac{\sin^2 x}{\cos^2 x} - 1 - 2u\frac{\sin x}{\cos x} - 2u^2\sin^2 x - 2u\sin x\cos x - u^2\cos^2 x + u^2\sin^2 x \\
&= \frac{u^2}{\cos^2 x} - u^2\frac{\sin^2 x}{\cos^2 x} - 1 - 2u\frac{\sin x}{\cos x} - u^2\sin^2 x - 2u\sin x\cos x - u^2\cos^2 x \\
&= u^2\left(\frac{1}{\cos^2 x} - \frac{\sin^2 x}{\cos^2 x} - \left(\sin^2 x + \cos^2 x\right)\right) - 1 + u\left(-2\frac{\sin x}{\cos x} - 2\sin x\cos x\right) \\
&= u^2\left(\frac{1-\sin^2 x}{\cos^2 x} - 1\right) - 1 + u\left(-2\frac{\sin x}{\cos x} - 2\sin x\cos x\right) \\
&= u^2\left(\frac{\cos^2 x}{\cos^2 x} - 1\right) - 1 + u\left(-2\frac{\sin x}{\cos x} - 2\sin x\cos x\right) \\
&= -1 + 2u\left(-\frac{\sin x}{\cos x} - \sin x\cos x\right)
\end{aligned}
$$

Hence

$$u' + 2u(\tan x + \sin x\cos x) = -1$$

Integrating factor is $e^{2\int \tan x + \sin x\cos x dx}$. But

$$\int \tan x dx = -\ln(\cos x)$$

And

$$\int \sin x\cos x dx = \frac{-1}{2}\cos^2 x$$

Hence $\mu = e^{-2\ln\cos x}e^{-\cos^2 x} = \frac{1}{\cos^2 x}e^{-\cos^2 x}$, therefore

$$d\left(\frac{1}{\cos^2 x}e^{-\cos^2 x}u\right) = \frac{-1}{\cos^2 x}e^{-\cos^2 x}$$

Integrating both sides

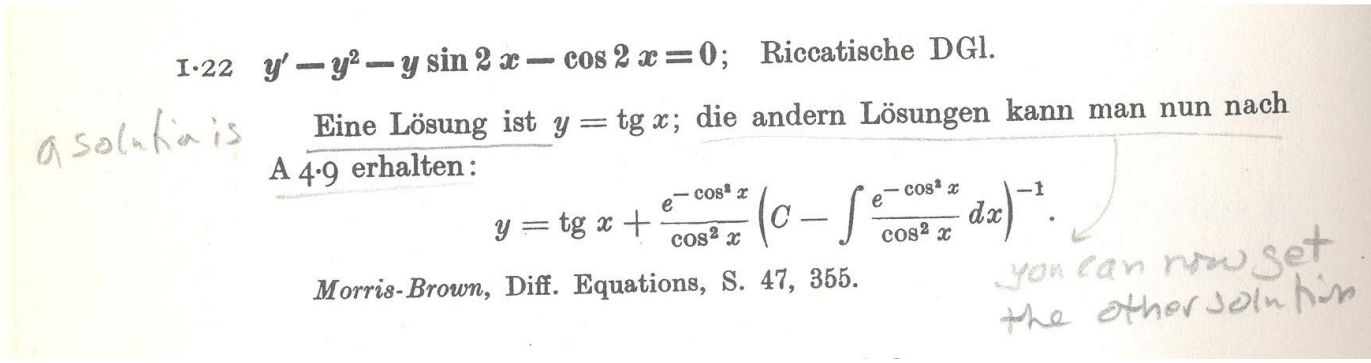
$$
\begin{aligned}
\frac{1}{\cos^2 x}e^{-\cos^2 x}u &= -\int \frac{e^{-\cos^2 x}}{\cos^2 x}dx + C \\
u &= \cos^2 x e^{\cos^2 x}\left(C - \int \frac{e^{-\cos^2 x}}{\cos^2 x}dx\right)
\end{aligned}
$$

Since $y = \tan x + \frac{1}{u}$ then

$$\begin{aligned} y &= \tan x + \frac{1}{\cos^2 x e^{\cos^2 x}\left(C - \int \frac{e^{-\cos^2 x}}{\cos^2 x} dx\right)} \\ &= \tan x + \frac{e^{-\cos^2 x}}{\cos^2 x}\left(C - \int \frac{e^{-\cos^2 x}}{\cos^2 x} dx\right)^{-1} \end{aligned}$$

I do not know how Maple came up with the solution involving HeunC functions since $\int \frac{e^{-\cos^2 x}}{\cos^2 x} dx$ has no closed form solution. I should ask CAS experts about this.

Below is screen shot from Kamke book of the solution it gives, which matches the above result



1·22 $y' - y^2 - y \sin 2x - \cos 2x = 0$; Riccatische DGl.

a solution is

Eine Lösung ist $y = \operatorname{tg} x$; die andern Lösungen kann man nun nach A 4·9 erhalten:

$$y = \operatorname{tg} x + \frac{e^{-\cos^2 x}}{\cos^2 x}\left(C - \int \frac{e^{-\cos^2 x}}{\cos^2 x} dx\right)^{-1}.$$

Morris-Brown, Diff. Equations, S. 47, 355.

you can now set the other solution

ODE No. 23

$$ay(x)^2 - b + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0745175 (sec), leaf count = 43

```
DSolve[-b + a*y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\sqrt{b}\tanh\left(\sqrt{a}\sqrt{b}x + \sqrt{a}\sqrt{b}c_1\right)}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 23

```
dsolve(diff(y(x),x)+a*y(x)^2-b = 0,y(x))
```

$$y(x) = \frac{\tanh\left(\sqrt{ab}\,(x + c_1)\right)\sqrt{ab}}{a}$$

Hand solution

$$y' + ay^2 - b = 0$$
$$\frac{dy}{dx} = b - ay^2$$

Separable,

$$\frac{dy}{b - ay^2} = dx$$
$$\int \frac{dy}{b - ay^2} = \int dx$$

But

$$\int \frac{dy}{b - ay^2} = \frac{1}{\sqrt{ab}}\tanh^{-1}\left(\sqrt{\frac{a}{b}}y\right)$$

Hence

$$\frac{1}{\sqrt{ab}}\tanh^{-1}\left(\sqrt{\frac{a}{b}}y\right) = x + C$$
$$\tanh^{-1}\left(\sqrt{\frac{a}{b}}y\right) = \sqrt{ab}(x + C)$$
$$\sqrt{\frac{a}{b}}y = \tanh\left(\sqrt{ab}(x + C)\right)$$
$$y = \sqrt{\frac{b}{a}}\tanh\left(\sqrt{ab}(x + C)\right)$$

ODE No. 24

$$ay(x)^2 - bx^\nu + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.123375 (sec), leaf count = 277

```
DSolve[-(b*x^nu) + a*y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{-a}\sqrt{b}x^{\frac{\nu+2}{2}}\left(c_1 J_{\frac{\nu+1}{\nu+2}}\left(\frac{2\sqrt{-a}\sqrt{b}x^{\frac{\nu}{2}+1}}{\nu+2}\right) - 2J_{\frac{1}{\nu+2}-1}\left(\frac{2\sqrt{-a}\sqrt{b}x^{\frac{\nu+2}{2}}}{\nu+2}\right) - c_1 J_{-\frac{\nu+3}{\nu+2}}\left(\frac{2\sqrt{-a}\sqrt{b}x^{\frac{\nu+2}{2}}}{\nu+2}\right)\right) - c_1}{2ax\left(J_{\frac{1}{\nu+2}}\left(\frac{2\sqrt{-a}\sqrt{b}x^{\frac{\nu+2}{2}}}{\nu+2}\right) + c_1 J_{-\frac{1}{\nu+2}}\left(\frac{2\sqrt{-a}\sqrt{b}x^{\frac{\nu+2}{2}}}{\nu+2}\right)\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.067 (sec), leaf count = 214

```
dsolve(diff(y(x),x)+a*y(x)^2-b*x^nu = 0,y(x))
```

$$y(x) = \frac{-\operatorname{BesselJ}\left(\frac{3+\nu}{\nu+2}, \frac{2\sqrt{-ab}\,x^{\frac{\nu}{2}+1}}{\nu+2}\right)\sqrt{-ab}\,x^{\frac{\nu}{2}+1}c_1 - \operatorname{BesselY}\left(\frac{3+\nu}{\nu+2}, \frac{2\sqrt{-ab}\,x^{\frac{\nu}{2}+1}}{\nu+2}\right)\sqrt{-ab}\,x^{\frac{\nu}{2}+1} + c_1 \operatorname{BesselJ}\left(\frac{1}{\nu+2}\right.}{xa\left(c_1 \operatorname{BesselJ}\left(\frac{1}{\nu+2}, \frac{2\sqrt{-ab}\,x^{\frac{\nu}{2}+1}}{\nu+2}\right) + \operatorname{BesselY}\left(\frac{1}{\nu+2}, \frac{2\sqrt{-ab}\,x^{\frac{\nu}{2}+1}}{\nu+2}\right.\right.}$$

Hand solution

$$\begin{aligned} y' + ay^2 - bx^v &= 0 \\ y' &= bx^v - ay^2 \\ &= P(x) + Q(x)\,y + R(x)\,y^2 \end{aligned} \tag{1}$$

This is Riccati first order non-linear ODE with $P(x) = bx^v, Q(x) = 0, R(x) = -a$. Using the standard substitution

$$y = -\frac{u'}{uR\,(x)} = \frac{u'}{au}$$

Hence

$$y' = \frac{u''}{au} - \frac{(u')^2}{au^2}$$

Therefore (1) becomes

$$\begin{aligned}\frac{u''}{au} - \frac{(u')^2}{au^2} &= bx^v - ay^2 \\ &= bx^v - a\left(\frac{u'}{au}\right)^2 \\ &= bx^v - \frac{(u')^2}{au^2}\end{aligned}$$

Hence

$$\begin{aligned}\frac{u''}{au} &= bx^v \\ u'' - abx^v u &= 0\end{aligned}$$

This is an Emden-Fowler equation, of the general form $u'' = Ax^n u^m$, where here $m = 1$ and $n = v$ and $A = ab$.

For any n, the solution uses Bessel functions and modified Bessel functions of first and second kind. From Handbook of exact solutions for ODE, page 237, equation 2.1.2.7 we see the solution is given as

$$u = \begin{cases} C_1\sqrt{x}J_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + C_2\sqrt{x}Y_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) & ab < 0 \\ C_1\sqrt{x}I_{\frac{1}{2q}}\left(\frac{\sqrt{ab}}{q}x^q\right) + C_2\sqrt{x}K_{\frac{1}{2q}}\left(\frac{\sqrt{ab}}{q}x^q\right) & ab > 0 \end{cases}$$

Where $q = \frac{n+1}{2}$. J is Bessel function of first kind and Y is Bessel function of second kind. I is modified Besself function of first kind and K is modified Besself function of second kind. To find y we now use $y = \frac{u'}{au}$. Derivative of Bessel functions is given by

$$\begin{aligned}J'_m(x) &= \frac{1}{2}(J_{m-1}(x) - J_{m+1}(x)) \\ Y'_m(x) &= \frac{1}{2}(Y_{m-1}(x) - Y_{m+1}(x)) \\ I'_m(x) &= \frac{1}{2}(I_{m-1}(x) + I_{m+1}(x)) \\ K'_m(x) &= -\frac{1}{2}(K_{m-1}(x) + K_{m+1}(x))\end{aligned}$$

Using these, then

$$u' = \begin{cases} C_1\left[\frac{1}{2\sqrt{x}}J_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + \sqrt{x}J'_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)\right] + C_2\left[\frac{1}{2\sqrt{x}}Y_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + \sqrt{x}Y'_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)\right] & ab < 0 \\ C_1\left[\frac{1}{2\sqrt{x}}I_{\frac{1}{2q}}\left(\frac{\sqrt{ab}}{q}x^q\right) + \sqrt{x}I'_{\frac{1}{2q}}\left(\frac{\sqrt{ab}}{q}x^q\right)\right] + C_2\left[\frac{1}{2\sqrt{x}}K_{\frac{1}{2q}}\left(\frac{\sqrt{ab}}{q}x^q\right) + \sqrt{x}K'_{\frac{1}{2q}}\left(\frac{\sqrt{ab}}{q}x^q\right)\right] & ab > 0 \end{cases}$$

Hence for $ab < 0$

$$
\begin{aligned}
y &= \frac{u'}{au} \\
&= \frac{C_1\left[\frac{1}{2\sqrt{x}}J_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + \sqrt{x}J'_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)\right] + C_2\left[\frac{1}{2\sqrt{x}}Y_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + \sqrt{x}Y'_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)\right]}{aC_1\sqrt{x}J_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + aC_2\sqrt{x}Y_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)} \\
&= \frac{\sqrt{x}C_1\left[\frac{1}{2x}J_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + J'_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)\right] + \sqrt{x}C_2\left[\frac{1}{2x}Y_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + Y'_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)\right]}{aC_1\sqrt{x}J_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + aC_2\sqrt{x}Y_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)} \\
&= \frac{C_1\left[\frac{1}{2x}J_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + J'_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)\right] + C_2\left[\frac{1}{2x}Y_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + Y'_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)\right]}{aC_1J_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + aC_2Y_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)}
\end{aligned}
$$

Using derivatives the above becomes

$$
\begin{aligned}
y = &\frac{C_1\left[\frac{1}{2x}J_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + \frac{1}{2}\left(J_{\frac{1}{2q}-1}\left(\frac{\sqrt{-ab}}{q}x^q\right) - J_{\frac{1}{2q}+1}\left(\frac{\sqrt{-ab}}{q}x^q\right)\right)\right]}{aC_1J_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + aC_2Y_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)} \\
&+ \frac{C_2\left[\frac{1}{2x}Y_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + \frac{1}{2}\left(Y_{\frac{1}{2q}-1}\left(\frac{\sqrt{-ab}}{q}x^q\right) - Y_{\frac{1}{2q}+1}\left(\frac{\sqrt{-ab}}{q}x^q\right)\right)\right]}{aC_1J_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right) + aC_2Y_{\frac{1}{2q}}\left(\frac{\sqrt{-ab}}{q}x^q\right)}
\end{aligned}
$$

Similar result can be found for $ab > 0$

ODE No. 25

$$ay(x)^2 - bx^{2\nu} - cx^{\nu-1} + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.365001 (sec), leaf count = 1835

```
DSolve[-(c*x^(-1 + nu)) - b*x^(2*nu) + a*y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{-2^{\frac{\nu}{2(\nu+1)}-1} e^{-\frac{\sqrt{a}\sqrt{b}x^{\nu+1}}{\sqrt{\nu^2+2\nu+1}}} \nu (x^{\nu+1})^{\frac{\nu}{2(\nu+1)}} L_{-\frac{\frac{\sqrt{a}\sqrt{b}\nu c}{\sqrt{(\nu+1)^2}}+\frac{\sqrt{a}\sqrt{b}c}{\sqrt{(\nu+1)^2}}+b\nu}{2(\nu b+b)}}^{\frac{\nu}{\nu+1}-1}\left(\frac{2\sqrt{a}\sqrt{b}x^{\nu+1}}{\sqrt{\nu^2+2\nu+1}}\right) x^{-\frac{\nu}{2}-1} - \cdots}{\cdots}\right\}\right\}$$

✓ **Maple** : cpu = 0.319 (sec), leaf count = 348

```
dsolve(diff(y(x),x)+a*y(x)^2-b*x^(2*nu)-c*x^(nu-1) = 0,y(x))
```

$$y(x) = -\frac{\left((-\nu-2)\,b^{\frac{3}{2}} + \sqrt{a}\,bc\right)\text{WhittakerM}\left(-\frac{(-2\nu-2)\sqrt{b}+\sqrt{a}\,c}{\sqrt{b}\,(2\nu+2)}, \frac{1}{2\nu+2}, \frac{2\sqrt{a}\,\sqrt{b}\,x^{\nu+1}}{\nu+1}\right) + 2b^{\frac{3}{2}} c_1(\nu+1)\,\text{Whittake}}{2b^{\frac{3}{2}}\left(\text{WhittakerW}\right.}$$

Hand solution

$$\begin{aligned} y' + ay^2 - bx^{2v} - cx^{v-1} &= 0 \\ y' &= bx^v + cx^{v-1} - ay^2 \\ &= P(x) + Q(x)\,y + R(x)\,y^2 \end{aligned} \tag{1}$$

This is Riccati first order non-linear ODE with $P(x) = bx^v + cx^{v-1}, Q(x) = 0, R(x) = -a$.

Need to do this later.

ODE No. 26

$$y'(x) - (Ay(x) - a)(By(x) - b) = 0$$

✓ **Mathematica** : cpu = 0.193939 (sec), leaf count = 68

```
DSolve[-((-a + A*y[x])*(-b + B*y[x])) + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{ae^{Abx+Abc_1} - be^{aBx+aBc_1}}{Ae^{Abx+Abc_1} - Be^{aBx+aBc_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.277 (sec), leaf count = 45

```
dsolve(diff(y(x),x)-(A*y(x)-a)*(B*y(x)-b) = 0,y(x))
```

$$y(x) = \frac{\mathrm{e}^{(x+c_1)(Ab-Ba)}a - b}{A\,\mathrm{e}^{(x+c_1)(Ab-Ba)} - B}$$

Hand solution

$$\begin{aligned} y' - (Ay - a)(By - b) = 0 \\ y' &= (Ay - a)(By - b) \\ &= ab - y(Ab + Ba) + ABy^2 \end{aligned} \tag{1}$$

This is Riccati first order non-linear ODE with $P(x) = ab, Q(x) = -(Ab + Ba), R(x) = AB$. Let $y = -\frac{u'}{uR(x)} = -\frac{u'}{ABu}$, hence

$$y' = \frac{-u''}{ABu} - \frac{(u')^2}{ABu^2}$$

Comparing to (1) results in

$$\begin{aligned} \frac{-u''}{ABu} - \frac{(u')^2}{ABu^2} &= ab - y(Ab + Ba) + ABy^2 \\ &= ab - \left(-\frac{u'}{ABu}\right)(Ab + Ba) + AB\left(-\frac{u'}{ABu}\right)^2 \\ &= ab + \frac{u'}{ABu}(Ab + Ba) + AB\frac{(u')^2}{(ABu)^2} \\ &= ab + \frac{u'}{ABu}(Ab + Ba) + \frac{(u')^2}{ABu^2} \end{aligned}$$

Hence

$$\begin{aligned}\frac{-u''}{ABu} &= ab + \frac{u'}{ABu}(Ab + Ba)\\ -u'' &= ABabu + u'(Ab + Ba)\\ u'' + u'(Ab + Ba) + u(ABab) &= 0\end{aligned}$$

This is second order ODE with constant coefficient. Solution is

$$u = c_1 e^{-aBx} + c_2 e^{-Abx}$$

Therefore

$$u' = -aBc_1 e^{-aBx} - c_2 Abe^{-Abx}$$

And therefore the solution is

$$\begin{aligned}y &= -\frac{u'}{ABu} = -\frac{1}{AB}\frac{-aBc_1 e^{-aBx} - c_2 Abe^{-Abx}}{c_1 e^{-aBx} + c_2 e^{-Abx}}\\ &= \frac{aBc_1 e^{-aBx} + c_2 Abe^{-Abx}}{AB\left(c_1 e^{-aBx} + c_2 e^{-Abx}\right)}\end{aligned}$$

Dividing by c_2 and letting $c = \frac{c_1}{c_2}$

$$y = \frac{aBce^{-aBx} + Abe^{-Abx}}{AB\left(ce^{-aBx} + e^{-Abx}\right)}$$

Verification

```
eq:=diff(y(x),x)-(A*y(x)-a)*(B*y(x)-b) = 0;
sol:=(a*B*_C1*exp(-a*B*x)+A*b*exp(-A*b*x))/(A*B*(_C1*exp(-a*B*x)+exp(-A*b*x)));
odetest(y(x)=sol,eq);
0
```

ODE No. 27

$$ay(x)(y(x)-x)+y'(x)-1=0$$

✓ **Mathematica** : cpu = 0.247046 (sec), leaf count = 120

```
DSolve[-1 + a*y[x]*(-x + y[x]) + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{axe^{\frac{ax^2}{2}}+c_1\left(\sqrt{\frac{\pi}{2}}\sqrt{a}xe^{\frac{ax^2}{2}}\operatorname{erf}\left(\frac{\sqrt{a}x}{\sqrt{2}}\right)+1\right)}{a\left(e^{\frac{ax^2}{2}}+\frac{\sqrt{\frac{\pi}{2}}c_1e^{\frac{ax^2}{2}}\operatorname{erf}\left(\frac{\sqrt{a}x}{\sqrt{2}}\right)}{\sqrt{a}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.216 (sec), leaf count = 72

```
dsolve(diff(y(x),x)+a*y(x)*(y(x)-x)-1 = 0,y(x))
```

$$y(x)=\frac{2\sqrt{a}\,\mathrm{e}^{-\frac{a\,x^2}{2}}+x\left(\sqrt{\pi}\,\operatorname{erf}\left(\frac{\sqrt{2}\sqrt{a}\,x}{2}\right)\sqrt{2}\,a+2a^{\frac{3}{2}}c_1\right)}{\sqrt{\pi}\,\operatorname{erf}\left(\frac{\sqrt{2}\sqrt{a}\,x}{2}\right)\sqrt{2}\,a+2a^{\frac{3}{2}}c_1}$$

Hand solution

$$\begin{aligned} y'+ay(y-x)-1&=0\\ y'&=1-\left(ay^2-ayx\right)\\ &=1+ayx-ay^2 \end{aligned} \tag{1}$$

This is Riccati first order non-linear ODE $y'=P(x)+A(x)\,y+R(x)\,y^2$ with $P(x)=1,Q(x)=-ax,R(x)=-a$. We can convert Riccati to Bernoulli which is easier to solve using the substitution $u=y-x$

$$\begin{aligned} u'&=y'-1\\ &=\left(1+ayx-ay^2\right)-1\\ &=\left(1+a(u+x)\,x-a(u+x)^2\right)-1\\ &=1+aux+ax^2-a\left(u^2+x^2+2ux\right)-1\\ &=1+aux+ax^2-au^2-ax^2-2aux-1\\ &=-aux-au^2\\ u'&=-aux-au^2 \end{aligned}$$

This is of the form $u'=P(x)+Q(x)\,u+R(x)\,u^2$ and since $P(x)=0$ then it is Bernoulli differential equation. (when $P(x)\neq 0$ and $R(x)\neq 0$ it is Riccati). To solve Bernoulli we

always start by dividing by u^2

$$\frac{u'}{u^2} = -\frac{ax}{u} - a$$

Then we let $\zeta = \frac{1}{u}$, hence $\zeta' = -\frac{u'}{u^2}$, therefore the above becomes

$$\begin{aligned} -\zeta' &= -ax\zeta - a \\ \zeta' - ax\zeta &= a \end{aligned}$$

Integrating factor is $e^{-\int axdx} = e^{-a\frac{x^2}{2}}$, hence $d\left(e^{-a\frac{x^2}{2}}\zeta\right) = ae^{-a\frac{x^2}{2}}$. Integrating both sides gives

$$e^{-a\frac{x^2}{2}}\zeta = a\int e^{-a\frac{x^2}{2}}dx + C$$

But

$$\int e^{-a\frac{x^2}{2}}dx = \sqrt{\frac{\pi}{2a}}\operatorname{erf}\left(\sqrt{\frac{a}{2}}x\right)$$

Therefore

$$\begin{aligned} e^{-a\frac{x^2}{2}}\zeta &= a\sqrt{\frac{\pi}{2a}}\operatorname{erf}\left(\sqrt{\frac{a}{2}}x\right) + C \\ \zeta &= e^{a\frac{x^2}{2}}\left(a\sqrt{\frac{\pi}{2a}}\operatorname{erf}\left(\sqrt{\frac{a}{2}}x\right) + C\right) \end{aligned}$$

Hence

$$\begin{aligned} u &= \frac{1}{\zeta} \\ &= e^{-a\frac{x^2}{2}}\left(a\sqrt{\frac{\pi}{2a}}\operatorname{erf}\left(\sqrt{\frac{a}{2}}x\right) + C\right)^{-1} \end{aligned}$$

Since $u = y - x$ then

$$\begin{aligned} y &= u + x \\ &= e^{-a\frac{x^2}{2}}\left(a\sqrt{\frac{\pi}{2a}}\operatorname{erf}\left(\sqrt{\frac{a}{2}}x\right) + C\right)^{-1} + x \\ &= \frac{e^{-a\frac{x^2}{2}}}{\sqrt{\frac{a\pi}{2}}\operatorname{erf}\left(\sqrt{\frac{a}{2}}x\right) + C} + x \end{aligned}$$

Verification

```
eq:=diff(y(x),x)+a*y(x)*(y(x)-x)-1 = 0;
sol:=exp(-a*x^2/2)/(sqrt(a*Pi/2)*erf(sqrt(a/2)*x)+_C1)+x;
odetest(y(x)=sol,eq);
0
```

ODE No. 28

$$x^3(-y(x)) + y'(x) + xy(x)^2 - 2x = 0$$

✓ **Mathematica** : cpu = 0.128181 (sec), leaf count = 96

```
DSolve[-2*x - x^3*y[x] + x*y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\frac{1}{2}\sqrt{\pi}e^{\frac{x^4}{4}}x^3\text{erf}\left(\frac{x^2}{2}\right) + c_1 e^{\frac{x^4}{4}}x^3 + x}{x\left(\frac{1}{2}\sqrt{\pi}e^{\frac{x^4}{4}}\text{erf}\left(\frac{x^2}{2}\right) + c_1 e^{\frac{x^4}{4}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.088 (sec), leaf count = 51

```
dsolve(diff(y(x),x)+x*y(x)^2-x^3*y(x)-2*x = 0,y(x))
```

$$y(x) = \frac{\text{erf}\left(\frac{x^2}{2}\right)\sqrt{\pi}\,c_1 x^2 + x^2\sqrt{\pi} + 2\,\mathrm{e}^{-\frac{x^4}{4}}c_1}{\sqrt{\pi}\,\left(\text{erf}\left(\frac{x^2}{2}\right)c_1 + 1\right)}$$

Hand solution

$$\begin{aligned} y' - yx^3 + xy^2 - 2x &= 0 \\ y' &= 2x + yx^3 - xy^2 \\ &= P(x) + Q(x)\,y + R(x)\,y^2 \end{aligned} \tag{1}$$

This is Riccati first order non-linear ODE with $P(x) = 2x, Q(x) = x^3, R(x) = -x$. We can convert Riccati to Bernoulli which is easier to solve using the substitution $u = x^2 - y$ or $y = x^2 - u$

$$\begin{aligned} u' &= 2x - y' \\ &= 2x - \left(2x + yx^3 - xy^2\right) \\ &= 2x - \left(2x + \left(x^2 - u\right)x^3 - x\left(x^2 - u\right)^2\right) \\ &= 2x - \left(2x + \left(x^5 - ux^3\right) - x\left(x^4 + u^2 - 2x^2u\right)\right) \\ u' &= 2x - \left(2x + \left(x^5 - ux^3\right) - \left(x^5 + xu^2 - 2x^3u\right)\right) \\ &= 2x - 2x - \left(x^5 - ux^3\right) + \left(x^5 + xu^2 - 2x^3u\right) \\ &= -x^5 + ux^3 + x^5 + xu^2 - 2x^3u \\ &= -ux^3 + xu^2 \end{aligned}$$

This is of the form $u' = P(x) + Q(x)\,u + R(x)\,u^2$ and since $P(x) = 0$ then it is Bernoulli differential equation. (when $P(x) \neq 0$ and $R(x) \neq 0$ it is Riccati). To solve Bernoulli we always start by dividing by u^2

$$\frac{u'}{u^2} = -\frac{1}{u}x^3 + x$$

Then we let $\zeta = -\frac{1}{u}$, hence $\zeta' = \frac{u'}{u^2}$, therefore the above becomes

$$\begin{aligned} \zeta' &= x^3\zeta + x \\ \zeta' - x^3\zeta &= x \end{aligned}$$

Integrating factor is $e^{-\int x^3 dx} = e^{-\frac{x^4}{4}}$, hence

$$d\left(e^{-\frac{x^4}{4}}\zeta\right) = xe^{-\frac{x^4}{4}}$$

Integrating both sides gives

$$e^{-\frac{x^4}{4}}\zeta = \int xe^{-\frac{x^4}{4}}dx + C$$

$\int xe^{-\frac{x^4}{4}}dx = \frac{\sqrt{\pi}}{2}\operatorname{erf}\left(\frac{x^2}{2}\right)$, hence from above

$$\begin{aligned} e^{-\frac{x^4}{4}}\zeta &= \frac{\sqrt{\pi}}{2}\operatorname{erf}\left(\frac{x^2}{2}\right) + C \\ \zeta &= e^{\frac{x^4}{4}}\left(\frac{\sqrt{\pi}}{2}\operatorname{erf}\left(\frac{x^2}{2}\right) + C\right) \end{aligned}$$

Since $\zeta = -\frac{1}{u}$ then

$$u = -e^{-\frac{x^4}{4}}\left(\frac{\sqrt{\pi}}{2}\operatorname{erf}\left(\frac{x^2}{2}\right) + C\right)^{-1}$$

And since $y = x^2 - u$ then

$$\begin{aligned} y &= x^2 + e^{-\frac{x^4}{4}}\left(\frac{\sqrt{\pi}}{2}\operatorname{erf}\left(\frac{x^2}{2}\right) + C\right)^{-1} \\ &= x^2 + \frac{e^{-\frac{x^4}{4}}}{\frac{\sqrt{\pi}}{2}\operatorname{erf}\left(\frac{x^2}{2}\right) + C} \end{aligned}$$

Verification

```
eq:=diff(y(x),x)+x*y(x)^2-x^3*y(x)-2*x = 0;
sol:=x^2+ exp(-x^4/4)/(_C1+ sqrt(Pi)/2*erf(x^2/2));
odetest(y(x)=sol,eq);
0
```

ODE No. 29

$$y'(x) - xy(x)^2 - 3xy(x) = 0$$

✓ **Mathematica** : cpu = 0.083778 (sec), leaf count = 39

```
DSolve[-3*x*y[x] - x*y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{3e^{\frac{3x^2}{2}+3c_1}}{-1+e^{\frac{3x^2}{2}+3c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 19

```
dsolve(diff(y(x),x)-x*y(x)^2-3*x*y(x) = 0,y(x))
```

$$y(x) = \frac{3}{-1+3\,\mathrm{e}^{-\frac{3x^2}{2}}c_1}$$

Hand solution

$$\begin{aligned} y' - xy^2 - 3xy &= 0 \\ y' &= 3xy + xy^2 \\ &= P(x) + Q(x)\,y + R(x)\,y^2 \end{aligned} \tag{1}$$

This is Bernoulli first order non-linear ODE since $P(x) = 0$. To solve Bernoulli we always start by dividing by y^2

$$\frac{y'}{y^2} = \frac{3x}{y} + x$$

Then we let $u = \frac{1}{y}$, hence $u' = \frac{-y'}{y^2}$, therefore the above becomes

$$\begin{aligned} -u' &= 3xu + x \\ u' + 3ux &= -x \end{aligned}$$

Integrating factor is $e^{\int 3x dx} = e^{\frac{3x^2}{2}}$, hence

$$d\left(e^{\frac{3x^2}{2}}u\right) = -xe^{\frac{3x^2}{2}}$$

Integrating both sides gives

$$\begin{aligned} e^{\frac{3x^2}{2}}u &= \int -xe^{\frac{3x^2}{2}}dx + C \\ &= -\frac{1}{3}e^{\frac{3x^2}{2}} + C \end{aligned}$$

Hence from above

$$u = e^{\frac{-3x^2}{2}} \left(-\frac{1}{3} e^{\frac{3x^2}{2}} + C \right)$$

And since $y = \frac{1}{u}$ then

$$y = \frac{e^{\frac{3x^2}{2}}}{C - \frac{1}{3} e^{\frac{3x^2}{2}}}$$

Verification

```
eq:=diff(y(x),x)-x*y(x)^2-3*x*y(x) = 0;
sol:=exp(3*x^2/2)/(_C1- 1/3*exp(3*x^2/2));
odetest(y(x)=sol,eq);
0
```

ODE No. 30

$$x^{-a-1}y(x)^2 - x^a + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.184436 (sec), leaf count = 230

```
DSolve[-x^a + x^(-1 - a)*y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{x^{a+1}\left(-\frac{1}{2}(-1)^{-a} a x^{-\frac{a}{2}-1}\Gamma(1-a) I_{-a}\left(2\sqrt{x}\right) + \frac{1}{2}(-1)^{-a} x^{-\frac{a}{2}-\frac{1}{2}}\Gamma(1-a)\left(I_{-a-1}\left(2\sqrt{x}\right) + I_{1-a}\left(2\sqrt{\right.\right.\right.}{(-1)^{-a}x^{-a/2}\Gamma(1-a) I_{-a}\left(2\sqrt{x}\right) +}\right.\right.$$

✓ **Maple** : cpu = 0.087 (sec), leaf count = 54

```
dsolve(diff(y(x),x)+x^(-a-1)*y(x)^2-x^a = 0,y(x))
```

$$y(x) = \frac{x^{a+1}\left(-\operatorname{BesselK}\left(a+1, 2\sqrt{x}\right) c_1 + \operatorname{BesselI}\left(a+1, 2\sqrt{x}\right)\right)}{\sqrt{x}\left(\operatorname{BesselK}\left(a, 2\sqrt{x}\right) c_1 + \operatorname{BesselI}\left(a, 2\sqrt{x}\right)\right)}$$

Hand solution

$$\begin{aligned} y' + x^{-a-1}y^2 - x^a &= 0 \\ y' &= x^a - x^{-a-1}y^2 \\ &= P(x) + Q(x)\,y + R(x)\,y^2 \end{aligned} \tag{1}$$

This is Ricatti first order non-linear ODE. Using standard transformation

$$y = -\frac{u'}{uR(x)} = x^{a+1}\frac{u'}{u}$$

Hence

$$y' = (a+1)\,x^a\frac{u'}{u} + x^{a+1}\frac{u''}{u} - x^{a+1}\frac{(u')^2}{u^2}$$

Comparing to (1) gives

$$
\begin{aligned}
x^a - x^{-a-1}y^2 &= (a+1)\, x^a \frac{u'}{u} + x^{a+1}\frac{u''}{u} - x^{a+1}\frac{(u')^2}{u^2} \\
x^a - x^{-a-1}\left(x^{a+1}\frac{u'}{u}\right)^2 &= (a+1)\, x^a \frac{u'}{u} + x^{a+1}\frac{u''}{u} - x^{a+1}\frac{(u')^2}{u^2} \\
1 - \frac{x^{-a-1}}{x^a}x^{2a+2}\frac{(u')^2}{u^2} &= (a+1)\,\frac{u'}{u} + x\frac{u''}{u} - x\frac{(u')^2}{u^2} \\
1 - x\frac{(u')^2}{u^2} &= (a+1)\,\frac{u'}{u} + x\frac{u''}{u} - x\frac{(u')^2}{u^2} \\
1 &= (a+1)\,\frac{u'}{u} + x\frac{u''}{u} \\
xu'' + (1+a)\,u' - u &= 0 \qquad (2)
\end{aligned}
$$

In standard form $u'' + \frac{1}{x}(1+a)\,u' - \frac{1}{x}u = 0$ or $u'' + p(x)\,(1+a)\,u' + q(x)\,u = 0$. We see that $p(x)$ is not analytic at $x = 0$ (the expansion point). So we can't use power series solution, and will use Forbenius series. Power series, which is $u = \sum_{n=0}^{\infty} c_n x^n$ is used when the expansion point is not singular point. (i.e. $p(x)$ and $q(x)$ are analytic there). Forbenius series $u = x^r \sum_{n=0}^{\infty} c_n x^n$ is used when there is a removable singular point (called also regular singular point), as in this case. Starting with

$$u = x^r \sum_{n=0}^{\infty} c_n x^n = \sum_{n=0}^{\infty} c_n x^{n+r}$$

Hence

$$
\begin{aligned}
u' &= \sum_{n=0}^{\infty} (n+r)\, c_n x^{n+r-1} \\
u'' &= \sum_{n=0}^{\infty} (n+r)\,(n+r-1)\, c_n x^{n+r-2}
\end{aligned}
$$

Substituting in (2) gives

$$
\begin{aligned}
x\sum_{n=0}^{\infty} (n+r)\,(n+r-1)\, c_n x^{n+r-2} + (1+a)\sum_{n=0}^{\infty} (n+r)\, c_n x^{n+r-1} - \sum_{n=0}^{\infty} c_n x^{n+r} &= 0 \\
\sum_{n=0}^{\infty} (n+r)\,(n+r-1)\, c_n x^{n+r-1} + (1+a)\sum_{n=0}^{\infty} (n+r)\, c_n x^{n+r-1} - \sum_{n=0}^{\infty} c_n x^{n+r} &= 0
\end{aligned}
$$

Dividing out x^r

$$\sum_{n=0}^{\infty} (n+r)\,(n+r-1)\, c_n x^{n-1} + (1+a)\sum_{n=0}^{\infty} (n+r)\, c_n x^{n-1} - \sum_{n=0}^{\infty} c_n x^{n} = 0$$

Each term should have x^{n-1} in it. So we adjust the last term

$$\sum_{n=0}^{\infty}(n+r)(n+r-1)c_n x^{n-1}+(1+a)\sum_{n=0}^{\infty}(n+r)c_n x^{n-1}-\sum_{n=1}^{\infty}c_{n-1}x^{n-1}=0$$

Expanding the second term

$$\sum_{n=0}^{\infty}(n+r)(n+r-1)c_n x^{n-1}+\sum_{n=0}^{\infty}(n+r)c_n x^{n-1}+\sum_{n=0}^{\infty}a(n+r)c_n x^{n-1}-\sum_{n=1}^{\infty}c_{n-1}x^{n-1}=0$$

Hence for $n=0$

$$\begin{aligned}(n+r)(n+r-1)c_n x^{n-1}+(n+r)c_n x^{n-1}+a(n+r)c_n x^{n-1}&=0\\ r(r-1)c_0+rc_0+arc_0&=0\end{aligned}$$

Since $c_0\neq 0$ then

$$r(r-1)+r+ar=0$$

Hence $r=-a$ or $r=0$. Now for $n\geq 1$

$$\begin{aligned}(n+r)(n+r-1)c_n x^{n-1}+\ (n+r)c_n x^{n-1}+\ a(n+r)c_n x^{n-1}-\ c_{n-1}x^{n-1}&=0\\ (n+r)(n+r-1)c_n\ +\ (n+r)c_n\ +\ a(n+r)c_n\ -\ c_{n-1}&=0\\ ((n+r)(n+r-1)\ +\ (n+r)\ +\ a(n+r))c_n&=c_{n-1}\\ c_n&=\frac{c_{n-1}}{(n+r)(n+r-1)\ +\ (n}\end{aligned}$$

For $r=0$, we obtain

$$c_n=\frac{c_{n-1}}{n(n-1)\ +\ n\ +\ an}\tag{3}$$

For $r=-a$

$$c_n=\frac{c_{n-1}}{(n-a)(n-a-1)\ +\ (n-a)\ +\ a(n-a)}\tag{4}$$

There are two solutions. Looking at (3) for now, for $n=1$

$$c_1=\frac{c_0}{1\ +\ a}$$

For $n=2$

$$c_2=\frac{c_1}{4\ +2a}=\frac{c_0}{1\ +\ a}\frac{1}{2(2\ +a)}$$

For $n=3$

$$c_3=\frac{c_2}{3(2)\ +\ 3\ +3a}=\frac{c_2}{3(3\ +a)}=\frac{c_0}{1\ +\ a}\frac{1}{2(2\ +a)}\frac{1}{3(3\ +a)}$$

And so on. Since the solution is assumed to be $x^r \sum_{n=0}^{\infty} c_n x^n$ and we are looking at case $r = 0$ then

$$\begin{aligned} u_{r=0}(x) &= \sum_{n=1}^{\infty} c_n x^n \\ &= c_0 + c_1 x + c_2 x^2 + \cdots \\ &= c_0 x^0 + \frac{c_0}{1 + a} x + \frac{c_0}{1 + a} \frac{1}{2\,(2 + a)} x^2 + \frac{c_0}{1 + a} \frac{1}{2\,(2 + a)} \frac{1}{3\,(3 + a)} x^3 + \cdots \\ &= c_0 \left(x^0 + \frac{1}{1 + a} x + \frac{1}{(1 + a)} \frac{1}{2\,(2 + a)} x^2 + \frac{1}{(1 + a)} \frac{1}{2\,(2 + a)} \frac{1}{3\,(3 + a)} x^3 + \cdots \right) \end{aligned} \tag{5}$$

Since

$$\Gamma(n) = (n-1)\,!$$

and

$$a(1+a)\,(2+a) \cdots (n+a) = \frac{\Gamma(a+n+1)}{\Gamma\,(a)}$$

Then

$$(1+a)\,(2+a) \cdots (n+a) = \frac{\Gamma(a+n+1)}{a\Gamma\,(a)}$$

And (5) can now be written as

$$y_{r=0}(x) = c_0 \sum_{n=1}^{\infty} \frac{1}{n!} \frac{a\Gamma(a)}{\Gamma\,(a+n+1)} x^n \tag{6}$$

But modified Bessel function of first kind is

$$\text{BesselI}\,(a, z) = \sum_{n=0}^{\infty} \frac{1}{n!} \frac{1}{\Gamma\,(a+n+1)} \left(\frac{z}{2} \right)^{2n+a}$$

So if we let $z = 2\sqrt{x}$ we obtain

$$\begin{aligned} \text{BesselI}\,\left(a, 2\sqrt{x}\right) &= \sum_{n=0}^{\infty} \frac{1}{n!} \frac{1}{\Gamma\,(a+n+1)} \left(\frac{2\sqrt{x}}{2} \right)^{2n+a} \\ &= \sum_{n=0}^{\infty} \frac{1}{n!} \frac{1}{\Gamma\,(a+n+1)} \left(\sqrt{x}\right)^{2n} \left(\sqrt{x}\right)^{a} \\ &= \sum_{n=0}^{\infty} \frac{1}{n!} \frac{1}{\Gamma\,(a+n+1)} x^n \left(\sqrt{x}\right)^{a} \end{aligned}$$

Hence

$$\frac{1}{\sqrt{x^a}}\,\text{BesselI}\,\left(a, 2\sqrt{x}\right) = \sum_{n=0}^{\infty} \frac{1}{n!} \frac{1}{\Gamma\,(a+n+1)} x^n \tag{7}$$

If we now compare (6) and (7), we see that if we set c_0, which is arbitrary, to be $c_0 = \frac{1}{a\Gamma(a)}$, then we obtain

$$\begin{aligned} u_{r=0}(x) &= \frac{1}{a\Gamma\left(a\right)} \sum_{n=0}^{\infty} \frac{1}{n!} \frac{a\Gamma(a)}{\Gamma\left(a+n+1\right)} x^n \\ &= \sum_{n=0}^{\infty} \frac{1}{n!} \frac{1}{\Gamma\left(a+n+1\right)} x^n \end{aligned}$$

But this is (7). Hence we found the first solution, which is

$$u_{r=0}(x) = \frac{1}{\sqrt{x^a}} \text{BesselI}\left(a, 2\sqrt{x}\right) \tag{8}$$

The above was for $r = 0$. Now we find the second solution for $r = -a$. From (4)

$$c_n = \frac{c_{n-1}}{(n-a)(n-a-1) + (n-a) + a(n-a)}$$

For $n = 1$

$$c_1 = \frac{c_0}{-a(1-a) + (1-a) + a(1-a)} = \frac{c_0}{(1-a)}$$

For $n = 2$

$$c_2 = \frac{c_1}{(2-a)(1-a) + (2-a) + a(2-a)} = \frac{c_1}{4-2a} = \frac{c_0}{(1-a)} \frac{1}{2(2-a)}$$

For $n = 3$

$$c_3 = \frac{c_2}{(3-a)(2-a) + (3-a) + a(3-a)} = \frac{c_2}{3(3-a)} = \frac{c_0}{(1-a)} \frac{1}{2(2-a)} \frac{1}{3(3-a)}$$

And so on. Since the solution is assumed to be $x^r \sum_{n=0}^{\infty} c_n x^n$ then

$$\begin{aligned} u_{r=-a} &= x^{-a} \sum_{n=0}^{\infty} c_n x^n \\ &= \sum_{n=0}^{\infty} c_n x^{n-a} \\ &= c_0 x^{-a} \sum_{n=0}^{\infty} \frac{1}{n!} \left(\frac{1}{(1-a)} \frac{1}{(2-a)} \frac{1}{(3-a)} \cdots \frac{1}{(n-a)} \right) x^{n-a} \end{aligned}$$

But as we found above, we obtain that $(1-a)(2-a)\cdots(n-a)=\frac{\Gamma(-a+n+1)}{-a\Gamma(-a)}$, therefore

$$u_{r=-a}=c_0\sum_{n=0}^{\infty}\frac{1}{n!}\frac{-a\Gamma(-a)}{\Gamma\left(-a+n+1\right)}x^{n-a}$$

Modified Bessel function of second kind is $\text{BesselK}\left(a,z\right)=\frac{\pi}{2}\frac{1}{\sin(a\pi)}(\text{BesselI}\left(-a,z\right)-\text{BesselI}\left(a,z\right))$. The above should result in $\frac{1}{\sqrt{x^a}}\text{BesselK}\left(a,2\sqrt{x}\right)$ for $z=2\sqrt{x}$ by setting c_0 to appropriate arbitrary value. I need to work out this final manipulation later. Hence we find $u_{r=-a}(x)=\frac{1}{\sqrt{x^a}}\text{BesselK}\left(a,2\sqrt{x}\right)$. Therefore, the solution is

$$u=C_1\frac{1}{\sqrt{x^a}}\text{BesselI}\left(a,2\sqrt{x}\right)+C_2\frac{1}{\sqrt{x^a}}\text{BesselK}\left(a,2\sqrt{x}\right)$$

But

$$\frac{d}{dx}\frac{1}{\sqrt{x^a}}\text{BesselI}\left(a,2\sqrt{x}\right)=\frac{1}{\sqrt{x^{1+a}}}\text{BesselI}\left(1+a,2\sqrt{x}\right)$$
$$\frac{d}{dx}\frac{1}{\sqrt{x^a}}\text{BesselI}\left(a,2\sqrt{x}\right)=-\frac{1}{\sqrt{x^{1+a}}}\text{BesselK}\left(1+a,2\sqrt{x}\right)$$

Hence

$$u'=C_1\frac{1}{\sqrt{x^{1+a}}}\text{BesselI}\left(1+a,2\sqrt{x}\right)-C_2\frac{1}{\sqrt{x^{1+a}}}\text{BesselK}\left(1+a,2\sqrt{x}\right)$$

And from $y=x^{a+1}\frac{u'}{u}$

$$y=x^{1+a}\frac{C_1\frac{1}{\sqrt{x^{1+a}}}\text{BesselI}\left(1+a,2\sqrt{x}\right)-C_2\frac{1}{\sqrt{x^{1+a}}}\text{BesselK}\left(1+a,2\sqrt{x}\right)}{C_1\frac{1}{\sqrt{x^a}}\text{BesselI}\left(a,2\sqrt{x}\right)+C_2\frac{1}{\sqrt{x^a}}\text{BesselK}\left(a,2\sqrt{x}\right)}$$

Let $C=\frac{C_2}{C_1}$ hence

$$y=x^{1+a}\frac{\frac{1}{\sqrt{x^{1+a}}}\text{BesselI}\left(1+a,2\sqrt{x}\right)-C\frac{1}{\sqrt{x^{1+a}}}\text{BesselK}\left(1+a,2\sqrt{x}\right)}{\frac{1}{\sqrt{x^a}}\text{BesselI}\left(a,2\sqrt{x}\right)+C\frac{1}{\sqrt{x^a}}\text{BesselK}\left(a,2\sqrt{x}\right)}$$

Or

$$y=x^{1+a}\frac{x^{-\frac{1}{2}}\text{BesselI}\left(1+a,2\sqrt{x}\right)-Cx^{-\frac{1}{2}}\text{BesselK}\left(1+a,2\sqrt{x}\right)}{\text{BesselI}\left(a,2\sqrt{x}\right)+C\,\text{BesselK}\left(a,2\sqrt{x}\right)}$$
$$=\frac{x^{\frac{1}{2}+a}\text{BesselI}\left(1+a,2\sqrt{x}\right)-Cx^{\frac{1}{2}+a}\text{BesselK}\left(1+a,2\sqrt{x}\right)}{\text{BesselI}\left(a,2\sqrt{x}\right)+C\,\text{BesselK}\left(a,2\sqrt{x}\right)}$$

Verification

```
eq:=diff(y(x),x)+x^(-a-1)*y(x)^2-x^a = 0;
num:=x^(1/2+a)*BesselI(1+a,2*sqrt(x))-_C1*x^(1/2+a)*BesselK(1+a,2*sqrt(x));
den:=BesselI(a,2*sqrt(x))+_C1*BesselK(a,2*sqrt(x));
my_sol:=num/den;
odetest(y(x)=my_sol,eq);
0
```

ODE No. 31

$$y'(x) - ax^n\left(y(x)^2 + 1\right) = 0$$

✓ **Mathematica** : cpu = 0.178547 (sec), leaf count = 21

```
DSolve[-(a*x^n*(1 + y[x]^2)) + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.058 (sec), leaf count = 23

```
dsolve(diff(y(x),x)-a*x^n*(y(x)^2+1) = 0,y(x))
```

$$y(x) = \tan\left(\frac{a(x^{n+1} + (n+1)\,c_1)}{n+1}\right)$$

Hand solution

$$\begin{aligned} y' - ax^n\left(y^2 + 1\right) &= 0 \\ y' &= ax^n + ax^n y^2 \\ &= P(x) + Q(x)\,y + R(x)\,y^2 \end{aligned} \tag{1}$$

This is Ricatti first order non-linear ODE. $P(x) = ax^n, Q(x) = 0, R(x) = ax^n$. But this is separable also. Hence

$$\frac{y'}{(y^2+1)} = ax^n$$
$$\frac{dy}{(y^2+1)} = ax^n dx$$

Integrating

$$\arctan\left(y(x)\right) = a\frac{x^{n+1}}{n+1} + C$$

Or

$$y(x) = \tan\left(a\frac{x^{n+1}}{n+1} + C\right)$$

Verification

```
restart;
eq:=diff(y(x),x)-a*x^n*(y(x)^2+1) = 0;
sol:=tan(a*x^(n+1)/(n+1)+_C1);
odetest(y(x)=sol,eq);
0
```

ODE No. 32

$$y'(x) + y(x)^2 \sin(x) - 2\tan(x)\sec(x) = 0$$

✓ **Mathematica** : cpu = 0.328093 (sec), leaf count = 34

```
DSolve[-2*Sec[x]*Tan[x] + Sin[x]*y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\csc(x)(-2\sin(x)\cos(x) + c_1 \tan(x)\sec(x))}{\cos^2(x) + c_1 \sec(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.26 (sec), leaf count = 28

```
dsolve(diff(y(x),x)+y(x)^2*sin(x)-2*sin(x)/cos(x)^2 = 0,y(x))
```

$$y(x) = \frac{-2(\cos^3(x))\, c_1 - 2}{((\cos^3(x))\, c_1 - 2)\cos(x)}$$

Hand solution

$$\begin{aligned} y' + y^2 \sin(x) - 2\frac{\sin x}{\cos^2 x} &= 0 \\ y' &= 2\frac{\sin x}{\cos^2 x} - y^2 \sin(x) \\ &= P(x) + Q(x)\, y + R(x)\, y^2 \end{aligned} \tag{1}$$

This is Ricatti first order non-linear ODE. $P(x) = 2\frac{\sin x}{\cos^2 x}, Q(x) = 0, R(x) = -\sin(x)$. A particular solution is $y_p = \frac{1}{\cos x}$, therefore the solution is

$$y = y_p + \frac{1}{u}$$
$$y = \frac{1}{\cos x} + \frac{1}{u}$$

Hence

$$y' = \frac{\sin x}{\cos^2 x} - \frac{u'}{u^2}$$

Equating this to RHS of (1) gives

$$\begin{aligned} \frac{\sin x}{\cos^2 x} - \frac{u'}{u^2} &= 2\frac{\sin x}{\cos^2 x} - y^2 \sin(x) \\ &= 2\frac{\sin x}{\cos^2 x} - \left(\frac{1}{\cos x} + \frac{1}{u}\right)^2 \sin(x) \\ &= 2\frac{\sin x}{\cos^2 x} - \left(\frac{1}{\cos^2 x} + \frac{1}{u^2} + \frac{2}{u\cos x}\right)\sin(x) \end{aligned}$$

Hence

$$\begin{aligned}-\frac{u'}{u^2} &= -\frac{\sin x}{\cos^2 x} + 2\frac{\sin x}{\cos^2 x} - \frac{\sin(x)}{\cos^2 x} - \frac{\sin(x)}{u^2} - \frac{2\sin(x)}{u\cos x} \\ &= -\frac{\sin(x)}{u^2} - \frac{2\sin(x)}{u\cos x}\end{aligned}$$

Or

$$\begin{aligned}u' &= \sin(x) + \frac{2u\sin(x)}{\cos x} \\ u' - 2u\tan(x) &= \sin(x)\end{aligned}$$

Integrating factor is $e^{-2\int \tan x dx} = e^{2\ln(\cos x)} = \cos^2(x)$. Hence the above becomes

$$d\left(u\cos^2 x\right) = \cos^2(x)\sin(x)$$

Integrating both sides

$$\begin{aligned}u\cos^2 x &= \int \cos^2(x)\sin(x)\,dx + C \\ &= \frac{-1}{3}\cos^3(x) + C\end{aligned}$$

Hence

$$u = \frac{-1}{3}\cos(x) + \frac{C}{\cos^2 x}$$

Therefore

$$\begin{aligned}y &= y_p + \frac{1}{u} \\ &= \frac{1}{\cos x} + \frac{1}{\frac{-1}{3}\cos(x) + \frac{C}{\cos^2 x}} \\ &= \frac{1}{\cos x} + \frac{3\cos^2 x}{3C - \cos^3(x)}\end{aligned}$$

Let $3C = C_1$

$$y = \frac{1}{\cos x} + \frac{3\cos^2 x}{C_2 - \cos^3(x)}$$

Verification

```
restart;
ode:=diff(y(x),x)+y(x)^2*sin(x)-2*sin(x)/cos(x)^2 = 0;
my_sol:=1/cos(x)+ 3*cos(x)^2/(_C1-cos(x)^3);
odetest(y(x)=my_sol,ode);
0
```

ODE No. 33

$$-\frac{y(x)^2 f'(x)}{g(x)}+\frac{g'(x)}{f(x)}+y'(x)=0$$

✓ **Mathematica** : cpu = 0.402088 (sec), leaf count = 160

```
DSolve[-((y[x]^2*Derivative[1][f][x])/g[x]) + Derivative[1][g][x]/f[x] + Derivative[1][y][x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{1}{(g(x)+f(x)K[2])^2}-\int_1^{x}\left(\frac{2(f(K[1])K[2]^2f'(K[1])-g(K[1])g'(K[1]))}{g(K[1])(g(K[1])+f(K[1])K[2])^3}-\frac{2K[2]f\right.\right.\right.$$

✓ **Maple** : cpu = 0.427 (sec), leaf count = 58

```
dsolve(diff(y(x),x)-y(x)^2*diff(f(x),x)/g(x)+diff(g(x),x)/f(x) = 0,y(x))
```

$$y(x)=\frac{-g(x)\,f(x)\left(\int\frac{\frac{d}{dx}f(x)}{g(x)f(x)^2}dx\right)-g(x)\,f(x)\,c_1-1}{f(x)^2\left(\int\frac{\frac{d}{dx}f(x)}{g(x)f(x)^2}dx+c_1\right)}$$

Hand solution

$$\begin{aligned}-\frac{f'}{g}y^2+\frac{g'}{f}+y'&=0\\ y'&=-\frac{g'}{f}+\frac{f'}{g}y^2\\ &=P(x)+Q(x)\,y+R(x)\,y^2\end{aligned}\tag{1}$$

This is Ricatti first order non-linear ODE. $P(x)=-\frac{g'}{f},Q(x)=0,R(x)=\frac{f'}{g}$.

To do.

ODE No. 34

$$f(x)y(x)^2+g(x)y(x)+y'(x)=0$$

✓ **Mathematica** : cpu = 0.101978 (sec), leaf count = 54

```
DSolve[g[x]*y[x] + f[x]*y[x]^2 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\exp\left(\int_1^x -g(K[1])dK[1]\right)}{-\int_1^x -\exp\left(\int_1^{K[2]} -g(K[1])dK[1]\right)f(K[2])dK[2]+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 28

```
dsolve(diff(y(x),x)+f(x)*y(x)^2+g(x)*y(x) = 0,y(x))
```

$$y(x)=\frac{\mathrm{e}^{\int -g(x)dx}}{\int \mathrm{e}^{\int -g(x)dx}f\left(x\right)dx+c_1}$$

Hand solution

$$\begin{aligned} y^2f+gy+y' &= 0 \\ y' &= -gy-y^2f \\ &= P(x)+Q(x)\,y+R(x)\,y^2 \end{aligned} \tag{1}$$

This is Bernoulli first order non-linear ODE. $P(x)=0, Q(x)=-g, R(x)=f$. First step is to divide by y^2

$$\frac{y'}{y^2}=-g\frac{1}{y}-f \tag{2}$$

Let $u=\frac{1}{y}$, then $u'=\frac{-y'}{y^2}$ and (2) becomes

$$\begin{aligned} -u' &= -gu-f \\ u'-gu &= f \end{aligned}$$

Integrating factor is $e^{-\int g dx}$ hence

$$\begin{aligned} d\left(e^{-\int g dx}u\right) &= fe^{-\int g dx} \\ e^{-\int g dx}u &= \int fe^{-\int g dx}dx+C \\ u &= e^{\int g dx}\left(\int fe^{-\int g dx}dx+C\right) \end{aligned}$$

Hence

$$\begin{aligned} y &= \frac{1}{e^{\int g dx}\left(\int f e^{-\int g dx} + C\right)} \\ &= \frac{e^{-\int g dx}}{\int f e^{-\int g dx} dx + C} \end{aligned}$$

Let $\beta = e^{-\int g dx}$ then

$$y = \frac{\beta}{\int f \beta dx + C}$$

Verification

```
restart;
eq:=diff(y(x),x)+f(x)*y(x)^2+g(x)*y(x) = 0;
beta:=exp(-Int(g(x),x)):
my_sol:=beta/(Int(f(x)*beta,x)+_C1);
odetest(y(x)=my_sol,eq);
0
```

ODE No. 35

$$f(x)\left(2ay(x)+b+y(x)^2\right)+y'(x)=0$$

✓ **Mathematica** : cpu = 0.123954 (sec), leaf count = 61

```
DSolve[f[x]*(b + 2*a*y[x] + y[x]^2) + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -a+\sqrt{b-a^2}\tan\left(\sqrt{b-a^2}\int_1^x -f(K[1])dK[1]+c_1\sqrt{b-a^2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.046 (sec), leaf count = 35

```
dsolve(diff(y(x),x)+f(x)*(y(x)^2+2*a*y(x)+b) = 0,y(x))
```

$$y(x)=\tanh\left(\sqrt{a^2-b}\left(c_1+\int f(x)\,dx\right)\right)\sqrt{a^2-b}-a$$

Hand solution

$$\begin{aligned} y'(x)+f(x)\left(2ay(x)+b+y^2(x)\right)&=0\\ y'(x)&=-2af(x)\,y(x)-bf(x)-f(x)\,y^2(x)\\ &=P(x)+Q(x)\,y+R(x)\,y^2 \end{aligned} \tag{1}$$

This is Riccati first order non-linear ODE. $P(x)=-bf(x)\,,Q(x)=-2af(x)\,,R(x)=-f(x)$.

Let

$$y(x)=-\frac{u'(x)}{u(x)\,R(x)}=\frac{u'(x)}{u(x)\,f(x)}$$

Hence

$$y'(x)=\frac{u''(x)}{u(x)\,f(x)}-\frac{\left(u'(x)\right)^2}{u^2(x)\,f(x)}-\frac{u'(x)\,f'(x)}{u(x)\,f^2(x)}$$

Equating this to RHS of (1) gives

$$\begin{aligned} \frac{u''(x)}{u(x)\,f(x)}-\frac{\left(u'(x)\right)^2}{u^2(x)\,f(x)}-\frac{u'(x)\,f'(x)}{u(x)\,f^2(x)}&=-2af(x)\,y(x)-bf(x)-f(x)\,y^2(x)\\ &=-2af(x)\left[\frac{u'(x)}{u(x)\,f(x)}\right]-bf(x)-f(x)\left[\frac{u'(x)}{u(x)\,f(x)}\right]^2\\ &=-2a\frac{u'(x)}{u(x)}-bf(x)-\frac{u'(x)^2}{u^2(x)\,f(x)} \end{aligned}$$

Simplifying

$$u''(x)-\frac{(u'(x))^2}{u(x)}-\frac{u'(x)f'(x)}{f(x)}=-2au'(x)f(x)-u(x)bf^2(x)-\frac{u'(x)^2}{u(x)}$$
$$u''(x)-\frac{u'(x)f'(x)}{f(x)}=-2au'(x)f(x)-u(x)bf^2(x)$$
$$u''(x)+u'(x)\left(-\frac{f'(x)}{f(x)}+2af(x)\right)+u(x)bf^2(x)=0$$

Second order ODE with variable coefficients. Since coefficients are variables and not constants, a power series method is the standard way to continue. When I tried solving this now pretending the coefficients are constants in time, using the standard auxiliary equation method, the solution did verify OK. I need to look more into this. For now, this is solved using standard method for solving second order ODE with constant coefficients.

$$u(x)=C_1\exp\left(\frac{\int f(x)\sqrt{-b}dx\left(\sqrt{\frac{b-a^2}{b}}b+a\sqrt{-b}\right)}{b}\right)+C_2\exp\left(\frac{\int f(x)\sqrt{-b}dx\left(-\sqrt{\frac{b-a^2}{b}}b+a\sqrt{-b}\right)}{b}\right)$$

Hence

$$u'(x)=\frac{C_1f(x)\sqrt{-b}}{b}\left(\sqrt{\frac{-a^2+b}{b}}b+\sqrt{-b}a\right)e^{\frac{\int f(x)\sqrt{-b}\,dx}{b}\left(\sqrt{\frac{-a^2+b}{b}}b+\sqrt{-b}a\right)}$$
$$+\frac{C_2f(x)\sqrt{-b}}{b}\left(-\sqrt{\frac{-a^2+b}{b}}b+\sqrt{-b}a\right)e^{\frac{\int f(x)\sqrt{-b}\,dx}{b}\left(-\sqrt{\frac{-a^2+b}{b}}b+\sqrt{-b}a\right)}$$

Therefore

$$y=\frac{u'(x)}{u(x)f(x)}$$
$$=\frac{\frac{C_1f(x)\sqrt{-b}}{b}\left(\sqrt{\frac{-a^2+b}{b}}b+\sqrt{-b}a\right)e^{\frac{\int f(x)\sqrt{-b}\,dx}{b}\left(\sqrt{\frac{-a^2+b}{b}}b+\sqrt{-b}a\right)}+\frac{C_2f(x)\sqrt{-b}}{b}\left(-\sqrt{\frac{-a^2+b}{b}}b+\sqrt{-b}a\right)e^{\frac{\int f(x)\sqrt{-b}\,dx}{b}\left(-\sqrt{\frac{-a^2+b}{b}}b+\sqrt{-b}a\right)}}{f(x)\left[C_1\exp\left(\frac{\int f(x)\sqrt{-b}dx\left(\sqrt{\frac{b-a^2}{b}}b+a\sqrt{-b}\right)}{b}\right)+C_2\exp\left(\frac{\int f(x)\sqrt{-b}dx\left(-\sqrt{\frac{b-a^2}{b}}b+a\sqrt{-b}\right)}{b}\right)\right]}$$

Verification

```
restart;
book:=diff(y(x),x)+f(x)*(2*a*y(x)+b+y(x)^2)=0;
```

```
eqU:=diff(u(x),x$2)+diff(u(x),x)*(- diff(f(x),x)/f(x)+2*a*f(x))+u(x)*f(x)^2*b=0;
solU:=dsolve(eqU,u(x));
my_sol:=diff(rhs(solU),x)/(rhs(solU)*f(x));
odetest(y(x)=my_sol,book);
0
```

ODE No. 36

$$axy(x)^2 + y'(x) + y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.324514 (sec), leaf count = 195

```
DSolve[a*x*y[x]^2 + y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{\text{Ai}'\left(\frac{\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}}{y(x)} - \frac{1}{2}\sqrt[3]{-\frac{1}{2}}a^{4/3}x^2\right) - \left(-\frac{1}{2}\right)^{2/3}a^{2/3}x\,\text{Ai}\left(\frac{\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}}{y(x)} - \frac{1}{2}\sqrt[3]{-\frac{1}{2}}a^{4/3}x^2\right)}{\text{Bi}'\left(\frac{\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}}{y(x)} - \frac{1}{2}\sqrt[3]{-\frac{1}{2}}a^{4/3}x^2\right) - \left(-\frac{1}{2}\right)^{2/3}a^{2/3}x\,\text{Bi}\left(\frac{\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}}{y(x)} - \frac{1}{2}\sqrt[3]{-\frac{1}{2}}a^{4/3}x^2\right)} + c_1 = 0, y(x)\right]$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 62

```
dsolve(diff(y(x),x)+y(x)^3+a*x*y(x)^2 = 0,y(x))
```

$$y(x) = \frac{2a}{a^2x^2 + 2\,\text{RootOf}\left(\text{AiryBi}\left(\_Z\right)\left(-2a^2\right)^{\frac{1}{3}}c_1x + \left(-2a^2\right)^{\frac{1}{3}}x\,\text{AiryAi}\left(\_Z\right) + 2\,\text{AiryBi}\left(1,\_Z\right)c_1 + 2\,\text{Airy}\right.$$

Hand solution

$$y'(x) = -axy^2 - y^3 \tag{1}$$

This is Abel first order non-linear. The general form is of Abel first kind is

$$y'(x) = f_0(x) + f_1(x)\,y(x) + f_2(x)\,y^2(x) + f_3(x)\,y^3(x)$$

In this case, $f_0(x) = 0, f_1(x) = 0, f_2(x) = -ax, f_3(x) = -1$. Note $\left(\frac{f_3}{f_2}\right)' = \left(\frac{1}{ax}\right)' = -\frac{1}{a}$. While Abel second kind has the form

$$(y + g(x))\,y'(x) = f_0(x) + f_1(x)\,y(x) + f_2(x)\,y^2(x)$$

For $g(x) \neq 0$.

Looking at (1) again, using the transformation suggested in Kamke $u = \frac{1}{y} - \frac{1}{2}ax^2$ or $y = \frac{1}{u+\frac{1}{2}ax^2}$Then

$$y' = \frac{-u' - ax}{\left(u + \frac{1}{2}ax^2\right)^2}$$

Equating the above to the RHS of (1) gives

$$\begin{aligned}\frac{-u'-ax}{\left(u+\frac{1}{2}ax^2\right)^2} &= -ax\left(\frac{1}{u+\frac{1}{2}ax^2}\right)^2-\left(\frac{1}{u+\frac{1}{2}ax^2}\right)^3\\ -u'-ax &= -ax-\frac{1}{u+\frac{1}{2}ax^2}\\ \frac{du}{dx} &= \frac{1}{u+\frac{1}{2}ax^2}\end{aligned}$$

Writing as

$$\frac{dx}{du}=u+\frac{1}{2}ax^2 \tag{2}$$

This can now be viewed as reverse Riccati in x. Using the standard transformation

$$x=-\frac{z'}{z\left(\frac{1}{2}a\right)}=-\frac{2z'}{az} \tag{3}$$

Hence

$$\frac{dx}{du}=-\frac{2}{a}\left(\frac{z''}{z}-\frac{\left(z'\right)^2}{z^2}\right)$$

Equating this to RHS of (2) gives a second order Airy ODE where the dependent variable is z and the independent variable is u

$$\begin{aligned}-\frac{2}{a}\left(\frac{z''}{z}-\frac{\left(z'\right)^2}{z^2}\right) &= u+\frac{1}{2}a\left(-\frac{2z'}{az}\right)^2\\ -\frac{2}{a}\frac{z''}{z}+\frac{2}{a}\frac{\left(z'\right)^2}{z^2} &= u+\frac{1}{2}a\frac{4\left(z'\right)^2}{a^2z^2}\\ -\frac{2}{a}\frac{z''}{z}+\frac{2}{a}\frac{\left(z'\right)^2}{z^2} &= u+\frac{2}{a}\frac{\left(z'\right)^2}{z^2}\\ -\frac{2}{a}\frac{z''}{z} &= u\\ z''(u)+\frac{a}{2}uz(u) &= 0\end{aligned}$$

This is Airy ODE whose solution is found using power series method. The solution is

$$z(u)=C_1\,\text{AiryAI}\left(-\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}u\right)+C_2\,\text{AiryBI}\left(-\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}u\right) \tag{4}$$

We now go back to (3) and find x

$$x=-\frac{2z'}{az}$$

Since

$$\frac{d}{du}\operatorname{AiryAI}\left(-\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}u\right) = -\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}\operatorname{AiryAI}\left(1,-\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}u\right)$$
$$\frac{d}{du}\operatorname{AiryBI}\left(-\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}u\right) = -\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}\operatorname{AiryBI}\left(1,-\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}u\right)$$

Then

$$x = -\frac{2}{a}\frac{-C_1\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}\operatorname{AiryAI}\left(1,-\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}u\right) - C_2\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}\operatorname{AiryBI}\left(1,-\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}u\right)}{C_1\operatorname{AiryAI}\left(-\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}u\right) + C_2\operatorname{AiryBI}\left(-\frac{1}{2}2^{\frac{2}{3}}a^{\frac{1}{3}}u\right)}$$

Therefore $\frac{dx}{du}$ is now found from above. Once we find $\frac{dx}{du}$ then $\frac{du}{dx}$ is also found. Using $\frac{du}{dx} = \frac{1}{u+\frac{1}{2}ax^2}$ now $u(x)$ is found. Once $u(x)$ is found then $y(x)$ is found from the original transformation $y = \frac{1}{u+\frac{1}{2}ax^2}$. This is all now just algebra.

ODE No. 37

$$-ae^x y(x)^2 + y'(x) - y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.933557 (sec), leaf count = 78

```
DSolve[-(a*E^x*y[x]^2) - y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[-iae^x = \frac{2e^{\frac{1}{2}\left(-iae^x - \frac{i}{y(x)}\right)^2}}{\sqrt{2\pi}\,\text{erfi}\left(\frac{-iae^x - \frac{i}{y(x)}}{\sqrt{2}}\right) + 2c_1}, y(x)\right]$$

✓ **Maple** : cpu = 0.09 (sec), leaf count = 50

```
dsolve(diff(y(x),x)-y(x)^3-a*exp(x)*y(x)^2 = 0,y(x))
```

$$c_1 + \frac{e^{-\frac{\left(e^x a + \frac{1}{y(x)}\right)^2}{2}} e^{-x}}{a} + \frac{\text{erf}\left(\frac{\left(e^x a + \frac{1}{y(x)}\right)\sqrt{2}}{2}\right)\sqrt{2}\sqrt{\pi}}{2} = 0$$

ODE No. 38

$$-ay(x)^3 - \frac{b}{x^{3/2}} + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.189032 (sec), leaf count = 99

```
DSolve[-(b/x^(3/2)) - a*y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[-2\text{RootSum}\left[-2\#1^3 + \#1\sqrt[3]{-\frac{1}{ab^2}} - 2\&, \frac{\log\left(y(x)\sqrt[3]{\frac{ax^{3/2}}{b}} - \#1\right)}{\sqrt[3]{-\frac{1}{ab^2}} - 6\#1^2}\&\right] = \frac{ax\log(x)}{\left(\frac{ax^{3/2}}{b}\right)^{2/3}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.025 (sec), leaf count = 34

```
dsolve(diff(y(x),x)-a*y(x)^3-b/x^(3/2) = 0,y(x))
```

$$y(x) = \frac{\text{RootOf}\left(-\ln(x) + c_1 + 2\left(\int^{-Z} \frac{1}{2a\_a^3 + \_a + 2b} d\_a\right)\right)}{\sqrt{x}}$$

Hand solution

$$y'(x) = ay^3 + bx^{-\frac{3}{2}} \tag{1}$$

This can be transformed to Abel first order non-linear ode as follows. Let $y(x) = x^{-\frac{1}{2}}\eta(\xi)$ where $\xi = \ln x$ hence

$$\begin{aligned}
\frac{dy}{dx} &= -\frac{1}{2}x^{-\frac{3}{2}}\eta(\xi) + x^{-\frac{1}{2}}\frac{d\eta}{d\xi}\frac{d\xi}{dx} \\
&= -\frac{1}{2}x^{-\frac{3}{2}}\eta(\xi) + x^{-\frac{1}{2}}\frac{d\eta}{d\xi}\frac{1}{x} \\
&= -\frac{1}{2}x^{-\frac{3}{2}}\eta(\xi) + x^{-\frac{3}{2}}\frac{d\eta}{d\xi}
\end{aligned}$$

Substituting in (1) gives

$$
\begin{aligned}
-\frac{1}{2}x^{-\frac{3}{2}}\eta(\xi) + x^{-\frac{3}{2}}\frac{d\eta}{d\xi} &= a\left(x^{-\frac{1}{2}}\eta(\xi)\right)^3 + bx^{-\frac{3}{2}} \\
-\frac{1}{2}x^{-\frac{3}{2}}\eta(\xi) + x^{-\frac{3}{2}}\frac{d\eta}{d\xi} &= ax^{-\frac{3}{2}}\eta^3(\xi) + bx^{-\frac{3}{2}} \\
-\frac{1}{2}\eta + \eta' &= a\eta^3 + b \\
\eta' &= b + \frac{1}{2}\eta + a\eta^3
\end{aligned}
$$

This is Abel first kind. In general form it is

$$\eta' = f_0 + f_1\eta + f_2\eta^2 + f_3\eta^3$$

Where in this case $f_0 = b, f_1 = \frac{1}{2}, f_2 = 0, f_3 = a$. Using Maple, the solution to the above is (I need to learn how to solve Able by hand more) is implicit, given as

$$\eta = \xi - \int^{\eta(\xi)} \frac{1}{b + \frac{1}{2}z + az^3}dz + C$$

Where C is constant of integration. Hence, since $y(x) = x^{-\frac{1}{2}}\eta(\xi)$, then $\eta(\xi) = \sqrt{x}y$ and the above becomes

$$
\begin{aligned}
\sqrt{x}y &= \ln x - \int^{\sqrt{x}y} \frac{1}{b + \frac{1}{2}z + az^3}dz + C \\
y(x) &= \left(\ln x - \int^{\sqrt{x}y} \frac{1}{b + \frac{1}{2}z + az^3}dz + C\right)\frac{1}{\sqrt{x}}
\end{aligned}
$$

DId not verify. Need to look more into this later.

ODE No. 39

$$-\mathrm{a0} - \mathrm{a1}y(x) - \mathrm{a2}y(x)^2 - \mathrm{a3}y(x)^3 + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.138756 (sec), leaf count = 54

```
DSolve[-a0 - a1*y[x] - a2*y[x]^2 - a3*y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

$$\mathrm{Solve}\left[\mathrm{RootSum}\left[\#1^3\mathrm{a3} + \#1^2\mathrm{a2} + \#1\mathrm{a1} + \mathrm{a0}\&, \frac{\log(y(x) - \#1)}{3\#1^2\mathrm{a3} + 2\#1\mathrm{a2} + \mathrm{a1}}\&\right] = x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 30

```
dsolve(diff(y(x),x)-a3*y(x)^3-a2*y(x)^2-a1*y(x)-a0 = 0,y(x))
```

$$x - \left(\int^{y(x)} \frac{1}{\_a^3 a3 + \_a^2 a2 + \_a a1 + a0} d\_a\right) + c_1 = 0$$

ODE No. 40

$$3ay(x)^3 + 6axy(x)^2 + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.438838 (sec), leaf count = 185

```
DSolve[6*a*x*y[x]^2 + 3*a*y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{\sqrt[3]{-3}\sqrt[3]{a}x\text{Ai}\left((-3)^{2/3}a^{2/3}x^2 - \frac{(-1)^{2/3}}{\sqrt[3]{3}\sqrt[3]{a}y(x)}\right) + \text{Ai}'\left((-3)^{2/3}a^{2/3}x^2 - \frac{(-1)^{2/3}}{\sqrt[3]{3}\sqrt[3]{a}y(x)}\right)}{\sqrt[3]{-3}\sqrt[3]{a}x\text{Bi}\left((-3)^{2/3}a^{2/3}x^2 - \frac{(-1)^{2/3}}{\sqrt[3]{3}\sqrt[3]{a}y(x)}\right) + \text{Bi}'\left((-3)^{2/3}a^{2/3}x^2 - \frac{(-1)^{2/3}}{\sqrt[3]{3}\sqrt[3]{a}y(x)}\right)} + c_1 = 0, y(x)\right]$$

✓ **Maple** : cpu = 0.061 (sec), leaf count = 48

```
dsolve(diff(y(x),x)+3*a*y(x)^3+6*a*x*y(x)^2 = 0,y(x))
```

$$y(x) = \frac{1}{3a\,x^2 + \text{RootOf}\left(\text{AiryBi}\left(\_Z\right)(-3a)^{\frac{1}{3}}c_1 x + (-3a)^{\frac{1}{3}}x\,\text{AiryAi}\left(\_Z\right) + \text{AiryBi}\left(1,\_Z\right)c_1 + \text{AiryAi}\left(1,\right.\right.$$

ODE No. 41

$$axy(x)^3 + by(x)^2 + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.251328 (sec), leaf count = 103

```
DSolve[b*y[x]^2 + a*x*y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[-\frac{b^2\left(\frac{2\tan^{-1}\left(\frac{-2axy(x)-b}{b\sqrt{-\frac{4a}{b^2}-1}}\right)}{\sqrt{-\frac{4a}{b^2}-1}}-\log\left(\frac{a(-x)y(x)(-axy(x)-b)-a}{a^2x^2y(x)^2}\right)\right)}{2a}=-\frac{b^2\log(x)}{a}+c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.304 (sec), leaf count = 103

```
dsolve(diff(y(x),x)+a*x*y(x)^3+b*y(x)^2 = 0,y(x))
```

$$y(x)=\frac{\mathrm{e}^{\text{RootOf}\left(2\sqrt{b^2+4a}\,b\arctan\left(\frac{2a\,\mathrm{e}^{-Z}+b}{\sqrt{b^2+4a}}\right)-\ln\left(x^2\left(a\,\mathrm{e}^{2\_Z}+b\,\mathrm{e}^{\_Z}-1\right)\right)b^2+2c_1b^2+2\_Zb^2-4\ln\left(x^2\left(a\,\mathrm{e}^{2\_Z}+b\,\mathrm{e}^{\_Z}-1\right)\right)a+8c_1a+8\_Za\right)}}{x}$$

ODE No. 42

$$y'(x) - x(x+2)y(x)^3 - (x+3)y(x)^2 = 0$$

✓ **Mathematica** : cpu = 1.05756 (sec), leaf count = 485

```
DSolve[-((3 + x)*y[x]^2) - x*(2 + x)*y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[c_1 = -\frac{i\sqrt{\frac{2}{\pi}}\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}\left(\frac{\sinh\left(\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}\right)}{\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}}-\cosh\left(\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}\right)\right)}{\sqrt{-i\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}}} - \frac{i\sqrt{\frac{2}{\pi}}\left(\frac{x+1}{2}+\frac{1}{2}\right)\sinh\left(\sqrt{\frac{1}{2y(x)}+\frac{1}{4}\right.}\right.}{\sqrt{-i\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2}}}$$
$$-\frac{i\sqrt{\frac{2}{\pi}}\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}\left(i\sinh\left(\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}\right)-\frac{i\cosh\left(\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}\right)}{\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}}\right)}{\sqrt{-i\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}}} - \frac{\sqrt{\frac{2}{\pi}}\left(\frac{x+1}{2}+\frac{1}{2}\right)\cosh\left(\sqrt{\frac{1}{2y(x)}+\right.}\right.}{\sqrt{-i\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)}}}\Bigg]$$

✓ **Maple** : cpu = 0.023 (sec), leaf count = 40

```
dsolve(diff(y(x),x)-x*(x+2)*y(x)^3-(x+3)*y(x)^2 = 0,y(x))
```

$$c_1 + \operatorname{arctanh}\left(\frac{\sqrt{y(x)}\,x}{\sqrt{x(x+2)y(x)+2}}\right) + \frac{\sqrt{x(x+2)y(x)+2}}{2\sqrt{y(x)}} = 0$$

ODE No. 43

$$y(x)^3\left(4a^2x+3ax^2+b\right)+y'(x)+3xy(x)^2=0$$

✓ **Mathematica** : cpu = 6.25063 (sec), leaf count = 490

```
DSolve[3*x*y[x]^2 + (b + 4*a^2*x + 3*a*x^2)*y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[c_1=-\frac{i\sqrt{-\frac{4a^3-3b}{4a^3}-\frac{3}{2a^2y(x)}+\frac{(-2a-3x)^2}{4a^2}}J_{\frac{1}{2}\sqrt{\frac{4a^3-3b}{a^3}}+1}\left(-i\sqrt{\frac{(-2a-3x)^2}{4a^2}-\frac{4a^3-3b}{4a^3}-\frac{3}{2a^2y(x)}}\right)+\left(\frac{1}{2}\sqrt{\frac{4a^3-3b}{a^3}}\right.}{i\sqrt{-\frac{4a^3-3b}{4a^3}-\frac{3}{2a^2y(x)}+\frac{(-2a-3x)^2}{4a^2}}Y_{\frac{1}{2}\sqrt{\frac{4a^3-3b}{a^3}}+1}\left(-i\sqrt{\frac{(-2a-3x)^2}{4a^2}-\frac{4a^3-3b}{4a^3}-\frac{3}{2a^2y(x)}}\right)+\left(\frac{1}{2}\sqrt{\frac{4a^3-3b}{a^3}}\right.}\right.$$

✓ **Maple** : cpu = 1.645 (sec), leaf count = 373

```
dsolve(diff(y(x),x)+(4*a^2*x+3*a*x^2+b)*y(x)^3+3*x*y(x)^2 = 0,y(x))
```

$$c_1+\frac{-\text{BesselK}\left(\frac{\sqrt{\frac{4a^3-3b}{a^3}}}{2}+1,-\frac{\sqrt{3}\sqrt{\frac{4y(x)a^2x+3a\,x^2y(x)+by(x)-2a}{a^3y(x)}}}{2}\right)\sqrt{3}\sqrt{\frac{4y(x)a^2x+3a\,x^2y(x)+by(x)-2a}{a^3y(x)}}\,a-\left(a\sqrt{\frac{4a^3-3b}{a^3}}-\right.}{\text{BesselI}\left(\frac{\sqrt{\frac{4a^3-3b}{a^3}}}{2}+1,-\frac{\sqrt{3}\sqrt{\frac{4y(x)a^2x+3a\,x^2y(x)+by(x)-2a}{a^3y(x)}}}{2}\right)\sqrt{3}\sqrt{\frac{4y(x)a^2x+3a\,x^2y(x)+by(x)-2a}{a^3y(x)}}\,a-\left(a\sqrt{\frac{4a^3-3b}{a^3}}-\right.}$$

ODE No. 44

$$2ax^3y(x)^3+y'(x)+2xy(x)=0$$

✓ **Mathematica** : cpu = 0.0825351 (sec), leaf count = 72

```
DSolve[2*x*y[x] + 2*a*x^3*y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{2}}{\sqrt{-2ax^2-a+2c_1e^{2x^2}}}\right\},\left\{y(x)\to \frac{\sqrt{2}}{\sqrt{-2ax^2-a+2c_1e^{2x^2}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 53

```
dsolve(diff(y(x),x)+2*a*x^3*y(x)^3+2*x*y(x) = 0,y(x))
```

$$y(x)=-\frac{2}{\sqrt{-4a\,x^2+4\,\mathrm{e}^{2x^2}c_1-2a}}$$

Hand solution

$$y'=-2xy-2ax^3y^3 \tag{1}$$

This is of the form $y'=f_0+f_1y+f_2y^2+f_3y^3$ where $f_0=0,f_2=0$. Hence this is Bernoulli first order non-linear ODE. We start by diving by y^3

$$\frac{y'}{y^3}=-2x\frac{1}{y^2}-2ax^3$$

Let $u=\frac{1}{y^2}$, hence $u'=-2\frac{y'}{y^3}$ and the above becomes

$$\begin{aligned}-\frac{1}{2}u'&=-2xu-2ax^3\\ u'-4xu&=4ax^3\end{aligned}$$

Integrating factor is $e^{-4\int xdx}=e^{-2x^2}$ hence

$$\frac{d}{dx}\left(e^{-2x^2}u\right)=4ax^3e^{-2x^2}$$

Integrating

$$\begin{aligned}e^{-2x^2}u&=4a\int x^3e^{-2x^2}dx+C\\ &=4a\left(\frac{-1}{8}\left(2x^2+1\right)e^{-2x^2}\right)+C\end{aligned}$$

Therefore

$$u = -\frac{1}{2}a\left(2x^2+1\right) + Ce^{2x^2}$$

Hence

$$y^2 = \frac{1}{u} = \frac{1}{-\frac{1}{2}a\left(2x^2+1\right) + Ce^{2x^2}}$$

Or

$$y = \pm\frac{\sqrt{2}}{\sqrt{-a\left(2x^2+1\right) + Ce^{2x^2}}}$$

Verification

```
ode:=2*a*x^3*y(x)^3+diff(y(x),x)+2*x*y(x)=0;
my_sol:=sqrt(2)/sqrt(-a*(2*x^2+1)+_C1*exp(2*x^2));
odetest(y(x)=my_sol,ode);
0
my_sol:=-sqrt(2)/sqrt(-a*(2*x^2+1)+_C1*exp(2*x^2));
odetest(y(x)=my_sol,ode);
0
```

ODE No. 45

$$2y(x)^3\left(a^2x^3-b^2x\right)+3by(x)^2+y'(x)=0$$

✓ **Mathematica** : cpu = 0.607111 (sec), leaf count = 133

```
DSolve[3*b*y[x]^2 + 2*(-(b^2*x) + a^2*x^3)*y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[c_1=\sqrt[4]{\left(\frac{b}{ax}-\frac{1}{ax^2y(x)}\right)^2-1}\left(-\frac{\left(\frac{b}{ax}-\frac{1}{ax^2y(x)}\right)\,{}_2F_1\left(\frac{1}{2},\frac{3}{4};\frac{3}{2};\left(\frac{b}{ax}-\frac{1}{ax^2y(x)}\right)^2\right)}{2\sqrt[4]{1-\left(\frac{b}{ax}-\frac{1}{ax^2y(x)}\right)^2}}-\frac{ax}{b}\right),y(x)\right]$$

✓ **Maple** : cpu = 0.15 (sec), leaf count = 123

```
dsolve(diff(y(x),x)+2*(a^2*x^3-b^2*x)*y(x)^3+3*b*y(x)^2 = 0,y(x))
```

$$c_1+\frac{\left(\left(\frac{ax}{b}+\frac{1}{\frac{b^2y(x)}{a}-\frac{b}{ax}}\right)^2-1\right)^{\frac{1}{4}}}{\left(\frac{b^2y(x)}{a}-\frac{b}{ax}\right)\sqrt{\frac{ax}{b}+\frac{1}{\frac{b^2y(x)}{a}-\frac{b}{ax}}}}-\left(\int^{\frac{a\,x^2y(x)}{bxy(x)-1}}\frac{(\_a^2-1)^{\frac{1}{4}}}{\sqrt{\_a}}d\_a\right)=0$$

ODE No. 46

$$-x^{-a}y(x)+ax^{-a-1}-x^{-2a}-x^{a}y(x)^{3}+y'(x)+3y(x)^{2}=0$$

✓ **Mathematica** : cpu = 0.290997 (sec), leaf count = 228

```
DSolve[a*x^(-1 - a) - x^(-2*a) - y[x]/x^a + 3*y[x]^2 - x^a*y[x]^3 + Derivative[1][y][x] == 0,
```

$$\left\{\left\{y(x)\to x^{-a}-\frac{e^{-\frac{2x^{1-a}}{1-a}}}{\sqrt{-\frac{2^{\frac{2(a+1)}{a-1}+1}x^{a+1}\left(\frac{x^{1-a}}{1-a}\right)^{\frac{a+1}{a-1}}\Gamma\left(\frac{a+1}{1-a},-\frac{4x^{1-a}}{a-1}\right)}{a-1}+c_1}}\right\},\left\{y(x)\to x^{-a}+\frac{e^{-\frac{2x^{1-a}}{1-a}}}{\sqrt{-\frac{2^{\frac{2(a+1)}{a-1}+1}x^{a+1}\left(\frac{x^{1-a}}{1-a}\right)^{\frac{a}{a-1}}}{a-1}}}\right.\right.$$

✓ **Maple** : cpu = 0.103 (sec), leaf count = 956

```
dsolve(diff(y(x),x)-x^a*y(x)^3+3*y(x)^2-x^(-a)*y(x)-x^(-2*a)+a*x^(-a-1) = 0,y(x))
```

$$y(x)=-\frac{}{\sqrt{c_1-\frac{2\,2^{-\frac{2a}{1-a}-\frac{2}{1-a}}\left(\frac{1}{1-a}\right)^{\frac{a+1}{a-1}}\left(-\frac{2^{-3+\frac{2a}{1-a}+\frac{2}{1-a}+\frac{2}{a-1}}(a-1)x^{-\frac{a^2}{1-a}+\frac{1}{1-a}-1+a}\left(\frac{1}{1-a}\right)^{-\frac{a+1}{a-1}}\left(-\frac{4x^{1-a}a^2}{1-a}+\frac{8a\,x^{1-a}}{1-a}-\frac{4x^{1-a}}{1-a}+2a-\right.\right.\right.}{(a+1)(-3+a)}}}$$

ODE No. 47

$$-a(x^n - x)\,y(x)^3 + y'(x) - y(x)^2 = 0$$

✗ **Mathematica** : cpu = 28.4705 (sec), leaf count = 0

```
DSolve[-y[x]^2 - a*(-x + x^n)*y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-y[x]^2 - a*(-x + x^n)*y[x]^3 + Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)-a*(x^n-x)*y(x)^3-y(x)^2 = 0,y(x))
```

, could not solve

```
dsolve(diff(y(x),x)-a*(x^n-x)*y(x)^3-y(x)^2 = 0,y(x))
```

ODE No. 48

$$-\left(y(x)^3\left(ax^n+bx\right)\right)-cy(x)^2+y'(x)=0$$

✗ **Mathematica** : cpu = 29.7751 (sec), leaf count = 0

```
DSolve[-(c*y[x]^2) - (b*x + a*x^n)*y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-(c*y[x]^2) - (b*x + a*x^n)*y[x]^3 + Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)-(a*x^n+b*x)*y(x)^3-c*y(x)^2 = 0,y(x))
```

, could not solve

```
dsolve(diff(y(x),x)-(a*x^n+b*x)*y(x)^3-c*y(x)^2 = 0,y(x))
```

ODE No. 49

$$ay(x)^3\phi'(x) + \frac{(2a+1)y(x)\phi''(x)}{\phi'(x)} + 6a\phi(x)y(x)^2 + 2a + y'(x) + 2 = 0$$

✗ **Mathematica** : cpu = 25.454 (sec), leaf count = 0

```
DSolve[2 + 2*a + 6*a*phi[x]*y[x]^2 + a*y[x]^3*Derivative[1][phi][x] + Derivative[1][y][x] + (
```

, could not solve

```
DSolve[2 + 2*a + 6*a*phi[x]*y[x]^2 + a*y[x]^3*Derivative[1][phi][x] + Derivative[1][y][
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)+a*diff(phi(x),x)*y(x)^3+6*a*phi(x)*y(x)^2+(2*a+1)*y(x)*diff(diff(phi(x),x
```

, could not solve

```
dsolve(diff(y(x),x)+a*diff(phi(x),x)*y(x)^3+6*a*phi(x)*y(x)^2+(2*a+1)*y(x)*diff(diff(ph
```

ODE No. 50

$$-\mathrm{f0}(x) - \mathrm{f1}(x)y(x) - \mathrm{f2}(x)y(x)^2 - \mathrm{f3}(x)y(x)^3 + y'(x) = 0$$

✗ **Mathematica** : cpu = 61.3055 (sec), leaf count = 0

```
DSolve[-f0[x] - f1[x]*y[x] - f2[x]*y[x]^2 - f3[x]*y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-f0[x] - f1[x]*y[x] - f2[x]*y[x]^2 - f3[x]*y[x]^3 + Derivative[1][y][x] == 0, y[
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)-f3(x)*y(x)^3-f2(x)*y(x)^2-f1(x)*y(x)-f0(x) = 0,y(x))
```

, could not solve

```
dsolve(diff(y(x),x)-f3(x)*y(x)^3-f2(x)*y(x)^2-f1(x)*y(x)-f0(x) = 0,y(x))
```

ODE No. 51

$$-h(x)(y(x)-f(x))(y(x)-g(x))\left(y(x)-\frac{af(x)+bg(x)}{a+b}\right)-\frac{f'(x)(y(x)-g(x))}{f(x)-g(x)}-\frac{(y(x)-f(x))g'(x)}{g(x)-f(x)}+y'(x)$$

✓ **Mathematica** : cpu = 1.89443 (sec), leaf count = 355

```
DSolve[-(h[x]*(-f[x] + y[x])*(-g[x] + y[x])*(-((a*f[x] + b*g[x])/(a + b)) + y[x])) - ((-g[x]
```

$$\text{Solve}\left[-\frac{1}{3}(a-b)^{2/3}(2a+b)^{2/3}(a+2b)^{2/3}\text{RootSum}\left[\#1^3(a-b)^{2/3}(2a+b)^{2/3}(a+2b)^{2/3}-3\#1a^2-3\#1ab\right.\right.$$

✓ **Maple** : cpu = 0.382 (sec), leaf count = 237

```
dsolve(diff(y(x),x)-(y(x)-f(x))*(y(x)-g(x))*(y(x)-(a*f(x)+b*g(x))/(a+b))*h(x)-diff(f(x),x)*(y
```

$$y(x)=\frac{2(f(x)-g(x))\,(a+2b)\,(a-b)\,\left(a+\frac{b}{2}\right)\text{RootOf}\left(-27\left(\int^{-Z}\frac{}{(2\_a a^2-\_a ab-\_a b^2-3a^2-3ab-3b^2)(\_a a^2+\_a}\right.\right.$$

ODE No. 52

$$-ay(x)^n - bx^{\frac{n}{1-n}} + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.275953 (sec), leaf count = 117

```
DSolve[-(b*x^(n/(1 - n))) - a*y[x]^n + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{\left(\frac{ax^{-\frac{n}{1-n}}}{b}\right)^{\frac{1}{n}} y(x)} \frac{1}{K[1]^n - \left(\frac{(-1)^n b^{1-n}(n-1)^{-n}}{a}\right)^{\frac{1}{n}} K[1] + 1} dK[1] = \int_1^x bK[2]^{\frac{n}{1-n}} \left(\frac{aK[2]^{-\frac{n}{1-n}}}{b}\right)^{\frac{1}{n}} dK[2]\right.$$

✓ **Maple** : cpu = 0.432 (sec), leaf count = 61

```
dsolve(diff(y(x),x)-a*y(x)^n-b*x^(n/(1-n)) = 0,y(x))
```

$$-\left(\int_{\_b}^{y(x)} \frac{x^{\frac{n}{n-1}}}{(ax\,(n-1)\,\_a^n + \_a)\,x^{\frac{n}{n-1}} + bx\,(n-1)} d\_a\right)(n-1) + \ln(x) - c_1 = 0$$

ODE No. 53

$$f(x)^{1-n}g'(x)y(x)^n\left(-(ag(x)+b)^{-n}\right)-\frac{y(x)f'(x)}{f(x)}-f(x)g'(x)+y'(x)=0$$

✓ **Mathematica** : cpu = 0.514176 (sec), leaf count = 96

```
DSolve[-((y[x]*Derivative[1][f][x])/f[x]) - f[x]*Derivative[1][g][x] - (f[x]^(1 - n)*y[x]^n*D
```

$$\text{Solve}\left[\int_1^{\left(f(x)^{-n}(b+ag(x))^{-n}\right)^{\frac{1}{n}}y(x)}\frac{1}{K[1]^n-(a^n)^{\frac{1}{n}}K[1]+1}dK[1]=\frac{f(x)(ag(x)+b)\log(ag(x)+b)\left(f(x)^{-n}(ag\right.}{a}\right.$$

✓ **Maple** : cpu = 0.178 (sec), leaf count = 281

```
dsolve(diff(y(x),x)-f(x)^(1-n)*diff(g(x),x)*y(x)^n/((a*g(x)+b)^n)-diff(f(x),x)*y(x)/f(x)-f(x)
```

$$y(x)=\frac{\text{RootOf}\left(-\left(\int^{\_Z}\frac{\left((ag(x)+b)^{-n}f(x)^{1-n}\left(\frac{d}{dx}g(x)\right)\right)^{-n-1}\left(f(x)\left(\right.\right.}{\_a\left((ag(x)+b)^{-n}f(x)^{1-n}\left(\frac{d}{dx}g(x)\right)\right)^{-n-1}\left(f(x)\left(\frac{d}{dx}g(x)\right)\right)^{-2n+1}\left((ag(x)+b)^{-n-1}af(x)^{2-n}\left(\frac{d}{dx}g(x)\right)^3n\right)^{n}}\right.\right.}{}$$

ODE No. 54

$$-a^n f(x)^{1-n} g'(x) y(x)^n - \frac{y(x) f'(x)}{f(x)} - f(x) g'(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.405642 (sec), leaf count = 74

```
DSolve[-((y[x]*Derivative[1][f][x])/f[x]) - f[x]*Derivative[1][g][x] - a^n*f[x]^(1 - n)*y[x]^
```

$$\text{Solve}\left[y(x)\left(a^n f(x)^{-n}\right)^{\frac{1}{n}}\, {}_2F_1\left(1, \frac{1}{n}; 1+\frac{1}{n}; -\left(\left(a^n f(x)^{-n}\right)^{\frac{1}{n}} y(x)\right)^n\right) = f(x) g(x)\left(a^n f(x)^{-n}\right)^{\frac{1}{n}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.181 (sec), leaf count = 38

```
dsolve(diff(y(x),x)-a^n*f(x)^(1-n)*diff(g(x),x)*y(x)^n-diff(f(x),x)*y(x)/f(x)-f(x)*diff(g(x),
```

$$\frac{a y(x)\, \Phi\left(-\left(\frac{a y(x)}{f(x)}\right)^n, 1, \frac{1}{n}\right)}{n f(x)} - a g(x) + c_1 = 0$$

ODE No. 55

$$-f(x)y(x)^n - g(x)y(x) - h(x) + y'(x) = 0$$

✗ **Mathematica** : cpu = 3.8442 (sec), leaf count = 0

```
DSolve[-h[x] - g[x]*y[x] - f[x]*y[x]^n + Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-h[x] - g[x]*y[x] - f[x]*y[x]^n + Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)-f(x)*y(x)^n-g(x)*y(x)-h(x) = 0,y(x))
```

, could not solve

```
dsolve(diff(y(x),x)-f(x)*y(x)^n-g(x)*y(x)-h(x) = 0,y(x))
```

ODE No. 56

$$-f(x)y(x)^a - g(x)y(x)^b + y'(x) = 0$$

✗ **Mathematica** : cpu = 1.38233 (sec), leaf count = 0

```
DSolve[-(f[x]*y[x]^a) - g[x]*y[x]^b + Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-(f[x]*y[x]^a) - g[x]*y[x]^b + Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)-f(x)*y(x)^a-g(x)*y(x)^b = 0,y(x))
```

, could not solve

```
dsolve(diff(y(x),x)-f(x)*y(x)^a-g(x)*y(x)^b = 0,y(x))
```

ODE No. 57

$$y'(x) - \sqrt{|y(x)|} = 0$$

✓ **Mathematica** : cpu = 0.0633034 (sec), leaf count = 26

```
DSolve[-Sqrt[Abs[y[x]]] + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{\sqrt{|K[1]|}} dK[1]\&\right][x + c_1]\right\}\right\}$$

✓ **Maple** : cpu = 0.09 (sec), leaf count = 31

```
dsolve(diff(y(x),x)-abs(y(x))^(1/2) = 0,y(x))
```

$$x - \left(\begin{cases} -2\sqrt{-y(x)} & y(x) \le 0 \\ 2\sqrt{y(x)} & 0 < y(x) \end{cases}\right) + c_1 = 0$$

ODE No. 58

$$a\left(-\sqrt{y(x)}\right) - bx + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.317116 (sec), leaf count = 118

```
DSolve[-(b*x) - a*Sqrt[y[x]] + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{a^2\left(-\log\left(a^2\left(\sqrt{\frac{a^2y(x)}{b^2x^2}}+1\right)-\frac{2a^2y(x)}{bx^2}\right)-\frac{2a\tanh^{-1}\left(\frac{a\left(1-\frac{4b\sqrt{\frac{a^2y(x)}{b^2x^2}}}{a^2}\right)}{\sqrt{a^2+8b}}\right)}{\sqrt{a^2+8b}}\right)}{2b} = \frac{a^2\log(x)}{b} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 68

```
dsolve(diff(y(x),x)-a*y(x)^(1/2)-b*x = 0,y(x))
```

$$-\frac{\ln\left(\sqrt{y(x)}\,ax + b\,x^2 - 2y(x)\right)}{2} + \frac{a\sqrt{y(x)}\,\operatorname{arctanh}\left(\frac{a\sqrt{y(x)}+2bx}{\sqrt{y(x)(a^2+8b)}}\right)}{\sqrt{y(x)\,(a^2+8b)}} + c_1 = 0$$

ODE No. 59

$$a\left(-\sqrt{y(x)^2+1}\right)-b+y'(x)=0$$

✓ **Mathematica** : cpu = 0.240022 (sec), leaf count = 96

```
DSolve[-b - a*Sqrt[1 + y[x]^2] + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{\frac{b\tan^{-1}\left(\frac{\#1_b}{\sqrt{\#1^2{}_{+1}\sqrt{a^2-b^2}}}\right)}{\sqrt{a^2-b^2}}-\frac{b\tan^{-1}\left(\frac{\#1_a}{\sqrt{a^2-b^2}}\right)}{\sqrt{a^2-b^2}}+\sinh^{-1}(\#1)}{a}\&\right][x+c_1]\right\}\right\}$$

✓ **Maple** : cpu = 0.057 (sec), leaf count = 26

```
dsolve(diff(y(x),x)-a*(y(x)^2+1)^(1/2)-b = 0,y(x))
```

$$x-\left(\int^{y(x)}\frac{1}{a\sqrt{\_a^2+1}+b}d\_a\right)+c_1=0$$

ODE No. 60

$$y'(x)-\frac{\sqrt{y(x)^2-1}}{\sqrt{x^2-1}}=0$$

✓ **Mathematica** : cpu = 0.13515 (sec), leaf count = 173

```
DSolve[-(Sqrt[-1 + y[x]^2]/Sqrt[-1 + x^2]) + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.02 (sec), leaf count = 29

```
dsolve(diff(y(x),x)-(y(x)^2-1)^(1/2)/(x^2-1)^(1/2) = 0,y(x))
```

$$\ln\left(x+\sqrt{x^2-1}\right)-\ln\left(y(x)+\sqrt{y\left(x\right)^2-1}\right)+c_1=0$$

Hand solution

$$y'=\pm\frac{\sqrt{y^2-1}}{\sqrt{x^2-1}} \tag{1}$$

Separable. For the positive case

$$\frac{dy}{dx}\frac{1}{\sqrt{y^2-1}}=\frac{1}{\sqrt{x^2-1}}$$
$$\frac{dy}{\left(y^2-1\right)^{\frac{1}{2}}}=\frac{dx}{\left(x^2-1\right)^{\frac{1}{2}}}$$

Integrating

$$\int\frac{dy}{\left(y^2-1\right)^{\frac{1}{2}}}=\int\frac{dx}{\left(x^2-1\right)^{\frac{1}{2}}}+C$$

But $\int\frac{dy}{\left(y^2-1\right)^{\frac{1}{2}}}=\tanh^{-1}\frac{y}{\left(y^2-1\right)^{\frac{1}{2}}}=\ln\left(y+\sqrt{y^2-1}\right)$, hence

$$\ln\left(y+\sqrt{y^2-1}\right)=\ln\left(x+\sqrt{x^2-1}\right)+C$$

For the negative case

$$\frac{dy}{dx}\frac{1}{\sqrt{y^2-1}} = -\frac{1}{\sqrt{x^2-1}}$$
$$\frac{dy}{(y^2-1)^{\frac{1}{2}}} = -\frac{dx}{(x^2-1)^{\frac{1}{2}}}$$

Integrating

$$\int \frac{dy}{(y^2-1)^{\frac{1}{2}}} = -\int \frac{dx}{(x^2-1)^{\frac{1}{2}}} + C$$

But $\int \frac{dy}{(y^2-1)^{\frac{1}{2}}} = \tanh^{-1}\frac{y}{(y^2-1)^{\frac{1}{2}}} = \ln\left(y+\sqrt{y^2-1}\right)$, hence

$$\ln\left(y+\sqrt{y^2-1}\right) = -\ln\left(x+\sqrt{x^2-1}\right) + C$$

Therefore

$$\ln\left(y+\sqrt{y^2-1}\right) = \pm\ln\left(x+\sqrt{x^2-1}\right) + C$$

ODE No. 61

$$y'(x) - \frac{\sqrt{x^2-1}}{\sqrt{y(x)^2-1}} = 0$$

✓ **Mathematica** : cpu = 0.207414 (sec), leaf count = 75

```
DSolve[-(Sqrt[-1 + x^2]/Sqrt[-1 + y[x]^2]) + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{1}{2}\#1\sqrt{\#1^2-1} - \frac{1}{2}\log\left(\sqrt{\#1^2-1}+\#1\right)\&\right]\left[\frac{1}{2}\sqrt{x^2-1}x - \frac{1}{2}\log\left(\sqrt{x^2-\right.\right.\right.$$

✓ **Maple** : cpu = 0.015 (sec), leaf count = 50

```
dsolve(diff(y(x),x)-(x^2-1)^(1/2)/(y(x)^2-1)^(1/2) = 0,y(x))
```

$$c_1 + x\sqrt{x^2-1} - \ln\left(x+\sqrt{x^2-1}\right) - y(x)\sqrt{y(x)^2-1} + \ln\left(y(x)+\sqrt{y(x)^2-1}\right) = 0$$

ODE No. 62

$$y'(x) - \frac{y(x) - x^2\sqrt{x^2 - y(x)^2}}{xy(x)\sqrt{x^2 - y(x)^2} + x} = 0$$

✓ **Mathematica** : cpu = 2.56867 (sec), leaf count = 44

```
DSolve[-((y[x] - x^2*Sqrt[x^2 - y[x]^2])/(x + x*y[x]*Sqrt[x^2 - y[x]^2])) + Derivative[1][y][
```

$$\text{Solve}\left[-\tan^{-1}\left(\frac{\sqrt{x^2 - y(x)^2}}{y(x)}\right) + \frac{x^2}{2} + \frac{y(x)^2}{2} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.384 (sec), leaf count = 34

```
dsolve(diff(y(x),x)-(y(x)-x^2*(x^2-y(x)^2)^(1/2))/(x*y(x)*(x^2-y(x)^2)^(1/2)+x) = 0,y(x))
```

$$\frac{y(x)^2}{2} + \arctan\left(\frac{y(x)}{\sqrt{x^2 - y\left(x\right)^2}}\right) + \frac{x^2}{2} - c_1 = 0$$

Hand solution

$$y' = \frac{y - x^2\sqrt{x^2 - y^2}}{xy\sqrt{x^2 - y^2} + x} \tag{1}$$

Let $y = ux$ then $y' = u + xu'$ therefore

$$\begin{aligned} u + xu' &= \frac{y - x^2\sqrt{x^2 - y^2}}{xy\sqrt{x^2 - y^2} + x} \\ &= \frac{ux - x^2\sqrt{x^2 - (ux)^2}}{x\,(ux)\sqrt{x^2 - (ux)^2} + x} \\ &= \frac{ux - x^3\sqrt{1 - u^2}}{x^3u\sqrt{1 - u^2} + x} \\ &= \frac{u - x^2\sqrt{1 - u^2}}{x^2u\sqrt{1 - u^2} + 1} \end{aligned}$$

Hence

$$\begin{aligned}
u\left(x^2u\sqrt{1-u^2}+1\right)+xu'\left(x^2u\sqrt{1-u^2}+1\right) &= u-x^2\sqrt{1-u^2}\\
x^2u^2\sqrt{1-u^2}+u+u'\left(x^3u\sqrt{1-u^2}+x\right) &= u-x^2\sqrt{1-u^2}\\
x^2u^2\sqrt{1-u^2}+u'\left(x^3u\sqrt{1-u^2}+x\right) &= -x^2\sqrt{1-u^2}\\
xu^2\sqrt{1-u^2}+u'\left(x^2u\sqrt{1-u^2}+1\right) &= -x\sqrt{1-u^2}\\
xu^2+u'\left(x^2u+\frac{1}{\sqrt{1-u^2}}\right) &= -x\\
x\left(1+u^2\right)+u'\left(x^2u+\frac{1}{\sqrt{1-u^2}}\right) &= 0
\end{aligned}$$

Hence

$$x\left(1+u^2\right)dx+\left(x^2u+\frac{1}{\sqrt{1-u^2}}\right)du=0 \tag{2}$$

Let $M=x(1+u^2)\,,N=\left(x^2u+\frac{1}{\sqrt{1-u^2}}\right)$.

$$\begin{aligned}
\frac{\partial M}{\partial u} &= 2xu\\
\frac{\partial N}{\partial x} &= 2xu
\end{aligned}$$

Therefore (2) is exact. Let

$$x\left(1+u^2\right)dx+\left(x^2u+\frac{1}{\sqrt{1-u^2}}\right)du=dU$$

Since $dU=\frac{\partial U}{\partial x}dx+\frac{\partial U}{\partial u}du$. Comparing with the above, we see that

$$\frac{\partial U}{\partial x}=x\left(1+u^2\right) \tag{3}$$

$$\frac{\partial U}{\partial u}=x^2u+\frac{1}{\sqrt{1-u^2}} \tag{4}$$

From (3)

$$\begin{aligned}
U &= \int x\left(1+u^2\right)dx\\
&= \frac{x^2}{2}\left(1+u^2\right)+f(u) \qquad (5)
\end{aligned}$$

From (4)

$$\begin{aligned}
\frac{d}{\partial u}\left(\frac{x^2}{2}\left(1+u^2\right)+f(u)\right) &= x^2u+\frac{1}{\sqrt{1-u^2}}\\
x^2u+f'(u) &= x^2u+\frac{1}{\sqrt{1-u^2}}\\
f'(u) &= \frac{1}{\sqrt{1-u^2}}
\end{aligned}$$

Therefore

$$f(u) = \arcsin(u)$$

From (5) we find

$$U(x,u) = \frac{x^2}{2}\left(1+u^2\right) + \arcsin(u)$$

Since $dU = 0$ then

$$\frac{x^2}{2}\left(1+u^2\right) + \arcsin(u) = C$$
$$\frac{x^2}{2}\left(1+u^2\right) + \arcsin(u) - C = 0$$

Since $y = ux$ then the above can be written as

$$\frac{x^2}{2}\left(1+\left(\frac{y}{x}\right)^2\right) + \arcsin\left(\frac{y}{x}\right) - C = 0$$
$$\frac{x^2}{2}\left(\frac{x^2+y^2}{x^2}\right) + \arcsin\left(\frac{y}{x}\right) - C = 0$$
$$\frac{1}{2}\left(x^2+y^2\right) + \arcsin\left(\frac{y}{x}\right) - C = 0$$
$$\arcsin\left(\frac{y}{x}\right) = C - \frac{1}{2}\left(x^2+y^2\right)$$

Hence

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

ODE No. 63

$$y'(x) - \frac{y(x)^2+1}{(x+1)^{3/2}\left|y(x)+\sqrt{y(x)+1}\right|} = 0$$

✓ **Mathematica** : cpu = 0.145814 (sec), leaf count = 48

```
DSolve[-((1 + y[x]^2)/((1 + x)^(3/2)*Abs[y[x] + Sqrt[1 + y[x]]])) + Derivative[1][y][x] == 0,
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{\left|K[1]+\sqrt{K[1]+1}\right|}{K[1]^2+1} dK[1]\&\right]\left[-\frac{2}{\sqrt{x+1}}+c_1\right]\right\}\right\}$$

✓ **Maple** : cpu = 5.703 (sec), leaf count = 35

```
dsolve(diff(y(x),x)-(y(x)^2+1)/abs(y(x)+(1+y(x))^(1/2))/(1+x)^(3/2) = 0,y(x))
```

$$-\frac{2}{\sqrt{1+x}} - \left(\int^{y(x)} \frac{|\_a+\sqrt{\_a+1}|}{\_a^2+1} d\_a\right) + c_1 = 0$$

ODE No. 64

$$y'(x) - \sqrt{\frac{ay(x)^2 + by(x) + c}{ax^2 + bx + c}} = 0$$

✓ **Mathematica** : cpu = 0.339405 (sec), leaf count = 269

```
DSolve[-Sqrt[(c + b*y[x] + a*y[x]^2)/(c + b*x + a*x^2)] + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{e^{-\sqrt{a}c_1}\left(-8a^{3/2}c\sqrt{ax^2+bx+c} + 8a^{3/2}ce^{2\sqrt{a}c_1}\sqrt{ax^2+bx+c} + 8a^2cx + 8a^2cxe^{2\sqrt{a}c_1} + 2b^3e^{\sqrt{a}c_1}\right.\right.\right.$$

✓ **Maple** : cpu = 0.098 (sec), leaf count = 124

```
dsolve(diff(y(x),x)-((a*y(x)^2+b*y(x)+c)/(a*x^2+b*x+c))^(1/2) = 0,y(x))
```

$$-\frac{\sqrt{\frac{ay(x)^2+by(x)+c}{ax^2+bx+c}}\sqrt{ax^2+bx+c}\,\ln\left(\frac{2\sqrt{ax^2+bx+c}\sqrt{a}+2ax+b}{2\sqrt{a}}\right)}{\sqrt{ay(x)^2+by(x)+c}\sqrt{a}} + \frac{\ln\left(\sqrt{ay(x)^2+by(x)+c} + \frac{2ay(x)+b}{2\sqrt{a}}\right)}{\sqrt{a}} + c_1 = 0$$

ODE No. 65

$$y'(x)-\sqrt{\frac{y(x)^3+1}{x^3+1}}=0$$

✓ **Mathematica** : cpu = 0.966941 (sec), leaf count = 312

```
DSolve[-Sqrt[(1 + y[x]^3)/(1 + x^3)] + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{i(\#1+1)\sqrt{1+\frac{6i}{\left(\sqrt{3}-3i\right)(\#1+1)}}\sqrt{\frac{2}{3}-\frac{4i}{\left(\sqrt{3}+3i\right)(\#1+1)}}F\left(i\sinh^{-1}\left(\frac{\sqrt{-\frac{6i}{3i+\sqrt{3}}}}{\sqrt{\#1+1}}\right)|\frac{3}{3}\right.\right.\right.\right.$$

$$\left.\left.\left.\left.\frac{}{\sqrt{-\frac{i}{\sqrt{3}+3i}}\sqrt{\#1^2-\#1+1}}\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.057 (sec), leaf count = 47

```
dsolve(diff(y(x),x)-((y(x)^3+1)/(x^3+1))^(1/2) = 0,y(x))
```

$$\int^{y(x)}\frac{1}{\sqrt{\_a^3+1}}d\_a+\int^{x}-\frac{\sqrt{\frac{y(x)^3+1}{\_a^3+1}}}{\sqrt{y\left(x\right)^3+1}}d\_a+c_1=0$$

ODE No. 66

$$y'(x)-\frac{\sqrt{|(1-y(x))y(x)(1-ay(x))|}}{\sqrt{|(1-x)x(1-ax)|}}=0$$

✓ **Mathematica** : cpu = 0.174545 (sec), leaf count = 67

```
DSolve[-(Sqrt[Abs[(1 - y[x])*y[x]*(1 - a*y[x])]]/Sqrt[Abs[(1 - x)*x*(1 - a*x)]]) + Derivative
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}\frac{1}{\sqrt{|(1-K[1])K[1](1-aK[1])|}}dK[1]\&\right]\left[\int_1^{x}\frac{1}{\sqrt{|(1-K[2])K[2](1-aK\right.\right.\right.$$

✓ **Maple** : cpu = 0.233 (sec), leaf count = 40

```
dsolve(diff(y(x),x)-abs(y(x)*(-1+y(x))*(-1+a*y(x)))^(1/2)/abs(x*(x-1)*(a*x-1))^(1/2) = 0,y(x)
```

$$\int\frac{1}{\sqrt{|x\,(x-1)\,(ax-1)\,|}}dx-\left(\int^{y(x)}\frac{1}{\sqrt{|\_a\,(\_a-1)\,(\_aa-1)\,|}}d\_a\right)+c_1=0$$

ODE No. 67

$$y'(x) - \frac{\sqrt{1-y(x)^4}}{\sqrt{1-x^4}} = 0$$

✓ **Mathematica** : cpu = 0.185079 (sec), leaf count = 14

```
DSolve[-(Sqrt[1 - y[x]^4]/Sqrt[1 - x^4]) + Derivative[1][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to \text{sn}\left(c_1 + F\left(\sin^{-1}(x)\middle| -1\right)\middle| -1\right)\}\}$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 51

```
dsolve(diff(y(x),x)-(1-y(x)^4)^(1/2)/(-x^4+1)^(1/2) = 0,y(x))
```

$$\frac{\sqrt{-x^2+1}\sqrt{x^2+1}\ \text{EllipticF}\left(x,i\right)}{\sqrt{-x^4+1}} - \left(\int^{y(x)} \frac{1}{\sqrt{-\_a^4+1}} d\_a\right) + c_1 = 0$$

ODE No. 68

$$y'(x) - \sqrt{\frac{ay(x)^4 + by(x)^2 + 1}{ax^4 + bx^2 + 1}} = 0$$

✓ **Mathematica** : cpu = 0.74081 (sec), leaf count = 373

```
DSolve[-Sqrt[(1 + b*y[x]^2 + a*y[x]^4)/(1 + b*x^2 + a*x^4)] + Derivative[1][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{i\sqrt{\frac{2\#1^2 a+\sqrt{b^2-4a}+b}{\sqrt{b^2-4a}+b}}\sqrt{\frac{2\#1^2 a}{b-\sqrt{b^2-4a}}+1}F\left(i\sinh^{-1}\left(\sqrt{2}\sqrt{\frac{a}{b+\sqrt{b^2-4a}}}\#1\right)|\frac{b+\sqrt{b^2-4}}{b-\sqrt{b^2-4}}\right.\right.\right.\right.$$

$$\left.\left.\left.\left.\frac{}{\sqrt{2}\sqrt{\frac{a}{\sqrt{b^2-4a}+b}}\sqrt{\#1^4 a+\#1^2 b+1}}\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 77

```
dsolve(diff(y(x),x)-((a*y(x)^4+b*y(x)^2+1)/(a*x^4+b*x^2+1))^(1/2) = 0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{\_a^4 a + \_a^2 b + 1}} d\_a + \int^{x} -\frac{\sqrt{\frac{ay(x)^4+by(x)^2+1}{\_a^4 a+\_a^2 b+1}}}{\sqrt{ay\left(x\right)^4 + by\left(x\right)^2 + 1}} d\_a + c_1 = 0$$

ODE No. 69

$$y'(x) - \sqrt{(\mathrm{a0} + \mathrm{a1}x + \mathrm{a2}x^2 + \mathrm{a3}x^3 + \mathrm{a4}x^4)(\mathrm{b0} + \mathrm{b1}y(x) + \mathrm{b2}y(x)^2 + \mathrm{b3}y(x)^3 + \mathrm{b4}y(x)^4)} = 0$$

✓ **Mathematica** : cpu = 8.16462 (sec), leaf count = 1163

```
DSolve[-Sqrt[(a0 + a1*x + a2*x^2 + a3*x^3 + a4*x^4)*(b0 + b1*y[x] + b2*y[x]^2 + b3*y[x]^3 + b
```

$$\mathrm{Solve}\left[-\frac{2F\left(\sin^{-1}\left(\sqrt{\frac{(\mathrm{Root}[\mathrm{b4}\#1^4+\mathrm{b3}\#1^3+\mathrm{b2}\#1^2+\mathrm{b1}\#1+\mathrm{b0}\&,2]-\mathrm{Root}[\mathrm{b4}\#1^4+\mathrm{b3}\#1^3+\mathrm{b2}\#1^2+\mathrm{b1}\#1+\mathrm{b0}}{(\mathrm{Root}[\mathrm{b4}\#1^4+\mathrm{b3}\#1^3+\mathrm{b2}\#1^2+\mathrm{b1}\#1+\mathrm{b0}\&,1]-\mathrm{Root}[\mathrm{b4}\#1^4+\mathrm{b3}\#1^3+\mathrm{b2}\#1^2+\mathrm{b1}\#1+\mathrm{b0}}}\right.\right.}{}\right.$$

✓ **Maple** : cpu = 0.177 (sec), leaf count = 111

```
dsolve(diff(y(x),x)-((b4*y(x)^4+b3*y(x)^3+b2*y(x)^2+b1*y(x)+b0)*(a4*x^4+a3*x^3+a2*x^2+a1*x+a0
```

$$\int^{y(x)} \frac{1}{\sqrt{_a^4 b4 + _a^3 b3 + _a^2 b2 + _a b1 + b0}} d_a + \int^{x} -\frac{\sqrt{\left(b4\, y(x)^4 + b3\, y(x)^3 + b2\, y(x)^2 + b1\, y(x) +\right.}}{\sqrt{b4\, y(x)^4 + b3\, y(x)^3 +}}$$

ODE No. 70

$$y'(x) - \sqrt{\frac{\text{a0} + \text{a1}x + \text{a2}x^2 + \text{a3}x^3 + \text{a4}x^4}{\text{b0} + \text{b1}y(x) + \text{b2}y(x)^2 + \text{b3}y(x)^3 + \text{b4}y(x)^4}} = 0$$

✓ **Mathematica** : cpu = 12.7936 (sec), leaf count = 81

```
DSolve[-Sqrt[(a0 + a1*x + a2*x^2 + a3*x^3 + a4*x^4)/(b0 + b1*y[x] + b2*y[x]^2 + b3*y[x]^3 + b
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \sqrt{\text{b4}K[1]^4 + \text{b3}K[1]^3 + \text{b2}K[1]^2 + \text{b1}K[1] + \text{b0}}\,dK[1]\&\right]\left[\int_1^x \sqrt{\text{a4}K[2]^4\right.\right.$$

✓ **Maple** : cpu = 0.174 (sec), leaf count = 113

```
dsolve(diff(y(x),x)-((a4*x^4+a3*x^3+a2*x^2+a1*x+a0)/(b4*y(x)^4+b3*y(x)^3+b2*y(x)^2+b1*y(x)+b0
```

$$\int^{y(x)} \sqrt{\_a^4 b4 + \_a^3 b3 + \_a^2 b2 + \_a b1 + b0}\,d\_a + \int^x -\sqrt{\frac{\_a^4 a4 + \_a^3 a3 + \_a^2 a2 + \_a a1 + a0}{b4\,y(x)^4 + b3\,y(x)^3 + b2\,y(x)^2 + b1\,y(x) + b}}$$

ODE No. 71

$$y'(x) - \sqrt{\frac{\mathrm{b0} + \mathrm{b1}y(x) + \mathrm{b2}y(x)^2 + \mathrm{b3}y(x)^3 + \mathrm{b4}y(x)^4}{\mathrm{a0} + \mathrm{a1}x + \mathrm{a2}x^2 + \mathrm{a3}x^3 + \mathrm{a4}x^4}} = 0$$

✓ **Mathematica** : cpu = 3.40963 (sec), leaf count = 2237

```
DSolve[-Sqrt[(b0 + b1*y[x] + b2*y[x]^2 + b3*y[x]^3 + b4*y[x]^4)/(a0 + a1*x + a2*x^2 + a3*x^3
```

$$\text{Solve}\left[-\frac{2F\left(\sin^{-1}\left(\sqrt{\frac{(\text{Root}[\text{b4}\#1^4+\text{b3}\#1^3+\text{b2}\#1^2+\text{b1}\#1+\text{b0}\&,2]-\text{Root}[\text{b4}\#1^4+\text{b3}\#1^3+\text{b2}\#1^2+\text{b1}\#1+\text{b0}}{(\text{Root}[\text{b4}\#1^4+\text{b3}\#1^3+\text{b2}\#1^2+\text{b1}\#1+\text{b0}\&,1]-\text{Root}[\text{b4}\#1^4+\text{b3}\#1^3+\text{b2}\#1^2+\text{b1}\#1+\text{b0}}}\right.\right.}{}\right.$$

✓ **Maple** : cpu = 0.121 (sec), leaf count = 113

```
dsolve(diff(y(x),x)-((b4*y(x)^4+b3*y(x)^3+b2*y(x)^2+b1*y(x)+b0)/(a4*x^4+a3*x^3+a2*x^2+a1*x+a0
```

$$\int^{y(x)} \frac{1}{\sqrt{\_a^4 b4 + \_a^3 b3 + \_a^2 b2 + \_ab1 + b0}} d\_a + \int^{x} -\frac{\sqrt{\frac{b4y(x)^4+b3y(x)^3+b2y(x)^2+b1y(x)+b0}{\_a^4 a4+\_a^3 a3+\_a^2 a2+\_a a1+a0}}}{\sqrt{b4y(x)^4 + b3y(x)^3 + b2y(x)^2 + b1y(x) + b}}$$

ODE No. 72

$$y'(x)-\mathrm{R1}\left(x,\sqrt{\mathrm{a0}+\mathrm{a1}x+\mathrm{a2}x^2+\mathrm{a3}x^3+\mathrm{a4}x^4}\right)\mathrm{R2}\left(y(x),\sqrt{\mathrm{b0}+\mathrm{b1}y(x)+\mathrm{b2}y(x)^2+\mathrm{b3}y(x)^3+\mathrm{b4}y(x)^4}\right)$$

✓ **Mathematica** : cpu = 0.187597 (sec), leaf count = 89

```
DSolve[-(R1[x, Sqrt[a0 + a1*x + a2*x^2 + a3*x^3 + a4*x^4]]*R2[y[x], Sqrt[b0 + b1*y[x] + b2*y[
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}\frac{1}{\mathrm{R2}\left(K[1],\sqrt{\mathrm{b4}K[1]^4+\mathrm{b3}K[1]^3+\mathrm{b2}K[1]^2+\mathrm{b1}K[1]+\mathrm{b0}}\right)}dK[1]\&\right]\right.\right.$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 64

```
dsolve(diff(y(x),x)-R1(x,(a4*x^4+a3*x^3+a2*x^2+a1*x+a0)^(1/2))*R2(y(x),(b4*y(x)^4+b3*y(x)^3+b
```

$$\int R1\left(x,\sqrt{a4\,x^4+a3\,x^3+a2\,x^2+a1\,x+a0}\right)dx-\left(\int^{y(x)}\frac{1}{R2\left(\_a,\sqrt{\_a^4b4+\_a^3b3+\_a^2b2+\_ab1}\right.}\right.$$

ODE No. 73

$$y'(x) - \left(\frac{\text{a0} + \text{a1}x + \text{a2}x^2 + \text{a3}x^3}{\text{a0} + \text{a1}y(x) + \text{a2}y(x)^2 + \text{a3}y(x)^3}\right)^{2/3} = 0$$

✓ **Mathematica** : cpu = 1.49231 (sec), leaf count = 733

```
DSolve[-((a0 + a1*x + a2*x^2 + a3*x^3)/(a0 + a1*y[x] + a2*y[x]^2 + a3*y[x]^3))^(2/3) + Deriva
```

$$\text{Solve}\left[\frac{3(\text{a0} + y(x)(\text{a1} + y(x)(\text{a2} + \text{a3}y(x))))^{2/3}\left(y(x) - \text{Root}\left[\#1^3\text{a3} + \#1^2\text{a2} + \#1\text{a1} + \text{a0}\&, 1\right]\right) F_1\left(\frac{5}{3}; -\right.}{5\left(\frac{y(x) - \text{Root}\left[\#1^3\text{a3}+\#1^2\text{a2}+\#1\text{a1}+\right.}{\text{Root}\left[\#1^3\text{a3}+\#1^2\text{a2}+\#1\text{a1}+\text{a0}\&,1\right] - \text{Root}\left[\#1^3\text{a3}\right.}\right.}\right.$$

✓ **Maple** : cpu = 0.469 (sec), leaf count = 91

```
dsolve(diff(y(x),x)-((a3*x^3+a2*x^2+a1*x+a0)/(a3*y(x)^3+a2*y(x)^2+a1*y(x)+a0))^(2/3) = 0,y(x)
```

$$\int^{y(x)} \left(\_a^3 a3 + \_a^2 a2 + \_a a1 + a0\right)^{\frac{2}{3}} d\_a + \int^{x} -\left(\frac{\_a^3 a3 + \_a^2 a2 + \_a a1 + a0}{a3\,y(x)^3 + a2\,y(x)^2 + a1\,y(x) + a0}\right)^{\frac{2}{3}} \left(a3\,y(x)^3 + a\right.$$

ODE No. 74

$$y'(x) - f(x)(y(x) - g(x))\sqrt{(y(x) - a)(y(x) - b)} = 0$$

✗ **Mathematica** : cpu = 2.0277 (sec), leaf count = 0

```
DSolve[-(f[x]*Sqrt[(-a + y[x])*(-b + y[x])]*(-g[x] + y[x])) + Derivative[1][y][x] == 0,y[x],x
```

, could not solve

```
DSolve[-(f[x]*Sqrt[(-a + y[x])*(-b + y[x])]*(-g[x] + y[x])) + Derivative[1][y][x] == 0,
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)-f(x)*(y(x)-g(x))*((y(x)-a)*(y(x)-b))^(1/2) = 0,y(x))
```

, 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))
```

ODE No. 75

$$y'(x) - e^{x-y(x)} + e^x = 0$$

✓ **Mathematica** : cpu = 0.175798 (sec), leaf count = 20

```
DSolve[E^x - E^(x - y[x]) + Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.155 (sec), leaf count = 20

```
dsolve(diff(y(x),x)-exp(x-y(x))+exp(x) = 0,y(x))
```

$$y(x) = -\mathrm{e}^x + \ln\left(-1 + \mathrm{e}^{\mathrm{e}^x + c_1}\right) - c_1$$

Hand solution

$$\begin{aligned} y' &= e^{x-y} - e^x \\ y' &= e^x\left(e^{-y} - 1\right) \\ \frac{1}{e^{-y} - 1} dy &= e^x dx \end{aligned} \tag{1}$$

Integrating both sides. $\int \frac{1}{e^{-y}-1} dy$. Let $e^{-y} = u$, then $\frac{du}{dy} = -e^{-y} = -u$. Hence $dy = -\frac{du}{u}$, therefore the integral becomes

$$\int \frac{1}{u-1}\left(-\frac{du}{u}\right) = -\int \frac{1}{u\,(u-1)} du$$

But $\frac{1}{u(u-1)} = -\left(\frac{1}{u} - \frac{1}{u-1}\right)$, hence

$$\begin{aligned} -\int \frac{1}{u\,(u-1)} du &= \int \left(\frac{1}{u} - \frac{1}{u-1}\right) du \\ &= \ln u - \ln\left(u-1\right) \\ &= \ln e^{-y} - \ln\left(e^{-y} - 1\right) \\ &= -\left(\ln\left(e^{-y} - 1\right) - \ln e^{-y}\right) \end{aligned}$$

But $\ln x - \ln y = \ln\left(\frac{x}{y}\right)$ and the above becomes

$$\begin{aligned} \int \frac{1}{e^{-y} - 1} dy &= -\left[\ln\left(\frac{e^{-y} - 1}{e^{-y}}\right)\right] \\ &= -\ln\left(1 - e^y\right) \end{aligned}$$

Back to (1), when we integrate both sides, and since $\int e^x dx = e^x + C$

$$\begin{aligned} -\ln\left(1-e^y\right) &= e^x + C \\ \ln\left(1-e^y\right) &= -e^x + C_1 \end{aligned}$$

Hence

$$\begin{aligned} 1-e^y &= \exp\left(-e^x + C_1\right) \\ e^y &= 1 - \exp\left(-e^x + C_1\right) \end{aligned}$$

Taking logs

$$y = \ln\left(1 - \exp\left(-e^x + C_1\right)\right)$$

Let $e^{C_1} = C_2$ then

$$y = \ln\left(1 - C_2 e^{-e^x}\right)$$

Verification

```
ode:=diff(y(x),x)=exp(x-y(x))-exp(x);
my_sol:=log(1-_C1*exp(-exp(x)));
odetest(y(x)=my_sol,ode);
0
```

ODE No. 76

$$-a\cos(y(x))+b+y'(x)=0$$

✓ **Mathematica** : cpu = 0.204094 (sec), leaf count = 116

```
DSolve[b - a*Cos[y[x]] + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to 2\tan^{-1}\left(\frac{a\tanh\left(\frac{1}{2}\left(x\sqrt{(a-b)(a+b)}-c_1\sqrt{(a-b)(a+b)}\right)\right)}{\sqrt{(a-b)(a+b)}}-\frac{b\tanh\left(\frac{1}{2}\left(x\sqrt{(a-b)(a+b)}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 41

```
dsolve(diff(y(x),x)-a*cos(y(x))+b = 0,y(x))
```

$$y(x)=2\arctan\left(\frac{\tanh\left(\frac{\sqrt{(a-b)(a+b)}\,(x+c_1)}{2}\right)\sqrt{(a-b)\,(a+b)}}{a+b}\right)$$

Hand solution

$$y'=a\cos y+b$$

This is separable.

$$\frac{dy}{a\cos y+b}=dx$$

$$\int\frac{dy}{a\cos y+b}=x+C \tag{1}$$

Using standard Tangent half-angle substitution, let $t=\tan\frac{y}{2},\cos y=\frac{1-t^2}{1+t^2},dy=\frac{2}{1+t^2}dt$, then the integral becomes

$$\begin{aligned}\int \frac{dy}{a\cos y+b} &= \int \frac{2}{1+t^2}\frac{1}{\left(a\frac{1-t^2}{1+t^2}+b\right)}dt \\ &= 2\int \frac{1+t^2}{(1+t^2)\left(a\left(1-t^2\right)+b\left(1+t^2\right)\right)}dt \\ &= 2\int \frac{dt}{a-at^2+b+bt^2} \\ &= 2\int \frac{dt}{(a+b)+t^2\left(b-a\right)} \\ &= 2\int \frac{dt}{(a+b)\left(1+\frac{t^2(b-a)}{(a+b)}\right)} \\ &= \frac{2}{a+b}\int \frac{dt}{\left(1+\frac{t^2(b-a)}{(a+b)}\right)}\end{aligned}$$

Let $z^2=\frac{t^2(b-a)}{(a+b)}$, or $z=\frac{t\sqrt{b-a}}{\sqrt{a+b}}$, then $\frac{dz}{dt}=\frac{\sqrt{b-a}}{\sqrt{a+b}}$ and the above integral becomes

$$\begin{aligned}\frac{2}{a+b}\int \frac{dt}{\left(1+\frac{t^2(b-a)}{(a+b)}\right)} &= \frac{2}{a+b}\int \frac{\sqrt{a+b}}{\sqrt{b-a}}\frac{dz}{(1+z^2)} \\ &= \frac{2}{a+b}\frac{\sqrt{a+b}}{\sqrt{b-a}}\int \frac{dz}{(1+z^2)} \\ &= \frac{2}{\sqrt{a+b}}\frac{1}{\sqrt{b-a}}\int \frac{dz}{(1+z^2)} \\ &= \frac{2}{\sqrt{(a+b)\left(b-a\right)}}\int \frac{dz}{(1+z^2)} \\ &= \frac{2}{\sqrt{b^2-a^2}}\int \frac{dz}{(1+z^2)}\end{aligned}$$

Now, $\int \frac{dz}{(1+z^2)}=\arctan\left(z\right)$, hence

$$\begin{aligned}\frac{2}{\sqrt{b^2-a^2}}\int \frac{dz}{(1+z^2)} &= \frac{2}{\sqrt{b^2-a^2}}\arctan\left(z\right) \\ &= \frac{2}{\sqrt{b^2-a^2}}\arctan\left(\frac{t\sqrt{b-a}}{\sqrt{a+b}}\right)\end{aligned}$$

But $t=\tan\frac{y}{2}$ therefore

$$\frac{2}{\sqrt{b^2-a^2}}\arctan\left(\frac{t\sqrt{b-a}}{\sqrt{a+b}}\right)=\frac{2}{\sqrt{b^2-a^2}}\arctan\left(\frac{\tan\left(\frac{y}{2}\right)\sqrt{b-a}}{\sqrt{a+b}}\right)$$

Going back to (1)

$$
\begin{aligned}
\int \frac{dy}{a\cos y + b} &= x + C \\
\frac{2}{\sqrt{b^2 - a^2}} \arctan\left(\frac{\tan\left(\frac{y}{2}\right)\sqrt{b-a}}{\sqrt{a+b}} \right) &= x + C \\
\arctan\left(\frac{\tan\left(\frac{y}{2}\right)\sqrt{b-a}}{\sqrt{a+b}} \right) &= \frac{1}{2}\sqrt{b^2 - a^2}(x + C) \\
\frac{\tan\left(\frac{y}{2}\right)\sqrt{b-a}}{\sqrt{a+b}} &= \tan\left(\frac{1}{2}\sqrt{b^2 - a^2}(x + C) \right) \\
\tan\left(\frac{y}{2}\right) &= \frac{\sqrt{a+b}}{\sqrt{b-a}} \tan\left(\frac{1}{2}\sqrt{b^2 - a^2}(x + C) \right) \\
\frac{y}{2} &= \arctan\left(\frac{(a+b)}{\sqrt{(a+b)(b-a)}} \tan\left(\frac{1}{2}\sqrt{b^2 - a^2}(x + C) \right) \right) \\
&= \arctan\left(\frac{(a+b)}{\sqrt{b^2 - a^2}} \tan\left(\frac{1}{2}\sqrt{b^2 - a^2}(x + C) \right) \right) \\
y &= 2\arctan\left(\frac{a+b}{\sqrt{b^2 - a^2}} \tan\left(\frac{1}{2}\sqrt{b^2 - a^2}(x + C) \right) \right)
\end{aligned}
$$

Verification

```
ode:=diff(y(x),x)=a*cos(y(x))+b;
my_sol:=2*arctan( (a+b)/sqrt(b^2-a^2) * tan(1/2*sqrt(b^2-a^2)*(x+_C1)));
odetest(y(x)=my_sol,ode);
0
```

ODE No. 77

$$y'(x) - \cos(ay(x) + bx) = 0$$

✓ **Mathematica** : cpu = 0.313988 (sec), leaf count = 124

```
DSolve[-Cos[b*x + a*y[x]] + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{-bx - 2\tan^{-1}\left(\frac{a\tanh\left(\frac{1}{2}\left(-x\sqrt{a^2-b^2}+c_1\sqrt{a^2-b^2}\right)\right)}{\sqrt{a^2-b^2}} + \frac{b\tanh\left(\frac{1}{2}\left(-x\sqrt{a^2-b^2}+c_1\sqrt{a^2-b^2}\right)\right)}{\sqrt{a^2-b^2}}\right)}{a}\right\}\right\}$$

✓ **Maple** : cpu = 0.08 (sec), leaf count = 54

```
dsolve(diff(y(x),x)-cos(a*y(x)+b*x) = 0,y(x))
```

$$y(x) = \frac{-bx + 2\arctan\left(\frac{\tanh\left(\frac{\sqrt{(a-b)(a+b)}\,(x-c_1)}{2}\right)\sqrt{(a-b)(a+b)}}{a-b}\right)}{a}$$

Hand solution

$$y' = \cos(ay + bx)$$

This is separable after transformation of $u = ay + bx$, hence $u' = ay' + b$ or $y' = \frac{1}{a}(u' - b)$. Therefore the above becomes

$$\begin{aligned}\frac{1}{a}(u' - b) &= \cos(u)\\ u' &= a\cos u + b\\ \frac{du}{a\cos u + b} &= dx\end{aligned}$$

This is the same as Kamke 76 (the problem before this), which we solved using half angle tan transformation, and the answer is

$$u = 2\arctan\left(\frac{a+b}{\sqrt{b^2-a^2}}\tan\left(\frac{1}{2}\sqrt{b^2-a^2}(x+C)\right)\right)$$

Since $u = ay + bx$ then $y = \frac{u-bx}{a}$, hence

$$y = \frac{1}{a}\left(2\arctan\left(\frac{a+b}{\sqrt{b^2-a^2}}\tan\left(\frac{1}{2}\sqrt{b^2-a^2}(x+C)\right)\right)-bx\right)$$

Verification

```
ode:=diff(y(x),x)=cos(a*y(x)+b*x);
my_sol:=(1/a)*(2*arctan( (a+b)/sqrt(b^2-a^2) * tan(1/2*sqrt(b^2-a^2)*(x+_C1)))-b*x);
odetest(y(x)=my_sol,ode);
0
```

ODE No. 78

$$a\sin(\alpha y(x)+\beta x)+b+y'(x)=0$$

✓ **Mathematica** : cpu = 0.68662 (sec), leaf count = 1317

```
DSolve[b + a*Sin[beta*x + alpha*y[x]] + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{2\tan^{-1}\left(\frac{\frac{a^2\sqrt{-((a\alpha+b\alpha-\beta)(a\alpha-b\alpha+\beta))}\tan\left(\frac{1}{2}\left(\frac{a^2x\alpha^2}{\sqrt{-((a\alpha+b\alpha-\beta)(a\alpha-b\alpha+\beta))}}-\frac{b^2x\alpha^2}{\sqrt{-((a\alpha+b\alpha-\beta)(a\alpha-b\alpha+\beta))}}-\frac{a^2c_1\alpha^2}{\sqrt{-((a\alpha+b\alpha-\beta)(a\alpha-b\alpha}\right.\right.}{}}{}\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.109 (sec), leaf count = 89

```
dsolve(diff(y(x),x)+a*sin(alpha*y(x)+beta*x)+b = 0,y(x))
```

$$y(x)=\frac{-\beta x+2\arctan\left(\frac{-\tan\left(\frac{\sqrt{\left(-a^2+b^2\right)\alpha^2-2\alpha b\beta+\beta^2}\,(x-c_1)}{2}\right)\sqrt{(-a^2+b^2)\alpha^2-2\alpha b\beta+\beta^2}-a\alpha}{b\alpha-\beta}\right)}{\alpha}$$

Hand solution

$$y'=-a\sin\left(\alpha y+\beta x\right)-b$$

This is separable after transformation of $u=\alpha y+\beta x$, hence $u'=\alpha y'+\beta$ or $y'=\frac{1}{\alpha}(u'-\beta)$. Therefore the above becomes

$$\begin{aligned}\frac{1}{\alpha}(u'-\beta)&=-a\sin\left(u\right)-b\\ u'&=-\alpha(a\sin\left(u\right)+b)+\beta\\ \frac{du}{\beta-\alpha\left(a\sin\left(u\right)+b\right)}&=dx \qquad (1)\end{aligned}$$

Using half angle tan transformation where $\tan\left(\frac{u}{2}\right)=t, \sin\left(u\right)=\frac{2t}{t^2+1}, du=\frac{2}{1+t^2}dt$ then

$$\begin{aligned}\int \frac{du}{\beta-\alpha\left(a\sin\left(u\right)+b\right)} &= \int \frac{2}{1+t^2}\frac{dt}{\beta-\alpha\left(a\frac{2t}{t^2+1}+b\right)}\\ &= 2\int \frac{dt}{\beta\left(t^2+1\right)-\alpha\left(a2t+b\left(t^2+1\right)\right)}\\ &= 2\int \frac{dt}{t\beta^2+\beta-\left(\alpha a2t+t^2\alpha b+\alpha b\right)}\\ &= 2\int \frac{dt}{\left(\beta-\alpha b\right)\left(\frac{t\beta^2-\alpha a2t-t^2\alpha b}{\left(\beta-\alpha b\right)}+1\right)}\\ &= \frac{2}{\left(\beta-\alpha b\right)}\int \frac{dt}{\frac{t\beta^2-\alpha a2t-t^2\alpha b}{\left(\beta-\alpha b\right)}+1}\\ &= \frac{2}{\left(\beta-\alpha b\right)}\frac{-\left(\alpha b-\beta\right)}{\sqrt{\alpha^2a^2-\left(\alpha^2b^2+\beta^2-2\alpha b\beta\right)}}\tanh^{-1}\left(\frac{\left(t+\frac{a\alpha}{b\alpha-\beta}\right)\left(b\alpha-\beta\right)}{\sqrt{\alpha^2a^2-\left(\alpha^2b^2+\beta^2-2\alpha b\beta\right)}}\right)\\ &= \frac{2}{\sqrt{\alpha^2a^2-\left(\alpha^2b^2+\beta^2-2\alpha b\beta\right)}}\tanh^{-1}\left(\frac{t(b\alpha-\beta)+a\alpha}{\sqrt{\alpha^2a^2-\left(\alpha^2b^2+\beta^2-2\alpha b\beta\right)}}\right)\end{aligned}$$

But $t=\tan\left(\frac{u}{2}\right)$ therefore

$$\int \frac{du}{\beta-\alpha\left(a\sin\left(u\right)+b\right)} = \frac{2}{\sqrt{\alpha^2a^2-\left(\alpha^2b^2+\beta^2-2\alpha b\beta\right)}}\tanh^{-1}\left(\frac{\tan\left(\frac{u}{2}\right)\left(b\alpha-\beta\right)+a\alpha}{\sqrt{\alpha^2a^2-\left(\alpha^2b^2+\beta^2-2\alpha b\beta\right)}}\right)$$

But $u=\alpha y+\beta x$, and the above becomes

$$\int \frac{du}{\beta-\alpha\left(a\sin\left(u\right)+b\right)} = \frac{2\tanh^{-1}\left(\frac{\tan\left(\frac{\alpha y+\beta x}{2}\right)\left(b\alpha-\beta\right)+a\alpha}{\sqrt{\alpha^2a^2-\left(\alpha^2b^2+\beta^2-2\alpha b\beta\right)}}\right)}{\sqrt{\alpha^2a^2-\left(\alpha^2b^2+\beta^2-2\alpha b\beta\right)}}$$

Back to (1), therefore after integrating both sides

$$\frac{2\tanh^{-1}\left(\frac{\tan\left(\frac{\alpha y+\beta x}{2}\right)\left(b\alpha-\beta\right)+a\alpha}{\sqrt{\alpha^2a^2-\left(\alpha^2b^2+\beta^2-2\alpha b\beta\right)}}\right)}{\sqrt{\alpha^2a^2-\left(\alpha^2b^2+\beta^2-2\alpha b\beta\right)}} = x+C$$

Let

$$A=\sqrt{\alpha^2a^2-\left(\alpha^2b^2+\beta^2-2\alpha b\beta\right)}$$

Then

$$\tanh^{-1}\left(\frac{\tan\left(\frac{\alpha y+\beta x}{2}\right)(b\alpha-\beta)+a\alpha}{A}\right)=\frac{1}{2}A(x+C)$$

$$\frac{\tan\left(\frac{\alpha y+\beta x}{2}\right)(b\alpha-\beta)+a\alpha}{A}=\tanh\left(\frac{1}{2}A(x+C)\right)$$

$$\tan\left(\frac{\alpha y+\beta x}{2}\right)(b\alpha-\beta)+a\alpha=A\tanh\left(\frac{1}{2}A(x+C)\right)$$

$$\tan\left(\frac{\alpha y+\beta x}{2}\right)=\frac{A}{(b\alpha-\beta)}\tanh\left(\frac{1}{2}A(x+C)\right)-\frac{a\alpha}{(b\alpha-\beta)}$$

$$\frac{\alpha y+\beta x}{2}=\arctan\left(\frac{A}{(b\alpha-\beta)}\tanh\left(\frac{1}{2}A(x+C)\right)-\frac{a\alpha}{(b\alpha-\beta)}\right)$$

$$y=\frac{2}{\alpha}\arctan\left(\frac{A}{(b\alpha-\beta)}\tanh\left(\frac{1}{2}A(x+C)\right)-\frac{a\alpha}{(b\alpha-\beta)}\right)-\frac{\beta x}{\alpha}$$

Verification

```
ode:=diff(y(x),x)=-a*sin(alpha*y(x)+beta*x)-b;
A0:=sqrt(alpha^2*a^2-(alpha^2*b^2+beta^2-2*alpha*b*beta));
B0:=(alpha*b-beta);
my_sol:=2/alpha*arctan(A0/B0*tanh((1/2)*A0*(x+_C1))-a*alpha/(B0))-beta*x/alpha;
odetest(y(x)=my_sol,ode);
0
```

ODE No. 79

$$f(x)\cos(ay(x)) + g(x)\sin(ay(x)) + h(x) + y'(x) = 0$$

✗ **Mathematica** : cpu = 24.643 (sec), leaf count = 0

```
DSolve[Cos[a*y[x]]*f[x] + h[x] + g[x]*Sin[a*y[x]] + Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[Cos[a*y[x]]*f[x] + h[x] + g[x]*Sin[a*y[x]] + Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)+f(x)*cos(a*y(x))+g(x)*sin(a*y(x))+h(x) = 0,y(x))
```

, could not solve

```
dsolve(diff(y(x),x)+f(x)*cos(a*y(x))+g(x)*sin(a*y(x))+h(x) = 0,y(x))
```

ODE No. 80

$$(1 - f'(x))\cos(y(x)) - f'(x) + f(x)\sin(y(x)) + y'(x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.0668998 (sec), leaf count = 72

```
DSolve[-1 + f[x]*Sin[y[x]] + Cos[y[x]]*(1 - Derivative[1][f][x]) - Derivative[1][f][x] + Deri
```

$$\left\{\left\{y(x) \to 2\tan^{-1}\left(f(x) + \frac{1}{\exp\left(\int_1^x -f(K[1])dK[1]\right)\int_1^x -\exp\left(-\int_1^{K[2]} -f(K[1])dK[1]\right)dK[2] + c_1\exp(\right.\right.\right.$$

✓ **Maple** : cpu = 1.389 (sec), leaf count = 41

```
dsolve(diff(y(x),x)+f(x)*sin(y(x))+(1-diff(f(x),x))*cos(y(x))-diff(f(x),x)-1 = 0,y(x))
```

$$y(x) = 2\arctan\left(\frac{-\mathrm{e}^{\int f(x)dx} + \left(\int \mathrm{e}^{\int f(x)dx}dx\right)f(x) + f(x)\,c_1}{c_1 + \int \mathrm{e}^{\int f(x)dx}dx}\right)$$

ODE No. 81

$$y'(x)+2\tan(x)\tan(y(x))-1=0$$

✓ **Mathematica** : cpu = 1.58851 (sec), leaf count = 220

```
DSolve[-1 + 2*Tan[x]*Tan[y[x]] + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[c_1=\frac{\frac{1}{2}\left(\frac{1}{\frac{i\tan(x)}{\tan^2(x)+1}-\frac{i\tan^2(x)\tan(y(x))}{\tan^2(x)+1}}+i\cot(x)\right)\sqrt[4]{1-\left(\frac{1}{\frac{i\tan(x)}{\tan^2(x)+1}-\frac{i\tan^2(x)\tan(y(x))}{\tan^2(x)+1}}+i\cot(x)\right)^2}\,{}_2F_1\left(\frac{1}{2},\frac{5}{4}\right.}{\sqrt[4]{-1+\left(\frac{1}{\frac{i\tan(x)}{\tan^2(x)+1}-\frac{i\tan^2(x)\tan(y(x))}{\tan^2(x)+1}}+i\cot(x)\right.}}\right.$$

✓ **Maple** : cpu = 1.573 (sec), leaf count = 78

```
dsolve(diff(y(x),x)+2*tan(y(x))*tan(x)-1 = 0,y(x))
```

$$c_1+\frac{\tan(x)}{\left(\frac{(1+\tan^2(y(x)))(1+\tan^2(x))}{(\tan(y(x))\tan(x)-1)^2}\right)^{\frac{1}{4}}}+\frac{(\tan(y(x))+\tan(x))\,\text{hypergeom}\left(\left[\frac{1}{2},\frac{5}{4}\right],\left[\frac{3}{2}\right],-\frac{(\tan(y(x))+\tan(x))^2}{(\tan(y(x))\tan(x)-1)^2}\right)}{2\tan(y(x))\tan(x)-2}=0$$

ODE No. 82

$$-a\left(\tan^2(y(x))+1\right)+y'(x)+\tan(x)\tan(y(x))=0$$

✗ **Mathematica** : cpu = 46.5047 (sec), leaf count = 0

```
DSolve[Tan[x]*Tan[y[x]] - a*(1 + Tan[y[x]]^2) + Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[Tan[x]*Tan[y[x]] - a*(1 + Tan[y[x]]^2) + Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)-a*(1+tan(y(x))^2)+tan(y(x))*tan(x) = 0,y(x))
```

, could not solve

```
dsolve(diff(y(x),x)-a*(1+tan(y(x))^2)+tan(y(x))*tan(x) = 0,y(x))
```

ODE No. 83

$$y'(x) - \tan(xy(x)) = 0$$

✓ **Mathematica** : cpu = 0.38866 (sec), leaf count = 69

```
DSolve[-Tan[x*y[x]] + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}\sqrt{\frac{\pi}{2}}e^{\frac{x^2}{2}}\left(\text{erfi}\left(\frac{y(x)-ix}{\sqrt{2}}\right)+\text{erfi}\left(\frac{y(x)+ix}{\sqrt{2}}\right)\right)=c_1 e^{\frac{x^2}{2}},y(x)\right]$$

✓ **Maple** : cpu = 0.374 (sec), leaf count = 44

```
dsolve(diff(y(x),x)-tan(x*y(x)) = 0,y(x))
```

$$y(x) = -i\,\text{RootOf}\left(-\text{erf}\left(\frac{(-x+\_Z)\sqrt{2}}{2}\right)\sqrt{\pi}-\text{erf}\left(\frac{\sqrt{2}\,(x+\_Z)}{2}\right)\sqrt{\pi}+\sqrt{2}\,c_1\right)$$

ODE No. 84

$$y'(x) - f(ax + by(x)) = 0$$

✓ **Mathematica** : cpu = 0.211784 (sec), leaf count = 248

```
DSolve[-f[a*x + b*y[x]] + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{f(ax+bK[2])\int_1^x \left(\frac{b^2 f'(aK[1]+bK[2])}{a+bf(aK[1]+bK[2])} - \frac{b^3 f(aK[1]+bK[2])f'(aK[1]+bK[2])}{(a+bf(aK[1]+bK[2]))^2}\right) dK[1]b + b + a\int_1^x \left(\frac{b^2 f'(aK}{a+bf(aK}\right.}{a+bf(ax+bK[2])}\right.$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 37

```
dsolve(diff(y(x),x)-f(a*x+b*y(x)) = 0,y(x))
```

$$y(x) = \frac{\text{RootOf}\left(\left(\int^{_Z} \frac{1}{f(_a b)b+a} d_a\right) b - x + c_1\right) b - ax}{b}$$

ODE No. 85

$$y'(x) - x^{a-1} y(x)^{1-b} f\left(\frac{x^a}{a} + \frac{y(x)^b}{b}\right) = 0$$

✓ **Mathematica** : cpu = 0.394186 (sec), leaf count = 238

```
DSolve[-(x^(-1 + a)*f[x^a/a + y[x]^b/b]*y[x]^(1 - b)) + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{K[2]^{b-1}}{f\left(\frac{x^a}{a} + \frac{K[2]^b}{b}\right) + 1} - \int_1^x \left(\frac{K[1]^{a-1} K[2]^{b-1} f'\left(\frac{K[1]^a}{a} + \frac{K[2]^b}{b}\right)}{f\left(\frac{K[1]^a}{a} + \frac{K[2]^b}{b}\right) + 1} - \frac{f\left(\frac{K[1]^a}{a} + \frac{K[2]^b}{b}\right) K[1]^{a-1} K}{\left(f\left(\frac{K[1]^a}{a} + \frac{K}{}\right.\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.46 (sec), leaf count = 153

```
dsolve(diff(y(x),x)-x^(a-1)*y(x)^(1-b)*f(x^a/a+y(x)^b/b) = 0,y(x))
```

$$y(x) = \left(-\frac{-\operatorname{RootOf}\left(\left(\left(\int^{_Z} \frac{1}{\left((-b+_a)^{\frac{1}{b}}\right)^{-b} \left(a^{\frac{1}{a}}\right)^a f\left(\frac{\left(a^{\frac{1}{a}}\right)^a b + \left((-b+_a)^{\frac{1}{b}}\right)^b a}{ab}\right) _a - \left((-b+_a)^{\frac{1}{b}}\right)^{-b} \left(a^{\frac{1}{a}}\right)^a f\left(\frac{\left(a^{\frac{1}{a}}\right)^a b + \left(\right.}{}\right.}\right.\right.\right.}{a}\right.$$

ODE No. 86

$$y'(x) - \frac{y(x) - xf(ay(x)^2 + x^2)}{ay(x)f\left(ay(x)^2 + x^2\right) + x} = 0$$

✓ **Mathematica** : cpu = 0.486306 (sec), leaf count = 184

```
DSolve[-((-(x*f[x^2 + a*y[x]^2]) + y[x])/(x + a*f[x^2 + a*y[x]^2]*y[x])) + Derivative[1][y][x
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{-f(x^2 + aK[2]^2)\,K[2]a^2 - xa}{x^2 + aK[2]^2} - \int_1^{x} \left(\frac{a - 2a^2K[1]K[2]f'(K[1]^2 + aK[2]^2)}{K[1]^2 + aK[2]^2} - \frac{2aK[2]\,(aK[2]}{(}\right.\right.$$

✓ **Maple** : cpu = 0.497 (sec), leaf count = 52

```
dsolve(diff(y(x),x)-(y(x)-x*f(x^2+a*y(x)^2))/(x+a*y(x)*f(x^2+a*y(x)^2)) = 0,y(x))
```

$$\frac{\arctan\left(\frac{\sqrt{a}\,x}{\sqrt{a^2y(x)^2}}\right)}{\sqrt{a}} - \frac{\left(\int^{y(x)^2+\frac{x^2}{a}} \frac{f(\_a a)}{\_a}\,d\_a\right)}{2} - c_1 = 0$$

ODE No. 87

$$y'(x) - \frac{cx^a y(x)^b + ay(x) f(x^c y(x))}{bx f\left(x^c y(x)\right) - x^a y(x)^b} = 0$$

✗ **Mathematica** : cpu = 10.3892 (sec), leaf count = 0

```
DSolve[-((a*f[x^c*y[x]]*y[x] + c*x^a*y[x]^b)/(b*x*f[x^c*y[x]] - x^a*y[x]^b)) + Derivative[1][
```

, could not solve

```
DSolve[-((a*f[x^c*y[x]]*y[x] + c*x^a*y[x]^b)/(b*x*f[x^c*y[x]] - x^a*y[x]^b)) + Derivati
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)-(y(x)*a*f(x^c*y(x))+c*x^a*y(x)^b)/(x*b*f(x^c*y(x))-x^a*y(x)^b) = 0,y(x))
```

, could not solve

```
dsolve(diff(y(x),x)-(y(x)*a*f(x^c*y(x))+c*x^a*y(x)^b)/(x*b*f(x^c*y(x))-x^a*y(x)^b) = 0,
```

ODE No. 88

$$-ce^{-2ax} - 4ay(x) - b + 2y'(x) - 3y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.504185 (sec), leaf count = 2831

```
DSolve[-b - c/E^(2*a*x) - 4*a*y[x] - 3*y[x]^2 + 2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{2\left(-2^{-\frac{a\sqrt{4a^2-3b}-2a^2}{a^2}+\frac{\sqrt{4a^4-3a^2b}}{a^2}+1}3^{\frac{a\sqrt{4a^2-3b}-2a^2}{4a^2}-\frac{\sqrt{4a^4-3a^2b}}{4a^2}}a^{-\frac{a\sqrt{4a^2-3b}-2a^2}{2a^2}+\frac{\sqrt{4a^4-3a^2b}}{2a^2}+1}b^{\frac{a\sqrt{4a^2-3b}-2a^2}{4a^2}}-\right.\right.\right.$$

✓ **Maple** : cpu = 0.252 (sec), leaf count = 256

```
dsolve(2*diff(y(x),x)-3*y(x)^2-4*a*y(x)-b-c*exp(-2*a*x) = 0,y(x))
```

$$y(x) = \frac{-\sqrt{3}\,\mathrm{e}^{-ax}\left(\mathrm{BesselY}\left(-\frac{\sqrt{4a^2-3b}-2a}{2a},\frac{\sqrt{3}\sqrt{c}\,\mathrm{e}^{-ax}}{2a}\right)c_1+\mathrm{BesselJ}\left(-\frac{\sqrt{4a^2-3b}-2a}{2a},\frac{\sqrt{3}\sqrt{c}\,\mathrm{e}^{-ax}}{2a}\right)\right)\sqrt{c}-\left(\sqrt{4a^2-\right.}$$
$$3\,\mathrm{BesselY}\left(-\frac{\sqrt{4a^2-3b}}{2a},\frac{\sqrt{3}\sqrt{c}\,\mathrm{e}^{-ax}}{2a}\right)c_1+3\,\mathrm{Besse}$$

Hand solution

$$y' = \frac{1}{2}b + \frac{1}{2}ce^{-2ax} + 2ay + \frac{3}{2}y^2$$

This is of the form $y' = f_0 + f_1 y + f_2 y^2$ with $f_0 = \frac{1}{2}b + \frac{1}{2}ce^{-2ax}$, $f_1 = 2a$, $f_3 = \frac{3}{2}$. Hence it is Riccati non-linear first order. Transforming to second order ODE using

$$\begin{aligned} y &= -\frac{u'}{uf_2} \\ &= \frac{-2}{3}\frac{u'}{u} \end{aligned}$$

Hence $y' = \frac{-2}{3}\left(\frac{u''}{u} - \frac{(u')^2}{u^2}\right)$ and equating this to RHS of the ODE gives

$$\frac{-2}{3}\left(\frac{u''}{u}-\frac{(u')^2}{u^2}\right)=\frac{1}{2}b+\frac{1}{2}ce^{-2ax}+2a\left(\frac{-2}{3}\frac{u'}{u}\right)+\frac{3}{2}\left(\frac{-2}{3}\frac{u'}{u}\right)^2$$

$$\frac{-2}{3}\frac{u''}{u}+\frac{2}{3}\frac{(u')^2}{u^2}=\frac{1}{2}b+\frac{1}{2}ce^{-2ax}-\frac{4}{3}a\frac{u'}{u}+\frac{2}{3}\frac{(u')^2}{u^2}$$

$$\frac{-2}{3}\frac{u''}{u}=\frac{1}{2}b+\frac{1}{2}ce^{-2ax}-\frac{4}{3}a\frac{u'}{u}$$

$$\frac{u''}{u}=-\frac{3}{4}b-\frac{3}{4}ce^{-2ax}+2a\frac{u'}{u}$$

$$u''=-\left(\frac{3}{4}b+\frac{3}{4}ce^{-2ax}\right)u+2au'$$

$$u''-2au'+\frac{3}{4}\left(b+ce^{-2ax}\right)u=0$$

This is second order linear ODE with varying coefficient. Solved using power series method giving solutions using special functions (Bessel functions). Let $A=\frac{\sqrt{4a^2-3b}}{a}, B=\frac{\sqrt{3ce^{-ax}}}{a}$ then

$$u(x)=C_1e^{ax}\,\text{BesselJ}\left(-\frac{1}{2}\frac{\sqrt{4a^2-3b}}{a},\frac{1}{2}\frac{\sqrt{3ce^{-ax}}}{a}\right)+C_2e^{ax}\,\text{BesselY}\left(-\frac{1}{2}\frac{\sqrt{4a^2-3b}}{a},\frac{1}{2}\frac{\sqrt{3ce^{-ax}}}{a}\right)$$

But

$$u'(x)=C_1\,a\exp(ax)\,\text{BesselJ}\left(-1/2\,\frac{\sqrt{4\,a^2-3\,b}}{a},1/2\,\frac{\sqrt{3}\sqrt{c}\exp(-ax)}{a}\right)$$

$$-1/2\,C_1\exp(ax)\left(-\text{BesselJ}\left(-1/2\,\frac{\sqrt{4\,a^2-3\,b}}{a}+1,1/2\,\frac{\sqrt{3}\sqrt{c}\exp(-ax)}{a}\right)-1/3\,\frac{\sqrt{3}\sqrt{4\,a^2-3\,b}}{\sqrt{c}\exp(-ax)}\,\text{BesselJ}\left(-1/2\,\frac{\sqrt{4\,a^2-3\,b}}{a}\right.\right.$$

$$+C_2\,a\exp(ax)\,\text{BesselY}\left(-1/2\,\frac{\sqrt{4\,a^2-3\,b}}{a},1/2\,\frac{\sqrt{3}\sqrt{c}\exp(-ax)}{a}\right)$$

$$-1/2\,C_1\,\exp(ax)\left(-\text{BesselY}\left(-1/2\,\frac{\sqrt{4\,a^2-3\,b}}{a}+1,1/2\,\frac{\sqrt{3}\sqrt{c}\exp(-ax)}{a}\right)-1/3\,\frac{\sqrt{3}\sqrt{4\,a^2-3\,b}}{\sqrt{c}\exp(-ax)}\,\text{BesselY}\left(-1/2\,\frac{\sqrt{4\,a^2-3}\right.\right.$$

Hence from $y=\frac{-2}{3}\frac{u'}{u}$ the solution is now found.

Verification

```
ode:=2*diff(y(x),x)-3*y(x)^2-4*a*y(x)=b+c*exp(-2*a*x);
uode:=diff(u(x),x$2)-2*a*diff(u(x),x)+3/4*(b+c*(exp(-2*a*x)))*u(x)=0;
uSol:=dsolve(uode,u(x));
my_sol:=(-2/3)*diff(rhs(uSol),x)/rhs(uSol);
odetest(y(x)=my_sol,ode);
0
```

ODE No. 89

$$xy'(x) - \sqrt{a^2 - x^2} = 0$$

✓ **Mathematica** : cpu = 0.0127715 (sec), leaf count = 42

```
DSolve[-Sqrt[a^2 - x^2] + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.022 (sec), leaf count = 56

```
dsolve(x*diff(y(x),x)-(a^2-x^2)^(1/2) = 0,y(x))
```

$$y(x) = \sqrt{a^2 - x^2} - \frac{a^2 \ln\left(\frac{2a^2 + 2\sqrt{a^2}\sqrt{a^2 - x^2}}{x}\right)}{\sqrt{a^2}} + c_1$$

Hand solution

$$xy' = \pm\sqrt{a^2 - x^2}$$

This is separable. $y' = \frac{\pm\sqrt{a^2 - x^2}}{x}$ or $dy = \frac{\pm\sqrt{a^2 - x^2}}{x} dx$. Hence

$$y = \pm \int \frac{\sqrt{a^2 - x^2}}{x} dx + C$$

Let $x = a \sin u$, then $dx = a \cos(u)\, du$ and the integral becomes

$$\begin{aligned}\int \frac{\sqrt{a^2-x^2}}{x}dx &= \int \frac{\sqrt{a^2-a^2\sin^2 u}}{a\sin u}a\cos(u)\,du \\ &= \int \frac{a\sqrt{1-\sin^2 u}}{a\sin u}a\cos(u)\,du \\ &= a\int \frac{\cos u}{\sin u}\cos(u)\,du \\ &= a\int \frac{\cos^2 u}{\sin u}du \\ &= a\int \frac{1-\sin^2 u}{\sin u}du \\ &= a\left(\int \frac{1}{\sin u}du - \int \sin u du\right) \\ &= a\left(\int \frac{1}{\sin u}du + \cos u\right) \end{aligned} \tag{1}$$

For $\int \frac{1}{\sin u}du$, using half tan angle, let $t=\tan\left(\frac{u}{2}\right), du=\frac{2}{1+t^2}dt, \sin u=\frac{2t}{1+t^2}$, therefore

$$\begin{aligned}\int \frac{1}{\sin u}du &= \int \frac{1+t^2}{2t}\frac{2}{1+t^2}dt \\ &= \int \frac{1}{t}dt \\ &= \ln(t)\end{aligned}$$

Hence $\int \frac{1}{\sin u}du = \ln\left(\tan\left(\frac{u}{2}\right)\right)$ and from (1)

$$\begin{aligned}\int \frac{\sqrt{a^2-x^2}}{x}dx &= a\left(\int \frac{1}{\sin u}du + \cos u\right) \\ &= a\left(\ln\left(\tan\left(\frac{u}{2}\right)\right) + \cos u\right)\end{aligned}$$

But $x=a\sin u$, hence $u=\arcsin\left(\frac{x}{a}\right)$ and the integral becomes

$$\int \frac{\sqrt{a^2-x^2}}{x}dx = a\left[\ln\left(\tan\left(\frac{\arcsin\left(\frac{x}{a}\right)}{2}\right)\right) + \cos\left(\arcsin\left(\frac{x}{a}\right)\right)\right]$$

Hence the solution is

$$y = \pm a\left[\ln\left(\tan\left(\frac{\arcsin\left(\frac{x}{a}\right)}{2}\right)\right) + \cos\left(\arcsin\left(\frac{x}{a}\right)\right)\right] + C$$

Maple do not verify the above, but I do not see what is wrong with the solution. Will investigate more later.

ODE No. 90

$$xy'(x) + y(x) - x\sin(x) = 0$$

✓ **Mathematica** : cpu = 0.0221124 (sec), leaf count = 24

```
DSolve[-(x*Sin[x]) + y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\sin(x) - x\cos(x)}{x} + \frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.021 (sec), leaf count = 17

```
dsolve(x*diff(y(x),x)+y(x)-x*sin(x) = 0,y(x))
```

$$y(x) = \frac{\sin(x) - \cos(x)\, x + c_1}{x}$$

Hand solution

$$xy' + y = x\sin x$$

Linear first order, exact, separable. $y' + \frac{y}{x} = \sin x$, integrating factor $\mu = e^{\int \frac{1}{x} dx} = x$, hence

$$d(\mu y) = \mu \sin x$$
$$xy = \int x\sin x dx + C$$

Using integration by parts. $\int udv = uv - \int vdu$. Let $u = x, dv = \sin x$, hence $du = 1, v = -\cos x$, therefore

$$\begin{aligned}\int x\sin x dx &= -x\cos x + \int \cos x \\ &= -x\cos x + \sin x\end{aligned}$$

Hence

$$xy = -x\cos x + \sin x + C$$
$$y = \frac{\sin x}{x} - \cos x + \frac{C}{x}$$

Verification

```
restart;
ode:=x*diff(y(x),x)+y(x)=x*sin(x);
my_sol:=sin(x)/x-cos(x)+_C1/x;
odetest(y(x)=my_sol,ode);
0
```

ODE No. 91

$$xy'(x) - y(x) - \frac{x}{\log(x)} = 0$$

✓ **Mathematica** : cpu = 0.0230704 (sec), leaf count = 15

```
DSolve[-(x/Log[x]) - y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.007 (sec), leaf count = 11

```
dsolve(x*diff(y(x),x)-y(x)-x/ln(x) = 0,y(x))
```

$$y(x) = (\ln(\ln(x)) + c_1)\, x$$

ODE No. 92

$$x^2(-\sin(x)) + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0220928 (sec), leaf count = 15

```
DSolve[-(x^2*Sin[x]) - y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.007 (sec), leaf count = 12

```
dsolve(x*diff(y(x),x)-y(x)-x^2*sin(x) = 0,y(x))
```

$$y(x) = (-\cos(x) + c_1)\, x$$

Hand solution

$$xy' - y = x^2 \sin x$$

Linear first order, exact, separable. $y' - \frac{y}{x} = x \sin x$, integrating factor $\mu = e^{\int -\frac{1}{x} dx} = e^{-\ln x} = \frac{1}{x}$, hence

$$\begin{aligned} d(\mu y) &= \mu \sin x \\ \frac{1}{x} y &= \int \sin x dx + C \\ y &= x(C - \cos x) \end{aligned}$$

Verification

```
restart;
ode:=x*diff(y(x),x)-y(x)=x^2*sin(x);
my_sol:=x*(_C1-cos(x));
odetest(y(x)=my_sol,ode);
0
```

ODE No. 93

$$xy'(x) - y(x) - \frac{x\cos(\log(\log(x)))}{\log(x)} = 0$$

✓ **Mathematica** : cpu = 0.045421 (sec), leaf count = 16

```
DSolve[-((x*Cos[Log[Log[x]]])/Log[x]) - y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.027 (sec), leaf count = 12

```
dsolve(x*diff(y(x),x)-y(x)-x*cos(ln(ln(x)))/ln(x) = 0,y(x))
```

$$y(x) = (\sin(\ln(\ln(x))) + c_1)\, x$$

ODE No. 94

$$ay(x) + bx^n + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0391452 (sec), leaf count = 25

```
DSolve[b*x^n + a*y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.018 (sec), leaf count = 23

```
dsolve(x*diff(y(x),x)+a*y(x)+b*x^n = 0,y(x))
```

$$y(x) = -\frac{b\,x^n}{n+a} + x^{-a}c_1$$

Hand solution

$$xy' + ay + bx^n = 0$$

Linear first order, exact, separable. $y' + \frac{ay}{x} = -bx^{n-1}$, integrating factor $\mu = e^{\int \frac{a}{x} dx} = e^{a \ln x} = x^a$, hence

$$\begin{aligned} d(\mu y) &= -\mu b x^{n-1} \\ x^a y &= -\int b x^{a+n-1} + C \end{aligned}$$

If $a = -n$ then

$$\begin{aligned} x^a y &= -\int b x^{-1} + C \\ y &= -x^{-a} b \ln(x) + x^{-a} C \\ &= x^{-a}(C - b \ln x) \end{aligned}$$

If $a \neq -n$ then

$$\begin{aligned} x^a y &= -\frac{bx^{a+n}}{a+n} + C \\ y &= -b\frac{x^n}{a+n} + Cx^{-a} \end{aligned}$$

Verification

```
restart;
ode:=x*diff(y(x),x)+a*y(x)+b*x^n=0;
s1:=x^(-a)*(_C1-b*ln(x));
s2:=-b*(x^n/(a+n))+_C1*x^(-a);
odetest(y(x)=s2,ode);
0
```

ODE No. 95

$$x^2 + xy'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.076789 (sec), leaf count = 32

```
DSolve[x^2 + y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{x(-Y_1(x) - c_1 J_1(x))}{Y_0(x) + c_1 J_0(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 27

```
dsolve(x*diff(y(x),x)+y(x)^2+x^2 = 0,y(x))
```

$$y(x) = -\frac{(c_1 \operatorname{BesselY}(1,x) + \operatorname{BesselJ}(1,x))\, x}{c_1 \operatorname{BesselY}(0,x) + \operatorname{BesselJ}(0,x)}$$

Hand solution

$$xy' + y^2 + x^2 = 0$$

This is Riccati first order non-linear. Writing it in standard form and for $x \neq 0$

$$\begin{aligned} y' &= -x - \frac{1}{x} y^2 \\ &= f_0 + f_1 y + f_2 y^2 \end{aligned} \tag{1}$$

Where $f_0 = -x, f_1 = 0, f_2 = -\frac{1}{x}$. Using standard substitution $y = \frac{-u'}{u f_2}$ changes the ODE to second order linear ODE

$$y = \frac{xu'}{u} \tag{2}$$

Hence

$$y' = \frac{u'}{u} + x\frac{u''}{u} - \frac{x(u')^2}{u^2}$$

Equating this to RHS of (1) gives

$$\frac{u'}{u}+x\frac{u''}{u}-\frac{x(u')^2}{u^2}=-x-\frac{1}{x}\left(\frac{xu'}{u}\right)^2$$
$$\frac{u'}{u}+x\frac{u''}{u}=-x$$
$$u''+\frac{1}{x}u'+u=0$$

This is Lienard ODE. Since it is not constant coefficient ODE, the solution will be in Bessel functions, using Power series method. The solution is

$$u=C_1\,\mathrm{BesselJ}\left(0,x\right)+C_2\,\mathrm{BesselY}\left(0,x\right)$$

But $\frac{d}{dx}\,\mathrm{BesselJ}\left(0,x\right)=-\,\mathrm{BesselJ}\left(1,x\right)$ and $\frac{d}{dx}\,\mathrm{BesselY}\left(0,x\right)=-\,\mathrm{BesselY}\left(1,x\right)$, hence

$$u'(x)=-C_1\,\mathrm{BesselJ}\left(1,x\right)-C_2\,\mathrm{BesselY}\left(1,x\right)$$

And from (2) the solution is

$$\begin{aligned}y&=\frac{xu'}{u}\\&=x\frac{\left[-C_1\,\mathrm{BesselJ}\left(1,x\right)-C_2\,\mathrm{BesselY}\left(1,x\right)\right]}{C_1\,\mathrm{BesselJ}\left(0,x\right)+C_2\,\mathrm{BesselY}\left(0,x\right)}\\&=-x\frac{C_1\,\mathrm{BesselJ}\left(1,x\right)+C_2\,\mathrm{BesselY}\left(1,x\right)}{C_1\,\mathrm{BesselJ}\left(0,x\right)+C_2\,\mathrm{BesselY}\left(0,x\right)}\end{aligned}$$

Let $C=\frac{C_1}{C_2}$ then

$$y=-x\frac{C\,\mathrm{BesselJ}\left(1,x\right)+\mathrm{BesselY}\left(1,x\right)}{C\,\mathrm{BesselJ}\left(0,x\right)+\mathrm{BesselY}\left(0,x\right)}$$

Verification

```
restart;
ode:=x*diff(y(x),x)+y(x)^2+x^2=0;
my_sol:=-x*(_C1*BesselJ(1, x)+BesselY(1,x))/(_C1*BesselJ(0, x)+BesselY(0,x));
odetest(y(x)=my_sol,ode);
0
```

ODE No. 96

$$xy'(x) - y(x)^2 + 1 = 0$$

✓ **Mathematica** : cpu = 0.0694451 (sec), leaf count = 33

```
DSolve[1 - y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.037 (sec), leaf count = 11

```
dsolve(x*diff(y(x),x)-y(x)^2+1 = 0,y(x))
```

$$y(x) = -\tanh\left(\ln\left(x\right) + c_1\right)$$

Hand solution

$$xy' - y^2 + 1 = 0$$

This is Riccati first order non-linear. But it is separable. Hence

$$y' = \frac{y^2 - 1}{x} \tag{1}$$

Hence

$$\frac{dy}{dx} = \frac{y^2 - 1}{x}$$
$$\frac{dy}{y^2 - 1} = \frac{dx}{x}$$

Integrating

$$-\tanh^{-1}(y) = \ln x + C$$
$$y = -\tanh\left(\ln x + C\right)$$

Verification

```
restart;
ode:=x*diff(y(x),x)-y(x)^2+1=0;
my_sol:=-tanh(ln(x)+_C1);
odetest(y(x)=my_sol,ode);
0
```

ODE No. 97

$$ay(x)^2 + bx^2 + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.113448 (sec), leaf count = 46

```
DSolve[b*x^2 - y[x] + a*y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{b}x\tan\left(\sqrt{a}\sqrt{b}x - \sqrt{a}\sqrt{b}c_1\right)}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.037 (sec), leaf count = 25

```
dsolve(x*diff(y(x),x)+a*y(x)^2-y(x)+b*x^2 = 0,y(x))
```

$$y(x) = -\frac{\tan\left(\sqrt{ab}\,(x + c_1)\right)x\sqrt{ab}}{a}$$

Hand solution

$$ay^2 + bx^2 + xy' - y = 0$$

This is Riccati first order non-linear. Let $y = ux$, hence the above becomes

$$\begin{aligned} au^2x^2 + bx^2 + x(u'x + u) - ux &= 0 \\ au^2x + bx + u'x &= 0 \\ au^2 + b + u' &= 0 \\ u' &= -au^2 - b \end{aligned}$$

Which is separable, Hence

$$\frac{du}{au^2 + b} = -dx$$

Integrating

$$\begin{aligned} \frac{1}{\sqrt{ab}}\arctan\left(\frac{au}{\sqrt{ab}}\right) &= -x + C \\ \frac{au}{\sqrt{ab}} &= \tan\left(\sqrt{ab}(-x + C)\right) \\ u &= \frac{\sqrt{ab}}{a}\tan\left(\sqrt{ab}(-x + C)\right) \end{aligned}$$

Therefore

$$\begin{aligned} y &= ux \\ &= x\frac{\sqrt{ab}}{a}\tan\left(\sqrt{ab}(-x+C)\right) \end{aligned}$$

Verification

```
restart;
ode:=a*y(x)^2+b*x^2+x*diff(y(x),x)-y(x)=0;
my_sol:=x*sqrt(a*b)/a*tan(sqrt(a*b)*(-x+_C1));
odetest(y(x)=my_sol,ode);
0
```

ODE No. 98

$$ay(x)^2 + cx^{2b} - by(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.189744 (sec), leaf count = 442

```
DSolve[c*x^(2*b) - b*y[x] + a*y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{-a}\sqrt{-c}x^b\left(-\frac{2\sqrt{\frac{2}{\pi}}\cos\left(\frac{\sqrt{-a}\sqrt{-c}x^b}{b}\right)}{\sqrt{\frac{\sqrt{-a}\sqrt{-c}x^b}{b}}}+\frac{\sqrt{\frac{2}{\pi}}c_1\sin\left(\frac{\sqrt{-a}\sqrt{-c}x^b}{b}\right)}{\sqrt{\frac{\sqrt{-a}\sqrt{-c}x^b}{b}}}-\frac{\sqrt{\frac{2}{\pi}}c_1\left(-\sin\left(\frac{\sqrt{-a}\sqrt{-c}x^b}{b}\right)-\frac{\sqrt{-a}b\sqrt{-c}x^{-b}\cos}{ac}\right.}{\sqrt{\frac{\sqrt{-a}\sqrt{-c}x^b}{b}}}\right.}{2a\left(\frac{\sqrt{\frac{2}{\pi}}\sin\left(\frac{\sqrt{-a}\sqrt{-c}x^b}{b}\right)}{\sqrt{\frac{\sqrt{-a}\sqrt{-c}x^b}{b}}}+\frac{\sqrt{\frac{2}{\pi}}c_1\cos\left(\frac{\sqrt{-a}\sqrt{-c}x^b}{b}\right)}{\sqrt{\frac{\sqrt{-a}\sqrt{-c}x^b}{b}}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 38

```
dsolve(x*diff(y(x),x)+a*y(x)^2-b*y(x)+c*x^(2*b) = 0,y(x))
```

$$y(x) = -\frac{\tan\left(\frac{x^b\sqrt{a}\sqrt{c}+c_1 b}{b}\right)\sqrt{c}\,x^b}{\sqrt{a}}$$

ODE No. 99

$$ay(x)^2 - by(x) - cx^\beta + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.180257 (sec), leaf count = 244

```
DSolve[-(c*x^beta) - b*y[x] + a*y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{-a}\sqrt{c}x^{\beta/2}\left(-2J_{\frac{b}{\beta}-1}\left(\frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right) + c_1 J_{1-\frac{b}{\beta}}\left(\frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right) - c_1 J_{-\frac{b+\beta}{\beta}}\left(\frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right)\right) - bc_1 J_{-}}{2a\left(J_{\frac{b}{\beta}}\left(\frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right) + c_1 J_{-\frac{b}{\beta}}\left(\frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right)\right)}\right.$$

✓ **Maple** : cpu = 0.102 (sec), leaf count = 171

```
dsolve(x*diff(y(x),x)+a*y(x)^2-b*y(x)-c*x^beta = 0,y(x))
```

$$y(x) = \frac{-\left(\text{BesselY}\left(\frac{b+\beta}{\beta}, \frac{2\sqrt{-ac}\,x^{\frac{\beta}{2}}}{\beta}\right)c_1 + \text{BesselJ}\left(\frac{b+\beta}{\beta}, \frac{2\sqrt{-ac}\,x^{\frac{\beta}{2}}}{\beta}\right)\right)\sqrt{-ac}\,x^{\frac{\beta}{2}} + b\left(\text{BesselY}\left(\frac{b}{\beta}, \frac{2\sqrt{-ac}\,x^{\frac{\beta}{2}}}{\beta}\right)\right.}{a\left(\text{BesselY}\left(\frac{b}{\beta}, \frac{2\sqrt{-ac}\,x^{\frac{\beta}{2}}}{\beta}\right)c_1 + \text{BesselJ}\left(\frac{b}{\beta}, \frac{2\sqrt{-ac}\,x^{\frac{\beta}{2}}}{\beta}\right)\right)}$$

ODE No. 100

$$a + xy'(x) + xy(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0841315 (sec), leaf count = 157

```
DSolve[a + x*y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{c_1 J_1\left(2i\sqrt{-a}\sqrt{x}\right) + i\sqrt{-a}\sqrt{x}\left(-2J_0\left(2i\sqrt{-a}\sqrt{x}\right) + c_1 J_0\left(2i\sqrt{-a}\sqrt{x}\right) - c_1 J_2\left(2i\sqrt{-a}\sqrt{x}\right)\right)}{2x\left(J_1\left(2i\sqrt{-a}\sqrt{x}\right) - c_1 J_1\left(2i\sqrt{-a}\sqrt{x}\right)\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.097 (sec), leaf count = 59

```
dsolve(x*diff(y(x),x)+x*y(x)^2+a = 0,y(x))
```

$$y(x) = \frac{\sqrt{a}\left(\text{BesselJ}\left(0, 2\sqrt{a}\sqrt{x}\right) c_1 + \text{BesselY}\left(0, 2\sqrt{a}\sqrt{x}\right)\right)}{\sqrt{x}\left(c_1 \text{BesselJ}\left(1, 2\sqrt{a}\sqrt{x}\right) + \text{BesselY}\left(1, 2\sqrt{a}\sqrt{x}\right)\right)}$$

Hand solution

$$xy' + xy^2 + a = 0$$
$$y' = -\frac{a}{x} - y^2$$

This is Riccati first order non-linear. Let $y = -\frac{u'}{uR} = \frac{u'}{u}$, hence $y' = \frac{u''}{u} - \frac{(u')^2}{u^2}$. Equating this to RHS of the above gives

$$\frac{u''}{u} - \frac{(u')^2}{u^2} = -\frac{a}{x} - \left(\frac{u'}{u}\right)^2$$
$$\frac{u''}{u} = -\frac{a}{x}$$
$$u'' + \frac{a}{x}u = 0$$

This is linear second order, an Emden Fowler ODE, with removal singularity. Solved using power series method. The solution is

$$u = C_1\sqrt{x}\,\text{BesselJ}\left(1, 2\sqrt{ax}\right) + C_2\sqrt{x}\,\text{BesselY}\left(1, 2\sqrt{ax}\right)$$

But

$$\frac{d}{dx}\text{BesselJ}\left(1, 2\sqrt{ax}\right) = \frac{\sqrt{a}}{\sqrt{x}}\left(\text{BesselJ}\left(0, 2\sqrt{ax}\right) - \frac{1}{2}\frac{1}{\sqrt{ax}}\text{BesselJ}\left(1, 2\sqrt{ax}\right)\right)$$

And

$$\frac{d}{dx}\operatorname{BesselY}\left(1,2\sqrt{ax}\right)=\frac{\sqrt{a}}{\sqrt{x}}\left(\operatorname{BesselY}\left(0,2\sqrt{ax}\right)-\frac{1}{2}\frac{1}{\sqrt{ax}}\operatorname{BesselY}\left(1,2\sqrt{ax}\right)\right)$$

Therefore,

$$\begin{aligned}u'=&C_1\left(\frac{1}{2\sqrt{x}}\operatorname{BesselJ}\left(1,2\sqrt{a}\sqrt{x}\right)+\sqrt{x}\frac{\sqrt{a}}{\sqrt{x}}\left(\operatorname{BesselJ}\left(0,2\sqrt{a}\sqrt{x}\right)-\frac{1}{2}\frac{1}{\sqrt{ax}}\operatorname{BesselJ}\left(1,2\sqrt{a}\sqrt{x}\right)\right)\right)\\&+C_2\left(\frac{1}{2\sqrt{x}}\operatorname{BesselY}\left(1,2\sqrt{a}\sqrt{x}\right)+\sqrt{x}\frac{\sqrt{a}}{\sqrt{x}}\left(\operatorname{BesselY}\left(0,2\sqrt{ax}\right)-\frac{1}{2}\frac{1}{\sqrt{ax}}\operatorname{BesselY}\left(1,2\sqrt{a}\sqrt{x}\right)\right)\right)\end{aligned}$$

Which is simplified to

$$u'=C_1\sqrt{a}\operatorname{BesselJ}\left(0,2\sqrt{a}\sqrt{x}\right)+C_2\sqrt{a}\operatorname{BesselY}\left(0,2\sqrt{a}\sqrt{x}\right)$$

Therefore, from $y=\frac{u'}{u}$, the solution is

$$y=\frac{C_1\sqrt{a}\operatorname{BesselJ}\left(0,2\sqrt{a}\sqrt{x}\right)+C_2\sqrt{a}\operatorname{BesselY}\left(0,2\sqrt{a}\sqrt{x}\right)}{C_1\sqrt{x}\operatorname{BesselJ}\left(1,2\sqrt{a}\sqrt{x}\right)+C_2\sqrt{x}\operatorname{BesselY}\left(1,2\sqrt{a}\sqrt{x}\right)}$$

Let $C=\frac{C_1}{C_2}$, hence

$$y=\frac{C\sqrt{a}\operatorname{BesselJ}\left(0,2\sqrt{a}\sqrt{x}\right)+\sqrt{a}\operatorname{BesselY}\left(0,2\sqrt{a}\sqrt{x}\right)}{C\sqrt{x}\operatorname{BesselJ}\left(1,2\sqrt{a}\sqrt{x}\right)+\sqrt{x}\operatorname{BesselY}\left(1,2\sqrt{a}\sqrt{x}\right)}$$

Verification

```
restart;
ode:=x*diff(y(x),x)+x*y(x)^2+a=0;
num:=_C1*sqrt(a)*BesselJ(0,2*sqrt(a)*sqrt(x))+sqrt(a)*BesselY(0,2*sqrt(a)*sqrt(x));
den:=_C1*sqrt(x)*BesselJ(1,2*sqrt(a)*sqrt(x))+sqrt(x)*BesselY(1,2*sqrt(a)*sqrt(x));
my_solution:=num/den;
odetest(y(x)=my_solution,ode);
0
```

ODE No. 101

$$xy'(x) + xy(x)^2 - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0825238 (sec), leaf count = 18

```
DSolve[-y[x] + x*y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.013 (sec), leaf count = 16

```
dsolve(x*diff(y(x),x)+x*y(x)^2-y(x) = 0,y(x))
```

$$y(x) = \frac{2x}{x^2 + 2c_1}$$

Hand solution

$$xy' + xy^2 - y = 0$$
$$y' = \frac{1}{x}y - y^2 \tag{1}$$

This is of the form $y' = f_0 + f_1 y + f_2 y^2$ with $f_0 = 0, f_1 = \frac{1}{x}, f_2 = -1$. Since $f_0 = 0$ this is Bernoulli differential equation. We always start by dividing by y^2

$$\frac{y'}{y^2} = \frac{1}{x}\frac{1}{y} - 1$$

Then $u = \frac{1}{y}$ or $y = \frac{1}{u}$, therefore $y' = -\frac{u'}{u^2}$. Equating this to RHS of (1) gives

$$-\frac{u'}{u^2}u^2 = \frac{1}{x}u - 1$$
$$-u' = \frac{u}{x} - 1$$
$$u' + \frac{u}{x} = 1$$

Integrating factor is $e^{\int \frac{1}{x}dx} = x$ and the above becomes

$$d(xu) = x$$

Integrating

$$\begin{aligned} xu &= \frac{x^2}{2} + C \\ u &= \frac{x}{2} + \frac{C}{x} \\ &= \frac{x^2 + 2C}{2x} \end{aligned}$$

Hence

$$\begin{aligned} y &= \frac{1}{u} \\ &= \frac{2x}{x^2 + 2C} \end{aligned}$$

Verification

```
restart;
ode:=x*diff(y(x),x)+x*y(x)^2-y=0;
my_solution:=2*x/(x^2+2*_C1);
odetest(y(x)=my_solution,ode);
0
```

ODE No. 102

$$-ax^3 + xy'(x) + xy(x)^2 - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0878519 (sec), leaf count = 36

```
DSolve[-(a*x^3) - y[x] + x*y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.045 (sec), leaf count = 22

```
dsolve(x*diff(y(x),x)+x*y(x)^2-y(x)-a*x^3 = 0,y(x))
```

$$y(x) = \tanh\left(\frac{\sqrt{a}\left(x^2 + 2c_1\right)}{2}\right) x\sqrt{a}$$

Hand solution

$$xy' + xy^2 - y - ax^3 = 0$$

This is Riccati non-linear first order. But using the transformation $y = xv$ it is transformed to easily solved ODE

$$y' = v + xv'$$

Therefore the ODE becomes

$$\begin{aligned} x(v + xv') + x(xv)^2 - xv - ax^3 &= 0 \\ xv + x^2v' + x^3v^2 - xv - ax^3 &= 0 \\ x^2v' + x^3v^2 - ax^3 &= 0 \\ v' + xv^2 - ax &= 0 \\ \frac{dv}{dx} &= x\left(a - v^2\right) \\ \frac{dv}{a - v^2} &= xdx \end{aligned}$$

Integrating

$$\begin{aligned}
\frac{1}{\sqrt{a}} \tanh^{-1}\left(\frac{v}{\sqrt{a}}\right) &= \frac{x^2}{2} + C \\
\tanh^{-1}\left(\frac{v}{\sqrt{a}}\right) &= \sqrt{a}\left(\frac{x^2}{2} + C\right) \\
\frac{v}{\sqrt{a}} &= \tanh\left(\sqrt{a}\left(\frac{x^2}{2} + C\right)\right) \\
v &= \sqrt{a}\tanh\left(\sqrt{a}\left(\frac{x^2}{2} + C\right)\right)
\end{aligned}$$

Therefore

$$\begin{aligned}
y &= xv \\
&= x\sqrt{a}\tanh\left(\sqrt{a}\left(\frac{x^2}{2} + C\right)\right)
\end{aligned}$$

Verification

```
restart;
ode:=x*diff(y(x),x)+x*y(x)^2-y(x)-a*x^3=0;
my_solution:=x*sqrt(a)*tanh(sqrt(a)*(x^2/2+_C1));
odetest(y(x)=my_solution,ode);
0
```

ODE No. 103

$$-x^3-\left(2x^2+1\right)y(x)+xy'(x)+xy(x)^2=0$$

✓ **Mathematica** : cpu = 0.160966 (sec), leaf count = 90

```
DSolve[-x^3 - (1 + 2*x^2)*y[x] + x*y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.034 (sec), leaf count = 29

```
dsolve(x*diff(y(x),x)+x*y(x)^2-(2*x^2+1)*y(x)-x^3 = 0,y(x))
```

$$y(x)=\frac{x\left(\sqrt{2}+2\tanh\left(\frac{(x^2+2c_1)\sqrt{2}}{2}\right)\right)\sqrt{2}}{2}$$

Hand solution

$$xy'-xy^2-\left(2x^2+1\right)y-x^3=0$$

This is Riccati non-linear first order. Converting it to standard form

$$\begin{aligned} y' &= x^2+\frac{(2x^2+1)}{x}y+y^2 \\ &= f_0+f_1y+f_2y^2 \end{aligned} \tag{1}$$

Using standard transformation $y=-\frac{u'}{uf_2}=-\frac{u'}{u}$, therefore

$$y'=-\frac{u''}{u}+\frac{(u')^2}{u^2}$$

Equating the above to RHS of (1) gives

$$\begin{aligned} -\frac{u''}{u}+\frac{(u')^2}{u^2} &= x^2-\frac{(2x^2+1)}{x}\frac{u'}{u}+\left(-\frac{u'}{u}\right)^2 \\ -\frac{u''}{u} &= x^2-\frac{(2x^2+1)}{x}\frac{u'}{u} \\ -u'' &= ux^2-\frac{(2x^2+1)}{x}u' \end{aligned}$$

$$-u''+\frac{(2x^2+1)}{x}u'-ux^2=0$$

$$xu''-\left(2x^2+1\right)u'+ux^3=0 \tag{2}$$

This is second order linear ODE (Sturm-Liouville). Using the transformation $t = \frac{x^2}{2}$, then $\frac{dt}{dx} = x$ and

$$\frac{du}{dx} = \frac{du}{dt}\frac{dt}{dx} = x\frac{du}{dt} = \sqrt{2t}\frac{du}{dt}$$

And

$$\begin{aligned}
\frac{d^2u}{dx^2} &= \frac{d}{dx}\left(\frac{du}{dx}\right) \\
&= \frac{d}{dx}\left(x\frac{du}{dt}\right) \\
&= \frac{du}{dt} + x\frac{d^2u}{dt^2}\frac{dt}{dx} \\
&= \frac{du}{dt} + x\frac{d^2u}{dt^2}x \\
&= \frac{du}{dt} + x^2\frac{d^2u}{dt^2} \\
&= \frac{du}{dt} + 2t\frac{d^2u}{dt^2}
\end{aligned}$$

Hence (2) can be written as

$$\begin{aligned}
\sqrt{2t}\left(\frac{du}{dt} + 2t\frac{d^2u}{dt^2}\right) - \left(2(2t)+1\right)\sqrt{2t}\frac{du}{dt} + u(2t)^{\frac{3}{2}} &= 0 \\
\sqrt{2t}\frac{du}{dt} + \sqrt{2t}2t\frac{d^2u}{dt^2} - (4t+1)\sqrt{2t}\frac{du}{dt} + u\left(\sqrt{2t}\right)^3 &= 0 \\
\frac{du}{dt} + 2t\frac{d^2u}{dt^2} - (4t+1)\frac{du}{dt} + 2tu &= 0 \\
\frac{du}{dt} + 2t\frac{d^2u}{dt^2} - 4t\frac{du}{dt} - \frac{du}{dt} + 2tu &= 0 \\
2t\frac{d^2u}{dt^2} - 4t\frac{du}{dt} + 2tu &= 0 \\
2t\left(\frac{d^2u}{dt^2} - 2\frac{du}{dt} + u\right) &= 0
\end{aligned}$$

Hence

$$\frac{d^2u}{dt^2} - 2\frac{du}{dt} + u = 0$$

This is linear second order with constant coefficients. The indicial equation is $\lambda^2 - 2\lambda + 1 = 0$ with roots $\lambda = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{2 \pm \sqrt{4-4}}{2} = 1$ double root. Hence

$$u(t) = Ae^t + tBe^t$$

Since $t = \frac{x^2}{2}$ then

$$u(x) = Ae^{\frac{x^2}{2}} + \frac{x^2}{2}Be^{\frac{x^2}{2}}$$

But $y = -\frac{u'}{u}$ therefore

$$\begin{aligned} u' &= Axe^{\frac{x^2}{2}} + \left(xBe^{\frac{x^2}{2}} + \frac{x^2}{2} xBe^{\frac{x^2}{2}} \right) \\ &= Axe^{\frac{x^2}{2}} + xBe^{\frac{x^2}{2}} + \frac{x^3}{2} Be^{\frac{x^2}{2}} \end{aligned}$$

Hence

$$y = -\frac{Axe^{\frac{x^2}{2}} + xBe^{\frac{x^2}{2}} + \frac{x^3}{2} Be^{\frac{x^2}{2}}}{Ae^{\frac{x^2}{2}} + \frac{x^2}{2} Be^{\frac{x^2}{2}}} = -\frac{Axe^{\frac{x^2}{2}} + B\left(xe^{\frac{x^2}{2}} + \frac{x^3}{2} e^{\frac{x^2}{2}} \right)}{Ae^{\frac{x^2}{2}} + \frac{x^2}{2} Be^{\frac{x^2}{2}}}$$

Let $C = \frac{A}{B}$

$$\begin{aligned} y &= -\frac{xe^{\frac{x^2}{2}} \left(C + 1 + \frac{x^2}{2} \right)}{e^{\frac{x^2}{2}} \left(C + \frac{x^2}{2} \right)} \\ &= -\frac{x\left(C + 1 + \frac{x^2}{2} \right)}{C + \frac{x^2}{2}} \\ &= -\frac{x(2C + 2 + x^2)}{2C + x^2} \\ &= -\frac{x(C_1 + 2 + x^2)}{C_1 + x^2} \end{aligned}$$

Verification

```
restart;
ode:=x*diff(y(x),x)-x*y(x)^2-(2*x^2+1)*y(x)-x^3;
my_solution:=-(x*(_C1+2+x^2))/(_C1+x^2);
odetest(y(x)=my_solution,ode);
0
```

ODE No. 104

$$axy(x)^2 + bx + xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.118798 (sec), leaf count = 43

```
DSolve[b*x + 2*y[x] + a*x*y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{1}{ax} - \sqrt{\frac{b}{a}} \tan\left(ax\sqrt{\frac{b}{a}} - c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 63

```
dsolve(x*diff(y(x),x)+a*x*y(x)^2+2*y(x)+b*x = 0,y(x))
```

$$y(x) = -\frac{-\frac{i\sqrt{a}\sqrt{b}\,x-1}{x} + \frac{e^{-2i\sqrt{a}\sqrt{b}\,x}}{c_1 - \frac{ie^{-2i\sqrt{a}\sqrt{b}\,x}}{2\sqrt{a}\sqrt{b}}}}{a}$$

Hand solution

$xy' + axy^2 + 2y + bx = 0$This is Riccati non-linear first order. Converting it to standard form

$$\begin{aligned} y' &= -b - \frac{2}{x}y - ay^2 \\ &= f_0 + f_1 y + f_2 y^2 \end{aligned} \tag{1}$$

Using transformation suggested by Kamke $y = u(x) - \frac{1}{ax}$ then $y' = u' + \frac{1}{ax^2}$. Equating this to RHS of (1) gives

$$\begin{aligned} u' + \frac{1}{ax^2} &= -b - \frac{2}{x}\left(u - \frac{1}{ax}\right) - a\left(u - \frac{1}{ax}\right)^2 \\ &= -b - \frac{2}{x}u + \frac{2}{ax^2} - a\left(u^2 + \frac{1}{a^2x^2} - \frac{2u}{ax}\right) \\ &= -b - \frac{2}{x}u + \frac{2}{ax^2} - au^2 - \frac{1}{ax^2} + \frac{2u}{x} \end{aligned}$$

Hence

$$\begin{aligned} u' &= -b - au^2 \\ \frac{du}{dx} &= -b - au^2 \end{aligned}$$

This is separable

$$\frac{du}{b+au^2} = -dx$$

Integrating

$$\begin{aligned}
\int \frac{du}{b+au^2} &= -x + C \\
\frac{1}{\sqrt{ba}} \arctan\left(\frac{au}{\sqrt{ba}}\right) &= -x + C \\
\arctan\left(\frac{au}{\sqrt{ba}}\right) &= -\sqrt{ba}x + C \\
u &= \frac{\sqrt{ba}}{a} \tan\left(-\sqrt{ba}x + C\right)
\end{aligned}$$

Hence

$$\begin{aligned}
y &= u - \frac{1}{ax} \\
&= \frac{\sqrt{ba}}{a} \tan\left(-\sqrt{ba}x + C\right) - \frac{1}{ax}
\end{aligned}$$

Verification

```
restart;
ode:=x*diff(y(x),x)+a*x*y(x)^2+2*y(x)+b*x = 0;
my_solution:=sqrt(b*a)/a*tan(-sqrt(b*a)*x+_C1)-1/(a*x);
odetest(y(x)=my_solution,ode);
0
```

ODE No. 105

$$axy(x)^2 + by(x) + cx + d + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.221277 (sec), leaf count = 473

```
DSolve[d + c*x + b*y[x] + a*x*y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1\left(i\sqrt{a}e^{-i\sqrt{a}\sqrt{c}x}\left(b\left(-\sqrt{c}\right) - i\sqrt{a}d\right)U\left(1 - \frac{-\sqrt{c}b - i\sqrt{a}d}{2\sqrt{c}}, b+1, 2i\sqrt{a}\sqrt{c}x\right) - i\sqrt{a}\sqrt{c}e^{-i\sqrt{a}\sqrt{c}x}U\left(-\right.\right.\right.}{a\left(c_1 e^{-i\sqrt{a}\sqrt{c}x}U\left(-\frac{-\sqrt{c}b-i\sqrt{a}d}{2\sqrt{c}}, b,\right.\right.}$$

✓ **Maple** : cpu = 0.241 (sec), leaf count = 844

```
dsolve(x*diff(y(x),x)+a*x*y(x)^2+b*y(x)+c*x+d = 0,y(x))
```

$$y(x) = -\frac{4c^2\left(-\frac{c_1\left(a^3c^2d^2+a^2b^2c^3-2(-ac)^{\frac{3}{2}}abcd-2(-ac)^{\frac{5}{2}}bd\right)\text{KummerU}\left(\frac{(-ac)^{\frac{3}{2}}d+ac(2\sqrt{-ac}\,d+c(b+2))}{2c^2a}, \frac{(-ac)^{\frac{3}{2}}d+ac(\sqrt{-ac}}{c^2a}\right.}{4}\right.}{-c_1\left(a^2b^2c^4\sqrt{-ac} + 2ac\,d^2\,(-ac)^{\frac{5}{2}} + (-ac)^{\frac{7}{2}}\,d^2\right)\text{KummerU}\left(\frac{(-ac)^{\frac{3}{2}}d+ac(2\sqrt{-ac}\,d+c(b+2))}{2c^2a}, \frac{(-ac)^{\frac{3}{2}}d+ac(}{}\right.}$$

ODE No. 106

$$\frac{1}{2}(a-b)y(x)+x^a y(x)^2+x^b+xy'(x)=0$$

✓ **Mathematica** : cpu = 0.213631 (sec), leaf count = 40

```
DSolve[x^b + ((a - b)*y[x])/2 + x^a*y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.062 (sec), leaf count = 41

```
dsolve(x*diff(y(x),x)+x^a*y(x)^2+1/2*(a-b)*y(x)+x^b = 0,y(x))
```

$$y(x)=-\tan\left(\frac{2x^{\frac{a}{2}+\frac{b}{2}}+c_1(a+b)}{a+b}\right)x^{-\frac{a}{2}+\frac{b}{2}}$$

ODE No. 107

$$a x^{\alpha} y(x)^2 + b y(x) - c x^{\beta} + x y'(x) = 0$$

✓ **Mathematica** : cpu = 0.346546 (sec), leaf count = 1415

```
DSolve[-(c*x^beta) + b*y[x] + a*x^alpha*y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{x^{1-\alpha}\left((-1)^{\frac{\alpha-b}{\alpha+\beta}} a^{\frac{\alpha-b}{\alpha+\beta}+\frac{1}{2}\left(\frac{b}{\alpha+\beta}-\frac{\alpha}{\alpha+\beta}\right)} (\alpha+\beta)^{\frac{\alpha}{\alpha+\beta}-\frac{b}{\alpha+\beta}+1} \left(\alpha^2+2\beta\alpha+\beta^2\right)^{-\frac{\alpha-b}{\alpha+\beta}} \left(\frac{\alpha-b}{\alpha+\beta}+\frac{1}{2}\left(\frac{b}{\alpha+\beta}-\frac{\alpha}{\alpha+\right.\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.233 (sec), leaf count = 174

```
dsolve(x*diff(y(x),x)+a*x^alpha*y(x)^2+b*y(x)-c*x^beta = 0,y(x))
```

$$y(x) = -\frac{\left(\mathrm{BesselY}\left(\frac{b+\beta}{\alpha+\beta}, \frac{2\sqrt{-ac}\, x^{\frac{\alpha}{2}+\frac{\beta}{2}}}{\alpha+\beta}\right) c_1 + \mathrm{BesselJ}\left(\frac{b+\beta}{\alpha+\beta}, \frac{2\sqrt{-ac}\, x^{\frac{\alpha}{2}+\frac{\beta}{2}}}{\alpha+\beta}\right)\right) x^{\frac{\alpha}{2}+\frac{\beta}{2}} \sqrt{-ac}\, x^{1-\alpha}}{\left(\mathrm{BesselY}\left(\frac{b-\alpha}{\alpha+\beta}, \frac{2\sqrt{-ac}\, x^{\frac{\alpha}{2}+\frac{\beta}{2}}}{\alpha+\beta}\right) c_1 + \mathrm{BesselJ}\left(\frac{b-\alpha}{\alpha+\beta}, \frac{2\sqrt{-ac}\, x^{\frac{\alpha}{2}+\frac{\beta}{2}}}{\alpha+\beta}\right)\right) a x}$$

ODE No. 108

$$xy'(x) + y(x) + y(x)^2(-\log(x)) = 0$$

✓ **Mathematica** : cpu = 0.0744407 (sec), leaf count = 15

```
DSolve[y[x] - Log[x]*y[x]^2 + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{\log(x) + c_1 x + 1}\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 13

```
dsolve(x*diff(y(x),x)-y(x)^2*ln(x)+y(x) = 0,y(x))
```

$$y(x) = \frac{1}{1 + c_1 x + \ln(x)}$$

Hand solution

$xy' + axy^2 + 2y + bx = 0$This is Riccati non-linear first order. Converting it to standard form

$$xy' - y^2 \ln x + y = 0 \tag{1}$$

$$\begin{aligned} y' &= -\frac{1}{x}y + y^2\frac{\ln x}{x} \\ &= f_0 + f_1 y + f_2 y^2 \end{aligned}$$

This is Bernoulli non-linear first order ODE since $f_0 = 0$. Dividing by y^2 gives

$$\frac{y'}{y^2} = -\frac{1}{x}\frac{1}{y} + \frac{\ln x}{x}$$

Let $u = \frac{1}{y}$, hence $u' = -\frac{y'}{y^2}$, and the above becomes

$$\begin{aligned} -u' &= -\frac{1}{x}u + \frac{\ln x}{x} \\ u' - \frac{1}{x}u &= -\frac{\ln x}{x} \end{aligned}$$

Integrating factor is $\mu = e^{\int -\frac{1}{x}dx} = e^{-\ln x} = \frac{1}{x}$, hence

$$d(\mu u) = -\mu\frac{\ln x}{x}$$

Integrating

$$\begin{aligned}\frac{1}{x}u &= -\int \frac{1}{x^2}\ln x dx + C \\ &= -\left(-\frac{\ln x}{x} - \frac{1}{x}\right) + C\end{aligned}$$

Therefore

$$u = \ln x + 1 + Cx$$

Since $u = \frac{1}{y}$ then

$$y = \frac{1}{\ln x + 1 + Cx}$$

Verification

```
restart;
ode:=x*diff(y(x),x)-y(x)^2*ln(x)+y(x)=0;
my_solution:=1/(ln(x)+1+_C1*x);
odetest(y(x)=my_solution,ode);
0
```

ODE No. 109

$$xy'(x) - y(x)(2y(x)\log(x) - 1) = 0$$

✓ **Mathematica** : cpu = 0.0749469 (sec), leaf count = 17

```
DSolve[-(y[x]*(-1 + 2*Log[x]*y[x])) + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.019 (sec), leaf count = 15

```
dsolve(x*diff(y(x),x)-y(x)*(2*y(x)*ln(x)-1) = 0,y(x))
```

$$y(x) = \frac{1}{2 + c_1 x + 2\ln(x)}$$

Hand solution

$xy' + axy^2 + 2y + bx = 0$This is Riccati non-linear first order. Converting it to standard form

$$\begin{aligned} xy' - y(2y\ln x - 1) &= 0 \\ xy' &= y(2y\ln x - 1) \\ y' &= -\frac{1}{x}y + y^2\frac{2}{x}\ln x \\ y' &= f_0 + f_1 y + f_2 y^2 \end{aligned} \tag{1}$$

This is Bernoulli non-linear first order ODE since $f_0 = 0$. Dividing by y^2 gives

$$\frac{y'}{y^2} = -\frac{1}{x}\frac{1}{y} + \frac{2}{x}\ln x$$

Putting $u = \frac{1}{y}$, hence $u' = -\frac{y'}{y^2}$, and the above becomes

$$\begin{aligned} -u' &= -\frac{1}{x}u + 2\frac{\ln x}{x} \\ -u' + \frac{1}{x}u &= 2\frac{\ln x}{x} \\ u' - \frac{1}{x}u &= -2\frac{\ln x}{x} \end{aligned}$$

Integrating factor is $\mu = e^{\int -\frac{1}{x}dx} = e^{-\ln x} = \frac{1}{x}$, hence

$$\begin{aligned} d(\mu u) &= -2\mu\frac{\ln x}{x} \\ d\left(\frac{1}{x}u\right) &= -2\frac{\ln x}{x^2} \end{aligned}$$

Integrating

$$\begin{aligned}\frac{1}{x}u &= -2\int \frac{1}{x^2}\ln x dx + C \\ &= -2\left(-\frac{\ln x}{x} - \frac{1}{x}\right) + C\end{aligned}$$

Therefore

$$\begin{aligned}u &= -2x\left(-\frac{\ln x}{x} - \frac{1}{x}\right) + Cx \\ &= 2(\ln x + 1) + Cx\end{aligned}$$

Since $u = \frac{1}{y}$ then

$$y = \frac{1}{2\left(\ln x + 1\right) + Cx}$$

Verification

```
restart;
ode:=x*diff(y(x),x)-y(x)*(2*y(x)*ln(x)-1)=0;
my_solution:=1/(2*(ln(x)+1)+_C1*x);
odetest(y(x)=my_solution,ode);
0
```

ODE No. 110

$$f(x)\left(y(x)^2-x^2\right)+xy'(x)=0$$

✗ **Mathematica** : cpu = 12.552 (sec), leaf count = 0

```
DSolve[f[x]*(-x^2 + y[x]^2) + x*Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[f[x]*(-x^2 + y[x]^2) + x*Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x*diff(y(x),x)+f(x)*(y(x)^2-x^2) = 0,y(x))
```

, could not solve

```
dsolve(x*diff(y(x),x)+f(x)*(y(x)^2-x^2) = 0,y(x))
```

Hand solution

$xy'+axy^2+2y+bx=0$This is Riccati non-linear first order. Converting it to standard form

$$\begin{aligned} xy'+f(x)\left(y^2-x^2\right)-y&=0\\ xy'&=-f\left(y^2-x^2\right)+y\\ y'&=-\frac{f}{x}y^2+fx+\frac{1}{x}y \end{aligned} \tag{1}$$

This is Riccati non-linear first order oder. There are two particular solutions $y_p=\pm x$. Using $y_p=x$, then using the transformation $y=y_p+\frac{1}{u}$, gives $y'=1-\frac{u'}{u^2}$ and (1) becomes

$$\begin{aligned} 1-\frac{u'}{u^2}&=-\frac{f}{x}\left(x+\frac{1}{u}\right)^2+fx+\frac{1}{x}\left(x+\frac{1}{u}\right)\\ &=-\frac{f}{x}\left(x^2+\frac{1}{u^2}+2\frac{x}{u}\right)+fx+\left(1+\frac{1}{ux}\right)\\ &=-fx-\frac{f}{x}\frac{1}{u^2}-2\frac{f}{u}+fx+1+\frac{1}{ux}\\ &=-\frac{f}{x}\frac{1}{u^2}-2\frac{f}{u}+1+\frac{1}{ux} \end{aligned}$$

Hence

$$\begin{aligned} u^2 - u' &= -\frac{f}{x} - 2fu + u^2 + \frac{u}{x} \\ -u' &= -\frac{f}{x} - 2fu + \frac{u}{x} \\ -u' - \frac{u}{x} + 2fu &= \frac{-f}{x} \\ u' + \frac{u}{x} - 2fu &= \frac{-f}{x} \\ u' + u\left(\frac{1}{x} - 2f\right) &= \frac{-f}{x} \end{aligned}$$

Integrating factor is $\mu = e^{\int \frac{1}{x} - 2f} = e^{\ln x} e^{-2\int f dx} = x e^{-2\int f dx}$, hence

$$\begin{aligned} d(\mu u) &= -\mu \frac{f}{x} \\ d\left(x e^{-2\int f dx} u\right) &= -\left(x e^{-2\int f dx}\right) \frac{f}{x} \\ d\left(x e^{-2\int f dx} u\right) &= -f\left(e^{-2\int f dx}\right) \end{aligned}$$

Integrating

$$\begin{aligned} x e^{-2\int f dx} u &= -\int f\left(e^{-2\int f dx}\right) + C \\ u &= -\frac{1}{x} e^{2\int f dx} \int f\left(e^{-2\int f dx}\right) + C \frac{1}{x} e^{2\int f dx} \end{aligned}$$

Since $u = \frac{1}{y}$ then

$$\begin{aligned} y &= \frac{1}{-\frac{1}{x} e^{2\int f dx} \int f\left(e^{-2\int f dx}\right) + C \frac{1}{x} e^{2\int f dx}} \\ &= \frac{x e^{-2\int f dx}}{-\int f e^{-2\int f dx} dx + C} \end{aligned}$$

Verification (Maple does not verify it, need to look more into this)

```
ode:=x*diff(y(x),x)+f(x)*(y(x)^2-x^2) =0;
dsolve(ode,y(x));
fint:=Int(f(x),x);
my_solution:=x*exp(-2*fint)/(-Int(f*exp(-2*fint),x)+_C1);
odetest(y(x)=my_solution,ode);
not zero
```

ODE No. 111

$$xy'(x) + y(x)^3 + 3xy(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.464474 (sec), leaf count = 55

```
DSolve[3*x*y[x]^2 + y[x]^3 + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[-3x = \frac{2e^{\frac{1}{2}\left(\frac{1}{y(x)}-3x\right)^2}}{\sqrt{2\pi}\,\text{erfi}\left(\frac{\frac{1}{y(x)}-3x}{\sqrt{2}}\right) + 2c_1}, y(x)\right]$$

✓ **Maple** : cpu = 0.119 (sec), leaf count = 54

```
dsolve(x*diff(y(x),x)+y(x)^3+3*x*y(x)^2 = 0,y(x))
```

$$c_1 - \frac{i\mathrm{e}^{\frac{(3xy(x)-1)^2}{2y(x)^2}}}{3x} + \frac{\text{erf}\left(\frac{(-i+3iy(x)x)\sqrt{2}}{2y(x)}\right)\sqrt{2}\sqrt{\pi}}{2} = 0$$

ODE No. 112

$$-\sqrt{x^2+y(x)^2}+xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.111233 (sec), leaf count = 13

```
DSolve[-y[x] - Sqrt[x^2 + y[x]^2] + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to x\sinh(\log(x)+c_1)\}\}$$

✓ **Maple** : cpu = 0.045 (sec), leaf count = 27

```
dsolve(x*diff(y(x),x)-(y(x)^2+x^2)^(1/2)-y(x) = 0,y(x))
```

$$\frac{\sqrt{y\left(x\right)^2+x^2}}{x^2}+\frac{y(x)}{x^2}-c_1=0$$

Hand solution

$$xy'=\sqrt{x^2+y^2}+y$$

Let $y=xv$, then $y'=v+xv'$ and the above becomes

$$\begin{aligned}x(v+xv')&=\sqrt{x^2+\left(xv\right)^2}+xv\\x(v+xv')&=x\sqrt{1+v^2}+xv\\(v+xv')&=\sqrt{1+v^2}+v\\xv'&=\sqrt{1+v^2}\end{aligned}$$

Separable.

$$\frac{dv}{\sqrt{1+v^2}}=\frac{1}{x}dx$$

Integrating

$$\begin{aligned}\operatorname{arcsinh}\left(v\right)&=\ln x+C\\v&=\sinh\left(\ln x+C\right)\end{aligned}$$

Since $y=xv$ then

$$y = x \sinh (\ln x + C)$$

Verification

```
ode:=x*diff(y(x),x)=sqrt(x^2+y(x)^2)+y(x);
y0:=x*sinh(ln(x)+_C1);
odetest(y(x)=y0,ode) assuming x>= 0;
0
```

ODE No. 113

$$a\sqrt{x^2+y(x)^2}+xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.117947 (sec), leaf count = 16

```
DSolve[-y[x] + a*Sqrt[x^2 + y[x]^2] + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to x\sinh(-a\log(x)+c_1)\}\}$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 33

```
dsolve(x*diff(y(x),x)+a*(y(x)^2+x^2)^(1/2)-y(x) = 0,y(x))
```

$$\frac{x^a\sqrt{y\left(x\right)^2+x^2}}{x}+\frac{x^a y(x)}{x}-c_1=0$$

Hand solution

$$xy'=-a\sqrt{x^2+y^2}+y$$

Let $y=xv$, then $y'=v+xv'$ and the above becomes

$$\begin{aligned}x(v+xv')&=-a\sqrt{x^2+(xv)^2}+xv\\x(v+xv')&=-ax\sqrt{1+v^2}+xv\\(v+xv')&=-a\sqrt{1+v^2}+v\\xv'&=-a\sqrt{1+v^2}\end{aligned}$$

Separable.

$$\frac{dv}{\sqrt{1+v^2}}=\frac{-a}{x}dx$$

Integrating

$$\begin{aligned}\operatorname{arcsinh}\left(v\right)&=-a\ln x+C\\v&=\sinh\left(C-a\ln x\right)\end{aligned}$$

Since $y=xv$ then

$$y = x \sinh\left(C - a \ln x\right)$$

Verification

```
ode:=x*diff(y(x),x)=-a*sqrt(x^2+y(x)^2)+y(x);
y0:=x*sinh(_C1-a*ln(x));
odetest(y(x)=y0,ode) assuming x >=0;
0
```

ODE No. 114

$$-x\sqrt{x^2+y(x)^2}+xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.109527 (sec), leaf count = 12

```
DSolve[-y[x] - x*Sqrt[x^2 + y[x]^2] + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 3.156 (sec), leaf count = 28

```
dsolve(x*diff(y(x),x)-x*(y(x)^2+x^2)^(1/2)-y(x) = 0,y(x))
```

$$\ln\left(\sqrt{y\left(x\right)^{2}+x^{2}}+y(x)\right)-x-\ln\left(x\right)-c_1=0$$

Hand solution

$$xy'=x\sqrt{x^2+y^2}+y$$

Let $y=xv$, then $y'=v+xv'$ and the above becomes

$$\begin{aligned}x(v+xv')&=x\sqrt{x^2+(xv)^2}+xv\\(v+xv')&=x\sqrt{1+v^2}+v\\xv'&=x\sqrt{1+v^2}\\v'&=\sqrt{1+v^2}\end{aligned}$$

Separable.

$$\frac{dv}{\sqrt{1+v^2}}=dx$$

Integrating

$$\begin{aligned}\operatorname{arcsinh}\left(v\right)&=x+C\\v&=\sinh\left(x+C\right)\end{aligned}$$

Since $y=xv$ then

$$y=x\sinh\left(x+C\right)$$

Verification

```
ode:=x*diff(y(x),x)=x*sqrt(x^2+y(x)^2)+y(x);
y0:=x*sinh(x+_C1);
odetest(y(x)=y0,ode) assuming x>0;
0
```

ODE No. 115

$$-x(y(x)-x)\sqrt{x^2+y(x)^2}+xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.288563 (sec), leaf count = 221

```
DSolve[-y[x] - x*(-x + y[x])*Sqrt[x^2 + y[x]^2] + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{x-2\sqrt{x^2\tanh^2\left(\frac{1}{2}\left(-\sqrt{2}x^2-2\sqrt{2}c_1\right)\right)-x^2\tanh^4\left(\frac{1}{2}\left(-\sqrt{2}x^2-2\sqrt{2}c_1\right)\right)}}{-1+2\tanh^2\left(\frac{1}{2}\left(-\sqrt{2}x^2-2\sqrt{2}c_1\right)\right)}\right\},\left\{y(x)\to \frac{x+2\sqrt{}}{}\right.$$

✓ **Maple** : cpu = 0.209 (sec), leaf count = 49

```
dsolve(x*diff(y(x),x)-x*(y(x)-x)*(y(x)^2+x^2)^(1/2)-y(x) = 0,y(x))
```

$$\ln\left(\frac{2x\left(\sqrt{2y\left(x\right)^2+2x^2}+y(x)+x\right)}{y\left(x\right)-x}\right)+\frac{\sqrt{2}\,x^2}{2}-\ln\left(x\right)-c_1=0$$

Hand solution

$$xy'=x(y-x)\sqrt{y^2-x^2}+y$$

Let $y=xu$, then $y'=u+xu'$ and the above becomes

$$\begin{aligned}x(u+xu')&=x(xu-x)\sqrt{(xu)^2-x^2}+xu\\(u+xu')&=(xu-x)\sqrt{(xu)^2-x^2}+u\\xu'&=(xu-x)\,x\sqrt{u^2-1}\\u'&=x(u-1)\sqrt{u^2-1}\end{aligned}$$

Separable.

$$\begin{aligned}\frac{du}{(u-1)\sqrt{u^2-1}}&=xdx\\\frac{-u-1}{\sqrt{u^2-1}}&=\frac{x^2}{2}+C\end{aligned}$$

But $y = xu$, hence

$$\frac{-\frac{y}{x} - 1}{\sqrt{\left(\frac{y}{x}\right)^2 - 1}} = \frac{x^2}{2} + C$$

Let $\frac{y}{x} = z$

$$\begin{aligned}
\frac{-z-1}{\sqrt{z^2-1}} &= \frac{x^2}{2} + C \\
-z - 1 &= \sqrt{z^2-1}\left(\frac{x^2}{2} + C\right) \\
(-z-1)^2 &= \left(z^2-1\right)\left(\frac{x^2}{2} + C\right)^2 \\
z^2 + 1 + 2z &= z^2\left(\frac{x^2}{2} + C\right)^2 - \left(\frac{x^2}{2} + C\right)^2 \\
z^2\left(1 - \left(\frac{x^2}{2} + C\right)^2\right) + 2z + 1 + \left(\frac{x^2}{2} + C\right)^2 &= 0
\end{aligned}$$

Solving for z (quadratic formula, some conditions apply), one of the solutions is

$$z = \frac{4Cx^2 + 4C^2 + x^4 + 4}{4Cx^2 + 4C^2 + x^4 - 4}$$

Hence

$$y = x\frac{4Cx^2 + 4C^2 + x^4 + 4}{4Cx^2 + 4C^2 + x^4 - 4}$$

Need to work on verification. Kamke gives the final solution as

$$y = x\frac{-2Cx^2 + C^2 + x^4 + 4}{-2Cx^2 + C^2 + x^4 - 4}$$

I am not sure where my error now is. Need to look at this again.

ODE No. 116

$$-x\sqrt{(y(x)^2-4x^2)\,(y(x)^2-x^2)}+xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.547666 (sec), leaf count = 121

```
DSolve[-y[x] - x*Sqrt[(-4*x^2 + y[x]^2)*(-x^2 + y[x]^2)] + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{\sqrt{\frac{\frac{y(x)}{x}+2}{\frac{y(x)}{x}-1}}\sqrt{\frac{\frac{y(x)}{x}+1}{\frac{2y(x)}{x}+4}}F\left(\sin^{-1}\left(\sqrt{\frac{2}{3}}\sqrt{\frac{\frac{y(x)}{x}-2}{\frac{y(x)}{x}-1}}\right)|\frac{9}{8}\right)}{\sqrt{\frac{\frac{y(x)}{x}+1}{\frac{y(x)}{x}-1}}}=\frac{x^2}{2}+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.229 (sec), leaf count = 86

```
dsolve(x*diff(y(x),x)-x*((y(x)^2-x^2)*(y(x)^2-4*x^2))^(1/2)-y(x) = 0,y(x))
```

$$\int_{\_b}^{x}\frac{\_a\sqrt{4\_a^4-5\_a^2y\left(x\right)^2+y\left(x\right)^4}+y(x)}{\sqrt{4\_a^4-5\_a^2y\left(x\right)^2+y\left(x\right)^4}}d\_a+\int^{y(x)}-\frac{\_b}{\sqrt{4\_b^4-5\_b^2\_f^2+\_f^4}}d\_f+c_1=0$$

ODE No. 117

$$xy'(x) + x\left(-e^{\frac{y(x)}{x}}\right) - y(x) - x = 0$$

✓ **Mathematica** : cpu = 0.180097 (sec), leaf count = 21

```
DSolve[-x - E^(y[x]/x)*x - y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.106 (sec), leaf count = 20

```
dsolve(x*diff(y(x),x)-x*exp(y(x)/x)-y(x)-x = 0,y(x))
```

$$y(x) = \left(\ln\left(-\frac{x}{-1 + x\,\mathrm{e}^{c_1}}\right) + c_1\right) x$$

ODE No. 118

$$xy'(x) - y(x)\log(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.0759239 (sec), leaf count = 13

```
DSolve[-(Log[y[x]]*y[x]) + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.08 (sec), leaf count = 8

```
dsolve(x*diff(y(x),x)-y(x)*ln(y(x)) = 0,y(x))
```

$$y(x) = \mathrm{e}^{c_1 x}$$

ODE No. 119

$$xy'(x) - y(x)(\log(xy(x)) - 1) = 0$$

✓ **Mathematica** : cpu = 0.101636 (sec), leaf count = 17

```
DSolve[-((-1 + Log[x*y[x]])*y[x]) + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.062 (sec), leaf count = 14

```
dsolve(x*diff(y(x),x)-y(x)*(ln(x*y(x))-1) = 0,y(x))
```

$$y(x) = \frac{\mathrm{e}^{\frac{x}{c_1}}}{x}$$

ODE No. 120

$$xy'(x) - y(x)\left(x\log\left(\frac{x^2}{y(x)}\right) + 2\right) = 0$$

✓ **Mathematica** : cpu = 0.1124 (sec), leaf count = 20

```
DSolve[-((2 + x*Log[x^2/y[x]])*y[x]) + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.18 (sec), leaf count = 17

```
dsolve(x*diff(y(x),x)-y(x)*(x*ln(x^2/y(x))+2) = 0,y(x))
```

$$y(x) = x^2 \mathrm{e}^{-\mathrm{e}^{-x} c_1}$$

ODE No. 121

$$xy'(x) - \sin(x - y(x)) = 0$$

✗ **Mathematica** : cpu = 1.92951 (sec), leaf count = 0

```
DSolve[-Sin[x - y[x]] + x*Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-Sin[x - y[x]] + x*Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x*diff(y(x),x)-sin(x-y(x)) = 0,y(x))
```

, could not solve

```
dsolve(x*diff(y(x),x)-sin(x-y(x)) = 0,y(x))
```

ODE No. 122

$$\cos(y(x))\left(\sin(y(x))-3x^2\cos(y(x))\right)+xy'(x)=0$$

✓ **Mathematica** : cpu = 0.299695 (sec), leaf count = 21

```
DSolve[Cos[y[x]]*(-3*x^2*Cos[y[x]] + Sin[y[x]]) + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \tan^{-1}\left(\frac{2x^3+c_1}{2x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.495 (sec), leaf count = 16

```
dsolve(x*diff(y(x),x)+(sin(y(x))-3*x^2*cos(y(x)))*cos(y(x)) = 0,y(x))
```

$$y(x)=\arctan\left(\frac{x^3+2c_1}{x}\right)$$

ODE No. 123

$$xy'(x) - y(x) - x \sin\left(\frac{y(x)}{x}\right) = 0$$

✓ **Mathematica** : cpu = 0.127073 (sec), leaf count = 19

```
DSolve[-(x*Sin[y[x]/x]) - y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.081 (sec), leaf count = 44

```
dsolve(x*diff(y(x),x)-x*sin(y(x)/x)-y(x) = 0,y(x))
```

$$y(x) = \arctan\left(\frac{2xc_1}{x^2c_1^2+1}, \frac{-x^2c_1^2+1}{x^2c_1^2+1}\right) x$$

ODE No. 124

$$xy'(x) - y(x) + x\cos\left(\frac{y(x)}{x}\right) + x = 0$$

✓ **Mathematica** : cpu = 0.101657 (sec), leaf count = 16

```
DSolve[x + x*Cos[y[x]/x] - y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to 2x\tan^{-1}(-\log(x) + c_1)\}\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 12

```
dsolve(x*diff(y(x),x)+x*cos(y(x)/x)-y(x)+x = 0,y(x))
```

$$y(x) = -2\arctan\left(\ln\left(x\right) + c_1\right)x$$

ODE No. 125

$$xy'(x) - y(x) + x \tan\left(\frac{y(x)}{x}\right) = 0$$

✓ **Mathematica** : cpu = 0.190442 (sec), leaf count = 16

```
DSolve[x*Tan[y[x]/x] - y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.069 (sec), leaf count = 14

```
dsolve(x*diff(y(x),x)+x*tan(y(x)/x)-y(x) = 0,y(x))
```

$$y(x) = \arcsin\left(\frac{1}{xc_1}\right) x$$

ODE No. 126

$$xy'(x) - y(x)f(xy(x)) = 0$$

✓ **Mathematica** : cpu = 0.182382 (sec), leaf count = 115

```
DSolve[-(f[x*y[x]]*y[x]) + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{1}{(-f(xK[2])-1)K[2]} - \int_1^{x} \left(\frac{f'(K[1]K[2])}{f(K[1]K[2])+1} - \frac{f(K[1]K[2])f'(K[1]K[2])}{(f(K[1]K[2])+1)^2}\right) dK[1]\right) dK[2\right.$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 29

```
dsolve(x*diff(y(x),x)-y(x)*f(x*y(x)) = 0,y(x))
```

$$y(x) = \frac{\text{RootOf}\left(-\ln(x) + c_1 + \int^{-Z} \frac{1}{\_a(1+f(\_a))} d\_a\right)}{x}$$

ODE No. 127

$$xy'(x) - y(x)f\left(x^a y(x)^b\right) = 0$$

✓ **Mathematica** : cpu = 0.276621 (sec), leaf count = 186

```
DSolve[-(f[x^a*y[x]^b]*y[x]) + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{b}{(a+bf\left(x^a K[2]^b\right))\,K[2]} - \int_1^{x} \left(\frac{b^2 K[1]^{a-1} K[2]^{b-1} f'\left(K[1]^a K[2]^b\right)}{a+bf\left(K[1]^a K[2]^b\right)} - \frac{b^3 f\left(K[1]^a K[2]^b\right) K[1]}{(a+bf\left(\right.}\right.\right.$$

✓ **Maple** : cpu = 0.12 (sec), leaf count = 39

```
dsolve(x*diff(y(x),x)-y(x)*f(x^a*y(x)^b) = 0,y(x))
```

$$\int_{\_b}^{y(x)} \frac{1}{\left(f\left(x^a \_a^b\right) b + a\right) \_a} d\_a - \frac{\ln(x)}{b} - c_1 = 0$$

ODE No. 128

$$-f(x)g(x^a y(x)) + ay(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 3.05133 (sec), leaf count = 41

```
DSolve[-(f[x]*g[x^a*y[x]]) + a*y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{x^a y(x)} \frac{1}{g(K[1])} dK[1] = \int_1^x f(K[2])K[2]^{a-1} dK[2] + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.285 (sec), leaf count = 33

```
dsolve(x*diff(y(x),x)+a*y(x)-f(x)*g(x^a*y(x)) = 0,y(x))
```

$$y(x) = \text{RootOf}\left(-\left(\int x^{a-1} f(x)\, dx\right) + \int^{\_Z} \frac{1}{g\left(\_a\right)} d\_a + c_1\right) x^{-a}$$

ODE No. 129

$$(x+1)y'(x)+y(x)(y(x)-x)=0$$

✓ **Mathematica** : cpu = 0.192605 (sec), leaf count = 44

```
DSolve[y[x]*(-x + y[x]) + (1 + x)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{e^{x+1}}{-x\text{Ei}(x+1)-\text{Ei}(x+1)+e^{x+1}-ec_1x-ec_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 33

```
dsolve((1+x)*diff(y(x),x)+y(x)*(y(x)-x) = 0,y(x))
```

$$y(x)=\frac{\mathrm{e}^{x}}{-\mathrm{e}^{-1}\left(1+x\right)\mathrm{expIntegral}\left(1,-1-x\right)-\mathrm{e}^{x}+c_1\left(1+x\right)}$$

ODE No. 130

$$-2x^3 + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0185268 (sec), leaf count = 21

```
DSolve[-2*x^3 - y[x] + 2*x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{2x^3}{5} + c_1\sqrt{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.009 (sec), leaf count = 15

```
dsolve(2*x*diff(y(x),x)-y(x)-2*x^3 = 0,y(x))
```

$$y(x) = \frac{2x^3}{5} + \sqrt{x}\, c_1$$

ODE No. 131

$$(2x+1)y'(x) - 4e^{-y(x)} + 2 = 0$$

✓ **Mathematica** : cpu = 0.213651 (sec), leaf count = 21

```
DSolve[2 - 4/E^y[x] + (1 + 2*x)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.185 (sec), leaf count = 31

```
dsolve((2*x+1)*diff(y(x),x)-4*exp(-y(x))+2 = 0,y(x))
```

$$y(x) = -\ln\left(\frac{2x+1}{-1+(4x+2)\,\mathrm{e}^{2c_1}}\right) - 2c_1$$

ODE No. 132

$$3xy'(x) - y(x) - 3xy(x)^4 \log(x) = 0$$

✓ **Mathematica** : cpu = 0.0898331 (sec), leaf count = 115

```
DSolve[-y[x] - 3*x*Log[x]*y[x]^4 + 3*x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{(-2)^{2/3}\sqrt[3]{x}}{\sqrt[3]{3x^2 - 6x^2\log(x) + 4c_1}}\right\}, \left\{y(x) \to \frac{2^{2/3}\sqrt[3]{x}}{\sqrt[3]{3x^2 - 6x^2\log(x) + 4c_1}}\right\}, \left\{y(x) \to -\frac{\sqrt[3]{-1}2^{2/3}}{\sqrt[3]{3x^2 - 6x^2\log}}\right.\right.$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 153

```
dsolve(3*x*diff(y(x),x)-3*x*ln(x)*y(x)^4-y(x) = 0,y(x))
```

$$y(x) = \frac{\left(-4x(6x^2\ln(x) - 3x^2 - 4c_1)^2\right)^{\frac{1}{3}}}{6x^2\ln(x) - 3x^2 - 4c_1}$$

ODE No. 133

$$x^2 y'(x) + y(x) - x = 0$$

✓ **Mathematica** : cpu = 0.0173052 (sec), leaf count = 27

```
DSolve[-x + y[x] + x^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -e^{\frac{1}{x}} \text{Ei}\left(-\frac{1}{x}\right) + c_1 e^{\frac{1}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 16

```
dsolve(x^2*diff(y(x),x)+y(x)-x = 0,y(x))
```

$$y(x) = \left(\text{expIntegral}\left(1, \frac{1}{x}\right) + c_1\right) \mathrm{e}^{\frac{1}{x}}$$

ODE No. 134

$$x^2 y'(x) + e^{x-\frac{1}{x}} x^2 - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0452343 (sec), leaf count = 27

```
DSolve[E^(-x^(-1) + x)*x^2 - y[x] + x^2*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.008 (sec), leaf count = 17

```
dsolve(x^2*diff(y(x),x)-y(x)+x^2*exp(x-1/x) = 0,y(x))
```

$$y(x) = \left(-\mathrm{e}^{x} + c_1\right) \mathrm{e}^{-\frac{1}{x}}$$

ODE No. 135

$$x^2 y'(x) - (x-1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.018228 (sec), leaf count = 14

```
DSolve[-((-1 + x)*y[x]) + x^2*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.008 (sec), leaf count = 11

```
dsolve(x^2*diff(y(x),x)-(x-1)*y(x) = 0,y(x))
```

$$y(x) = c_1 x \, \mathrm{e}^{\frac{1}{x}}$$

ODE No. 136

$$x^2 y'(x) + x^2 + xy(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0814146 (sec), leaf count = 28

```
DSolve[x^2 + x*y[x] + y[x]^2 + x^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{-x + x\log(x) - c_1 x}{-\log(x) + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 18

```
dsolve(x^2*diff(y(x),x)+y(x)^2+x*y(x)+x^2 = 0,y(x))
```

$$y(x) = -\frac{x(\ln(x) + c_1 - 1)}{\ln(x) + c_1}$$

ODE No. 137

$$x^2 y'(x) - xy(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0827759 (sec), leaf count = 16

```
DSolve[-(x*y[x]) - y[x]^2 + x^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{x}{-\log(x) + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 14

```
dsolve(x^2*diff(y(x),x)-y(x)^2-x*y(x) = 0,y(x))
```

$$y(x) = \frac{x}{-\ln(x) + c_1}$$

ODE No. 138

$$x^2 y'(x) - x^2 - xy(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0784615 (sec), leaf count = 13

```
DSolve[-x^2 - x*y[x] - y[x]^2 + x^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to x \tan(\log(x) + c_1)\}\}$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 11

```
dsolve(x^2*diff(y(x),x)-y(x)^2-x*y(x)-x^2 = 0,y(x))
```

$$y(x) = \tan\left(\ln\left(x\right) + c_1\right) x$$

ODE No. 139

$$ax^k-(b-1)b+x^2\left(y'(x)+y(x)^2\right)=0$$

✓ **Mathematica** : cpu = 0.231431 (sec), leaf count = 821

```
DSolve[-((-1 + b)*b) + a*x^k + x^2*(y[x]^2 + Derivative[1][y][x]) == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{a^{\frac{b}{k}+\frac{1}{2}\left(\frac{1}{k}-\frac{2b}{k}\right)}\left(\frac{b}{k}+\frac{1}{2}\left(\frac{1}{k}-\frac{2b}{k}\right)\right)x^{k-1}\left(x^k\right)^{\frac{b}{k}+\frac{1}{2}\left(\frac{1}{k}-\frac{2b}{k}\right)-1}J_{\frac{2b-1}{k}}\left(\frac{2\sqrt{a}\sqrt{x^k}}{k}\right)\Gamma\left(\frac{2b}{k}-\frac{1}{k}+1\right)k^{1-\frac{1}{k}}+\frac{1}{2}a^{\frac{b}{k}}\right.\right.$$

✓ **Maple** : cpu = 0.129 (sec), leaf count = 219

```
dsolve(x^2*(diff(y(x),x)+y(x)^2)+a*x^k-b*(b-1) = 0,y(x))
```

$$y(x)=\frac{-2\,\mathrm{BesselJ}\left(\frac{\sqrt{(-1+2b)^2}+k}{k},\frac{2\sqrt{a}\,x^{\frac{k}{2}}}{k}\right)\sqrt{a}\,x^{\frac{k}{2}}-2x^{\frac{k}{2}}\,\mathrm{BesselY}\left(\frac{\sqrt{(-1+2b)^2}+k}{k},\frac{2\sqrt{a}\,x^{\frac{k}{2}}}{k}\right)\sqrt{a}\,c_1+2\left(\frac{1}{2}+(b-\right.}{2x\left(\mathrm{BesselY}\left(\frac{\sqrt{(-1+2b)^2}}{k},\frac{2\sqrt{a}\,x^{\frac{k}{2}}}{k}\right)c_1+\mathrm{Bes}\right.}$$

ODE No. 140

$$x^2\left(y'(x)+y(x)^2\right)+4xy(x)+2=0$$

✓ **Mathematica** : cpu = 0.0917137 (sec), leaf count = 17

```
DSolve[2 + 4*x*y[x] + x^2*(y[x]^2 + Derivative[1][y][x]) == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.095 (sec), leaf count = 20

```
dsolve(x^2*(diff(y(x),x)+y(x)^2)+4*x*y(x)+2 = 0,y(x))
```

$$y(x)=\frac{-2c_1+x}{x\left(-x+c_1\right)}$$

ODE No. 141

$$axy(x)+b+x^2\left(y'(x)+y(x)^2\right)=0$$

✓ **Mathematica** : cpu = 0.131508 (sec), leaf count = 67

```
DSolve[b + a*x*y[x] + x^2*(y[x]^2 + Derivative[1][y][x]) == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{a}{2x}-\frac{-1+\sqrt{a^2-2a-4b+1}\left(-1+\frac{2c_1}{x^{\sqrt{a^2-2a-4b+1}}+c_1}\right)}{2x}\right\}\right\}$$

✓ **Maple** : cpu = 0.059 (sec), leaf count = 51

```
dsolve(x^2*(diff(y(x),x)+y(x)^2)+a*x*y(x)+b = 0,y(x))
```

$$y(x)=\frac{-\tanh\left(\frac{\sqrt{a^2-2a-4b+1}\,(-\ln(x)+c_1)}{2}\right)\sqrt{a^2-2a-4b+1}-a+1}{2x}$$

ODE No. 142

$$-ax^2y(x)+ax+x^2\left(y'(x)-y(x)^2\right)+2=0$$

✓ **Mathematica** : cpu = 0.200223 (sec), leaf count = 122

```
DSolve[2 + a*x - a*x^2*y[x] + x^2*(-y[x]^2 + Derivative[1][y][x]) == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.102 (sec), leaf count = 52

```
dsolve(x^2*(diff(y(x),x)-y(x)^2)-a*x^2*y(x)+a*x+2 = 0,y(x))
```

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

ODE No. 143

$$x^2\left(ay(x)^2+y'(x)\right)-b=0$$

✓ **Mathematica** : cpu = 0.0985813 (sec), leaf count = 51

```
DSolve[-b + x^2*(a*y[x]^2 + Derivative[1][y][x]) == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{-1+\sqrt{4ab+1}\left(-1+\frac{2c_1}{x^{\sqrt{4ab+1}}+c_1}\right)}{2ax}\right\}\right\}$$

✓ **Maple** : cpu = 0.053 (sec), leaf count = 41

```
dsolve(x^2*(diff(y(x),x)+a*y(x)^2)-b = 0,y(x))
```

$$y(x)=\frac{-\tanh\left(\frac{\sqrt{4ab+1}\,(-\ln(x)+c_1)}{2}\right)\sqrt{4ab+1}+1}{2ax}$$

ODE No. 144

$$x^2\left(a y(x)^2+y'(x)\right)+b x^{\alpha}+c=0$$

✓ **Mathematica** : cpu = 0.250037 (sec), leaf count = 1787

```
DSolve[c + b*x^alpha + x^2*(a*y[x]^2 + Derivative[1][y][x]) == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{a^{\frac{i\sqrt{4ac-1}\alpha+\alpha}{2\alpha^2}-\frac{\sqrt{\alpha^2-4a\alpha^2c}}{2\alpha^2}}\alpha^{-\frac{i\sqrt{4ac-1}\alpha+\alpha}{\alpha^2}+\frac{\sqrt{\alpha^2-4a\alpha^2c}}{\alpha^2}+1}b^{\frac{i\sqrt{4ac-1}\alpha+\alpha}{2\alpha^2}-\frac{\sqrt{\alpha^2-4a\alpha^2c}}{2\alpha^2}}\left(\frac{i\sqrt{4ac-1}\alpha+\alpha}{2\alpha^2}-\frac{\sqrt{\alpha^2-4a\alpha^2c}}{2\alpha^2}\right)(x\right.\right.$$

✓ **Maple** : cpu = 0.11 (sec), leaf count = 219

```
dsolve(x^2*(diff(y(x),x)+a*y(x)^2)+b*x^alpha+c = 0,y(x))
```

$$y(x)=\frac{-2\left(\text{BesselY}\left(\frac{\sqrt{-4ac+1}+\alpha}{\alpha},\frac{2\sqrt{ab}\,x^{\frac{\alpha}{2}}}{\alpha}\right)c_1+\text{BesselJ}\left(\frac{\sqrt{-4ac+1}+\alpha}{\alpha},\frac{2\sqrt{ab}\,x^{\frac{\alpha}{2}}}{\alpha}\right)\right)\sqrt{ab}\,x^{\frac{\alpha}{2}}+\left(\sqrt{-4ac+1}+1\right)}{2xa\left(\text{BesselY}\left(\frac{\sqrt{-4ac+1}}{\alpha},\frac{2\sqrt{ab}\,x^{\frac{\alpha}{2}}}{\alpha}\right)c_1+\text{BesselJ}\left(\frac{\sqrt{-4}}{\alpha}\right.\right.}$$

ODE No. 145

$$-ax^2y(x)^2+ay(x)^3+x^2y'(x)=0$$

✓ **Mathematica** : cpu = 0.637943 (sec), leaf count = 267

```
DSolve[-(a*x^2*y[x]^2) + a*y[x]^3 + x^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{\left(-\frac{1}{2^{2/3}a^{2/3}y(x)}-\frac{\sqrt[3]{a}x}{2^{2/3}}\right)\text{Ai}\left(\left(-\frac{\sqrt[3]{a}x}{2^{2/3}}-\frac{1}{2^{2/3}a^{2/3}y(x)}\right)^2+\frac{1}{\sqrt[3]{2}\sqrt[3]{a}x}\right)+\text{Ai}'\left(\left(-\frac{\sqrt[3]{a}x}{2^{2/3}}-\frac{1}{2^{2/3}a^{2/3}y(x)}\right)^2+\right.}{\left(-\frac{1}{2^{2/3}a^{2/3}y(x)}-\frac{\sqrt[3]{a}x}{2^{2/3}}\right)\text{Bi}\left(\left(-\frac{\sqrt[3]{a}x}{2^{2/3}}-\frac{1}{2^{2/3}a^{2/3}y(x)}\right)^2+\frac{1}{\sqrt[3]{2}\sqrt[3]{a}x}\right)+\text{Bi}'\left(\left(-\frac{\sqrt[3]{a}x}{2^{2/3}}-\frac{1}{2^{2/3}a^{2/3}y(x)}\right)^2+\right.}\right]$$

✓ **Maple** : cpu = 0.106 (sec), leaf count = 117

```
dsolve(x^2*diff(y(x),x)+a*y(x)^3-a*x^2*y(x)^2 = 0,y(x))
```

$$y(x)=-\frac{1}{ax+(-2a)^{\frac{2}{3}}\,\text{RootOf}\left(\text{AiryBi}\left(\frac{\_Z^2(-2a)^{\frac{1}{3}}x-1}{(-2a)^{\frac{1}{3}}x}\right)c_1\_Z+\_Z\,\text{AiryAi}\left(\frac{\_Z^2(-2a)^{\frac{1}{3}}x-1}{(-2a)^{\frac{1}{3}}x}\right)+\text{AiryBi}\left(1,\right.\right.}$$

ODE No. 146

$$ay(x)^2 + x^2y'(x) + xy(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.8498 (sec), leaf count = 78

```
DSolve[a*y[x]^2 + x*y[x]^3 + x^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[-\frac{ia}{x} = \frac{2e^{\frac{1}{2}\left(-\frac{ia}{x}-\frac{i}{y(x)}\right)^2}}{\sqrt{2\pi}\,\text{erfi}\left(\frac{-\frac{ia}{x}-\frac{i}{y(x)}}{\sqrt{2}}\right)+2c_1}, y(x)\right]$$

✓ **Maple** : cpu = 0.138 (sec), leaf count = 84

```
dsolve(x^2*diff(y(x),x)+x*y(x)^3+a*y(x)^2 = 0,y(x))
```

$$\frac{\left(a\sqrt{\pi}\,\sqrt{2}\,\text{erf}\left(\frac{\sqrt{2}\,(ay(x)+x)}{2y(x)x}\right)e^{\frac{(ay(x)+x)^2}{2y(x)^2x^2}}+2x\right)e^{-\frac{((x+a)y(x)+x)((a-x)y(x)+x)}{2y(x)^2x^2}}}{2}+c_1=0$$

ODE No. 147

$$ax^2y(x)^3+by(x)^2+x^2y'(x)=0$$

✓ **Mathematica** : cpu = 0.851908 (sec), leaf count = 343

```
DSolve[b*y[x]^2 + a*x^2*y[x]^3 + x^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{a}x}+\frac{1}{2^{2/3}\sqrt[3]{a}\sqrt[3]{b}y(x)}\right)\text{Ai}\left(\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{a}x}+\frac{1}{2^{2/3}\sqrt[3]{a}y(x)\sqrt[3]{b}}\right)^2-\frac{\sqrt[3]{a}x}{\sqrt[3]{2}b^{2/3}}\right)+\text{Ai}'\left(\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{a}x}+\frac{}{2^{2/3}\sqrt[3]{}}\right.\right.}{\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{a}x}+\frac{1}{2^{2/3}\sqrt[3]{a}\sqrt[3]{b}y(x)}\right)\text{Bi}\left(\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{a}x}+\frac{1}{2^{2/3}\sqrt[3]{a}y(x)\sqrt[3]{b}}\right)^2-\frac{\sqrt[3]{a}x}{\sqrt[3]{2}b^{2/3}}\right)+\text{Bi}'\left(\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{a}x}+\frac{}{2^{2/3}\sqrt[3]{}}\right.\right.}\right]$$

✓ **Maple** : cpu = 0.183 (sec), leaf count = 178

```
dsolve(x^2*diff(y(x),x)+a*x^2*y(x)^3+b*y(x)^2 = 0,y(x))
```

$$y(x)=-\frac{2^{\frac{1}{3}}abx}{2^{\frac{1}{3}}ab^2-2\left(a^2b^2\right)^{\frac{2}{3}}\text{RootOf}\left(\text{AiryBi}\left(-\frac{a2^{\frac{2}{3}}x-2\_Z^2\left(a^2b^2\right)^{\frac{1}{3}}}{2\left(a^2b^2\right)^{\frac{1}{3}}}\right)c_1\_Z+\_Z\,\text{AiryAi}\left(-\frac{a2^{\frac{2}{3}}x-2\_Z^2\left(a^2b^2\right)^{\frac{1}{3}}}{2\left(a^2b^2\right)^{\frac{1}{3}}}\right.\right.}$$

ODE No. 148

$$\left(x^2+1\right) y'(x)+xy(x)-1=0$$

✓ **Mathematica** : cpu = 0.0220228 (sec), leaf count = 30

```
DSolve[-1 + x*y[x] + (1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.011 (sec), leaf count = 16

```
dsolve((x^2+1)*diff(y(x),x)+x*y(x)-1 = 0,y(x))
```

$$y(x)=\frac{\operatorname{arcsinh}(x)+c_1}{\sqrt{x^2+1}}$$

ODE No. 149

$$\left(x^2+1\right) y'(x) - x\left(x^2+1\right) + xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0224785 (sec), leaf count = 27

```
DSolve[-(x*(1 + x^2)) + x*y[x] + (1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{3}\left(x^2+1\right) + \frac{c_1}{\sqrt{x^2+1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 20

```
dsolve((x^2+1)*diff(y(x),x)+x*y(x)-x*(x^2+1) = 0,y(x))
```

$$y(x) = \frac{x^2}{3} + \frac{1}{3} + \frac{c_1}{\sqrt{x^2+1}}$$

ODE No. 150

$$\left(x^2+1\right) y'(x) - 2x^2 + 2xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0213692 (sec), leaf count = 30

```
DSolve[-2*x^2 + 2*x*y[x] + (1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{2x^3}{3\left(x^2+1\right)} + \frac{c_1}{x^2+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.007 (sec), leaf count = 23

```
dsolve((x^2+1)*diff(y(x),x)+2*x*y(x)-2*x^2 = 0,y(x))
```

$$y(x) = \frac{2x^3 + 3c_1}{3x^2+3}$$

ODE No. 151

$$\left(x^2+1\right) y'(x)+(2xy(x)-1)\left(y(x)^2+1\right)=0$$

✓ **Mathematica** : cpu = 0.599954 (sec), leaf count = 203

```
DSolve[(-1 + 2*x*y[x])*(1 + y[x]^2) + (1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[c_1=\frac{\frac{1}{2}\left(\frac{1}{\frac{ix}{x^2+1}-\frac{ix^2y(x)}{x^2+1}}+\frac{i}{x}\right)\sqrt[4]{1-\left(\frac{1}{\frac{ix}{x^2+1}-\frac{ix^2y(x)}{x^2+1}}+\frac{i}{x}\right)^2}\,{}_2F_1\left(\frac{1}{2},\frac{5}{4};\frac{3}{2};\left(\frac{1}{\frac{ix}{x^2+1}-\frac{ix^2y(x)}{x^2+1}}+\frac{i}{x}\right)^2\right)+ix}{\sqrt[4]{-1+\left(\frac{1}{\frac{ix}{x^2+1}-\frac{ix^2y(x)}{x^2+1}}+\frac{i}{x}\right)^2}},y(\right.$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 85

```
dsolve((x^2+1)*diff(y(x),x)+(y(x)^2+1)*(2*x*y(x)-1) = 0,y(x))
```

$$c_1+\frac{x}{\left(\left(\frac{1}{x}+\frac{x^2}{\frac{x^4y(x)}{x^2+1}-\frac{x^3}{x^2+1}}\right)^2+1\right)^{\frac{1}{4}}}+\frac{(y(x)+x)\,\text{hypergeom}\left(\left[\frac{1}{2},\frac{5}{4}\right],\left[\frac{3}{2}\right],-\frac{(y(x)+x)^2}{(xy(x)-1)^2}\right)}{2xy\left(x\right)-2}=0$$

ODE No. 152

$$\left(x^2+1\right) y'(x) - x\left(x^2+1\right)\cos^2(y(x)) + x\sin(y(x))\cos(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.387859 (sec), leaf count = 40

```
DSolve[-(x*(1 + x^2)*Cos[y[x]]^2) + x*Cos[y[x]]*Sin[y[x]] + (1 + x^2)*Derivative[1][y][x] ==
```

$$\left\{\left\{y(x) \to \tan^{-1}\left(\frac{x^4+2x^2-6c_1\sqrt{x^2+1}+1}{3\left(x^2+1\right)}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.904 (sec), leaf count = 159

```
dsolve((x^2+1)*diff(y(x),x)+x*sin(y(x))*cos(y(x))-x*(x^2+1)*cos(y(x))^2 = 0,y(x))
```

$$y(x) = \frac{\arctan\left(\frac{6\sqrt{x^2+1}\left(x^2\sqrt{x^2+1}+\sqrt{x^2+1}+3c_1\right)}{(6x^2c_1+6c_1)\sqrt{x^2+1}+x^6+3x^4+12x^2+9c_1^2+10}, \frac{(-6x^2c_1-6c_1)\sqrt{x^2+1}-x^6-3x^4+6x^2-9c_1^2+8}{(6x^2c_1+6c_1)\sqrt{x^2+1}+x^6+3x^4+12x^2+9c_1^2+10}\right)}{2}$$

ODE No. 153

$$a + \left(x^2 - 1\right) y'(x) - xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0236248 (sec), leaf count = 21

```
DSolve[a - x*y[x] + (-1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.021 (sec), leaf count = 20

```
dsolve((x^2-1)*diff(y(x),x)-x*y(x)+a = 0,y(x))
```

$$y(x) = \sqrt{x - 1}\,\sqrt{1 + x}\,c_1 + ax$$

ODE No. 154

$$\left(x^2-1\right)y'(x)+2xy(x)-\cos(x)=0$$

✓ **Mathematica** : cpu = 0.0245701 (sec), leaf count = 26

```
DSolve[-Cos[x] + 2*x*y[x] + (-1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.01 (sec), leaf count = 19

```
dsolve((x^2-1)*diff(y(x),x)+2*x*y(x)-cos(x) = 0,y(x))
```

$$y(x)=\frac{\sin\left(x\right)+c_1}{\left(x-1\right)\left(1+x\right)}$$

ODE No. 155

$$\left(x^2-1\right) y'(x)+y(x)^2-2xy(x)+1=0$$

✓ **Mathematica** : cpu = 0.145993 (sec), leaf count = 46

```
DSolve[1 - 2*x*y[x] + y[x]^2 + (-1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.126 (sec), leaf count = 14

```
dsolve((x^2-1)*diff(y(x),x)+y(x)^2-2*x*y(x)+1 = 0,y(x))
```

$$y(x)=x+\frac{1}{c_1-\operatorname{arctanh}(x)}$$

ODE No. 156

$$\left(x^2-1\right) y'(x)-y(x)(y(x)-x)=0$$

✓ **Mathematica** : cpu = 0.0921561 (sec), leaf count = 21

```
DSolve[-(y[x]*(-x + y[x])) + (-1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.019 (sec), leaf count = 20

```
dsolve((x^2-1)*diff(y(x),x)-y(x)*(y(x)-x) = 0,y(x))
```

$$y(x)=\frac{1}{\sqrt{x-1}\sqrt{1+x}\,c_1+x}$$

ODE No. 157

$$a\left(y(x)^2-2xy(x)+1\right)+\left(x^2-1\right)y'(x)=0$$

✓ **Mathematica** : cpu = 0.21159 (sec), leaf count = 158

```
DSolve[a*(1 - 2*x*y[x] + y[x]^2) + (-1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\left(x^2-1\right)\left(c_1\left(ax\left(x^2-1\right)^{\frac{a}{2}-1}P_{a-1}(x)+\left(x^2-1\right)^{\frac{a}{2}-1}\left(aP_a(x)-axP_{a-1}(x)\right)\right)+ax\left(x^2-1\right)^{\frac{a}{2}-1}Q\right.\right.}{a\left(\left(x^2-1\right)^{a/2}Q_{a-1}(x)+c_1\left(x^2-1\right)^{a/2}P_{a-1}(x)\right)}$$

✓ **Maple** : cpu = 0.265 (sec), leaf count = 231

```
dsolve((x^2-1)*diff(y(x),x)+a*(y(x)^2-2*x*y(x)+1) = 0,y(x))
```

$$y(x)=\frac{8c_1\left(\left(a-\frac{1}{2}\right)x-\frac{a}{2}+\frac{1}{2}\right)(1+x)\,\text{HeunC}\left(0,-2a+1,0,0,a^2-a+\frac{1}{2},\frac{2}{1+x}\right)-a\left(-\frac{x}{2}-\frac{1}{2}\right)^{-2a+1}(1+x)}{4a\left(\text{HeunC}\left(0,-2a+1\right.\right.}$$

ODE No. 158

$$axy(x)^2 + \left(x^2 - 1\right) y'(x) + xy(x) = 0$$

✓ **Mathematica** : cpu = 0.153612 (sec), leaf count = 31

```
DSolve[x*y[x] + a*x*y[x]^2 + (-1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.017 (sec), leaf count = 22

```
dsolve((x^2-1)*diff(y(x),x)+a*x*y(x)^2+x*y(x) = 0,y(x))
```

$$y(x) = \frac{1}{\sqrt{x-1}\sqrt{1+x}\,c_1 - a}$$

ODE No. 159

$$\left(x^2-1\right) y'(x)-2 x y(x) \log (y(x))=0$$

✓ **Mathematica** : cpu = 0.103174 (sec), leaf count = 22

```
DSolve[-2*x*Log[y[x]]*y[x] + (-1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.118 (sec), leaf count = 13

```
dsolve((x^2-1)*diff(y(x),x)-2*x*y(x)*ln(y(x)) = 0,y(x))
```

$$y(x)=\mathrm{e}^{c_1 (x-1)(1+x)}$$

ODE No. 160

$$\left(x^2-4\right)y'(x)+(x+2)y(x)^2-4y(x)=0$$

✓ **Mathematica** : cpu = 0.134792 (sec), leaf count = 27

```
DSolve[-4*y[x] + (2 + x)*y[x]^2 + (-4 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.032 (sec), leaf count = 21

```
dsolve((x^2-4)*diff(y(x),x)+(x+2)*y(x)^2-4*y(x) = 0,y(x))
```

$$y(x)=\frac{x-2}{\left(\ln\left(x+2\right)+c_1\right)\left(x+2\right)}$$

ODE No. 161

$$\left(x^2-5x+6\right)y'(x)+x^2+3xy(x)-8y(x)=0$$

✓ **Mathematica** : cpu = 0.0279917 (sec), leaf count = 53

```
DSolve[x^2 - 8*y[x] + 3*x*y[x] + (6 - 5*x + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\frac{x^4}{4}-\frac{2x^3}{3}}{(2-x)^2(3-x)}+\frac{c_1}{(2-x)^2(3-x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 27

```
dsolve((x^2-5*x+6)*diff(y(x),x)+3*x*y(x)-8*y(x)+x^2 = 0,y(x))
```

$$y(x)=\frac{-\frac{1}{4}x^4+\frac{2}{3}x^3+c_1}{(x-3)\left(x-2\right)^2}$$

ODE No. 162

$$k(-a+y(x)+x)(-b+y(x)+x)+(x-a)(x-b)y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.499635 (sec), leaf count = 133

```
DSolve[y[x]^2 + k*(-a + x + y[x])*(-b + x + y[x]) + (-a + x)*(-b + x)*Derivative[1][y][x] ==
```

$$\left\{\left\{y(x)\to -\frac{-ak-bk+2kx}{2(k+1)}+\frac{1}{2}\sqrt{\frac{-a^2k^2+2abk^2-b^2k^2}{(k+1)^2}}\tan\left(\frac{(k+1)\sqrt{\frac{-a^2k^2+2abk^2-b^2k^2}{(k+1)^2}}(\log(x-b)-l\right.\right.\right.$$

✓ **Maple** : cpu = 0.181 (sec), leaf count = 58

```
dsolve((x-a)*(x-b)*diff(y(x),x)+y(x)^2+k*(y(x)+x-a)*(y(x)+x-b) = 0,y(x))
```

$$y(x)=\frac{k\left((a-x)(a-x)^k+c_1(b-x)^k(b-x)\right)}{(k+1)\left(c_1(b-x)^k+(a-x)^k\right)}$$

ODE No. 163

$$2a^2x + 2x^2y'(x) - 2y(x)^2 - xy(x) = 0$$

✓ **Mathematica** : cpu = 0.110642 (sec), leaf count = 43

```
DSolve[2*a^2*x - x*y[x] - 2*y[x]^2 + 2*x^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{-a^2}\sqrt{x}\tan\left(\frac{2\sqrt{-a^2}}{\sqrt{x}} - c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 27

```
dsolve(2*x^2*diff(y(x),x)-2*y(x)^2-x*y(x)+2*a^2*x = 0,y(x))
```

$$y(x) = -i\tan\left(\frac{2ia - \sqrt{x}\,c_1}{\sqrt{x}}\right)\sqrt{x}\,a$$

ODE No. 164

$$2a^2x + 2x^2y'(x) - 2y(x)^2 - 3xy(x) = 0$$

✓ **Mathematica** : cpu = 0.142898 (sec), leaf count = 131

```
DSolve[2*a^2*x - 3*x*y[x] - 2*y[x]^2 + 2*x^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{x^2\left(-\frac{e^{\frac{2a}{\sqrt{x}}}}{4a\sqrt{x}} + \frac{e^{\frac{2a}{\sqrt{x}}}}{2x} + c_1\left(\frac{ae^{-\frac{2a}{\sqrt{x}}}}{x} + \frac{e^{-\frac{2a}{\sqrt{x}}}}{2\sqrt{x}}\right)\right)}{-\frac{\sqrt{x}e^{\frac{2a}{\sqrt{x}}}}{2a} + c_1\sqrt{x}e^{-\frac{2a}{\sqrt{x}}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.201 (sec), leaf count = 100

```
dsolve(2*x^2*diff(y(x),x)-2*y(x)^2-3*x*y(x)+2*a^2*x = 0,y(x))
```

$$y(x) = \frac{-x\left(c_1 - 2\sqrt{-\frac{a^2}{x}}\right)\cos\left(2\sqrt{-\frac{a^2}{x}}\right) - 2\sin\left(2\sqrt{-\frac{a^2}{x}}\right)x\left(c_1\sqrt{-\frac{a^2}{x}} + \frac{1}{2}\right)}{2\cos\left(2\sqrt{-\frac{a^2}{x}}\right)c_1 + 2\sin\left(2\sqrt{-\frac{a^2}{x}}\right)}$$

ODE No. 165

$$x(2x-1)y'(x)+y(x)^2-(4x+1)y(x)+4x=0$$

✓ **Mathematica** : cpu = 0.128505 (sec), leaf count = 22

```
DSolve[4*x - (1 + 4*x)*y[x] + y[x]^2 + x*(-1 + 2*x)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.022 (sec), leaf count = 17

```
dsolve(x*(2*x-1)*diff(y(x),x)+y(x)^2-(4*x+1)*y(x)+4*x = 0,y(x))
```

$$y(x)=\frac{2x^2+c_1}{x+c_1}$$

ODE No. 166

$$2(x-1)xy'(x)+(x-1)y(x)^2-x=0$$

✓ **Mathematica** : cpu = 0.155871 (sec), leaf count = 71

```
DSolve[-x + (-1 + x)*y[x]^2 + 2*(-1 + x)*x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{2x\left(-G^{2,0}_{2,2}\left(x\left|\begin{array}{c}-\frac{1}{2},\frac{1}{2}\\-1,0\end{array}\right.\right)+\frac{c_1(E(x)-K(x))}{\pi x}\right)}{G^{2,0}_{2,2}\left(x\left|\begin{array}{c}\frac{1}{2},\frac{3}{2}\\0,0\end{array}\right.\right)+\frac{2c_1E(x)}{\pi}}\right\}\right\}$$

✓ **Maple** : cpu = 0.146 (sec), leaf count = 97

```
dsolve(2*x*(x-1)*diff(y(x),x)+(x-1)*y(x)^2-x = 0,y(x))
```

$$y(x)=\frac{x\left(\text{LegendreQ}\left(-\frac{1}{2},1,\frac{2-x}{x}\right)c_1-\text{LegendreQ}\left(\frac{1}{2},1,\frac{2-x}{x}\right)c_1+\text{LegendreP}\left(-\frac{1}{2},1,\frac{2-x}{x}\right)-\text{LegendreP}\left(\frac{1}{2}\right.\right.}{2\left(\text{LegendreQ}\left(-\frac{1}{2},1,\frac{2-x}{x}\right)c_1+\text{LegendreP}\left(-\frac{1}{2},1,\frac{2-x}{x}\right)\right)(x-1)}$$

ODE No. 167

$$3x^2y'(x) - x^2 - 3xy(x) - 7y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0927967 (sec), leaf count = 35

```
DSolve[-x^2 - 3*x*y[x] - 7*y[x]^2 + 3*x^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{x \tan\left(\frac{1}{3}\left(\sqrt{7}\log(x) + 3\sqrt{7}c_1\right)\right)}{\sqrt{7}}\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 20

```
dsolve(3*x^2*diff(y(x),x)-7*y(x)^2-3*x*y(x)-x^2 = 0,y(x))
```

$$y(x) = \frac{\tan\left(\frac{(\ln(x)+c_1)\sqrt{7}}{3}\right) x\sqrt{7}}{7}$$

ODE No. 168

$$3\left(x^2-4\right)y'(x)+y(x)^2-xy(x)-3=0$$

✓ **Mathematica** : cpu = 0.204183 (sec), leaf count = 234

```
DSolve[-3 - x*y[x] + y[x]^2 + 3*(-4 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{3(x^2-4)\left(c_1\left(\frac{xP^{\frac{1}{3}}_{-\frac{1}{6}}\left(\frac{x}{2}\right)}{6(x^2-4)^{11/12}}+\frac{\sqrt[12]{x^2-4}\left(\frac{1}{2}P^{\frac{1}{3}}_{\frac{5}{6}}\left(\frac{x}{2}\right)-\frac{5}{12}xP^{\frac{1}{3}}_{-\frac{1}{6}}\left(\frac{x}{2}\right)\right)}{2\left(\frac{x^2}{4}-1\right)}\right)+\frac{xQ^{\frac{1}{3}}_{-\frac{1}{6}}\left(\frac{x}{2}\right)}{6(x^2-4)^{11/12}}+\frac{\sqrt[12]{x^2-4}\left(\frac{1}{2}Q^{\frac{1}{3}}_{\frac{5}{6}}\left(\frac{x}{2}\right)\right.}{2\left(\frac{x^2}{4}-1\right)}\right.}{\sqrt[12]{x^2-4}Q^{\frac{1}{3}}_{-\frac{1}{6}}\left(\frac{x}{2}\right)+c_1\sqrt[12]{x^2-4}P^{\frac{1}{3}}_{-\frac{1}{6}}\left(\frac{x}{2}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.171 (sec), leaf count = 140

```
dsolve(3*(x^2-4)*diff(y(x),x)+y(x)^2-x*y(x)-3 = 0,y(x))
```

$$y(x)=-\frac{3\left(\text{HeunC}\left(0,\frac{4}{3},-\frac{1}{3},0,\frac{25}{36},\frac{4}{x+2}\right)c_1-\frac{(-\frac{x}{4}-}{}\right.}{4c_1\left(x-\frac{5}{4}\right)(x+2)\,\text{HeunC}\left(0,\frac{4}{3},-\frac{1}{3},0,\frac{25}{36},\frac{4}{x+2}\right)-\left(-\frac{x}{4}-\frac{1}{2}\right)^{\frac{4}{3}}(x+2)\,\text{HeunC}\left(0,-\frac{4}{3},-\frac{1}{3},0,\frac{25}{36},\frac{4}{x+2}\right.}$$

ODE No. 169

$$(ax+b)^2 y'(x) + y(x)^3(ax+b) + cy(x)^2 = 0$$

✓ **Mathematica** : cpu = 2.11208 (sec), leaf count = 149

```
DSolve[c*y[x]^2 + (b + a*x)*y[x]^3 + (b + a*x)^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[-\frac{c}{\sqrt{-a(ax+b)^2}} = \frac{2\exp\left(\frac{1}{2}\left(-\frac{c}{\sqrt{-a(ax+b)^2}} - \frac{\left(-a(ax+b)^2\right)^{3/2}}{ay(x)(ax+b)^3}\right)^2\right)}{\sqrt{2\pi}\,\text{erfi}\left(\frac{-\frac{c}{\sqrt{-a(ax+b)^2}} - \frac{\left(-a(ax+b)^2\right)^{3/2}}{ay(x)(ax+b)^3}}{\sqrt{2}}\right) + 2c_1}, y(x)\right]$$

✓ **Maple** : cpu = 0.136 (sec), leaf count = 153

```
dsolve((a*x+b)^2*diff(y(x),x)+(a*x+b)*y(x)^3+c*y(x)^2 = 0,y(x))
```

$$\frac{\left(\sqrt{\pi}\sqrt{2}\,\text{erf}\left(\frac{\sqrt{2}\,(cy(x)+a(ax+b))}{2\sqrt{a}\,y(x)(ax+b)}\right)\text{e}^{\frac{(cy(x)+a(ax+b))^2}{2y(x)^2(ax+b)^2a}}ac + 2(ax+b)\,a^{\frac{3}{2}}\right)\text{e}^{-\frac{((-ax-b+c)y(x)+a(ax+b))((ax+b+c)y(x)+a(ax+b))}{2y(x)^2(ax+b)^2a}} + 2}{2a^{\frac{5}{2}}}$$

ODE No. 170

$$-x^4 + x^3 y'(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0846121 (sec), leaf count = 43

```
DSolve[-x^4 - y[x]^2 + x^3*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{x^3\left(\frac{1}{x^2} - \frac{\log(x)}{x^2} - \frac{c_1}{x^2}\right)}{\frac{\log(x)}{x} + \frac{c_1}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 23

```
dsolve(x^3*diff(y(x),x)-y(x)^2-x^4 = 0,y(x))
```

$$y(x) = \frac{x^2(\ln(x) - c_1 - 1)}{\ln(x) - c_1}$$

ODE No. 171

$$x^3 y'(x) - x^2 y(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0768693 (sec), leaf count = 17

```
DSolve[-(x^2*y[x]) - y[x]^2 + x^3*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.014 (sec), leaf count = 15

```
dsolve(x^3*diff(y(x),x)-y(x)^2-x^2*y(x) = 0,y(x))
```

$$y(x) = \frac{x^2}{c_1 x + 1}$$

ODE No. 172

$$x^4\left(-y(x)^2\right)+x^3y'(x)+x^2y(x)+20=0$$

✓ **Mathematica** : cpu = 0.0902252 (sec), leaf count = 35

```
DSolve[20 + x^2*y[x] - x^4*y[x]^2 + x^3*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{5x^4-\frac{4c_1}{x^5}}{x\left(x^5+\frac{c_1}{x^4}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.314 (sec), leaf count = 26

```
dsolve(x^3*diff(y(x),x)-x^4*y(x)^2+x^2*y(x)+20 = 0,y(x))
```

$$y(x)=\frac{5x^9+4c_1}{x^2\left(-x^9+c_1\right)}$$

ODE No. 173

$$x^6\left(-y(x)^2\right)+x^3y'(x)-(2x-3)x^2y(x)+3=0$$

✓ **Mathematica** : cpu = 0.0985881 (sec), leaf count = 29

```
DSolve[3 - x^2*(-3 + 2*x)*y[x] - x^6*y[x]^2 + x^3*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{3}{x^3}+\frac{1}{x^3\left(\frac{1}{4}+c_1e^{4x}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (sec), leaf count = 27

```
dsolve(x^3*diff(y(x),x)-x^6*y(x)^2-(2*x-3)*x^2*y(x)+3 = 0,y(x))
```

$$y(x)=\frac{-3\,\mathrm{e}^{4x}c_1-3}{x^3\left(\mathrm{e}^{4x}c_1-3\right)}$$

ODE No. 174

$$\left(x^2+1\right) xy'(x)+x^2y(x)=0$$

✓ **Mathematica** : cpu = 0.0177874 (sec), leaf count = 17

```
DSolve[x^2*y[x] + x*(1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.005 (sec), leaf count = 13

```
dsolve(x*(x^2+1)*diff(y(x),x)+x^2*y(x) = 0,y(x))
```

$$y(x)=\frac{c_1}{\sqrt{x^2+1}}$$

ODE No. 175

$$ax^3+\left(x^2-1\right)xy'(x)-\left(2x^2-1\right)y(x)=0$$

✓ **Mathematica** : cpu = 0.0305071 (sec), leaf count = 24

```
DSolve[a*x^3 - (-1 + 2*x^2)*y[x] + x*(-1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.019 (sec), leaf count = 20

```
dsolve(x*(x^2-1)*diff(y(x),x)-(2*x^2-1)*y(x)+a*x^3 = 0,y(x))
```

$$y(x)=x\left(\sqrt{x-1}\,\sqrt{1+x}\,c_1+a\right)$$

ODE No. 176

$$\left(x^2-1\right) x y'(x)+\left(x^2-1\right) y(x)^2-x^2=0$$

✓ **Mathematica** : cpu = 0.19405 (sec), leaf count = 82

```
DSolve[-x^2 + (-1 + x^2)*y[x]^2 + x*(-1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{x\left(-2xG^{2,0}_{2,2}\left(x^2\middle| \begin{array}{c} -\frac{1}{2},\frac{1}{2} \\ -1,0 \end{array}\right)+\frac{2c_1\left(E\left(x^2\right)-K\left(x^2\right)\right)}{\pi x}\right)}{G^{2,0}_{2,2}\left(x^2\middle| \begin{array}{c} \frac{1}{2},\frac{3}{2} \\ 0,0 \end{array}\right)+\frac{2c_1E\left(x^2\right)}{\pi}}\right\}\right\}$$

✓ **Maple** : cpu = 0.095 (sec), leaf count = 30

```
dsolve(x*(x^2-1)*diff(y(x),x)+(x^2-1)*y(x)^2-x^2 = 0,y(x))
```

$$y(x)=\frac{c_1\,\text{EllipticCE}\left(x\right)+\text{EllipticE}\left(x\right)-\text{EllipticK}\left(x\right)}{c_1\,\text{EllipticCE}\left(x\right)-c_1\,\text{EllipticCK}\left(x\right)+\text{EllipticE}\left(x\right)}$$

ODE No. 177

$$(x-1)x^2y'(x)-(x-2)xy(x)-y(x)^2=0$$

✓ **Mathematica** : cpu = 0.116554 (sec), leaf count = 22

```
DSolve[-((-2 + x)*x*y[x]) - y[x]^2 + (-1 + x)*x^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{x^2}{c_1x-1-c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 17

```
dsolve(x^2*(x-1)*diff(y(x),x)-y(x)^2-x*(x-2)*y(x) = 0,y(x))
```

$$y(x)=\frac{x^2}{1+c_1\,(x-1)}$$

ODE No. 178

$$2\left(x^2-1\right)xy'(x)+2\left(x^2-1\right)y(x)^2-\left(3x^2-5\right)y(x)+x^2-3=0$$

✓ **Mathematica** : cpu = 0.160648 (sec), leaf count = 49

```
DSolve[-3 + x^2 - (-5 + 3*x^2)*y[x] + 2*(-1 + x^2)*y[x]^2 + 2*x*(-1 + x^2)*Derivative[1][y][x
```

$$\left\{\left\{y(x)\to 1+\frac{\sqrt{x}}{\sqrt{1-x^2}\left(2\sqrt{x}\,{}_2F_1\left(\frac{1}{4},\frac{1}{2};\frac{5}{4};x^2\right)+c_1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.109 (sec), leaf count = 61

```
dsolve(2*x*(x^2-1)*diff(y(x),x)+2*(x^2-1)*y(x)^2-(3*x^2-5)*y(x)+x^2-3 = 0,y(x))
```

$$y(x)=1-\frac{2\sqrt{x}}{\sqrt{1+x}\sqrt{x-1}\left(c_1-\frac{2\,\text{EllipticF}\left(\sqrt{1+x},\frac{\sqrt{2}}{2}\right)\sqrt{-x}\sqrt{2}\sqrt{1-x}}{\sqrt{x-1}\sqrt{x}}\right)}$$

ODE No. 179

$$3x\left(x^2-1\right)y'(x)-\left(x^2+1\right)y(x)+xy(x)^2-3x=0$$

✓ **Mathematica** : cpu = 0.608678 (sec), leaf count = 2833

```
DSolve[-3*x - (1 + x^2)*y[x] + x*y[x]^2 + 3*x*(-1 + x^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{3(x^2-1)\left(c_1\left(e^{\int_1^x \text{Root}\left[125K[1]^8-164K[1]^6+70K[1]^4-20K[1]^2+\left(1296K[1]^{12}-5184K[1]^{10}+7776K[1]^8-5184K[1]^6+1296K[1]^4\right)\#1^4-\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.162 (sec), leaf count = 112

```
dsolve(3*x*(x^2-1)*diff(y(x),x)+x*y(x)^2-(x^2+1)*y(x)-3*x = 0,y(x))
```

$$y(x)=\frac{35c_1\left(\frac{8x^2}{7}-\frac{16}{35}\right)\text{hypergeom}\left(\left[\frac{5}{6},\frac{7}{6}\right],\left[\frac{4}{3}\right],x^2\right)+35(x^4-x^2)\,c_1\,\text{hypergeom}\left(\left[\frac{11}{6},\frac{13}{6}\right],\left[\frac{7}{3}\right],x^2\right)+35\left(-\right.}{x^{\frac{1}{3}}\left(8x^{\frac{2}{3}}\,\text{hypergeom}\left(\left[\frac{5}{6},\frac{7}{6}\right],\left[\frac{4}{3}\right],x^2\right)c_1+8\,\text{hyp}\right.}$$

ODE No. 180

$$(xy'(x) - y(x))\left(ax^2 + bx + c\right) + x^2 - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.372908 (sec), leaf count = 132

```
DSolve[x^2 - y[x]^2 + (c + b*x + a*x^2)*(-y[x] + x*Derivative[1][y][x]) == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{x\left(-1+\exp\left(\frac{4\tan^{-1}\left(\frac{2ax}{\sqrt{4ac-b^2}}+\frac{b}{\sqrt{4ac-b^2}}\right)}{\sqrt{4ac-b^2}}+2c_1\right)\right)}{1+\exp\left(\frac{4\tan^{-1}\left(\frac{2ax}{\sqrt{4ac-b^2}}+\frac{b}{\sqrt{4ac-b^2}}\right)}{\sqrt{4ac-b^2}}+2c_1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 58

```
dsolve((a*x^2+b*x+c)*(x*diff(y(x),x)-y(x))-y(x)^2+x^2 = 0,y(x))
```

$$y(x) = -\tanh\left(\frac{c_1\sqrt{4ac-b^2}+2\arctan\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{4ac-b^2}}\right)x$$

ODE No. 181

$$a + x^4\left(y'(x) + y(x)^2\right) = 0$$

✓ **Mathematica** : cpu = 0.097367 (sec), leaf count = 347

```
DSolve[a + x^4*(y[x]^2 + Derivative[1][y][x]) == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\frac{i\sqrt{\frac{2}{\pi}}c_1 \sinh\left(\frac{\sqrt{-a}}{x}\right)}{\sqrt{-\frac{i\sqrt{-a}}{x}}} + \frac{i\sqrt{-a}\left(-\frac{2\sqrt{\frac{2}{\pi}}\left(i\sinh\left(\frac{\sqrt{-a}}{x}\right)+\frac{i\sqrt{-a}x\cosh\left(\frac{\sqrt{-a}}{x}\right)}{a}\right)}{\sqrt{-\frac{i\sqrt{-a}}{x}}} - \frac{\sqrt{\frac{2}{\pi}}c_1\cosh\left(\frac{\sqrt{-a}}{x}\right)}{\sqrt{-\frac{i\sqrt{-a}}{x}}} + \frac{\sqrt{\frac{2}{\pi}}c_1\left(-\frac{\sqrt{-a}x\sinh\left(\frac{\sqrt{-a}}{x}\right)}{a} - \right.\right.}{x}}{2x\left(\frac{\sqrt{\frac{2}{\pi}}\cosh\left(\frac{\sqrt{-a}}{x}\right)}{\sqrt{-\frac{i\sqrt{-a}}{x}}} - \frac{i\sqrt{\frac{2}{\pi}}c_1\sinh\left(\frac{\sqrt{-a}}{x}\right)}{\sqrt{-\frac{i\sqrt{-a}}{x}}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.108 (sec), leaf count = 28

```
dsolve(x^4*(diff(y(x),x)+y(x)^2)+a = 0,y(x))
```

$$y(x) = \frac{-\sqrt{a}\,\tan\left(\frac{\sqrt{a}\,(c_1 x-1)}{x}\right) + x}{x^2}$$

ODE No. 182

$$\left(x^3-1\right) xy'(x)+x^2-2xy(x)^2+y(x)=0$$

✓ **Mathematica** : cpu = 0.22159 (sec), leaf count = 96

```
DSolve[x^2 + y[x] - 2*x*y[x]^2 + x*(-1 + x^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\left(x^3-1\right)\left(\frac{x}{\left(1-x^3\right)^{2/3}}+\frac{x^4}{\left(1-x^3\right)^{5/3}}+\frac{2c_1x^2}{\left(1-x^3\right)^{5/3}}\right)}{2\left(\frac{x^2}{2\left(1-x^3\right)^{2/3}}+\frac{c_1}{\left(1-x^3\right)^{2/3}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.136 (sec), leaf count = 18

```
dsolve(x*(x^3-1)*diff(y(x),x)-2*x*y(x)^2+y(x)+x^2 = 0,y(x))
```

$$y(x)=\frac{x(x+c_1)}{x^2c_1+1}$$

ODE No. 183

$$\left(2x^4 - x\right) y'(x) - 2\left(x^3 - 1\right) y(x) = 0$$

✓ **Mathematica** : cpu = 0.0253468 (sec), leaf count = 22

```
DSolve[-2*(-1 + x^3)*y[x] + (-x + 2*x^4)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1 x^2}{\sqrt[3]{1 - 2x^3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 18

```
dsolve((2*x^4-x)*diff(y(x),x)-2*(x^3-1)*y(x) = 0,y(x))
```

$$y(x) = \frac{c_1 x^2}{\left(2x^3 - 1\right)^{\frac{1}{3}}}$$

ODE No. 184

$$\left(y'(x)+y(x)^2\right)\left(ax^2+bx+c\right)^2+A=0$$

✓ **Mathematica** : cpu = 1.13879 (sec), leaf count = 704

```
DSolve[A + (c + b*x + a*x^2)^2*(y[x]^2 + Derivative[1][y][x]) == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{-\frac{2a\sqrt{ax^2+bx+c}\exp\left(-\frac{\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\tan^{-1}\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)}{(b^2-4ac)\left(\frac{(2ax+b)^2}{4ac-b^2}+1\right)}+\frac{(2ax+b)\exp\left(-\frac{\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\tan^{-1}\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)}{2\sqrt{b^2-4ac}\sqrt{1-\frac{4A}{b^2-4ac}}\sqrt{ax^2+bx+c}}}{-\frac{\sqrt{ax^2+bx+c}\exp\left(-\frac{\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\tan^{-1}\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)}{\sqrt{b^2-4ac}\sqrt{1-\frac{4A}{b^2-4ac}}}}\right.\right.$$

✓ **Maple** : cpu = 0.396 (sec), leaf count = 493

```
dsolve((a*x^2+b*x+c)^2*(diff(y(x),x)+y(x)^2)+A = 0,y(x))
```

$$y(x)=\frac{2\left(\left(i\sqrt{\frac{-4ac+b^2-4A}{a^2}}\,a\sqrt{4ac-b^2}-2\left(ax+\frac{b}{2}\right)\sqrt{-4ac+b^2}\right)c_1\left(\frac{i\sqrt{4ac-b^2}-2ax-b}{2ax+b+i\sqrt{4ac-b^2}}\right)^{-\frac{a\sqrt{\frac{-4ac+b^2-4A}{a^2}}}{2\sqrt{-4ac+b^2}}}-\left(i\sqrt{\right.\right.}}{\sqrt{-4ac+b^2}\left(2ax+b+i\sqrt{4ac-b^2}\right)\left(i\sqrt{4ac-b^2}-2ax-b\right)\left(c_1\left(\frac{i\sqrt{4ac-}}{2ax+b+}\right.\right.}$$

ODE No. 185

$$x^7 y'(x) + 5x^3 y(x)^2 + 2\left(x^2+1\right) y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.440254 (sec), leaf count = 123

```
DSolve[5*x^3*y[x]^2 + 2*(1 + x^2)*y[x]^3 + x^7*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[c_1 = \frac{\frac{1}{2}\sqrt[4]{1-\left(\frac{ix^2}{y(x)}+\frac{i}{x}\right)^2}\left(\frac{ix^2}{y(x)}+\frac{i}{x}\right)\,{}_2F_1\left(\frac{1}{2},\frac{5}{4};\frac{3}{2};\left(\frac{ix^2}{y(x)}+\frac{i}{x}\right)^2\right)+ix}{\sqrt[4]{-1+\left(\frac{ix^2}{y(x)}+\frac{i}{x}\right)^2}}, y(x)\right]$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 63

```
dsolve(x^7*diff(y(x),x)+2*(x^2+1)*y(x)^3+5*x^3*y(x)^2 = 0,y(x))
```

$$c_1 + \frac{x}{\left(\left(\frac{1}{x}+\frac{x^2}{y(x)}\right)^2+1\right)^{\frac{1}{4}}} + \frac{\left(x^3+y(x)\right)\text{hypergeom}\left(\left[\frac{1}{2},\frac{5}{4}\right],\left[\frac{3}{2}\right],-\frac{\left(x^3+y(x)\right)^2}{x^2 y(x)^2}\right)}{2xy\,(x)} = 0$$

ODE No. 186

$$-\left((n-1)x^{n-1}y(x)\right)+x^{2n-2}+x^n y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.244603 (sec), leaf count = 19

```
DSolve[x^(-2 + 2*n) - (-1 + n)*x^(-1 + n)*y[x] + y[x]^2 + x^n*Derivative[1][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x)\to x^{n-1}\tan(-\log(x)+c_1)\right\}\right\}$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 17

```
dsolve(x^n*diff(y(x),x)+y(x)^2-(n-1)*x^(n-1)*y(x)+x^(2*n-2) = 0,y(x))
```

$$y(x)=\tan\left(-\ln\left(x\right)+c_1\right)x^{n-1}$$

ODE No. 187

$$-ay(x)^2 - bx^{2n-2} + x^n y'(x) = 0$$

✓ **Mathematica** : cpu = 0.233043 (sec), leaf count = 328

```
DSolve[-(b*x^(-2 + 2*n)) - a*y[x]^2 + x^n*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{x^n\left(\frac{1}{2}\sqrt{a}\sqrt{b}\left(\sqrt{\frac{(n-1)^2}{ab}-4}-\frac{n-1}{\sqrt{a}\sqrt{b}}\right)x^{\frac{1}{2}\sqrt{a}\sqrt{b}\left(\sqrt{\frac{(n-1)^2}{ab}-4}-\frac{n-1}{\sqrt{a}\sqrt{b}}\right)-1}+\frac{1}{2}\sqrt{a}\sqrt{b}c_1\left(-\frac{n-1}{\sqrt{a}\sqrt{b}}-\sqrt{\frac{(n-1)^2}{ab}-4}\right)\right.}{a\left(x^{\frac{1}{2}\sqrt{a}\sqrt{b}\left(\sqrt{\frac{(n-1)^2}{ab}-4}-\frac{n-1}{\sqrt{a}\sqrt{b}}\right)}+c_1 x^{\frac{1}{2}\sqrt{a}\sqrt{b}\left(-\frac{n-1}{\sqrt{a}\sqrt{b}}-\sqrt{\frac{(n-1)^2}{ab}-4}\right.}\right.}\right.$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 60

```
dsolve(x^n*diff(y(x),x)-a*y(x)^2-b*x^(2*n-2) = 0,y(x))
```

$$y(x) = \frac{\left(-\tan\left(\frac{\sqrt{4ab-n^2+2n-1}\,(-\ln(x)+c_1)}{2}\right)\sqrt{4ab-n^2+2n-1}+n-1\right)x^{n-1}}{2a}$$

ODE No. 188

$$-ay(x)^3 - bnx^3 + x^{2n+1}y'(x) = 0$$

✗ **Mathematica** : cpu = 12.8835 (sec), leaf count = 0

```
DSolve[-(b*n*x^3) - a*y[x]^3 + x^(1 + 2*n)*Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-(b*n*x^3) - a*y[x]^3 + x^(1 + 2*n)*Derivative[1][y][x] == 0, y[x], x]
```

✓ **Maple** : cpu = 0.029 (sec), leaf count = 32

```
dsolve(x^(2*n+1)*diff(y(x),x)-a*y(x)^3-b*x^(3*n) = 0,y(x))
```

$$y(x) = \text{RootOf}\left(-\ln(x) + c_1 + \int^{\_Z} \frac{1}{\_a^3 a - n\_a + b} d\_a\right) x^n$$

ODE No. 189

$$-ay(x)^n - bx^{(m+1)n} + x^{m(n-1)+n}y'(x) = 0$$

✓ **Mathematica** : cpu = 0.453605 (sec), leaf count = 91

```
DSolve[-(b*x^((1 + m)*n)) - a*y[x]^n + x^(m*(-1 + n) + n)*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{\left(\frac{ax^{-((m+1)n)}}{b}\right)^{\frac{1}{n}}y(x)} \frac{1}{K[1]^n - \left(\frac{b^{1-n}(m+1)^n}{a}\right)^{\frac{1}{n}}K[1] + 1}dK[1] = bx^{m+1}\log(x)\left(\frac{ax^{-((m+1)n)}}{b}\right)^{\frac{1}{n}} + c_1, y(\right.$$

✓ **Maple** : cpu = 0.321 (sec), leaf count = 60

```
dsolve(x^(m*(n-1)+n)*diff(y(x),x)-a*y(x)^n-b*x^(n*(m+1)) = 0,y(x))
```

$$\int_{\_b}^{y(x)} -\frac{x^{mn}x^n}{(x^m x b - (m+1)\_a)\,x^n x^{mn} + x^m x a\_a^n}d\_a + \ln(x) - c_1 = 0$$

ODE No. 190

$$\sqrt{x^2-1}y'(x)-\sqrt{y(x)^2-1}=0$$

✓ **Mathematica** : cpu = 0.0782209 (sec), leaf count = 173

```
DSolve[-Sqrt[-1 + y[x]^2] + Sqrt[-1 + x^2]*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.007 (sec), leaf count = 29

```
dsolve((x^2-1)^(1/2)*diff(y(x),x)-(y(x)^2-1)^(1/2) = 0,y(x))
```

$$\ln\left(x+\sqrt{x^2-1}\right)-\ln\left(y(x)+\sqrt{y\left(x\right)^2-1}\right)+c_1=0$$

ODE No. 191

$$\sqrt{1-x^2}y'(x) - y(x)\sqrt{y(x)^2-1} = 0$$

✓ **Mathematica** : cpu = 0.135985 (sec), leaf count = 39

```
DSolve[-(y[x]*Sqrt[-1 + y[x]^2]) + Sqrt[1 - x^2]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{1+\tan^2\left(\sin^{-1}(x)+c_1\right)}\right\}, \left\{y(x) \to \sqrt{1+\tan^2\left(\sin^{-1}(x)+c_1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 16

```
dsolve((-x^2+1)^(1/2)*diff(y(x),x)-y(x)*(y(x)^2-1)^(1/2) = 0,y(x))
```

$$\arcsin(x) + \arctan\left(\frac{1}{\sqrt{y(x)^2-1}}\right) + c_1 = 0$$

ODE No. 192

$$\sqrt{a^2+x^2}y'(x)-\sqrt{a^2+x^2}+y(x)+x=0$$

✓ **Mathematica** : cpu = 0.698778 (sec), leaf count = 168

```
DSolve[x - Sqrt[a^2 + x^2] + y[x] + Sqrt[a^2 + x^2]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt{1-\frac{x}{\sqrt{a^2+x^2}}}\int_1^x \frac{\sqrt{\frac{K[1]}{\sqrt{a^2+K[1]^2}}+1}\left(\sqrt{a^2+K[1]^2}-K[1]\right)}{\sqrt{a^2+K[1]^2}\sqrt{1-\frac{K[1]}{\sqrt{a^2+K[1]^2}}}}dK[1]}{\sqrt{\frac{x}{\sqrt{a^2+x^2}}+1}}+\frac{c_1\sqrt{1-\frac{x}{\sqrt{a^2+x^2}}}}{\sqrt{\frac{x}{\sqrt{a^2+x^2}}+1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 36

```
dsolve((a^2+x^2)^(1/2)*diff(y(x),x)+y(x)-(a^2+x^2)^(1/2)+x = 0,y(x))
```

$$y(x)=\frac{a^2\ln\left(x+\sqrt{a^2+x^2}\right)+c_1}{x+\sqrt{a^2+x^2}}$$

ODE No. 193

$$-ax(\log(x)+1)+x\log(x)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.027725 (sec), leaf count = 16

```
DSolve[-(a*x*(1 + Log[x])) + y[x] + x*Log[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to ax+\frac{c_1}{\log(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.008 (sec), leaf count = 14

```
dsolve(x*diff(y(x),x)*ln(x)+y(x)-a*x*(ln(x)+1) = 0,y(x))
```

$$y(x)=ax+\frac{c_1}{\ln(x)}$$

ODE No. 194

$$x\log(x)y'(x)-y(x)\left(2\log^2(x)+1\right)-y(x)^2\log(x)-\log^3(x)=0$$

✓ **Mathematica** : cpu = 0.184863 (sec), leaf count = 98

```
DSolve[-Log[x]^3 - (1 + 2*Log[x]^2)*y[x] - Log[x]*y[x]^2 + x*Log[x]*Derivative[1][y][x] == 0,
```

$$\left\{\left\{y(x)\to -\frac{x\left(\frac{e^{\frac{\log^2(x)}{2}}\log(x)}{x}+\frac{e^{\frac{\log^2(x)}{2}}\log^3(x)}{2x}+\frac{c_1e^{\frac{\log^2(x)}{2}}\log(x)}{x}\right)}{\frac{1}{2}e^{\frac{\log^2(x)}{2}}\log^2(x)+c_1e^{\frac{\log^2(x)}{2}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.031 (sec), leaf count = 23

```
dsolve(x*diff(y(x),x)*ln(x)-y(x)^2*ln(x)-(2*ln(x)^2+1)*y(x)-ln(x)^3 = 0,y(x))
```

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

ODE No. 195

$$\sin(x)y'(x) + y(x)^2\left(-\sin^2(x)\right) + y(x)(\cos(x) - 3\sin(x)) + 4 = 0$$

✓ **Mathematica** : cpu = 0.16743 (sec), leaf count = 27

```
DSolve[4 + (Cos[x] - 3*Sin[x])*y[x] - Sin[x]^2*y[x]^2 + Sin[x]*Derivative[1][y][x] == 0,y[x],
```

$$\left\{\left\{y(x) \to -4\csc(x) + \frac{\csc(x)}{\frac{1}{5} + c_1 e^{5x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.108 (sec), leaf count = 28

```
dsolve(sin(x)*diff(y(x),x)-y(x)^2*sin(x)^2+(cos(x)-3*sin(x))*y(x)+4 = 0,y(x))
```

$$y(x) = \frac{-4\,\mathrm{e}^{5x}c_1 - 4}{\sin(x)\left(\mathrm{e}^{5x}c_1 - 4\right)}$$

ODE No. 196

$$\cos(x)y'(x) + y(x) + (\sin(x) + 1)\cos(x) = 0$$

✓ **Mathematica** : cpu = 0.21876 (sec), leaf count = 53

```
DSolve[Cos[x]*(1 + Sin[x]) + y[x] + Cos[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to e^{-2\tanh^{-1}\left(\tan\left(\frac{x}{2}\right)\right)}\left(\sin(x) + 4\log\left(\cos\left(\frac{x}{2}\right) - \sin\left(\frac{x}{2}\right)\right)\right) + c_1 e^{-2\tanh^{-1}\left(\tan\left(\frac{x}{2}\right)\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.153 (sec), leaf count = 29

```
dsolve(cos(x)*diff(y(x),x)+y(x)+(1+sin(x))*cos(x) = 0,y(x))
```

$$y(x) = \frac{\sin(x) + 2\ln(\cos(x)) - 2\ln(\sec(x) + \tan(x)) + c_1}{\sec(x) + \tan(x)}$$

ODE No. 197

$$\cos(x)y'(x) - y(x)^4 - y(x)\sin(x) = 0$$

✓ **Mathematica** : cpu = 0.121139 (sec), leaf count = 98

```
DSolve[-(Sin[x]*y[x]) - y[x]^4 + Cos[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{\sqrt[3]{-\sin(x) + c_1\cos^3(x) - 2\sin(x)\cos^2(x)}}\right\}, \left\{y(x) \to -\frac{\sqrt[3]{-1}}{\sqrt[3]{-\sin(x) + c_1\cos^3(x) - 2\sin(x)\cos}}\right.$$

✓ **Maple** : cpu = 0.123 (sec), leaf count = 237

```
dsolve(cos(x)*diff(y(x),x)-y(x)^4-y(x)*sin(x) = 0,y(x))
```

$$y(x) = \frac{\left(\cos(x)\left(c_1(\sin^4(x)) + 2\cos(x)(\sin^3(x)) - 2c_1(\sin^2(x)) - 3\sin(x)\cos(x) + c_1\right)^2\right)^{\frac{1}{3}}}{c_1(\sin^4(x)) + 2\cos(x)(\sin^3(x)) - 2c_1(\sin^2(x)) - 3\sin(x)\cos(x) + c_1}$$

ODE No. 198

$$\sin(x)\cos(x)y'(x) - y(x) - \sin^3(x) = 0$$

✓ **Mathematica** : cpu = 0.0313304 (sec), leaf count = 15

```
DSolve[-Sin[x]^3 - y[x] + Cos[x]*Sin[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to -\sin(x) + c_1 \tan(x)\}\}$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 13

```
dsolve(sin(x)*cos(x)*diff(y(x),x)-y(x)-sin(x)^3 = 0,y(x))
```

$$y(x) = (-\cos(x) + c_1)\tan(x)$$

ODE No. 199

$$\sin(2x)y'(x) + \sin(2y(x)) = 0$$

✓ **Mathematica** : cpu = 0.215688 (sec), leaf count = 15

```
DSolve[Sin[2*y[x]] + Sin[2*x]*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.187 (sec), leaf count = 105

```
dsolve(sin(2*x)*diff(y(x),x)+sin(2*y(x)) = 0,y(x))
```

$$y(x) = \frac{\arctan\left(-\frac{2c_1(\sin(4x)+2\sin(2x))}{c_1^2\cos(4x)-c_1^2-\cos(4x)-4\cos(2x)-3}, \frac{c_1^2\cos(4x)-c_1^2+\cos(4x)+4\cos(2x)+3}{c_1^2\cos(4x)-c_1^2-\cos(4x)-4\cos(2x)-3}\right)}{2}$$

ODE No. 200

$$Ax\left(a\sin^2(x)+c\right)+y'(x)\left(a\sin^2(x)+b\right)+ay(x)\sin(2x)=0$$

✓ **Mathematica** : cpu = 0.128949 (sec), leaf count = 77

```
DSolve[A*x*(c + a*Sin[x]^2) + a*Sin[2*x]*y[x] + (b + a*Sin[x]^2)*Derivative[1][y][x] == 0,y[x
```

$$\left\{\left\{y(x)\to \frac{\frac{1}{2}aAx^2-\frac{1}{2}aAx\sin(2x)-\frac{1}{4}aA\cos(2x)+Acx^2}{a\cos(2x)-a-2b}+\frac{c_1}{a\cos(2x)-a-2b}\right\}\right\}$$

✓ **Maple** : cpu = 0.094 (sec), leaf count = 53

```
dsolve((a*sin(x)^2+b)*diff(y(x),x)+a*y(x)*sin(2*x)+A*x*(a*sin(x)^2+c) = 0,y(x))
```

$$y(x)=\frac{-Aa\cos\left(2x\right)-2Axa\sin\left(2x\right)+2x^2(a+2c)\,A-8c_1}{4a\cos\left(2x\right)-4a-8b}$$

ODE No. 201

$$-y(x)f'(x)+2f(x)y'(x)+2f(x)y(x)^2-2f(x)^2=0$$

✓ **Mathematica** : cpu = 0.148826 (sec), leaf count = 39

```
DSolve[-2*f[x]^2 + 2*f[x]*y[x]^2 - y[x]*Derivative[1][f][x] + 2*f[x]*Derivative[1][y][x] == 0
```

$$\left\{\left\{y(x)\to i\sqrt{f(x)}\tan\left(i\int_1^x-\sqrt{f(K[1])}dK[1]+c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.049 (sec), leaf count = 23

```
dsolve(2*f(x)*diff(y(x),x)+2*f(x)*y(x)^2-diff(f(x),x)*y(x)-2*f(x)^2 = 0,y(x))
```

$$y(x)=i\tan\left(-i\left(\int\sqrt{f\left(x\right)}dx\right)+c_1\right)\sqrt{f\left(x\right)}$$

ODE No. 202

$$f(x)y'(x) + g(x)\text{tg}(y(x)) + h(x) = 0$$

✗ **Mathematica** : cpu = 20.2726 (sec), leaf count = 0

```
DSolve[h[x] + g[x]*tg[y[x]] + f[x]*Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[h[x] + g[x]*tg[y[x]] + f[x]*Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(f(x)*diff(y(x),x)+g(x)*tg(y(x))+h(x) = 0,y(x))
```

, could not solve

```
dsolve(f(x)*diff(y(x),x)+g(x)*tg(y(x))+h(x) = 0,y(x))
```

ODE No. 203

$$x^3 + y(x)y'(x) + y(x) = 0$$

✗ **Mathematica** : cpu = 1.65124 (sec), leaf count = 0

```
DSolve[x^3 + y[x] + y[x]*Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[x^3 + y[x] + y[x]*Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(y(x)*diff(y(x),x)+y(x)+x^3 = 0,y(x))
```

, could not solve

```
dsolve(y(x)*diff(y(x),x)+y(x)+x^3 = 0,y(x))
```

ODE No. 204

$$ay(x) + y(x)y'(x) + x = 0$$

✓ **Mathematica** : cpu = 0.125276 (sec), leaf count = 70

```
DSolve[x + a*y[x] + y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}\log\left(\frac{ay(x)}{x} + \frac{y(x)^2}{x^2} + 1\right) - \frac{a\tan^{-1}\left(\frac{a+\frac{2y(x)}{x}}{\sqrt{4-a^2}}\right)}{\sqrt{4-a^2}} = -\log(x) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.325 (sec), leaf count = 92

```
dsolve(y(x)*diff(y(x),x)+a*y(x)+x = 0,y(x))
```

$$y(x) = \text{RootOf}\left(\_Z^2 - \mathrm{e}^{\text{RootOf}\left(x^2\left(\left(\tanh^2\left(\frac{\sqrt{(a-2)(a+2)}\left(2c_1+\_Z+2\ln(x)\right)}{2a}\right)\right)a^2-4\left(\tanh^2\left(\frac{\sqrt{(a-2)(a+2)}\left(2c_1+\_Z+2\ln(x)\right)}{2a}\right)\right)-a^2\right.\right.\right.$$

ODE No. 205

$$\frac{1}{4}\left(a^2-1\right)x+ay(x)+bx^n+y(x)y'(x)=0$$

✗ **Mathematica** : cpu = 14.2981 (sec), leaf count = 0

```
DSolve[((-1 + a^2)*x)/4 + b*x^n + a*y[x] + y[x]*Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[((-1 + a^2)*x)/4 + b*x^n + a*y[x] + y[x]*Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(y(x)*diff(y(x),x)+a*y(x)+1/4*(a^2-1)*x+b*x^n = 0,y(x))
```

, could not solve

```
dsolve(y(x)*diff(y(x),x)+a*y(x)+1/4*(a^2-1)*x+b*x^n = 0,y(x))
```

ODE No. 206

$$ay(x) - 2a + be^x + y(x)y'(x) = 0$$

✗ **Mathematica** : cpu = 25.944 (sec), leaf count = 0

```
DSolve[-2*a + b*E^x + a*y[x] + y[x]*Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-2*a + b*E^x + a*y[x] + y[x]*Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(y(x)*diff(y(x),x)+a*y(x)+b*exp(x)-2*a = 0,y(x))
```

, could not solve

```
dsolve(y(x)*diff(y(x),x)+a*y(x)+b*exp(x)-2*a = 0,y(x))
```

ODE No. 207

$$y(x)y'(x) + y(x)^2 + 4x(x+1) = 0$$

✓ **Mathematica** : cpu = 0.0947851 (sec), leaf count = 47

```
DSolve[4*x*(1 + x) + y[x]^2 + y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{-4x^2 + c_1 e^{-2x}}\right\}, \left\{y(x) \to \sqrt{-4x^2 + c_1 e^{-2x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 37

```
dsolve(y(x)*diff(y(x),x)+y(x)^2+4*x*(1+x) = 0,y(x))
```

$$y(x) = \sqrt{\mathrm{e}^{-2x} c_1 - 4x^2}$$

ODE No. 208

$$ay(x)^2 - b\cos(c+x) + y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.21905 (sec), leaf count = 118

```
DSolve[-(b*Cos[c + x]) + a*y[x]^2 + y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{4a^2c_1e^{-2ax} + 4ab\cos(c+x) + c_1e^{-2ax} + 2b\sin(c+x)}}{\sqrt{4a^2+1}}\right\}, \left\{y(x) \to \frac{\sqrt{4a^2c_1e^{-2ax} + 4ab\cos(}\right.\right.$$

✓ **Maple** : cpu = 0.083 (sec), leaf count = 106

```
dsolve(y(x)*diff(y(x),x)+a*y(x)^2-b*cos(x+c) = 0,y(x))
```

$$y(x) = \frac{\sqrt{16c_1\left(a^2+\frac{1}{4}\right)^2 \mathrm{e}^{-2ax} + 16\left(a\cos(x+c) + \frac{\sin(x+c)}{2}\right)\left(a^2+\frac{1}{4}\right)b}}{4a^2+1}$$

ODE No. 209

$$y(x)y'(x) - \sqrt{ay(x)^2 + b} = 0$$

✓ **Mathematica** : cpu = 0.122002 (sec), leaf count = 84

```
DSolve[-Sqrt[b + a*y[x]^2] + y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{a^2x^2 + 2a^2c_1x + a^2{c_1}^2 - b}}{\sqrt{a}}\right\}, \left\{y(x) \to \frac{\sqrt{a^2x^2 + 2a^2c_1x + a^2{c_1}^2 - b}}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.015 (sec), leaf count = 21

```
dsolve(y(x)*diff(y(x),x)-(a*y(x)^2+b)^(1/2) = 0,y(x))
```

$$x - \frac{\sqrt{ay\left(x\right)^2 + b}}{a} + c_1 = 0$$

ODE No. 210

$$y(x)y'(x) + xy(x)^2 - 4x = 0$$

✓ **Mathematica** : cpu = 0.0902105 (sec), leaf count = 47

```
DSolve[-4*x + x*y[x]^2 + y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{4 + e^{-x^2+2c_1}}\right\}, \left\{y(x) \to \sqrt{4 + e^{-x^2+2c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 33

```
dsolve(y(x)*diff(y(x),x)+x*y(x)^2-4*x = 0,y(x))
```

$$y(x) = \sqrt{\mathrm{e}^{-x^2} c_1 + 4}$$

ODE No. 211

$$y(x)y'(x) - xe^{\frac{x}{y(x)}} = 0$$

✓ **Mathematica** : cpu = 0.237999 (sec), leaf count = 41

```
DSolve[-(E^(x/y[x])*x) + y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{\frac{y(x)}{x}} \frac{K[1]}{K[1]^2 - e^{\frac{1}{K[1]}}} dK[1] = -\log(x) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.049 (sec), leaf count = 31

```
dsolve(y(x)*diff(y(x),x)-x*exp(x/y(x)) = 0,y(x))
```

$$y(x) = \text{RootOf}\left(-\left(\int^{\_Z} \frac{\_a}{-\_a^2 + \mathrm{e}^{\frac{1}{-\_a}}} d\_a\right) + \ln(x) + c_1\right) x$$

ODE No. 212

$$g(x)f\left(x^2+y(x)^2\right)+y(x)y'(x)+x=0$$

✓ **Mathematica** : cpu = 0.359821 (sec), leaf count = 95

```
DSolve[x + f[x^2 + y[x]^2]*g[x] + y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{K[2]}{f\left(x^2+K[2]^2\right)}-\int_1^x-\frac{2K[1]K[2]f'(K[1]^2+K[2]^2)}{f\left(K[1]^2+K[2]^2\right)^2}dK[1]\right)dK[2]+\int_1^x\left(g(K[1])+\frac{}{f\left(K[1]\right.}\right.$$

✓ **Maple** : cpu = 0.136 (sec), leaf count = 30

```
dsolve(y(x)*diff(y(x),x)+f(y(x)^2+x^2)*g(x)+x = 0,y(x))
```

$$\int_{\_b}^{y(x)}\frac{\_a}{f\left(\_a^2+x^2\right)}d\_a+\int g(x)\,dx-c_1=0$$

ODE No. 213

$$(y(x)+1)y'(x)-y(x)-x=0$$

✓ **Mathematica** : cpu = 0.13845 (sec), leaf count = 71

```
DSolve[-x - y[x] + (1 + y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}\log\left(\frac{x^2-y(x)^2+(x-3)y(x)-x-1}{(x-1)^2}\right)+\log(1-x)=\frac{\tanh^{-1}\left(\frac{y(x)+2x-1}{\sqrt{5}(y(x)+1)}\right)}{\sqrt{5}}+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.789 (sec), leaf count = 66

```
dsolve((1+y(x))*diff(y(x),x)-y(x)-x = 0,y(x))
```

$$-\frac{\ln\left(\frac{y(x)^2+(-x+3)y(x)-x^2+x+1}{(x-1)^2}\right)}{2}-\frac{\sqrt{5}\,\operatorname{arctanh}\left(\frac{(-2y(x)-3+x)\sqrt{5}}{5x-5}\right)}{5}-\ln(x-1)-c_1=0$$

ODE No. 214

$$(y(x)+x-1)y'(x)-y(x)+2x+3=0$$

✓ **Mathematica** : cpu = 0.158845 (sec), leaf count = 78

```
DSolve[3 + 2*x - y[x] + (-1 + x + y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[2\sqrt{2}\tan^{-1}\left(\frac{-y(x)+2x+3}{\sqrt{2}(y(x)+x-1)}\right)=2\log\left(\frac{6x^2+3y(x)^2-10y(x)+8x+11}{(3x+2)^2}\right)+4\log(3x+2)+3c_1,\right.$$

✓ **Maple** : cpu = 0.164 (sec), leaf count = 48

```
dsolve((y(x)+x-1)*diff(y(x),x)-y(x)+2*x+3 = 0,y(x))
```

$$y(x)=\frac{5}{3}+\frac{(-3x-2)\sqrt{2}\,\tan\left(\text{RootOf}\left(\sqrt{2}\,\ln\left(2(\tan^2(\_Z)+1)\,(3x+2)^2\right)+2\sqrt{2}\,c_1-2\_Z\right)\right)}{3}$$

ODE No. 215

$$(y(x)+2x-2)y'(x)-y(x)+x+1=0$$

✓ **Mathematica** : cpu = 0.158436 (sec), leaf count = 80

```
DSolve[1 + x - y[x] + (-2 + 2*x + y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[6\sqrt{3}\tan^{-1}\left(\frac{4-3y(x)}{\sqrt{3}(y(x)+2x-2)}\right)=3\log\left(\frac{3x^2+3y(x)^2+3(x-3)y(x)-6x+7}{(1-3x)^2}\right)+6\log(3x-1)\right]$$

✓ **Maple** : cpu = 0.202 (sec), leaf count = 51

```
dsolve((y(x)+2*x-2)*diff(y(x),x)-y(x)+x+1 = 0,y(x))
```

$$y(x)=\frac{3}{2}-\frac{x}{2}+\frac{\sqrt{3}\,(3x-1)\tan\left(\text{RootOf}\left(\sqrt{3}\,\ln\left(\frac{3\left(\tan^2\left(\_Z\right)+1\right)(3x-1)^2}{4}\right)+2\sqrt{3}\,c_1+6\_Z\right)\right)}{6}$$

ODE No. 216

$$(y(x)-2x+1)y'(x)+y(x)+x=0$$

✓ **Mathematica** : cpu = 0.143248 (sec), leaf count = 82

```
DSolve[x + y[x] + (1 - 2*x + y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[6\sqrt{3}\tan^{-1}\left(\frac{3y(x)+1}{\sqrt{3}(-y(x)+2x-1)}\right)=3\log\left(\frac{3x^2+3y(x)^2-3(x-1)y(x)-3x+1}{(1-3x)^2}\right)+6\log(3x-1\right.$$

✓ **Maple** : cpu = 0.176 (sec), leaf count = 51

```
dsolve((y(x)-2*x+1)*diff(y(x),x)+y(x)+x = 0,y(x))
```

$$y(x)=\frac{(-3x+1)\sqrt{3}\tan\left(\text{RootOf}\left(\sqrt{3}\ln\left(\frac{3\left(\tan^2\left(\_Z\right)+1\right)(3x-1)^2}{4}\right)+2\sqrt{3}c_1+6\_Z\right)\right)}{6}+\frac{x}{2}-\frac{1}{2}$$

ODE No. 217

$$\left(y(x)-x^2\right)y'(x)-x=0$$

✓ **Mathematica** : cpu = 0.0263249 (sec), leaf count = 29

```
DSolve[-x + (-x^2 + y[x])*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.037 (sec), leaf count = 23

```
dsolve((y(x)-x^2)*diff(y(x),x)-x = 0,y(x))
```

$$y(x)=x^2+\frac{\text{LambertW}\left(-4c_1\mathrm{e}^{-2x^2-1}\right)}{2}+\frac{1}{2}$$

ODE No. 218

$$\left(y(x)-x^2\right)y'(x)+4xy(x)=0$$

✓ **Mathematica** : cpu = 0.140635 (sec), leaf count = 257

```
DSolve[4*x*y[x] + (-x^2 + y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to x^2+\frac{1}{-\frac{1}{2x^2}-\frac{\frac{1}{2}-\frac{i}{2}}{\sqrt{2}x^2\sqrt{x^2\cosh\left(\frac{2c_1}{9}\right)+x^2\sinh\left(\frac{2c_1}{9}\right)-i}}}\right\},\left\{y(x)\to x^2+\frac{1}{-\frac{1}{2x^2}+\frac{\frac{1}{2}-\frac{i}{2}}{\sqrt{2}x^2\sqrt{x^2\cosh\left(\frac{2c_1}{9}\right)+x^2\sinh\left(\frac{2}{}\right.}}}\right.$$

✓ **Maple** : cpu = 0.162 (sec), leaf count = 57

```
dsolve((y(x)-x^2)*diff(y(x),x)+4*x*y(x) = 0,y(x))
```

$$y(x)=-\frac{c_1\sqrt{-4x^2+c_1^2}}{2}+\frac{c_1^2}{2}-x^2$$

ODE No. 219

$$-\text{f0}(x) - \text{f1}(x)y(x) - \text{f2}(x)y(x)^2 + (g(x) + y(x))y'(x) = 0$$

✗ **Mathematica** : cpu = 300.295 (sec), leaf count = 0

```
DSolve[-f0[x] - f1[x]*y[x] - f2[x]*y[x]^2 + (g[x] + y[x])*Derivative[1][y][x] == 0,y[x],x]
```

, timed out

```
$Aborted
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((y(x)+g(x))*diff(y(x),x)-f2(x)*y(x)^2-f1(x)*y(x)-f0(x) = 0,y(x))
```

, could not solve

```
dsolve((y(x)+g(x))*diff(y(x),x)-f2(x)*y(x)^2-f1(x)*y(x)-f0(x) = 0,y(x))
```

ODE No. 220

$$-x^3+2y(x)y'(x)-xy(x)^2=0$$

✓ **Mathematica** : cpu = 0.0822247 (sec), leaf count = 57

```
DSolve[-x^3 - x*y[x]^2 + 2*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\sqrt{-x^2+c_1e^{\frac{x^2}{2}}-2}\right\},\left\{y(x)\to \sqrt{-x^2+c_1e^{\frac{x^2}{2}}-2}\right\}\right\}$$

✓ **Maple** : cpu = 0.031 (sec), leaf count = 43

```
dsolve(2*y(x)*diff(y(x),x)-x*y(x)^2-x^3 = 0,y(x))
```

$$y(x)=\sqrt{\mathrm{e}^{\frac{x^2}{2}}c_1-x^2-2}$$

ODE No. 221

$$(2y(x)+x+1)y'(x)-2y(x)-x+1=0$$

✓ **Mathematica** : cpu = 0.0261708 (sec), leaf count = 35

```
DSolve[1 - x - 2*y[x] + (1 + x + 2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{2}(-x-1)+\frac{2}{3}\left(1+W\left(-e^{\frac{9x}{4}-1+c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.09 (sec), leaf count = 21

```
dsolve((2*y(x)+x+1)*diff(y(x),x)-2*y(x)-x+1 = 0,y(x))
```

$$y(x)=-\frac{x}{2}+\frac{2\,\text{LambertW}\left(\frac{e^{-\frac{1}{4}}e^{\frac{9x}{4}}c_1}{4}\right)}{3}+\frac{1}{6}$$

ODE No. 222

$$(2y(x)+x+7)y'(x)-y(x)+2x+4=0$$

✓ **Mathematica** : cpu = 0.0834344 (sec), leaf count = 65

```
DSolve[4 + 2*x - y[x] + (7 + x + 2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[2\log\left(\frac{4(x^2+y(x)^2+4y(x)+6x+13)}{5(x+3)^2}\right)+2\tan^{-1}\left(\frac{y(x)-2(x+2)}{2y(x)+x+7}\right)+4\log(x+3)+5c_1=0,y(\right.$$

✓ **Maple** : cpu = 0.096 (sec), leaf count = 32

```
dsolve((2*y(x)+x+7)*diff(y(x),x)-y(x)+2*x+4 = 0,y(x))
```

$$y(x)=-2+(-x-3)\tan\left(\text{RootOf}\left(\ln\left(\frac{1}{\cos(\_Z)^2}\right)-\_Z+2\ln(x+3)+2c_1\right)\right)$$

ODE No. 223

$$(2y(x)-x)y'(x)-y(x)-2x=0$$

✓ **Mathematica** : cpu = 0.0319335 (sec), leaf count = 55

```
DSolve[-2*x - y[x] + (-x + 2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{2}\left(x-\sqrt{5x^2-4e^{c_1}}\right)\right\},\left\{y(x)\to \frac{1}{2}\left(x+\sqrt{5x^2-4e^{c_1}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.155 (sec), leaf count = 51

```
dsolve((2*y(x)-x)*diff(y(x),x)-y(x)-2*x = 0,y(x))
```

$$y(x)=\frac{c_1x-\sqrt{5x^2c_1^2+4}}{2c_1}$$

ODE No. 224

$$(2y(x)-6x)y'(x)-y(x)+3x+2=0$$

✓ **Mathematica** : cpu = 0.0261774 (sec), leaf count = 29

```
DSolve[2 + 3*x - y[x] + (-6*x + 2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to 3x-\frac{2}{5}\left(1+W\left(-e^{\frac{25x}{4}-1+c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.107 (sec), leaf count = 35

```
dsolve((2*y(x)-6*x)*diff(y(x),x)-y(x)+3*x+2 = 0,y(x))
```

$$y(x)=\frac{\mathrm{e}^{-\mathrm{LambertW}\left(-\frac{\mathrm{e}^{\frac{25x}{4}}\mathrm{e}^{-1}\mathrm{e}^{-\frac{25c_1}{4}}}{2}\right)+\frac{25x}{4}-1-\frac{25c_1}{4}}}{5}+3x-\frac{2}{5}$$

ODE No. 225

$$(4y(x)+2x+3)y'(x)-2y(x)-x-1=0$$

✓ **Mathematica** : cpu = 0.0250535 (sec), leaf count = 33

```
DSolve[-1 - x - 2*y[x] + (3 + 2*x + 4*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{4}(-2x-3)+\frac{1}{8}\left(1+W\left(-e^{8x-1+c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 20

```
dsolve((4*y(x)+2*x+3)*diff(y(x),x)-2*y(x)-x-1 = 0,y(x))
```

$$y(x)=-\frac{x}{2}+\frac{\text{LambertW}\left(\text{e}^5\text{e}^{8x}c_1\right)}{8}-\frac{5}{8}$$

ODE No. 226

$$(4y(x)-2x-3)y'(x)+2y(x)-x-1=0$$

✓ **Mathematica** : cpu = 0.0247217 (sec), leaf count = 35

```
DSolve[-1 - x + 2*y[x] + (-3 - 2*x + 4*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{4}(2x+3)+\frac{1}{8}\left(-1-W\left(-e^{8x-1+c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.074 (sec), leaf count = 21

```
dsolve((4*y(x)-2*x-3)*diff(y(x),x)+2*y(x)-x-1 = 0,y(x))
```

$$y(x)=\frac{x}{2}-\frac{\text{LambertW}\left(-\text{e}^5\text{e}^{8x}c_1\right)}{8}+\frac{5}{8}$$

ODE No. 227

$$(4y(x)-3x-5)y'(x)-3y(x)+7x+2=0$$

✓ **Mathematica** : cpu = 0.0223636 (sec), leaf count = 107

```
DSolve[2 + 7*x - 3*y[x] + (-5 - 3*x + 4*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{4}(3x+5)-\frac{1}{2}i\sqrt{-2\left(-\frac{7x^2}{2}-2x\right)-\frac{1}{4}(3x+5)^2-4c_1}\right\},\left\{y(x)\to \frac{1}{4}(3x+5)+\frac{1}{2}i\sqrt{-2\left(-\right.\right.\right.$$

✓ **Maple** : cpu = 0.165 (sec), leaf count = 33

```
dsolve((4*y(x)-3*x-5)*diff(y(x),x)-3*y(x)+7*x+2 = 0,y(x))
```

$$y(x)=\frac{-\sqrt{4-6859\left(x-\frac{7}{19}\right)^2c_1^2}+(57x+95)c_1}{76c_1}$$

ODE No. 228

$$(4y(x)+11x-11)y'(x)-25y(x)-8x+62=0$$

✓ **Mathematica** : cpu = 0.260718 (sec), leaf count = 3357

```
DSolve[62 - 8*x - 25*y[x] + (-11 + 11*x + 4*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{4\left(-\frac{}{81(9x-1)\left(81\cosh\left(\frac{3c_1}{8}\right)x^2+81\sinh\left(\frac{3c_1}{8}\right)x^2-18\cosh\left(\frac{3c_1}{8}\right)x-18\sinh\left(\frac{3c_1}{8}\right)x+\cosh\left(\frac{3c_1}{8}\right)+\sinh\left(\frac{3c_1}{8}\right)-1\right)\sqrt[3]{-25828}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.387 (sec), leaf count = 271

```
dsolve((4*y(x)+11*x-11)*diff(y(x),x)-25*y(x)-8*x+62 = 0,y(x))
```

$$y(x)=\frac{(-76x+28)\left(64-8748(9x-1)^2c_1+108\sqrt{43046721}\sqrt{\left(-\frac{32}{177147}+\left(x-\frac{1}{9}\right)^2c_1\right)\left(x-\frac{1}{9}\right)^2c_1}\right)^{\frac{1}{3}}+}{8\left(64-8748\,(9x-1)^2c_1+108\sqrt{43046721}\sqrt{\left(-\frac{32}{177147}+\left(x-\frac{1}{9}\right)^2c_1\right)\left(x-\frac{1}{9}\right)^2c_1}\right)^{\frac{1}{3}}+}$$

ODE No. 229

$$(12y(x)-5x-8)y'(x)-5y(x)+2x+3=0$$

✓ **Mathematica** : cpu = 0.0247762 (sec), leaf count = 121

```
DSolve[3 + 2*x - 5*y[x] + (-8 - 5*x + 12*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{12}(5x+8)-\frac{i\sqrt{-24\left(-\frac{x^2}{12}-\frac{x}{4}\right)-\frac{1}{12}(5x+8)^2-12c_1}}{2\sqrt{3}}\right\},\left\{y(x)\to \frac{1}{12}(5x+8)+\frac{i\sqrt{-24\left(-\frac{x}{1}\right.}}\right.$$

✓ **Maple** : cpu = 0.164 (sec), leaf count = 32

```
dsolve((12*y(x)-5*x-8)*diff(y(x),x)-5*y(x)+2*x+3 = 0,y(x))
```

$$y(x)=\frac{-\sqrt{(x+4)^2c_1^2+24}+(5x+8)c_1}{12c_1}$$

ODE No. 230

$$ay(x)y'(x) + by(x)^2 + f(x) = 0$$

✓ **Mathematica** : cpu = 0.173082 (sec), leaf count = 98

```
DSolve[f[x] + b*y[x]^2 + a*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -e^{-\frac{bx}{a}}\sqrt{2\int_1^x -\frac{e^{\frac{2bK[1]}{a}}f(K[1])}{a}dK[1] + c_1}\right\}, \left\{y(x) \to e^{-\frac{bx}{a}}\sqrt{2\int_1^x -\frac{e^{\frac{2bK[1]}{a}}f(K[1])}{a}dK[1] + c_1}\right.\right.$$

✓ **Maple** : cpu = 0.053 (sec), leaf count = 100

```
dsolve(a*y(x)*diff(y(x),x)+b*y(x)^2+f(x) = 0,y(x))
```

$$y(x) = \frac{\mathrm{e}^{-\frac{2bx}{a}}\sqrt{\mathrm{e}^{\frac{2bx}{a}}a\left(c_1 a - 2\left(\int \mathrm{e}^{\frac{2bx}{a}}f(x)\,dx\right)\right)}}{a}$$

ODE No. 231

$$y'(x)(ay(x)+bx+c)+\alpha y(x)+\beta x+\gamma=0$$

✓ **Mathematica** : cpu = 2.46037 (sec), leaf count = 252

```
DSolve[EulerGamma + beta*x + alpha*y[x] + (c + b*x + a*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{(\alpha-b)^2\left(-\log\left(\frac{(ay(x)+bx+c)^2\left(-\frac{(\alpha(bx+c)-a(\beta x+\gamma))\left(a(\alpha-b)y(x)+a(\beta x+\gamma)+b^2(-x)-bc\right)}{(ay(x)+bx+c)^2}+a\beta-\alpha b\right)}{(\alpha(bx+c)-a(\beta x+\gamma))^2}\right)\right)-2\tan^{-1}\left(\frac{\frac{2a(\beta x+\gamma)-2}{ay(x)+b}}{(\alpha-b)\sqrt{\frac{4}{\sqrt{\frac{4(a\beta-\alpha b}{(\alpha-b)^2}}}}}\right)}{2(a\beta-\alpha b)}\right.$$

✓ **Maple** : cpu = 0.237 (sec), leaf count = 178

```
dsolve((a*y(x)+b*x+c)*diff(y(x),x)+alpha*y(x)+beta*x+gamma = 0,y(x))
```

$$y(x)=\frac{-b\gamma+\beta c+\frac{(x(a\beta-b\alpha)+a\gamma-\alpha c)\left(\sqrt{4a\beta-\alpha^2-2b\alpha-b^2}\tan\left(\text{RootOf}\left(\sqrt{4a\beta-\alpha^2-2b\alpha-b^2}\ln\left(\frac{(a\beta x-\alpha bx+a\gamma-\alpha c)^2\left(\tan^2\left(\_Z\right)+1\right)}{4a}\right.\right.\right.\right.}{2a}}{-a\beta+b\alpha}$$

ODE No. 232

$$x^2 + xy(x)y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0789555 (sec), leaf count = 56

```
DSolve[x^2 + y[x]^2 + x*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{-x^4 + 2c_1}}{\sqrt{2}x}\right\}, \left\{y(x) \to \frac{\sqrt{-x^4 + 2c_1}}{\sqrt{2}x}\right\}\right\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 39

```
dsolve(x*y(x)*diff(y(x),x)+y(x)^2+x^2 = 0,y(x))
```

$$y(x) = -\frac{\sqrt{-2x^4 + 4c_1}}{2x}$$

ODE No. 233

$$ax^3 \cos(x) + xy(x)y'(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.148438 (sec), leaf count = 38

```
DSolve[a*x^3*Cos[x] - y[x]^2 + x*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -x\sqrt{-2a\sin(x) + c_1}\right\}, \left\{y(x) \to x\sqrt{-2a\sin(x) + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.032 (sec), leaf count = 30

```
dsolve(x*y(x)*diff(y(x),x)-y(x)^2+a*x^3*cos(x) = 0,y(x))
```

$$y(x) = \sqrt{-2a\sin(x) + c_1}\, x$$

ODE No. 234

$$x^3 - 2x^2 + xy(x)y'(x) + xy(x) - y(x)^2 = 0$$

✗ **Mathematica** : cpu = 24.9569 (sec), leaf count = 0

```
DSolve[-2*x^2 + x^3 + x*y[x] - y[x]^2 + x*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-2*x^2 + x^3 + x*y[x] - y[x]^2 + x*y[x]*Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x*y(x)*diff(y(x),x)-y(x)^2+x*y(x)+x^3-2*x^2 = 0,y(x))
```

, could not solve

```
dsolve(x*y(x)*diff(y(x),x)-y(x)^2+x*y(x)+x^3-2*x^2 = 0,y(x))
```

ODE No. 235

$$(a + xy(x))y'(x) + by(x) = 0$$

✓ **Mathematica** : cpu = 0.108396 (sec), leaf count = 40

```
DSolve[b*y[x] + (a + x*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[x = -\frac{ae^{-\frac{y(x)}{b}}\,\text{Ei}\left(\frac{y(x)}{b}\right)}{b} + c_1 e^{-\frac{y(x)}{b}}, y(x)\right]$$

✓ **Maple** : cpu = 0.055 (sec), leaf count = 30

```
dsolve((x*y(x)+a)*diff(y(x),x)+b*y(x) = 0,y(x))
```

$$c_1 + \frac{1}{-\mathrm{e}^{\frac{y(x)}{b}} bx + a\,\text{expIntegral}\left(1, -\frac{y(x)}{b}\right)} = 0$$

ODE No. 236

$$x(y(x)+4)y'(x)-y(x)^2-2y(x)-2x=0$$

✓ **Mathematica** : cpu = 0.126611 (sec), leaf count = 114

```
DSolve[-2*x - 2*y[x] - y[x]^2 + x*(4 + y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -4+\frac{1}{x\left(\frac{1}{x^2+4x}-\frac{e^{-2\left(\frac{\log(x)}{4}+\frac{3}{4}\log(x+4)\right)}}{\sqrt{-\frac{4}{x+4}+c_1}}\right)}\right\},\left\{y(x)\to -4+\frac{1}{x\left(\frac{1}{x^2+4x}+\frac{e^{-2\left(\frac{\log(x)}{4}+\frac{3}{4}\log(x+4)\right)}}{\sqrt{-\frac{4}{x+4}+c_1}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 141

```
dsolve(x*(y(x)+4)*diff(y(x),x)-y(x)^2-2*y(x)-2*x = 0,y(x))
```

$$y(x)=\frac{-(x+4)^{\frac{3}{2}}\sqrt{\frac{c_1(x+4)-4}{x+4}}\,x-16\sqrt{x}-4x^{\frac{3}{2}}}{-(x+4)^{\frac{3}{2}}\sqrt{\frac{c_1(x+4)-4}{x+4}}+4\sqrt{x}+x^{\frac{3}{2}}}$$

ODE No. 237

$$x(a+y(x))y'(x)+by(x)+cx=0$$

✗ **Mathematica** : cpu = 3.90119 (sec), leaf count = 0

```
DSolve[c*x + b*y[x] + x*(a + y[x])*Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[c*x + b*y[x] + x*(a + y[x])*Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x*(y(x)+a)*diff(y(x),x)+b*y(x)+c*x = 0,y(x))
```

, could not solve

```
dsolve(x*(y(x)+a)*diff(y(x),x)+b*y(x)+c*x = 0,y(x))
```

ODE No. 238

$$(a+x(y(x)+x))y'(x)-b-y(x)(y(x)+x)=0$$

✓ **Mathematica** : cpu = 0.254391 (sec), leaf count = 192

```
DSolve[-b - y[x]*(x + y[x]) + (a + x*(x + y[x]))*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{a+x^2}{x}+\frac{1}{x\left(-\frac{a}{-a^2-ax^2-bx^2}-\frac{x}{\left(a^2+ax^2+bx^2\right)^{3/2}\sqrt{-\frac{1}{(a+b)\left(a^2+ax^2+bx^2\right)}+c_1}}\right)}\right\},\left\{y(x)\to -\frac{a+x^2}{x}+\right.$$

✓ **Maple** : cpu = 0.072 (sec), leaf count = 93

```
dsolve((x*(y(x)+x)+a)*diff(y(x),x)-y(x)*(y(x)+x)-b = 0,y(x))
```

$$y(x)=\frac{-abx-c_1x+\sqrt{c_1\left(a+b\right)\left(a\,x^2+b\,x^2+a^2-c_1\right)}}{-a^2+c_1}$$

ODE No. 239

$$\left(xy(x)-x^2\right)y'(x)-2x^2-3xy(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.118808 (sec), leaf count = 54

```
DSolve[-2*x^2 - 3*x*y[x] + y[x]^2 + (-x^2 + x*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.166 (sec), leaf count = 59

```
dsolve((x*y(x)-x^2)*diff(y(x),x)+y(x)^2-3*x*y(x)-2*x^2 = 0,y(x))
```

$$y(x)=\frac{x^2c_1-\sqrt{2x^4c_1^2+1}}{c_1x}$$

ODE No. 240

$$ax + 2xy(x)y'(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.10105 (sec), leaf count = 41

```
DSolve[a*x - y[x]^2 + 2*x*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{-ax\log(x) + c_1 x}\right\}, \left\{y(x) \to \sqrt{-ax\log(x) + c_1 x}\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 34

```
dsolve(2*x*y(x)*diff(y(x),x)-y(x)^2+a*x = 0,y(x))
```

$$y(x) = \sqrt{-ax\ln(x) + c_1 x}$$

ODE No. 241

$$ax^2 + 2xy(x)y'(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0967095 (sec), leaf count = 41

```
DSolve[a*x^2 - y[x]^2 + 2*x*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{-ax^2 + c_1 x}\right\}, \left\{y(x) \to \sqrt{-ax^2 + c_1 x}\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 33

```
dsolve(2*x*y(x)*diff(y(x),x)-y(x)^2+a*x^2 = 0,y(x))
```

$$y(x) = \sqrt{-a\,x^2 + c_1 x}$$

ODE No. 242

$$2xy(x)y'(x) + 2y(x)^2 + 1 = 0$$

✓ **Mathematica** : cpu = 0.0835599 (sec), leaf count = 60

```
DSolve[1 + 2*y[x]^2 + 2*x*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.021 (sec), leaf count = 39

```
dsolve(2*x*y(x)*diff(y(x),x)+2*y(x)^2+1 = 0,y(x))
```

$$y(x) = -\frac{\sqrt{-2x^2 + 4c_1}}{2x}$$

ODE No. 243

$$x(2y(x)+x-1)y'(x)-y(x)(y(x)+2x+1)=0$$

✓ **Mathematica** : cpu = 8.87073 (sec), leaf count = 487

```
DSolve[-(y[x]*(1 + 2*x + y[x])) + x*(-1 + x + 2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{2}x}{\sqrt[3]{-27c_1{}^2x^2+\sqrt{108c_1{}^3x^3+\left(27c_1{}^2x-27c_1{}^2x^2\right){}^2}+27c_1{}^2x}}+\frac{\sqrt[3]{-27c_1{}^2x^2+\sqrt{108c_1{}^3x^3+(2}}}{3\sqrt[3]{2}}\right.\right.$$

✓ **Maple** : cpu = 0.117 (sec), leaf count = 391

```
dsolve(x*(2*y(x)+x-1)*diff(y(x),x)-y(x)*(y(x)+2*x+1) = 0,y(x))
```

$$y(x)=\frac{3\,5^{\frac{1}{3}}\left(x\left(\sqrt{5}\sqrt{\frac{80x^2c_1-160c_1x-x+80c_1}{c_1}}+20x-20\right)c_1^2\right)^{\frac{1}{3}}}{40c_1}+\frac{3x5^{\frac{2}{3}}}{40\left(x\left(\sqrt{5}\sqrt{\frac{80x^2c_1-160c_1x-x+80c_1}{c_1}}+20x-20\right)\right.}$$

ODE No. 244

$$x(2y(x)-x-1)y'(x)+(-y(x)+2x-1)y(x)=0$$

✓ **Mathematica** : cpu = 8.99478 (sec), leaf count = 484

```
DSolve[(-1 + 2*x - y[x])*y[x] + x*(-1 - x + 2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{2}x}{\sqrt[3]{27{c_1}^2x^2+\sqrt{\left(27{c_1}^2x^2+27{c_1}^2x\right)^2-108{c_1}^3x^3}+27{c_1}^2x}}-\frac{\sqrt[3]{27{c_1}^2x^2+\sqrt{(27{c_1}^2x^2+27{c_1}^2}}}{3\sqrt[3]{2}c_1}\right.\right.$$

✓ **Maple** : cpu = 0.1 (sec), leaf count = 391

```
dsolve(x*(2*y(x)-x-1)*diff(y(x),x)+y(x)*(2*x-y(x)-1) = 0,y(x))
```

$$y(x)=\frac{3\,5^{\frac{1}{3}}\left(x\left(\sqrt{5}\sqrt{\frac{80x^2c_1+160c_1x-x+80c_1}{c_1}}-20x-20\right)c_1^2\right)^{\frac{1}{3}}}{40c_1}+\frac{3x5^{\frac{2}{3}}}{40\left(x\left(\sqrt{5}\sqrt{\frac{80x^2c_1+160c_1x-x+80c_1}{c_1}}-20x-20\right)\right.}$$

ODE No. 245

$$\left(4x^3+2xy(x)\right)y'(x)+112x^2y(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.416322 (sec), leaf count = 1453

```
DSolve[112*x^2*y[x] + y[x]^2 + (4*x^3 + 2*x*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{Root}\left[-1521681143169024\#1x^{22}-697437190619136\#1^2x^{20}-145299414712320\#1^3x^{18}-181\right.\right.$$

✓ **Maple** : cpu = 1.314 (sec), leaf count = 31

```
dsolve((2*x*y(x)+4*x^3)*diff(y(x),x)+y(x)^2+112*x^2*y(x) = 0,y(x))
```

$$y(x)=\frac{c_1}{x^{28}\,\text{RootOf}\left(x^{30}\_Z^{360}-24x^{30}\_Z^{330}-c_1\right)^{330}}$$

ODE No. 246

$$x(3y(x)+2x)y'(x)+3(y(x)+x)^2=0$$

✓ **Mathematica** : cpu = 0.137318 (sec), leaf count = 80

```
DSolve[3*(x + y[x])^2 + x*(2*x + 3*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{6}\left(-4x-\frac{\sqrt{2}\sqrt{-x^4+3e^{4c_1}}}{x}\right)\right\},\left\{y(x)\to \frac{1}{6}\left(-4x+\frac{\sqrt{2}\sqrt{-x^4+3e^{4c_1}}}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 63

```
dsolve(x*(3*y(x)+2*x)*diff(y(x),x)+3*(y(x)+x)^2 = 0,y(x))
```

$$y(x)=\frac{-4x^2c_1-\sqrt{-2x^4c_1^2+6}}{6c_1x}$$

ODE No. 247

$$-7x^2+(3x+2)(y(x)-2x-1)y'(x)+xy(x)-y(x)^2-9x-3=0$$

✓ **Mathematica** : cpu = 8.77461 (sec), leaf count = 693

```
DSolve[-3 - 9*x - 7*x^2 + x*y[x] - y[x]^2 + (2 + 3*x)*(-1 - 2*x + y[x])*Derivative[1][y][x] =
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{1458x^3+2916x^2+\sqrt{4\left(-81x^2-108x-36\right)^3+\left(1458x^3+2916x^2+1944x-324e^{2c_1}x+43\right.}}}{6\sqrt[3]{2}}\right.\right.$$

✓ **Maple** : cpu = 0.201 (sec), leaf count = 517

```
dsolve((3*x+2)*(y(x)-2*x-1)*diff(y(x),x)-y(x)^2+x*y(x)-7*x^2-9*x-3 = 0,y(x))
```

$$y(x)=-\frac{1}{3}+\frac{(3x+2)\left(7\left(-\frac{\left(2(3x+2)c_1-27(3x+2)^3c_1^3+2\sqrt{-27(3x+2)^4c_1^4+(3x+2)^2c_1^2}\right)^{\frac{1}{3}}}{4}-\frac{9(3x+2)^2c_1^2}{4\left(2(3x+2)c_1-27(3x+2)^3c_1^3+2\sqrt{-27(\right.}\right.\right.}{6\left(-\frac{\left(2(3x+2)c_1-27(3x+2)^3c_1^3+2\sqrt{-27(3x+2)^4c_1^4+(3x+2)^2c_1^2}\right)^{\frac{1}{3}}}{4}-\frac{9(3x+2)^2c_1^2}{4\left(2(3x+2)c_1-27(3x+2)^3c_1^3+2\sqrt{-27(3x-\right.}\right.}$$

ODE No. 248

$$\left(x^2+6xy(x)+3\right)y'(x)+3y(x)^2+2xy(x)+2x=0$$

✓ **Mathematica** : cpu = 0.192285 (sec), leaf count = 110

```
DSolve[2*x + 2*x*y[x] + 3*y[x]^2 + (3 + x^2 + 6*x*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{-x^2-3}{6x}-\frac{\sqrt{-2x^3+\frac{1}{6}\left(x^2+3\right)^2+6c_1x}}{\sqrt{6}x}\right\},\left\{y(x)\to \frac{-x^2-3}{6x}+\frac{\sqrt{-2x^3+\frac{1}{6}\left(x^2+3\right)^2+6c_1}}{\sqrt{6}x}\right.$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 75

```
dsolve((6*x*y(x)+x^2+3)*diff(y(x),x)+3*y(x)^2+2*x*y(x)+2*x = 0,y(x))
```

$$y(x)=\frac{-x^2-3+\sqrt{x^4-12x^3+6x^2-12c_1x+9}}{6x}$$

ODE No. 249

$$y'(x)\left(axy(x)+bx^n\right)+\alpha y(x)^3+\beta y(x)^2=0$$

✓ **Mathematica** : cpu = 3.48464 (sec), leaf count = 115

```
DSolve[beta*y[x]^2 + alpha*y[x]^3 + (b*x^n + a*x*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{(a(-n)+a+\alpha y(x))y(x)^{\frac{a-an}{\beta}-1}(\alpha y(x)+\beta)^{\frac{a(n-1)}{\beta}}}{a^2(n-1)^2(a(n-1)+\beta)}+\frac{x^{1-n}\exp\left(-\frac{a(n-1)(\log(y(x))-\log(\alpha y(x)+\beta))}{\beta}\right)}{ab(1-n)(n-1)}=c_1,y\right.$$

✓ **Maple** : cpu = 0.25 (sec), leaf count = 202

```
dsolve((a*x*y(x)+b*x^n)*diff(y(x),x)+alpha*y(x)^3+beta*y(x)^2 = 0,y(x))
```

$$y(x)=\frac{}{\text{RootOf}\left(-x^{1-n}\_Z^{\frac{a(n-1)}{\beta}}a^2\beta n+c_1a^2b\,n^2+x^{1-n}\_Z^{\frac{a(n-1)}{\beta}}a^2\beta-x^{1-n}\_Z^{\frac{a(n-1)}{\beta}}a\,\beta^2-\_Z^{\frac{an-a+\beta}{\beta}}\beta abn-\right.}$$

ODE No. 250

$$y'(x)\left(ax+Ax^2+by(x)+Bxy(x)+c\right)+Axy(x)+\alpha x-By(x)^2+\beta y(x)+\gamma=0$$

✗ **Mathematica** : cpu = 300.422 (sec), leaf count = 0

```
DSolve[EulerGamma + alpha*x + beta*y[x] + A*x*y[x] - B*y[x]^2 + (c + a*x + A*x^2 + b*y[x] + B
```

, timed out

```
$Aborted
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((B*x*y(x)+A*x^2+a*x+b*y(x)+c)*diff(y(x),x)-B*g(x)^2+A*x*y(x)+alpha*x+beta*y(x)+gamma =
```

, could not solve

```
dsolve((B*x*y(x)+A*x^2+a*x+b*y(x)+c)*diff(y(x),x)-B*g(x)^2+A*x*y(x)+alpha*x+beta*y(x)+g
```

ODE No. 251

$$\left(x^2 y(x)-1\right) y'(x)+x y(x)^2-1=0$$

✓ **Mathematica** : cpu = 0.138568 (sec), leaf count = 60

```
DSolve[-1 + x*y[x]^2 + (-1 + x^2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{x^2}-\frac{\sqrt{2x^3+c_1x^2+1}}{x^2}\right\},\left\{y(x)\to \frac{1}{x^2}+\frac{\sqrt{2x^3+c_1x^2+1}}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.017 (sec), leaf count = 51

```
dsolve((x^2*y(x)-1)*diff(y(x),x)+x*y(x)^2-1 = 0,y(x))
```

$$y(x)=\frac{1+\sqrt{2x^3-2x^2c_1+1}}{x^2}$$

ODE No. 252

$$\left(x^2 y(x)-1\right) y'(x)-x y(x)^2+1=0$$

✓ **Mathematica** : cpu = 8.68071 (sec), leaf count = 819

```
DSolve[1 - x*y[x]^2 + (-1 + x^2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{6xc_1-x}{6c_1-1}+\frac{\sqrt[3]{-1944{c_1}^2x^3+648c_1x^3-54x^3+1944{c_1}^2-648c_1+\sqrt{4\left(54x^2c_1-9x^2\right)^3+(-19}}}{3\sqrt[3]{2}(6c_1-1)}\right.\right.$$

✓ **Maple** : cpu = 0.654 (sec), leaf count = 1338

```
dsolve((x^2*y(x)-1)*diff(y(x),x)-x*y(x)^2+1 = 0,y(x))
```

$$y(x)=\frac{\left((-c_1+80)x^7-160x^4+80x\right)4^{\frac{1}{3}}\left(\left(-\frac{1}{4}+\sqrt{\frac{-5x^6+10x^3-5}{-80+(c_1-80)x^6+160x^3}}\right)c_1(-80+(c_1-80)x^6+160x^3\right.}{\left(80+(-c_1+80)x^6-160x^3\right)4^{\frac{1}{3}}\left(\left(-\frac{1}{4}+\sqrt{\frac{-5x^6+10x^3-5}{-80+(c_1-80)x^6+160x^3}}\right)c_1\left(-80+(c_1-80)x^6+160x^3\right)^2\right)^{\frac{1}{3}}}$$

ODE No. 253

$$\left(x^2 y(x) - 1\right) y'(x) + 8xy(x)^2 - 8 = 0$$

✗ **Mathematica** : cpu = 10.5914 (sec), leaf count = 0

```
DSolve[-8 + 8*x*y[x]^2 + (-1 + x^2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-8 + 8*x*y[x]^2 + (-1 + x^2*y[x])*Derivative[1][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((x^2*y(x)-1)*diff(y(x),x)+8*x*y(x)^2-8 = 0,y(x))
```

, could not solve

```
dsolve((x^2*y(x)-1)*diff(y(x),x)+8*x*y(x)^2-8 = 0,y(x))
```

ODE No. 254

$$x^2 y(x)^3 + x(xy(x) - 2)y'(x) + xy(x)^2 - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.13917 (sec), leaf count = 99

```
DSolve[-2*y[x] + x*y[x]^2 + x^2*y[x]^3 + x*(-2 + x*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{2x}{-x^2 + \frac{\sqrt{2}\sqrt{-\frac{x}{2} - 2x(-\log(x) + c_1)}}{\sqrt{-\frac{1}{x^3}}}}\right\}, \left\{y(x) \to \frac{2x}{x^2 + \frac{\sqrt{2}\sqrt{-\frac{x}{2} - 2x(-\log(x) + c_1)}}{\sqrt{-\frac{1}{x^3}}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 59

```
dsolve(x*(x*y(x)-2)*diff(y(x),x)+x^2*y(x)^3+x*y(x)^2-2*y(x) = 0,y(x))
```

$$y(x) = \frac{-1 + \sqrt{1 - 4\ln(x) + 4c_1}}{2(-\ln(x) + c_1)x}$$

ODE No. 255

$$x(xy(x)-3)y'(x)+xy(x)^2-y(x)=0$$

✓ **Mathematica** : cpu = 5.02468 (sec), leaf count = 30

```
DSolve[-y[x] + x*y[x]^2 + x*(-3 + x*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{3W\left(e^{-1+\frac{9c_1}{2^{2/3}}}x^{2/3}\right)}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.194 (sec), leaf count = 74

```
dsolve(x*(x*y(x)-3)*diff(y(x),x)+x*y(x)^2-y(x) = 0,y(x))
```

$$y(x)=-\frac{3\,\text{LambertW}\left(\frac{2\left(-\frac{x^2}{8}\right)^{\frac{1}{3}}c_1}{3}\right)}{x}$$

ODE No. 256

$$x^2(y(x)-1)y'(x)+(x-1)y(x)=0$$

✓ **Mathematica** : cpu = 0.0313338 (sec), leaf count = 21

```
DSolve[(-1 + x)*y[x] + x^2*(-1 + y[x])*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.133 (sec), leaf count = 31

```
dsolve(x^2*(-1+y(x))*diff(y(x),x)+(x-1)*y(x) = 0,y(x))
```

$$y(x)=\mathrm{e}^{\frac{c_1 x+x\ln(x)-\mathrm{LambertW}\left(-x\,\mathrm{e}^{c_1+\frac{1}{x}}\right)x+1}{x}}$$

ODE No. 257

$$x\left(x^4+xy(x)-1\right)y'(x)-y(x)\left(-x^4+xy(x)-1\right)=0$$

✓ **Mathematica** : cpu = 0.391728 (sec), leaf count = 39

```
DSolve[-(y[x]*(-1 - x^4 + x*y[x])) + x*(-1 + x^4 + x*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[2x^2+\frac{y(x)}{x}+\frac{x\left(-2\log\left(\frac{1}{1-xy(x)}\right)-2+c_1\right)}{y(x)}=0,y(x)\right]$$

✓ **Maple** : cpu = 0.122 (sec), leaf count = 98

```
dsolve(x*(x*y(x)+x^4-1)*diff(y(x),x)-y(x)*(x*y(x)-x^4-1) = 0,y(x))
```

$$y(x)=\frac{\left(-c_1+\mathrm{e}^{\text{RootOf}\left(-2\_Z x^4\mathrm{e}^{2\_Z}+2x^4\mathrm{e}^{2\_Z}-2\mathrm{e}^{\_Z}c_1x^4+\mathrm{e}^{2\_Z}-2\mathrm{e}^{\_Z}c_1+c_1^2\right)}\right)\mathrm{e}^{-\text{RootOf}\left(-2\_Z x^4\mathrm{e}^{2\_Z}+2x^4\mathrm{e}^{2\_Z}-2\mathrm{e}^{\_Z}c_1x^4+\mathrm{e}^{2\_Z}\right.}}{x}$$

ODE No. 258

$$-2x^3 + 2x^2 y(x) y'(x) - x^2 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.111562 (sec), leaf count = 43

```
DSolve[-x^2 - 2*x^3 + y[x]^2 + 2*x^2*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.027 (sec), leaf count = 33

```
dsolve(2*x^2*y(x)*diff(y(x),x)+y(x)^2-2*x^3-x^2 = 0,y(x))
```

$$y(x) = \sqrt{\mathrm{e}^{\frac{1}{x}} c_1 + x^2}$$

ODE No. 259

$$2x^2y(x)y'(x) - e^{x-\frac{1}{x}}x^2 - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.266419 (sec), leaf count = 50

```
DSolve[-(E^(-x^(-1) + x)*x^2) - y[x]^2 + 2*x^2*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.036 (sec), leaf count = 51

```
dsolve(2*x^2*y(x)*diff(y(x),x)-y(x)^2-x^2*exp(x-1/x) = 0,y(x))
```

$$y(x) = \sqrt{\mathrm{e}^{-\frac{1}{x}}c_1 + \mathrm{e}^{\frac{x^2-1}{x}}}$$

ODE No. 260

$$\left(2x^2y(x)+x\right)y'(x)-x^2y(x)^3+2xy(x)^2+y(x)=0$$

✓ **Mathematica** : cpu = 0.130032 (sec), leaf count = 80

```
DSolve[y[x] + 2*x*y[x]^2 - x^2*y[x]^3 + (x + 2*x^2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{x}{-2x^2+\frac{\sqrt{4x+x(-2\log(x)+c_1)}}{\sqrt{\frac{1}{x^3}}}}\right\},\left\{y(x)\to -\frac{x}{2x^2+\frac{\sqrt{4x+x(-2\log(x)+c_1)}}{\sqrt{\frac{1}{x^3}}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 59

```
dsolve((2*x^2*y(x)+x)*diff(y(x),x)-x^2*y(x)^3+2*x*y(x)^2+y(x) = 0,y(x))
```

$$y(x)=\frac{-2+\sqrt{4-2\ln(x)+2c_1}}{2\left(\ln(x)-c_1\right)x}$$

ODE No. 261

$$\left(2x^2y(x)-x\right)y'(x)-2xy(x)^2-y(x)=0$$

✓ **Mathematica** : cpu = 0.654662 (sec), leaf count = 32

```
DSolve[-y[x] - 2*x*y[x]^2 + (-x + 2*x^2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{1}{2xW\left(\frac{e^{-1+\frac{9c_1}{2^{2/3}}}}{x^2}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.119 (sec), leaf count = 18

```
dsolve((2*x^2*y(x)-x)*diff(y(x),x)-2*x*y(x)^2-y(x) = 0,y(x))
```

$$y(x)=-\frac{1}{2\,\mathrm{LambertW}\left(-\frac{c_1}{2x^2}\right)x}$$

ODE No. 262

$$2x^3 + \left(2x^2 y(x) - x^3\right) y'(x) - 4xy(x)^2 + y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.170012 (sec), leaf count = 101

```
DSolve[2*x^3 - 4*x*y[x]^2 + y[x]^3 + (-x^3 + 2*x^2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{2x^3 - \sqrt{e^{4c_1}x^2 - 3e^{2c_1}x^4}}{x^2 + e^{2c_1}}\right\}, \left\{y(x) \to \frac{2x^3 + \sqrt{e^{4c_1}x^2 - 3e^{2c_1}x^4}}{x^2 + e^{2c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.222 (sec), leaf count = 65

```
dsolve((2*x^2*y(x)-x^3)*diff(y(x),x)+y(x)^3-4*x*y(x)^2+2*x^3 = 0,y(x))
```

$$y(x) = \frac{x\left(2x^2 c_1 - \sqrt{3x^2 c_1 + 1}\right)}{x^2 c_1 - 1}$$

ODE No. 263

$$2x^3 + 3x^2 y(x)^2 + y(x)y'(x) + 7 = 0$$

✓ **Mathematica** : cpu = 0.0993097 (sec), leaf count = 181

```
DSolve[7 + 2*x^3 + 3*x^2*y[x]^2 + y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{\frac{7\ 2^{2/3}e^{-2x^3}x\Gamma\left(\frac{1}{3},-2x^3\right)}{3\sqrt[3]{-x^3}} - \frac{2^{2/3}e^{-2x^3}x\Gamma\left(\frac{4}{3},-2x^3\right)}{3\sqrt[3]{-x^3}} + c_1 e^{-2x^3}}\right\}, \left\{y(x) \to \sqrt{\frac{7\ 2^{2/3}e^{-2x^3}x\Gamma}{3\sqrt[3]{-}}\right.\right.$$

✓ **Maple** : cpu = 0.148 (sec), leaf count = 173

```
dsolve(2*x^3+y(x)*diff(y(x),x)+3*x^2*y(x)^2+7 = 0,y(x))
```

$$y(x) = -\frac{2^{\frac{2}{3}}\sqrt{-240\Gamma\left(\frac{2}{3}\right)(-x^3)^{\frac{1}{3}}\left(\frac{9\Gamma\left(\frac{2}{3}\right)2^{\frac{1}{3}}\left(-\frac{3\,e^{-2x^3}c_1}{2}+x\right)(-x^3)^{\frac{1}{3}}}{40} + e^{-2x^3}x\left(\pi\sqrt{3} - \frac{3\Gamma\left(\frac{1}{3},-2x^3\right)\Gamma\left(\frac{2}{3}\right)}{2}\right)\right)2^{\frac{1}{3}}}}{18\,(-x^3)^{\frac{1}{3}}\,\Gamma\left(\frac{2}{3}\right)}$$

ODE No. 264

$$2x\left(x^3y(x)+1\right)y'(x)+y(x)\left(3x^3y(x)-1\right)=0$$

✓ **Mathematica** : cpu = 0.398825 (sec), leaf count = 680

```
DSolve[y[x]*(-1 + 3*x^3*y[x]) + 2*x*(1 + x^3*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{Root}\left[81\#1^7e^{\frac{21c_1}{2}}x^{12}+756\#1^6e^{\frac{21c_1}{2}}x^9+2646\#1^5e^{\frac{21c_1}{2}}x^6+4116\#1^4e^{\frac{21c_1}{2}}x^3+2401\#1^3e^{\frac{21c_1}{2}}-x\right.\right.$$

✓ **Maple** : cpu = 0.864 (sec), leaf count = 78

```
dsolve(2*x*(x^3*y(x)+1)*diff(y(x),x)+(3*x^3*y(x)-1)*y(x) = 0,y(x))
```

$$y(x)=\frac{9\,\text{RootOf}\left(9x^7\_Z^{98}-49\_Z^{42}c_1+14\_Z^{21}c_1-c_1\right)^{77}x^7-49\,\text{RootOf}\left(9x^7\_Z^{98}-49\_Z^{42}c_1+14\_Z^2\right.}{3c_1x^3}$$

ODE No. 265

$$2(n+1)^2 x^{n-1}\left(x^{n^2} y(x)^2 - 1\right) + \left(x^{n(n+1)} y(x) - 1\right) y'(x) = 0$$

✗ **Mathematica** : cpu = 251.655 (sec), leaf count = 0

```
DSolve[2*(1 + n)^2*x^(-1 + n)*(-1 + x^n^2*y[x]^2) + (-1 + x^(n*(1 + n))*y[x])*Derivative[1][y
```

, could not solve

```
DSolve[2*(1 + n)^2*x^(-1 + n)*(-1 + x^n^2*y[x]^2) + (-1 + x^(n*(1 + n))*y[x])*Derivativ
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((x^(n*(n+1))*y(x)-1)*diff(y(x),x)+2*(n+1)^2*x^(n-1)*(x^(n^2)*y(x)^2-1) = 0,y(x))
```

, could not solve

```
dsolve((x^(n*(n+1))*y(x)-1)*diff(y(x),x)+2*(n+1)^2*x^(n-1)*(x^(n^2)*y(x)^2-1) = 0,y(x))
```

ODE No. 266

$$\sqrt{x^2+1}(y(x)-x)y'(x)-a\sqrt{(y(x)^2+1)^3}=0$$

✓ **Mathematica** : cpu = 1.89272 (sec), leaf count = 69

```
DSolve[-(a*Sqrt[(1 + y[x]^2)^3]) + Sqrt[1 + x^2]*(-x + y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\left\{\frac{2a\tan^{-1}\left(\frac{1-a\tan\left(\frac{K[1]}{2}\right)}{\sqrt{a^2-1}}\right)}{\sqrt{a^2-1}}+K[1]+\tan^{-1}(x)=c_1, y(x)=\frac{\tan(K[1])+x}{1-x\tan(K[1])}\right\},\{K[1],y(x)\}\right]$$

✓ **Maple** : cpu = 2.161 (sec), leaf count = 65

```
dsolve((y(x)-x)*(x^2+1)^(1/2)*diff(y(x),x)-a*((y(x)^2+1)^3)^(1/2) = 0,y(x))
```

$$y(x)=\tan\left(\text{RootOf}\left(-\arctan(x)+\int^{-\arctan(x)+\_Z}-\frac{-\sqrt{2}\sqrt{\frac{a^2}{\cos(2\_a)+1}}\sin(2\_a)+\cos(2\_a)-1}{2a^2+\cos(2\_a)-1}d\_a+\right.\right.$$

ODE No. 267

$$y(x)\sin^2(x)y'(x) + y(x)^2\sin(x)\cos(x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.275093 (sec), leaf count = 36

```
DSolve[-1 + Cos[x]*Sin[x]*y[x]^2 + Sin[x]^2*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{2x + c_1}\csc(x)\right\}, \left\{y(x) \to \sqrt{2x + c_1}\csc(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 32

```
dsolve(y(x)*diff(y(x),x)*sin(x)^2+y(x)^2*cos(x)*sin(x)-1 = 0,y(x))
```

$$y(x) = \frac{\sqrt{2x + c_1}}{\sin(x)}$$

ODE No. 268

$$f(x)y(x)y'(x)+g(x)y(x)^2+h(x)=0$$

✓ **Mathematica** : cpu = 0.171931 (sec), leaf count = 146

```
DSolve[h[x] + g[x]*y[x]^2 + f[x]*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\exp\left(\int_1^x -\frac{g(K[1])}{f(K[1])}dK[1]\right)\sqrt{2\int_1^x -\frac{\exp\left(-2\int_1^{K[2]} -\frac{g(K[1])}{f(K[1])}dK[1]\right)h(K[2])}{f(K[2])}dK[2]+c_1}\right\},\left\{\right.\right.$$

✓ **Maple** : cpu = 0.074 (sec), leaf count = 118

```
dsolve(f(x)*y(x)*diff(y(x),x)+g(x)*y(x)^2+h(x) = 0,y(x))
```

$$y(x)=\mathrm{e}^{\int -\frac{2g(x)}{f(x)}dx}\sqrt{\mathrm{e}^{2\left(\int \frac{g(x)}{f(x)}dx\right)}\left(-2\left(\int \frac{\mathrm{e}^{\int \frac{2g(x)}{f(x)}dx}h(x)}{f(x)}dx\right)+c_1\right)}$$

ODE No. 269

$$-\mathrm{f0}(x) - \mathrm{f1}(x)y(x) - \mathrm{f2}(x)y(x)^2 - \mathrm{f3}(x)y(x)^3 + y'(x)(\mathrm{g0}(x) + \mathrm{g1}(x)y(x)) = 0$$

✗ **Mathematica** : cpu = 305.09 (sec), leaf count = 0

```
DSolve[-f0[x] - f1[x]*y[x] - f2[x]*y[x]^2 - f3[x]*y[x]^3 + (g0[x] + g1[x]*y[x])*Derivative[1]
```

, timed out

```
$Aborted
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((g1(x)*y(x)+g0(x))*diff(y(x),x)-f1(x)*y(x)-f2(x)*y(x)^2-f3(x)*y(x)^3-f0(x) = 0,y(x))
```

, could not solve

```
dsolve((g1(x)*y(x)+g0(x))*diff(y(x),x)-f1(x)*y(x)-f2(x)*y(x)^2-f3(x)*y(x)^3-
f0(x) = 0,y(x))
```

ODE No. 270

$$x^2 + \left(y(x)^2 - x\right) y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.148463 (sec), leaf count = 327

```
DSolve[x^2 - y[x] + (-x + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{3\sqrt[3]{2}x}{\sqrt[3]{27x^3 + \sqrt{-2916x^3 + (27x^3 + 81c_1)^2} + 81c_1}} - \frac{\sqrt[3]{27x^3 + \sqrt{-2916x^3 + (27x^3 + 81c_1)^2} + 8}}{3\sqrt[3]{2}}\right.\right.$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 319

```
dsolve((y(x)^2-x)*diff(y(x),x)-y(x)+x^2 = 0,y(x))
```

$$y(x) = \frac{\left(-4x^3 - 12c_1 + 4\sqrt{x^6 + (6c_1 - 4)x^3 + 9c_1^2}\right)^{\frac{2}{3}} + 4x}{2\left(-4x^3 - 12c_1 + 4\sqrt{x^6 + (6c_1 - 4)x^3 + 9c_1^2}\right)^{\frac{1}{3}}}$$

ODE No. 271

$$\left(x^2+y(x)^2\right)y'(x)+2x(y(x)+2x)=0$$

✓ **Mathematica** : cpu = 0.269527 (sec), leaf count = 370

```
DSolve[2*x*(2*x + y[x]) + (x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{-4x^3+\sqrt{20x^6-8e^{3c_1}x^3+e^{6c_1}}+e^{3c_1}}}{\sqrt[3]{2}}-\frac{\sqrt[3]{2}x^2}{\sqrt[3]{-4x^3+\sqrt{20x^6-8e^{3c_1}x^3+e^{6c_1}}+e^{3c_1}}}\right\},\left\{y(x)\right.\right.$$

✓ **Maple** : cpu = 0.184 (sec), leaf count = 352

```
dsolve((y(x)^2+x^2)*diff(y(x),x)+2*x*(y(x)+2*x) = 0,y(x))
```

$$y(x)=\frac{\frac{\left(4-16x^3c_1^{\frac{3}{2}}+4\sqrt{20c_1^3x^6-8x^3c_1^{\frac{3}{2}}+1}\right)^{\frac{1}{3}}}{2}-\frac{2c_1x^2}{\left(4-16x^3c_1^{\frac{3}{2}}+4\sqrt{20c_1^3x^6-8x^3c_1^{\frac{3}{2}}+1}\right)^{\frac{1}{3}}}}{\sqrt{c_1}}$$

ODE No. 272

$$\left(x^2+y(x)^2\right)y'(x)-y(x)^2=0$$

✓ **Mathematica** : cpu = 0.154072 (sec), leaf count = 42

```
DSolve[-y[x]^2 + (x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\log\left(\frac{y(x)}{x}\right)+\frac{2\tan^{-1}\left(\frac{\frac{2y(x)}{x}-1}{\sqrt{3}}\right)}{\sqrt{3}}=-\log(x)+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.149 (sec), leaf count = 43

```
dsolve((y(x)^2+x^2)*diff(y(x),x)-y(x)^2 = 0,y(x))
```

$$y(x)=\mathrm{e}^{\frac{2\sqrt{3}\ \text{RootOf}\left(-\sqrt{3}\,x\,\mathrm{e}^{c_1}+3\tan\left(\_Z\right)x\,\mathrm{e}^{c_1}+2\sqrt{3}\,\mathrm{e}^{\frac{2\sqrt{3}\_Z}{3}}\right)}{3}-c_1}$$

ODE No. 273

$$\left(a+x^2+y(x)^2\right)y'(x)+2xy(x)=0$$

✓ **Mathematica** : cpu = 0.17482 (sec), leaf count = 297

```
DSolve[2*x*y[x] + (a + x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{\sqrt{2916\left(a+x^2\right)^3+6561{c_1}^2}+81c_1}}{3\sqrt[3]{2}}-\frac{3\sqrt[3]{2}\left(a+x^2\right)}{\sqrt[3]{\sqrt{2916\left(a+x^2\right)^3+6561{c_1}^2}+81c_1}}\right\},\left\{y(x)\to -\right.\right.$$
$$\left.\left.2^{2/}\right.\right.$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 401

```
dsolve((y(x)^2+x^2+a)*diff(y(x),x)+2*x*y(x) = 0,y(x))
```

$$y(x)=\frac{\left(-12c_1+4\sqrt{4x^6+12a\,x^4+12a^2x^2+4a^3+9c_1^2}\right)^{\frac{2}{3}}-4x^2-4a}{2\left(-12c_1+4\sqrt{4x^6+12a\,x^4+12a^2x^2+4a^3+9c_1^2}\right)^{\frac{1}{3}}}$$

ODE No. 274

$$\left(a+x^2+y(x)^2\right)y'(x)+b+x^2+2xy(x)=0$$

✓ **Mathematica** : cpu = 0.174577 (sec), leaf count = 411

```
DSolve[b + x^2 + 2*x*y[x] + (a + x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{\sqrt{2916\left(a+x^2\right)^3+\left(-81bx-27x^3+81c_1\right)^2}-81bx-27x^3+81c_1}}{3\sqrt[3]{2}}-\frac{\sqrt[3]{\sqrt{2916\left(a+x^2\right)^3+}}\right.\right.$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 657

```
dsolve((y(x)^2+x^2+a)*diff(y(x),x)+2*x*y(x)+x^2+b = 0,y(x))
```

$$y(x)=\frac{\left(-4x^3-12bx-12c_1+4\sqrt{5x^6+\left(12a+6b\right)x^4+6x^3c_1+\left(12a^2+9b^2\right)x^2+18bxc_1+4a^3+9c_1^2}\right)^{\frac{2}{3}}}{2\left(-4x^3-12bx-12c_1+4\sqrt{5x^6+\left(12a+6b\right)x^4+6x^3c_1+\left(12a^2+9b^2\right)x^2+18bxc_1+4a^3+\right.}}$$

ODE No. 275

$$\left(x^2+y(x)^2+x\right)y'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.122071 (sec), leaf count = 18

```
DSolve[-y[x] + (x + x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[y(x)-\tan^{-1}\left(\frac{x}{y(x)}\right)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.071 (sec), leaf count = 30

```
dsolve((y(x)^2+x^2+x)*diff(y(x),x)-y(x) = 0,y(x))
```

$$c_1+\frac{\mathrm{e}^{-2iy(x)}(ix+y(x))}{2iy\left(x\right)+2x}=0$$

ODE No. 276

$$\left(y(x)^2 - x^2\right) y'(x) + 2xy(x) = 0$$

✓ **Mathematica** : cpu = 0.142776 (sec), leaf count = 61

```
DSolve[2*x*y[x] + (-x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.047 (sec), leaf count = 47

```
dsolve((y(x)^2-x^2)*diff(y(x),x)+2*x*y(x) = 0,y(x))
```

$$y(x) = \frac{1 - \sqrt{-4x^2c_1^2 + 1}}{2c_1}$$

ODE No. 277

$$\left(x^4+y(x)^2\right)y'(x)-4x^3y(x)=0$$

✓ **Mathematica** : cpu = 0.113704 (sec), leaf count = 53

```
DSolve[-4*x^3*y[x] + (x^4 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.277 (sec), leaf count = 41

```
dsolve((y(x)^2+x^4)*diff(y(x),x)-4*x^3*y(x) = 0,y(x))
```

$$y(x)=-\frac{\sqrt{4x^4+c_1^2}}{2}+\frac{c_1}{2}$$

ODE No. 278

$$y'(x)\left(y(x)^2+4\sin(x)\right)-\cos(x)=0$$

✓ **Mathematica** : cpu = 0.222127 (sec), leaf count = 39

```
DSolve[-Cos[x] + (4*Sin[x] + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[-\frac{1}{32}e^{-4y(x)}\left(8y(x)^2+4y(x)+1\right)-e^{-4y(x)}\sin(x)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 28

```
dsolve((y(x)^2+4*sin(x))*diff(y(x),x)-cos(x) = 0,y(x))
```

$$\frac{\left(-8y(x)^2-4y(x)-32\sin\left(x\right)-1\right)\mathrm{e}^{-4y(x)}}{32}+c_1=0$$

ODE No. 279

$$\left(y(x)^2+2y(x)+x\right)y'(x)+y(x)^2(y(x)+x)^2+y(x)(y(x)+1)=0$$

✓ **Mathematica** : cpu = 0.541299 (sec), leaf count = 107

```
DSolve[y[x]*(1 + y[x]) + y[x]^2*(x + y[x])^2 + (x + 2*y[x] + y[x]^2)*Derivative[1][y][x] == 0
```

$$\left\{\left\{y(x)\to \frac{-x^2-\sqrt{\left(x^2-c_1x-1\right)^2+4(x-c_1)}+c_1x+1}{2(x-c_1)}\right\},\left\{y(x)\to \frac{-x^2+\sqrt{\left(x^2-c_1x-1\right)^2+4(x-\right.}}{2(x-c_1)}\right.$$

✓ **Maple** : cpu = 0.176 (sec), leaf count = 116

```
dsolve((y(x)^2+2*y(x)+x)*diff(y(x),x)+(y(x)+x)^2*y(x)^2+y(x)*(1+y(x)) = 0,y(x))
```

$$y(x)=\frac{2x^2-c_1x+\sqrt{4x^4-4x^3c_1+\left(c_1^2-8\right)x^2+\left(4c_1+16\right)x-8c_1+4}-2}{2c_1-4x}$$

ODE No. 280

$$(y(x)+x)^2 y'(x) - a^2 = 0$$

✓ **Mathematica** : cpu = 0.139244 (sec), leaf count = 21

```
DSolve[-a^2 + (x + y[x])^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[y(x) - a\tan^{-1}\left(\frac{y(x)+x}{a}\right) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 24

```
dsolve((y(x)+x)^2*diff(y(x),x)-a^2 = 0,y(x))
```

$$y(x) = a\,\text{RootOf}\left(\tan\left(\_Z\right) a - \_Z a + c_1 - x\right) - c_1$$

ODE No. 281

$$\left(-x^2+2xy(x)+y(x)^2\right)y'(x)+x^2+2xy(x)-y(x)^2=0$$

✓ **Mathematica** : cpu = 0.195536 (sec), leaf count = 75

```
DSolve[x^2 + 2*x*y[x] - y[x]^2 + (-x^2 + 2*x*y[x] + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.048 (sec), leaf count = 55

```
dsolve((y(x)^2+2*x*y(x)-x^2)*diff(y(x),x)-y(x)^2+2*x*y(x)+x^2 = 0,y(x))
```

$$y(x)=\frac{1-\sqrt{-4x^2c_1^2+4c_1x+1}}{2c_1}$$

ODE No. 282

$$(y(x)+3x-1)^2y'(x)-(2y(x)-1)(4y(x)+6x-3)=0$$

✓ **Mathematica** : cpu = 0.229853 (sec), leaf count = 2129

```
DSolve[-((-1 + 2*y[x])*(-3 + 6*x + 4*y[x])) + (-1 + 3*x + y[x])^2*Derivative[1][y][x] == 0,y[
```

$$\left\{\left\{y(x)\to \frac{1}{6}(12x+4e^{c_1}+1)-\frac{1}{6}\sqrt{36x^2+96e^{c_1}x-12x-16e^{c_1}+16e^{2c_1}+3\ 2^{2/3}\sqrt[3]{-7776e^{c_1}x^5+6480e^{c_1}}\right.\right.$$

✓ **Maple** : cpu = 0.328 (sec), leaf count = 71

```
dsolve((y(x)+3*x-1)^2*diff(y(x),x)-(2*y(x)-1)*(4*y(x)+6*x-3) = 0,y(x))
```

$$-\ln\left(\frac{-6y(x)+4-6x}{6x-1}\right)+3\ln\left(\frac{-6y(x)+3}{6x-1}\right)-3\ln\left(\frac{-6y(x)+18x}{6x-1}\right)-\ln(6x-1)-c_1=0$$

ODE No. 283

$$3\left(y(x)^2-x^2\right)y'(x)+2y(x)^3-6x(x+1)y(x)-3e^x=0$$

✓ **Mathematica** : cpu = 0.348255 (sec), leaf count = 477

```
DSolve[-3*E^x - 6*x*(1 + x)*y[x] + 2*y[x]^3 + 3*(-x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\to -\frac{e^{-2x}\sqrt[3]{\sqrt{-2916e^{12x}x^6+\left(-27e^{7x}+27c_1e^{4x}\right)^2}-27e^{7x}+27c_1e^{4x}}}{3\sqrt[3]{2}}-\frac{\right.\right.$$

$$\sqrt[3]{\sqrt{-2916e^{12x}x^6+(-27}$$

✓ **Maple** : cpu = 0.074 (sec), leaf count = 407

```
dsolve(3*(y(x)^2-x^2)*diff(y(x),x)+2*y(x)^3-6*x*(1+x)*y(x)-3*exp(x) = 0,y(x))
```

$$y(x)=\frac{\left(4x^2\mathrm{e}^{4x}+\left(\left(4\,\mathrm{e}^{3x}-4c_1+4\sqrt{-4x^6\mathrm{e}^{4x}+\mathrm{e}^{6x}-2\,\mathrm{e}^{3x}c_1+c_1^2}\right)\mathrm{e}^{4x}\right)^{\frac{2}{3}}\right)\mathrm{e}^{-2x}}{2\left(-4\left(-\mathrm{e}^{3x}+c_1-\sqrt{-4x^6\mathrm{e}^{4x}+\mathrm{e}^{6x}-2\,\mathrm{e}^{3x}c_1+c_1^2}\right)\mathrm{e}^{4x}\right)^{\frac{1}{3}}}$$

ODE No. 284

$$\left(x^2+4y(x)^2\right)y'(x)-xy(x)=0$$

✓ **Mathematica** : cpu = 0.111886 (sec), leaf count = 59

```
DSolve[-(x*y[x]) + (x^2 + 4*y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{x}{2\sqrt{W\left(\frac{1}{4}e^{-\frac{c_1}{2}}x^2\right)}}\right\},\left\{y(x)\to \frac{x}{2\sqrt{W\left(\frac{1}{4}e^{-\frac{c_1}{2}}x^2\right)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.116 (sec), leaf count = 21

```
dsolve((4*y(x)^2+x^2)*diff(y(x),x)-x*y(x) = 0,y(x))
```

$$y(x)=\mathrm{e}^{\frac{\mathrm{LambertW}\left(\frac{\mathrm{e}^{2c_1}x^2}{4}\right)}{2}-c_1}$$

ODE No. 285

$$\left(3x^2+2xy(x)+4y(x)^2\right)y'(x)+2x^2+6xy(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.167262 (sec), leaf count = 402

```
DSolve[2*x^2 + 6*x*y[x] + y[x]^2 + (3*x^2 + 2*x*y[x] + 4*y[x]^2)*Derivative[1][y][x] == 0,y[x
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{54x^3+\sqrt{3881196x^6+\left(54x^3+432e^{3c_1}\right)^2}+432e^{3c_1}}}{12\sqrt[3]{2}}-\frac{33x^2}{2\ 2^{2/3}\sqrt[3]{54x^3+\sqrt{3881196x^6+(54x^3}}}\right.\right.$$

✓ **Maple** : cpu = 0.077 (sec), leaf count = 432

```
dsolve((4*y(x)^2+2*x*y(x)+3*x^2)*diff(y(x),x)+y(x)^2+6*x*y(x)+2*x^2 = 0,y(x))
```

$$y(x)=\frac{\frac{\left(x^3c_1^3+8+2\sqrt{333x^6c_1^6+4x^3c_1^3+16}\right)^{\frac{1}{3}}}{4}-\frac{11c_1^2x^2}{4\left(x^3c_1^3+8+2\sqrt{333x^6c_1^6+4x^3c_1^3+16}\right)^{\frac{1}{3}}}-\frac{c_1x}{4}}{c_1}$$

ODE No. 286

$$(2y(x)-3x+1)^2y'(x)-(3y(x)-2x-4)^2=0$$

✓ **Mathematica** : cpu = 0.258203 (sec), leaf count = 3501

```
DSolve[-(-4 - 2*x + 3*y[x])^2 + (1 - 3*x + 2*y[x])^2*Derivative[1][y][x] == 0,y[x],x]
```

✓ **Maple** : cpu = 1.237 (sec), leaf count = 1337

```
dsolve((2*y(x)-3*x+1)^2*diff(y(x),x)-(3*y(x)-2*x-4)^2 = 0,y(x))
```

$$y(x)=\frac{(5x+3)\,\text{RootOf}\left((115330078125c_1x^9-2283535546875c_1x^8+20095112812500c_1x^7-10315491243\right.}{5\,\text{RootOf}\left((115330078125c_1x^9-2283535546875c_1x^8+20095112812500c_1x^7-1031549124\right.}$$

ODE No. 287

$$(2y(x)-4x+1)^2y'(x)-(y(x)-2x)^2=0$$

✓ **Mathematica** : cpu = 2.58571 (sec), leaf count = 77

```
DSolve[-(-2*x + y[x])^2 + (1 - 4*x + 2*y[x])^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{y(x)}{2}+\frac{1}{196}\left(14y(x)-\left(8-9\sqrt{2}\right)\log\left(-7y(x)+14x+\sqrt{2}-4\right)-\left(8+9\sqrt{2}\right)\log\left(7y(x)-14x+\right.\right.\right.$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 56

```
dsolve((2*y(x)-4*x+1)^2*diff(y(x),x)-(y(x)-2*x)^2 = 0,y(x))
```

$$-\frac{x}{7}-\frac{9\sqrt{2}\,\operatorname{arctanh}\left(\frac{(7y(x)-14x+4)\sqrt{2}}{2}\right)}{98}-\frac{2\ln\left(7(y(x)-2x)^2+8y(x)-16x+2\right)}{49}+\frac{4y(x)}{7}-c_1=0$$

ODE No. 288

$$\left(-3x^2y(x)+6y(x)^2+1\right)y'(x)-3xy(x)^2+x=0$$

✓ **Mathematica** : cpu = 0.233917 (sec), leaf count = 534

```
DSolve[x - 3*x*y[x]^2 + (1 - 3*x^2*y[x] + 6*y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{x^2}{4}-\frac{\sqrt[3]{-9x^6+108x^2+4\sqrt{3}\sqrt{-27x^8-54c_1x^6+207x^4+648c_1x^2+32+432{c_1}^2}+144c_1}}{4\ 3^{2/3}}+\right.$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 579

```
dsolve((6*y(x)^2-3*x^2*y(x)+1)*diff(y(x),x)-3*x*y(x)^2+x = 0,y(x))
```

$$y(x)=\frac{\left(-324x^2-432c_1+27x^6+12\sqrt{-81x^8-162x^6c_1+621x^4+1944x^2c_1+1296c_1^2+96}\right)^{\frac{1}{3}}}{12}+\frac{}{4\left(-324\right.}$$

ODE No. 289

$$a + (6y(x) - x)^2 y'(x) - 6y(x)^2 + 2xy(x) = 0$$

✓ **Mathematica** : cpu = 0.187592 (sec), leaf count = 115

```
DSolve[a + 2*x*y[x] - 6*y[x]^2 + (-x + 6*y[x])^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{6}\left(x + \sqrt[3]{-18ax - x^3 + 18c_1}\right)\right\}, \left\{y(x) \to \frac{x}{6} - \frac{1}{12}\left(1 - i\sqrt{3}\right)\sqrt[3]{-18ax - x^3 + 18c_1}\right\}, \left\{y(x) -\right.\right.$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 115

```
dsolve((6*y(x)-x)^2*diff(y(x),x)-6*y(x)^2+2*x*y(x)+a = 0,y(x))
```

$$y(x) = \frac{(-x^3 - 18ax - 18c_1)^{\frac{1}{3}}}{6} + \frac{x}{6}$$

ODE No. 290

$$y'(x)\left(ay(x)^2+2bxy(x)+cx^2\right)+by(x)^2+2cxy(x)+dx^2=0$$

✓ **Mathematica** : cpu = 0.458174 (sec), leaf count = 831

```
DSolve[d*x^2 + 2*c*x*y[x] + b*y[x]^2 + (c*x^2 + 2*b*x*y[x] + a*y[x]^2)*Derivative[1][y][x] ==
```

$$\left\{\left\{y(x)\to -\frac{bx}{a}+\frac{\sqrt[3]{-54b^3x^3+81abcx^3-27a^2dx^3+27a^2e^{3c_1}+\sqrt{4\left(9acx^2-9b^2x^2\right)^3+\left(-54b^3x^3+81ab\right.}}}{3\sqrt[3]{2}a}\right.\right.$$

✓ **Maple** : cpu = 0.132 (sec), leaf count = 1388

```
dsolve((a*y(x)^2+2*b*x*y(x)+c*x^2)*diff(y(x),x)+b*y(x)^2+2*c*x*y(x)+d*x^2 = 0,y(x))
```

$$y(x)=\frac{\left(-4c_1^3a^2dx^3+12cx^3c_1^3ba-8b^3x^3c_1^3+4\sqrt{a^2d^2x^6c_1^6-6abcdx^6c_1^6+4ac^3x^6c_1^6+4b^3dx^6c_1^6-3b^2c^2x^6c_1^6-2c_1^3a^2dx^3+6cx^3c_1^3ba-4b^3x^3c_1^3+a^2a}\right.}{2a}$$

ODE No. 291

$$y'(x)\left(b(\alpha x+\beta y(x))^2-\beta(ax+by(x))\right)-\alpha(ax+by(x))+a(\alpha x+\beta y(x))^2=0$$

✓ **Mathematica** : cpu = 1.1306 (sec), leaf count = 39

```
DSolve[-(alpha*(a*x + b*y[x])) + a*(alpha*x + beta*y[x])^2 + (-(beta*(a*x + b*y[x])) + b*(alp
```

$$\text{Solve}\left[\frac{a\beta\left(\log(ax+by(x))+\frac{1}{\alpha x+\beta y(x)}\right)}{a\beta-\alpha b}=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.16 (sec), leaf count = 50

```
dsolve((b*(beta*y(x)+alpha*x)^2-beta*(a*x+b*y(x)))*diff(y(x),x)+a*(beta*y(x)+alpha*x)^2-alpha
```

$$y(x)=\frac{-ax+\mathrm{e}^{\text{RootOf}\left(c_1a\beta x-c_1\alpha bx-\_Za\beta x+\_Z\alpha bx-c_1\beta\,\mathrm{e}^{-Z}+\mathrm{e}^{-Z}\_Z\beta+b\right)}}{b}$$

ODE No. 292

$$y'(x)(ay(x)+bx+c)^2+(\alpha y(x)+\beta x+\gamma)^2=0$$

✓ **Mathematica** : cpu = 45.7758 (sec), leaf count = 1716

```
DSolve[(EulerGamma + beta*x + alpha*y[x])^2 + (c + b*x + a*y[x])^2*Derivative[1][y][x] == 0,y
```

$$\text{Solve}\left[(\alpha b-a\beta)\text{RootSum}\left[-cy(x)^2\alpha^3-b\#1y(x)^2\alpha^3+a\beta\#1y(x)^2\alpha^2+a\gamma y(x)^2\alpha^2-2b\beta\#1^2y(x)\alpha^2-2\beta c\right.\right.$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 115

```
dsolve((a*y(x)+b*x+c)^2*diff(y(x),x)+(alpha*y(x)+beta*x+gamma)^2 = 0,y(x))
```

$$y(x)=\frac{((bx+c)\,\alpha-a(\beta x+\gamma))\,\text{RootOf}\left(\int^{-Z}\frac{(\_a\alpha-b)^2}{\_a^3a^2-2\_a^2ab-\_a^2\alpha^2+2\_a\alpha\beta+\_ab^2-\beta^2}d\_a+\ln(a\beta x-\alpha bx+\right.}{a\beta-b\alpha}$$

ODE No. 293

$$x\left(y(x)^2-3x\right)y'(x)+2y(x)^3-5xy(x)=0$$

✓ **Mathematica** : cpu = 0.181795 (sec), leaf count = 661

```
DSolve[-5*x*y[x] + 2*y[x]^3 + x*(-3*x + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{Root}\left[-\#1^{15}-\frac{25\#1^2e^{\frac{65c_1}{2}}}{x^{26}}+\frac{65e^{\frac{65c_1}{2}}}{x^{25}}\&,1\right]\right\},\left\{y(x)\to \text{Root}\left[-\#1^{15}-\frac{25\#1^2e^{\frac{65c_1}{2}}}{x^{26}}+\frac{65e^{\frac{65c_1}{2}}}{x^{25}}\right.\right.$$

✓ **Maple** : cpu = 0.283 (sec), leaf count = 35

```
dsolve(x*(y(x)^2-3*x)*diff(y(x),x)+2*y(x)^3-5*x*y(x) = 0,y(x))
```

$$\ln(x)-c_1-\frac{2\ln\left(\frac{5y(x)^2-13x}{x}\right)}{65}+\frac{6\ln\left(\frac{y(x)}{\sqrt{x}}\right)}{13}=0$$

ODE No. 294

$$x\left(-a+x^2+y(x)^2\right)y'(x)-y(x)\left(a+x^2+y(x)^2\right)=0$$

✓ **Mathematica** : cpu = 0.243601 (sec), leaf count = 71

```
DSolve[-(y[x]*(a + x^2 + y[x]^2)) + x*(-a + x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{2}\left(c_1 x-\sqrt{-4a+4x^2+{c_1}^2x^2}\right)\right\},\left\{y(x)\to \frac{1}{2}\left(\sqrt{-4a+4x^2+{c_1}^2x^2}+c_1 x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.115 (sec), leaf count = 112

```
dsolve(x*(y(x)^2+x^2-a)*diff(y(x),x)-y(x)*(y(x)^2+x^2+a) = 0,y(x))
```

$$\frac{1}{\frac{1}{y(x)^2}-\frac{1}{-x^2+a}}=-\frac{\sqrt{x^2-a}\,x}{\sqrt{c_1+\frac{4a}{x^2-a}}}+\frac{x^2}{2}-\frac{a}{2}$$

ODE No. 295

$$x\left(-x^2+xy(x)+y(x)^2\right)y'(x)+x^2y(x)-y(x)^3+xy(x)^2=0$$

✓ **Mathematica** : cpu = 0.230981 (sec), leaf count = 31

```
DSolve[x^2*y[x] + x*y[x]^2 - y[x]^3 + x*(-x^2 + x*y[x] + y[x]^2)*Derivative[1][y][x] == 0,y[x
```

$$\text{Solve}\left[\frac{x}{y(x)}+\frac{y(x)}{x}+\log\left(\frac{y(x)}{x}\right)=-2\log(x)+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.261 (sec), leaf count = 29

```
dsolve(x*(y(x)^2+x*y(x)-x^2)*diff(y(x),x)-y(x)^3+x*y(x)^2+x^2*y(x) = 0,y(x))
```

$$y(x)=\mathrm{e}^{\text{RootOf}\left(\mathrm{e}^{2\_Z}+2\,\mathrm{e}^{\_Z}\ln(x)+2\,\mathrm{e}^{\_Z}c_1+\_Z\mathrm{e}^{\_Z}+1\right)}x$$

ODE No. 296

$$x^4 + x\left(x^2 y(x) + x^2 + y(x)^2\right) y'(x) - 2x^2 y(x)^2 - 2y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.447394 (sec), leaf count = 102

```
DSolve[x^4 - 2*x^2*y[x]^2 - 2*y[x]^3 + x*(x^2 + x^2*y[x] + y[x]^2)*Derivative[1][y][x] == 0,y
```

$$\left\{\left\{y(x) \to -e^{-c_1} x^2 - e^{-c_1}\sqrt{x^4 - e^{c_1} x^4 + e^{2c_1} x^2}\right\}, \left\{y(x) \to e^{-c_1}\sqrt{x^4 - e^{c_1} x^4 + e^{2c_1} x^2} - e^{-c_1} x^2\right\}\right\}$$

✓ **Maple** : cpu = 0.592 (sec), leaf count = 135

```
dsolve(x*(y(x)^2+x^2*y(x)+x^2)*diff(y(x),x)-2*y(x)^3-2*x^2*y(x)^2+x^4 = 0,y(x))
```

$$y(x) = -\frac{\left(x^3 - c_1 x - x^2 + \sqrt{-c_1 x^4 + x^4 + x^2 c_1^2}\right) x}{-c_1 x + x^2 + \sqrt{-c_1 x^4 + x^4 + x^2 c_1^2}}$$

ODE No. 297

$$2x\left(5x^2+y(x)^2\right)y'(x)-x^2y(x)+y(x)^3=0$$

✓ **Mathematica** : cpu = 0.163946 (sec), leaf count = 216

```
DSolve[-(x^2*y[x]) + y[x]^3 + 2*x*(5*x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{Root}\left[-\#1^5+\frac{\#1^2e^{3c_1}}{x^{3/2}}+3e^{3c_1}\sqrt{x}\&,1\right]\right\},\left\{y(x)\to \text{Root}\left[-\#1^5+\frac{\#1^2e^{3c_1}}{x^{3/2}}+3e^{3c_1}\sqrt{x}\&,2\right]\right\},\right.$$

✓ **Maple** : cpu = 0.288 (sec), leaf count = 29

```
dsolve(2*x*(y(x)^2+5*x^2)*diff(y(x),x)+y(x)^3-x^2*y(x) = 0,y(x))
```

$$y(x)=\text{RootOf}\left(\_Z^{45}x^9c_1-\_Z^{18}-6\_Z^9-9\right)^{\frac{9}{2}}x$$

ODE No. 298

$$3xy(x)^2y'(x) + y(x)^3 - 2x = 0$$

✓ **Mathematica** : cpu = 0.0990429 (sec), leaf count = 72

```
DSolve[-2*x + y[x]^3 + 3*x*y[x]^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{x^2+c_1}}{\sqrt[3]{x}}\right\}, \left\{y(x) \to -\frac{\sqrt[3]{-1}\sqrt[3]{x^2+c_1}}{\sqrt[3]{x}}\right\}, \left\{y(x) \to \frac{(-1)^{2/3}\sqrt[3]{x^2+c_1}}{\sqrt[3]{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 73

```
dsolve(3*x*y(x)^2*diff(y(x),x)+y(x)^3-2*x = 0,y(x))
```

$$y(x) = \frac{\left(\left(x^2+c_1\right)x^2\right)^{\frac{1}{3}}}{x}$$

ODE No. 299

$$\left(3xy(x)^2-x^2\right)y'(x)+y(x)^3-2xy(x)=0$$

✓ **Mathematica** : cpu = 0.119808 (sec), leaf count = 371

```
DSolve[-2*x*y[x] + y[x]^3 + (-x^2 + 3*x*y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{\frac{2}{3}}x^2}{\sqrt[3]{9c_1x^2+\sqrt{3}\sqrt{-4x^9+27{c_1}^2x^4}}}-\frac{\sqrt[3]{9c_1x^2+\sqrt{3}\sqrt{-4x^9+27{c_1}^2x^4}}}{\sqrt[3]{2}3^{2/3}x}\right\},\left\{y(x)\to \frac{}{2^{2/3}\sqrt[3]{3}\sqrt[3]{9}}\right.\right.$$

✓ **Maple** : cpu = 0.204 (sec), leaf count = 276

```
dsolve((3*x*y(x)^2-x^2)*diff(y(x),x)+y(x)^3-2*x*y(x) = 0,y(x))
```

$$y(x)=\frac{\left(\left(12\sqrt{-12x^5+81c_1^2}+108c_1\right)x^2\right)^{\frac{1}{3}}}{6x}+\frac{2x^2}{\left(\left(12\sqrt{-12x^5+81c_1^2}+108c_1\right)x^2\right)^{\frac{1}{3}}}$$

ODE No. 300

$$6xy(x)^2y'(x) + 2y(x)^3 + x = 0$$

✓ **Mathematica** : cpu = 0.0937339 (sec), leaf count = 99

```
DSolve[x + 2*y[x]^3 + 6*x*y[x]^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{-x^2+4c_1}}{2^{2/3}\sqrt[3]{x}}\right\}, \left\{y(x) \to -\frac{\sqrt[3]{-1}\sqrt[3]{-x^2+4c_1}}{2^{2/3}\sqrt[3]{x}}\right\}, \left\{y(x) \to \frac{(-1)^{2/3}\sqrt[3]{-x^2+4c_1}}{2^{2/3}\sqrt[3]{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.025 (sec), leaf count = 83

```
dsolve(6*x*y(x)^2*diff(y(x),x)+2*y(x)^3+x = 0,y(x))
```

$$y(x) = \frac{\left(-2\left(x^2-4c_1\right)x^2\right)^{\frac{1}{3}}}{2x}$$

ODE No. 301

$$\left(x^2+6xy(x)^2\right)y'(x)-y(x)\left(3y(x)^2-x\right)=0$$

✓ **Mathematica** : cpu = 0.14042 (sec), leaf count = 64

```
DSolve[-(y[x]*(-x + 3*y[x]^2)) + (x^2 + 6*x*y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{x}\sqrt{W\left(\frac{6e^{3c_1}}{x^3}\right)}}{\sqrt{6}}\right\},\left\{y(x)\to \frac{\sqrt{x}\sqrt{W\left(\frac{6e^{3c_1}}{x^3}\right)}}{\sqrt{6}}\right\}\right\}$$

✓ **Maple** : cpu = 0.202 (sec), leaf count = 25

```
dsolve((6*x*y(x)^2+x^2)*diff(y(x),x)-y(x)*(3*y(x)^2-x) = 0,y(x))
```

$$y(x)=\frac{\mathrm{e}^{-\frac{\mathrm{LambertW}\left(\frac{6\,e^{3c_1}}{x^3}\right)}{2}+\frac{3c_1}{2}}}{x}$$

ODE No. 302

$$\left(x^2 y(x)^2 + x\right) y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.106127 (sec), leaf count = 70

```
DSolve[y[x] + (x + x^2*y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1 x - \sqrt{x}\sqrt{4 + {c_1}^2 x}}{2x}\right\}, \left\{y(x) \to \frac{c_1 x + \sqrt{x}\sqrt{4 + {c_1}^2 x}}{2x}\right\}\right\}$$

✓ **Maple** : cpu = 0.125 (sec), leaf count = 133

```
dsolve((x^2*y(x)^2+x)*diff(y(x),x)+y(x) = 0,y(x))
```

$$y(x) = -\frac{\sqrt{-2xc_1\left(-2c_1 - x + \sqrt{x\left(4c_1 + x\right)}\right)}}{2xc_1}$$

ODE No. 303

$$y(x)\left(x^2y(x)^2+1\right)+x(xy(x)-1)^2y'(x)=0$$

✓ **Mathematica** : cpu = 0.147247 (sec), leaf count = 25

```
DSolve[y[x]*(1 + x^2*y[x]^2) + x*(-1 + x*y[x])^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[xy(x)-\frac{1}{xy(x)}-2\log(y(x))=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.235 (sec), leaf count = 34

```
dsolve((x*y(x)-1)^2*x*diff(y(x),x)+(x^2*y(x)^2+1)*y(x) = 0,y(x))
```

$$y(x)=\frac{\mathrm{e}^{\text{RootOf}\left(-\mathrm{e}^{2\_Z}-2\,\mathrm{e}^{\_Z}\ln(x)+2\,\mathrm{e}^{\_Z}c_1+2\_Z\mathrm{e}^{\_Z}+1\right)}}{x}$$

ODE No. 304

$$5x^2y(x)^3+\left(10x^3y(x)^2+x^2y(x)+2x\right)y'(x)+xy(x)^2=0$$

✓ **Mathematica** : cpu = 0.420414 (sec), leaf count = 44

```
DSolve[x*y[x]^2 + 5*x^2*y[x]^3 + (2*x + x^2*y[x] + 10*x^3*y[x]^2)*Derivative[1][y][x] == 0,y[
```

$$\text{Solve}\left[y(x)\sqrt{5x^2y(x)^2+2}e^{\frac{\tan^{-1}\left(\sqrt{\frac{5}{2}}xy(x)\right)}{\sqrt{10}}}=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.251 (sec), leaf count = 44

```
dsolve((10*x^3*y(x)^2+x^2*y(x)+2*x)*diff(y(x),x)+5*x^2*y(x)^3+x*y(x)^2 = 0,y(x))
```

$$y(x)=\frac{\tan\left(\text{RootOf}\left(\sqrt{10}\ln\left(\frac{4\left(\tan^2\left(\_Z\right)\right)\left(\tan^2\left(\_Z\right)+1\right)}{5x^2}\right)+2\sqrt{10}c_1+2\_Z\right)\right)\sqrt{10}}{5x}$$

ODE No. 305

$$x^2 + \left(y(x)^3 - 3x\right) y'(x) - 3y(x) = 0$$

✓ **Mathematica** : cpu = 0.187656 (sec), leaf count = 1277

```
DSolve[x^2 - 3*y[x] + (-3*x + y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{1}{2}\sqrt{\frac{16\sqrt[3]{2}\left(x^3+3c_1\right)}{\sqrt[3]{104976x^2-\sqrt{11019960576x^4-4\left(144x^3+432c_1\right)^3}}}+\frac{\sqrt[3]{104976x^2-\sqrt{11019960576x^4-4\left(144x^3+432c_1\right)^3}}}{9\sqrt[3]{2}}}\right.\right.$$

✓ **Maple** : cpu = 0.022 (sec), leaf count = 21

```
dsolve((y(x)^3-3*x)*diff(y(x),x)-3*y(x)+x^2 = 0,y(x))
```

$$\frac{x^3}{3} - 3xy(x) + \frac{y(x)^4}{4} + c_1 = 0$$

ODE No. 306

$$\left(y(x)^3-x^3\right)y'(x)-x^2y(x)=0$$

✓ **Mathematica** : cpu = 0.141688 (sec), leaf count = 201

```
DSolve[-(x^2*y[x]) + (-x^3 + y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \sqrt[3]{x^3-\sqrt{x^6-e^{6c_1}}}\right\},\left\{y(x)\to -\sqrt[3]{-1}\sqrt[3]{x^3-\sqrt{x^6-e^{6c_1}}}\right\},\left\{y(x)\to (-1)^{2/3}\sqrt[3]{x^3-\sqrt{x^6-e^{6c}}}\right.\right.$$

✓ **Maple** : cpu = 0.233 (sec), leaf count = 231

```
dsolve((y(x)^3-x^3)*diff(y(x),x)-x^2*y(x) = 0,y(x))
```

$$y(x)=\frac{x}{\left(-\left(x^3c_1-\sqrt{x^6c_1^2+1}\right)x^3c_1\right)^{\frac{1}{3}}}$$

ODE No. 307

$$y(x)\left(a+x^2+y(x)^2\right)y'(x)+x\left(-a+x^2+y(x)^2\right)=0$$

✓ **Mathematica** : cpu = 0.23311 (sec), leaf count = 149

```
DSolve[x*(-a + x^2 + y[x]^2) + y[x]*(a + x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\sqrt{-\sqrt{a^2+4ax^2+4c_1}-a-x^2}\right\},\left\{y(x)\to \sqrt{-\sqrt{a^2+4ax^2+4c_1}-a-x^2}\right\},\left\{y(x)\to -\sqrt{\right.\right.$$

✓ **Maple** : cpu = 0.047 (sec), leaf count = 125

```
dsolve((y(x)^2+x^2+a)*y(x)*diff(y(x),x)+(y(x)^2+x^2-a)*x = 0,y(x))
```

$$y(x)=\sqrt{-x^2-a-\sqrt{4a\,x^2+a^2-4c_1}}$$

ODE No. 308

$$2y(x)^3y'(x) + xy(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0158077 (sec), leaf count = 55

```
DSolve[x*y[x]^2 + 2*y[x]^3*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\{y(x) \to 0\}, \left\{y(x) \to -\frac{\sqrt{-x^2+4c_1}}{\sqrt{2}}\right\}, \left\{y(x) \to \frac{\sqrt{-x^2+4c_1}}{\sqrt{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 37

```
dsolve(2*y(x)^3*diff(y(x),x)+x*y(x)^2 = 0,y(x))
```

$$y(x) = 0$$

ODE No. 309

$$-2x^3+\left(2y(x)^3+y(x)\right)y'(x)-x=0$$

✓ **Mathematica** : cpu = 0.10347 (sec), leaf count = 151

```
DSolve[-x - 2*x^3 + (y[x] + 2*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{-1-\sqrt{4x^4+4x^2+1+8c_1}}}{\sqrt{2}}\right\},\left\{y(x)\to \frac{\sqrt{-1-\sqrt{4x^4+4x^2+1+8c_1}}}{\sqrt{2}}\right\},\left\{y(x)\to -\frac{\sqrt{}\right.\right.$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 113

```
dsolve((2*y(x)^3+y(x))*diff(y(x),x)-2*x^3-x = 0,y(x))
```

$$y(x)=-\frac{\sqrt{-2-2\sqrt{4x^4+4x^2+8c_1+1}}}{2}$$

ODE No. 310

$$x^3 + \left(5x^2 y(x) + 2y(x)^3\right) y'(x) + 5xy(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.175346 (sec), leaf count = 159

```
DSolve[x^3 + 5*x*y[x]^2 + (5*x^2*y[x] + 2*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{-5x^2 - \sqrt{23x^4 + 2e^{4c_1}}}}{\sqrt{2}}\right\}, \left\{y(x) \to \frac{\sqrt{-5x^2 - \sqrt{23x^4 + 2e^{4c_1}}}}{\sqrt{2}}\right\}, \left\{y(x) \to -\frac{\sqrt{-5x^2 + \sqrt{2}}}{\sqrt{2}}\right.\right.$$

✓ **Maple** : cpu = 0.183 (sec), leaf count = 125

```
dsolve((2*y(x)^3+5*x^2*y(x))*diff(y(x),x)+5*x*y(x)^2+x^3 = 0,y(x))
```

$$y(x) = -\frac{\sqrt{-10x^2 c_1 - 2\sqrt{23x^4 c_1^2 + 2}}}{2\sqrt{c_1}}$$

ODE No. 311

$$4x^3+9x^2y(x)+\left(3x^3+6x^2y(x)-3xy(x)^2+20y(x)^3\right)y'(x)+6xy(x)^2-y(x)^3=0$$

✓ **Mathematica** : cpu = 0.228815 (sec), leaf count = 2201

```
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]^
```

$$\left\{\left\{y(x)\to \frac{x}{20}+\frac{1}{2}\sqrt{-\frac{39x^2}{100}+\frac{\sqrt[3]{99x^6+351e^{c_1}x^2+\sqrt{3}\sqrt{-67037x^{12}+185406e^{c_1}x^8-83733e^{2c_1}x^4+3200}}}{5\sqrt[3]{2}3^{2/3}}}\right.\right.$$

✓ **Maple** : cpu = 0.103 (sec), leaf count = 50

```
dsolve((20*y(x)^3-3*x*y(x)^2+6*x^2*y(x)+3*x^3)*diff(y(x),x)-y(x)^3+6*x*y(x)^2+9*x^2*y(x)+4*x^
```

$$y(x)=\frac{\text{RootOf}\left(x^4c_1^4+3\_Zx^3c_1^3+3\_Z^2x^2c_1^2-\_Z^3xc_1+5\_Z^4-1\right)}{c_1}$$

ODE No. 312

$$(y(x)y'(x)+x)\left(\frac{x^2}{a}+\frac{y(x)^2}{b}\right)+\frac{(a-b)\,(y(x)y'(x)-x)}{a+b}=0$$

✓ **Mathematica** : cpu = 0.685227 (sec), leaf count = 204

```
DSolve[((a - b)*(-x + y[x]*Derivative[1][y][x]))/(a + b) + (x^2/a + y[x]^2/b)*(x + y[x]*Deriv
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{b}\sqrt{a^2+2a^2W\left(\frac{c_1(a+b)e^{\frac{bx^2}{2a^2}-\frac{b}{2a}-\frac{x^2}{2b}-\frac{1}{2}}}{2a^3b^2}\right)+ab-ax^2-bx^2}}{\sqrt{a}\sqrt{a+b}}\right\},\left\{y(x)\to \frac{\sqrt{b}\sqrt{a^2+2a^2W\left(\frac{c_1}{}\right.}}{}\right.$$

✓ **Maple** : cpu = 2.367 (sec), leaf count = 240

```
dsolve((y(x)^2/b+x^2/a)*(y(x)*diff(y(x),x)+x)+(a-b)/(a+b)*(y(x)*diff(y(x),x)-x) = 0,y(x))
```

$$y(x)=\frac{\sqrt{a\left(e^{\frac{-2\,\mathrm{LambertW}\left(\frac{(a+b)e^{-\frac{x^2}{2b}}e^{\frac{bx^2}{2a^2}}e^{-\frac{1}{2}}e^{-\frac{b}{2a}}e^{-\frac{c_1}{ab}}}{2a^2b}\right)a^2b+\left(-x^2-b\right)a^2+\left(-b^2-2c_1\right)a+b^2x^2}{2a^2b}}+b\left(-x^2+a\right)\right)}}{a}$$

ODE No. 313

$$y'(x)\left(3axy(x)^2+2ay(x)^3-bx^3+cx^2\right)-ay(x)^3+2bx^3+3bx^2y(x)+cy(x)^2=0$$

✓ **Mathematica** : cpu = 0.349186 (sec), leaf count = 537

```
DSolve[2*b*x^3 + 3*b*x^2*y[x] + c*y[x]^2 - a*y[x]^3 + (c*x^2 - b*x^3 + 3*a*x*y[x]^2 + 2*a*y[x
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{2}(3acx+3ac_1)}{3a\sqrt[3]{\sqrt{\left(27a^2bx^3+27a^2c_1x\right)^2+4(3acx+3ac_1)^3}+27a^2bx^3+27a^2c_1x}}-\frac{\sqrt[3]{\sqrt{(27a^2bx^3+27a^2c}\right.\right.$$

✓ **Maple** : cpu = 0.176 (sec), leaf count = 748

```
dsolve((2*a*y(x)^3+3*a*x*y(x)^2-b*x^3+c*x^2)*diff(y(x),x)-a*y(x)^3+c*y(x)^2+3*b*x^2*y(x)+2*b*
```

$$y(x)=\frac{(-12cx+12c_1)\,a+\left(\left(-108b\,x^3+108c_1x+12\sqrt{\frac{81a\,b^2x^6-162ab\,x^4c_1+12c^3x^3+81a\,x^2c_1^2-36c^2x^2c_1+36cxc_1^2-12c_1^3}{a}}\right.\right.}{6\left(\left(-108b\,x^3+108c_1x+12\sqrt{\frac{81a\,b^2x^6-162ab\,x^4c_1+12c^3x^3+81a\,x^2c_1^2-36c^2x^2c_1+36cxc_1^2-12c_1^3}{a}}\right)a^2\right)^{\frac{1}{3}}a}$$

ODE No. 314

$$xy(x)^3y'(x) + y(x)^4 - x\sin(x) = 0$$

✓ **Mathematica** : cpu = 0.153255 (sec), leaf count = 188

```
DSolve[-(x*Sin[x]) + y[x]^4 + x*y[x]^3*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt[4]{-4x^4\cos(x) + 16x^3\sin(x) + 48x^2\cos(x) - 96x\sin(x) - 96\cos(x) + c_1}}{x}\right\}, \left\{y(x) \to -\frac{i\sqrt[4]{-}\right.$$

✓ **Maple** : cpu = 0.067 (sec), leaf count = 158

```
dsolve(x*y(x)^3*diff(y(x),x)+y(x)^4-x*sin(x) = 0,y(x))
```

$$y(x) = \frac{\left((-4x^4 + 48x^2 - 96)\cos(x) + (16x^3 - 96x)\sin(x) + c_1\right)^{\frac{1}{4}}}{x}$$

ODE No. 315

$$\left(2xy(x)^3 - x^4\right) y'(x) + 2x^3 y(x) - y(x)^4 = 0$$

✓ **Mathematica** : cpu = 0.312119 (sec), leaf count = 368

```
DSolve[2*x^3*y[x] - y[x]^4 + (-x^4 + 2*x*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{\frac{2}{3}} e^{c_1} x}{\sqrt[3]{-9x^3 + \sqrt{3}\sqrt{27x^6 - 4e^{3c_1}x^3}}} + \frac{\sqrt[3]{-9x^3 + \sqrt{3}\sqrt{27x^6 - 4e^{3c_1}x^3}}}{\sqrt[3]{2}3^{2/3}}\right\}, \left\{y(x) \to -\frac{(1}{2^{2/3}\sqrt[3]{3}\sqrt[3]{-9x}\right.$$

✓ **Maple** : cpu = 0.071 (sec), leaf count = 376

```
dsolve((2*x*y(x)^3-x^4)*diff(y(x),x)-y(x)^4+2*x^3*y(x) = 0,y(x))
```

$$y(x) = \frac{12^{\frac{1}{3}}\left(x12^{\frac{1}{3}}c_1 + \left(x\left(-9x^2c_1 + \sqrt{3}\sqrt{\frac{27x^4c_1^3 - 4x}{c_1}}\right)c_1^2\right)^{\frac{2}{3}}\right)}{6c_1\left(x\left(-9x^2c_1 + \sqrt{3}\sqrt{\frac{27x^4c_1^3 - 4x}{c_1}}\right)c_1^2\right)^{\frac{1}{3}}}$$

ODE No. 316

$$\left(2xy(x)^3+y(x)\right)y'(x)+2y(x)^2=0$$

✓ **Mathematica** : cpu = 0.169528 (sec), leaf count = 48

```
DSolve[2*y[x]^2 + (y[x] + 2*x*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\{y(x)\to 0\},\text{Solve}\left[x=-\frac{1}{4}e^{-\frac{1}{2}y(x)^2}\text{Ei}\left(\frac{y(x)^2}{2}\right)+c_1e^{-\frac{1}{2}y(x)^2},y(x)\right]\right\}$$

✓ **Maple** : cpu = 0.055 (sec), leaf count = 53

```
dsolve((2*x*y(x)^3+y(x))*diff(y(x),x)+2*y(x)^2 = 0,y(x))
```

$$y(x)=0$$

ODE No. 317

$$\left(x^2+2xy(x)^3+xy(x)\right)y'(x)+y(x)^2-xy(x)=0$$

✓ **Mathematica** : cpu = 0.305927 (sec), leaf count = 23

```
DSolve[-(x*y[x]) + y[x]^2 + (x^2 + x*y[x] + 2*x*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[y(x)^2-\frac{x}{y(x)}+\log(y(x))+\log(x)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.183 (sec), leaf count = 29

```
dsolve((2*x*y(x)^3+x*y(x)+x^2)*diff(y(x),x)+y(x)^2-x*y(x) = 0,y(x))
```

$$y(x)=\mathrm{e}^{\text{RootOf}\left(-\mathrm{e}^{3\_Z}-\mathrm{e}^{\_Z}\ln(x)+\mathrm{e}^{\_Z}c_1-\_Z\mathrm{e}^{\_Z}+x\right)}$$

ODE No. 318

$$\left(3xy(x)^3-4xy(x)+y(x)\right)y'(x)+\left(y(x)^2-2\right)y(x)^2=0$$

✓ **Mathematica** : cpu = 0.241989 (sec), leaf count = 4284

```
DSolve[y[x]^2*(-2 + y[x]^2) + (y[x] - 4*x*y[x] + 3*x*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\{y(x)\to 0\},\left\{y(x)\to -\sqrt{\frac{4\sqrt[3]{2}x^2}{3\sqrt[3]{16x^6+24x^5-27{c_1}^2x^4+12x^4+2x^3+3\sqrt{3}\sqrt{-32{c_1}^2x^{10}-48{c_1}^2x^9+27c_1}}}}\right.\right.$$

✓ **Maple** : cpu = 0.022 (sec), leaf count = 28

```
dsolve((3*x*y(x)^3-4*x*y(x)+y(x))*diff(y(x),x)+y(x)^2*(y(x)^2-2) = 0,y(x))
```

$$y(x)=0$$

ODE No. 319

$$\left(7xy(x)^3+y(x)-5x\right)y'(x)+y(x)^4-5y(x)=0$$

✓ **Mathematica** : cpu = 0.162886 (sec), leaf count = 302

```
DSolve[-5*y[x] + y[x]^4 + (-5*x + y[x] + 7*x*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{Root}\left[10\#1^7x+2\#1^5-100\#1^4x-25\#1^2+250\#1x-10c_1\&,1\right]\right\},\left\{y(x)\to \text{Root}\left[10\#1^7x+2\right.\right.$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 35

```
dsolve((7*x*y(x)^3+y(x)-5*x)*diff(y(x),x)+y(x)^4-5*y(x) = 0,y(x))
```

$$x+\frac{2y(x)^5-25y(x)^2-10c_1}{10y\left(x\right)\left(y\left(x\right)^3-5\right)^2}=0$$

ODE No. 320

$$\left(x^2 y(x)^3 + x y(x)\right) y'(x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.118859 (sec), leaf count = 76

```
DSolve[-1 + (x*y[x] + x^2*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.101 (sec), leaf count = 78

```
dsolve((x^2*y(x)^3+x*y(x))*diff(y(x),x)-1 = 0,y(x))
```

$$y(x) = \frac{\sqrt{2x^2 \operatorname{LambertW}\left(\frac{c_1 \mathrm{e}^{-\frac{2x-1}{2x}}}{2}\right)+2x^2-x}}{x}$$

ODE No. 321

$$\left(2x^2y(x)^3+x^2y(x)^2-2x\right)y'(x)-2y(x)-1=0$$

✓ **Mathematica** : cpu = 0.452487 (sec), leaf count = 47

```
DSolve[-1 - 2*y[x] + (-2*x + x^2*y[x]^2 + 2*x^2*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{1}{64}\left(-4y(x)^2+4y(x)-2\log(8y(x)+4)+3\right)-\frac{1}{4x(2y(x)+1)}=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.254 (sec), leaf count = 42

```
dsolve((2*x^2*y(x)^3+x^2*y(x)^2-2*x)*diff(y(x),x)-2*y(x)-1 = 0,y(x))
```

$$y(x)=\frac{\mathrm{e}^{\text{RootOf}\left(x\,\mathrm{e}^{3\_Z}-4x\,\mathrm{e}^{2\_Z}+8c_1x\,\mathrm{e}^{\_Z}+2\_Z x\,\mathrm{e}^{\_Z}+3x\,\mathrm{e}^{\_Z}+16\right)}}{2}-\frac{1}{2}$$

ODE No. 322

$$\left(10x^2y(x)^3-3y(x)^2-2\right)y'(x)+5xy(x)^4+x=0$$

✓ **Mathematica** : cpu = 0.28965 (sec), leaf count = 2077

```
DSolve[x + 5*x*y[x]^4 + (-2 - 3*y[x]^2 + 10*x^2*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{1}{2}\sqrt{\frac{4\sqrt[3]{2}\left(5x^4-10c_1x^2-2\right)}{5x^2\sqrt[3]{2268x^2-216c_1+\sqrt{\left(2160x^2+108\left(x^2-2c_1\right)\right)^2-4\left(60x^4-120c_1x^2-24\right)^3}}}+\frac{\sqrt[3]{2}}{}\right.\right.$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 29

```
dsolve((10*x^2*y(x)^3-3*y(x)^2-2)*diff(y(x),x)+5*x*y(x)^4+x = 0,y(x))
```

$$\frac{5x^2y(x)^4}{2}-y(x)^3+\frac{x^2}{2}-2y(x)+c_1=0$$

ODE No. 323

$$xy'(x)\left(axy(x)^3+c\right)+y(x)\left(bx^3y(x)+c\right)=0$$

✓ **Mathematica** : cpu = 0.252462 (sec), leaf count = 463

```
DSolve[y[x]*(c + b*x^3*y[x]) + x*(c + a*x*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{54a^2cx^2+\sqrt{2916a^4c^2x^4+108a^3x^3\left(bx^3-2c_1x\right)^3}}}{3\sqrt[3]{2}ax}-\frac{\sqrt[3]{2}(bx^3-2c_1x)}{\sqrt[3]{54a^2cx^2+\sqrt{2916a^4c^2x^4+108a^3x^3(}}\right.\right.$$

✓ **Maple** : cpu = 0.108 (sec), leaf count = 630

```
dsolve((a*x*y(x)^3+c)*x*diff(y(x),x)+(b*x^3*y(x)+c)*y(x) = 0,y(x))
```

$$y(x)=\frac{\left(-3ab\,x^4+6c_1a\,x^2+\left(\left(27c+3\sqrt{\frac{3b^3x^8-18b^2x^6c_1+36b\,x^4c_1^2-24x^2c_1^3+81c^2a}{a}}\right)a^2x^2\right)^{\frac{2}{3}}\right)3^{\frac{2}{3}}}{9ax\left(\left(9c+\sqrt{\frac{3b^3x^8-18b^2x^6c_1+36b\,x^4c_1^2-24x^2c_1^3+81c^2a}{a}}\right)a^2x^2\right)^{\frac{1}{3}}}$$

ODE No. 324

$$\left(2x^3y(x)^3-x\right)y'(x)+2x^3y(x)^3-y(x)=0$$

✓ **Mathematica** : cpu = 0.121467 (sec), leaf count = 723

```
DSolve[-y[x] + 2*x^3*y[x]^3 + (-x + 2*x^3*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{2x^3-c_1x^2}{6x^2}+\frac{\sqrt[3]{-8x^9+12c_1x^8-6{c_1}^2x^7+{c_1}^3x^6-27x^4+3\sqrt{3}\sqrt{16x^{13}-24c_1x^{12}+12{c_1}^2x^{11}}}}{6x^2}\right.\right.$$

✓ **Maple** : cpu = 0.129 (sec), leaf count = 815

```
dsolve((2*x^3*y(x)^3-x)*diff(y(x),x)+2*x^3*y(x)^3-y(x) = 0,y(x))
```

$$y(x)=\frac{\left(\left(x^2c_1^3-6c_1^2x^3+12c_1x^4-8x^5+3\sqrt{48x^5-72c_1x^4+36c_1^2x^3-6x^2c_1^3+81}-27\right)x\right)^{\frac{1}{3}}}{6x}+\frac{}{6\left(\left(x^2c_1^3-\right.\right.}$$

ODE No. 325

$$y(x)\left(y(x)^3-2x^3\right)y'(x)+x\left(2y(x)^3-x^3\right)=0$$

✓ **Mathematica** : cpu = 0.194464 (sec), leaf count = 139

```
DSolve[x*(-x^3 + 2*y[x]^3) + y[x]*(-2*x^3 + y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{1}{7}\text{RootSum}\left[\#1^4+\#1^3+3\#1^2+\#1+1\&,\frac{8\#1^3\log\left(\frac{y(x)}{x}-\#1\right)+9\#1^2\log\left(\frac{y(x)}{x}-\#1\right)+12\#1}{4\#1^3+3\#1^2+6\#1+}\right.\right.$$

✓ **Maple** : cpu = 0.669 (sec), leaf count = 124

```
dsolve(y(x)*(y(x)^3-2*x^3)*diff(y(x),x)+(2*y(x)^3-x^3)*x = 0,y(x))
```

$$\frac{\ln\left(\frac{y(x)-x}{x}\right)}{7}-\frac{2\ln\left(\frac{4x^4+4x^3y(x)+12x^2y(x)^2+4xy(x)^3+4y(x)^4}{x^4}\right)}{7}-\frac{2\sqrt{3}\arctan\left(\frac{(x+2y(x))\sqrt{3}}{3x}\right)}{7}+\frac{2\sqrt{3}\arctan\left(\frac{\sqrt{3}\left(x^3+4x^2y\right.\right.}{7}$$

ODE No. 326

$$y(x)y'(x)\left((ay(x)+bx)^3+bx^3\right)+x\left((ay(x)+bx)^3+ay(x)^3\right)=0$$

✓ **Mathematica** : cpu = 2.94291 (sec), leaf count = 13289

```
DSolve[x*(a*y[x]^3 + (b*x + a*y[x])^3) + y[x]*(b*x^3 + (b*x + a*y[x])^3)*Derivative[1][y][x]
```

Too large to display

✓ **Maple** : cpu = 0.514 (sec), leaf count = 160

```
dsolve(y(x)*((a*y(x)+b*x)^3+b*x^3)*diff(y(x),x)+x*((a*y(x)+b*x)^3+a*y(x)^3) = 0,y(x))
```

$$y(x)=\frac{x\left(c_1x-b\,\text{RootOf}\left(b^2\_Z^4-2bxc_1\_Z^3+\left(a^2x^2c_1^2+b^2x^2c_1^2+x^2c_1^2-a^2\right)\_Z^2-2b\,x^3c_1^3\_Z+x^4c_1^4\right)\right)}{a\,\text{RootOf}\left(b^2\_Z^4-2bxc_1\_Z^3+\left(a^2x^2c_1^2+b^2x^2c_1^2+x^2c_1^2-a^2\right)\_Z^2-2b\,x^3c_1^3\_Z+x^4c_1^4\right)}$$

ODE No. 327

$$\left(2x^2y(x)^3+xy(x)^4+2y(x)+x\right)y'(x)+y(x)^5+y(x)=0$$

✓ **Mathematica** : cpu = 0.301904 (sec), leaf count = 669

```
DSolve[y[x] + y[x]^5 + (x + 2*y[x] + 2*x^2*y[x]^3 + x*y[x]^4)*Derivative[1][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{27x^2+9{c_1}^2x^2+3\sqrt{3}\sqrt{-4{c_1}^3x^6+27x^4-{c_1}^4x^4+18{c_1}^2x^4+4{c_1}^3x^2}+2{c_1}^3}}{3\sqrt[3]{2}x}-\frac{}{3x\sqrt[3]{27x^2+9c}\right.\right.$$

✓ **Maple** : cpu = 0.155 (sec), leaf count = 583

```
dsolve((x*y(x)^4+2*x^2*y(x)^3+2*y(x)+x)*diff(y(x),x)+y(x)^5+y(x) = 0,y(x))
```

$$y(x)=\frac{\left(108x^2c_1^3+12\sqrt{3}\,\sqrt{27x^2c_1^4+4c_1x^4+18x^2c_1^2-x^2-4c_1}\,xc_1+36x^2c_1-8\right)^{\frac{1}{3}}}{6xc_1}-\frac{}{3c_1x\left(108x^2c_1^3+12\sqrt{}\right.}$$

ODE No. 328

$$ax^2y(x)^ny'(x) - 2xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.279144 (sec), leaf count = 42

```
DSolve[y[x] - 2*x*Derivative[1][y][x] + a*x^2*y[x]^n*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{n(\log(x) - \log(-axy(x)^n + n + 2))}{n+2} - \frac{2n\log(y(x))}{n+2} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.215 (sec), leaf count = 33

```
dsolve(a*x^2*y(x)^n*diff(y(x),x)-2*x*diff(y(x),x)+y(x) = 0,y(x))
```

$$(y(x)^n\, ax - n - 2)^n\, y(x)^{2n}\, x^{-n} - c_1 = 0$$

ODE No. 329

$$x^n y(x)^m \left(axy'(x) + by(x)\right) + \alpha xy'(x) + \beta y(x) = 0$$

✓ **Mathematica** : cpu = 0.741449 (sec), leaf count = 102

```
DSolve[beta*y[x] + alpha*x*Derivative[1][y][x] + x^n*y[x]^m*(b*y[x] + a*x*Derivative[1][y][x]
```

$$\text{Solve}\left[\frac{m((a\beta - \alpha b)\log\left(x^n y(x)^m(bm - an) - \alpha n + \beta m\right) + \beta\log(x)(bm - an))}{(bm - an)(\beta m - \alpha n)} + \frac{\alpha m\log(\beta m y(x) - \alpha n y(x}{\beta m - \alpha n}\right.$$

✓ **Maple** : cpu = 0.443 (sec), leaf count = 71

```
dsolve(y(x)^m*x^n*(a*x*diff(y(x),x)+b*y(x))+alpha*x*diff(y(x),x)+beta*y(x) = 0,y(x))
```

$$x^{\beta m(an-bm)}(y(x)^m)^{\alpha(an-bm)}\left(x^n(an - bm)\,y(x)^m - \beta m + \alpha n\right)^{-a\beta m + bm\alpha} - c_1 = 0$$

ODE No. 330

$$(f(y(x)+x)+1)y'(x)+f(y(x)+x)=0$$

✓ **Mathematica** : cpu = 0.112949 (sec), leaf count = 52

```
DSolve[f[x + y[x]] + (1 + f[x + y[x]])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(f(x+K[2])-\int_1^x f'(K[1]+K[2])dK[1]+1\right)dK[2]+\int_1^x f(K[1]+y(x))dK[1]=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 22

```
dsolve((f(y(x)+x)+1)*diff(y(x),x)+f(y(x)+x) = 0,y(x))
```

$$y(x)=-x+\text{RootOf}\left(-x+\int^{\_Z}(1+f(\_a))\,d\_a+c_1\right)$$

ODE No. 331

$$y'(x)\left(\sum_{\nu=1}^{p} y(x)^{\nu} f(\nu)(x)\right) - \sum_{\nu=1}^{q} y(x)^{\nu} g(\nu)(x) = 0$$

✗ **Mathematica** : cpu = 53.2164 (sec), leaf count = 0

```
DSolve[-Sum[y[x]^nu*g[nu][x], {nu, 1, q}] + Sum[y[x]^nu*f[nu][x], {nu, 1, p}]*Derivative[1][y
```

, could not solve

```
DSolve[-Sum[y[x]^nu*g[nu][x], {nu, 1, q}] + Sum[y[x]^nu*f[nu][x], {nu, 1, p}]*Derivativ
```

✓ **Maple** : cpu = 0.232 (sec), leaf count = 78

```
dsolve(diff(y(x),x)*f[nu](x)*(-y(x)+y(x)^(p+1))/(-1+y(x))-g[nu](x)*(-y(x)+y(x)^(q+1))/(-1+y(x
```

$$\frac{y(x)^{p+1}\,\Phi\left(-y(x)^{q}\,(-1)^{\operatorname{csgn}(iy(x)^{q})},1,\frac{p+1}{q}\right) - y(x)\,\Phi\left(-y(x)^{q}\,(-1)^{\operatorname{csgn}(iy(x)^{q})},1,\frac{1}{q}\right) + q\left(\int \frac{g_{\nu}(x)}{f_{\nu}(x)}dx + c_1\right)}{q} = 0$$

ODE No. 332

$$x\left(\sqrt{xy(x)}-1\right)y'(x)-y(x)\left(\sqrt{xy(x)}+1\right)=0$$

✓ **Mathematica** : cpu = 0.277196 (sec), leaf count = 34

```
DSolve[-(y[x]*(1 + Sqrt[x*y[x]])) + x*(-1 + Sqrt[x*y[x]])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\log(y(x))-\frac{y(x)\log(x)-\frac{2y(x)}{\sqrt{xy(x)}}}{y(x)}=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 33

```
dsolve(((x*y(x))^(1/2)-1)*x*diff(y(x),x)-((x*y(x))^(1/2)+1)*y(x) = 0,y(x))
```

$$-\frac{1+\left(c_1-\ln(x)+\frac{\ln(xy(x))}{2}\right)\sqrt{xy(x)}}{\sqrt{xy(x)}}=0$$

ODE No. 333

$$-x^{3/2}y(x)^{5/2}+\left(2x^{5/2}y(x)^{3/2}+x^2y(x)-x\right)y'(x)+xy(x)^2-y(x)=0$$

✓ **Mathematica** : cpu = 0.4241 (sec), leaf count = 72

```
DSolve[-y[x] + x*y[x]^2 - x^(3/2)*y[x]^(5/2) + (-x + x^2*y[x] + 2*x^(5/2)*y[x]^(3/2))*Derivat
```

$$\text{Solve}\left[\frac{2\sqrt{xy(x)}\log(y(x))}{\sqrt{x}\sqrt{y(x)}}-\frac{\sqrt{xy(x)}\left(3x^{3/2}y(x)^{3/2}\log(x)+6xy(x)-2\right)}{3x^2y(x)^2}=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.097 (sec), leaf count = 32

```
dsolve((2*x^(5/2)*y(x)^(3/2)+x^2*y(x)-x)*diff(y(x),x)-x^(3/2)*y(x)^(5/2)+x*y(x)^2-y(x) = 0,y(
```

$$\ln\left(y(x)\right)+\frac{1}{3x^{\frac{3}{2}}y\left(x\right)^{\frac{3}{2}}}-\frac{1}{\sqrt{x}\sqrt{y\left(x\right)}}-\frac{\ln\left(x\right)}{2}-c_1=0$$

ODE No. 334

$$\left(\sqrt{y(x)+x}+1\right)y'(x)+1=0$$

✓ **Mathematica** : cpu = 0.119264 (sec), leaf count = 39

```
DSolve[1 + (1 + Sqrt[x + y[x]])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -2\sqrt{x+1+c_1}+2+c_1\right\},\left\{y(x)\to 2\sqrt{x+1+c_1}+2+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 19

```
dsolve(((y(x)+x)^(1/2)+1)*diff(y(x),x)+1 = 0,y(x))
```

$$-y(x)-2\sqrt{y\left(x\right)+x}-c_1=0$$

ODE No. 335

$$\sqrt{y(x)^2-1}y'(x)-\sqrt{x^2-1}=0$$

✓ **Mathematica** : cpu = 0.149084 (sec), leaf count = 75

```
DSolve[-Sqrt[-1 + x^2] + Sqrt[-1 + y[x]^2]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{1}{2}\#1\sqrt{\#1^2-1}-\frac{1}{2}\log\left(\sqrt{\#1^2-1}+\#1\right)\&\right]\left[\frac{1}{2}\sqrt{x^2-1}x-\frac{1}{2}\log\left(\sqrt{x^2-\right.\right.\right.$$

✓ **Maple** : cpu = 0.008 (sec), leaf count = 50

```
dsolve((y(x)^2-1)^(1/2)*diff(y(x),x)-(x^2-1)^(1/2) = 0,y(x))
```

$$c_1+x\sqrt{x^2-1}-\ln\left(x+\sqrt{x^2-1}\right)-y(x)\sqrt{y\left(x\right)^2-1}+\ln\left(y(x)+\sqrt{y\left(x\right)^2-1}\right)=0$$

ODE No. 336

$$\left(ax+\sqrt{y(x)^2+1}\right)y'(x)+ay(x)+\sqrt{x^2+1}=0$$

✓ **Mathematica** : cpu = 0.281508 (sec), leaf count = 53

```
DSolve[Sqrt[1 + x^2] + a*y[x] + (a*x + Sqrt[1 + y[x]^2])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[axy(x)+\frac{1}{2}\sqrt{x^2+1}x+\frac{1}{2}\left(y(x)\sqrt{y(x)^2+1}+\sinh^{-1}(y(x))\right)+\frac{1}{2}\sinh^{-1}(x)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 41

```
dsolve(((y(x)^2+1)^(1/2)+a*x)*diff(y(x),x)+(x^2+1)^(1/2)+a*y(x) = 0,y(x))
```

$$\frac{x\sqrt{x^2+1}}{2}+\frac{\operatorname{arcsinh}(x)}{2}+axy(x)+\frac{y(x)\sqrt{y(x)^2+1}}{2}+\frac{\operatorname{arcsinh}(y(x))}{2}+c_1=0$$

ODE No. 337

$$\left(\sqrt{x^2+y(x)^2}+x\right)y'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.225766 (sec), leaf count = 161

```
DSolve[-y[x] + (x + Sqrt[x^2 + y[x]^2])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\sqrt{-2ix\cosh(c_1)-2ix\sinh(c_1)-\cosh(2c_1)-\sinh(2c_1)}\right\},\left\{y(x)\to \sqrt{-2ix\cosh(c_1)-2ix\sin\right.\right.$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 28

```
dsolve(((y(x)^2+x^2)^(1/2)+x)*diff(y(x),x)-y(x) = 0,y(x))
```

$$-c_1+\frac{\sqrt{y\left(x\right)^2+x^2}}{y\left(x\right)^2}+\frac{x}{y\left(x\right)^2}=0$$

ODE No. 338

$$y'(x)\left(\sin(\alpha)\left(y(x)^2-x^2\right)-2x\cos(\alpha)y(x)+\sqrt{x^2+y(x)^2}y(x)\right)+\cos(\alpha)\left(y(x)^2-x^2\right)+2x\sin(\alpha)y(x)+x\sqrt$$

✓ **Mathematica** : cpu = 61.416 (sec), leaf count = 17681

```
DSolve[2*x*Sin[alpha]*y[x] + Cos[alpha]*(-x^2 + y[x]^2) + x*Sqrt[x^2 + y[x]^2] + (-2*x*Cos[al
```

Too large to display

✓ **Maple** : cpu = 0.857 (sec), leaf count = 127

```
dsolve((y(x)*(y(x)^2+x^2)^(1/2)+(y(x)^2-x^2)*sin(alpha)-2*x*y(x)*cos(alpha))*diff(y(x),x)+x*(
```

$$y(x)=\text{RootOf}\left(-\ln(x)+\int^{-Z}-\frac{\_a^3\cos(2\alpha)+3\_a^2\sin(2\alpha)+\_a^3-3\_a\cos(2\alpha)-\sin(2\alpha)+\sqrt{2}\sqrt{(}}{(\_a^2+1)(\_a^2\cos(2\alpha)+2\_a\sin}\right.$$

ODE No. 339

$$\left(x\sqrt{x^2+y(x)^2+1}-y(x)\left(x^2+y(x)^2\right)\right)y'(x)-\sqrt{x^2+y(x)^2+1}y(x)-x\left(x^2+y(x)^2\right)=0$$

✓ **Mathematica** : cpu = 0.354526 (sec), leaf count = 27

```
DSolve[-(x*(x^2 + y[x]^2)) - y[x]*Sqrt[1 + x^2 + y[x]^2] + (-(y[x]*(x^2 + y[x]^2)) + x*Sqrt[1
```

$$\text{Solve}\left[\sqrt{x^2+y(x)^2+1}+\tan^{-1}\left(\frac{x}{y(x)}\right)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.204 (sec), leaf count = 27

```
dsolve((x*(x^2+y(x)^2+1)^(1/2)-y(x)*(y(x)^2+x^2))*diff(y(x),x)-y(x)*(x^2+y(x)^2+1)^(1/2)-x*(y
```

$$\arctan\left(\frac{y(x)}{x}\right)-\sqrt{x^2+y\left(x\right)^2+1}-c_1=0$$

ODE No. 340

$$y'(x)\left(\frac{\text{e1}(a+x)}{((a+x)^2+y(x)^2)^{3/2}}+\frac{\text{e2}(x-a)}{((x-a)^2+y(x)^2)^{3/2}}\right)-y(x)\left(\frac{\text{e1}}{((a+x)^2+y(x)^2)^{3/2}}+\frac{\text{e2}}{((x-a)^2+y(x)^2)^{3}}\right.$$

✗ **Mathematica** : cpu = 77.0519 (sec), leaf count = 0

```
DSolve[-(y[x]*(e2/((-a + x)^2 + y[x]^2)^(3/2) + e1/((a + x)^2 + y[x]^2)^(3/2))) + ((e2*(-a +
```

, could not solve

```
DSolve[-(y[x]*(e2/((-a + x)^2 + y[x]^2)^(3/2) + e1/((a + x)^2 + y[x]^2)^(3/2))) + ((e2*
a + x))/((-a + x)^2 + y[x]^2)^(3/2) + (e1*(a + x))/((a + x)^2 + y[x]^2)^(3/2))*Derivati
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((e1*(x+a)/((x+a)^2+y(x)^2)^(3/2)+e2*(x-a)/((x-a)^2+y(x)^2)^(3/2))*diff(y(x),x)-y(x)*(e
```

, exception

```
time expired
```

ODE No. 341

$$\left(xe^{y(x)}+e^{x}\right)y'(x)+e^{x}y(x)+e^{y(x)}=0$$

✓ **Mathematica** : cpu = 0.247981 (sec), leaf count = 33

```
DSolve[E^y[x] + E^x*y[x] + (E^x + E^y[x]*x)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{-x}-W\left(xe^{-x+c_1e^{-x}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 33

```
dsolve((x*exp(y(x))+exp(x))*diff(y(x),x)+exp(y(x))+y(x)*exp(x) = 0,y(x))
```

$$y(x)=\left(-\operatorname{LambertW}\left(x\,\mathrm{e}^{-x}\mathrm{e}^{-\mathrm{e}^{-x}c_1}\right)\mathrm{e}^{x}-c_1\right)\mathrm{e}^{-x}$$

ODE No. 342

$$x\left(2e^{-xy(x)}+3e^{xy(x)}\right)\left(xy'(x)+y(x)\right)+1=0$$

✓ **Mathematica** : cpu = 0.544607 (sec), leaf count = 163

```
DSolve[1 + (2/E^(x*y[x]) + 3*E^(x*y[x]))*x*(y[x] + x*Derivative[1][y][x]) == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\cosh^{-1}\left(\frac{1}{24}\left(-5\sqrt{24+\log^2\left(\frac{c_1}{x}\right)}-\log\left(\frac{c_1}{x}\right)\right)\right)}{x}\right\},\left\{y(x)\to \frac{\cosh^{-1}\left(\frac{1}{24}\left(-5\sqrt{24+\log^2\left(\frac{c_1}{x}\right)}-\right.\right.\right.}{x}$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 17

```
dsolve(x*(3*exp(x*y(x))+2*exp(-x*y(x)))*(x*diff(y(x),x)+y(x))+1 = 0,y(x))
```

$$y(x)=\frac{\ln\left(-\frac{\ln(x)}{5}+\frac{c_1}{5}\right)}{x}$$

ODE No. 343

$$y'(x)(\log(y(x))+x)-1=0$$

✓ **Mathematica** : cpu = 0.157325 (sec), leaf count = 35

```
DSolve[-1 + (x + Log[y[x]])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[x=e^{y(x)}\left(\text{Ei}(-y(x))-e^{-y(x)}\log(y(x))\right)+c_1e^{y(x)},y(x)\right]$$

✓ **Maple** : cpu = 0.117 (sec), leaf count = 27

```
dsolve((ln(y(x))+x)*diff(y(x),x)-1 = 0,y(x))
```

$$y(x)=\mathrm{e}^{\mathrm{RootOf}\left(-x-\_Z-\mathrm{e}^{\mathrm{e}^{-\_Z}}\,\mathrm{expIntegral}\left(1,\mathrm{e}^{-\_Z}\right)+\mathrm{e}^{\mathrm{e}^{-\_Z}}c_1\right)}$$

ODE No. 344

$$y'(x)(\log(y(x)) + 2x - 1) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.180837 (sec), leaf count = 23

```
DSolve[-2*y[x] + (-1 + 2*x + Log[y[x]])*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.059 (sec), leaf count = 19

```
dsolve((ln(y(x))+2*x-1)*diff(y(x),x)-2*y(x) = 0,y(x))
```

$$y(x) = \mathrm{e}^{-\operatorname{LambertW}\left(-2\,\mathrm{e}^{-2x}c_1\right)-2x}$$

ODE No. 345

$$xy'(x)\left(2x^2y(x)\log(y(x))+1\right)-2y(x)=0$$

✓ **Mathematica** : cpu = 0.204343 (sec), leaf count = 35

```
DSolve[-2*y[x] + x*(1 + 2*x^2*Log[y[x]]*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{y(x)}{x^2}+2\left(\frac{1}{2}y(x)^2\log(y(x))-\frac{y(x)^2}{4}\right)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.098 (sec), leaf count = 36

```
dsolve(x*(2*x^2*y(x)*ln(y(x))+1)*diff(y(x),x)-2*y(x) = 0,y(x))
```

$$y(x)=\mathrm{e}^{\text{RootOf}\left(2\_Zx^2\mathrm{e}^{2\_Z}-x^2\mathrm{e}^{2\_Z}+2x^2c_1+2\,\mathrm{e}^{\_Z}\right)}$$

ODE No. 346

$$xy'(x)(-ax+y(x)+y(x)\log(xy(x)))-y(x)(ax\log(xy(x))+ax-y(x))=0$$

✓ **Mathematica** : cpu = 0.395319 (sec), leaf count = 24

```
DSolve[-((a*x + a*x*Log[x*y[x]] - y[x])*y[x]) + x*(-(a*x) + y[x] + Log[x*y[x]]*y[x])*Derivati
```

$$\text{Solve}[ax\log(xy(x))-y(x)\log(xy(x))=c_1,y(x)]$$

✓ **Maple** : cpu = 0.312 (sec), leaf count = 19

```
dsolve(x*(y(x)*ln(x*y(x))+y(x)-a*x)*diff(y(x),x)-y(x)*(a*x*ln(x*y(x))-y(x)+a*x) = 0,y(x))
```

$$(xy(x))^{-ax+y(x)}-c_1=0$$

ODE No. 347

$$(\sin(x)+1)y'(x)\sin(y(x))+\cos(x)(\cos(y(x))-1)=0$$

✓ **Mathematica** : cpu = 0.300544 (sec), leaf count = 32

```
DSolve[Cos[x]*(-1 + Cos[y[x]]) + (1 + Sin[x])*Sin[y[x]]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\{y(x)\to 0\},\left\{y(x)\to 2\sin^{-1}\left(\frac{1}{4}c_1\left(\sin\left(\frac{x}{2}\right)+\cos\left(\frac{x}{2}\right)\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.149 (sec), leaf count = 12

```
dsolve(diff(y(x),x)*(1+sin(x))*sin(y(x))+cos(x)*(cos(y(x))-1) = 0,y(x))
```

$$y(x)=\arccos\left(\sin\left(x\right)c_1+c_1+1\right)$$

ODE No. 348

$$y'(x)(x\cos(y(x))+\sin(x))+\sin(y(x))+y(x)\cos(x)=0$$

✓ **Mathematica** : cpu = 0.186432 (sec), leaf count = 17

```
DSolve[Sin[y[x]] + Cos[x]*y[x] + (x*Cos[y[x]] + Sin[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}[x\sin(y(x))+y(x)\sin(x)=c_1,y(x)]$$

✓ **Maple** : cpu = 0.107 (sec), leaf count = 15

```
dsolve((x*cos(y(x))+sin(x))*diff(y(x),x)+y(x)*cos(x)+sin(y(x)) = 0,y(x))
```

$$y(x)\sin(x)+x\sin(y(x))+c_1=0$$

ODE No. 349

$$xy'(x)\cot\left(\frac{y(x)}{x}\right)+2x\sin\left(\frac{y(x)}{x}\right)-y(x)\cot\left(\frac{y(x)}{x}\right)=0$$

✓ **Mathematica** : cpu = 0.231829 (sec), leaf count = 15

```
DSolve[2*x*Sin[y[x]/x] - Cot[y[x]/x]*y[x] + x*Cot[y[x]/x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to x\csc^{-1}(2(\log(x)+c_1))\}\}$$

✓ **Maple** : cpu = 0.046 (sec), leaf count = 17

```
dsolve(x*diff(y(x),x)*cot(y(x)/x)+2*x*sin(y(x)/x)-y(x)*cot(y(x)/x) = 0,y(x))
```

$$y(x)=\arcsin\left(\frac{1}{2\ln(x)+2c_1}\right)x$$

ODE No. 350

$$y'(x)\cos(y(x)) - \sin(y(x)) - \cos(x)\sin^2(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.578619 (sec), leaf count = 53

```
DSolve[-Sin[y[x]] - Cos[x]*Sin[y[x]]^2 + Cos[y[x]]*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 1.043 (sec), leaf count = 226

```
dsolve(diff(y(x),x)*cos(y(x))-cos(x)*sin(y(x))^2-sin(y(x)) = 0,y(x))
```

$$y(x) = \arctan\left(-\frac{2\,\mathrm{e}^{x}}{\mathrm{e}^{x}\left(\cos\left(x\right)+\sin\left(x\right)\right)+2c_1}, \frac{\sqrt{16}\sqrt{\left(\left(\frac{\sin(x)\cos(x)}{2}+\frac{1}{4}\right)\mathrm{e}^{2x}+\mathrm{e}^{x}\left(\cos\left(x\right)+\sin\left(x\right)\right)c_1+c_1^2\right)}}{4c_1^2+4\,\mathrm{e}^{x}\left(\cos\left(x\right)+\sin\left(x\right)\right)c_1+}\right.$$

ODE No. 351

$$y'(x)\cos(y(x)) - \sin^3(y(x)) + x\sin(y(x))\cos^2(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.489369 (sec), leaf count = 61

```
DSolve[x*Cos[y[x]]^2*Sin[y[x]] - Sin[y[x]]^3 + Cos[y[x]]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\cot^{-1}\left(\sqrt{e^{x^2}\left(-\sqrt{\pi}\text{erf}(x) + 4c_1\right)}\right)\right\}, \left\{y(x) \to \cot^{-1}\left(\sqrt{e^{x^2}\left(-\sqrt{\pi}\text{erf}(x) + 4c_1\right)}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.534 (sec), leaf count = 55

```
dsolve(diff(y(x),x)*cos(y(x))+x*sin(y(x))*cos(y(x))^2-sin(y(x))^3 = 0,y(x))
```

$$y(x) = \arcsin\left(\frac{1}{\sqrt{1 - \sqrt{\pi}\ \text{erf}\left(x\right)\text{e}^{x^2} - 2c_1\text{e}^{x^2}}}\right)$$

ODE No. 352

$$y'(x)\cos(y(x))(\cos(y(x))-\sin(\alpha)\sin(x))+\cos(x)(\cos(x)-\sin(\alpha)\sin(y(x)))=0$$

✓ **Mathematica** : cpu = 0.55124 (sec), leaf count = 43

```
DSolve[Cos[x]*(Cos[x] - Sin[alpha]*Sin[y[x]]) + Cos[y[x]]*(Cos[y[x]] - Sin[alpha]*Sin[x])*Der
```

$$\text{Solve}\left[4\sin(\alpha)\sin(x)\sin(y(x))-4\left(\frac{y(x)}{2}+\frac{1}{4}\sin(2y(x))\right)-2x-\sin(2x)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.521 (sec), leaf count = 33

```
dsolve(diff(y(x),x)*(cos(y(x))-sin(alpha)*sin(x))*cos(y(x))+(cos(x)-sin(alpha)*sin(y(x)))*cos
```

$$\frac{(-2\sin(\alpha)\sin(x)+\cos(y(x)))\sin(y(x))}{2}+\frac{\sin(x)\cos(x)}{2}+\frac{x}{2}+c_1+\frac{y(x)}{2}=0$$

ODE No. 353

$$xy'(x)\cos(y(x)) + \sin(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.0821974 (sec), leaf count = 14

```
DSolve[Sin[y[x]] + x*Cos[y[x]]*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.078 (sec), leaf count = 12

```
dsolve(x*diff(y(x),x)*cos(y(x))+sin(y(x)) = 0,y(x))
```

$$y(x) = \arcsin\left(\frac{1}{xc_1}\right)$$

ODE No. 354

$$y'(x)(x\sin(y(x))-1)+\cos(y(x))=0$$

✓ **Mathematica** : cpu = 0.170607 (sec), leaf count = 145

```
DSolve[Cos[y[x]] + (-1 + x*Sin[y[x]])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\cos^{-1}\left(\frac{c_1 x-\sqrt{-x^2+1+{c_1}^2}}{1+{c_1}^2}\right)\right\},\left\{y(x)\to \cos^{-1}\left(\frac{c_1 x-\sqrt{-x^2+1+{c_1}^2}}{1+{c_1}^2}\right)\right\},\left\{y(x)\to -\right.\right.$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 108

```
dsolve((x*sin(y(x))-1)*diff(y(x),x)+cos(y(x)) = 0,y(x))
```

$$y(x)=\arctan\left(\frac{-c_1\sqrt{-x^2+c_1^2+1}+x}{c_1^2+1},\frac{c_1 x+\sqrt{-x^2+c_1^2+1}}{c_1^2+1}\right)$$

ODE No. 355

$$y'(x)(x\cos(y(x))+\cos(x))+\sin(y(x))-y(x)\sin(x)=0$$

✓ **Mathematica** : cpu = 0.175107 (sec), leaf count = 17

```
DSolve[Sin[y[x]] - Sin[x]*y[x] + (Cos[x] + x*Cos[y[x]])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}[x\sin(y(x))+y(x)\cos(x)=c_1,y(x)]$$

✓ **Maple** : cpu = 0.111 (sec), leaf count = 15

```
dsolve((x*cos(y(x))+cos(x))*diff(y(x),x)-y(x)*sin(x)+sin(y(x)) = 0,y(x))
```

$$y(x)\cos(x)+x\sin(y(x))+c_1=0$$

ODE No. 356

$$y'(x)\left(x^2\cos(y(x))+2y(x)\sin(x)\right)+2x\sin(y(x))+y(x)^2\cos(x)=0$$

✓ **Mathematica** : cpu = 0.247359 (sec), leaf count = 21

```
DSolve[2*x*Sin[y[x]] + Cos[x]*y[x]^2 + (x^2*Cos[y[x]] + 2*Sin[x]*y[x])*Derivative[1][y][x] ==
```

$$\text{Solve}\left[x^2\sin(y(x))+y(x)^2\sin(x)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.127 (sec), leaf count = 19

```
dsolve((x^2*cos(y(x))+2*y(x)*sin(x))*diff(y(x),x)+2*x*sin(y(x))+y(x)^2*cos(x) = 0,y(x))
```

$$y(x)^2\sin(x)+\sin(y(x))x^2+c_1=0$$

ODE No. 357

$$x \log(x) y'(x) \sin(y(x)) + \cos(y(x))(1 - x \cos(y(x))) = 0$$

✓ **Mathematica** : cpu = 0.524471 (sec), leaf count = 35

```
DSolve[Cos[y[x]]*(1 - x*Cos[y[x]]) + x*Log[x]*Sin[y[x]]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sec^{-1}\left(\frac{x - c_1}{\log(x)}\right)\right\}, \left\{y(x) \to \sec^{-1}\left(\frac{x - c_1}{\log(x)}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.696 (sec), leaf count = 13

```
dsolve(x*diff(y(x),x)*ln(x)*sin(y(x))+cos(y(x))*(1-x*cos(y(x))) = 0,y(x))
```

$$y(x) = \arccos\left(\frac{\ln(x)}{x + c_1}\right)$$

ODE No. 358

$$\cos(x)y'(x)\sin(y(x)) + \sin(x)\cos(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.150897 (sec), leaf count = 29

```
DSolve[Cos[y[x]]*Sin[x] + Cos[x]*Sin[y[x]]*Derivative[1][y][x] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.09 (sec), leaf count = 11

```
dsolve(diff(y(x),x)*sin(y(x))*cos(x)+cos(y(x))*sin(x) = 0,y(x))
```

$$y(x) = \arccos\left(\frac{c_1}{\cos(x)}\right)$$

ODE No. 359

$$3\sin(x)y'(x)\sin(y(x)) + 5y(x)\cos^4(x) = 0$$

✓ **Mathematica** : cpu = 0.317546 (sec), leaf count = 45

```
DSolve[5*Cos[x]^4*y[x] + 3*Sin[x]*Sin[y[x]]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{SinIntegral}^{(-1)}\left(-\frac{5}{3}\left(\frac{5\cos(x)}{4} + \frac{1}{12}\cos(3x) + \log\left(\sin\left(\frac{x}{2}\right)\right) - \log\left(\cos\left(\frac{x}{2}\right)\right)\right) + c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.072 (sec), leaf count = 28

```
dsolve(3*diff(y(x),x)*sin(x)*sin(y(x))+5*cos(x)^4*y(x) = 0,y(x))
```

$$\frac{3\,\text{sinIntegral}\left(y(x)\right)}{5} + c_1 + \ln\left(\csc\left(x\right) - \cot\left(x\right)\right) + \frac{\cos\left(3x\right)}{12} + \frac{5\cos\left(x\right)}{4} = 0$$

ODE No. 360

$$y'(x)\cos(ay(x)) - b(1 - c\cos(ay(x)))\sqrt{c\cos(ay(x)) + \cos^2(ay(x)) - 1} = 0$$

✓ **Mathematica** : cpu = 4.12004 (sec), leaf count = 369

```
DSolve[-(b*(1 - c*Cos[a*y[x]])*Sqrt[-1 + c*Cos[a*y[x]] + Cos[a*y[x]]^2]) + Cos[a*y[x]]*Deriva
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{i(\cos(\#1a)+1)\sqrt{\frac{2c\cos(\#1a)+\cos(2\#1a)-1}{(\cos(\#1a)+1)^2}}\sqrt{\frac{c\tan^2\left(\frac{\#1_a}{2}\right)+\sqrt{c^2+4}+2}{\sqrt{c^2+4}+2}}\sqrt{1-\frac{c\tan^2}{\sqrt{c^2}}}}{a\left(c^2-1\right)\sqrt{\frac{}{4-}}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.432 (sec), leaf count = 48

```
dsolve(diff(y(x),x)*cos(a*y(x))-b*(1-c*cos(a*y(x)))*(cos(a*y(x))^2-1+c*cos(a*y(x)))^(1/2) = 0
```

$$x + c_1 + \int^{y(x)} \frac{2\cos(\_aa)}{b\left(c\cos(\_aa) - 1\right)\sqrt{-2 + 2\cos(2\_aa) + 4c\cos(\_aa)}} d\_a = 0$$

ODE No. 361

$$y'(x)(-\sin(y(x))+x\sin(xy(x))+\cos(y(x)+x))+y(x)\sin(xy(x))+\cos(y(x)+x)+\cos(x)=0$$

✓ **Mathematica** : cpu = 0.850341 (sec), leaf count = 31

```
DSolve[Cos[x] + Cos[x + y[x]] + Sin[x*y[x]]*y[x] + (Cos[x + y[x]] - Sin[y[x]] + x*Sin[x*y[x]]
```

$$\text{Solve}[\cos(y(x))-\cos(xy(x))+\sin(x)\cos(y(x))+\cos(x)\sin(y(x))+\sin(x)=c_1,y(x)]$$

✓ **Maple** : cpu = 0.234 (sec), leaf count = 22

```
dsolve((x*sin(x*y(x))+cos(y(x)+x)-sin(y(x)))*diff(y(x),x)+y(x)*sin(x*y(x))+cos(y(x)+x)+cos(x)
```

$$-\cos(xy(x))+\sin(x)+\sin(y(x)+x)+\cos(y(x))+c_1=0$$

ODE No. 362

$$y'(x)\left(x^2 y(x)\sin(xy(x)) - 4x\right) - y(x) + xy(x)^2\sin(xy(x)) = 0$$

✓ **Mathematica** : cpu = 0.353993 (sec), leaf count = 23

```
DSolve[-y[x] + x*Sin[x*y[x]]*y[x]^2 + (-4*x + x^2*Sin[x*y[x]]*y[x])*Derivative[1][y][x] == 0,
```

$$\text{Solve}[-4\log(y(x)) - \cos(xy(x)) - \log(x) = c_1, y(x)]$$

✓ **Maple** : cpu = 0.232 (sec), leaf count = 23

```
dsolve((x^2*y(x)*sin(x*y(x))-4*x)*diff(y(x),x)+x*y(x)^2*sin(x*y(x))-y(x) = 0,y(x))
```

$$y(x) = \frac{\text{RootOf}\left(-\_Z + \mathrm{e}^{-\frac{\cos\left(\_Z\right)}{4}} c_1 x^{\frac{3}{4}}\right)}{x}$$

ODE No. 363

$$(xy'(x) - y(x)) \cos^2\left(\frac{y(x)}{x}\right) + x = 0$$

✓ **Mathematica** : cpu = 0.363155 (sec), leaf count = 33

```
DSolve[x + Cos[y[x]/x]^2*(-y[x] + x*Derivative[1][y][x]) == 0,y[x],x]
```

$$\text{Solve}\left[\frac{y(x)}{2x} + \frac{1}{4}\sin\left(\frac{2y(x)}{x}\right) = -\log(x) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.08 (sec), leaf count = 35

```
dsolve((x*diff(y(x),x)-y(x))*cos(y(x)/x)^2+x = 0,y(x))
```

$$-\frac{\cos\left(\frac{y(x)}{x}\right)\sin\left(\frac{y(x)}{x}\right)x + y(x)}{2x} - \ln(x) - c_1 = 0$$

ODE No. 364

$$xy'(x)\left(y(x)\sin\left(\frac{y(x)}{x}\right)-x\cos\left(\frac{y(x)}{x}\right)\right)-y(x)\left(y(x)\sin\left(\frac{y(x)}{x}\right)+x\cos\left(\frac{y(x)}{x}\right)\right)=0$$

✓ **Mathematica** : cpu = 0.432297 (sec), leaf count = 31

```
DSolve[-(y[x]*(x*Cos[y[x]/x] + Sin[y[x]/x]*y[x])) + x*(-(x*Cos[y[x]/x]) + Sin[y[x]/x]*y[x])*D
```

$$\text{Solve}\left[-\log\left(\frac{y(x)}{x}\right)-\log\left(\cos\left(\frac{y(x)}{x}\right)\right)=2\log(x)+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.191 (sec), leaf count = 23

```
dsolve((y(x)*sin(y(x)/x)-x*cos(y(x)/x))*x*diff(y(x),x)-(x*cos(y(x)/x)+y(x)*sin(y(x)/x))*y(x)
```

$$y(x)=\frac{c_1}{\cos\left(\text{RootOf}\left(-\_Z\cos\left(\_Z\right)x^2+c_1\right)\right)x}$$

ODE No. 365

$$\left(y(x) f\left(x^2+y(x)^2\right)-x\right) y'(x)+x f\left(x^2+y(x)^2\right)+y(x)=0$$

✓ **Mathematica** : cpu = 0.35744 (sec), leaf count = 156

```
DSolve[x*f[x^2 + y[x]^2] + y[x] + (-x + f[x^2 + y[x]^2]*y[x])*Derivative[1][y][x] == 0,y[x],x
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{x-f(x^2+K[2]^2)\,K[2]}{x^2+K[2]^2}-\int_1^{x}\left(\frac{-2K[1]K[2]f'(K[1]^2+K[2]^2)-1}{K[1]^2+K[2]^2}-\frac{2(-f(K[1]^2+K[2]^2)}{(K[1]^2+K[2]^2)}\right.\right.\right.$$

✓ **Maple** : cpu = 0.337 (sec), leaf count = 42

```
dsolve((y(x)*f(y(x)^2+x^2)-x)*diff(y(x),x)+y(x)+x*f(y(x)^2+x^2) = 0,y(x))
```

$$y(x)=\frac{x}{\tan\left(\text{RootOf}\left(-2\_Z-\left(\int^{\frac{x^2\left(\tan^2\left(\_Z\right)+1\right)}{\tan\left(\_Z\right)^2}}\frac{f(\_a)}{\_a}d\_a\right)+2c_1\right)\right)}$$

ODE No. 366

$$f\left(ay(x)^2+x^2\right)\left(ay(x)y'(x)+x\right)-xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.303217 (sec), leaf count = 91

```
DSolve[-y[x] - x*Derivative[1][y][x] + f[x^2 + a*y[x]^2]*(x + a*y[x]*Derivative[1][y][x]) ==
```

$$\text{Solve}\left[\int_1^{y(x)}\left(x-af\left(x^2+aK[2]^2\right)K[2]-\int_1^x\left(1-2aK[1]K[2]f'\left(K[1]^2+aK[2]^2\right)\right)dK[1]\right)dK[2]+\int_1^x($$

✓ **Maple** : cpu = 0.126 (sec), leaf count = 45

```
dsolve(f(x^2+a*y(x)^2)*(a*y(x)*diff(y(x),x)+x)-y(x)-x*diff(y(x),x) = 0,y(x))
```

$$-\frac{ay(x)^2x}{\sqrt{a^2y\left(x\right)^2}}-\left(\int^{-\frac{ay(x)^2}{2}-\frac{x^2}{2}}f(-2\_a)\,d\_a\right)+c_1=0$$

ODE No. 367

$$f(x^c y(x))\left(bxy'(x)-a\right)-x^a y(x)^b\left(cy(x)+xy'(x)\right)=0$$

✗ **Mathematica** : cpu = 10.2605 (sec), leaf count = 0

```
DSolve[-(x^a*y[x]^b*(c*y[x] + x*Derivative[1][y][x])) + f[x^c*y[x]]*(-a + b*x*Derivative[1][y
```

, could not solve

```
DSolve[-(x^a*y[x]^b*(c*y[x] + x*Derivative[1][y][x])) + f[x^c*y[x]]*(-a + b*x*Derivativ
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(f(x^c*y(x))*(b*x*diff(y(x),x)-a)-x^a*y(x)^b*(x*diff(y(x),x)+c*y(x)) = 0,y(x))
```

, could not solve

```
dsolve(f(x^c*y(x))*(b*x*diff(y(x),x)-a)-x^a*y(x)^b*(x*diff(y(x),x)+c*y(x)) = 0,y(x))
```

ODE No. 368

$$ay(x) + bx^2 + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 1.28434 (sec), leaf count = 795

```
DSolve[b*x^2 + a*y[x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\int_1^x \left(\frac{2\sqrt{-bK[1]^2 - ay(x)}y(x)}{bK[1]^4 + ay(x)K[1]^2 + 4y(x)^2} + \frac{bK[1]^3 + ay(x)K[1]}{bK[1]^4 + ay(x)K[1]^2 + 4y(x)^2}\right) dK[1] + \int_1^{y(x)} \left(-\frac{\sqrt{-}\right.\right.$$
$$bx^4 + a$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)^2+a*y(x)+b*x^2 = 0,y(x))
```

, exception

```
time expired
```

ODE No. 369

$$-a^2 + y'(x)^2 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0817852 (sec), leaf count = 107

```
DSolve[-a^2 + y[x]^2 + Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.108 (sec), leaf count = 68

```
dsolve(diff(y(x),x)^2+y(x)^2-a^2 = 0,y(x))
```

$$y(x) = a$$

ODE No. 370

$$-f(x)^2 + y'(x)^2 + y(x)^2 = 0$$

✗ **Mathematica** : cpu = 13.1611 (sec), leaf count = 0

```
DSolve[-f[x]^2 + y[x]^2 + Derivative[1][y][x]^2 == 0,y[x],x]
```

, could not solve

```
DSolve[-f[x]^2 + y[x]^2 + Derivative[1][y][x]^2 == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)^2+y(x)^2-f(x)^2 = 0,y(x))
```

, could not solve

```
dsolve(diff(y(x),x)^2+y(x)^2-f(x)^2 = 0,y(x))
```

ODE No. 371

$$y'(x)^2 - y(x)^3 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.050681 (sec), leaf count = 37

```
DSolve[y[x]^2 - y[x]^3 + Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.112 (sec), leaf count = 20

```
dsolve(diff(y(x),x)^2-y(x)^3+y(x)^2 = 0,y(x))
```

$$y(x) = 1$$

ODE No. 372

$$ay(x) + b + y'(x)^2 - 4y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.0033538 (sec), leaf count = 27

```
DSolve[b + a*y[x] - 4*y[x]^3 + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\{\{y(x) \to \wp(x - c_1; a, b)\}, \{y(x) \to \wp(x + c_1; a, b)\}\}$$

✓ **Maple** : cpu = 0.047 (sec), leaf count = 232

```
dsolve(diff(y(x),x)^2-4*y(x)^3+a*y(x)+b = 0,y(x))
```

$$y(x) = \frac{\left(27b + 3\sqrt{-3a^3 + 81b^2}\right)^{\frac{2}{3}} + 3a}{6\left(27b + 3\sqrt{-3a^3 + 81b^2}\right)^{\frac{1}{3}}}$$

ODE No. 373

$$a^2 y(x)^2 \left(\log^2(y(x)) - 1\right) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.291367 (sec), leaf count = 185

```
DSolve[a^2*(-1 + Log[y[x]]^2)*y[x]^2 + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \exp\left(-\frac{1}{2}\sqrt{-e^{2iax-2c_1} - e^{2c_1-2iax} + 2}\right)\right\}, \left\{y(x) \to \exp\left(\frac{1}{2}\sqrt{-e^{2iax-2c_1} - e^{2c_1-2iax} + 2}\right)\right\}, \left\{y(\right.$$

✓ **Maple** : cpu = 0.226 (sec), leaf count = 49

```
dsolve(diff(y(x),x)^2+a^2*y(x)^2*(ln(y(x))^2-1) = 0,y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(a^2 \mathrm{e}^{2\_Z} \left(\_Z^2 - 1\right)\right)}$$

ODE No. 374

$$y'(x)^2 - 2y'(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.077079 (sec), leaf count = 73

```
DSolve[-y[x]^2 - 2*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{\sqrt{\#1^2+1}}{\#1} - \frac{1}{\#1} + \sinh^{-1}(\#1)\&\right][-x + c_1]\right\}, \left\{y(x) \to \text{InverseFunction}\right.\right.$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 85

```
dsolve(diff(y(x),x)^2-2*diff(y(x),x)-y(x)^2 = 0,y(x))
```

$$x - \frac{1}{y(x)} - \frac{\left(y(x)^2+1\right)^{\frac{3}{2}}}{y(x)} + y(x)\sqrt{y(x)^2+1} + \operatorname{arcsinh}(y(x)) - c_1 = 0$$

ODE No. 375

$$ay'(x) + bx + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0305831 (sec), leaf count = 71

```
DSolve[b*x + a*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{2}\left(-\frac{(a^2-4bx)^{3/2}}{6b} - ax\right) + c_1\right\}, \left\{y(x) \to \frac{1}{2}\left(\frac{(a^2-4bx)^{3/2}}{6b} - ax\right) + c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 49

```
dsolve(diff(y(x),x)^2+a*diff(y(x),x)+b*x = 0,y(x))
```

$$y(x) = -\frac{ax}{2} + \frac{(a^2-4bx)^{\frac{3}{2}}}{12b} + c_1$$

ODE No. 376

$$ay'(x) + by(x) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.227776 (sec), leaf count = 110

```
DSolve[b*y[x] + a*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{\sqrt{a^2-4\#1b}+a\log\left(a-\sqrt{a^2-4\#1b}\right)}{2b}\&\right]\left[\frac{x}{2}+c_1\right]\right\},\left\{y(x) \to \text{InverseFu}\right.\right.$$

✓ **Maple** : cpu = 0.734 (sec), leaf count = 279

```
dsolve(diff(y(x),x)^2+a*diff(y(x),x)+b*y(x) = 0,y(x))
```

$$y(x) = -\frac{a^2\left(\text{LambertW}\left(-\frac{2\sqrt{-b}\,\mathrm{e}^{\frac{c_1 b}{a}}\mathrm{e}^{-\frac{bx}{a}}\mathrm{e}^{-1}}{a}\right)+2\right)\text{LambertW}\left(-\frac{2\sqrt{-b}\,\mathrm{e}^{\frac{c_1 b}{a}}\mathrm{e}^{-\frac{bx}{a}}\mathrm{e}^{-1}}{a}\right)}{4b}$$

ODE No. 377

$$y'(x)^2 + (x-2)y'(x) - y(x) + 1 = 0$$

✓ **Mathematica** : cpu = 0.0034291 (sec), leaf count = 19

```
DSolve[1 - y[x] + (-2 + x)*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\{\{y(x) \to c_1 x + 1 + {c_1}^2 - 2c_1\}\}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 24

```
dsolve(diff(y(x),x)^2+(x-2)*diff(y(x),x)-y(x)+1 = 0,y(x))
```

$$y(x) = -\frac{1}{4}x^2 + x$$

ODE No. 378

$$(a+x)y'(x)+y'(x)^2-y(x)=0$$

✓ **Mathematica** : cpu = 0.0034375 (sec), leaf count = 18

```
DSolve[-y[x] + (a + x)*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\{\{y(x)\to ac_1+c_1x+{c_1}^2\}\}$$

✓ **Maple** : cpu = 0.025 (sec), leaf count = 20

```
dsolve(diff(y(x),x)^2+(x+a)*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x)=-\frac{(x+a)^2}{4}$$

ODE No. 379

$$y'(x)^2 - (x+1)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.003448 (sec), leaf count = 18

```
DSolve[y[x] - (1 + x)*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\{\{y(x) \to c_1 x - {c_1}^2 + c_1\}\}$$

✓ **Maple** : cpu = 0.022 (sec), leaf count = 22

```
dsolve(diff(y(x),x)^2-(1+x)*diff(y(x),x)+y(x) = 0,y(x))
```

$$y(x) = \frac{(1+x)^2}{4}$$

ODE No. 380

$$y'(x)^2 + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.369751 (sec), leaf count = 1757

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{x^2}{4} - \frac{1}{4}\sqrt[3]{x^6 - 20\cosh(3c_1)x^3 - 20\sinh(3c_1)x^3 - 8\cosh(6c_1) - 8\sinh(6c_1) + 8\sqrt{-\cosh(3c_1)}}\right.\right.$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 619

```
dsolve(diff(y(x),x)^2+2*x*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = \frac{\left(\frac{x^2}{\left(6c_1 - x^3 + 2\sqrt{-3x^3c_1 + 9c_1^2}\right)^{\frac{1}{3}}} - x + \left(6c_1 - x^3 + 2\sqrt{-3x^3c_1 + 9c_1^2}\right)^{\frac{1}{3}}\right)^2}{4} + x\left(\frac{x^2}{\left(6c_1 - x^3 + 2\sqrt{-3x^3c_1 +\right.\right.}\right.$$

ODE No. 381

$$y'(x)^2 - 2xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.372407 (sec), leaf count = 1757

```
DSolve[y[x] - 2*x*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{x^2}{4} + \frac{1}{4}\sqrt[3]{x^6 - 20\cosh(3c_1)x^3 - 20\sinh(3c_1)x^3 - 8\cosh(6c_1) - 8\sinh(6c_1) + 8\sqrt{-\cosh(3c_1)x^9}\right.\right.$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 579

```
dsolve(diff(y(x),x)^2-2*x*diff(y(x),x)+y(x) = 0,y(x))
```

$$y(x) = -\frac{\left(\frac{x^2}{\left(-6c_1+x^3+2\sqrt{-3x^3c_1+9c_1^2}\right)^{\frac{1}{3}}} + x + \left(-6c_1 + x^3 + 2\sqrt{-3x^3c_1 + 9c_1^2}\right)^{\frac{1}{3}}\right)^2}{4} + x\left(\frac{x^2}{\left(-6c_1 + x^3 + 2\sqrt{-3}\right.\right.$$

ODE No. 382

$$axy'(x) - bx^2 - c + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.166147 (sec), leaf count = 201

```
DSolve[-c - b*x^2 + a*x*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{2}\left(\frac{1}{2}x\sqrt{a^2x^2+4bx^2+4c} + \frac{2c\log\left(\sqrt{a^2+4b}\sqrt{a^2x^2+4bx^2+4c}+a^2x+4bx\right)}{\sqrt{a^2+4b}} - \frac{ax^2}{2}\right) + c_1\right\},$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 146

```
dsolve(diff(y(x),x)^2+a*x*diff(y(x),x)-b*x^2-c = 0,y(x))
```

$$y(x) = -\frac{x\sqrt{(a^2+4b)\,x^2+4c}}{4} - \frac{c\ln\left(\sqrt{a^2+4b}\,x + \sqrt{(a^2+4b)\,x^2+4c}\right)}{\sqrt{a^2+4b}} - \frac{a\,x^2}{4} + c_1$$

ODE No. 383

$$axy'(x) + by(x) + cx^2 + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 5.01886 (sec), leaf count = 1118

```
DSolve[c*x^2 + b*y[x] + a*x*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\int_1^x \left(\frac{\sqrt{a^2K[1]^2 - 4cK[1]^2 - 4by(x)}y(x)}{cK[1]^4 + 2ay(x)K[1]^2 + by(x)K[1]^2 + 4y(x)^2} + \frac{cK[1]^3 + ay(x)K[1] + by(x)K[1]}{cK[1]^4 + 2ay(x)K[1]^2 + by(x)K[1]^2 + 4y(x)}\right.\right.$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)^2+a*x*diff(y(x),x)+b*y(x)+c*x^2 = 0,y(x))
```

, exception

```
time expired
```

ODE No. 384

$$(ax+b)y'(x)-ay(x)+c+y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.0045838 (sec), leaf count = 24

```
DSolve[c - a*y[x] + (b + a*x)*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{bc_1+c+{c_1}^2}{a}+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 50

```
dsolve(diff(y(x),x)^2+(a*x+b)*diff(y(x),x)-a*y(x)+c = 0,y(x))
```

$$y(x)=\frac{-a^2x^2-2abx-b^2+4c}{4a}$$

ODE No. 385

$$-2x^2y'(x)+y'(x)^2+2xy(x)=0$$

✓ **Mathematica** : cpu = 0.627675 (sec), leaf count = 6217

```
DSolve[2*x*y[x] - 2*x^2*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -x^3\left(\frac{1}{2}\sqrt{\frac{2\left(8e^{6c_1}x^{18}+e^{12c_1}x^{12}\right)}{9x^{24}\sqrt[3]{\frac{64\sqrt{e^{12c_1}x^{60}-3e^{18c_1}x^{54}+3e^{24c_1}x^{48}-e^{30c_1}x^{42}}}{x^{36}}+\frac{64e^{6c_1}}{x^6}+\frac{160e^{12c_1}}{x^{12}}-\frac{8e^{18c_1}}{x^{18}}}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.293 (sec), leaf count = 169

```
dsolve(diff(y(x),x)^2-2*x^2*diff(y(x),x)+2*x*y(x) = 0,y(x))
```

$$y(x)=\frac{x^4-\text{RootOf}\left(x^{16}-12\_Z^2x^{12}+16\_Z^3x^{10}+30\_Z^4x^8-96\_Z^5x^6+100\_Z^6x^4-48\_Z^7x^2+9\_Z^8\right.}{2x}$$

ODE No. 386

$$ax^3y'(x) - 2ax^2y(x) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.175172 (sec), leaf count = 119

```
DSolve[-2*a*x^2*y[x] + a*x^3*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{2}(\cosh(2c_1) + \sinh(2c_1))\left(-\sqrt{2}\sqrt{a}x^2 + 2\cosh(2c_1) + 2\sinh(2c_1)\right)\right\}, \left\{y(x) \to \frac{\sqrt{a}x^2\cosh(2c_1)}{\sqrt{2}}\right.$$

✓ **Maple** : cpu = 0.784 (sec), leaf count = 27

```
dsolve(diff(y(x),x)^2+a*x^3*diff(y(x),x)-2*a*x^2*y(x) = 0,y(x))
```

$$y(x) = -\frac{a\,x^4}{8}$$

ODE No. 387

$$y'(x)^2 + e^x(y'(x) - y(x)) = 0$$

✓ **Mathematica** : cpu = 1.99202 (sec), leaf count = 190

```
DSolve[Derivative[1][y][x]^2 + E^x*(-y[x] + Derivative[1][y][x]) == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\log(y(x)) - \frac{-e^{x/2}\sqrt{4y(x)+e^x} - \frac{4\sqrt{\frac{e^x}{y(x)}+4}\,y(x)^{3/2}\sinh^{-1}\left(\frac{e^{x/2}}{2\sqrt{y(x)}}\right)}{\sqrt{4y(x)+e^x}} + e^x}{2y(x)} = c_1, y(x) \right], \text{Solve}\left[\log(y(x)) -
$$

✓ **Maple** : cpu = 0.743 (sec), leaf count = 115

```
dsolve(diff(y(x),x)^2+(diff(y(x),x)-y(x))*exp(x) = 0,y(x))
```

$$\ln(y(x)) + \frac{\sqrt{\mathrm{e}^{2x} + 4y(x)\,\mathrm{e}^x}}{2y(x)} + 2\,\mathrm{arctanh}\left(\sqrt{\mathrm{e}^{2x} + 4y(x)\,\mathrm{e}^x}\,\mathrm{e}^{-x}\right) - \frac{\mathrm{e}^x}{2y(x)} - c_1 = 0$$

ODE No. 388

$$y'(x)^2 - 2y(x)y'(x) - 2x = 0$$

✓ **Mathematica** : cpu = 0.627399 (sec), leaf count = 61

```
DSolve[-2*x - 2*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x = \frac{K[1]\sinh^{-1}(K[1])}{2\sqrt{K[1]^2+1}} + \frac{c_1 K[1]}{\sqrt{K[1]^2+1}}, y(x) = \frac{K[1]}{2} - \frac{x}{K[1]}\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.082 (sec), leaf count = 223

```
dsolve(diff(y(x),x)^2-2*y(x)*diff(y(x),x)-2*x = 0,y(x))
```

$$\frac{\left(\frac{y(x)}{2} - \frac{\sqrt{y(x)^2+2x}}{2}\right)\operatorname{arcsinh}\left(-y(x) + \sqrt{y(x)^2+2x}\right) + x\sqrt{2y(x)^2+2x-2y(x)\sqrt{y(x)^2+2x}+1} - 2c_1 y$$
$$\sqrt{2y(x)^2+2x-2y(x)\sqrt{y(x)^2+2x}+1}$$

ODE No. 389

$$y'(x)^2 - (4y(x)+1)y'(x) + y(x)(4y(x)+1) = 0$$

✓ **Mathematica** : cpu = 0.0741217 (sec), leaf count = 57

```
DSolve[y[x]*(1 + 4*y[x]) - (1 + 4*y[x])*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x]
```

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

✓ **Maple** : cpu = 0.75 (sec), leaf count = 71

```
dsolve(diff(y(x),x)^2-(4*y(x)+1)*diff(y(x),x)+(4*y(x)+1)*y(x) = 0,y(x))
```

$$y(x) = -\frac{1}{4}$$

ODE No. 390

$$ay(x)y'(x) - bx - c + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 1.53879 (sec), leaf count = 154

```
DSolve[-c - b*x + a*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x = \left(\frac{\tan^{-1}\left(\frac{\sqrt{a}K[1]}{\sqrt{b-aK[1]^2}}\right)}{\sqrt{a}} - \frac{c\sqrt{b-aK[1]^2}}{bK[1]}\right)\exp\left(b\left(\frac{\log(K[1])}{b} - \frac{\log\left(b-aK[1]^2\right)}{2b}\right)\right) + c_1 \exp\left(\right.\right.\right.$$

✓ **Maple** : cpu = 0.592 (sec), leaf count = 281

```
dsolve(diff(y(x),x)^2+a*y(x)*diff(y(x),x)-b*x-c = 0,y(x))
```

$$y(x) = \frac{2\,\mathrm{e}^{\text{RootOf}\left(\sqrt{a}\,c_1 b\,\mathrm{e}^{2\_Z} - \mathrm{e}^{2\_Z} abx + \sqrt{a}\,c_1 b^2 - \mathrm{e}^{2\_Z}\_Zb - \mathrm{e}^{2\_Z} ac + a\,b^2 x - \_Z b^2 + abc\right)}\left(-\frac{\left(\mathrm{e}^{2\,\text{RootOf}\left(\sqrt{a}\,c_1 b\,\mathrm{e}^{2\_Z} - \mathrm{e}^{2\_Z} abx + \sqrt{a}\,c_1 b^2 - \mathrm{e}^{2\_Z}\right.\right.\right.}}{a^{\frac{3}{2}}\left(\mathrm{e}^{2\,\text{RootOf}\left(\sqrt{a}\,c_1 b\,\mathrm{e}^{2\_Z} - \mathrm{e}^{2\_Z} abx + \sqrt{a}\,c_1 b\right.\right.\right.}}$$

ODE No. 391

$$y'(x)(ay(x)+bx)+abxy(x)+y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.0151063 (sec), leaf count = 29

```
DSolve[a*b*x*y[x] + (b*x + a*y[x])*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.017 (sec), leaf count = 22

```
dsolve(diff(y(x),x)^2+(a*y(x)+b*x)*diff(y(x),x)+a*b*x*y(x) = 0,y(x))
```

$$y(x)=\mathrm{e}^{-ax}c_1$$

ODE No. 392

$$y(x)^2 \log(ay(x)) - xy(x)y'(x) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.202929 (sec), leaf count = 27

```
DSolve[Log[a*y[x]]*y[x]^2 - x*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.662 (sec), leaf count = 50

```
dsolve(diff(y(x),x)^2-x*y(x)*diff(y(x),x)+y(x)^2*ln(a*y(x)) = 0,y(x))
```

$$y(x) = \frac{\mathrm{e}^{\frac{x^2}{4}}}{a}$$

ODE No. 393

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

✓ **Mathematica** : cpu = 0.0921654 (sec), leaf count = 31

```
DSolve[-y[x]^2 + 2*Cot[x]*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.213 (sec), leaf count = 77

```
dsolve(diff(y(x),x)^2+2*y(x)*diff(y(x),x)*cot(x)-y(x)^2 = 0,y(x))
```

$$y(x) = \frac{c_1(1+\tan^2(x))\sqrt{\frac{\tan^2(x)}{1+\tan^2(x)}}}{\left(1+\sqrt{1+\tan^2(x)}\right)\tan(x)}$$

ODE No. 394

$$-\left(g(x)-f(x)^2\right)e^{-2\int_a^x f(\mathrm{xp})\,d\mathrm{xp}}+2f(x)y(x)y'(x)+g(x)y(x)^2+y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.341279 (sec), leaf count = 89

```
DSolve[-((-f[x]^2 + g[x])/E^(2*Integrate[f[xp], {xp, a, x}])) + g[x]*y[x]^2 + 2*f[x]*y[x]*Der
```

$$\left\{\left\{y(x)\to e^{-\int_a^x f(K[1])\,dK[1]}\left(\begin{array}{ll}\sin\left(c_1+\int_a^x\sqrt{g(K[1])-f(K[1])^2}\,dK[1]\right) & g(x)>f(x)^2\\ \cosh\left(c_1+\int_a^x\sqrt{f(K[1])^2-g(K[1])}\,dK[1]\right) & g(x)<f(x)^2\\ c_1 & \text{True}\end{array}\right)\right\}\right\}$$

✓ **Maple** : cpu = 5.547 (sec), leaf count = 109

```
dsolve(diff(y(x),x)^2+2*f(x)*y(x)*diff(y(x),x)+g(x)*y(x)^2-(g(x)-f(x)^2)*exp(-2*int(f(xp),xp
```

$$y(x)=\tan\left(-\left(\int \mathrm{e}^{\int_a^x 2f(xp)dxp}\sqrt{\left(g\left(x\right)-f\left(x\right)^2\right)\mathrm{e}^{\int_a^x -4f(xp)dxp}}dx\right)+c_1\right)\sqrt{\frac{\mathrm{e}^{-2(}}{\tan^2\left(-\left(\int \mathrm{e}^{\int_a^x 2f(xp)dxp}\sqrt{(g\,(x)}\right.\right.}}$$

ODE No. 395

$$2f(x)y(x)y'(x) + g(x)y(x)^2 + h(x) + y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 27.9498 (sec), leaf count = 0

```
DSolve[h[x] + g[x]*y[x]^2 + 2*f[x]*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x]
```

, could not solve

```
DSolve[h[x] + g[x]*y[x]^2 + 2*f[x]*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^2 ==
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)^2+2*f(x)*y(x)*diff(y(x),x)+g(x)*y(x)^2+h(x) = 0,y(x))
```

, could not solve

```
dsolve(diff(y(x),x)^2+2*f(x)*y(x)*diff(y(x),x)+g(x)*y(x)^2+h(x) = 0,y(x))
```

ODE No. 396

$$(y(x)-x)y(x)y'(x)+y'(x)^2-xy(x)^3=0$$

✓ **Mathematica** : cpu = 0.0634282 (sec), leaf count = 29

```
DSolve[-(x*y[x]^3) + y[x]*(-x + y[x])*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x
```

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

✓ **Maple** : cpu = 0.019 (sec), leaf count = 20

```
dsolve(diff(y(x),x)^2+y(x)*(y(x)-x)*diff(y(x),x)-x*y(x)^3 = 0,y(x))
```

$$y(x)=\mathrm{e}^{\frac{x^2}{2}}c_1$$

ODE No. 397

$$-2x^3y(x)^2y'(x) - 4x^2y(x)^3 + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.643822 (sec), leaf count = 143

```
DSolve[-4*x^2*y[x]^3 - 2*x^3*y[x]^2*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[-\frac{x\sqrt{x^4y(x)+4}\,y(x)^{3/2}\sinh^{-1}\left(\frac{1}{2}x^2\sqrt{y(x)}\right)}{2\sqrt{x^2y(x)^3\left(x^4y(x)+4\right)}} - \frac{1}{4}\log(y(x)) = c_1, y(x) \right], \text{Solve}\left[\frac{xy(x)^{3/2}\sqrt{x^4y(x)}}{2\sqrt{x^2y(x)}} \right.\right.$$

✓ **Maple** : cpu = 0.376 (sec), leaf count = 128

```
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))
```

$$y(x) = -\frac{4}{x^4}$$

ODE No. 398

$$y'(x)^2 - 3xy(x)^{2/3}y'(x) + 9y(x)^{5/3} = 0$$

✓ **Mathematica** : cpu = 1.52946 (sec), leaf count = 258

```
DSolve[9*y[x]^(5/3) - 3*x*y[x]^(2/3)*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[-\frac{\left(x^2 - 4\sqrt[3]{y(x)}\right)^{3/2} y(x)^2 \log(y(x))}{6\left(\left(x^2 - 4\sqrt[3]{y(x)}\right) y(x)^{4/3}\right)^{3/2}} + \frac{\sqrt{\left(x^2 - 4\sqrt[3]{y(x)}\right) y(x)^{4/3}} \log\left(\sqrt{x^2 - 4\sqrt[3]{y(x)}} + x\right)}{\sqrt{x^2 - 4\sqrt[3]{y(x)}} y(x)^{2/3}} + \frac{1}{6} \right. \right.$$

✓ **Maple** : cpu = 2.128 (sec), leaf count = 137

```
dsolve(diff(y(x),x)^2-3*x*y(x)^(2/3)*diff(y(x),x)+9*y(x)^(5/3) = 0,y(x))
```

$$y(x) = \frac{x^6}{64}$$

ODE No. 399

$$2y'(x)^2 + (x-1)y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0033501 (sec), leaf count = 20

```
DSolve[-y[x] + (-1 + x)*Derivative[1][y][x] + 2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\{\{y(x) \to c_1 x + 2{c_1}^2 - c_1\}\}$$

✓ **Maple** : cpu = 0.022 (sec), leaf count = 22

```
dsolve(2*diff(y(x),x)^2+(x-1)*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = -\frac{(x-1)^2}{8}$$

ODE No. 400

$$-2x^2y'(x)+2y'(x)^2+3xy(x)=0$$

✓ **Mathematica** : cpu = 0.428789 (sec), leaf count = 135

```
DSolve[3*x*y[x] - 2*x^2*Derivative[1][y][x] + 2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\frac{1}{3}\log(y(x))-\frac{2\sqrt{x^4-6xy(x)}\tanh^{-1}\left(\frac{x^{3/2}}{\sqrt{x^3-6y(x)}}\right)}{3\sqrt{x}\sqrt{x^3-6y(x)}}=c_1,y(x)\right],\text{Solve}\left[\frac{2\sqrt{x^4-6xy(x)}\tanh^{-1}\left(\frac{}{\sqrt{}}\right.}{3\sqrt{x}\sqrt{x^3-6y(x)}}\right.$$

✓ **Maple** : cpu = 0.199 (sec), leaf count = 74

```
dsolve(2*diff(y(x),x)^2-2*x^2*diff(y(x),x)+3*x*y(x) = 0,y(x))
```

$$y(x)=\frac{x^3}{6}$$

ODE No. 401

$$3y'(x)^2 - 2xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.300724 (sec), leaf count = 1093

```
DSolve[y[x] - 2*x*Derivative[1][y][x] + 3*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\{\{y(x) \to \text{Root}\left[-16e^{6c_1}x^6 + 3\#1^4x^4 + 144e^{6c_1}\#1x^4 - 24\#1^5x^2 - 378e^{6c_1}\#1^2x^2 + 243e^{12c_1} + 48\#1^6 + 216\right.$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 580

```
dsolve(3*diff(y(x),x)^2-2*x*diff(y(x),x)+y(x) = 0,y(x))
```

$$y(x) = -\frac{\left(\frac{x^2}{\left(-54c_1+x^3+6\sqrt{-3x^3c_1+81c_1^2}\right)^{\frac{1}{3}}} + x + \left(-54c_1 + x^3 + 6\sqrt{-3x^3c_1 + 81c_1^2}\right)^{\frac{1}{3}}\right)^2}{12} + x\left(\frac{x^2}{\left(-54c_1+x^3+6\sqrt{-3x^3}\right.\right.}$$

ODE No. 402

$$x^2 + 4xy'(x) + 3y'(x)^2 - y(x) = 0$$

✓ **Mathematica** : cpu = 5.44897 (sec), leaf count = 1211

```
DSolve[x^2 - y[x] + 4*x*Derivative[1][y][x] + 3*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{1}{2}\left(\frac{\tanh^{-1}\left(\frac{1-3x}{2\sqrt{1-9y(x)}}\right)}{\sqrt{1-9y(x)}} + \log\left(-3x^2+2x-12y(x)+1\right) + \frac{9\tanh^{-1}\left(\frac{-2\sqrt{1-9y(x)}x+x+9y(x)}{\sqrt{-9y(x)-4\sqrt{1-9y(x)}+5}\sqrt{x^2+3y(x}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.156 (sec), leaf count = 101

```
dsolve(3*diff(y(x),x)^2+4*x*diff(y(x),x)-y(x)+x^2 = 0,y(x))
```

$$y(x) = -\frac{x^2}{3}$$

ODE No. 403

$$ay'(x)^2 + by'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.224895 (sec), leaf count = 116

```
DSolve[-y[x] + b*Derivative[1][y][x] + a*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{\sqrt{4\#1a+b^2}+b\log\left(b-\sqrt{4\#1a+b^2}\right)}{2a}\&\right]\left[\frac{x}{2a}+c_1\right]\right\},\left\{y(x) \to \text{InverseFun}\right.\right.$$

✓ **Maple** : cpu = 1.182 (sec), leaf count = 247

```
dsolve(a*diff(y(x),x)^2+b*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = \frac{e^{-\frac{b\ln\left(\frac{1}{4a}\right)+2b\,\text{LambertW}\left(\frac{2e^{-\frac{c_1}{b}}e^{-1}e^{\frac{x}{b}}}{b\sqrt{\frac{1}{a}}}\right)+2c_1+2b-2x}{2b}}\left(e^{-\frac{b\ln\left(\frac{1}{4a}\right)+2b\,\text{LambertW}\left(\frac{2e^{-\frac{c_1}{b}}e^{-1}e^{\frac{x}{b}}}{b\sqrt{\frac{1}{a}}}\right)+2c_1+2b-2x}{2b}}+2b\right)}{4a}$$

ODE No. 404

$$ay'(x)^2 + bx^2y'(x) + cxy(x) = 0$$

✓ **Mathematica** : cpu = 2.27835 (sec), leaf count = 795

```
DSolve[c*x*y[x] + b*x^2*Derivative[1][y][x] + a*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\int_1^x \left(\frac{(3b+2c)K[1]^2}{2\left(3bK[1]^3+cK[1]^3+9ay(x)\right)}+\frac{3\sqrt{K[1]\left(b^2K[1]^3-4acy(x)\right)}}{2\left(3bK[1]^3+cK[1]^3+9ay(x)\right)}\right)dK[1]+\int_1^{y(x)}\left(\frac{9\sqrt{}\right.\right.$$

✓ **Maple** : cpu = 0.256 (sec), leaf count = 389

```
dsolve(a*diff(y(x),x)^2+b*x^2*diff(y(x),x)+c*x*y(x) = 0,y(x))
```

$$\int_{\_b}^{x}\frac{-b\_a^2+\sqrt{\_a^4b^2-4\_aacy\left(x\right)}}{b\_a^3+6ay\left(x\right)-\sqrt{\_a^4b^2-4\_aacy\left(x\right)}\_a}d\_a+\int^{y(x)}\left(\frac{2a}{-b\,x^3+\sqrt{b^2x^4-4\_facx}\,x-6\_fa}-\left(\int_{\_b}^{x}-\right.\right.$$

ODE No. 405

$$ay'(x)^2 + y(x)y'(x) - x = 0$$

✓ **Mathematica** : cpu = 1.11934 (sec), leaf count = 61

```
DSolve[-x + y[x]*Derivative[1][y][x] + a*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x = \frac{aK[1]\sin^{-1}(K[1])}{\sqrt{1-K[1]^2}} + \frac{c_1 K[1]}{\sqrt{1-K[1]^2}}, y(x) = \frac{x}{K[1]} - aK[1]\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.201 (sec), leaf count = 378

```
dsolve(a*diff(y(x),x)^2+y(x)*diff(y(x),x)-x = 0,y(x))
```

$$\frac{c_1\left(y(x) - \sqrt{4ax + y(x)^2}\right)}{\sqrt{\frac{-y(x)+\sqrt{4ax+y(x)^2}+2a}{a}}\sqrt{\frac{-y(x)+\sqrt{4ax+y(x)^2}-2a}{a}}} + x + \frac{\left(-y(x) + \sqrt{4ax + y(x)^2}\right)\ln\left(\frac{\sqrt{\frac{4ax+2y(x)^2-2y(x)\sqrt{4ax+y(x)^2}-4a}{a^2}}}{2a}\right.}{\sqrt{-\frac{2\left(y(x)\sqrt{4ax+y(x)^2}+2a^2-2ax-y(x)^2\right)}{a^2}}}$$

ODE No. 406

$$ay'(x)^2 - y(x)y'(x) - x = 0$$

✓ **Mathematica** : cpu = 0.743245 (sec), leaf count = 57

```
DSolve[-x - y[x]*Derivative[1][y][x] + a*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x = \frac{aK[1]\sinh^{-1}(K[1])}{\sqrt{K[1]^2+1}} + \frac{c_1 K[1]}{\sqrt{K[1]^2+1}}, y(x) = aK[1] - \frac{x}{K[1]}\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.092 (sec), leaf count = 262

```
dsolve(a*diff(y(x),x)^2-y(x)*diff(y(x),x)-x = 0,y(x))
```

$$\frac{-\frac{\sqrt{2}\left(y(x)+\sqrt{4ax+y(x)^2}\right)\operatorname{arcsinh}\left(\frac{y(x)+\sqrt{4ax+y(x)^2}}{2a}\right)}{2} + x\sqrt{\frac{y(x)\sqrt{4ax+y(x)^2}+2a^2+2ax+y(x)^2}{a^2}} + c_1 y(x) + c_1\sqrt{4ax+y\,(x)^2}}{\sqrt{\frac{y(x)\sqrt{4ax+y(x)^2}+y(x)^2+2a(x+a)}{a^2}}} =
$$

ODE No. 407

$$xy'(x)^2 - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0308156 (sec), leaf count = 51

```
DSolve[-y[x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.036 (sec), leaf count = 39

```
dsolve(x*diff(y(x),x)^2-y(x) = 0,y(x))
```

$$y(x) = 0$$

ODE No. 408

$$xy'(x)^2 - 2y(x) + x = 0$$

✓ **Mathematica** : cpu = 0.255006 (sec), leaf count = 97

```
DSolve[x - 2*y[x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[-2\left(\frac{1}{1-\sqrt{\frac{2y(x)}{x}-1}}+\log\left(1-\sqrt{\frac{2y(x)}{x}-1}\right)\right)=\log(x)+c_1,y(x)\right],\text{Solve}\left[2\left(\frac{1}{\sqrt{\frac{2y(x)}{x}-1}+1}\right.\right.\right.$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 73

```
dsolve(x*diff(y(x),x)^2-2*y(x)+x = 0,y(x))
```

$$y(x)=\left(\frac{\left(\text{LambertW}\left(\frac{\sqrt{c_1 x}}{c_1}\right)+1\right)^2}{2\,\text{LambertW}\left(\frac{\sqrt{c_1 x}}{c_1}\right)^2}+\frac{1}{2}\right)x$$

ODE No. 409

$$xy'(x)^2 - 2y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 1.98956 (sec), leaf count = 50

```
DSolve[-y[x] - 2*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x = \frac{2K[1] - 2\log(K[1])}{(K[1]-1)^2} + \frac{c_1}{(K[1]-1)^2}, y(x) = xK[1]^2 - 2K[1]\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.166 (sec), leaf count = 63

```
dsolve(x*diff(y(x),x)^2-2*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = x\,\mathrm{e}^{2\,\mathrm{RootOf}\left(-x\,\mathrm{e}^{2\_Z} + 2x\,\mathrm{e}^{\_Z} + 2\,\mathrm{e}^{\_Z} + c_1 - 2\_Z - x\right)} - 2\,\mathrm{e}^{\mathrm{RootOf}\left(-x\,\mathrm{e}^{2\_Z} + 2x\,\mathrm{e}^{\_Z} + 2\,\mathrm{e}^{\_Z} + c_1 - 2\_Z - x\right)}$$

ODE No. 410

$$xy'(x)^2 + 4y'(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 30.724 (sec), leaf count = 90

```
DSolve[-2*y[x] + 4*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x = -\frac{2(2K[1] - y(K[1]))}{K[1]^2}, y(x) = 4\left(\frac{2}{K[1]} + \log(K[1])\right)\exp\left(-4\left(\frac{1}{2}\log(2 - K[1]) - \frac{1}{2}\log(K[1])\right.\right.\right.$$

✓ **Maple** : cpu = 0.177 (sec), leaf count = 64

```
dsolve(x*diff(y(x),x)^2+4*diff(y(x),x)-2*y(x) = 0,y(x))
```

$$y(x) = \frac{x\,\mathrm{e}^{2\,\mathrm{RootOf}\left(-x\,\mathrm{e}^{2\_Z}+4x\,\mathrm{e}^{\_Z}-4\,\mathrm{e}^{\_Z}+c_1+8\_Z-4x\right)}}{2} + 2\,\mathrm{e}^{\mathrm{RootOf}\left(-x\,\mathrm{e}^{2\_Z}+4x\,\mathrm{e}^{\_Z}-4\,\mathrm{e}^{\_Z}+c_1+8\_Z-4x\right)}$$

ODE No. 411

$$xy'(x)^2 + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.242675 (sec), leaf count = 99

```
DSolve[-y[x] + x*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{1}{\sqrt{\frac{4y(x)}{x}+1}-1} - \log\left(1-\sqrt{\frac{4y(x)}{x}+1}\right) = \frac{\log(x)}{2} + c_1, y(x) \right], \text{Solve}\left[\frac{1}{\sqrt{\frac{4y(x)}{x}+1}+1} + \log\left(\sqrt{\right.\right.\right.$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 65

```
dsolve(x*diff(y(x),x)^2+x*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = \frac{\left(1 + 2\,\text{LambertW}\left(-\frac{1}{2\sqrt{\frac{c_1}{x}}}\right)\right) x}{4\,\text{LambertW}\left(-\frac{1}{2\sqrt{\frac{c_1}{x}}}\right)^2}$$

ODE No. 412

$$a + xy'(x)^2 + y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.388556 (sec), leaf count = 3229

```
DSolve[a + y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{1}{2}\sqrt{-\frac{16ax}{9} + \frac{\sqrt[3]{-131072a^6x^6 + 2560a^3e^{3c_1}x^3 + e^{6c_1} + \sqrt{-1073741824a^9e^{3c_1}x^9 + 3145728a^6}}}{18\ 2^{2/3}ax}}\right.\right.$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 146

```
dsolve(x*diff(y(x),x)^2+y(x)*diff(y(x),x)+a = 0,y(x))
```

$$-\frac{c_1\left(\frac{-y(x)+\sqrt{y(x)^2-4ax}}{x}\right)^{\frac{3}{2}}x^2}{\left(-y(x)+\sqrt{y(x)^2-4ax}\right)^2} + x + \frac{4a\,x^2}{3\left(-y(x)+\sqrt{y(x)^2-4ax}\right)^2} = 0$$

ODE No. 413

$$-x^2 + xy'(x)^2 + y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.111246 (sec), leaf count = 673

```
DSolve[-x^2 + y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\int \left(\frac{4\sqrt{4x^3+y(x)^2}x^2}{5y(x)\left(4x^3-15y(x)^2\right)}+\frac{16x^2}{5\left(4x^3-15y(x)^2\right)}-\frac{\sqrt{4x^3+y(x)^2}}{5y(x)x}+\frac{1}{5x}\right)dx+\int \left(\frac{8y(x)}{15y(x)^2-4x^3}\right.\right.$$

✓ **Maple** : cpu = 0.173 (sec), leaf count = 269

```
dsolve(x*diff(y(x),x)^2+y(x)*diff(y(x),x)-x^2 = 0,y(x))
```

$$\int_{\_b}^{x} \frac{-y(x)+\sqrt{4\_a^3+y(x)^2}}{\_a\left(4y(x)-\sqrt{4\_a^3+y(x)^2}\right)}d\_a+\int^{y(x)} \frac{-2+\left(48\_f-12\sqrt{4x^3+\_f^2}\right)\left(\int_{\_b}^{x} \frac{\_a^2}{\left(-4\_f+\sqrt{4\_a^3+\_f^2}\right)^2\sqrt{}}\right.}{4\_f-\sqrt{4x^3+\_f^2}}$$

ODE No. 414

$$x^3 + xy'(x)^2 + y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.129043 (sec), leaf count = 107

```
DSolve[x^3 + y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to x^2 \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{5K[2] + \sqrt{K[2]^2 - 4}} dK[2]\&\right]\left[\int_1^x -\frac{1}{2K[3]} dK[3] + c_1\right]\right\}, \left\{y(x) \to \right.\right.$$

✓ **Maple** : cpu = 0.177 (sec), leaf count = 269

```
dsolve(x*diff(y(x),x)^2+y(x)*diff(y(x),x)+x^3 = 0,y(x))
```

$$\int_{\_b}^{x} \frac{-y(x) + \sqrt{-4\_a^4 + y(x)^2}}{\_a\left(5y(x) - \sqrt{-4\_a^4 + y(x)^2}\right)} d\_a + \int^{y(x)} \frac{-2 + \left(-80\_f + 16\sqrt{-4x^4 + \_f^2}\right)\left(\int_{\_b}^{x} \frac{}{\left(-5\_f + \sqrt{-4\_a^4}\right.}\right.}{5\_f - \sqrt{-4x^4 + \_f^2}}$$

ODE No. 415

$$y(x)y'(x) + xy'(x)^2 - y(x)^4 = 0$$

✓ **Mathematica** : cpu = 0.31125 (sec), leaf count = 25

```
DSolve[-y[x]^4 + y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.289 (sec), leaf count = 95

```
dsolve(x*diff(y(x),x)^2+y(x)*diff(y(x),x)-y(x)^4 = 0,y(x))
```

$$y(x) = -\frac{1}{2\sqrt{-x}}$$

ODE No. 416

$$xy'(x)^2 + (y(x) - 3x)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 2.02653 (sec), leaf count = 383

```
DSolve[y[x] + (-3*x + y[x])*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{1}{8}\left(-\sqrt{\frac{\frac{y(x)}{x} - 9}{\frac{y(x)}{x} - 1}}\left(\frac{y(x)}{x} - 1 \right) + \sqrt{\frac{y(x)}{x} - 9}\sqrt{\frac{y(x)}{x} - 1} - 3\log\left(\frac{y(x)}{x} \right) - \frac{10\sqrt{\frac{y(x)}{x} - 9}\sin^{-1}\left(\frac{\sqrt{9-}}{2} \right.}{\sqrt{9 - \frac{y(x)}{x}}} \right.\right.\right.$$

✓ **Maple** : cpu = 0.068 (sec), leaf count = 136

```
dsolve(x*diff(y(x),x)^2+(y(x)-3*x)*diff(y(x),x)+y(x) = 0,y(x))
```

$$y(x) = x$$

ODE No. 417

$$a + xy'(x)^2 - y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0038925 (sec), leaf count = 16

```
DSolve[a - y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{a}{c_1} + c_1 x\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 35

```
dsolve(x*diff(y(x),x)^2-y(x)*diff(y(x),x)+a = 0,y(x))
```

$$y(x) = -2\sqrt{ax}$$

ODE No. 418

$$ay(x) + xy'(x)^2 - y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.843289 (sec), leaf count = 220

```
DSolve[a*y[x] - y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[-\frac{-\frac{4a^{3/2}\sqrt{4-\frac{y(x)}{ax}}\sin^{-1}\left(\frac{\sqrt{\frac{y(x)}{x}}}{2\sqrt{a}}\right)}{\sqrt{\frac{y(x)}{x}-4a}} + \sqrt{\frac{y(x)}{x}}\sqrt{\frac{y(x)}{x}-4a} + \frac{y(x)}{x}}{4a} = \frac{\log(x)}{2} + c_1, y(x) \right], \text{Solve}\left[\frac{4a^{3/2}\sqrt{4-\frac{y(x)}{ax}}\text{s}}{\sqrt{\frac{y(x)}{x}}} \right. \right.$$

✓ **Maple** : cpu = 0.057 (sec), leaf count = 42

```
dsolve(x*diff(y(x),x)^2-y(x)*diff(y(x),x)+a*y(x) = 0,y(x))
```

$$y(x) = 0$$

ODE No. 419

$$xy'(x)^2 + 2y(x)y'(x) - x = 0$$

✓ **Mathematica** : cpu = 0.949697 (sec), leaf count = 9073

```
DSolve[-x + 2*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

✓ **Maple** : cpu = 0.045 (sec), leaf count = 109

```
dsolve(x*diff(y(x),x)^2+2*y(x)*diff(y(x),x)-x = 0,y(x))
```

$$x + \frac{\left(y(x) - \sqrt{y(x)^2 + x^2}\right) c_1}{\left(\frac{2x^2+6y(x)^2-6y(x)\sqrt{y(x)^2+x^2}}{x^2}\right)^{\frac{2}{3}} x} = 0$$

ODE No. 420

$$a + xy'(x)^2 - 2y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.282294 (sec), leaf count = 777

```
DSolve[a - 2*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{4}a^2 e^{-\frac{3c_1}{2}} x^2 + \frac{1}{4}e^{-\frac{3c_1}{2}} \sqrt[3]{a^6x^6 - 20a^3e^{3c_1}x^3 + 8\sqrt{-a^9e^{3c_1}x^9 + 3a^6e^{6c_1}x^6 - 3a^3e^{9c_1}x^3 + e^{12c_1}} - 8e^{}\right.\right.$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 689

```
dsolve(x*diff(y(x),x)^2-2*y(x)*diff(y(x),x)+a = 0,y(x))
```

$$y(x) = \frac{x\left(\frac{4x^2}{\left(-36ac_1^2+8x^3+12\sqrt{a\left(9ac_1^2-4x^3\right)}\,c_1\right)^{\frac{1}{3}}} + 2x + \left(-36ac_1^2 + 8x^3 + 12\sqrt{a\left(9ac_1^2 - 4x^3\right)}\,c_1\right)^{\frac{1}{3}}\right)}{12c_1} + \frac{}{\left(-36ac_1^2+8x^3+\right.}$$

ODE No. 421

$$x y'(x)^2 - 2y(x)y'(x) - x = 0$$

✓ **Mathematica** : cpu = 0.0470449 (sec), leaf count = 27

```
DSolve[-x - 2*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\{\{y(x) \to x \sinh(-\log(x) + c_1)\}, \{y(x) \to x \sinh(\log(x) + c_1)\}\}$$

✓ **Maple** : cpu = 0.051 (sec), leaf count = 32

```
dsolve(x*diff(y(x),x)^2-2*y(x)*diff(y(x),x)-x = 0,y(x))
```

$$y(x) = -ix$$

ODE No. 422

$$xy'(x)^2 - 2y(x)y'(x) + 4x = 0$$

✓ **Mathematica** : cpu = 0.0796024 (sec), leaf count = 81

```
DSolve[4*x - 2*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.042 (sec), leaf count = 30

```
dsolve(x*diff(y(x),x)^2-2*y(x)*diff(y(x),x)+4*x = 0,y(x))
```

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

ODE No. 423

$$xy'(x)^2 - 2y(x)y'(x) + 2y(x) + x = 0$$

✓ **Mathematica** : cpu = 0.0847699 (sec), leaf count = 59

```
DSolve[x + 2*y[x] - 2*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.046 (sec), leaf count = 44

```
dsolve(x*diff(y(x),x)^2-2*y(x)*diff(y(x),x)+2*y(x)+x = 0,y(x))
```

$$y(x) = \left(1 - \sqrt{2}\right)x$$

ODE No. 424

$$ay(x)y'(x) + bx + xy'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.768636 (sec), leaf count = 223

```
DSolve[b*x + a*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{-2a\tan^{-1}\left(\frac{ay(x)}{x\sqrt{4b-\frac{a^2y(x)^2}{x^2}}}\right) + (a+2)\left(2\tan^{-1}\left(\frac{(a+2)y(x)}{x\sqrt{4b-\frac{a^2y(x)^2}{x^2}}}\right) - i\log\left(\frac{(a+1)y(x)^2}{x^2}+b\right)\right)}{8(a+1)} = \frac{1}{2}i\log \right.\right.$$

✓ **Maple** : cpu = 0.124 (sec), leaf count = 193

```
dsolve(x*diff(y(x),x)^2+a*y(x)*diff(y(x),x)+b*x = 0,y(x))
```

$$\frac{c_1\left(ay(x)+\sqrt{a^2y\left(x\right)^2-4bx^2}\right)\left(\frac{a\left(y(x)(a+1)\sqrt{a^2y(x)^2-4bx^2}+(a^2+a)y(x)^2-2bx^2\right)}{2x^2}\right)^{\frac{-a-2}{2a+2}}+x^2}{x} = 0$$

ODE No. 425

$$(x+1)y'(x)^2-(y(x)+x)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.0045486 (sec), leaf count = 21

```
DSolve[y[x] - (x + y[x])*Derivative[1][y][x] + (1 + x)*Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.039 (sec), leaf count = 45

```
dsolve((1+x)*diff(y(x),x)^2-(y(x)+x)*diff(y(x),x)+y(x) = 0,y(x))
```

$$y(x)=x+2-2\sqrt{1+x}$$

ODE No. 426

$$(3x+1)y'(x)^2 - 3(y(x)+2)y'(x) + 9 = 0$$

✓ **Mathematica** : cpu = 0.0042806 (sec), leaf count = 28

```
DSolve[9 - 3*(2 + y[x])*Derivative[1][y][x] + (1 + 3*x)*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x + \frac{9 + {c_1}^2 - 6c_1}{3c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.037 (sec), leaf count = 51

```
dsolve((3*x+1)*diff(y(x),x)^2-3*(y(x)+2)*diff(y(x),x)+9 = 0,y(x))
```

$$y(x) = -2 - 2\sqrt{3x+1}$$

ODE No. 427

$$(3x+5)y'(x)^2-(3y(x)+x)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.0048006 (sec), leaf count = 24

```
DSolve[y[x] - (x + 3*y[x])*Derivative[1][y][x] + (5 + 3*x)*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 x+\frac{5{c_1}^2}{-1+3c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 60

```
dsolve((3*x+5)*diff(y(x),x)^2-(3*y(x)+x)*diff(y(x),x)+y(x) = 0,y(x))
```

$$y(x)=\frac{x}{3}+\frac{10}{9}-\frac{2\sqrt{15x+25}}{9}$$

ODE No. 428

$$y'(x)(-ay(x)+bx+c)+axy'(x)^2-by(x)=0$$

✓ **Mathematica** : cpu = 0.0051497 (sec), leaf count = 22

```
DSolve[-(b*y[x]) + (c + b*x - a*y[x])*Derivative[1][y][x] + a*x*Derivative[1][y][x]^2 == 0,y[
```

$$\left\{\left\{y(x)\to \frac{cc_1}{b+ac_1}+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 66

```
dsolve(a*x*diff(y(x),x)^2+(b*x-a*y(x)+c)*diff(y(x),x)-b*y(x) = 0,y(x))
```

$$y(x)=\frac{-bx+c-2\sqrt{-bcx}}{a}$$

ODE No. 429

$$-y'(x)(ay(x)-a+bx-b)+axy'(x)^2+by(x)=0$$

✓ **Mathematica** : cpu = 0.0054335 (sec), leaf count = 30

```
DSolve[b*y[x] - (-a - b + b*x + a*y[x])*Derivative[1][y][x] + a*x*Derivative[1][y][x]^2 == 0,
```

$$\left\{\left\{y(x)\to \frac{ac_1+bc_1}{-b+ac_1}+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 72

```
dsolve(a*x*diff(y(x),x)^2-(a*y(x)+b*x-a-b)*diff(y(x),x)+b*y(x) = 0,y(x))
```

$$y(x)=\frac{bx+a+b-2\sqrt{bx\,(a+b)}}{a}$$

ODE No. 430

$$\mathrm{a0}x + y'(x)(\mathrm{a1}x + \mathrm{b1}y(x) + \mathrm{c1}) + (\mathrm{a2}x + \mathrm{c2})y'(x)^2 + \mathrm{b0}y(x) + \mathrm{c0} = 0$$

✓ **Mathematica** : cpu = 235.303 (sec), leaf count = 507

```
DSolve[c0 + a0*x + b0*y[x] + (c1 + a1*x + b1*y[x])*Derivative[1][y][x] + (c2 + a2*x)*Derivati
```

$$\text{Solve}\left[\left\{\left\{x = (\mathrm{b1}K[1] + \mathrm{b0})\exp\left(\frac{(\mathrm{b1}(\mathrm{b0} - \mathrm{a1}) + 2\mathrm{a2b0})\tan^{-1}\left(\frac{2(\mathrm{a2}+\mathrm{b1})K[1]+\mathrm{a1}+\mathrm{b0}}{\sqrt{4\mathrm{a0}(\mathrm{a2}+\mathrm{b1})-\mathrm{a1}^2-2\mathrm{a1b0}-\mathrm{b0}^2}}\right)}{(\mathrm{a2}+\mathrm{b1})\sqrt{4\mathrm{a0}(\mathrm{a2}+\mathrm{b1}) - \mathrm{a1}^2 - 2\mathrm{a1b0} - \mathrm{b0}^2}} - \frac{(2\mathrm{a2}+\right.\right.\right.$$

✓ **Maple** : cpu = 6.387 (sec), leaf count = 1602

```
dsolve((a2*x+c2)*diff(y(x),x)^2+(a1*x+b1*y(x)+c1)*diff(y(x),x)+a0*x+b0*y(x)+c0 = 0,y(x))
```

$$2\,\mathrm{e}^{\frac{(-2a2b0+b1(a1-b0))\arctan\left(\frac{(a2+b1)\sqrt{b1^2y(x)^2+((2a1b1-4a2b0)x-4b0c2+2b1c1)y(x)+\left(-4a0a2+a1^2\right)x^2+(-4a0c2+2a1c1-4c0a2)x-4c0c2+c1^2}+b1(a2+}{\sqrt{(4a2+4b1)a0-(a1+b0)^2}\,(a2x+c2)}\right)}{\sqrt{(4a2+4b1)a0-(a1+b0)^2}\,(a2+b1)}}$$

ODE No. 431

$$x^2 y'(x)^2 - y(x)^4 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0542527 (sec), leaf count = 81

```
DSolve[y[x]^2 - y[x]^4 + x^2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{1+\tan^2(-\log(x)+c_1)}\right\}, \left\{y(x) \to \sqrt{1+\tan^2(-\log(x)+c_1)}\right\}, \left\{y(x) \to -\sqrt{1+\tan^2(\text{lo}\right.\right.$$

✓ **Maple** : cpu = 0.258 (sec), leaf count = 62

```
dsolve(x^2*diff(y(x),x)^2-y(x)^4+y(x)^2 = 0,y(x))
```

$$y(x) = -1$$

ODE No. 432

$$(a + xy'(x))^2 - 2ay(x) + x^2 = 0$$

✓ **Mathematica** : cpu = 1.13082 (sec), leaf count = 70

```
DSolve[x^2 - 2*a*y[x] + (a + x*Derivative[1][y][x])^2 == 0,y[x],x]
```

$$\text{Solve}\left[\left\{y(x) = \frac{2axK[1] + x^2K[1]^2 + a^2 + x^2}{2a}, x = -\frac{a\sinh^{-1}(K[1])}{\sqrt{K[1]^2+1}} + \frac{c_1}{\sqrt{K[1]^2+1}}\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 11.198 (sec), leaf count = 242

```
dsolve((x*diff(y(x),x)+a)^2-2*a*y(x)+x^2 = 0,y(x))
```

$$y(x) = \frac{-2a\,\text{RootOf}\left(\arcsinh\left(\_Z\right)^2 a^2 - \_Z^2 x^2 - 2\arcsinh\left(\_Z\right) c_1 a + c_1^2 - x^2\right)\left(a\arcsinh\left(\text{RootOf}\left(\arcsinh\right.\right.\right.}{}$$

ODE No. 433

$$-4a - 4x^2 + (xy'(x) + y(x) + 2x)^2 - 4xy(x) = 0$$

✓ **Mathematica** : cpu = 1.08467 (sec), leaf count = 22

```
DSolve[-4*a - 4*x^2 - 4*x*y[x] + (2*x + y[x] + x*Derivative[1][y][x])^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.244 (sec), leaf count = 34

```
dsolve((x*diff(y(x),x)+y(x)+2*x)^2-4*x*y(x)-4*x^2-4*a = 0,y(x))
```

$$y(x) = \frac{-x^2 - a}{x}$$

ODE No. 434

$$x^2 y'(x)^2 - x^2 - 2xy(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0498541 (sec), leaf count = 27

```
DSolve[-x^2 - 2*x*y[x]*Derivative[1][y][x] + x^2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\{\{y(x) \to x \sinh(-\log(x) + c_1)\}, \{y(x) \to x \sinh(\log(x) + c_1)\}\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 7

```
dsolve(diff(y(x),x)-1 = 0,y(x))
```

$$y(x) = x + c_1$$

ODE No. 435

$$x^2 y'(x)^2 - 2xy(x)y'(x) + y(x)(y(x)+1) - x = 0$$

✓ **Mathematica** : cpu = 0.0728798 (sec), leaf count = 61

```
DSolve[-x + y[x]*(1 + y[x]) - 2*x*y[x]*Derivative[1][y][x] + x^2*Derivative[1][y][x]^2 == 0,y
```

$$\left\{\left\{y(x) \to \frac{1}{4}\left(4x + {c_1}^2 x - 4ic_1\sqrt{x} - 4\right)\right\}, \left\{y(x) \to \frac{1}{4}\left(4x + {c_1}^2 x + 4ic_1\sqrt{x} - 4\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.246 (sec), leaf count = 22

```
dsolve(x^2*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)+y(x)*(1+y(x))-x = 0,y(x))
```

$$y(x) = x$$

ODE No. 436

$$-x^4 + x^2 y'(x)^2 + \left(1 - x^2\right) y(x)^2 - 2xy(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0642821 (sec), leaf count = 26

```
DSolve[-x^4 + (1 - x^2)*y[x]^2 - 2*x*y[x]*Derivative[1][y][x] + x^2*Derivative[1][y][x]^2 ==
```

$$\{\{y(x) \to -x \sinh(x - c_1)\}, \{y(x) \to x \sinh(x + c_1)\}\}$$

✓ **Maple** : cpu = 3.914 (sec), leaf count = 61

```
dsolve(x^2*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)+y(x)^2*(-x^2+1)-x^4 = 0,y(x))
```

$$y(x) = -ix$$

ODE No. 437

$$-(a+2xy(x))y'(x)+x^2y'(x)^2+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.329576 (sec), leaf count = 47

```
DSolve[y[x]^2 - (a + 2*x*y[x])*Derivative[1][y][x] + x^2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{x-2\sqrt{a}c_1}{4{c_1}^2}\right\},\left\{y(x)\to \frac{x+2\sqrt{a}c_1}{4{c_1}^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.047 (sec), leaf count = 36

```
dsolve(x^2*diff(y(x),x)^2-(2*x*y(x)+a)*diff(y(x),x)+y(x)^2 = 0,y(x))
```

$$y(x)=-\frac{a}{4x}$$

ODE No. 438

$$x^2 y'(x)^2 + 3xy(x)y'(x) + 2y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0257594 (sec), leaf count = 21

```
DSolve[2*y[x]^2 + 3*x*y[x]*Derivative[1][y][x] + x^2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1}{x^2}\right\}, \left\{y(x) \to \frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 17

```
dsolve(x^2*diff(y(x),x)^2+3*x*y(x)*diff(y(x),x)+2*y(x)^2 = 0,y(x))
```

$$y(x) = \frac{c_1}{x}$$

ODE No. 439

$$x^2 y'(x)^2 + 3xy(x)y'(x) + 3y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0473524 (sec), leaf count = 49

```
DSolve[3*y[x]^2 + 3*x*y[x]*Derivative[1][y][x] + x^2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x^{\frac{1}{2}\left(-3-i\sqrt{3}\right)}\right\}, \left\{y(x) \to c_1 x^{\frac{1}{2}i\left(\sqrt{3}+3i\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 33

```
dsolve(x^2*diff(y(x),x)^2+3*x*y(x)*diff(y(x),x)+3*y(x)^2 = 0,y(x))
```

$$y(x) = \frac{c_1 x^{-\frac{i\sqrt{3}}{2}}}{x^{\frac{3}{2}}}$$

ODE No. 440

$$x^2 y'(x)^2 + 4xy(x)y'(x) - 5y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.024792 (sec), leaf count = 19

```
DSolve[-5*y[x]^2 + 4*x*y[x]*Derivative[1][y][x] + x^2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1}{x^5}\right\}, \{y(x) \to c_1 x\}\right\}$$

✓ **Maple** : cpu = 0.015 (sec), leaf count = 15

```
dsolve(x^2*diff(y(x),x)^2+4*x*y(x)*diff(y(x),x)-5*y(x)^2 = 0,y(x))
```

$$y(x) = c_1 x$$

ODE No. 441

$$x^2 y'(x)^2 - 4x(y(x)+2)y'(x) + 4y(x)(y(x)+2) = 0$$

✓ **Mathematica** : cpu = 0.0917761 (sec), leaf count = 65

```
DSolve[4*y[x]*(2 + y[x]) - 4*x*(2 + y[x])*Derivative[1][y][x] + x^2*Derivative[1][y][x]^2 ==
```

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

✓ **Maple** : cpu = 1.404 (sec), leaf count = 137

```
dsolve(x^2*diff(y(x),x)^2-4*x*(y(x)+2)*diff(y(x),x)+4*y(x)*(y(x)+2) = 0,y(x))
```

$$y(x) = -2$$

ODE No. 442

$$x^2 y'(x)^2 + (1-x)\left(y(x)^2 - x^2 y(x)\right) + \left(x^3 + x^2 y(x) - 2x y(x)\right) y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0301087 (sec), leaf count = 28

```
DSolve[(1 - x)*(-(x^2*y[x]) + y[x]^2) + (x^3 - 2*x*y[x] + x^2*y[x])*Derivative[1][y][x] + x^2
```

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

✓ **Maple** : cpu = 0.035 (sec), leaf count = 21

```
dsolve(x^2*diff(y(x),x)^2+(x^2*y(x)-2*x*y(x)+x^3)*diff(y(x),x)+(y(x)^2-x^2*y(x))*(1-x) = 0,y(
```

$$y(x) = (-x + c_1)\, x$$

ODE No. 443

$$x(xy'(x)-y(x))^2-y'(x)=0$$

✓ **Mathematica** : cpu = 2.36913 (sec), leaf count = 10121

```
DSolve[-Derivative[1][y][x] + x*(-y[x] + x*Derivative[1][y][x])^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{1}{2}\sqrt{-\frac{4}{9}\cosh(6c_1)x^2+\frac{4}{9}\sinh(6c_1)x^2+\frac{\sqrt[3]{2}\sqrt[3]{-32\cosh(18c_1)x^{12}+32\sinh(18c_1)x^{12}+40\cosh}}{}\right.\right.$$

✓ **Maple** : cpu = 1.949 (sec), leaf count = 221

```
dsolve(x*(x*diff(y(x),x)-y(x))^2-diff(y(x),x) = 0,y(x))
```

$$y(x)=\frac{\left(\text{RootOf}\left(-729x^{12}c_1+\_Z^8-12\_Z^7+60\_Z^6-160\_Z^5+240\_Z^4-192\_Z^3+64\_Z^2\right)-2\right)(\text{Roo}}{9x^2}$$

ODE No. 444

$$x^2 y'(x)^2 - (y(x) - 2x)y(x)y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.382983 (sec), leaf count = 75

```
DSolve[y[x]^2 - y[x]*(-2*x + y[x])*Derivative[1][y][x] + x^2*Derivative[1][y][x]^2 == 0,y[x],
```

$$\left\{\left\{y(x) \to -\frac{\cosh(2c_1) - \sinh(2c_1)}{x\cosh(2c_1) + x\sinh(2c_1) - 1}\right\}, \left\{y(x) \to -\frac{\cosh(2c_1) - \sinh(2c_1)}{x\cosh(2c_1) + x\sinh(2c_1) + 1}\right\}\right\}$$

✓ **Maple** : cpu = 1.155 (sec), leaf count = 120

```
dsolve(x^2*diff(y(x),x)^2-y(x)*(y(x)-2*x)*diff(y(x),x)+y(x)^2 = 0,y(x))
```

$$y(x) = 4x$$

ODE No. 445

$$y'(x)\left(ax^2y(x)^3+b\right)+aby(x)^3+x^2y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.0628687 (sec), leaf count = 49

```
DSolve[a*b*y[x]^3 + (b + a*x^2*y[x]^3)*Derivative[1][y][x] + x^2*Derivative[1][y][x]^2 == 0,y
```

$$\left\{\left\{y(x)\to -\frac{1}{\sqrt{2ax-2c_1}}\right\},\left\{y(x)\to \frac{1}{\sqrt{2ax-2c_1}}\right\},\left\{y(x)\to \frac{b}{x}+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.023 (sec), leaf count = 35

```
dsolve(x^2*diff(y(x),x)^2+(a*x^2*y(x)^3+b)*diff(y(x),x)+a*b*y(x)^3 = 0,y(x))
```

$$y(x)=\frac{1}{\sqrt{2ax+c_1}}$$

ODE No. 446

$$\left(x^2+1\right) y'(x)^2-2xy(x)y'(x)+y(x)^2-1=0$$

✓ **Mathematica** : cpu = 0.0385488 (sec), leaf count = 45

```
DSolve[-1 + y[x]^2 - 2*x*y[x]*Derivative[1][y][x] + (1 + x^2)*Derivative[1][y][x]^2 == 0,y[x]
```

$$\left\{\left\{y(x)\to c_1 x-\sqrt{1-{c_1}^2}\right\},\left\{y(x)\to c_1 x+\sqrt{1-{c_1}^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.052 (sec), leaf count = 57

```
dsolve((x^2+1)*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)+y(x)^2-1 = 0,y(x))
```

$$y(x)=\sqrt{x^2+1}$$

ODE No. 447

$$\left(x^2-1\right) y'(x)^2-1=0$$

✓ **Mathematica** : cpu = 0.0096007 (sec), leaf count = 89

```
DSolve[-1 + (-1 + x^2)*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{2}\log\left(1-\frac{x}{\sqrt{x^2-1}}\right)-\frac{1}{2}\log\left(\frac{x}{\sqrt{x^2-1}}+1\right)+c_1\right\},\left\{y(x)\to -\frac{1}{2}\log\left(1-\frac{x}{\sqrt{x^2-1}}\right)+\frac{1}{2}\lo\right.$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 33

```
dsolve((x^2-1)*diff(y(x),x)^2-1 = 0,y(x))
```

$$y(x)=\ln\left(x+\sqrt{x^2-1}\right)+c_1$$

ODE No. 448

$$\left(x^2-1\right) y'(x)^2-y(x)^2+1=0$$

✓ **Mathematica** : cpu = 0.108614 (sec), leaf count = 349

```
DSolve[1 - y[x]^2 + (-1 + x^2)*Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((x^2-1)*diff(y(x),x)^2-y(x)^2+1 = 0,y(x))
```

, exception

```
time expired
```

ODE No. 449

$$\left(x^2-a^2\right)y'(x)^2+2xy(x)y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.0305393 (sec), leaf count = 27

```
DSolve[y[x]^2 + 2*x*y[x]*Derivative[1][y][x] + (-a^2 + x^2)*Derivative[1][y][x]^2 == 0,y[x],x
```

$$\left\{\left\{y(x)\to \frac{c_1}{a-x}\right\},\left\{y(x)\to \frac{c_1}{a+x}\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 23

```
dsolve((-a^2+x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+y(x)^2 = 0,y(x))
```

$$y(x)=\frac{c_1}{a-x}$$

ODE No. 450

$$\left(x^2-a^2\right)y'(x)^2-x^2-2xy(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.304775 (sec), leaf count = 26

```
DSolve[-x^2 - 2*x*y[x]*Derivative[1][y][x] + (-a^2 + x^2)*Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.924 (sec), leaf count = 51

```
dsolve((-a^2+x^2)*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)-x^2 = 0,y(x))
```

$$y(x)=\sqrt{a^2-x^2}$$

ODE No. 451

$$\left(a+x^2\right) y'(x)^2+b-2xy(x)y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.0494847 (sec), leaf count = 51

```
DSolve[b + y[x]^2 - 2*x*y[x]*Derivative[1][y][x] + (a + x^2)*Derivative[1][y][x]^2 == 0,y[x],
```

$$\left\{\left\{y(x)\to c_1 x-\sqrt{-b-ac_1{}^2}\right\},\left\{y(x)\to \sqrt{-b-ac_1{}^2}+c_1 x\right\}\right\}$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 78

```
dsolve((x^2+a)*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)+y(x)^2+b = 0,y(x))
```

$$y(x)=\frac{\sqrt{-ab\left(x^2+a\right)}}{a}$$

ODE No. 452

$$\left(2x^2+1\right)y'(x)^2+\left(x^2+2xy(x)+y(x)^2+2\right)y'(x)+2y(x)^2+1=0$$

✓ **Mathematica** : cpu = 0.0152068 (sec), leaf count = 23

```
DSolve[1 + 2*y[x]^2 + (2 + x^2 + 2*x*y[x] + y[x]^2)*Derivative[1][y][x] + (1 + 2*x^2)*Derivat
```

$$\left\{\left\{y(x)\to \frac{-c_1x+1+{c_1}^2}{x+c_1}\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((2*x^2+1)*diff(y(x),x)^2+(y(x)^2+2*x*y(x)+x^2+2)*diff(y(x),x)+2*y(x)^2+1 = 0,y(x))
```

, could not solve

```
dsolve((2*x^2+1)*diff(y(x),x)^2+(y(x)^2+2*x*y(x)+x^2+2)*diff(y(x),x)+2*y(x)^2+1 = 0,y(x
```

ODE No. 453

$$\left(a^2-1\right)x^2y'(x)^2+a^2x^2+2xy(x)y'(x)-y(x)^2=0$$

✓ **Mathematica** : cpu = 0.892883 (sec), leaf count = 327

```
DSolve[a^2*x^2 - y[x]^2 + 2*x*y[x]*Derivative[1][y][x] + (-1 + a^2)*x^2*Derivative[1][y][x]^2
```

$$\left\{\text{Solve}\left[\frac{2i\tan^{-1}\left(\frac{y(x)}{x\sqrt{a^2-\frac{y(x)^2}{x^2}}-1}\right)+a\tanh^{-1}\left(\frac{-a^2-\frac{iy(x)}{x}+1}{a\sqrt{a^2-\frac{y(x)^2}{x^2}}-1}\right)-a\tanh^{-1}\left(\frac{-a^2+\frac{iy(x)}{x}+1}{a\sqrt{a^2-\frac{y(x)^2}{x^2}}-1}\right)+a\log\left(\frac{y(x)^2}{x^2}+\right.}{2a^2-2}\right.\right.$$

✓ **Maple** : cpu = 3.486 (sec), leaf count = 229

```
dsolve((a^2-1)*x^2*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)-y(x)^2+a^2*x^2 = 0,y(x))
```

$$\frac{-2c_1a+2a\ln(x)+\ln\left(\frac{y(x)^2+x^2}{x^2}\right)a-2\sqrt{-a^2}\arctan\left(\frac{a^2y(x)}{\sqrt{-a^2}\sqrt{\frac{y(x)^2+\left(-a^2+1\right)x^2}{x^2}}\,x}\right)+2\ln\left(\frac{\sqrt{\frac{-a^2x^2+x^2+y(x)^2}{x^2}}\,x+y(x\right.}{x}}{2a}$$

ODE No. 454

$$ax^2y'(x)^2-(a-1)ax^2-2axy(x)y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.376706 (sec), leaf count = 241

```
DSolve[-((-1 + a)*a*x^2) + y[x]^2 - 2*a*x*y[x]*Derivative[1][y][x] + a*x^2*Derivative[1][y][x
```

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

✓ **Maple** : cpu = 0.148 (sec), leaf count = 106

```
dsolve(a*x^2*diff(y(x),x)^2-2*a*x*y(x)*diff(y(x),x)+y(x)^2-a*(a-1)*x^2 = 0,y(x))
```

$$y(x)=\sqrt{-a}\,x$$

ODE No. 455

$$a + x^3 y'(x)^2 + x^2 y(x) y'(x) = 0$$

✓ **Mathematica** : cpu = 0.834565 (sec), leaf count = 123

```
DSolve[a + x^2*y[x]*Derivative[1][y][x] + x^3*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{e^{-\frac{c_1}{2}}(x + 2ae^{c_1})}{\sqrt{2}x}\right\}, \left\{y(x) \to \frac{e^{-\frac{c_1}{2}}(x + 2ae^{c_1})}{\sqrt{2}x}\right\}, \left\{y(x) \to -\frac{e^{-\frac{c_1}{2}}(2ax + e^{c_1})}{\sqrt{2}x}\right\}, \left\{y(x) \to \frac{e^{-}\right.\right.$$

✓ **Maple** : cpu = 0.548 (sec), leaf count = 66

```
dsolve(x^3*diff(y(x),x)^2+x^2*y(x)*diff(y(x),x)+a = 0,y(x))
```

$$y(x) = -\frac{2\sqrt{ax}}{x}$$

ODE No. 456

$$2\left(1-x^2\right)y(x)y'(x)+x\left(x^2-1\right)y'(x)^2+xy(x)^2-x=0$$

✓ **Mathematica** : cpu = 0.128906 (sec), leaf count = 421

```
DSolve[-x + x*y[x]^2 + 2*(1 - x^2)*y[x]*Derivative[1][y][x] + x*(-1 + x^2)*Derivative[1][y][x
```

$$\left\{\left\{y(x)\to \frac{-x-x\tanh^2\left(\frac{1}{4}\left(-\frac{i\sqrt{x-1}\sqrt{x+1}\sqrt{(x-1)(x+1)}\tan^{-1}\left(\sqrt{x^2-1}\right)}{1-x}-\frac{i\sqrt{x-1}\sqrt{(x-1)(x+1)}\tan^{-1}\left(\sqrt{x^2-1}\right)}{\sqrt{x+1}}+2c_1\right)\right)}{-1+\tanh^2\left(\frac{1}{4}\left(-\frac{i\sqrt{x-1}\sqrt{x+1}\sqrt{(x-1)(x+1)}\tan^{-1}\left(\sqrt{x^2-1}\right)}{1-x}-\frac{i\sqrt{x-1}\sqrt{(x-1)(x+1)}\tan^{-1}\left(\sqrt{x^2-1}\right)}{\sqrt{x+1}}+2c_1\right)\right)}\right\}\right.$$

✓ **Maple** : cpu = 0.419 (sec), leaf count = 33

```
dsolve(x*(x^2-1)*diff(y(x),x)^2+2*(-x^2+1)*y(x)*diff(y(x),x)+x*y(x)^2-x = 0,y(x))
```

$$y(x)=x$$

ODE No. 457

$$x^4 y'(x)^2 - x y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.378635 (sec), leaf count = 118

```
DSolve[-y[x] - x*Derivative[1][y][x] + x^4*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[-\frac{x\sqrt{4x^2y(x)+1}\,\tanh^{-1}\left(\sqrt{4x^2y(x)+1}\right)}{\sqrt{4x^4y(x)+x^2}} - \frac{1}{2}\log(y(x)) = c_1, y(x) \right], \text{Solve}\left[\frac{x\sqrt{4x^2y(x)+1}\,\tanh \right.\right.$$
$$\left.\left. \sqrt{4x^4y} \right.\right.$$

✓ **Maple** : cpu = 1.25 (sec), leaf count = 45

```
dsolve(x^4*diff(y(x),x)^2-x*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = -\frac{1}{4x^2}$$

ODE No. 458

$$x^2\left(x^2-a^2\right)y'(x)^2-1=0$$

✓ **Mathematica** : cpu = 0.0212745 (sec), leaf count = 120

```
DSolve[-1 + x^2*(-a^2 + x^2)*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{x\sqrt{x^2-a^2}\tan^{-1}\left(\frac{\sqrt{x^2-a^2}}{a}\right)}{a\sqrt{x^4-a^2x^2}}+c_1\right\},\left\{y(x)\to \frac{x\sqrt{x^2-a^2}\tan^{-1}\left(\frac{\sqrt{x^2-a^2}}{a}\right)}{a\sqrt{x^4-a^2x^2}}+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 90

```
dsolve(x^2*(-a^2+x^2)*diff(y(x),x)^2-1 = 0,y(x))
```

$$y(x)=-\frac{\ln\left(\frac{-2a^2+2\sqrt{-a^2}\sqrt{-a^2+x^2}}{x}\right)}{\sqrt{-a^2}}+c_1$$

ODE No. 459

$$-(y'(x)-1)^2+e^{-2x}y'(x)^2+e^{-2y(x)}=0$$

✓ **Mathematica** : cpu = 2.75519 (sec), leaf count = 271

```
DSolve[E^(-2*y[x]) - (-1 + Derivative[1][y][x])^2 + Derivative[1][y][x]^2/E^(2*x) == 0,y[x],x
```

$$\left\{\left\{y(x)\to \log\left(-\frac{e^{-c_1}\left(e^x+1\right)\left(-e^x+e^{x+2c_1}-1-e^{2c_1}\right)}{\sqrt{8e^x+4e^{2x}+4}}\right)\right\},\left\{y(x)\to \log\left(\frac{e^{-c_1}\left(e^x+1\right)\left(-e^x+e^{x+2c_1}-\right.\right.\right.$$

✓ **Maple** : cpu = 0.726 (sec), leaf count = 65

```
dsolve(exp(-2*x)*diff(y(x),x)^2-(diff(y(x),x)-1)^2+exp(-2*y(x)) = 0,y(x))
```

$$y(x)=x+\ln\left(\left(-1-\sqrt{\mathrm{e}^{2x}-\mathrm{e}^{-2c_1}\mathrm{e}^{2x}}\right)\mathrm{e}^{-x}\right)+c_1$$

ODE No. 460

$$\cos^4(x)\left(y'(x)^2+y(x)^2\right)-a^2=0$$

✗ **Mathematica** : cpu = 44.6526 (sec), leaf count = 0

```
DSolve[-a^2 + Cos[x]^4*(y[x]^2 + Derivative[1][y][x]^2) == 0,y[x],x]
```

, could not solve

```
DSolve[-a^2 + Cos[x]^4*(y[x]^2 + Derivative[1][y][x]^2) == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((diff(y(x),x)^2+y(x)^2)*cos(x)^4-a^2 = 0,y(x))
```

, could not solve

```
dsolve((diff(y(x),x)^2+y(x)^2)*cos(x)^4-a^2 = 0,y(x))
```

ODE No. 461

$$a(x)y'(x)^2+2b(x)y(x)y'(x)+c(x)y(x)^2+2d(x)y'(x)+2e(x)y(x)+f(x)=0$$

✗ **Mathematica** : cpu = 300.062 (sec), leaf count = 0

```
DSolve[f[x] + 2*e[x]*y[x] + c[x]*y[x]^2 + 2*d[x]*Derivative[1][y][x] + 2*b[x]*y[x]*Derivative
```

, timed out

```
$Aborted
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(d0(x)*diff(y(x),x)^2+2*b0(x)*y(x)*diff(y(x),x)+c0(x)*y(x)^2+2*d0(x)*diff(y(x),x)+2*e0(
```

, could not solve

```
dsolve(d0(x)*diff(y(x),x)^2+2*b0(x)*y(x)*diff(y(x),x)+c0(x)*y(x)^2+2*d0(x)*diff(y(x),x)
```

ODE No. 462

$$y(x)y'(x)^2 - 1 = 0$$

✓ **Mathematica** : cpu = 0.0296313 (sec), leaf count = 43

```
DSolve[-1 + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \left(\frac{3}{2}\right)^{2/3} (-x + c_1)^{2/3}\right\}, \left\{y(x) \to \left(\frac{3}{2}\right)^{2/3} (x + c_1)^{2/3}\right\}\right\}$$

✓ **Maple** : cpu = 0.046 (sec), leaf count = 27

```
dsolve(y(x)*diff(y(x),x)^2-1 = 0,y(x))
```

$$x - \frac{2y(x)^{\frac{3}{2}}}{3} - c_1 = 0$$

ODE No. 463

$$y(x)y'(x)^2 - e^{2x} = 0$$

✓ **Mathematica** : cpu = 0.0468933 (sec), leaf count = 47

```
DSolve[-E^(2*x) + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \left(\frac{3}{2}\right)^{2/3} \left(-e^x + c_1\right)^{2/3}\right\}, \left\{y(x) \to \left(\frac{3}{2}\right)^{2/3} \left(e^x + c_1\right)^{2/3}\right\}\right\}$$

✓ **Maple** : cpu = 0.125 (sec), leaf count = 50

```
dsolve(y(x)*diff(y(x),x)^2-exp(2*x) = 0,y(x))
```

$$-\frac{\sqrt{e^{2x} y(x)}}{\sqrt{y(x)}} + \frac{2y(x)^{\frac{3}{2}}}{3} + c_1 = 0$$

ODE No. 464

$$y(x)y'(x)^2 + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0979504 (sec), leaf count = 52

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.871 (sec), leaf count = 70

```
dsolve(y(x)*diff(y(x),x)^2+2*x*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = -ix$$

ODE No. 465

$$y(x)y'(x)^2+2xy'(x)-9y(x)=0$$

✓ **Mathematica** : cpu = 0.0514538 (sec), leaf count = 107

```
DSolve[-9*y[x] + 2*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\int \frac{y(x)}{x\left(\frac{y(x)^2}{x^2}-\sqrt{\frac{9y(x)^2}{x^2}+1}+1\right)}d\frac{y(x)}{x}=-\log(x)+c_1,y(x)\right],\text{Solve}\left[\int \frac{y(x)}{x\left(\frac{y(x)^2}{x^2}+\sqrt{\frac{9y(x)^2}{x^2}+1}+\right.\right.\right.$$

✓ **Maple** : cpu = 0.084 (sec), leaf count = 210

```
dsolve(y(x)*diff(y(x),x)^2+2*x*diff(y(x),x)-9*y(x) = 0,y(x))
```

$$\frac{c_1 x\left(x+\sqrt{x^2+9y\left(x\right)^2}\right)\left(\frac{-x-\sqrt{x^2+9y(x)^2}}{y(x)}\right)^{\frac{2}{7}}}{\left(x\sqrt{x^2+9y\left(x\right)^2}+x^2+y\left(x\right)^2\right)\left(\frac{x\sqrt{x^2+9y(x)^2}+x^2+y(x)^2}{y(x)^2}\right)^{\frac{1}{7}}}+x=0$$

ODE No. 466

$$y(x)y'(x)^2 - 2xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 2.95138 (sec), leaf count = 433

```
DSolve[y[x] - 2*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[-\frac{i\sqrt{\frac{y(x)^2}{x^2}-1}\tan^{-1}\left(\sqrt{\frac{y(x)^2}{x^2}-1}\right)}{\sqrt{\frac{y(x)}{x}-1}\sqrt{\frac{y(x)}{x}+1}} - i\sqrt{\frac{\frac{y(x)}{x}-1}{\frac{y(x)}{x}+1}}\left(\frac{y(x)}{x}+1\right) + i\sqrt{\frac{y(x)}{x}-1}\sqrt{\frac{y(x)}{x}+1} + \log\left(\frac{y}{}\right.\right.\right.$$

✓ **Maple** : cpu = 0.821 (sec), leaf count = 71

```
dsolve(y(x)*diff(y(x),x)^2-2*x*diff(y(x),x)+y(x) = 0,y(x))
```

$$y(x) = x$$

ODE No. 467

$$y(x)y'(x)^2 - 4xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.243314 (sec), leaf count = 226

```
DSolve[y[x] - 4*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \sqrt{x^2 + \frac{2^{2/3}{c_1}^3 x}{\sqrt[3]{32x^6 - 40{c_1}^3x^3 + \sqrt{-4096{c_1}^3x^9 + 768{c_1}^6x^6 - 48{c_1}^9x^3 + {c_1}^{12}} - {c_1}^6}} + \frac{\sqrt[3]{32x^6 - 40c_1}}{}\right.\right.$$

✓ **Maple** : cpu = 0.075 (sec), leaf count = 148

```
dsolve(y(x)*diff(y(x),x)^2-4*x*diff(y(x),x)+y(x) = 0,y(x))
```

$$-\frac{c_1 x}{y\left(x\right)\left(\frac{x\sqrt{4x^2-y(x)^2}+2x^2-y(x)^2}{y(x)^2}\right)^{\frac{1}{3}}\left(\frac{2x+\sqrt{4x^2-y(x)^2}}{y(x)}\right)^{\frac{1}{3}}} + x = 0$$

ODE No. 468

$$-4a^2xy'(x)+a^2y(x)+y(x)y'(x)^2=0$$

✓ **Mathematica** : cpu = 6.7618 (sec), leaf count = 753

```
DSolve[a^2*y[x] - 4*a^2*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\frac{8\left(4a^2-\frac{y(x)^2}{x^2}\right)^{3/2}\sinh^{-1}\left(\frac{\sqrt{\frac{y(x)}{x}-2a}}{2\sqrt{a}}\right)+\sqrt{a}\sqrt{\frac{y(x)}{ax}+2}\left(4\sqrt{\frac{y(x)}{x}-2a}\left(\frac{y(x)^2}{x^2}-4a^2\right)\tanh^{-1}\left(\frac{\sqrt{4a^2-\right.}\right.}{2a}\right.\right.\right.$$

✓ **Maple** : cpu = 0.086 (sec), leaf count = 181

```
dsolve(y(x)*diff(y(x),x)^2-4*a^2*x*diff(y(x),x)+a^2*y(x) = 0,y(x))
```

$$-\frac{c_1x}{y\left(x\right)a\left(\frac{a^2\left(2a^2x^2+\sqrt{4a^2x^2-y(x)^2}\,ax-y(x)^2\right)}{y(x)^2}\right)^{\frac{1}{3}}\left(\frac{\left(2ax+\sqrt{4a^2x^2-y(x)^2}\right)a}{y(x)}\right)^{\frac{1}{3}}}+x=0$$

ODE No. 469

$$axy'(x) + by(x) + y(x)y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.361771 (sec), leaf count = 157

```
DSolve[b*y[x] + a*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{(a+2b)\log\left(-\sqrt{a^2-\frac{4by(x)^2}{x^2}}+a+2b\right)+a\log\left(\sqrt{a^2-\frac{4by(x)^2}{x^2}}+a\right)}{4(a+b)} = -\frac{\log(x)}{2}+c_1, y(x)\right], \text{Sol}\right.$$

✓ **Maple** : cpu = 0.152 (sec), leaf count = 264

```
dsolve(y(x)*diff(y(x),x)^2+a*x*diff(y(x),x)+b*y(x) = 0,y(x))
```

$$\frac{x\left(c_1\left(-\frac{ax+\sqrt{a^2x^2-4by(x)^2}}{2y(x)}\right)^{-\frac{a}{a+b}}\left(ax+\sqrt{a^2x^2-4by\left(x\right)^2}\right)\left(\frac{a\left(a\,x^2+\sqrt{a^2x^2-4by(x)^2}\,x+2y(x)^2\right)}{2y(x)^2}\right)^{\frac{-a-2b}{2a+2b}}+y(x)^2\right)}{y\left(x\right)^2}$$

ODE No. 470

$$x^3 y'(x) - x^2 y(x) + y(x) y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.382072 (sec), leaf count = 143

```
DSolve[-(x^2*y[x]) + x^3*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{1}{2}\log(y(x)) - \frac{\sqrt{x^6+4x^2y(x)^2}\tanh^{-1}\left(\frac{x^2}{\sqrt{x^4+4y(x)^2}}\right)}{2x\sqrt{x^4+4y(x)^2}} = c_1, y(x) \right], \text{Solve}\left[\frac{\sqrt{x^6+4x^2y(x)^2}\tanh^{-1}\left(\right.\right.\right.$$
$$\left.\left.\left. 2x\sqrt{x^4+4y(x\right.\right.\right.$$

✓ **Maple** : cpu = 0.573 (sec), leaf count = 87

```
dsolve(y(x)*diff(y(x),x)^2+x^3*diff(y(x),x)-x^2*y(x) = 0,y(x))
```

$$y(x) = -\frac{ix^2}{2}$$

ODE No. 471

$$y(x)y'(x)^2 - (y(x) - x)y'(x) - x = 0$$

✓ **Mathematica** : cpu = 0.0163362 (sec), leaf count = 47

```
DSolve[-x - (-x + y[x])*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.025 (sec), leaf count = 33

```
dsolve(y(x)*diff(y(x),x)^2-(y(x)-x)*diff(y(x),x)-x = 0,y(x))
```

$$y(x) = \sqrt{-x^2 + c_1}$$

ODE No. 472

$$(y(x)+x)y'(x)^2+2xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.51932 (sec), leaf count = 269

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + (x + y[x])*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{2\sqrt{-\sqrt{3}x\cosh(c_1)-\sqrt{3}x\sinh(c_1)+\cosh(2c_1)+\sinh(2c_1)}}{\sqrt{3}}-\frac{\cosh(c_1)}{\sqrt{3}}-\frac{\sinh(c_1)}{\sqrt{3}}\right\},\left\{y(x)\right.\right.$$

✓ **Maple** : cpu = 0.57 (sec), leaf count = 121

```
dsolve((y(x)+x)*diff(y(x),x)^2+2*x*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x)=-\frac{\left(1+i\sqrt{3}\right)x}{2}$$

ODE No. 473

$$(y(x)-2x)y'(x)^2-2(x-1)y'(x)+y(x)-2=0$$

✓ **Mathematica** : cpu = 0.307533 (sec), leaf count = 165

```
DSolve[-2 + y[x] - 2*(-1 + x)*Derivative[1][y][x] + (-2*x + y[x])*Derivative[1][y][x]^2 == 0,
```

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

✓ **Maple** : cpu = 0.706 (sec), leaf count = 71

```
dsolve((y(x)-2*x)*diff(y(x),x)^2-2*(x-1)*diff(y(x),x)+y(x)-2 = 0,y(x))
```

$$y(x)=-\sqrt{2}\,x+\sqrt{2}+x+1$$

ODE No. 474

$$2y(x)y'(x)^2 - (4x-5)y'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.174796 (sec), leaf count = 135

```
DSolve[2*y[x] - (-5 + 4*x)*Derivative[1][y][x] + 2*y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -i\sqrt{2}e^{\frac{c_1}{2}}\sqrt{4x-5+8e^{c_1}}\right\}, \left\{y(x) \to i\sqrt{2}e^{\frac{c_1}{2}}\sqrt{4x-5+8e^{c_1}}\right\}, \left\{y(x) \to -\frac{1}{4}ie^{\frac{c_1}{2}}\sqrt{8x-10+e^{c_1}}\right.\right.$$

✓ **Maple** : cpu = 1.148 (sec), leaf count = 152

```
dsolve(2*y(x)*diff(y(x),x)^2-(4*x-5)*diff(y(x),x)+2*y(x) = 0,y(x))
```

$$y(x) = -x + \frac{5}{4}$$

ODE No. 475

$$4y(x)y'(x)^2 + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.10912 (sec), leaf count = 57

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + 4*y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.892 (sec), leaf count = 67

```
dsolve(4*y(x)*diff(y(x),x)^2+2*x*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = -\frac{ix}{2}$$

ODE No. 476

$$4x^3y'(x) - 4x^2y(x) + 9y(x)y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.38149 (sec), leaf count = 143

```
DSolve[-4*x^2*y[x] + 4*x^3*Derivative[1][y][x] + 9*y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{1}{2}\log(y(x)) - \frac{\sqrt{x^6+9x^2y(x)^2}\tanh^{-1}\left(\frac{x^2}{\sqrt{x^4+9y(x)^2}}\right)}{2x\sqrt{x^4+9y(x)^2}} = c_1, y(x) \right], \text{Solve}\left[\frac{\sqrt{x^6+9x^2y(x)^2}\tanh^{-1}\left(\right.\right.\right.$$
$$\left.\left.\left. 2x\sqrt{x^4+9y(x$$

✓ **Maple** : cpu = 0.58 (sec), leaf count = 87

```
dsolve(9*y(x)*diff(y(x),x)^2+4*x^3*diff(y(x),x)-4*x^2*y(x) = 0,y(x))
```

$$y(x) = -\frac{ix^2}{3}$$

ODE No. 477

$$ay(x)y'(x)^2 + (2x - b)y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.216727 (sec), leaf count = 146

```
DSolve[-y[x] + (-b + 2*x)*Derivative[1][y][x] + a*y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{e^{\frac{c_1}{2}}\sqrt{2b - 4x + e^{c_1}}}{2\sqrt{a}}\right\}, \left\{y(x) \to \frac{e^{\frac{c_1}{2}}\sqrt{2b - 4x + e^{c_1}}}{2\sqrt{a}}\right\}, \left\{y(x) \to -\sqrt{2}e^{\frac{c_1}{2}}\sqrt{2ae^{c_1} - b + 2x}\right\}, \{$$

✓ **Maple** : cpu = 0.548 (sec), leaf count = 622

```
dsolve(a*y(x)*diff(y(x),x)^2+(2*x-b)*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = -\frac{-2x + b}{2\sqrt{-a}}$$

ODE No. 478

$$\left(y'(x)^2+1\right)(ay(x)+b)-c=0$$

✓ **Mathematica** : cpu = 0.30966 (sec), leaf count = 223

```
DSolve[-c + (b + a*y[x])*(1 + Derivative[1][y][x]^2) == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{c\sqrt{-ac}\sqrt{\frac{\#1_{a+b}}{c}}\sin^{-1}\left(\frac{a\sqrt{-\#1_{a-b+c}}}{\sqrt{-a}\sqrt{-ac}}\right)}{\sqrt{-a}}-(\#1a+b)\sqrt{-\#1a-b+c}}{a\sqrt{\#1a+b}}\&\right][-x+c_1]\right\}$$

✓ **Maple** : cpu = 0.108 (sec), leaf count = 88

```
dsolve((a*y(x)+b)*(diff(y(x),x)^2+1)-c = 0,y(x))
```

$$y(x)=\frac{-b+c}{a}$$

ODE No. 479

$$\mathrm{a0}x + y'(x)(\mathrm{a1}x + \mathrm{b1}y(x) + \mathrm{c1}) + y'(x)^2(\mathrm{a2}x + \mathrm{b2}y(x) + \mathrm{c2}) + \mathrm{b0}y(x) + \mathrm{c0} = 0$$

✓ **Mathematica** : cpu = 6.34434 (sec), leaf count = 576

```
DSolve[c0 + a0*x + b0*y[x] + (c1 + a1*x + b1*y[x])*Derivative[1][y][x] + (c2 + a2*x + b2*y[x]
```

$$\text{Solve}\left[\left\{\left\{x = -\frac{-(K[2](\mathrm{b2}K[2] + \mathrm{b1}) + \mathrm{b0})\exp\left(\text{RootSum}\left[\#1^3\mathrm{b2} + \#1^2\mathrm{a2} + \#1^2\mathrm{b1} + \#1\mathrm{a1} + \#1\mathrm{b0} + \mathrm{a}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.482 (sec), leaf count = 929

```
dsolve((b2*y(x)+a2*x+c2)*diff(y(x),x)^2+(a1*x+b1*y(x)+c1)*diff(y(x),x)+a0*x+b0*y(x)+c0 = 0,y(
```

$$x - \mathrm{e}^{\int \frac{-a1x - b1y(x) - \sqrt{-4a0a2x^2 - 4a0b2xy(x) + a1^2x^2 + 2a1b1xy(x) - 4a2b0xy(x) - 4b0b2y(x)^2 + b1^2y(x)^2 - 4a0c2x + 2a1c1x - 4a2c0x - 4b0c2y(x) + 2b1c1y(x) - 4b}}{2b2y(x) + 2a2x + 2c2}}$$

ODE No. 480

$$\left(ay(x)-x^2\right)y'(x)^2+2xy(x)y'(x)^2-y(x)^2=0$$

✗ **Mathematica** : cpu = 26.2556 (sec), leaf count = 0

```
DSolve[-y[x]^2 + 2*x*y[x]*Derivative[1][y][x]^2 + (-x^2 + a*y[x])*Derivative[1][y][x]^2 == 0,
```

, could not solve

```
DSolve[-y[x]^2 + 2*x*y[x]*Derivative[1][y][x]^2 + (-x^2 + a*y[x])*Derivative[1][y][x]^2
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((a*y(x)-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)^2-y(x)^2 = 0,y(x))
```

, could not solve

```
dsolve((a*y(x)-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)^2-y(x)^2 = 0,y(x))
```

ODE No. 481

$$\left(x^2+y(x)^2\right)y'(x)+xy(x)y'(x)^2+xy(x)=0$$

✓ **Mathematica** : cpu = 0.0266205 (sec), leaf count = 49

```
DSolve[x*y[x] + (x^2 + y[x]^2)*Derivative[1][y][x] + x*y[x]*Derivative[1][y][x]^2 == 0,y[x],x
```

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

✓ **Maple** : cpu = 0.037 (sec), leaf count = 35

```
dsolve(x*y(x)*diff(y(x),x)^2+(y(x)^2+x^2)*diff(y(x),x)+x*y(x) = 0,y(x))
```

$$y(x)=\frac{c_1}{x}$$

ODE No. 482

$$\left(a+x^{22}-y(x)^2\right)y'(x)+xy(x)y'(x)^2-xy(x)=0$$

✗ **Mathematica** : cpu = 53.8931 (sec), leaf count = 0

```
DSolve[-(x*y[x]) + (a + x^22 - y[x]^2)*Derivative[1][y][x] + x*y[x]*Derivative[1][y][x]^2 ==
```

, could not solve

```
DSolve[-(x*y[x]) + (a + x^22 - y[x]^2)*Derivative[1][y][x] + x*y[x]*Derivative[1][y][x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x*y(x)*diff(y(x),x)^2+(x^22-y(x)^2+a)*diff(y(x),x)-x*y(x) = 0,y(x))
```

, could not solve

```
dsolve(x*y(x)*diff(y(x),x)^2+(x^22-y(x)^2+a)*diff(y(x),x)-x*y(x) = 0,y(x))
```

ODE No. 483

$$\left(2xy(x)-x^2\right)y'(x)^2+2xy(x)y'(x)-y(x)^2+2xy(x)=0$$

✓ **Mathematica** : cpu = 0.203436 (sec), leaf count = 71

```
DSolve[2*x*y[x] - y[x]^2 + 2*x*y[x]*Derivative[1][y][x] + (-x^2 + 2*x*y[x])*Derivative[1][y][
```

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

✓ **Maple** : cpu = 0.077 (sec), leaf count = 103

```
dsolve((2*x*y(x)-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+2*x*y(x)-y(x)^2 = 0,y(x))
```

$$y(x)=0$$

ODE No. 484

$$\left(2xy(x)-x^2\right)y'(x)^2-6xy(x)y'(x)-y(x)^2+2xy(x)=0$$

✓ **Mathematica** : cpu = 0.172743 (sec), leaf count = 81

```
DSolve[2*x*y[x] - y[x]^2 - 6*x*y[x]*Derivative[1][y][x] + (-x^2 + 2*x*y[x])*Derivative[1][y][
```

$$\left\{\left\{y(x)\to -\sqrt{3x^2-2e^{\frac{c_1}{2}}x}+2x-e^{\frac{c_1}{2}}\right\},\left\{y(x)\to \sqrt{3x^2-2e^{\frac{c_1}{2}}x}+2x-e^{\frac{c_1}{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.09 (sec), leaf count = 115

```
dsolve((2*x*y(x)-x^2)*diff(y(x),x)^2-6*x*y(x)*diff(y(x),x)-y(x)^2+2*x*y(x) = 0,y(x))
```

$$y(x)=0$$

ODE No. 485

$$-y'(x)\left(ay(x)^2+bx^2+c\right)+axy(x)y'(x)^2+bxy(x)=0$$

✓ **Mathematica** : cpu = 0.0535309 (sec), leaf count = 29

```
DSolve[b*x*y[x] - (c + b*x^2 + a*y[x]^2)*Derivative[1][y][x] + a*x*y[x]*Derivative[1][y][x]^2
```

$$\left\{\left\{y(x)\to\sqrt{\frac{cc_1}{b-ac_1}+c_1x^2}\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(a*x*y(x)*diff(y(x),x)^2-(a*y(x)^2+b*x^2+c)*diff(y(x),x)+b*x*y(x) = 0,y(x))
```

, exception

```
time expired
```

ODE No. 486

$$-a^2 + y(x)^2 y'(x)^2 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0575558 (sec), leaf count = 117

```
DSolve[-a^2 + y[x]^2 + y[x]^2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{a^2 - x^2 - 2c_1 x - {c_1}^2}\right\}, \left\{y(x) \to \sqrt{a^2 - x^2 - 2c_1 x - {c_1}^2}\right\}, \left\{y(x) \to -\sqrt{a^2 - x^2 + 2c_1 x -
$$

✓ **Maple** : cpu = 0.297 (sec), leaf count = 54

```
dsolve(y(x)^2*diff(y(x),x)^2+y(x)^2-a^2 = 0,y(x))
```

$$y(x) = a$$

ODE No. 487

$$-6x^3y'(x)+4x^2y(x)+y(x)^2y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.418786 (sec), leaf count = 157

```
DSolve[4*x^2*y[x] - 6*x^3*Derivative[1][y][x] + y[x]^2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\frac{3}{4}\log(y(x))-\frac{\sqrt{9x^6-4x^2y(x)^3}\tanh^{-1}\left(\frac{3x^2}{\sqrt{9x^4-4y(x)^3}}\right)}{2x\sqrt{9x^4-4y(x)^3}}=c_1,y(x)\right],\text{Solve}\left[\frac{\sqrt{9x^6-4x^2y(x)^3}\tanh^{-1}}{2x\sqrt{9x^4-4}}\right.\right.$$

✓ **Maple** : cpu = 0.557 (sec), leaf count = 100

```
dsolve(y(x)^2*diff(y(x),x)^2-6*x^3*diff(y(x),x)+4*x^2*y(x) = 0,y(x))
```

$$y(x)=\frac{18^{\frac{1}{3}}x^{\frac{4}{3}}}{2}$$

ODE No. 488

$$4a^2 - 4ay(x)y'(x) - 4ax + y(x)^2y'(x)^2 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.305845 (sec), leaf count = 85

```
DSolve[4*a^2 - 4*a*x + y[x]^2 - 4*a*y[x]*Derivative[1][y][x] + y[x]^2*Derivative[1][y][x]^2 =
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{16a^3x - 4a^2x^2 - 4ac_1x - {c_1}^2}}{2a}\right\}, \left\{y(x) \to \frac{\sqrt{16a^3x - 4a^2x^2 - 4ac_1x - {c_1}^2}}{2a}\right\}\right\}$$

✓ **Maple** : cpu = 0.607 (sec), leaf count = 111

```
dsolve(y(x)^2*diff(y(x),x)^2-4*a*y(x)*diff(y(x),x)+y(x)^2-4*a*x+4*a^2 = 0,y(x))
```

$$y(x) = -2\sqrt{ax}$$

ODE No. 489

$$ay(x)^2 + bx + c + y(x)^2 y'(x)^2 + 2xy(x)y'(x) = 0$$

✗ **Mathematica** : cpu = 300.189 (sec), leaf count = 0

```
DSolve[c + b*x + a*y[x]^2 + 2*x*y[x]*Derivative[1][y][x] + y[x]^2*Derivative[1][y][x]^2 == 0,
```

, timed out

```
$Aborted
```

✓ **Maple** : cpu = 2.416 (sec), leaf count = 551

```
dsolve(y(x)^2*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+a*y(x)^2+b*x+c = 0,y(x))
```

$$y(x) = -\frac{\sqrt{16}\sqrt{a\left(a\left(ax-\frac{1}{2}b+x\right)^2(a+1)^2\,\mathrm{RootOf}\left(-b\ln(2ax-b+2x)+2\left(\int^{-Z}-\frac{\left(4\_a a^2+\sqrt{-(4\_a a}\right.}{4(}\right.\right.\right.}}{}$$

ODE No. 490

$$a - x^2 - 2xy(x)y'(x) + y(x)^2y'(x)^2 + 2y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.420323 (sec), leaf count = 70

```
DSolve[a - x^2 + 2*y[x]^2 - 2*x*y[x]*Derivative[1][y][x] + y[x]^2*Derivative[1][y][x]^2 == 0,
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{-a - 2x^2 + 8c_1x - 4{c_1}^2}}{\sqrt{2}}\right\}, \left\{y(x) \to \frac{\sqrt{-a - 2x^2 + 8c_1x - 4{c_1}^2}}{\sqrt{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.526 (sec), leaf count = 145

```
dsolve(y(x)^2*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)+2*y(x)^2-x^2+a = 0,y(x))
```

$$y(x) = -\frac{\sqrt{4x^2 - 2a}}{2}$$

ODE No. 491

$$(a-1)b+ax^2+2axy(x)y'(x)+(1-a)y(x)^2+y(x)^2y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.716191 (sec), leaf count = 79

```
DSolve[(-1 + a)*b + a*x^2 + (1 - a)*y[x]^2 + 2*a*x*y[x]*Derivative[1][y][x] + y[x]^2*Derivati
```

$$\left\{\left\{y(x)\to -\sqrt{-2ac_1x+ac_1{}^2+b-x^2+2c_1x-c_1{}^2}\right\},\left\{y(x)\to \sqrt{-2ac_1x+ac_1{}^2+b-x^2+2c_1x-c_1{}^2}\right\}\right.$$

✓ **Maple** : cpu = 0.8 (sec), leaf count = 195

```
dsolve(y(x)^2*diff(y(x),x)^2+2*a*x*y(x)*diff(y(x),x)+(1-a)*y(x)^2+a*x^2+(a-1)*b = 0,y(x))
```

$$y(x)=\sqrt{-a\,x^2+b}$$

ODE No. 492

$$\left(y(x)^2-a^2\right)y'(x)^2+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.0891483 (sec), leaf count = 97

```
DSolve[y[x]^2 + (-a^2 + y[x]^2)*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\sqrt{a^2-\#1^2}-a\tanh^{-1}\left(\frac{\sqrt{a^2-\#1^2}}{a}\right)\&\right][-x+c_1]\right\},\left\{y(x)\to \text{InverseFun}\right.\right.$$

✓ **Maple** : cpu = 0.685 (sec), leaf count = 122

```
dsolve((y(x)^2-a^2)*diff(y(x),x)^2+y(x)^2 = 0,y(x))
```

$$x-\sqrt{a^2-y\left(x\right)^2}+\frac{a^2\ln\left(\frac{2a^2+2\sqrt{a^2}\sqrt{a^2-y(x)^2}}{y(x)}\right)}{\sqrt{a^2}}-c_1=0$$

ODE No. 493

$$\left(a^2-2ax+y(x)^2\right)y'(x)^2+2ay(x)y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 6.81854 (sec), leaf count = 615

```
DSolve[y[x]^2 + 2*a*y[x]*Derivative[1][y][x] + (a^2 - 2*a*x + y[x]^2)*Derivative[1][y][x]^2 =
```

$$\left\{\text{Solve}\left[\left\{y(x)=\frac{-\sqrt{-aK[1]^2\left(aK[1]^2-2xK[1]^2-2x\right)}-aK[1]}{K[1]^2+1},x=\frac{aK[1]^2+aK[1]^2\log^2(K[1])+a\log\right.\right.$$

✓ **Maple** : cpu = 1.39 (sec), leaf count = 111

```
dsolve((y(x)^2-2*a*x+a^2)*diff(y(x),x)^2+2*a*y(x)*diff(y(x),x)+y(x)^2 = 0,y(x))
```

$$\left[x(\_T)=\frac{\operatorname{arctanh}\left(\frac{1}{\sqrt{\_T^2+1}}\right)^2\sqrt{\_T^2+1}\,a^2+\left(-2ac_1\sqrt{\_T^2+1}-2a^2\right)\operatorname{arctanh}\left(\frac{1}{\sqrt{\_T^2+1}}\right)+(a^2+c_1^2}{2\sqrt{\_T^2+1}\,a}\right.$$

ODE No. 494

$$\left(y(x)^2-a^2x^2\right)y'(x)^2+\left(1-a^2\right)x^2+2xy(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.116077 (sec), leaf count = 49

```
DSolve[(1 - a^2)*x^2 + 2*x*y[x]*Derivative[1][y][x] + (-(a^2*x^2) + y[x]^2)*Derivative[1][y][
```

$$\left\{\left\{y(x)\to ac_1-\sqrt{-x^2+{c_1}^2}\right\},\left\{y(x)\to ac_1+\sqrt{-x^2+{c_1}^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.199 (sec), leaf count = 161

```
dsolve((y(x)^2-a^2*x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+(-a^2+1)*x^2 = 0,y(x))
```

$$y(x)=\sqrt{a^2-1}\,x$$

ODE No. 495

$$\left((1-a)x^2+y(x)^2\right)y'(x)^2+2axy(x)y'(x)+(1-a)y(x)^2+x^2=0$$

✓ **Mathematica** : cpu = 0.21179 (sec), leaf count = 83

```
DSolve[x^2 + (1 - a)*y[x]^2 + 2*a*x*y[x]*Derivative[1][y][x] + ((1 - a)*x^2 + y[x]^2)*Derivat
```

$$\left\{\text{Solve}\left[\sqrt{a-1}\tan^{-1}\left(\frac{y(x)}{x}\right)-\frac{1}{2}\log\left(\frac{y(x)^2}{x^2}+1\right)=\log(x)+c_1,y(x)\right],\text{Solve}\left[\sqrt{a-1}\tan^{-1}\left(\frac{y(x)}{x}\right)+\right.\right.$$

✓ **Maple** : cpu = 0.881 (sec), leaf count = 61

```
dsolve((y(x)^2+(1-a)*x^2)*diff(y(x),x)^2+2*a*x*y(x)*diff(y(x),x)+(1-a)*y(x)^2+x^2 = 0,y(x))
```

$$y(x)=\tan\left(\text{RootOf}\left(-2\_Z\sqrt{a-1}-\ln\left(\frac{x^2}{\cos(\_Z)^2}\right)+2c_1\right)\right)x$$

ODE No. 496

$$(y(x)-x)^2\left(y'(x)^2+1\right)-a^2(y'(x)+1)^2=0$$

✓ **Mathematica** : cpu = 20.5772 (sec), leaf count = 17831

```
DSolve[-(a^2*(1 + Derivative[1][y][x])^2) + (-x + y[x])^2*(1 + Derivative[1][y][x]^2) == 0,y[
```

Too large to display

✓ **Maple** : cpu = 0.256 (sec), leaf count = 130

```
dsolve((y(x)-x)^2*(diff(y(x),x)^2+1)-a^2*(diff(y(x),x)+1)^2 = 0,y(x))
```

$$y(x)=x-\sqrt{2}\,a$$

ODE No. 497

$$-x^2 - 2xy(x)y'(x) + 3y(x)^2y'(x)^2 + 4y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.159791 (sec), leaf count = 76

```
DSolve[-x^2 + 4*y[x]^2 - 2*x*y[x]*Derivative[1][y][x] + 3*y[x]^2*Derivative[1][y][x]^2 == 0,y
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{-3x^2 - 4ie^{3c_1}x + e^{6c_1}}}{\sqrt{3}}\right\}, \left\{y(x) \to \frac{\sqrt{-3x^2 - 4ie^{3c_1}x + e^{6c_1}}}{\sqrt{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.578 (sec), leaf count = 203

```
dsolve(3*y(x)^2*diff(y(x),x)^2-2*x*y(x)*diff(y(x),x)+4*y(x)^2-x^2 = 0,y(x))
```

$$y(x) = -\frac{\sqrt{3}\,x}{3}$$

ODE No. 498

$$(3y(x)-2)y'(x)^2+4y(x)-4=0$$

✓ **Mathematica** : cpu = 0.11678 (sec), leaf count = 155

```
DSolve[-4 + 4*y[x] + (-2 + 3*y[x])*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\sqrt{3(\#1-1)+1}\sqrt{1-\#1}-\frac{\sqrt{1-\#1}\sinh^{-1}\left(\sqrt{3}\sqrt{\#1-1}\right)}{\sqrt{3}\sqrt{\#1-1}}\&\right][-2x+c_1]\right.$$

✓ **Maple** : cpu = 0.447 (sec), leaf count = 99

```
dsolve((3*y(x)-2)*diff(y(x),x)^2-4+4*y(x) = 0,y(x))
```

$$y(x)=1$$

ODE No. 499

$$a^2\left(-x^2\right)-2a^2xy(x)y'(x)+\left(1-a^2\right)y(x)^2y'(x)^2+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.366741 (sec), leaf count = 212

```
DSolve[-(a^2*x^2) + y[x]^2 - 2*a^2*x*y[x]*Derivative[1][y][x] + (1 - a^2)*y[x]^2*Derivative[1
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{a^6\left(-x^2\right)+3a^4x^2-3a^2x^2+2a^2xe^{a^2c_1-c_1}-2xe^{a^2c_1-c_1}+e^{2a^2c_1-2c_1}+x^2}}{\sqrt{a^6-3a^4+3a^2-1}}\right\},\left\{y(x)\to \frac{\sqrt{a^6\left(\right.}\right.$$

✓ **Maple** : cpu = 0.211 (sec), leaf count = 189

```
dsolve((-a^2+1)*y(x)^2*diff(y(x),x)^2-2*a^2*x*y(x)*diff(y(x),x)+y(x)^2-a^2*x^2 = 0,y(x))
```

$$y(x)=\frac{xa}{\sqrt{-a^2+1}}$$

ODE No. 500

$$(a-b)y(x)^2y'(x)^2 - ab + ay(x)^2 - bx^2 - 2bxy(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.908565 (sec), leaf count = 100

```
DSolve[-(a*b) - b*x^2 + a*y[x]^2 - 2*b*x*y[x]*Derivative[1][y][x] + (a - b)*y[x]^2*Derivative
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{-ab + ax^2 - 2ac_1x + {ac_1}^2 + b^2 - bx^2}}{\sqrt{b-a}}\right\}, \left\{y(x) \to \frac{\sqrt{-ab + ax^2 - 2ac_1x + {ac_1}^2 + b^2 - bx^2}}{\sqrt{b-a}}\right.\right.$$

✓ **Maple** : cpu = 1.176 (sec), leaf count = 220

```
dsolve((a-b)*y(x)^2*diff(y(x),x)^2-2*b*x*y(x)*diff(y(x),x)+a*y(x)^2-b*x^2-a*b = 0,y(x))
```

$$y(x) = \frac{\sqrt{(a-b)\,b\,(x^2+a-b)}}{a-b}$$

ODE No. 501

$$y'(x)^2 \left(a y(x)^2 + b x + c\right) - b y(x) y'(x) + d y(x)^2 = 0$$

✓ **Mathematica** : cpu = 18.5797 (sec), leaf count = 975

```
DSolve[d*y[x]^2 - b*y[x]*Derivative[1][y][x] + (c + b*x + a*y[x]^2)*Derivative[1][y][x]^2 ==
```

$$\left\{ \text{Solve}\left[\left\{ y(x) = \frac{bK[1] - \sqrt{-K[1]^2 \left(-b^2 + 4axK[1]^2 b + 4dxb + 4acK[1]^2 + 4cd\right)}}{2\left(aK[1]^2 + d\right)}, x = \frac{-b^2 {c_1}^2 d^4 - a b^2 {c_1}^2}{} \right. \right.$$

✓ **Maple** : cpu = 4.926 (sec), leaf count = 215

```
dsolve((a*y(x)^2+b*x+c)*diff(y(x),x)^2-b*y(x)*diff(y(x),x)+d*y(x)^2=0,y(x))
```

$$\left[x(\_T) = -\frac{\sqrt{\_T^2 a + d}\, \ln\left(\frac{\sqrt{d}\sqrt{\_T^2 a + d} + d}{\_T}\right)^2 b^2 + \left(\left(2\ln(2) b^2 + 4\sqrt{d}\, c_1 b\right)\sqrt{\_T^2 a + d} - 2\sqrt{d}\, b^2\right) \ln\left(\frac{\sqrt{}}{} \right.}{4\sqrt{\_T}} \right.$$

ODE No. 502

$$(ay(x)-bx)^2\left(a^2y'(x)^2+b^2\right)-c^2(ay'(x)+b)^2=0$$

✓ **Mathematica** : cpu = 1.09134 (sec), leaf count = 100

```
DSolve[-(c^2*(b + a*Derivative[1][y][x])^2) + (-(b*x) + a*y[x])^2*(b^2 + a^2*Derivative[1][y]
```

$$\left\{\left\{y(x)\to \frac{bc_1}{a}-\frac{\sqrt{b^2\left(-x^2\right)+2b^2c_1x-b^2{c_1}^2+c^2}}{a}\right\},\left\{y(x)\to \frac{\sqrt{b^2\left(-x^2\right)+2b^2c_1x-b^2{c_1}^2+c^2}}{a}+\frac{bc_1}{a}\right\}\right.$$

✓ **Maple** : cpu = 0.371 (sec), leaf count = 195

```
dsolve((a*y(x)-b*x)^2*(a^2*diff(y(x),x)^2+b^2)-c^2*(a*diff(y(x),x)+b)^2=0,y(x))
```

$$y(x)=\frac{bx-\sqrt{2}\,c}{a}$$

ODE No. 503

$$\mathrm{a0} + y'(x)(\mathrm{a1}x + \mathrm{b1}y(x) + \mathrm{c1}) + y'(x)^2(\mathrm{a2}x + \mathrm{b2}y(x) + \mathrm{c2})^2 + \mathrm{b0}y(x) + \mathrm{c0} = 0$$

✗ **Mathematica** : cpu = 300.036 (sec), leaf count = 0

```
DSolve[a0 + c0 + b0*y[x] + (c1 + a1*x + b1*y[x])*Derivative[1][y][x] + (c2 + a2*x + b2*y[x])^
```

, timed out

```
$Aborted
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((b2*y(x)+a2*x+c2)^2*diff(y(x),x)^2+(a1*x+b1*y(x)+c1)*diff(y(x),x)+b0*y(x)+a0+c0=0,y(x)
```

, could not solve

```
dsolve((b2*y(x)+a2*x+c2)^2*diff(y(x),x)^2+(a1*x+b1*y(x)+c1)*diff(y(x),x)+b0*y(x)+a0+c0=
```

ODE No. 504

$$-\left(-a+x^3+y(x)^3\right)y'(x)+x^2y(x)+xy(x)^2y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.0679216 (sec), leaf count = 36

```
DSolve[x^2*y[x] - (-a + x^3 + y[x]^3)*Derivative[1][y][x] + x*y[x]^2*Derivative[1][y][x]^2 ==
```

$$\left\{y(x)\to \frac{\sqrt[3]{c_1}\sqrt[3]{a-x^3+c_1x^3}}{\sqrt[3]{-1+c_1}}\right\}$$

✓ **Maple** : cpu = 0.839 (sec), leaf count = 247

```
dsolve(x*y(x)^2*diff(y(x),x)^2-(y(x)^3+x^3-a)*diff(y(x),x)+x^2*y(x)=0,y(x))
```

$$y(x)=\left(x^3+a-2x\sqrt{ax}\right)^{\frac{1}{3}}$$

ODE No. 505

$$-x^3+xy(x)^2y'(x)^2-2y(x)^3y'(x)+2xy(x)^2=0$$

✓ **Mathematica** : cpu = 0.0985869 (sec), leaf count = 73

```
DSolve[-x^3 + 2*x*y[x]^2 - 2*y[x]^3*Derivative[1][y][x] + x*y[x]^2*Derivative[1][y][x]^2 == 0
```

$$\left\{\left\{y(x)\to -\sqrt{x^2+2c_1}\right\},\left\{y(x)\to \sqrt{x^2+2c_1}\right\},\left\{y(x)\to -\sqrt{x^2+c_1x^4}\right\},\left\{y(x)\to \sqrt{x^2+c_1x^4}\right\}\right\}$$

✓ **Maple** : cpu = 0.037 (sec), leaf count = 52

```
dsolve(x*y(x)^2*diff(y(x),x)^2-2*y(x)^3*diff(y(x),x)+2*x*y(x)^2-x^3=0,y(x))
```

$$y(x)=\sqrt{x^2+c_1}$$

ODE No. 506

$$2x^2(y(x)-x)y(x)^2y'(x)+x^2\left(xy(x)^2-1\right)y'(x)^2-\left(\left(x^2y(x)-1\right)y(x)^2\right)=0$$

✗ **Mathematica** : cpu = 54.8425 (sec), leaf count = 0

```
DSolve[-(y[x]^2*(-1 + x^2*y[x])) + 2*x^2*y[x]^2*(-x + y[x])*Derivative[1][y][x] + x^2*(-1 + x
```

, could not solve

```
DSolve[-(y[x]^2*(-1 + x^2*y[x])) + 2*x^2*y[x]^2*(-x + y[x])*Derivative[1][y][x] + x^2*(
1 + x*y[x]^2)*Derivative[1][y][x]^2 == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^2*(x*y(x)^2-1)*diff(y(x),x)^2+2*x^2*y(x)^2*(y(x)-x)*diff(y(x),x)-y(x)^2*(x^2*y(x)-1)
```

, could not solve

```
dsolve(x^2*(x*y(x)^2-1)*diff(y(x),x)^2+2*x^2*y(x)^2*(y(x)-x)*diff(y(x),x)-y(x)^2*(x^2*y
1)=0,y(x))
```

ODE No. 507

$$\left(y(x)^4 - a^2x^2\right) y'(x)^2 + 2a^2xy(x)y'(x) + y(x)^2\left(y(x)^2 - a^2\right) = 0$$

✗ **Mathematica** : cpu = 43.4163 (sec), leaf count = 0

```
DSolve[y[x]^2*(-a^2 + y[x]^2) + 2*a^2*x*y[x]*Derivative[1][y][x] + (-(a^2*x^2) + y[x]^4)*Deri
```

, could not solve

```
DSolve[y[x]^2*(-a^2 + y[x]^2) + 2*a^2*x*y[x]*Derivative[1][y][x] + (-(a^2*x^2) + y[x]^4
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((y(x)^4-a^2*x^2)*diff(y(x),x)^2+2*a^2*x*y(x)*diff(y(x),x)+y(x)^2*(y(x)^2-a^2)=0,y(x))
```

, could not solve

```
dsolve((y(x)^4-a^2*x^2)*diff(y(x),x)^2+2*a^2*x*y(x)*diff(y(x),x)+y(x)^2*(y(x)^2-
a^2)=0,y(x))
```

ODE No. 508

$$\left(x^2 y(x)^2 - x^2 + y(x)^4\right) y'(x)^2 + 2xy(x)y'(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 2.07274 (sec), leaf count = 88

```
DSolve[-y[x]^2 + 2*x*y[x]*Derivative[1][y][x] + (-x^2 + x^2*y[x]^2 + y[x]^4)*Derivative[1][y]
```

$$\text{Solve}\left[\frac{\sqrt{x^2+y(x)^2}\,y(x)\left(\log\left(\frac{x}{\sqrt{x^2+y(x)^2}}+1\right)-\log\left(1-\frac{x}{\sqrt{x^2+y(x)^2}}\right)\right)}{2x^2\sqrt{\frac{y(x)^2(x^2+y(x)^2)}{x^4}}}+y(x)=c_1, y(x)\right]$$

✓ **Maple** : cpu = 2.641 (sec), leaf count = 60

```
dsolve((y(x)^4+x^2*y(x)^2-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)-y(x)^2=0,y(x))
```

$$y(x) = -ix$$

ODE No. 509

$$9\left(x^2-1\right)y(x)^4y'(x)^2-4x^2-6xy(x)^5y'(x)=0$$

✓ **Mathematica** : cpu = 0.283644 (sec), leaf count = 34

```
DSolve[-4*x^2 - 6*x*y[x]^5*Derivative[1][y][x] + 9*(-1 + x^2)*y[x]^4*Derivative[1][y][x]^2 ==
```

$$\left\{y(x)\to -\frac{\sqrt[3]{-\frac{1}{2}}\sqrt[3]{-4x^2+4+{c_1}^2}}{\sqrt[3]{c_1}}\right\}$$

✓ **Maple** : cpu = 1.664 (sec), leaf count = 212

```
dsolve(9*y(x)^4*(x^2-1)*diff(y(x),x)^2-6*x*y(x)^5*diff(y(x),x)-4*x^2=0,y(x))
```

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

ODE No. 510

$$-\left(x^4 y(x)^2-1\right) y(x)^2+x^2\left(x^2 y(x)^4-1\right) y'(x)^2+2x^3\left(y(x)^2-x^2\right) y(x)^3 y'(x)=0$$

✗ **Mathematica** : cpu = 51.0346 (sec), leaf count = 0

```
DSolve[-(y[x]^2*(-1 + x^4*y[x]^2)) + 2*x^3*y[x]^3*(-x^2 + y[x]^2)*Derivative[1][y][x] + x^2*(
```

, could not solve

```
DSolve[-(y[x]^2*(-1 + x^4*y[x]^2)) + 2*x^3*y[x]^3*(-x^2 + y[x]^2)*Derivative[1][y][x] +
1 + x^2*y[x]^4)*Derivative[1][y][x]^2 == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^2*(x^2*y(x)^4-1)*diff(y(x),x)^2+2*x^3*y(x)^3*(y(x)^2-x^2)*diff(y(x),x)-y(x)^2*(x^4*y
```

, could not solve

```
dsolve(x^2*(x^2*y(x)^4-1)*diff(y(x),x)^2+2*x^3*y(x)^3*(y(x)^2-x^2)*diff(y(x),x)-
y(x)^2*(x^4*y(x)^2-1)=0,y(x))
```

ODE No. 511

$$\left(a^2\sqrt{x^2+y(x)^2}-x^2\right)y'(x)^2+a^2\sqrt{x^2+y(x)^2}+2xy(x)y'(x)-y(x)^2=0$$

✓ **Mathematica** : cpu = 1.48383 (sec), leaf count = 229

```
DSolve[-y[x]^2 + a^2*Sqrt[x^2 + y[x]^2] + 2*x*y[x]*Derivative[1][y][x] + (-x^2 + a^2*Sqrt[x^2
```

$$\left\{\text{Solve}\left[\tan^{-1}\left(\frac{x}{y(x)}\right)-\frac{2\sqrt{a^2\left(x^2+y(x)^2\right)\left(\sqrt{x^2+y(x)^2}-a^2\right)}\tan^{-1}\left(\frac{\sqrt{\sqrt{x^2+y(x)^2}-a^2}}{a}\right)}{a\sqrt{x^2+y(x)^2}\sqrt{\sqrt{x^2+y(x)^2}-a^2}}=c_1,y(x)\right],\text{So}\right.$$

✓ **Maple** : cpu = 5.939 (sec), leaf count = 199

```
dsolve((a^2*(y(x)^2+x^2)^(1/2)-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+a^2*(y(x)^2+x^2)^(1/
```

$$\arctan\left(\frac{x}{y(x)}\right)-\frac{2\sqrt{a^2\left(y(x)^2+x^2\right)\left(-a^2+\sqrt{y(x)^2+x^2}\right)}\arctan\left(\frac{\sqrt{-a^2+\sqrt{y(x)^2+x^2}}}{a}\right)}{a\sqrt{y(x)^2+x^2}\sqrt{-a^2+\sqrt{y(x)^2+x^2}}}-c_1=0$$

ODE No. 512

$$\left(a\left(x^2+y(x)^2\right)^{3/2}-x^2\right)y'(x)^2+a\left(x^2+y(x)^2\right)^{3/2}+2xy(x)y'(x)-y(x)^2=0$$

✓ **Mathematica** : cpu = 6.21129 (sec), leaf count = 713

```
DSolve[-y[x]^2 + a*(x^2 + y[x]^2)^(3/2) + 2*x*y[x]*Derivative[1][y][x] + (-x^2 + a*(x^2 + y[x
```

$$\left\{\text{Solve}\left[\tan^{-1}\left(\frac{x}{y(x)}\right)-\frac{i\sqrt{a\left(\left(x^2+y(x)^2\right)^{5/2}-a\left(x^2+y(x)^2\right)^3\right)}\left(\sqrt{2}\left(\log\left(\frac{a^{3/2}\left(3i\sqrt{2}a\sqrt{x^2+y(x)^2}+4\sqrt{a}\sqrt{\sqrt{x^2}}\right.}{4a\sqrt{x^2+y(x}}\right.\right.\right.}{}\right.\right.\right.$$

✓ **Maple** : cpu = 7.271 (sec), leaf count = 135

```
dsolve((a*(y(x)^2+x^2)^(3/2)-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)+a*(y(x)^2+x^2)^(3/2)-y
```

$$y(x)=\frac{x}{\tan\left(\text{RootOf}\left(-\_Z+\int^{\frac{x^2\left(\tan^2(\_Z)+1\right)}{\tan(\_Z)^2}}-\frac{\sqrt{-\_a^{\frac{5}{2}}a\left(\sqrt{\_a}a-1\right)}\left(\sqrt{\_a}a+1\right)}{2\_a^2\left(\_a a^2-1\right)}d\_a+c_1\right)\right)}$$

ODE No. 513

$$y'(x)^2\sin(y(x))+2xy'(x)\cos^3(y(x))-\sin(y(x))\cos^4(y(x))=0$$

✓ **Mathematica** : cpu = 0.0748295 (sec), leaf count = 81

```
DSolve[-(Cos[y[x]]^4*Sin[y[x]]) + 2*x*Cos[y[x]]^3*Derivative[1][y][x] + Sin[y[x]]*Derivative[
```

$$\left\{\left\{y(x)\to\tan^{-1}\left(2\left(-\frac{{c_1}^{3/2}}{\sqrt{x+c_1}}-\frac{\sqrt{c_1}x}{\sqrt{x+c_1}}\right)\right)\right\},\left\{y(x)\to\tan^{-1}\left(2\left(\frac{{c_1}^{3/2}}{\sqrt{x+c_1}}+\frac{\sqrt{c_1}x}{\sqrt{x+c_1}}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 2.298 (sec), leaf count = 1134

```
dsolve(diff(y(x),x)^2*sin(y(x))+2*x*diff(y(x),x)*cos(y(x))^3-sin(y(x))*cos(y(x))^4=0,y(x))
```

$$\left[x(_T)=\frac{\left(\cos^4\left(\frac{\left(\arctan\left(\frac{c_1^2_T^2-2c_1_T\left(c_1^3_T^3+54c_1_T+6\sqrt{3}\sqrt{c_1^2_T^2\left(c_1^2_T^2+27\right)}\right)^{\frac{1}{3}}+\left(c_1^3_T^3+54c_1_T+6\sqrt{3}\sqrt{c_1^2_T^2\left(c\right.}\right.}{\left(c_1^3_T^3+54c_1_T+6\sqrt{3}\sqrt{c_1^2_T^2\left(c_1^2_T^2+27\right)}\right)^{\frac{1}{3}}}\right.\right.}{}\right.\right.}{}\right.$$

ODE No. 514

$$y'(x)^2(a\cos(y(x))+b)-c\cos(y(x))+d=0$$

✓ **Mathematica** : cpu = 8.68478 (sec), leaf count = 605

```
DSolve[d - c*Cos[y[x]] + (b + a*Cos[y[x]])*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{4\sin^2\left(\frac{\#1}{2}\right)\csc(\#1)\sqrt{a\cos(\#1)+b}\sqrt{\frac{\cot^2\left(\frac{\#1}{2}\right)(c-d)}{c+d}}\sqrt{\frac{\csc^2\left(\frac{\#1}{2}\right)(a+b)(d-c\cos(\right.}{ad+bc}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.348 (sec), leaf count = 87

```
dsolve(diff(y(x),x)^2*(a*cos(y(x))+b)-c*cos(y(x))+d=0,y(x))
```

$$y(x)=\arccos\left(\frac{d}{c}\right)$$

ODE No. 515

$$f\left(x^2+y(x)^2\right)\left(y'(x)^2+1\right)-\left(xy'(x)-y(x)\right)^2=0$$

✓ **Mathematica** : cpu = 1.88204 (sec), leaf count = 1922

```
DSolve[-(-y[x] + x*Derivative[1][y][x])^2 + f[x^2 + y[x]^2]*(1 + Derivative[1][y][x]^2) == 0,
```

$$\left\{\text{Solve}\left[\int_1^x\left(\frac{\sqrt{f\left(K[1]^2+y(x)^2\right)\left(K[1]^2+y(x)^2-f\left(K[1]^2+y(x)^2\right)\right)}K[1]}{f\left(K[1]^2+y(x)^2\right)\left(K[1]^2+y(x)^2\right)}-\frac{\sqrt{f\left(K[1]^2+y(x)^2\right)\left(K[1]^2\right.}}{f\left(K[1]^2+y(x)^2\right)\left(K[1]^2\right.}\right.\right.$$

✓ **Maple** : cpu = 1.548 (sec), leaf count = 117

```
dsolve(f(y(x)^2+x^2)*(diff(y(x),x)^2+1)-(x*diff(y(x),x)-y(x))^2=0,y(x))
```

$$y(x)=\frac{x}{\tan\left(\text{RootOf}\left(-2\_Z-\left(\int^{\frac{x^2\left(\tan^2\left(\_Z\right)+1\right)}{\tan\left(\_Z\right)^2}}\frac{\sqrt{-f(\_a)(f(\_a)-\_a)}}{\_a(f(\_a)-\_a)}d\_a\right)+2c_1\right)\right)}$$

ODE No. 516

$$\left(x^2+y(x)^2\right) f\left(\frac{x}{\sqrt{x^2+y(x)^2}}\right)\left(y'(x)^2+1\right)-\left(xy'(x)-y(x)\right)^2=0$$

✓ **Mathematica** : cpu = 0.523367 (sec), leaf count = 253

```
DSolve[-(-y[x] + x*Derivative[1][y][x])^2 + f[x/Sqrt[x^2 + y[x]^2]]*(x^2 + y[x]^2)*(1 + Deriv
```

$$\left\{\text{Solve}\left[\int_1^{\frac{y(x)}{x}} \frac{f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)K[1]^2+f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)-1}{\sqrt{f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)}(K[1]-i)(K[1]+i)\left(\sqrt{f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)}K[1]+i\sqrt{f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)-1}\right)}dK[1]=\right.\right.$$

✓ **Maple** : cpu = 1.023 (sec), leaf count = 70

```
dsolve((y(x)^2+x^2)*f(x/(y(x)^2+x^2)^(1/2))*(diff(y(x),x)^2+1)-(x*diff(y(x),x)-y(x))^2=0,y(x)
```

$$y(x)=\text{RootOf}\left(-\ln(x)+\int^{-Z}-\frac{\_af\left(\frac{1}{\sqrt{\_a^2+1}}\right)+\sqrt{-f\left(\frac{1}{\sqrt{\_a^2+1}}\right)^2+f\left(\frac{1}{\sqrt{\_a^2+1}}\right)}}{(\_a^2+1)\,f\left(\frac{1}{\sqrt{\_a^2+1}}\right)}d\_a+c_1\right)x$$

ODE No. 517

$$\left(x^2+y(x)^2\right) f\left(\frac{y(x)}{\sqrt{x^2+y(x)^2}}\right)\left(y'(x)^2+1\right)-\left(xy'(x)-y(x)\right)^2=0$$

✓ **Mathematica** : cpu = 0.542636 (sec), leaf count = 283

```
DSolve[-(-y[x] + x*Derivative[1][y][x])^2 + f[y[x]/Sqrt[x^2 + y[x]^2]]*(x^2 + y[x]^2)*(1 + De
```

$$\left\{\text{Solve}\left[\int_1^{\frac{y(x)}{x}} \frac{f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)K[1]^2+f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)-1}{\sqrt{f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)}(K[1]-i)(K[1]+i)\left(\sqrt{f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)}K[1]+i\sqrt{f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)-1}\right)}dK[1]=\right.\right.$$

✓ **Maple** : cpu = 1.093 (sec), leaf count = 78

```
dsolve((y(x)^2+x^2)*f(y(x)/(y(x)^2+x^2)^(1/2))*(diff(y(x),x)^2+1)-(x*diff(y(x),x)-y(x))^2=0,y
```

$$y(x)=\text{RootOf}\left(-\ln(x)+\int^{-Z}-\frac{\_af\left(\frac{\_a}{\sqrt{\_a^2+1}}\right)+\sqrt{-f\left(\frac{\_a}{\sqrt{\_a^2+1}}\right)^2+f\left(\frac{\_a}{\sqrt{\_a^2+1}}\right)}}{\left(\_a^2+1\right)f\left(\frac{\_a}{\sqrt{\_a^2+1}}\right)}d\_a+c_1\right)x$$

ODE No. 518

$$y'(x)^3-(y(x)-a)^2(y(x)-b)^2=0$$

✓ **Mathematica** : cpu = 0.494235 (sec), leaf count = 236

```
DSolve[-((-a + y[x])^2*(-b + y[x])^2) + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{3\sqrt[3]{a-\#1}\left(\frac{\#1-b}{a-b}\right)^{2/3}\,{}_2F_1\left(\frac{1}{3},\frac{2}{3};\frac{4}{3};\frac{a-\#1}{a-b}\right)}{(b-\#1)^{2/3}}\&\right][x+c_1]\right\},\left\{y(x)\to \text{Inverse}\right.\right.$$

✓ **Maple** : cpu = 0.289 (sec), leaf count = 126

```
dsolve(diff(y(x),x)^3-(y(x)-a)^2*(y(x)-b)^2=0,y(x))
```

$$y(x)=a$$

ODE No. 519

$$y'(x)^3 - f(x)\left(ay(x)^2 + by(x) + c\right)^2 = 0$$

✓ **Mathematica** : cpu = 0.597848 (sec), leaf count = 353

```
DSolve[-(f[x]*(c + b*y[x] + a*y[x]^2)^2) + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{\sqrt[3]{2}(2\#1a+b)\left(\frac{a(\#1(\#1a+b)+c)}{4ac-b^2}\right)^{2/3}\,{}_2F_1\left(\frac{1}{2},\frac{2}{3};\frac{3}{2};\frac{(b+2a\#1)^2}{b^2-4ac}\right)}{a(\#1(\#1a+b)+c)^{2/3}}\&\right]\left[\int_1^x \sqrt[3]{f(K[\right.\right.\right.$$

✓ **Maple** : cpu = 0.598 (sec), leaf count = 197

```
dsolve(diff(y(x),x)^3-f(x)*(a*y(x)^2+b*y(x)+c)^2=0,y(x))
```

$$\int^{y(x)} \frac{1}{(\_a^2 a + \_a b + c)^{\frac{2}{3}}} d\_a + \int^{x} -\frac{\left(f(\_a)\left(ay(x)^2 + by(x) + c\right)^2\right)^{\frac{1}{3}}}{\left(ay\left(x\right)^2 + by\left(x\right) + c\right)^{\frac{2}{3}}} d\_a + c_1 = 0$$

ODE No. 520

$$y'(x)^3 + y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0238652 (sec), leaf count = 1115

```
DSolve[-y[x] + Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int \frac{\sqrt[3]{-271^2\#}}{0\ 2\sqrt[3]{-271^2\#1 + 2\ 0^3 - 0\ 27\ 1^2 + \sqrt{4\left(-0^2 + 3\ 1\ 1\right)^3 + \left(-271^2\#1 + 2\ 0^3\right.}}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.193 (sec), leaf count = 249

```
dsolve(diff(y(x),x)^3+diff(y(x),x)-y(x)=0,y(x))
```

$$x - \left(\int^{y(x)} \frac{6\left(108\_a + 12\sqrt{81\_a^2 + 12}\right)^{\frac{1}{3}}}{\left(108\_a + 12\sqrt{81\_a^2 + 12}\right)^{\frac{2}{3}} - 12} d\_a\right) - c_1 = 0$$

ODE No. 521

$$y'(x)^3 + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0031373 (sec), leaf count = 14

```
DSolve[-y[x] + x*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\{\{y(x) \to c_1 x + {c_1}^3\}\}$$

✓ **Maple** : cpu = 0.049 (sec), leaf count = 33

```
dsolve(diff(y(x),x)^3+x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = -\frac{2\sqrt{-3x}\,x}{9}$$

ODE No. 522

$$y'(x)^3 - (x+5)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0032365 (sec), leaf count = 20

```
DSolve[y[x] - (5 + x)*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\{\{y(x) \to c_1 x - {c_1}^3 + 5c_1\}\}$$

✓ **Maple** : cpu = 0.047 (sec), leaf count = 44

```
dsolve(diff(y(x),x)^3-(x+5)*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = -\frac{2\sqrt{3x+15}\,(x+5)}{9}$$

ODE No. 523

$$-axy'(x)+x^3+y'(x)^3=0$$

✓ **Mathematica** : cpu = 145.263 (sec), leaf count = 392

```
DSolve[x^3 - a*x*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \int_1^x \left(\frac{\sqrt[3]{\frac{2}{3}}aK[1]}{\sqrt[3]{\sqrt{3}\sqrt{27K[1]^6-4a^3K[1]^3}-9K[1]^3}}+\frac{\sqrt[3]{\sqrt{3}\sqrt{27K[1]^6-4a^3K[1]^3}-9K[1]^3}}{\sqrt[3]{2}3^{2/3}}\right)dK[1]-\right.\right.$$

✓ **Maple** : cpu = 0.067 (sec), leaf count = 231

```
dsolve(diff(y(x),x)^3-a*x*diff(y(x),x)+x^3=0,y(x))
```

$$y(x)=\int \frac{i\left(\left(\frac{i}{12}+\frac{\sqrt{3}}{12}\right)\left(-108x^3+12\sqrt{-12a^3x^3+81x^6}\right)^{\frac{2}{3}}+\left(i-\sqrt{3}\right)ax\right)}{\left(-108x^3+12\sqrt{-12a^3x^3+81x^6}\right)^{\frac{1}{3}}}dx+c_1$$

ODE No. 524

$$y'(x)^3 - 2y(x)y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0167742 (sec), leaf count = 422

```
DSolve[y[x]^2 - 2*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int \frac{\sqrt[3]{\sqrt{3}\sqrt{\#1^3(27\#1-32)} - 9\#1^2}}{\sqrt[3]{2}\left(\sqrt{3}\sqrt{\#1^3(27\#1-32)} - 9\#1^2\right)^{2/3} + 4\sqrt[3]{3}\#1} d\#1\&\right]\left[\frac{x}{6^{2/3}} + c_1\right]\right\},$$

✓ **Maple** : cpu = 0.068 (sec), leaf count = 243

```
dsolve(diff(y(x),x)^3-2*y(x)*diff(y(x),x)+y(x)^2=0,y(x))
```

$$x - \left(\int^{y(x)} \frac{6\left(-108\_a^2 + 12\sqrt{81\_a^4 - 96\_a^3}\right)^{\frac{1}{3}}}{\left(-108\_a^2 + 12\sqrt{81\_a^4 - 96\_a^3}\right)^{\frac{2}{3}} + 24\_a} d\_a\right) - c_1 = 0$$

ODE No. 525

$$-axy(x)y'(x) + 2ay(x)^2 + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0806359 (sec), leaf count = 135

```
DSolve[2*a*y[x]^2 - a*x*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \exp\left(\frac{1}{2}\left(\frac{ax^2}{2} + \frac{1}{2}\sqrt{a}x\sqrt{ax^2-8} - 4\log\left(\sqrt{a}\sqrt{ax^2-8} + ax\right)\right)\right)\right\}, \left\{y(x) \to c_1 \exp\left(\frac{1}{2}\left(\frac{ax^2}{2}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.075 (sec), leaf count = 122

```
dsolve(diff(y(x),x)^2-a*x*y(x)*diff(y(x),x)+2*a*y(x)^2=0,y(x))
```

$$y(x) = c_1\left(\frac{a^2x}{\sqrt{a^2}} + \sqrt{a^2x^2 - 8a}\right)^{-\frac{2a}{\sqrt{a^2}}} \mathrm{e}^{\frac{x\left(ax+\sqrt{a^2x^2-8a}\right)}{4}}$$

ODE No. 526

$$-x^3 y(x)^3 - \left(x^2 + x y(x) + y(x)^2\right) y'(x)^2 + \left(x^3 y(x) + x^2 y(x)^2 + x y(x)^3\right) y'(x) + y'(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.0662602 (sec), leaf count = 45

```
DSolve[-(x^3*y[x]^3) + (x^3*y[x] + x^2*y[x]^2 + x*y[x]^3)*Derivative[1][y][x] - (x^2 + x*y[x]
```

$$\left\{\left\{y(x) \to \frac{1}{-x - c_1}\right\}, \left\{y(x) \to c_1 e^{\frac{x^2}{2}}\right\}, \left\{y(x) \to \frac{x^3}{3} + c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 32

```
dsolve(diff(y(x),x)^3-(y(x)^2+x*y(x)+x^2)*diff(y(x),x)^2+(x*y(x)^3+x^2*y(x)^2+x^3*y(x))*diff(
```

$$y(x) = \frac{x^3}{3} + c_1$$

ODE No. 527

$$-xy(x)^4y'(x)+y'(x)^3-y(x)^5=0$$

✓ **Mathematica** : cpu = 0.0151647 (sec), leaf count = 20

```
DSolve[-y[x]^5 - x*y[x]^4*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.854 (sec), leaf count = 43

```
dsolve(diff(y(x),x)^3-x*y(x)^4*diff(y(x),x)-y(x)^5=0,y(x))
```

$$y(x)=-\frac{3\sqrt{3}}{2x^{\frac{3}{2}}}$$

ODE No. 528

$$abx + ay'(x)^2 + by(x) + y'(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.850846 (sec), leaf count = 398

```
DSolve[a*b*x + b*y[x] + a*Derivative[1][y][x]^2 + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x = -\frac{-a\left(\frac{\sqrt[3]{-2a^3+\sqrt{(-2a^3-27abx-27by(x))^2-4a^6}-27abx-27by(x)}}{3\sqrt[3]{2}}+\frac{}{3\sqrt[3]{-2a^3+\sqrt{(-}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.126 (sec), leaf count = 86

```
dsolve(diff(y(x),x)^3+a*diff(y(x),x)^2+b*y(x)+a*b*x=0,y(x))
```

$$y(x) = -ax - \frac{\left(e^{\text{RootOf}\left(-2\_Z a^2-3e^{2\_Z}+8a e^{\_Z}+2c_1 b-5a^2-2bx\right)}-a\right)^2 e^{\text{RootOf}\left(-2\_Z a^2-3e^{2\_Z}+8a e^{\_Z}+2c_1 b-5a^2-2bx\right)}}{b}$$

ODE No. 529

$$y'(x)^3 + xy'(x)^2 - y(x) = 0$$

✓ **Mathematica** : cpu = 33.3651 (sec), leaf count = 1758

```
DSolve[-y[x] + x*Derivative[1][y][x]^2 + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{2}\left(\frac{4\ 2^{2/3}x^4}{3\left(-16x^3-72x^2-108x+216c_1+\sqrt{4\left(-4x^2-12x-9\right)^3+\left(-16x^3-72x^2-108x+216\right.}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 1251

```
dsolve(diff(y(x),x)^3+x*diff(y(x),x)^2-y(x)=0,y(x))
```

$$y(x) = 0$$

ODE No. 530

$$y'(x)^3 - y(x)y'(x)^2 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 7.03214 (sec), leaf count = 648

```
DSolve[y[x]^2 - y[x]*Derivative[1][y][x]^2 + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{\sqrt[3]{2K[1]^3 - 27K[1]^2 + 3\sqrt{3}\sqrt{-}}}{2\sqrt[3]{2}K[1]^2 + 2\sqrt[3]{2K[1]^3 - 27K[1]^2 + 3\sqrt{3}\sqrt{-K[1]^4(4K[1] - 27)}}K[1] +}\right.\right.\right.$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 424

```
dsolve(diff(y(x),x)^3-y(x)*diff(y(x),x)^2+y(x)^2=0,y(x))
```

$$y(x) = 0$$

ODE No. 531

$$-x^3 y(x)^6 - \left(x^2 + y(x)^4 + x y(x)^2\right) y'(x)^2 + \left(x^3 y(x)^2 + x^2 y(x)^4 + x y(x)^6\right) y'(x) + y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 59.0009 (sec), leaf count = 0

```
DSolve[-(x^3*y[x]^6) + (x^3*y[x]^2 + x^2*y[x]^4 + x*y[x]^6)*Derivative[1][y][x] + Derivative[
```

, could not solve

```
DSolve[-(x^3*y[x]^6) + (x^3*y[x]^2 + x^2*y[x]^4 + x*y[x]^6)*Derivative[1][y][x] + Deriv
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)^2-(y(x)^4+x*y(x)^2+x^2)*diff(y(x),x)^2+(x*y(x)^6+x^2*y(x)^4+x^3*y(x)^2)*d
```

, could not solve

```
dsolve(diff(y(x),x)^2-(y(x)^4+x*y(x)^2+x^2)*diff(y(x),x)^2+(x*y(x)^6+x^2*y(x)^4+x^3*y(x
x^3*y(x)^6=0,y(x))
```

ODE No. 532

$$ay'(x)^3 + by'(x)^2 + cy'(x) - d - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0280241 (sec), leaf count = 1124

```
DSolve[-d - y[x] + c*Derivative[1][y][x] + b*Derivative[1][y][x]^2 + a*Derivative[1][y][x]^3
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int \frac{\sqrt[3]{2b^3 - 9acb -}}{2b\sqrt[3]{2b^3 - 9acb - 27a^2d - 27a^2\#1 + \sqrt{4\left(3ac - b^2\right)^3 + \left(2b^3 - 9acb - 27a^2\right.}}}\right.\right.$$

✓ **Maple** : cpu = 0.182 (sec), leaf count = 874

```
dsolve(a*diff(y(x),x)^3+b*diff(y(x),x)^2+c*diff(y(x),x)-y(x)-d=0,y(x))
```

$$x - \left(\int^{y(x)} \frac{6\,6^{\frac{1}{3}} a \left(12\sqrt{3}\sqrt{27\left(d + \_a\right)^2 a^2 + 18}\right.}{6^{\frac{1}{3}}\left(12\sqrt{3}\sqrt{27\left(d+\_a\right)^2 a^2 + 18\left(\left(d+\_a\right)b + \frac{2c^2}{9}\right)ca + \left(-4d - 4\_a\right)b^3 - b^2c^2}\,a + (108d + 10\right.}\right.$$

ODE No. 533

$$a + xy'(x)^3 - y(x)y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0041365 (sec), leaf count = 16

```
DSolve[a - y[x]*Derivative[1][y][x]^2 + x*Derivative[1][y][x]^3 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.04 (sec), leaf count = 76

```
dsolve(x*diff(y(x),x)^3-y(x)*diff(y(x),x)^2+a=0,y(x))
```

$$y(x) = \frac{3\,2^{\frac{1}{3}}(a\,x^2)^{\frac{1}{3}}}{2}$$

ODE No. 534

$$4xy'(x)^3 - 6y(x)y'(x)^2 + 3y(x) - x = 0$$

✓ **Mathematica** : cpu = 0.0579034 (sec), leaf count = 114

```
DSolve[-x + 3*y[x] - 6*y[x]*Derivative[1][y][x]^2 + 4*x*Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{-\sqrt{2}\sqrt{c_1 x^3 + 3{c_1}^2 x^2 + 3{c_1}^3 x + {c_1}^4} - {c_1}^2}{3c_1}\right\}, \left\{y(x) \to \frac{\sqrt{2}\sqrt{c_1 x^3 + 3{c_1}^2 x^2 + 3{c_1}^3 x + {c_1}^4} - {c_1}^2}{3c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.06 (sec), leaf count = 84

```
dsolve(4*x*diff(y(x),x)^3-6*y(x)*diff(y(x),x)^2+3*y(x)-x=0,y(x))
```

$$y(x) = x$$

ODE No. 535

$$8xy'(x)^3 - 12y(x)y'(x)^2 + 9y(x) = 0$$

✓ **Mathematica** : cpu = 0.0457137 (sec), leaf count = 49

```
DSolve[9*y[x] - 12*y[x]*Derivative[1][y][x]^2 + 8*x*Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{(x+3c_1)^{3/2}}{3\sqrt{c_1}}\right\}, \left\{y(x) \to \frac{(x+3c_1)^{3/2}}{3\sqrt{c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 51

```
dsolve(8*x*diff(y(x),x)^3-12*y(x)*diff(y(x),x)^2+9*y(x)=0,y(x))
```

$$y(x) = -\frac{3x}{2}$$

ODE No. 536

$$bx\left(x^2-a^2\right)y'(x)^2+\left(x^2-a^2\right)y'(x)^3+bx+y'(x)=0$$

✓ **Mathematica** : cpu = 0.0117279 (sec), leaf count = 64

```
DSolve[b*x + Derivative[1][y][x] + b*x*(-a^2 + x^2)*Derivative[1][y][x]^2 + (-a^2 + x^2)*Deri
```

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

✓ **Maple** : cpu = 0.043 (sec), leaf count = 52

```
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))
```

$$y(x)=-\frac{b\,x^2}{2}+c_1$$

ODE No. 537

$$\left(x^6+3xy(x)^2\right)y'(x)-2x^5y(x)+x^3y'(x)^3-3x^2y(x)y'(x)^2-y(x)^3=0$$

✓ **Mathematica** : cpu = 0.03308 (sec), leaf count = 16

```
DSolve[-2*x^5*y[x] - y[x]^3 + (x^6 + 3*x*y[x]^2)*Derivative[1][y][x] - 3*x^2*y[x]*Derivative[
```

$$\left\{\left\{y(x)\to x\left(c_1x+{c_1}^3\right)\right\}\right\}$$

✓ **Maple** : cpu = 4.368 (sec), leaf count = 209

```
dsolve(x^3*diff(y(x),x)^3-3*x^2*y(x)*diff(y(x),x)^2+(3*x*y(x)^2+x^6)*diff(y(x),x)-y(x)^3-2*x^
```

$$y(x)=-\frac{2\sqrt{-3x}\,x^2}{9}$$

ODE No. 538

$$2(xy'(x)+y(x))^3 - y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 7.85677 (sec), leaf count = 113

```
DSolve[-(y[x]*Derivative[1][y][x]) + 2*(y[x] + x*Derivative[1][y][x])^3 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\int_1^x \frac{\text{InverseFunction}\left[-\frac{2\sqrt{\#1^2-8\#1^3}\tan^{-1}\left(\sqrt{8\#1-1}\right)}{\#1\sqrt{8\#1-1}}+\log(8\#1-1)+\log\left(1+\frac{1}{8\#1-1}\right)+\frac{3\sqrt{\#1^2-8\#1^3}}{\#1}\&\right][c_1+2}{K[1]}}{x}\right.\right.$$

✓ **Maple** : cpu = 1.278 (sec), leaf count = 1625

```
dsolve(2*(x*diff(y(x),x)+y(x))^3-y(x)*diff(y(x),x)=0,y(x))
```

$$\int_{\_b}^{x} \frac{-6^{\frac{2}{3}}\left(-9y(x)\left(-\frac{\sqrt{3}\sqrt{\frac{27\_a_{y(x)}{}^2-2y(x)}{\_a}}}{9}+y(x)\right)\_a^2\right)^{\frac{2}{3}}+6\_ay(x)\left(6^{\frac{1}{3}}\left(-9y(x)\left(-\frac{\sqrt{3}\sqrt{\frac{27\_a_{y(x)}{}^2-2y(x)}{\_a}}}{9}-\right.\right.\right.}{6\_a^2y(x)+\_a6^{\frac{2}{3}}\left(-9y(x)\left(-\frac{\sqrt{3}\sqrt{\frac{27\_a_{y(x)}{}^2-2y(x)}{\_a}}}{9}+y(x)\right)\_a^2\right)^{\frac{2}{3}}}$$

ODE No. 539

$$\sin(x)y'(x)^3 - y'(x)^2\left(y(x)\sin(x) - \cos^2(x)\right) - y'(x)\left(y(x)\cos^2(x) + \sin(x)\right) + y(x)\sin(x) = 0$$

✓ **Mathematica** : cpu = 0.0329279 (sec), leaf count = 45

```
DSolve[Sin[x]*y[x] - (Sin[x] + Cos[x]^2*y[x])*Derivative[1][y][x] - (-Cos[x]^2 + Sin[x]*y[x])
```

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

✓ **Maple** : cpu = 0.059 (sec), leaf count = 32

```
dsolve(diff(y(x),x)^3*sin(x)-(y(x)*sin(x)-cos(x)^2)*diff(y(x),x)^2-(y(x)*cos(x)^2+sin(x))*dif
```

$$y(x) = c_1 \mathrm{e}^x$$

ODE No. 540

$$2y(x)y'(x)^3 - y(x)y'(x)^2 + 2xy'(x) - x = 0$$

✓ **Mathematica** : cpu = 0.0369771 (sec), leaf count = 69

```
DSolve[-x + 2*x*Derivative[1][y][x] - y[x]*Derivative[1][y][x]^2 + 2*y[x]*Derivative[1][y][x]
```

$$\left\{\left\{y(x) \to \frac{x}{2} + c_1\right\}, \left\{y(x) \to \frac{\left(3c_1 - 2ix^{3/2}\right)^{2/3}}{2^{2/3}}\right\}, \left\{y(x) \to \frac{\left(2ix^{3/2} + 3c_1\right)^{2/3}}{2^{2/3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.081 (sec), leaf count = 109

```
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))
```

$$x + \frac{xc_1}{\left(\frac{-\sqrt{-xy(x)}+y(x)}{y(x)}\right)^{\frac{2}{3}} \left(\frac{-x+\sqrt{-xy(x)}+y(x)}{y(x)}\right)^{\frac{2}{3}} y(x)} = 0$$

ODE No. 541

$$y(x)^2 y'(x)^3 + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0287588 (sec), leaf count = 39

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + y[x]^2*Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{2c_1 x + {c_1}^3}\right\}, \left\{y(x) \to \sqrt{2c_1 x + {c_1}^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.554 (sec), leaf count = 103

```
dsolve(y(x)^2*diff(y(x),x)^3+2*x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = -\frac{2\,2^{\frac{1}{4}} 3^{\frac{1}{4}} (-x^3)^{\frac{1}{4}}}{3}$$

ODE No. 542

$$16y(x)^2y'(x)^3 + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0291685 (sec), leaf count = 20

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + 16*y[x]^2*Derivative[1][y][x]^3 == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.549 (sec), leaf count = 107

```
dsolve(16*y(x)^2*diff(y(x),x)^3+2*x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = -\frac{2^{\frac{1}{4}}3^{\frac{1}{4}}(-x^3)^{\frac{1}{4}}}{3}$$

ODE No. 543

$$x\left(x^2+1\right)y'(x)-x^2y(x)+y(x)^3\left(-y'(x)^2\right)+xy(x)^2y'(x)^3=0$$

✓ **Mathematica** : cpu = 0.0230807 (sec), leaf count = 55

```
DSolve[-(x^2*y[x]) + x*(1 + x^2)*Derivative[1][y][x] - y[x]^3*Derivative[1][y][x]^2 + x*y[x]^
```

$$\left\{\left\{y(x)\to -\sqrt{c_1x^2+\frac{c_1}{1+{c_1}^2}}\right\},\left\{y(x)\to \sqrt{c_1x^2+\frac{c_1}{1+{c_1}^2}}\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
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))
```

, could not solve

```
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))
```

ODE No. 544

$$x^7 y(x)^2 y'(x)^3 - \left(3x^6 y(x)^3 - 1\right) y'(x)^2 + 3x^5 y(x)^4 y'(x) - x^4 y(x)^5 = 0$$

✓ **Mathematica** : cpu = 0.0719408 (sec), leaf count = 22

```
DSolve[-(x^4*y[x]^5) + 3*x^5*y[x]^4*Derivative[1][y][x] - (-1 + 3*x^6*y[x]^3)*Derivative[1][y
```

$$\left\{\left\{y(x) \to \sqrt[3]{c_1 x^3 + {c_1}^{2/3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.898 (sec), leaf count = 4201

```
dsolve(x^7*y(x)^2*diff(y(x),x)^3-(3*x^6*y(x)^3-1)*diff(y(x),x)^2+3*x^5*y(x)^4*diff(y(x),x)-x^
```

$$y(x) = \frac{2^{\frac{2}{3}}}{3x^2}$$

ODE No. 545

$$y'(x)^4 - (y(x)-a)^3(y(x)-b)^2 = 0$$

✓ **Mathematica** : cpu = 0.613965 (sec), leaf count = 323

```
DSolve[-((-a + y[x])^3*(-b + y[x])^2) + Derivative[1][y][x]^4 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{4\sqrt[4]{a-\#1}\sqrt{\frac{\#1-b}{a-b}}\,{}_2F_1\left(\frac{1}{4},\frac{1}{2};\frac{5}{4};\frac{a-\#1}{a-b}\right)}{\sqrt{b-\#1}}\&\right]\left[-\sqrt[4]{-1}x+c_1\right]\right\},\left\{y(x)\to \text{Inv}\right.\right.$$

✓ **Maple** : cpu = 0.217 (sec), leaf count = 144

```
dsolve(diff(y(x),x)^4-(y(x)-a)^3*(y(x)-b)^2=0,y(x))
```

$$y(x) = a$$

ODE No. 546

$$y'(x)^4+3(x-1)y'(x)^2-3(2y(x)-1)y'(x)+3x=0$$

✓ **Mathematica** : cpu = 0.039006 (sec), leaf count = 113

```
DSolve[3*x - 3*(-1 + 2*y[x])*Derivative[1][y][x] + 3*(-1 + x)*Derivative[1][y][x]^2 + Derivat
```

$$\left\{\left\{y(x)\to \frac{1}{12}\left(-\sqrt{64x^3+48{c_1}^2x^2+12{c_1}^4x+{c_1}^6}-6c_1x+6-{c_1}^3+6c_1\right)\right\},\left\{y(x)\to \frac{1}{12}\left(\sqrt{64x^3+48c_1\right.}\right.\right.$$

✓ **Maple** : cpu = 0.104 (sec), leaf count = 171

```
dsolve(diff(y(x),x)^4+3*(x-1)*diff(y(x),x)^2-3*(2*y(x)-1)*diff(y(x),x)+3*x=0,y(x))
```

$$y(x)=-x+\frac{5}{6}$$

ODE No. 547

$$y'(x)^4 - 4y(x)\left(xy'(x) - 2y(x)\right)^2 = 0$$

✓ **Mathematica** : cpu = 2.59593 (sec), leaf count = 490

```
DSolve[Derivative[1][y][x]^4 - 4*y[x]*(-2*y[x] + x*Derivative[1][y][x])^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{\sqrt{\left(x^2 - 4\sqrt{y(x)}\right) y(x)}\log\left(\sqrt{x^2 - 4\sqrt{y(x)}} + x\right)}{\sqrt{x^2 - 4\sqrt{y(x)}}\sqrt{y(x)}} - \frac{\sqrt{x^2 - 4\sqrt{y(x)}}\sqrt{y(x)}\log(y(x))}{4\sqrt{\left(x^2 - 4\sqrt{y(x)}\right) y(x)}} + \frac{1}{4}\log(y(x \right.\right.$$

✓ **Maple** : cpu = 0.276 (sec), leaf count = 118

```
dsolve(diff(y(x),x)^4-4*y(x)*(x*diff(y(x),x)-2*y(x))^2=0,y(x))
```

$$y(x) = \frac{x^4}{16}$$

ODE No. 548

$$y'(x)^6 - (y(x) - a)^4 (y(x) - b)^3 = 0$$

✓ **Mathematica** : cpu = 0.93247 (sec), leaf count = 479

```
DSolve[-((-a + y[x])^4*(-b + y[x])^3) + Derivative[1][y][x]^6 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{3\sqrt[3]{a-\#1}\sqrt{\frac{\#1-b}{a-b}}\,{}_2F_1\left(\frac{1}{3},\frac{1}{2};\frac{4}{3};\frac{a-\#1}{a-b}\right)}{\sqrt{b-\#1}}\&\right][c_1 - ix]\right\}, \left\{y(x) \to \text{InverseFu}\right.$$

✓ **Maple** : cpu = 0.451 (sec), leaf count = 250

```
dsolve(diff(y(x),x)^6-(y(x)-a)^4*(y(x)-b)^3=0,y(x))
```

$$y(x) = a$$

ODE No. 549

$$x^2\left(y'(x)^2+1\right)^3-a^2=0$$

✓ **Mathematica** : cpu = 0.231281 (sec), leaf count = 216

```
DSolve[-a^2 + x^2*(1 + Derivative[1][y][x]^2)^3 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -x\left(\frac{a^{2/3}}{x^{2/3}}-1\right)^{3/2}+c_1\right\},\left\{y(x)\to x\left(\frac{a^{2/3}}{x^{2/3}}-1\right)^{3/2}+c_1\right\},\left\{y(x)\to c_1-x\left(-1-\frac{i\left(\sqrt{3}-i\right)}{2x^{2/3}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.818 (sec), leaf count = 553

```
dsolve(x^2*(diff(y(x),x)^2+1)^3-a^2=0,y(x))
```

$$y(x)=\frac{\sqrt{-\frac{\left(a^2x\right)^{\frac{4}{3}}\left(\left(a^2x\right)^{\frac{2}{3}}-a^2\right)}{a^4}}\left(\left(a^2x\right)^{\frac{2}{3}}-a^2\right)}{\left(a^2x\right)^{\frac{2}{3}}}+c_1$$

ODE No. 550

$$-ay(x)^s - bx^{\frac{rs}{r-s}} + y'(x)^r = 0$$

✓ **Mathematica** : cpu = 0.751529 (sec), leaf count = 488

```
DSolve[-(b*x^((r*s)/(r - s))) - a*y[x]^s + Derivative[1][y][x]^r == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{r}{-rx\left(aK[2]^s + bx^{\frac{rs}{r-s}}\right)^{\frac{1}{r}} + sx\left(aK[2]^s + bx^{\frac{rs}{r-s}}\right)^{\frac{1}{r}} + rK[2]} - \int_1^{x} \left(\frac{asK[2]^{s}}{rK[1]\left(aK[2]^s + bK[1]^{\frac{r}{r-}}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.293 (sec), leaf count = 60

```
dsolve(diff(y(x),x)^r-a*y(x)^s-b*x^(r*s/(r-s))=0,y(x))
```

$$(-r+s)\left(\int_{\_b}^{y(x)} \frac{1}{x\,(r-s)\left(\_a^s + b\,x^{\frac{rs}{r-s}}\right)^{\frac{1}{r}} - r\_a}\, d\_a\right) + \ln(x) - c_1 = 0$$

ODE No. 551

$$y'(x)^n - f(x)^n (y(x)-a)^{n+1} (y(x)-b)^{n-1} = 0$$

✓ **Mathematica** : cpu = 0.166825 (sec), leaf count = 86

```
DSolve[-(f[x]^n*(-a + y[x])^(1 + n)*(-b + y[x])^(-1 + n)) + Derivative[1][y][x]^n == 0,y[x],x
```

$$\left\{\left\{y(x) \to \frac{-bn^n - a(a-b)^n \left(\int_1^x (-1)^{1+\frac{1}{n}} f(K[1])dK[1] + c_1\right)^n}{-n^n - (a-b)^n \left(\int_1^x (-1)^{1+\frac{1}{n}} f(K[1])dK[1] + c_1\right)^n}\right\}\right\}$$

✓ **Maple** : cpu = 0.67 (sec), leaf count = 55

```
dsolve(diff(y(x),x)^n-f(x)^n*(y(x)-a)^(n+1)*(y(x)-b)^(n-1)=0,y(x))
```

$$y(x) = \frac{\left(-\frac{n}{(a-b)\left(\int f(x)dx + c_1\right)}\right)^n b - a}{-1 + \left(-\frac{n}{(a-b)\left(\int f(x)dx + c_1\right)}\right)^n}$$

ODE No. 552

$$y'(x)^n - f(x)g(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.049637 (sec), leaf count = 41

```
DSolve[-(f[x]*g[y[x]]) + Derivative[1][y][x]^n == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} g(K[1])^{-1/n} dK[1]\&\right]\left[\int_1^x f(K[2])^{\frac{1}{n}} dK[2] + c_1\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.099 (sec), leaf count = 43

```
dsolve(diff(y(x),x)^n-f(x)*g(y(x))=0,y(x))
```

$$\int^{y(x)} g(\_a)^{-\frac{1}{n}}\, d\_a + \int^x -(f(\_a)\, g(y(x)))^{\frac{1}{n}}\, g(y(x))^{-\frac{1}{n}}\, d\_a + c_1 = 0$$

ODE No. 553

$$ay'(x)^m + by'(x)^n - y(x) = 0$$

✓ **Mathematica** : cpu = 0.238174 (sec), leaf count = 56

```
DSolve[-y[x] + a*Derivative[1][y][x]^m + b*Derivative[1][y][x]^n == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x = \frac{amK[1]^{m-1}}{m-1} + \frac{bnK[1]^{n-1}}{n-1} + c_1, y(x) = aK[1]^m + bK[1]^n\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 36

```
dsolve(a*diff(y(x),x)^m+b*diff(y(x),x)^n-y(x)=0,y(x))
```

$$y(x) = 0$$

ODE No. 554

$$x^{n-1}y'(x)^n - nxy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.150736 (sec), leaf count = 54

```
DSolve[y[x] - n*x*Derivative[1][y][x] + x^(-1 + n)*Derivative[1][y][x]^n == 0,y[x],x]
```

$$\text{Solve}\left[\left\{y(x) = \frac{nx^2K[1] - x^nK[1]^n}{x}, x = c_1(K[1] - nK[1])^{\frac{n}{1-n}}\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.449 (sec), leaf count = 32

```
dsolve(x^(n-1)*diff(y(x),x)^n-n*x*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = \frac{c_1^2 n\left(\frac{x}{c_1}\right)^{\frac{1}{n}} - \left(\frac{1}{c_1}\right)^{-n}}{c_1}$$

ODE No. 555

$$xy'(x) + \sqrt{y'(x)^2 + 1} - y(x) = 0$$

✓ **Mathematica** : cpu = 0.006146 (sec), leaf count = 20

```
DSolve[-y[x] + x*Derivative[1][y][x] + Sqrt[1 + Derivative[1][y][x]^2] == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.033 (sec), leaf count = 15

```
dsolve((diff(y(x),x)^2+1)^(1/2)+x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = \sqrt{c_1^2 + 1} + x c_1$$

ODE No. 556

$$xy'(x)^2+\sqrt{y'(x)^2+1}+y(x)=0$$

✓ **Mathematica** : cpu = 4.18701 (sec), leaf count = 67

```
DSolve[y[x] + x*Derivative[1][y][x]^2 + Sqrt[1 + Derivative[1][y][x]^2] == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x=\frac{-\sqrt{K[1]^2+1}-\sinh^{-1}(K[1])}{(K[1]+1)^2}+\frac{c_1}{(K[1]+1)^2},y(x)=-xK[1]^2-\sqrt{K[1]^2+1}\right\},\{y(x),K[1]\}\right.$$

✓ **Maple** : cpu = 0.232 (sec), leaf count = 581

```
dsolve((diff(y(x),x)^2+1)^(1/2)+x*diff(y(x),x)^2+y(x)=0,y(x))
```

$$\frac{x^2c_1}{\left(\sqrt{-4xy\left(x\right)+2+2\sqrt{4x^2-4xy\left(x\right)+1}}-2x\right)^2}+x+\frac{2x^2\left(\sqrt{2}\sqrt{\frac{2x^2-2xy(x)+\sqrt{4x^2-4xy(x)+1}+1}{x^2}}-2\operatorname{arcsinh}\left(\right.\right.}{\left(\sqrt{-4xy\left(x\right)+2+2\sqrt{4x^2-4xy\left(x\right.}\right.}$$

ODE No. 557

$$x\left(y'(x)+\sqrt{y'(x)^2+1}\right)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0458822 (sec), leaf count = 39

```
DSolve[-y[x] + x*(Derivative[1][y][x] + Sqrt[1 + Derivative[1][y][x]^2]) == 0,y[x],x]
```

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

✓ **Maple** : cpu = 0.283 (sec), leaf count = 74

```
dsolve(x*((diff(y(x),x)^2+1)^(1/2)+diff(y(x),x))-y(x)=0,y(x))
```

$$\frac{2xy(x)\,c_1}{\sqrt{\frac{\left(y(x)^2+x^2\right)^2}{x^2y(x)^2}}\left(\sqrt{\frac{x^4+2x^2y(x)^2+y(x)^4}{x^2y(x)^2}}\,xy\left(x\right)+y\left(x\right)^2-x^2\right)}+x=0$$

ODE No. 558

$$ax\sqrt{y'(x)^2+1}+xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.91211 (sec), leaf count = 327

```
DSolve[-y[x] + x*Derivative[1][y][x] + a*x*Sqrt[1 + Derivative[1][y][x]^2] == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\frac{2i\tan^{-1}\left(\frac{y(x)}{x\sqrt{a^2-\frac{y(x)^2}{x^2}}-1}\right)+a\tanh^{-1}\left(\frac{-a^2-\frac{iy(x)}{x}+1}{a\sqrt{a^2-\frac{y(x)^2}{x^2}}-1}\right)-a\tanh^{-1}\left(\frac{-a^2+\frac{iy(x)}{x}+1}{a\sqrt{a^2-\frac{y(x)^2}{x^2}}-1}\right)+a\log\left(\frac{y(x)^2}{x^2}+\right.}{2a^2-2}\right.\right.$$

✓ **Maple** : cpu = 0.386 (sec), leaf count = 223

```
dsolve(a*x*(diff(y(x),x)^2+1)^(1/2)+x*diff(y(x),x)-y(x)=0,y(x))
```

$$x-\frac{e^{\frac{\operatorname{arcsinh}\left(\frac{\sqrt{-a^2x^2+x^2+y(x)^2}\,a+y(x)}{\left(a^2-1\right)x}\right)}{a}}c_1}{\sqrt{\frac{-a^2x^2+a^2y(x)^2+2\sqrt{-a^2x^2+x^2+y(x)^2}\,ay(x)+x^2+y(x)^2}{(a^2-1)^2x^2}}}=0$$

ODE No. 559

$$-ay(x)y'(x) - ax + y(x)\sqrt{y'(x)^2 + 1} = 0$$

✓ **Mathematica** : cpu = 0.33402 (sec), leaf count = 212

```
DSolve[-(a*x) - a*y[x]*Derivative[1][y][x] + y[x]*Sqrt[1 + Derivative[1][y][x]^2] == 0,y[x],x
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{a^6\left(-x^2\right) + 3a^4x^2 - 3a^2x^2 + 2a^2xe^{a^2c_1 - c_1} - 2xe^{a^2c_1 - c_1} + e^{2a^2c_1 - 2c_1} + x^2}}{\sqrt{a^6 - 3a^4 + 3a^2 - 1}}\right\}, \left\{y(x) \to \frac{\sqrt{a^6\left(\right.}\right.$$

✓ **Maple** : cpu = 0.258 (sec), leaf count = 215

```
dsolve(y(x)*(diff(y(x),x)^2+1)^(1/2)-a*y(x)*diff(y(x),x)-a*x=0,y(x))
```

$$-e^{\int \frac{-a^2x+\sqrt{\left(a^2-1\right)y(x)^2+a^2x^2}}{\left(a^2-1\right)y(x)} \frac{\left(a\sqrt{\_a^2+1}-\_a\right)a}{\sqrt{\_a^2+1}\left(\_aa-\sqrt{\_a^2+1}\right)\left(\_a^2a-\sqrt{\_a^2+1}\_a+a\right)}d\_a} c_1 + x = 0$$

ODE No. 560

$$ay(x)\sqrt{y'(x)^2+1}-x^2-2xy(x)y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 12.4519 (sec), leaf count = 110

```
DSolve[-x^2 + y[x]^2 - 2*x*y[x]*Derivative[1][y][x] + a*y[x]*Sqrt[1 + Derivative[1][y][x]^2]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{a^2c_1{}^2\left(-x^2\right)-4a^2c_1x-4a^2+4x^2}}{\sqrt{-4+a^2c_1{}^2}}\right\},\left\{y(x)\to \frac{\sqrt{a^2c_1{}^2\left(-x^2\right)-4a^2c_1x-4a^2+4x^2}}{\sqrt{-4+a^2c_1{}^2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.976 (sec), leaf count = 1120

```
dsolve(a*y(x)*(diff(y(x),x)^2+1)^(1/2)-2*x*y(x)*diff(y(x),x)+y(x)^2-x^2=0,y(x))
```

$$\int_{\_b}^{x}\frac{2\_a^3-2\_ay(x)^2+\sqrt{a^2\left(\_a^4+2\_a^2y(x)^2-a^2y(x)^2+y}}{-2a^2\_ay(x)^2+2\_a^5+4\_a^3y(x)^2+2y(x)^4\_a+\_a^2\sqrt{a^2\left(\_a^4+2\_a^2y(x)^2-a^2y(x)^2+y(x)^4\right)}-}$$

ODE No. 561

$$f\left(x^2+y(x)^2\right)\sqrt{y'(x)^2+1}-xy'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 1.79561 (sec), leaf count = 2138

```
DSolve[y[x] - x*Derivative[1][y][x] + f[x^2 + y[x]^2]*Sqrt[1 + Derivative[1][y][x]^2] == 0,y[
```

$$\left\{\text{Solve}\left[\int_1^x\left(\frac{\sqrt{f\left(K[1]^2+y(x)^2\right)^2\left(-f\left(K[1]^2+y(x)^2\right)^2+K[1]^2+y(x)^2\right)}K[1]}{f\left(K[1]^2+y(x)^2\right)^2\left(K[1]^2+y(x)^2\right)}-\frac{\sqrt{f\left(K[1]^2+y(x)^2\right)^2\left(-\right.}}{f\left(K[1]^2+y(x)^2\right)^2(\right.}\right.\right.$$

✓ **Maple** : cpu = 2.306 (sec), leaf count = 50

```
dsolve(f(y(x)^2+x^2)*(diff(y(x),x)^2+1)^(1/2)-x*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x)=\frac{x}{\tan\left(\text{RootOf}\left(-2\_Z+\int^{\frac{x^2\left(\tan^2\left(\_Z\right)+1\right)}{\tan\left(\_Z\right)^2}}\frac{f(\_a)}{\sqrt{-f(\_a)^2+\_a\_a}}d\_a+2c_1\right)\right)}$$

ODE No. 562

$$a\sqrt[3]{y'(x)^3+1}+bxy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.125057 (sec), leaf count = 84

```
DSolve[-y[x] + b*x*Derivative[1][y][x] + a*(1 + Derivative[1][y][x]^3)^(1/3) == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x=K[1]^{\frac{b}{1-b}}\left(\frac{a\int\frac{K[1]^{\frac{2b-1}{b-1}}}{(K[1]^3+1)^{2/3}}dK[1]}{1-b}+c_1\right),y(x)=a\sqrt[3]{K[1]^3+1}+bxK[1]\right\},\{K[1],y(x)\}\right]$$

✓ **Maple** : cpu = 0.184 (sec), leaf count = 3306

```
dsolve(a*(diff(y(x),x)^3+1)^(1/3)+b*x*diff(y(x),x)-y(x)=0,y(x))
```

$$\left(-\left(\int\frac{2b^2x^2y(x)\left(-4b^6x^6-8a^3b^3x^3-4b^3x^3y(x)^3+4\sqrt{b^6x^6+2a^3b^3x^3+2b^3x^3y(x)^3+a^6-2y(x)^3a^3+y(x)^6}\,b^3x^3-4a^6+4y(x)^3a^3+4a^3\sqrt{b^6x^6+2a^3b^3x^3+2b^3x^3\right.}}{\left(-4b^6x^6-8a^3b^3x^3-4b^3x^3y(x)^3+4\sqrt{b^6x^6+2a^3b^3x^3+2b^3\right.}}\right.\right.$$

ODE No. 563

$$ay(x)+b+xy'(x)+\log\left(y'(x)\right)=0$$

✓ **Mathematica** : cpu = 0.20711 (sec), leaf count = 59

```
DSolve[b + Log[Derivative[1][y][x]] + a*y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[a\left(\frac{(a+1)\log\left(1-aW\left(xe^{-ay(x)-b}\right)\right)}{a^2}+\frac{W\left(xe^{-ay(x)-b}\right)}{a}\right)+ay(x)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.239 (sec), leaf count = 66

```
dsolve(ln(diff(y(x),x))+x*diff(y(x),x)+a*y(x)+b=0,y(x))
```

$$-\left(\mathrm{e}^{-ay(x)-\text{LambertW}\left(x\,\mathrm{e}^{-ay(x)-b}\right)-b}\right)^{-\frac{1}{a+1}}c_1+x-\frac{\mathrm{e}^{ay(x)+\text{LambertW}\left(x\,\mathrm{e}^{-ay(x)-b}\right)+b}}{a}=0$$

ODE No. 564

$$a(xy'(x) - y(x)) + \log(y'(x)) = 0$$

✓ **Mathematica** : cpu = 0.0038985 (sec), leaf count = 17

```
DSolve[Log[Derivative[1][y][x]] + a*(-y[x] + x*Derivative[1][y][x]) == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\log(c_1)}{a} + c_1 x\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 32

```
dsolve(ln(diff(y(x),x))+a*(x*diff(y(x),x)-y(x))=0,y(x))
```

$$y(x) = \frac{\ln\left(-\frac{1}{ax}\right) - 1}{a}$$

ODE No. 565

$$y'(x) + y(x) \log (y'(x)) - xy(x) - y(x) \log(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.0274835 (sec), leaf count = 25

```
DSolve[-(x*y[x]) - Log[y[x]]*y[x] + Log[Derivative[1][y][x]]*y[x] + Derivative[1][y][x] == 0,
```

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

✓ **Maple** : cpu = 0.25 (sec), leaf count = 17

```
dsolve(y(x)*ln(diff(y(x),x))+diff(y(x),x)-y(x)*ln(y(x))-x*y(x)=0,y(x))
```

$$y(x) = c_1 \mathrm{e}^{\frac{\mathrm{LambertW}(\mathrm{e}^x)(\mathrm{LambertW}(\mathrm{e}^x)+2)}{2}}$$

ODE No. 566

$$y'(x) + \sin(y'(x)) - x = 0$$

✓ **Mathematica** : cpu = 0.0404544 (sec), leaf count = 38

```
DSolve[-x + Sin[Derivative[1][y][x]] + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x = K[1] + \sin(K[1]), y(x) = \frac{K[1]^2}{2} + K[1]\sin(K[1]) + \cos(K[1]) + c_1\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 16

```
dsolve(sin(diff(y(x),x))+diff(y(x),x)-x=0,y(x))
```

$$y(x) = \int \text{RootOf}\left(\sin(\_Z) + \_Z - x\right) dx + c_1$$

ODE No. 567

$$a\cos\left(y'(x)\right)+by'(x)+x=0$$

✓ **Mathematica** : cpu = 0.0667237 (sec), leaf count = 49

```
DSolve[x + a*Cos[Derivative[1][y][x]] + b*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\left\{y(x)=a\sin(K[1])-aK[1]\cos(K[1])-\frac{1}{2}bK[1]^2+c_1,x=-a\cos(K[1])-bK[1]\right\},\{y(x),K[1]\}\right]$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 18

```
dsolve(a*cos(diff(y(x),x))+b*diff(y(x),x)+x=0,y(x))
```

$$y(x)=\int \text{RootOf}\left(a\cos\left(\_Z\right)+b\_Z+x\right)dx+c_1$$

ODE No. 568

$$y'(x)^2 \sin(y'(x)) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0798205 (sec), leaf count = 34

```
DSolve[-y[x] + Sin[Derivative[1][y][x]]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\text{Solve}\left[\{x = K[1]\sin(K[1]) - \cos(K[1]) + c_1, y(x) = K[1]^2 \sin(K[1])\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.069 (sec), leaf count = 32

```
dsolve(diff(y(x),x)^2*sin(diff(y(x),x))-y(x)=0,y(x))
```

$$y(x) = 0$$

ODE No. 569

$$\left(y'(x)^2+1\right)\sin^2\left(y(x)-xy'(x)\right)-1=0$$

✓ **Mathematica** : cpu = 0.100249 (sec), leaf count = 59

```
DSolve[-1 + Sin[y[x] - x*Derivative[1][y][x]]^2*(1 + Derivative[1][y][x]^2) == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1x-\frac{1}{2}\cos^{-1}\left(\frac{-1+{c_1}^2}{1+{c_1}^2}\right)\right\},\left\{y(x)\to c_1x+\frac{1}{2}\cos^{-1}\left(\frac{-1+{c_1}^2}{1+{c_1}^2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.39 (sec), leaf count = 147

```
dsolve((diff(y(x),x)^2+1)*sin(x*diff(y(x),x)-y(x))^2-1=0,y(x))
```

$$y(x)=-x\sqrt{1-x}\sqrt{\frac{1}{x}}-\arcsin\left(\sqrt{\frac{1}{x}}\,x\right)$$

ODE No. 570

$$\left(y'(x)^2+1\right)\left(ax+\tan^{-1}\left(y'(x)\right)\right)+y'(x)=0$$

✓ **Mathematica** : cpu = 1.676 (sec), leaf count = 58

```
DSolve[Derivative[1][y][x] + (a*x + ArcTan[Derivative[1][y][x]])*(1 + Derivative[1][y][x]^2)
```

$$\text{Solve}\left[\left\{y(x)=\frac{1}{a\left(K[1]^2+1\right)}+c_1, x=\frac{-K[1]+K[1]^2\left(-\tan^{-1}(K[1])\right)-\tan^{-1}(K[1])}{a\left(K[1]^2+1\right)}\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 30

```
dsolve((diff(y(x),x)^2+1)*(arctan(diff(y(x),x))+a*x)+diff(y(x),x)=0,y(x))
```

$$y(x)=\int \tan\left(\text{RootOf}\left(ax\left(\tan^2\left(\_Z\right)\right)+\left(\tan^2\left(\_Z\right)\right)\_Z+ax+\tan\left(\_Z\right)+\_Z\right)\right)dx+c_1$$

ODE No. 571

$$ax^n f(y'(x)) + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.140992 (sec), leaf count = 124

```
DSolve[a*x^n*f[Derivative[1][y][x]] - y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\left\{y(x) = ax^n f(K[1]) + xK[1], x = \left(nf(K[1])^{\frac{1}{n}-1}\int_1^{K[1]} -\frac{f(K[2])^{\frac{n-1}{n}-1}}{an}dK[2] - f(K[1])^{\frac{1}{n}-1}\int_1^{K[1]}\right.\right.$$

✓ **Maple** : cpu = 0.52 (sec), leaf count = 169

```
dsolve(a*x^n*f(diff(y(x),x))+x*diff(y(x),x)-y(x)=0,y(x))
```

$$\left[y(\_T) = a\left(\left(\frac{(1-n)\left(\int f(\_T)^{-\frac{1}{n}}\,d\_T\right) + c_1 an}{anf(\_T)}\right)^{\frac{1}{n-1}} f(\_T)^{\frac{1}{n(n-1)}}\right)^n f(\_T) + \left(\frac{(1-n)\left(\int f(\_T)^{-\frac{1}{n}}\right.\right.\right.$$

ODE No. 572

$$f(y'(x))\left(xy'(x)-y(x)\right)^n+y(x)g(y'(x))+xh(y'(x))=0$$

✗ **Mathematica** : cpu = 0.065879 (sec), leaf count = 0

```
DSolve[x*h[Derivative[1][y][x]] + g[Derivative[1][y][x]]*y[x] + f[Derivative[1][y][x]]*(-y[x]
```

, could not solve

```
DSolve[x*h[Derivative[1][y][x]] + g[Derivative[1][y][x]]*y[x] + f[Derivative[1][y][x]]*
y[x] + x*Derivative[1][y][x])^n == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((x*diff(y(x),x)-y(x))^n*f(diff(y(x),x))+y(x)*g(diff(y(x),x))+x*h(diff(y(x),x))=0,y(x))
```

, could not solve

```
dsolve((x*diff(y(x),x)-y(x))^n*f(diff(y(x),x))+y(x)*g(diff(y(x),x))+x*h(diff(y(x),x))=0
```

ODE No. 573

$$f\left(xy'(x)^2\right)+2xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu $=0.0254396$ (sec), leaf count $=42$

```
DSolve[f[x*Derivative[1][y][x]^2] - y[x] + 2*x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to f(c_1)-2\sqrt{c_1}\sqrt{x},y(x)\to f(c_1)+2\sqrt{c_1}\sqrt{x}\right\}\right\}$$

✓ **Maple** : cpu $=0.141$ (sec), leaf count $=24$

```
dsolve(f(x*diff(y(x),x)^2)+2*x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x)=c_1+2\,\mathrm{RootOf}\left(-f\left(\_Z^2\right)-2\_Z+c_1+c_2\right)\sqrt{x}$$

ODE No. 574

$$f\left(x-\frac{3}{2}y'(x)^2\right)+y'(x)^3-y(x)=0$$

✓ **Mathematica** : cpu = 0.0339602 (sec), leaf count = 102

```
DSolve[f[x - (3*Derivative[1][y][x]^2)/2] - y[x] + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{9}\left(9f(c_1)+2\sqrt{6}x\sqrt{x-c_1}-2\sqrt{6}c_1\sqrt{x-c_1}\right),y(x)\to \frac{1}{9}\left(9f(c_1)-2\sqrt{6}x\sqrt{x-c_1}+2\sqrt{6}c_1\sqrt{x-\right.\right.\right.$$

✓ **Maple** : cpu = 0.141 (sec), leaf count = 41

```
dsolve(f(x-3/2*diff(y(x),x)^2)+diff(y(x),x)^3-y(x)=0,y(x))
```

$$y(x)=f(c_1)-\frac{2\sqrt{6}\sqrt{(-c_1+x)^3}}{9}$$

ODE No. 575

$$y'(x)f\left(xy(x)y'(x)-y(x)^2\right)+x^2(-y'(x))+xy(x)=0$$

✗ **Mathematica** : cpu = 0.0352502 (sec), leaf count = 0

```
DSolve[x*y[x] - x^2*Derivative[1][y][x] + f[-y[x]^2 + x*y[x]*Derivative[1][y][x]]*Derivative[
```

, could not solve

```
DSolve[x*y[x] - x^2*Derivative[1][y][x] + f[-y[x]^2 + x*y[x]*Derivative[1][y][x]]*Deriv
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)*f(x*y(x)*diff(y(x),x)-y(x)^2)-x^2*diff(y(x),x)+x*y(x)=0,y(x))
```

, could not solve

```
dsolve(diff(y(x),x)*f(x*y(x)*diff(y(x),x)-y(x)^2)-x^2*diff(y(x),x)+x*y(x)=0,y(x))
```

ODE No. 576

$$\phi(f(x,y(x),y'(x)),g(x,y(x),y'(x)))=0$$

✗ **Mathematica** : cpu = 0.0165662 (sec), leaf count = 0

```
DSolve[phi[f[x, y[x], Derivative[1][y][x]], g[x, y[x], Derivative[1][y][x]]] == 0,y[x],x]
```

, could not solve

```
DSolve[phi[f[x, y[x], Derivative[1][y][x]], g[x, y[x], Derivative[1][y][x]]] == 0, y[x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(phi(f(x,y(x),diff(y(x),x)),g(x,y(x),diff(y(x),x)))=0,y(x))
```

, could not solve

```
dsolve(phi(f(x,y(x),diff(y(x),x)),g(x,y(x),diff(y(x),x)))=0,y(x))
```

ODE No. 577

$$y'(x) = F\left(\frac{y(x)}{a+x}\right)$$

✓ **Mathematica** : cpu = 0.271736 (sec), leaf count = 243

```
DSolve[Derivative[1][y][x] == F[y[x]/(a + x)],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{1}{-aF\left(\frac{K[2]}{a+x}\right) - xF\left(\frac{K[2]}{a+x}\right) + K[2]} - \int_1^{x} \left(\frac{F'\left(\frac{K[2]}{a+K[1]}\right)}{(a+K[1])\left(aF\left(\frac{K[2]}{a+K[1]}\right) + K[1]F\left(\frac{K[2]}{a+K[1]}\right) - K[\right.\right.\right.$$

✓ **Maple** : cpu = 0.038 (sec), leaf count = 28

```
dsolve(diff(y(x),x) = F(y(x)/(x+a)),y(x))
```

$$y(x) = -\operatorname{RootOf}\left(\int^{-Z} \frac{1}{F(-\_a) + \_a} d\_a + \ln(x+a) + c_1\right)(x+a)$$

ODE No. 578

$$y'(x) = F\left(y(x) - x^2\right) + 2x$$

✓ **Mathematica** : cpu = 0.187151 (sec), leaf count = 100

```
DSolve[Derivative[1][y][x] == 2*x + F[-x^2 + y[x]],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F(K[2]-x^2)\int_1^x -\frac{2K[1]F'(K[2]-K[1]^2)}{F(K[2]-K[1]^2)^2}dK[1]+1}{F\left(K[2]-x^2\right)}dK[2] + \int_1^x \left(\frac{2K[1]}{F\left(y(x)-K[1]^2\right)}+1\right)dK[1] =\right.$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = 2*x+F(y(x)-x^2),y(x))
```

$$y(x) = x^2 + \text{RootOf}\left(-x + \int^{-Z} \frac{1}{F\left(\_a\right)}d\_a + c_1\right)$$

ODE No. 579

$$y'(x) = F\left(\frac{ax^2}{4} + \frac{bx}{2} + y(x)\right) - \frac{ax}{2}$$

✓ **Mathematica** : cpu = 0.284012 (sec), leaf count = 514

```
DSolve[Derivative[1][y][x] == -1/2*(a*x) + F[(b*x)/2 + (a*x^2)/4 + y[x]],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{b\int_1^x \left(\frac{2aK[1]F'\left(\frac{1}{4}aK[1]^2+\frac{1}{2}bK[1]+K[2]\right)}{\left(b+2F\left(\frac{1}{4}aK[1]^2+\frac{1}{2}bK[1]+K[2]\right)\right)^2} + \frac{2F'\left(\frac{1}{4}aK[1]^2+\frac{1}{2}bK[1]+K[2]\right)}{b+2F\left(\frac{1}{4}aK[1]^2+\frac{1}{2}bK[1]+K[2]\right)} - \frac{4F\left(\frac{1}{4}aK[1]^2+\frac{1}{2}bK[1]+K[2]\right)F'\left(\frac{1}{4}aK[1]\right.}{\left(b+2F\left(\frac{1}{4}aK[1]^2+\frac{1}{2}bK[1]+K\right.\right.}\right.\right.$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = -1/2*a*x+F(y(x)+1/4*a*x^2+1/2*b*x),y(x))
```

$$y(x) = -\frac{a\,x^2}{4} - \frac{bx}{2} + \text{RootOf}\left(-x + 2\left(\int^{\_Z} \frac{1}{2F\left(\_a\right) + b} d\_a\right) + c_1\right)$$

ODE No. 580

$$y'(x) = e^{bx} F\left(e^{-bx} y(x)\right)$$

✓ **Mathematica** : cpu = 0.295867 (sec), leaf count = 203

```
DSolve[Derivative[1][y][x] == E^(b*x)*F[y[x]/E^(b*x)],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{1}{bK[2] - e^{bx} F\left(e^{-bx} K[2]\right)} - \int_1^{x} \left(\frac{F'\left(e^{-bK[1]} K[2]\right)}{e^{bK[1]} F\left(e^{-bK[1]} K[2]\right) - bK[2]} - \frac{e^{bK[1]} F\left(e^{-bK[1]} K[2]\right) \left(F'(\right.\right.\right.$$

✓ **Maple** : cpu = 0.075 (sec), leaf count = 31

```
dsolve(diff(y(x),x) = F(y(x)*exp(-b*x))*exp(b*x),y(x))
```

$$y(x) = \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{F\left(\_a\right) - \_ab} d\_a + c_1\right) \mathrm{e}^{bx}$$

ODE No. 581

$$y'(x) = \frac{xF\left(\frac{x^2y(x)+\frac{1}{4}}{x^2}\right)+\frac{1}{2}}{x^3}$$

✓ **Mathematica** : cpu = 0.253463 (sec), leaf count = 144

```
DSolve[Derivative[1][y][x] == (1/2 + x*F[(1/4 + x^2*y[x])/x^2])/x^3,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(\frac{K[2]x^2+\frac{1}{4}}{x^2}\right)\int_1^x -\frac{F'\left(\frac{K[2]K[1]^2+\frac{1}{4}}{K[1]^2}\right)}{2F\left(\frac{K[2]K[1]^2+\frac{1}{4}}{K[1]^2}\right)^2K[1]^3}dK[1]+1}{F\left(\frac{K[2]x^2+\frac{1}{4}}{x^2}\right)}dK[2]+\int_1^x\left(\frac{1}{K[1]^2}+\frac{1}{2K[1]^3F\left(\frac{y(x)K[1]^2+\frac{1}{4}}{K[1]^2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.312 (sec), leaf count = 32

```
dsolve(diff(y(x),x) = 1/2*(1+2*F(1/4*(4*x^2*y(x)+1)/x^2)*x)/x^3,y(x))
```

$$y(x) = \frac{4\,\text{RootOf}\left(\left(\int^{-Z}\frac{1}{F(\_a)}d\_a\right)x+xc_1+1\right)x^2-1}{4x^2}$$

ODE No. 582

$$y'(x) = \frac{ax^2 F\left(\frac{axy(x)+1}{ax}\right) + 1}{ax^2}$$

✓ **Mathematica** : cpu = 0.272169 (sec), leaf count = 142

```
DSolve[Derivative[1][y][x] == (1 + a*x^2*F[(1 + a*x*y[x])/(a*x)])/(a*x^2),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(\frac{axK[2]+1}{ax}\right)\int_1^x \frac{F'\left(\frac{aK[1]K[2]+1}{aK[1]}\right)}{aF\left(\frac{aK[1]K[2]+1}{aK[1]}\right)^2 K[1]^2}dK[1] - 1}{F\left(\frac{axK[2]+1}{ax}\right)}dK[2] + \int_1^x \left(-1 - \frac{1}{aK[1]^2 F\left(\frac{aK[1]y(x)+1}{aK[1]}\right)}\right) d\right.$$

✓ **Maple** : cpu = 0.366 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = (1+F((a*x*y(x)+1)/a/x)*a*x^2)/a/x^2,y(x))
```

$$y(x) = \frac{\text{RootOf}\left(-x + \int^{-Z} \frac{1}{F(\_a)} d\_a + c_1\right) ax - 1}{ax}$$

ODE No. 583

$$y'(x) = -\frac{1}{2}x\left(ax^2 - 2F\left(\frac{ax^4}{8} + y(x)\right)\right)$$

✓ **Mathematica** : cpu = 0.240592 (sec), leaf count = 126

```
DSolve[Derivative[1][y][x] == -1/2*(x*(a*x^2 - 2*F[(a*x^4)/8 + y[x]])),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(\frac{ax^4}{8} + K[2]\right)\int_1^x \frac{aK[1]^3F'\left(\frac{1}{8}aK[1]^4+K[2]\right)}{2F\left(\frac{1}{8}aK[1]^4+K[2]\right)^2}dK[1] + 1}{F\left(\frac{ax^4}{8} + K[2]\right)}dK[2] + \int_1^x \left(K[1] - \frac{aK[1]^3}{2F\left(\frac{1}{8}aK[1]^4 + y(x)\right)}\right.\right.$$

✓ **Maple** : cpu = 0.162 (sec), leaf count = 31

```
dsolve(diff(y(x),x) = -1/2*(a*x^2-2*F(y(x)+1/8*a*x^4))*x,y(x))
```

$$y(x) = -\frac{a\,x^4}{8} + \text{RootOf}\left(-x^2 + 2\left(\int^{-Z} \frac{1}{F\left(\_a\right)}d\_a\right) + 2c_1\right)$$

ODE No. 584

$$y'(x) = \frac{2a}{2aF\left(y(x)^2 - 4ax\right) + y(x)}$$

✓ **Mathematica** : cpu = 0.283631 (sec), leaf count = 115

```
DSolve[Derivative[1][y][x] == (2*a)/(2*a*F[-4*a*x + y[x]^2] + y[x]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{K[2]}{4a^2F\left(K[2]^2 - 4ax\right)} - \frac{2a\int_1^x \frac{K[2]F'(K[2]^2-4aK[1])}{aF(K[2]^2-4aK[1])^2}dK[1] - 1}{2a}\right) dK[2] + \int_1^x -\frac{1}{2aF\left(y(x)^2 - 4aF\right.}\right.$$

✓ **Maple** : cpu = 0.092 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = 2*a/(y(x)+2*F(y(x)^2-4*a*x)*a),y(x))
```

$$\frac{y(x)}{2a} + \frac{\int^{y(x)^2-4ax} \frac{1}{F(\_a)} d\_a}{8a^2} - c_1 = 0$$

ODE No. 585

$$y'(x) = y(x)F(\log(\log(y(x))) - \log(x))$$

✓ **Mathematica** : cpu = 0.241464 (sec), leaf count = 205

```
DSolve[Derivative[1][y][x] == F[-Log[x] + Log[Log[y[x]]]]*y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{1}{K[2](xF(\log(\log(K[2])) - \log(x)) - \log(K[2]))} - \int_1^{x} \left(\frac{F(\log(\log(K[2])) - \log(K[1]))\left(\frac{K[}{(F(\log(\log(K[2])) - \log(K}\right.\right.\right.$$

✓ **Maple** : cpu = 0.491 (sec), leaf count = 120

```
dsolve(diff(y(x),x) = F(ln(ln(y(x)))-ln(x))*y(x),y(x))
```

$$\int_{\_b}^{x} \frac{F(\ln(\ln(y(x))) - \ln(\_a))}{\_aF(\ln(\ln(y(x))) - \ln(\_a)) - \ln(y(x))} d\_a + \int^{y(x)} \left(\frac{1}{\_f(-xF(\ln(\ln(\_f)) - \ln(x)) + \ln(\_f))} - \left(\right.\right.$$

ODE No. 586

$$y'(x) = \frac{xF\left(\frac{y(x)}{\sqrt{x^2+1}}\right)}{\sqrt{x^2+1}}$$

✓ **Mathematica** : cpu = 0.615308 (sec), leaf count = 975

```
DSolve[Derivative[1][y][x] == (x*F[y[x]/Sqrt[1 + x^2]])/Sqrt[1 + x^2],y[x],x]
```

$$\text{Solve}\left[\int_1^x \left(-\frac{K[1]\sqrt{K[1]^2+1}F\left(\frac{y(x)}{\sqrt{K[1]^2+1}}\right)^3}{y(x)\left(K[1]^2F\left(\frac{y(x)}{\sqrt{K[1]^2+1}}\right)^2+F\left(\frac{y(x)}{\sqrt{K[1]^2+1}}\right)^2-y(x)^2\right)}-\frac{K[1]F\left(\frac{y(x)}{\sqrt{K[1]^2+1}}\right)^2}{K[1]^2F\left(\frac{y(x)}{\sqrt{K[1]^2+1}}\right)^2+F\left(\frac{y(x)}{\sqrt{K[1]^2+}\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.286 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = F(y(x)/(x^2+1)^(1/2))*x/(x^2+1)^(1/2),y(x))
```

$$y(x) = \text{RootOf}\left(-\ln\left(x^2+1\right)+2\left(\int^{\_Z}\frac{1}{F\left(\_a\right)-\_a}d\_a\right)+2c_1\right)\sqrt{x^2+1}$$

ODE No. 587

$$y'(x) = \frac{1}{2}\sqrt{x}\left(2F\left(y(x) - \frac{x^3}{6}\right) + x^{3/2}\right)$$

✓ **Mathematica** : cpu = 0.250836 (sec), leaf count = 123

```
DSolve[Derivative[1][y][x] == (Sqrt[x]*(x^(3/2) + 2*F[-1/6*x^3 + y[x]]))/2,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(K[2] - \frac{x^3}{6}\right)\int_1^x -\frac{K[1]^2 F'\left(K[2]-\frac{K[1]^3}{6}\right)}{2F\left(K[2]-\frac{K[1]^3}{6}\right)^2}dK[1] + 1}{F\left(K[2] - \frac{x^3}{6}\right)}dK[2] + \int_1^x \left(\frac{K[1]^2}{2F\left(y(x) - \frac{K[1]^3}{6}\right)} + \sqrt{K[1]}\right.\right.$$

✓ **Maple** : cpu = 0.133 (sec), leaf count = 29

```
dsolve(diff(y(x),x) = 1/2*(x^(3/2)+2*F(y(x)-1/6*x^3))*x^(1/2),y(x))
```

$$\int_{\_b}^{y(x)} \frac{1}{F\left(\_a - \frac{x^3}{6}\right)}d\_a - \frac{2x^{\frac{3}{2}}}{3} - c_1 = 0$$

ODE No. 588

$$y'(x) = \frac{F((y(x)-x)(y(x)+x))+x}{y(x)}$$

✓ **Mathematica** : cpu = 0.204053 (sec), leaf count = 109

```
DSolve[Derivative[1][y][x] == (x + F[(-x + y[x])*(x + y[x])])/y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{K[2]}{F((K[2]-x)(x+K[2]))} - \int_1^{x} -\frac{2K[1]K[2]F'((K[2]-K[1])(K[1]+K[2]))}{F((K[2]-K[1])(K[1]+K[2]))^2} dK[1]\right) dK[2\right.$$

✓ **Maple** : cpu = 0.135 (sec), leaf count = 53

```
dsolve(diff(y(x),x) = (x+F(-(x-y(x))*(y(x)+x)))/y(x),y(x))
```

$$y(x) = \sqrt{x^2 + \text{RootOf}\left(-2x + \int^{\_Z} \frac{1}{F(\_a)} d\_a + 2c_1\right)}$$

ODE No. 589

$$y'(x) = \frac{y(x)^2 F\left(\frac{1-y(x)\log(x)}{y(x)}\right)}{x}$$

✓ **Mathematica** : cpu = 0.250712 (sec), leaf count = 245

```
DSolve[Derivative[1][y][x] == (F[(1 - Log[x]*y[x])/y[x]]*y[x]^2)/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{1}{\left(-F\left(\frac{1-K[2]\log(x)}{K[2]}\right)-1\right)K[2]^2} - \int_1^{x} \left(\frac{\left(-\frac{\log(K[1])}{K[2]} - \frac{1-K[2]\log(K[1])}{K[2]^2}\right)F'\left(\frac{1-K[2]\log(K[1])}{K[2]}\right)}{\left(F\left(\frac{1-K[2]\log(K[1])}{K[2]}\right)+1\right)K[1]} - \right.\right.\right.$$

✓ **Maple** : cpu = 0.167 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = F(-(-1+y(x)*ln(x))/y(x))*y(x)^2/x,y(x))
```

$$\int_{\_b}^{y(x)} \frac{1}{\left(F\left(\frac{1-\_a\ln(x)}{\_a}\right)+1\right)\_a^2} d\_a - \ln(x) - c_1 = 0$$

ODE No. 590

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

✓ **Mathematica** : cpu = 0.2465 (sec), leaf count = 94

```
DSolve[Derivative[1][y][x] == x/(F[x^2 + y[x]^2] - y[x]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{K[2]}{F\left(x^2 + K[2]^2\right)} - \int_1^x \frac{2K[1]K[2]F'(K[1]^2 + K[2]^2)}{F\left(K[1]^2 + K[2]^2\right)^2} dK[1] + 1\right) dK[2] + \int_1^x -\frac{K[1]}{F\left(K[1]^2 + \right.}\right.$$

✓ **Maple** : cpu = 0.144 (sec), leaf count = 28

```
dsolve(diff(y(x),x) = x/(-y(x)+F(y(x)^2+x^2)),y(x))
```

$$-y(x) + \frac{\left(\int^{y(x)^2+x^2} \frac{1}{F(\_a)} d\_a\right)}{2} - c_1 = 0$$

ODE No. 591

$$y'(x) = \frac{xF\left(\frac{ay(x)^2+bx^2}{a}\right)}{\sqrt{a}y(x)}$$

✓ **Mathematica** : cpu = 0.509152 (sec), leaf count = 253

```
DSolve[Derivative[1][y][x] == (x*F[(b*x^2 + a*y[x]^2)/a])/(Sqrt[a]*y[x]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\frac{bK[2]}{b+\sqrt{a}F\left(\frac{bx^2+aK[2]^2}{a}\right)}-\int_1^{x}\left(\frac{2bK[1]K[2]F'\left(\frac{bK[1]^2+aK[2]^2}{a}\right)}{\sqrt{a}\left(b+\sqrt{a}F\left(\frac{bK[1]^2+aK[2]^2}{a}\right)\right)}-\frac{2bF\left(\frac{bK[1]^2+aK[2]^2}{a}\right)K[1]}{\left(b+\sqrt{a}F\left(\frac{bK[1]}{}\right.\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.245 (sec), leaf count = 108

```
dsolve(diff(y(x),x) = F((a*y(x)^2+b*x^2)/a)*x/a^(1/2)/y(x),y(x))
```

$$y(x) = \frac{\sqrt{a\left(-bx^2+\text{RootOf}\left(\left(\int^{-Z}\frac{1}{F(\_a)a+b\sqrt{a}}d\_a\right)ba^{\frac{3}{2}}-bx^2+2c_1a\right)a\right)}}{a}$$

ODE No. 592

$$y'(x) = \frac{F\left(-\frac{2x^3}{5} + y(x) - 2\sqrt{x}\right) + \frac{6x^3}{5} + \sqrt{x}}{x}$$

✓ **Mathematica** : cpu = 0.550474 (sec), leaf count = 241

```
DSolve[Derivative[1][y][x] == (Sqrt[x] + (6*x^3)/5 + F[-2*Sqrt[x] - (2*x^3)/5 + y[x]])/x,y[x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(-\frac{2x^3}{5} - 2\sqrt{x} + K[2]\right)\int_1^x \left(-\frac{6F'\left(-\frac{2}{5}K[1]^3 - 2\sqrt{K[1]} + K[2]\right)K[1]^2}{5F\left(-\frac{2}{5}K[1]^3 - 2\sqrt{K[1]} + K[2]\right)^2} - \frac{F'\left(-\frac{2}{5}K[1]^3 - 2\sqrt{K[1]} + K[2]\right)}{F\left(-\frac{2}{5}K[1]^3 - 2\sqrt{K[1]} + K[2]\right)^2\sqrt{K[1]}}\right.}{F\left(-\frac{2x^3}{5} - 2\sqrt{x} + K[2]\right)}$$

✓ **Maple** : cpu = 0.182 (sec), leaf count = 33

```
dsolve(diff(y(x),x) = 1/5*(6*x^3+5*x^(1/2)+5*F(y(x)-2/5*x^3-2*x^(1/2)))/x,y(x))
```

$$\int_{\_b}^{y(x)} \frac{1}{F\left(\_a - \frac{2x^3}{5} - 2\sqrt{x}\right)} d\_a - \ln(x) - c_1 = 0$$

ODE No. 593

$$y'(x) = \frac{e^x F\left(y(x)^{3/2} - \frac{3e^x}{2}\right)}{\sqrt{y(x)}}$$

✓ **Mathematica** : cpu = 0.408659 (sec), leaf count = 221

```
DSolve[Derivative[1][y][x] == (E^x*F[(-3*E^x)/2 + y[x]^(3/2)])/Sqrt[y[x]],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{\sqrt{K[2]}}{F\left(K[2]^{3/2} - \frac{3e^x}{2}\right) - 1} - \int_1^{x} \left(\frac{3e^{K[1]} F\left(K[2]^{3/2} - \frac{3e^{K[1]}}{2}\right) \sqrt{K[2]} F'\left(K[2]^{3/2} - \frac{3e^{K[1]}}{2}\right)}{2\left(F\left(K[2]^{3/2} - \frac{3e^{K[1]}}{2}\right) - 1\right)^2} - \frac{3e^{K}}{2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.308 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = F(y(x)^(3/2)-3/2*exp(x))/y(x)^(1/2)*exp(x),y(x))
```

$$\int_{\_b}^{y(x)} \frac{\sqrt{\_a}}{F\left(\_a^{\frac{3}{2}} - \frac{3\,\mathrm{e}^x}{2}\right) - 1} d\_a - \mathrm{e}^x - c_1 = 0$$

ODE No. 594

$$y'(x) = \frac{xF\left(\frac{y(x)^2-b}{x^2}\right)}{y(x)}$$

✓ **Mathematica** : cpu = 0.373226 (sec), leaf count = 236

```
DSolve[Derivative[1][y][x] == (x*F[(-b + y[x]^2)/x^2])/y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{K[2]}{-F\left(\frac{K[2]^2-b}{x^2}\right)x^2 + K[2]^2 - b} - \int_1^{x} \left(\frac{F\left(\frac{K[2]^2-b}{K[1]^2}\right)K[1]\left(2K[2]F'\left(\frac{K[2]^2-b}{K[1]^2}\right) - 2K[2]\right)}{\left(F\left(\frac{K[2]^2-b}{K[1]^2}\right)K[1]^2 - K[2]^2 + b\right)^2} - \frac{}{K\right.\right.\right.$$

✓ **Maple** : cpu = 0.14 (sec), leaf count = 67

```
dsolve(diff(y(x),x) = F(-(-y(x)^2+b)/x^2)*x/y(x),y(x))
```

$$y(x) = \sqrt{\text{RootOf}\left(-2\ln(x) + \int^{-Z} \frac{1}{F(\_a) - \_a} d\_a + 2c_1\right)x^2 + b}$$

ODE No. 595

$$y'(x) = \frac{F\left(\frac{xy(x)^2+1}{x}\right)}{x^2 y(x)}$$

✓ **Mathematica** : cpu = 0.338394 (sec), leaf count = 204

```
DSolve[Derivative[1][y][x] == F[(1 + x*y[x]^2)/x]/(x^2*y[x]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{K[2]}{2F\left(\frac{xK[2]^2+1}{x}\right)-1} - \int_1^{x} \left(\frac{4F\left(\frac{K[1]K[2]^2+1}{K[1]}\right)K[2]F'\left(\frac{K[1]K[2]^2+1}{K[1]}\right)}{\left(2F\left(\frac{K[1]K[2]^2+1}{K[1]}\right)-1\right)^2 K[1]^2} - \frac{2K[2]F'\left(\frac{K[1]K[2]^2+1}{K[1]}\right)}{\left(2F\left(\frac{K[1]K[2]^2+1}{K[1]}\right)-1\right)}\right.\right.$$

✓ **Maple** : cpu = 0.181 (sec), leaf count = 72

```
dsolve(diff(y(x),x) = F((x*y(x)^2+1)/x)/y(x)/x^2,y(x))
```

$$y(x) = \frac{\sqrt{x\left(\text{RootOf}\left(\left(\int^{-Z} \frac{1}{-1+2F(\_a)} d\_a\right)x + xc_1 + 1\right)x - 1\right)}}{x}$$

ODE No. 596

$$y'(x) = \frac{F(x^2 + y(x) - x) - 2x^2 + x}{x}$$

✓ **Mathematica** : cpu = 0.285003 (sec), leaf count = 156

```
DSolve[Derivative[1][y][x] == (x - 2*x^2 + F[-x + x^2 + y[x]])/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F(x^2 - x + K[2]) \int_1^x \left(\frac{2K[1]F'(K[1]^2 - K[1] + K[2])}{F(K[1]^2 - K[1] + K[2])^2} - \frac{F'(K[1]^2 - K[1] + K[2])}{F(K[1]^2 - K[1] + K[2])^2}\right) dK[1] + 1}{F(x^2 - x + K[2])} dK[2] + \int_1^x \left(-\right.\right.$$

✓ **Maple** : cpu = 0.105 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = (-2*x^2+x+F(y(x)+x^2-x))/x,y(x))
```

$$y(x) = -x^2 + \text{RootOf}\left(-\ln(x) + \int^{-Z} \frac{1}{F(\_a)} d\_a + c_1\right) + x$$

ODE No. 597

$$y'(x) = \frac{2a}{x^2\left(2aF\left(\frac{xy(x)^2-4a}{x}\right) - y(x)\right)}$$

✓ **Mathematica** : cpu = 0.383257 (sec), leaf count = 130

```
DSolve[Derivative[1][y][x] == (2*a)/(x^2*(2*a*F[(-4*a + x*y[x]^2)/x] - y[x])),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{K[2]}{2aF\left(\frac{xK[2]^2-4a}{x}\right)} - \int_1^x \frac{2K[2]F'\left(\frac{K[1]K[2]^2-4a}{K[1]}\right)}{F\left(\frac{K[1]K[2]^2-4a}{K[1]}\right)^2 K[1]^2} dK[1] + 1\right) dK[2] + \int_1^x -\frac{1}{F\left(\frac{K[1]y(x)^2-4a}{K[1]}\right)}\right.$$

✓ **Maple** : cpu = 0.651 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = 2*a/x^2/(-y(x)+2*F((x*y(x)^2-4*a)/x)*a),y(x))
```

$$-\frac{y(x)}{2a} + \frac{\int^{y(x)^2-\frac{4a}{x}} \frac{1}{F(\_a)} d\_a}{8a^2} - c_1 = 0$$

ODE No. 598

$$y'(x) = \frac{F\left(\frac{y(x)}{x}\right) + y(x)}{x - 1}$$

✓ **Mathematica** : cpu = 0.174556 (sec), leaf count = 37

```
DSolve[Derivative[1][y][x] == (F[y[x]/x] + y[x])/(-1 + x),y[x],x]
```

$$\text{Solve}\left[\int_1^{\frac{y(x)}{x}} \frac{1}{F(K[1]) + K[1]} dK[1] = \log(1 - x) - \log(x) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.025 (sec), leaf count = 29

```
dsolve(diff(y(x),x) = (y(x)+F(y(x)/x))/(x-1),y(x))
```

$$y(x) = \text{RootOf}\left(-\left(\int^{-Z} \frac{1}{F\left(\_a\right) + \_a} d\_a\right) + \ln\left(x - 1\right) - \ln\left(x\right) + c_1\right) x$$

ODE No. 599

$$y'(x) = \frac{F(x^2 + y(x)^2) - x}{y(x)}$$

✓ **Mathematica** : cpu = 0.164708 (sec), leaf count = 95

```
DSolve[Derivative[1][y][x] == (-x + F[x^2 + y[x]^2])/y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{K[2]}{F\left(x^2 + K[2]^2\right)} - \int_1^x \frac{2K[1]K[2]F'(K[1]^2 + K[2]^2)}{F\left(K[1]^2 + K[2]^2\right)^2} dK[1]\right) dK[2] + \int_1^x \left(1 - \frac{K[1]}{F\left(K[1]^2 + \right.\right.\right.$$

✓ **Maple** : cpu = 0.106 (sec), leaf count = 57

```
dsolve(diff(y(x),x) = (-x+F(y(x)^2+x^2))/y(x),y(x))
```

$$y(x) = \sqrt{-x^2 + \text{RootOf}\left(-2x + \int^{-Z} \frac{1}{F\left(\_a\right)} d\_a + 2c_1\right)}$$

ODE No. 600

$$y'(x) = \frac{y(x)^2 F\left(\frac{1-2y(x)\log(x)}{y(x)}\right)}{x}$$

✓ **Mathematica** : cpu = 0.290184 (sec), leaf count = 246

```
DSolve[Derivative[1][y][x] == (F[(1 - 2*Log[x]*y[x])/y[x]]*y[x]^2)/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\int_1^x\left(\frac{2\left(-\frac{2\log(K[1])}{K[2]}-\frac{1-2K[2]\log(K[1])}{K[2]^2}\right)F'\left(\frac{1-2K[2]\log(K[1])}{K[2]}\right)}{\left(F\left(\frac{1-2K[2]\log(K[1])}{K[2]}\right)+2\right)K[1]}-\frac{2F\left(\frac{1-2K[2]\log(K[1])}{K[2]}\right)\left(-\frac{2\log(K}{K[2}\right.}{\left(F\left(\frac{1-2K}{}\right.\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.142 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = F(-(2*y(x)*ln(x)-1)/y(x))*y(x)^2/x,y(x))
```

$$\int_{_b}^{y(x)} \frac{1}{\left(F\left(\frac{-2_a\ln(x)+1}{_a}\right)+2\right)_a^2} d_a - \ln(x) - c_1 = 0$$

ODE No. 601

$$y'(x) = \frac{xF((y(x)-x)(y(x)+x))}{y(x)}$$

✓ **Mathematica** : cpu = 0.255247 (sec), leaf count = 182

```
DSolve[Derivative[1][y][x] == (x*F[(-x + y[x])*(x + y[x])])/y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{K[2]}{F((K[2]-x)(x+K[2]))-1} - \int_1^{x} \left(\frac{2F((K[2]-K[1])(K[1]+K[2]))K[1]K[2]F'((K[2]-}{(F((K[2]-K[1])(K[1]+K[2]))-}\right.\right.$$

✓ **Maple** : cpu = 0.13 (sec), leaf count = 61

```
dsolve(diff(y(x),x) = F(-(x-y(x))*(y(x)+x))*x/y(x),y(x))
```

$$y(x) = \sqrt{x^2 + \text{RootOf}\left(-x^2 + \int^{-Z} \frac{1}{F(\_a)-1} d\_a + 2c_1\right)}$$

ODE No. 602

$$y'(x) = \frac{y(x)^2 \left(x^2 F\left(\frac{x^2-y(x)}{x^2 y(x)}\right) + 2\right)}{x^3}$$

✓ **Mathematica** : cpu = 0.509008 (sec), leaf count = 167

```
DSolve[Derivative[1][y][x] == ((2 + x^2*F[(x^2 - y[x])/(x^2*y[x])])*y[x]^2)/x^3,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\int_1^x -\frac{2\left(-\frac{K[1]^2-K[2]}{K[1]^2K[2]^2} - \frac{1}{K[1]^2K[2]}\right) F'\left(\frac{K[1]^2-K[2]}{K[1]^2K[2]}\right)}{F\left(\frac{K[1]^2-K[2]}{K[1]^2K[2]}\right)^2 K[1]^3} dK[1] - \frac{1}{F\left(\frac{x^2-K[2]}{x^2K[2]}\right) K[2]^2}\right) dK[2] + \int_1^x$$

✓ **Maple** : cpu = 0.127 (sec), leaf count = 33

```
dsolve(diff(y(x),x) = 1/x^3*y(x)^2*(2+F((x^2-y(x))/y(x)/x^2)*x^2),y(x))
```

$$y(x) = \frac{x^2}{\text{RootOf}\left(-\ln(x) - \left(\int^{-Z} \frac{1}{F(\_a)} d\_a\right) + c_1\right) x^2 + 1}$$

ODE No. 603

$$y'(x) = \frac{2xF(y(x)+\log(2x+1)) + F(y(x)+\log(2x+1)) - 2}{2x+1}$$

✓ **Mathematica** : cpu = 0.351902 (sec), leaf count = 117

```
DSolve[Derivative[1][y][x] == (-2 + F[Log[1 + 2*x] + y[x]] + 2*x*F[Log[1 + 2*x] + y[x]])/(1 +
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F(K[2]+\log(2x+1))\int_1^x -\frac{2F'(K[2]+\log(2K[1]+1))}{F(K[2]+\log(2K[1]+1))^2(2K[1]+1)}dK[1]-1}{F(K[2]+\log(2x+1))}dK[2] + \int_1^x \left(\frac{}{F(\log(2K[1]\right.\right.$$

✓ **Maple** : cpu = 0.155 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = 1/(2*x+1)*(2*F(y(x)+ln(2*x+1))*x+F(y(x)+ln(2*x+1))-2),y(x))
```

$$y(x) = -\ln(2x+1) + \text{RootOf}\left(-x + \int^{-Z} \frac{1}{F(\_a)}d\_a + c_1\right)$$

ODE No. 604

$$y'(x) = \frac{2y(x)^3}{2y(x)F\left(\frac{4xy(x)^2+1}{y(x)^2}\right)+1}$$

✓ **Mathematica** : cpu = 0.393198 (sec), leaf count = 143

```
DSolve[Derivative[1][y][x] == (2*y[x]^3)/(1 + 2*F[(1 + 4*x*y[x]^2)/y[x]^2]*y[x]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\int_1^x \frac{\left(\frac{8K[1]}{K[2]}-\frac{2(4K[1]K[2]^2+1)}{K[2]^3}\right)F'\left(\frac{4K[1]K[2]^2+1}{K[2]^2}\right)}{F\left(\frac{4K[1]K[2]^2+1}{K[2]^2}\right)^2}dK[1]+\frac{1}{K[2]^2}+\frac{1}{2F\left(\frac{4xK[2]^2+1}{K[2]^2}\right)K[2]^3}\right)dK\right.$$

✓ **Maple** : cpu = 0.176 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = 2*y(x)^3/(1+2*F((1+4*x*y(x)^2)/y(x)^2)*y(x)),y(x))
```

$$-c_1-\frac{1}{y(x)}-\frac{\left(\int^{4x+\frac{1}{y(x)^2}}\frac{1}{F(\_a)}d\_a\right)}{4}=0$$

ODE No. 605

$$y'(x) = -\frac{y(x)^2 \left(2x - F\left(\frac{1-\frac{1}{2}xy(x)}{y(x)}\right)\right)}{4x}$$

✓ **Mathematica** : cpu = 0.463128 (sec), leaf count = 145

```
DSolve[Derivative[1][y][x] == -1/4*((2*x - F[(1 - (x*y[x])/2)/y[x]])*y[x]^2)/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\int_1^x \frac{2\left(-\frac{K[1]}{2K[2]} - \frac{1-\frac{1}{2}K[1]K[2]}{K[2]^2}\right) F'\left(\frac{1-\frac{1}{2}K[1]K[2]}{K[2]}\right)}{F\left(\frac{1-\frac{1}{2}K[1]K[2]}{K[2]}\right)^2} dK[1] - \frac{4}{F\left(\frac{1-\frac{1}{2}xK[2]}{K[2]}\right) K[2]^2}\right) dK[2] + \int_1^x \left(\right.\right.$$

✓ **Maple** : cpu = 0.138 (sec), leaf count = 29

```
dsolve(diff(y(x),x) = -1/4*y(x)^2*(2*x-F(-1/2*(x*y(x)-2)/y(x)))/x,y(x))
```

$$y(x) = \frac{2}{2\,\text{RootOf}\left(-\ln(x) - 4\left(\int^{-Z} \frac{1}{F(\_a)} d\_a\right) + c_1\right) + x}$$

ODE No. 606

$$y'(x) = x\left(F\left(y(x) - \frac{1}{2}e^{-x^2}x^2\right) - e^{-x^2}x^2 + e^{-x^2}\right)$$

✓ **Mathematica** : cpu = 0.603505 (sec), leaf count = 361

```
DSolve[Derivative[1][y][x] == x*(E^(-x^2) - x^2/E^x^2 + F[-1/2*x^2/E^x^2 + y[x]]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(K[2] - \frac{1}{2}e^{-x^2}x^2\right)\int_1^x \left(\frac{e^{-K[1]^2}F'\left(K[2]-\frac{1}{2}e^{-K[1]^2}K[1]^2\right)K[1]^3}{F\left(K[2]-\frac{1}{2}e^{-K[1]^2}K[1]^2\right)^2} - \frac{e^{-K[1]^2}\left(e^{K[1]^2}F\left(K[2]-\frac{1}{2}e^{-K[1]^2}K[1]^2\right)+1\right.}{F\left(K[2]-\frac{1}{2}e^{-K[1]^2}K[1]^2\right.}\right.}{F\left(K[2] - \frac{1}{2}e^{-x^2}x^2\right)}\right.$$

✓ **Maple** : cpu = 0.679 (sec), leaf count = 34

```
dsolve(diff(y(x),x) = -(-exp(-x^2)+x^2*exp(-x^2)-F(y(x)-1/2*x^2*exp(-x^2)))*x,y(x))
```

$$y(x) = \frac{x^2\mathrm{e}^{-x^2}}{2} + \text{RootOf}\left(x^2 - 2\left(\int^{-Z} \frac{1}{F\left(\_a\right)}d\_a\right) + 2c_1\right)$$

ODE No. 607

$$y'(x) = \frac{x^3 F\left(\frac{y(x)}{x^2}\right) + 2y(x)}{x}$$

✓ **Mathematica** : cpu = 0.233257 (sec), leaf count = 121

```
DSolve[Derivative[1][y][x] == (x^3*F[y[x]/x^2] + 2*y[x])/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(\frac{K[2]}{x^2}\right)\int_1^x \left(\frac{2}{F\left(\frac{K[2]}{K[1]^2}\right)K[1]^3} - \frac{2K[2]F'\left(\frac{K[2]}{K[1]^2}\right)}{F\left(\frac{K[2]}{K[1]^2}\right)^2 K[1]^5}\right) dK[1]x^2 + 1}{x^2 F\left(\frac{K[2]}{x^2}\right)} dK[2] + \int_1^x \left(\frac{2y(x)}{F\left(\frac{y(x)}{K[1]^2}\right)K[1]^3} + 1\right.\right.$$

✓ **Maple** : cpu = 0.11 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = (2*y(x)+F(1/x^2*y(x))*x^3)/x,y(x))
```

$$y(x) = \text{RootOf}\left(-x + \int^{-Z} \frac{1}{F(\_a)} d\_a + c_1\right) x^2$$

ODE No. 608

$$y'(x) = \frac{\sqrt{y(x)}}{F\left(\frac{x-y(x)}{\sqrt{y(x)}}\right) + \sqrt{y(x)}}$$

✓ **Mathematica** : cpu = 0.452795 (sec), leaf count = 274

```
DSolve[Derivative[1][y][x] == Sqrt[y[x]]/(F[(x - y[x])/Sqrt[y[x]]] + Sqrt[y[x]]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{F\left(\frac{x-K[2]}{\sqrt{K[2]}}\right)}{x\sqrt{K[2]}} - \int_1^{x} -\frac{-\frac{F\left(\frac{K[1]-K[2]}{\sqrt{K[2]}}\right)}{\sqrt{K[2]}} - 2\left(-\frac{K[1]-K[2]}{2K[2]^{3/2}} - \frac{1}{\sqrt{K[2]}}\right)\sqrt{K[2]}F'\left(\frac{K[1]-K[2]}{\sqrt{K[2]}}\right) - 1}{\left(-2\sqrt{K[2]}F\left(\frac{K[1]-K[2]}{\sqrt{K[2]}}\right) + K[1] - K[2]\right)^2} dK[1\right.\right.$$

✓ **Maple** : cpu = 0.17 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = y(x)^(1/2)/(y(x)^(1/2)+F((x-y(x))/y(x)^(1/2))),y(x))
```

$$\frac{\ln(y(x))}{2} - \left(\int^{\frac{x}{\sqrt{y(x)}} - \sqrt{y(x)}} \frac{1}{2F(\_a) - \_a} d\_a \right) - c_1 = 0$$

ODE No. 609

$$y'(x) = \frac{F(x^3 y(x)) - 3x^2 y(x)}{x^3}$$

✓ **Mathematica** : cpu = 0.284743 (sec), leaf count = 117

```
DSolve[Derivative[1][y][x] == (F[x^3*y[x]] - 3*x^2*y[x])/x^3,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{x^3 + F(x^3 K[2]) \int_1^x \left(\frac{3K[1]^5 K[2] F'(K[1]^3 K[2])}{F(K[1]^3 K[2])^2} - \frac{3K[1]^2}{F(K[1]^3 K[2])}\right) dK[1]}{F\left(x^3 K[2]\right)} dK[2] + \int_1^x \left(1 - \frac{3K[1]^2 y(x}{F\left(K[1]^3 y(\right.}\right.$$

✓ **Maple** : cpu = 0.269 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = (-3*x^2*y(x)+F(x^3*y(x)))/x^3,y(x))
```

$$y(x) = \frac{\text{RootOf}\left(x - \left(\int^{-Z} \frac{1}{F(\_a)} d\_a\right) + c_1\right)}{x^3}$$

ODE No. 610

$$y'(x) = \frac{x^2 F\left(\frac{y(x)}{x}\right) + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.0977757 (sec), leaf count = 25

```
DSolve[Derivative[1][y][x] == (x^2*F[y[x]/x] + y[x])/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{\frac{y(x)}{x}} \frac{1}{F(K[1])} dK[1] = x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 20

```
dsolve(diff(y(x),x) = (y(x)+F(y(x)/x)*x^2)/x,y(x))
```

$$y(x) = \text{RootOf}\left(x - \left(\int^{\_Z} \frac{1}{F\left(\_a\right)} d\_a\right) + c_1\right) x$$

ODE No. 611

$$y'(x) = \frac{F(x(y(x)+x)) - y(x) - 2x}{x}$$

✓ **Mathematica** : cpu = 0.283096 (sec), leaf count = 191

```
DSolve[Derivative[1][y][x] == (-2*x + F[x*(x + y[x])] - y[x])/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{x + F(x(x+K[2]))\int_1^x \left(\frac{2F'(K[1](K[1]+K[2]))K[1]^2}{F(K[1](K[1]+K[2]))^2} + \frac{(K[2]-F(K[1](K[1]+K[2])))F'(K[1](K[1]+K[2]))K[1]}{F(K[1](K[1]+K[2]))^2} - \right.}{F(x(x+K[2]))}$$

✓ **Maple** : cpu = 0.097 (sec), leaf count = 28

```
dsolve(diff(y(x),x) = (-2*x-y(x)+F(x*(y(x)+x)))/x,y(x))
```

$$y(x) = \frac{-x^2 + \text{RootOf}\left(-x + \int^{-Z} \frac{1}{F(\_a)} d\_a + c_1\right)}{x}$$

ODE No. 612

$$y'(x) = \frac{1}{2} e^{\frac{x^2}{4}} \left(2F\left(e^{-\frac{x^2}{4}} y(x) \right) + e^{-\frac{x^2}{4}} x y(x) \right)$$

✓ **Mathematica** : cpu = 0.383425 (sec), leaf count = 199

```
DSolve[Derivative[1][y][x] == (E^(x^2/4)*(2*F[y[x]/E^(x^2/4)] + (x*y[x])/E^(x^2/4)))/2,y[x],x
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{e^{-\frac{x^2}{4}} \left(e^{\frac{x^2}{4}} F\left(e^{-\frac{x^2}{4}} K[2] \right) \int_1^x \left(\frac{e^{-\frac{1}{4}K[1]^2} K[1]}{2F\left(e^{-\frac{1}{4}K[1]^2} K[2] \right)} - \frac{e^{-\frac{1}{2}K[1]^2} K[1] K[2] F'\left(e^{-\frac{1}{4}K[1]^2} K[2] \right)}{2F\left(e^{-\frac{1}{4}K[1]^2} K[2] \right)^2} \right) dK[1] + 1 \right)}{F\left(e^{-\frac{x^2}{4}} K[2] \right)} d \right.$$

✓ **Maple** : cpu = 0.142 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = 1/2*(y(x)*exp(-1/4*x^2)*x+2*F(y(x)*exp(-1/4*x^2)))*exp(1/4*x^2),y(x))
```

$$y(x) = \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{F(\_a)} d\_a + c_1 \right) e^{\frac{x^2}{4}}$$

ODE No. 613

$$y'(x) = \frac{x^2 F\left(\frac{y(x)-x\log(x)}{x}\right) + y(x) + x}{x}$$

✓ **Mathematica** : cpu = 0.310001 (sec), leaf count = 226

```
DSolve[Derivative[1][y][x] == (x + x^2*F[(-(x*Log[x]) + y[x])/x] + y[x])/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{xF\left(\frac{K[2]-x\log(x)}{x}\right)\int_1^x\left(-\frac{K[2]F'\left(\frac{K[2]-K[1]\log(K[1])}{K[1]}\right)}{F\left(\frac{K[2]-K[1]\log(K[1])}{K[1]}\right)^2 K[1]^3} - \frac{F'\left(\frac{K[2]-K[1]\log(K[1])}{K[1]}\right)}{F\left(\frac{K[2]-K[1]\log(K[1])}{K[1]}\right)^2 K[1]^2} + \frac{1}{F\left(\frac{K[2]-K[1]\log(K[1])}{K[1]}\right)}\right.}{xF\left(\frac{K[2]-x\log(x)}{x}\right)}\right.$$

✓ **Maple** : cpu = 0.109 (sec), leaf count = 23

```
dsolve(diff(y(x),x) = (x+y(x)+F(-(-y(x)+x*ln(x))/x)*x^2)/x,y(x))
```

$$y(x) = \left(\ln(x) + \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{F(\_a)} d\_a + c_1\right)\right) x$$

ODE No. 614

$$y'(x) = \frac{(a-1)(a+1)x}{a^2 F\left(-\frac{1}{2}a^2x^2 + \frac{x^2}{2} + \frac{y(x)^2}{2}\right) - F\left(-\frac{1}{2}a^2x^2 + \frac{x^2}{2} + \frac{y(x)^2}{2}\right) + y(x)}$$

✓ **Mathematica** : cpu = 0.389328 (sec), leaf count = 177

```
DSolve[Derivative[1][y][x] == ((-1 + a)*(1 + a)*x)/(-F[x^2/2 - (a^2*x^2)/2 + y[x]^2/2] + a^2*
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{K[2]}{(a-1)(a+1)F\left(-\frac{1}{2}a^2x^2 + \frac{x^2}{2} + \frac{K[2]^2}{2}\right)} - \int_1^x \frac{K[1]K[2]F'\left(-\frac{1}{2}a^2K[1]^2 + \frac{K[1]^2}{2} + \frac{K[2]^2}{2}\right)}{F\left(-\frac{1}{2}a^2K[1]^2 + \frac{K[1]^2}{2} + \frac{K[2]^2}{2}\right)^2} dK\right.\right.$$

✓ **Maple** : cpu = 0.461 (sec), leaf count = 60

```
dsolve(diff(y(x),x) = x*(a-1)*(a+1)/(y(x)+F(1/2*y(x)^2-1/2*a^2*x^2+1/2*x^2)*a^2-F(1/2*y(x)^2-
```

$$\frac{y(x)}{(a-1)(a+1)} + \frac{\int^{-a^2x^2+x^2+y(x)^2} \frac{1}{F\left(\frac{a}{2}\right)} d\_a}{2a^4 - 4a^2 + 2} - c_1 = 0$$

ODE No. 615

$$y'(x) = \frac{y(x)}{x(y(x)F(xy(x)) - 1)}$$

✓ **Mathematica** : cpu = 0.266676 (sec), leaf count = 77

```
DSolve[Derivative[1][y][x] == y[x]/(x*(-1 + F[x*y[x]]*y[x])),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\int_1^x \frac{F'(K[1]K[2])}{F(K[1]K[2])^2} dK[1] - \frac{1}{F(xK[2])K[2]} + 1\right) dK[2] + \int_1^x -\frac{1}{F(K[1]y(x))K[1]} dK[1] = c\right.$$

✓ **Maple** : cpu = 0.142 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = y(x)/x/(-1+F(x*y(x))*y(x)),y(x))
```

$$-y(x) + \int^{xy(x)} \frac{1}{F(\_a)\_a} d\_a - c_1 = 0$$

ODE No. 616

$$y'(x) = \frac{F(x(xy(x)-1)) - 2x^3 y(x) + x^2}{x^4}$$

✓ **Mathematica** : cpu = 0.469631 (sec), leaf count = 177

```
DSolve[Derivative[1][y][x] == (x^2 + F[x*(-1 + x*y[x])] - 2*x^3*y[x])/x^4,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{x^2 + F(x(xK[2]-1))\int_1^x \left(\frac{2K[2]F'(K[1](K[1]K[2]-1))K[1]^3}{F(K[1](K[1]K[2]-1))^2} - \frac{F'(K[1](K[1]K[2]-1))K[1]^2}{F(K[1](K[1]K[2]-1))^2} - \frac{2K[1]}{F(K[1](K[1]K[2]$$

✓ **Maple** : cpu = 0.09 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = -1/x^4*(-x^2+2*x^3*y(x)-F((x*y(x)-1)*x)),y(x))
```

$$y(x) = \frac{\text{RootOf}\left(\left(\int^{-Z} \frac{1}{F(\_a)} d\_a\right) x + x c_1 + 1\right) + x}{x^2}$$

ODE No. 617

$$y'(x) = \frac{1}{9} e^{-\frac{3x^2}{2}} x y(x)^2 F\left(\frac{e^{\frac{3x^2}{2}}(y(x)+3)}{3y(x)}\right)$$

✓ **Mathematica** : cpu = 0.990258 (sec), leaf count = 615

```
DSolve[Derivative[1][y][x] == (x*F[(E^((3*x^2)/2)*(3 + y[x]))/(3*y[x])]*y[x]^2)/(9*E^((3*x^2)
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{9e^{\frac{3x^2}{2}} - F\left(\frac{e^{\frac{3x^2}{2}}(K[2]+3)}{3K[2]}\right)}{3\left(\left(9e^{\frac{3x^2}{2}} - F\left(\frac{e^{\frac{3x^2}{2}}(K[2]+3)}{3K[2]}\right)\right)K[2] + 27e^{\frac{3x^2}{2}}\right)} - \int_1^{x} \left(-\frac{K[2]\left(\frac{e^{\frac{3K[1]^2}{2}}}{3K[2]} - \frac{e^{\frac{3K[1]^2}{2}}(K[2]+3)}{3K[2]^2}\right)}{-9e^{\frac{3K[1]^2}{2}}K[2] + F\left(\frac{e^{\frac{3K[1]^2}{2}}(K[2]\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.248 (sec), leaf count = 47

```
dsolve(diff(y(x),x) = 1/9*F(1/3*(3+y(x))*exp(3/2*x^2)/y(x))*x*y(x)^2*exp(3*x^2)/exp(9/2*x^2),
```

$$y(x) = -\frac{3\,\mathrm{e}^{\frac{3x^2}{2}}}{\mathrm{e}^{\frac{3x^2}{2}} - 3\,\mathrm{RootOf}\left(-x^2 - 18\left(\int^{-Z} \frac{1}{F(\_a)-27\_a} d\_a\right) + 2c_1\right)}$$

ODE No. 618

$$y'(x) = \frac{(y(x)+1)(x(y(x)-\log(y(x)+1)-\log(x))+1)}{xy(x)}$$

✓ **Mathematica** : cpu = 0.210125 (sec), leaf count = 25

```
DSolve[Derivative[1][y][x] == ((1 + y[x])*(1 + x*(-Log[x] - Log[1 + y[x]] + y[x])))/(x*y[x]),
```

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

✓ **Maple** : cpu = 0.549 (sec), leaf count = 34

```
dsolve(diff(y(x),x) = (1+y(x))*((y(x)-ln(1+y(x))-ln(x))*x+1)/y(x)/x,y(x))
```

$$y(x) = \frac{\mathrm{e}^{-\mathrm{LambertW}\left(-\frac{\mathrm{e}^{c_1 \mathrm{e}^x - 1}}{x}\right) + c_1 \mathrm{e}^x - 1}}{x} - x$$

ODE No. 619

$$y'(x) = \frac{6y(x)}{-F\left(-\frac{1}{3}y(x)^4 - \frac{y(x)^3}{2} - y(x)^2 - y(x) + x\right) + 8y(x)^4 + 9y(x)^3 + 12y(x)^2 + 6y(x)}$$

✓ **Mathematica** : cpu = 0.693716 (sec), leaf count = 330

```
DSolve[Derivative[1][y][x] == (6*y[x])/(-F[x - y[x] - y[x]^2 - y[x]^3/2 - y[x]^4/3] + 6*y[x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{8K[2]^3}{F\left(-\frac{1}{3}K[2]^4 - \frac{K[2]^3}{2} - K[2]^2 - K[2] + x\right)} - \frac{9K[2]^2}{F\left(-\frac{1}{3}K[2]^4 - \frac{K[2]^3}{2} - K[2]^2 - K[2] + x\right)} -\right.\right.$$

✓ **Maple** : cpu = 0.403 (sec), leaf count = 81

```
dsolve(diff(y(x),x) = 6*y(x)/(8*y(x)^4+9*y(x)^3+12*y(x)^2+6*y(x)-F(-1/3*y(x)^4-1/2*y(x)^3-y(x
```

$$\int_{\_b}^{y(x)} \frac{-8\_a^4 - 9\_a^3 - 12\_a^2 + F\left(-\frac{1}{3}\_a^4 - \frac{1}{2}\_a^3 - \_a^2 - \_a + x\right) - 6\_a}{F\left(-\frac{1}{3}\_a^4 - \frac{1}{2}\_a^3 - \_a^2 - \_a + x\right)\_a} d\_a - c_1 = 0$$

ODE No. 620

$$y'(x) = \frac{e^{2F((y(x)-x)(y(x)+x))} + x^2 + 2xy(x) + y(x)^2}{-e^{2F((y(x)-x)(y(x)+x))} + x^2 + 2xy(x) + y(x)^2}$$

✓ **Mathematica** : cpu = 0.802721 (sec), leaf count = 205

```
DSolve[Derivative[1][y][x] == (E^(2*F[(-x + y[x])*(x + y[x])]) + x^2 + 2*x*y[x] + y[x]^2)/(-E
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{2K[2]}{-x^2 + e^{2F((K[2]-x)(x+K[2]))} + K[2]^2} - \int_1^{x} \left(\frac{2K[1]\left(-4e^{2F((K[2]-K[1])(K[1]+K[2]))}F'((K[2]-K\right.\right.\right.$$

✓ **Maple** : cpu = 0.246 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = (y(x)^2+2*x*y(x)+x^2+exp(2*F(-(x-y(x))*(y(x)+x))))/(y(x)^2+2*x*y(x)+x^2
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-\_Z + \int^{\mathrm{e}^{2\_Z}-2\,\mathrm{e}^{\_Z}x} \frac{1}{\mathrm{e}^{2F(\_a)}+\_a}\,d\_a + c_1\right)} - x$$

ODE No. 621

$$y'(x) = \frac{1}{y(x) + \sqrt{x}}$$

✓ **Mathematica** : cpu = 0.0649803 (sec), leaf count = 445

```
DSolve[Derivative[1][y][x] == (Sqrt[x] + y[x])^(-1),y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{x} + \frac{1}{\text{Root}\left[\#1^6\left(16x^3 + 16e^{12c_1}\right) - 24\#1^4x^2 + 8\#1^3x^{3/2} + 9\#1^2x - 6\#1\sqrt{x} + 1\&, 1\right]}\right\}, \left\{y\right.$$

✓ **Maple** : cpu = 0.246 (sec), leaf count = 59

```
dsolve(diff(y(x),x) = 1/(y(x)+x^(1/2)),y(x))
```

$$y(x) = \frac{\sqrt{x}\ \text{RootOf}\left(\_Z^{18}c_1 - 9x\_Z^6 - 6\sqrt{x}\_Z^3 - 1\right)^3 + 1}{\text{RootOf}\left(\_Z^{18}c_1 - 9x\_Z^6 - 6\sqrt{x}\_Z^3 - 1\right)^3}$$

ODE No. 622

$$y'(x) = \frac{1}{y(x) + \sqrt{3x+1} + 2}$$

✓ **Mathematica** : cpu = 0.311572 (sec), leaf count = 140

```
DSolve[Derivative[1][y][x] == (2 + Sqrt[1 + 3*x] + y[x])^(-1),y[x],x]
```

$$\text{Solve}\left[6\sqrt{33}\tanh^{-1}\left(\frac{3y(x)+7\sqrt{3x+1}+6}{\sqrt{33}\left(y(x)+\sqrt{3x+1}+2\right)}\right)+44c_1 = 33\left(\log\left(\frac{-3\sqrt{3x+1}y(x)^2-3\left(3x+4\sqrt{3x+\right.\right.\right.$$

✓ **Maple** : cpu = 0.217 (sec), leaf count = 77

```
dsolve(diff(y(x),x) = 1/(y(x)+2+(3*x+1)^(1/2)),y(x))
```

$$\ln\left(\left(3y(x)+6\right)\sqrt{3x+1}+3y(x)^2-6x+12y(x)+10\right)-\frac{6\sqrt{3x+1}\,\text{arctanh}\left(\frac{3\sqrt{3x+1}+6y(x)+12}{\sqrt{99x+33}}\right)}{\sqrt{99x+33}}-c_1 = 0$$

ODE No. 623

$$y'(x) = \frac{x^2}{x^{3/2} + y(x)}$$

✓ **Mathematica** : cpu = 0.203697 (sec), leaf count = 77

```
DSolve[Derivative[1][y][x] == x^2/(x^(3/2) + y[x]),y[x],x]
```

$$\text{Solve}\left[6\sqrt{33}\tanh^{-1}\left(\frac{7x^{3/2}+3y(x)}{\sqrt{33}\left(x^{3/2}+y(x)\right)}\right)+44c_1 = 33\left(\log\left(-\frac{3y(x)}{2x^{3/2}}-\frac{3y(x)^2}{2x^3}+1\right)+3\log(x)\right), y(x)\right]$$

✓ **Maple** : cpu = 0.255 (sec), leaf count = 49

```
dsolve(diff(y(x),x) = x^2/(y(x)+x^(3/2)),y(x))
```

$$\ln\left(3x^{\frac{3}{2}}y(x) - 2x^3 + 3y(x)^2\right) - \frac{2\sqrt{33}\ \text{arctanh}\left(\frac{\left(x^{\frac{3}{2}}+2y(x)\right)\sqrt{33}}{11x^{\frac{3}{2}}}\right)}{11} - c_1 = 0$$

ODE No. 624

$$y'(x) = \frac{x^{5/3}}{x^{4/3} + y(x)}$$

✓ **Mathematica** : cpu = 24.6633 (sec), leaf count = 9837

```
DSolve[Derivative[1][y][x] == x^(5/3)/(x^(4/3) + y[x]),y[x],x]
```

✓ **Maple** : cpu = 29.544 (sec), leaf count = 46

```
dsolve(diff(y(x),x) = x^(5/3)/(y(x)+x^(4/3)),y(x))
```

$$y(x) = \frac{\text{RootOf}\left(\_Z^{192} + 12x^{\frac{4}{3}}\_Z^{176} + 48x^{\frac{8}{3}}\_Z^{160} + 64x^4\_Z^{144} - c_1\right)^{16}}{2} + \frac{x^{\frac{4}{3}}}{2}$$

ODE No. 625

$$y'(x) = \frac{1}{2} i x^2 \left(-2\sqrt{6y(x) - x^3} + i\right)$$

✓ **Mathematica** : cpu = 0.308303 (sec), leaf count = 56

```
DSolve[Derivative[1][y][x] == (I/2)*x^2*(I - 2*Sqrt[-x^3 + 6*y[x]]),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{6}\left(-W\left(ie^{-x^3-1-6c_1}\right)^2 - 2W\left(ie^{-x^3-1-6c_1}\right) + x^3 - 1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.271 (sec), leaf count = 53

```
dsolve(diff(y(x),x) = 1/2*I*x^2*(I-2*(-x^3+6*y(x))^(1/2)),y(x))
```

$$\ln\left(x^3 - 6y(x) - 1\right) - 2i\sqrt{-x^3 + 6y\left(x\right)} + 2i \arctan\left(\sqrt{-x^3 + 6y\left(x\right)}\right) + 2x^3 - c_1 = 0$$

ODE No. 626

$$y'(x) = \frac{x}{\sqrt{x^2+1}+y(x)}$$

✓ **Mathematica** : cpu = 0.212384 (sec), leaf count = 88

```
DSolve[Derivative[1][y][x] == x/(Sqrt[1 + x^2] + y[x]),y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}\left(\log\left(-\frac{y(x)^2}{x^2+1}-\frac{y(x)}{\sqrt{x^2+1}}+1\right)+\log\left(x^2+1\right)\right)=\frac{\tanh^{-1}\left(\frac{3\sqrt{x^2+1}+y(x)}{\sqrt{5}\left(\sqrt{x^2+1}+y(x)\right)}\right)}{\sqrt{5}}+c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.438 (sec), leaf count = 115

```
dsolve(diff(y(x),x) = x/(y(x)+(x^2+1)^(1/2)),y(x))
```

$$-\frac{4\ln\left(\frac{36\sqrt{x^2+1}}{y(x)+\sqrt{x^2+1}}\right)}{3}+\frac{2\ln\left(-\frac{1296\left(\sqrt{x^2+1}\,y(x)-x^2+y(x)^2-1\right)}{11\left(y(x)+\sqrt{x^2+1}\right)^2}\right)}{3}-\frac{4\sqrt{5}\,\operatorname{arctanh}\left(\frac{\left(3\sqrt{x^2+1}+y(x)\right)\sqrt{5}}{5y(x)+5\sqrt{x^2+1}}\right)}{15}+\frac{2\ln\left(x^2+1\right)}{3}-$$

ODE No. 627

$$y'(x) = \frac{(y(x)\log(x)-1)^2}{x}$$

✓ **Mathematica** : cpu = 0.827632 (sec), leaf count = 25

```
DSolve[Derivative[1][y][x] == (-1 + Log[x]*y[x])^2/x,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\tan(\log(x)+c_1)}{1+\log(x)\tan(\log(x)+c_1)}\right\}\right\}$$

✓ **Maple** : cpu = 0.236 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = (-1+y(x)*ln(x))^2/x,y(x))
```

$$y(x) = \frac{\sin(\ln(x))\,c_1 + \cos(\ln(x))}{(c_1+\ln(x))\cos(\ln(x)) + \sin(\ln(x))\,(\ln(x)\,c_1 - 1)}$$

ODE No. 628

$$y'(x) = \frac{1}{3}x\left(3\sqrt{x^2+3y(x)}-2\right)$$

✓ **Mathematica** : cpu = 0.171358 (sec), leaf count = 38

```
DSolve[Derivative[1][y][x] == (x*(-2 + 3*Sqrt[x^2 + 3*y[x]]))/3,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{432}\left(81x^4-72x^2-486c_1x^2+16+729{c_1}^2-216c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.308 (sec), leaf count = 23

```
dsolve(diff(y(x),x) = 1/3*x*(-2+3*(x^2+3*y(x))^(1/2)),y(x))
```

$$c_1+\frac{3x^2}{4}+\frac{2}{3}-\sqrt{x^2+3y\left(x\right)}=0$$

ODE No. 629

$$y'(x) = \frac{(2y(x)\log(x) - 1)^2}{x}$$

✓ **Mathematica** : cpu = 0.855755 (sec), leaf count = 47

```
DSolve[Derivative[1][y][x] == (-1 + 2*Log[x]*y[x])^2/x,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{\sqrt{2}\left(\sqrt{2}\log(x) - \tan\left(\frac{1}{2}\left(2\sqrt{2}\log(x) + \sqrt{2}c_1\right)\right)\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.225 (sec), leaf count = 62

```
dsolve(diff(y(x),x) = (2*y(x)*ln(x)-1)^2/x,y(x))
```

$$y(x) = \frac{\sin\left(\ln(x)\sqrt{2}\right)c_1 - \cos\left(\ln(x)\sqrt{2}\right)}{\sin\left(\ln(x)\sqrt{2}\right)\left(2\ln(x)c_1 + \sqrt{2}\right) + \left(\sqrt{2}c_1 - 2\ln(x)\right)\cos\left(\ln(x)\sqrt{2}\right)}$$

ODE No. 630

$$y'(x) = \frac{e^{bx}}{e^{-bx}y(x) + 1}$$

✓ **Mathematica** : cpu = 0.441927 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == E^(b*x)/(1 + y[x]/E^(b*x)),y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}b\left(\log\left(-be^{-2bx}y(x)^2 - be^{-bx}y(x) + 1\right) + 2bx\right) = \frac{b\tan^{-1}\left(\frac{(b+2)\left(-e^{bx}\right)-by(x)}{b\sqrt{-\frac{b+4}{b}}\left(e^{bx}+y(x)\right)}\right)}{\sqrt{-\frac{b+4}{b}}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.377 (sec), leaf count = 98

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(-b*x)+1)*exp(b*x),y(x))
```

$$y(x) = \text{RootOf}\left(-\text{e}^{\text{RootOf}\left(\left(\tanh^2\left(\frac{\sqrt{b^2+4b}\left(-2bx+2c_1b-\_Z\right)}{2b}\right)\right)b+4\left(\tanh^2\left(\frac{\sqrt{b^2+4b}\left(-2bx+2c_1b-\_Z\right)}{2b}\right)\right)-4\,\text{e}^{-Z}-b-4\right)} - 1 + b\_\right.$$

ODE No. 631

$$y'(x) = \frac{1}{2}x^2\left(2\sqrt{x^3 - 6y(x)} + 1\right)$$

✓ **Mathematica** : cpu = 0.195288 (sec), leaf count = 38

```
DSolve[Derivative[1][y][x] == (x^2*(1 + 2*Sqrt[x^3 - 6*y[x]]))/2,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{96}\left(-16x^6 + 8x^3 - 192c_1x^3 - 1 - 576{c_1}^2 - 48c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.275 (sec), leaf count = 23

```
dsolve(diff(y(x),x) = 1/2*x^2*(1+2*(x^3-6*y(x))^(1/2)),y(x))
```

$$c_1 - x^3 - \frac{1}{2} - \sqrt{x^3 - 6y\left(x\right)} = 0$$

ODE No. 632

$$y'(x) = \frac{e^x}{e^{-x}y(x) + 1}$$

✓ **Mathematica** : cpu = 0.219493 (sec), leaf count = 65

```
DSolve[Derivative[1][y][x] == E^x/(1 + y[x]/E^x),y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}\log\left(-e^{-2x}y(x)^2 - e^{-x}y(x) + 1\right) + x = \frac{\tanh^{-1}\left(\frac{y(x)+3e^x}{\sqrt{5}(y(x)+e^x)}\right)}{\sqrt{5}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.341 (sec), leaf count = 54

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(-x)+1)*exp(x),y(x))
```

$$x - \frac{\sqrt{5}\,\operatorname{arctanh}\left(\frac{2y(x)\sqrt{5}\,\mathrm{e}^{-x}}{5} + \frac{\sqrt{5}}{5}\right)}{5} + \frac{\ln\left(y(x)^2\,\mathrm{e}^{-2x} + y(x)\,\mathrm{e}^{-x} - 1\right)}{2} - c_1 = 0$$

ODE No. 633

$$y'(x) = \frac{e^{2x/3}}{e^{-2x/3}y(x) + 1}$$

✓ **Mathematica** : cpu = 0.234842 (sec), leaf count = 85

```
DSolve[Derivative[1][y][x] == E^((2*x)/3)/(1 + y[x]/E^((2*x)/3)),y[x],x]
```

$$\text{Solve}\left[7\left(3\log\left(-\frac{2}{3}e^{-4x/3}y(x)^2 - \frac{2}{3}e^{-2x/3}y(x) + 1\right) + 4x - 9c_1\right) = 6\sqrt{7}\tanh^{-1}\left(\frac{y(x) + 4e^{2x/3}}{\sqrt{7}\left(y(x) + e^{2x/3}\right)}\right), y(x\right.$$

✓ **Maple** : cpu = 1.194 (sec), leaf count = 52

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(-2/3*x)+1)*exp(2/3*x),y(x))
```

$$y(x) = \text{RootOf}\left(-\mathrm{e}^{\text{RootOf}\left(343 - 343\left(\tanh^2\left(\frac{\left(4c_1 - 4x - 3\_Z\right)\sqrt{7}}{6}\right)\right) + 98\,\mathrm{e}^{-\_Z}\right)} - 3 + 2\_Z + 2\_Z^2\right)\mathrm{e}^{\frac{2x}{3}}$$

ODE No. 634

$$y'(x) = \frac{x^5 \sqrt{4x^2 y(x) + 1} + \frac{1}{2}}{x^3}$$

✓ **Mathematica** : cpu = 0.224467 (sec), leaf count = 33

```
DSolve[Derivative[1][y][x] == (1/2 + x^5*Sqrt[1 + 4*x^2*y[x]])/x^3,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{x^{10} - 8c_1 x^6 + 16{c_1}^2 x^2 - 4}{16x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.376 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = 1/2*(1+2*x^5*(4*x^2*y(x)+1)^(1/2))/x^3,y(x))
```

$$c_1 - \frac{\sqrt{4x^2 y\left(x\right) + 1}}{x} + \frac{x^4}{2} = 0$$

ODE No. 635

$$y'(x) = \frac{1}{2}x\left(2\sqrt{x^3 - 6y(x)} + x\right)$$

✓ **Mathematica** : cpu = 0.190465 (sec), leaf count = 33

```
DSolve[Derivative[1][y][x] == (x*(x + 2*Sqrt[x^3 - 6*y[x]]))/2,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{24}\left(-9x^4 + 4x^3 + 36c_1x^2 - 36{c_1}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.325 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = 1/2*x*(x+2*(x^3-6*y(x))^(1/2)),y(x))
```

$$c_1 - \frac{3x^2}{2} - \sqrt{x^3 - 6y\left(x\right)} = 0$$

ODE No. 636

$$y'(x) = y(x) \left(x^2 - \log(y(x))\right)$$

✓ **Mathematica** : cpu = 0.112185 (sec), leaf count = 24

```
DSolve[Derivative[1][y][x] == (x^2 - Log[y[x]])*y[x],y[x],x]
```

$$\left\{\left\{y(x) \to e^{x^2-2x-2c_1e^{-x}+2}\right\}\right\}$$

✓ **Maple** : cpu = 0.234 (sec), leaf count = 19

```
dsolve(diff(y(x),x) = (-ln(y(x))+x^2)*y(x),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{e}^{-x}c_1+x^2-2x+2}$$

ODE No. 637

$$y'(x) = \frac{e^{-x^2} x}{e^{x^2} y(x) + 1}$$

✓ **Mathematica** : cpu = 9.01193 (sec), leaf count = 59

```
DSolve[Derivative[1][y][x] == x/(E^x^2*(1 + E^x^2*y[x])),y[x],x]
```

$$\text{Solve}\left[-\frac{1}{4}\log\left(2e^{2x^2}y(x)^2 + 2e^{x^2}y(x) + 1\right) - \frac{1}{2}\tan^{-1}\left(2e^{x^2}y(x) + 1\right) + \frac{x^2}{2} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.241 (sec), leaf count = 84

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(x^2)+1)*exp(-x^2)*x,y(x))
```

$$y(x) = -\frac{\tan\left(\text{RootOf}\left(2x^2 - \ln\left(\frac{81\left(\tan^2\left(\_Z\right)\right)}{10} + \frac{81}{10}\right) + 2\ln\left(\frac{9\tan\left(\_Z\right)}{2} - \frac{9}{2}\right) + 6c_1 - 2\_Z\right)\right)\mathrm{e}^{-x^2}}{\tan\left(\text{RootOf}\left(2x^2 - \ln\left(\frac{81\left(\tan^2\left(\_Z\right)\right)}{10} + \frac{81}{10}\right) + 2\ln\left(\frac{9\tan\left(\_Z\right)}{2} - \frac{9}{2}\right) + 6c_1 - 2\_Z\right)\right) - 1}$$

ODE No. 638

$$y'(x) = y(x)(\log(\log(y(x))) - \log(x))$$

✓ **Mathematica** : cpu = 0.127669 (sec), leaf count = 41

```
DSolve[Derivative[1][y][x] == (-Log[x] + Log[Log[y[x]]])*y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \frac{1}{K[1](x\log(x) + \log(K[1]) - x\log(\log(K[1])))} dK[1] = -\log(x) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.21 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = -(-ln(ln(y(x)))+ln(x))*y(x),y(x))
```

$$\int_{\_b}^{y(x)} \frac{1}{\_a\,(x\ln(x) - \ln(\ln(\_a))\,x + \ln(\_a))} d\_a + \ln(x) - c_1 = 0$$

ODE No. 639

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

✓ **Mathematica** : cpu = 0.168847 (sec), leaf count = 53

```
DSolve[Derivative[1][y][x] == (Log[x] - Log[Log[y[x]]])^2*y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \frac{1}{K[1]\left(x\log^2(x) - 2x\log(\log(K[1]))\log(x) + x\log^2(\log(K[1])) - \log(K[1])\right)} dK[1] = \log(x) +$$

✓ **Maple** : cpu = 0.285 (sec), leaf count = 50

```
dsolve(diff(y(x),x) = (-ln(ln(y(x)))+ln(x))^2*y(x),y(x))
```

$$\int_{\_b}^{y(x)} \frac{1}{\_a\left(x\ln(x)^2 - 2\ln(\ln(\_a))\ln(x)\,x + \ln(\ln(\_a))^2 x - \ln(\_a)\right)} d\_a - \ln(x) - c_1 = 0$$

ODE No. 640

$$y'(x) = \frac{y(x)}{\log(\log(y(x))) - \log(x) + 1}$$

✓ **Mathematica** : cpu = 0.287755 (sec), leaf count = 53

```
DSolve[Derivative[1][y][x] == y[x]/(1 - Log[x] + Log[Log[y[x]]]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \frac{\log(x) - \log(\log(K[1])) - 1}{K[1](x + \log(x)\log(K[1]) - \log(K[1]) - \log(K[1])\log(\log(K[1])))} dK[1] = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.38 (sec), leaf count = 47

```
dsolve(diff(y(x),x) = 1/(ln(ln(y(x)))-ln(x)+1)*y(x),y(x))
```

$$\int_{\_b}^{y(x)} \frac{-\ln(\ln(\_a)) + \ln(x) - 1}{(\ln(\_a)\ln(x) - \ln(\_a)\ln(\ln(\_a)) + x - \ln(\_a))\_a} d\_a - c_1 = 0$$

ODE No. 641

$$y'(x) = \frac{x^4 \sqrt{4x^2 y(x) + 1} + \frac{1}{2}}{x^3}$$

✓ **Mathematica** : cpu = 0.214723 (sec), leaf count = 35

```
DSolve[Derivative[1][y][x] == (1/2 + x^4*Sqrt[1 + 4*x^2*y[x]])/x^3,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{4x^8 - 24c_1 x^5 + 36{c_1}^2 x^2 - 9}{36x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.364 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = 1/2*(1+2*(4*x^2*y(x)+1)^(1/2)*x^4)/x^3,y(x))
```

$$c_1 - \frac{\sqrt{4x^2 y(x) + 1}}{x} + \frac{2x^3}{3} = 0$$

ODE No. 642

$$y'(x) = \frac{(4ax - y(x)^2)^2}{y(x)}$$

✓ **Mathematica** : cpu = 0.169847 (sec), leaf count = 105

```
DSolve[Derivative[1][y][x] == (4*a*x - y[x]^2)^2/y[x],y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{4ax - \sqrt{2}\sqrt{a}\tanh\left(\frac{2\sqrt{2}ax - \sqrt{2}c_1}{\sqrt{a}}\right)}\right\}, \left\{y(x) \to \sqrt{4ax - \sqrt{2}\sqrt{a}\tanh\left(\frac{2\sqrt{2}ax - \sqrt{2}c_1}{\sqrt{a}}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.332 (sec), leaf count = 286

```
dsolve(diff(y(x),x) = (-y(x)^2+4*a*x)^2/y(x),y(x))
```

$$y(x) = \frac{\sqrt{4}\sqrt{\left(c_1\left(ax - \frac{\sqrt{2}\sqrt{a}}{4}\right)e^{2x\left(\sqrt{2}\sqrt{a}-2ax\right)} + e^{-2x\left(\sqrt{2}\sqrt{a}+2ax\right)}\left(ax + \frac{\sqrt{2}\sqrt{a}}{4}\right)\right)\left(c_1 e^{2x\left(\sqrt{2}\sqrt{a}-2ax\right)} + e^{-2x\left(\sqrt{}\right.}\right.}}{c_1 e^{2x\left(\sqrt{2}\sqrt{a}-2ax\right)} + e^{-2x\left(\sqrt{2}\sqrt{a}+2ax\right)}}$$

ODE No. 643

$$y'(x) = \frac{1}{3}x\left(3x\sqrt{x^2+3y(x)} - 2\right)$$

✓ **Mathematica** : cpu = 0.185588 (sec), leaf count = 31

```
DSolve[Derivative[1][y][x] == (x*(-2 + 3*x*Sqrt[x^2 + 3*y[x]]))/3,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{12}\left(x^6 - 6c_1x^3 - 4x^2 + 9{c_1}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.254 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = 1/3*x*(-2+3*x*(x^2+3*y(x))^(1/2)),y(x))
```

$$c_1 + \frac{x^3}{2} - \sqrt{x^2+3y\left(x\right)} = 0$$

ODE No. 644

$$y'(x) = -\frac{1}{2}x^2\left(ax - 2\sqrt{a\left(ax^4 + 8y(x)\right)}\right)$$

✓ **Mathematica** : cpu = 0.370179 (sec), leaf count = 34

```
DSolve[Derivative[1][y][x] == -1/2*(x^2*(a*x - 2*Sqrt[a*(a*x^4 + 8*y[x])])),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{72}a\left(16x^6 - 9x^4 - 96c_1x^3 + 144{c_1}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.565 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = -1/2*x^2*(a*x-2*(a*(a*x^4+8*y(x)))^(1/2)),y(x))
```

$$c_1 + \frac{4a\,x^3}{3} - \sqrt{a\left(a\,x^4 + 8y\left(x\right)\right)} = 0$$

ODE No. 645

$$y'(x) = y(x)(x - \log(y(x)))$$

✓ **Mathematica** : cpu = 0.0884454 (sec), leaf count = 20

```
DSolve[Derivative[1][y][x] == (x - Log[y[x]])*y[x],y[x],x]
```

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

✓ **Maple** : cpu = 0.157 (sec), leaf count = 14

```
dsolve(diff(y(x),x) = (-ln(y(x))+x)*y(x),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{e}^{-x}c_1-1+x}$$

ODE No. 646

$$y'(x) = \frac{\sqrt{x^3 - 6y(x)} + \frac{x^3}{2} + \frac{x^2}{2}}{x+1}$$

✓ **Mathematica** : cpu = 0.287367 (sec), leaf count = 35

```
DSolve[Derivative[1][y][x] == (x^2/2 + x^3/2 + Sqrt[x^3 - 6*y[x]])/(1 + x),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{6}\left(x^3 - 9\log^2(x+1) + 18c_1 \log(x+1) - 9{c_1}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.4 (sec), leaf count = 23

```
dsolve(diff(y(x),x) = 1/2*(x^3+x^2+2*(x^3-6*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 - 3\ln(1+x) - \sqrt{x^3 - 6y(x)} = 0$$

ODE No. 647

$$y'(x) = \frac{x(ay(x)^2 + bx^2)^2}{a^{5/2}y(x)}$$

✓ **Mathematica** : cpu = 0.361914 (sec), leaf count = 115

```
DSolve[Derivative[1][y][x] == (x*(b*x^2 + a*y[x]^2)^2)/(a^(5/2)*y[x]),y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{-\frac{bx^2}{a} + \frac{\sqrt{b}\tan\left(\frac{a^{3/2}bx^2+2c_1}{a^{9/4}\sqrt{b}}\right)}{\sqrt[4]{a}}}\right\}, \left\{y(x) \to \sqrt{-\frac{bx^2}{a} + \frac{\sqrt{b}\tan\left(\frac{a^{3/2}bx^2+2c_1}{a^{9/4}\sqrt{b}}\right)}{\sqrt[4]{a}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.322 (sec), leaf count = 460

```
dsolve(diff(y(x),x) = (a*y(x)^2+b*x^2)^2*x/a^(5/2)/y(x),y(x))
```

$$y(x) = \frac{\sqrt{-a\left(c_1 \mathrm{e}^{\frac{x^2\left(2a^{\frac{3}{2}}\sqrt{-\frac{b}{a^{\frac{3}{2}}}}+b\,x^2\right)}{2a^{\frac{3}{2}}}} + \mathrm{e}^{\frac{x^2\left(-2a^{\frac{3}{2}}\sqrt{-\frac{b}{a^{\frac{3}{2}}}}+b\,x^2\right)}{2a^{\frac{3}{2}}}}\right)\left(\left(b\,x^2 - a^{\frac{3}{2}}\sqrt{-\frac{b}{a^{\frac{3}{2}}}}\right)\mathrm{e}^{\frac{x^2\left(-2a^{\frac{3}{2}}\sqrt{-\frac{b}{a^{\frac{3}{2}}}}+b\,x^2\right)}{2a^{\frac{3}{2}}}} + c_1\left(a\right.\right.}}{a\left(c_1 \mathrm{e}^{\frac{x^2\left(2a^{\frac{3}{2}}\sqrt{-\frac{b}{a^{\frac{3}{2}}}}+b\,x^2\right)}{2a^{\frac{3}{2}}}} + \mathrm{e}^{\frac{x^2\left(-2a^{\frac{3}{2}}\sqrt{-\frac{b}{a^{\frac{3}{2}}}}+b\,x^2\right)}{2a^{\frac{3}{2}}}}\right)}$$

ODE No. 648

$$y'(x) = -\frac{\sqrt{a}x^3\left(-2\sqrt{ax^4+8y(x)}+\sqrt{a}x+\sqrt{a}\right)}{2(x+1)}$$

✓ **Mathematica** : cpu = 0.521124 (sec), leaf count = 128

```
DSolve[Derivative[1][y][x] == -1/2*(Sqrt[a]*x^3*(Sqrt[a] + Sqrt[a]*x - 2*Sqrt[a*x^4 + 8*y[x]]
```

$$\left\{\left\{y(x) \to \frac{1}{72}(16ax^6 - 48ax^5 + 123ax^4 - 96ax^3\log(x+1) - 96ac_1x^3 - 72ax^2 + 144ax^2\log(x+1) + 144a\right.\right.$$

✓ **Maple** : cpu = 0.906 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = -1/2*x^3*(a^(1/2)*x+a^(1/2)-2*(a*x^4+8*y(x))^(1/2))*a^(1/2)/(1+x),y(x))
```

$$\frac{\sqrt{a\,x^4+8y\,(x)}}{4\sqrt{a}} - \frac{x^3}{3} + \frac{x^2}{2} - x + \ln\,(1+x) - c_1 = 0$$

ODE No. 649

$$y'(x) = x\sqrt{x^2 + 8y(x) - 2x + 1} - \frac{x}{4} + \frac{1}{4}$$

✓ **Mathematica** : cpu = 0.268263 (sec), leaf count = 37

```
DSolve[Derivative[1][y][x] == 1/4 - x/4 + x*Sqrt[1 - 2*x + x^2 + 8*y[x]],y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{8}\left(4x^4 - x^2 - 16c_1x^2 + 2x - 1 + 16{c_1}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.334 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = -1/4*x+1/4+x*(x^2-2*x+1+8*y(x))^(1/2),y(x))
```

$$c_1 + 2x^2 + \frac{1}{4} - \sqrt{x^2 - 2x + 1 + 8y\left(x\right)} = 0$$

ODE No. 650

$$y'(x) = x\sqrt{a^2 + 2ax + x^2 + 4y(x)} - \frac{a}{2} - \frac{x}{2}$$

✓ **Mathematica** : cpu = 0.491214 (sec), leaf count = 109

```
DSolve[Derivative[1][y][x] == -1/2*a - x/2 + x*Sqrt[a^2 + 2*a*x + x^2 + 4*y[x]],y[x],x]
```

$$\text{Solve}\left[-\frac{1}{2}\sqrt{a^2 + 2ax + x^2 + 4y(x)} - \frac{1}{2}a\log\left(\sqrt{a^2 + 2ax + x^2 + 4y(x)} + a + x\right) + \frac{1}{2}a\tanh^{-1}\left(\frac{2}{2\sqrt{a^2 + 2a}}\right.\right.$$

✓ **Maple** : cpu = 0.354 (sec), leaf count = 28

```
dsolve(diff(y(x),x) = -1/2*x-1/2*a+x*(x^2+2*a*x+a^2+4*y(x))^(1/2),y(x))
```

$$c_1 + x^2 + \frac{1}{2} - \sqrt{x^2 + 2ax + a^2 + 4y\,(x)} = 0$$

ODE No. 651

$$y'(x) = \frac{y(x)\left(x^2 + \log(y(x))\right)}{x}$$

✓ **Mathematica** : cpu = 0.102878 (sec), leaf count = 16

```
DSolve[Derivative[1][y][x] == ((x^2 + Log[y[x]])*y[x])/x,y[x],x]
```

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

✓ **Maple** : cpu = 0.128 (sec), leaf count = 13

```
dsolve(diff(y(x),x) = (ln(y(x))+x^2)*y(x)/x,y(x))
```

$$y(x) = \mathrm{e}^{xc_1}\mathrm{e}^{x^2}$$

ODE No. 652

$$y'(x) = \frac{x\sqrt{4ax - y(x)^2} + 2a}{y(x)}$$

✓ **Mathematica** : cpu = 1.15176 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (2*a + x*Sqrt[4*a*x - y[x]^2])/y[x],y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{4096a^5x - 256a^4x^4 + 32a^2e^{c_1}x^2 - e^{2c_1}}}{32a^2}\right\}, \left\{y(x) \to \frac{\sqrt{4096a^5x - 256a^4x^4 + 32a^2e^{c_1}x^2 - e^{2c}}}{32a^2}\right.\right.$$

✓ **Maple** : cpu = 0.221 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = (2*a+x*(-y(x)^2+4*a*x)^(1/2))/y(x),y(x))
```

$$-\sqrt{-y(x)^2 + 4ax} - \frac{x^2}{2} - c_1 = 0$$

ODE No. 653

$$y'(x) = x\sqrt{x^2 + 4y(x) - 4x} - \frac{x}{2} + 1$$

✓ **Mathematica** : cpu = 0.755841 (sec), leaf count = 94

```
DSolve[Derivative[1][y][x] == 1 - x/2 + x*Sqrt[-4*x + x^2 + 4*y[x]],y[x],x]
```

$$\text{Solve}\left[-\frac{1}{2}\sqrt{x^2 + 4y(x) - 4x} + \log\left(-\sqrt{x^2 + 4y(x) - 4x} - x + 2\right) - \tanh^{-1}\left(\frac{2x - 4}{2\sqrt{x^2 + 4y(x) - 4x}}\right) + \frac{x^2}{2}\right.$$

✓ **Maple** : cpu = 0.304 (sec), leaf count = 24

```
dsolve(diff(y(x),x) = -1/2*x+1+x*(x^2-4*x+4*y(x))^(1/2),y(x))
```

$$c_1 + x^2 + \frac{1}{2} - \sqrt{x^2 - 4x + 4y\,(x)} = 0$$

ODE No. 654

$$y'(x) = \frac{\sqrt{x^2 + 3y(x)} - \frac{2x^2}{3} - \frac{2x}{3}}{x + 1}$$

✓ **Mathematica** : cpu = 0.284733 (sec), leaf count = 37

```
DSolve[Derivative[1][y][x] == ((-2*x)/3 - (2*x^2)/3 + Sqrt[x^2 + 3*y[x]])/(1 + x),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{12}\left(-4x^2 + 9\log^2(x+1) - 18c_1\log(x+1) + 9{c_1}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.396 (sec), leaf count = 23

```
dsolve(diff(y(x),x) = -1/3*(2*x^2+2*x-3*(x^2+3*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 + \frac{3\ln(1+x)}{2} - \sqrt{x^2 + 3y(x)} = 0$$

ODE No. 655

$$y'(x) = \frac{e^{-4x/3} y(x)^3}{e^{-2x/3} y(x) + 1}$$

✓ **Mathematica** : cpu = 11.3154 (sec), leaf count = 82

```
DSolve[Derivative[1][y][x] == y[x]^3/(E^((4*x)/3)*(1 + y[x]/E^((2*x)/3))),y[x],x]
```

$$\text{Solve}\left[\frac{3}{2}\log(y(x)) + \frac{1}{28}\left(-21\log\left(-3y(x)^2 + 2e^{2x/3}y(x) + 2e^{4x/3}\right) + 6\sqrt{7}\tanh^{-1}\left(\frac{y(x) + 2e^{2x/3}}{\sqrt{7}y(x)}\right) + 28x\right)\right]$$

✓ **Maple** : cpu = 0.789 (sec), leaf count = 66

```
dsolve(diff(y(x),x) = y(x)^3/(y(x)*exp(-2/3*x)+1)*exp(-4/3*x),y(x))
```

$$x + \frac{3\sqrt{7}\,\text{arctanh}\left(\frac{3y(x)\sqrt{7}\,\mathrm{e}^{-\frac{2x}{3}}}{7} - \frac{\sqrt{7}}{7}\right)}{14} - \frac{3\ln\left(3y(x)^2\,\mathrm{e}^{-\frac{4x}{3}} - 2y(x)\,\mathrm{e}^{-\frac{2x}{3}} - 2\right)}{4} + \frac{3\ln\left(y(x)\,\mathrm{e}^{-\frac{2x}{3}}\right)}{2} - c_1 = 0$$

ODE No. 656

$$y'(x) = \frac{y(x)\left(x^3 + \log(y(x))\right)}{x}$$

✓ **Mathematica** : cpu = 0.102947 (sec), leaf count = 20

```
DSolve[Derivative[1][y][x] == ((x^3 + Log[y[x]])*y[x])/x,y[x],x]
```

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

✓ **Maple** : cpu = 0.14 (sec), leaf count = 15

```
dsolve(diff(y(x),x) = (ln(y(x))+x^3)*y(x)/x,y(x))
```

$$y(x) = \mathrm{e}^{\frac{x^3}{2}} \mathrm{e}^{x c_1}$$

ODE No. 657

$$y'(x) = x^2\sqrt{x^2 + 8y(x) - 2x + 1} - \frac{x}{4} + \frac{1}{4}$$

✓ **Mathematica** : cpu = 0.259776 (sec), leaf count = 37

```
DSolve[Derivative[1][y][x] == 1/4 - x/4 + x^2*Sqrt[1 - 2*x + x^2 + 8*y[x]],y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{72}\left(16x^6 - 96c_1x^3 - 9x^2 + 18x - 9 + 144{c_1}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.287 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = -1/4*x+1/4+x^2*(x^2-2*x+1+8*y(x))^(1/2),y(x))
```

$$c_1 + \frac{4x^3}{3} - \sqrt{x^2 - 2x + 1 + 8y\left(x\right)} = 0$$

ODE No. 658

$$y'(x) = \frac{\sqrt{x^2 + 8y(x) - 2x + 1} - \frac{x^2}{4} + \frac{1}{4}}{x + 1}$$

✓ **Mathematica** : cpu = 0.417135 (sec), leaf count = 41

```
DSolve[Derivative[1][y][x] == (1/4 - x^2/4 + Sqrt[1 - 2*x + x^2 + 8*y[x]])/(1 + x),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{8}\left(-x^2 + 2x + 16\log^2(x+1) - 32c_1\log(x+1) - 1 + 16{c_1}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.462 (sec), leaf count = 28

```
dsolve(diff(y(x),x) = -1/4*(x^2-1-4*(x^2-2*x+1+8*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 + 4\ln(1+x) - \frac{1}{4} - \sqrt{x^2 - 2x + 1 + 8y(x)} = 0$$

ODE No. 659

$$y'(x) = x\sqrt{a^2x^2 + 2abx + 4ay(x) + b^2 - 4c} - \frac{ax}{2} - \frac{b}{2}$$

✓ **Mathematica** : cpu = 0.81148 (sec), leaf count = 164

```
DSolve[Derivative[1][y][x] == -1/2*b - (a*x)/2 + x*Sqrt[b^2 - 4*c + 2*a*b*x + a^2*x^2 + 4*a*y
```

$$\text{Solve}\left[-\frac{\sqrt{a^2x^2 + 2abx + 4ay(x) + b^2 - 4c}}{2a} - \frac{b\log\left(\sqrt{a^2x^2 + 2abx + 4ay(x) + b^2 - 4c} + ax + b\right)}{2a} + \frac{b\tanh\right.$$

✓ **Maple** : cpu = 0.375 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = -1/2*a*x-1/2*b+x*(a^2*x^2+2*a*b*x+b^2+4*a*y(x)-4*c)^(1/2),y(x))
```

$$c_1 + a\,x^2 + \frac{a}{2} - \sqrt{a^2x^2 + 2abx + b^2 + 4ay\,(x) - 4c} = 0$$

ODE No. 660

$$y'(x) = x^2\sqrt{a^2 + 2ax + x^2 + 4y(x)} - \frac{a}{2} - \frac{x}{2}$$

✓ **Mathematica** : cpu = 0.496464 (sec), leaf count = 109

```
DSolve[Derivative[1][y][x] == -1/2*a - x/2 + x^2*Sqrt[a^2 + 2*a*x + x^2 + 4*y[x]],y[x],x]
```

$$\text{Solve}\left[-\frac{1}{2}\sqrt{a^2 + 2ax + x^2 + 4y(x)} - \frac{1}{2}a\log\left(\sqrt{a^2 + 2ax + x^2 + 4y(x)} + a + x\right) + \frac{1}{2}a\tanh^{-1}\left(\frac{2}{2\sqrt{a^2 + 2a}}\right.\right.$$

✓ **Maple** : cpu = 0.317 (sec), leaf count = 29

```
dsolve(diff(y(x),x) = -1/2*x-1/2*a+x^2*(x^2+2*a*x+a^2+4*y(x))^(1/2),y(x))
```

$$c_1 + \frac{2x^3}{3} - \sqrt{x^2 + 2ax + a^2 + 4y\,(x)} = 0$$

ODE No. 661

$$y'(x) = x^2\sqrt{a^2x^2 + 2abx + 4ay(x) + b^2 - 4c} - \frac{ax}{2} - \frac{b}{2}$$

✓ **Mathematica** : cpu = 0.778113 (sec), leaf count = 164

```
DSolve[Derivative[1][y][x] == -1/2*b - (a*x)/2 + x^2*Sqrt[b^2 - 4*c + 2*a*b*x + a^2*x^2 + 4*a
```

$$\text{Solve}\left[-\frac{\sqrt{a^2x^2 + 2abx + 4ay(x) + b^2 - 4c}}{2a} - \frac{b\log\left(\sqrt{a^2x^2 + 2abx + 4ay(x) + b^2 - 4c} + ax + b\right)}{2a} + \frac{b\tanh\right.$$

✓ **Maple** : cpu = 0.329 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = -1/2*a*x-1/2*b+x^2*(a^2*x^2+2*a*b*x+b^2+4*a*y(x)-4*c)^(1/2),y(x))
```

$$c_1 + \frac{2a\,x^3}{3} - \sqrt{a^2x^2 + 2abx + b^2 + 4ay\,(x) - 4c} = 0$$

ODE No. 662

$$y'(x) = x^2\sqrt{x^2 - 4y(x) + 2x + 1} + \frac{x}{2} + \frac{1}{2}$$

✓ **Mathematica** : cpu = 0.265984 (sec), leaf count = 37

```
DSolve[Derivative[1][y][x] == 1/2 + x/2 + x^2*Sqrt[1 + 2*x + x^2 - 4*y[x]],y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{36}\left(-4x^6 + 24c_1x^3 + 9x^2 + 18x + 9 - 36{c_1}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.294 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = 1/2*x+1/2+x^2*(x^2+2*x+1-4*y(x))^(1/2),y(x))
```

$$c_1 - \frac{2x^3}{3} - \sqrt{x^2 + 2x + 1 - 4y\left(x\right)} = 0$$

ODE No. 663

$$y'(x) = \frac{x^2\sqrt{4ax - y(x)^2} + 2a}{y(x)}$$

✓ **Mathematica** : cpu = 1.43339 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (2*a + x^2*Sqrt[4*a*x - y[x]^2])/y[x],y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{147456a^7x - 4096a^6x^6 + 128a^3e^{c_1}x^3 - e^{2c_1}}}{192a^3}\right\}, \left\{y(x) \to \frac{\sqrt{147456a^7x - 4096a^6x^6 + 128a^3e}\right.$$

✓ **Maple** : cpu = 0.187 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = (2*a+x^2*(-y(x)^2+4*a*x)^(1/2))/y(x),y(x))
```

$$-\sqrt{-y\left(x\right)^2 + 4ax} - \frac{x^3}{3} - c_1 = 0$$

ODE No. 664

$$y'(x) = x^2\sqrt{x^2+4y(x)-4x} - \frac{x}{2} + 1$$

✓ **Mathematica** : cpu = 0.804774 (sec), leaf count = 94

```
DSolve[Derivative[1][y][x] == 1 - x/2 + x^2*Sqrt[-4*x + x^2 + 4*y[x]],y[x],x]
```

$$\text{Solve}\left[\frac{x^3}{3} - \frac{1}{2}\sqrt{x^2+4y(x)-4x} + \log\left(-\sqrt{x^2+4y(x)-4x} - x + 2\right) - \tanh^{-1}\left(\frac{2x-4}{2\sqrt{x^2+4y(x)-4x}}\right) -$$

✓ **Maple** : cpu = 0.254 (sec), leaf count = 25

```
dsolve(diff(y(x),x) = -1/2*x+1+x^2*(x^2-4*x+4*y(x))^(1/2),y(x))
```

$$c_1 + \frac{2x^3}{3} - \sqrt{x^2-4x+4y\left(x\right)} = 0$$

ODE No. 665

$$y'(x) = -\frac{\sqrt{a}\left(-2\sqrt{ax^4+8y(x)}+\sqrt{a}x^4+\sqrt{a}x^3\right)}{2(x+1)}$$

✓ **Mathematica** : cpu = 0.43991 (sec), leaf count = 41

```
DSolve[Derivative[1][y][x] == -1/2*(Sqrt[a]*(Sqrt[a]*x^3 + Sqrt[a]*x^4 - 2*Sqrt[a*x^4 + 8*y[x
```

$$\left\{\left\{y(x) \to \frac{1}{8}\left(-ax^4+16a\log^2(x+1)-32ac_1\log(x+1)+16a{c_1}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.669 (sec), leaf count = 28

```
dsolve(diff(y(x),x) = -1/2*(a^(1/2)*x^4+a^(1/2)*x^3-2*(a*x^4+8*y(x))^(1/2))*a^(1/2)/(1+x),y(x
```

$$-\frac{\sqrt{a\,x^4+8y\,(x)}}{4\sqrt{a}}+\ln\left(1+x\right)-c_1=0$$

ODE No. 666

$$y'(x) = y(x)\left(x^3 + x^2 - \log(y(x)) + 1\right)$$

✓ **Mathematica** : cpu = 0.147325 (sec), leaf count = 29

```
DSolve[Derivative[1][y][x] == (1 + x^2 + x^3 - Log[y[x]])*y[x],y[x],x]
```

$$\left\{\left\{y(x) \to e^{x^3-2x^2+4x-c_1 e^{-x}-3}\right\}\right\}$$

✓ **Maple** : cpu = 0.252 (sec), leaf count = 24

```
dsolve(diff(y(x),x) = (-ln(y(x))+1+x^2+x^3)*y(x),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{e}^{-x}c_1+x^3-2x^2+4x-3}$$

ODE No. 667

$$y'(x) = \frac{e^{-2bx} y(x)^3}{e^{-bx} y(x) + 1}$$

✓ **Mathematica** : cpu = 1.00245 (sec), leaf count = 90

```
DSolve[Derivative[1][y][x] == y[x]^3/(E^(2*b*x)*(1 + y[x]/E^(b*x))),y[x],x]
```

$$\text{Solve}\left[\frac{\log(y(x))}{b} + \frac{1}{2}\left(-\frac{\log\left(y(x)^2 - be^{bx}\left(e^{bx} + y(x)\right)\right)}{b} + \frac{2\tanh^{-1}\left(\frac{\sqrt{\frac{b}{b+4}}\left(2e^{bx}+y(x)\right)}{y(x)}\right)}{\sqrt{b}\sqrt{b+4}} + 2x\right) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.283 (sec), leaf count = 82

```
dsolve(diff(y(x),x) = y(x)^3/(y(x)*exp(-b*x)+1)*exp(-2*b*x),y(x))
```

$$bx - \frac{b\,\text{arctanh}\left(\frac{-2y(x)\mathrm{e}^{-bx}+b}{\sqrt{b^2+4b}}\right)}{\sqrt{b^2+4b}} - \frac{\ln\left(-by(x)\,\mathrm{e}^{-bx} + y(x)^2\,\mathrm{e}^{-2bx} - b\right)}{2} + \ln\left(y(x)\,\mathrm{e}^{-bx}\right) - c_1 = 0$$

ODE No. 668

$$y'(x) = \frac{e^{-2x} y(x)^3}{e^{-x} y(x) + 1}$$

✓ **Mathematica** : cpu = 0.664958 (sec), leaf count = 78

```
DSolve[Derivative[1][y][x] == y[x]^3/(E^(2*x)*(1 + y[x]/E^x)),y[x],x]
```

$$\text{Solve}\left[\log(y(x)) + y(x)^2 \left(\frac{x}{y(x)^2} - \frac{\log\left(-y(x)^2 + e^x y(x) + e^{2x}\right)}{2y(x)^2} + \frac{\tanh^{-1}\left(\frac{y(x)+2e^x}{\sqrt{5}y(x)}\right)}{\sqrt{5}y(x)^2}\right) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.866 (sec), leaf count = 58

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(-x)+1)*y(x)^3*exp(-2*x),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(2\sqrt{5}\,\mathrm{arctanh}\left(\frac{\left(-2\,\mathrm{e}^{-Z}+\mathrm{e}^{x}\right)\sqrt{5}\,\mathrm{e}^{-x}}{5}\right)+5\ln\left(-\mathrm{e}^{2x}-\mathrm{e}^{-Z+x}+\mathrm{e}^{2-Z}\right)+10c_1-10\_Z-10x\right)}$$

ODE No. 669

$$y'(x) = \frac{e^x \left(3e^x - 2y(x)^{3/2}\right)^2}{4\sqrt{y(x)}}$$

✓ **Mathematica** : cpu = 0.712139 (sec), leaf count = 264

```
DSolve[Derivative[1][y][x] == (E^x*(3*E^x - 2*y[x]^(3/2))^2)/(4*Sqrt[y[x]]),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\left(-2e^{3e^x} + 3e^{x+3e^x} + 3e^{x+3c_1} + 2e^{3c_1}\right)^{2/3}}{\sqrt[3]{4e^{6e^x} + 8e^{3e^x+3c_1} + 4e^{6c_1}}}\right\}, \left\{y(x) \to -\frac{\sqrt[3]{-1}\left(-2e^{3e^x} + 3e^{x+3e^x} + 3e^{x+3c_1} + 2e^{3}\right.\right.\right.$$

✓ **Maple** : cpu = 0.19 (sec), leaf count = 72

```
dsolve(diff(y(x),x) = 1/4*(-2*y(x)^(3/2)+3*exp(x))^2*exp(x)/y(x)^(1/2),y(x))
```

$$c_1 + \frac{e^{-\frac{3e^x}{2} - \frac{9e^{2x}}{8}} \left(2y(x)^{\frac{3}{2}} e^x - 2e^x - 3e^{2x}\right) e^{-\frac{3e^x}{2} + \frac{9e^{2x}}{8}}}{2y(x)^{\frac{3}{2}} e^x + 2e^x - 3e^{2x}} = 0$$

ODE No. 670

$$y'(x) = \frac{1}{2} i x y(x) \left(-2\sqrt{4\log(a) - x^2 + 4\log(y(x))} + i\right)$$

✓ **Mathematica** : cpu = 0.524555 (sec), leaf count = 62

```
DSolve[Derivative[1][y][x] == (I/2)*x*(I - 2*Sqrt[-x^2 + 4*Log[a] + 4*Log[y[x]]])*y[x],y[x],x
```

$$\left\{\left\{y(x) \to \exp\left(\frac{1}{4}\left(-4\log(a) - W\left(ie^{-x^2-1-4c_1}\right)^2 - 2W\left(ie^{-x^2-1-4c_1}\right) + x^2 - 1\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.299 (sec), leaf count = 70

```
dsolve(diff(y(x),x) = 1/2*I*x*(I-2*(-x^2+4*ln(a)+4*ln(y(x)))^(1/2))*y(x),y(x))
```

$$-\frac{\sqrt{-x^2 + 4\ln(a) + 4\ln(y(x))}}{2} + \frac{\arctan\left(\sqrt{-x^2 + 4\ln(a) + 4\ln(y(x))}\right)}{2} - \frac{i\ln(x^2 - 4\ln(a) - 4\ln(y(x))}{4}$$

ODE No. 671

$$y'(x) = \frac{(xy(x)^2+1)^2}{x^4 y(x)}$$

✓ **Mathematica** : cpu = 0.325607 (sec), leaf count = 192

```
DSolve[Derivative[1][y][x] == (1 + x*y[x]^2)^2/(x^4*y[x]),y[x],x]
```

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

✓ **Maple** : cpu = 0.236 (sec), leaf count = 237

```
dsolve(diff(y(x),x) = (x*y(x)^2+1)^2/y(x)/x^4,y(x))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{-x\left(c_1 \mathrm{e}^{\frac{-1-\sqrt{2}x}{x^2}}+\mathrm{e}^{\frac{-1+\sqrt{2}x}{x^2}}\right)\left(c_1\left(\sqrt{2}x+2\right)\mathrm{e}^{\frac{-1-\sqrt{2}x}{x^2}}+\left(2-\sqrt{2}x\right)\mathrm{e}^{\frac{-1+\sqrt{2}x}{x^2}}\right)}}{2x\left(c_1 \mathrm{e}^{\frac{-1-\sqrt{2}x}{x^2}}+\mathrm{e}^{\frac{-1+\sqrt{2}x}{x^2}}\right)}$$

ODE No. 672

$$y'(x) = \frac{x^2\left(\sqrt{4y(x)^3 - 9x^4} + 3x\right)}{y(x)^2}$$

✓ **Mathematica** : cpu = 1.84893 (sec), leaf count = 4512

```
DSolve[Derivative[1][y][x] == (x^2*(3*x + Sqrt[-9*x^4 + 4*y[x]^3]))/y[x]^2,y[x],x]
```

$$\text{Solve}\left[\int_1^x \left(-\frac{24\sqrt{4y(x)^3 - 9K[1]^4}\,y(x)^9}{\left(9K[1]^4 - 4y(x)^3\right)\left(4y(x)^9 - 729\right)} + \frac{16K[1]^2\sqrt{4y(x)^3 - 9K[1]^4}\,y(x)^9}{\left(4K[1]^6 + 9K[1]^4 + 16K[1]^3 - 4y(x)^3 + 16\right)\left(4y(x)^9 - 7\right.}\right.$$

✓ **Maple** : cpu = 0.229 (sec), leaf count = 36

```
dsolve(diff(y(x),x) = x^2*(3*x+(-9*x^4+4*y(x)^3)^(1/2))/y(x)^2,y(x))
```

$$\int_{\_b}^{y(x)} \frac{\_a^2}{\sqrt{-9x^4 + 4\_a^3}}\,d\_a - \frac{x^3}{3} - c_1 = 0$$

ODE No. 673

$$y'(x) = \frac{\frac{1}{2}x^2\cos(2y(x)) + \frac{x^2}{2} - \frac{1}{2}\sin(2y(x))}{x}$$

✓ **Mathematica** : cpu = 0.304625 (sec), leaf count = 23

```
DSolve[Derivative[1][y][x] == (x^2/2 + (x^2*Cos[2*y[x]])/2 - Sin[2*y[x]]/2)/x,y[x],x]
```

$$\left\{\left\{y(x) \to \tan^{-1}\left(\frac{2x^3 + 3c_1}{6x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.56 (sec), leaf count = 17

```
dsolve(diff(y(x),x) = 1/2*(-sin(2*y(x))+cos(2*y(x))*x^2+x^2)/x,y(x))
```

$$y(x) = \arctan\left(\frac{x^3 + 6c_1}{3x}\right)$$

ODE No. 674

$$y'(x) = \frac{\sqrt{x^2+4y(x)-4x} - \frac{x^2}{2} + \frac{x}{2} + 1}{x+1}$$

✓ **Mathematica** : cpu = 0.821096 (sec), leaf count = 91

```
DSolve[Derivative[1][y][x] == (1 + x/2 - x^2/2 + Sqrt[-4*x + x^2 + 4*y[x]])/(1 + x),y[x],x]
```

$$\text{Solve}\left[-\frac{1}{2}\sqrt{x^2+4y(x)-4x} + \log\left(-\sqrt{x^2+4y(x)-4x} - x + 2\right) - \tanh^{-1}\left(\frac{2x-4}{2\sqrt{x^2+4y(x)-4x}}\right) - \frac{1}{2}\text{l}\right.$$

✓ **Maple** : cpu = 0.494 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = -1/2*(x^2-x-2-2*(x^2-4*x+4*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 + 2\ln(1+x) - 1 - \sqrt{x^2-4x+4y(x)} = 0$$

ODE No. 675

$$y'(x) = \frac{ax^4 + ae^x x^3 + ax^3 - x^2 y(x)^2 - e^x x y(x)^2 - x y(x)^2 + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.342033 (sec), leaf count = 48

```
DSolve[Derivative[1][y][x] == (a*x^3 + a*E^x*x^3 + a*x^4 + y[x] - x*y[x]^2 - E^x*x*y[x]^2 - x
```

$$\left\{\left\{y(x) \to \sqrt{a}x \tanh\left(\frac{1}{6}\sqrt{a}\left(2x^3 + 3x^2 + 6e^x x - 6e^x + 6c_1\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.076 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = (y(x)+x^3*a*exp(x)+a*x^4+a*x^3-x*y(x)^2*exp(x)-x^2*y(x)^2-x*y(x)^2)/x,y
```

$$y(x) = \tanh\left(\frac{\left((6x-6)\,\mathrm{e}^x + 2x^3 + 3x^2 + 6c_1\right)\sqrt{a}}{6}\right) x\sqrt{a}$$

ODE No. 676

$$y'(x) = \frac{x^6\sqrt{4x^2y(x)+1}+\frac{x}{2}+\frac{1}{2}}{x^3(x+1)}$$

✓ **Mathematica** : cpu = 0.434449 (sec), leaf count = 144

```
DSolve[Derivative[1][y][x] == (1/2 + x/2 + x^6*Sqrt[1 + 4*x^2*y[x]])/(x^3*(1 + x)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{9x^{10}-24x^9+52x^8-120x^7+132x^6+72x^6\log(x+1)-72c_1x^6-144x^5-96x^5\log(x+1)+9\right.\right.$$

✓ **Maple** : cpu = 0.644 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = 1/2*(x+1+2*x^6*(4*x^2*y(x)+1)^(1/2))/x^3/(1+x),y(x))
```

$$c_1+2\ln(1+x)-\frac{\sqrt{4x^2y(x)+1}}{x}-2x+x^2-\frac{2x^3}{3}+\frac{x^4}{2}=0$$

ODE No. 677

$$y'(x) = \frac{ax^4 + ax^3 + ax^3 \log(x+1) - x^2 y(x)^2 - xy(x)^2 + y(x) - xy(x)^2 \log(x+1)}{x}$$

✓ **Mathematica** : cpu = 0.181987 (sec), leaf count = 80

```
DSolve[Derivative[1][y][x] == (a*x^3 + a*x^4 + a*x^3*Log[1 + x] + y[x] - x*y[x]^2 - x^2*y[x]^
```

$$\left\{\left\{y(x) \to \sqrt{a}x \tanh\left(\frac{1}{12}(4\sqrt{a}x^3 + 3\sqrt{a}x^2 + 6\sqrt{a}x^2 \log(x+1) + 6\sqrt{a}x - 6\sqrt{a}\log(x+1) + 12\sqrt{a}c_1)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.083 (sec), leaf count = 48

```
dsolve(diff(y(x),x) = (y(x)+x^3*a*ln(1+x)+a*x^4+a*x^3-x*y(x)^2*ln(1+x)-x^2*y(x)^2-x*y(x)^2)/x
```

$$y(x) = \tanh\left(\frac{\sqrt{a}\left(6\ln(1+x)x^2 + 4x^3 + 3x^2 - 6\ln(1+x) + 12c_1 + 6x + 9\right)}{12}\right) x\sqrt{a}$$

ODE No. 678

$$y'(x) = \frac{x^2\left(2x\sqrt{x^3-6y(x)}+x+1\right)}{2(x+1)}$$

✓ **Mathematica** : cpu = 0.30446 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (x^2*(1 + x + 2*x*Sqrt[x^3 - 6*y[x]]))/(2*(1 + x)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{24}(-4x^6+12x^5-33x^4+40x^3+24x^3\log(x+1)+24c_1x^3-36x^2-36x^2\log(x+1)-36c_1x^2\right.\right.$$

✓ **Maple** : cpu = 0.495 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = 1/2*x^2*(x+1+2*x*(x^3-6*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 - x^3 + \frac{3x^2}{2} - 3x + 3\ln(1+x) - \frac{1}{2} - \sqrt{x^3-6y(x)} = 0$$

ODE No. 679

$$y'(x) = \frac{x^4 + x^3 + x^3 \log(x) + 7x^2 y(x)^2 + 7xy(x)^2 + y(x) + 7xy(x)^2 \log(x)}{x}$$

✓ **Mathematica** : cpu = 0.167162 (sec), leaf count = 59

```
DSolve[Derivative[1][y][x] == (x^3 + x^4 + x^3*Log[x] + y[x] + 7*x*y[x]^2 + 7*x^2*y[x]^2 + 7*
```

$$\left\{\left\{y(x) \to \frac{x \tan\left(\frac{1}{12}\left(4\sqrt{7}x^3 + 3\sqrt{7}x^2 + 6\sqrt{7}x^2 \log(x) + 12\sqrt{7}c_1\right)\right)}{\sqrt{7}}\right\}\right\}$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = (y(x)+x^3*ln(x)+x^4+x^3+7*x*y(x)^2*ln(x)+7*x^2*y(x)^2+7*x*y(x)^2)/x,y(x
```

$$y(x) = \frac{\tan\left(\frac{\left(6x^2 \ln(x) + 4x^3 + 3x^2 + 12c_1\right)\sqrt{7}}{12}\right) x\sqrt{7}}{7}$$

ODE No. 680

$$y'(x) = \frac{\sqrt{x^2 - 4y(x) + 2x + 1} + \frac{x^2}{2} + x + \frac{1}{2}}{x + 1}$$

✓ **Mathematica** : cpu = 1.02059 (sec), leaf count = 89

```
DSolve[Derivative[1][y][x] == (1/2 + x + x^2/2 + Sqrt[1 + 2*x + x^2 - 4*y[x]])/(1 + x),y[x],x
```

$$\text{Solve}\left[\frac{1}{2}\left(\sqrt{x^2 - 4y(x) + 2x + 1} + \log\left(\sqrt{x^2 - 4y(x) + 2x + 1} + x + 1\right) - \tanh^{-1}\left(\frac{2x + 2}{2\sqrt{x^2 - 4y(x) + 2x +}\right.\right.\right.$$

✓ **Maple** : cpu = 0.469 (sec), leaf count = 28

```
dsolve(diff(y(x),x) = 1/2*(x^2+2*x+1+2*(x^2+2*x+1-4*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 - 2\ln(1 + x) - \frac{1}{2} - \sqrt{x^2 + 2x + 1 - 4y(x)} = 0$$

ODE No. 681

$$y'(x) = \frac{ax^2y(x)^2 + axy(x)^2 + axy(x)^2\log\left(\frac{1}{x}\right) + bx^4 + bx^3 + bx^3\log\left(\frac{1}{x}\right) + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.207604 (sec), leaf count = 84

```
DSolve[Derivative[1][y][x] == (b*x^3 + b*x^4 + b*x^3*Log[x^(-1)] + y[x] + a*x*y[x]^2 + a*x^2*
```

$$\left\{\left\{y(x) \to \frac{\sqrt{b}x\tan\left(\frac{1}{12}\left(4\sqrt{a}\sqrt{b}x^3 + 9\sqrt{a}\sqrt{b}x^2 - 6\sqrt{a}\sqrt{b}x^2\log(x) + 12\sqrt{a}\sqrt{b}c_1\right)\right)}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 45

```
dsolve(diff(y(x),x) = (y(x)+x^3*b*ln(1/x)+x^4*b+b*x^3+x*a*y(x)^2*ln(1/x)+a*x^2*y(x)^2+a*x*y(x
```

$$y(x) = \frac{\tan\left(\frac{\sqrt{ab}\left(4x^3+6x^2\ln\left(\frac{1}{x}\right)+9x^2+12c_1\right)}{12}\right)x\sqrt{ab}}{a}$$

ODE No. 682

$$y'(x) = \frac{2a}{x\left(-8a^2 + 2axy(x)^2 - xy(x)\right)}$$

✓ **Mathematica** : cpu = 0.294872 (sec), leaf count = 39

```
DSolve[Derivative[1][y][x] == (2*a)/(x*(-8*a^2 - x*y[x] + 2*a*x*y[x]^2)),y[x],x]
```

$$\text{Solve}\left[\frac{y(x)^2 e^{-4ay(x)}}{8a} - \frac{e^{-4ay(x)}}{2x} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.475 (sec), leaf count = 28

```
dsolve(diff(y(x),x) = 2*a/x/(-x*y(x)+2*a*x*y(x)^2-8*a^2),y(x))
```

$$c_1 + \frac{\left(-xy(x)^2 + 4a\right) \mathrm{e}^{-4ay(x)}}{x} = 0$$

ODE No. 683

$$y'(x) = \frac{y(x)\left(x^4 y(x)\log(x(x+1)) - x^3\log(x(x+1)) - 1\right)}{x}$$

✓ **Mathematica** : cpu = 1.01087 (sec), leaf count = 84

```
DSolve[Derivative[1][y][x] == (y[x]*(-1 - x^3*Log[x*(1 + x)] + x^4*Log[x*(1 + x)]*y[x]))/x,y[
```

$$\left\{\left\{y(x) \to \frac{e^{\frac{2x^3}{9}+\frac{x}{3}}}{e^{\frac{x^2}{6}+\frac{1}{18}(4x^2-3x+6)x}x + c_1 e^{\frac{x^2}{6}} x\sqrt[3]{x+1}(x(x+1))^{\frac{x^3}{3}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.162 (sec), leaf count = 114

```
dsolve(diff(y(x),x) = y(x)*(-1+ln(x*(1+x))*y(x)*x^4-ln(x*(1+x))*x^3)/x,y(x))
```

$$y(x) = \frac{(x(1+x))^{-\frac{x^3}{3}}}{(1+x)^{\frac{1}{3}}\,\mathrm{e}^{-\frac{2}{9}x^3+\frac{1}{6}x^2-\frac{1}{3}x}c_1 x + x^{1-\frac{x^3}{3}}\,(1+x)^{-\frac{x^3}{3}}\,\mathrm{e}^{\frac{ix^3\mathrm{csgn}(ix(1+x))\pi(-\mathrm{csgn}(ix(1+x))+\mathrm{csgn}(ix))(\mathrm{csgn}(ix+i)-\mathrm{csgn}(ix(1+x)))}{6}}}$$

ODE No. 684

$$y'(x) = \frac{x^2\sqrt{x^2 + y(x)^2} + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.123257 (sec), leaf count = 20

```
DSolve[Derivative[1][y][x] == (y[x] + x^2*Sqrt[x^2 + y[x]^2])/x,y[x],x]
```

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

✓ **Maple** : cpu = 3.691 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = (y(x)+(y(x)^2+x^2)^(1/2)*x^2)/x,y(x))
```

$$\ln\left(\sqrt{y\left(x\right)^2 + x^2} + y(x)\right) - \frac{x^2}{2} - \ln\left(x\right) - c_1 = 0$$

ODE No. 685

$$y'(x) = \frac{x^3 \log((x-1)(x+1)) + y(x) + 7xy(x)^2 \log((x-1)(x+1))}{x}$$

✓ **Mathematica** : cpu = 0.152912 (sec), leaf count = 87

```
DSolve[Derivative[1][y][x] == (x^3*Log[(-1 + x)*(1 + x)] + y[x] + 7*x*Log[(-1 + x)*(1 + x)]*y
```

$$\left\{\left\{y(x) \to \frac{x \tan\left(\frac{1}{2}\left(-\sqrt{7}x^2 + \sqrt{7}x^2 \log(x-1) + \sqrt{7}x^2 \log(x+1) - \sqrt{7}\log(1-x) - \sqrt{7}\log(x+1) + 2\sqrt{7}\right.\right.\right.}{\sqrt{7}}$$

✓ **Maple** : cpu = 0.093 (sec), leaf count = 48

```
dsolve(diff(y(x),x) = (y(x)+ln((x-1)*(1+x))*x^3+7*ln((x-1)*(1+x))*x*y(x)^2)/x,y(x))
```

$$y(x) = \frac{\tan\left(\frac{(x^2 \ln((x-1)(1+x)) - x^2 - \ln((x-1)(1+x)) + 2c_1 + 1)\sqrt{7}}{2}\right) x\sqrt{7}}{7}$$

ODE No. 686

$$y'(x) = \frac{e^{2x^2} x y(x)^3}{e^{x^2} y(x) + 1}$$

✓ **Mathematica** : cpu = 8.62443 (sec), leaf count = 68

```
DSolve[Derivative[1][y][x] == (E^(2*x^2)*x*y[x]^3)/(1 + E^x^2*y[x]),y[x],x]
```

$$\text{Solve}\left[\log(y(x)) - 2y(x)^2 \left(\frac{\log\left(e^{2x^2} y(x)^2 + 2e^{x^2} y(x) + 2\right)}{4y(x)^2} - \frac{\tan^{-1}\left(e^{x^2} y(x) + 1\right)}{2y(x)^2}\right) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.206 (sec), leaf count = 85

```
dsolve(diff(y(x),x) = y(x)^3/(y(x)*exp(x^2)+1)*x*exp(2*x^2),y(x))
```

$$y(x) = \frac{\left(-\tan\left(\text{RootOf}\left(-2x^2 - \ln\left(\frac{81\left(\tan^2\left(\_Z\right)\right)}{10} + \frac{81}{10}\right) + 2\ln\left(\frac{9\tan\left(\_Z\right)}{2} - \frac{9}{2}\right) + 6c_1 - 2\_Z\right)\right) + 1\right) e}{\tan\left(\text{RootOf}\left(-2x^2 - \ln\left(\frac{81\left(\tan^2\left(\_Z\right)\right)}{10} + \frac{81}{10}\right) + 2\ln\left(\frac{9\tan\left(\_Z\right)}{2} - \frac{9}{2}\right) + 6c_1 - 2\_Z\right)\right)}$$

ODE No. 687

$$y'(x) = \frac{x^3\left(-\log\left(\frac{x+1}{x-1}\right)\right) + y(x) + xy(x)^2 \log\left(\frac{x+1}{x-1}\right)}{x}$$

✓ **Mathematica** : cpu = 0.1661 (sec), leaf count = 130

```
DSolve[Derivative[1][y][x] == (-(x^3*Log[(1 + x)/(-1 + x)]) + y[x] + x*Log[(1 + x)/(-1 + x)]*
```

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

✓ **Maple** : cpu = 0.125 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = (y(x)-ln((1+x)/(x-1))*x^3+ln((1+x)/(x-1))*x*y(x)^2)/x,y(x))
```

$$y(x) = -\tanh\left(\frac{x^2 \ln\left(\frac{1+x}{x-1}\right)}{2} - \frac{\ln\left(\frac{1+x}{x-1}\right)}{2} + c_1 + x - 1\right) x$$

ODE No. 688

$$y'(x) = \frac{e^{\frac{x+1}{x-1}} x^3 + e^{\frac{x+1}{x-1}} x y(x)^2 + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.380523 (sec), leaf count = 82

```
DSolve[Derivative[1][y][x] == (E^((1 + x)/(-1 + x))*x^3 + y[x] + E^((1 + x)/(-1 + x))*x*y[x]^
```

$$\left\{\left\{y(x) \to x \tan\left(\frac{1}{2}\left(-8e\mathrm{Ei}\left(\frac{2}{x-1}\right) + e^{\frac{x}{x-1}+\frac{1}{x-1}} x^2 + 2e^{\frac{x}{x-1}+\frac{1}{x-1}} x - 3e^{\frac{x}{x-1}+\frac{1}{x-1}} + 2c_1\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.101 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = (y(x)+exp((1+x)/(x-1))*x^3+exp((1+x)/(x-1))*x*y(x)^2)/x,y(x))
```

$$y(x) = \tan\left(\frac{(x^2+2x-3)\,\mathrm{e}^{\frac{1+x}{x-1}}}{2} + 4\,\mathrm{e}\,\mathrm{expIntegral}\left(1, -\frac{2}{x-1}\right) + c_1\right) x$$

ODE No. 689

$$y'(x) = \frac{-e^{x+1}x^3 + e^{x+1}xy(x)^2 + xy(x) - y(x)}{(x-1)x}$$

✓ **Mathematica** : cpu = 0.348341 (sec), leaf count = 60

```
DSolve[Derivative[1][y][x] == (-(E^(1 + x)*x^3) - y[x] + x*y[x] + E^(1 + x)*x*y[x]^2)/((-1 +
```

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

✓ **Maple** : cpu = 0.071 (sec), leaf count = 25

```
dsolve(diff(y(x),x) = (x*y(x)-y(x)-exp(1+x)*x^3+exp(1+x)*x*y(x)^2)/(x-1)/x,y(x))
```

$$y(x) = -\tanh\left(\mathrm{e}^{1+x} - \mathrm{e}^2\,\mathrm{expIntegral}\left(1, 1-x\right) + c_1\right) x$$

ODE No. 690

$$y'(x) = \frac{-\frac{x^2}{4} + x^3\sqrt{x^2 + 8y(x) - 2x + 1} + \frac{1}{4}}{x + 1}$$

✓ **Mathematica** : cpu = 0.508206 (sec), leaf count = 105

```
DSolve[Derivative[1][y][x] == (1/4 - x^2/4 + x^3*Sqrt[1 - 2*x + x^2 + 8*y[x]])/(1 + x),y[x],x
```

$$\left\{\left\{y(x) \to \frac{1}{72}\left(16x^6 - 48x^5 + 132x^4 - 144x^3 - 96x^3\log(x+1) - 96c_1x^3 + 135x^2 + 144x^2\log(x+1) + 144\right.\right.\right.$$

✓ **Maple** : cpu = 0.533 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = 1/4*(-x^2+1+4*x^3*(x^2-2*x+1+8*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 + \frac{4x^3}{3} - 2x^2 + 4x - 4\ln(1+x) - \sqrt{x^2 - 2x + 1 + 8y(x)} = 0$$

ODE No. 691

$$y'(x) = \frac{\frac{1}{2}x^3 \cos(2y(x)) + \frac{x^3}{2} - \frac{1}{2}\sin(2y(x))}{x}$$

✓ **Mathematica** : cpu = 0.286483 (sec), leaf count = 21

```
DSolve[Derivative[1][y][x] == (x^3/2 + (x^3*Cos[2*y[x]])/2 - Sin[2*y[x]]/2)/x,y[x],x]
```

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

✓ **Maple** : cpu = 0.831 (sec), leaf count = 17

```
dsolve(diff(y(x),x) = 1/2*(-sin(2*y(x))+cos(2*y(x))*x^3+x^3)/x,y(x))
```

$$y(x) = \arctan\left(\frac{x^4 + 8c_1}{4x}\right)$$

ODE No. 692

$$y'(x) = \frac{x^3\sqrt{x^2+y(x)^2}+y(x)}{x}$$

✓ **Mathematica** : cpu = 0.118584 (sec), leaf count = 20

```
DSolve[Derivative[1][y][x] == (y[x] + x^3*Sqrt[x^2 + y[x]^2])/x,y[x],x]
```

$$\left\{\left\{y(x) \to x \sinh\left(\frac{1}{3}\left(x^3+3c_1\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 3.871 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = (y(x)+x^3*(y(x)^2+x^2)^(1/2))/x,y(x))
```

$$\ln\left(\sqrt{y\left(x\right)^2+x^2}+y(x)\right)-\frac{x^3}{3}-\ln\left(x\right)-c_1=0$$

ODE No. 693

$$y'(x) = e^{bx}\left(e^{-3bx}y(x)^3 + e^{-2bx}y(x)^2 + 1\right)$$

✓ **Mathematica** : cpu = 0.370088 (sec), leaf count = 146

```
DSolve[Derivative[1][y][x] == E^(b*x)*(1 + y[x]^2/E^(2*b*x) + y[x]^3/E^(3*b*x)),y[x],x]
```

$$\text{Solve}\left[-\frac{1}{3}(9b+29)^{2/3}\text{RootSum}\left[\#1^3(9b+29)^{2/3} - 9\#1 b - 3\#1 + (9b+29)^{2/3}\&, \frac{\log\left(\frac{3e^{-2bx}y(x)+e^{-bx}}{\sqrt[3]{(9b+29)e^{-3bx}}}\right.}{\#1^2\left(-(9b+29)^{2/3}\right)+3}\right.\right.$$

✓ **Maple** : cpu = 0.111 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = (1+y(x)^2*exp(-2*b*x)+y(x)^3*exp(-3*b*x))*exp(b*x),y(x))
```

$$y(x) = \text{RootOf}\left(-x - \left(\int^{-Z} -\frac{1}{\_a^3 + \_a^2 - \_a b + 1} d\_a\right) + c_1\right) \mathrm{e}^{bx}$$

ODE No. 694

$$y'(x) = \frac{x^3\sqrt{4x^2y(x)+1} + \frac{x}{2} + \frac{1}{2}}{x^3(x+1)}$$

✓ **Mathematica** : cpu = 0.422825 (sec), leaf count = 66

```
DSolve[Derivative[1][y][x] == (1/2 + x/2 + x^3*Sqrt[1 + 4*x^2*y[x]])/(x^3*(1 + x)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{4x^4 - 8x^3\log(x+1) - 8c_1x^3 + 4x^2\log^2(x+1) + 4{c_1}^2x^2 + 8c_1x^2\log(x+1) - 1}{4x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.587 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = 1/2*(x+1+2*(4*x^2*y(x)+1)^(1/2)*x^3)/x^3/(1+x),y(x))
```

$$-2\ln(1+x) - \frac{\sqrt{4x^2y(x)+1}}{x} + 2x + c_1 = 0$$

ODE No. 695

$$y'(x) = \frac{x^4 + x^3 + x^2 y(x)^2 + x y(x)^2 + y(x) \log(x-1)}{x \log(x-1)}$$

✓ **Mathematica** : cpu = 0.224744 (sec), leaf count = 34

```
DSolve[Derivative[1][y][x] == (x^3 + x^4 + Log[-1 + x]*y[x] + x*y[x]^2 + x^2*y[x]^2)/(x*Log[-
```

$$\{\{y(x) \to x \tan(2\text{Ei}(\log(x-1)) + 3\text{Ei}(2\log(x-1)) + \text{Ei}(3\log(x-1)) + c_1)\}\}$$

✓ **Maple** : cpu = 0.067 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = (y(x)*ln(x-1)+x^4+x^3+x^2*y(x)^2+x*y(x)^2)/ln(x-1)/x,y(x))
```

$$y(x) = \tan\left(-\text{expIntegral}\left(1, -3\ln\left(x-1\right)\right) - 3\,\text{expIntegral}\left(1, -2\ln\left(x-1\right)\right) - 2\,\text{expIntegral}\left(1, -\ln\left(x-\right.\right.\right.$$

ODE No. 696

$$y'(x) = \frac{e^{x+1}x^3 + 7e^{x+1}xy(x)^2 + y(x)\log(x-1)}{x\log(x-1)}$$

✓ **Mathematica** : cpu = 0.951418 (sec), leaf count = 51

```
DSolve[Derivative[1][y][x] == (E^(1 + x)*x^3 + Log[-1 + x]*y[x] + 7*E^(1 + x)*x*y[x]^2)/(x*Lo
```

$$\left\{\left\{y(x) \to \frac{x\tan\left(\sqrt{7}\int_1^x \frac{e^{K[1]+1}K[1]}{\log(K[1]-1)}dK[1] + \sqrt{7}c_1\right)}{\sqrt{7}}\right\}\right\}$$

✓ **Maple** : cpu = 0.075 (sec), leaf count = 32

```
dsolve(diff(y(x),x) = (y(x)*ln(x-1)+exp(1+x)*x^3+7*exp(1+x)*x*y(x)^2)/ln(x-1)/x,y(x))
```

$$y(x) = \frac{\tan\left(\left(\mathrm{e}\left(\int \frac{x\,\mathrm{e}^x}{\ln(x-1)}dx\right) + c_1\right)\sqrt{7}\right)x\sqrt{7}}{7}$$

ODE No. 697

$$y'(x) = e^{2x/3}\left(e^{-2x}y(x)^3 + e^{-4x/3}y(x)^2 + 1\right)$$

✓ **Mathematica** : cpu = 0.322516 (sec), leaf count = 114

```
DSolve[Derivative[1][y][x] == E^((2*x)/3)*(1 + y[x]^2/E^((4*x)/3) + y[x]^3/E^(2*x)),y[x],x]
```

$$\text{Solve}\left[-\frac{35}{3}\text{RootSum}\left[-35\#1^3 + 9\sqrt[3]{35}\#1 - 35\&, \frac{\log\left(\frac{3e^{-4x/3}y(x)+e^{-2x/3}}{\sqrt[3]{35}\sqrt[3]{e^{-2x}}} - \#1\right)}{3\sqrt[3]{35} - 35\#1^2}\&\right]\right. = \frac{1}{9}35^{2/3}e^{4x/3}\left(e^{-2x}\right)^{2/3}$$

✓ **Maple** : cpu = 0.114 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = (1+y(x)^2*exp(-4/3*x)+y(x)^3*exp(-2*x))*exp(2/3*x),y(x))
```

$$y(x) = \text{RootOf}\left(-x + 3\left(\int^{-Z} \frac{1}{3\_a^3 + 3\_a^2 - 2\_a + 3} d\_a\right) + c_1\right) \mathrm{e}^{\frac{2x}{3}}$$

ODE No. 698

$$y'(x) = e^x \left(e^{-3x} y(x)^3 + e^{-2x} y(x)^2 + 1\right)$$

✓ **Mathematica** : cpu = 0.31447 (sec), leaf count = 108

```
DSolve[Derivative[1][y][x] == E^x*(1 + y[x]^2/E^(2*x) + y[x]^3/E^(3*x)),y[x],x]
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{3e^{-2x}y(x)+e^{-x}}{\sqrt[3]{38}\sqrt[3]{e^{-3x}}} - \#1\right)}{2\sqrt[3]{38} - 19\#1^2}\&\right] = \frac{1}{9}38^{2/3}e^{2x}\left(e^{-3x}\right)^{2/3} x +$$

✓ **Maple** : cpu = 0.099 (sec), leaf count = 34

```
dsolve(diff(y(x),x) = (1+y(x)^2*exp(-2*x)+y(x)^3*exp(-3*x))*exp(x),y(x))
```

$$y(x) = \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{\_a^3 + \_a^2 - \_a + 1} d\_a + c_1\right) \mathrm{e}^x$$

ODE No. 699

$$y'(x) = \frac{x\left(3x^2\sqrt{x^2+3y(x)} - 2x - 2\right)}{3(x+1)}$$

✓ **Mathematica** : cpu = 0.343419 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (x*(-2 - 2*x + 3*x^2*Sqrt[x^2 + 3*y[x]]))/(3*(1 + x)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{48}\left(4x^6 - 12x^5 + 33x^4 - 36x^3 - 24x^3\log(x+1) - 24c_1x^3 + 20x^2 + 36x^2\log(x+1) + 36c_1x^2 +\right.\right.$$

✓ **Maple** : cpu = 0.504 (sec), leaf count = 36

```
dsolve(diff(y(x),x) = 1/3*x*(-2*x-2+3*x^2*(x^2+3*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 + \frac{x^3}{2} - \frac{3x^2}{4} - \frac{3\ln(1+x)}{2} + \frac{3x}{2} - \sqrt{x^2+3y(x)} = 0$$

ODE No. 700

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

✓ **Mathematica** : cpu = 0.15342 (sec), leaf count = 76

```
DSolve[Derivative[1][y][x] == 1/(x*y[x]*(1 + x + x*y[x]^2)),y[x],x]
```

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

✓ **Maple** : cpu = 0.143 (sec), leaf count = 62

```
dsolve(diff(y(x),x) = 1/x/(x*y(x)^2+1+x)/y(x),y(x))
```

$$y(x) = \frac{\sqrt{x\left(2\,\mathrm{LambertW}\left(\frac{c_1 \mathrm{e}^{-\frac{x-1}{2x}}}{2}\right)x+x-1\right)}}{x}$$

ODE No. 701

$$y'(x) = \frac{x^4 + x^4 \log(x) - 2x^2 y(x) - 2x^2 y(x) \log(x) + y(x)^2 + y(x)^2 \log(x) + 2e^x x - 2x - \log(x) - 1}{e^x - 1}$$

✓ **Mathematica** : cpu = 1.77961 (sec), leaf count = 88

```
DSolve[Derivative[1][y][x] == (-1 - 2*x + 2*E^x*x + x^4 - Log[x] + x^4*Log[x] - 2*x^2*y[x] -
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x \frac{2(\log(K[5])+1)}{-1+e^{K[5]}} dK[5]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[6]} \frac{2(\log(K[5])+1)}{-1+e^{K[5]}} dK[5]\right)(\log(K[6])+1)}{-1+e^{K[6]}} dK[6] + c_1} + x^2 + 1\right\}\right\}$$

✓ **Maple** : cpu = 9.357 (sec), leaf count = 71

```
dsolve(diff(y(x),x) = (2*x*exp(x)-2*x-ln(x)-1+x^4*ln(x)+x^4-2*y(x)*x^2*ln(x)-2*x^2*y(x)+y(x)^
```

$$y(x) = \frac{-x^2 \mathrm{e}^{\int \frac{2\ln(x)+2}{\mathrm{e}^x-1} dx} + c_1 x^2 + \mathrm{e}^{\int \frac{2\ln(x)+2}{\mathrm{e}^x-1} dx} + c_1}{-\mathrm{e}^{\int \frac{2\ln(x)+2}{\mathrm{e}^x-1} dx} + c_1}$$

ODE No. 702

$$y'(x) = \frac{-x^3 + x^3(-\log(x)) - xy(x)^2 + xy(x) - e^x y(x) - xy(x)^2 \log(x)}{x\left(x - e^x\right)}$$

✓ **Mathematica** : cpu = 2.40073 (sec), leaf count = 37

```
DSolve[Derivative[1][y][x] == (-x^3 - x^3*Log[x] - E^x*y[x] + x*y[x] - x*y[x]^2 - x*Log[x]*y[
```

$$\left\{\left\{y(x) \to x \tan\left(\int_1^x \frac{K[1](\log(K[1]) + 1)}{e^{K[1]} - K[1]} dK[1] + c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.095 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = (-y(x)*exp(x)+x*y(x)-x^3*ln(x)-x^3-x*y(x)^2*ln(x)-x*y(x)^2)/(-exp(x)+x)
```

$$y(x) = \tan\left(\int \frac{x \ln(x)}{\mathrm{e}^x - x} dx + \int \frac{x}{\mathrm{e}^x - x} dx + c_1\right) x$$

ODE No. 703

$$y'(x) = \frac{y(x)\left(x^3 y(x) + x^2 y(x)\log(x) - x^2 - x - x\log(x) + 1\right)}{(x-1)x}$$

✓ **Mathematica** : cpu = 0.455162 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (y[x]*(1 - x - x^2 - x*Log[x] + x^3*y[x] + x^2*Log[x]*y[x]))/((
```

$$\left\{\left\{y(x) \to -\frac{e^{-\text{Li}_2(x)-x}(1-x)^{-\log(x)}}{(x-1)x\left(-\int_1^x \frac{\exp(-K[1]-\log(1-K[1])(\log(K[1])+1)-\text{Li}_2(K[1]))(K[1]^3+\log(K[1])K[1]^2)}{(K[1]-1)K[1]^2} dK[1] + c_1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.23 (sec), leaf count = 44

```
dsolve(diff(y(x),x) = y(x)*(1-x+y(x)*x^2*ln(x)+x^3*y(x)-x*ln(x)-x^2)/(x-1)/x,y(x))
```

$$y(x) = \frac{e^{\text{dilog}(x)} e^{-x}}{x\left(\int -\frac{e^{\text{dilog}(x)}(x+\ln(x))e^{-x}}{(x-1)^2} dx + c_1\right)(x-1)}$$

ODE No. 704

$$y'(x) = \frac{2ax^3y(x)^2 + 2bx^5 - y(x) + xy(x)\log(x)}{x(x\log(x) - 1)}$$

✓ **Mathematica** : cpu = 7.64759 (sec), leaf count = 66

```
DSolve[Derivative[1][y][x] == (2*b*x^5 - y[x] + x*Log[x]*y[x] + 2*a*x^3*y[x]^2)/(x*(-1 + x*Lo
```

$$\left\{\left\{y(x) \to \frac{\sqrt{b}x\tan\left(\sqrt{a}\sqrt{b}\int_1^x \frac{2K[1]^3}{K[1]\log(K[1])-1}dK[1] + \sqrt{a}\sqrt{b}c_1\right)}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.072 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = (y(x)*ln(x)*x-y(x)+2*x^5*b+2*x^3*a*y(x)^2)/(x*ln(x)-1)/x,y(x))
```

$$y(x) = \frac{\tan\left(2\sqrt{ab}\left(c_1 + \int \frac{x^3}{x\ln(x)-1}dx\right)\right)x\sqrt{ab}}{a}$$

ODE No. 705

$$y'(x) = \frac{y(x)\left(x^4 + x^3 + \log(y(x)) + x\right)}{x}$$

✓ **Mathematica** : cpu = 0.147836 (sec), leaf count = 30

```
DSolve[Derivative[1][y][x] == ((x + x^3 + x^4 + Log[y[x]])*y[x])/x,y[x],x]
```

$$\left\{\left\{y(x) \to x^x e^{\frac{x^4}{3}+\frac{x^3}{2}+c_1 x}\right\}\right\}$$

✓ **Maple** : cpu = 0.211 (sec), leaf count = 24

```
dsolve(diff(y(x),x) = (ln(y(x))+x+x^3+x^4)*y(x)/x,y(x))
```

$$y(x) = \mathrm{e}^{\frac{x^4}{3}} \mathrm{e}^{\frac{x^3}{2}} \mathrm{e}^{x c_1} x^x$$

ODE No. 706

$$y'(x) = -\frac{1}{8}x(y(x)+1)^2(-\log(y(x)-1)+\log(y(x)+1)+2\log(x))$$

✓ **Mathematica** : cpu = 33.4825 (sec), leaf count = 610

```
DSolve[Derivative[1][y][x] == -1/8*(x*(2*Log[x] - Log[-1 + y[x]] + Log[1 + y[x]])*(1 + y[x])^
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{-2\log(x)x^2+\log(K[2]-1)x^2-\log(K[2]+1)x^2-8}{2\left(2\log(x)x^2-\log(K[2]-1)x^2+\log(K[2]+1)x^2+K[2]\left(2\log(x)x^2-\log(K[2]-1)x^2+1\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.678 (sec), leaf count = 65

```
dsolve(diff(y(x),x) = -1/8*(-ln(-1+y(x))+ln(1+y(x))+2*ln(x))*x*(1+y(x))^2,y(x))
```

$$\int_{\_b}^{y(x)}\frac{1}{2\left(-\frac{x^2(1+\_a)\ln(\_a-1)}{2}+\frac{x^2(1+\_a)\ln(1+\_a)}{2}+x^2(1+\_a)\ln(x)+4\_a-4\right)(1+\_a)}d\_a+\frac{\ln(x)}{8}-c_1$$

ODE No. 707

$$y'(x) = \frac{1}{16} x (y(x)+1)^2 (-\log(y(x)-1) + \log(y(x)+1) + 2\log(x))^2$$

✓ **Mathematica** : cpu = 4.8318 (sec), leaf count = 1391

```
DSolve[Derivative[1][y][x] == (x*(2*Log[x] - Log[-1 + y[x]] + Log[1 + y[x]])^2*(1 + y[x])^2)/
```

$$\text{Solve}\left[\int_1^x -\frac{}{4\log^2(K[1])K[1]^2 + \log^2(y(x)-1)K[1]^2 + \log^2(y(x)+1)K[1]^2 - 4\log(K[1])\log(y(x)-1)K[}\right.$$

✓ **Maple** : cpu = 0.61 (sec), leaf count = 105

```
dsolve(diff(y(x),x) = 1/16*(-ln(-1+y(x))+ln(1+y(x))+2*ln(x))^2*x*(1+y(x))^2,y(x))
```

$$\int_{\_b}^{y(x)} \frac{1}{4\,(1+\_a)\left(\frac{x^2(1+\_a)\ln(1+\_a)^2}{4} + \left(-\frac{\ln(\_a-1)}{2} + \ln(x)\right) x^2\,(1+\_a)\ln(1+\_a) + \frac{x^2(1+\_a)\ln(\_a-1)^2}{4} -}$$

ODE No. 708

$$y'(x) = \frac{(4ax - y(x)^2)^3}{y(x)\,(4ax - y(x)^2 - 1)}$$

✓ **Mathematica** : cpu = 0.363625 (sec), leaf count = 89

```
DSolve[Derivative[1][y][x] == (4*a*x - y[x]^2)^3/(y[x]*(-1 + 4*a*x - y[x]^2)),y[x],x]
```

$$\text{Solve}\left[2a\left(x - \frac{\text{RootSum}\left[-\#1^3 + 2\#1 a - 2a\&,\ \frac{\#1 a \log\left(-\#1 + 4ax - y(x)^2\right) - a\log\left(-\#1 + 4ax - y(x)^2\right)}{2a - 3\#1^2}\&\right]}{2a}\right)\right] = c_1, y(x$$

✓ **Maple** : cpu = 1095.87 (sec), leaf count = 229

```
dsolve(diff(y(x),x) = (-y(x)^2+4*a*x)^3/(-y(x)^2+4*a*x-1)/y(x),y(x))
```

$$\int_{\_b}^{x} -\frac{\left(4\_aa - y(x)^2\right)^3}{-y(x)^6 + 12\_aay(x)^4 + \left(-48\_a^2a^2 + 2a\right)y(x)^2 + 64\_a^3a^3 - 8\_aa^2 + 2a} d\_a + \int^{y(x)} \left(\frac{}{-\_f^6 + 12\_}\right.$$

ODE No. 709

$$y'(x) = \frac{x^3\sqrt{4ax - y(x)^2} + 2ax + 2a}{(x+1)y(x)}$$

✓ **Mathematica** : cpu = 2.55579 (sec), leaf count = 217

```
DSolve[Derivative[1][y][x] == (2*a + 2*a*x + x^3*Sqrt[4*a*x - y[x]^2])/((1 + x)*y[x]),y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{1}{6}\sqrt{144ax - 4x^6 + 12x^5 - 33x^4 + 36x^3 + 24x^3\log(x+1) - 24c_1x^3 - 36x^2 - 36x^2\log(x+1)\right.\right.$$

✓ **Maple** : cpu = 0.312 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = (2*a*x+2*a+x^3*(-y(x)^2+4*a*x)^(1/2))/(1+x)/y(x),y(x))
```

$$-\sqrt{-y\left(x\right)^{2}+4ax}-\frac{x^{3}}{3}+\frac{x^{2}}{2}-x+\ln\left(1+x\right)-c_{1}=0$$

ODE No. 710

$$y'(x) = \frac{2x^3 + 4x^2 y(x) + 2xy(x)^2 + 2x + e^{\frac{1}{x}} - \log(x)}{\log(x) - e^{\frac{1}{x}}}$$

✓ **Mathematica** : cpu = 1.13319 (sec), leaf count = 38

```
DSolve[Derivative[1][y][x] == (E^x^(-1) + 2*x + 2*x^3 - Log[x] + 4*x^2*y[x] + 2*x*y[x]^2)/(-E
```

$$\left\{\left\{y(x) \to -x + \tan\left(\int_1^x -\frac{2K[5]}{e^{\frac{1}{K[5]}} - \log(K[5])} dK[5] + c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 3.249 (sec), leaf count = 31

```
dsolve(diff(y(x),x) = (-ln(x)+exp(1/x)+4*x^2*y(x)+2*x+2*x*y(x)^2+2*x^3)/(ln(x)-exp(1/x)),y(x)
```

$$y(x) = -x + \tan\left(2c_1 - 2\left(\int -\frac{x}{\ln(x) - \mathrm{e}^{\frac{1}{x}}} dx\right)\right)$$

ODE No. 711

$$y'(x) = \frac{y(x)(-x\log(y(x)) - \log(y(x)) + 1)}{x+1}$$

✓ **Mathematica** : cpu = 0.224005 (sec), leaf count = 28

```
DSolve[Derivative[1][y][x] == ((1 - Log[y[x]] - x*Log[y[x]])*y[x])/(1 + x),y[x],x]
```

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

✓ **Maple** : cpu = 0.277 (sec), leaf count = 31

```
dsolve(diff(y(x),x) = -(ln(y(x))*x+ln(y(x))-1)*y(x)/(1+x),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{e}^{-x}c_1}\mathrm{e}^{-\operatorname{expIntegral}(1,-1-x)\mathrm{e}^{-1-x}}$$

ODE No. 712

$$y'(x) = \frac{\frac{x^2}{2} + x^3\sqrt{x^2 - 4y(x) + 2x + 1} + x + \frac{1}{2}}{x + 1}$$

✓ **Mathematica** : cpu = 0.453364 (sec), leaf count = 105

```
DSolve[Derivative[1][y][x] == (1/2 + x + x^2/2 + x^3*Sqrt[1 + 2*x + x^2 - 4*y[x]])/(1 + x),y[
```

$$\left\{\left\{y(x) \to \frac{1}{36}\left(-4x^6 + 12x^5 - 33x^4 + 36x^3 + 24x^3\log(x+1) + 24c_1x^3 - 27x^2 - 36x^2\log(x+1) - 36c_1x^2\right.\right.$$

✓ **Maple** : cpu = 0.538 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = 1/2*(x^2+2*x+1+2*x^3*(x^2+2*x+1-4*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 - \frac{2x^3}{3} + x^2 - 2x + 2\ln(1+x) - \sqrt{x^2 + 2x + 1 - 4y(x)} = 0$$

ODE No. 713

$$y'(x) = \frac{-a^2 - aby(x) - ab\sqrt{x} + ab + b^2x + b^2}{a\left(a(-y(x)) - a\sqrt{x} + a + bx + b\right)}$$

✓ **Mathematica** : cpu = 0.114632 (sec), leaf count = 649

```
DSolve[Derivative[1][y][x] == (-a^2 + a*b + b^2 - a*b*Sqrt[x] + b^2*x - a*b*y[x])/(a*(a + b -
```

$$\left\{\left\{y(x) \to -\frac{a\sqrt{x} - a - bx - b}{a} + \frac{1}{a^2 \text{Root}\left[\#1^6\left(16x^3 + 16e^{12c_1}\right) - \frac{24\#1^4 x^2}{a^4} + \frac{8\#1^3 x^{3/2}}{a^6} + \frac{9\#1^2 x}{a^8} - \frac{6\#1\sqrt{x}}{a^{10}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.405 (sec), leaf count = 86

```
dsolve(diff(y(x),x) = (-b*y(x)*a+b^2+a*b+b^2*x-b*a*x^(1/2)-a^2)/a/(-a*y(x)+b+a+b*x-a*x^(1/2))
```

$$y(x) = \frac{3\tanh\left(\text{RootOf}\left(729x^3\left(\tanh^6(\_Z)\right)a^6 - 2187x^3\left(\tanh^4(\_Z)\right)a^6 + 2187x^3\left(\tanh^2(\_Z)\right)a^6 - 729a^6\right.\right.}{2a}$$

ODE No. 714

$$y'(x) = -\frac{y(x)\left(x^3 y(x) + x^2 y(x)\log(x) - x^2 + e^x - x\log(x) - \log\left(\frac{1}{x}\right)\right)}{x\left(e^x - \log\left(\frac{1}{x}\right)\right)}$$

✓ **Mathematica** : cpu = 1.36151 (sec), leaf count = 162

```
DSolve[Derivative[1][y][x] == -((y[x]*(E^x - x^2 - Log[x^(-1)] - x*Log[x] + x^3*y[x] + x^2*Lo
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x -\frac{-K[1]^2-\log(K[1])K[1]+e^{K[1]}-\log\left(\frac{1}{K[1]}\right)}{K[1]\left(e^{K[1]}-\log\left(\frac{1}{K[1]}\right)\right)}dK[1]\right)}{-\int_1^x -\frac{\exp\left(\int_1^{K[2]} -\frac{-K[1]^2-\log(K[1])K[1]+e^{K[1]}-\log\left(\frac{1}{K[1]}\right)}{K[1]\left(e^{K[1]}-\log\left(\frac{1}{K[1]}\right)\right)}dK[1]\right)(K[2]^3+\log(K[2])K[2]^2)}{K[2]\left(e^{K[2]}-\log\left(\frac{1}{K[2]}\right)\right)}dK[2]+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.304 (sec), leaf count = 96

```
dsolve(diff(y(x),x) = -y(x)*(-ln(1/x)+exp(x)+y(x)*x^2*ln(x)+x^3*y(x)-x*ln(x)-x^2)/(-ln(1/x)+e
```

$$y(x) = \frac{e^{\int \frac{x\ln(x)+x^2+\ln\left(\frac{1}{x}\right)-e^x}{\left(-\ln\left(\frac{1}{x}\right)+e^x\right)x}dx}}{\int \frac{e^{\int \frac{x\ln(x)+x^2+\ln\left(\frac{1}{x}\right)-e^x}{\left(-\ln\left(\frac{1}{x}\right)+e^x\right)x}dx}}{-\ln\left(\frac{1}{x}\right)+e^x}x(x+\ln(x))dx + c_1}$$

ODE No. 715

$$y'(x) = \frac{-\frac{x^2}{2} + x^3\sqrt{x^2+4y(x)-4x} + \frac{x}{2} + 1}{x+1}$$

✓ **Mathematica** : cpu $= 0.474216$ (sec), leaf count $= 104$

```
DSolve[Derivative[1][y][x] == (1 + x/2 - x^2/2 + x^3*Sqrt[-4*x + x^2 + 4*y[x]])/(1 + x),y[x],
```

$$\left\{\left\{y(x) \to \frac{1}{36}\left(4x^6 - 12x^5 + 33x^4 - 36x^3 - 24x^3\log(x+1) - 24c_1x^3 + 27x^2 + 36x^2\log(x+1) + 36c_1x^2 +\right.\right.$$

✓ **Maple** : cpu $= 0.501$ (sec), leaf count $= 39$

```
dsolve(diff(y(x),x) = 1/2*(-x^2+x+2+2*x^3*(x^2-4*x+4*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 + \frac{2x^3}{3} - x^2 + 2x - 2\ln(1+x) - \sqrt{x^2-4x+4y(x)} = 0$$

ODE No. 716

$$y'(x) = \frac{\sqrt{9x^4 - 4y(x)^3} + 3x^4 + 3x^3}{(x+1)y(x)^2}$$

✓ **Mathematica** : cpu = 2.36111 (sec), leaf count = 133

```
DSolve[Derivative[1][y][x] == (3*x^3 + 3*x^4 + Sqrt[9*x^4 - 4*y[x]^3])/((1 + x)*y[x]^2),y[x],
```

$$\left\{\left\{y(x) \to \left(-\frac{3}{2}\right)^{2/3} \sqrt[3]{x^4 - 4\log^2(x+1) + 8c_1 \log(x+1) - 4{c_1}^2}\right\}, \left\{y(x) \to \left(\frac{3}{2}\right)^{2/3} \sqrt[3]{x^4 - 4\log^2(x+1}\right.\right.$$

✓ **Maple** : cpu = 0.312 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = (3*x^4+3*x^3+(9*x^4-4*y(x)^3)^(1/2))/(1+x)/y(x)^2,y(x))
```

$$\int_{\_b}^{y(x)} \frac{\_a^2}{\sqrt{9x^4 - 4\_a^3}} d\_a - \ln(1+x) - c_1 = 0$$

ODE No. 717

$$y'(x) = \frac{\sqrt{a^2+2ax+x^2+4y(x)} - \frac{ax}{2} - \frac{a}{2} - \frac{x^2}{2} - \frac{x}{2}}{x+1}$$

✓ **Mathematica** : cpu = 0.641073 (sec), leaf count = 106

```
DSolve[Derivative[1][y][x] == (-1/2*a - x/2 - (a*x)/2 - x^2/2 + Sqrt[a^2 + 2*a*x + x^2 + 4*y[
```

$$\text{Solve}\left[-\frac{1}{2}\sqrt{a^2+2ax+x^2+4y(x)} - \frac{1}{2}a\log\left(\sqrt{a^2+2ax+x^2+4y(x)}+a+x\right) + \frac{1}{2}a\tanh^{-1}\left(\frac{2}{2\sqrt{a^2+2a}}\right.\right.$$

✓ **Maple** : cpu = 0.582 (sec), leaf count = 33

```
dsolve(diff(y(x),x) = -1/2*(x^2+x+a*x+a-2*(x^2+2*a*x+a^2+4*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 + \frac{a}{2} + 2\ln(1+x) - \sqrt{x^2+2ax+a^2+4y(x)} = 0$$

ODE No. 718

$$y'(x) = e^{-x^2} x \left(e^{3x^2} y(x)^3 + e^{2x^2} y(x)^2 + 1 \right)$$

✓ **Mathematica** : cpu = 0.33927 (sec), leaf count = 127

```
DSolve[Derivative[1][y][x] == (x*(1 + E^(2*x^2)*y[x]^2 + E^(3*x^2)*y[x]^3))/E^x^2,y[x],x]
```

$$\text{Solve}\left[\frac{11}{3}\text{RootSum}\left[11\#1^3 + 15\sqrt[3]{11}\#1 + 11\&, \frac{\log\left(\frac{3e^{2x^2}xy(x)+e^{x^2}x}{\sqrt[3]{11}\sqrt[3]{e^{3x^2}x^3}} - \#1\right)}{11\#1^2 + 5\sqrt[3]{11}}\&\right] = \frac{11^{2/3}e^{x^2}x^3}{18\sqrt[3]{e^{3x^2}x^3}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.08 (sec), leaf count = 44

```
dsolve(diff(y(x),x) = (1+y(x)^2*exp(2*x^2)+y(x)^3*exp(3*x^2))*exp(-x^2)*x,y(x))
```

$$y(x) = \frac{\left(-11\,\text{RootOf}\left(-5x^2 + 20250\left(\int^{-Z} \frac{1}{121\_a^3+3375\_a-3375} d\_a\right) + 6c_1\right) - 15\right) \mathrm{e}^{-x^2}}{45}$$

ODE No. 719

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

✓ **Mathematica** : cpu = 0.406401 (sec), leaf count = 49

```
DSolve[Derivative[1][y][x] == (y[x]*(-E^x - x*Log[2*x] + x^2*Log[2*x]*y[x]))/(E^x*x),y[x],x]
```

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

✓ **Maple** : cpu = 0.152 (sec), leaf count = 34

```
dsolve(diff(y(x),x) = y(x)*(-exp(x)+ln(2*x)*x^2*y(x)-ln(2*x)*x)/x/exp(x),y(x))
```

$$y(x) = \frac{1}{2^{-\mathrm{e}^{-x}} x^{-\mathrm{e}^{-x}+1} c_1 \mathrm{e}^{-\operatorname{expIntegral}(1,x)} + x}$$

ODE No. 720

$$y'(x) = \frac{x^3\left(\sqrt{9x^4 - 4y(x)^3} + 3x + 3\right)}{(x+1)y(x)^2}$$

✓ **Mathematica** : cpu = 2.51908 (sec), leaf count = 314

```
DSolve[Derivative[1][y][x] == (x^3*(3 + 3*x + Sqrt[9*x^4 - 4*y[x]^3]))/((1 + x)*y[x]^2),y[x],
```

$$\left\{\left\{y(x) \to \sqrt[3]{-x^6 + 3x^5 - 6x^4 + 9x^3 + 6x^3\log(x+1) + 6c_1x^3 - 9x^2 - 9x^2\log(x+1) - 9c_1x^2 - 9\log^2(x+\right.$$

✓ **Maple** : cpu = 0.212 (sec), leaf count = 48

```
dsolve(diff(y(x),x) = x^3*(3*x+3+(9*x^4-4*y(x)^3)^(1/2))/(1+x)/y(x)^2,y(x))
```

$$\int_{\_b}^{y(x)} \frac{\_a^2}{\sqrt{9x^4 - 4\_a^3}} d\_a - \frac{x^3}{3} + \frac{x^2}{2} - x + \ln(1+x) - c_1 = 0$$

ODE No. 721

$$y'(x) = \frac{1}{36}\sqrt{x}\left(18x^{3/2} + x^6 - 12x^3 y(x) + 36y(x)^2\right)$$

✓ **Mathematica** : cpu = 0.119879 (sec), leaf count = 27

```
DSolve[Derivative[1][y][x] == (Sqrt[x]*(18*x^(3/2) + x^6 - 12*x^3*y[x] + 36*y[x]^2))/36,y[x],
```

$$\left\{\left\{y(x) \to \frac{x^3}{6} + \frac{1}{-\frac{2x^{3/2}}{3} + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.1 (sec), leaf count = 19

```
dsolve(diff(y(x),x) = 1/36*(18*x^(3/2)+36*y(x)^2-12*x^3*y(x)+x^6)*x^(1/2),y(x))
```

$$y(x) = \frac{x^3}{6} + \frac{1}{c_1 - \frac{2x^{\frac{3}{2}}}{3}}$$

ODE No. 722

$$y'(x) = -\frac{y(x)^3}{x(-y(x) + 2y(x)\log(x) - 1)}$$

✓ **Mathematica** : cpu = 23.8351 (sec), leaf count = 490

```
DSolve[Derivative[1][y][x] == -(y[x]^3/(x*(-1 - y[x] + 2*Log[x]*y[x]))),y[x],x]
```

$$\text{Solve}\left[-\frac{\sqrt[3]{-2}\left((-2)^{2/3} - \frac{(1-2\log(x))^2\left(-\frac{1}{(2\log(x)-1)^3}\right)^{2/3}(y(x)(5-4\log(x))+2)}{2\sqrt[3]{2}(y(x)(2\log(x)-1)-1)}\right)\left(\frac{y(x)(4\log(x)-5)-2}{\sqrt[3]{2}\sqrt[3]{-\frac{1}{(2\log(x)-1)^3}}(2\log(x)-1)(y(\right.\right.\right.$$

✓ **Maple** : cpu = 0.522 (sec), leaf count = 70

```
dsolve(diff(y(x),x) = -y(x)^3/(-1+2*y(x)*ln(x)-y(x))/x,y(x))
```

$$y(x) = \frac{e^{\text{RootOf}\left(-e^{-Z}\ln\left(\frac{e^{-Z}+2}{2x^4}\right)+3c_1e^{-Z}+\_Ze^{-Z}+2\right)}}{1+(2\ln(x)-1)\,e^{\text{RootOf}\left(-e^{-Z}\ln\left(\frac{e^{-Z}+2}{2x^4}\right)+3c_1e^{-Z}+\_Ze^{-Z}+2\right)}}$$

ODE No. 723

$$y'(x) = \frac{2a}{32a^3x^2 - 16a^2xy(x)^2 + 2ay(x)^4 + y(x)}$$

✓ **Mathematica** : cpu = 0.222643 (sec), leaf count = 663

```
DSolve[Derivative[1][y][x] == (2*a)/(32*a^3*x^2 + y[x] - 16*a^2*x*y[x]^2 + 2*a*y[x]^4),y[x],x
```

$$\left\{\left\{y(x) \to -\frac{\sqrt[3]{-1024a^6{c_1}^3 + 9216a^5c_1x - 432a^2 + \sqrt{4\left(-192a^3x - 64a^4{c_1}^2\right)^3 + \left(-1024a^6{c_1}^3 + 9216a^5c_1\right.}}}{12\sqrt[3]{2}a}\right.\right.$$

✓ **Maple** : cpu = 0.115 (sec), leaf count = 856

```
dsolve(diff(y(x),x) = 2*a/(y(x)+2*a*y(x)^4-16*a^2*x*y(x)^2+32*a^3*x^2),y(x))
```

$$y(x) = \frac{\left(\left(64c_1^3a^4 - 576c_1a^3x + 3\sqrt{-12288a^7xc_1^4 + 24576a^6x^2c_1^2 - 12288a^5x^3 + 384c_1^3a^4 - 3456c_1a^3x + 81}\right.\right.}{6a}$$

ODE No. 724

$$y'(x) = -\frac{y(x)^3}{x(-y(x) + y(x)\log(x) - 1)}$$

✓ **Mathematica** : cpu = 15.4478 (sec), leaf count = 422

```
DSolve[Derivative[1][y][x] == -(y[x]^3/(x*(-1 - y[x] + Log[x]*y[x]))),y[x],x]
```

$$\text{Solve}\left[-\frac{\sqrt[3]{-2}\left(\frac{1-y(x)(\log(x)-4)}{\sqrt[3]{2}\sqrt[3]{-\frac{1}{(\log(x)-1)^3}(\log(x)-1)(y(x)(\log(x)-1)-1)}}+(-2)^{2/3}\right)\left(\frac{2^{2/3}(y(x)(\log(x)-4)-1)}{\sqrt[3]{-\frac{1}{(\log(x)-1)^3}(\log(x)-1)(y(x)(\log(x)-1)-1)}}+\sqrt[3]{2}\right)}{\right.$$

✓ **Maple** : cpu = 0.068 (sec), leaf count = 18

```
dsolve(diff(y(x),x) = -y(x)^3/(-1+y(x)*ln(x)-y(x))/x,y(x))
```

$$y(x) = \frac{1}{-\text{LambertW}\left(c_1 \mathrm{e}^{-2} x\right) + \ln(x) - 2}$$

ODE No. 725

$$y'(x) = \frac{x^2 \log(2x) + 2xy(x) \log(2x) + y(x)^2 \log(2x) - \log(x) + \log(2x)}{\log(x)}$$

✓ **Mathematica** : cpu = 0.318638 (sec), leaf count = 19

```
DSolve[Derivative[1][y][x] == (-Log[x] + Log[2*x] + x^2*Log[2*x] + 2*x*Log[2*x]*y[x] + Log[2*
```

$$\{\{y(x) \to -x + \tan(\log(2)\text{li}(x) + x + c_1)\}\}$$

✓ **Maple** : cpu = 1.019 (sec), leaf count = 25

```
dsolve(diff(y(x),x) = (-ln(x)+2*ln(2*x)*x*y(x)+ln(2*x)+ln(2*x)*y(x)^2+ln(2*x)*x^2)/ln(x),y(x)
```

$$y(x) = -x - \tan\left(\ln\left(2\right) \text{expIntegral}\left(1, -\ln\left(x\right)\right) + c_1 - x\right)$$

ODE No. 726

$$y'(x) = \frac{a^2 - aby(x) - ab\sqrt{x} - b^2x + bc}{a\left(ay(x) + a\sqrt{x} + bx - c\right)}$$

✓ **Mathematica** : cpu = 0.103769 (sec), leaf count = 625

```
DSolve[Derivative[1][y][x] == (a^2 + b*c - a*b*Sqrt[x] - b^2*x - a*b*y[x])/(a*(-c + a*Sqrt[x]
```

$$\left\{\left\{y(x) \to -\frac{a\sqrt{x} + bx - c}{a} + \frac{1}{a^2 \text{Root}\left[\#1^6\left(16x^3 + 16e^{12c_1}\right) - \frac{24\#1^4 x^2}{a^4} + \frac{8\#1^3 x^{3/2}}{a^6} + \frac{9\#1^2 x}{a^8} - \frac{6\#1\sqrt{x}}{a^{10}} + \frac{1}{a^1}\right.\right.\right.$$

✓ **Maple** : cpu = 0.329 (sec), leaf count = 83

```
dsolve(diff(y(x),x) = -(b*y(x)*a-b*c+b^2*x+b*a*x^(1/2)-a^2)/a/(a*y(x)-c+b*x+a*x^(1/2)),y(x))
```

$$y(x) = \frac{3\tanh\left(\text{RootOf}\left(-729x^3\left(\tanh^6\left(\_Z\right)\right)a^6 + 2187x^3\left(\tanh^4\left(\_Z\right)\right)a^6 - 2187x^3\left(\tanh^2\left(\_Z\right)\right)a^6 + 729a\right.\right.}{2a}$$

ODE No. 727

$$y'(x) = \frac{y(x)(y(x)+2x+2)}{(x+1)(\log(y(x))+2x-1)}$$

✓ **Mathematica** : cpu = 0.460526 (sec), leaf count = 29

```
DSolve[Derivative[1][y][x] == (y[x]*(2 + 2*x + y[x]))/((1 + x)*(-1 + 2*x + Log[y[x]])),y[x],x
```

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

✓ **Maple** : cpu = 0.3 (sec), leaf count = 25

```
dsolve(diff(y(x),x) = (2*x+2+y(x))/(ln(y(x))+2*x-1)*y(x)/(1+x),y(x))
```

$$y(x) = \mathrm{e}^{-\operatorname{LambertW}\left((\ln(1+x)-c_1)\mathrm{e}^{-2x}\right)-2x}$$

ODE No. 728

$$y'(x) = \frac{y(x)\left(x^3 + 3y(x)^2\right)}{x\left(6y(x)^2 + x\right)}$$

✓ **Mathematica** : cpu = 0.305029 (sec), leaf count = 72

```
DSolve[Derivative[1][y][x] == (y[x]*(x^3 + 3*y[x]^2))/(x*(x + 6*y[x]^2)),y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{x}\sqrt{W\left(\frac{6e^{x^2+2c_1}}{x}\right)}}{\sqrt{6}}\right\}, \left\{y(x) \to \frac{\sqrt{x}\sqrt{W\left(\frac{6e^{x^2+2c_1}}{x}\right)}}{\sqrt{6}}\right\}\right\}$$

✓ **Maple** : cpu = 0.437 (sec), leaf count = 50

```
dsolve(diff(y(x),x) = 1/(6*y(x)^2+x)*(x^3+3*y(x)^2)*y(x)/x,y(x))
```

$$\frac{1}{\frac{1}{y(x)^2} + \frac{6}{x}} = \frac{\left(e^{\operatorname{RootOf}\left(x^2 e^{-Z} - e^{-Z}\ln\left(\frac{\left(e^{-Z}+9\right)x}{2}\right) + 3c_1 e^{-Z} + \_Z e^{-Z} + 9\right)} + 9\right)x}{54}$$

ODE No. 729

$$y'(x) = \frac{(x - y(x))y(x)}{x\,(x - y(x)^3)}$$

✓ **Mathematica** : cpu = 0.257993 (sec), leaf count = 327

```
DSolve[Derivative[1][y][x] == ((x - y[x])*y[x])/(x*(x - y[x]^3)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{2}(-6\log(x) + 6c_1)}{3\sqrt[3]{54x + \sqrt{2916x^2 + 4(-6\log(x) + 6c_1)^3}}} - \frac{\sqrt[3]{54x + \sqrt{2916x^2 + 4(-6\log(x) + 6c_1)^3}}}{3\sqrt[3]{2}}\right\}, \left\{y(\right.$$

✓ **Maple** : cpu = 0.128 (sec), leaf count = 404

```
dsolve(diff(y(x),x) = y(x)*(x-y(x))/x/(x-y(x)^3),y(x))
```

$$y(x) = \frac{\left(-27x + 3\sqrt{24c_1^3 - 72c_1^2\ln(x) + 72c_1\ln(x)^2 - 24\ln(x)^3 + 81x^2}\right)^{\frac{2}{3}} + 6\ln(x) - 6c_1}{3\left(-27x + 3\sqrt{24c_1^3 - 72c_1^2\ln(x) + 72c_1\ln(x)^2 - 24\ln(x)^3 + 81x^2}\right)^{\frac{1}{3}}}$$

ODE No. 730

$$y'(x) = \frac{e^x \left(2y(x)^{3/2} - 3e^x\right)^3}{4\sqrt{y(x)}\left(2y(x)^{3/2} - 3e^x + 2\right)}$$

✓ **Mathematica** : cpu = 0.308546 (sec), leaf count = 83

```
DSolve[Derivative[1][y][x] == (E^x*(-3*E^x + 2*y[x]^(3/2))^3)/(4*Sqrt[y[x]]*(2 - 3*E^x + 2*y[
```

$$\text{Solve}\left[-\frac{2}{3}\text{RootSum}\left[\#1^3 - \#1 - 1\&,\ \frac{\#1 \log\left(-\#1 + y(x)^{3/2} - \frac{3e^x}{2}\right) + \log\left(-\#1 + y(x)^{3/2} - \frac{3e^x}{2}\right)}{3\#1^2 - 1}\&\right] + e^x\right.$$

✓ **Maple** : cpu = 1.582 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = 1/4*(2*y(x)^(3/2)-3*exp(x))^3*exp(x)/(2*y(x)^(3/2)-3*exp(x)+2)/y(x)^(1/
```

$$\mathrm{e}^x - \left(\int^{y(x)^{\frac{3}{2}} - \frac{3\,\mathrm{e}^x}{2}} \frac{2 + 2\_a}{3\_a^3 - 3\_a - 3}\, d\_a\right) - c_1 = 0$$

ODE No. 731

$$y'(x) = \frac{2y(x)+1}{x\left(2xy(x)^3 + xy(x)^2 - 2\right)}$$

✓ **Mathematica** : cpu = 0.464685 (sec), leaf count = 47

```
DSolve[Derivative[1][y][x] == (1 + 2*y[x])/(x*(-2 + x*y[x]^2 + 2*x*y[x]^3)),y[x],x]
```

$$\text{Solve}\left[\frac{1}{64}\left(-4y(x)^2 + 4y(x) - 2\log(8y(x)+4) + 3\right) - \frac{1}{4x(2y(x)+1)} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.31 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = 1/x*(1+2*y(x))/(-2+x*y(x)^2+2*x*y(x)^3),y(x))
```

$$y(x) = \frac{\mathrm{e}^{\text{RootOf}\left(x\,\mathrm{e}^{3\_Z} - 4x\,\mathrm{e}^{2\_Z} + 8xc_1\mathrm{e}^{\_Z} + 2\_Z\mathrm{e}^{\_Z}x + 3\,\mathrm{e}^{\_Z}x + 16\right)}}{2} - \frac{1}{2}$$

ODE No. 732

$$y'(x) = \frac{x^3\sqrt{a^2+2ax+x^2+4y(x)} - \frac{ax}{2} - \frac{a}{2} - \frac{x^2}{2} - \frac{x}{2}}{x+1}$$

✓ **Mathematica** : cpu = 0.775273 (sec), leaf count = 116

```
DSolve[Derivative[1][y][x] == (-1/2*a - x/2 - (a*x)/2 - x^2/2 + x^3*Sqrt[a^2 + 2*a*x + x^2 +
```

$$\text{Solve}\left[-\frac{1}{2}\sqrt{a^2+2ax+x^2+4y(x)} - \frac{1}{2}a\log\left(\sqrt{a^2+2ax+x^2+4y(x)}+a+x\right) + \frac{1}{2}a\tanh^{-1}\left(\frac{a}{\sqrt{a^2+2a}\right.\right.$$

✓ **Maple** : cpu = 0.589 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = 1/2*(-x^2-x-a*x-a+2*x^3*(x^2+2*a*x+a^2+4*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 + \frac{2x^3}{3} - x^2 + 2x - 2\ln(1+x) - \sqrt{x^2+2ax+a^2+4y(x)} = 0$$

ODE No. 733

$$y'(x) = \csc(x)\left(x^4\log(2x) - 2x^2y(x)\log(2x) + y(x)^2\log(2x) - \log(2x) + 2x\sin(x)\right)$$

✓ **Mathematica** : cpu = 12.3739 (sec), leaf count = 73

```
DSolve[Derivative[1][y][x] == Csc[x]*(-Log[2*x] + x^4*Log[2*x] + 2*x*Sin[x] - 2*x^2*Log[2*x]*
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x 2\csc(K[5])\log(2K[5])dK[5]\right)}{-\int_1^x \exp\left(\int_1^{K[6]} 2\csc(K[5])\log(2K[5])dK[5]\right)\csc(K[6])\log(2K[6])dK[6] + c_1} + x^2 + 1\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x) = (2*x*sin(x)-ln(2*x)+ln(2*x)*x^4-2*ln(2*x)*x^2*y(x)+ln(2*x)*y(x)^2)/sin(
```

, could not solve

```
dsolve(diff(y(x),x) = (2*x*sin(x)-ln(2*x)+ln(2*x)*x^4-2*ln(2*x)*x^2*y(x)+ln(2*x)*y(x)^2
```

ODE No. 734

$$y'(x) = \frac{y(x)\left(x^3 - x\log(y(x)) - \log(y(x))\right)}{x+1}$$

✓ **Mathematica** : cpu = 0.245322 (sec), leaf count = 37

```
DSolve[Derivative[1][y][x] == ((x^3 - Log[y[x]] - x*Log[y[x]])*y[x])/(1 + x),y[x],x]
```

$$\left\{\left\{y(x) \to \exp\left(-e^{-x-1}\text{Ei}(x+1) + x^2 - 3x - c_1 e^{-x} + 4\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.314 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = (-ln(y(x))*x-ln(y(x))+x^3)*y(x)/(1+x),y(x))
```

$$y(x) = \mathrm{e}^{x^2}\mathrm{e}^{-3x}\mathrm{e}^{4}\mathrm{e}^{\mathrm{e}^{-x}c_1}\mathrm{e}^{\mathrm{e}^{-1}\,\mathrm{expIntegral}(1,-1-x)\mathrm{e}^{-x}}$$

ODE No. 735

$$y'(x) = \frac{(2y(x)\log(x) - 1)^3}{x(-y(x) + 2y(x)\log(x) - 1)}$$

✓ **Mathematica** : cpu = 1.40552 (sec), leaf count = 573

```
DSolve[Derivative[1][y][x] == (-1 + 2*Log[x]*y[x])^3/(x*(-1 - y[x] + 2*Log[x]*y[x])),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{2(2\log(x)K[1] - K[1] - 1)}{8\log^3(x)K[1]^3 + 4\log(x)K[1]^3 - 2K[1]^3 - 12\log^2(x)K[1]^2 - 2K[1]^2 + 6\log(x)K[1] - 1} + 2 \right.\right.$$

✓ **Maple** : cpu = 0.095 (sec), leaf count = 78

```
dsolve(diff(y(x),x) = (2*y(x)*ln(x)-1)^3/(-1+2*y(x)*ln(x)-y(x))/x,y(x))
```

$$y(x) = \frac{71\,\text{RootOf}\left(-82944\left(\int^{-Z} \frac{1}{5041\_a^3 - 27648\_a + 27648} d\_a\right) - 16\ln(x) + 3c_1\right) - 120}{(142\ln(x) - 71)\,\text{RootOf}\left(-82944\left(\int^{-Z} \frac{1}{5041\_a^3 - 27648\_a + 27648} d\_a\right) - 16\ln(x) + 3c_1\right) - 240\ln(x)}$$

ODE No. 736

$$y'(x) = \frac{x^4 - 2x^2 y(x) + 2x^2 + y(x)^2 + 2x - 1}{x + 1}$$

✓ **Mathematica** : cpu = 0.208642 (sec), leaf count = 31

```
DSolve[Derivative[1][y][x] == (-1 + 2*x + 2*x^2 + x^4 - 2*x^2*y[x] + y[x]^2)/(1 + x),y[x],x]
```

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

✓ **Maple** : cpu = 0.19 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = (2*x^2+2*x+x^4-2*x^2*y(x)-1+y(x)^2)/(1+x),y(x))
```

$$y(x) = \frac{c_1(x^4 + 2x^3 - x^2 - 2x - 2) + x^2 + 1}{1 + (x^2 + 2x)\,c_1}$$

ODE No. 737

$$y'(x) = \frac{x(2x^3 - 2xy(x) + x - 1)}{x^2 - y(x)}$$

✓ **Mathematica** : cpu = 0.0380702 (sec), leaf count = 36

```
DSolve[Derivative[1][y][x] == (x*(-1 + x + 2*x^3 - 2*x*y[x]))/(x^2 - y[x]),y[x],x]
```

$$\left\{\left\{y(x) \to x^2 + \frac{1}{2}\left(1 + W\left(-e^{\frac{4x^3}{3} - 2x^2 - 1 + c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.229 (sec), leaf count = 29

```
dsolve(diff(y(x),x) = 1/(x^2-y(x))*x*(-1+x-2*x*y(x)+2*x^3),y(x))
```

$$y(x) = x^2 + \frac{\text{LambertW}\left(-2\,\mathrm{e}^{\frac{4x^3}{3}}\mathrm{e}^{-2x^2}c_1\mathrm{e}^{-1}\right)}{2} + \frac{1}{2}$$

ODE No. 738

$$y'(x) = \frac{2a}{32a^3 - 16a^2xy(x)^2 + 2ax^2y(x)^4 - x^2y(x)}$$

✓ **Mathematica** : cpu = 0.444818 (sec), leaf count = 1347

```
DSolve[Derivative[1][y][x] == (2*a)/(32*a^3 - x^2*y[x] - 16*a^2*x*y[x]^2 + 2*a*x^2*y[x]^4),y[
```

$$\left\{\left\{y(x) \to -\frac{4a + e^{c_1}}{12a} + \frac{\sqrt[3]{4608x^2a^4 - 128x^3a^3 + 1152e^{c_1}x^2a^3 - 96e^{c_1}x^3a^2 - 432x^3a^2 - 24e^{2c_1}x^3a - 2e^{3c_1}}}{}\right.\right.$$

✓ **Maple** : cpu = 1.425 (sec), leaf count = 1054

```
dsolve(diff(y(x),x) = 2*a/(-x^2*y(x)+2*a*y(x)^4*x^2-16*a^2*x*y(x)^2+32*a^3),y(x))
```

$$y(x) = \frac{\left(\left(-216c_1^3a^2x + 576a^3c_1^2 + 12\sqrt{-\frac{3\left(16384a^7c_1^4 - 108a^2x^3c_1^4 + 576a^3x^2c_1^3 - 512a^4xc_1^2 - x^3c_1 + 4a\,x^2\right)}{x}}\,c_1a - x\right)x^2\right)^{\frac{1}{3}}}{12xc_1a} + \frac{}{1}$$

ODE No. 739

$$y'(x) = \frac{2y(x)+1}{x\left(2xy(x)^2+xy(x)-2\right)}$$

✓ **Mathematica** : cpu = 0.395344 (sec), leaf count = 39

```
DSolve[Derivative[1][y][x] == (1 + 2*y[x])/(x*(-2 + x*y[x] + 2*x*y[x]^2)),y[x],x]
```

$$\text{Solve}\left[\frac{1}{8}(-2y(x)+\log(4y(x)+2)-1)-\frac{1}{2x(2y(x)+1)}=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.266 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = 1/x*(1+2*y(x))/(-2+x*y(x)+2*x*y(x)^2),y(x))
```

$$y(x)=\frac{\mathrm{e}^{\text{RootOf}\left(x\,\mathrm{e}^{2\_Z}+2xc_1\mathrm{e}^{\_Z}-\_Z\mathrm{e}^{\_Z}x-\mathrm{e}^{\_Z}x+4\right)}}{2}-\frac{1}{2}$$

ODE No. 740

$$y'(x) = \frac{x^4 - 2x^2 y(x)^2 + y(x)^4 + x}{y(x)}$$

✓ **Mathematica** : cpu = 0.117538 (sec), leaf count = 74

```
DSolve[Derivative[1][y][x] == (x + x^4 - 2*x^2*y[x]^2 + y[x]^4)/y[x],y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{2x^3 + 2c_1 x^2 - 1}}{\sqrt{2}\sqrt{x + c_1}}\right\}, \left\{y(x) \to \frac{\sqrt{2x^3 + 2c_1 x^2 - 1}}{\sqrt{2}\sqrt{x + c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.106 (sec), leaf count = 72

```
dsolve(diff(y(x),x) = (x+y(x)^4-2*x^2*y(x)^2+x^4)/y(x),y(x))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{(c_1 + x)\left(2x^3 + 2x^2 c_1 - 1\right)}}{2c_1 + 2x}$$

ODE No. 741

$$y'(x) = \frac{x(ay(x)^2 + bx^2)^3}{a^{5/2}y(x)\,(ay(x)^2 + a + bx^2)}$$

✓ **Mathematica** : cpu = 1.53207 (sec), leaf count = 175

```
DSolve[Derivative[1][y][x] == (x*(b*x^2 + a*y[x]^2)^3)/(a^(5/2)*y[x]*(a + b*x^2 + a*y[x]^2)),
```

$$\text{Solve}\left[\frac{1}{2}\left(x^2 - a^{3/2}\text{RootSum}\left[\#1^3b^3 + 3\#1^2ab^2y(x)^2 + \#1a^{3/2}b^2 + 3\#1a^2by(x)^4 + a^{5/2}by(x)^2 + a^{5/2}b + a^3\right.\right.\right.$$

✓ **Maple** : cpu = 1.172 (sec), leaf count = 246

```
dsolve(diff(y(x),x) = (a*y(x)^2+b*x^2)^3/a^(5/2)*x/(a*y(x)^2+b*x^2+a)/y(x),y(x))
```

$$\int_{\_b}^{x} \frac{\left(\_a^2b + ay(x)^2\right)^3 \_a}{a^3\left(b\left(y(x)^2+1\right)a^{\frac{5}{2}} + a^{\frac{3}{2}}b^2\_a^2 + \left(\_a^2b + ay(x)^2\right)^3\right)} d\_a + \int^{y(x)} \frac{\left(\left(-\_f^2 - 1\right)ba^{\frac{5}{2}} - a^{\frac{3}{2}}b^2x^2 - \left(\_f^2a\right.\right.}{}$$

ODE No. 742

$$y'(x) = -\frac{(-\cos(y(x)) + x + 1)\cos(y(x))}{(x+1)(x\sin(y(x)) - 1)}$$

✓ **Mathematica** : cpu = 2.87251 (sec), leaf count = 3913

```
DSolve[Derivative[1][y][x] == -(((1 + x - Cos[y[x]])*Cos[y[x]])/((1 + x)*(-1 + x*Sin[y[x]])))
```

$$\left\{\left\{y(x) \to -\sec^{-1}\left(\frac{c_1 x^3}{x^2-1} + \frac{\log(x+1)x^3}{x^2-1} - \frac{{c_1}^3 x^3}{(x^2-1)\left({c_1}^2 + 2\log(x+1)c_1 + \log^2(x+1) + 1\right)} - \frac{}{(x^2-1}\right.\right.$$

✓ **Maple** : cpu = 1.87 (sec), leaf count = 239

```
dsolve(diff(y(x),x) = -cos(y(x))/(x*sin(y(x))-1)*(x-cos(y(x))+1)/(1+x),y(x))
```

$$y(x) = \arctan\left(\frac{(c_1 - \ln(1+x))\sqrt{\ln(1+x)^2 - 2c_1\ln(1+x) + c_1^2 - x^2 + 1} + x}{c_1^2 - 2c_1\ln(1+x) + \ln(1+x)^2 + 1}, \frac{\ln(1+x)\,x - xc_1 + \sqrt{\ln}}{c_1^2 - 2c_1\ln}\right.$$

ODE No. 743

$$y'(x) = -\frac{i(x^4 + 8x^2y(x)^2 + 16y(x)^4 + 8ix)}{32y(x)}$$

✓ **Mathematica** : cpu = 0.096443 (sec), leaf count = 406

```
DSolve[Derivative[1][y][x] == ((-1/32*I)*((8*I)*x + x^4 + 8*x^2*y[x]^2 + 16*y[x]^4))/y[x],y[x
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{2}\sqrt{\left(\text{Bi}\left(\frac{1}{2}\left(i-\sqrt{3}\right)x\right)+c_1\text{Ai}\left(\frac{1}{2}\left(i-\sqrt{3}\right)x\right)\right)\left(-\frac{1}{2}x^2\left(\text{Bi}\left(\frac{1}{2}\left(i-\sqrt{3}\right)x\right)+c_1\text{Ai}\left(\frac{1}{2}\left(i-\sqrt{3}\right)\right.\right.\right.}}{2\text{Bi}\left(\frac{1}{2}\left(i-\sqrt{3}\right)x\right)+2c_1\text{Ai}\left(\frac{1}{2}\left(\right.\right.}\right.\right.$$

✓ **Maple** : cpu = 0.597 (sec), leaf count = 296

```
dsolve(diff(y(x),x) = -1/32*I*(8*I*x+16*y(x)^4+8*x^2*y(x)^2+x^4)/y(x),y(x))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{\left(\text{AiryAi}\left(\frac{\left(i-\sqrt{3}\right)x}{2}\right)c_1+\text{AiryBi}\left(\frac{\left(i-\sqrt{3}\right)x}{2}\right)\right)\left(\left(1+i\sqrt{3}\right)c_1\,\text{AiryAi}\left(1,\frac{\left(i-\sqrt{3}\right)x}{2}\right)+(1+i}}{2\,\text{AiryAi}\left(\frac{\left(i-\sqrt{3}\right)x}{2}\right)c_1+2\,\text{AiryBi}\left(\frac{(i}{}\right.}$$

ODE No. 744

$$y'(x) = \frac{x}{x^4 + 2x^2 y(x)^2 + y(x)^4 - y(x)}$$

✓ **Mathematica** : cpu = 0.150396 (sec), leaf count = 510

```
DSolve[Derivative[1][y][x] == x/(x^4 - y[x] + 2*x^2*y[x]^2 + y[x]^4),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{144c_1x^2 + \sqrt{4\left(12x^2 - 4{c_1}^2\right)^3 + \left(144c_1x^2 - 108 + 16{c_1}^3\right)^2} - 108 + 16{c_1}^3}}{6\sqrt[3]{2}} - \frac{}{3\ 2^{2/3}\sqrt[3]{144c_1x^2}}\right.\right.$$

✓ **Maple** : cpu = 0.2 (sec), leaf count = 621

```
dsolve(diff(y(x),x) = x/(-y(x)+x^4+2*x^2*y(x)^2+y(x)^4),y(x))
```

$$y(x) = \frac{\left(-36x^2c_1 - 54 - c_1^3 + 6\sqrt{48x^6 + 24x^4c_1^2 + 3x^2c_1^4 + 108x^2c_1 + 3c_1^3 + 81}\right)^{\frac{1}{3}}}{6} + \frac{}{6\left(-36x^2c_1 - 54 - c_1^3 +\right.}$$

ODE No. 745

$$y'(x) = \frac{(y(x)\log(x)-1)^3}{x(-y(x)+y(x)\log(x)-1)}$$

✓ **Mathematica** : cpu = 1.24108 (sec), leaf count = 546

```
DSolve[Derivative[1][y][x] == (-1 + Log[x]*y[x])^3/(x*(-1 - y[x] + Log[x]*y[x])),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{\log(x)K[1]-K[1]-1}{\log^3(x)K[1]^3+\log(x)K[1]^3-K[1]^3-3\log^2(x)K[1]^2-K[1]^2+3\log(x)K[1]-1}+\text{RootSu}\right.\right.$$

✓ **Maple** : cpu = 0.09 (sec), leaf count = 78

```
dsolve(diff(y(x),x) = (-1+y(x)*ln(x))^3/(-1+y(x)*ln(x)-y(x))/x,y(x))
```

$$y(x) = \frac{47\,\text{RootOf}\left(-27783\left(\int^{-Z}\frac{1}{2209\_a^3-9261\_a+9261}d\_a\right)-7\ln(x)+3c_1\right)-84}{(47\ln(x)-47)\,\text{RootOf}\left(-27783\left(\int^{-Z}\frac{1}{2209\_a^3-9261\_a+9261}d\_a\right)-7\ln(x)+3c_1\right)-84\ln(x)+21}$$

ODE No. 746

$$y'(x) = -\frac{i(x^4 + 2x^2 y(x)^2 + y(x)^4 + ix)}{y(x)}$$

✓ **Mathematica** : cpu = 0.082101 (sec), leaf count = 274

```
DSolve[Derivative[1][y][x] == ((-I)*(I*x + x^4 + 2*x^2*y[x]^2 + y[x]^4))/y[x],y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{2}\sqrt{\left(\text{Bi}\left(2(-1)^{5/6}x\right) + c_1 \text{Ai}\left(2(-1)^{5/6}x\right)\right)\left(-2x^2\left(\text{Bi}\left(2(-1)^{5/6}x\right) + c_1 \text{Ai}\left(2(-1)^{5/6}x\right)\right) + \left(1 + \right.\right.}}{2\text{Bi}\left(2(-1)^{5/6}x\right) + 2c_1 \text{Ai}\left(2(-1)^{5/6}x\right)}\right.\right.$$

✓ **Maple** : cpu = 0.551 (sec), leaf count = 232

```
dsolve(diff(y(x),x) = -I*(I*x+x^4+2*x^2*y(x)^2+y(x)^4)/y(x),y(x))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{\left(\text{AiryAi}\left(-(-8i)^{\frac{1}{3}}x\right)c_1 + \text{AiryBi}\left(-(-8i)^{\frac{1}{3}}x\right)\right)\left(\left(1 + i\sqrt{3}\right)c_1 \text{AiryAi}\left(1, -(-8i)^{\frac{1}{3}}x\right) + \right.}}{2\,\text{AiryAi}\left(-(-8i)^{\frac{1}{3}}x\right)c_1 + }$$

ODE No. 747

$$y'(x) = -\frac{y(x)\cot(x)\left(x^2 y(x)(-\log(2x)) + x\log(2x) + \tan(x)\right)}{x}$$

✓ **Mathematica** : cpu = 2.86091 (sec), leaf count = 88

```
DSolve[Derivative[1][y][x] == -((Cot[x]*y[x]*(x*Log[2*x] + Tan[x] - x^2*Log[2*x]*y[x]))/x),y[
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x \frac{-\cot(K[1])K[1]\log(2K[1])-1}{K[1]}dK[1]\right)}{-\int_1^x \exp\left(\int_1^{K[2]} \frac{-\cot(K[1])K[1]\log(2K[1])-1}{K[1]}dK[1]\right)\cot(K[2])K[2]\log(2K[2])dK[2] + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.326 (sec), leaf count = 75

```
dsolve(diff(y(x),x) = -y(x)*(tan(x)+ln(2*x)*x-ln(2*x)*x^2*y(x))/x/tan(x),y(x))
```

$$y(x) = \frac{e^{\int \frac{-x\ln(2)-x\ln(x)-\tan(x)}{x\tan(x)}dx}}{\int -\frac{e^{\int \frac{-x\ln(2)-x\ln(x)-\tan(x)}{x\tan(x)}dx}(\ln(2)+\ln(x))x}{\tan(x)}dx + c_1}$$

ODE No. 748

$$y'(x) = \frac{y(x)(y(x)+x)}{x\left(y(x)^3+x\right)}$$

✓ **Mathematica** : cpu = 0.269172 (sec), leaf count = 285

```
DSolve[Derivative[1][y][x] == (y[x]*(x + y[x]))/(x*(x + y[x]^3)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{2\sqrt[3]{2}(\log(x)+c_1)}{\sqrt[3]{54x+\sqrt{2916x^2-864(\log(x)+c_1)^3}}} + \frac{\sqrt[3]{54x+\sqrt{2916x^2-864(\log(x)+c_1)^3}}}{3\sqrt[3]{2}}\right\}, \left\{y(x) \to \right.$$

✓ **Maple** : cpu = 0.123 (sec), leaf count = 404

```
dsolve(diff(y(x),x) = y(x)*(y(x)+x)/x/(x+y(x)^3),y(x))
```

$$y(x) = \frac{\left(27x+3\sqrt{-24c_1^3-72c_1^2\ln(x)-72c_1\ln(x)^2-24\ln(x)^3+81x^2}\right)^{\frac{2}{3}}+6\ln(x)+6c_1}{3\left(27x+3\sqrt{-24c_1^3-72c_1^2\ln(x)-72c_1\ln(x)^2-24\ln(x)^3+81x^2}\right)^{\frac{1}{3}}}$$

ODE No. 749

$$y'(x) = \frac{x(x-y(x))^2(y(x)+x)^2}{y(x)}$$

✓ **Mathematica** : cpu = 0.162253 (sec), leaf count = 126

```
DSolve[Derivative[1][y][x] == (x*(x - y[x])^2*(x + y[x])^2)/y[x],y[x],x]
```

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

✓ **Maple** : cpu = 0.149 (sec), leaf count = 192

```
dsolve(diff(y(x),x) = (x-y(x))^2*(y(x)+x)^2*x/y(x),y(x))
```

$$y(x) = \frac{\sqrt{\left(\left(x^2+1\right)\mathrm{e}^{-\frac{x^2\left(x^2+2\right)}{2}}+c_1\left(x^2-1\right)\mathrm{e}^{-\frac{x^2\left(x^2-2\right)}{2}}\right)\left(c_1\mathrm{e}^{-\frac{x^2\left(x^2-2\right)}{2}}+\mathrm{e}^{-\frac{x^2\left(x^2+2\right)}{2}}\right)}}{c_1\mathrm{e}^{-\frac{x^2\left(x^2-2\right)}{2}}+\mathrm{e}^{-\frac{x^2\left(x^2+2\right)}{2}}}$$

ODE No. 750

$$y'(x) = \frac{y(x)\left(x^2 + 3y(x)^2\right)}{x\left(6y(x)^2 + x\right)}$$

✓ **Mathematica** : cpu = 0.28709 (sec), leaf count = 72

```
DSolve[Derivative[1][y][x] == (y[x]*(x^2 + 3*y[x]^2))/(x*(x + 6*y[x]^2)),y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{x}\sqrt{W\left(\frac{6e^{2x+2c_1}}{x}\right)}}{\sqrt{6}}\right\}, \left\{y(x) \to \frac{\sqrt{x}\sqrt{W\left(\frac{6e^{2x+2c_1}}{x}\right)}}{\sqrt{6}}\right\}\right\}$$

✓ **Maple** : cpu = 0.432 (sec), leaf count = 49

```
dsolve(diff(y(x),x) = 1/(6*y(x)^2+x)*(x^2+3*y(x)^2)*y(x)/x,y(x))
```

$$\frac{1}{\frac{1}{y(x)^2} + \frac{6}{x}} = \frac{\left(e^{\text{RootOf}\left(-e^{-Z}\ln\left(\frac{\left(e^{-Z}+9\right)x}{2}\right)+3c_1e^{-Z}+\_Ze^{-Z}+2e^{-Z}x+9\right)} + 9\right)x}{54}$$

ODE No. 751

$$y'(x) = \frac{y(x)\left(x^4 + x\log(y(x)) + \log(y(x))\right)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.175678 (sec), leaf count = 30

```
DSolve[Derivative[1][y][x] == ((x^4 + Log[y[x]] + x*Log[y[x]])*y[x])/(x*(1 + x)),y[x],x]
```

$$\left\{\left\{y(x) \to (x+1)^x e^{\frac{x^3}{2}-x^2+c_1 x}\right\}\right\}$$

✓ **Maple** : cpu = 0.208 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = (ln(y(x))*x+ln(y(x))+x^4)*y(x)/x/(1+x),y(x))
```

$$y(x) = \mathrm{e}^{\frac{x^3}{2}} (1+x)^x \, \mathrm{e}^{x c_1} \mathrm{e}^{-x^2}$$

ODE No. 752

$$y'(x) = \frac{\cos(y(x))\left(x^3\cos(y(x)) - x - 1\right)}{(x+1)(x\sin(y(x)) - 1)}$$

✓ **Mathematica** : cpu = 0.212125 (sec), leaf count = 849

```
DSolve[Derivative[1][y][x] == (Cos[y[x]]*(-1 - x + x^3*Cos[y[x]]))/((1 + x)*(-1 + x*Sin[y[x]]
```

$$\left\{\left\{y(x) \to \tan^{-1}\left(\frac{6\left(2x^4 - 3x^3 + 6x^2 + 6c_1x - 6\log(x+1)x + \sqrt{4x^6 - 12x^5 + 33x^4 + 12(2c_1 - 3)x^3 -}\right.\right.\right.$$
$$\left.\left.\left.4x^6 - 12x^5 + 33x^4 + 12(2c_1 - 3)x^3 - 36(c_1 - 1)x^2 + 72c_1x + 36\right.\right.\right.$$

✓ **Maple** : cpu = 2.487 (sec), leaf count = 723

```
dsolve(diff(y(x),x) = cos(y(x))/(x*sin(y(x))-1)*(cos(y(x))*x^3-x-1)/(1+x),y(x))
```

$$y(x) = \arctan\left(\frac{(-2x^3 + 3x^2 - 6x - 6c_1 + 6\ln(1+x))\sqrt{36\ln(1+x)^2 + (-24x^3 + 36x^2 - 72x - 72c_1)\ln}\right.$$
$$\left.36\ln(1+x)^2 + (-24x^3 + 36x^2 - 72x - 72c_1)\ln(1+x) + 4x^6 - 12x^5\right.$$

ODE No. 753

$$y'(x) = \frac{y(x)\log(y(x))\left(x^4\log(y(x)) + x + 1\right)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.172769 (sec), leaf count = 41

```
DSolve[Derivative[1][y][x] == (Log[y[x]]*(1 + x + x^4*Log[y[x]])*y[x])/(x*(1 + x)),y[x],x]
```

$$\left\{\left\{y(x) \to \exp\left(-\frac{12x}{3x^4 - 4x^3 + 6x^2 - 12x + 12\log(x+1) - 12c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.291 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = (x+1+x^4*ln(y(x)))*y(x)*ln(y(x))/x/(1+x),y(x))
```

$$y(x) = \mathrm{e}^{-\frac{12x}{3x^4-4x^3+6x^2+12\ln(1+x)-12c_1-12x}}$$

ODE No. 754

$$y'(x) = \frac{x^3 + xy(x)^2 + xy(x) + y(x)^3}{x^2}$$

✓ **Mathematica** : cpu = 0.121707 (sec), leaf count = 47

```
DSolve[Derivative[1][y][x] == (x^3 + x*y[x] + x*y[x]^2 + y[x]^3)/x^2,y[x],x]
```

$$\text{Solve}\left[\text{RootSum}\left[\#1^3 + \#1^2 + 1\&, \frac{\log\left(\frac{y(x)}{x} - \#1\right)}{3\#1^2 + 2\#1}\&\right] = x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = (x*y(x)+x^3+x*y(x)^2+y(x)^3)/x^2,y(x))
```

$$y(x) = \text{RootOf}\left(-\left(\int^{-Z} \frac{1}{\_a^3 + \_a^2 + 1} d\_a\right) + x + c_1\right) x$$

ODE No. 755

$$y'(x) = \frac{y(x)^{3/2}}{x^2 - 2xy(x) + y(x)^2 + y(x)^{3/2}}$$

✓ **Mathematica** : cpu = 0.291109 (sec), leaf count = 2633

```
DSolve[Derivative[1][y][x] == y[x]^(3/2)/(x^2 - 2*x*y[x] + y[x]^(3/2) + y[x]^2),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{2}{3}\left(x + e^{c_1} + 2e^{2c_1}\right) - \frac{1}{3}\sqrt[3]{x^3 + 3e^{c_1}x^2 - 12e^{2c_1}x^2 + 3e^{2c_1}x + 12e^{3c_1}x + 48e^{4c_1}x + e^{3c_1} - 30e^{4c_1} -\right.\right.$$

✓ **Maple** : cpu = 0.116 (sec), leaf count = 44

```
dsolve(diff(y(x),x) = y(x)^(3/2)/(y(x)^(3/2)+x^2-2*x*y(x)+y(x)^2),y(x))
```

$$\frac{2\sqrt{y(x)}}{y(x) - x} + \frac{1}{y(x) - x} - \frac{2x}{(y(x) - x)\sqrt{y(x)}} - c_1 = 0$$

ODE No. 756

$$y'(x) = \frac{x^6 + 2x^3 y(x) + x^2 y(x)^2 + y(x)^3}{x^4}$$

✓ **Mathematica** : cpu = 0.173028 (sec), leaf count = 95

```
DSolve[Derivative[1][y][x] == (x^6 + 2*x^3*y[x] + x^2*y[x]^2 + y[x]^3)/x^4,y[x],x]
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3y(x)}{x^4}+\frac{1}{x^2}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^6}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}\left(\frac{1}{x^6}\right)^{2/3} x^5 + c_1, y\right.$$

✓ **Maple** : cpu = 0.049 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = (2*x^3*y(x)+x^6+x^2*y(x)^2+y(x)^3)/x^4,y(x))
```

$$y(x) = \frac{\left(-3 + 29\,\text{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + x + 3c_1\right)\right) x^2}{9}$$

ODE No. 757

$$y'(x) = \frac{x^3 + 2x^2 - 4xy(x) - 4x - 8}{2x^2 - 8y(x) + 4x - 8}$$

✓ **Mathematica** : cpu = 0.0365716 (sec), leaf count = 36

```
DSolve[Derivative[1][y][x] == (-8 - 4*x + 2*x^2 + x^3 - 4*x*y[x])/(-8 + 4*x + 2*x^2 - 8*y[x])
```

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

✓ **Maple** : cpu = 0.121 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = (-4*x*y(x)+x^3+2*x^2-4*x-8)/(-8*y(x)+2*x^2+4*x-8),y(x))
```

$$y(x) = \frac{x^2}{4} + 2\,\mathrm{LambertW}\left(\frac{c_1 \mathrm{e}^{-\frac{x}{4}} \mathrm{e}^{-\frac{1}{2}}}{2}\right) + \frac{x}{2} + 1$$

ODE No. 758

$$y'(x) = \frac{y(x)\left(x^3 y(x) + 2x + 2\right)}{(x+1)(\log(y(x)) + 2x - 1)}$$

✓ **Mathematica** : cpu = 0.733455 (sec), leaf count = 459

```
DSolve[Derivative[1][y][x] == (y[x]*(2 + 2*x + x^3*y[x]))/((1 + x)*(-1 + 2*x + Log[y[x]])),y[
```

$$\left\{\left\{y(x) \to \frac{6W\left(-\frac{1}{6}\sqrt[6]{e^{-12x}\left(2x^3 - 3x^2 + 6x - 6\log(x+1) + 6c_1\right)^6}\right)}{2x^3 - 3x^2 + 6x - 6\log(x+1) + 6c_1}\right\}, \left\{y(x) \to \frac{6W\left(\frac{1}{6}\sqrt[6]{e^{-12x}\left(2x^3 - 3\right.}\right.}{2x^3 - 3x^2 + 6}\right.$$

✓ **Maple** : cpu = 0.315 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = (2*x+2+x^3*y(x))/(ln(y(x))+2*x-1)*y(x)/(1+x),y(x))
```

$$y(x) = \mathrm{e}^{-\mathrm{LambertW}\left(-\frac{\left(-2x^3+3x^2+6\ln(1+x)+6c_1-6x\right)\mathrm{e}^{-2x}}{6}\right)-2x}$$

ODE No. 759

$$y'(x) = -\frac{ix(x^8 + 18x^4y(x)^2 + 54ix^2 + 81y(x)^4)}{243y(x)}$$

✓ **Mathematica** : cpu = 0.091879 (sec), leaf count = 498

```
DSolve[Derivative[1][y][x] == ((-1/243*I)*x*((54*I)*x^2 + x^8 + 18*x^4*y[x]^2 + 81*y[x]^4))/y
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{\left(Y_{\frac{1}{3}}\left(\left(\frac{2}{9}-\frac{2i}{9}\right)\sqrt{\frac{2}{3}}x^3\right)+c_1 J_{\frac{1}{3}}\left(\left(\frac{2}{9}-\frac{2i}{9}\right)\sqrt{\frac{2}{3}}x^3\right)\right)\left((1+i)\sqrt{6}x^3\left(Y_{\frac{4}{3}}\left(\left(\frac{2}{9}-\frac{2i}{9}\right)\sqrt{\frac{2}{3}}x^3\right)+c_1\right.\right.}}{\sqrt{3}x\left(Y_{\frac{1}{3}}\left(\left(\frac{2}{9}-\frac{2i}{9}\right)\sqrt{\frac{2}{3}}x^3\right.\right.}\right.\right.$$

✓ **Maple** : cpu = 0.816 (sec), leaf count = 305

```
dsolve(diff(y(x),x) = -1/243*I*(54*I*x^2+81*y(x)^4+18*x^4*y(x)^2+x^8)*x/y(x),y(x))
```

$$y(x) = -\frac{\sqrt{3}\sqrt{\left(\text{BesselJ}\left(\frac{1}{3},\left(\frac{2}{27}-\frac{2i}{27}\right)\sqrt{6}\,x^3\right)c_1+\text{BesselY}\left(\frac{1}{3},\left(\frac{2}{27}-\frac{2i}{27}\right)\sqrt{6}\,x^3\right)\right)\left(-9c_1\left(\frac{x^6}{27}+i\right)\text{BesselJ}\left(\frac{1}{3},\right.}}{3\left(\text{BesselJ}\right.}$$

ODE No. 760

$$y'(x) = \frac{(xy(x)^2+1)^3}{x^4 y(x)\,(xy(x)^2+x+1)}$$

✓ **Mathematica** : cpu = 0.877406 (sec), leaf count = 112

```
DSolve[Derivative[1][y][x] == (1 + x*y[x]^2)^3/(x^4*y[x]*(1 + x + x*y[x]^2)),y[x],x]
```

$$\text{Solve}\left[2\left(\frac{1}{10}\log\left(2x^2y(x)^4+2x^2y(x)^2+x^2+4xy(x)^2+2x+2\right)-\frac{1}{5}\log\left(xy(x)^2-x+1\right)-\frac{1}{10}\tan^{-1}\left(2xy\right.\right.\right.$$

✓ **Maple** : cpu = 1.296 (sec), leaf count = 137

```
dsolve(diff(y(x),x) = (x*y(x)^2+1)^3/x^4/(x*y(x)^2+1+x)/y(x),y(x))
```

$$\frac{(-1+y(x))\,(1+y(x))\,\left(2y(x)^4+2y(x)^2+1\right)\left(2\ln\left(xy(x)^2-x+1\right)x-\ln\left(2x^2y(x)^4+\left(2x^2+4x\right)y(x)^2+\right.\right.}{5x\left(2y\,(x)^6-y\,(\right.}$$

ODE No. 761

$$y'(x) = \frac{-x^3 + 4x^2 - 4xy(x) - 4x + 8}{2x^2 + 8y(x) - 8x + 8}$$

✓ **Mathematica** : cpu = 0.0348274 (sec), leaf count = 33

```
DSolve[Derivative[1][y][x] == (8 - 4*x + 4*x^2 - x^3 - 4*x*y[x])/(8 - 8*x + 2*x^2 + 8*y[x]),y
```

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

✓ **Maple** : cpu = 0.12 (sec), leaf count = 18

```
dsolve(diff(y(x),x) = (-4*x*y(x)-x^3+4*x^2-4*x+8)/(8*y(x)+2*x^2-8*x+8),y(x))
```

$$y(x) = -\frac{x^2}{4} + \text{LambertW}\left(\mathrm{e}^{-x} c_1\right) + x$$

ODE No. 762

$$y'(x) = \frac{y(x)(x(-\log(y(x))) - \log(y(x)) + x)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.166473 (sec), leaf count = 26

```
DSolve[Derivative[1][y][x] == ((x - Log[y[x]] - x*Log[y[x]])*y[x])/(x*(1 + x)),y[x],x]
```

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

✓ **Maple** : cpu = 0.21 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = -(ln(y(x))*x+ln(y(x))-x)*y(x)/x/(1+x),y(x))
```

$$y(x) = \mathrm{e}(1+x)^{-\frac{1}{x}}\, \mathrm{e}^{\frac{c_1}{x}}$$

ODE No. 763

$$y'(x) = \frac{y(x)(x\log(y(x)) + \log(y(x)) + x)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.15342 (sec), leaf count = 22

```
DSolve[Derivative[1][y][x] == ((x + Log[y[x]] + x*Log[y[x]])*y[x])/(x*(1 + x)),y[x],x]
```

$$\{\{y(x) \to x^x (x+1)^{-x} e^{c_1 x}\}\}$$

✓ **Maple** : cpu = 0.247 (sec), leaf count = 14

```
dsolve(diff(y(x),x) = (ln(y(x))*x+ln(y(x))+x)*y(x)/x/(1+x),y(x))
```

$$y(x) = \left(\frac{c_1 x}{1+x}\right)^x$$

ODE No. 764

$$y'(x) = \frac{y(x)\left(x^4 - x\log(y(x)) - \log(y(x))\right)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.168346 (sec), leaf count = 50

```
DSolve[Derivative[1][y][x] == ((x^4 - Log[y[x]] - x*Log[y[x]])*y[x])/(x*(1 + x)),y[x],x]
```

$$\left\{\left\{y(x) \to (x+1)^{\frac{1}{x}} e^{\frac{x^3}{4} - \frac{x^2}{3} + \frac{x}{2} - \frac{25}{12x} - \frac{c_1}{x} - 1}\right\}\right\}$$

✓ **Maple** : cpu = 0.267 (sec), leaf count = 36

```
dsolve(diff(y(x),x) = (-ln(y(x))*x-ln(y(x))+x^4)*y(x)/x/(1+x),y(x))
```

$$y(x) = \mathrm{e}^{\frac{x^3}{4}} \mathrm{e}^{-\frac{x^2}{3}} \mathrm{e}^{\frac{x}{2}} (1+x)^{\frac{1}{x}} \mathrm{e}^{\frac{c_1}{x}} \mathrm{e}^{-1}$$

ODE No. 765

$$y'(x) = \frac{y(x)\left(xy(x)\log\left(\frac{(x-1)(x+1)}{x}\right) - \log\left(\frac{(x-1)(x+1)}{x}\right) - 1\right)}{x}$$

✓ **Mathematica** : cpu = 0.348267 (sec), leaf count = 138

```
DSolve[Derivative[1][y][x] == (y[x]*(-1 - Log[((-1 + x)*(1 + x))/x] + x*Log[((-1 + x)*(1 + x)
```

$$\left\{\left\{y(x) \to \frac{\exp\left(-\text{Li}_2(1-x) + \text{Li}_2(-x) - \frac{1}{2}\log^2(x) + \log(x+1)\log(x) - \log\left(x - \frac{1}{x}\right)\log(\right.}{x\left(-\int_1^x \frac{\exp\left(-\frac{1}{2}\log^2(K[1]) + \log(K[1]+1)\log(K[1]) - \log\left(K[1] - \frac{1}{K[1]}\right)\log(K[1]) - \text{Li}_2(1-K[1]) + \text{Li}_2(-K[1])\right)\log\left(\frac{(K[1]-1)(}{K[1]}\right.}{K[1]}\right.}\right\}\right.$$

✓ **Maple** : cpu = 0.208 (sec), leaf count = 106

```
dsolve(diff(y(x),x) = y(x)*(-1-ln((x-1)*(1+x)/x)+ln((x-1)*(1+x)/x)*x*y(x))/x,y(x))
```

$$y(x) = \frac{e^{\text{dilog}(1+x)} x^{\ln(1+x)} e^{-\frac{\ln(x)^2}{2}} x^{-\ln\left(\frac{(x-1)(1+x)}{x}\right)} e^{-\text{dilog}(x)}}{x\left(\int -\frac{x^{-\ln\left(\frac{(x-1)(1+x)}{x}\right)} e^{\text{dilog}(1+x)} x^{\ln(1+x)} e^{-\text{dilog}(x)} e^{-\frac{\ln(x)^2}{2}} \ln\left(\frac{(x-1)(1+x)}{x}\right)}{x} dx + c_1\right)}$$

ODE No. 766

$$y'(x) = \frac{y(x)\left(x^2 y(x)\log\left(\frac{(x-1)(x+1)}{x}\right) - x\log\left(\frac{(x-1)(x+1)}{x}\right) - \log(x)\right)}{x\log(x)}$$

✓ **Mathematica** : cpu = 0.313138 (sec), leaf count = 129

```
DSolve[Derivative[1][y][x] == (y[x]*(-Log[x] - x*Log[((-1 + x)*(1 + x))/x] + x^2*Log[((-1 + x
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x \frac{-\log(K[1]) - K[1]\log\left(\frac{(K[1]-1)(K[1]+1)}{K[1]}\right)}{K[1]\log(K[1])} dK[1]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[2]} \frac{-\log(K[1]) - K[1]\log\left(\frac{(K[1]-1)(K[1]+1)}{K[1]}\right)}{K[1]\log(K[1])} dK[1]\right) K[2]\log\left(\frac{(K[2]-1)(K[2]+1)}{K[2]}\right)}{\log(K[2])} dK[2] + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.202 (sec), leaf count = 89

```
dsolve(diff(y(x),x) = y(x)*(-ln(x)-x*ln((x-1)*(1+x)/x)+ln((x-1)*(1+x)/x)*x^2*y(x))/x/ln(x),y(
```

$$y(x) = \frac{e^{\int \frac{-x\ln\left(\frac{(x-1)(1+x)}{x}\right) - \ln(x)}{x\ln(x)} dx}}{\int -\frac{e^{\int \frac{-x\ln\left(\frac{(x-1)(1+x)}{x}\right) - \ln(x)}{x\ln(x)} dx} x\ln\left(\frac{(x-1)(1+x)}{x}\right)}{\ln(x)} dx + c_1}$$

ODE No. 767

$$y'(x) = \frac{-x^3 + 2x^2 - 8xy(x) - 8x + 32}{4x^2 + 32y(x) - 8x + 32}$$

✓ **Mathematica** : cpu = 0.036282 (sec), leaf count = 38

```
DSolve[Derivative[1][y][x] == (32 - 8*x + 2*x^2 - x^3 - 8*x*y[x])/(32 - 8*x + 4*x^2 + 32*y[x]
```

$$\left\{\left\{y(x) \to \frac{1}{8}\left(-x^2 + 2x - 8\right) + 4\left(1 + W\left(-e^{-\frac{x}{16} - 1 + c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.117 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = (-8*x*y(x)-x^3+2*x^2-8*x+32)/(32*y(x)+4*x^2-8*x+32),y(x))
```

$$y(x) = -\frac{x^2}{8} + 4\,\mathrm{LambertW}\left(\frac{c_1 \mathrm{e}^{-\frac{x}{16}} \mathrm{e}^{-\frac{3}{4}}}{4}\right) + \frac{x}{4} + 3$$

ODE No. 768

$$y'(x) = \frac{y(x)(y(x)+1)}{x(xy(x)-y(x)-1)}$$

✓ **Mathematica** : cpu = 1.40413 (sec), leaf count = 66

```
DSolve[Derivative[1][y][x] == (y[x]*(1 + y[x]))/(x*(-1 - y[x] + x*y[x])),y[x],x]
```

$$\text{Solve}\left[\frac{2^{2/3}\left(xy(x)\left(-\log\left(\frac{xy(x)}{(x-1)y(x)-1}\right)+\log\left(\frac{y(x)+1}{-xy(x)+y(x)+1}\right)+\log(x)+1\right)-1\right)}{9xy(x)} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.16 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = y(x)*(1+y(x))/x/(-y(x)-1+x*y(x)),y(x))
```

$$y(x) = -\frac{1}{x\,\text{LambertW}\left(\frac{e^{-\frac{1}{x}}}{xc_1}\right)+1}$$

ODE No. 769

$$y'(x) = -\frac{ix(x^8 + 8x^4 y(x)^2 + 16ix^2 + 16y(x)^4)}{32y(x)}$$

✓ **Mathematica** : cpu = 0.0916419 (sec), leaf count = 360

```
DSolve[Derivative[1][y][x] == ((-1/32*I)*x*((16*I)*x^2 + x^8 + 8*x^4*y[x]^2 + 16*y[x]^4))/y[x
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{\left(Y_{\frac{1}{3}}\left(\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)+c_1 J_{\frac{1}{3}}\left(\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)\right)\left((1+i)x^3\left(Y_{\frac{4}{3}}\left(\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)+c_1 J_{\frac{4}{3}}\left(\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)\right)\right.}}{x\left(Y_{\frac{1}{3}}\left(\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)+c_1 J_{\frac{1}{3}}\left(\left(\frac{1}{3}-\frac{i}{3}\right)\right.\right.}\right.\right.$$

✓ **Maple** : cpu = 0.617 (sec), leaf count = 251

```
dsolve(diff(y(x),x) = -1/32*I*(16*I*x^2+16*y(x)^4+8*x^4*y(x)^2+x^8)*x/y(x),y(x))
```

$$y(x) = -\frac{\sqrt{4}\sqrt{\left(\text{BesselJ}\left(\frac{1}{3},\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)c_1+\text{BesselY}\left(\frac{1}{3},\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)\right)\left(-2\left(\frac{x^6}{8}+i\right)c_1\,\text{BesselJ}\left(\frac{1}{3},\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right.\right.}}{2\left(\text{BesselJ}\left(\frac{1}{3},\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right.\right.}$$

ODE No. 770

$$y'(x) = \frac{2y(x)^6}{32x^2y(x)^4 + y(x)^3 + 16xy(x)^2 + 2}$$

✓ **Mathematica** : cpu = 0.219852 (sec), leaf count = 705

```
DSolve[Derivative[1][y][x] == (2*y[x]^6)/(2 + 16*x*y[x]^2 + y[x]^3 + 32*x^2*y[x]^4),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{8192x^3 + 18432{c_1}^2x^2 + \sqrt{4\left(-256x^2 + 192{c_1}^2x - 12c_1\right)^3 + \left(8192x^3 + 18432{c_1}^2x^2 - 2880c_1x\right.}}}{3\sqrt[3]{2}(1 - 16c_1x)}\right.\right.$$

✓ **Maple** : cpu = 0.161 (sec), leaf count = 1105

```
dsolve(diff(y(x),x) = 2*y(x)^6/(y(x)^3+2+16*x*y(x)^2+32*x^2*y(x)^4),y(x))
```

$$y(x) = \frac{\left(4096x^3c_1^3 + 6\sqrt{3}\sqrt{4096x^3c_1^4 + 2048x^2c_1^2 + 576xc_1^3 + 27c_1^4 + 256x + 16c_1}\,c_1 + 96\sqrt{3}\sqrt{4096x^3c_1^4 + 2\right.}}{3c_1 + 48x}$$

ODE No. 771

$$y'(x) = \frac{-a^2x^3 - 2abx^2 - 4axy(x) - 4ax + 8}{2ax^2 + 4bx + 8y(x) + 8}$$

✓ **Mathematica** : cpu = 0.046064 (sec), leaf count = 46

```
DSolve[Derivative[1][y][x] == (8 - 4*a*x - 2*a*b*x^2 - a^2*x^3 - 4*a*x*y[x])/(8 + 4*b*x + 2*a
```

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

✓ **Maple** : cpu = 0.294 (sec), leaf count = 84

```
dsolve(diff(y(x),x) = (-4*a*x*y(x)-a^2*x^3-2*a*x^2*b-4*a*x+8)/(8*y(x)+2*a*x^2+4*b*x+8),y(x))
```

$$y(x) = \frac{-a\,x^2b - 2b^2x - 4b + 4\,\mathrm{e}^{\frac{-4\,\mathrm{LambertW}\left(-\mathrm{e}^{-\frac{b^2x}{4}}\mathrm{e}^{-\frac{c_1b^2}{2a}}\mathrm{e}^{-\frac{b}{2}}\mathrm{e}^{-1}\right)a + \left(-b^2x - 2b - 4\right)a - 2c_1b^2}{4a}} - 8}{4b}$$

ODE No. 772

$$y'(x) = \frac{y(x)\log(y(x))(x\log(y(x)) + x + 1)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.168454 (sec), leaf count = 21

```
DSolve[Derivative[1][y][x] == (Log[y[x]]*(1 + x + x*Log[y[x]])*y[x])/(x*(1 + x)),y[x],x]
```

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

✓ **Maple** : cpu = 0.201 (sec), leaf count = 18

```
dsolve(diff(y(x),x) = (x+1+ln(y(x))*x)*ln(y(x))*y(x)/x/(1+x),y(x))
```

$$y(x) = \mathrm{e}^{\frac{x}{\ln(1+x)+c_1-x}}$$

ODE No. 773

$$y'(x) = \frac{y(x)^2 + xy(x) + x}{(x-1)(y(x)+x)}$$

✓ **Mathematica** : cpu = 0.196742 (sec), leaf count = 61

```
DSolve[Derivative[1][y][x] == (x + x*y[x] + y[x]^2)/((-1 + x)*(x + y[x])),y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}\log\left(\frac{y(x)^2}{x^2} + \frac{y(x)}{x} + 1\right) + \frac{\tan^{-1}\left(\frac{\frac{2y(x)}{x}+1}{\sqrt{3}}\right)}{\sqrt{3}} = \log(1-x) - \log(x) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.285 (sec), leaf count = 48

```
dsolve(diff(y(x),x) = 1/(x-1)*(x*y(x)+x+y(x)^2)/(y(x)+x),y(x))
```

$$y(x) = -\frac{x}{2} + \frac{\sqrt{3}\,x\tan\left(\text{RootOf}\left(-\sqrt{3}\,\ln\left(\frac{3x^2\left(\tan^2\left(\_Z\right)+1\right)}{4(x-1)^2}\right) + 2\sqrt{3}\,c_1 - 2\_Z\right)\right)}{2}$$

ODE No. 774

$$y'(x) = \frac{-2ax^2 - x^3 - 4xy(x) - 4x + 8}{4ax + 2x^2 + 8y(x) + 8}$$

✓ **Mathematica** : cpu = 0.0406884 (sec), leaf count = 45

```
DSolve[Derivative[1][y][x] == (8 - 4*x - 2*a*x^2 - x^3 - 4*x*y[x])/(8 + 4*a*x + 2*x^2 + 8*y[x
```

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

✓ **Maple** : cpu = 0.198 (sec), leaf count = 51

```
dsolve(diff(y(x),x) = (-4*x*y(x)-x^3-2*a*x^2-4*x+8)/(8*y(x)+2*x^2+4*a*x+8),y(x))
```

$$y(x) = \frac{-2a^2 x - a\,x^2 - 8\,\mathrm{LambertW}\left(-\frac{e^{-\frac{a^2 x}{4}} e^{-\frac{a}{2}} e^{-1} e^{\frac{c_1 a^2}{4}}}{2}\right) - 4a - 8}{4a}$$

ODE No. 775

$$y'(x) = \frac{-y(x) + \sqrt{y(x)} + x}{-y(x) + \sqrt{y(x)} + x + 1}$$

✓ **Mathematica** : cpu = 0.169144 (sec), leaf count = 943

```
DSolve[Derivative[1][y][x] == (x + Sqrt[y[x]] - y[x])/(1 + x + Sqrt[y[x]] - y[x]),y[x],x]
```

$$\{\{y(x) \to \text{Root}\left[x^6 - 2e^{3c_1}x^3 + e^{6c_1} + \#1^6 + (-6x-6)\#1^5 + \left(15x^2+24x+9\right)\#1^4 + \left(-20x^3-36x^2-1\right.\right.$$

✓ **Maple** : cpu = 0.098 (sec), leaf count = 44

```
dsolve(diff(y(x),x) = (x-y(x)+y(x)^(1/2))/(x-y(x)+y(x)^(1/2)+1),y(x))
```

$$-2y(x)^{\frac{3}{2}} + y(x)^3 + (-3x-3)\,y(x)^2 + \left(3x^2+3x\right)y(x) - x^3 - c_1 = 0$$

ODE No. 776

$$y'(x) = \frac{y(x)\left(x^2 y(x) \log\left(\frac{x^2+1}{x}\right) - x \log\left(\frac{x^2+1}{x}\right) - \log\left(\frac{1}{x}\right)\right)}{x \log\left(\frac{1}{x}\right)}$$

✓ **Mathematica** : cpu = 0.378235 (sec), leaf count = 133

```
DSolve[Derivative[1][y][x] == (y[x]*(-Log[x^(-1)] - x*Log[(1 + x^2)/x] + x^2*Log[(1 + x^2)/x]
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x \frac{-\log\left(\frac{1}{K[1]}\right) - K[1]\log\left(\frac{K[1]^2+1}{K[1]}\right)}{K[1]\log\left(\frac{1}{K[1]}\right)} dK[1]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[2]} \frac{-\log\left(\frac{1}{K[1]}\right) - K[1]\log\left(\frac{K[1]^2+1}{K[1]}\right)}{K[1]\log\left(\frac{1}{K[1]}\right)} dK[1]\right) K[2]\log\left(\frac{K[2]^2+1}{K[2]}\right)}{\log\left(\frac{1}{K[2]}\right)} dK[2] + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.246 (sec), leaf count = 96

```
dsolve(diff(y(x),x) = y(x)*(-ln(1/x)-ln((x^2+1)/x)*x+ln((x^2+1)/x)*x^2*y(x))/x/ln(1/x),y(x))
```

$$y(x) = \frac{e^{\int \frac{-\ln\left(\frac{x^2+1}{x}\right)x - \ln\left(\frac{1}{x}\right)}{x\ln\left(\frac{1}{x}\right)} dx}}{\int -\frac{e^{\int \frac{-\ln\left(\frac{x^2+1}{x}\right)x - \ln\left(\frac{1}{x}\right)}{x\ln\left(\frac{1}{x}\right)} dx} \ln\left(\frac{x^2+1}{x}\right)x}{\ln\left(\frac{1}{x}\right)} dx + c_1}$$

ODE No. 777

$$y'(x) = \frac{y(x)(y(x)+1)}{x\left(xy(x)^4 - y(x) - 1\right)}$$

✓ **Mathematica** : cpu = 0.267341 (sec), leaf count = 39

```
DSolve[Derivative[1][y][x] == (y[x]*(1 + y[x]))/(x*(-1 - y[x] + x*y[x]^4)),y[x],x]
```

$$\text{Solve}\left[-\frac{1}{2}(y(x)+1)^2 + 2(y(x)+1) - \frac{1}{xy(x)} - \log(y(x)+1) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.382 (sec), leaf count = 51

```
dsolve(diff(y(x),x) = y(x)*(1+y(x))/x/(-y(x)-1+x*y(x)^4),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(x\,\mathrm{e}^{3\_Z} - 5x\,\mathrm{e}^{2\_Z} + 2xc_1\mathrm{e}^{\_Z} + 2\_Z\mathrm{e}^{\_Z}x + 7\,\mathrm{e}^{\_Z}x - 2xc_1 - 2\_Zx - 3x + 2\right)} - 1$$

ODE No. 778

$$y'(x) = \frac{x^9 y(x)^3 + x^6 y(x)^2 - 3x^2 y(x) + 1}{x^3}$$

✓ **Mathematica** : cpu = 0.160002 (sec), leaf count = 95

```
DSolve[Derivative[1][y][x] == (1 - 3*x^2*y[x] + x^6*y[x]^2 + x^9*y[x]^3)/x^3,y[x],x]
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3x^6 y(x)+x^3}{\sqrt[3]{29}\sqrt[3]{x^9}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{29^{2/3}(x^9)^{2/3}}{9x^5} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.05 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = (-3*x^2*y(x)+1+x^6*y(x)^2+y(x)^3*x^9)/x^3,y(x))
```

$$y(x) = \frac{-3 + 29\,\text{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + x + 3c_1\right)}{9x^3}$$

ODE No. 779

$$y'(x) = \frac{x^3 y(x) + x^3 + x y(x)^2 + y(x)^3}{(x-1)x^3}$$

✓ **Mathematica** : cpu = 0.166378 (sec), leaf count = 57

```
DSolve[Derivative[1][y][x] == (x^3 + x^3*y[x] + x*y[x]^2 + y[x]^3)/((-1 + x)*x^3),y[x],x]
```

$$\text{Solve}\left[-\frac{1}{4}\log\left(\frac{y(x)^2}{x^2}+1\right)+\frac{1}{2}\log\left(\frac{y(x)}{x}+1\right)+\frac{1}{2}\tan^{-1}\left(\frac{y(x)}{x}\right) = \log(1-x)-\log(x)+c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.088 (sec), leaf count = 50

```
dsolve(diff(y(x),x) = 1/(x-1)*(x^3*y(x)+x^3+x*y(x)^2+y(x)^3)/x^3,y(x))
```

$$\frac{\ln\left(\frac{y(x)+x}{x}\right)}{2} - \frac{\ln\left(\frac{y(x)^2+x^2}{x^2}\right)}{4} + \frac{\arctan\left(\frac{y(x)}{x}\right)}{2} - \ln(x-1) + \ln(x) - c_1 = 0$$

ODE No. 780

$$y'(x) = \frac{x\sqrt{x^2 + y(x)^2} + xy(x) + y(x)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.166202 (sec), leaf count = 15

```
DSolve[Derivative[1][y][x] == (y[x] + x*y[x] + x*Sqrt[x^2 + y[x]^2])/(x*(1 + x)),y[x],x]
```

$$\{\{y(x) \to x \sinh(\log(x+1) + c_1)\}\}$$

✓ **Maple** : cpu = 0.662 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = (x*y(x)+y(x)+x*(y(x)^2+x^2)^(1/2))/x/(1+x),y(x))
```

$$c_1 + \frac{\sqrt{y(x)^2 + x^2} + y(x)}{x(1+x)} = 0$$

ODE No. 781

$$y'(x) = \frac{y(x)\left(x^4 + x^3 + 3y(x)^2 + x\right)}{x\left(6y(x)^2 + x\right)}$$

✓ **Mathematica** : cpu = 0.418494 (sec), leaf count = 82

```
DSolve[Derivative[1][y][x] == (y[x]*(x + x^3 + x^4 + 3*y[x]^2))/(x*(x + 6*y[x]^2)),y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{x}\sqrt{W\left(6xe^{\frac{2x^3}{3}+x^2+2c_1}\right)}}{\sqrt{6}}\right\}, \left\{y(x) \to \frac{\sqrt{x}\sqrt{W\left(6xe^{\frac{2x^3}{3}+x^2+2c_1}\right)}}{\sqrt{6}}\right\}\right\}$$

✓ **Maple** : cpu = 0.63 (sec), leaf count = 61

```
dsolve(diff(y(x),x) = 1/(6*y(x)^2+x)*(x^4+x^3+x+3*y(x)^2)*y(x)/x,y(x))
```

$$\frac{1}{\frac{1}{y(x)^2} + \frac{6}{x}} = \frac{\left(e^{\text{RootOf}\left(2x^3e^{-Z}+3x^2e^{-Z}-3\,e^{-Z}\ln\left(\frac{e^{-Z}+9}{2x}\right)+9c_1e^{-Z}+3\_Ze^{-Z}+27\right)} + 9\right)x}{54}$$

ODE No. 782

$$y'(x) = \frac{y(x)\coth\left(\frac{1}{x}\right)\left(x^2 y(x)\log\left(\frac{x^2+1}{x}\right) - x\log\left(\frac{x^2+1}{x}\right) - \tanh\left(\frac{1}{x}\right)\right)}{x}$$

✓ **Mathematica** : cpu = 4.03079 (sec), leaf count = 115

```
DSolve[Derivative[1][y][x] == (Coth[x^(-1)]*y[x]*(-(x*Log[(1 + x^2)/x]) - Tanh[x^(-1)] + x^2*
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x \frac{-\coth\left(\frac{1}{K[1]}\right)K[1]\log\left(\frac{K[1]^2+1}{K[1]}\right)-1}{K[1]}dK[1]\right)}{-\int_1^x \exp\left(\int_1^{K[2]} \frac{-\coth\left(\frac{1}{K[1]}\right)K[1]\log\left(\frac{K[1]^2+1}{K[1]}\right)-1}{K[1]}dK[1]\right)\coth\left(\frac{1}{K[2]}\right)K[2]\log\left(\frac{K[2]^2+1}{K[2]}\right)dK[2] + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 1.714 (sec), leaf count = 96

```
dsolve(diff(y(x),x) = y(x)*(-tanh(1/x)-ln((x^2+1)/x)*x+ln((x^2+1)/x)*x^2*y(x))/x/tanh(1/x),y(
```

$$y(x) = \frac{e^{\int \frac{-\ln\left(\frac{x^2+1}{x}\right)x-\tanh\left(\frac{1}{x}\right)}{x\tanh\left(\frac{1}{x}\right)}dx}}{\int -\frac{e^{\int \frac{-\ln\left(\frac{x^2+1}{x}\right)x-\tanh\left(\frac{1}{x}\right)}{x\tanh\left(\frac{1}{x}\right)}dx} x\ln\left(\frac{x^2+1}{x}\right)}{\tanh\left(\frac{1}{x}\right)}dx + c_1}$$

ODE No. 783

$$y'(x) = -\frac{y(x)\coth(x)\left(x^2 y(x)(-\log(2x)) + x\log(2x) + \tanh(x)\right)}{x}$$

✓ **Mathematica** : cpu = 3.98131 (sec), leaf count = 88

```
DSolve[Derivative[1][y][x] == -((Coth[x]*y[x]*(x*Log[2*x] + Tanh[x] - x^2*Log[2*x]*y[x]))/x),
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x \frac{-\coth(K[1])K[1]\log(2K[1])-1}{K[1]}dK[1]\right)}{-\int_1^x \exp\left(\int_1^{K[2]} \frac{-\coth(K[1])K[1]\log(2K[1])-1}{K[1]}dK[1]\right)\coth(K[2])K[2]\log(2K[2])dK[2] + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.235 (sec), leaf count = 75

```
dsolve(diff(y(x),x) = -y(x)*(tanh(x)+ln(2*x)*x-ln(2*x)*x^2*y(x))/x/tanh(x),y(x))
```

$$y(x) = \frac{e^{\int \frac{-x\ln(2)-x\ln(x)-\tanh(x)}{x\tanh(x)}dx}}{\int -\frac{e^{\int \frac{-x\ln(2)-x\ln(x)-\tanh(x)}{x\tanh(x)}dx}(\ln(2)+\ln(x))x}{\tanh(x)}dx + c_1}$$

ODE No. 784

$$y'(x) = \operatorname{csch}(x)\left(x^2\log(x) + 2xy(x)\log(x) + y(x)^2\log(x) + \log(x) - \sinh(x)\right)$$

✓ **Mathematica** : cpu = 19.8502 (sec), leaf count = 27

```
DSolve[Derivative[1][y][x] == Csch[x]*(Log[x] + x^2*Log[x] - Sinh[x] + 2*x*Log[x]*y[x] + Log[
```

$$\left\{\left\{y(x) \to -x + \tan\left(\int_1^x \operatorname{csch}(K[5])\log(K[5])dK[5] + c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 10.138 (sec), leaf count = 24

```
dsolve(diff(y(x),x) = (-sinh(x)+x^2*ln(x)+2*y(x)*ln(x)*x+ln(x)+y(x)^2*ln(x))/sinh(x),y(x))
```

$$y(x) = -x - \tan\left(c_1 - \left(\int \frac{\ln(x)}{\sinh(x)}dx\right)\right)$$

ODE No. 785

$$y'(x) = \frac{x^2 \sinh(x) + 2xy(x)\sinh(x) + y(x)^2 \sinh(x) - \log(x) + \sinh(x)}{\log(x)}$$

✓ **Mathematica** : cpu = 7.94874 (sec), leaf count = 29

```
DSolve[Derivative[1][y][x] == (-Log[x] + Sinh[x] + x^2*Sinh[x] + 2*x*Sinh[x]*y[x] + Sinh[x]*y
```

$$\left\{\left\{y(x) \to -x + \tan\left(\int_1^x \frac{\sinh(K[5])}{\log(K[5])} dK[5] + c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 58.379 (sec), leaf count = 24

```
dsolve(diff(y(x),x) = -(ln(x)-sinh(x)*x^2-2*sinh(x)*x*y(x)-sinh(x)-sinh(x)*y(x)^2)/ln(x),y(x)
```

$$y(x) = -x - \tan\left(c_1 - \left(\int \frac{\sinh(x)}{\ln(x)} dx\right)\right)$$

ODE No. 786

$$y'(x) = \frac{axy(x)^2 \cosh(x) + bx^3 \cosh(x) + y(x) \log(x)}{x \log(x)}$$

✓ **Mathematica** : cpu = 4.03671 (sec), leaf count = 61

```
DSolve[Derivative[1][y][x] == (b*x^3*Cosh[x] + Log[x]*y[x] + a*x*Cosh[x]*y[x]^2)/(x*Log[x]),y
```

$$\left\{\left\{y(x) \to \frac{\sqrt{b}x \tan\left(\sqrt{a}\sqrt{b}\int_1^x \frac{\cosh(K[1])K[1]}{\log(K[1])}dK[1] + \sqrt{a}\sqrt{b}c_1\right)}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.086 (sec), leaf count = 33

```
dsolve(diff(y(x),x) = (y(x)*ln(x)+cosh(x)*x*a*y(x)^2+cosh(x)*x^3*b)/x/ln(x),y(x))
```

$$y(x) = \frac{\tan\left(\sqrt{ab}\left(c_1 + \int \frac{x\cosh(x)}{\ln(x)}dx\right)\right)x\sqrt{ab}}{a}$$

ODE No. 787

$$y'(x) = \frac{x(2x^4 - 2x^2 y(x) + x^2 - x - 1)}{(x+1)(x^2 - y(x))}$$

✓ **Mathematica** : cpu = 23.4919 (sec), leaf count = 488

```
DSolve[Derivative[1][y][x] == (x*(-1 - x + x^2 + 2*x^4 - 2*x^2*y[x]))/((1 + x)*(x^2 - y[x])),
```

$$\text{Solve}\left[\frac{\left(2 - \frac{x(x^2-x-1)(2x^2-2y(x)+3)}{\sqrt[3]{x^3(x^2-x-1)^3}_{(x^2-y(x))}}\right)\left(\frac{x(x^2-x-1)(2x^2-2y(x)+3)}{\sqrt[3]{x^3(x^2-x-1)^3}_{(x^2-y(x))}}+4\right)\left(\left(1 - \frac{x(x^2-x-1)(2x^2-2y(x}{2\sqrt[3]{x^3(x^2-x-1)^3}(\right.\right.}{18\sqrt[3]{2}\left(-\frac{(2x^2-}{8(x^2}\right.}\right.$$

✓ **Maple** : cpu = 0.994 (sec), leaf count = 191

```
dsolve(diff(y(x),x) = 1/(x^2-y(x))*x*(-x-1+x^2-2*x^2*y(x)+2*x^4)/(1+x),y(x))
```

$$y(x) = \frac{4x^2 \mathrm{e}^{\mathrm{RootOf}\left(8x^3\mathrm{e}^{-Z}-24x^2\mathrm{e}^{-Z}-36x^3+6\ln\left(\frac{2\mathrm{e}^{-Z}-9}{(1+x)^4}\right)\mathrm{e}^{-Z}+18c_1\mathrm{e}^{-Z}-6\_Z\mathrm{e}^{-Z}+24\mathrm{e}^{-Z}x+108x^2-27\ln\left(\frac{2\mathrm{e}^{-Z}-9}{(1+x)^4}\right)-81c_1+27\_Z-108\right.}}{4\,\mathrm{e}^{\mathrm{RootOf}\left(8x^3\mathrm{e}^{-Z}-24x^2\mathrm{e}^{-Z}-36x^3+6\ln\left(\frac{2\mathrm{e}^{-Z}-9}{(1+x)^4}\right)\mathrm{e}^{-Z}+18c_1\mathrm{e}^{-Z}-6\_Z\mathrm{e}^{-Z}+24\mathrm{e}^{-Z}x+108x^2-27\ln\left(\frac{2\mathrm{e}^{-Z}-9}{(1+x)^4}\right)-81c_1+27\_Z-1\right.}}$$

ODE No. 788

$$y'(x) = -\frac{y(x)\left(x^2 y(x)(-\coth(x+1)) + \log(x-1) + x\coth(x+1)\right)}{x\log(x-1)}$$

✓ **Mathematica** : cpu = 24.1334 (sec), leaf count = 348

```
DSolve[Derivative[1][y][x] == -((y[x]*(x*Coth[1 + x] + Log[-1 + x] - x^2*Coth[1 + x]*y[x]))/(
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x \frac{-e^2\cosh(K[1])K[1]-\cosh(K[1])K[1]-e^2\sinh(K[1])K[1]+\sinh(K[1])K[1]-e^2\cosh(K[1])\log(K[1]-1)+\cosh(K[1])\log(K[1]-1)}{K[1]\log(K[1]-1)\left(e^2\cosh(K[1])-\cosh(K[1])+e^2\sinh(K[1])+\sinh(K[1])\right)}dK[1]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[2]} \frac{-e^2\cosh(K[1])K[1]-\cosh(K[1])K[1]-e^2\sinh(K[1])K[1]+\sinh(K[1])K[1]-e^2\cosh(K[1])\log(K[1]-1)+\cosh(K[1])\log(K[1]-1)}{K[1]\log(K[1]-1)\left(e^2\cosh(K[1])-\cosh(K[1])+e^2\sinh(K[1])+\sinh(K[1])\right)}dK[1]\right)}{K[2]\log(K[2]-1)(e^2\cosh(K[2])}dK[2]}\right\}\right\}$$

✓ **Maple** : cpu = 0.355 (sec), leaf count = 108

```
dsolve(diff(y(x),x) = -y(x)*(ln(x-1)+coth(1+x)*x-coth(1+x)*x^2*y(x))/x/ln(x-1),y(x))
```

$$y(x) = \frac{e^{\int -\frac{\ln(x-1)\sinh(1+x)+x\cosh(1+x)}{x\ln(x-1)\sinh(1+x)}dx}}{c_1 + \int -\frac{e^{\int \frac{-x\cosh(1+x)-\ln(x-1)\sinh(1+x)}{\sinh(1+x)\ln(x-1)x}dx} x\cosh(1+x)}{\ln(x-1)\sinh(1+x)}dx}$$

ODE No. 789

$$y'(x) = \frac{x^2 \coth(x+1) + 2xy(x)\coth(x+1) + y(x)^2 \coth(x+1) - \log(x-1) + \coth(x+1)}{\log(x-1)}$$

✓ **Mathematica** : cpu = 57.3856 (sec), leaf count = 120

```
DSolve[Derivative[1][y][x] == (Coth[1 + x] + x^2*Coth[1 + x] - Log[-1 + x] + 2*x*Coth[1 + x]*
```

$$\left\{\left\{y(x) \to -\frac{e^2 x \sinh(x) - x\sinh(x) + e^2 x\cosh(x) + x\cosh(x)}{e^2\sinh(x) - \sinh(x) + e^2\cosh(x) + \cosh(x)} + \tan\left(\int_1^x \frac{e^2\cosh(K[5]) + \cosh(K[5]) - \right.\right.\right.$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x) = -(ln(x-1)-coth(1+x)*x^2-2*coth(1+x)*x*y(x)-coth(1+x)-coth(1+x)*y(x)^2)/
```

, could not solve

```
dsolve(diff(y(x),x) = -(ln(x-1)-coth(1+x)*x^2-2*coth(1+x)*x*y(x)-coth(1+x)-coth(1+x)*y(
1),y(x))
```

ODE No. 790

$$y'(x) = \frac{x^4 \coth\left(\frac{x+1}{x-1}\right) - 2x^2 y(x) \coth\left(\frac{x+1}{x-1}\right) + y(x)^2 \coth\left(\frac{x+1}{x-1}\right) + 2x \log\left(\frac{1}{x-1}\right) - \coth\left(\frac{x+1}{x-1}\right)}{\log\left(\frac{1}{x-1}\right)}$$

✓ **Mathematica** : cpu = 71.9734 (sec), leaf count = 127

```
DSolve[Derivative[1][y][x] == (-Coth[(1 + x)/(-1 + x)] + x^4*Coth[(1 + x)/(-1 + x)] + 2*x*Log
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x \frac{2\coth\left(\frac{K[5]}{K[5]-1}+\frac{1}{K[5]-1}\right)}{\log\left(\frac{1}{K[5]-1}\right)} dK[5]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[6]} \frac{2\coth\left(\frac{K[5]}{K[5]-1}+\frac{1}{K[5]-1}\right)}{\log\left(\frac{1}{K[5]-1}\right)} dK[5]\right) \coth\left(\frac{K[6]}{K[6]-1}+\frac{1}{K[6]-1}\right)}{\log\left(\frac{1}{K[6]-1}\right)} dK[6] + c_1} + x^2 + 1\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x) = (2*x*ln(1/(x-1))-coth((1+x)/(x-1))+coth((1+x)/(x-1))*y(x)^2-2*coth((1+x
```

, could not solve

```
dsolve(diff(y(x),x) = (2*x*ln(1/(x-1))-coth((1+x)/(x-1))+coth((1+x)/(x-1))*y(x)^2-
2*coth((1+x)/(x-1))*x^2*y(x)+coth((1+x)/(x-1))*x^4)/ln(1/(x-1)),y(x))
```

ODE No. 791

$$y'(x) = \frac{\operatorname{sech}\left(\frac{1}{x-1}\right)\left(x^5+x^4-2x^3y(x)-2x^2y(x)+2x^2\cosh\left(\frac{1}{x-1}\right)+xy(x)^2+y(x)^2-x-2x\cosh\left(\frac{1}{x-1}\right)-\right.}{x-1}$$

✓ **Mathematica** : cpu = 6.99969 (sec), leaf count = 110

```
DSolve[Derivative[1][y][x] == (Sech[(-1 + x)^(-1)]*(-1 - x + x^4 + x^5 - 2*x*Cosh[(-1 + x)^(-
```

$$\left\{\left\{y(x)\to \frac{\exp\left(\int_1^x \frac{2(K[5]+1)\operatorname{sech}\left(\frac{1}{K[5]-1}\right)}{K[5]-1}dK[5]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[6]} \frac{2(K[5]+1)\operatorname{sech}\left(\frac{1}{K[5]-1}\right)}{K[5]-1}dK[5]\right)(K[6]+1)\operatorname{sech}\left(\frac{1}{K[6]-1}\right)}{K[6]-1}dK[6]+c_1} + \frac{x^3+x^2}{x+1}+1\right\}\right\}$$

✓ **Maple** : cpu = 7.334 (sec), leaf count = 306

```
dsolve(diff(y(x),x) = (2*x^2*cosh(1/(x-1))-2*x*cosh(1/(x-1))-1+y(x)^2-2*x^2*y(x)+x^4-x+x*y(x)
```

$$y(x) = \frac{(-x^2+1)\,\mathrm{e}^{\frac{\int \frac{4\,\mathrm{e}^{\frac{1}{x-1}}(1+x)}{\left(\mathrm{e}^{\frac{2}{x-1}}+1\right)(x-1)}dx}{\mathrm{e}^{\frac{2}{x-1}}+1}}\,\mathrm{e}^{\frac{\left(\int \frac{4\,\mathrm{e}^{\frac{1}{x-1}}(1+x)}{\left(\mathrm{e}^{\frac{2}{x-1}}+1\right)(x-1)}dx\right)\mathrm{e}^{\frac{2}{x-1}}}{\mathrm{e}^{\frac{2}{x-1}}+1}} + \mathrm{e}^{\frac{4c_1\mathrm{e}^{\frac{2}{x-1}}}{\mathrm{e}^{\frac{2}{x-1}}+1}}\,\mathrm{e}^{\frac{4c_1}{\mathrm{e}^{\frac{2}{x-1}}+1}}(x^2+1)}{\mathrm{e}^{\frac{4c_1\mathrm{e}^{\frac{2}{x-1}}}{\mathrm{e}^{\frac{2}{x-1}}+1}}\,\mathrm{e}^{\frac{4c_1}{\mathrm{e}^{\frac{2}{x-1}}+1}} - \mathrm{e}^{\frac{\left(\int \frac{4\,\mathrm{e}^{\frac{1}{x-1}}(1+x)}{\left(\mathrm{e}^{\frac{2}{x-1}}+1\right)(x-1)}dx\right)\mathrm{e}^{\frac{2}{x-1}}}{\mathrm{e}^{\frac{2}{x-1}}+1}}\,\mathrm{e}^{\frac{\int \frac{4\,\mathrm{e}^{\frac{1}{x-1}}(1+x)}{\left(\mathrm{e}^{\frac{2}{x-1}}+1\right)(x-1)}dx}{\mathrm{e}^{\frac{2}{x-1}}+1}}}$$

ODE No. 792

$$y'(x) = \frac{y(x)\text{sech}\left(\frac{1}{x+1}\right)\left(x^3 y(x) + x^2 y(x) - x^2 - x - x\cosh\left(\frac{1}{x+1}\right) + \cosh\left(\frac{1}{x+1}\right)\right)}{(x-1)x}$$

✓ **Mathematica** : cpu = 2.7716 (sec), leaf count = 157

```
DSolve[Derivative[1][y][x] == (Sech[(1 + x)^(-1)]*y[x]*(-x - x^2 + Cosh[(1 + x)^(-1)] - x*Cos
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x \frac{-\text{sech}\left(\frac{1}{K[1]+1}\right)K[1]^2 - \text{sech}\left(\frac{1}{K[1]+1}\right)K[1] - K[1] + 1}{(K[1]-1)K[1]}dK[1]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[2]} \frac{-\text{sech}\left(\frac{1}{K[1]+1}\right)K[1]^2 - \text{sech}\left(\frac{1}{K[1]+1}\right)K[1] - K[1] + 1}{(K[1]-1)K[1]}dK[1]\right)\left(\text{sech}\left(\frac{1}{K[2]+1}\right)K[2]^3 + \text{sech}\left(\frac{1}{K[2]+1}\right)K[2]^2\right)}{(K[2]-1)K[2]}d\right.}\right.$$

✓ **Maple** : cpu = 0.302 (sec), leaf count = 112

```
dsolve(diff(y(x),x) = y(x)*(-cosh(1/(1+x))*x+cosh(1/(1+x))-x+x^2*y(x)-x^2+x^3*y(x))/x/(x-1)/c
```

$$y(x) = \frac{e^{\int \frac{(1-x)\cosh\left(\frac{1}{1+x}\right) - x^2 - x}{x(x-1)\cosh\left(\frac{1}{1+x}\right)}dx}}{\int -\frac{e^{\int \frac{(1-x)\cosh\left(\frac{1}{1+x}\right) - x^2 - x}{x(x-1)\cosh\left(\frac{1}{1+x}\right)}dx}}{\cosh\left(\frac{1}{1+x}\right)(x-1)}x(1+x)dx + c_1}$$

ODE No. 793

$$y'(x) = -\frac{y(x)(xy(x)+1)}{x(xy(x)-y(x)+1)}$$

✓ **Mathematica** : cpu = 12.1163 (sec), leaf count = 399

```
DSolve[Derivative[1][y][x] == -((y[x]*(1 + x*y[x]))/(x*(1 - y[x] + x*y[x]))),y[x],x]
```

$$\text{Solve}\left[-\frac{\sqrt[3]{-2}\left(\frac{2^{2/3}((x-1)y(x)-2)}{\sqrt[3]{-\frac{1}{(x-1)^3}(x-1)((x-1)y(x)+1)}}+(-2)^{2/3}\right)\left(\frac{-xy(x)+y(x)+2}{\sqrt[3]{2}\sqrt[3]{-\frac{1}{(x-1)^3}(x-1)((x-1)y(x)+1)}}+(-2)^{2/3}\right)}{\left(\right.}\right.$$

✓ **Maple** : cpu = 1.955 (sec), leaf count = 32

```
dsolve(diff(y(x),x) = -1/x*y(x)*(x*y(x)+1)/(x*y(x)+1-y(x)),y(x))
```

$$y(x) = -\frac{2\,\mathrm{e}^{-\mathrm{LambertW}\left(-\frac{2(x-1)\mathrm{e}^{3c_1}\mathrm{e}^{-1}}{x}\right)+3c_1-1}}{x}$$

ODE No. 794

$$y'(x) = \frac{y(x)}{x\left(x^3 y(x)^4 + x^2 y(x)^3 + y(x) - 1\right)}$$

✓ **Mathematica** : cpu = 0.207418 (sec), leaf count = 67

```
DSolve[Derivative[1][y][x] == y[x]/(x*(-1 + y[x] + x^2*y[x]^3 + x^3*y[x]^4)),y[x],x]
```

$$\text{Solve}\left[\text{RootSum}\left[\#1^3 y(x)^3 + \#1^2 y(x)^2 + 1\&, \frac{\#1 y(x)\log(x - \#1) + \log(x - \#1)}{3\#1 y(x) + 2}\&\right] + y(x) - \log(x) = c_1\right.$$

✓ **Maple** : cpu = 0.543 (sec), leaf count = 32

```
dsolve(diff(y(x),x) = y(x)/x/(-1+y(x)+x^2*y(x)^3+y(x)^4*x^3),y(x))
```

$$-y(x) + \int^{xy(x)} \frac{1}{\_a\left(\_a^3 + \_a^2 + 1\right)} d\_a - c_1 = 0$$

ODE No. 795

$$y'(x) = \frac{a^3 + 3a^2x + 3ax^2 + ay(x)^2 + x^3 + y(x)^3 + xy(x)^2}{(a+x)^3}$$

✓ **Mathematica** : cpu = 0.440144 (sec), leaf count = 111

```
DSolve[Derivative[1][y][x] == (a^3 + 3*a^2*x + 3*a*x^2 + x^3 + a*y[x]^2 + x*y[x]^2 + y[x]^3)/
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{\frac{3y(x)}{(a+x)^3} + \frac{1}{(a+x)^2}}{\sqrt[3]{38}\sqrt[3]{\frac{1}{(a+x)^6}}} - \#1\right)}{2\sqrt[3]{38} - 19\#1^2}\&\right] = \frac{1}{9}38^{2/3}\left(\frac{1}{(a+x)^6}\right)\right.$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = (x^3+3*a*x^2+3*a^2*x+a^3+x*y(x)^2+a*y(x)^2+y(x)^3)/(x+a)^3,y(x))
```

$$y(x) = -\text{RootOf}\left(-\left(\int^{-Z} \frac{1}{\_a^3 - \_a^2 - \_a - 1} d\_a\right) + \ln(x+a) + c_1\right)(x+a)$$

ODE No. 796

$$y'(x) = \frac{e^{-\frac{3x^2}{2}} x y(x)^3}{3\left(e^{\frac{3x^2}{2}} y(x) + 3e^{\frac{3x^2}{2}} + 3y(x)\right)}$$

✓ **Mathematica** : cpu = 9.2938 (sec), leaf count = 102

```
DSolve[Derivative[1][y][x] == (x*y[x]^3)/(3*E^((3*x^2)/2)*(3*E^((3*x^2)/2) + 3*y[x] + E^((3*x
```

$$\text{Solve}\left[\frac{1}{62}\left(-31\log\left(9e^{\frac{3x^2}{2}}(y(x)+3)y(x) + 3e^{3x^2}(y(x)+3)^2 - y(x)^2\right) + 6\sqrt{93}\tanh^{-1}\left(\frac{\sqrt{\frac{3}{31}}\left(2e^{\frac{3x^2}{2}}(y(x)+\right.\right.\right.\right.$$
$$\left.\left.\left.\left.y(x)\right.\right.\right.\right.$$

✓ **Maple** : cpu = 1.363 (sec), leaf count = 143

```
dsolve(diff(y(x),x) = 1/3*y(x)^3*x*exp(3*x^2)/(3*exp(3/2*x^2)+exp(3/2*x^2)*y(x)+3*y(x))/exp(9
```

$$y(x) = \text{RootOf}\left(\left(7\,\mathrm{e}^{3x^2+\text{RootOf}\left(\mathrm{e}^{3x^2}\left(217\left(\tanh^2\left(\frac{\left(c_1-5\_Z\right)\sqrt{93}}{90}\right)\right)\mathrm{e}^{3x^2+\_Z}+42\tanh\left(\frac{\left(c_1-5\_Z\right)\sqrt{93}}{90}\right)\sqrt{93}\,\mathrm{e}^{3x^2+\_Z}+189\,\mathrm{e}^{3x^2+\_Z}\right.\right.\right.\right.$$
$$\left.\left.\left.\left.\right.\right.\right.\right.$$

ODE No. 797

$$y'(x) = \frac{y(x)\left(x^3 y(x)\cosh\left(\frac{x+1}{x-1}\right) + x^2 y(x)\cosh\left(\frac{x+1}{x-1}\right) - x^2\cosh\left(\frac{x+1}{x-1}\right) - x\cosh\left(\frac{x+1}{x-1}\right) - 1\right)}{x}$$

✓ **Mathematica** : cpu = 1.82436 (sec), leaf count = 349

```
DSolve[Derivative[1][y][x] == (y[x]*(-1 - x*Cosh[(1 + x)/(-1 + x)] - x^2*Cosh[(1 + x)/(-1 + x
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\frac{(3e^2-1)\text{Chi}\left(\frac{2}{x-1}\right)}{e} + \frac{(1+3e^2)\text{Shi}\left(\frac{2}{x-1}\right)}{e} - \frac{1}{4}ex^2\sinh\left(\frac{2}{x-1}\right) + \frac{x^2\sinh\left(\frac{2}{x-1}\right)}{4e} - \frac{1}{4}ex^2\cosh\left(\frac{2}{x-1}\right) - \frac{x}{}\right.\right.}{x\left(\exp\left(\frac{(3e^2-1)\text{Chi}\left(\frac{2}{x-1}\right)}{e}\right.\right.}$$

✓ **Maple** : cpu = 0.549 (sec), leaf count = 168

```
dsolve(diff(y(x),x) = y(x)*(-1-cosh((1+x)/(x-1))*x+cosh((1+x)/(x-1))*x^2*y(x)-cosh((1+x)/(x-1
```

$$y(x) = \frac{e^{-\frac{\left(x^2-1\right)e^{\frac{-1-x}{x-1}}}{4} - \frac{\left(x^2+4x-5\right)e^{\frac{1+x}{x-1}}}{4} + \text{expIntegral}\left(1,\frac{2}{x-1}\right)e^{-1} - 3\,\text{expIntegral}\left(1,-\frac{2}{x-1}\right)e}}{x\left(c_1 + \int -e^{\frac{\left(-x^2+1\right)e^{\frac{-1-x}{x-1}}}{4} + \frac{\left(-x^2-4x+5\right)e^{\frac{1+x}{x-1}}}{4} + \text{expIntegral}\left(1,\frac{2}{x-1}\right)e^{-1} - 3\,\text{expIntegral}\left(1,-\frac{2}{x-1}\right)e}(1+x)\cosh\left(\frac{1+x}{x-1}\right)d\right.}$$

ODE No. 798

$$y'(x) = \frac{y(x)(y(x)+x+1)}{(x+1)\left(2y(x)^3+y(x)+x\right)}$$

✓ **Mathematica** : cpu = 0.527223 (sec), leaf count = 27

```
DSolve[Derivative[1][y][x] == (y[x]*(1 + x + y[x]))/((1 + x)*(x + y[x] + 2*y[x]^3)),y[x],x]
```

$$\text{Solve}\left[y(x)^2 - \frac{x}{y(x)} + \log(y(x)) - \log(x+1) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.187 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = 1/(2*y(x)^3+y(x)+x)*(x+y(x)+1)*y(x)/(1+x),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-\mathrm{e}^{3\_Z}+\ln(1+x)\mathrm{e}^{\_Z}+\mathrm{e}^{\_Z}c_1-\_Z\mathrm{e}^{\_Z}+x\right)}$$

ODE No. 799

$$y'(x) = \frac{y(x)\left(e^{\frac{x+1}{x-1}}x^3y(x) + e^{\frac{x+1}{x-1}}x^2y(x) - e^{\frac{x+1}{x-1}}x^2 - e^{\frac{x+1}{x-1}}x - 1\right)}{x}$$

✓ **Mathematica** : cpu = 1.088 (sec), leaf count = 126

```
DSolve[Derivative[1][y][x] == (y[x]*(-1 - E^((1 + x)/(-1 + x))*x - E^((1 + x)/(-1 + x))*x^2 +
```

$$\left\{\left\{y(x) \to \frac{\exp\left(6e\mathrm{Ei}\left(\frac{2}{x-1}\right) + \frac{1}{2}e^{\frac{x}{x-1}+\frac{1}{x-1}}(x^2+4x-5) - e^{\frac{2}{x-1}}\left(\frac{1}{2}e(x-1)^2 + 3e(x-1)\right)\right)}{x\left(e^{6e\mathrm{Ei}\left(\frac{2}{x-1}\right)} + c_1 e^{\frac{1}{2}e^{\frac{x}{x-1}+\frac{1}{x-1}}(x^2+4x-5)}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.271 (sec), leaf count = 147

```
dsolve(diff(y(x),x) = y(x)*(-1-x*exp((1+x)/(x-1))+x^2*exp((1+x)/(x-1))*y(x)-x^2*exp((1+x)/(x-
```

$$y(x) = \frac{e^{\frac{5e^{\frac{1+x}{x-1}}}{2}}e^{-\frac{x^2e^{\frac{1+x}{x-1}}}{2}}e^{-6\,\mathrm{expIntegral}\left(1,-\frac{2}{x-1}\right)e}e^{-2xe^{\frac{1+x}{x-1}}}}{x\left(\int -(1+x)e^{\frac{1+x}{x-1}}e^{\frac{5e^{\frac{1+x}{x-1}}}{2}}e^{-\frac{x^2e^{\frac{1+x}{x-1}}}{2}}e^{-2xe^{\frac{1+x}{x-1}}}e^{-6\,\mathrm{expIntegral}\left(1,-\frac{2}{x-1}\right)e}dx + c_1\right)}$$

ODE No. 800

$$y'(x) = \frac{-b^3 + 6b^2x - 12bx^2 - 4by(x)^2 + 8x^3 + 8y(x)^3 + 8xy(x)^2}{(2x-b)^3}$$

✓ **Mathematica** : cpu = 0.422899 (sec), leaf count = 128

```
DSolve[Derivative[1][y][x] == (-b^3 + 6*b^2*x - 12*b*x^2 + 8*x^3 - 4*b*y[x]^2 + 8*x*y[x]^2 +
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{\frac{4}{(b-2x)^2} - \frac{24y(x)}{(b-2x)^3}}{4\sqrt[3]{38}\sqrt[3]{\frac{1}{(b-2x)^6}}} - \#1\right)}{2\sqrt[3]{38} - 19\#1^2}\&\right]\right] = \frac{1}{9}38^{2/3}\left(\frac{1}{(b-2x)}\right.$$

✓ **Maple** : cpu = 0.021 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = (-b^3+6*b^2*x-12*b*x^2+8*x^3-4*b*y(x)^2+8*x*y(x)^2+8*y(x)^3)/(2*x-b)^3,
```

$$y(x) = \frac{\text{RootOf}\left(-\left(\int^{-Z} \frac{1}{\_a^3 - \_a^2 - \_a - 1} d\_a\right) + \ln(-2x+b) + c_1\right)(-2x+b)}{2}$$

ODE No. 801

$$y'(x) = \frac{1}{2} e^{\frac{x^2}{4}} \left(2e^{-\frac{3x^2}{4}} y(x)^3 + 2e^{-\frac{x^2}{2}} y(x)^2 + e^{-\frac{x^2}{4}} x y(x) + 2 \right)$$

✓ **Mathematica** : cpu = 0.380032 (sec), leaf count = 126

```
DSolve[Derivative[1][y][x] == (E^(x^2/4)*(2 + (x*y[x])/E^(x^2/4) + (2*y[x]^2)/E^(x^2/2) + (2*
```

$$\text{Solve}\left[-\frac{29}{3} \text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3e^{-\frac{x^2}{2}} y(x) + e^{-\frac{x^2}{4}}}{\sqrt[3]{29} \sqrt[3]{e^{-\frac{3x^2}{4}}}} - \#1 \right)}{\sqrt[3]{29} - 29\#1^2} \& \right] \right] = \frac{1}{9} 29^{2/3} e^{\frac{x^2}{2}} \left(e^{-\frac{3x^2}{4}} \right)^{2/3}$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 63

```
dsolve(diff(y(x),x) = 1/2*(y(x)*exp(-1/4*x^2)*x+2+2*y(x)^2*exp(-1/2*x^2)+2*y(x)^3*exp(-3/4*x^
```

$$y(x) = \frac{\left(-3\,\mathrm{e}^{-\frac{x^2}{4}} \mathrm{e}^{\frac{x^2}{4}} + 29\,\text{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a \right) + x + 3c_1 \right) \right) \mathrm{e}^{-\frac{x^2}{4}} \mathrm{e}^{\frac{x^2}{2}}}{9}$$

ODE No. 802

$$y'(x) = \frac{\_\mathrm{F1}\left(y(x) + \frac{1}{x}\right) + \frac{1}{x}}{x}$$

✓ **Mathematica** : cpu = 0.140421 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (x^(-1) + _F1[x^(-1) + y[x]])/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{\_\mathrm{F1}\left(K[2] + \frac{1}{x}\right) \int_1^x -\frac{\_\mathrm{F1}'\left(K[2] + \frac{1}{K[1]}\right)}{K[1]^2 \left(\_\mathrm{F1}\left(K[2] + \frac{1}{K[1]}\right)\right)^2} dK[1] + 1}{\_\mathrm{F1}\left(K[2] + \frac{1}{x}\right)} dK[2] + \int_1^x \left(\frac{1}{K[1]} + \frac{1}{\_\mathrm{F1}\left(y(x) + \frac{1}{K}\right.\right.\right.$$

✓ **Maple** : cpu = 0.135 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = -(-1/x-_F1(y(x)+1/x))/x,y(x))
```

$$y(x) = \frac{\text{RootOf}\left(-\ln(x) + \int^{\_Z} \frac{1}{\_F1(\_a)} d\_a + c_1\right) x - 1}{x}$$

ODE No. 803

$$y'(x) = \frac{_F1(y(x)^2 - 2\log(x))}{x\sqrt{y(x)^2}}$$

✓ **Mathematica** : cpu = 0.40937 (sec), leaf count = 637

```
DSolve[Derivative[1][y][x] == _F1[-2*Log[x] + y[x]^2]/(x*Sqrt[y[x]^2]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{K[2]}{(_F1\left(K[2]^2 - 2\log(x)\right) - 1)\left(_F1\left(K[2]^2 - 2\log(x)\right) + 1\right)} - \int_1^x\left(\frac{2K[2]_F1'(K[2]^2 -}{K[1]\left(_F1\left(K[2]^2 - 2\log\right.\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.41 (sec), leaf count = 65

```
dsolve(diff(y(x),x) = _F1(y(x)^2-2*ln(x))/(y(x)^2)^(1/2)/x,y(x))
```

$$y(x) = \sqrt{2\ln(x) + 2\,\text{RootOf}\left(\ln(x) - \left(\int^{_Z}\frac{1}{_F1(2_a) - 1}d_a\right) + c_1\right)}$$

ODE No. 804

$$y'(x) = \frac{\frac{1}{2}x^4\cos(2y(x)) + \frac{x^4}{2} - \frac{1}{2}x\sin(2y(x)) - \frac{1}{2}\sin(2y(x))}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.605085 (sec), leaf count = 43

```
DSolve[Derivative[1][y][x] == (x^4/2 + (x^4*Cos[2*y[x]])/2 - Sin[2*y[x]]/2 - (x*Sin[2*y[x]])/
```

$$\left\{\left\{y(x) \to \tan^{-1}\left(\frac{3x^4 - 4x^3 + 6x^2 - 12x + 12\log(x+1) - 25 - 12c_1}{12x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.323 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = 1/2*(-sin(2*y(x))*x-sin(2*y(x))+cos(2*y(x))*x^4+x^4)/x/(1+x),y(x))
```

$$y(x) = \arctan\left(\frac{3x^4 - 4x^3 + 6x^2 + 12\ln(1+x) - 12c_1 - 12x}{12x}\right)$$

ODE No. 805

$$y'(x) = \frac{x^4\sqrt{x^2+y(x)^2}+xy(x)+y(x)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.171916 (sec), leaf count = 37

```
DSolve[Derivative[1][y][x] == (y[x] + x*y[x] + x^4*Sqrt[x^2 + y[x]^2])/(x*(1 + x)),y[x],x]
```

$$\left\{\left\{y(x)\to x\sinh\left(\frac{1}{6}\left(2x^3-3x^2+6x-6\log(x+1)+11+6c_1\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.702 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = (x*y(x)+y(x)+x^4*(y(x)^2+x^2)^(1/2))/x/(1+x),y(x))
```

$$\ln\left(y(x)+\sqrt{y\left(x\right)^2+x^2}\right)-\frac{x^3}{3}+\frac{x^2}{2}-x-\ln\left(x\right)+\ln\left(1+x\right)-c_1=0$$

ODE No. 806

$$y'(x) = \frac{-\frac{1}{2}x\sin(2y(x)) - \frac{1}{2}\sin(2y(x)) + \frac{1}{2}x\cos(2y(x)) + \frac{x}{2}}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.426154 (sec), leaf count = 22

```
DSolve[Derivative[1][y][x] == (x/2 + (x*Cos[2*y[x]])/2 - Sin[2*y[x]]/2 - (x*Sin[2*y[x]])/2)/(
```

$$\left\{\left\{y(x) \to \tan^{-1}\left(\frac{x - \log(x+1) - c_1}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.692 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = 1/2*(-sin(2*y(x))*x-sin(2*y(x))+x*cos(2*y(x))+x)/x/(1+x),y(x))
```

$$y(x) = -\arctan\left(\frac{\ln(1+x) - x - c_1}{x}\right)$$

ODE No. 807

$$y'(x) = -\frac{1}{-e^{y(x)}y(x)\_\mathrm{F1}(y(x) - \log(x)) - x}$$

✓ **Mathematica** : cpu = 0.274051 (sec), leaf count = 59

```
DSolve[Derivative[1][y][x] == -(-x - E^y[x]*y[x]*_F1[-Log[x] + y[x]])^(-1),y[x],x]
```

$$\text{Solve}\left[-\int_1^{y(x)-\log(x)} \frac{K[1]\_\mathrm{F1}(K[1]) + e^{-K[1]}}{\_\mathrm{F1}(K[1])} dK[1] - y(x)\log(x) + \frac{\log^2(x)}{2} = -c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.467 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = -1/(-x-_F1(y(x)-ln(x))*y(x)*exp(y(x))),y(x))
```

$$\frac{\ln(x)^2}{2} - y(x)\ln(x) - \left(\int^{y(x)-\ln(x)} \frac{\_F1(\_a)\_a + \mathrm{e}^{-\_a}}{\_F1(\_a)} d\_a\right) + c_1 = 0$$

ODE No. 808

$$y'(x) = \frac{(y(x)+1)(2y(x)+1)}{x(2xy(x)-2y(x)+x-2)}$$

✓ **Mathematica** : cpu = 1.92831 (sec), leaf count = 149

```
DSolve[Derivative[1][y][x] == ((1 + y[x])*(1 + 2*y[x]))/(x*(-2 + x - 2*y[x] + 2*x*y[x])),y[x]
```

$$\text{Solve}\left[\frac{2^{2/3}\left(x\log\left(-\frac{6\ 2^{2/3}(y(x)+1)}{2(x-1)y(x)+x-2}\right)-x\log\left(\frac{3\ 2^{2/3}(2xy(x)+x)}{2(x-1)y(x)+x-2}\right)+2xy(x)\left(\log\left(-\frac{6\ 2^{2/3}(y(x)+1)}{2(x-1)y(x)+x-2}\right)-\log\left(\frac{3\ 2^{2/3}(}{2(x-1)}\right.\right.\right.}{9(2xy(x)+x)}$$

✓ **Maple** : cpu = 0.13 (sec), leaf count = 45

```
dsolve(diff(y(x),x) = 1/x*(1+2*y(x))*(1+y(x))/(-2*y(x)-2+x+2*x*y(x)),y(x))
```

$$y(x) = \frac{-x\,\text{LambertW}\left(\frac{e^{-\frac{1}{x}}}{xc_1}\right)-2}{2x\,\text{LambertW}\left(\frac{e^{-\frac{1}{x}}}{xc_1}\right)+2}$$

ODE No. 809

$$y'(x) = \frac{64x^3 - 240x^2 + 64xy(x)^2 + 64y(x)^3 - 80y(x)^2 + 300x - 125}{(4x-5)^3}$$

✓ **Mathematica** : cpu = 0.340878 (sec), leaf count = 128

```
DSolve[Derivative[1][y][x] == (-125 + 300*x - 240*x^2 + 64*x^3 - 80*y[x]^2 + 64*x*y[x]^2 + 64
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{\frac{192y(x)}{(4x-5)^3} + \frac{16}{(4x-5)^2}}{16\sqrt[3]{38}\sqrt[3]{\frac{1}{(4x-5)^6}}} - \#1\right)}{2\sqrt[3]{38} - 19\#1^2}\&\right]\right. = \frac{1}{9}38^{2/3}\left(\frac{1}{(5-4x)}\right.$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = (-125+300*x-240*x^2+64*x^3-80*y(x)^2+64*x*y(x)^2+64*y(x)^3)/(4*x-5)^3,y
```

$$y(x) = -\frac{\text{RootOf}\left(-\left(\int^{-Z} \frac{1}{\_a^3 - \_a^2 - \_a - 1} d\_a\right) + \ln(4x-5) + c_1\right)(4x-5)}{4}$$

ODE No. 810

$$y'(x) = \frac{x^2 \log^2(x) + y(x)^2 + y(x) - 2xy(x)\log(x) + x}{x}$$

✓ **Mathematica** : cpu = 0.116504 (sec), leaf count = 40

```
DSolve[Derivative[1][y][x] == (x + x^2*Log[x]^2 + y[x] - 2*x*Log[x]*y[x] + y[x]^2)/x,y[x],x]
```

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

✓ **Maple** : cpu = 0.064 (sec), leaf count = 16

```
dsolve(diff(y(x),x) = (x+y(x)+y(x)^2-2*y(x)*ln(x)*x+x^2*ln(x)^2)/x,y(x))
```

$$y(x) = \left(\ln(x) + \frac{1}{c_1 - x}\right)x$$

ODE No. 811

$$y'(x) = \frac{x^4 + x^3 e^{y(x)} + xy(x) + e^{y(x)} y(x) - x \log\left(e^{y(x)} + x\right) - e^{y(x)} \log\left(e^{y(x)} + x\right) + x}{x^2}$$

✓ **Mathematica** : cpu = 1.67877 (sec), leaf count = 33

```
DSolve[Derivative[1][y][x] == (x + E^y[x]*x^3 + x^4 - E^y[x]*Log[E^y[x] + x] - x*Log[E^y[x] +
```

$$\left\{\left\{y(x) \to -\log\left(-\frac{1}{x} + \frac{e^{-\frac{x^3}{2} - c_1 x}}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.766 (sec), leaf count = 32

```
dsolve(diff(y(x),x) = (x^3*exp(y(x))+x^4+exp(y(x))*y(x)-exp(y(x))*ln(exp(y(x))+x)+x*y(x)-ln(e
```

$$y(x) = \frac{x^3}{2} + x c_1 + \ln\left(-\frac{x}{-1 + \mathrm{e}^{\frac{x^3}{2}} \mathrm{e}^{x c_1}}\right)$$

ODE No. 812

$$y'(x) = x^3\sqrt{x^3 - 6y(x)} + \sqrt{x^3 - 6y(x)} + \frac{x^2}{2} + x^2\sqrt{x^3 - 6y(x)}$$

✓ **Mathematica** : cpu = 0.391758 (sec), leaf count = 78

```
DSolve[Derivative[1][y][x] == x^2/2 + Sqrt[x^3 - 6*y[x]] + x^2*Sqrt[x^3 - 6*y[x]] + x^3*Sqrt[
```

$$\left\{\left\{y(x) \to \frac{1}{96}(-9x^8 - 24x^7 - 16x^6 - 72x^5 - 102x^4 + 72c_1x^4 + 8x^3 + 96c_1x^3 - 144x^2 - 24x + 288c_1x - 1\right.\right.$$

✓ **Maple** : cpu = 0.315 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = 1/2*x^2+(x^3-6*y(x))^(1/2)+x^2*(x^3-6*y(x))^(1/2)+x^3*(x^3-6*y(x))^(1/2
```

$$c_1 - \frac{3x^4}{4} - x^3 - 3x - \sqrt{x^3 - 6y\left(x\right)} = 0$$

ODE No. 813

$$y'(x) = \frac{1}{2}\sqrt{a}\left(2\sqrt{ax^4+8y(x)} - \sqrt{a}x^3 + 2x^3\sqrt{ax^4+8y(x)} + 2x^2\sqrt{ax^4+8y(x)}\right)$$

✓ **Mathematica** : cpu = 0.56267 (sec), leaf count = 93

```
DSolve[Derivative[1][y][x] == (Sqrt[a]*(-(Sqrt[a]*x^3) + 2*Sqrt[a*x^4 + 8*y[x]] + 2*x^2*Sqrt[
```

$$\left\{\left\{y(x) \to \frac{144ax^8 + 384ax^7 + 256ax^6 + 1152ax^5 + 1464ax^4 - 1152ac_1x^4 + 96ax^3 - 1536ac_1x^3 + 2304ax^2}{1152}\right.\right.$$

✓ **Maple** : cpu = 0.593 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = 1/2*(-a^(1/2)*x^3+2*(a*x^4+8*y(x))^(1/2)+2*x^2*(a*x^4+8*y(x))^(1/2)+2*x
```

$$\frac{\sqrt{a\,x^4+8y\,(x)}}{4} + \frac{(-3x^4-4x^3-12x)\,\sqrt{a}}{12} - c_1 = 0$$

ODE No. 814

$$y'(x) = \frac{y(x)\left(x^7 y(x)^2 - 3x^3 y(x) - 3\right)}{x\left(x^3 y(x) + 1\right)}$$

✓ **Mathematica** : cpu = 0.134753 (sec), leaf count = 72

```
DSolve[Derivative[1][y][x] == (y[x]*(-3 - 3*x^3*y[x] + x^7*y[x]^2))/(x*(1 + x^3*y[x])),y[x],x
```

$$\left\{\left\{y(x) \to \frac{x}{-x^4 + \frac{\sqrt{x+x(-2x+c_1)}}{\sqrt{\frac{1}{x^7}}}}\right\}, \left\{y(x) \to -\frac{x}{x^4 + \frac{\sqrt{x+x(-2x+c_1)}}{\sqrt{\frac{1}{x^7}}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = y(x)/x*(-3*x^3*y(x)-3+y(x)^2*x^7)/(x^3*y(x)+1),y(x))
```

$$y(x) = \frac{1}{x^3\left(\sqrt{c_1 - 2x} - 1\right)}$$

ODE No. 815

$$y'(x) = \frac{e^{3x^2} x (y(x)+3)^3}{81\left(e^{\frac{3x^2}{2}} y(x) + 3e^{\frac{3x^2}{2}} + 3y(x)\right)}$$

✓ **Mathematica** : cpu = 9.92522 (sec), leaf count = 99

```
DSolve[Derivative[1][y][x] == (E^(3*x^2)*x*(3 + y[x])^3)/(81*(3*E^((3*x^2)/2) + 3*y[x] + E^((
```

$$\text{Solve}\left[\frac{1}{186}\left(\left(31+3\sqrt{93}\right)\log\left(9\left(9+\sqrt{93}\right)y(x) - 2e^{\frac{3x^2}{2}}(y(x)+3)\right) + \left(31-3\sqrt{93}\right)\log\left(2e^{\frac{3x^2}{2}}(y(x)+3)+\right.\right.\right.$$

✓ **Maple** : cpu = 0.827 (sec), leaf count = 168

```
dsolve(diff(y(x),x) = 1/81*(3+y(x))^3*exp(9/2*x^2)*x*exp(3/2*x^2)/(3*exp(3/2*x^2)+exp(3/2*x^2
```

$$5\ln\left(\frac{100(3+y(x))^2 e^{3x^2} + \left(-8100y(x)^2 - 24300y(x)\right)e^{\frac{3x^2}{2}} - 24300y(x)^2}{189\left(e^{\frac{3x^2}{2}}(3+y(x)) + 3y(x)\right)^2}\right) - \frac{30\sqrt{93}\,\text{arctanh}\left(\frac{\left(29e^{\frac{3x^2}{2}}y(x)+\right.}{(279y(x)+}\right.}{31}$$

ODE No. 816

$$y'(x) = \frac{x(x - y(x))^3 (y(x) + x)^3}{y(x) \left(x^2 - y(x)^2 - 1\right)}$$

✓ **Mathematica** : cpu = 0.239919 (sec), leaf count = 74

```
DSolve[Derivative[1][y][x] == (x*(x - y[x])^3*(x + y[x])^3)/(y[x]*(-1 + x^2 - y[x]^2)),y[x],x
```

$$\text{Solve}\left[\frac{1}{2}\left(\text{RootSum}\left[\#1^3 - \#1 + 1\&, \frac{\#1 \log\left(-\#1 + x^2 - y(x)^2\right) - \log\left(-\#1 + x^2 - y(x)^2\right)}{3\#1^2 - 1}\&\right] + x^2\right) = c$$

✓ **Maple** : cpu = 0.547 (sec), leaf count = 190

```
dsolve(diff(y(x),x) = (x-y(x))^3*(y(x)+x)^3*x/(-y(x)^2+x^2-1)/y(x),y(x))
```

$$\int_{\_b}^{x} \frac{(\_a - y(x))^3 (y(x) + \_a)^3 \_a}{\_a^6 - 3\_a^4 y(x)^2 + 3\_a^2 y(x)^4 - y(x)^6 - \_a^2 + y(x)^2 + 1} d\_a + \int^{y(x)} \left(- \frac{(-\_f^2 + x^2 -}{-\_f^6 + 3\_f^4 x^2 - 3\_f^2 x^4 +} \right.$$

ODE No. 817

$$y'(x) = \frac{\csc(y(x)) \left(\frac{1}{2}x^3 \log(x) \cos(2y(x)) + \frac{1}{2}x^3 \log(x) - \cos(y(x))\right)}{x \log(x)}$$

✓ **Mathematica** : cpu = 0.594891 (sec), leaf count = 63

```
DSolve[Derivative[1][y][x] == (Csc[y[x]]*(-Cos[y[x]] + (x^3*Log[x])/2 + (x^3*Cos[2*y[x]]*Log[
```

$$\left\{\left\{y(x) \to -\sec^{-1}\left(\frac{-x^3 + 3x^3 \log(x) - 9c_1}{9 \log(x)}\right)\right\}, \left\{y(x) \to \sec^{-1}\left(\frac{-x^3 + 3x^3 \log(x) - 9c_1}{9 \log(x)}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.97 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = 1/2*(-2*cos(y(x))+x^3*cos(2*y(x))*ln(x)+x^3*ln(x))/sin(y(x))/ln(x)/x,y(
```

$$y(x) = \arccos\left(\frac{9 \ln(x)}{3x^3 \ln(x) - x^3 + 9c_1}\right)$$

ODE No. 818

$$y'(x) = \frac{y(x)}{x\left(xy(x)^4 + xy(x)^3 + xy(x) - 1\right)}$$

✓ **Mathematica** : cpu = 0.233857 (sec), leaf count = 34

```
DSolve[Derivative[1][y][x] == y[x]/(x*(-1 + x*y[x] + x*y[x]^3 + x*y[x]^4)),y[x],x]
```

$$\text{Solve}\left[\frac{y(x)^3}{3} + \frac{y(x)^2}{2} + \frac{1}{xy(x)} + \log(y(x)) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.217 (sec), leaf count = 34

```
dsolve(diff(y(x),x) = y(x)/x/(-1+x*y(x)+x*y(x)^3+x*y(x)^4),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-2x\,\mathrm{e}^{4\_Z} - 3x\,\mathrm{e}^{3\_Z} + 6c_1 x\,\mathrm{e}^{\_Z} - 6\_Z x\,\mathrm{e}^{\_Z} - 6\right)}$$

ODE No. 819

$$y'(x) = x^2\sqrt{x^2+3y(x)} + \sqrt{x^2+3y(x)} + x^3\sqrt{x^2+3y(x)} - \frac{2x}{3}$$

✓ **Mathematica** : cpu = 0.307955 (sec), leaf count = 65

```
DSolve[Derivative[1][y][x] == (-2*x)/3 + Sqrt[x^2 + 3*y[x]] + x^2*Sqrt[x^2 + 3*y[x]] + x^3*Sq
```

$$\left\{\left\{y(x) \to \frac{1}{192}\left(9x^8+24x^7+16x^6+72x^5+96x^4-72c_1x^4-96c_1x^3+80x^2-288c_1x+144{c_1}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.294 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = -2/3*x+(x^2+3*y(x))^(1/2)+x^2*(x^2+3*y(x))^(1/2)+x^3*(x^2+3*y(x))^(1/2)
```

$$c_1 + \frac{3x^4}{8} + \frac{x^3}{2} + \frac{3x}{2} - \sqrt{x^2+3y\left(x\right)} = 0$$

ODE No. 820

$$y'(x) = \frac{\csc(y(x)) \left(\frac{1}{2}x^2 \log(x) \cos(2y(x)) + \frac{1}{2}x^2 \log(x) - \cos(y(x))\right)}{x \log(x)}$$

✓ **Mathematica** : cpu = 0.499912 (sec), leaf count = 63

```
DSolve[Derivative[1][y][x] == (Csc[y[x]]*(-Cos[y[x]] + (x^2*Log[x])/2 + (x^2*Cos[2*y[x]]*Log[
```

$$\left\{\left\{y(x) \to -\sec^{-1}\left(\frac{-x^2 + 2x^2 \log(x) - 4c_1}{4 \log(x)}\right)\right\}, \left\{y(x) \to \sec^{-1}\left(\frac{-x^2 + 2x^2 \log(x) - 4c_1}{4 \log(x)}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.874 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = 1/2*(-2*cos(y(x))+x^2*cos(2*y(x))*ln(x)+x^2*ln(x))/sin(y(x))/ln(x)/x,y(
```

$$y(x) = \arccos\left(\frac{4 \ln(x)}{2x^2 \ln(x) - x^2 + 4c_1}\right)$$

ODE No. 821

$$y'(x) = \frac{y(x)(xy(x)+1)}{x\left(x^3y(x)^4 - xy(x) - 1\right)}$$

✓ **Mathematica** : cpu = 0.216683 (sec), leaf count = 2093

```
DSolve[Derivative[1][y][x] == (y[x]*(1 + x*y[x]))/(x*(-1 - x*y[x] + x^3*y[x]^4)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1}{4} - \frac{1}{2}\sqrt{\frac{{c_1}^2}{4} + \frac{\sqrt[3]{1944{c_1}^2x^6 + 1458x^5 + \sqrt{\left(1944{c_1}^2x^6 + 1458x^5\right)^2 - 4\left(54c_1x^4 + 144x^3\right)^3}}}{18\sqrt[3]{2}x^3} + \frac{}{x^3}}\right.\right.$$

✓ **Maple** : cpu = 0.134 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = 1/x*y(x)*(x*y(x)+1)/(-x*y(x)-1+y(x)^4*x^3),y(x))
```

$$-\frac{1}{2x^2y\left(x\right)^2} - \frac{1}{3y\left(x\right)^3x^3} - y(x) + c_1 = 0$$

ODE No. 822

$$y'(x) = \frac{1}{4}x\left(-4e^{-x^2}x^2y(x) - 4e^{-x^2}x^2 + 4e^{-x^2} + e^{-2x^2}x^4 + 4y(x)^2\right)$$

✓ **Mathematica** : cpu = 0.322253 (sec), leaf count = 32

```
DSolve[Derivative[1][y][x] == (x*(4/E^x^2 - (4*x^2)/E^x^2 + x^4/E^(2*x^2) - (4*x^2*y[x])/E^x^
```

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

✓ **Maple** : cpu = 0.119 (sec), leaf count = 25

```
dsolve(diff(y(x),x) = 1/4*(4*exp(-x^2)-4*x^2*exp(-x^2)+4*y(x)^2-4*x^2*exp(-x^2)*y(x)+x^4*exp(
```

$$y(x) = \frac{x^2\mathrm{e}^{-x^2}}{2} + \frac{1}{c_1 - \frac{x^2}{2}}$$

ODE No. 823

$$y'(x) = \frac{y(x)(y(x)+x)}{x\left(y(x)^4+y(x)^3+y(x)+x\right)}$$

✓ **Mathematica** : cpu = 0.383922 (sec), leaf count = 39

```
DSolve[Derivative[1][y][x] == (y[x]*(x + y[x]))/(x*(x + y[x] + y[x]^3 + y[x]^4)),y[x],x]
```

$$\text{Solve}\left[\frac{y(x)^3}{3}+\frac{y(x)^2}{2}+\log(y(x))-\frac{y(x)\log(x)+x}{y(x)}=c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.189 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = y(x)*(y(x)+x)/x/(x+y(x)+y(x)^3+y(x)^4),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-2\,\mathrm{e}^{4\_Z}-3\,\mathrm{e}^{3\_Z}+6\ln(x)\mathrm{e}^{\_Z}+6\,\mathrm{e}^{\_Z}c_1-6\_Z\mathrm{e}^{\_Z}+6x\right)}$$

ODE No. 824

$$y'(x) = \frac{y(x)\left(x^3 + x^2 y(x) + y(x)^2\right)}{(x-1)x^2(y(x)+x)}$$

✓ **Mathematica** : cpu = 0.243062 (sec), leaf count = 68

```
DSolve[Derivative[1][y][x] == (y[x]*(x^3 + x^2*y[x] + y[x]^2))/((-1 + x)*x^2*(x + y[x])),y[x]
```

$$\text{Solve}\left[-\frac{1}{2}\log\left(\frac{y(x)^2}{x^2}+\frac{y(x)}{x}+1\right)+\log\left(\frac{y(x)}{x}\right)+\frac{\tan^{-1}\left(\frac{\frac{2y(x)}{x}+1}{\sqrt{3}}\right)}{\sqrt{3}} = \log(1-x)-\log(x)+c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.314 (sec), leaf count = 61

```
dsolve(diff(y(x),x) = y(x)/x^2/(x-1)*(x^3+x^2*y(x)+y(x)^2)/(y(x)+x),y(x))
```

$$-\frac{\ln\left(\frac{y(x)^2+xy(x)+x^2}{x^2}\right)}{2}+\frac{\sqrt{3}\arctan\left(\frac{(x+2y(x))\sqrt{3}}{3x}\right)}{3}+\ln\left(\frac{y(x)}{x}\right)-\ln(x-1)+\ln(x)-c_1=0$$

ODE No. 825

$$y'(x) = \frac{x\left(x^2 y(x)^3 + (x^2+1)^{3/2} y(x)^2 + x^2(x^2+1)^{3/2} + (x^2+1)^{3/2} + y(x)^3\right)}{(x^2+1)^3}$$

✓ **Mathematica** : cpu = 0.496181 (sec), leaf count = 148

```
DSolve[Derivative[1][y][x] == (x*((1 + x^2)^(3/2) + x^2*(1 + x^2)^(3/2) + (1 + x^2)^(3/2)*y[x
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{\frac{3xy(x)}{\left(x^2+1\right)^2} + \frac{x}{\left(x^2+1\right)^{3/2}}}{\sqrt[3]{38}\sqrt[3]{\frac{x^3}{(x^2+1)^{9/2}}}} - \#1\right)}{2\sqrt[3]{38} - 19\#1^2}\&\right] = \frac{19^{2/3}\left(\frac{x^3}{(x^2+1)^{9/2}}\right)}{}\right.$$

✓ **Maple** : cpu = 0.1 (sec), leaf count = 48

```
dsolve(diff(y(x),x) = ((x^2+1)^(3/2)*x^2+(x^2+1)^(3/2)+y(x)^2*(x^2+1)^(3/2)+x^2*y(x)^3+y(x)^3
```

$$y(x) = \frac{\sqrt{x^2+1}\left(19\,\text{RootOf}\left(-1296\left(\int^{-Z} \frac{1}{361\_a^3 - 432\_a + 432} d\_a\right) + 2\ln\left(x^2+1\right) + 3c_1\right) - 6\right)}{18}$$

ODE No. 826

$$y'(x) = \frac{y(x)\left(3xy(x)^2 + 3y(x)^2 + x\right)}{x(x+1)\left(6y(x)^2 + x\right)}$$

✓ **Mathematica** : cpu = 0.474483 (sec), leaf count = 70

```
DSolve[Derivative[1][y][x] == (y[x]*(x + 3*y[x]^2 + 3*x*y[x]^2))/(x*(1 + x)*(x + 6*y[x]^2)),y
```

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

✓ **Maple** : cpu = 0.377 (sec), leaf count = 51

```
dsolve(diff(y(x),x) = 1/(6*y(x)^2+x)*(3*x*y(x)^2+x+3*y(x)^2)*y(x)/x/(1+x),y(x))
```

$$\frac{1}{\frac{1}{y(x)^2} + \frac{6}{x}} = \frac{\left(e^{\mathrm{RootOf}\left(-e^{-Z}\ln\left(\frac{(1+x)^2\left(e^{-Z}+9\right)}{2x}\right)+3e^{-Z}c_1+\_Ze^{-Z}+9\right)} + 9\right)x}{54}$$

ODE No. 827

$$y'(x) = \frac{x^2 y(x) \sqrt{x^2 + y(x)^2} + x^3 \left(-\sqrt{x^2 + y(x)^2}\right) + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.278409 (sec), leaf count = 221

```
DSolve[Derivative[1][y][x] == (y[x] - x^3*Sqrt[x^2 + y[x]^2] + x^2*y[x]*Sqrt[x^2 + y[x]^2])/x
```

$$\left\{\left\{y(x) \to \frac{x - 2\sqrt{x^2 \tanh^2\left(\frac{1}{3}\left(-\sqrt{2}x^3 - 3\sqrt{2}c_1\right)\right) - x^2 \tanh^4\left(\frac{1}{3}\left(-\sqrt{2}x^3 - 3\sqrt{2}c_1\right)\right)}}{-1 + 2\tanh^2\left(\frac{1}{3}\left(-\sqrt{2}x^3 - 3\sqrt{2}c_1\right)\right)}\right\}, \left\{y(x) \to \frac{x + 2\sqrt{}\right.\right.$$

✓ **Maple** : cpu = 0.192 (sec), leaf count = 49

```
dsolve(diff(y(x),x) = -(-y(x)+x^3*(y(x)^2+x^2)^(1/2)-x^2*(y(x)^2+x^2)^(1/2)*y(x))/x,y(x))
```

$$\ln\left(\frac{2x\left(\sqrt{2y(x)^2 + 2x^2} + y(x) + x\right)}{y(x) - x}\right) + \frac{\sqrt{2}\,x^3}{3} - \ln(x) - c_1 = 0$$

ODE No. 828

$$y'(x) = \frac{(y(x)+1)(2y(x)+1)}{x\left(2xy(x)^4 + xy(x)^3 - 2y(x) - 2\right)}$$

✓ **Mathematica** : cpu = 0.582033 (sec), leaf count = 56

```
DSolve[Derivative[1][y][x] == ((1 + y[x])*(1 + 2*y[x]))/(x*(-2 - 2*y[x] + x*y[x]^3 + 2*x*y[x]
```

$$\text{Solve}\left[-\frac{1}{8}y(x)^2 + \frac{3y(x)}{8} - \frac{1}{2x(2y(x)+1)} - \frac{1}{2}\log(y(x)+1) + \frac{1}{16}\log(2y(x)+1) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.267 (sec), leaf count = 54

```
dsolve(diff(y(x),x) = 1/x*(1+2*y(x))*(1+y(x))/(-2*y(x)-2+x*y(x)^3+2*x*y(x)^4),y(x))
```

$$y(x) = \frac{\mathrm{e}^{\text{RootOf}\left(x\,\mathrm{e}^{3\_Z} - 8x\,\mathrm{e}^{2\_Z} + 16\ln\left(\frac{\mathrm{e}^{\_Z}}{2}+\frac{1}{2}\right)x\,\mathrm{e}^{\_Z} + 8c_1 x\,\mathrm{e}^{\_Z} - 2\_Zx\,\mathrm{e}^{\_Z} + 7\,\mathrm{e}^{\_Z}x + 16\right)}}{2} - \frac{1}{2}$$

ODE No. 829

$$y'(x) = \frac{x^6\sqrt{4x^2y(x)+1} + x^5\sqrt{4x^2y(x)+1} + x^3\sqrt{4x^2y(x)+1} + \frac{1}{2}}{x^3}$$

✓ **Mathematica** : cpu = 0.442082 (sec), leaf count = 74

```
DSolve[Derivative[1][y][x] == (1/2 + x^3*Sqrt[1 + 4*x^2*y[x]] + x^5*Sqrt[1 + 4*x^2*y[x]] + x^
```

$$\left\{\left\{y(x) \to \frac{16x^{12} + 40x^{11} + 25x^{10} + 80x^9 + 100x^8 - 160c_1x^7 + 100x^6 - 200c_1x^6 - 400c_1x^4 + 400{c_1}^2x^2 - 1}{400x^2}\right.\right.$$

✓ **Maple** : cpu = 0.372 (sec), leaf count = 34

```
dsolve(diff(y(x),x) = 1/2*(1+2*(4*x^2*y(x)+1)^(1/2)*x^3+2*x^5*(4*x^2*y(x)+1)^(1/2)+2*x^6*(4*x
```

$$c_1 - \frac{\sqrt{4x^2y\left(x\right)+1}}{x} + x^2 + \frac{x^4}{2} + \frac{2x^5}{5} = 0$$

ODE No. 830

$$y'(x) = \frac{(x - y(x))y(x)}{x\left(-y(x)^4 - y(x)^3 - y(x) + x\right)}$$

✓ **Mathematica** : cpu = 0.427055 (sec), leaf count = 37

```
DSolve[Derivative[1][y][x] == ((x - y[x])*y[x])/(x*(x - y[x] - y[x]^3 - y[x]^4)),y[x],x]
```

$$\text{Solve}\left[-\frac{1}{3}y(x)^3 - \frac{y(x)^2}{2} - \frac{x}{y(x)} - \log(y(x)) + \log(x) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.197 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = y(x)*(x-y(x))/x/(x-y(x)-y(x)^3-y(x)^4),y(x))
```

$$y(x) = \mathrm{e}^{\text{RootOf}\left(2\,\mathrm{e}^{4\_Z} + 3\,\mathrm{e}^{3\_Z} - 6\ln(x)\mathrm{e}^{\_Z} + 6\,\mathrm{e}^{\_Z}c_1 + 6\_Z\mathrm{e}^{\_Z} + 6x\right)}$$

ODE No. 831

$$y'(x) = \frac{x^3\sqrt{4ax - y(x)^2} + x^2\sqrt{4ax - y(x)^2} + \sqrt{4ax - y(x)^2} + 2a}{y(x)}$$

✓ **Mathematica** : cpu = 2.73291 (sec), leaf count = 145

```
DSolve[Derivative[1][y][x] == (2*a + Sqrt[4*a*x - y[x]^2] + x^2*Sqrt[4*a*x - y[x]^2] + x^3*Sq
```

$$\left\{\left\{y(x) \to -\frac{1}{12}\sqrt{576ax - 9x^8 - 24x^7 - 16x^6 - 72x^5 - 96x^4 - 72c_1x^4 - 96c_1x^3 - 144x^2 - 288c_1x - 144c_1}\right.\right.$$

✓ **Maple** : cpu = 0.359 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = (2*a+(-y(x)^2+4*a*x)^(1/2)+x^2*(-y(x)^2+4*a*x)^(1/2)+x^3*(-y(x)^2+4*a*x
```

$$-\sqrt{-y\left(x\right)^2 + 4ax} - \frac{x^4}{4} - \frac{x^3}{3} - x - c_1 = 0$$

ODE No. 832

$$y'(x) = \frac{y(x)(y(x)+x+1)}{(x+1)\left(y(x)^4+y(x)^3+y(x)^2+x\right)}$$

✓ **Mathematica** : cpu = 1.94673 (sec), leaf count = 2497

```
DSolve[Derivative[1][y][x] == (y[x]*(1 + x + y[x]))/((1 + x)*(x + y[x]^2 + y[x]^3 + y[x]^4)),
```

$$\left\{\left\{y(x) \to -\frac{1}{2}\sqrt{\frac{3\sqrt[3]{2}(-8x+3c_1+}{\sqrt[3]{1944(c_1+\log(x+1))^2+972(c_1+\log(x+1))+3726x+\sqrt{(1944(c_1+\log(x+1))^2+}}}\right.\right.$$

✓ **Maple** : cpu = 0.171 (sec), leaf count = 31

```
dsolve(diff(y(x),x) = 1/(y(x)^4+y(x)^3+y(x)^2+x)*(x+y(x)+1)*y(x)/(1+x),y(x))
```

$$\ln(1+x) + \frac{x}{y(x)} - \frac{y(x)^3}{3} - \frac{y(x)^2}{2} - y(x) + c_1 = 0$$

ODE No. 833

$$y'(x) = \frac{x^4\left(-\sqrt{x^2+y(x)^2}\right) + x^3 y(x)\sqrt{x^2+y(x)^2} + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.279044 (sec), leaf count = 221

```
DSolve[Derivative[1][y][x] == (y[x] - x^4*Sqrt[x^2 + y[x]^2] + x^3*y[x]*Sqrt[x^2 + y[x]^2])/x
```

$$\left\{\left\{y(x) \to \frac{x - 2\sqrt{x^2\tanh^2\left(\frac{1}{4}\left(-\sqrt{2}x^4 - 4\sqrt{2}c_1\right)\right) - x^2\tanh^4\left(\frac{1}{4}\left(-\sqrt{2}x^4 - 4\sqrt{2}c_1\right)\right)}}{-1 + 2\tanh^2\left(\frac{1}{4}\left(-\sqrt{2}x^4 - 4\sqrt{2}c_1\right)\right)}\right\}, \left\{y(x) \to \frac{x + 2\sqrt{}\right.\right.$$

✓ **Maple** : cpu = 0.153 (sec), leaf count = 49

```
dsolve(diff(y(x),x) = -(-y(x)+x^4*(y(x)^2+x^2)^(1/2)-x^3*(y(x)^2+x^2)^(1/2)*y(x))/x,y(x))
```

$$\ln\left(\frac{2x\left(\sqrt{2y(x)^2 + 2x^2} + y(x) + x\right)}{y(x) - x}\right) + \frac{\sqrt{2}\,x^4}{4} - \ln(x) - c_1 = 0$$

ODE No. 834

$$y'(x) = \frac{y(x)\left(x^4 + 3xy(x)^2 + 3y(x)^2\right)}{x(x+1)\left(6y(x)^2 + x\right)}$$

✓ **Mathematica** : cpu = 0.549935 (sec), leaf count = 90

```
DSolve[Derivative[1][y][x] == (y[x]*(x^4 + 3*y[x]^2 + 3*x*y[x]^2))/(x*(1 + x)*(x + 6*y[x]^2))
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{x}\sqrt{W\left(\frac{6(x+1)^2 e^{x^2-2x-3+2c_1}}{x}\right)}}{\sqrt{6}}\right\}, \left\{y(x) \to \frac{\sqrt{x}\sqrt{W\left(\frac{6(x+1)^2 e^{x^2-2x-3+2c_1}}{x}\right)}}{\sqrt{6}}\right\}\right\}$$

✓ **Maple** : cpu = 0.671 (sec), leaf count = 60

```
dsolve(diff(y(x),x) = (x^4+3*x*y(x)^2+3*y(x)^2)/(6*y(x)^2+x)*y(x)/x/(1+x),y(x))
```

$$\frac{1}{\frac{1}{y(x)^2} + \frac{6}{x}} = \frac{\left(\mathrm{e}^{\mathrm{RootOf}\left(x^2\mathrm{e}^{-Z} - \mathrm{e}^{-Z}\ln\left(\frac{x\left(\mathrm{e}^{-Z}+9\right)}{2(1+x)^2}\right) + 3\,\mathrm{e}^{-Z}c_1 + \_Z\mathrm{e}^{-Z} - 2\,\mathrm{e}^{-Z}x + 9\right)} + 9\right)x}{54}$$

ODE No. 835

$$y'(x) = -\frac{1}{x\left(-\sqrt[3]{y(x)^3}\right)\,\_\mathrm{F1}\left(y(x)^3 - 3\log(x)\right) - x\left(y(x)^3\right)^{2/3}}$$

✗ **Mathematica** : cpu = 1.49049 (sec), leaf count = 0

```
DSolve[Derivative[1][y][x] == -(-(x*(y[x]^3)^(2/3)) - x*(y[x]^3)^(1/3)*_F1[-3*Log[x] + y[x]^3
```

, could not solve

```
DSolve[Derivative[1][y][x] == -(-(x*(y[x]^3)^(2/3)) - x*(y[x]^3)^(1/3)*_F1[-
3*Log[x] + y[x]^3])^(-1), y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x) = -1/(-(y(x)^3)^(2/3)*x-_F1(y(x)^3-3*ln(x))*(y(x)^3)^(1/3)*x),y(x))
```

, could not solve

```
dsolve(diff(y(x),x) = -1/(-(y(x)^3)^(2/3)*x-_F1(y(x)^3-3*ln(x))*(y(x)^3)^(1/3)*x),y(x))
```

ODE No. 836

$$y'(x) = \frac{(x - y(x))y(x)(y(x) + 1)}{x(xy(x) - y(x) + x)}$$

✓ **Mathematica** : cpu = 11.1854 (sec), leaf count = 379

```
DSolve[Derivative[1][y][x] == ((x - y[x])*y[x]*(1 + y[x]))/(x*(x - y[x] + x*y[x])),y[x],x]
```

$$\text{Solve}\left[\frac{1}{9}2^{2/3}\left(\frac{\left(1-\frac{(x-1)^2\left(\frac{x^6}{(x-1)^3}\right)^{2/3}((x+2)y(x)+x)}{x^4((x-1)y(x)+x)}\right)\left(\frac{\left(\frac{x^6}{(x-1)^3}\right)^{2/3}(x-1)^2((x+2)y(x)+x)}{x^4((x-1)y(x)+x)}+2\right)\left(\left(1-\frac{(x-1)^2\left(\frac{x^6}{(x-1)^3}\right)^{2/3}}{x^4((x-1)y\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.224 (sec), leaf count = 73

```
dsolve(diff(y(x),x) = y(x)*(x-y(x))*(1+y(x))/x/(x*y(x)+x-y(x)),y(x))
```

$$y(x) = -\frac{x\,\mathrm{e}^{\mathrm{RootOf}\left(-\ln\left(\frac{\mathrm{e}^{-Z}}{2}+\frac{9}{2}\right)\mathrm{e}^{-Z}+3\,\mathrm{e}^{-Z}c_1+\_Z\mathrm{e}^{-Z}-\mathrm{e}^{-Z}x+9\right)}}{-9+(x-1)\,\mathrm{e}^{\mathrm{RootOf}\left(-\ln\left(\frac{\mathrm{e}^{-Z}}{2}+\frac{9}{2}\right)\mathrm{e}^{-Z}+3\,\mathrm{e}^{-Z}c_1+\_Z\mathrm{e}^{-Z}-\mathrm{e}^{-Z}x+9\right)}}$$

ODE No. 837

$$y'(x) = -\frac{1}{-\sqrt[3]{y(x)^3}\log(x)\_\mathrm{F1}\left(3\mathrm{Ei}(-\log(x)) + y(x)^3\right) - \left(y(x)^3\right)^{2/3}\log(x)}$$

✗ **Mathematica** : cpu = 1.724 (sec), leaf count = 0

```
DSolve[Derivative[1][y][x] == -(-(Log[x]*(y[x]^3)^(2/3)) - Log[x]*(y[x]^3)^(1/3)*_F1[3*ExpInt
```

, could not solve

```
DSolve[Derivative[1][y][x] == -(-(Log[x]*(y[x]^3)^(2/3)) - Log[x]*(y[x]^3)^(1/3)*_F1[3*
Log[x]] + y[x]^3])^(-1), y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x) = -1/(-ln(x)*(y(x)^3)^(2/3)-_F1(y(x)^3+3*Ei(1,-ln(x)))*ln(x)*(y(x)^3)^(1/
```

, could not solve

```
dsolve(diff(y(x),x) = -1/(-ln(x)*(y(x)^3)^(2/3)-_F1(y(x)^3+3*Ei(1,-ln(x)))*ln(x)*(y(x)^
```

ODE No. 838

$$y'(x) = \frac{\frac{8x^{7/2}}{5} + \frac{4x^6}{25} - \frac{4}{5}x^3 y(x) + \frac{6x^3}{5} - 4\sqrt{x}y(x) + y(x)^2 + 4x + \sqrt{x}}{x}$$

✓ **Mathematica** : cpu = 0.168017 (sec), leaf count = 31

```
DSolve[Derivative[1][y][x] == (Sqrt[x] + 4*x + (6*x^3)/5 + (8*x^(7/2))/5 + (4*x^6)/25 - 4*Sqr
```

$$\left\{\left\{y(x) \to \frac{2}{5}\sqrt{x}\left(x^{5/2}+5\right) + \frac{1}{-\log(x)+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.108 (sec), leaf count = 25

```
dsolve(diff(y(x),x) = 1/25*(30*x^3+25*x^(1/2)+25*y(x)^2-20*x^3*y(x)-100*y(x)*x^(1/2)+4*x^6+40
```

$$y(x) = \frac{2\left(x^2 + \frac{5}{\sqrt{x}}\right)x}{5} + \frac{1}{c_1 - \ln(x)}$$

ODE No. 839

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

✓ **Mathematica** : cpu = 0.281035 (sec), leaf count = 28

```
DSolve[Derivative[1][y][x] == (E^(y[x]/x)*(x/E^(y[x]/x) + x^2 + y[x]/E^(y[x]/x)))/x,y[x],x]
```

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

✓ **Maple** : cpu = 0.072 (sec), leaf count = 19

```
dsolve(diff(y(x),x) = (exp(-y(x)/x)*y(x)+exp(-y(x)/x)*x+x^2)*exp(y(x)/x)/x,y(x))
```

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

ODE No. 840

$$y'(x) = \frac{e^{\frac{y(x)}{x}}\left(x^3 + xe^{-\frac{y(x)}{x}} + e^{-\frac{y(x)}{x}}y(x)\right)}{x}$$

✓ **Mathematica** : cpu = 0.289763 (sec), leaf count = 30

```
DSolve[Derivative[1][y][x] == (E^(y[x]/x)*(x/E^(y[x]/x) + x^3 + y[x]/E^(y[x]/x)))/x,y[x],x]
```

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

✓ **Maple** : cpu = 0.07 (sec), leaf count = 19

```
dsolve(diff(y(x),x) = (exp(-y(x)/x)*y(x)+exp(-y(x)/x)*x+x^3)*exp(y(x)/x)/x,y(x))
```

$$y(x) = \ln\left(\frac{3x}{-x^3 + c_1}\right)x$$

ODE No. 841

$$y'(x) = \frac{-2a^{3/2}bx^2y(x)^2 + 2a^{3/2}cy(x)^2 + a^{5/2}y(x)^4 + \sqrt{a}b^2x^4 - 2\sqrt{a}bcx^2 + \sqrt{a}c^2 + bx^3}{ax^2y(x)}$$

✓ **Mathematica** : cpu = 0.970533 (sec), leaf count = 236

```
DSolve[Derivative[1][y][x] == (Sqrt[a]*c^2 - 2*Sqrt[a]*b*c*x^2 + b*x^3 + Sqrt[a]*b^2*x^4 + 2*
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{2a^{5/2}bx^2 - 2a^{5/2}c + 4a^3b^2x^3 - 4a^3bcx + a^2x + 4\sqrt{a}b^2c_1x^2 - 4\sqrt{a}bcc_1 + 2bc_1x}}{\sqrt{2}\sqrt{2a^{3/2}bc_1 + a^{7/2} + 2a^4bx}}\right\}, \left\{y(x) \to \right.\right.$$

✓ **Maple** : cpu = 0.297 (sec), leaf count = 97

```
dsolve(diff(y(x),x) = (b*x^3+c^2*a^(1/2)-2*c*b*x^2*a^(1/2)+2*c*y(x)^2*a^(3/2)+b^2*x^4*a^(1/2)
```

$$y(x) = -\frac{2\sqrt{a^{\frac{3}{2}}\left((xc_1+1)\left(bx^2-c\right)\sqrt{a}+\frac{x}{2}\right)(xc_1+1)}}{a^{\frac{3}{2}}(2xc_1+2)}$$

ODE No. 842

$$y'(x) = \frac{2x^2 y(x) \log^2(x) + x^2 y(x)^2 \log(x) + x^2 \log^3(x) + y(x)}{x \log(x)}$$

✓ **Mathematica** : cpu = 0.218033 (sec), leaf count = 186

```
DSolve[Derivative[1][y][x] == (x^2*Log[x]^3 + y[x] + 2*x^2*Log[x]^2*y[x] + x^2*Log[x]*y[x]^2)
```

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

✓ **Maple** : cpu = 0.032 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = (y(x)+x^2*ln(x)^3+2*x^2*ln(x)^2*y(x)+x^2*ln(x)*y(x)^2)/x/ln(x),y(x))
```

$$y(x) = -\frac{\ln(x)\left(2x^2\ln(x) - x^2 + 2c_1 + 4\right)}{2x^2\ln(x) - x^2 + 2c_1}$$

ODE No. 843

$$y'(x) = \frac{2x^3 y(x) \log^2(x) + x^3 y(x)^2 \log(x) + x^3 \log^3(x) + y(x)}{x \log(x)}$$

✓ **Mathematica** : cpu = 0.207729 (sec), leaf count = 198

```
DSolve[Derivative[1][y][x] == (x^3*Log[x]^3 + y[x] + 2*x^3*Log[x]^2*y[x] + x^3*Log[x]*y[x]^2)
```

$$\left\{\left\{y(x) \to -\frac{\frac{1}{9}x^3 e^{\frac{1}{9}x^3(3\log(x)-1)}(3\log(x)-1)\left(\frac{x^2}{3}+\frac{1}{3}x^2(3\log(x)-1)\right)+\frac{1}{3}x^2 e^{\frac{1}{9}x^3(3\log(x)-1)}+\frac{1}{3}x^2 e^{\frac{1}{9}x^3(3\log(x}}{x^2\left(\frac{1}{9}x^3 e^{\frac{1}{9}x^3(3\log(x)-1)}(3\log(x)-1)+c_1 e^{\frac{1}{9}x^}\right.}\right.$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = (y(x)+x^3*ln(x)^3+2*x^3*ln(x)^2*y(x)+x^3*ln(x)*y(x)^2)/x/ln(x),y(x))
```

$$y(x) = -\frac{\ln(x)\left(6x^3\ln(x) - 2x^3 + 9c_1 + 18\right)}{6x^3\ln(x) - 2x^3 + 9c_1}$$

ODE No. 844

$$y'(x) = \frac{y(x)(y(x)+1)(y(x)+x)}{x(xy(x)+y(x)+x)}$$

✓ **Mathematica** : cpu = 11.7745 (sec), leaf count = 386

```
DSolve[Derivative[1][y][x] == (y[x]*(1 + y[x])*(x + y[x]))/(x*(x + y[x] + x*y[x])),y[x],x]
```

$$\text{Solve}\left[\frac{2^{2/3}\left(1-\frac{\left(\frac{x^6}{(x+1)^3}\right)^{2/3}(x+1)^2((x-2)y(x)+x)}{x^4((x+1)y(x)+x)}\right)\left(\frac{\left(\frac{x^6}{(x+1)^3}\right)^{2/3}(x+1)^2((x-2)y(x)+x)}{x^4((x+1)y(x)+x)}+2\right)\left(\left(1-\frac{\left(\frac{x^6}{(x+1)^3}\right)^{2/3}(x+1)^2((x-\right.\right.}{9\left(\right.}\right.$$

✓ **Maple** : cpu = 0.212 (sec), leaf count = 97

```
dsolve(diff(y(x),x) = y(x)*(y(x)+x)*(1+y(x))/x/(x*y(x)+x+y(x)),y(x))
```

$$y(x) = -\frac{e^{\text{RootOf}\left(-\ln\left(\frac{e^{-Z}}{2}+\frac{9}{2}\right)e^{-Z}+3e^{-Z}c_1+\_Ze^{-Z}+e^{-Z}x+9\right)}x}{e^{\text{RootOf}\left(-\ln\left(\frac{e^{-Z}}{2}+\frac{9}{2}\right)e^{-Z}+3e^{-Z}c_1+\_Ze^{-Z}+e^{-Z}x+9\right)}x+e^{\text{RootOf}\left(-\ln\left(\frac{e^{-Z}}{2}+\frac{9}{2}\right)e^{-Z}+3e^{-Z}c_1+\_Ze^{-Z}+e^{-Z}x+9\right)}+9}$$

ODE No. 845

$$y'(x) = \frac{\sqrt{4y(x)^3 - 9x^4} + 3x^3 + x^3\sqrt{4y(x)^3 - 9x^4} + x^2\sqrt{4y(x)^3 - 9x^4}}{y(x)^2}$$

✓ **Mathematica** : cpu = 2.94794 (sec), leaf count = 266

```
DSolve[Derivative[1][y][x] == (3*x^3 + Sqrt[-9*x^4 + 4*y[x]^3] + x^2*Sqrt[-9*x^4 + 4*y[x]^3]
```

$$\left\{\left\{y(x) \to -\frac{1}{2}\sqrt[3]{-\frac{1}{2}}\sqrt[3]{9x^8 + 24x^7 + 16x^6 + 72x^5 + 114x^4 + 72c_1x^4 - 24x^3 + 96c_1x^3 + 144x^2 - 72x + 288}\right.\right.$$

✓ **Maple** : cpu = 0.213 (sec), leaf count = 44

```
dsolve(diff(y(x),x) = (3*x^3+(-9*x^4+4*y(x)^3)^(1/2)+x^2*(-9*x^4+4*y(x)^3)^(1/2)+x^3*(-9*x^4+
```

$$\int_{\_b}^{y(x)} \frac{\_a^2}{\sqrt{-9x^4 + 4\_a^3}} d\_a - \frac{x^4}{4} - \frac{x^3}{3} - x - c_1 = 0$$

ODE No. 846

$$y'(x) = \frac{1}{-\left(x^2\left(\frac{1}{y(x)}+1\right)_F1\left(x\left(\frac{1}{y(x)}+1\right)\right)\right)+x^2_F1\left(x\left(\frac{1}{y(x)}+1\right)\right)+x\left(\frac{1}{y(x)}+1\right)-x}$$

✓ **Mathematica** : cpu = 0.776136 (sec), leaf count = 365

```
DSolve[Derivative[1][y][x] == (-x + x*(1 + y[x]^(-1)) + x^2*_F1[x*(1 + y[x]^(-1))] - x^2*(1 +
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{x_F1\left(x\left(1+\frac{1}{K[2]}\right)\right)-1}{x_F1\left(x\left(1+\frac{1}{K[2]}\right)\right)K[2]-K[2]+x_F1\left(x\left(1+\frac{1}{K[2]}\right)\right)}-\int_1^x\left(\frac{_F1\left(K[1]\left(1+\frac{1}{K[2]}\right)\right)}{K[1]\left(K[2]_F1\left(K[1]\right.\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.223 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = 1/(-x+(1/y(x)+1)*x+_F1((1/y(x)+1)*x)*x^2-_F1((1/y(x)+1)*x)*x^2*(1/y(x)+
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-_Z-\left(\int^{\frac{x\,\mathrm{e}^{_Z}}{\mathrm{e}^{_Z}-1}}\frac{1}{(_F1(_a)_a-1)_a}d_a\right)+c_1\right)}-1$$

ODE No. 847

$$y'(x) = x^2\sqrt{x^2-4y(x)+2x+1}+\sqrt{x^2-4y(x)+2x+1}+x^3\sqrt{x^2-4y(x)+2x+1}+\frac{x}{2}+\frac{1}{2}$$

✓ **Mathematica** : cpu = 1.14282 (sec), leaf count = 103

```
DSolve[Derivative[1][y][x] == 1/2 + x/2 + Sqrt[1 + 2*x + x^2 - 4*y[x]] + x^2*Sqrt[1 + 2*x + x
```

$$\text{Solve}\left[\frac{x^4}{4}+\frac{x^3}{3}+\frac{1}{2}\sqrt{x^2-4y(x)+2x+1}+\frac{1}{2}\log\left(\sqrt{x^2-4y(x)+2x+1}+x+1\right)-\frac{1}{2}\tanh^{-1}\left(\frac{}{2\sqrt{x^2-}\right.\right.$$

✓ **Maple** : cpu = 0.351 (sec), leaf count = 34

```
dsolve(diff(y(x),x) = 1/2*x+1/2+(x^2+2*x+1-4*y(x))^(1/2)+x^2*(x^2+2*x+1-4*y(x))^(1/2)+x^3*(x^
```

$$c_1-\frac{x^4}{2}-\frac{2x^3}{3}-2x-\sqrt{x^2+2x+1-4y\left(x\right)}=0$$

ODE No. 848

$$y'(x) = \_\mathrm{F1}(y(x) - \log(\sinh(x))) + \coth(x)$$

✓ **Mathematica** : cpu = 0.211298 (sec), leaf count = 157

```
DSolve[Derivative[1][y][x] == Coth[x] + _F1[-Log[Sinh[x]] + y[x]],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{\_\mathrm{F1}(K[2] - \log(\sinh(x))) \int_1^x \left(\frac{(\coth(K[1]) + \_\mathrm{F1}(K[2] - \log(\sinh(K[1])))) \_\mathrm{F1}'(K[2] - \log(\sinh(K[1])))}{(\_\mathrm{F1}(K[2] - \log(\sinh(K[1]))))^2} - \frac{\_\mathrm{F}}{\_\mathrm{F}} \right.}{\_\mathrm{F1}(K[2] - \log(\sinh(x)))}$$

✓ **Maple** : cpu = 0.595 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = 1/sinh(x)*cosh(x)+_F1(y(x)-ln(sinh(x))),y(x))
```

$$\int_{\_b}^{y(x)} \frac{1}{\_F1\left(\_a - \ln\left(\sinh\left(x\right)\right)\right)} d\_a - x - c_1 = 0$$

ODE No. 849

$$y'(x) = x^2\sqrt{x^2+4y(x)-4x} + \sqrt{x^2+4y(x)-4x} + x^3\sqrt{x^2+4y(x)-4x} - \frac{x}{2} + 1$$

✓ **Mathematica** : cpu = 1.02817 (sec), leaf count = 102

```
DSolve[Derivative[1][y][x] == 1 - x/2 + Sqrt[-4*x + x^2 + 4*y[x]] + x^2*Sqrt[-4*x + x^2 + 4*y
```

$$\text{Solve}\left[\frac{x^4}{4} + \frac{x^3}{3} - \frac{1}{2}\sqrt{x^2+4y(x)-4x} + \log\left(-\sqrt{x^2+4y(x)-4x} - x + 2\right) - \tanh^{-1}\left(\frac{2x-4}{2\sqrt{x^2+4y(x)-4}}\right.\right.$$

✓ **Maple** : cpu = 0.333 (sec), leaf count = 33

```
dsolve(diff(y(x),x) = -1/2*x+1+(x^2-4*x+4*y(x))^(1/2)+x^2*(x^2-4*x+4*y(x))^(1/2)+x^3*(x^2-4*x
```

$$c_1 + \frac{x^4}{2} + \frac{2x^3}{3} + 2x - \sqrt{x^2-4x+4y(x)} = 0$$

ODE No. 850

$$y'(x) = \_\mathrm{F1}(y(x) - \log(\sin(x)) + \log(\cos(x) + 1)) + \csc(x)$$

✓ **Mathematica** : cpu = 0.30643 (sec), leaf count = 1485

```
DSolve[Derivative[1][y][x] == Csc[x] + _F1[Log[1 + Cos[x]] - Log[Sin[x]] + y[x]],y[x],x]
```

$$\text{Solve}\left[\int_1^x -\frac{(\cot^2(K[1]) + \csc(K[1])\cot(K[1]) + 1)\sin(K[1])(\csc(K[1]) + \_\mathrm{F1}(\log(co}{-\cot^2(K[1]) + \_\mathrm{F1}(\log(\cos(K[1]) + 1) - \log(\sin(K[1])) + y(x))\cot(K[1]) + \csc^2(K[1]) + \csc}\right.$$

✓ **Maple** : cpu = 1.173 (sec), leaf count = 32

```
dsolve(diff(y(x),x) = 1/sin(x)+_F1(y(x)-ln(sin(x))+ln(cos(x)+1)),y(x))
```

$$\int_{\_b}^{y(x)} \frac{1}{\_F1\left(\_a - \ln\left(\sin\left(x\right)\right) + \ln\left(\cos\left(x\right) + 1\right)\right)} d\_a - x - c_1 = 0$$

ODE No. 851

$$y'(x) = \frac{a^3x^3 + 3a^2bx^2y(x) + a^2bx^2 + 3ab^2xy(x)^2 + 2ab^2xy(x) + b^3y(x)^3 + b^3y(x)^2 + b^3}{b^3}$$

✓ **Mathematica** : cpu = 0.366508 (sec), leaf count = 145

```
DSolve[Derivative[1][y][x] == (b^3 + a^2*b*x^2 + a^3*x^3 + 2*a*b^2*x*y[x] + 3*a^2*b*x^2*y[x]
```

$$\text{Solve}\left[-\frac{1}{3}(27a+29b)^{2/3}\text{RootSum}\left[\#1^3(27a+29b)^{2/3} - 3\#1b^{2/3} + (27a+29b)^{2/3}\&, \frac{\log\left(\frac{\frac{3ax+b}{b}+3y(x)}{\sqrt[3]{\frac{27a+29b}{b}}} - \right.\right.\right.$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 42

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

$$y(x) = \frac{\text{RootOf}\left(\left(\int^{-Z} \frac{1}{\_a^3b+\_a^2b+a+b} d\_a\right)b - x + c_1\right)b - ax}{b}$$

ODE No. 852

$$y'(x) = \frac{\alpha^3 y(x)^3 + \alpha^3 y(x)^2 + \alpha^3 + 3\alpha^2\beta x y(x)^2 + 2\alpha^2\beta x y(x) + 3\alpha\beta^2 x^2 y(x) + \alpha\beta^2 x^2 + \beta^3 x^3}{\alpha^3}$$

✓ **Mathematica** : cpu = 0.359029 (sec), leaf count = 145

```
DSolve[Derivative[1][y][x] == (alpha^3 + alpha*beta^2*x^2 + beta^3*x^3 + 2*alpha^2*beta*x*y[x
```

$$\text{Solve}\left[-\frac{1}{3}(29\alpha+27\beta)^{2/3}\text{RootSum}\left[\#1^3(29\alpha+27\beta)^{2/3} - 3\#1\alpha^{2/3} + (29\alpha+27\beta)^{2/3}\&, \frac{\log\left(\frac{\frac{\alpha+3\beta x}{\alpha}+3y(x)}{\sqrt[3]{\frac{29\alpha+27\beta}{\alpha}}}\right.}{\alpha^{2/3} - \#1^2(29\alpha+\right.\right.$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = (alpha^3+y(x)^2*alpha^3+2*y(x)*alpha^2*beta*x+alpha*beta^2*x^2+y(x)^3*a
```

$$y(x) = \frac{\text{RootOf}\left(\left(\int^{-Z} \frac{1}{\_a^3\alpha + \_a^2\alpha + \alpha + \beta} d\_a\right)\alpha - x + c_1\right)\alpha - \beta x}{\alpha}$$

ODE No. 853

$$y'(x) = \frac{x^3 y(x)^3 + 6x^2 y(x)^2 + 14xy(x) + 2x + 12}{x^2(xy(x) + x + 2)}$$

✓ **Mathematica** : cpu = 0.170054 (sec), leaf count = 76

```
DSolve[Derivative[1][y][x] == (12 + 2*x + 14*x*y[x] + 6*x^2*y[x]^2 + x^3*y[x]^3)/(x^2*(2 + x
```

$$\left\{\left\{y(x) \to -\frac{x+2}{x} + \frac{1}{x^3\left(\frac{1}{x^3} - \frac{1}{x^3\sqrt{-2x+c_1}}\right)}\right\}, \left\{y(x) \to -\frac{x+2}{x} + \frac{1}{x^3\left(\frac{1}{x^3} + \frac{1}{x^3\sqrt{-2x+c_1}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.038 (sec), leaf count = 63

```
dsolve(diff(y(x),x) = 1/x^2*(14*x*y(x)+12+2*x+x^3*y(x)^3+6*x^2*y(x)^2)/(x*y(x)+2+x),y(x))
```

$$y(x) = \frac{-2\sqrt{c_1 - 2x} + x + 2}{x\left(\sqrt{c_1 - 2x} - 1\right)}$$

ODE No. 854

$$y'(x) = \frac{y(x)\left(x^2 \log^2(y(x)) + 2x^2 \log(x)\log(y(x)) + x^2 \log^2(x) + \log(y(x)) + \log(x) - 1\right)}{x}$$

✓ **Mathematica** : cpu = 0.141734 (sec), leaf count = 24

```
DSolve[Derivative[1][y][x] == ((-1 + Log[x] + x^2*Log[x]^2 + Log[y[x]] + 2*x^2*Log[x]*Log[y[x
```

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

✓ **Maple** : cpu = 0.243 (sec), leaf count = 51

```
dsolve(diff(y(x),x) = y(x)*(ln(x)+ln(y(x))-1+x^2*ln(x)^2+2*x^2*ln(y(x))*ln(x)+x^2*ln(y(x))^2)
```

$$y(x) = x^{-\frac{x^3}{x^3+3c_1}} x^{-\frac{3c_1}{x^3+3c_1}} \mathrm{e}^{-\frac{3x}{x^3+3c_1}}$$

ODE No. 855

$$y'(x) = \frac{y(x)\left(x^3 \log^2(y(x)) + 2x^3 \log(x)\log(y(x)) + x^3 \log^2(x) + \log(y(x)) + \log(x) - 1\right)}{x}$$

✓ **Mathematica** : cpu = 0.143981 (sec), leaf count = 24

```
DSolve[Derivative[1][y][x] == ((-1 + Log[x] + x^3*Log[x]^2 + Log[y[x]] + 2*x^3*Log[x]*Log[y[x
```

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

✓ **Maple** : cpu = 0.254 (sec), leaf count = 51

```
dsolve(diff(y(x),x) = y(x)*(ln(y(x))-1+ln(x)+x^3*ln(x)^2+2*x^3*ln(y(x))*ln(x)+x^3*ln(y(x))^2)
```

$$y(x) = x^{-\frac{x^4}{x^4+4c_1}} x^{-\frac{4c_1}{x^4+4c_1}} \mathrm{e}^{-\frac{4x}{x^4+4c_1}}$$

ODE No. 856

$$y'(x) = \frac{x\left(\_\mathrm{F1}(y(x)^2 - 2x) + \frac{1}{x}\right)}{\sqrt{y(x)^2}}$$

✓ **Mathematica** : cpu = 0.560243 (sec), leaf count = 103

```
DSolve[Derivative[1][y][x] == (x*(x^(-1) + _F1[-2*x + y[x]^2]))/Sqrt[y[x]^2],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{\sqrt{K[2]^2}}{\_\mathrm{F1}\left(K[2]^2 - 2x\right)} - \int_1^x \frac{2K[2]\_\mathrm{F1}'(K[2]^2 - 2K[1])}{\left(\_\mathrm{F1}\left(K[2]^2 - 2K[1]\right)\right)^2} dK[1]\right) dK[2] + \int_1^x \left(-K[1] - \frac{}{\_\mathrm{F1}\,(y(\right.\right.$$

✓ **Maple** : cpu = 0.301 (sec), leaf count = 65

```
dsolve(diff(y(x),x) = -(-1/x-_F1(y(x)^2-2*x))/(y(x)^2)^(1/2)*x,y(x))
```

$$y(x) = \sqrt{2\,\mathrm{RootOf}\left(x^2 - 2\left(\int^{\_Z} \frac{1}{\_F1\left(2\_a\right)} d\_a\right) + 4c_1\right) + 2x}$$

ODE No. 857

$$y'(x) = x^2\sqrt{x^2+8y(x)-2x+1}+\sqrt{x^2+8y(x)-2x+1}+x^3\sqrt{x^2+8y(x)-2x+1}-\frac{x}{4}+\frac{1}{4}$$

✓ **Mathematica** : cpu = 0.803014 (sec), leaf count = 107

```
DSolve[Derivative[1][y][x] == 1/4 - x/4 + Sqrt[1 - 2*x + x^2 + 8*y[x]] + x^2*Sqrt[1 - 2*x + x
```

$$\text{Solve}\left[\frac{x^4}{4}+\frac{x^3}{3}-\frac{1}{4}\sqrt{x^2+8y(x)-2x+1}+\frac{1}{4}\log\left(-\sqrt{x^2+8y(x)-2x+1}-x+1\right)-\frac{1}{4}\tanh^{-1}\left(\frac{}{2\sqrt{x^2}}\right.\right.$$

✓ **Maple** : cpu = 0.352 (sec), leaf count = 32

```
dsolve(diff(y(x),x) = -1/4*x+1/4+(x^2-2*x+1+8*y(x))^(1/2)+x^2*(x^2-2*x+1+8*y(x))^(1/2)+x^3*(x
```

$$c_1+x^4+\frac{4x^3}{3}+4x-\sqrt{x^2-2x+1+8y\left(x\right)}=0$$

ODE No. 858

$$y'(x) = \frac{a^3 y(x)^3 + a^3 y(x)^2 + a^3 + 3a^2 b x y(x)^2 + 2a^2 b x y(x) + 3ab^2 x^2 y(x) + ab^2 x^2 + b^3 x^3}{a^3}$$

✓ **Mathematica** : cpu = 0.36825 (sec), leaf count = 145

```
DSolve[Derivative[1][y][x] == (a^3 + a*b^2*x^2 + b^3*x^3 + 2*a^2*b*x*y[x] + 3*a*b^2*x^2*y[x]
```

$$\text{Solve}\left[-\frac{1}{3}(29a+27b)^{2/3}\text{RootSum}\left[\#1^3(29a+27b)^{2/3} - 3\#1 a^{2/3} + (29a+27b)^{2/3}\&, \frac{\log\left(\frac{\frac{a+3bx}{a}+3y(x)}{\sqrt[3]{\frac{29a+27b}{a}}} - \right.\right.\right.$$
$$\left.\left.\left.a^{2/3} - \#1^2(29a+27\right.\right.\right.$$

✓ **Maple** : cpu = 0.057 (sec), leaf count = 42

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

$$y(x) = \frac{\text{RootOf}\left(\left(\int^{-Z} \frac{1}{\_a^3 a + \_a^2 a + a + b} d\_a\right) a - x + c_1\right) a - bx}{a}$$

ODE No. 859

$$y'(x) = \frac{\_\mathrm{F1}(y(x)^2 - 2x) + x}{x\sqrt{y(x)^2}}$$

✓ **Mathematica** : cpu = 0.75609 (sec), leaf count = 105

```
DSolve[Derivative[1][y][x] == (x + _F1[-2*x + y[x]^2])/(x*Sqrt[y[x]^2]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{\sqrt{K[2]^2}}{\_\mathrm{F1}\left(K[2]^2 - 2x\right)} - \int_1^x \frac{2K[2]\_\mathrm{F1}'(K[2]^2 - 2K[1])}{\left(\_\mathrm{F1}\left(K[2]^2 - 2K[1]\right)\right)^2} dK[1] \right) dK[2] + \int_1^x \left(- \frac{1}{\_\mathrm{F1}\left(y(x)^2 - 2\right.} \right.$$

✓ **Maple** : cpu = 0.259 (sec), leaf count = 63

```
dsolve(diff(y(x),x) = -(-x-_F1(y(x)^2-2*x))/(y(x)^2)^(1/2)/x,y(x))
```

$$y(x) = \sqrt{2\,\mathrm{RootOf}\left(\ln(x) - \left(\int^{\_Z} \frac{1}{\_F1\left(2\_a\right)} d\_a\right) + 2c_1\right) + 2x}$$

ODE No. 860

$$y'(x) = \frac{\frac{1}{2}x^4\cos(2y(x)) + \frac{x^4}{2} + \frac{1}{2}x^3\cos(2y(x)) + \frac{x^3}{2} - \frac{1}{2}\sin(2y(x)) + \frac{1}{2}x\cos(2y(x)) + \frac{x}{2}}{x}$$

✓ **Mathematica** : cpu = 0.351119 (sec), leaf count = 33

```
DSolve[Derivative[1][y][x] == (x/2 + x^3/2 + x^4/2 + (x*Cos[2*y[x]])/2 + (x^3*Cos[2*y[x]])/2
```

$$\left\{\left\{y(x) \to \tan^{-1}\left(\frac{4x^5 + 5x^4 + 10x^2 + 10c_1}{20x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 2.522 (sec), leaf count = 29

```
dsolve(diff(y(x),x) = 1/2*(-sin(2*y(x))+x*cos(2*y(x))+cos(2*y(x))*x^3+cos(2*y(x))*x^4+x+x^3+x
```

$$y(x) = \arctan\left(\frac{4x^5 + 5x^4 + 10x^2 + 40c_1}{20x}\right)$$

ODE No. 861

$$y'(x) = \frac{e^{-1/x}\left(\_\mathrm{F1}\left(e^{\frac{1}{x}}y(x)\right) + \frac{e^{\frac{1}{x}}y(x)}{x}\right)}{x}$$

✓ **Mathematica** : cpu = 1.24725 (sec), leaf count = 158

```
DSolve[Derivative[1][y][x] == ((E^x^(-1)*y[x])/x + _F1[E^x^(-1)*y[x]])/(E^x^(-1)*x),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{\_\mathrm{F1}\left(e^{\frac{1}{x}}K[2]\right)\int_1^x \left(\frac{e^{\frac{1}{K[1]}}}{K[1]^2\_\mathrm{F1}\left(e^{\frac{1}{K[1]}}K[2]\right)} - \frac{e^{\frac{2}{K[1]}}K[2]\_\mathrm{F1}'\left(e^{\frac{1}{K[1]}}K[2]\right)}{K[1]^2\left(\_\mathrm{F1}\left(e^{\frac{1}{K[1]}}K[2]\right)\right)^2}\right)dK[1] + e^{\frac{1}{x}}}{\_\mathrm{F1}\left(e^{\frac{1}{x}}K[2]\right)}dK[2] + \int_1^x\right.$$

✓ **Maple** : cpu = 0.156 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = -(-1/x*y(x)/exp(-1/x)-_F1(y(x)/exp(-1/x)))*exp(-1/x)/x,y(x))
```

$$y(x) = \text{RootOf}\left(-\ln(x) + \int^{\_Z} \frac{1}{\_F1(\_a)}d\_a + c_1\right)\mathrm{e}^{-\frac{1}{x}}$$

ODE No. 862

$$y'(x) = \log(y(x) - 1)\left(\_\mathrm{F1}(x) - \frac{\mathrm{Ei}(-\log(y(x) - 1))}{x}\right)$$

✗ **Mathematica** : cpu = 0.684188 (sec), leaf count = 0

```
DSolve[Derivative[1][y][x] == Log[-1 + y[x]]*(-(ExpIntegralEi[-Log[-1 + y[x]]]/x) + _F1[x]),y
```

, could not solve

```
DSolve[Derivative[1][y][x] == Log[-1 + y[x]]*(-(ExpIntegralEi[-Log[-1 + y[x]]]/x) + _F1
```

✓ **Maple** : cpu = 0.193 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = -(1/x*Ei(1,-ln(-1+y(x)))-_F1(x))*ln(-1+y(x)),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(\left(\int \frac{-F1(x)}{x}dx\right)x + xc_1 + \mathrm{expIntegral}(1,-\_Z)\right)} + 1$$

ODE No. 863

$$y'(x) = \frac{x\sqrt{x^2+y(x)^2}+x^4\sqrt{x^2+y(x)^2}+x^3\sqrt{x^2+y(x)^2}+y(x)}{x}$$

✓ **Mathematica** : cpu = 0.19731 (sec), leaf count = 30

```
DSolve[Derivative[1][y][x] == (y[x] + x*Sqrt[x^2 + y[x]^2] + x^3*Sqrt[x^2 + y[x]^2] + x^4*Sqr
```

$$\left\{\left\{y(x) \to x \sinh\left(\frac{1}{12}\left(3x^4+4x^3+12x+12c_1\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 13.823 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = (y(x)+x*(y(x)^2+x^2)^(1/2)+x^3*(y(x)^2+x^2)^(1/2)+x^4*(y(x)^2+x^2)^(1/2
```

$$\ln\left(y(x)+\sqrt{y(x)^2+x^2}\right)-\frac{x^4}{4}-\frac{x^3}{3}-x-\ln(x)-c_1=0$$

ODE No. 864

$$y'(x) = \frac{e^{\frac{x^2}{4}} y(x) \left(2e^{-\frac{3x^2}{4}} y(x)^2 + e^{-\frac{x^2}{2}} x y(x) + e^{-\frac{x^2}{4}} x\right)}{2e^{-\frac{x^2}{4}} y(x) + 2}$$

✓ **Mathematica** : cpu = 0.32708 (sec), leaf count = 137

```
DSolve[Derivative[1][y][x] == (E^(x^2/4)*y[x]*(x/E^(x^2/4) + (x*y[x])/E^(x^2/2) + (2*y[x]^2)/
```

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

✓ **Maple** : cpu = 0.085 (sec), leaf count = 162

```
dsolve(diff(y(x),x) = y(x)*(exp(-1/4*x^2)^2*x*y(x)+exp(-1/4*x^2)*x+2*y(x)^2*exp(-3/4*x^2))*ex
```

$$y(x) = \frac{\left(\mathrm{e}^{\frac{x^2}{2}}\left(\sqrt{c_1 - 2x} + 1\right)\mathrm{e}^{-\frac{x^2}{4}} - \mathrm{e}^{\frac{x^2}{4}}\sqrt{c_1 - 2x}\right)\mathrm{e}^{\frac{x^2}{4}}}{\mathrm{e}^{\frac{x^2}{4}}\sqrt{c_1 - 2x} - \mathrm{e}^{-\frac{x^2}{4}}\mathrm{e}^{\frac{x^2}{2}}}$$

ODE No. 865

$$y'(x) = (1 - y(x)) \left(-f(x) + \frac{y(x) \log(y(x) - 1)}{x(1 - y(x)) \log(x)} - \frac{\log(y(x) - 1)}{x(1 - y(x)) \log(x)} \right)$$

✓ **Mathematica** : cpu = 0.333367 (sec), leaf count = 87

```
DSolve[Derivative[1][y][x] == (1 - y[x])*(-f[x] - Log[-1 + y[x]]/(x*Log[x]*(1 - y[x])) + (Log
```

$$\text{Solve}\left[\int_1^x \left(-\frac{f(K[1])}{\log(K[1])} - \frac{\log(y(x) - 1)}{K[1] \log^2(K[1])} \right) dK[1] + \int_1^{y(x)} \left(\frac{1}{(K[2] - 1) \log(x)} - \int_1^x -\frac{1}{K[1](K[2] - 1) \log \right.$$

✓ **Maple** : cpu = 0.184 (sec), leaf count = 23

```
dsolve(diff(y(x),x) = (1/(1-y(x))/ln(x)/x*ln(-1+y(x))*y(x)-1/(1-y(x))/ln(x)/x*ln(-1+y(x))-f(x
```

$$y(x) = \mathrm{e}^{\left(\int \frac{f(x)}{\ln(x)} dx \right) \ln(x)} x^{c_1} + 1$$

ODE No. 866

$$y'(x) = x^2\sqrt{a^2+2ax+x^2+4y(x)}+\sqrt{a^2+2ax+x^2+4y(x)}+x^3\sqrt{a^2+2ax+x^2+4y(x)}-\frac{a}{2}-\frac{x}{2}$$

✓ **Mathematica** : cpu = 0.759691 (sec), leaf count = 117

```
DSolve[Derivative[1][y][x] == -1/2*a - x/2 + Sqrt[a^2 + 2*a*x + x^2 + 4*y[x]] + x^2*Sqrt[a^2
```

$$\text{Solve}\left[-\frac{1}{2}\sqrt{a^2+2ax+x^2+4y(x)}-\frac{1}{2}a\log\left(\sqrt{a^2+2ax+x^2+4y(x)}+a+x\right)+\frac{1}{2}a\tanh^{-1}\left(\frac{2}{2\sqrt{a^2+2a}}\right.\right.$$

✓ **Maple** : cpu = 0.385 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = -1/2*x-1/2*a+(x^2+2*a*x+a^2+4*y(x))^(1/2)+x^2*(x^2+2*a*x+a^2+4*y(x))^(1
```

$$c_1+\frac{x^4}{2}+\frac{2x^3}{3}+2x-\sqrt{x^2+2ax+a^2+4y\left(x\right)}=0$$

ODE No. 867

$$y'(x) = \frac{x^6}{27} + \frac{1}{3}x^4 y(x) + \frac{x^4}{9} + x^2 y(x)^2 + \frac{2}{3}x^2 y(x) + y(x)^3 + y(x)^2 - \frac{2x}{3} + 1$$

✓ **Mathematica** : cpu = 0.202909 (sec), leaf count = 77

```
DSolve[Derivative[1][y][x] == 1 - (2*x)/3 + x^4/9 + x^6/27 + (2*x^2*y[x])/3 + (x^4*y[x])/3 +
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{x^2+3y(x)+1}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.06 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = -2/3*x+1+y(x)^2+2/3*x^2*y(x)+1/9*x^4+y(x)^3+x^2*y(x)^2+1/3*y(x)*x^4+1/2
```

$$y(x) = -\frac{x^2}{3} + \text{RootOf}\left(-x + \int^{-Z} \frac{1}{\_a^3 + \_a^2 + 1} d\_a + c_1\right)$$

ODE No. 868

$$y'(x) = -x^6 + 3x^4 y(x) + x^4 - 3x^2 y(x)^2 - 2x^2 y(x) + y(x)^3 + y(x)^2 + 2x + 1$$

✓ **Mathematica** : cpu = 0.171782 (sec), leaf count = 79

```
DSolve[Derivative[1][y][x] == 1 + 2*x + x^4 - x^6 - 2*x^2*y[x] + 3*x^4*y[x] + y[x]^2 - 3*x^2*
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{-3x^2+3y(x)+1}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 28

```
dsolve(diff(y(x),x) = 2*x+1+y(x)^2-2*x^2*y(x)+x^4+y(x)^3-3*x^2*y(x)^2+3*y(x)*x^4-x^6,y(x))
```

$$y(x) = x^2 + \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{\_a^3 + \_a^2 + 1} d\_a + c_1\right)$$

ODE No. 869

$$y'(x) = \frac{2x^5 + 2x^4 - 2x^3 y(x) + x^3 - 2x^2 y(x) + 3x^2 - 2y(x) - x + 1}{x^2 - y(x)}$$

✓ **Mathematica** : cpu = 0.0454136 (sec), leaf count = 42

```
DSolve[Derivative[1][y][x] == (1 - x + 3*x^2 + x^3 + 2*x^4 + 2*x^5 - 2*y[x] - 2*x^2*y[x] - 2*
```

$$\left\{\left\{y(x) \to x^2 + \frac{1}{2}\left(1 + W\left(-e^{x^4 + \frac{4x^3}{3} - 2x^2 + 4x - 1 + c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.196 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = 1/(x^2-y(x))*(-x+1-2*y(x)+3*x^2-2*x^2*y(x)+2*x^4+x^3-2*x^3*y(x)+2*x^5),
```

$$y(x) = x^2 + \frac{\text{LambertW}\left(-2\,\mathrm{e}^{x^4}\mathrm{e}^{\frac{4x^3}{3}}\mathrm{e}^{-2x^2}c_1\mathrm{e}^{4x}\mathrm{e}^{-1}\right)}{2} + \frac{1}{2}$$

ODE No. 870

$$y'(x) = \frac{e^{\frac{y(x)}{x}}\left(x^4 + x^3 + xe^{-\frac{y(x)}{x}} + e^{-\frac{y(x)}{x}}y(x) + x\right)}{x}$$

✓ **Mathematica** : cpu = 1.35868 (sec), leaf count = 35

```
DSolve[Derivative[1][y][x] == (E^(y[x]/x)*(x + x/E^(y[x]/x) + x^3 + x^4 + y[x]/E^(y[x]/x)))/x
```

$$\left\{\left\{y(x) \to -x \log\left(\frac{-\frac{x^4}{4} - \frac{x^3}{3} - x - c_1}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.682 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = (exp(-y(x)/x)*y(x)+exp(-y(x)/x)*x+x+x^3+x^4)*exp(y(x)/x)/x,y(x))
```

$$y(x) = -\ln\left(-\frac{3x^4 + 4x^3 + 12x + 12c_1}{12x}\right)x$$

ODE No. 871

$$y'(x) = \frac{2xy(x)^2 + y(x)^2 + 4xy(x)\log(2x+1) + 2y(x)\log(2x+1) + 2x\log^2(2x+1) + \log^2(2x+1) - 2}{2x+1}$$

✓ **Mathematica** : cpu = 0.301742 (sec), leaf count = 22

```
DSolve[Derivative[1][y][x] == (-2 + Log[1 + 2*x]^2 + 2*x*Log[1 + 2*x]^2 + 2*Log[1 + 2*x]*y[x]
```

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

✓ **Maple** : cpu = 0.09 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = 1/(2*x+1)*(2*x*y(x)^2+4*y(x)*ln(2*x+1)*x+2*ln(2*x+1)^2*x+y(x)^2-2+ln(2*
```

$$y(x) = \frac{-1 + (c_1 - x)\ln(2x+1)}{-c_1 + x}$$

ODE No. 872

$$y'(x) = \frac{14x^{7/2} + \frac{12x^6}{5} - 6x^3 y(x) - 6x^3 - 5\sqrt{x}y(x) + 10x - 5\sqrt{x} - 5}{x\left(2x^3 - 5y(x) + 10\sqrt{x} - 5\right)}$$

✓ **Mathematica** : cpu = 0.060433 (sec), leaf count = 215

```
DSolve[Derivative[1][y][x] == (-5 - 5*Sqrt[x] + 10*x - 6*x^3 + 14*x^(7/2) + (12*x^6)/5 - 5*Sq
```

$$\left\{\left\{y(x) \to \frac{1}{5}\left(2x^3 + 10\sqrt{x} - 5\right) - \frac{\sqrt{-x\left(2x^3 + 10\sqrt{x} - 5\right)^2 - 50x\left(-\frac{4x^{7/2}}{5} - \frac{2x^6}{25} + \frac{2x^3}{5} - 2x + 2\sqrt{x} + \log(\right.}}{5\sqrt{-\frac{1}{x}}x}\right.$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 49

```
dsolve(diff(y(x),x) = 1/5*(-30*x^3*y(x)+12*x^6+70*x^(7/2)-30*x^3-25*y(x)*x^(1/2)+50*x-25*x^(1
```

$$y(x) = \frac{2x^3}{5} + 2\sqrt{x} - \sqrt{c_1 + 2\ln(x)} - 1$$

ODE No. 873

$$y'(x) = \frac{2y(x)+1}{x\left(2xy(x)^4+3xy(x)^3+xy(x)^2+2xy(x)+x-2\right)}$$

✓ **Mathematica** : cpu = 0.774063 (sec), leaf count = 53

```
DSolve[Derivative[1][y][x] == (1 + 2*y[x])/(x*(-2 + x + 2*x*y[x] + x*y[x]^2 + 3*x*y[x]^3 + 2*
```

$$\text{Solve}\left[\frac{1}{192}\left(-16y(x)^3-12y(x)^2+12y(x)-54\log(4y(x)+2)+7\right)-\frac{1}{2x(2y(x)+1)}=c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.333 (sec), leaf count = 50

```
dsolve(diff(y(x),x) = 1/x*(1+2*y(x))/(-2+x+x*y(x)^2+3*x*y(x)^3+2*x*y(x)+2*x*y(x)^4),y(x))
```

$$y(x) = \frac{\mathrm{e}^{\mathrm{RootOf}\left(2x\,\mathrm{e}^{4\_Z}-3x\,\mathrm{e}^{3\_Z}-6x\,\mathrm{e}^{2\_Z}+48c_1x\,\mathrm{e}^{\_Z}+54\_Zx\,\mathrm{e}^{\_Z}+7\,\mathrm{e}^{\_Z}x+96\right)}}{2}-\frac{1}{2}$$

ODE No. 874

$$y'(x) = \frac{1}{512}x\left(a^3x^{12} + 24a^2x^8y(x) + 8a^2x^8 + 192ax^4y(x)^2 + 128ax^4y(x) - 256ax^2 + 512y(x)^3 + 512y(x)^2 -$$

✓ **Mathematica** : cpu = 0.236333 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (x*(512 - 256*a*x^2 + 8*a^2*x^8 + a^3*x^12 + 128*a*x^4*y[x] + 2
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{1}{8}(3ax^5+8x)+3xy(x)}{\sqrt[3]{29}\sqrt[3]{x^3}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right]\right] = \frac{1}{18}29^{2/3}\left(x^3\right)^{2/3} + c_1$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = 1/512*(-256*a*x^2+512+512*y(x)^2+128*y(x)*a*x^4+8*a^2*x^8+512*y(x)^3+19
```

$$y(x) = -\frac{a\,x^4}{8} - \frac{1}{3} + \frac{29\,\text{RootOf}\left(x^2 - 162\left(\int^{-Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + 6c_1\right)}{9}$$

ODE No. 875

$$y'(x) = \frac{x^5\left(-\sqrt{x^2+y(x)^2}\right) + x^4 y(x)\sqrt{x^2+y(x)^2} + xy(x) + y(x)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.256636 (sec), leaf count = 497

```
DSolve[Derivative[1][y][x] == (y[x] + x*y[x] - x^5*Sqrt[x^2 + y[x]^2] + x^4*y[x]*Sqrt[x^2 + y
```

$$\left\{\left\{y(x) \to \frac{x - 2\sqrt{x^2\tanh^2\left(\frac{1}{12}\left(-3\sqrt{2}x^4 + 4\sqrt{2}x^3 - 6\sqrt{2}x^2 + 12\sqrt{2}x - 12\sqrt{2}\log(x+1) + 25\sqrt{2} - 12\sqrt{2}\right.\right.\right.}}{-1 + 2\tanh^2\left(\frac{1}{12}\left(-3\sqrt{2}x^4 + 4\sqrt{2}x^3 - 6\sqrt{2}x^2\right.\right.\right.}\right.\right.$$

✓ **Maple** : cpu = 0.21 (sec), leaf count = 73

```
dsolve(diff(y(x),x) = -(-x*y(x)-y(x)+x^5*(y(x)^2+x^2)^(1/2)-x^4*(y(x)^2+x^2)^(1/2)*y(x))/x/(1
```

$$\ln\left(\frac{2x\left(\sqrt{2y(x)^2+2x^2}+y(x)+x\right)}{y(x)-x}\right) + \sqrt{2}\ln(1+x) + \frac{(3x^4-4x^3+6x^2-12x)\sqrt{2}}{12} - c_1 - \ln(x) = 0$$

ODE No. 876

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

✓ **Mathematica** : cpu = 0.183129 (sec), leaf count = 135

```
DSolve[Derivative[1][y][x] == -1/2*(y[x]^2*(-2*x + y[x] - 2*x*y[x] + x^2*y[x]))/(x*(-2 - 2*y[
```

$$\left\{\left\{y(x) \to -\frac{4x}{-2(x-2)x + \frac{2\sqrt{-x(x-2)^2-4x\left(-2\left(\frac{x^2}{8}-\frac{x}{2}+\frac{\log(x)}{4}\right)+c_1\right)}}{\sqrt{-\frac{1}{x}}}}\right\}, \left\{y(x) \to \frac{4x}{2(x-2)x + \frac{2\sqrt{-x(x-2)^2-4x\left(-2\left(\right.\right.}}{\sqrt{-}}\right.$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = -1/2*y(x)^2*(x^2*y(x)-2*x-2*x*y(x)+y(x))/(-2+x*y(x)-2*y(x))/x,y(x))
```

$$y(x) = \frac{4}{\sqrt{c_1 - 8\ln(x)} + 2x - 4}$$

ODE No. 877

$$y'(x) = \frac{x^6 - 3x^4 y(x) + 2x^3 + 3x^2 y(x)^2 - 2xy(x) - y(x)^3 - 2x}{x^2 - y(x) - 1}$$

✓ **Mathematica** : cpu = 0.153651 (sec), leaf count = 49

```
DSolve[Derivative[1][y][x] == (-2*x + 2*x^3 + x^6 - 2*x*y[x] - 3*x^4*y[x] + 3*x^2*y[x]^2 - y[
```

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

✓ **Maple** : cpu = 0.039 (sec), leaf count = 73

```
dsolve(diff(y(x),x) = (-2*x*y(x)+2*x^3-2*x-y(x)^3+3*x^2*y(x)^2-3*y(x)*x^4+x^6)/(-y(x)+x^2-1),
```

$$y(x) = \frac{-2c_1 x^2 + 2x^3 + \sqrt{2c_1 - 2x + 1} - 1}{-2c_1 + 2x}$$

ODE No. 878

$$y'(x) = \frac{-64a^3x^3 + 48a^2x^2y(x)^2 + 16a^2x^2 - 12axy(x)^4 - 8axy(x)^2 + y(x)^6 + y(x)^4 + 1}{y(x)}$$

✓ **Mathematica** : cpu = 0.362563 (sec), leaf count = 130

```
DSolve[Derivative[1][y][x] == (1 + 16*a^2*x^2 - 64*a^3*x^3 - 8*a*x*y[x]^2 + 48*a^2*x^2*y[x]^2
```

$$\text{Solve}\left[2a\left(x - \frac{1}{2}\text{RootSum}\left[64\#1^3a^3 - 48\#1^2a^2y(x)^2 - 16\#1^2a^2 + 12\#1ay(x)^4 + 8\#1ay(x)^2 + 2a - y(x)^6\right.\right.\right.$$

✓ **Maple** : cpu = 12.383 (sec), leaf count = 75

```
dsolve(diff(y(x),x) = (1+y(x)^4-8*a*x*y(x)^2+16*a^2*x^2+y(x)^6-12*y(x)^4*a*x+48*y(x)^2*a^2*x^
```

$$\int_{\_b}^{y(x)} \frac{\_a}{-\_a^6 + 12\_a^4ax - 48\_a^2a^2x^2 + 64a^3x^3 - \_a^4 + 8\_a^2ax - 16a^2x^2 + 2a - 1} d\_a + x - c_1 = 0$$

ODE No. 879

$$y'(x) = \frac{x^2\left(-\sqrt{x^2+y(x)^2}\right) + xy(x)\sqrt{x^2+y(x)^2} + xy(x) + y(x)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.329682 (sec), leaf count = 239

```
DSolve[Derivative[1][y][x] == (y[x] + x*y[x] - x^2*Sqrt[x^2 + y[x]^2] + x*y[x]*Sqrt[x^2 + y[x
```

$$\left\{\left\{y(x) \to \frac{x - 2\sqrt{x^2\tanh^2\left(\sqrt{2}x - \sqrt{2}\log(x+1) + \sqrt{2}c_1\right) - x^2\tanh^4\left(\sqrt{2}x - \sqrt{2}\log(x+1) + \sqrt{2}c_1\right)}}{-1 + 2\tanh^2\left(\sqrt{2}x - \sqrt{2}\log(x+1) + \sqrt{2}c_1\right)}\right\}\right.$$

✓ **Maple** : cpu = 0.196 (sec), leaf count = 55

```
dsolve(diff(y(x),x) = -(-x*y(x)-y(x)+(y(x)^2+x^2)^(1/2)*x^2-x*(y(x)^2+x^2)^(1/2)*y(x))/x/(1+x
```

$$\ln\left(\frac{2x\left(\sqrt{2y(x)^2+2x^2}+y(x)+x\right)}{y(x)-x}\right) + \sqrt{2}\,x - \ln(x) - \sqrt{2}\,\ln(1+x) - c_1 = 0$$

ODE No. 880

$$y'(x) = -\frac{2a}{128a^4x^3 - 96a^3x^2y(x)^2 - 32a^3x^2 + 24a^2xy(x)^4 + 16a^2xy(x)^2 - 2ay(x)^6 - 2ay(x)^4 - 2a - y(x)}$$

✓ **Mathematica** : cpu = 0.421412 (sec), leaf count = 131

```
DSolve[Derivative[1][y][x] == (-2*a)/(-2*a - 32*a^3*x^2 + 128*a^4*x^3 - y[x] + 16*a^2*x*y[x]^
```

$$\text{Solve}\left[\frac{\text{RootSum}\left[-64\#1^3a^3 + 48\#1^2a^2y(x)^2 + 16\#1^2a^2 - 12\#1ay(x)^4 - 8\#1ay(x)^2 + y(x)^6 + y(x)^4 + 18\right.}{8a^2}\right.$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = -2*a/(-y(x)-2*a-2*a*y(x)^4+16*a^2*x*y(x)^2-32*a^3*x^2-2*a*y(x)^6+24*y(x
```

$$\frac{y(x)}{2a} + \frac{\int^{y(x)^2-4ax} \frac{1}{\_a^3+\_a^2+1}d\_a}{8a^2} - c_1 = 0$$

ODE No. 881

$$y'(x) = \frac{x^6 + 9x^4 y(x) - 6x^3 + 27x^2 y(x)^2 - 18xy(x) + 27y(x)^3 - 18x}{9x^2 + 27y(x) + 27}$$

✓ **Mathematica** : cpu = 0.170973 (sec), leaf count = 75

```
DSolve[Derivative[1][y][x] == (-18*x - 6*x^3 + x^6 - 18*x*y[x] + 9*x^4*y[x] + 27*x^2*y[x]^2 +
```

$$\left\{\left\{y(x) \to \frac{1}{3}\left(-x^2 - 3\right) + \frac{1}{27\left(\frac{1}{27} - \frac{1}{\sqrt{-1458x + c_1}}\right)}\right\}, \left\{y(x) \to \frac{1}{3}\left(-x^2 - 3\right) + \frac{1}{27\left(\frac{1}{27} + \frac{1}{\sqrt{-1458x + c_1}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 77

```
dsolve(diff(y(x),x) = (-18*x*y(x)-6*x^3-18*x+27*y(x)^3+27*x^2*y(x)^2+9*y(x)*x^4+x^6)/(27*y(x)
```

$$y(x) = \frac{-2c_1 x^2 + 2x^3 + 3\sqrt{2c_1 - 2x + 1} + 3}{-6x + 6c_1}$$

ODE No. 882

$$y'(x) = -\frac{1}{216}\sqrt{x}(-108x^{3/2} + x^9 - 18x^6 y(x) - 6x^6 + 108x^3 y(x)^2 + 72x^3 y(x) - 216y(x)^3 - 216y(x)^2 - 216$$

✓ **Mathematica** : cpu = 0.252304 (sec), leaf count = 119

```
DSolve[Derivative[1][y][x] == -1/216*(Sqrt[x]*(-216 - 108*x^(3/2) - 6*x^6 + x^9 + 72*x^3*y[x]
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{1}{2}(2\sqrt{x} - x^{7/2}) + 3\sqrt{x}y(x)}{\sqrt[3]{29}\sqrt[3]{x^{3/2}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right]\right] = \frac{2}{27}29^{2/3}\sqrt{x}(x^{3/2})$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = -1/216*(-108*x^(3/2)-216-216*y(x)^2+72*x^3*y(x)-6*x^6-216*y(x)^3+108*x^
```

$$y(x) = \frac{x^3}{6} - \frac{1}{3} + \frac{29\,\text{RootOf}\left(2x^{\frac{3}{2}} - 243\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + 9c_1\right)}{9}$$

ODE No. 883

$$y'(x) = \frac{x(a^3y(x)^6 + a^3y(x)^4 + a^3 + 3a^2bx^2y(x)^4 + 2a^2bx^2y(x)^2 + 3ab^2x^4y(x)^2 + ab^2x^4 + b^3x^6)}{a^{7/2}y(x)}$$

✓ **Mathematica** : cpu = 1.09102 (sec), leaf count = 164

```
DSolve[Derivative[1][y][x] == (x*(a^3 + a*b^2*x^4 + b^3*x^6 + 2*a^2*b*x^2*y[x]^2 + 3*a*b^2*x^
```

$$\text{Solve}\left[\frac{x^2}{2} - \frac{1}{2}a^{5/2}\text{RootSum}\left[\#1^3b^3 + 3\#1^2ab^2y(x)^2 + \#1^2ab^2 + 3\#1a^2by(x)^4 + 2\#1a^2by(x)^2 + a^{5/2}b + a^3y\right.\right.$$

✓ **Maple** : cpu = 0.642 (sec), leaf count = 352

```
dsolve(diff(y(x),x) = (a^3+y(x)^4*a^3+2*y(x)^2*a^2*b*x^2+a*x^4*b^2+y(x)^6*a^3+3*y(x)^4*a^2*b*
```

$$\int_{\_b}^{x} \frac{\left(b^3\_a^6 + 3y(x)^2\,a\,b^2\_a^4 + 3y(x)^4\,a^2b\_a^2 + y(x)^6\,a^3 + a\_a^4b^2 + 2a^2y(x)^2\,b\_a^2 + y(x)^4\,a^3 + a^3\right)\_}{\left(y\,(x)^6\,a^3 + 3y\,(x)^4\,a^2b\_a^2 + 3y\,(x)^2\,a\,b^2\_a^4 + b^3\_a^6 + y\,(x)^4\,a^3 + 2a^2y\,(x)^2\,b\_a^2 + a\_a^4b^2 + a^3 + a^{\frac{3}{2}}\right.}$$

ODE No. 884

$$y'(x) = \frac{x(-x^6 + 3x^4 y(x)^2 + x^4 - 3x^2 y(x)^4 - 2x^2 y(x)^2 + y(x)^6 + y(x)^4 + 1)}{y(x)}$$

✓ **Mathematica** : cpu = 0.725771 (sec), leaf count = 71

```
DSolve[Derivative[1][y][x] == (x*(1 + x^4 - x^6 - 2*x^2*y[x]^2 + 3*x^4*y[x]^2 + y[x]^4 - 3*x^
```

$$\text{Solve}\left[\frac{1}{4}\left(2\log\left(-x^2 + y(x)^2 + 1\right) - 2x^2 - \frac{1}{y(x)(y(x)+x)} + \frac{1}{xy(x) - y(x)^2} - 2\log(x - y(x)) - 2\log(y(x)\right.\right.$$

✓ **Maple** : cpu = 0.42 (sec), leaf count = 107

```
dsolve(diff(y(x),x) = -(-1-y(x)^4+2*x^2*y(x)^2-x^4-y(x)^6+3*x^2*y(x)^4-3*x^4*y(x)^2+x^6)*x/y(
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-3x^2\mathrm{e}^{2\_Z} + 6x^3\mathrm{e}^{\_Z} + 3\,\mathrm{e}^{2\_Z}\ln\left(\frac{\mathrm{e}^{2\_Z} - 2\,\mathrm{e}^{\_Z}x + 1}{\mathrm{e}^{\_Z} - 2x}\right) - 2c_1\mathrm{e}^{2\_Z} - 3\_Z\,\mathrm{e}^{2\_Z} - 6\,\mathrm{e}^{\_Z}\ln\left(\frac{\mathrm{e}^{2\_Z} - 2\,\mathrm{e}^{\_Z}x + 1}{\mathrm{e}^{\_Z} - 2x}\right)x + 4c_1 x\,\mathrm{e}^{\_Z} + 6\_Z x\,\mathrm{e}^{\_Z} - 3\right.}$$

ODE No. 885

$$y'(x) = -\frac{i(x^6 + 12x^4y(x)^2 + 4x^4 + 48x^2y(x)^4 + 32x^2y(x)^2 + 64y(x)^6 + 64y(x)^4 + 32ix + 64)}{128y(x)}$$

✗ **Mathematica** : cpu = 40.64 (sec), leaf count = 0

```
DSolve[Derivative[1][y][x] == ((-1/128*I)*(64 + (32*I)*x + 4*x^4 + x^6 + 32*x^2*y[x]^2 + 12*x
```

, could not solve

```
DSolve[Derivative[1][y][x] == ((-1/128*I)*(64 + (32*I)*x + 4*x^4 + x^6 + 32*x^2*y[x]^2
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x) = -1/128*I*(32*I*x+64+64*y(x)^4+32*x^2*y(x)^2+4*x^4+64*y(x)^6+48*x^2*y(x)
```

, could not solve

```
dsolve(diff(y(x),x) = -1/128*I*(32*I*x+64+64*y(x)^4+32*x^2*y(x)^2+4*x^4+64*y(x)^6+48*x^
```

ODE No. 886

$$y'(x) = \frac{x^6 y(x)^3 - 3x^5 y(x)^2 + x^4 y(x)^2 + 3x^4 y(x) - 4x^3 y(x) - x^3 + 2x^2 + 1}{x^4}$$

✓ **Mathematica** : cpu = 0.196385 (sec), leaf count = 82

```
DSolve[Derivative[1][y][x] == (1 + 2*x^2 - x^3 - 4*x^3*y[x] + 3*x^4*y[x] + x^4*y[x]^2 - 3*x^5
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3x^2 y(x) - 3x + 1}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = -\frac{29^{2/3}}{9x} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = 1/x^4*(2*x^2-4*x^3*y(x)+1+x^4*y(x)^2+x^6*y(x)^3-3*y(x)^2*x^5+3*y(x)*x^4
```

$$y(x) = \frac{9x - 3 + 29\,\text{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) x + 3xc_1 - 1\right)}{9x^2}$$

ODE No. 887

$$y'(x) = \frac{a^3x^3y(x)^3 + 3a^2x^2y(x)^2 + a^2xy(x) + a^2x + 3axy(x) + a + 1}{a^2x^2(axy(x) + ax + 1)}$$

✓ **Mathematica** : cpu = 0.241931 (sec), leaf count = 106

```
DSolve[Derivative[1][y][x] == (1 + a + a^2*x + 3*a*x*y[x] + a^2*x*y[x] + 3*a^2*x^2*y[x]^2 + a
```

$$\left\{\left\{y(x) \to -\frac{ax+1}{ax} + \frac{1}{a^3x^3\left(\frac{1}{a^3x^3} - \frac{1}{x^3\sqrt{-2a^6x+c_1}}\right)}\right\}, \left\{y(x) \to -\frac{ax+1}{ax} + \frac{1}{a^3x^3\left(\frac{1}{a^3x^3} + \frac{1}{x^3\sqrt{-2a^6x+c_1}}\right)}\right\}\right.$$

✓ **Maple** : cpu = 0.047 (sec), leaf count = 72

```
dsolve(diff(y(x),x) = 1/a^2/x^2*(y(x)*a^2*x+a+a^2*x+y(x)^3*a^3*x^3+3*y(x)^2*a^2*x^2+3*a*x*y(x
```

$$y(x) = \frac{ax - \sqrt{c_1 - 2x} + 1}{ax\left(\sqrt{c_1 - 2x} - 1\right)}$$

ODE No. 888

$$y'(x) = \frac{x^4 y(x)^3 - 5x^3 y(x)^2 + 6x^2 y(x) - 2xy(x) - 2x + 1}{x^2\left(x^2 y(x) - x + 1\right)}$$

✓ **Mathematica** : cpu = 0.161241 (sec), leaf count = 78

```
DSolve[Derivative[1][y][x] == (1 - 2*x - 2*x*y[x] + 6*x^2*y[x] - 5*x^3*y[x]^2 + x^4*y[x]^3)/(
```

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

✓ **Maple** : cpu = 0.05 (sec), leaf count = 79

```
dsolve(diff(y(x),x) = 1/x^2*(6*x^2*y(x)-2*x+1-5*x^3*y(x)^2-2*x*y(x)+y(x)^3*x^4)/(x^2*y(x)-x+1
```

$$y(x) = \frac{\sqrt{\frac{xc_1+2}{x}}\, x - x + 1}{x^2\left(\sqrt{\frac{xc_1+2}{x}} - 1\right)}$$

ODE No. 889

$$y'(x) = -\frac{e^x\left(-8y(x)^{9/2} + 36e^x y(x)^3 - 8y(x)^3 + 24e^x y(x)^{3/2} - 54e^{2x} y(x)^{3/2} - 18e^{2x} + 27e^{3x} - 8\right)}{8\sqrt{y(x)}}$$

✓ **Mathematica** : cpu = 1.50614 (sec), leaf count = 68

```
DSolve[Derivative[1][y][x] == -1/8*(E^x*(-8 - 18*E^(2*x) + 27*E^(3*x) + 24*E^x*y[x]^(3/2) - 5
```

$$\text{Solve}\left[\frac{2}{3}\log\left(y(x)^{3/2} - \frac{3e^x}{2}\right) + e^x = \frac{4}{9e^x - 6y(x)^{3/2}} + \frac{2}{3}\log\left(y(x)^{3/2} - \frac{3e^x}{2} + 1\right) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.864 (sec), leaf count = 49

```
dsolve(diff(y(x),x) = -1/8*(-8-8*y(x)^3+24*y(x)^(3/2)*exp(x)-18*exp(x)^2-8*y(x)^(9/2)+36*y(x)
```

$$\mathrm{e}^x - \frac{4}{-6y\,(x)^{\frac{3}{2}} + 9\,\mathrm{e}^x} + \frac{2\ln\left(y(x)^{\frac{3}{2}} - \frac{3\,\mathrm{e}^x}{2}\right)}{3} - \frac{2\ln\left(y(x)^{\frac{3}{2}} - \frac{3\,\mathrm{e}^x}{2} + 1\right)}{3} - c_1 = 0$$

ODE No. 890

$$y'(x) = \frac{x}{x^6 + 3x^4 y(x)^2 + x^4 + 3x^2 y(x)^4 + 2x^2 y(x)^2 + y(x)^6 + y(x)^4 - y(x) + 1}$$

✓ **Mathematica** : cpu = 0.192657 (sec), leaf count = 103

```
DSolve[Derivative[1][y][x] == x/(1 + x^4 + x^6 - y[x] + 2*x^2*y[x]^2 + 3*x^4*y[x]^2 + y[x]^4
```

$$\text{Solve}\left[y(x) - \frac{1}{2}\text{RootSum}\left[\#1^3 + 3\#1^2 y(x)^2 + \#1^2 + 3\#1 y(x)^4 + 2\#1 y(x)^2 + y(x)^6 + y(x)^4 + 1\&, \frac{}{3\#1^2 +}\right.\right.$$

✓ **Maple** : cpu = 0.633 (sec), leaf count = 34

```
dsolve(diff(y(x),x) = x/(-y(x)+1+y(x)^4+2*x^2*y(x)^2+x^4+y(x)^6+3*x^2*y(x)^4+3*x^4*y(x)^2+x^6
```

$$-y(x) + \frac{\left(\int^{y(x)^2+x^2} \frac{1}{\_a^3+\_a^2+1} d\_a\right)}{2} - c_1 = 0$$

ODE No. 891

$$y'(x) = \frac{y(x)^2 \left(x^4 y(x) + 2x^2 y(x) + 2x^2 - 2y(x)\right)}{x^3 \left(x^2 y(x) + x^2 - y(x)\right)}$$

✓ **Mathematica** : cpu = 0.188438 (sec), leaf count = 135

```
DSolve[Derivative[1][y][x] == (y[x]^2*(2*x^2 - 2*y[x] + 2*x^2*y[x] + x^4*y[x]))/(x^3*(x^2 - y
```

$$\left\{\left\{y(x) \to \frac{x^5}{-x^3\left(x^2-1\right) + \frac{\sqrt{\left(x^2-1\right)^2 x + x^5\left(-2\left(\frac{1}{2x^4} - \frac{1}{x^2} + \log(x)\right) + c_1\right)}}{\sqrt{\frac{1}{x^5}}}}\right\}, \left\{y(x) \to -\frac{x^5}{\left(x^2-1\right)x^3 + \frac{\sqrt{\left(x^2-1\right)^2 x + x^5\left(-2\right.}}{}}\right.$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 56

```
dsolve(diff(y(x),x) = y(x)^2/x^3*(-2*y(x)+2*x^2+2*x^2*y(x)+y(x)*x^4)/(x^2-y(x)+x^2*y(x)),y(x)
```

$$y(x) = \frac{x^2}{\sqrt{c_1 - 2\ln(x)}\, x^2 - x^2 + 1}$$

ODE No. 892

$$y'(x) = \frac{e^{-\frac{2}{x^2-y(x)^2-1}} + x^2 + 2xy(x) + y(x)^2}{-e^{-\frac{2}{x^2-y(x)^2-1}} + x^2 + 2xy(x) + y(x)^2}$$

✓ **Mathematica** : cpu = 2.08742 (sec), leaf count = 1283

```
DSolve[Derivative[1][y][x] == (E^(-2/(-1 + x^2 - y[x]^2)) + x^2 + 2*x*y[x] + y[x]^2)/(-E^(-2/
```

$$\text{Solve}\left[\int_1^x \left(-e^{\int_1^{(K[2]-y(x))(K[2]+y(x))} \frac{2((K[1]-3)K[1]+1)}{\left(e^{-\frac{2}{K[1]-1}}-K[1]\right)(K[1]-1)^2}dK[1]+\frac{2}{K[2]^2-y(x)^2-1}} K[2]^2 - 2e^{\int_1^{(K[2]-y(x))(K[2]+y(x))} \frac{2((K[\right.$$

✓ **Maple** : cpu = 0.582 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = (y(x)^2+2*x*y(x)+x^2+exp(-2/(-y(x)^2+x^2-1)))/(y(x)^2+2*x*y(x)+x^2-exp(
```

$$y(x) = e^{\text{RootOf}\left(-\_Z+\int^{e^{2\_Z}-2\,e^{-\_Z}x} \frac{1}{e^{\frac{2}{1+\_a}}+\_a}d\_a+c_1\right)} - x$$

ODE No. 893

$$y'(x) = \frac{x^3 y(x)^3 + x^3 y(x)^2 + x^3 + 6x^2 y(x)^2 + 4x^2 y(x) + 12xy(x) + 6x + 8}{x^3}$$

✓ **Mathematica** : cpu = 0.178968 (sec), leaf count = 80

```
DSolve[Derivative[1][y][x] == (8 + 6*x + x^3 + 12*x*y[x] + 4*x^2*y[x] + 6*x^2*y[x]^2 + x^3*y[
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3y(x)+\frac{x+6}{x}}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = (6*x+x^3+x^3*y(x)^2+4*x^2*y(x)+x^3*y(x)^3+6*x^2*y(x)^2+12*x*y(x)+8)/x^3
```

$$y(x) = \frac{29\,\text{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + x + 3c_1\right)x - 3x - 18}{9x}$$

ODE No. 894

$$y'(x) = -\frac{i(x^6 + 3x^4 y(x)^2 + x^4 + 3x^2 y(x)^4 + 2x^2 y(x)^2 + y(x)^6 + y(x)^4 + ix + 1)}{y(x)}$$

✗ **Mathematica** : cpu = 40.5965 (sec), leaf count = 0

```
DSolve[Derivative[1][y][x] == ((-I)*(1 + I*x + x^4 + x^6 + 2*x^2*y[x]^2 + 3*x^4*y[x]^2 + y[x]
```

, could not solve

```
DSolve[Derivative[1][y][x] == ((-I)*(1 + I*x + x^4 + x^6 + 2*x^2*y[x]^2 + 3*x^4*y[x]^2
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x) = -I*(I*x+1+x^4+2*x^2*y(x)^2+y(x)^4+x^6+3*x^4*y(x)^2+3*x^2*y(x)^4+y(x)^6)
```

, could not solve

```
dsolve(diff(y(x),x) = -I*(I*x+1+x^4+2*x^2*y(x)^2+y(x)^4+x^6+3*x^4*y(x)^2+3*x^2*y(x)^4+y
```

ODE No. 895

$$y'(x) = \frac{x(a^3x^{12} + 24a^2x^8y(x) - 32a^2x^6 + 192ax^4y(x)^2 - 256ax^2y(x) - 256ax^2 + 512y(x)^3)}{64ax^4 + 512y(x) + 512}$$

✓ **Mathematica** : cpu = 0.227092 (sec), leaf count = 81

```
DSolve[Derivative[1][y][x] == (x*(-256*a*x^2 - 32*a^2*x^6 + a^3*x^12 - 256*a*x^2*y[x] + 24*a^
```

$$\left\{\left\{y(x) \to \frac{1}{8}\left(-ax^4 - 8\right) + \frac{1}{512\left(\frac{1}{512} - \frac{1}{\sqrt{-262144x^2 + c_1}}\right)}\right\}, \left\{y(x) \to \frac{1}{8}\left(-ax^4 - 8\right) + \frac{1}{512\left(\frac{1}{512} + \frac{1}{\sqrt{-262144x^2}}\right.}\right.$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 79

```
dsolve(diff(y(x),x) = (-256*a*x^2*y(x)-32*a^2*x^6-256*a*x^2+512*y(x)^3+192*x^4*a*y(x)^2+24*y(
```

$$y(x) = \frac{8 + \left(-\sqrt{-x^2 + c_1} + 1\right) a\, x^4}{-8 + 8\sqrt{-x^2 + c_1}}$$

ODE No. 896

$$y'(x) = \frac{-x^6 + 3x^4 y(x)^2 + x^4 - 3x^2 y(x)^4 - 2x^2 y(x)^2 + y(x)^6 + y(x)^4 + x + 1}{y(x)}$$

✓ **Mathematica** : cpu = 0.27372 (sec), leaf count = 106

```
DSolve[Derivative[1][y][x] == (1 + x + x^4 - x^6 - 2*x^2*y[x]^2 + 3*x^4*y[x]^2 + y[x]^4 - 3*x
```

$$\text{Solve}\left[\frac{1}{2}\text{RootSum}\left[-\#1^3 + 3\#1^2 y(x)^2 + \#1^2 - 3\#1 y(x)^4 - 2\#1 y(x)^2 + y(x)^6 + y(x)^4 + 1\&, \frac{}{3\#1^2 - 6\#1}\right.\right.$$

✓ **Maple** : cpu = 0.48 (sec), leaf count = 63

```
dsolve(diff(y(x),x) = (x+1+y(x)^4-2*x^2*y(x)^2+x^4+y(x)^6-3*x^2*y(x)^4+3*x^4*y(x)^2-x^6)/y(x)
```

$$\int_{\_b}^{y(x)} \frac{\_a}{-\_a^6 + 3\_a^4 x^2 - 3\_a^2 x^4 + x^6 - \_a^4 + 2\_a^2 x^2 - x^4 - 1} d\_a + x - c_1 = 0$$

ODE No. 897

$$y'(x) = \frac{\sqrt{x}\left(-108x^{3/2}y(x) + 18x^{9/2} - 108x^{3/2} + x^9 - 18x^6 y(x) + 108x^3 y(x)^2 - 216y(x)^3\right)}{36x^3 - 216y(x) - 216}$$

✓ **Mathematica** : cpu = 0.214607 (sec), leaf count = 79

```
DSolve[Derivative[1][y][x] == (Sqrt[x]*(-108*x^(3/2) + 18*x^(9/2) + x^9 - 108*x^(3/2)*y[x] -
```

$$\left\{\left\{y(x) \to \frac{1}{6}\left(x^3 - 6\right) - \frac{1}{216\left(-\frac{1}{216} - \frac{1}{\sqrt{-62208x^{3/2}+c_1}}\right)}\right\}, \left\{y(x) \to \frac{1}{6}\left(x^3 - 6\right) - \frac{1}{216\left(-\frac{1}{216} + \frac{1}{\sqrt{-62208x^{3/2}+}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.081 (sec), leaf count = 87

```
dsolve(diff(y(x),x) = (-108*x^(3/2)*y(x)+18*x^(9/2)-108*x^(3/2)-216*y(x)^3+108*x^3*y(x)^2-18*
```

$$y(x) = \frac{\sqrt{9c_1 - 12x^{\frac{3}{2}}}\, x^3 - 3x^3 + 18}{6\sqrt{9c_1 - 12x^{\frac{3}{2}}} - 18}$$

ODE No. 898

$$y'(x) = \frac{4x^6y(x)^3 + 2x^5y(x) + 2x^5 + 3x^4y(x)^2 + \frac{x^3}{2} + \frac{3}{4}x^2y(x) + \frac{1}{16}}{x^6\left(4x^2y(x) + 4x^2 + 1\right)}$$

✓ **Mathematica** : cpu = 0.187675 (sec), leaf count = 106

```
DSolve[Derivative[1][y][x] == (1/16 + x^3/2 + 2*x^5 + (3*x^2*y[x])/4 + 2*x^5*y[x] + 3*x^4*y[x
```

$$\left\{\left\{y(x) \to -\frac{4x^2+1}{4x^2} + \frac{1}{64x^8\left(\frac{1}{64x^8} - \frac{1}{x^8\sqrt{\frac{8192}{x}+c_1}}\right)}\right\}, \left\{y(x) \to -\frac{4x^2+1}{4x^2} + \frac{1}{64x^8\left(\frac{1}{64x^8} + \frac{1}{x^8\sqrt{\frac{8192}{x}+c_1}}\right)}\right\}$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 87

```
dsolve(diff(y(x),x) = 1/16/x^6*(32*x^5*y(x)+8*x^3+32*x^5+64*x^6*y(x)^3+48*x^4*y(x)^2+12*x^2*y
```

$$y(x) = \frac{4x^2 - \sqrt{\frac{xc_1+2}{x}} + 1}{4x^2\left(\sqrt{\frac{xc_1+2}{x}} - 1\right)}$$

ODE No. 899

$$y'(x) = \frac{x^6 y(x)^3 + x^6 y(x)^2 + x^6 + \frac{x^5}{2} + \frac{3}{4}x^4 y(x)^2 + \frac{1}{2}x^4 y(x) + \frac{3}{16}x^2 y(x) + \frac{x^2}{16} + \frac{1}{64}}{x^8}$$

✓ **Mathematica** : cpu = 0.213944 (sec), leaf count = 106

```
DSolve[Derivative[1][y][x] == (1/64 + x^2/16 + x^5/2 + x^6 + (3*x^2*y[x])/16 + (x^4*y[x])/2 +
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3y(x)}{x^2} + \frac{4x^2+3}{4x^4}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^6}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right]\right] = -\frac{1}{9}29^{2/3}\left(\frac{1}{x^6}\right)^{2/3} x^3 + c_1$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 47

```
dsolve(diff(y(x),x) = 1/64*(32*x^5+64*x^6+64*x^6*y(x)^2+32*y(x)*x^4+4*x^2+64*x^6*y(x)^3+48*x^
```

$$y(x) = \frac{116\,\text{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right)x + 3xc_1 - 1\right)x^2 - 12x^2 - 9}{36x^2}$$

ODE No. 900

$$y'(x) = \frac{2a(4ax - y(x)^2 - 1)}{128a^4x^3 - 96a^3x^2y(x)^2 + 24a^2xy(x)^4 - 2ay(x)^6 + 4axy(x) - y(x)^3 - y(x)}$$

✓ **Mathematica** : cpu = 0.185562 (sec), leaf count = 381

```
DSolve[Derivative[1][y][x] == (2*a*(-1 + 4*a*x - y[x]^2))/(128*a^4*x^3 - y[x] + 4*a*x*y[x] -
```

$$\{\{y(x) \to \text{Root}\left[8\#1^5a - 16\#1^4a^2c_1 - 64\#1^3a^2x + \#1^2\left(-2 + 128a^3c_1x\right) + 128\#1a^3x^2 - 256a^4c_1x^2 + 8ax\right.$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 48

```
dsolve(diff(y(x),x) = 2*a*(-y(x)^2+4*a*x-1)/(-y(x)^3+4*a*x*y(x)-y(x)-2*a*y(x)^6+24*y(x)^4*a^2
```

$$\frac{y(x)}{2a} - \frac{1}{16a^2\left(y(x)^2 - 4ax\right)^2} + \frac{1}{32a^3x - 8a^2y(x)^2} - c_1 = 0$$

ODE No. 901

$$y'(x) = \frac{y(x)\left(-ax\log(y(x)) + x^2 + y(x)\right)}{x(ax - y(x) - y(x)\log(x) - y(x)\log(y(x)))}$$

✓ **Mathematica** : cpu = 0.575128 (sec), leaf count = 33

```
DSolve[Derivative[1][y][x] == (y[x]*(x^2 - a*x*Log[y[x]] + y[x]))/(x*(a*x - y[x] - Log[x]*y[x
```

$$\text{Solve}\left[ax\log(y(x)) - \frac{x^2}{2} - y(x)\log(x) - y(x)\log(y(x)) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.584 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = (y(x)-a*ln(y(x))*x+x^2)/(-y(x)*ln(y(x))-y(x)*ln(x)-y(x)+a*x)*y(x)/x,y(x
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-2\_Zax + 2\ln(x)\mathrm{e}^{-\_Z} + 2\_Z\mathrm{e}^{-\_Z} + 2c_1a + x^2\right)}$$

ODE No. 902

$$y'(x) = \frac{x^6 - 3x^4 y(x)^2 + x^3 + 3x^2 y(x)^4 - x y(x)^2 - y(x)^6 - x}{y(x)\left(x^2 - y(x)^2 - 1\right)}$$

✓ **Mathematica** : cpu = 0.208899 (sec), leaf count = 295

```
DSolve[Derivative[1][y][x] == (-x + x^3 + x^6 - x*y[x]^2 - 3*x^4*y[x]^2 + 3*x^2*y[x]^4 - y[x]
```

$$\left\{\left\{y(x) \to -\frac{1}{2}\sqrt{\frac{4x^3}{x-c_1} - \frac{4c_1x^2}{x-c_1} - \frac{\sqrt{-4x+1+4c_1}}{x-c_1} - \frac{1}{x-c_1}}\right\}, \left\{y(x) \to \frac{1}{2}\sqrt{\frac{4x^3}{x-c_1} - \frac{4c_1x^2}{x-c_1} - \frac{\sqrt{-4}}{}\right.\right.$$

✓ **Maple** : cpu = 0.211 (sec), leaf count = 183

```
dsolve(diff(y(x),x) = (-x*y(x)^2+x^3-x-y(x)^6+3*x^2*y(x)^4-3*x^4*y(x)^2+x^6)/(-y(x)^2+x^2-1)/
```

$$y(x) = -\frac{\sqrt{(c_1+3x)\left(4c_1x^2 + 12x^3 + \sqrt{-12c_1 - 36x + 9} - 3\right)}}{2c_1 + 6x}$$

ODE No. 903

$$y'(x) = \frac{\sin\left(\frac{y(x)}{x}\right)\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\left(2x^2\sin\left(\frac{y(x)}{2x}\right)\cos\left(\frac{y(x)}{2x}\right)+y(x)\right)}{2x}$$

✓ **Mathematica** : cpu = 0.123305 (sec), leaf count = 19

```
DSolve[Derivative[1][y][x] == (Csc[y[x]/(2*x)]*Sec[y[x]/(2*x)]*Sin[y[x]/x]*(2*x^2*Cos[y[x]/(2
```

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

✓ **Maple** : cpu = 0.114 (sec), leaf count = 48

```
dsolve(diff(y(x),x) = 1/2*sin(y(x)/x)*(y(x)+2*x^2*sin(1/2*y(x)/x)*cos(1/2*y(x)/x))/sin(1/2*y(
```

$$y(x) = \arctan\left(\frac{2c_1\mathrm{e}^x}{c_1^2\mathrm{e}^{2x}+1}, \frac{-c_1^2\mathrm{e}^{2x}+1}{c_1^2\mathrm{e}^{2x}+1}\right)x$$

ODE No. 904

$$y'(x) = \frac{\sin\left(\frac{y(x)}{x}\right)\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\left(2x^3\sin\left(\frac{y(x)}{2x}\right)\cos\left(\frac{y(x)}{2x}\right)+y(x)\right)}{2x}$$

✓ **Mathematica** : cpu = 0.109158 (sec), leaf count = 23

```
DSolve[Derivative[1][y][x] == (Csc[y[x]/(2*x)]*Sec[y[x]/(2*x)]*Sin[y[x]/x]*(2*x^3*Cos[y[x]/(2
```

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

✓ **Maple** : cpu = 0.091 (sec), leaf count = 64

```
dsolve(diff(y(x),x) = 1/2*sin(y(x)/x)*(y(x)+2*x^3*cos(1/2*y(x)/x)*sin(1/2*y(x)/x))/sin(1/2*y(
```

$$y(x) = \arctan\left(\frac{2\,\mathrm{e}^{\frac{x^2}{2}}c_1}{\mathrm{e}^{x^2}c_1^2+1},\frac{-\mathrm{e}^{x^2}c_1^2+1}{\mathrm{e}^{x^2}c_1^2+1}\right)x$$

ODE No. 905

$$y'(x) = \frac{a^3x^3y(x)^3 + a^3x^3y(x)^2 + a^3x^3 + 3a^2x^2y(x)^2 + 2a^2x^2y(x) + a^2x + 3axy(x) + ax + 1}{a^3x^3}$$

✓ **Mathematica** : cpu = 0.243453 (sec), leaf count = 85

```
DSolve[Derivative[1][y][x] == (1 + a*x + a^2*x + a^3*x^3 + 3*a*x*y[x] + 2*a^2*x^2*y[x] + 3*a^
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{ax+3}{ax}+3y(x)}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.037 (sec), leaf count = 46

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

$$y(x) = \frac{29\,\text{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + x + 3c_1\right)ax - 3ax - 9}{9ax}$$

ODE No. 906

$$y'(x) = \frac{x(x^2 + y(x)^2 + 1)}{x^6 + 3x^4 y(x)^2 + 3x^2 y(x)^4 - x^2 y(x) + y(x)^6 - y(x)^3 - y(x)}$$

✓ **Mathematica** : cpu = 0.137126 (sec), leaf count = 326

```
DSolve[Derivative[1][y][x] == (x*(1 + x^2 + y[x]^2))/(x^6 - y[x] - x^2*y[x] + 3*x^4*y[x]^2 -
```

$$\left\{\left\{y(x) \to \text{Root}\left[4\#1^5 - 4\#1^4 c_1 + 8\#1^3 x^2 + \#1^2\left(2 - 8c_1 x^2\right) + 4\#1 x^4 - 4c_1 x^4 + 2x^2 + 1\&, 1\right]\right\}, \{y(x) \to$$

✓ **Maple** : cpu = 0.284 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = x*(x^2+y(x)^2+1)/(-y(x)^3-x^2*y(x)-y(x)+y(x)^6+3*x^2*y(x)^4+3*x^4*y(x)^
```

$$-\frac{1}{4\left(y\left(x\right)^2 + x^2\right)^2} - \frac{1}{2y\left(x\right)^2 + 2x^2} - y(x) + c_1 = 0$$

ODE No. 907

$$y'(x) = \frac{\frac{3x^2}{2} + x^2 \sin(x) - 2x^2 \cos(x) + \frac{1}{2}x^2 \cos(2x) - 2xy(x) + y(x)^2 + 2xy(x)\cos(x) + x - x\cos(x)}{x}$$

✓ **Mathematica** : cpu = 0.249218 (sec), leaf count = 22

```
DSolve[Derivative[1][y][x] == (x + (3*x^2)/2 - x*Cos[x] - 2*x^2*Cos[x] + (x^2*Cos[2*x])/2 + x
```

$$\left\{\left\{y(x) \to -x(\cos(x) - 1) + \frac{1}{-\log(x) + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.174 (sec), leaf count = 20

```
dsolve(diff(y(x),x) = 1/2*(-2*cos(x)*x+2*x^2*sin(x)+2*x+2*y(x)^2+4*y(x)*cos(x)*x-4*x*y(x)+x^2
```

$$y(x) = -(-1 + \cos(x))\, x + \frac{1}{c_1 - \ln(x)}$$

ODE No. 908

$$y'(x) = \frac{4(a-1)(a+1)x}{a^6x^4 - 3a^4x^4 - 2a^4x^2y(x)^2 + 3a^2x^4 + 4a^2x^2y(x)^2 + a^2y(x)^4 - x^4 - 2x^2y(x)^2 - y(x)^4 + 4y(x)}$$

✓ **Mathematica** : cpu = 0.903235 (sec), leaf count = 1269

```
DSolve[Derivative[1][y][x] == (4*(-1 + a)*(1 + a)*x)/(-x^4 + 3*a^2*x^4 - 3*a^4*x^4 + a^6*x^4
```

$$\left\{\left\{y(x) \to \frac{c_1}{3\left(a^2-1\right)} + \sqrt[3]{-18x^2c_1a^6 + 54x^2c_1a^4 + 54a^4 - 54x^2c_1a^2 - 108a^2 + 2{c_1}^3 + 18x^2c_1 + \sqrt{4\left(-3x\right.}\right.\right.$$

✓ **Maple** : cpu = 0.313 (sec), leaf count = 1742

```
dsolve(diff(y(x),x) = 4*x*(a-1)*(a+1)/(4*y(x)+a^2*y(x)^4-2*a^4*y(x)^2*x^2+4*y(x)^2*a^2*x^2+a^
```

$$y(x) = \frac{\left((-a^2c_1 + c_1)\,9^{\frac{1}{3}}\left(\left(\frac{\sqrt{-3(a-1)^5(a+1)^5x^6+6c_1^2(a-1)^4(a+1)^4x^4-3c_1(a-1)^2(a+1)^2\left(c_1^3a^2-c_1^3-18\right)x^2-6c_1^3a^2+6c_1^3+81}}{3} + 3 +\right.\right.\right.}{}$$

ODE No. 909

$$y'(x) = \frac{x^3 y(x)^6 + x^3 y(x)^4 + x^3 + 3x^2 y(x)^4 + 2x^2 y(x)^2 + 3x y(x)^2 + x + 1}{x^5 y(x)}$$

✓ **Mathematica** : cpu = 0.146759 (sec), leaf count = 64

```
DSolve[Derivative[1][y][x] == (1 + x + x^3 + 3*x*y[x]^2 + 2*x^2*y[x]^2 + 3*x^2*y[x]^4 + x^3*y
```

$$\text{Solve}\left[\frac{1}{2}\text{RootSum}\left[2\#1^3 + 2\#1^2 + 1\&, \frac{\log\left(\frac{x y(x)^2+1}{x} - \#1\right)}{3\#1^2 + 2\#1}\&\right] + \frac{1}{x} + c_1 = 0, y(x)\right]$$

✓ **Maple** : cpu = 1.779 (sec), leaf count = 84

```
dsolve(diff(y(x),x) = (x^3+y(x)^4*x^3+2*x^2*y(x)^2+x+x^3*y(x)^6+3*x^2*y(x)^4+3*x*y(x)^2+1)/x^
```

$$y(x) = \frac{\sqrt{x\left(\text{RootOf}\left(\left(\int^{-Z} \frac{1}{2\_a^3+2\_a^2+1} d\_a\right) x + c_1 x + 1\right) x - 1\right)}}{x}$$

ODE No. 910

$$y'(x) = \frac{x^6 + 3x^5 y(x) + 3x^4 y(x)^2 + x^4 + x^3 y(x)^3 + 2x^3 y(x) + x^2 y(x)^2 - y(x) - 2x + 1}{x}$$

✓ **Mathematica** : cpu = 0.204913 (sec), leaf count = 98

```
DSolve[Derivative[1][y][x] == (1 - 2*x + x^4 + x^6 - y[x] + 2*x^3*y[x] + 3*x^5*y[x] + x^2*y[x
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3x^3+3x^2y(x)+x}{\sqrt[3]{29}\sqrt[3]{x^3}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{29^{2/3}(x^3)^{2/3}}{9x} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = (-2*x-y(x)+1+x^2*y(x)^2+2*x^3*y(x)+x^4+x^3*y(x)^3+3*x^4*y(x)^2+3*x^5*y(
```

$$y(x) = \frac{-9x^2 + 29\,\text{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + x + 3c_1\right) - 3}{9x}$$

ODE No. 911

$$y'(x) = y(x)\left(\_\mathrm{F1}(x) + \frac{\log(y(x))}{x} - \cot(x)\log(y(x))\right)$$

✓ **Mathematica** : cpu = 0.779976 (sec), leaf count = 106

```
DSolve[Derivative[1][y][x] == y[x]*(Log[y[x]]/x - Cot[x]*Log[y[x]] + _F1[x]),y[x],x]
```

$$\text{Solve}\left[\int_1^x \left(\frac{2\log(y(x))\sin(K[1])}{K[1]^2} - \frac{2(\cos(K[1])\log(y(x)) - \sin(K[1])\_\mathrm{F1}(K[1]))}{K[1]}\right) dK[1] + \int_1^{y(x)} \left(-\frac{2\sin}{xK}\right.\right.$$

✓ **Maple** : cpu = 1.02 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = -(-1/x*ln(y(x))+1/sin(x)*cos(x)*ln(y(x))-_F1(x))*y(x),y(x))
```

$$y(x) = \mathrm{e}^{\frac{x c_1}{\sin(x)}} \mathrm{e}^{\frac{x\left(\int -\frac{\_F1(x)\sin(x)}{x}\,dx\right)}{\sin(x)}}$$

ODE No. 912

$$y'(x) = \frac{2ax}{-128a^4 + 96a^3xy(x)^2 + 32a^3x - 24a^2x^2y(x)^4 - 16a^2x^2y(x)^2 + 2ax^3y(x)^6 + 2ax^3y(x)^4 + 2ax^3 - x^3}$$

✓ **Mathematica** : cpu = 1.07978 (sec), leaf count = 201

```
DSolve[Derivative[1][y][x] == (2*a*x)/(-128*a^4 + 32*a^3*x + 2*a*x^3 - x^3*y[x] + 96*a^3*x*y[
```

$$\text{Solve}\left[-\text{RootSum}\left[-\#1^3y(x)^6 - \#1^3y(x)^4 - \#1^3 + 12\#1^2ay(x)^4 + 8\#1^2ay(x)^2 - 48\#1a^2y(x)^2 - 16\#1a^2\right.\right.$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x) = 2*a*x/(-x^3*y(x)+2*a*x^3+2*a*y(x)^4*x^3-16*y(x)^2*a^2*x^2+32*a^3*x+2*a*
```

, could not solve

```
dsolve(diff(y(x),x) = 2*a*x/(-x^3*y(x)+2*a*x^3+2*a*y(x)^4*x^3-16*y(x)^2*a^2*x^2+32*a^3*
24*y(x)^4*a^2*x^2+96*y(x)^2*x*a^3-128*a^4),y(x))
```

ODE No. 913

$$y'(x) = \frac{y(x)^3 + y(x) + y(x)^3\left(-\log^3(x)\right) + y(x)^3\log^2(x) + 3y(x)^2\log^2(x) - 2y(x)^2\log(x) - 3y(x)\log(x) +}{xy(x)}$$

✓ **Mathematica** : cpu = 0.758696 (sec), leaf count = 716

```
DSolve[Derivative[1][y][x] == (1 + y[x] - 3*Log[x]*y[x] - 2*Log[x]*y[x]^2 + 3*Log[x]^2*y[x]^2
```

$$\text{Solve}\left[\int_1^{y(x)}\left(2\text{RootSum}\left[\#1^3K[1]^3 - \#1^2K[1]^3 - 2K[1]^3 - 3\#1^2K[1]^2 + 2\#1K[1]^2 + 3\#1K[1] - K[1] -\right.\right.$$

✓ **Maple** : cpu = 0.189 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = -(-y(x)^3-y(x)+2*y(x)^2*ln(x)-ln(x)^2*y(x)^3-1+3*y(x)*ln(x)-3*ln(x)^2*y
```

$$y(x) = \frac{9}{9\ln(x) + 56\,\text{RootOf}\left(-81\left(\int^{-Z}\frac{1}{3136\_a^3 - 27\_a + 27}d\_a\right) - \ln(x) + 3c_1\right) - 3}$$

ODE No. 914

$$y'(x) = \frac{2a(-4a + xy(x)^2 + x)}{-128a^4 + 96a^3xy(x)^2 - 24a^2x^2y(x)^4 + 2ax^3y(x)^6 + 4ax^2y(x) - x^3y(x)^3 - x^3y(x)}$$

✓ **Mathematica** : cpu = 1.00516 (sec), leaf count = 401

```
DSolve[Derivative[1][y][x] == (2*a*(-4*a + x + x*y[x]^2))/(-128*a^4 + 4*a*x^2*y[x] - x^3*y[x]
```

$$\{\{y(x) \to \text{Root}\left[8\#1^5ax^2 - 8\#1^4ac_1x^2 - 64\#1^3a^2x + \#1^2\left(2x^2 + 64a^2c_1x\right) + 128\#1a^3 - 128a^3c_1 - 8ax +\right.$$

✓ **Maple** : cpu = 5.042 (sec), leaf count = 71

```
dsolve(diff(y(x),x) = 2*a*(x*y(x)^2-4*a+x)/(-x^3*y(x)^3+4*a*x^2*y(x)-x^3*y(x)+2*a*y(x)^6*x^3-
```

$$\frac{xy(x)^4 + (-4a + x)\,y(x)^2 - 2a}{2ay\,(x)^4\left(-xy\,(x)^2 + 4a\right)^2} + \frac{8ay(x)^5 + 2y(x)^2 + 1}{16a^2y\,(x)^4} + c_1 = 0$$

ODE No. 915

$$y'(x) = \frac{y(x)^3 + y(x) - 8y(x)^3 \log^3(x) + 4y(x)^3 \log^2(x) + 12y(x)^2 \log^2(x) - 4y(x)^2 \log(x) - 6y(x) \log(x) +}{xy(x)}$$

✓ **Mathematica** : cpu = 0.829654 (sec), leaf count = 724

```
DSolve[Derivative[1][y][x] == (1 + y[x] - 6*Log[x]*y[x] - 4*Log[x]*y[x]^2 + 12*Log[x]^2*y[x]^
```

$$\text{Solve}\left[\int_1^{y(x)} \left(4\text{RootSum}\left[8\#1^3 K[1]^3 - 4\#1^2 K[1]^3 - 3K[1]^3 - 12\#1^2 K[1]^2 + 4\#1 K[1]^2 + 6\#1 K[1] - K[\right.\right.\right.$$

✓ **Maple** : cpu = 0.083 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = -(-y(x)^3-y(x)+4*y(x)^2*ln(x)-4*ln(x)^2*y(x)^3-1+6*y(x)*ln(x)-12*ln(x)^
```

$$y(x) = \frac{9}{18\ln(x) + 83\,\text{RootOf}\left(-81\left(\int^{-Z} \frac{1}{6889\_a^3 - 27\_a + 27} d\_a\right) - \ln(x) + 3c_1\right) - 3}$$

ODE No. 916

$$y'(x) = \frac{y(x)\left(x^4 \log^2(y(x)) + 2x^4 \log(x)\log(y(x)) + x^4 \log^2(x) + x\log(y(x)) + \log(y(x)) - x + x\log(x) + l\right.}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.204728 (sec), leaf count = 43

```
DSolve[Derivative[1][y][x] == ((-1 - x + Log[x] + x*Log[x] + x^4*Log[x]^2 + Log[y[x]] + x*Log
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\frac{12x}{-3x^4+4x^3-6x^2+12x-12\log(x+1)+c_1}\right)}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.389 (sec), leaf count = 73

```
dsolve(diff(y(x),x) = y(x)*(ln(y(x))*x+ln(y(x))-x-1+x*ln(x)+ln(x)+x^4*ln(x)^2+2*x^4*ln(y(x))*
```

$$y(x) = \mathrm{e}^{\frac{-12\ln(1+x)\ln(x)+\left(-3x^4+4x^3-6x^2+12x+12c_1\right)\ln(x)-12x}{3x^4-4x^3+6x^2+12\ln(1+x)-12c_1-12x}}$$

ODE No. 917

$$y'(x) = \frac{y(x)\left(x\log^2(y(x)) + 2x\log(x)\log(y(x)) + x\log(y(x)) + \log(y(x)) - x + x\log^2(x) + x\log(x) + \log(\right.}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.199566 (sec), leaf count = 28

```
DSolve[Derivative[1][y][x] == ((-1 - x + Log[x] + x*Log[x] + x*Log[x]^2 + Log[y[x]] + x*Log[y
```

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

✓ **Maple** : cpu = 0.202 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = y(x)*(x*ln(x)+ln(x)+ln(y(x))*x+ln(y(x))-x-1+x*ln(x)^2+2*x*ln(y(x))*ln(x
```

$$y(x) = \mathrm{e}^{\frac{\ln(1+x)\ln(x)+(-x+c_1)\ln(x)-x}{-\ln(1+x)-c_1+x}}$$

ODE No. 918

$$y'(x) = \frac{2y(x)^8}{128x^3y(x)^6 + 32x^2y(x)^6 + 96x^2y(x)^4 + 2y(x)^6 + y(x)^5 + 16xy(x)^4 + 24xy(x)^2 + 2y(x)^2 + 2}$$

✓ **Mathematica** : cpu = 0.489549 (sec), leaf count = 720

```
DSolve[Derivative[1][y][x] == (2*y[x]^8)/(2 + 2*y[x]^2 + 24*x*y[x]^2 + 16*x*y[x]^4 + 96*x^2*y
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\text{RootSum}\left[64\#1^3K[1]^6 + 16\#1^2K[1]^6 + K[1]^6 + 48\#1^2K[1]^4 + 8\#1K[1]^4 + 12\#1K[1]^2 + I\right.\right.\right.$$

✓ **Maple** : cpu = 1.171 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = 2*y(x)^8/(y(x)^5+2*y(x)^6+2*y(x)^2+16*x*y(x)^4+32*y(x)^6*x^2+2+24*x*y(x
```

$$x - \text{RootOf}\left(\left(\int^{\_Z} \frac{1}{64\_a^3 + 16\_a^2 + 1} d\_a\right) y(x) + c_1 y(x) + 1\right) + \frac{1}{4y(x)^2} = 0$$

ODE No. 919

$$y'(x) = \frac{\left(-y(x) + \sqrt{y(x)} + x\right) y(x)^{3/2}}{x^3 - 3x^2 y(x) + 3x y(x)^2 + x y(x)^{3/2} - y(x)^3 - y(x)^{5/2} + y(x)^2}$$

✓ **Mathematica** : cpu = 0.302682 (sec), leaf count = 251

```
DSolve[Derivative[1][y][x] == ((x + Sqrt[y[x]] - y[x])*y[x]^(3/2))/(x^3 - 3*x^2*y[x] + x*y[x]
```

$$\{\{y(x) \to \text{Root}\left[\#1^9 {c_1}^4 - 6\#1^8 {c_1}^4 x + \#1^7\left(15{c_1}^4 x^2 - 6{c_1}^2\right) + \#1^6\left(-20{c_1}^4 x^3 + 30{c_1}^2 x - 4 + 2{c_1}^2\right) + \#1^5($$

✓ **Maple** : cpu = 0.195 (sec), leaf count = 82

```
dsolve(diff(y(x),x) = y(x)^(3/2)*(x-y(x)+y(x)^(1/2))/(y(x)^(3/2)*x-y(x)^(5/2)+y(x)^2+x^3-3*x^
```

$$-\frac{\left(x^3 c_1 - 6x - 1\right) y(x)^{\frac{5}{2}} + \left(-3x^2 c_1 + 3\right) y(x)^{\frac{7}{2}} - y(x)^{\frac{11}{2}} c_1 + 3y(x)^{\frac{3}{2}} x^2 + 3y(x)^{\frac{9}{2}} c_1 x - 2y(x)\left(x - y(x)\right)^3}{y(x)^{\frac{5}{2}}\left(x - y(x)\right)^3} =$$

ODE No. 920

$$y'(x) = \frac{2y(x)^6\left(4xy(x)^2 + y(x)^2 + 1\right)}{128x^3y(x)^6 + 96x^2y(x)^4 + 4xy(x)^5 + y(x)^5 + y(x)^3 + 24xy(x)^2 + 2}$$

✓ **Mathematica** : cpu = 0.393593 (sec), leaf count = 301

```
DSolve[Derivative[1][y][x] == (2*y[x]^6*(1 + y[x]^2 + 4*x*y[x]^2))/(2 + 24*x*y[x]^2 + y[x]^3
```

$$\left\{\left\{y(x) \to \text{Root}\left[\#1^5\left(128c_1x^2 - 8x - 1\right) + 128\#1^4x^2 + \#1^3(-2 + 64c_1x) + 64\#1^2x + 8\#1c_1 + 8\&, 1\right]\right\}, \{\right.$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x) = 2*y(x)^6*(1+4*x*y(x)^2+y(x)^2)/(y(x)^3+4*y(x)^5*x+y(x)^5+2+24*x*y(x)^2+
```

, could not solve

```
dsolve(diff(y(x),x) = 2*y(x)^6*(1+4*x*y(x)^2+y(x)^2)/(y(x)^3+4*y(x)^5*x+y(x)^5+2+24*x*y
```

ODE No. 921

$$y'(x) = y(x)\left(\_\mathrm{F1}(x) + \frac{\log(y(x))}{x} - \frac{\log(y(x))}{x\log(x)}\right)$$

✓ **Mathematica** : cpu = 0.245942 (sec), leaf count = 92

```
DSolve[Derivative[1][y][x] == y[x]*(Log[y[x]]/x - Log[y[x]]/(x*Log[x]) + _F1[x]),y[x],x]
```

$$\text{Solve}\left[\int_1^x \left(\frac{\log(y(x)) - \log(K[1])\log(y(x))}{K[1]^2} - \frac{\log(K[1])\_\mathrm{F1}(K[1])}{K[1]}\right) dK[1] + \int_1^{y(x)} \left(\frac{\log(x)}{xK[2]} - \int_1^x \frac{\frac{1}{K[2]} -}{K}\right.\right.$$

✓ **Maple** : cpu = 0.208 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = -(-1/x*ln(y(x))+1/x/ln(x)*ln(y(x))-_F1(x))*y(x),y(x))
```

$$y(x) = \mathrm{e}^{\frac{xc_1}{\ln(x)}}\mathrm{e}^{\frac{x\left(\int \frac{\_F1(x)\ln(x)}{x}dx\right)}{\ln(x)}}$$

ODE No. 922

$$y'(x) = \frac{y(x)^2}{x^3 - 3x^2y(x) + x^2\sqrt{y(x)} + 3xy(x)^2 - 2xy(x)^{3/2} - y(x)^3 + y(x)^{5/2} + y(x)^2 + y(x)^{3/2}}$$

✓ **Mathematica** : cpu = 1.14706 (sec), leaf count = 882

```
DSolve[Derivative[1][y][x] == y[x]^2/(x^3 + x^2*Sqrt[y[x]] - 3*x^2*y[x] + y[x]^(3/2) - 2*x*y[
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{-x - K[1]}{2\left(-2x^3 + 6K[1]x^2 - 2\sqrt{K[1]}x^2 - 6K[1]^2x + 4K[1]^{3/2}x + K[1]x + 2K[1]^3 - 2K[1]^{5/2} - K\right.\right.\right.$$

✓ **Maple** : cpu = 0.144 (sec), leaf count = 47

```
dsolve(diff(y(x),x) = y(x)^2/(y(x)^2+y(x)^(3/2)+y(x)^(1/2)*x^2-2*y(x)^(3/2)*x+y(x)^(5/2)+x^3-
```

$$\frac{\ln(y(x))}{2} - \left(\int^{\frac{x}{\sqrt{y(x)}} - \sqrt{y(x)}} \frac{1}{2\_a^3 + 2\_a^2 - \_a + 2} d\_a \right) - c_1 = 0$$

ODE No. 923

$$y'(x) = \frac{x^2 + 2xy(x) + e^{-2(x-y(x))(y(x)+x)} + y(x)^2}{x^2 + 2xy(x) - e^{-2(x-y(x))(y(x)+x)} + y(x)^2}$$

✓ **Mathematica** : cpu = 1.35597 (sec), leaf count = 432

```
DSolve[Derivative[1][y][x] == (E^(-2*(x - y[x])*(x + y[x])) + x^2 + 2*x*y[x] + y[x]^2)/(-E^(-
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{2e^{2(x-K[2])(x+K[2])}K[2]}{-e^{2(x-K[2])(x+K[2])}x^2 + e^{2(x-K[2])(x+K[2])}K[2]^2 + 1} - \int_1^{x} \left(-\frac{2e^{2(K[1]-K[2])(K[1]+K[2])}K[1](2(K\right.\right.\right.$$

✓ **Maple** : cpu = 0.402 (sec), leaf count = 36

```
dsolve(diff(y(x),x) = (y(x)^2+2*x*y(x)+x^2+exp(-2*(x-y(x))*(y(x)+x)))/(y(x)^2+2*x*y(x)+x^2-ex
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-\_Z + \int^{\mathrm{e}^{2\_Z} - 2\,\mathrm{e}^{\_Z x}} \frac{1}{\mathrm{e}^{2\_a} + \_a} d\_a + c_1\right)} - x$$

ODE No. 924

$$y'(x) = \frac{y(x)\left(\_\text{F1}(x) + \frac{\log^2(y(x))}{2x}\right)}{\log(y(x))}$$

✓ **Mathematica** : cpu = 0.251202 (sec), leaf count = 80

```
DSolve[Derivative[1][y][x] == (y[x]*(Log[y[x]]^2/(2*x) + _F1[x]))/Log[y[x]],y[x],x]
```

$$\text{Solve}\left[\int_1^x \left(-\frac{\log^2(y(x))}{2K[1]^2} - \frac{\_\text{F1}(K[1])}{K[1]}\right) dK[1] + \int_1^{y(x)} \left(\frac{\log(K[2])}{xK[2]} - \int_1^x -\frac{\log(K[2])}{K[1]^2 K[2]} dK[1]\right) dK[2] = c_1,\right.$$

✓ **Maple** : cpu = 0.123 (sec), leaf count = 46

```
dsolve(diff(y(x),x) = -(-1/2*ln(y(x))^2/x-_F1(x))/ln(y(x))*y(x),y(x))
```

$$y(x) = \mathrm{e}^{\sqrt{2\left(\int \frac{\_F1(x)}{x} dx\right)x + 2c_1 x}}$$

ODE No. 925

$$y'(x) = \frac{x^2 + 2xy(x) + e^{2(x-y(x))^2(y(x)+x)^2} + y(x)^2}{x^2 + 2xy(x) - e^{2(x-y(x))^2(y(x)+x)^2} + y(x)^2}$$

✓ **Mathematica** : cpu = 1.89132 (sec), leaf count = 228

```
DSolve[Derivative[1][y][x] == (E^(2*(x - y[x])^2*(x + y[x])^2) + x^2 + 2*x*y[x] + y[x]^2)/(-E
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{2K[2]}{-x^2 + e^{2(x-K[2])^2(x+K[2])^2} + K[2]^2} - \int_1^{x} \left(\frac{2K[1]\left(-2K[2] - e^{2(K[1]-K[2])^2(K[1]+K[2])^2}(4(K[1]\right.\right.\right.}{(K[1]^2 - e^{2(K[1]}\right.$$

✓ **Maple** : cpu = 0.287 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = (y(x)^2+2*x*y(x)+x^2+exp(2*(x-y(x))^2*(y(x)+x)^2))/(y(x)^2+2*x*y(x)+x^2
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-\_Z + \int^{\mathrm{e}^{2\_Z - 2\,\mathrm{e}^{-\_Z} x}} \frac{1}{\mathrm{e}^{2\_a^2} + \_a} d\_a + c_1\right)} - x$$

ODE No. 926

$$y'(x) = \frac{\frac{1}{16}x^3y(x)^3 - \frac{1}{2}x^2y(x)^3 - \frac{3}{8}x^2y(x)^2 + xy(x)^3 + xy(x)^2 + \frac{3}{4}xy(x) - \frac{1}{2}}{x(xy(x) - 2y(x) - 2)}$$

✓ **Mathematica** : cpu = 0.193882 (sec), leaf count = 128

```
DSolve[Derivative[1][y][x] == (-1/2 + (3*x*y[x])/4 + x*y[x]^2 - (3*x^2*y[x]^2)/8 + x*y[x]^3 -
```

$$\left\{\left\{y(x) \to \frac{2}{x-2} + \frac{1}{16x(x-2)\left(-\frac{1}{64} - \frac{e^{2\left(\frac{1}{2}\log(2-x) - \frac{\log(x)}{2}\right)}}{\sqrt{2048\log(x)+c_1}}\right)}\right\}, \left\{y(x) \to \frac{2}{x-2} + \frac{1}{16x(x-2)\left(-\frac{1}{64} + \frac{e^{2\left(\right.}}{\sqrt{}}\right.}\right.$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 67

```
dsolve(diff(y(x),x) = 1/16*(-8*x^2*y(x)^3+16*x*y(x)^2+16*x*y(x)^3-8+12*x*y(x)-6*x^2*y(x)^2+x^
```

$$y(x) = \frac{2\sqrt{c_1 + 8\ln(x)} + 8}{x\sqrt{c_1 + 8\ln(x)} + 4x - 8}$$

ODE No. 927

$$y'(x) = -\frac{1}{8}x\left(12e^{-x^2}x^2y(x)^2 + 8e^{-x^2}x^2y(x) + 8e^{-x^2}x^2 - 8e^{-x^2} + e^{-3x^2}x^6 - 6e^{-2x^2}x^4y(x) - 2e^{-2x^2}x^4 - 8y(\right.$$

✓ **Mathematica** : cpu = 0.589588 (sec), leaf count = 112

```
DSolve[Derivative[1][y][x] == -1/8*(x*(-8 - 8/E^x^2 + (8*x^2)/E^x^2 - (2*x^4)/E^(2*x^2) + x^6
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{1}{2}e^{-x^2}x\left(2e^{x^2}-3x^2\right)+3xy(x)}{\sqrt[3]{29}\sqrt[3]{x^3}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right]\right. = \frac{1}{18}29^{2/3}\left(x^3\right)^{2/}$$

✓ **Maple** : cpu = 0.106 (sec), leaf count = 68

```
dsolve(diff(y(x),x) = -1/8*(-8*exp(-x^2)+8*x^2*exp(-x^2)-8-8*y(x)^2+8*x^2*exp(-x^2)*y(x)-2*x^
```

$$y(x) = \frac{\left(58\,\text{RootOf}\left(x^2 - 162\left(\int^{-Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + 6c_1\right) + \left(9x^2 - 6\,\mathrm{e}^{x^2}\right)\mathrm{e}^{-x^2}\right)\mathrm{e}^{x^2}\mathrm{e}^{-x^2}}{18}$$

ODE No. 928

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

✓ **Mathematica** : cpu = 0.95621 (sec), leaf count = 23

```
DSolve[Derivative[1][y][x] == (E^(y[x]/x)*(x + x/E^(y[x]/x) + x^2/E^(y[x]/x) + y[x]/E^(y[x]/x
```

$$\left\{\left\{y(x) \to -x \log\left(-\frac{\log(x+1) - c_1}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.283 (sec), leaf count = 20

```
dsolve(diff(y(x),x) = (exp(-y(x)/x)*y(x)*x+exp(-y(x)/x)*y(x)+exp(-y(x)/x)*x^2+exp(-y(x)/x)*x+
```

$$y(x) = -\ln\left(\frac{-\ln(1+x) + c_1}{x}\right) x$$

ODE No. 929

$$y'(x) = \frac{-\frac{1}{32}x^3y(x)^3 + \frac{1}{16}x^2y(x)^3 + \frac{3}{16}x^2y(x)^2 - \frac{1}{2}xy(x)^3 + \frac{y(x)^3}{4} - \frac{1}{4}xy(x)^2 - \frac{3}{8}xy(x) + \frac{y(x)}{4} + \frac{1}{4}}{xy(x)}$$

✓ **Mathematica** : cpu = 0.757207 (sec), leaf count = 683

```
DSolve[Derivative[1][y][x] == (1/4 + y[x]/4 - (3*x*y[x])/8 - (x*y[x]^2)/4 + (3*x^2*y[x]^2)/16
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-32\text{RootSum}\left[\#1^3K[1]^3 - 2\#1^2K[1]^3 - 8K[1]^3 - 6\#1^2K[1]^2 + 8\#1K[1]^2 + 12\#1K[1] - 8\right.\right.\right.$$

✓ **Maple** : cpu = 0.037 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = -1/32/y(x)*(16*x*y(x)^3-8*y(x)^3-8*y(x)+8*x*y(x)^2-2*x^2*y(x)^3-8+12*x*
```

$$y(x) = \frac{18}{58\,\text{RootOf}\left(-324\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) - \ln(x) + 12c_1\right) + 9x - 6}$$

ODE No. 930

$$y'(x) = \frac{e^{\frac{y(x)}{x}} \left(x^4 + x^2 e^{-\frac{y(x)}{x}} + x e^{-\frac{y(x)}{x}} + x e^{-\frac{y(x)}{x}} y(x) + e^{-\frac{y(x)}{x}} y(x) \right)}{x(x+1)}$$

✓ **Mathematica** : cpu = 1.22919 (sec), leaf count = 39

```
DSolve[Derivative[1][y][x] == (E^(y[x]/x)*(x/E^(y[x]/x) + x^2/E^(y[x]/x) + x^4 + y[x]/E^(y[x]
```

$$\left\{ \left\{ y(x) \to -x \log \left(\frac{-\frac{x^3}{3} + \frac{x^2}{2} - x + \log(x+1) - c_1}{x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.408 (sec), leaf count = 36

```
dsolve(diff(y(x),x) = (exp(-y(x)/x)*y(x)*x+exp(-y(x)/x)*y(x)+exp(-y(x)/x)*x^2+exp(-y(x)/x)*x+
```

$$y(x) = -\ln \left(\frac{-2x^3 + 3x^2 + 6\ln(1+x) - 6c_1 - 6x}{6x} \right) x$$

ODE No. 931

$$y'(x) = \frac{x^6 + 3x^5 y(x) + 3x^4 y(x)^2 + x^3 y(x)^3 - 2x^3 - 3x^2 y(x) - x y(x)^2 - y(x) - 2x}{x\left(x^2 + x y(x) + 1\right)}$$

✓ **Mathematica** : cpu = 0.177271 (sec), leaf count = 80

```
DSolve[Derivative[1][y][x] == (-2*x - 2*x^3 + x^6 - y[x] - 3*x^2*y[x] + 3*x^5*y[x] - x*y[x]^2
```

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

✓ **Maple** : cpu = 0.04 (sec), leaf count = 73

```
dsolve(diff(y(x),x) = (-3*x^2*y(x)-2*x^3-2*x-x*y(x)^2-y(x)+x^3*y(x)^3+3*x^4*y(x)^2+3*x^5*y(x)
```

$$y(x) = \frac{-\sqrt{c_1 - 2x}\, x^2 + x^2 + 1}{x\left(\sqrt{c_1 - 2x} - 1\right)}$$

ODE No. 932

$$y'(x) = \frac{e^{-\frac{3x^2}{2}} x \left(3e^{3x^2} y(x)^3 + e^{\frac{9x^2}{2}} y(x)^3 + 18e^{3x^2} y(x)^2 + 9e^{\frac{9x^2}{2}} y(x)^2 + 27e^{3x^2} y(x) + 27e^{\frac{9x^2}{2}} y(x) + 27e^{\frac{9x^2}{2}} + 2\right.}{243y(x)}$$

✓ **Mathematica** : cpu = 4.36027 (sec), leaf count = 4323

```
DSolve[Derivative[1][y][x] == (x*(27*E^((9*x^2)/2) + 27*E^(3*x^2)*y[x] + 27*E^((9*x^2)/2)*y[x
```

$$\text{Solve}\left[\frac{x^2}{2} + \frac{27}{2}\text{RootSum}\left[y(x)^3\#1^3 + 9y(x)^2\#1^3 + 27y(x)\#1^3 + 27\#1^3 + 3y(x)^3\#1^2 + 18y(x)^2\#1^2 + 27y\right.\right.$$

✓ **Maple** : cpu = 0.128 (sec), leaf count = 54

```
dsolve(diff(y(x),x) = 1/243*(27*y(x)^3+27*exp(3*x^2)*y(x)+18*exp(3*x^2)*y(x)^2+3*y(x)^3*exp(3
```

$$y(x) = -\frac{369\,\mathrm{e}^{\frac{3x^2}{2}}}{123 + 123\,\mathrm{e}^{\frac{3x^2}{2}} - 136\,\text{RootOf}\left(-41x^2 - 50243409\left(\int^{-Z} \frac{1}{9248\_a^3 - 1860867\_a + 1860867} d\_a\right) + 27c_1\right)}$$

ODE No. 933

$$y'(x) = \frac{x^3 + x^3\left(-\log^3(x)\right) + x^3\log^2(x) + 3x^2y(x)\log^2(x) - 2x^2y(x)\log(x) + x^2 + xy(x)^2 + xy(x) + y(x)^3}{x^2}$$

✓ **Mathematica** : cpu = 0.240104 (sec), leaf count = 99

```
DSolve[Derivative[1][y][x] == (x^2 + x^3 + x^3*Log[x]^2 - x^3*Log[x]^3 + x*y[x] - 2*x^2*Log[x
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3y(x)}{x^2} + \frac{1-3\log(x)}{x}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^3}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{29^{2/3}}{9\sqrt[3]{\frac{1}{x^3}}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = -(-x^2-x*y(x)-x^3-x*y(x)^2+2*y(x)*x^2*ln(x)-x^3*ln(x)^2-y(x)^3+3*x*y(x)
```

$$y(x) = \frac{x\left(9\ln(x) - 3 + 29\,\text{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + x + 3c_1\right)\right)}{9}$$

ODE No. 934

$$y'(x) = -\frac{x^6}{64} - \frac{3x^5}{32} + \frac{3}{16}x^4 y(x) - \frac{x^4}{8} + \frac{3}{4}x^3 y(x) + \frac{x^3}{8} - \frac{3}{4}x^2 y(x)^2 + \frac{1}{4}x^2 y(x) + \frac{x^2}{4} - \frac{3}{2}x y(x)^2 - x y(x) + y(x)^3 + y(x)^2$$

✓ **Mathematica** : cpu = 0.283358 (sec), leaf count = 102

```
DSolve[Derivative[1][y][x] == 1 + x/2 + x^2/4 + x^3/8 - x^4/8 - (3*x^5)/32 - x^6/64 - x*y[x]
```

$$\text{Solve}\left[-\frac{31}{3}\text{RootSum}\left[-31\#1^3 + 3\ 2^{2/3}\sqrt[3]{31}\#1 - 31\&,\ \frac{\log\left(\sqrt[3]{\frac{2}{31}}\left(\frac{1}{4}(-3x^2 - 6x + 4) + 3y(x)\right) - \#1\right)}{2^{2/3}\sqrt[3]{31} - 31\#1^2}\&\right]\right]$$

✓ **Maple** : cpu = 0.061 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = 1/2*x+1+y(x)^2+1/4*x^2*y(x)-x*y(x)-1/8*x^4+1/8*x^3+1/4*x^2+y(x)^3-3/4*x
```

$$y(x) = \frac{x^2}{4} + \frac{x}{2} + \text{RootOf}\left(-x + 2\left(\int^{\_Z} \frac{1}{2\_a^3 + 2\_a^2 + 1}d\_a\right) + c_1\right)$$

ODE No. 935

$$y'(x) = \frac{x^6}{64} - \frac{3x^5}{16} + \frac{3}{16}x^4 y(x) + \frac{13x^4}{16} - \frac{3}{2}x^3 y(x) - \frac{3x^3}{2} + \frac{3}{4}x^2 y(x)^2 + \frac{7}{2}x^2 y(x) + x^2 - 3xy(x)^2 - 2xy(x) + y(x)^3 + y(x$$

✓ **Mathematica** : cpu = 47.4009 (sec), leaf count = 248

```
DSolve[Derivative[1][y][x] == 1 - x/2 + x^2 - (3*x^3)/2 + (13*x^4)/16 - (3*x^5)/16 + x^6/64 -
```

$$\text{Solve}\left[\frac{\sqrt[3]{2}\left(\frac{\frac{1}{4}(3x^2-12x+4)+3y(x)}{\sqrt[3]{2}}+2^{2/3}\right)\left(2^{2/3}-2^{2/3}\left(\frac{1}{4}(3x^2-12x+4)+3y(x)\right)\right)\left(\left(\frac{1}{4}(-3x^2+12x-4)-3y\right.\right.}{9\left(-\left(\frac{1}{4}(3x^2-12x+\right.\right.}\right.$$

✓ **Maple** : cpu = 0.193 (sec), leaf count = 55

```
dsolve(diff(y(x),x) = -1/2*x+1+y(x)^2+7/2*x^2*y(x)-2*x*y(x)+13/16*x^4-3/2*x^3+x^2+y(x)^3+3/4*
```

$$y(x) = \frac{e^{\text{RootOf}\left(\ln\left(e^{-Z}-4\right)e^{-Z}+c_1 e^{-Z}-\_Z e^{-Z}+e^{-Z}x-4\ln\left(e^{-Z}-4\right)-4c_1+4\_Z-4x+4\right)}}{4} - 1 - \frac{x^2}{4} + x$$

ODE No. 936

$$y'(x) = \frac{x^6}{512} - \frac{3x^5}{256} + \frac{3}{64}x^4 y(x) + \frac{5x^4}{128} - \frac{3}{16}x^3 y(x) - \frac{5x^3}{64} + \frac{3}{8}x^2 y(x)^2 + \frac{7}{16}x^2 y(x) + \frac{x^2}{16} - \frac{3}{4}x y(x)^2 - \frac{1}{2}x y(x) + y(x)^3 +$$

✓ **Mathematica** : cpu = 0.265812 (sec), leaf count = 99

```
DSolve[Derivative[1][y][x] == 1 - x/4 + x^2/16 - (5*x^3)/64 + (5*x^4)/128 - (3*x^5)/256 + x^6
```

$$\text{Solve}\left[-\frac{89}{3}\text{RootSum}\left[-89\#1^3 + 6\sqrt[3]{178}\#1 - 89\&, \frac{\log\left(\frac{2^{2/3}\left(\frac{1}{8}(3x^2-6x+8)+3y(x)\right)}{\sqrt[3]{89}} - \#1\right)}{2\sqrt[3]{178} - 89\#1^2}\&\right]\right] = \frac{89^{2/3}x}{18\sqrt[3]{2}} + c_1, y$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = -1/4*x+1+y(x)^2+7/16*x^2*y(x)-1/2*x*y(x)+5/128*x^4-5/64*x^3+1/16*x^2+y(
```

$$y(x) = -\frac{x^2}{8} + \frac{x}{4} + \text{RootOf}\left(-x + 4\left(\int^{-Z} \frac{1}{4\_a^3 + 4\_a^2 + 3} d\_a\right) + c_1\right)$$

ODE No. 937

$$y'(x) = \frac{2xy(x)^3 + y(x)^3 - 2y(x) + 6xy(x)\log^2(2x+1) + 3y(x)\log^2(2x+1) + 6xy(x)^2\log(2x+1) + 3y(x$$
$$(2x+1)(y(x) + \log(2x+1) + 1$$

✓ **Mathematica** : cpu = 0.279504 (sec), leaf count = 124

```
DSolve[Derivative[1][y][x] == (-2 - 2*Log[1 + 2*x] + Log[1 + 2*x]^3 + 2*x*Log[1 + 2*x]^3 - 2*
```

$$\left\{\left\{y(x) \to \frac{1}{(2x+1)\left(\frac{2x+1}{4x^2+4x+1} - \frac{1}{(2x+1)\sqrt{-2x+c_1}}\right)} - \log(2x+1) - 1\right\}, \left\{y(x) \to \frac{1}{(2x+1)\left(\frac{2x+1}{4x^2+4x+1} + \frac{}{(2x+}\right.\right.$$

✓ **Maple** : cpu = 0.08 (sec), leaf count = 79

```
dsolve(diff(y(x),x) = 1/(2*x+1)*(-2*y(x)-2*ln(2*x+1)-2+2*x*y(x)^3+y(x)^3+6*y(x)^2*ln(2*x+1)*x
```

$$y(x) = \frac{-\sqrt{c_1 - 2x}\,\ln(2x+1) + \ln(2x+1) + 1}{\sqrt{c_1 - 2x} - 1}$$

ODE No. 938

$$y'(x) = \frac{x^6 - 3x^5 + 3x^4 y(x) + 4x^4 - 6x^3 y(x) - 3x^3 + 3x^2 y(x)^2 + 5x^2 y(x) - x^2 - 3x y(x)^2 - 2x y(x) + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.23742 (sec), leaf count = 108

```
DSolve[Derivative[1][y][x] == (1 + x - x^2 - 3*x^3 + 4*x^4 - 3*x^5 + x^6 - 2*x*y[x] + 5*x^2*y
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3x^2-3x+1}{x}+\frac{3y(x)}{x}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^3}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right]\right] = \frac{1}{9}29^{2/3}\left(\frac{1}{x^3}\right)^{2/3} x^2 \log($$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = (-x^2+x+1+y(x)^2+5*x^2*y(x)-2*x*y(x)+4*x^4-3*x^3+y(x)^3+3*x^2*y(x)^2-3*
```

$$y(x) = -x^2 + x - \frac{1}{3} + \frac{29\,\text{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + \ln(x) + 3c_1\right)}{9}$$

ODE No. 939

$$y'(x) = \frac{x^6 + 6x^5 - 12x^4 y(x) + 12x^4 - 48x^3 y(x) + 16x^3 + 48x^2 y(x)^2 - 48x^2 y(x) + 16x^2 + 96x y(x)^2 - 32x}{16x^2 - 64y(x) + 32x - 64}$$

✓ **Mathematica** : cpu = 0.509029 (sec), leaf count = 136

```
DSolve[Derivative[1][y][x] == (-32*x + 16*x^2 + 16*x^3 + 12*x^4 + 6*x^5 + x^6 - 32*x*y[x] - 4
```

$$\text{Solve}\left[\frac{2}{5}\text{RootSum}\left[\#1^4 + 4\#1^3 - 8\#1^2 y(x) - 16\#1 y(x) - 8\#1 + 16y(x)^2 + 16y(x) + 8\&, \frac{\#1^2(-\log(x -}\right.\right.$$

✓ **Maple** : cpu = 0.088 (sec), leaf count = 70

```
dsolve(diff(y(x),x) = (-32*x*y(x)+16*x^3+16*x^2-32*x-64*y(x)^3+48*x^2*y(x)^2+96*x*y(x)^2-12*y
```

$$x - \frac{4\ln\left(y(x) - \frac{x^2}{4} - \frac{x}{2} - 1\right)}{5} + \frac{2\ln\left(2\left(y(x) - \frac{x^2}{4} - \frac{x}{2}\right)^2 + 2y(x) - \frac{x^2}{2} - x + 1\right)}{5} - \frac{2\arctan\left(-2y(x) + \frac{x^2}{2} +}{5}$$

ODE No. 940

$$y'(x) = \frac{x^3 \log^3(x) - 3x^2 y(x) \log^2(x) - x^2 + x^2 \log(x) - y(x)^3 - y(x)^2 - 2xy(x) + 3xy(x)^2 \log(x) + xy(x) l}{x(-y(x) - x + x \log(x))}$$

✓ **Mathematica** : cpu = 0.204781 (sec), leaf count = 80

```
DSolve[Derivative[1][y][x] == (-x^2 + x^2*Log[x] + x^3*Log[x]^3 - 2*x*y[x] + x*Log[x]*y[x] -
```

$$\left\{\left\{y(x) \to -\frac{1}{x\left(-\frac{1}{x^2} - \frac{1}{x^2\sqrt{-2x+c_1}}\right)} - x + x\log(x)\right\}, \left\{y(x) \to -\frac{1}{x\left(-\frac{1}{x^2} + \frac{1}{x^2\sqrt{-2x+c_1}}\right)} - x + x\log(x)\right\}\right.$$

✓ **Maple** : cpu = 0.067 (sec), leaf count = 63

```
dsolve(diff(y(x),x) = 1/x*(y(x)*ln(x)*x+x^2*ln(x)-2*x*y(x)-x^2-y(x)^2-y(x)^3+3*x*y(x)^2*ln(x)
```

$$y(x) = \frac{x\left(\ln(x)\sqrt{c_1 - 2x} - \ln(x) + 1\right)}{\sqrt{c_1 - 2x} - 1}$$

ODE No. 941

$$y'(x) = \frac{x^6 - 12x^5 + 12x^4 y(x) + 48x^4 - 96x^3 y(x) - 72x^3 + 48x^2 y(x)^2 + 192x^2 y(x) + 32x^2 - 192x y(x)^2 - }{16x^2 + 64y(x) - 64x + 64}$$

✓ **Mathematica** : cpu = 0.456035 (sec), leaf count = 53

```
DSolve[Derivative[1][y][x] == (-32*x + 32*x^2 - 72*x^3 + 48*x^4 - 12*x^5 + x^6 - 32*x*y[x] +
```

$$\text{Solve}\left[x - 8\text{RootSum}\left[11776\#1^3 - 40\#1 - 1\&, \#1 \log\left(17664\#1^2 - 1472\#1 + 11x^2 + 44y(x) - 44x - 40\right)\right.\right.$$

✓ **Maple** : cpu = 0.051 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = (-32*x*y(x)-72*x^3+32*x^2-32*x+64*y(x)^3+48*x^2*y(x)^2-192*x*y(x)^2+12*
```

$$y(x) = -\frac{x^2}{4} + x + \text{RootOf}\left(-x + \int^{-Z} \frac{\_a + 1}{\_a^3 - \_a - 1} d\_a + c_1\right)$$

ODE No. 942

$$y'(x) = \frac{-\exp\left(\frac{2(x-y(x))^3(y(x)+x)^3}{x^2-y(x)^2-1}\right) - x^2 - 2xy(x) - y(x)^2}{\exp\left(\frac{2(x-y(x))^3(y(x)+x)^3}{x^2-y(x)^2-1}\right) - x^2 - 2xy(x) - y(x)^2}$$

✓ **Mathematica** : cpu = 4.04824 (sec), leaf count = 349

```
DSolve[Derivative[1][y][x] == (-E^((2*(x - y[x])^3*(x + y[x])^3)/(-1 + x^2 - y[x]^2)) - x^2 -
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{2K[2]}{-x^2+\exp\left(\frac{2(x-K[2])^3(x+K[2])^3}{x^2-K[2]^2-1}\right)+K[2]^2} - \int_1^{x} \left(\frac{2K[1]\left(-2K[2]-\exp\left(\frac{2(K[1]-K[2])^3(K[1]+K[2])^3}{K[1]^2-K[2]^2-1}\right)\right.\right.\right.\right.$$

$$\left.\left.\left.\left.\left(K\right.\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.663 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = -(y(x)^2+2*x*y(x)+x^2+exp(2*(x-y(x))^3*(y(x)+x)^3/(-y(x)^2+x^2-1)))/(-y
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-\_Z+\int^{\mathrm{e}^{2\_Z}\mathrm{e}^{-2\_Z}\mathrm{e}^{-Z_x}} \frac{1}{\frac{2\_a^3}{\mathrm{e}^{-a+1}}+\_a}\,d\_a+c_1\right)} - x$$

ODE No. 943

$$y'(x) = \frac{x^6 - 6x^5 + 24x^4 y(x) + 12x^4 - 96x^3 y(x) - 24x^3 + 192x^2 y(x)^2 + 96x^2 y(x) + 32x^2 - 384x y(x)^2 - 1}{64x^2 + 512y(x) - 128x + 512}$$

✓ **Mathematica** : cpu = 0.498528 (sec), leaf count = 53

```
DSolve[Derivative[1][y][x] == (-128*x + 32*x^2 - 24*x^3 + 12*x^4 - 6*x^5 + x^6 - 128*x*y[x] +
```

$$\text{Solve}\left[x - 16\text{RootSum}\left[6656\#1^3 - 23\#1 - 1\&, \#1 \log\left(79872\#1^2 - 18304\#1 + 181x^2 + 1448y(x) - 362x\right.\right.\right.$$

✓ **Maple** : cpu = 0.051 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = (-128*x*y(x)-24*x^3+32*x^2-128*x+512*y(x)^3+192*x^2*y(x)^2-384*x*y(x)^2
```

$$y(x) = -\frac{x^2}{8} + \frac{x}{4} + \text{RootOf}\left(-x + \int^{\_Z} \frac{4\_a + 4}{4\_a^3 - \_a - 1} d\_a + c_1\right)$$

ODE No. 944

$$y'(x) = \frac{a^3x^6 + 6a^2bx^5 + 12a^2x^4y(x) - 8a^2x^3 + 12ab^2x^4 + 48abx^3y(x) - 16abx^2 + 48ax^2y(x)^2 - 32axy(x) +}{16ax^2 + 32bx + 64y(x) + 64}$$

✓ **Mathematica** : cpu = 1.5874 (sec), leaf count = 233

```
DSolve[Derivative[1][y][x] == (-32*a*x - 16*a*b*x^2 - 8*a^2*x^3 + 8*b^3*x^3 + 12*a*b^2*x^4 +
```

$$\text{Solve}\left[x - 4\text{RootSum}\left[\#1^6a^3 + 6\#1^5a^2b + 12\#1^4a^2y(x) + 12\#1^4ab^2 + 48\#1^3aby(x) + 8\#1^3b^3 + 8\#1^2ab +\right.\right.$$

✓ **Maple** : cpu = 0.069 (sec), leaf count = 47

```
dsolve(diff(y(x),x) = (-32*a*x*y(x)-8*a^2*x^3-16*a*x^2*b-32*a*x+64*y(x)^3+48*a*x^2*y(x)^2+96*
```

$$y(x) = -\frac{a\,x^2}{4} - \frac{bx}{2} + \text{RootOf}\left(bx + 2\left(\int^{-Z} -\frac{b(\_a+1)}{2\_a^3 + \_ab + b}d\_a\right) + 2c_1\right)$$

ODE No. 945

$$y'(x) = \frac{8a^3x^3 + 12a^2x^4 + 48a^2x^2y(x) + 6ax^5 + 48ax^3y(x) - 16ax^2 + 96axy(x)^2 + x^6 + 12x^4y(x) - 8x^3 +}{32ax + 16x^2 + 64y(x) + 64}$$

✓ **Mathematica** : cpu = 1.22802 (sec), leaf count = 213

```
DSolve[Derivative[1][y][x] == (-32*x - 16*a*x^2 - 8*x^3 + 8*a^3*x^3 + 12*a^2*x^4 + 6*a*x^5 +
```

$$\text{Solve}\left[x - 4\text{RootSum}\left[\#1^6 + 6\#1^5a + 12\#1^4a^2 + 12\#1^4y(x) + 8\#1^3a^3 + 48\#1^3ay(x) + 48\#1^2a^2y(x) + 8\right.\right.$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = (-32*x*y(x)-8*x^3-16*a*x^2-32*x+64*y(x)^3+48*x^2*y(x)^2+96*a*x*y(x)^2+1
```

$$y(x) = -\frac{x^2}{4} - \frac{ax}{2} + \text{RootOf}\left(-x + \int^{-Z} \frac{2\_a + 2}{2\_a^3 + \_aa + a} d\_a + c_1\right)$$

ODE No. 946

$$y'(x) = \frac{x\left(12e^{-x^2}x^2y(x)^2 + 8e^{-x^2}x^2y(x) - 8e^{-x^2}y(x) + 4e^{-2x^2}x^2 + 8e^{-x^2}x^2 - 8e^{-x^2} + e^{-3x^2}x^6 - 6e^{-2x^2}x^4y\right.}{4e^{-x^2}x^2 - 8y(x) - 8}$$

✓ **Mathematica** : cpu = 0.63857 (sec), leaf count = 150

```
DSolve[Derivative[1][y][x] == (x*(-8/E^x^2 + (4*x^2)/E^(2*x^2) + (8*x^2)/E^x^2 - (4*x^4)/E^(2
```

$$\left\{\left\{y(x) \to -\frac{1}{2}e^{-x^2}\left(2e^{x^2} - x^2\right) + \frac{e^{-3x^2}}{8\left(\frac{1}{8}e^{-3x^2} - \frac{e^{-3x^2}}{\sqrt{-64x^2+c_1}}\right)}\right\}, \left\{y(x) \to -\frac{1}{2}e^{-x^2}\left(2e^{x^2} - x^2\right) + \frac{e}{8\left(\frac{1}{8}e^{-3x^2}\right.}\right.$$

✓ **Maple** : cpu = 0.132 (sec), leaf count = 85

```
dsolve(diff(y(x),x) = (-8*exp(-x^2)*y(x)+4*x^2*exp(-x^2)^2-8*exp(-x^2)+8*x^2*exp(-x^2)*y(x)-4
```

$$y(x) = \frac{2 + x^2\left(\sqrt{-x^2 + c_1} - 1\right)\mathrm{e}^{-x^2}}{2\sqrt{-x^2 + c_1} - 2}$$

ODE No. 947

$$y'(x) = \frac{x^3 \sin(x) + x^2 y(x)^2 + 2x^2 y(x) \cos(x) + \frac{x^2}{2} + x^2 \cos(x) + \frac{1}{2} x^2 \cos(2x) + 2xy(x) - 2xy(x) \sin(x) + x}{x^3}$$

✓ **Mathematica** : cpu = 0.37182 (sec), leaf count = 30

```
DSolve[Derivative[1][y][x] == (3/2 + x + x^2/2 + 2*x*Cos[x] + x^2*Cos[x] - Cos[2*x]/2 + (x^2*
```

$$\left\{\left\{y(x) \to -\frac{-\sin(x) + x\cos(x) + 1}{x} + \frac{1}{-\log(x) + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.313 (sec), leaf count = 44

```
dsolve(diff(y(x),x) = 1/2*(2*x^2*cos(x)+2*sin(x)*x^3-2*x*sin(x)+2*x+2*x^2*y(x)^2-4*y(x)*sin(x
```

$$y(x) = \frac{(\cos(x)\, x - \sin(x) + 1) \ln(x) - \cos(x)\, c_1 x + \sin(x)\, c_1 + x - c_1}{x\,(c_1 - \ln(x))}$$

ODE No. 948

$$y'(x) = -\frac{216y(x)}{36x^2 + 4y(x)^8 + 12y(x)^7 + 33y(x)^6 + 60y(x)^5 - 24xy(x)^4 - 216y(x)^4 - 36xy(x)^3 - 252y(x)^3 - 7}$$

✓ **Mathematica** : cpu = 0.654306 (sec), leaf count = 39

```
DSolve[Derivative[1][y][x] == (-216*y[x])/(36*x^2 - 216*y[x] - 72*x*y[x] - 396*y[x]^2 - 72*x*
```

$$\text{Solve}\left[\frac{36}{y(x)\left(2y(x)^3 + 3y(x)^2 + 6y(x) + 6\right) - 6x} + \log(y(x)) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.314 (sec), leaf count = 68

```
dsolve(diff(y(x),x) = -216*y(x)/(-216*y(x)^4-252*y(x)^3-396*y(x)^2-216*y(x)+36*x^2-72*x*y(x)+
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-12c_1\mathrm{e}^{4\_Z} - 2\,\mathrm{e}^{4\_Z}\_Z - 18c_1\mathrm{e}^{3\_Z} - 3\,\mathrm{e}^{3\_Z}\_Z - 36c_1\mathrm{e}^{2\_Z} - 6\,\mathrm{e}^{2\_Z}\_Z - 36c_1\mathrm{e}^{\_Z} - 6\_Z\mathrm{e}^{\_Z} + 36c_1x + 6\_Zx - 36\right)}$$

ODE No. 949

$$y'(x) = \frac{x^6 - 3x^5 + 3x^4 y(x) + x^4 - 6x^3 y(x) + 2x^3 + 3x^2 y(x)^2 + x^2 y(x) - 3x^2 - 3x y(x)^2 + x y(x) + y(x)^3 +}{x\left(x^2 + y(x) - x + 1\right)}$$

✓ **Mathematica** : cpu = 0.202494 (sec), leaf count = 76

```
DSolve[Derivative[1][y][x] == (x - 3*x^2 + 2*x^3 + x^4 - 3*x^5 + x^6 + x*y[x] + x^2*y[x] - 6*
```

$$\left\{\left\{y(x) \to -x^2 + x + \frac{1}{x\left(\frac{1}{x} - \frac{1}{x\sqrt{-2\log(x)+c_1}}\right)} - 1\right\}, \left\{y(x) \to -x^2 + x + \frac{1}{x\left(\frac{1}{x} + \frac{1}{x\sqrt{-2\log(x)+c_1}}\right)} - 1\right\}\right\}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 81

```
dsolve(diff(y(x),x) = (x^2*y(x)+x^4+2*x^3-3*x^2+x*y(x)+x+y(x)^3+3*x^2*y(x)^2-3*x*y(x)^2+3*y(x
```

$$y(x) = \frac{(-x^2 + x)\sqrt{c_1 - 2\ln(x)} + x^2 - x + 1}{-1 + \sqrt{c_1 - 2\ln(x)}}$$

ODE No. 950

$$y'(x) = \frac{a^3x^6}{64}+\frac{3}{32}a^2bx^5+\frac{3}{16}a^2x^4y(x)+\frac{a^2x^4}{16}+\frac{3}{16}ab^2x^4+\frac{3}{4}abx^3y(x)+\frac{1}{4}abx^3+\frac{3}{4}ax^2y(x)^2+\frac{1}{2}ax^2y(x)-\frac{ax}{2}+\frac{b^3}{8}$$

✓ **Mathematica** : cpu = 0.489397 (sec), leaf count = 141

```
DSolve[Derivative[1][y][x] == 1 - (a*x)/2 + (b^2*x^2)/4 + (a*b*x^3)/4 + (b^3*x^3)/8 + (a^2*x^
```

$$\text{Solve}\left[-\frac{1}{3}(27b+58)^{2/3}\text{RootSum}\left[\#1^3(27b+58)^{2/3}-3\ 2^{2/3}\#1+(27b+58)^{2/3}\&,\ \frac{\log\left(\frac{\sqrt[3]{2}(\frac{1}{4}(3ax^2+6bx+4)+3}{\sqrt[3]{27b+58}}\right.\right.\right.$$
$$\left.\left.\left.2^{2/3}-\#1^2(27b+\right.\right.\right.$$

✓ **Maple** : cpu = 0.076 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = -1/2*a*x+1+y(x)^2+1/2*a*x^2*y(x)+b*x*y(x)+1/16*a^2*x^4+1/4*a*x^3*b+1/4*
```

$$y(x) = -\frac{a\,x^2}{4}-\frac{bx}{2}+\text{RootOf}\left(-x+2\left(\int^{-Z}\frac{1}{2\_a^3+2\_a^2+b+2}d\_a\right)+c_1\right)$$

ODE No. 951

$$y'(x) = \frac{a^3x^3}{8}+\frac{3a^2x^4}{16}+\frac{3}{4}a^2x^2y(x)+\frac{a^2x^2}{4}+\frac{3ax^5}{32}+\frac{3}{4}ax^3y(x)+\frac{ax^3}{4}+\frac{3}{2}axy(x)^2+axy(x)+\frac{x^6}{64}+\frac{3}{16}x^4y(x)+\frac{x^4}{16}+$$

✓ **Mathematica** : cpu = 0.393057 (sec), leaf count = 140

```
DSolve[Derivative[1][y][x] == 1 - x/2 + (a^2*x^2)/4 + (a*x^3)/4 + (a^3*x^3)/8 + x^4/16 + (3*a
```

$$\text{Solve}\left[-\frac{1}{3}(27a+58)^{2/3}\text{RootSum}\left[\#1^3(27a+58)^{2/3}-3\ 2^{2/3}\#1+(27a+58)^{2/3}\&,\ \frac{\log\left(\frac{\sqrt[3]{2}(\frac{1}{4}(6ax+3x^2+4)+3}{\sqrt[3]{27a+58}}\right.}{2^{2/3}-\#1^2(27a+}\right.\right.$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = -1/2*x+1+y(x)^2+1/2*x^2*y(x)+a*x*y(x)+1/16*x^4+1/4*a*x^3+1/4*a^2*x^2+y(
```

$$y(x) = -\frac{x^2}{4}-\frac{ax}{2}+\text{RootOf}\left(-x+2\left(\int^{\_Z}\frac{1}{2\_a^3+2\_a^2+a+2}d\_a\right)+c_1\right)$$

ODE No. 952

$$y'(x) = \frac{-x^2\sqrt{x^2+y(x)^2}+xy(x)\sqrt{x^2+y(x)^2}+x^5\left(-\sqrt{x^2+y(x)^2}\right)+x^4y(x)\sqrt{x^2+y(x)^2}-x^4\sqrt{x^2+y(}}{x}$$

✓ **Mathematica** : cpu = 0.371185 (sec), leaf count = 341

```
DSolve[Derivative[1][y][x] == (y[x] - x^2*Sqrt[x^2 + y[x]^2] - x^4*Sqrt[x^2 + y[x]^2] - x^5*S
```

$$\left\{\left\{y(x)\to \frac{x-2\sqrt{x^2\tanh^2\left(\frac{1}{20}\left(-4\sqrt{2}x^5-5\sqrt{2}x^4-10\sqrt{2}x^2-20\sqrt{2}c_1\right)\right)-x^2\tanh^4\left(\frac{1}{20}\left(-4\sqrt{2}x^5-5\sqrt{2}\right.\right.}}{-1+2\tanh^2\left(\frac{1}{20}\left(-4\sqrt{2}x^5-5\sqrt{2}x^4-10\sqrt{2}x^2-20\sqrt{2}c_1\right)\right)}\right.\right.$$

✓ **Maple** : cpu = 0.297 (sec), leaf count = 62

```
dsolve(diff(y(x),x) = -(-y(x)+(y(x)^2+x^2)^(1/2)*x^2-x*(y(x)^2+x^2)^(1/2)*y(x)+x^4*(y(x)^2+x^
```

$$\ln\left(\frac{2x\left(\sqrt{2y(x)^2+2x^2}+y(x)+x\right)}{y(x)-x}\right)+\frac{\left(4x^5+5x^4+10x^2\right)\sqrt{2}}{20}-c_1-\ln(x)=0$$

ODE No. 953

$$y'(x) = \frac{y(x)\left(x^4\log^2(y(x)) + 2x^4\log(x)\log(y(x)) + x^4\log^2(x) + x^3\log^2(y(x)) + 2x^3\log(x)\log(y(x)) + x^3 l\right.}{x}$$

✓ **Mathematica** : cpu = 0.246193 (sec), leaf count = 36

```
DSolve[Derivative[1][y][x] == ((-1 + Log[x] + x*Log[x]^2 + x^3*Log[x]^2 + x^4*Log[x]^2 + Log[
```

$$\left\{\left\{y(x) \to \frac{e^{-\frac{20x}{4x^5+5x^4+10x^2+20c_1}}}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.371 (sec), leaf count = 145

```
dsolve(diff(y(x),x) = y(x)*(ln(x)+ln(y(x))-1+x*ln(x)^2+2*x*ln(y(x))*ln(x)+x*ln(y(x))^2+x^3*ln
```

$$y(x) = x^{-\frac{4x^5}{4x^5+5x^4+10x^2+20c_1}} x^{-\frac{5x^4}{4x^5+5x^4+10x^2+20c_1}} x^{-\frac{10x^2}{4x^5+5x^4+10x^2+20c_1}} x^{-\frac{20c_1}{4x^5+5x^4+10x^2+20c_1}} \mathrm{e}^{-\frac{20x}{4x^5+5x^4+10x^2+20c_1}}$$

ODE No. 954

$$y'(x) = \frac{\frac{24}{5}x^{7/2}y(x) - \frac{24x^{13/2}}{25} + \frac{8x^{7/2}}{5} - 8x^{3/2} - \frac{8x^9}{125} + \frac{12}{25}x^6y(x) + \frac{4x^6}{25} - \frac{24x^4}{5} - \frac{6}{5}x^3y(x)^2 - \frac{4}{5}x^3y(x) + \frac{6x^3}{5} + 1}{x}$$

✓ **Mathematica** : cpu = 0.349102 (sec), leaf count = 115

```
DSolve[Derivative[1][y][x] == (1 + Sqrt[x] + 4*x - 8*x^(3/2) + (6*x^3)/5 + (8*x^(7/2))/5 - (2
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{-6x^3-30\sqrt{x}+5}{5x} + \frac{3y(x)}{x}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^3}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right]\right] = \frac{1}{9}29^{2/3}\left(\frac{1}{x^3}\right)^{2/3}x^2$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 53

```
dsolve(diff(y(x),x) = 1/125*(150*x^3+125*x^(1/2)+125+125*y(x)^2-100*x^3*y(x)-500*y(x)*x^(1/2)
```

$$y(x) = \frac{18x^{\frac{7}{2}} + 145\,\text{RootOf}\left(-81\left(\int^{-Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + \ln(x) + 3c_1\right)\sqrt{x} - 15\sqrt{x} + 90x}{45\sqrt{x}}$$

ODE No. 955

$$y'(x) = \frac{-24x^{7/2}y(x) + \frac{24x^{13/2}}{5} + 14x^{7/2} + 40x^{3/2} + \frac{8x^9}{25} - \frac{12}{5}x^6y(x) + \frac{12x^6}{5} + 24x^4 + 6x^3y(x)^2 - 6x^3y(x) - 6}{x\left(2x^3 - 5y(x) + 10\sqrt{x} - 5\right)}$$

✓ **Mathematica** : cpu = 0.307405 (sec), leaf count = 112

```
DSolve[Derivative[1][y][x] == (-5*Sqrt[x] + 10*x + 40*x^(3/2) - 6*x^3 + 14*x^(7/2) + 24*x^4 +
```

$$\left\{\left\{y(x) \to \frac{1}{5}\left(2x^3 + 10\sqrt{x} - 5\right) - \frac{1}{125x\left(-\frac{1}{125x} - \frac{1}{x\sqrt{-31250\log(x) + c_1}}\right)}\right\}, \left\{y(x) \to \frac{1}{5}\left(2x^3 + 10\sqrt{x} - 5\right) - \right.\right.$$

✓ **Maple** : cpu = 0.098 (sec), leaf count = 101

```
dsolve(diff(y(x),x) = 1/25*(-150*x^3*y(x)+60*x^6+350*x^(7/2)-150*x^3-125*y(x)*x^(1/2)+250*x-1
```

$$y(x) = \frac{\left(2x^3 + 10\sqrt{x}\right)\sqrt{c_1 - 2\ln(x)} - 2x^3 - 10\sqrt{x} + 5}{5\sqrt{c_1 - 2\ln(x)} - 5}$$

ODE No. 956

$$y'(x) = \frac{y(x)\left(y(x)e^{\frac{2\log^2(x)}{\log(x)+1}}x^{\frac{2}{\log(x)+1}+2} + y(x)e^{\frac{2\log^2(x)}{\log(x)+1}}\log^2(x)x^{\frac{2}{\log(x)+1}+2} + 2y(x)e^{\frac{2\log^2(x)}{\log(x)+1}}\log(x)x^{\frac{2}{\log(x)+1}+2} - e^{\frac{2\log}{}}\right.}{x(\log(x)+1)}$$

✓ **Mathematica** : cpu = 1.17251 (sec), leaf count = 28

```
DSolve[Derivative[1][y][x] == (y[x]*(-1 - E^((2*Log[x]^2)/(1 + Log[x]))*x^(2 + 2/(1 + Log[x])
```

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

✓ **Maple** : cpu = 0.148 (sec), leaf count = 79

```
dsolve(diff(y(x),x) = 1/(ln(x)+1)*y(x)*(-1-x^(2/(ln(x)+1))*exp(2/(ln(x)+1)*ln(x)^2)*x^2-x^(2/
```

$$y(x) = \frac{e^{-\frac{x^4}{4}}}{(\ln(x)+1)\left(x^{-\frac{2\ln(x)}{\ln(x)+1}}(\ln(x)+1)\,e^{\frac{(-4\ln(x)-4)\ln(\ln(x)+1)-x^4\ln(x)-x^4+8\ln(x)^2}{4\ln(x)+4}}+c_1\right)}$$

ODE No. 957

$$y'(x) = \frac{y(x)\left(y(x)e^{\frac{2\log^2(x)}{\log(x)+1}}x^{\frac{2}{\log(x)+1}+3} + y(x)e^{\frac{2\log^2(x)}{\log(x)+1}}\log^2(x)x^{\frac{2}{\log(x)+1}+3} + 2y(x)e^{\frac{2\log^2(x)}{\log(x)+1}}\log(x)x^{\frac{2}{\log(x)+1}+3} - e^{\frac{2\log}{\log}}\right.}{x(\log(x)+1)}$$

✓ **Mathematica** : cpu = 1.1374 (sec), leaf count = 28

```
DSolve[Derivative[1][y][x] == (y[x]*(-1 - E^((2*Log[x]^2)/(1 + Log[x]))*x^(3 + 2/(1 + Log[x])
```

$$\left\{\left\{y(x) \to \frac{1}{\left(1+c_1 e^{\frac{x^5}{5}}\right)(\log(x)+1)}\right\}\right\}$$

✓ **Maple** : cpu = 0.095 (sec), leaf count = 79

```
dsolve(diff(y(x),x) = 1/(ln(x)+1)*y(x)*(-1-x^3*x^(2/(ln(x)+1))*exp(2/(ln(x)+1)*ln(x)^2)-x^3*x
```

$$y(x) = \frac{e^{-\frac{x^5}{5}}}{(\ln(x)+1)\left(x^{-\frac{2\ln(x)}{\ln(x)+1}}(\ln(x)+1)\,e^{\frac{(-5\ln(x)-5)\ln(\ln(x)+1)-x^5\ln(x)-x^5+10\ln(x)^2}{5\ln(x)+5}}+c_1\right)}$$

ODE No. 958

$$y'(x) = \frac{2xy(x)^3 + y(x)^3 + 2xy(x)^2 + y(x)^2 + 6xy(x)\log^2(2x+1) + 3y(x)\log^2(2x+1) + 6xy(x)^2\log(2x+}{}$$

✓ **Mathematica** : cpu = 0.409979 (sec), leaf count = 82

```
DSolve[Derivative[1][y][x] == (-1 + 2*x + Log[1 + 2*x]^2 + 2*x*Log[1 + 2*x]^2 + Log[1 + 2*x]^
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3y(x)+3\log(2x+1)+1}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = 1/(2*x+1)*(2*x+4*y(x)*ln(2*x+1)*x+6*y(x)^2*ln(2*x+1)*x+6*y(x)*ln(2*x+1)
```

$$y(x) = -\ln(2x+1) - \frac{1}{3} + \frac{29\,\text{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + x + 3c_1\right)}{9}$$

ODE No. 959

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(x^3\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2x}\right) - \frac{1}{2}y(x)\sin\left(\frac{y(x)}{x}\right) + \frac{1}{2}y(x)\sin\left($$
$$x$$

✓ **Mathematica** : cpu = 0.227861 (sec), leaf count = 20

```
DSolve[Derivative[1][y][x] == (Csc[y[x]/(2*x)]*Sec[y[x]/(2*x)]*Sec[y[x]/x]*(x^3*Cos[y[x]/(2*x
```

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

✓ **Maple** : cpu = 0.091 (sec), leaf count = 15

```
dsolve(diff(y(x),x) = 1/2*(-y(x)*sin(y(x)/x)+y(x)*sin(3/2*y(x)/x)*cos(1/2*y(x)/x)+y(x)*cos(1/
```

$$y(x) = \arcsin\left(\mathrm{e}^{\frac{x^2}{2}}c_1\right)x$$

ODE No. 960

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(x^2\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2x}\right) - \frac{1}{2}y(x)\sin\left(\frac{y(x)}{x}\right) + \frac{1}{2}y(x)\sin\left(\right.\right.}{x}$$

✓ **Mathematica** : cpu = 0.170872 (sec), leaf count = 14

```
DSolve[Derivative[1][y][x] == (Csc[y[x]/(2*x)]*Sec[y[x]/(2*x)]*Sec[y[x]/x]*(x^2*Cos[y[x]/(2*x
```

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

✓ **Maple** : cpu = 0.057 (sec), leaf count = 11

```
dsolve(diff(y(x),x) = 1/2*(-y(x)*sin(y(x)/x)+y(x)*sin(3/2*y(x)/x)*cos(1/2*y(x)/x)+y(x)*cos(1/
```

$$y(x) = \arcsin\left(\mathrm{e}^x c_1\right) x$$

ODE No. 961

$$y'(x) = \frac{\exp\left(-2x^6+6x^4y(x)^2+2x^4-6x^2y(x)^4-4x^2y(x)^2+2y(x)^6+2y(x)^4+2\right)+x^2+2xy(x)+y(x)}{-\exp\left(-2x^6+6x^4y(x)^2+2x^4-6x^2y(x)^4-4x^2y(x)^2+2y(x)^6+2y(x)^4+2\right)+x^2+2xy(x)+y(x}$$

✓ **Mathematica** : cpu = 4.73342 (sec), leaf count = 813

```
DSolve[Derivative[1][y][x] == (E^(2 + 2*x^4 - 2*x^6 - 4*x^2*y[x]^2 + 6*x^4*y[x]^2 + 2*y[x]^4
```

$$\text{Solve}\left[\int_1^x \left(\frac{1}{K[1]+y(x)} - \frac{2e^{2K[1]^6+6y(x)^4K[1]^2+4y(x)^2K[1]^2}K[1]}{e^{2K[1]^6+6y(x)^4K[1]^2+4y(x)^2K[1]^2}K[1]^2 - e^{2y(x)^6+2y(x)^4+6K[1]^4y(x)^2+2K[1]^4+2} - e^{2K[1]^6+6y}}\right.\right.$$

✓ **Maple** : cpu = 0.4 (sec), leaf count = 45

```
dsolve(diff(y(x),x) = (y(x)^2+2*x*y(x)+x^2+exp(2+2*y(x)^4-4*x^2*y(x)^2+2*x^4+2*y(x)^6-6*x^2*y
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-\_Z+\int^{\mathrm{e}^{2\_Z}-2\,\mathrm{e}^{\_Z}x}\frac{1}{\mathrm{e}^{2\_a^3+2\_a^2+2+\_a}}d\_a+c_1\right)} - x$$

ODE No. 962

$$y'(x) = \frac{4(a-1)(a+1)x(a^2x^2 -}{a^8x^6 - 4a^6x^6 - 3a^6x^4y(x)^2 + 6a^4x^6 + 9a^4x^4y(x)^2 + 3a^4x^2y(x)^4 - 4a^2x^6 - 9a^2x^4y(x)^2 - 6a^2x^2y(x)}$$

✓ **Mathematica** : cpu = 3.94572 (sec), leaf count = 1191

```
DSolve[Derivative[1][y][x] == (4*(-1 + a)*(1 + a)*x*(-2 - x^2 + a^2*x^2 - y[x]^2))/(x^6 - 4*a
```

$$\{\{y(x) \to \text{Root}\left[2x^4a^8 - 8x^4a^6 + e^{c_1}x^4a^4 + 11x^4a^4 - 2e^{c_1}x^4a^2 - 6x^4a^2 + 4x^2a^2 + \left(2a^2 - 2\right)\#1^5 + e^{c_1}x^4 +\right.$$

✓ **Maple** : cpu = 1.407 (sec), leaf count = 79

```
dsolve(diff(y(x),x) = 4*x*(a-1)*(a+1)*(-y(x)^2+a^2*x^2-x^2-2)/(-4*y(x)^3+4*a^2*x^2*y(x)-4*x^2
```

$$-\frac{y(x)}{(a-1)(a+1)} + \frac{2}{(a^2-1)^2\left(a^2x^2 - x^2 - y(x)^2\right)^2} - \frac{2}{(a^2-1)^2\left(a^2x^2 - x^2 - y(x)^2\right)} + c_1 = 0$$

ODE No. 963

$$y'(x) = \frac{-\frac{5x^3}{2} + \frac{15}{4}x^3\cos(x) - \frac{3}{2}x^3\cos(2x) + \frac{1}{4}x^3\cos(3x) + \frac{9}{2}x^2y(x) - 6x^2y(x)\cos(x) + \frac{3}{2}x^2y(x)\cos(2x) + \frac{3}{2}}{}$$

✓ **Mathematica** : cpu = 0.46152 (sec), leaf count = 108

```
DSolve[Derivative[1][y][x] == (1 + x + (3*x^2)/2 - (5*x^3)/2 - x*Cos[x] - 2*x^2*Cos[x] + (15*
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3y(x)}{x} + \frac{-3x+3x\cos(x)+1}{x}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^3}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right]\right] = \frac{1}{9}29^{2/3}\left(\frac{1}{x^3}\right)^{2/3}x$$

✓ **Maple** : cpu = 0.214 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = 1/4*(-4*cos(x)*x+4*x^2*sin(x)+4*x+4+4*y(x)^2+8*y(x)*cos(x)*x-8*x*y(x)+2
```

$$y(x) = -\cos(x)\,x + x - \frac{1}{3} + \frac{29\,\text{RootOf}\left(-81\left(\int^{-Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + \ln(x) + 3c_1\right)}{9}$$

ODE No. 964

$$y'(x) = -\frac{}{a^8x^6 - 4a^6x^6 - 3a^6x^4y(x)^2 - 2a^6x^4 + 6a^4x^6 + 9a^4x^4y(x)^2 + 6a^4x^4 + 3a^4x^2y(x)^4 + 4a^4x^2y(x)^2 -$$

✓ **Mathematica** : cpu = 3.48779 (sec), leaf count = 264

```
DSolve[Derivative[1][y][x] == (-8*(-1 + a)*(1 + a)*x)/(8 - 8*a^2 + 2*x^4 - 6*a^2*x^4 + 6*a^4*
```

$$\text{Solve}\left[\frac{y(x)}{(a-1)(a+1)} - \frac{8\text{RootSum}\left[-\#1^3a^6 + 3\#1^3a^4 - 3\#1^3a^2 + \#1^3 + 3\#1^2a^4y(x)^2 + 2\#1^2a^4 - 6\#1^2\right.\right.}{}$$

✓ **Maple** : cpu = 2.365 (sec), leaf count = 80

```
dsolve(diff(y(x),x) = -8*x*(a-1)*(a+1)/(8-8*y(x)+2*x^4+3*a^4*y(x)^4*x^2-3*a^6*y(x)^2*x^4+9*y(
```

$$\frac{y(x)}{(a-1)(a+1)} + \frac{4\left(\sum_{\_R=\text{RootOf}(\_Z^3+2\_Z^2+8)} \frac{\ln\left(-a^2x^2+x^2+y(x)^2-\_R\right)}{3\_R^2+4\_R}\right)}{a^4-2a^2+1} - c_1 = 0$$

ODE No. 965

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(x^4\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2x}\right)+x^3\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2}\right.\right.$$

✓ **Mathematica** : cpu = 0.278253 (sec), leaf count = 29

```
DSolve[Derivative[1][y][x] == (Csc[y[x]/(2*x)]*Sec[y[x]/(2*x)]*Sec[y[x]/x]*(x*Cos[y[x]/(2*x)]
```

$$\left\{\left\{y(x)\to x\sin^{-1}\left(xe^{\frac{x^3}{3}+\frac{x^2}{2}+c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.069 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = 1/2*(-y(x)*sin(y(x)/x)+y(x)*sin(3/2*y(x)/x)*cos(1/2*y(x)/x)+y(x)*cos(1/
```

$$y(x) = \arcsin\left(x\,\mathrm{e}^{\frac{x^3}{3}}\mathrm{e}^{\frac{x^2}{2}}c_1\right)x$$

ODE No. 966

$$y'(x) = -\frac{}{216x^3 - 216x^2y(x)^4 - 324x^2y(x)^3 - 648x^2y(x)^2 - 648x^2y(x) + 216x^2 - 8y(x)^{12} - 36y(x)^{11} - 12}$$

✓ **Mathematica** : cpu = 0.721135 (sec), leaf count = 292

```
DSolve[Derivative[1][y][x] == (-1296*y[x])/(216 + 216*x^2 + 216*x^3 - 1296*y[x] - 432*x*y[x]
```

$$\text{Solve}\left[72\text{RootSum}\left[-216\#1^3 + 216\#1^2y(x)^4 + 324\#1^2y(x)^3 + 648\#1^2y(x)^2 + 648\#1^2y(x) - 216\#1^2 - 72\right.\right.$$

✓ **Maple** : cpu = 0.599 (sec), leaf count = 50

```
dsolve(diff(y(x),x) = -1296*y(x)/(216-1728*y(x)^3-2376*y(x)^2-1296*y(x)+216*x^2+216*x*y(x)^2-
```

$$y(x) = \mathrm{e}^{\text{RootOf}\left(-\_Z - 6\left(\int^{x} -\frac{\mathrm{e}^{4\_Z}}{3} - \frac{\mathrm{e}^{3\_Z}}{2} - \mathrm{e}^{2\_Z} - \mathrm{e}^{\_Z} \frac{1}{\_a^3 + \_a^2 + 1} d\_a\right) + c_1\right)}$$

ODE No. 967

$$y'(x) = -\frac{x(64x^9 - 288x^8y(x) - 96x^8 + 432x^7y(x)^2 + 288x^7y(x) - 144x^7 - 216x^6y(x)^3 - 216x^6y(x)^2 - 28}$$

✓ **Mathematica** : cpu = 0.524111 (sec), leaf count = 151

```
DSolve[Derivative[1][y][x] == -1/216*(x*(-513 - 432*x - 1134*x^2 - 756*x^3 - 864*x^4 - 576*x^
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3xy(x)}{x^2+1} + \frac{-4x^4+2x^3+5x}{2\left(x^2+1\right)^2}}{\sqrt[3]{29}\sqrt[3]{\frac{x^3}{(x^2+1)^3}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{29^{2/3}\left(\frac{x^3}{(x^2+1)^3}\right)^{2/3}}{1}\right.$$

✓ **Maple** : cpu = 0.078 (sec), leaf count = 91

```
dsolve(diff(y(x),x) = -1/216*x/(x^2+1)^4*(-513-432*x-216*y(x)^3-540*y(x)^2-378*y(x)-864*x^4-1
```

$$y(x) = \frac{58\,\text{RootOf}\left(-162\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + \ln\left(x^2+1\right) + 6c_1\right)x^2 + 12x^3 - 6x^2 + 58\,\text{RootOf}\left(-\right.}{18x^2 + 18}$$

ODE No. 968

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(x^4\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2x}\right) - \frac{1}{2}xy(x)\sin\left(\frac{y(x)}{x}\right) - \frac{1}{2}y(x)\sin\right.$$

✓ **Mathematica** : cpu = 0.354935 (sec), leaf count = 30

```
DSolve[Derivative[1][y][x] == (Csc[y[x]/(2*x)]*Sec[y[x]/(2*x)]*Sec[y[x]/x]*(x^4*Cos[y[x]/(2*x
```

$$\left\{\left\{y(x) \to x\sin^{-1}\left((x+1)e^{\frac{x^2}{2}-x-\frac{3}{2}+c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.088 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = 1/2*(-sin(y(x)/x)*y(x)*x-y(x)*sin(y(x)/x)+y(x)*sin(3/2*y(x)/x)*cos(1/2*
```

$$y(x) = \arcsin\left(\mathrm{e}^{\frac{x^2}{2}}\mathrm{e}^{-x}c_1(1+x)\right)x$$

ODE No. 969

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(-\frac{1}{2}xy(x)\sin\left(\frac{y(x)}{x}\right) - \frac{1}{2}y(x)\sin\left(\frac{y(x)}{x}\right) + x\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\right.$$

✓ **Mathematica** : cpu = 0.240143 (sec), leaf count = 19

```
DSolve[Derivative[1][y][x] == (Csc[y[x]/(2*x)]*Sec[y[x]/(2*x)]*Sec[y[x]/x]*(x*Cos[y[x]/(2*x)]
```

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

✓ **Maple** : cpu = 0.09 (sec), leaf count = 15

```
dsolve(diff(y(x),x) = 1/2*(y(x)*sin(3/2*y(x)/x)*cos(1/2*y(x)/x)*x+y(x)*sin(3/2*y(x)/x)*cos(1/
```

$$y(x) = \arcsin\left(\frac{xc_1}{1+x}\right)x$$

ODE No. 970

$$y'(x) = -\frac{}{216x^3 - 216x^2y(x)^4 - 324x^2y(x)^3 - 648x^2y(x)^2 - 648x^2y(x) - 8y(x)^{12} - 36y(x)^{11} - 126y(x)^{10} -}$$

✓ **Mathematica** : cpu = 0.637253 (sec), leaf count = 66

```
DSolve[Derivative[1][y][x] == (-216*y[x]*(6 + 6*x - 6*y[x] - 6*y[x]^2 - 3*y[x]^3 - 2*y[x]^4))
```

$$\text{Solve}\left[\frac{36(2y(x)^4 + 3y(x)^3 + 6y(x)^2 + 6y(x) - 6x - 3)}{(y(x)\,(2y(x)^3 + 3y(x)^2 + 6y(x) + 6) - 6x)^2} + \log(y(x)) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.678 (sec), leaf count = 181

```
dsolve(diff(y(x),x) = -216*y(x)*(-2*y(x)^4-3*y(x)^3-6*y(x)^2-6*y(x)+6*x+6)/(1728*y(x)^3-1296*
```

$$\frac{-6\sqrt{3\ln(y(x)) - 3c_1 + 9} + \left(2y(x)^4 + 3y(x)^3 + 6y(x)^2 - 6x + 6y(x)\right)\ln(y(x)) - 2c_1y(x)^4 - 3c_1y(x)^3 - 6}{6c_1 - 6\ln(y(x))}$$

ODE No. 971

$$y'(x) = \frac{(xy(x)+1)^3}{x^5}$$

✓ **Mathematica** : cpu = 0.287235 (sec), leaf count = 157

```
DSolve[Derivative[1][y][x] == (1 + x*y[x])^3/x^5,y[x],x]
```

$$\text{Solve}\left[\frac{1}{3}\log\left(\frac{\frac{3}{x^3}+\frac{3y(x)}{x^2}}{3\sqrt[3]{-\frac{1}{x^6}}}+1\right)-\frac{1}{6}\log\left(\frac{\left(\frac{3}{x^3}+\frac{3y(x)}{x^2}\right)^2}{9\left(-\frac{1}{x^6}\right)^{2/3}}-\frac{\frac{3}{x^3}+\frac{3y(x)}{x^2}}{3\sqrt[3]{-\frac{1}{x^6}}}+1\right)+\frac{\tan^{-1}\left(\frac{\frac{2\left(\frac{3}{x^3}+\frac{3y(x)}{x^2}\right)}{3\sqrt[3]{-\frac{1}{x^6}}}-1}{\sqrt{3}}\right)}{\sqrt{3}}=-\right.$$

✓ **Maple** : cpu = 0.279 (sec), leaf count = 86

```
dsolve(diff(y(x),x) = (x*y(x)+1)^3/x^5,y(x))
```

$$y(x)=\frac{\left(3\tan\left(\text{RootOf}\left(-18x^3\left(-\frac{1}{x^6}\right)^{\frac{2}{3}}-6\_Z\sqrt{3}-\ln\left(\frac{\left(\sqrt{3}+\tan\left(\_Z\right)\right)^6}{\left(\tan^2\left(\_Z\right)+1\right)^3}\right)+18c_1\right)\right)x^3\left(-\frac{1}{x^6}\right)^{\frac{1}{3}}+\sqrt{3}\left(x^3\right.\right.}{6x}$$

ODE No. 972

$$y'(x) = \frac{x(-2x^4 + 2x^2 y(x) - x^2 + 1)}{y(x) - x^2}$$

✓ **Mathematica** : cpu = 0.0358921 (sec), leaf count = 32

```
DSolve[Derivative[1][y][x] == (x*(1 - x^2 - 2*x^4 + 2*x^2*y[x]))/(-x^2 + y[x]),y[x],x]
```

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

✓ **Maple** : cpu = 0.165 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = x*(-x^2+2*x^2*y(x)-2*x^4+1)/(y(x)-x^2),y(x))
```

$$y(x) = x^2 + \frac{\text{LambertW}\left(-2\,\mathrm{e}^{x^4}\mathrm{e}^{-2x^2}c_1\mathrm{e}^{-1}\right)}{2} + \frac{1}{2}$$

ODE No. 973

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

✓ **Mathematica** : cpu = 0.406176 (sec), leaf count = 146

```
DSolve[Derivative[1][y][x] == (y[x]*(E^(2*b*x) + E^(b*x)*y[x] + y[x]^2))/E^(2*b*x),y[x],x]
```

$$\text{Solve}\left[-\frac{1}{3}(9b-7)^{2/3}\text{RootSum}\left[\#1^3(9b-7)^{2/3} - 9\#1 b + 6\#1 + (9b-7)^{2/3}\&,\ \frac{\log\left(\frac{3e^{-2bx}y(x)+e^{-bx}}{\sqrt[3]{(9b-7)e^{-3bx}}} - \#1\right.\right.\right.$$
$$\left.\left.\left.\#1^2\left(-(9b-7)^{2/3}\right) + 3b -\right.\right.\right.$$

✓ **Maple** : cpu = 0.37 (sec), leaf count = 134

```
dsolve(diff(y(x),x) = y(x)*(y(x)^2+y(x)*exp(b*x)+exp(b*x)^2)/exp(b*x)^2,y(x))
```

$$y(x) = -\frac{\tan\left(\text{RootOf}\left(-\ln\left(\frac{4\left(\tan^2\left(\_Z\right)\right)b-3\left(\tan^2\left(\_Z\right)\right)+4b-3}{\left(\tan\left(\_Z\right)\sqrt{-e^{2bx}(4b-3)}+e^{bx}\right)^2}\right)\sqrt{-e^{2bx}(4b-3)} + c_1\sqrt{-e^{2bx}(4b-3)} - 2\right.\right.}{2}$$

ODE No. 974

$$y'(x) = -x^6 + 3x^4 y(x) - 3x^2 y(x)^2 + y(x)^3 + 2x$$

✓ **Mathematica** : cpu = 0.083613 (sec), leaf count = 39

```
DSolve[Derivative[1][y][x] == 2*x - x^6 + 3*x^4*y[x] - 3*x^2*y[x]^2 + y[x]^3,y[x],x]
```

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

✓ **Maple** : cpu = 0.039 (sec), leaf count = 57

```
dsolve(diff(y(x),x) = y(x)^3-3*x^2*y(x)^2+3*y(x)*x^4-x^6+2*x,y(x))
```

$$y(x) = \frac{x^2\sqrt{2c_1 - 2x} - 1}{\sqrt{2c_1 - 2x}}$$

ODE No. 975

$$y'(x) = \frac{x^6}{27} + \frac{1}{3}x^4 y(x) + x^2 y(x)^2 + y(x)^3 - \frac{2x}{3}$$

✓ **Mathematica** : cpu = 0.0893045 (sec), leaf count = 47

```
DSolve[Derivative[1][y][x] == (-2*x)/3 + x^6/27 + (x^4*y[x])/3 + x^2*y[x]^2 + y[x]^3,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{x^2}{3} - \frac{1}{\sqrt{-2x + c_1}}\right\}, \left\{y(x) \to -\frac{x^2}{3} + \frac{1}{\sqrt{-2x + c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 59

```
dsolve(diff(y(x),x) = y(x)^3+x^2*y(x)^2+1/3*y(x)*x^4+1/27*x^6-2/3*x,y(x))
```

$$y(x) = -\frac{x^2\sqrt{-54c_1 - 2x} - 3}{3\sqrt{-54c_1 - 2x}}$$

ODE No. 976

$$y'(x) = \frac{y(x)\left(x^7 y(x)^2 + x^4 y(x) + x - 3\right)}{x}$$

✓ **Mathematica** : cpu = 0.180744 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (y[x]*(-3 + x + x^4*y[x] + x^7*y[x]^2))/x,y[x],x]
```

$$\text{Solve}\left[-\frac{7}{3}\text{RootSum}\left[-7\#1^3 + 6\sqrt[3]{-7}\#1 - 7\&, \frac{\log\left(\frac{3x^6 y(x)+x^3}{\sqrt[3]{7}\sqrt[3]{-x^9}} - \#1\right)}{2\sqrt[3]{-7} - 7\#1^2}\&\right] = \frac{7^{2/3}\left(-x^9\right)^{2/3}}{9x^5} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.247 (sec), leaf count = 57

```
dsolve(diff(y(x),x) = y(x)/x*(y(x)^2*x^7+y(x)*x^4+x-3),y(x))
```

$$y(x) = \frac{\sqrt{3}\tan\left(\text{RootOf}\left(-\sqrt{3}\ln\left(\frac{\frac{9\left(\tan^2\left(\_Z\right)\right)}{7}+\frac{9}{7}}{\left(-3\tan\left(\_Z\right)+\sqrt{3}\right)^2}\right) + 3\sqrt{3}c_1 - 2\sqrt{3}x - 2\_Z\right)\right) - 1}{2x^3}$$

ODE No. 977

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

✓ **Mathematica** : cpu = 0.386356 (sec), leaf count = 139

```
DSolve[Derivative[1][y][x] == E^(2*x^2)*x*y[x]*(E^(-2*x^2) + y[x]/E^x^2 + y[x]^2),y[x],x]
```

$$\text{Solve}\left[-\frac{25}{3} \text{RootSum}\left[-25\#1^3 + 24\sqrt[3]{-1}15^{2/3}\#1 - 25\&, \frac{\log\left(\frac{3e^{2x^2} x y(x) + e^{x^2} x}{5^{2/3}\sqrt[3]{-e^{3x^2}x^3}} - \#1 \right)}{8\sqrt[3]{-1}15^{2/3} - 25\#1^2}\& \right] \right] = -\frac{5\sqrt[3]{5}e^{x^2}x^3}{18\sqrt[3]{-e^{3x^2}x^3}}$$

✓ **Maple** : cpu = 0.195 (sec), leaf count = 122

```
dsolve(diff(y(x),x) = y(x)*(y(x)^2+exp(-x^2)*y(x)+exp(-x^2)^2)/exp(-x^2)^2*x,y(x))
```

$$y(x) = \frac{\left(\sqrt{11}\tan\left(\text{RootOf}\left(-4\sqrt{11}\,x^2 + 4\sqrt{11}\ln(11) + 8\sqrt{11}\ln\left(-\frac{36\sqrt{11}}{11} + 36\tan(\_Z) \right) - 4\sqrt{11}\ln\left(\frac{14}{} \right.\right.\right.\right.}{2}$$

ODE No. 978

$$y'(x) = \frac{y(x)\left(x^2 + xy(x) + y(x)^2 + x\right)}{x^2}$$

✓ **Mathematica** : cpu = 0.183538 (sec), leaf count = 60

```
DSolve[Derivative[1][y][x] == (y[x]*(x + x^2 + x*y[x] + y[x]^2))/x^2,y[x],x]
```

$$\text{Solve}\left[-\frac{1}{2}\log\left(\frac{y(x)^2}{x^2} + \frac{y(x)}{x} + 1\right) + \log\left(\frac{y(x)}{x}\right) - \frac{\tan^{-1}\left(\frac{\frac{2y(x)}{x}+1}{\sqrt{3}}\right)}{\sqrt{3}} = x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.178 (sec), leaf count = 71

```
dsolve(diff(y(x),x) = y(x)/x^2*(y(x)^2+x*y(x)+x^2+x),y(x))
```

$$y(x) = -\frac{x}{2} + \frac{\sqrt{3}\,x\tan\left(\text{RootOf}\left(-\sqrt{3}\,\ln(3) - \sqrt{3}\,\ln\left(\frac{4}{3\left(\tan^2\left(\_Z\right)+1\right)}\right) - 2\sqrt{3}\,\ln\left(-\frac{\sqrt{3}}{6} + \frac{\tan\left(\_Z\right)}{2}\right) + 2\sqrt{}\right.\right.}{2}$$

ODE No. 979

$$y'(x) = \frac{-x^3 + 3x^2 y(x) - 3x y(x)^2 + y(x)^3 + x}{x}$$

✓ **Mathematica** : cpu = 0.101009 (sec), leaf count = 37

```
DSolve[Derivative[1][y][x] == (x - x^3 + 3*x^2*y[x] - 3*x*y[x]^2 + y[x]^3)/x,y[x],x]
```

$$\left\{\left\{y(x) \to x - \frac{1}{\sqrt{-2\log(x) + c_1}}\right\}, \left\{y(x) \to x + \frac{1}{\sqrt{-2\log(x) + c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 57

```
dsolve(diff(y(x),x) = (y(x)^3-3*x*y(x)^2+3*x^2*y(x)-x^3+x)/x,y(x))
```

$$y(x) = \frac{x\sqrt{2c_1 - 2\ln(x)} - 1}{\sqrt{2c_1 - 2\ln(x)}}$$

ODE No. 980

$$y'(x) = \frac{x^3 y(x)^3 + 6x^2 y(x)^2 + 12xy(x) + 2x + 8}{x^3}$$

✓ **Mathematica** : cpu = 0.118529 (sec), leaf count = 43

```
DSolve[Derivative[1][y][x] == (8 + 2*x + 12*x*y[x] + 6*x^2*y[x]^2 + x^3*y[x]^3)/x^3,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{2}{x} - \frac{1}{\sqrt{-2x + c_1}}\right\}, \left\{y(x) \to -\frac{2}{x} + \frac{1}{\sqrt{-2x + c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = (x^3*y(x)^3+6*x^2*y(x)^2+12*x*y(x)+8+2*x)/x^3,y(x))
```

$$y(x) = -\frac{1}{\sqrt{c_1 - 2x}} - \frac{2}{x}$$

ODE No. 981

$$y'(x) = \frac{a^3x^3y(x)^3 + 3a^2x^2y(x)^2 + a^2x + 3axy(x) + 1}{a^3x^3}$$

✓ **Mathematica** : cpu = 0.148008 (sec), leaf count = 49

```
DSolve[Derivative[1][y][x] == (1 + a^2*x + 3*a*x*y[x] + 3*a^2*x^2*y[x]^2 + a^3*x^3*y[x]^3)/(a
```

$$\left\{\left\{y(x) \to -\frac{1}{ax} - \frac{1}{\sqrt{-2x + c_1}}\right\}, \left\{y(x) \to -\frac{1}{ax} + \frac{1}{\sqrt{-2x + c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = (y(x)^3*a^3*x^3+3*y(x)^2*a^2*x^2+3*a*x*y(x)+1+a^2*x)/x^3/a^3,y(x))
```

$$y(x) = -\frac{1}{\sqrt{c_1 - 2x}} - \frac{1}{xa}$$

ODE No. 982

$$y'(x) = \frac{1}{2} e^{-\frac{x^2}{2}} y(x) \left(2e^{\frac{x^2}{4}} y(x) + 2e^{\frac{x^2}{2}} + e^{\frac{x^2}{2}} x + 2y(x)^2\right)$$

✓ **Mathematica** : cpu = 0.395083 (sec), leaf count = 132

```
DSolve[Derivative[1][y][x] == (y[x]*(2*E^(x^2/2) + E^(x^2/2)*x + 2*E^(x^2/4)*y[x] + 2*y[x]^2)
```

$$\text{Solve}\left[-\frac{7}{3}\text{RootSum}\left[-7\#1^3 + 6\sqrt[3]{-7}\#1 - 7\&, \frac{\log\left(\frac{3e^{-\frac{x^2}{2}} y(x) + e^{-\frac{x^2}{4}}}{\sqrt[3]{7}\sqrt[3]{-e^{-\frac{3x^2}{4}}}} - \#1\right)}{2\sqrt[3]{-7} - 7\#1^2}\&\right]\right] = \frac{1}{9} 7^{2/3} e^{\frac{x^2}{2}} \left(-e^{-\frac{3x^2}{4}}\right)^{2/3} x$$

✓ **Maple** : cpu = 0.287 (sec), leaf count = 145

```
dsolve(diff(y(x),x) = 1/2*y(x)/exp(1/4*x^2)^2*(2*y(x)^2+2*y(x)*exp(1/4*x^2)+2*exp(1/4*x^2)^2+
```

$$-\frac{2\ln\left(-6 + \left(18y(x)\,\mathrm{e}^{-\frac{x^2}{2}} + 6\,\mathrm{e}^{-\frac{x^2}{4}}\right)\mathrm{e}^{\frac{x^2}{4}}\right)}{3} + \frac{\ln\left(36 + \frac{324\left(y(x)\mathrm{e}^{-\frac{x^2}{2}} + \frac{\mathrm{e}^{-\frac{x^2}{4}}}{3}\right)^2 \mathrm{e}^{\frac{x^2}{2}}}{7} + \frac{\left(108y(x)\mathrm{e}^{-\frac{x^2}{2}} + 36\,\mathrm{e}^{-\frac{x^2}{4}}\right)\mathrm{e}^{\frac{x^2}{4}}}{7}\right)}{3} +

ODE No. 983

$$y'(x) = \frac{-x^3 + 3x^2 y(x) + x^2 - 3xy(x)^2 + y(x)^3}{(x-1)(x+1)}$$

✓ **Mathematica** : cpu = 0.682168 (sec), leaf count = 238

```
DSolve[Derivative[1][y][x] == (x^2 - x^3 + 3*x^2*y[x] - 3*x*y[x]^2 + y[x]^3)/((-1 + x)*(1 + x
```

$$\text{Solve}\left[\frac{1}{3}\log\left(\frac{\frac{3y(x)}{x^2-1}-\frac{3x}{x^2-1}}{3\sqrt[3]{\frac{1}{(x-1)^3(x+1)^3}}}+1\right)-\frac{1}{6}\log\left(\frac{\left(\frac{3y(x)}{x^2-1}-\frac{3x}{x^2-1}\right)^2}{9\left(\frac{1}{(x-1)^3(x+1)^3}\right)^{2/3}}-\frac{\frac{3y(x)}{x^2-1}-\frac{3x}{x^2-1}}{3\sqrt[3]{\frac{1}{(x-1)^3(x+1)^3}}}+1\right)+\text{tan}\right.$$

✓ **Maple** : cpu = 0.495 (sec), leaf count = 188

```
dsolve(diff(y(x),x) = (y(x)^3-3*x*y(x)^2+3*x^2*y(x)-x^3+x^2)/(x-1)/(1+x),y(x))
```

$$y(x) = \frac{\left((x^2-1)\left(3\tan\left(\text{RootOf}\left(9\left(\frac{1}{(x-1)^3(1+x)^3}\right)^{\frac{2}{3}}\ln\left(\frac{x-1}{1+x}\right)x^4-18\left(\frac{1}{(x-1)^3(1+x)^3}\right)^{\frac{2}{3}}\ln\left(\frac{x-1}{1+x}\right)x^2+9\left(\frac{1}{(x-1)^3(1+x)^3}\right)^{\frac{2}{3}}\ln\left(\frac{x-1}{1+x}\right)-6\_Z\sqrt{3}\right.\right.\right.}{3}}{2}$$

ODE No. 984

$$y'(x) = \frac{e^{-2x}(x-1)y(x)\left(x^2y(x)^2 + e^x xy(x) + e^{2x}\right)}{x}$$

✓ **Mathematica** : cpu = 9.64187 (sec), leaf count = 428

```
DSolve[Derivative[1][y][x] == ((-1 + x)*y[x]*(E^(2*x) + E^x*x*y[x] + x^2*y[x]^2))/(E^(2*x)*x)
```

$$\text{Solve}\left[\frac{\sqrt[3]{2}\left(\frac{3e^{-2x}x(x-1)y(x)+e^{-x}(x-1)}{\sqrt[3]{2}\sqrt[3]{e^{-3x}(x-1)^3}}+2^{2/3}\right)\left(2^{2/3}-\frac{2^{2/3}\left(3e^{-2x}x(x-1)y(x)+e^{-x}(x-1)\right)}{\sqrt[3]{e^{-3x}(x-1)^3}}\right)\left(\left(1-\frac{3e^{-2x}x(x-1)y(x)+e^{-x}(\right.\right.}{9\left(-\frac{e^{3x}(3e^{-2x}x(x-1)y}{(x-1}\right.}\right.$$

✓ **Maple** : cpu = 0.296 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = y(x)/x*(x^2*y(x)^2+y(x)*x*exp(x)+exp(x)^2)/exp(x)^2*(x-1),y(x))
```

$$y(x) = \frac{\mathrm{e}^{\mathrm{RootOf}\left(-\mathrm{e}^{-Z}\ln\left(\frac{x\left(\mathrm{e}^{-Z}+9\right)}{2}\right)+3c_1\mathrm{e}^{-Z}+\_Z\mathrm{e}^{-Z}+\mathrm{e}^{-Z}x+9\right)+x}}{9x}$$

ODE No. 985

$$y'(x) = \frac{(xy(x)+1)\left(x^2y(x)^2+x^2y(x)+x^2+2xy(x)+x+1\right)}{x^5}$$

✓ **Mathematica** : cpu = 0.343964 (sec), leaf count = 103

```
DSolve[Derivative[1][y][x] == ((1 + x*y[x])*(1 + x + x^2 + 2*x*y[x] + x^2*y[x] + x^2*y[x]^2))
```

$$\text{Solve}\left[-\frac{17}{3}\text{RootSum}\left[-17\#1^3+3\sqrt[3]{-34}\#1-17\&,\frac{\log\left(\frac{\frac{x+3}{x^3}+\frac{3y(x)}{x^2}}{\sqrt[3]{34}\sqrt[3]{-\frac{1}{x^6}}}-\#1\right)}{\sqrt[3]{-34}-17\#1^2}\&\right]\right] = -\frac{1}{9}34^{2/3}\left(-\frac{1}{x^6}\right)^{2/3}x$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = (x*y(x)+1)*(x^2*y(x)^2+x^2*y(x)+2*x*y(x)+1+x+x^2)/x^5,y(x))
```

$$y(x) = \frac{17\,\text{RootOf}\left(162\left(\int^{-Z}\frac{1}{289\_a^3+54\_a-54}d\_a\right)x+3c_1x+2\right)x-3x-9}{9x}$$

ODE No. 986

$$y'(x) = \frac{-x^3 \log^3(x) + 3x^2 y(x) \log^2(x) + x^2 + y(x)^3 + xy(x) - 3xy(x)^2 \log(x)}{x^2}$$

✓ **Mathematica** : cpu = 0.117719 (sec), leaf count = 44

```
DSolve[Derivative[1][y][x] == (x^2 - x^3*Log[x]^3 + x*y[x] + 3*x^2*Log[x]^2*y[x] - 3*x*Log[x]
```

$$\left\{\left\{y(x) \to x \log(x) - \frac{x}{\sqrt{-2x + c_1}}\right\}, \left\{y(x) \to x \log(x) + \frac{x}{\sqrt{-2x + c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 36

```
dsolve(diff(y(x),x) = (y(x)^3-3*x*y(x)^2*ln(x)+3*x^2*ln(x)^2*y(x)-x^3*ln(x)^3+x^2+x*y(x))/x^2
```

$$y(x) = -\frac{x}{\sqrt{c_1 - 2x}} + x \ln(x)$$

ODE No. 987

$$y'(x) = \frac{y(x)}{x} - F(x)\left(y(x)^2 - ax^2\right)$$

✓ **Mathematica** : cpu = 0.152515 (sec), leaf count = 41

```
DSolve[Derivative[1][y][x] == y[x]/x - F[x]*(-(a*x^2) + y[x]^2),y[x],x]
```

$$\left\{\left\{y(x) \to \sqrt{a}x \tanh\left(\sqrt{a}\int_1^x F(K[1])K[1]dK[1] + \sqrt{a}c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = -F(x)*(-a*x^2+y(x)^2)+y(x)/x,y(x))
```

$$y(x) = \tanh\left(\sqrt{a}\left(c_1 + \int F(x)\,x dx\right)\right)x\sqrt{a}$$

ODE No. 988

$$y'(x) = \frac{y(x)}{x} - F(x)\left(-x^2 - 2xy(x) + y(x)^2\right)$$

✓ **Mathematica** : cpu = 0.203353 (sec), leaf count = 107

```
DSolve[Derivative[1][y][x] == y[x]/x - F[x]*(-x^2 - 2*x*y[x] + y[x]^2),y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{x\left(-\exp\left(2\sqrt{2}\left(\int_1^x -F(K[1])K[1]dK[1] + c_1\right)\right) + \sqrt{2}\exp\left(2\sqrt{2}\left(\int_1^x -F(K[1])K[1]dK[1] + c_1\right)\right.\right.\right.}{1 + \exp\left(2\sqrt{2}\left(\int_1^x -F(K[1])K[1]dK[1] + c_1\right)\right)}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 29

```
dsolve(diff(y(x),x) = -F(x)*(-x^2-2*x*y(x)+y(x)^2)+y(x)/x,y(x))
```

$$y(x) = \frac{x\left(\sqrt{2} + 2\tanh\left(\left(c_1 + \int F(x)\,x dx\right)\sqrt{2}\right)\right)\sqrt{2}}{2}$$

ODE No. 989

$$y'(x) = \frac{y(x)}{x} - F(x)\left(-ay(x)^2 - bx^2\right)$$

✓ **Mathematica** : cpu = 0.161945 (sec), leaf count = 56

```
DSolve[Derivative[1][y][x] == y[x]/x - F[x]*(-(b*x^2) - a*y[x]^2),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\sqrt{b}x \tan\left(\sqrt{a}\sqrt{b}\int_1^x F(K[1])K[1]dK[1] + \sqrt{a}\sqrt{b}c_1\right)}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.046 (sec), leaf count = 29

```
dsolve(diff(y(x),x) = -F(x)*(-a*y(x)^2-b*x^2)+y(x)/x,y(x))
```

$$y(x) = \frac{\tan\left(\sqrt{ab}\left(c_1 + \int F(x)\,xdx\right)\right)x\sqrt{ab}}{a}$$

ODE No. 990

$$y'(x) = 2x - F(x)\left(-x^4 + 2x^2 y(x) - y(x)^2 + 1\right)$$

✓ **Mathematica** : cpu = 0.196767 (sec), leaf count = 58

```
DSolve[Derivative[1][y][x] == 2*x - F[x]*(1 - x^4 + 2*x^2*y[x] - y[x]^2),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x 2F(K[5])dK[5]\right)}{-\int_1^x \exp\left(\int_1^{K[6]} 2F(K[5])dK[5]\right) F(K[6])dK[6] + c_1} + x^2 + 1\right\}\right\}$$

✓ **Maple** : cpu = 0.465 (sec), leaf count = 44

```
dsolve(diff(y(x),x) = -F(x)*(-y(x)^2+2*x^2*y(x)+1-x^4)+2*x,y(x))
```

$$y(x) = \frac{-x^2 \mathrm{e}^{\int 2F(x)dx} + c_1 x^2 + \mathrm{e}^{\int 2F(x)dx} + c_1}{-\mathrm{e}^{\int 2F(x)dx} + c_1}$$

ODE No. 991

$$y'(x) = \frac{y(x)}{x} - F(x)\left(x^2 + 2xy(x) - y(x)^2\right)$$

✓ **Mathematica** : cpu = 0.181947 (sec), leaf count = 104

```
DSolve[Derivative[1][y][x] == y[x]/x - F[x]*(x^2 + 2*x*y[x] - y[x]^2),y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{x\left(-\exp\left(2\sqrt{2}\left(\int_1^x F(K[1])K[1]dK[1] + c_1\right)\right) + \sqrt{2}\exp\left(2\sqrt{2}\left(\int_1^x F(K[1])K[1]dK[1] + c_1\right)\right) -\right.\right.}{1 + \exp\left(2\sqrt{2}\left(\int_1^x F(K[1])K[1]dK[1] + c_1\right)\right)}$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 29

```
dsolve(diff(y(x),x) = -F(x)*(x^2+2*x*y(x)-y(x)^2)+y(x)/x,y(x))
```

$$y(x) = \frac{x\left(\sqrt{2} - 2\tanh\left(\left(c_1 + \int F(x)\,x dx\right)\sqrt{2}\right)\right)\sqrt{2}}{2}$$

ODE No. 992

$$y'(x) = \frac{y(x)}{x} - F(x)\left(-x^3 - 7xy(x)^2\right)$$

✓ **Mathematica** : cpu = 0.129916 (sec), leaf count = 43

```
DSolve[Derivative[1][y][x] == y[x]/x - F[x]*(-x^3 - 7*x*y[x]^2),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{x \tan\left(\sqrt{7}\int_1^x F(K[1])K[1]^2 dK[1] + \sqrt{7}c_1\right)}{\sqrt{7}}\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 25

```
dsolve(diff(y(x),x) = -F(x)*(-7*x*y(x)^2-x^3)+y(x)/x,y(x))
```

$$y(x) = \frac{\tan\left(\left(\int F(x)\,x^2 dx + c_1\right)\sqrt{7}\right) x\sqrt{7}}{7}$$

ODE No. 993

$$y'(x) = \frac{y(x)}{x \log(x)} - F(x) \left(-y(x)^2 - 2y(x) \log(x) - \log^2(x)\right)$$

✓ **Mathematica** : cpu = 1.40908 (sec), leaf count = 73

```
DSolve[Derivative[1][y][x] == y[x]/(x*Log[x]) - F[x]*(-Log[x]^2 - 2*Log[x]*y[x] - y[x]^2),y[x
```

$$\left\{\left\{y(x) \to \frac{\int_1^x \frac{F(K[5])}{\sqrt{\frac{1}{\log^2(K[5])}}} dK[5] - 1 + c_1}{\sqrt{\frac{1}{\log^2(x)}} \int_1^x \frac{F(K[5])}{\sqrt{\frac{1}{\log^2(K[5])}}} dK[5] + c_1 \sqrt{\frac{1}{\log^2(x)}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = -F(x)*(-y(x)^2-2*y(x)*ln(x)-ln(x)^2)+1/ln(x)/x*y(x),y(x))
```

$$y(x) = -\frac{\ln(x) \left(\int -2F(x) \ln(x)\, dx - c_1 - 2\right)}{\int -2F(x) \ln(x)\, dx - c_1}$$

ODE No. 994

$$y'(x) = \frac{y(x)}{x\log(x)} - x^3\left(-y(x)^2 - 2y(x)\log(x) - \log^2(x)\right)$$

✓ **Mathematica** : cpu = 0.208772 (sec), leaf count = 198

```
DSolve[Derivative[1][y][x] == y[x]/(x*Log[x]) - x^3*(-Log[x]^2 - 2*Log[x]*y[x] - y[x]^2),y[x]
```

$$\left\{\left\{y(x)\to -\frac{\frac{1}{16}x^4 e^{\frac{1}{16}x^4(4\log(x)-1)}(4\log(x)-1)\left(\frac{x^3}{4}+\frac{1}{4}x^3(4\log(x)-1)\right)+\frac{1}{4}x^3 e^{\frac{1}{16}x^4(4\log(x)-1)}+\frac{1}{4}x^3 e^{\frac{1}{16}x^4(4\log}}{x^3\left(\frac{1}{16}x^4 e^{\frac{1}{16}x^4(4\log(x)-1)}(4\log(x)-1)+c_1 e\right.}\right.\right.$$

✓ **Maple** : cpu = 0.032 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = -x^3*(-y(x)^2-2*y(x)*ln(x)-ln(x)^2)+1/ln(x)/x*y(x),y(x))
```

$$y(x) = -\frac{\ln(x)\left(4x^4\ln(x) - x^4 + 8c_1 + 16\right)}{4x^4\ln(x) - x^4 + 8c_1}$$

ODE No. 995

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

✓ **Mathematica** : cpu = 0.18281 (sec), leaf count = 17

```
DSolve[Derivative[1][y][x] == E^x + (-E^x + y[x])^2,y[x],x]
```

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

✓ **Maple** : cpu = 0.142 (sec), leaf count = 14

```
dsolve(diff(y(x),x) = (y(x)-exp(x))^2+exp(x),y(x))
```

$$y(x) = \mathrm{e}^x + \frac{1}{-x + c_1}$$

ODE No. 996

$$y'(x) = \frac{(y(x) - \mathrm{Si}(x))^2 + \sin(x)}{x}$$

✓ **Mathematica** : cpu = 0.114821 (sec), leaf count = 17

```
DSolve[Derivative[1][y][x] == (Sin[x] + (-SinIntegral[x] + y[x])^2)/x,y[x],x]
```

$$\left\{\left\{y(x) \to \mathrm{Si}(x) + \frac{1}{-\log(x) + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.08 (sec), leaf count = 15

```
dsolve(diff(y(x),x) = ((y(x)-Si(x))^2+sin(x))/x,y(x))
```

$$y(x) = \mathrm{sinIntegral}\,(x) + \frac{1}{c_1 - \ln\,(x)}$$

ODE No. 997

$$y'(x) = (y(x) + \cos(x))^2 + \sin(x)$$

✓ **Mathematica** : cpu = 0.110306 (sec), leaf count = 18

```
DSolve[Derivative[1][y][x] == Sin[x] + (Cos[x] + y[x])^2,y[x],x]
```

$$\left\{\left\{y(x) \to -\cos(x) + \frac{1}{-x + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.078 (sec), leaf count = 16

```
dsolve(diff(y(x),x) = (y(x)+cos(x))^2+sin(x),y(x))
```

$$y(x) = -\cos(x) + \frac{1}{-x + c_1}$$

ODE No. 998

$$y'(x) = \frac{(-\mathrm{Ci}(x) + y(x) - \log(x))^2 + \cos(x)}{x}$$

✓ **Mathematica** : cpu = 0.492351 (sec), leaf count = 27

```
DSolve[Derivative[1][y][x] == (Cos[x] + (-CosIntegral[x] - Log[x] + y[x])^2)/x,y[x],x]
```

$$\left\{\left\{y(x) \to \mathrm{Ci}(x) + \frac{x^2}{-\frac{x^2}{2} + c_1} + \log(x) + 1\right\}\right\}$$

✓ **Maple** : cpu = 0.299 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = ((y(x)-ln(x)-Ci(x))^2+cos(x))/x,y(x))
```

$$y(x) = \ln(x) + \mathrm{cosineIntegral}(x) + \frac{-c_1 x^2 + 1}{c_1 x^2 + 1}$$

ODE No. 999

$$y'(x) = \frac{(y(x) - x + \log(x+1))^2 + x}{x+1}$$

✓ **Mathematica** : cpu = 0.194336 (sec), leaf count = 24

```
DSolve[Derivative[1][y][x] == (x + (-x + Log[1 + x] + y[x])^2)/(1 + x),y[x],x]
```

$$\left\{\left\{y(x) \to x - \log(x+1) + \frac{1}{-\log(x+1) + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 36

```
dsolve(diff(y(x),x) = ((y(x)-x+ln(1+x))^2+x)/(1+x),y(x))
```

$$y(x) = \frac{-\ln(1+x)^2 + (x - c_1)\ln(1+x) + c_1 x - 1}{\ln(1+x) + c_1}$$

ODE No. 1000

$$y'(x) = \frac{x^3 + 2x^2 y(x) - x y(x) - y(x)^2 + x y(x) \log(x)}{x^2 (x + \log(x))}$$

✓ **Mathematica** : cpu = 0.933371 (sec), leaf count = 351

```
DSolve[Derivative[1][y][x] == (x^3 - x*y[x] + 2*x^2*y[x] + x*Log[x]*y[x] - y[x]^2)/(x^2*(x +
```

$$\left\{\left\{y(x) \to \frac{x^2(x+\log(x))\left(-\frac{\sqrt{x}(x+\log(x)+2)\log(x)\exp\left(-\frac{1}{2}\int_1^x \frac{K[5]+\log(K[5])+2}{K[5]^2+\log(K[5])K[5]}dK[5]\right)}{2(x^2+x\log(x))} + c_1\left(\frac{\exp\left(-\frac{1}{2}\int_1^x \frac{K[5]+\log(K[5])+2}{K[5]^2+\log(K[5])K[5]}\right.\right.\right.\right.}{2\sqrt{x}}}{\sqrt{x}\log(x)\exp\left(-\frac{1}{2}\int_1^x \frac{K[5]+\log(}{K[5]^2+\log(}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.127 (sec), leaf count = 19

```
dsolve(diff(y(x),x) = 1/x^2*(2*x^2*y(x)+x^3+y(x)*ln(x)*x-y(x)^2-x*y(x))/(x+ln(x)),y(x))
```

$$y(x) = \frac{x(c_1 x - 1)}{c_1 \ln(x) + 1}$$

ODE No. 1001

$$y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0031917 (sec), leaf count = 12

```
DSolve[Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_2 x + c_1\}\}$$

✓ **Maple** : cpu = 0.005 (sec), leaf count = 9

```
dsolve(diff(diff(y(x),x),x)=0,y(x))
```

$$y(x) = c_1 x + c_2$$

Hand solution

$$y'' = 0$$

Integration twice gives

$$y(x) = c_1 x + c_2$$

ODE No. 1002

$$y''(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0037368 (sec), leaf count = 16

```
DSolve[y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 \cos(x) + c_2 \sin(x)\}\}$$

✓ **Maple** : cpu = 0.007 (sec), leaf count = 13

```
dsolve(diff(diff(y(x),x),x)+y(x)=0,y(x))
```

$$y(x) = \sin(x)\, c_1 + c_2 \cos(x)$$

Hand solution

$$y'' + y = 0$$

Let $y = e^{\lambda x}$, substitution in above gives

$$\begin{aligned} \lambda^2 e^{\lambda x} + e^{\lambda x} &= 0 \\ \lambda^2 + 1 &= 0 \end{aligned}$$

Hence $\lambda = \pm i$, therefore the solution is

$$\begin{aligned} y &= Ae^{ix} + Be^{-ix} \\ &= A(\cos x + i \sin x) + B(\cos x - i \sin x) \\ &= \cos x(A + B) + \sin x(Ai - iB) \\ &= \cos x(A + B) + \sin x(i(A - B)) \end{aligned}$$

Let $A + B = c_1, i(A - B) = c_2$ hence

$$y = c_1 \cos x + c_2 \sin x$$

ODE No. 1003

$$-\sin(nx)+y''(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.0959813 (sec), leaf count = 45

```
DSolve[-Sin[n*x] + y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\cos^2(x)(-\sin(nx))-\sin^2(x)\sin(nx)}{n^2-1}+c_1\cos(x)+c_2\sin(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 26

```
dsolve(diff(diff(y(x),x),x)+y(x)-sin(n*x)=0,y(x))
```

$$y(x)=\sin(x)\,c_2+\cos(x)\,c_1-\frac{\sin(nx)}{n^2-1}$$

Hand solution

$$y''+y=\sin nx \tag{1}$$

We start by solving the homogeneous equation

$$y''+y=0$$

Let $y=e^{\lambda x}$, substitution in above gives

$$\begin{aligned}\lambda^2 e^{\lambda x}+e^{\lambda x}&=0\\ \lambda^2+1&=0\end{aligned}$$

Hence $\lambda=\pm i$, therefore the solution is

$$\begin{aligned}y_h&=Ae^{ix}+Be^{-ix}\\ &=A(\cos x+i\sin x)+B(\cos x-i\sin x)\\ &=\cos x(A+B)+\sin x(Ai-iB)\\ &=\cos x(A+B)+\sin x(i(A-B))\end{aligned}$$

Let $A+B=c_1, i(A-B)=c_2$ hence

$$y_h=c_1\cos x+c_2\sin x$$

Now we solve for the particular solution using variation of parameters. Let

$$\begin{aligned}y_p&=u_1(x)\cos x+u_2(x)\sin x\\ y_p'&=u_1'\cos x-u_1\sin x+u_2'\sin x+u_2\cos x\\ &=u_2\cos x-u_1\sin x+u_1'\cos x+u_2'\sin x\end{aligned}$$

Let first condition be

$$u_1' \cos x + u_2' \sin x = 0 \tag{2}$$

Hence

$$\begin{aligned} y_p' &= u_2 \cos x - u_1 \sin x \\ y_p'' &= u_2' \cos x - u_2 \sin x - u_1' \sin x - u_1 \cos x \end{aligned}$$

Substituting in (1) gives

$$\begin{aligned} y_p'' + y_p &= \sin nx \\ u_2' \cos x - u_2 \sin x - u_1' \sin x - u_1 \cos x + u_1 \cos x + u_2 \sin x &= \sin nx \\ u_2' \cos x - u_1' \sin x &= \sin nx \end{aligned} \tag{3}$$

So we have two equations (1)(2) to solve for u_1, u_2

$$\begin{aligned} u_1' \cos x + u_2' \sin x &= 0 \\ u_2' \cos x - u_1' \sin x &= \sin nx \end{aligned}$$

From the first equation

$$u_1' = -u_2' \frac{\sin x}{\cos x} \tag{4}$$

Substituting in the second equation

$$\begin{aligned} u_2' \cos x - \left(-u_2' \frac{\sin x}{\cos x} \right) \sin x &= \sin nx \\ u_2' \left(\cos x + \frac{\sin x}{\cos x} \sin x \right) &= \sin nx \\ u_2' \left(\frac{\cos^2 x + \sin^2 x}{\cos x} \right) &= \sin nx \\ u_2' &= \cos x \sin nx \end{aligned}$$

Hence

$$\begin{aligned} u_2 &= \int \cos x \sin (nx)\, dx \\ &= \frac{-n \cos x \cos (nx) - \sin x \sin (nx)}{n^2 - 1} \end{aligned}$$

From (4)

$$\begin{aligned} u_1' &= -\cos x \sin nx \frac{\sin x}{\cos x} \\ u_1 &= -\int \sin (nx) \sin x dx \\ &= \frac{n \cos (nx) \sin x - \cos x \sin (nx)}{n^2 - 1} \end{aligned}$$

Since $y_p = u_1(x)\cos x + u_2(x)\sin x$ then

$$\begin{aligned}
y_p &= \left(\frac{n\cos(nx)\sin x - \cos x \sin(nx)}{n^2-1}\right)\cos x + \left(\frac{-n\cos x\cos(nx) - \sin x\sin(nx)}{n^2-1}\right)\sin x \\
&= \frac{n\cos(nx)\cos x\sin x - \cos^2 x\sin(nx) - n\cos x\sin x\cos(nx) - \sin^2 x\sin(nx)}{n^2-1} \\
&= \frac{-\sin(nx)\left(\cos^2 x + \sin^2 x\right)}{n^2-1} \\
&= \frac{\sin(nx)}{1-n^2}
\end{aligned}$$

Therefore, the full solution is (for $n^2 \neq 1$)

$$\begin{aligned}
y &= y_h + y_p \\
&= c_1\cos x + c_2\sin x + \frac{\sin(nx)}{1-n^2}
\end{aligned}$$

Solution using undetermined coefficients: Since RHS is $\sin nx$ we guess $y_p = A\cos(nx) + B\sin(nx)$, therefore

$$\begin{aligned}
y_p' &= -An\sin(nx) + Bn\cos(nx) \\
y_p'' &= -An^2\cos(nx) - Bn^2\sin(nx)
\end{aligned}$$

Plug into the ODE gives

$$\begin{aligned}
y_p'' + y_p &= \sin nx \\
-An^2\cos(nx) - Bn^2\sin(nx) + A\cos(nx) + B\sin(nx) &= \sin nx \\
\cos(nx)\left(-An^2 + A\right) + \sin(nx)\left(-Bn^2 + B\right) &= \sin(nx)
\end{aligned}$$

Hence $-Bn^2 - B = 1$ and $-An^2 + A = 0$. Therefore $A = 0$ and from the first equation

$$\begin{aligned}
B\left(n^2+1\right) &= -1 \\
B &= \frac{-1}{n^2+1}
\end{aligned}$$

Hence

$$\begin{aligned}
y_p &= A\cos(nx) + B\sin(nx) \\
&= \frac{\sin(nx)}{1-n^2}
\end{aligned}$$

Which is the same as variation of parameters method.

Note: Full solution should also really consider the case for $n = 1$. Will update later.

```
restart;
ode:=diff(diff(y(x),x),x)+y(x)-sin(n*x)=0;
y0:=_C1*cos(x)+_C2*sin(x)+sin(n*x)/(1-n^2);
odetest(y(x)=y0,ode);
0
```

ODE No. 1004

$$-a\cos(bx)+y''(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.0899925 (sec), leaf count = 47

```
DSolve[-(a*Cos[b*x]) + y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{-a\cos^2(x)\cos(bx)-a\sin^2(x)\cos(bx)}{b^2-1}+c_1\cos(x)+c_2\sin(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x)+y(x)-a*cos(b*x)=0,y(x))
```

$$y(x)=\sin(x)\,c_2+\cos(x)\,c_1-\frac{a\cos(bx)}{b^2-1}$$

Hand solution

$$y''+y=a\cos bx \tag{1}$$

We start by solving the homogeneous equation

$$y''+y=0$$

Let $y=e^{\lambda x}$, substitution in above gives

$$\begin{aligned}\lambda^2 e^{\lambda x}+e^{\lambda x}&=0\\ \lambda^2+1&=0\end{aligned}$$

Hence $\lambda=\pm i$, therefore the solution is

$$\begin{aligned}y_h&=Ae^{ix}+Be^{-ix}\\ &=A(\cos x+i\sin x)+B(\cos x-i\sin x)\\ &=\cos x(A+B)+\sin x(Ai-iB)\\ &=\cos x(A+B)+\sin x(i(A-B))\end{aligned}$$

Let $A+B=c_1, i(A-B)=c_2$ hence

$$y_h=c_1\cos x+c_2\sin x$$

Now we solve for the particular solution using variation of parameters. Let

$$\begin{aligned}y_p&=u_1(x)\cos x+u_2(x)\sin x\\ y_p'&=u_1'\cos x-u_1\sin x+u_2'\sin x+u_2\cos x\\ &=u_2\cos x-u_1\sin x+u_1'\cos x+u_2'\sin x\end{aligned}$$

Let first condition be

$$u_1' \cos x + u_2' \sin x = 0 \tag{2}$$

Hence

$$\begin{aligned} y_p' &= u_2 \cos x - u_1 \sin x \\ y_p'' &= u_2' \cos x - u_2 \sin x - u_1' \sin x - u_1 \cos x \end{aligned}$$

Substituting in (1) gives

$$\begin{aligned} y_p'' + y_p &= a \cos bx \\ u_2' \cos x - u_2 \sin x - u_1' \sin x - u_1 \cos x + u_1 \cos x + u_2 \sin x &= a \cos bx \\ u_2' \cos x - u_1' \sin x &= a \cos bx \end{aligned} \tag{3}$$

So we have two equations (1)(2) to solve for u_1, u_2

$$\begin{aligned} u_1' \cos x + u_2' \sin x &= 0 \\ u_2' \cos x - u_1' \sin x &= a \cos bx \end{aligned}$$

From the first equation

$$u_1' = -u_2' \frac{\sin x}{\cos x} \tag{4}$$

Substituting in the second equation

$$\begin{aligned} u_2' \cos x - \left(-u_2' \frac{\sin x}{\cos x} \right) \sin x &= a \cos bx \\ u_2' \left(\cos x + \frac{\sin x}{\cos x} \sin x \right) &= a \cos bx \\ u_2' \left(\frac{\cos^2 x + \sin^2 x}{\cos x} \right) &= a \cos bx \\ u_2' &= a \cos x \cos bx \end{aligned}$$

Hence

$$\begin{aligned} u_2 &= a \int \cos x \cos (bx) \, dx \\ &= a \frac{-\cos (bx) \sin x + b \cos x \sin (bx)}{b^2 - 1} \end{aligned}$$

From (4)

$$\begin{aligned} u_1' &= -a \cos (bx) \sin x \\ u_1 &= -a \int \cos (bx) \sin x dx \\ &= -a \frac{\cos (bx) \cos x + b \sin x \sin (bx)}{b^2 - 1} \end{aligned}$$

Since $y_p = u_1(x)\cos x + u_2(x)\sin x$ then

$$\begin{aligned}
y_p &= \left(-a\frac{\cos(bx)\cos x + b\sin x\sin(bx)}{b^2-1}\right)\cos x + \left(a\frac{-\cos(bx)\sin x + b\cos x\sin(bx)}{b^2-1}\right)\sin x \\
&= \frac{-a\cos(bx)\cos^2 x - ab\cos x\sin x\sin(bx) - a\cos(bx)\sin^2 x + ab\sin x\cos x\sin(bx)}{b^2-1} \\
&= \frac{-a\cos(bx)\cos^2 x - a\cos(bx)\sin^2 x}{b^2-1} \\
&= \frac{-a\cos(bx)\left(\cos^2 x + \sin^2 x\right)}{b^2-1} \\
&= \frac{-a\cos(bx)}{b^2-1} \\
&= \frac{a\cos(bx)}{1-b^2}
\end{aligned}$$

Therefore, the full solution is (for $b^2 \neq 1$)

$$\begin{aligned}
y &= y_h + y_p \\
&= c_1\cos x + c_2\sin x + \frac{a\cos(bx)}{1-b^2}
\end{aligned}$$

```
restart;
ode:=diff(diff(y(x),x),x)+y(x)-a*cos(b*x)=0;
y0:=_C1*cos(x)+_C2*sin(x)+a*cos(b*x)/(1-b^2);
odetest(y(x)=y0,ode);
0
```

ODE No. 1005

$$-\sin(ax)\sin(bx)+y''(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.396437 (sec), leaf count = 1163

```
DSolve[-(Sin[a*x]*Sin[b*x]) + y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cos(x)+c_2\sin(x)+\frac{-\cos(x)\cos((a-b-1)x)a^3+\cos(x)\cos((a-b+1)x)a^3+\cos(x)\cos((\right.\right.$$

✓ **Maple** : cpu = 0.129 (sec), leaf count = 82

```
dsolve(diff(diff(y(x),x),x)+y(x)-sin(a*x)*sin(b*x)=0,y(x))
```

$$y(x)=\sin(x)\,c_2+\cos(x)\,c_1+\frac{-(a+b+1)\,(a+b-1)\cos(x(a-b))+\cos((a+b)\,x)\,(a-b+1)\,(a-b-1}{2a^4+(-4b^2-4)\,a^2+2b^4-4b^2+2}$$

Hand solution

$$y''+y=\sin ax\sin bx \tag{1}$$

We start by solving the homogeneous equation

$$y''+y=0$$

Let $y=e^{\lambda x}$, substitution in above gives

$$\begin{aligned}\lambda^2 e^{\lambda x}+e^{\lambda x}&=0\\ \lambda^2+1&=0\end{aligned}$$

Hence $\lambda=\pm i$, therefore the solution is

$$\begin{aligned}y_h&=Ae^{ix}+Be^{-ix}\\ &=A(\cos x+i\sin x)+B(\cos x-i\sin x)\\ &=\cos x(A+B)+\sin x(Ai-iB)\\ &=\cos x(A+B)+\sin x(i(A-B))\end{aligned}$$

Let $A+B=c_1, i(A-B)=c_2$ hence

$$\begin{aligned}y_h&=c_1\cos x+c_2\sin x\\ &=y_h=c_1y_1+c_2y_2\end{aligned}$$

Now we solve for the particular solution using variation of parameters.

$$y_p = u_1 y_1 + u_2 y_2$$

Wonskian is

$$W = \begin{vmatrix} y_1 & y_2 \\ y_1' & y_2' \end{vmatrix} = \begin{vmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{vmatrix} = \cos^2 x + \sin^2 x = 1$$

Hence, using $f = \sin ax \sin bx$, which is the RHS of the ODE, and noting that a_0 is the coefficient of y'' which is one here, then

$$\begin{aligned} u_1 &= \int \frac{-y_2}{W}\frac{f}{a_0}dx = -\int \sin x \sin(ax)\sin(bx)\,dx \\ &= -\frac{1}{4}\left(\frac{\cos((a-b-1)x)}{a-b-1} - \frac{\cos((a-b+1)x)}{a-b+1} - \frac{\cos((a+b-1)x)}{a+b-1} + \frac{\cos((a+b+1)x)}{a+b+1}\right) \end{aligned}$$

And

$$\begin{aligned} u_2 &= \int \frac{y_1}{W}\frac{f}{a_0}dx = -\int \cos x \sin(ax)\sin(bx)\,dx \\ &= \frac{1}{4}\left(\frac{\sin((a-b-1)x)}{a-b-1} + \frac{\sin((a-b+1)x)}{a-b+1} - \frac{\sin((a+b-1)x)}{a+b-1} - \frac{\sin((a+b+1)x)}{a+b+1}\right) \end{aligned}$$

Since $y_p = u_1(x)\cos x + u_2(x)\sin x$ then

$$\begin{aligned} y_p &= -\frac{1}{4}\left(\frac{\cos((a-b-1)x)}{a-b-1} - \frac{\cos((a-b+1)x)}{a-b+1} - \frac{\cos((a+b-1)x)}{a+b-1} + \frac{\cos((a+b+1)x)}{a+b+1}\right)\cos x \\ &\quad + \frac{1}{4}\left(\frac{\sin((a-b-1)x)}{a-b-1} + \frac{\sin((a-b+1)x)}{a-b+1} - \frac{\sin((a+b-1)x)}{a+b-1} - \frac{\sin((a+b+1)x)}{a+b+1}\right)\sin x \\ &= \frac{1}{4}\left(-\frac{\cos^2((a-b-1)x)}{a-b-1} + \frac{\sin^2((a-b-1)x)}{a-b-1}\right) + \frac{1}{4}\left(\frac{\cos^2((a-b+1)x)}{a-b+1} + \frac{\sin^2((a-b+1)x)}{a-b+1}\right) \\ &\quad + \frac{1}{4}\left(\frac{\cos^2((a+b-1)x)}{a+b-1} - \frac{\sin^2((a+b-1)x)}{a+b-1}\right) + \frac{1}{4}\left(-\frac{\cos^2((a+b+1)x)}{a+b+1} - \frac{\sin^2((a+b+1)x)}{a+b+1}\right) \\ &= \frac{1}{4}\left(-\frac{\cos^2((a-b-1)x)}{a-b-1} + \frac{\sin^2((a-b-1)x)}{a-b-1}\right) + \frac{1}{4}\left(\frac{1}{a-b+1}\right) \\ &\quad + \frac{1}{4}\left(\frac{\cos^2((a+b-1)x)}{a+b-1} - \frac{\sin^2((a+b-1)x)}{a+b-1}\right) - \frac{1}{4}\left(\frac{1}{a+b+1}\right) \end{aligned}$$

Let $a-b-1=\alpha, a+b-1=\beta$ then

$$\begin{aligned} y_p &= \frac{1}{4}\left(\frac{\sin^2(\alpha x)-\cos^2(\alpha x)}{\alpha}\right)+\frac{1}{4}\left(\frac{\cos^2(\beta x)-\sin^2(\beta x)}{\beta}\right)+\frac{1}{4}\left(\frac{1}{\alpha+2}\right)-\frac{1}{4}\left(\frac{1}{\beta+2}\right) \\ &= \frac{1}{4}\left(\frac{\sin^2(\alpha x)-\cos^2(\alpha x)}{\alpha}+\frac{\cos^2(\beta x)-\sin^2(\beta x)}{\beta}+\frac{1}{\alpha+2}-\frac{1}{\beta+2}\right) \end{aligned}$$

Therefore, the full solution is

$$\begin{aligned} y &= y_h + y_p \\ &= c_1\cos x + c_2 \sin x + \frac{1}{4}\left(\frac{\sin^2(\alpha x)-\cos^2(\alpha x)}{\alpha}+\frac{\cos^2(\beta x)-\sin^2(\beta x)}{\beta}+\frac{1}{\alpha+2}-\frac{1}{\beta+2}\right) \end{aligned}$$

I made mistake. Need to go over it again. I do not see it now. Maple does not verify.

```
restart;
ode:=diff(diff(y(x),x),x)+y(x)-sin(a*x)*sin(b*x)=0;
alpha:=a-b-1;
beta:=a+b-1;
yp:=1/4*(1/alpha* (sin(alpha*x)^2-cos(alpha*x)^2)+1/beta* (cos(beta*x)^2-sin(beta*x)^2))+(1/4
y0:=yp+_C1*sin(x)+_C2*cos(x);
not zero
```

ODE No. 1006

$$y''(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0036825 (sec), leaf count = 20

```
DSolve[-y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 e^x + c_2 e^{-x}\}\}$$

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

```
dsolve(diff(diff(y(x),x),x)-y(x)=0,y(x))
```

$$y(x) = c_1 \mathrm{e}^{-x} + c_2 \mathrm{e}^{x}$$

Hand solution

$$y'' - y = 0 \tag{1}$$

Let $y = e^{\lambda x}$, substitution in above gives

$$\lambda^2 e^{\lambda x} - e^{\lambda x} = 0$$
$$\lambda^2 - 1 = 0$$

Hence $\lambda = \pm 1$, therefore the solution is

$$y_h = Ae^x + Be^{-x}$$

ODE No. 1007

$$-4e^{x^2}x^2 + y''(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0880372 (sec), leaf count = 135

```
DSolve[-4*E^x^2*x^2 - 2*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{e^{-\sqrt{2}x}\left(-2e^{x\left(x+\sqrt{2}\right)}x + 2e^{\left(x-\sqrt{2}\right)x+2\sqrt{2}x}x + \sqrt{2}e^{x\left(x+\sqrt{2}\right)} + \sqrt{2}e^{\left(x-\sqrt{2}\right)x+2\sqrt{2}x}\right)}{2\sqrt{2}} + c_1 e^{\sqrt{2}x} + c_2 e^{-\sqrt{}}\right.\right.$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 26

```
dsolve(diff(diff(y(x),x),x)-2*y(x)-4*x^2*exp(x^2)=0,y(x))
```

$$y(x) = \mathrm{e}^{\sqrt{2}x}c_2 + \mathrm{e}^{-\sqrt{2}x}c_1 + \mathrm{e}^{x^2}$$

Hand solution

$$y'' - 2y = 4x^2e^{x^2} \tag{1}$$

We start by solving the homogeneous equation

$$y'' - 2y = 0$$

Let $y = e^{\lambda x}$, substitution in above gives

$$\begin{aligned}\lambda^2 e^{\lambda x} - 2e^{\lambda x} &= 0\\ \lambda^2 - 2 &= 0\end{aligned}$$

Hence $\lambda = \pm\sqrt{2}$, therefore the solution is

$$\begin{aligned}y_h &= Ae^{\sqrt{2}x} + Be^{\ -\sqrt{2}x}\\ &= Ay_1 + By_2\end{aligned}$$

Now we solve for the particular solution using variation of parameters.

$$y_p = u_1y_1 + u_2y_2$$

wronskian is

$$W = \begin{vmatrix} y_1 & y_2 \\ y_1' & y_2' \end{vmatrix} = \begin{vmatrix} e^{\sqrt{2}x} & e^{-\sqrt{2}x} \\ \sqrt{2}e^{\sqrt{2}x} & -\sqrt{2}e^{-\sqrt{2}x} \end{vmatrix} = -\sqrt{2} - \sqrt{2} = -2\sqrt{2}$$

Hence, using $f = 4x^2e^{x^2}$, which is the RHS of the ODE, and noting that a_0 is the coefficient of y'' which is one here, then

$$\begin{aligned} u_1 &= \int \frac{-y_2}{W}\frac{f}{a_0}dx = -\int \frac{e^{-\sqrt{2}x}}{-2\sqrt{2}}4x^2e^{x^2}dx \\ &= \frac{2}{\sqrt{2}}\int x^2 e^{x^2}\,e^{-\sqrt{2}x}dx \\ &= \frac{2}{\sqrt{2}}\left(\frac{1}{4}e^{x\left(x-\sqrt{2}\right)}\left(\sqrt{2}+2x\right)\right) \end{aligned}$$

And

$$\begin{aligned} u_2 &= \int \frac{y_1}{W}\frac{f}{a_0}dx = \int \frac{e^{\sqrt{2}x}}{-2\sqrt{2}}4x^2e^{x^2}dx \\ &= \frac{-2}{\sqrt{2}}\int x^2 e^{x^2}\,e^{\sqrt{2}x}dx \\ &= \frac{-2}{\sqrt{2}}\left(-\frac{1}{4}e^{x\left(x+\sqrt{2}\right)}\left(\sqrt{2}-2x\right)\right) \end{aligned}$$

Since $y_p = u_1e^{\sqrt{2}x} + u_2e^{-\sqrt{2}x}$ then

$$\begin{aligned} y_p &= \frac{2}{\sqrt{2}}\left(\frac{1}{4}e^{x\left(x-\sqrt{2}\right)}\left(\sqrt{2}+2x\right)\right)e^{\sqrt{2}x} - \frac{2}{\sqrt{2}}\left(-\frac{1}{4}e^{x\left(x+\sqrt{2}\right)}\left(\sqrt{2}-2x\right)\right)e^{-\sqrt{2}x} \\ &= \frac{2}{\sqrt{2}}\frac{1}{4}e^{x^2}\left(\sqrt{2}+2x\right) + \frac{2}{\sqrt{2}}\frac{1}{4}e^{x^2}\left(\sqrt{2}-2x\right) \\ &= \frac{1}{2}e^{x^2} + \frac{1}{2}e^{x^2} \\ &= e^{x^2} \end{aligned}$$

Therefore, the full solution is

$$\begin{aligned} y &= y_h + y_p \\ &= Ae^{\sqrt{2}x} + Be^{-\sqrt{2}x} + e^{x^2} \end{aligned}$$

```
restart;
ode:=diff(y(x),x$2)-2*y(x)=4*x^2*exp(x^2);
y0:=_C1*exp(sqrt(2)*x)+_C2*exp(-sqrt(2)*x)+exp(x^2);
odetest(y(x)=y0,ode);
0
```

ODE No. 1008

$$a^2 y(x) - \cot(ax) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0381168 (sec), leaf count = 48

```
DSolve[-Cot[a*x] + a^2*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sin(ax)\left(\log\left(\cos\left(\frac{ax}{2}\right)\right) - \log\left(\sin\left(\frac{ax}{2}\right)\right)\right)}{a^2} + c_1 \cos(ax) + c_2 \sin(ax)\right\}\right\}$$

✓ **Maple** : cpu = 0.105 (sec), leaf count = 41

```
dsolve(diff(diff(y(x),x),x)+a^2*y(x)-cot(a*x)=0,y(x))
```

$$y(x) = \sin(ax)\, c_2 + \cos(ax)\, c_1 + \frac{\sin(ax) \ln\left(\frac{1-\cos(ax)}{\sin(ax)}\right)}{a^2}$$

ODE No. 1009

$$ly(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0038759 (sec), leaf count = 28

```
DSolve[l*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \cos\left(\sqrt{l}x\right) + c_2 \sin\left(\sqrt{l}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x)+l*y(x)=0,y(x))
```

$$y(x) = c_1 \sin\left(\sqrt{l}\,x\right) + c_2 \cos\left(\sqrt{l}\,x\right)$$

ODE No. 1010

$$y(x)(ax+b)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0053763 (sec), leaf count = 46

```
DSolve[(b + a*x)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\text{Ai}\left(\frac{-b-ax}{(-a)^{2/3}}\right)+c_2\text{Bi}\left(\frac{-b-ax}{(-a)^{2/3}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 31

```
dsolve(diff(diff(y(x),x),x)+(a*x+b)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{AiryAi}\left(-\frac{ax+b}{a^{\frac{2}{3}}}\right)+c_2\,\text{AiryBi}\left(-\frac{ax+b}{a^{\frac{2}{3}}}\right)$$

Hand solution

$$y''+(ax+b)\,y=0 \tag{1}$$

For $a\neq 0$. Let $y=\eta(\xi)\,,\xi=ax+b$, hence

$$\begin{aligned}\frac{dy}{dx}&=\frac{d\eta}{d\xi}\frac{d\xi}{dx}\\&=\frac{d\eta}{d\xi}a\end{aligned}$$

And

$$\begin{aligned}\frac{d^2y}{dx^2}&=\frac{d}{dx}\left(\frac{d\eta}{d\xi}a\right)\\&=a\frac{d}{dx}\left(\frac{d\eta}{d\xi}\right)\\&=a\left(\frac{d^2\eta}{d\xi^2}\frac{d\xi}{dx}\right)\\&=a^2\frac{d^2\eta}{d\xi^2}\end{aligned}$$

Therefore (1) becomes

$$\begin{aligned} a^2\frac{d^2\eta}{d\xi^2}+\xi\eta(\xi)&=0\\ a^2\eta''+\xi\eta&=0 \end{aligned} \tag{2}$$

This is Airy ODE but with plus sign instead of the normal Airy $\eta''-\xi\eta=0$. Let

$$\begin{aligned} \eta &= \sum_{n=0}^{\infty} c_n\xi^n\\ \eta' &= \sum_{n=0}^{\infty} nc_n\xi^{n-1} = \sum_{n=1}^{\infty} nc_n\xi^{n-1} = \sum_{n=0}^{\infty} (n+1)\,c_{n+1}\xi^n\\ \eta'' &= \sum_{n=0}^{\infty} n(n+1)\,c_{n+1}\xi^{n-1} = \sum_{n=1}^{\infty} n(n+1)\,c_{n+1}\xi^{n-1} = \sum_{n=0}^{\infty} (n+1)\,(n+2)\,c_{n+2}\xi^n \end{aligned}$$

Hence (2) becomes

$$\begin{aligned} a^2\sum_{n=0}^{\infty} (n+1)\,(n+2)\,c_{n+2}\xi^n+\xi\sum_{n=0}^{\infty} c_n\xi^n &= 0\\ \sum_{n=0}^{\infty} a^2(n+1)\,(n+2)\,c_{n+2}\xi^n+\sum_{n=0}^{\infty} c_n\xi^{n+1} &= 0\\ \sum_{n=0}^{\infty} a^2(n+1)\,(n+2)\,c_{n+2}\xi^n+\sum_{n=1}^{\infty} c_{n-1}\xi^n &= 0\\ 2a^2c_2+\sum_{n=1}^{\infty} \left(a^2(n+1)\,(n+2)\,c_{n+2}+c_{n-1}\right)\xi^n &= 0 \end{aligned}$$

Hence

$$2a^2c_2 = 0 \tag{3}$$

$$a^2(n+1)\,(n+2)\,c_{n+2}+c_{n-1} = 0 \qquad n\geq 1 \tag{4}$$

From (3) and since $a\neq 0$

$$c_2 = 0$$

From (4)

$$c_{n+2} = \frac{-c_{n-1}}{a^2 (n+1)(n+2)}$$

Hence for $n = 3$, we see from the above recurrence equation and because $c_2 = 0$ that

$$c_5 = \frac{-c_2}{a^2 (4)(6)} = 0$$

Similarly, for $n = 6$

$$c_8 = \frac{-c_5}{a^2 (7)(8)} = 0$$

Similarly, for $n = 9$

$$c_{11} = \frac{-c_8}{a^2 (10)(11)} = 0$$

And so on. Hence we found so far that for $n = 3, 6, 9, 12, \cdots$ all terms generated which are $c_5, c_8, c_{11}, \cdots$ are zero.

Now, for $n = 1$, the recurrence equation gives

$$c_3 = \frac{-c_0}{a^2} \frac{1}{2 \cdot 3}$$

For $n = 2$

$$c_4 = \frac{-c_1}{a^2} \frac{1}{3 \cdot 4}$$

For $n = 4$

$$c_6 = \frac{-c_3}{a^2 (5)(6)} = c_0 \left(\frac{1}{a^2} \frac{1}{5 \cdot 6} \right) \left(\frac{1}{a^2} \frac{1}{2 \cdot 3} \right)$$

For $n = 5$

$$c_7 = \frac{-c_4}{a^2 (6)(7)} = c_1 \left(\frac{1}{a^2} \frac{1}{6 \cdot 7} \right) \left(\frac{1}{a^2} \frac{1}{3 \cdot 4} \right)$$

For $n = 7$

$$c_9 = \frac{-c_6}{a^2 (8)(9)} = -c_0 \left(\frac{1}{a^2} \frac{1}{8 \cdot 9} \right) \left(\frac{1}{a^2} \frac{1}{5 \cdot 6} \right) \left(\frac{1}{a^2} \frac{1}{2 \cdot 3} \right)$$

For $n = 8$

$$c_{10} = \frac{-c_7}{a^2\,(9)\,(10)} = -c_1\left(\frac{1}{a^2}\frac{1}{9\cdot 10}\right)\left(\frac{1}{a^2}\frac{1}{6\cdot 7}\right)\left(\frac{1}{a^2}\frac{1}{3\cdot 4}\right)$$

Therefore, in summary, this is what we have so far. For $n = 3, 6, 9, 12, \cdots$ all terms are zero. For $n = 1, 4, 7, \cdots$ all terms are expressed using c_0 and for $n = 2, 5, 8, \cdots$ all terms are expressed using c_1. So there are two arbitrary constants c_0, c_1.

In other words, $c_2, c_5, c_8, c_{11}, \cdots = 0$ and $c_3, c_6, c_9, c_{12}, \cdots = f(c_0)$ and $c_4, c_7, c_{10}, c_{13}, \cdots = f(c_1)$.

$$\begin{aligned}
\eta &= \sum_{n=0}^{\infty} c_n \xi^n \\
&= c_0 + c_1\xi^1 + c_2\xi^2 + c_3\xi^3 + \cdots \\
&= c_0 + \left(c_1\xi^1\right) + 0 - \left(c_0\frac{\xi^3}{a^2}\frac{1}{2\cdot 3}\right) - \left(c_1\frac{\xi^4}{a^2}\frac{1}{3\cdot 4}\right) + 0 + c_0\frac{\xi^6}{a^4}\frac{1}{2\cdot 3\cdot 5\cdot 6} + c_1\frac{\xi^7}{a^4}\frac{1}{3\cdot 4\cdot 6\cdot 7} + 0 \\
&= c_0\left(1 - \frac{\xi^3}{a^2}\frac{1}{2\cdot 3} + \frac{\xi^6}{a^4}\frac{1}{2\cdot 3\cdot 5\cdot 6} - \cdots\right) + c_1\left(\xi - \frac{\xi^4}{a^2}\frac{1}{3\cdot 4} + \frac{\xi^7}{a^4}\frac{1}{3\cdot 4\cdot 6\cdot 7} - \cdots\right) \\
&= c_0\left(1 - \frac{1}{a^2}\frac{\xi^3}{3!} + \frac{1\cdot 4}{a^4}\frac{\xi^6}{6!} - \frac{1\cdot 4\cdot 7}{a^6}\frac{\xi^9}{9!} + \cdots\right) + c_1\left(\xi - \frac{\xi^4}{a^2}\frac{2}{4!} + \frac{\xi^7}{a^4}\frac{2\cdot 5}{7!} - \frac{\xi^{10}}{a^6}\frac{2\cdot 5\cdot 8}{10!} + \cdots\right)
\end{aligned}$$

Hence

$$\eta = c_0\left(\sum_{n=0}^{\infty} 3^n\left(\frac{1}{3}\right)_n \frac{(-1)^n}{a^{2n}}\frac{\xi^{3n}}{(3n)\,!}\right) + c_1\left(\sum_{n=0}^{\infty} 3^n\left(\frac{2}{3}\right)_n \frac{(-1)^n}{a^{2n}}\frac{\xi^{3n+1}}{(3n+1)\,!}\right) \tag{5}$$

Where

$$\begin{aligned}
3^n\left(\frac{1}{3}\right)_n &= (1)\cdot(4)\cdot(7)\ldots(3n-2) \\
3^n\left(\frac{2}{3}\right)_n &= (2)\cdot(5)\cdot(8)\ldots(3n-1)
\end{aligned}$$

And

$$\left(\frac{1}{3}\right)_0 = \left(\frac{2}{3}\right)_0 = 1$$

Equation (5) can be simplified more by moving $\frac{(-1)^n}{a^{2n}}$ into ξ as follows

$$\eta = c_0\left(\sum_{n=0}^{\infty} 3^n\left(\frac{1}{3}\right)_n \frac{1}{(3n)\,!}\left(\frac{-\xi}{a^{\frac{2}{3}}}\right)^{3n}\right) + ac_1\left(\sum_{n=0}^{\infty} 3^n\left(\frac{2}{3}\right)_n \frac{1}{(3n+1)\,!}\left(\frac{-\xi}{a^{\frac{2}{3}}}\right)^{3n+1}\right)$$

Let $\left(\frac{-\xi}{a^{\frac{2}{3}}}\right) = z$ then the above is

$$\eta = c_0\left(\sum_{n=0}^{\infty} 3^n \left(\frac{1}{3}\right)_n \frac{z^{3n}}{(3n)!}\right) + ac_1\left(\sum_{n=0}^{\infty} 3^n \left(\frac{2}{3}\right)_n \frac{z^{3n+1}}{(3n+1)!}\right)$$

Let

$$f(\xi) = \sum_{n=0}^{\infty} 3^n \left(\frac{1}{3}\right)_n \frac{\xi^{3n}}{(3n)!}$$
$$g(\xi) = \sum_{n=0}^{\infty} 3^n \left(\frac{2}{3}\right)_n \frac{\xi^{3n+1}}{(3n+1)!}$$

Now looking at definition of $\operatorname{AiryAI}(z)$ we see

$$\operatorname{AiryAI}(z) = r_1 f(z) - r_2 g(z)$$
$$\operatorname{AiryBI}(z) = \sqrt{3}(r_1 f(z) + r_2 g(z))$$

These are Airy functions AiryAI and AiryBI with appropriate choice of c_0, c_1. See definition of these special functions. Converting back to x using $\xi = ax + b$ should result in solution given by CAS. Need to write these final details to make sure. Will finish later.

ODE No. 1011

$$\left(-x^2-1\right)y(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0056983 (sec), leaf count = 33

```
DSolve[(-1 - x^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 D_{-1}\left(\sqrt{2}x\right)+c_2 D_0\left(i\sqrt{2}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.032 (sec), leaf count = 17

```
dsolve(diff(diff(y(x),x),x)-(x^2+1)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{\frac{x^2}{2}}\left(\operatorname{erf}\left(x\right)c_2+c_1\right)$$

Hand solution

$$y''-\left(x^2+1\right)y=0 \tag{1}$$

Second order with varying coefficient. Using power series, let $y=\sum_{n=0}^{\infty}c_n x^n$, hence

$$y'=\sum_{n=0}^{\infty}nc_n x^{n-1}=\sum_{n=1}^{\infty}nc_n x^{n-1}=\sum_{n=0}^{\infty}(n+1)c_{n+1}x^n$$
$$y''=\sum_{n=0}^{\infty}n(n+1)c_{n+1}x^{n-1}=\sum_{n=1}^{\infty}n(n+1)c_{n+1}x^{n-1}=\sum_{n=0}^{\infty}(n+1)(n+2)c_{n+2}x^n$$

Substituting back in the original ODE gives

$$\sum_{n=0}^{\infty}(n+1)(n+2)c_{n+2}x^n-\left(x^2+1\right)\sum_{n=0}^{\infty}c_n x^n=0$$
$$\sum_{n=0}^{\infty}(n+1)(n+2)c_{n+2}x^n-x^2\sum_{n=0}^{\infty}c_n x^n-\sum_{n=0}^{\infty}c_n x^n=0$$
$$\sum_{n=0}^{\infty}(n+1)(n+2)c_{n+2}x^n-\sum_{n=0}^{\infty}c_n x^{n+2}-\sum_{n=0}^{\infty}c_n x^n=0$$
$$\sum_{n=0}^{\infty}(n+1)(n+2)c_{n+2}x^n-\sum_{n=2}^{\infty}c_{n-2}x^n-\sum_{n=0}^{\infty}c_n x^n=0$$

For $n=0$

$$\begin{aligned}(n+1)(n+2)c_{n+2}-c_n&=0\\2c_2-c_0&=0\\c_2&=\frac{c_0}{2}\end{aligned}$$

For $n=1$

$$\begin{aligned}(n+1)(n+2)c_{n+2}-c_n&=0\\(2)(3)c_3-c_1&=0\\c_3&=\frac{c_1}{6}\end{aligned}$$

For $n\geq 2$

$$\begin{aligned}(n+1)(n+2)c_{n+2}-c_{n-2}-c_n&=0\\c_{n+2}&=\frac{c_{n-2}+c_n}{(n+1)(n+2)}\end{aligned}$$

Hence for $n=2$

$$c_4=\frac{c_0+c_2}{(3)(4)}=\frac{c_0+\frac{c_0}{2}}{(3)(4)}=\frac{2c_0+c_0}{(2)(3)(4)}=c_0\frac{3}{(2)(3)(4)}$$

For $n=3$

$$c_5=\frac{c_1+c_3}{(4)(5)}=\frac{c_1+\frac{c_1}{6}}{(4)(5)}=\frac{6c_1+c_1}{(4)(5)(6)}=c_1\frac{7}{(4)(5)(6)}$$

For $n=4$

$$c_6=\frac{c_2+c_4}{(5)(6)}=\frac{\frac{c_0}{2}+c_0\frac{3}{(2)(3)(4)}}{(5)(6)}=\frac{c_0(3)(4)+3c_0}{(2)(3)(4)(5)(6)}=c_0\frac{15}{(2)(3)(4)(5)(6)}$$

For $n=5$

$$\begin{aligned}c_7&=\frac{c_3+c_5}{(6)(7)}\\&=\frac{\frac{c_1}{6}+c_1\frac{7}{(4)(5)(6)}}{(6)(7)}=\frac{3}{560}c_1\end{aligned}$$

And so on. Hence the series is

$$\begin{aligned}y&=\sum_{n=0}^{\infty}c_nx^n\\&=c_0+c_1x+c_2x^2+c_3x^3+\cdots\\&=c_0+c_1x+\frac{c_0}{2}x^2+\frac{c_1}{6}x^3+c_0\frac{3}{(2)(3)(4)}x^4+c_1\frac{7}{(4)(5)(6)}x^5+c_0\frac{15}{(2)(3)(4)(5)(6)}x^6+c_1\frac{3}{560}x^7+\cdots\\&=c_0+c_1x+\frac{c_0}{2}x^2+\frac{c_1}{6}x^3+c_0\frac{1}{8}x^4+c_1\frac{7}{120}x^5+c_0\frac{1}{48}x^6+c_1\frac{3}{560}x^7+\cdots\\&=c_0\left(1+\frac{x^2}{2}+\frac{1}{8}x^4+\frac{1}{48}x^6+\cdots\right)+c_1\left(x+\frac{1}{6}x^3+\frac{7}{120}x^5+\frac{3}{560}x^7+\cdots\right)\end{aligned}$$

Now the power series for $e^{\frac{x^2}{2}} = 1 + \frac{x^2}{2} + \frac{x^4}{8} + \frac{x^6}{48} + \cdots$, so we can convert the first term above (the expression for c_0 to be $e^{\frac{x^2}{2}}$. Hence

$$c_0\left(1 + \frac{x^2}{2} + \frac{1}{8}x^4 + \frac{1}{48}x^6 + \cdots\right) = c_0 e^{\frac{x^2}{2}}$$

So now we have to work on the second term (the expression for c_1)

$$c_1\left(x + \frac{1}{6}x^3 + \frac{7}{120}x^5 + \frac{3}{560}x^7 + \cdots\right) = ?$$

Recall that series for error function is

$$\operatorname{erf}(x) = \frac{2}{\sqrt{\pi}}\left(x - \frac{x^3}{3} + \frac{x^5}{10} - \frac{x^7}{48} + \cdots\right)$$

Multiplying $e^{\frac{x^2}{2}}$ by $\operatorname{erf}(x)$ gives

$$\begin{aligned} e^{\frac{x^2}{2}} \operatorname{erf}(x) &= \frac{2}{\sqrt{\pi}}\left(1 + \frac{x^2}{2} + \frac{x^4}{(2)(4)} + \frac{x^6}{(2)(4)(6)} + \cdots\right)\left(x - \frac{x^3}{3} + \frac{x^5}{10} - \frac{x^7}{48} + \cdots\right) \\ &= \frac{2}{\sqrt{\pi}}\left(x - \frac{x^3}{3} + \frac{x^5}{10} - \frac{x^7}{48} + \cdots + \frac{x^3}{2} - \frac{x^5}{6} + \frac{x^7}{20} - \frac{x^{15}}{96} + \cdots\right) \\ &= \frac{2}{\sqrt{\pi}}\left(x + \frac{x^3}{6} + \frac{7x^5}{120} + \frac{3}{560}x^7 + \cdots\right) \end{aligned}$$

Comparing the above to the term next to c_1 above, we see they are the same with a multiplier $\frac{2}{\sqrt{\pi}}$, which can be absorbed into the constant c_1, Hence

$$\begin{aligned} y &= c_0\left(1 + \frac{x^2}{2} + \frac{1}{8}x^4 + \frac{1}{48}x^6 + \cdots\right) + c_1\left(x + \frac{1}{6}x^3 + \frac{7}{120}x^5 + \frac{3}{560}x^7 + \cdots\right) \\ &= c_0 e^{\frac{x^2}{2}} + c_1\left(e^{\frac{x^2}{2}} \operatorname{erf}(x)\right) \end{aligned}$$

Hence final solution is

$$y = c_0 e^{\frac{x^2}{2}} + c_2\left(e^{\frac{x^2}{2}} \operatorname{erf}(x)\right)$$

Verification

```
restart;
ode:=diff(diff(y(x),x),x)-(x^2+1)*y(x)=0;
y0:=_C1*exp(x^2/2)+_C2*exp(x^2/2)*erf(x);
odetest(y(x)=y0,ode);
0
```

ODE No. 1012

$$\left(-a-x^2\right) y(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0064868 (sec), leaf count = 47

```
DSolve[(-a - x^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 D_{\frac{1}{2}(-a-1)}\left(\sqrt{2}x\right)+c_2 D_{\frac{a-1}{2}}\left(i\sqrt{2}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.098 (sec), leaf count = 29

```
dsolve(diff(diff(y(x),x),x)-(x^2+a)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\,\text{WhittakerW}\left(-\frac{a}{4},\frac{1}{4},x^2\right)+c_1\,\text{WhittakerM}\left(-\frac{a}{4},\frac{1}{4},x^2\right)}{\sqrt{x}}$$

ODE No. 1013

$$\left(-a^2x^2-a\right)y(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0123819 (sec), leaf count = 43

```
DSolve[(-a - a^2*x^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 D_{-1}\left(\sqrt{2}\sqrt{a}x\right)+c_2 D_0\left(i\sqrt{2}\sqrt{a}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 22

```
dsolve(diff(diff(y(x),x),x)-(a^2*x^2+a)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{\frac{a\,x^2}{2}}\left(\mathrm{erf}\left(\sqrt{a}\,x\right)c_2+c_1\right)$$

ODE No. 1014

$$y''(x) - cx^a y(x) = 0$$

✓ **Mathematica** : cpu = 0.0191805 (sec), leaf count = 170

```
DSolve[-(c*x^a*y[x]) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to (a+2)^{-\frac{1}{a+2}} c_1 c^{\frac{1}{2(a+2)}} x^{\frac{a}{2}+1} \Gamma\left(1-\frac{1}{a+2}\right) I_{-\frac{1}{a+2}}\left(\frac{2\sqrt{c}x^{\frac{a+2}{2}}}{a+2}\right) + (-1)^{\frac{1}{a+2}}(a+2)^{-\frac{1}{a+2}} c_2 c^{\frac{1}{2(a+2)}} x^{1-\frac{a}{2}}$$

✓ **Maple** : cpu = 0.117 (sec), leaf count = 63

```
dsolve(diff(diff(y(x),x),x)-c*x^a*y(x)=0,y(x))
```

$$y(x) = \sqrt{x}\left(\text{BesselY}\left(\frac{1}{a+2}, \frac{2\sqrt{-c}\,x^{\frac{a}{2}+1}}{a+2}\right) c_2 + \text{BesselJ}\left(\frac{1}{a+2}, \frac{2\sqrt{-c}\,x^{\frac{a}{2}+1}}{a+2}\right) c_1\right)$$

ODE No. 1015

$$y(x)\left(1-a^2x^{2n}\right)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.290983 (sec), leaf count = 0

```
DSolve[(1 - a^2*x^(2*n))*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[(1 - a^2*x^(2*n))*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-(a^2*x^(2*n)-1)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x)+\left(-a^2x^{2n}+1\right)\_Y(x)\right\},\{\_Y(x)\}\right)$$

ODE No. 1016

$$y(x)\left(ax^{2c}+bx^{c-1}\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.10514 (sec), leaf count = 312

```
DSolve[(b*x^(-1 + c) + a*x^(2*c))*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to 2^{\frac{c}{2(c+1)}}c_1\left(x^{c+1}\right)^{\frac{c}{2(c+1)}}x^{-c/2}e^{-\frac{\sqrt{a}x^{c+1}}{\sqrt{-c^2-2c-1}}}U\left(\frac{\frac{\sqrt{a}cb}{\sqrt{-(c+1)^2}}+\frac{\sqrt{a}b}{\sqrt{-(c+1)^2}}+ac}{2(ca+a)},\frac{c}{c+1},\frac{2\sqrt{a}x^{c+1}}{\sqrt{-c^2-2c-1}}\right)+\right.\right.$$

✓ **Maple** : cpu = 0.218 (sec), leaf count = 91

```
dsolve(diff(diff(y(x),x),x)+(a*x^(2*c)+b*x^(c-1))*y(x)=0,y(x))
```

$$y(x)=x^{-\frac{c}{2}}\left(\text{WhittakerW}\left(-\frac{ib}{\sqrt{a}\,(2c+2)},\frac{1}{2c+2},\frac{2i\sqrt{a}\,x^{c+1}}{c+1}\right)c_2+\text{WhittakerM}\left(-\frac{ib}{\sqrt{a}\,(2c+2)},\frac{1}{2c+2},\right.\right.$$

ODE No. 1017

$$\left(e^{2x}-v^2\right)y(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.019605 (sec), leaf count = 46

```
DSolve[(E^(2*x) - v^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\Gamma(1-v)J_{-v}\left(\sqrt{e^{2x}}\right)+c_2\Gamma(v+1)J_v\left(\sqrt{e^{2x}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.052 (sec), leaf count = 17

```
dsolve(diff(diff(y(x),x),x)+(exp(2*x)-v^2)*y(x)=0,y(x))
```

$$y(x)=c_1\,\mathrm{BesselJ}\left(v,\mathrm{e}^x\right)+c_2\,\mathrm{BesselY}\left(v,\mathrm{e}^x\right)$$

ODE No. 1018

$$ae^{bx}y(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0157518 (sec), leaf count = 55

```
DSolve[a*E^(b*x)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 J_0\left(\frac{2\sqrt{a}\sqrt{e^{bx}}}{b}\right)+2c_2 Y_0\left(\frac{2\sqrt{a}\sqrt{e^{bx}}}{b}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x)+a*exp(b*x)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{BesselJ}\left(0,\frac{2\sqrt{a}\,\mathrm{e}^{\frac{bx}{2}}}{b}\right)+c_2\,\text{BesselY}\left(0,\frac{2\sqrt{a}\,\mathrm{e}^{\frac{bx}{2}}}{b}\right)$$

ODE No. 1019

$$y(x)\left(1-4a^2b^2x^2e^{2bx^2}\right)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.580956 (sec), leaf count = 0

```
DSolve[(1 - 4*a^2*b^2*E^(2*b*x^2)*x^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[(1 - 4*a^2*b^2*E^(2*b*x^2)*x^2)*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-(4*a^2*b^2*x^2*exp(2*b*x^2)-1)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x)+\left(-4a^2b^2x^2\mathrm{e}^{2b\,x^2}+1\right)\_Y(x)\right\},\{\_Y(x)\}\right)$$

ODE No. 1020

$$y(x)\left(ae^{2x}+be^{x}+c\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.496692 (sec), leaf count = 180

```
DSolve[(c + b*E^x + a*E^(2*x))*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 e^{i\left(\sqrt{c}\log\left(e^x\right)-\sqrt{a}e^x\right)}U\left(\frac{i\left(b-i\sqrt{a}+2\sqrt{a}\sqrt{c}\right)}{2\sqrt{a}},2i\sqrt{c}+1,2i\sqrt{a}e^x\right)+c_2 e^{i\left(\sqrt{c}\log\left(e^x\right)-\sqrt{a}e^x\right)}L_{-\frac{i(b-i\sqrt{a}+}{2\sqrt{}}}^{2i\sqrt{c}}\right.\right.$$

✓ **Maple** : cpu = 0.196 (sec), leaf count = 58

```
dsolve(diff(diff(y(x),x),x)+(a*exp(2*x)+b*exp(x)+c)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{x}{2}}\left(\mathrm{WhittakerM}\left(-\frac{ib}{2\sqrt{a}},i\sqrt{c},2i\sqrt{a}\,\mathrm{e}^{x}\right)c_1+\mathrm{WhittakerW}\left(-\frac{ib}{2\sqrt{a}},i\sqrt{c},2i\sqrt{a}\,\mathrm{e}^{x}\right)c_2\right)$$

ODE No. 1021

$$y(x)\left(a\cos^2(x)+b\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0269298 (sec), leaf count = 44

```
DSolve[(b + a*Cos[x]^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\text{MathieuC}\left[\frac{1}{2}(a+2b),-\frac{a}{4},x\right]+c_2\text{MathieuS}\left[\frac{1}{2}(a+2b),-\frac{a}{4},x\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.211 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x)+(a*cosh(x)^2+b)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{MathieuC}\left(-\frac{a}{2}-b,\frac{a}{4},ix\right)+c_2\,\text{MathieuS}\left(-\frac{a}{2}-b,\frac{a}{4},ix\right)$$

ODE No. 1022

$$y(x)(a\cos(2x)+b)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0186718 (sec), leaf count = 28

```
DSolve[(b + a*Cos[2*x])*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\text{MathieuC}\left[b,-\frac{a}{2},x\right]+c_2\text{MathieuS}\left[b,-\frac{a}{2},x\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.2 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x)+(a*cos(2*x)+b)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{MathieuC}\left(b,-\frac{a}{2},x\right)+c_2\,\text{MathieuS}\left(b,-\frac{a}{2},x\right)$$

ODE No. 1023

$$y(x)\left(a\cos^2(x)+b\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0095474 (sec), leaf count = 44

```
DSolve[(b + a*Cos[x]^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\text{MathieuC}\left[\frac{1}{2}(a+2b),-\frac{a}{4},x\right]+c_2\text{MathieuS}\left[\frac{1}{2}(a+2b),-\frac{a}{4},x\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.19 (sec), leaf count = 29

```
dsolve(diff(diff(y(x),x),x)+(a*cos(x)^2+b)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{MathieuC}\left(\frac{a}{2}+b,-\frac{a}{4},x\right)+c_2\,\text{MathieuS}\left(\frac{a}{2}+b,-\frac{a}{4},x\right)$$

ODE No. 1024

$$y''(x) + y(x)\left(-2\tan^2(x) - 1\right) = 0$$

✓ **Mathematica** : cpu = 0.129848 (sec), leaf count = 84

```
DSolve[(-1 - 2*Tan[x]^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1 \sqrt[4]{1-\cos^2(x)}\sec(x)}{\sqrt[4]{\cos^2(x)-1}} - \frac{c_2 \sqrt[4]{1-\cos^2(x)}\sec(x)\left(\cos(x)\sqrt{1-\cos^2(x)} - \sin^{-1}(\cos(x))\right)}{2\sqrt[4]{\cos^2(x)-1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.127 (sec), leaf count = 30

```
dsolve(diff(diff(y(x),x),x)-(1+2*tan(x)^2)*y(x)=0,y(x))
```

$$y(x) = \frac{i\sin(x)\cos(x)\,c_2 + \ln(\cos(x) + i\sin(x))\,c_2 + c_1}{\cos(x)}$$

ODE No. 1025

$$y(x)\left(-a-(m-1)m\sec^2(x)-\left((n-1)n\csc^2(x)\right)\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.884459 (sec), leaf count = 615

```
DSolve[(-a - (-1 + n)*n*Csc[x]^2 - (-1 + m)*m*Sec[x]^2)*y[x] + Derivative[2][y][x] == 0,y[x],
```

$$\left\{\left\{y(x)\to \frac{c_2(-1)^{\frac{1}{2}(-2m-1)+1}\cos^2(x)^{\frac{1}{4}(-2m-1)+1}\left(\cos^2(x)-1\right)^{\frac{1}{2}\left(\frac{4am+4\sqrt{-a}n^2+4an-4\sqrt{-a}n+4(-a)^{3/2}+8\sqrt{-a}a+\sqrt{-a}+4mn^2-}{8a+8n^2-8n+2}\right.}}{\right.\right.$$

✓ **Maple** : cpu = 0.184 (sec), leaf count = 102

```
dsolve(diff(diff(y(x),x),x)-(m*(m-1)/cos(x)^2+n*(n-1)/sin(x)^2+a)*y(x)=0,y(x))
```

$$y(x)=\left(\sin^n(x)\right)\left(\left(\cos^{-m+1}(x)\right)\text{hypergeom}\left(\left[\frac{n}{2}-\frac{m}{2}+\frac{i\sqrt{a}}{2}+\frac{1}{2},\frac{n}{2}-\frac{m}{2}-\frac{i\sqrt{a}}{2}+\frac{1}{2}\right],\left[\frac{3}{2}-m\right],\cos^2(

ODE No. 1026

$$y''(x) - y(x)(B + n(n+1)\wp(x; \text{g2}, \text{g3})) = 0$$

✗ **Mathematica** : cpu = 0.17283 (sec), leaf count = 0

```
DSolve[-((B + n*(1 + n)*WeierstrassP[x, {g2, g3}])*y[x]) + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-((B + n*(1 + n)*WeierstrassP[x, {g2, g3}])*y[x]) + Derivative[2][y][x] == 0, y[
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-(n*(n+1)*WeierstrassP(x,g2,g3)+B)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x) + (-n(n+1)\,\text{WeierstrassP}\,(x, g2, g3) - B)\_Y(x)\right\}, \{\_Y(x)\}\right)$$

ODE No. 1027

$$y(x)\left(a\text{sn}(x|k)^2+b\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.768449 (sec), leaf count = 235

```
DSolve[(b + a*JacobiSN[x, k]^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\sqrt{k\text{sn}(x|k)^2-1}\text{HeunG}\left[\frac{1}{k},-\frac{b-k}{4k},\frac{\sqrt{k-4a}+3\sqrt{k}}{4\sqrt{k}},\frac{\sqrt{k}\sqrt{k-4a}+2a+k}{2\sqrt{k}\left(\sqrt{k-4a}+\sqrt{k}\right)},\frac{1}{2},\frac{1}{2},\text{sn}(x|k)^2\right.\right.\right.$$

✓ **Maple** : cpu = 0.332 (sec), leaf count = 69

```
dsolve(diff(diff(y(x),x),x)-(n*(n+1)*k^2*JacobiSN(x,k)^2+b)*y(x)=0,y(x))
```

$$y(x)=c_1 HG\left(\frac{1}{k^2},\frac{b}{4k^2},-\frac{n}{2},\frac{n}{2}+\frac{1}{2},\frac{1}{2},\frac{1}{2},\text{sn}(x|k)^2\right)+c_2 HG\left(\frac{1}{k^2},\frac{k^2+b+1}{4k^2},\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2},\frac{3}{2},\frac{1}{2},\text{sn}(x|k)^2\right.$$

ODE No. 1028

$$y''(x) - y(x)\left(ap(x) + b + \frac{p^4(x)}{30} + \frac{7p''(x)}{3}\right) = 0$$

✗ **Mathematica** : cpu = 0.218298 (sec), leaf count = 0

```
DSolve[-(y[x]*(b + a*p[x] + (p^4)[x]/30 + (7*Derivative[2][p][x])/3)) + Derivative[2][y][x] =
```

, could not solve

```
DSolve[-(y[x]*(b + a*p[x] + (p^4)[x]/30 + (7*Derivative[2][p][x])/3)) + Derivative[2][y
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-(1/30*diff(diff(diff(diff(p(x),x),x),x),x)+7/3*diff(diff(p(x),x),
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x) + \left(-\frac{\frac{d^4}{dx^4}p(x)}{30} - \frac{7\frac{d^2}{dx^2}p(x)}{3} - ap(x) - b\right)\_Y(x)\right\}, \{\_Y(x)\}\right)$$

ODE No. 1029

$$y''(x) - y(x)\left(f'(x) + f(x)^2\right) = 0$$

✓ **Mathematica** : cpu = 0.0211334 (sec), leaf count = 58

```
DSolve[-(y[x]*(f[x]^2 + Derivative[1][f][x])) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \exp\left(\int_1^x f(K[1])dK[1]\right) + c_2 \exp\left(\int_1^x f(K[2])dK[2]\right) \int_1^x \exp\left(\int_1^{K[4]} -2f(K[3])dK[3]\right) d\right.\right.$$

✓ **Maple** : cpu = 0.115 (sec), leaf count = 22

```
dsolve(diff(diff(y(x),x),x)-(f(x)^2+diff(f(x),x))*y(x)=0,y(x))
```

$$y(x) = \left(\int \mathrm{e}^{\int -2f(x)dx} dx + c_1\right) \mathrm{e}^{\int f(x)dx} c_2$$

ODE No. 1030

$$y(x)(l+P(x))+y''(x)=0$$

✗ **Mathematica** : cpu = 0.170249 (sec), leaf count = 0

```
DSolve[(l + P[x])*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[(l + P[x])*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+(P(x)+l)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{(P(x)+l)\_Y(x)+\frac{d^2}{dx^2}\_Y(x)\right\},\{\_Y(x)\}\right)$$

ODE No. 1031

$$y''(x) - f(x)y(x) = 0$$

✗ **Mathematica** : cpu = 0.116518 (sec), leaf count = 0

```
DSolve[-(f[x]*y[x]) + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-(f[x]*y[x]) + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-f(x)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{-f(x)\_Y(x) + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

ODE No. 1032

$$y(x)\left(\frac{\left(\frac{1}{4}-v^2\right)g'(x)^2}{g(x)}+g'(x)^2+\frac{g^3(x)}{2g'(x)}-\frac{3g''(x)^2}{4g'(x)^2}\right)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.375258 (sec), leaf count = 0

```
DSolve[y[x]*((g^3)[x]/(2*Derivative[1][g][x]) + Derivative[1][g][x]^2 + ((1/4 - v^2)*Derivati
```

, could not solve

```
DSolve[y[x]*((g^3)[x]/(2*Derivative[1][g][x]) + Derivative[1][g][x]^2 + ((1/4 - v^2)*De
```

✓ **Maple** : cpu = 0.108 (sec), leaf count = 48

```
dsolve(diff(diff(y(x),x),x)+(1/2*diff(diff(diff(g(x),x),x),x)/diff(g(x),x)-3/4*diff(diff(g(x)
```

$$y(x)=\frac{c_2\,\text{WhittakerW}\left(\frac{1}{2}iv^2-\frac{1}{8}i,\frac{1}{2},2ig(x)\right)+c_1\,\text{WhittakerM}\left(\frac{1}{2}iv^2-\frac{1}{8}i,\frac{1}{2},2ig(x)\right)}{\sqrt{\frac{d}{dx}g\left(x\right)}}$$

ODE No. 1033

$$ae^{-2x}y(x)+y''(x)+y'(x)=0$$

✓ **Mathematica** : cpu = 0.0124364 (sec), leaf count = 37

```
DSolve[(a*y[x])/E^(2*x) + Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to c_1\cos\left(\sqrt{a}e^{-x}\right)-c_2\sin\left(\sqrt{a}e^{-x}\right)\}\}$$

✓ **Maple** : cpu = 0.017 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)+a*exp(-2*x)*y(x)=0,y(x))
```

$$y(x)=c_1\sin\left(\mathrm{e}^{-x}\sqrt{a}\right)+c_2\cos\left(\mathrm{e}^{-x}\sqrt{a}\right)$$

Hand solution

$$y''+y'+ae^{-2x}y=0$$

Let $y(x)=\eta(\xi)$ where $\xi=e^{-x}$, hence

$$\begin{aligned}\frac{dy}{dx}&=\frac{d\eta}{d\xi}\frac{d\xi}{dx}\\&=\frac{d\eta}{d\xi}\left(-e^{-x}\right)\end{aligned}$$

And

$$\begin{aligned}\frac{d^2y}{dx^2}&=\frac{d}{dx}\left(\frac{d\eta}{d\xi}\left(-e^{-x}\right)\right)\\&=\frac{d^2\eta}{d\xi^2}\frac{d\xi}{dx}\left(-e^{-x}\right)+\frac{d\eta}{d\xi}\left(e^{-x}\right)\\&=\frac{d^2\eta}{d\xi^2}\left(-e^{-x}\right)\left(-e^{-x}\right)+\frac{d\eta}{d\xi}\left(e^{-x}\right)\\&=\frac{d^2\eta}{d\xi^2}\left(e^{-2x}\right)+\frac{d\eta}{d\xi}\left(e^{-x}\right)\end{aligned}$$

Hence the original ODE becomes

$$\frac{d^2\eta}{d\xi^2}\left(e^{-2x}\right)+\frac{d\eta}{d\xi}\left(e^{-x}\right)+\frac{d\eta}{d\xi}\left(-e^{-x}\right)+ae^{-2x}\eta(\xi)=0$$
$$\eta''+a\eta=0$$

This is standard second order with constant coefficients. The solution is

$$\eta=c_1\cos\left(\sqrt{a}\xi\right)+c_2\sin\left(\sqrt{a}\xi\right)$$

Substituting back

$$y(x)=c_1\cos\left(\sqrt{a}e^{-x}\right)+c_2\sin\left(\sqrt{a}e^{-x}\right)$$

Verification

```
restart;
ode:=diff(diff(y(x),x),x)+diff(y(x),x)+a*exp(-2*x)*y(x)=0;
ys:=_C1*cos(sqrt(a)*exp(-x))+_C2*sin(sqrt(a)*exp(-x));
odetest(y(x)=ys,ode);
0
```

ODE No. 1034

$$y''(x) - y'(x) + e^{2x} y(x) = 0$$

✓ **Mathematica** : cpu = 0.0088873 (sec), leaf count = 20

```
DSolve[E^(2*x)*y[x] - Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 \cos(e^x) + c_2 \sin(e^x)\}\}$$

✓ **Maple** : cpu = 0.013 (sec), leaf count = 15

```
dsolve(diff(diff(y(x),x),x)-diff(y(x),x)+exp(2*x)*y(x)=0,y(x))
```

$$y(x) = c_1 \sin(\mathrm{e}^x) + c_2 \cos(\mathrm{e}^x)$$

Hand solution

$$y'' - y' + e^{2x} y = 0$$

Let $y(x) = \eta(\xi)$ where $\xi = e^x$, hence

$$\begin{aligned} \frac{dy}{dx} &= \frac{d\eta}{d\xi}\frac{d\xi}{dx} \\ &= \frac{d\eta}{d\xi} e^x \end{aligned}$$

And

$$\begin{aligned} \frac{d^2y}{dx^2} &= \frac{d}{dx}\left(\frac{d\eta}{d\xi} e^x\right) \\ &= \frac{d^2\eta}{d\xi^2}\frac{d\xi}{dx}(e^x) + \frac{d\eta}{d\xi}(e^x) \\ &= \frac{d^2\eta}{d\xi^2}(e^x)\,(e^x) + \frac{d\eta}{d\xi}(e^x) \\ &= \frac{d^2\eta}{d\xi^2}(e^{2x}) + \frac{d\eta}{d\xi}(e^x) \end{aligned}$$

Hence the original ODE becomes

$$\frac{d^2\eta}{d\xi^2}(e^{2x}) + \frac{d\eta}{d\xi}(e^x) - \frac{d\eta}{d\xi}(e^x) + e^{2x}\eta = 0$$
$$\eta'' + \eta = 0$$

This is standard second order with constant coefficients. The solution is

$$\eta = c_1 \cos(\xi) + c_2 \sin(\xi)$$

Substituting back

$$y(x) = c_1 \cos(e^x) + c_2 \sin(e^x)$$

Verification

```
restart;
ode:=diff(diff(y(x),x),x)-diff(y(x),x)+exp(2*x)*y(x)=0;
ys:=_C1*cos(exp(x))+_C2*sin(exp(x));
odetest(y(x)=ys,ode);
0
```

ODE No. 1035

$$ay'(x) + by(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.004556 (sec), leaf count = 58

```
DSolve[b*y[x] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{\frac{1}{2}x\left(-\sqrt{a^2-4b}-a\right)} + c_2 e^{\frac{1}{2}x\left(\sqrt{a^2-4b}-a\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 41

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*y(x)=0,y(x))
```

$$y(x) = c_1 \mathrm{e}^{-\frac{\left(a-\sqrt{a^2-4b}\right)x}{2}} + c_2 \mathrm{e}^{-\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}}$$

ODE No. 1036

$$ay'(x)+by(x)-f(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.139536 (sec), leaf count = 209

```
DSolve[-f[x] + b*y[x] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to e^{\frac{1}{2}x\left(-\sqrt{a^2-4b}-a\right)}\int_1^x -\frac{e^{aK[1]+\frac{1}{2}\left(\sqrt{a^2-4b}-a\right)K[1]}f(K[1])}{\sqrt{a^2-4b}}dK[1]+e^{\frac{1}{2}x\left(\sqrt{a^2-4b}-a\right)}\int_1^x \frac{e^{aK[2]+\frac{1}{2}\left(-a-\sqrt{a^2-}\right.}}{\sqrt{a^2-}\right.$$

✓ **Maple** : cpu = 0.112 (sec), leaf count = 134

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*y(x)-f(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{\left(a-\sqrt{a^2-4b}\right)x}{2}}c_2+\mathrm{e}^{-\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}}c_1+\frac{\left(\left(\int f(x)\,\mathrm{e}^{-\frac{\left(-a+\sqrt{a^2-4b}\right)x}{2}}dx\right)\mathrm{e}^{\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}}-\left(\int f(x)\,\mathrm{e}^{\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}}d\right.\right.}{\sqrt{a^2-4b}}$$

ODE No. 1037

$$ay'(x)+y(x)\left(-b^2x^2-c\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0197887 (sec), leaf count = 101

```
DSolve[(-c - b^2*x^2)*y[x] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{-\frac{ax}{2}-\frac{bx^2}{2}}H_{\frac{-a^2-4b-4c}{8b}}\left(\sqrt{b}x\right)+c_2e^{-\frac{ax}{2}-\frac{bx^2}{2}}\,{}_1F_1\left(-\frac{-a^2-4b-4c}{16b};\frac{1}{2};bx^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.098 (sec), leaf count = 64

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)-(b^2*x^2+c)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{x(bx+a)}{2}}x\left(\mathrm{KummerU}\left(\frac{a^2+12b+4c}{16b},\frac{3}{2},b\,x^2\right)c_2+\mathrm{KummerM}\left(\frac{a^2+12b+4c}{16b},\frac{3}{2},b\,x^2\right)c_1\right)$$

ODE No. 1038

$$2ay'(x) + f(x)y(x) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.333463 (sec), leaf count = 0

```
DSolve[f[x]*y[x] + 2*a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[f[x]*y[x] + 2*a*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+2*a*diff(y(x),x)+f(x)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{f(x)\_Y(x) + 2a\left(\frac{d}{dx}\_Y(x)\right) + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

ODE No. 1039

$$y''(x) + xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.009149 (sec), leaf count = 47

```
DSolve[y[x] + x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \sqrt{\frac{\pi}{2}} c_1 e^{-\frac{x^2}{2}} \operatorname{erfi}\left(\frac{x}{\sqrt{2}}\right) + c_2 e^{-\frac{x^2}{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 25

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = \left(\operatorname{erf}\left(\frac{i\sqrt{2}\,x}{2}\right) c_1 + c_2\right) \mathrm{e}^{-\frac{x^2}{2}}$$

ODE No. 1040

$$y''(x) + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.039041 (sec), leaf count = 53

```
DSolve[-y[x] + x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x - \frac{1}{2}c_2 e^{-\frac{x^2}{2}}\left(\sqrt{2\pi}e^{\frac{x^2}{2}}x\text{erf}\left(\frac{x}{\sqrt{2}}\right) + 2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.045 (sec), leaf count = 33

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = \sqrt{\pi}\,\sqrt{2}\,\mathrm{e}^{-\frac{x^2}{2}}c_2 + x\left(\pi c_2\,\mathrm{erf}\left(\frac{\sqrt{2}\,x}{2}\right) + c_1\right)$$

ODE No. 1041

$$(n+1)y(x)+y''(x)+xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0072297 (sec), leaf count = 55

```
DSolve[(1 + n)*y[x] + x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 e^{-\frac{x^2}{2}} H_n\left(\frac{x}{\sqrt{2}}\right)+c_2 e^{-\frac{x^2}{2}}\,{}_1F_1\left(-\frac{n}{2};\frac{1}{2};\frac{x^2}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.076 (sec), leaf count = 41

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)+(n+1)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{x^2}{2}}x\left(\mathrm{KummerU}\left(-\frac{n}{2}+\frac{1}{2},\frac{3}{2},\frac{x^2}{2}\right)c_2+\mathrm{KummerM}\left(-\frac{n}{2}+\frac{1}{2},\frac{3}{2},\frac{x^2}{2}\right)c_1\right)$$

ODE No. 1042

$$-ny(x)+y''(x)+xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0064842 (sec), leaf count = 61

```
DSolve[-(n*y[x]) + x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 e^{-\frac{x^2}{2}} H_{-n-1}\left(\frac{x}{\sqrt{2}}\right)+c_2 e^{-\frac{x^2}{2}}\, {}_1F_1\left(\frac{n+1}{2};\frac{1}{2};\frac{x^2}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 41

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)-n*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{x^2}{2}}x\left(\mathrm{KummerU}\left(\frac{n}{2}+1,\frac{3}{2},\frac{x^2}{2}\right)c_2+\mathrm{KummerM}\left(\frac{n}{2}+1,\frac{3}{2},\frac{x^2}{2}\right)c_1\right)$$

ODE No. 1043

$$y''(x) - xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.101548 (sec), leaf count = 69

```
DSolve[2*y[x] - x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{4}c_2\left(\sqrt{2\pi}x^2\operatorname{erfi}\left(\frac{x}{\sqrt{2}}\right) - \sqrt{2\pi}\operatorname{erfi}\left(\frac{x}{\sqrt{2}}\right) - 2e^{\frac{x^2}{2}}x\right) + c_1\left(x^2-1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.218 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x)-x*diff(y(x),x)+2*y(x)=0,y(x))
```

$$y(x) = -2\,\mathrm{e}^{\frac{x^2}{2}}c_1 x + (x-1)(1+x)\left(\sqrt{\pi}\,\sqrt{2}\,\operatorname{erfi}\left(\frac{\sqrt{2}\,x}{2}\right)c_1 + c_2\right)$$

Hand solution

$$y'' - xy' + 2y = 0 \tag{1}$$

Second order with varying coefficient. Using power series, let $y = \sum_{n=0}^{\infty} c_n x^n$, hence

$$y' = \sum_{n=0}^{\infty} nc_n x^{n-1} = \sum_{n=1}^{\infty} nc_n x^{n-1} = \sum_{n=0}^{\infty} (n+1)\,c_{n+1}x^n$$
$$y'' = \sum_{n=0}^{\infty} n(n+1)\,c_{n+1}x^{n-1} = \sum_{n=1}^{\infty} n(n+1)\,c_{n+1}x^{n-1} = \sum_{n=0}^{\infty} (n+1)(n+2)\,c_{n+2}x^n$$

Substituting back in the original ODE gives

$$\sum_{n=0}^{\infty} (n+1)(n+2)\,c_{n+2}x^n - x\sum_{n=0}^{\infty} (n+1)\,c_{n+1}x^n + 2\sum_{n=0}^{\infty} c_n x^n = 0$$
$$\sum_{n=0}^{\infty} (n+1)(n+2)\,c_{n+2}x^n - \sum_{n=0}^{\infty} (n+1)\,c_{n+1}x^{n+1} + \sum_{n=0}^{\infty} 2c_n x^n = 0$$
$$\sum_{n=0}^{\infty} (n+1)(n+2)\,c_{n+2}x^n - \sum_{n=1}^{\infty} nc_n x^n + \sum_{n=0}^{\infty} 2c_n x^n = 0$$

For $n = 0$

$$(n+1)(n+2)\,c_{n+2} + 2c_n = 0$$
$$(1)(2)\,c_2 + 2c_0 = 0$$
$$c_2 = -c_0$$

For $n \geq 1$

$$(n+1)(n+2)c_{n+2} - nc_n + 2c_n = 0$$

$$c_{n+2} = \frac{c_n(n-2)}{(n+1)(n+2)}$$

Hence for $n = 1$

$$c_3 = \frac{-c_1}{(2)(3)}$$

For $n = 2$

$$c_4 = \frac{c_2(2-2)}{(3)(4)} = 0$$

For $n = 3$

$$c_5 = \frac{c_3}{(4)(5)} = \frac{-c_1}{(2)(3)(4)(5)}$$

For $n = 4$ and since $c_4 = 0$ then

$$c_6 = \frac{c_4(n-2)}{(n+1)(n+2)} = 0$$

For $n = 5$

$$c_7 = \frac{3c_5}{(6)(7)} = -\frac{3c_1}{(2)(3)(4)(5)(6)(7)}$$

For $n = 6$ and since $c_6 = 0$ then

$$c_8 = \frac{c_6(n-2)}{(n+1)(n+2)} = 0$$

For $n = 7$

$$c_9 = \frac{5c_7}{(8)(9)} = -\frac{(3)(5)c_1}{(2)(3)(4)(5)(6)(7)(8)(9)}$$

And so on. Hence

$$\begin{aligned}
y &= \sum_{n=0}^{\infty} c_n x^n \\
&= c_0 + c_1 x + c_2 x^2 + c_3 x^3 + \cdots \\
&= c_0 + c_1 x - c_0 x^2 - \frac{c_1}{(2)(3)}x^3 - \frac{c_1}{(2)(3)(4)(5)}x^5 - \frac{3c_1}{(2)(3)(4)(5)(6)(7)}x^7 - \frac{(3)(5)c_1}{(2)(3)(4)(5)(6)(7)(8)(9)} \\
&= c_0(1-x^2) + c_1\left(x - \frac{1}{(2)(3)}x^3 - \frac{1}{(2)(3)(4)(5)}x^5 - \frac{3}{(2)(3)(4)(5)(6)(7)}x^7 - \frac{(3)(5)}{(2)(3)(4)(5)(6)(7)(8)} \right. \\
&= c_0(1-x^2) + c_1\left(x - \frac{1}{3!}x^3 - \frac{1}{5!}x^5 - \frac{3}{7!}x^7 - \frac{15}{9!}x^9 - \cdots\right)
\end{aligned}$$

Hence

$$y(x) = c_0(1-x^2) + c_1\left(x - \frac{1}{6}x^3 - \frac{1}{120}x^5 - \frac{1}{1680}x^7 - \frac{1}{24\,192}x^9 - \cdots\right)$$

Verification

```
restart;
Order:=10:
sol:=dsolve(ode,y(x),series):
subs({y(0)=c0,D(y)(0)=c1},rhs(sol)):
sol:=convert(%,polynom):

sol:=collect(sol,{c0,c1});
sol := (-x^2+1)*c0+(x-(1/6)*x^3-(1/120)*x^5-(1/1680)*x^7-(1/24192)*x^9)*c1
```

ODE No. 1044

$$-ay(x)+y''(x)-xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0058615 (sec), leaf count = 39

```
DSolve[-(a*y[x]) - x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 H_{-a}\left(\frac{x}{\sqrt{2}}\right)+c_2\,{}_1F_1\left(\frac{a}{2};\frac{1}{2};\frac{x^2}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 35

```
dsolve(diff(diff(y(x),x),x)-x*diff(y(x),x)-a*y(x)=0,y(x))
```

$$y(x)=x\left(\text{KummerU}\left(\frac{1}{2}+\frac{a}{2},\frac{3}{2},\frac{x^2}{2}\right)c_2+\text{KummerM}\left(\frac{1}{2}+\frac{a}{2},\frac{3}{2},\frac{x^2}{2}\right)c_1\right)$$

ODE No. 1045

$$y''(x) - xy'(x) + (x-1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0370513 (sec), leaf count = 39

```
DSolve[(-1 + x)*y[x] - x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \sqrt{\frac{\pi}{2}} c_2 e^{x-2} \text{erfi}\left(\frac{x-2}{\sqrt{2}}\right) + c_1 e^x\right\}\right\}$$

✓ **Maple** : cpu = 0.015 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x)-x*diff(y(x),x)+(x-1)*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^x \left(\operatorname{erf}\left(\frac{i\sqrt{2}\,(x-2)}{2}\right) c_1 + c_2\right)$$

ODE No. 1046

$$ay(x)+y''(x)-2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0056274 (sec), leaf count = 31

```
DSolve[a*y[x] - 2*x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 H_{\frac{a}{2}}(x)+c_2\,{}_1F_1\left(-\frac{a}{4};\frac{1}{2};x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.08 (sec), leaf count = 31

```
dsolve(diff(diff(y(x),x),x)-2*x*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x)=x\left(\text{KummerU}\left(\frac{1}{2}-\frac{a}{4},\frac{3}{2},x^2\right)c_2+\text{KummerM}\left(\frac{1}{2}-\frac{a}{4},\frac{3}{2},x^2\right)c_1\right)$$

ODE No. 1047

$$\left(4x^2+2\right)y(x)+y''(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0100467 (sec), leaf count = 27

```
DSolve[(2 + 4*x^2)*y[x] + 4*x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{-x^2}+c_2e^{-x^2}x\right\}\right\}$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 16

```
dsolve(diff(diff(y(x),x),x)+4*x*diff(y(x),x)+(4*x^2+2)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-x^2}(xc_2+c_1)$$

Hand solution

$$y''+4xy'+\left(4x^2+2\right)y=0 \tag{1}$$

Second order with varying coefficient. Using power series, let $y=\sum_{n=0}^{\infty}c_nx^n$, hence

$$y'=\sum_{n=0}^{\infty}nc_nx^{n-1}=\sum_{n=1}^{\infty}nc_nx^{n-1}=\sum_{n=0}^{\infty}(n+1)\,c_{n+1}x^n$$
$$y''=\sum_{n=0}^{\infty}n(n+1)\,c_{n+1}x^{n-1}=\sum_{n=1}^{\infty}n(n+1)\,c_{n+1}x^{n-1}=\sum_{n=0}^{\infty}(n+1)\,(n+2)\,c_{n+2}x^n$$

Substituting back in the original ODE gives

$$\sum_{n=0}^{\infty}(n+1)\,(n+2)\,c_{n+2}x^n+4x\sum_{n=0}^{\infty}(n+1)\,c_{n+1}x^n+\left(4x^2+2\right)\sum_{n=0}^{\infty}c_nx^n=0$$
$$\sum_{n=0}^{\infty}(n+1)\,(n+2)\,c_{n+2}x^n+\sum_{n=0}^{\infty}4(n+1)\,c_{n+1}x^{n+1}+\sum_{n=0}^{\infty}4c_nx^{n+2}+\sum_{n=0}^{\infty}2c_nx^n=0$$
$$\sum_{n=0}^{\infty}(n+1)\,(n+2)\,c_{n+2}x^n+\sum_{n=1}^{\infty}4nc_nx^n+\sum_{n=2}^{\infty}4c_{n-2}x^n+\sum_{n=0}^{\infty}2c_nx^n=0$$

For $n=0$

$$(n+1)\,(n+2)\,c_{n+2}+2c_n=0$$
$$(1)\,(2)\,c_2+2c_0=0$$
$$c_2=-c_0$$

For $n=1$

$$\begin{aligned}(n+1)(n+2)c_{n+2}+4nc_n+2c_n&=0\\(2)(3)c_3+4c_1+2c_1&=0\\c_3&=-c_1\end{aligned}$$

For $n\geq 2$

$$(n+1)(n+2)c_{n+2}+4nc_n+4c_{n-2}+2c_n=0$$

$$c_{n+2}=\frac{(-4n-2)c_n-4c_{n-2}}{(n+1)(n+2)}$$

Hence for $n=2$

$$c_4=\frac{(-8-2)c_2-4c_0}{(3)(4)}=\frac{(-8-2)(-c_0)-4c_0}{(3)(4)}=c_0\frac{6}{(3)(4)}$$

For $n=3$

$$c_5=\frac{(-12-2)c_3-4c_1}{(4)(5)}=\frac{(-12-2)(-c_1)-4c_1}{(4)(5)}=c_1\frac{10}{(4)(5)}$$

For $n=4$

$$c_6=\frac{(-16-2)c_4-4c_2}{(5)(6)}=\frac{(-16-2)\left(c_0\frac{6}{(3)(4)}\right)-4(-c_0)}{(5)(6)}=c_0\frac{-5}{(5)(6)}$$

For $n=5$

$$c_7=\frac{(-20-2)c_5-4c_3}{(6)(7)}=\frac{(-20-2)\left(c_1\frac{10}{(4)(5)}\right)-4(-c_1)}{(6)(7)}=c_1\frac{-7}{(6)(7)}$$

For $n=6$

$$c_8=\frac{(-24-2)c_6-4c_4}{(7)(8)}=\frac{(-24-2)\left(c_0\frac{-5}{(5)(6)}\right)-4\left(c_0\frac{6}{(3)(4)}\right)}{(7)(8)}=c_0\frac{7}{3}\frac{1}{(7)(8)}$$

And so on. Hence

$$\begin{aligned}y&=\sum_{n=0}^{\infty}c_nx^n\\&=c_0+c_1x+c_2x^2+\cdots\\&=c_0+c_1x-c_0x^2-c_1x^3+c_0\frac{6}{(3)(4)}x^4+c_1\frac{10}{(4)(5)}x^5-c_0\frac{5}{(5)(7)}x^6-c_1\frac{7}{(6)(7)}x^7+c_0\frac{12}{7}\frac{1}{(7)(8)}x^8+\cdots\\&=c_0\left(1-x^2+\frac{6}{(3)(4)}x^4-\frac{5}{(5)(6)}x^6+\frac{7}{3}\frac{1}{(7)(8)}x^8+\cdots\right)+c_1\left(x-x^3+\frac{10}{(4)(5)}x^5-\frac{7}{(6)(7)}x^7+\cdots\right)\\&=c_0\left(1-x^2+\frac{1}{2}x^4-\frac{1}{6}x^6+\frac{1}{24}x^8+\cdots\right)+c_1\left(x-x^3+\frac{1}{2}x^5-\frac{1}{6}x^7+\cdots\right)\end{aligned}$$

But Taylor series for $e^{-x^2} = 1 - x^2 + \frac{1}{2}x^4 - \frac{x^6}{4} + \cdots$, therefore the above becomes

$$y = c_0 e^{-x^2} + c_1 x e^{-x^2}$$

Verification

```
restart;
restart;
ode:=diff(diff(y(x),x),x)+4*x*diff(y(x),x)+(4*x^2+2)*y(x)=0;
y0:=_C0*exp(-x^2)+_C1*x*exp(-x^2);
odetest(y(x)=y0,ode);
0
```

ODE No. 1048

$$\left(2n+3x^2-1\right)y(x)+y''(x)-4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0079975 (sec), leaf count = 45

```
DSolve[(-1 + 2*n + 3*x^2)*y[x] - 4*x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 e^{\frac{x^2}{2}} H_n(x)+c_2 e^{\frac{x^2}{2}}\, {}_1F_1\left(-\frac{n}{2};\frac{1}{2};x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 37

```
dsolve(diff(diff(y(x),x),x)-4*x*diff(y(x),x)+(3*x^2+2*n-1)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{\frac{x^2}{2}}x\left(\mathrm{KummerU}\left(-\frac{n}{2}+\frac{1}{2},\frac{3}{2},x^2\right)c_2+\mathrm{KummerM}\left(-\frac{n}{2}+\frac{1}{2},\frac{3}{2},x^2\right)c_1\right)$$

ODE No. 1049

$$\left(4x^2-1\right)y(x)+y''(x)-4xy'(x)-e^x=0$$

✓ **Mathematica** : cpu = 0.0509568 (sec), leaf count = 109

```
DSolve[-E^x + (-1 + 4*x^2)*y[x] - 4*x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{4}\sqrt{\pi}e^{x(x-i)-\frac{i}{2}}\left(e^{2ix}\text{erfi}\left(\left(\frac{1}{2}+\frac{i}{2}\right)-ix\right)-ie^{i}\text{erf}\left(-x+\left(\frac{1}{2}+\frac{i}{2}\right)\right)\right)+c_1e^{x(x-i)}-\frac{1}{2}ic_2e^{(x-i)x}\right.\right.$$

✓ **Maple** : cpu = 0.149 (sec), leaf count = 66

```
dsolve(diff(diff(y(x),x),x)-4*x*diff(y(x),x)+(4*x^2-1)*y(x)-exp(x)=0,y(x))
```

$$y(x)=\frac{\left(\left(i\cos\left(x\right)+\sin\left(x\right)\right)\sqrt{\pi}\,\mathrm{e}^{\frac{i}{2}}\,\mathrm{erf}\left(x-\frac{1}{2}-\frac{i}{2}\right)-\left(i\cos\left(x\right)-\sin\left(x\right)\right)\mathrm{e}^{-\frac{i}{2}}\sqrt{\pi}\,\mathrm{erf}\left(x-\frac{1}{2}+\frac{i}{2}\right)+4\sin\left(x\right)\right.}{4}$$

ODE No. 1050

$$\left(4x^2-2\right)y(x)+y''(x)-4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0091604 (sec), leaf count = 23

```
DSolve[(-2 + 4*x^2)*y[x] - 4*x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{x^2}+c_2e^{x^2}x\right\}\right\}$$

✓ **Maple** : cpu = 0.023 (sec), leaf count = 14

```
dsolve(diff(diff(y(x),x),x)-4*x*diff(y(x),x)+(4*x^2-2)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{x^2}(xc_2+c_1)$$

ODE No. 1051

$$\left(4x^2-3\right)y(x)-e^{x^2}+y''(x)-4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0198552 (sec), leaf count = 44

```
DSolve[-E^x^2 + (-3 + 4*x^2)*y[x] - 4*x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x)\to -e^{(x-1)x+x}+c_1e^{(x-1)x}+\frac{1}{2}c_2e^{(x-1)x+2x}\right\}\right\}$$

✓ **Maple** : cpu = 0.031 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x)-4*x*diff(y(x),x)+(4*x^2-3)*y(x)-exp(x^2)=0,y(x))
```

$$y(x)=\mathrm{e}^{x(1+x)}c_2+\mathrm{e}^{x(x-1)}c_1-\mathrm{e}^{x^2}$$

ODE No. 1052

$$axy'(x) + by(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0152488 (sec), leaf count = 78

```
DSolve[b*y[x] + a*x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{-\frac{ax^2}{2}} H_{\frac{b-a}{a}}\left(\frac{\sqrt{a}x}{\sqrt{2}}\right) + c_2 e^{-\frac{ax^2}{2}} {}_1F_1\left(-\frac{b-a}{2a}; \frac{1}{2}; \frac{ax^2}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.083 (sec), leaf count = 58

```
dsolve(diff(diff(y(x),x),x)+a*x*diff(y(x),x)+b*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{-\frac{a\,x^2}{2}} x \left(\mathrm{KummerM}\left(\frac{2a-b}{2a}, \frac{3}{2}, \frac{a\,x^2}{2}\right) c_1 + \mathrm{KummerU}\left(\frac{2a-b}{2a}, \frac{3}{2}, \frac{a\,x^2}{2}\right) c_2\right)$$

ODE No. 1053

$$a^2x^2y(x)+2axy'(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0233135 (sec), leaf count = 57

```
DSolve[a^2*x^2*y[x] + 2*a*x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{-\frac{ax^2}{2}-\sqrt{a}x}+\frac{c_2e^{\sqrt{a}x-\frac{ax^2}{2}}}{2\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 35

```
dsolve(diff(diff(y(x),x),x)+2*a*x*diff(y(x),x)+a^2*x^2*y(x)=0,y(x))
```

$$y(x)=c_1\mathrm{e}^{-\frac{x\left(ax-2\sqrt{a}\right)}{2}}+c_2\mathrm{e}^{-\frac{x\left(ax+2\sqrt{a}\right)}{2}}$$

ODE No. 1054

$$(ax+b)y'(x)+y(x)(cx+d)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0339103 (sec), leaf count = 172

```
DSolve[(d + c*x)*y[x] + (b + a*x)*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 e^{\frac{cx}{a}-\frac{ax^2}{2}-bx} H_{\frac{-a^3+da^2-bca+c^2}{a^3}}\left(\frac{ab-2c}{\sqrt{2}a^{3/2}}+\frac{\sqrt{a}x}{\sqrt{2}}\right)+c_2 e^{\frac{cx}{a}-\frac{ax^2}{2}-bx}\,{}_1F_1\left(-\frac{-a^3+da^2-bca+c^2}{2a^3};\frac{1}{2};\right.\right.$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 98

```
dsolve(diff(diff(y(x),x),x)+(a*x+b)*diff(y(x),x)+(c*x+d)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{cx}{a}}\left(\mathrm{KummerU}\left(\frac{d\,a^2-abc+c^2}{2a^3},\frac{1}{2},-\frac{\left(a^2x+ab-2c\right)^2}{2a^3}\right)c_2+\mathrm{KummerM}\left(\frac{d\,a^2-abc+c^2}{2a^3},\frac{1}{2},-\right.\right.$$

ODE No. 1055

$$(ax+b)y'(x)+y(x)\left(\text{a1}x^2+\text{b1}x+\text{c1}\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.117508 (sec), leaf count = 421

```
DSolve[(c1 + b1*x + a1*x^2)*y[x] + (b + a*x)*Derivative[1][y][x] + Derivative[2][y][x] == 0,y
```

$$\left\{\left\{y(x)\to c_1 \exp\left(\frac{-bx\sqrt{a^2-4\text{a1}}-\frac{1}{2}ax^2\sqrt{a^2-4\text{a1}}-\frac{1}{2}a^2x^2-abx+2\text{a1}x^2+2\text{b1}x}{2\sqrt{a^2-4\text{a1}}}\right) H_{\frac{-a^3+2\text{c1}a^2-\sqrt{a^2-4\text{a1}}a}{}}\right.\right.$$

✓ **Maple** : cpu = 0.248 (sec), leaf count = 262

```
dsolve(diff(diff(y(x),x),x)+(a*x+b)*diff(y(x),x)+(a1*x^2+b1*x+c1)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{x\left((ax+2b)\left(a^2-4a1\right)^{\frac{3}{2}}+\left(a^2-4a1\right)\left(a^2x+2ab-4a1x-4b1\right)\right)}{4\left(a^2-4a1\right)^{\frac{3}{2}}}}\left(c_2\left(a^2x+ab-4a1x-2b1\right)\text{hypergeom}\left(\left[\frac{3(a^2-4a1)}{}\right.\right.\right.$$

ODE No. 1056

$$x^2(-y'(x)) + y''(x) + xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0397665 (sec), leaf count = 41

```
DSolve[x*y[x] - x^2*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x - \frac{c_2 \sqrt[3]{-x^3}\,\Gamma\left(-\frac{1}{3}, -\frac{x^3}{3}\right)}{3\sqrt[3]{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.097 (sec), leaf count = 48

```
dsolve(diff(diff(y(x),x),x)-x^2*diff(y(x),x)+x*y(x)=0,y(x))
```

$$y(x) = \frac{-(-x^3)^{\frac{2}{3}}\, 3^{\frac{1}{3}} \mathrm{e}^{\frac{x^3}{3}} c_2 + x^3\left(c_2\Gamma\left(\frac{2}{3}\right) - c_2\Gamma\left(\frac{2}{3}, -\frac{x^3}{3}\right) + c_1\right)}{x^2}$$

ODE No. 1057

$$x^2(-y'(x)) + y''(x) - (x+1)^2 y(x) = 0$$

✓ **Mathematica** : cpu = 0.0484582 (sec), leaf count = 56

```
DSolve[-((1 + x)^2*y[x]) - x^2*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 e^{\frac{x^3}{3}+x} \int_1^x e^{-\frac{1}{3}K[1]^3 - 2K[1]} dK[1] + c_1 e^{\frac{x^3}{3}+x}\right\}\right\}$$

✓ **Maple** : cpu = 0.148 (sec), leaf count = 50

```
dsolve(diff(diff(y(x),x),x)-x^2*diff(y(x),x)-(1+x)^2*y(x)=0,y(x))
```

$$y(x) = c_1 HT\left(0, -3, 2\,3^{\frac{1}{3}}, \frac{3^{\frac{2}{3}}x}{3}\right) \mathrm{e}^{-x} + c_2 HT\left(0, 3, 2\,3^{\frac{1}{3}}, -\frac{3^{\frac{2}{3}}x}{3}\right) \mathrm{e}^{\frac{x\left(x^2+3\right)}{3}}$$

ODE No. 1058

$$\left(x^4-2\right)xy(x)-\left((x+1)x^2y'(x)\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0527202 (sec), leaf count = 56

```
DSolve[x*(-2 + x^4)*y[x] - x^2*(1 + x)*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2e^{\frac{x^3}{3}}\int_1^x e^{\frac{K[1]^4}{4}-\frac{K[1]^3}{3}}dK[1]+c_1e^{\frac{x^3}{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.122 (sec), leaf count = 29

```
dsolve(diff(diff(y(x),x),x)-x^2*(1+x)*diff(y(x),x)+x*(x^4-2)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{\frac{x^3}{3}}\left(\left(\int \mathrm{e}^{\frac{1}{4}x^4-\frac{1}{3}x^3}dx\right)c_2+c_1\right)$$

ODE No. 1059

$$x^4 y'(x) - x^3 y(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0514939 (sec), leaf count = 39

```
DSolve[-(x^3*y[x]) + x^4*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x - \frac{c_2 \sqrt[5]{x^5}\,\Gamma\left(-\frac{1}{5}, \frac{x^5}{5}\right)}{5\sqrt[5]{5}}\right\}\right\}$$

✓ **Maple** : cpu = 0.076 (sec), leaf count = 56

```
dsolve(diff(diff(y(x),x),x)+x^4*diff(y(x),x)-x^3*y(x)=0,y(x))
```

$$y(x) = \frac{9c_2 e^{-\frac{x^5}{10}}(x^5+4)\,\text{WhittakerM}\left(\frac{7}{5}, \frac{9}{10}, \frac{x^5}{5}\right) + x^8\left(x^2 c_2 e^{-\frac{x^5}{10}}\,\text{WhittakerM}\left(\frac{2}{5}, \frac{9}{10}, \frac{x^5}{5}\right) + c_1\right)}{x^7}$$

ODE No. 1060

$$ax^{q-1}y'(x)+bx^{q-2}y(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0256687 (sec), leaf count = 83

```
DSolve[b*x^(-2 + q)*y[x] + a*x^(-1 + q)*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x)\to c_2 q^{-1/q}a^{\frac{1}{q}}(x^q)^{\frac{1}{q}}\ {}_1F_1\left(\frac{b}{aq}+\frac{1}{q};1+\frac{1}{q};-\frac{ax^q}{q}\right)+c_1\,{}_1F_1\left(\frac{b}{aq};1-\frac{1}{q};-\frac{ax^q}{q}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.162 (sec), leaf count = 81

```
dsolve(diff(diff(y(x),x),x)+a*x^(q-1)*diff(y(x),x)+b*x^(q-2)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{x^q a}{q}}x\left(\mathrm{KummerM}\left(\frac{aq-b}{aq},\frac{q+1}{q},\frac{x^q a}{q}\right)c_1+\mathrm{KummerU}\left(\frac{aq-b}{aq},\frac{q+1}{q},\frac{x^q a}{q}\right)c_2\right)$$

ODE No. 1061

$$-e^{-\frac{x^{3/2}}{3}}x + y''(x) + \sqrt{x}y'(x) + \left(\frac{x}{4} + \frac{1}{4\sqrt{x}} - 9\right)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0587448 (sec), leaf count = 70

```
DSolve[-(x/E^(x^(3/2)/3)) + (-9 + 1/(4*Sqrt[x]) + x/4)*y[x] + Sqrt[x]*Derivative[1][y][x] + D
```

$$\left\{\left\{y(x) \to -\frac{1}{9}e^{3x-\frac{1}{3}(\sqrt{x}+9)x}x + c_1 e^{-\frac{1}{3}(\sqrt{x}+9)x} + \frac{1}{6}c_2 e^{6x-\frac{1}{3}(\sqrt{x}+9)x}\right\}\right\}$$

✓ **Maple** : cpu = 0.084 (sec), leaf count = 28

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)*x^(1/2)+(1/4/x^(1/2)+1/4*x-9)*y(x)-x*exp(-1/3*x^(3/2
```

$$y(x) = -\frac{\mathrm{e}^{-\frac{x^{\frac{3}{2}}}{3}}\left(-9\cosh(3x)c_1 - 9\sinh(3x)c_2 + x\right)}{9}$$

ODE No. 1062

$$\frac{\left(x+\sqrt{x}-8\right)y(x)}{4x^2}+y''(x)-\frac{y'(x)}{\sqrt{x}}=0$$

✓ **Mathematica** : cpu = 0.0185837 (sec), leaf count = 35

```
DSolve[((-8 + Sqrt[x] + x)*y[x])/(4*x^2) - Derivative[1][y][x]/Sqrt[x] + Derivative[2][y][x]
```

$$\left\{\left\{y(x)\to \frac{1}{3}c_2e^{\sqrt{x}}x^2+\frac{c_1e^{\sqrt{x}}}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.022 (sec), leaf count = 19

```
dsolve(diff(diff(y(x),x),x)-diff(y(x),x)/x^(1/2)+1/4*(x+x^(1/2)-8)*y(x)/x^2=0,y(x))
```

$$y(x)=\frac{\mathrm{e}^{\sqrt{x}}(x^3c_2+c_1)}{x}$$

ODE No. 1063

$$y''(x) - (2e^x + 1)\, y'(x) + e^{2x} y(x) - e^{3x} = 0$$

✓ **Mathematica** : cpu = 0.0429803 (sec), leaf count = 28

```
DSolve[-E^(3*x) + E^(2*x)*y[x] - (1 + 2*E^x)*Derivative[1][y][x] + Derivative[2][y][x] == 0,y
```

$$\left\{\left\{y(x) \to e^x + c_1 e^{e^x} + c_2 e^{x+e^x} + 2\right\}\right\}$$

✓ **Maple** : cpu = 0.291 (sec), leaf count = 34

```
dsolve(diff(diff(y(x),x),x)-(2*exp(x)+1)*diff(y(x),x)+exp(2*x)*y(x)-exp(3*x)=0,y(x))
```

$$y(x) = \mathrm{e}^{e^x + \frac{x}{2}} \sinh\left(\frac{x}{2}\right) c_2 + \mathrm{e}^{e^x + \frac{x}{2}} \cosh\left(\frac{x}{2}\right) c_1 + \mathrm{e}^x + 2$$

ODE No. 1064

$$ay'(x)+by(x)+y''(x)+\tan(x)=0$$

✓ **Mathematica** : cpu = 0.439261 (sec), leaf count = 1400

```
DSolve[Tan[x] + b*y[x] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to e^{\frac{1}{2}\left(-a-\sqrt{a^2-4b}\right)x}c_1+e^{\frac{1}{2}\left(\sqrt{a^2-4b}-a\right)x}c_2+\frac{8\left(2\,{}_2F_1\left(1,\frac{1}{4}i\left(\sqrt{a^2-4b}-a\right);\frac{1}{4}i\left(\sqrt{a^2-4b}-a\right)+1;-e^{2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.343 (sec), leaf count = 134

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+tan(x)+b*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{\left(a-\sqrt{a^2-4b}\right)x}{2}}c_2+\mathrm{e}^{-\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}}c_1+\frac{\left(\left(\int\tan(x)\,\mathrm{e}^{\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}}dx\right)\mathrm{e}^{-\frac{\left(-a+\sqrt{a^2-4b}\right)x}{2}}-\left(\int\tan(x)\,\mathrm{e}^{-\frac{\left(-a+\sqrt{a}\right.}{2}}\right.\right.}{\sqrt{a^2-4b}}$$

ODE No. 1065

$$\left(n^2-a^2\right) y(x)+2n\cot(x)y'(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.139125 (sec), leaf count = 114

```
DSolve[(-a^2 + n^2)*y[x] + 2*n*Cot[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\left(\cos^2(x)-1\right)^{\frac{1}{4}(1-2n)} P^{\frac{1}{2}(2n-1)}_{\frac{1}{2}\left(2\sqrt{2n^2-a^2}-1\right)}(\cos(x))+c_2\left(\cos^2(x)-1\right)^{\frac{1}{4}(1-2n)} Q^{\frac{1}{2}(2n-1)}_{\frac{1}{2}\left(2\sqrt{2n^2-a^2}-1\right)}(\cos(x))\right.\right.$$

✓ **Maple** : cpu = 0.21 (sec), leaf count = 60

```
dsolve(diff(diff(y(x),x),x)+2*n*diff(y(x),x)*cot(x)+(-a^2+n^2)*y(x)=0,y(x))
```

$$y(x)=\left(\sin^{-n+\frac{1}{2}}(x)\right)\left(\text{LegendreQ}\left(-\frac{1}{2}+\sqrt{-a^2+2n^2},n-\frac{1}{2},\cos(x)\right)c_2+\text{LegendreP}\left(-\frac{1}{2}+\sqrt{-a^2+2}\right.\right.$$

ODE No. 1066

$$y''(x) + \tan(x)y'(x) + y(x)\cos^2(x) = 0$$

✓ **Mathematica** : cpu = 0.0236075 (sec), leaf count = 18

```
DSolve[Cos[x]^2*y[x] + Tan[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_2 \sin(\sin(x)) + c_1 \cos(\sin(x))\}\}$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 15

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)*tan(x)+y(x)*cos(x)^2=0,y(x))
```

$$y(x) = c_1 \sin(\sin(x)) + c_2 \cos(\sin(x))$$

ODE No. 1067

$$y''(x) + \tan(x)y'(x) - y(x)\cos^2(x) = 0$$

✓ **Mathematica** : cpu = 0.0233371 (sec), leaf count = 21

```
DSolve[-(Cos[x]^2*y[x]) + Tan[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 \cosh(\sin(x)) + ic_2 \sinh(\sin(x))\}\}$$

✓ **Maple** : cpu = 0.051 (sec), leaf count = 17

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)*tan(x)-y(x)*cos(x)^2=0,y(x))
```

$$y(x) = c_1 \mathrm{e}^{\sin(x)} + c_2 \mathrm{e}^{-\sin(x)}$$

ODE No. 1068

$$v(v+1)y(x)+y''(x)+\cot(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.112921 (sec), leaf count = 20

```
DSolve[v*(1 + v)*y[x] + Cot[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to c_1 P_v(\cos(x))+c_2 Q_v(\cos(x))\}\}$$

✓ **Maple** : cpu = 0.196 (sec), leaf count = 45

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)*cot(x)+v*(v+1)*y(x)=0,y(x))
```

$$y(x)=c_1 \operatorname{hypergeom}\left(\left[-\frac{v}{2},\frac{1}{2}+\frac{v}{2}\right],\left[\frac{1}{2}\right],\cos^2(x)\right)+c_2\cos(x)\operatorname{hypergeom}\left(\left[1+\frac{v}{2},\frac{1}{2}-\frac{v}{2}\right],\left[\frac{3}{2}\right],\cos^2(x\right.$$

ODE No. 1069

$$y''(x) - \cot(x)y'(x) + y(x)\sin^2(x) = 0$$

✓ **Mathematica** : cpu = 0.024718 (sec), leaf count = 19

```
DSolve[Sin[x]^2*y[x] - Cot[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 \cos(\cos(x)) - c_2 \sin(\cos(x))\}\}$$

✓ **Maple** : cpu = 0.094 (sec), leaf count = 15

```
dsolve(diff(diff(y(x),x),x)-diff(y(x),x)*cot(x)+y(x)*sin(x)^2=0,y(x))
```

$$y(x) = c_1 \sin(\cos(x)) + c_2 \cos(\cos(x))$$

ODE No. 1070

$$a\tan(x)y'(x)+by(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.244218 (sec), leaf count = 143

```
DSolve[b*y[x] + a*Tan[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(-\frac{a}{4}-\frac{1}{4}\sqrt{a^2+4b},\frac{1}{4}\sqrt{a^2+4b}-\frac{a}{4};\frac{1}{2}-\frac{a}{2};\cos^2(x)\right)+i^{a+1}c_2\cos^{a+1}(x)\,{}_2F_1\left(\frac{a}{4}-\frac{1}{4}\sqrt{a^2+\right.\right.$$

✓ **Maple** : cpu = 0.157 (sec), leaf count = 60

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)*tan(x)+b*y(x)=0,y(x))
```

$$y(x)=\left(\cos^{\frac{1}{2}+\frac{a}{2}}(x)\right)\left(\text{LegendreP}\left(\frac{\sqrt{a^2+4b}}{2}-\frac{1}{2},\frac{1}{2}+\frac{a}{2},\sin(x)\right)c_1+\text{LegendreQ}\left(\frac{\sqrt{a^2+4b}}{2}-\frac{1}{2},\frac{1}{2}+\right.\right.$$

ODE No. 1071

$$\left(b^2-a^2\right) y(x)+2a\cot(ax)y'(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.061108 (sec), leaf count = 44

```
DSolve[(-a^2 + b^2)*y[x] + 2*a*Cot[a*x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x)\to c_1 e^{-ibx}\csc(ax)-\frac{ic_2 e^{ibx}\csc(ax)}{2b}\right\}\right\}$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 24

```
dsolve(diff(diff(y(x),x),x)+2*a*diff(y(x),x)*cot(a*x)+(-a^2+b^2)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\cos(bx)+c_1\sin(bx)}{\sin(ax)}$$

ODE No. 1072

$$y(x)\left(-4anp(x)^2+a+bp(x)\right)+ap''(x)y'(x)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.290872 (sec), leaf count = 0

```
DSolve[(a + b*p[x] - 4*a*n*p[x]^2)*y[x] + a*Derivative[1][y][x]*Derivative[2][p][x] + Derivat
```

, could not solve

```
DSolve[(a + b*p[x] - 4*a*n*p[x]^2)*y[x] + a*Derivative[1][y][x]*Derivative[2][p][x] + D
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a*diff(diff(p(x),x),x)*diff(y(x),x)+(a+b*p(x)-4*n*a*p(x)^2)*y(x)=
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x)+a\left(\frac{d^2}{dx^2}p(x)\right)\left(\frac{d}{dx}\_Y(x)\right)+\left(a+bp(x)-4nap(x)^2\right)\_Y(x)\right\},\{\_Y(x)\}\right)$$

ODE No. 1073

$$\frac{y'(x)\left(-\wp(x;a,b)\wp'(x;a,b)+\wp(x;a,b)^3-6\wp(x;a,b)^2+\frac{a}{2}\right)}{\wp'(x;a,b)-\wp(x;a,b)^2}+\frac{y(x)\left(\wp(x;a,b)^2(-\wp'(x;a,b))-\left(6\wp(x;a,b)^2-\right.\right.}{\wp(x;a,b)^2+\wp'(x;a,}$$

✗ **Mathematica** : cpu = 1.06813 (sec), leaf count = 0

```
DSolve[((-(WeierstrassP[x, {a, b}]*(-1/2*a + 6*WeierstrassP[x, {a, b}]^2)) - WeierstrassP[x,
```

, could not solve

```
DSolve[((-(WeierstrassP[x, {a, b}]*(-1/2*a + 6*WeierstrassP[x, {a, b}]^2)) - Weierstras
WeierstrassP[x, {a, b}]^2 + WeierstrassPPrime[x, {a, b}]) + Derivative[2][y][x] == 0, y
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+(11*WeierstrassP(x,a,b)*WeierstrassPPrime(x,a,b)-6*WeierstrassP(x
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x)+\frac{\left(11\,\text{WeierstrassP}\left(x,a,b\right)\mathcal{P}'(x;a,b)-6\,\text{WeierstrassP}\left(x,a,b\right)^2+\frac{a}{2}\right)\left(\frac{d}{dx}\_Y(\right.}{\mathcal{P}'\left(x;a,b\right)+\text{WeierstrassP}\left(x,a,b\right)^2}\right.$$

ODE No. 1074

$$\frac{k^2 \mathrm{cn}(x|k)\mathrm{sn}(x|k)y'(x)}{\mathrm{dn}(x|k)} + n^2 y(x)\mathrm{dn}(x|k)^2 + y''(x) = 0$$

✗ **Mathematica** : cpu = 4.03005 (sec), leaf count = 0

```
DSolve[n^2*JacobiDN[x, k]^2*y[x] + (k^2*JacobiCN[x, k]*JacobiSN[x, k]*Derivative[1][y][x])/Ja
```

, could not solve

```
DSolve[n^2*JacobiDN[x, k]^2*y[x] + (k^2*JacobiCN[x, k]*JacobiSN[x, k]*Derivative[1][y][
```

✓ **Maple** : cpu = 0.034 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x)+k^2*JacobiSN(x,k)*JacobiCN(x,k)/JacobiDN(x,k)*diff(y(x),x)+n^2*y(
```

$$y(x) = c_1 \sin\left(n\,\mathrm{am}(x|k)\right) + c_2 \cos\left(n\,\mathrm{am}(x|k)\right)$$

ODE No. 1075

$$f(x)y'(x) + g(x)y(x) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.215446 (sec), leaf count = 0

```
DSolve[g[x]*y[x] + f[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[g[x]*y[x] + f[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+f(x)*diff(y(x),x)+g(x)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{g(x)\_Y(x) + f(x)\left(\frac{d}{dx}\_Y(x)\right) + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

ODE No. 1076

$$y(x)\left(a+f'(x)\right)+f(x)y'(x)-g(x)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.206154 (sec), leaf count = 0

```
DSolve[-g[x] + y[x]*(a + Derivative[1][f][x]) + f[x]*Derivative[1][y][x] + Derivative[2][y][x
```

, could not solve

```
DSolve[-g[x] + y[x]*(a + Derivative[1][f][x]) + f[x]*Derivative[1][y][x] + Derivative[2
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+f(x)*diff(y(x),x)+(diff(f(x),x)+a)*y(x)-g(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x)+f(x)\left(\frac{d}{dx}\_Y(x)\right)+\left(\frac{d}{dx}f(x)+a\right)\_Y(x)-g(x)\right\},\{\_Y(x)\}\right)$$

ODE No. 1077

$$y'(x)(af(x)+b)+y(x)(cf(x)+d)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.353646 (sec), leaf count = 0

```
DSolve[(d + c*f[x])*y[x] + (b + a*f[x])*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x
```

, could not solve

```
DSolve[(d + c*f[x])*y[x] + (b + a*f[x])*Derivative[1][y][x] + Derivative[2][y][x] == 0,
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+(a*f(x)+b)*diff(y(x),x)+(c*f(x)+d)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x)+(af(x)+b)\left(\frac{d}{dx}\_Y(x)\right)+(cf(x)+d)\_Y(x)\right\},\{\_Y(x)\}\right)$$

ODE No. 1078

$$y(x)\left(a+\frac{f'(x)}{2}+\frac{f(x)^2}{4}\right)+f(x)y'(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0304972 (sec), leaf count = 76

```
DSolve[y[x]*(a + f[x]^2/4 + Derivative[1][f][x]/2) + f[x]*Derivative[1][y][x] + Derivative[2]
```

$$\left\{\left\{y(x)\to c_1 \exp\left(-\frac{1}{2}\int_1^x f(K[1])dK[1]-i\sqrt{a}x\right)-\frac{ic_2 \exp\left(-\frac{1}{2}\int_1^x f(K[1])dK[1]+i\sqrt{a}x\right)}{2\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 33

```
dsolve(diff(diff(y(x),x),x)+f(x)*diff(y(x),x)+(1/4*f(x)^2+1/2*diff(f(x),x)+a)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{\left(\int f(x)dx\right)}{2}}\left(\sinh\left(\sqrt{-a}\,x\right)c_1+\cosh\left(\sqrt{-a}\,x\right)c_2\right)$$

ODE No. 1079

$$by(x)f(x)^{2a} - \frac{af'(x)y'(x)}{f(x)} + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.207405 (sec), leaf count = 315

```
DSolve[b*f[x]^(2*a)*y[x] - (a*Derivative[1][f][x]*Derivative[1][y][x])/f[x] + Derivative[2][y
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{c_1}\exp\left(-\int_1^x -i\sqrt{b}f(K[1])^a dK[1] - c_2\right)\left(-1+\exp\left(2\int_1^x -i\sqrt{b}f(K[1])^a dK[1] + 2c_2\right)\right)}{\sqrt{2}}\right\}\right\},$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 37

```
dsolve(diff(diff(y(x),x),x)-a*diff(f(x),x)/f(x)*diff(y(x),x)+b*f(x)^(2*a)*y(x)=0,y(x))
```

$$y(x) = c_1 \mathrm{e}^{\int i f(x)^a \sqrt{b} dx} + c_2 \mathrm{e}^{-\left(\int i f(x)^a \sqrt{b} dx\right)}$$

ODE No. 1080

$$y(x)\left(a^2+\frac{af'(x)}{f(x)}-b^2f(x)^2\right)-y'(x)\left(2a+\frac{f'(x)}{f(x)}\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0576106 (sec), leaf count = 49

```
DSolve[y[x]*(a^2 - b^2*f[x]^2 + (a*Derivative[1][f][x])/f[x]) - (2*a + Derivative[1][f][x]/f[
```

$$\left\{\left\{y(x)\to c_1\exp\left(b\int_1^x f(K[1])dK[1]+ax\right)+c_2\exp\left(ax-b\int_1^x f(K[2])dK[2]\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.492 (sec), leaf count = 74

```
dsolve(diff(diff(y(x),x),x)-(diff(f(x),x)/f(x)+2*a)*diff(y(x),x)+(a*diff(f(x),x)/f(x)+a^2-b^2
```

$$y(x)=\mathrm{e}^{\int -\frac{f(x)\mathrm{e}^{\int -2bf(x)dx}\mathrm{e}^{2c_1}b+bf(x)-\mathrm{e}^{\int -2bf(x)dx}\mathrm{e}^{2c_1}b+a}{\mathrm{e}^{\int -2bf(x)dx}\mathrm{e}^{2c_1}b-1}dx}c_2$$

ODE No. 1081

$$-\frac{a^2 y(x) f'(x)^2}{b^2+f(x)^2}+\frac{f(x) f^3(x) y'(x)}{b^2+f(x)^2}+y''(x)=0$$

✗ **Mathematica** : cpu = 0.667839 (sec), leaf count = 0

```
DSolve[-((a^2*y[x]*Derivative[1][f][x]^2)/(b^2 + f[x]^2)) + (f[x]*(f^3)[x]*Derivative[1][y][x
```

, could not solve

```
DSolve[-((a^2*y[x]*Derivative[1][f][x]^2)/(b^2 + f[x]^2)) + (f[x]*(f^3)[x]*Derivative[1
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+f(x)*diff(diff(diff(f(x),x),x),x)/(f(x)^2+b^2)*diff(y(x),x)-a^2*d
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x)+\frac{f(x)\left(\frac{d^3}{dx^3}f(x)\right)\left(\frac{d}{dx}\_Y(x)\right)}{f(x)^2+b^2}-\frac{a^2\left(\frac{d}{dx}f(x)\right)^2\_Y(x)}{f(x)^2+b^2}\right\},\{\_Y(x)\}\right)$$

ODE No. 1082

$$y(x)\left(\frac{(m^2-v^2)\,g'(x)^2}{g(x)}+g'(x)^2\right)-y'(x)\left(\frac{(2m-1)g'(x)}{g(x)}+\frac{g''(x)}{g'(x)}\right)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.529297 (sec), leaf count = 0

```
DSolve[y[x]*(Derivative[1][g][x]^2 + ((m^2 - v^2)*Derivative[1][g][x]^2)/g[x]) - Derivative[1
```

, could not solve

```
DSolve[y[x]*(Derivative[1][g][x]^2 + ((m^2 - v^2)*Derivative[1][g][x]^2)/g[x]) - Deriva
1 + 2*m)*Derivative[1][g][x])/g[x] + Derivative[2][g][x]/Derivative[1][g][x]) + Derivat
```

✓ **Maple** : cpu = 0.126 (sec), leaf count = 74

```
dsolve(diff(diff(y(x),x),x)-(diff(diff(g(x),x),x)/diff(g(x),x)+(2*m-1)*diff(g(x),x)/g(x))*dif
```

$$y(x)=g(x)^{2m}\,\mathrm{e}^{-ig(x)}\left(\mathrm{KummerM}\left(\frac{1}{2}im^2-\frac{1}{2}iv^2+m+\frac{1}{2},1+2m,2ig(x)\right)c_1+\mathrm{KummerU}\left(\frac{1}{2}im^2-\frac{1}{2}iv^2\right.\right.$$

ODE No. 1083

$$-\frac{f'(x)y'(x)}{f(x)}+y(x)\left(-\frac{f''(x)}{2f(x)}+\frac{3f'(x)^2}{4f(x)^2}+\frac{\left(\frac{1}{4}-v^2\right)g'(x)^2}{g(x)^2}+g'(x)^2+\frac{g^3(x)}{2g'(x)}-\frac{3g''(x)^2}{4g'(x)^2}\right)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.650077 (sec), leaf count = 0

```
DSolve[-((Derivative[1][f][x]*Derivative[1][y][x])/f[x]) + y[x]*((3*Derivative[1][f][x]^2)/(4
```

, could not solve

```
DSolve[-((Derivative[1][f][x]*Derivative[1][y][x])/f[x]) + y[x]*((3*Derivative[1][f][x]
```

✓ **Maple** : cpu = 0.11 (sec), leaf count = 31

```
dsolve(diff(diff(y(x),x),x)-diff(f(x),x)*diff(y(x),x)/f(x)+(3/4*diff(f(x),x)^2/f(x)^2-1/2*dif
```

$$y(x)=\sqrt{\frac{g(x)f(x)}{\frac{d}{dx}g(x)}}\left(\text{BesselY}\left(v,g(x)\right)c_2+\text{BesselJ}\left(v,g(x)\right)c_1\right)$$

ODE No. 1084

$$-y'(x)\left(\frac{2f'(x)}{f(x)}-\frac{g'(x)}{g(x)}+\frac{g''(x)}{g'(x)}\right)+y(x)\left(-\frac{f''(x)}{f(x)}+\frac{f'(x)\left(\frac{2f'(x)}{f(x)}-\frac{g'(x)}{g(x)}+\frac{g''(x)}{g'(x)}\right)}{f(x)}-\frac{v^2g'(x)^2}{g(x)^2}+g'(x)^2\right)+$$

✓ **Mathematica** : cpu = 0.144912 (sec), leaf count = 36

```
DSolve[-(Derivative[1][y][x]*((2*Derivative[1][f][x])/f[x] - Derivative[1][g][x]/g[x] + Deriv
```

$$\{\{y(x)\to c_1f(x)J_{\sqrt{v^2}}(g(x))+c_2f(x)Y_{\sqrt{v^2}}(g(x))\}\}$$

✓ **Maple** : cpu = 0.09 (sec), leaf count = 20

```
dsolve(diff(diff(y(x),x),x)-(2*diff(f(x),x)/f(x)+diff(diff(g(x),x),x)/diff(g(x),x))-diff(g(x),
```

$$y(x)=f(x)\left(\text{BesselY}\left(v,g(x)\right)c_2+\text{BesselJ}\left(v,g(x)\right)c_1\right)$$

ODE No. 1085

$$-y'(x)\left(\frac{(2v-1)g'(x)}{g(x)}+\frac{g''(x)}{g'(x)}+\frac{2h'(x)}{h(x)}\right)+y(x)\left(g'(x)^2+\frac{h'(x)\left(\frac{(2v-1)g'(x)}{g(x)}+\frac{g''(x)}{g'(x)}+\frac{2h'(x)}{h(x)}\right)}{h(x)}-\frac{h''(x)}{h(x)}\right)+$$

✓ **Mathematica** : cpu = 0.142464 (sec), leaf count = 32

```
DSolve[-(Derivative[1][y][x]*(((-1 + 2*v)*Derivative[1][g][x])/g[x] + (2*Derivative[1][h][x])
```

$$\{\{y(x)\to c_1 h(x) g(x)^v J_v(g(x))+c_2 h(x) g(x)^v Y_v(g(x))\}\}$$

✓ **Maple** : cpu = 0.082 (sec), leaf count = 24

```
dsolve(diff(diff(y(x),x),x)-(diff(diff(g(x),x),x)/diff(g(x),x)+(2*v-1)*diff(g(x),x)/g(x)+2*di
```

$$y(x)=h(x)\,g(x)^v\left(\text{BesselY}\left(v,g(x)\right)c_2+\text{BesselJ}\left(v,g(x)\right)c_1\right)$$

ODE No. 1086

$$4y''(x) + 9xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0044427 (sec), leaf count = 42

```
DSolve[9*x*y[x] + 4*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \text{Ai}\left(\sqrt[3]{-1}\left(\frac{3}{2}\right)^{2/3} x\right) + c_2 \text{Bi}\left(\sqrt[3]{-1}\left(\frac{3}{2}\right)^{2/3} x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.021 (sec), leaf count = 29

```
dsolve(4*diff(diff(y(x),x),x)+9*x*y(x)=0,y(x))
```

$$y(x) = c_1 \,\text{AiryAi}\left(-\frac{3^{\frac{2}{3}} 2^{\frac{1}{3}} x}{2}\right) + c_2 \,\text{AiryBi}\left(-\frac{3^{\frac{2}{3}} 2^{\frac{1}{3}} x}{2}\right)$$

ODE No. 1087

$$\left(-a-x^2\right) y(x)+4y''(x)=0$$

✓ **Mathematica** : cpu = 0.0066156 (sec), leaf count = 36

```
DSolve[(-a - x^2)*y[x] + 4*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 D_{\frac{1}{4}(-a-2)}(x)+c_2 D_{\frac{a-2}{4}}(ix)\right\}\right\}$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 33

```
dsolve(4*diff(diff(y(x),x),x)-(x^2+a)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\,\text{WhittakerW}\left(-\frac{a}{8},\frac{1}{4},\frac{x^2}{2}\right)+c_1\,\text{WhittakerM}\left(-\frac{a}{8},\frac{1}{4},\frac{x^2}{2}\right)}{\sqrt{x}}$$

ODE No. 1088

$$4y''(x) + 4\tan(x)y'(x) + y(x)\left(-5\tan^2(x) - 2\right) = 0$$

✓ **Mathematica** : cpu = 0.0680934 (sec), leaf count = 180

```
DSolve[(-2 - 5*Tan[x]^2)*y[x] + 4*Tan[x]*Derivative[1][y][x] + 4*Derivative[2][y][x] == 0,y[x
```

$$\left\{\left\{y(x) \to \frac{3(-1)^{5/8}c_2\left(4\sqrt[4]{-1}2^{3/4}\sinh^{-1}\left(\frac{1}{2}\sqrt[4]{-\frac{1}{2}}\sqrt[4]{-8\cos^2(2x) - 16\cos(2x) - 8}\right) - i\sqrt[4]{-8\cos^2(2x) - 1\right.}\right.}{8\sqrt[8]{2}\sqrt[8]{-8\cos^2(2x) - 16\cos(2x) - 8}}\right.\right.$$

✓ **Maple** : cpu = 0.131 (sec), leaf count = 31

```
dsolve(4*diff(diff(y(x),x),x)+4*diff(y(x),x)*tan(x)-(5*tan(x)^2+2)*y(x)=0,y(x))
```

$$y(x) = \frac{i\sin(x)\cos(x)c_2 - \ln\left(i\cos(x) + \sin(x)\right)c_2 + c_1}{\sqrt{\cos(x)}}$$

ODE No. 1089

$$-y'(x)(ab+c+x)+ay''(x)+y(x)(b(c+x)+d)=0$$

✓ **Mathematica** : cpu = 0.0316982 (sec), leaf count = 99

```
DSolve[(d + b*(c + x))*y[x] - (a*b + c + x)*Derivative[1][y][x] + a*Derivative[2][y][x] == 0,
```

$$\left\{\left\{y(x)\to c_1 e^{bx} H_d\left(\frac{x}{\sqrt{2}\sqrt{a}}-\frac{ab-c}{\sqrt{2}\sqrt{a}}\right)+c_2 e^{bx}\,{}_1F_1\left(-\frac{d}{2};\frac{1}{2};\left(\frac{x}{\sqrt{2}\sqrt{a}}-\frac{ab-c}{\sqrt{2}\sqrt{a}}\right)^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 58

```
dsolve(a*diff(diff(y(x),x),x)-(a*b+c+x)*diff(y(x),x)+(b*(x+c)+d)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{bx}\left(\mathrm{KummerU}\left(-\frac{d}{2},\frac{1}{2},\frac{(ab-c-x)^2}{2a}\right)c_2+\mathrm{KummerM}\left(-\frac{d}{2},\frac{1}{2},\frac{(ab-c-x)^2}{2a}\right)c_1\right)$$

ODE No. 1090

$$a\left(a^2-2be^{-ax}\right)y'(x)+a^2y''(x)+b^2e^{-2ax}y(x)=0$$

✓ **Mathematica** : cpu = 0.0247021 (sec), leaf count = 50

```
DSolve[(b^2*y[x])/E^(2*a*x) + a*(a^2 - (2*b)/E^(a*x))*Derivative[1][y][x] + a^2*Derivative[2]
```

$$\left\{\left\{y(x)\to c_1e^{-\frac{be^{-ax}}{a^2}}-\frac{bc_2e^{-\frac{be^{-ax}}{a^2}-ax}}{a^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.041 (sec), leaf count = 40

```
dsolve(a^2*diff(diff(y(x),x),x)+a*(a^2-2*b*exp(-a*x))*diff(y(x),x)+b^2*exp(-2*a*x)*y(x)=0,y(x
```

$$y(x)=\mathrm{e}^{-\frac{a^3x+2b\,\mathrm{e}^{-ax}}{2a^2}}\left(\sinh\left(\frac{ax}{2}\right)c_1+\cosh\left(\frac{ax}{2}\right)c_2\right)$$

ODE No. 1091

$$x(y''(x)+y(x))-\cos(x)=0$$

✓ **Mathematica** : cpu = 0.0171449 (sec), leaf count = 41

```
DSolve[-Cos[x] + x*(y[x] + Derivative[2][y][x]) == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{2}(\text{Ci}(2x)\sin(x)-\text{Si}(2x)\cos(x)+\log(x)\sin(x))+c_1\cos(x)+c_2\sin(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 35

```
dsolve(x*(diff(diff(y(x),x),x)+y(x))-cos(x)=0,y(x))
```

$$y(x)=\frac{\sin(x)\,\text{cosineIntegral}(2x)}{2}-\frac{\text{sinIntegral}(2x)\cos(x)}{2}+\frac{(2c_2+\ln(x))\sin(x)}{2}+\cos(x)\,c_1$$

ODE No. 1092

$$(a+x)y(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0678056 (sec), leaf count = 72

```
DSolve[(a + x)*y[x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2 e^{-ix}x\,{}_1F_1\left(1-\frac{1}{4}i(-2(a-2)-4);2;2ix\right)+c_1 e^{-ix}xU\left(1-\frac{1}{4}i(-2(a-2)-4),2,2ix\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 29

```
dsolve(x*diff(diff(y(x),x),x)+(x+a)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{WhittakerM}\left(-\frac{ia}{2},\frac{1}{2},2ix\right)+c_2\,\text{WhittakerW}\left(-\frac{ia}{2},\frac{1}{2},2ix\right)$$

ODE No. 1093

$$xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0146809 (sec), leaf count = 13

```
DSolve[Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 \log(x) + c_2\}\}$$

✓ **Maple** : cpu = 0.007 (sec), leaf count = 10

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)=0,y(x))
```

$$y(x) = c_2 \ln(x) + c_1$$

ODE No. 1094

$$ay(x) + xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.016364 (sec), leaf count = 41

```
DSolve[a*y[x] + Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 J_0\left(2\sqrt{a}\sqrt{x}\right) + 2c_2 Y_0\left(2\sqrt{a}\sqrt{x}\right)\}\}$$

✓ **Maple** : cpu = 0.013 (sec), leaf count = 29

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = c_1 \,\text{BesselJ}\left(0, 2\sqrt{a}\,\sqrt{x}\right) + c_2 \,\text{BesselY}\left(0, 2\sqrt{a}\,\sqrt{x}\right)$$

ODE No. 1095

$$lxy(x) + xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0066836 (sec), leaf count = 30

```
DSolve[l*x*y[x] + Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 J_0\left(\sqrt{l}x\right) + c_2 Y_0\left(\sqrt{l}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.038 (sec), leaf count = 23

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)+l*x*y(x)=0,y(x))
```

$$y(x) = c_1 \,\text{BesselJ}\left(0, \sqrt{l}\,x\right) + c_2 \,\text{BesselY}\left(0, \sqrt{l}\,x\right)$$

ODE No. 1096

$$(a+x)y(x)+xy''(x)+y'(x)=0$$

✓ **Mathematica** : cpu = 0.0093284 (sec), leaf count = 61

```
DSolve[(a + x)*y[x] + Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 e^{-ix} U\left(\frac{1}{2}i(a-i),1,2ix\right)+c_2 e^{-ix} L_{-\frac{1}{2}i(a-i)}(2ix)\right\}\right\}$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 39

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)+(x+a)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-ix}\left(\mathrm{KummerU}\left(\frac{1}{2}+\frac{ia}{2},1,2ix\right)c_2+\mathrm{KummerM}\left(\frac{1}{2}+\frac{ia}{2},1,2ix\right)c_1\right)$$

ODE No. 1097

$$ay(x) + xy''(x) - y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0197088 (sec), leaf count = 46

```
DSolve[a*y[x] - Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to 2ac_1 x J_2\left(2\sqrt{a}\sqrt{x}\right) - 2ac_2 x Y_2\left(2\sqrt{a}\sqrt{x}\right)\}\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 31

```
dsolve(x*diff(diff(y(x),x),x)-diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = x\left(\text{BesselY}\left(2, 2\sqrt{a}\,\sqrt{x}\right) c_2 + \text{BesselJ}\left(2, 2\sqrt{a}\,\sqrt{x}\right) c_1\right)$$

ODE No. 1098

$$-ax^3y(x)+xy''(x)-y'(x)=0$$

✓ **Mathematica** : cpu = 0.0071431 (sec), leaf count = 41

```
DSolve[-(a*x^3*y[x]) - Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cosh\left(\frac{\sqrt{a}x^2}{2}\right)+ic_2\sinh\left(\frac{\sqrt{a}x^2}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.009 (sec), leaf count = 27

```
dsolve(x*diff(diff(y(x),x),x)-diff(y(x),x)-y(x)*a*x^3=0,y(x))
```

$$y(x)=c_1\sinh\left(\frac{\sqrt{a}\,x^2}{2}\right)+c_2\cosh\left(\frac{\sqrt{a}\,x^2}{2}\right)$$

ODE No. 1099

$$x^3\left(e^{x^3}-v^2\right)y(x)+xy''(x)-y'(x)=0$$

✗ **Mathematica** : cpu = 0.862301 (sec), leaf count = 0

```
DSolve[(E^x^3 - v^2)*x^3*y[x] - Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[(E^x^3 - v^2)*x^3*y[x] - Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x],
```

✓ **Maple** : cpu = 0.054 (sec), leaf count = 25

```
dsolve(x*diff(diff(y(x),x),x)-diff(y(x),x)+x^3*(exp(x^2)-v^2)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{BesselJ}\left(v,\mathrm{e}^{\frac{x^2}{2}}\right)+c_2\,\text{BesselY}\left(v,\mathrm{e}^{\frac{x^2}{2}}\right)$$

ODE No. 1100

$$xy''(x) + 2y'(x) - xy(x) - e^x = 0$$

✓ **Mathematica** : cpu = 0.0155858 (sec), leaf count = 44

```
DSolve[-E^x - x*y[x] + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{e^x(2x-1)}{4x} + \frac{c_1 e^{-x}}{x} + \frac{c_2 e^x}{2x}\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 23

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)-x*y(x)-exp(x)=0,y(x))
```

$$y(x) = \frac{\sinh(x)\, c_2}{x} + \frac{\cosh(x)\, c_1}{x} + \frac{\mathrm{e}^x}{2}$$

Hand solution

$$xy'' + 2y' - xy = e^x \tag{1}$$

First method, much shorter, using transformation. Let $y_h = \frac{u(x)}{x}$, hence (now we are solving only the homogeneous part).

$$y' = \frac{u'}{x} - \frac{u}{x^2}$$
$$y'' = \frac{u''}{x} - \frac{u'}{x^2} - \frac{u'}{x^2} + 2\frac{u}{x^3}$$

And (1) becomes

$$x\left(\frac{u''}{x} - \frac{u'}{x^2} - \frac{u'}{x^2} + 2\frac{u}{x^3}\right) + 2\left(\frac{u'}{x} - \frac{u}{x^2}\right) - x\left(\frac{u}{x}\right) = 0$$
$$u'' - 2\frac{u'}{x} + 2\frac{u}{x^2} + \frac{2u'}{x} - \frac{2u}{x^2} - u = 0$$
$$u'' - u = 0$$

Hence the roots of the characteristic equation are ± 1 and the solution is

$$u = Ae^x + Be^{-x}$$

Hence

$$y_h = \frac{1}{x}\left(Ae^{x} + Be^{-x}\right)$$

The particular solution is found below, and given in the second method. The transformation method is much simpler.

The second method, which is much longer, using series method. This is used if a transformation is not known or can not be found. There is singularity at $x = 0$. We need to check if the singularity is regular or not. Writing in standard form $y'' + p(x)\, y' + q(x)\, y = 0$ gives (we are looking at the homogeneous part now only)

$$y'' + \frac{2}{x}y' - y = 0$$

Hence $\lim_{x\to 0} xp(x) = \lim_{x\to 0} x\frac{2}{x} = 2$ which is analytic at $x = 0$. And $\lim_{x\to 0} x^2 q(x) = \lim_{x\to 0} -x^2 = 0$ which is analytic. Hence the singularity is regular (removable). Using Frobenius series, assume that

$$y = \sum_{n=-\infty}^{\infty} c_n x^{n+r}$$

Where $c_n = 0$ for $n < 0$. Hence

$$\begin{aligned} y' &= \sum (n+r)\, c_n x^{n+r-1} \\ y'' &= \sum (n+r)\,(n+r-1)\, c_n x^{n+r-2} \end{aligned}$$

Substituting back in the original ODE gives

$$\sum (n+r)\,(n+r-1)\, c_n x^{n+r-1} + \sum 2(n+r)\, c_n x^{n+r-1} - \sum c_n x^{n+r+1} = 0$$

Adjusting so that all have same power x^{n+r} gives

$$\sum (n+r+1)\,(n+r)\, c_{n+1} x^{n+r} + \sum 2(n+r+1)\, c_{n+1} x^{n+r} - \sum c_{n-1} x^{n+r} = 0$$

Hence

$$\begin{aligned} (n+r+1)\,(n+r)\, c_{n+1} + 2(n+r+1)\, c_{n+1} - c_{n-1} &= 0 \\ (n+r+1)\,(2+(n+r))\, c_{n+1} - c_{n-1} &= 0 \end{aligned} \tag{2}$$

We want equation with c_0 in it. Hence let $n = -1$

$$(-1+r+1)\,(2+(-1+r))\, c_0 - c_{-2} = 0$$

But $c_n = 0$ for all $n < 0$ hence

$$(-1+r+1)\,(2+(-1+r))\, c_0 = 0$$

But $c_0 \neq 0$, as this is the basis for this method. Therefore, we obtain the indicial equation for r

$$\begin{aligned}(-1+r+1)\,(2+(-1+r)) &= 0\\ r(r+1) &= 0\end{aligned}$$

Hence $r = 0$ or $r = -1$ are the roots. Now for each r we find a solution. Using $r = 0$, we go back the recurrence equation (2)

$$\begin{aligned}(n+1)\,(2+n)\,c_{n+1} - c_{n-1} &= 0\\ c_{n+1} &= \frac{c_{n-1}}{(n+1)\,(2+n)}\end{aligned}$$

For $n = 0$

$$c_1 = \frac{c_{-1}}{(n+1)\,(2+n)} = 0$$

For $n = 1$

$$c_2 = \frac{c_0}{(2)\,(3)}$$

For $n = 2$

$$c_3 = \frac{c_1}{(n+1)\,(2+n)} = 0$$

For $n = 3$

$$c_4 = \frac{c_2}{(4)\,(5)} = \frac{c_0}{(2)\,(3)\,(4)\,(5)}$$

And so on. Hence, for $r = 0$ we have

$$\begin{aligned}y_{r=0} &= \sum_{n=0}^{\infty} c_n x^n = c_0 + c_1 x^1 + c_2 x^2 + c_3 x^3 + \cdots\\ &= c_0 + \frac{c_0}{6}x^2 + \frac{c_0}{120}x^4 + \cdots\\ &= A\left(1 + \frac{1}{6}x^2 + \frac{1}{120}x^4 + \cdots\right)\end{aligned} \tag{3}$$

Where A is used as arbitrary constant instead of a_0. Now we find the solution for $r = -1$. we go back the recurrence equation (2)

$$\begin{aligned}(n-1+1)\,(2+(n-1))\,c_{n+1} - c_{n-1} &= 0\\ n(1+n)\,c_{n+1} - c_{n-1} &= 0\\ c_{n+1} &= \frac{c_{n-1}}{n\,(1+n)}\end{aligned}$$

For $n = 0$

$$c_1 = \frac{c_{-1}}{n\,(1+n)} = 0$$

For $n = 1$

$$c_2 = \frac{c_0}{2}$$

For $n=2$

$$c_3 = \frac{c_1}{n\,(1+n)} = 0$$

For $n=3$

$$c_4 = \frac{c_2}{(3)\,(4)} = \frac{c_0}{(2)\,(3)\,(4)}$$

For $n=4$

$$c_5 = \frac{c_3}{n\,(1+n)} = 0$$

For $n=5$

$$c_6 = \frac{c_4}{(5)\,(6)} = \frac{c_0}{(2)\,(3)\,(4)\,(5)\,(6)}$$

And so on. Hence solution is

$$\begin{aligned} y_{r=-1} &= \frac{1}{x}\sum_{n=0}^{\infty} c_n x^n = \frac{1}{x}\left(c_0 + \frac{c_0}{2}x^2 + \frac{c_0}{(2)\,(3)\,(4)}x^4 + \frac{c_0}{(2)\,(3)\,(4)\,(5)\,(6)}x^6 + \cdots \right) \\ &= \frac{B}{x}\left(1 + \frac{1}{2}x^2 + \frac{1}{24}x^4 + \frac{1}{720}x^6 + \cdots \right) \end{aligned}$$

Where B is used as arbitrary constant instead of a_0. Therefore, the homogeneous solution found is

$$\begin{aligned} y_h &= y_{r=0} + y_{r=-1} \\ &= A\left(1 + \frac{1}{6}x^2 + \frac{1}{120}x^4 + \cdots \right) + \frac{B}{x}\left(1 + \frac{1}{2}x^2 + \frac{1}{24}x^4 + \frac{1}{720}x^6 + \cdots \right) \end{aligned}$$

But

$$e^x = 1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \frac{1}{24}x^4 + \frac{1}{120}x^5 + \cdots \tag{3}$$

And

$$e^{-x} = 1 - x + \frac{1}{2}x^2 - \frac{1}{6}x^3 + \frac{1}{24}x^4 - \frac{1}{120}x^5 + \cdots \tag{4}$$

Hence adding (3)+(4) gives

$$\begin{aligned} e^x + e^{-x} &= 2 + 2\frac{1}{2}x^2 + 2\frac{1}{24}x^4 + \cdots \\ &= 2\left(1 + \frac{1}{2}x^2 + \frac{1}{24}x^4 + \frac{1}{720}x^6 \cdots \right) \end{aligned}$$

But $y_{r=-1} = \frac{B}{x}\left(1 + \frac{1}{2}x^2 + \frac{1}{24}x^4 + \frac{1}{720}x^6 + \cdots\right)$, therefore comparing the result we found above, we see that we can write $y_{r=-1}$ as

$$y_{r=-1} = \frac{B}{x}\left(\frac{e^x + e^{-x}}{2} \right)$$

Similarly, we obtain $y_{r=0}$ expression

$$\begin{aligned}\frac{1}{x}e^{x} &= \frac{1}{x}\left(1+x+\frac{1}{2}x^{2}+\frac{1}{6}x^{3}+\frac{1}{24}x^{4}+\frac{1}{120}x^{5}+\cdots\right)\\ &= \frac{1}{x}+1+\frac{1}{2}x+\frac{1}{6}x^{2}+\frac{1}{24}x^{3}+\frac{1}{120}x^{4}+\cdots \end{aligned} \tag{3A}$$

And

$$\begin{aligned}\frac{1}{x}e^{-x} &= \frac{1}{x}\left(1-x+\frac{1}{2}x^{2}-\frac{1}{6}x^{3}+\frac{1}{24}x^{4}-\frac{1}{120}x^{5}+\cdots\right)\\ &= \frac{1}{x}-1+\frac{1}{2}x-\frac{1}{6}x^{2}+\frac{1}{24}x^{3}-\frac{1}{120}x^{4}+\cdots \end{aligned} \tag{4A}$$

Now (3A)-(4A) gives

$$\begin{aligned}\frac{1}{x}e^{x}-\frac{1}{x}e^{-x} &= \left(\frac{1}{x}+1+\frac{1}{2}x+\frac{1}{6}x^{2}+\frac{1}{24}x^{3}+\frac{1}{120}x^{4}+\cdots\right)-\left(\frac{1}{x}-1+\frac{1}{2}x-\frac{1}{6}x^{2}+\frac{1}{24}x^{3}-\frac{1}{120}x^{4}+\cdots\right)\\ &= 2+2\frac{1}{6}x^{2}+2\frac{1}{120}x^{4}+\cdots\\ &= 2\left(1+\frac{1}{6}x^{2}+\frac{1}{120}x^{4}+\cdots\right)\end{aligned}$$

Hence

$$\left(1+\frac{1}{6}x^{2}+\frac{1}{120}x^{4}+\cdots\right)=\frac{1}{2x}\left(e^{x}-e^{-x}\right)$$

But $y_{r=0}=A\left(1+\frac{1}{6}x^{2}+\frac{1}{120}x^{4}+\cdots\right)$, therefore comparing the result we found above, wee see that we can write $y_{r=0}$ as

$$\begin{aligned}y_{r=0} &= A\left(\frac{1}{2x}\left(e^{x}-e^{-x}\right)\right)\\ &= \frac{A}{2x}\left(e^{x}-e^{-x}\right)\end{aligned}$$

Therefore

$$\begin{aligned}y_{h} &= y_{r=0}+y_{r=-1}\\ &= \frac{A}{2x}\left(e^{x}-e^{-x}\right)+\frac{B}{2x}\left(e^{x}+e^{-x}\right)\\ &= \frac{1}{x}\left(\frac{A}{2}e^{x}-\frac{A}{2}e^{-x}+\frac{B}{2}e^{x}+\frac{B}{2}e^{-x}\right)\\ &= \frac{1}{x}\left(e^{x}\left(\frac{A}{2}+\frac{B}{2}\right)+e^{-x}\left(-\frac{A}{2}+\frac{B}{2}\right)\right)\end{aligned}$$

Let $\frac{A+B}{2}=A_{0}$, $\frac{B-A}{2}=B_{0}$ hence the above becomes

$$y_{h}=\frac{1}{x}\left(A_{0}e^{x}+B_{0}e^{-x}\right)$$

We see this is the same solution using the transformation method given above. We now need to find particular solution. Let $y_1 = \frac{e^x}{x}, y_2 = \frac{e^{-x}}{x}$, hence $y_1' = \frac{e^x}{x} - \frac{e^x}{x^2}$ and $y_2' = \frac{-e^{-x}}{x^2} - \frac{e^{-x}}{x}$, hence the Wronskian is

$$\begin{aligned} W &= \begin{vmatrix} y_1 & y_2 \\ y_1' & y_2' \end{vmatrix} \\ &= \begin{vmatrix} \frac{e^x}{x} & \frac{e^{-x}}{x} \\ \frac{e^x}{x} - \frac{e^x}{x^2} & \frac{-e^{-x}}{x^2} - \frac{e^{-x}}{x} \end{vmatrix} \\ &= \frac{e^x}{x}\left(\frac{-e^{-x}}{x^2} - \frac{e^{-x}}{x}\right) - \frac{e^{-x}}{x}\left(\frac{e^x}{x} - \frac{e^x}{x^2}\right) \\ &= \left(\frac{-1}{x^3} - \frac{1}{x^2}\right) - \left(\frac{1}{x^2} - \frac{1}{x^3}\right) \\ &= -\frac{2}{x^2} \end{aligned}$$

Therefore, let $y_p = u_1 y_1 + u_2 y_2$ and hence

$$u_1 = -\int \frac{y_2}{aW} e^x dx$$

Where $a = x$ since the original ODE is $xy'' + 2y' - xy = e^x$, and a is the coefficient of y'' always. Hence the above becomes

$$u_1 = -\int \frac{\frac{e^{-x}}{x}}{x\left(-\frac{2}{x^2}\right)} e^x dx = \int \frac{e^{-x}}{2} e^x dx = \int \frac{1}{2} dx = \frac{x}{2}$$

And

$$u_2 = \int \frac{\frac{e^x}{x}}{x\left(-\frac{2}{x^2}\right)} e^x dx = -\int \frac{\frac{e^x}{x}}{\frac{2}{x}} e^x dx = -\frac{1}{2}\int e^{2x} dx = -\frac{1}{2}\frac{e^{2x}}{2} = \frac{-1}{4} e^{2x}$$

Hence

$$\begin{aligned} y_p &= u_1 y_1 + u_2 y_2 \\ &= \frac{x}{2}\frac{e^x}{x} - \frac{1}{4} e^{2x}\frac{e^{-x}}{x} \\ &= \frac{1}{2} e^x - \frac{1}{4x} e^x \end{aligned}$$

Therefore

$$y_p = e^x\left(\frac{1}{2} - \frac{1}{4x}\right)$$

Hence the general solution is

$$\begin{aligned} y &= y_h + y_p \\ &= \frac{1}{x}\left(A_0 e^x + B_0 e^{-x}\right) + e^x\left(\frac{1}{2} - \frac{1}{4x}\right) \end{aligned}$$

Verification

```
restart;
ode:=x*diff(diff(y(x),x),x)+2*diff(y(x),x)-x*y(x)=exp(x);
y0:=1/x*( _C1* exp(x)+ _C2*exp(-x))+ (1/2-1/(4*x))*exp(x);
odetest(y(x)=y0,ode);
0
```

ODE No. 1101

$$axy(x) + xy''(x) + 2y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0171003 (sec), leaf count = 52

```
DSolve[a*x*y[x] + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1 e^{-i\sqrt{a}x}}{x} - \frac{ic_2 e^{i\sqrt{a}x}}{2\sqrt{a}x}\right\}\right\}$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 29

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+a*x*y(x)=0,y(x))
```

$$y(x) = \frac{\sinh\left(\sqrt{-a}\,x\right) c_1 + \cosh\left(\sqrt{-a}\,x\right) c_2}{x}$$

Hand solution

$$xy'' + 2y' + axy = 0 \tag{1}$$

First method much shorter, using transformation suggested by Kamke. Let $y = \frac{u(x)}{x}$, hence

$$\begin{aligned} y' &= \frac{u'}{x} - \frac{u}{x^2} \\ y'' &= \frac{u''}{x} - \frac{u'}{x^2} - \frac{u'}{x^2} + 2\frac{u}{x^3} \end{aligned}$$

And (1) becomes

$$\begin{aligned} x\left(\frac{u''}{x} - \frac{u'}{x^2} - \frac{u'}{x^2} + 2\frac{u}{x^3}\right) + 2\left(\frac{u'}{x} - \frac{u}{x^2}\right) + ax\left(\frac{u}{x}\right) &= 0 \\ u'' - 2\frac{u'}{x} + 2\frac{u}{x^2} + \frac{2u'}{x} - \frac{2u}{x^2} + au &= 0 \\ u'' + au &= 0 \end{aligned}$$

Hence the roots of the characteristic equation are $\pm\sqrt{-a}$ and the solution is

$$u = A\cos\left(\sqrt{a}x\right) + B\sin\left(\sqrt{a}x\right)$$

Hence

$$y = \frac{1}{x}\left(A\cos\left(\sqrt{a}x\right) + B\sin\left(\sqrt{a}x\right)\right)$$

Second method Using series method.

There is singularity at $x = 0$. We need to check if it regular or not. Writing in standard form $y'' + p(x)\,y' + q(x)\,y = 0$ gives (we are looking at the homogeneous part now only)

$$y'' + \frac{2}{x}y' + ay = 0$$

Hence $\lim_{x\to 0} xp(x) = \lim_{x\to 0} x\frac{2}{x} = 2$ which is analytic at $x = 0$. And $\lim_{x\to 0} x^2 q(x) = \lim_{x\to 0} -ax^2 = 0$ which is analytic. Hence the singularity is regular (removable). Using Frobenius series, assume that

$$y = \sum_{n=-\infty}^{\infty} c_n x^{n+r}$$

Where $c_n = 0$ for $n < 0$. Hence

$$\begin{aligned} y' &= \sum (n+r)\,c_n x^{n+r-1} \\ y'' &= \sum (n+r)\,(n+r-1)\,c_n x^{n+r-2} \end{aligned}$$

Substituting back in the original ODE gives

$$\sum (n+r)\,(n+r-1)\,c_n x^{n+r-1} + \sum 2(n+r)\,c_n x^{n+r-1} + \sum a c_n x^{n+r+1} = 0$$

Adjusting so that all have same power x^{n+r} gives

$$\sum (n+r+1)\,(n+r)\,c_{n+1} x^{n+r} + \sum 2(n+r+1)\,c_{n+1} x^{n+r} + \sum a c_{n-1} x^{n+r} = 0$$

Hence

$$\begin{aligned} (n+r+1)\,(n+r)\,c_{n+1} + 2(n+r+1)\,c_{n+1} + a c_{n-1} &= 0 \\ (n+r+1)\,(2+(n+r))\,c_{n+1} + a c_{n-1} &= 0 \end{aligned} \tag{2}$$

We want equation with c_0 in it. Hence let $n = -1$

$$(-1+r+1)\,(2+(-1+r))\,c_0 + a c_{-2} = 0$$

But $c_n = 0$ for all $n < 0$ hence

$$(-1+r+1)\,(2+(-1+r))\,c_0 = 0$$

But $c_0 \neq 0$, as this is the basis for this method. Therefore, we obtain the indicial equation for r

$$\begin{aligned} (-1+r+1)\,(2+(-1+r)) &= 0 \\ r(r+1) &= 0 \end{aligned}$$

Hence $r = 0$ or $r = -1$ are the roots. Now for each r we find a solution. Using $r = 0$, we go back the recurrence equation (2)

$$\begin{aligned}(n+1)(2+n)c_{n+1} + ac_{n-1} &= 0\\ c_{n+1} &= \frac{-ac_{n-1}}{(n+1)(2+n)}\end{aligned}$$

For $n = 0$

$$c_1 = \frac{-ac_{-1}}{(n+1)(2+n)} = 0$$

For $n = 1$

$$c_2 = \frac{-ac_0}{(2)(3)}$$

For $n = 2$

$$c_3 = \frac{-ac_1}{(n+1)(2+n)} = 0$$

For $n = 3$

$$c_4 = \frac{-ac_2}{(4)(5)} = \frac{-a(-ac_0)}{(2)(3)(4)(5)} = \frac{a^2c_0}{(2)(3)(4)(5)}$$

And so on. Hence, for $r = 0$ we have

$$\begin{aligned}y_{r=0} &= \sum_{n=0}^{\infty} c_n x^n = c_0 + c_1x^1 + c_2x^2 + c_3x^3 + \cdots\\ &= c_0 - a\frac{c_0}{6}x^2 + a^2\frac{c_0}{120}x^4 + \cdots\\ &= A\left(1 - a\frac{1}{6}x^2 + a^2\frac{1}{120}x^4 + \cdots\right)\end{aligned} \tag{3}$$

Where A is used as arbitrary constant instead of a_0. Now we find the solution for $r = -1$. we go back the recurrence equation (2)

$$\begin{aligned}(n-1+1)(2+(n-1))c_{n+1} + ac_{n-1} &= 0\\ n(1+n)c_{n+1} + ac_{n-1} &= 0\\ c_{n+1} &= \frac{-ac_{n-1}}{n(1+n)}\end{aligned}$$

For $n = 0$

$$c_1 = \frac{-ac_{-1}}{n(1+n)} = 0$$

For $n = 1$

$$c_2 = \frac{-ac_0}{2}$$

For $n = 2$

$$c_3 = \frac{-ac_1}{n(1+n)} = 0$$

For $n=3$

$$c_4 = \frac{-ac_2}{(3)(4)} = \frac{-a(-ac_0)}{(2)(3)(4)} = \frac{a^2c_0}{(2)(3)(4)}$$

For $n=4$

$$c_5 = \frac{-ac_3}{n(1+n)} = 0$$

For $n=5$

$$c_6 = \frac{-ac_4}{(5)(6)} = \frac{-a(a^2c_0)}{(2)(3)(4)(5)(6)} = \frac{-a^3c_0}{(2)(3)(4)(5)(6)}$$

And so on. Hence solution is

$$\begin{aligned} y_{r=-1} &= \frac{1}{x}\sum_{n=0}^{\infty} c_n x^n = \frac{1}{x}\left(c_0 - \frac{ac_0}{2}x^2 + \frac{a^2c_0}{(2)(3)(4)}x^4 - \frac{a^3c_0}{(2)(3)(4)(5)(6)}x^6 + \cdots\right) \\ &= \frac{B}{x}\left(1 - \frac{a}{2}x^2 + \frac{a^2}{24}x^4 - \frac{a^3}{720}x^6 + \cdots\right) \end{aligned}$$

Where B is used as arbitrary constant instead of a_0. Therefore, the homogeneous solution found is

$$\begin{aligned} y_h &= y_{r=0} + y_{r=-1} \\ &= A\left(1 - a\frac{1}{6}x^2 + a^2\frac{1}{120}x^4 + \cdots\right) + \frac{B}{x}\left(1 - \frac{a}{2}x^2 + \frac{a^2}{24}x^4 - \frac{a^3}{720}x^6 + \cdots\right) \\ &= A\left(1 - \frac{1}{6}\left(\sqrt{a}x\right)^2 + \frac{1}{120}\left(\sqrt{a}x\right)^4 + \cdots\right) + \frac{B}{x}\left(1 - \frac{1}{2}\left(\sqrt{a}x\right)^2 + \frac{1}{24}\left(\sqrt{a}x\right)^4 - \frac{1}{720}\left(\sqrt{a}x\right)^6 + \cdots\right) \end{aligned}$$

But

$$\sin x = x - \frac{1}{6}x^3 + \frac{1}{120}x^5 - \cdots \tag{3}$$

And

$$\cos x = 1 - \frac{1}{2}x^2 + \frac{1}{24}x^4 - \frac{1}{720}x^6 + \cdots \tag{4}$$

Therefore

$$\begin{aligned} \sin\left(\sqrt{a}x\right) &= \sqrt{a}x - \frac{1}{6}\left(\sqrt{a}x\right)^3 + \frac{1}{120}\left(\sqrt{a}x\right)^5 - \cdots \\ \cos\left(\sqrt{a}x\right) &= 1 - \frac{1}{2}\left(\sqrt{a}x\right)^2 + \frac{1}{24}\left(\sqrt{a}x\right)^4 - \frac{1}{720}\left(\sqrt{a}x\right)^6 + \cdots \end{aligned}$$

Therefore, using the above, we can write y_h as

$$\begin{aligned} y_h &= \frac{A}{\sqrt{a}x}\sqrt{a}x\left(1 - \frac{1}{6}\left(\sqrt{a}x\right)^2 + \frac{1}{120}\left(\sqrt{a}x\right)^4 + \cdots\right) + \frac{B}{x}\cos\left(\sqrt{a}x\right) \\ &= \frac{A}{\sqrt{a}x}\left(\sqrt{a}x - \frac{1}{6}\left(\sqrt{a}x\right)^3 + \frac{1}{120}\left(\sqrt{a}x\right)^5 + \cdots\right) + \frac{B}{x}\cos\left(\sqrt{a}x\right) \\ &= \frac{A}{\sqrt{a}x}\sin\left(\sqrt{a}x\right) + \frac{B}{x}\cos\left(\sqrt{a}x\right) \end{aligned}$$

Let $A_0 = \frac{A}{\sqrt{a}}$, hence the above becomes the same solution found using the transformation method

$$y(x) = \frac{1}{x}\left(A_0 \sin\left(\sqrt{a}x\right) + B\cos\left(\sqrt{a}x\right)\right)$$

Clearly, the transformation method is much faster and better. But the trick is to see the correct transformation needed and this is not always easy.

Third method Using Laplace transform. Using property $\mathcal{L}xf(x) = -\frac{d}{ds}F(s)$ then the Laplace transform of the ODE becomes

$$\begin{aligned}
\mathcal{L}(xy'' + 2y' + axy) &= 0 \\
-\frac{d}{ds}(\mathcal{L}y'') + 2\left(-\frac{d}{ds}(\mathcal{L}y')\right) + a\left(-\frac{d}{ds}Y\right) &= 0 \\
-\frac{d}{ds}\left(s^2Y - sA - B\right) + 2\left(-\frac{d}{ds}(sY - A)\right) + a(-Y') &= 0
\end{aligned}$$

Where $A = y(0)\,, B = y'(0)$. Simplifying gives

$$\begin{aligned}
-\left(2sY + s^2Y' - A\right) - 2(Y + sY') - aY' &= 0 \\
Y'\left(-s^2 - 2s - a\right) + Y(-2s - 2) + A &= 0 \\
Y' + Y\frac{2s+2}{s^2 + 2s + a} &= \frac{A}{s^2 + 2s + a}
\end{aligned}$$

This is first order ODE, which is solved easily using an integrating factor. Solving for $Y(s)$ gives

$$Y(s) = \frac{As + c_1}{s^2 + a + 2s}$$

Where c_1 is constant of integration. The inverse Laplace of the above is

$$y(x) = e^{-x}\left(A\cos\left(x\sqrt{1-a}\right) + \frac{(-A + c_1)}{\sqrt{1-a}}\sinh\left(x\sqrt{1-a}\right)\right)$$

I need to find why the above does not verify. May be I made a mistake somewhere. Verification of the result of the first two methods is below.

```
restart;
ode:=x*diff(diff(y(x),x),x)+2*diff(y(x),x)+a*x*y(x)=0;
y0:=1/x*( _C1* cos(sqrt(a)*x)+ _C2*sin(sqrt(a)*x));
odetest(y(x)=y0,ode);
0
```

ODE No. 1102

$$ax^2y(x)+xy''(x)+2y'(x)=0$$

✓ **Mathematica** : cpu = 0.0053405 (sec), leaf count = 42

```
DSolve[a*x^2*y[x] + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1 \text{Ai}\left(-\frac{ax}{(-a)^{2/3}}\right)}{x}+\frac{c_2 \text{Bi}\left(-\frac{ax}{(-a)^{2/3}}\right)}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 33

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+a*x^2*y(x)=0,y(x))
```

$$y(x)=\frac{c_2 \,\text{BesselY}\left(\frac{1}{3},\frac{2\sqrt{a}\,x^{\frac{3}{2}}}{3}\right)+c_1 \,\text{BesselJ}\left(\frac{1}{3},\frac{2\sqrt{a}\,x^{\frac{3}{2}}}{3}\right)}{\sqrt{x}}$$

Hand solution

$$xy''+2y'+ax^2y=0 \tag{1}$$

Since there is a term $2y$, we can use $y=\frac{u(x)}{x}$, hence

$$y'=\frac{u'}{x}-\frac{u}{x^2}$$
$$y''=\frac{u''}{x}-\frac{u'}{x^2}-\frac{u'}{x^2}+2\frac{u}{x^3}$$

And (1) becomes

$$x\left(\frac{u''}{x}-\frac{u'}{x^2}-\frac{u'}{x^2}+2\frac{u}{x^3}\right)+2\left(\frac{u'}{x}-\frac{u}{x^2}\right)+ax^2\left(\frac{u}{x}\right)=0$$
$$u''-2\frac{u'}{x}+2\frac{u}{x^2}+\frac{2u'}{x}-\frac{2u}{x^2}+axu=0$$
$$u''+axu=0 \tag{2}$$

This is Emdon-Fowler. (form is $u''+x^nu=0$) with $n=1$. Assume that

$$u=\sum_{n=0}^{\infty}c_nx^n$$

Hence

$$u' = \sum_{n=0} n c_n x^{n-1} = \sum_{n=1} n c_n x^{n-1} = \sum_{n=0} (n+1)\, c_{n+1} x^n$$
$$u'' = \sum_{n=0} n(n+1)\, c_{n+1} x^{n-1} = \sum_{n=1} n(n+1)\, c_{n+1} x^{n-1} = \sum_{n=0} (n+1)\,(n+2)\, c_{n+2} x^n$$

Substituting back in (2) gives

$$\sum_{n=0} (n+1)\,(n+2)\, c_{n+2} x^n + \sum_{n=0} a c_n x^{n+1} = 0$$
$$\sum_{n=0} (n+1)\,(n+2)\, c_{n+2} x^n + \sum_{n=1} a c_{n-1} x^n = 0$$

For $n = 0$

$$(1)\,(2)\, c_2 = 0$$

Hence $c_2 = 0$. For $n \geq 1$

$$(n+1)\,(n+2)\, c_{n+2} + a c_{n-1} = 0$$
$$c_{n+2} = \frac{-a c_{n-1}}{(n+1)\,(n+2)} \tag{3}$$

For $n = 1$, from (3)

$$c_3 = \frac{-a c_0}{(2)\,(3)}$$

For $n = 2$, from (3)

$$c_4 = \frac{-a c_1}{(3)\,(4)}$$

For $n = 3$, from (3)

$$c_5 = \frac{-a c_2}{(4)\,(5)} = 0$$

For $n = 4$, from (3)

$$c_6 = \frac{-a c_3}{(5)\,(6)} = \frac{-a}{(5)\,(6)} \left(\frac{-a c_0}{(2)\,(3)} \right) = \frac{a^2 c_0}{(2)\,(3)\,(5)\,(6)}$$

For $n = 5$, from (3)

$$c_7 = \frac{-a c_4}{(6)\,(7)} = \frac{-a}{(6)\,(7)} \left(\frac{-a c_1}{(3)\,(4)} \right) = \frac{a^2 c_1}{(3)\,(4)\,(6)\,(7)}$$

For $n = 6$, from (3)

$$c_8 = \frac{-a c_5}{(7)\,(8)} = 0$$

For $n = 7$, from (3)

$$c_9 = \frac{-a c_6}{(8)\,(9)} = \frac{-a}{(8)\,(9)} \left(\frac{a^2 c_0}{(2)\,(3)\,(5)\,(6)} \right) = \frac{-a^3 c_0}{(2)\,(3)\,(5)\,(6)\,(8)\,(9)}$$

For $n=8$, from (3)

$$c_{10}=\frac{-ac_7}{(9)(10)}=\frac{-a}{(9)(10)}\left(\frac{a^2c_1}{(3)(4)(6)(7)}\right)=\frac{-a^3c_1}{(3)(4)(6)(7)(9)(10)}$$

And so on. Hence,

$$\begin{aligned}
u&=\sum_{n=0}^{\infty}c_nx^n=c_0+c_1x^1+c_2x^2+c_3x^3+\cdots\\
&=c_0+c_1x+0+c_3x^3+c_4x^4+0+c_6x^6+c_7x^7+0+c_9x^9+\cdots\\
&=c_0+c_1x-\frac{ac_0}{(2)(3)}x^3-\frac{ac_1}{(3)(4)}x^4+\frac{a^2c_0}{(2)(3)(5)(6)}x^6+\frac{a^2c_1}{(3)(4)(6)(7)}x^7-\frac{a^3c_0}{(2)(3)(5)(6)(8)(9)}x^9-\frac{}{(3)}\\
&=c_0\left(1-\frac{a}{6}x^3+\frac{a^2}{180}x^6-\frac{a^3}{12\,960}x^9+\cdots\right)+xc_1\left(1-\frac{a}{12}x^3+\frac{a^2}{504}x^6-\frac{a^3}{45\,360}x^9+\cdots\right)\\
&=c_0\left(1-\frac{1}{6}\left(a^{\frac{1}{3}}x\right)^3+\frac{1}{180}\left(a^{\frac{1}{3}}x\right)^6-\frac{1}{12\,960}\left(a^{\frac{1}{3}}x\right)^9+\cdots\right)+xc_1\left(1-\frac{1}{12}\left(a^{\frac{1}{3}}x\right)^3+\frac{1}{504}\left(a^{\frac{1}{3}}x\right)^6-\frac{1}{45\,360}\right)
\end{aligned}$$

Comparing the above to the series expansion of Airy functions, we see that

$$u=c_0\,\mathrm{AiryAI}\left(-a^{\frac{1}{3}}x\right)+c_1\,\mathrm{AiryBI}\left(-a^{\frac{1}{3}}x\right)$$

And since $y=\frac{u(x)}{x}$ then

$$y=\frac{1}{x}\left(c_0\,\mathrm{AiryAI}\left(-a^{\frac{1}{3}}x\right)+c_1\,\mathrm{AiryBI}\left(-a^{\frac{1}{3}}x\right)\right)$$

Verification

```
restart;
#for series solution of u''+axu=0, use this:
Order:=10;
sol:=dsolve(ode,u(x),series);
sol:=convert(sol,polynom);
sol:=subs({u(0)=c0,D(u)(0)=c1},rhs(sol));
collect(sol,{c0,c1});
(1-(1/6)*a*x^3+(1/180)*a^2*x^6-(1/12960)*a^3*x^9)*c0+(x-(1/12)*a*x^4+(1/504)*a^2*x^7)*c1
#to verify final solution use this:
ode:=x*diff(y(x),x$2)+2*diff(y(x),x)+a*x^2*y(x)=0;
y0:=(1/x)*(_C0*AiryAi(-a^(1/3)*x)+_C1*AiryBi(-a^(1/3)*x));
odetest(y(x)=y0,ode);
0
```

ODE No. 1103

$$ay(x) + xy''(x) - 2y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0197573 (sec), leaf count = 64

```
DSolve[a*y[x] - 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to 6a^{3/2}c_1x^{3/2}J_3\left(2\sqrt{a}\sqrt{x}\right) - 2ia^{3/2}c_2x^{3/2}Y_3\left(2\sqrt{a}\sqrt{x}\right)\}\}$$

✓ **Maple** : cpu = 0.009 (sec), leaf count = 33

```
dsolve(x*diff(diff(y(x),x),x)-2*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = x^{\frac{3}{2}}\left(\text{BesselY}\left(3, 2\sqrt{a}\,\sqrt{x}\right)c_2 + \text{BesselJ}\left(3, 2\sqrt{a}\,\sqrt{x}\right)c_1\right)$$

ODE No. 1104

$$ay(x) + vy'(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0265865 (sec), leaf count = 104

```
DSolve[a*y[x] + v*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 a^{\frac{v-1}{2}-v+1} x^{\frac{v-1}{2}-v+1} \Gamma(2-v) J_{1-v}\left(2\sqrt{a}\sqrt{x}\right) + c_1 a^{\frac{1-v}{2}} x^{\frac{1-v}{2}} \Gamma(v) J_{v-1}\left(2\sqrt{a}\sqrt{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 41

```
dsolve(x*diff(diff(y(x),x),x)+v*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = x^{\frac{1}{2}-\frac{v}{2}} \left(\text{BesselY}\left(v-1, 2\sqrt{a}\,\sqrt{x}\right) c_2 + \text{BesselJ}\left(v-1, 2\sqrt{a}\,\sqrt{x}\right) c_1\right)$$

ODE No. 1105

$$ay'(x) + bxy(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0145185 (sec), leaf count = 64

```
DSolve[b*x*y[x] + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x^{\frac{1-a}{2}} J_{\frac{a-1}{2}}\left(\sqrt{b}x\right) + c_2 x^{\frac{1-a}{2}} Y_{\frac{a-1}{2}}\left(\sqrt{b}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.046 (sec), leaf count = 39

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x)+b*x*y(x)=0,y(x))
```

$$y(x) = x^{-\frac{a}{2}+\frac{1}{2}}\left(\text{BesselY}\left(\frac{a}{2}-\frac{1}{2},\sqrt{b}\,x\right)c_2 + \text{BesselJ}\left(\frac{a}{2}-\frac{1}{2},\sqrt{b}\,x\right)c_1\right)$$

ODE No. 1106

$$ay'(x)+bx^{\mathrm{a1}}y(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0359605 (sec), leaf count = 441

```
DSolve[b*x^a1*y[x] + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\left(\frac{1}{\mathrm{a1}}+1\right)^{\frac{a}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}-\frac{1}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}}\,\mathrm{a1}^{\frac{a}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}-\frac{1}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}}\,b^{\frac{1}{2}\left(\frac{1}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}-\frac{a}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}\right)}\left(x^{\mathrm{a1}}\right)^{\frac{1}{2}\left(\frac{1}{\mathrm{a1}}+1\right)\left(\frac{1}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}-\right.}\right.$$

✓ **Maple** : cpu = 0.093 (sec), leaf count = 71

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x)+b*x^a1*y(x)=0,y(x))
```

$$y(x)=x^{-\frac{a}{2}+\frac{1}{2}}\left(\mathrm{BesselY}\left(\frac{a-1}{a1+1},\frac{2\sqrt{b}\,x^{\frac{a1}{2}+\frac{1}{2}}}{a1+1}\right)c_2+\mathrm{BesselJ}\left(\frac{a-1}{a1+1},\frac{2\sqrt{b}\,x^{\frac{a1}{2}+\frac{1}{2}}}{a1+1}\right)c_1\right)$$

ODE No. 1107

$$ay(x) + (b + x)y'(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0206616 (sec), leaf count = 40

```
DSolve[a*y[x] + (b + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 e^{-x} U(b - a, b, x) + c_2 e^{-x} L_{a-b}^{b-1}(x)\}\}$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 30

```
dsolve(x*diff(diff(y(x),x),x)+(x+b)*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{-x}(\mathrm{KummerU}\left(-a + b, b, x\right) c_2 + \mathrm{KummerM}\left(-a + b, b, x\right) c_1)$$

ODE No. 1108

$$(a+b+x)y'(x)+ay(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0243341 (sec), leaf count = 37

```
DSolve[a*y[x] + (a + b + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to c_1 e^{-x}U(b,a+b,x)+c_2 e^{-x}L_{-b}^{a+b-1}(x)\}\}$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 26

```
dsolve(x*diff(diff(y(x),x),x)+(x+a+b)*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-x}(\mathrm{KummerU}\left(b,a+b,x\right)c_2+\mathrm{KummerM}\left(b,a+b,x\right)c_1)$$

ODE No. 1109

$$xy''(x) - xy'(x) - y(x) - e^x x(x+1) = 0$$

✓ **Mathematica** : cpu = 0.117987 (sec), leaf count = 45

```
DSolve[-(E^x*x*(1 + x)) - y[x] - x*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_2(-e^x x \text{Ei}(-x) - 1) + e^x\left(x^2 + x - x\log(-x) - 1\right) + c_1 e^x x\}\}$$

✓ **Maple** : cpu = 0.032 (sec), leaf count = 33

```
dsolve(x*diff(diff(y(x),x),x)-x*diff(y(x),x)-y(x)-x*(1+x)*exp(x)=0,y(x))
```

$$y(x) = \mathrm{e}^x\left(-c_1 x\,\text{expIntegral}\left(1,x\right) + x^2 + x c_2 - x\ln\left(x\right) + c_1 \mathrm{e}^{-x} - 1\right)$$

ODE No. 1110

$$-ay(x)+xy''(x)-xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0307258 (sec), leaf count = 36

```
DSolve[-(a*y[x]) - x*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2 G^{2,0}_{1,2}\left(-x\left|\begin{array}{c}1-a\\0,1\end{array}\right.\right)+c_1 x\,{}_1F_1(a+1;2;x)\right\}\right\}$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 23

```
dsolve(x*diff(diff(y(x),x),x)-x*diff(y(x),x)-a*y(x)=0,y(x))
```

$$y(x)=x(\text{KummerU}\left(a+1,2,x\right)c_2+\text{KummerM}\left(a+1,2,x\right)c_1)$$

ODE No. 1111

$$xy''(x) - (x+1)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0158896 (sec), leaf count = 20

```
DSolve[y[x] - (1 + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 e^x + c_2(-x-1)\}\}$$

✓ **Maple** : cpu = 0.021 (sec), leaf count = 13

```
dsolve(x*diff(diff(y(x),x),x)-(1+x)*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = c_2 \mathrm{e}^x + c_1 x + c_1$$

Hand solution

$$xy'' - (x+1)\,y' + y = 0 \tag{1}$$

Taking Laplace transform of each term and using property of $\mathcal{L}(xf(x)) = -\frac{d}{ds}F(s)$ where $F(s) = \mathcal{L}f(x)$, then

$$\mathcal{L}(xy'') = -\frac{d}{ds}(\mathcal{L}y'')$$

Let $\mathcal{L}y(x) = Y(s) \equiv Y$. Now $\mathcal{L}y'' = s^2Y - sy(0) - y'(0)$. Assuming $y(0) = A, y'(0) = B$ then

$$\begin{aligned}\mathcal{L}(xy'') &= -\frac{d}{ds}\left(s^2Y - As - B\right)\\ &= -\left(2sY + s^2Y' - A\right)\end{aligned}$$

And

$$\begin{aligned}\mathcal{L}((x+1)\,y') &= \mathcal{L}(xy' + y')\\ &= -\frac{d}{ds}(\mathcal{L}y') + \mathcal{L}y'\\ &= -\frac{d}{ds}(sY - y(0)) + (sY - y(0))\\ &= -\frac{d}{ds}(sY - A) + (sY - y(0))\\ &= -(Y + sY') + (sY - A)\\ &= -Y - sY' + sY - A\end{aligned}$$

Hence Laplace transform of the ODE becomes

$$\begin{aligned}
-\left(2sY + s^2Y' - A\right) - \left(-Y - sY' + sY - A\right) + Y &= 0 \\
-2sY - s^2Y' + A + Y + sY' - sY + A + Y &= 0 \\
Y'\left(s - s^2\right) + Y(-2s + 1 - s + 1) &= -2A \\
Y'\left(s^2 - s\right) + Y(3s - 2) &= 2A \\
Y' + \frac{(3s-2)}{s\,(s-1)}Y &= \frac{2A}{s\,(s-1)}
\end{aligned}$$

The integrating factor is $\mu = e^{\int \frac{(3s-2)}{s(s-1)}} = e^{\ln(s-1)+2\ln(s)} = (s-1)\,s^2$, hence

$$\begin{aligned}
d\left((s-1)\,s^2Y\right) &= (s-1)\,s^2\frac{2A}{s\,(s-1)} \\
(s-1)\,s^2Y &= 2A\int s ds + c_1 \\
(s-1)\,s^2Y &= 2A\frac{s^2}{2} + c_1 \\
Y &= \frac{As^2 + c_1}{(s-1)\,s^2}
\end{aligned}$$

Inverse Laplace transform gives

$$\begin{aligned}
y(x) &= -c_1 + (A + c_1)\,e^x - c_1 x \\
&= -c_1(1 + x) + (A + c_1)\,e^x
\end{aligned}$$

Let $-c_1 = A_0, A + c_1 + B_0$, hence

$$y(x) = A_0(1 + x) + B_0 e^x$$

Verification

```
rrestart;
ode:=x*diff(diff(y(x),x),x)-(1+x)*diff(y(x),x)+y(x)=0;
y0:=_C0*(1+x)+_C1*exp(x);
odetest(y(x)=y0,ode);
0
```

ODE No. 1112

$$xy''(x) - (x+1)y'(x) - 2(x-1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0202247 (sec), leaf count = 30

```
DSolve[-2*(-1 + x)*y[x] - (1 + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{2x} - \frac{1}{9}c_2 e^{-x}(3x+1)\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 22

```
dsolve(x*diff(diff(y(x),x),x)-(1+x)*diff(y(x),x)-2*(x-1)*y(x)=0,y(x))
```

$$y(x) = c_1 \mathrm{e}^{2x} + c_2 \mathrm{e}^{-x}(3x+1)$$

ODE No. 1113

$$-ay(x) + (b - x)y'(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0126111 (sec), leaf count = 24

```
DSolve[-(a*y[x]) + (b - x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 U(a, b, x) + c_2 L_{-a}^{b-1}(x)\}\}$$

✓ **Maple** : cpu = 0.061 (sec), leaf count = 17

```
dsolve(x*diff(diff(y(x),x),x)+(b-x)*diff(y(x),x)-a*y(x)=0,y(x))
```

$$y(x) = c_1 \,\mathrm{KummerM}\,(a, b, x) + c_2 \,\mathrm{KummerU}\,(a, b, x)$$

ODE No. 1114

$$xy''(x) - 2(x-1)y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0386883 (sec), leaf count = 39

```
DSolve[-y[x] - 2*(-1 + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 G^{2,0}_{1,2}\left(-2x \middle| \begin{matrix} \frac{1}{2} \\ -1, 0 \end{matrix}\right) + c_1 e^x (I_0(x) - I_1(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.049 (sec), leaf count = 34

```
dsolve(x*diff(diff(y(x),x),x)-2*(x-1)*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^x (c_2 \operatorname{BesselK}(1, -x) - c_2 \operatorname{BesselK}(0, -x) + c_1 (\operatorname{BesselI}(0, x) - \operatorname{BesselI}(1, x)))$$

ODE No. 1115

$$xy''(x) - (3x-2)y'(x) + (3-2x)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0478526 (sec), leaf count = 76

```
DSolve[(3 - 2*x)*y[x] - (-2 + 3*x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 e^{-\frac{1}{2}\left(\sqrt{17}-3\right)x}\, {}_1F_1\left(1-\frac{6}{\sqrt{17}};2;\sqrt{17}x\right) + c_1 e^{-\frac{1}{2}\left(\sqrt{17}-3\right)x} U\left(1-\frac{6}{\sqrt{17}},2,\sqrt{17}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.727 (sec), leaf count = 47

```
dsolve(x*diff(diff(y(x),x),x)-(3*x-2)*diff(y(x),x)-(2*x-3)*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{-\frac{x\left(-3+\sqrt{17}\right)}{2}}\left(\mathrm{KummerM}\left(1-\frac{6\sqrt{17}}{17},2,\sqrt{17}\,x\right)c_1 + \mathrm{KummerU}\left(1-\frac{6\sqrt{17}}{17},2,\sqrt{17}\,x\right)c_2\right)$$

ODE No. 1116

$$y'(x)(ax+b+n)+anyx)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0396758 (sec), leaf count = 43

```
DSolve[a*n*y[x] + (b + n + a*x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to c_1 e^{-ax}U(b,b+n,ax)+c_2 e^{-ax}L_{-b}^{b+n-1}(ax)\}\}$$

✓ **Maple** : cpu = 0.082 (sec), leaf count = 31

```
dsolve(x*diff(diff(y(x),x),x)+(a*x+b+n)*diff(y(x),x)+n*a*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-ax}(\mathrm{KummerM}\left(b,b+n,ax\right)c_1+\mathrm{KummerU}\left(b,b+n,ax\right)c_2)$$

ODE No. 1117

$$-(x+1)(a+b)y'(x)+abxy(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.059985 (sec), leaf count = 107

```
DSolve[a*b*x*y[x] - (a + b)*(1 + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 U\left(-\frac{-a^2-ba-a+b}{a-b},a+b+2,(a-b)x\right)e^{(a+b+1)\log(x)+bx}+c_2 L^{a+b+1}_{\frac{-a^2-ba-a+b}{a-b}}((a-b)x)e^{(a+b+1}\right.\right.$$

✓ **Maple** : cpu = 0.11 (sec), leaf count = 82

```
dsolve(x*diff(diff(y(x),x),x)-(a+b)*(1+x)*diff(y(x),x)+a*b*x*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{bx}x^{a+b+1}\left(\mathrm{KummerM}\left(\frac{a^2+ab+a-b}{a-b},a+b+2,x(a-b)\right)c_1+\mathrm{KummerU}\left(\frac{a^2+ab+a-b}{a-b},a-\right.\right.$$

ODE No. 1118

$$y'(x)(x(a+b)+m+n)+y(x)(abx+an+bm)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0556294 (sec), leaf count = 51

```
DSolve[(b*m + a*n + a*b*x)*y[x] + (m + n + (a + b)*x)*Derivative[1][y][x] + x*Derivative[2][y
```

$$\{\{y(x)\to c_1 e^{-ax}U(m,m+n,(a-b)x)+c_2 e^{-ax}L_{-m}^{m+n-1}((a-b)x)\}\}$$

✓ **Maple** : cpu = 0.09 (sec), leaf count = 39

```
dsolve(x*diff(diff(y(x),x),x)+((a+b)*x+m+n)*diff(y(x),x)+(a*b*x+a*n+b*m)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-ax}(\mathrm{KummerM}\left(m,m+n,x(a-b)\right)c_1+\mathrm{KummerU}\left(m,m+n,x(a-b)\right)c_2)$$

ODE No. 1119

$$y(x)\left(a^2x+2ab\right)-2(ax+b)y'(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.106843 (sec), leaf count = 77

```
DSolve[(2*a*b + a^2*x)*y[x] - 2*(b + a*x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[
```

$$\left\{\left\{y(x)\to c_1e^{ax}x^{b-\frac{1}{2}\sqrt{(2b+1)^2}+\frac{1}{2}}+\frac{c_2e^{ax}x^{b+\frac{1}{2}\sqrt{(2b+1)^2}+\frac{1}{2}}}{\sqrt{(2b+1)^2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 20

```
dsolve(x*diff(diff(y(x),x),x)-2*(a*x+b)*diff(y(x),x)+(a^2*x+2*a*b)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{ax}\left(x^{2b+1}c_2+c_1\right)$$

ODE No. 1120

$$(ax+b)y'(x)+y(x)(cx+d)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0379683 (sec), leaf count = 168

```
DSolve[(d + c*x)*y[x] + (b + a*x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 e^{-\frac{1}{2}x\sqrt{a^2-4c}-\frac{ax}{2}}U\left(-\frac{-ab-\sqrt{a^2-4c}b+2d}{2\sqrt{a^2-4c}},b,\sqrt{a^2-4c}x\right)+c_2 e^{-\frac{1}{2}x\sqrt{a^2-4c}-\frac{ax}{2}}L^{b-1}_{\frac{-ab-\sqrt{a^2-4c}b+2d}{2\sqrt{a^2-4c}}}\right.\right.$$

✓ **Maple** : cpu = 0.215 (sec), leaf count = 109

```
dsolve(x*diff(diff(y(x),x),x)+(a*x+b)*diff(y(x),x)+(c*x+d)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{x\left(a+\sqrt{a^2-4c}\right)}{2}}\left(\mathrm{KummerM}\left(\frac{b\sqrt{a^2-4c}+ab-2d}{2\sqrt{a^2-4c}},b,\sqrt{a^2-4c}\,x\right)c_1+\mathrm{KummerU}\left(\frac{b\sqrt{a^2-4c}+ab}{2\sqrt{a^2-4c}}\right.\right.$$

ODE No. 1121

$$-\left(x^2-x\right)y'(x)+xy''(x)+(x-1)y(x)=0$$

✓ **Mathematica** : cpu = 0.185273 (sec), leaf count = 41

```
DSolve[(-1 + x)*y[x] - (-x + x^2)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2 x\int_1^x\frac{e^{\frac{K[1]^2}{2}-K[1]}}{K[1]^2}dK[1]+c_1 x\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 23

```
dsolve(x*diff(diff(y(x),x),x)-(x^2-x)*diff(y(x),x)+(x-1)*y(x)=0,y(x))
```

$$y(x)=\left(\left(\int\frac{\mathrm{e}^{\frac{x(x-2)}{2}}}{x^2}dx\right)c_1+c_2\right)x$$

ODE No. 1122

$$-\left(x^2-x-2\right)y'(x)+xy''(x)-x(x+3)y(x)=0$$

✓ **Mathematica** : cpu = 0.190959 (sec), leaf count = 57

```
DSolve[-(x*(3 + x)*y[x]) - (-2 - x + x^2)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[
```

$$\left\{\left\{y(x)\to c_2 e^{\frac{x^2}{2}}\int_1^x \frac{e^{-\frac{1}{2}K[1]^2-K[1]}}{K[1]^2}dK[1]+c_1 e^{\frac{x^2}{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.133 (sec), leaf count = 28

```
dsolve(x*diff(diff(y(x),x),x)-(x^2-x-2)*diff(y(x),x)-x*(x+3)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{\frac{x^2}{2}}\left(\left(\int \frac{\mathrm{e}^{-\frac{x(x+2)}{2}}}{x^2}dx\right)c_2+c_1\right)$$

ODE No. 1123

$$-\left(2ax^2+1\right)y'(x)+bx^3y(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0094349 (sec), leaf count = 91

```
DSolve[b*x^3*y[x] - (1 + 2*a*x^2)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{\frac{1}{2}\sqrt{b}x^2\left(\frac{a}{\sqrt{b}}-\frac{\sqrt{a^2-b}}{\sqrt{b}}\right)}+c_2e^{\frac{1}{2}\sqrt{b}x^2\left(\frac{\sqrt{a^2-b}}{\sqrt{b}}+\frac{a}{\sqrt{b}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 45

```
dsolve(x*diff(diff(y(x),x),x)-(2*a*x^2+1)*diff(y(x),x)+b*x^3*y(x)=0,y(x))
```

$$y(x)=c_1\mathrm{e}^{\frac{x^2\left(\sqrt{a^2-b}+a\right)}{2}}+c_2\mathrm{e}^{-\frac{x^2\left(\sqrt{a^2-b}-a\right)}{2}}$$

ODE No. 1124

$$-2\left(x^2-a\right)y'(x)+2nxy(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0617711 (sec), leaf count = 65

```
DSolve[2*n*x*y[x] - 2*(-a + x^2)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,{}_1F_1\left(-\frac{n}{2};a+\frac{1}{2};x^2\right)+i^{1-2a}c_2x^{1-2a}\,{}_1F_1\left(-a-\frac{n}{2}+\frac{1}{2};\frac{3}{2}-a;x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.082 (sec), leaf count = 29

```
dsolve(x*diff(diff(y(x),x),x)-2*(x^2-a)*diff(y(x),x)+2*n*x*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{KummerM}\left(-\frac{n}{2},\frac{1}{2}+a,x^2\right)+c_2\,\text{KummerU}\left(-\frac{n}{2},\frac{1}{2}+a,x^2\right)$$

ODE No. 1125

$$-4x^5 - 4x^3 y(x) + \left(4x^2 - 1\right) y'(x) + x y''(x) = 0$$

✓ **Mathematica** : cpu = 0.100093 (sec), leaf count = 84

```
DSolve[-4*x^5 - 4*x^3*y[x] + (-1 + 4*x^2)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[
```

$$\left\{\left\{y(x) \to -\frac{3\sqrt{2}x^2 + 4x^2 + 6\sqrt{2} + 8}{\sqrt{2}\left(3 + 2\sqrt{2}\right)} + c_1 e^{-\left(\left(1-\sqrt{2}\right)x^2\right)} + c_2 e^{-\left(\left(1+\sqrt{2}\right)x^2\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 36

```
dsolve(x*diff(diff(y(x),x),x)+(4*x^2-1)*diff(y(x),x)-4*x^3*y(x)-4*x^5=0,y(x))
```

$$y(x) = \mathrm{e}^{x^2\left(\sqrt{2}-1\right)} c_2 + \mathrm{e}^{-x^2\left(1+\sqrt{2}\right)} c_1 - x^2 - 2$$

ODE No. 1126

$$\left(a^2x^3+a\right)y(x)+\left(2ax^3-1\right)y'(x)+xy''(x)=0$$

✗ **Mathematica** : cpu = 0.880147 (sec), leaf count = 0

```
DSolve[(a + a^2*x^3)*y[x] + (-1 + 2*a*x^3)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y
```

, DifferentialRoot result

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

✓ **Maple** : cpu = 0.034 (sec), leaf count = 19

```
dsolve(x*diff(diff(y(x),x),x)+(2*a*x^3-1)*diff(y(x),x)+(a^2*x^3+a)*x^2*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{a\,x^3}{3}}\left(x^2c_2+c_1\right)$$

ODE No. 1127

$$y(x)\left(a^2x\log^2(x)+a\log(x)+a\right)+(2ax\log(x)+1)y'(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0279614 (sec), leaf count = 36

```
DSolve[(a + a*Log[x] + a^2*x*Log[x]^2)*y[x] + (1 + 2*a*x*Log[x])*Derivative[1][y][x] + x*Deri
```

$$\{\{y(x)\to c_1e^{ax}x^{-ax}+c_2e^{ax}x^{-ax}\log(x)\}\}$$

✓ **Maple** : cpu = 0.025 (sec), leaf count = 21

```
dsolve(x*diff(diff(y(x),x),x)+(2*a*x*ln(x)+1)*diff(y(x),x)+(a^2*x*ln(x)^2+a*ln(x)+a)*y(x)=0,y
```

$$y(x)=x^{-ax}\mathrm{e}^{ax}(c_2\ln(x)+c_1)$$

ODE No. 1128

$$(xf(x)+2)y'(x)+f(x)y(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.020017 (sec), leaf count = 40

```
DSolve[f[x]*y[x] + (2 + x*f[x])*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2 \int_1^x \exp\left(-\int_1^{K[2]} f(K[1])dK[1]\right)dK[2]}{x}+\frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.195 (sec), leaf count = 32

```
dsolve(x*diff(diff(y(x),x),x)+(x*f(x)+2)*diff(y(x),x)+f(x)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\left(\int \mathrm{e}^{\int \frac{-xf(x)-2}{x}dx}x^2dx\right)+c_1}{x}$$

ODE No. 1129

$$(x-3)y''(x)-(4x-9)y'(x)+(3x-6)y(x)=0$$

✓ **Mathematica** : cpu = 0.0563003 (sec), leaf count = 42

```
DSolve[(-6 + 3*x)*y[x] - (-9 + 4*x)*Derivative[1][y][x] + (-3 + x)*Derivative[2][y][x] == 0,y
```

$$\left\{\left\{y(x)\to \frac{1}{8}c_2 e^{3x-9}\left(4x^3-42x^2+150x-183\right)+c_1 e^{x-3}\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 30

```
dsolve((x-3)*diff(diff(y(x),x),x)-(4*x-9)*diff(y(x),x)+(3*x-6)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{x}c_1+c_2\mathrm{e}^{3x}\left(4x^3-42x^2+150x-183\right)$$

ODE No. 1130

$$ay(x) + 2xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0090178 (sec), leaf count = 46

```
DSolve[a*y[x] + Derivative[1][y][x] + 2*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \cos\left(\sqrt{2}\sqrt{a}\sqrt{x}\right) + c_2 \sin\left(\sqrt{2}\sqrt{a}\sqrt{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 31

```
dsolve(2*x*diff(diff(y(x),x),x)+diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = c_1 \sin\left(\sqrt{x}\,\sqrt{2}\,\sqrt{a}\right) + c_2 \cos\left(\sqrt{x}\,\sqrt{2}\,\sqrt{a}\right)$$

ODE No. 1131

$$ay(x) + 2xy''(x) - (x-1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.008519 (sec), leaf count = 58

```
DSolve[a*y[x] - (-1 + x)*Derivative[1][y][x] + 2*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \sqrt{x} U\left(\frac{1}{2}(1-2a), \frac{3}{2}, \frac{x}{2}\right) + c_2 \sqrt{x} L^{\frac{1}{2}}_{\frac{1}{2}(2a-1)}\left(\frac{x}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.078 (sec), leaf count = 33

```
dsolve(2*x*diff(diff(y(x),x),x)-(x-1)*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = \sqrt{x}\left(\text{KummerU}\left(-a + \frac{1}{2}, \frac{3}{2}, \frac{x}{2}\right) c_2 + \text{KummerM}\left(-a + \frac{1}{2}, \frac{3}{2}, \frac{x}{2}\right) c_1\right)$$

ODE No. 1132

$$ay(x)+2xy''(x)-(2x-1)y'(x)=0$$

✓ **Mathematica** : cpu = 0.0084256 (sec), leaf count = 48

```
DSolve[a*y[x] - (-1 + 2*x)*Derivative[1][y][x] + 2*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\sqrt{x}U\left(\frac{1-a}{2},\frac{3}{2},x\right)+c_2\sqrt{x}L^{\frac{1}{2}}_{\frac{a-1}{2}}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 29

```
dsolve(2*x*diff(diff(y(x),x),x)-(2*x-1)*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x)=\sqrt{x}\left(\text{KummerU}\left(-\frac{a}{2}+\frac{1}{2},\frac{3}{2},x\right)c_2+\text{KummerM}\left(-\frac{a}{2}+\frac{1}{2},\frac{3}{2},x\right)c_1\right)$$

ODE No. 1133

$$(2x-1)y''(x)-(3x-4)y'(x)+(x-3)y(x)=0$$

✓ **Mathematica** : cpu = 0.047766 (sec), leaf count = 52

```
DSolve[(-3 + x)*y[x] - (-4 + 3*x)*Derivative[1][y][x] + (-1 + 2*x)*Derivative[2][y][x] == 0,y
```

$$\left\{\left\{y(x)\to 2^{5/8}c_1e^{x-\frac{1}{2}}-\frac{c_2e^{x-\frac{1}{2}}\Gamma\left(-\frac{1}{4},\frac{1}{4}(2x-1)\right)}{4\sqrt[8]{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.093 (sec), leaf count = 37

```
dsolve((2*x-1)*diff(diff(y(x),x),x)-(3*x-4)*diff(y(x),x)+(x-3)*y(x)=0,y(x))
```

$$y(x)=\frac{\mathrm{e}^{\frac{x}{2}}\left(\mathrm{KummerU}\left(1,\frac{3}{4},\frac{x}{2}-\frac{1}{4}\right)c_2+\mathrm{KummerM}\left(1,\frac{3}{4},\frac{x}{2}-\frac{1}{4}\right)c_1\right)}{(2x-1)^{\frac{1}{4}}}$$

ODE No. 1134

$$(-a-x)y(x)+4xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0702304 (sec), leaf count = 78

```
DSolve[(-a - x)*y[x] + 4*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{4}c_2 e^{-x/2} x\, {}_1F_1\left(\frac{1}{128}(-32(-a-4i)-128i)+1;2;x\right)+\frac{1}{4}c_1 e^{-x/2} x U\left(\frac{1}{128}(-32(-a-4i)-128\right.\right.$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 21

```
dsolve(4*x*diff(diff(y(x),x),x)-(x+a)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{WhittakerM}\left(-\frac{a}{4},\frac{1}{2},x\right)+c_2\,\text{WhittakerW}\left(-\frac{a}{4},\frac{1}{2},x\right)$$

ODE No. 1135

$$4xy''(x) + 2y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0072951 (sec), leaf count = 27

```
DSolve[-y[x] + 2*Derivative[1][y][x] + 4*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 \cosh\left(\sqrt{x}\right) + ic_2 \sinh\left(\sqrt{x}\right)\}\}$$

✓ **Maple** : cpu = 0.011 (sec), leaf count = 17

```
dsolve(4*x*diff(diff(y(x),x),x)+2*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = c_1 \sinh\left(\sqrt{x}\right) + c_2 \cosh\left(\sqrt{x}\right)$$

ODE No. 1136

$$4xy''(x) + 4y'(x) + (-x-2)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0184617 (sec), leaf count = 30

```
DSolve[(-2 - x)*y[x] + 4*Derivative[1][y][x] + 4*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_2 e^{x/2}\text{Ei}(-x) + c_1 e^{x/2}\}\}$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 16

```
dsolve(4*x*diff(diff(y(x),x),x)+4*diff(y(x),x)-(x+2)*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{\frac{x}{2}}(\text{expIntegral}\,(1,x)\,c_2 + c_1)$$

ODE No. 1137

$$ly(x) + 4xy''(x) - (x+2)y(x) + 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.0706303 (sec), leaf count = 74

```
DSolve[4*y[x] + l*y[x] - (2 + x)*y[x] + 4*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{4}c_2 e^{-x/2} x\, {}_1F_1\left(\frac{1}{128}(-32(l+(2-4i))-128i)+1;2;x\right) + \frac{1}{4}c_1 e^{-x/2} x U\left(\frac{1}{128}(-32(l+(2-4i)\right)\right.\right.$$

✓ **Maple** : cpu = 0.045 (sec), leaf count = 25

```
dsolve(4*x*diff(diff(y(x),x),x)+4*y(x)-(x+2)*y(x)+l*y(x)=0,y(x))
```

$$y(x) = c_1 \,\text{WhittakerM}\left(\frac{l}{4}+\frac{1}{2},\frac{1}{2},x\right) + c_2 \,\text{WhittakerW}\left(\frac{l}{4}+\frac{1}{2},\frac{1}{2},x\right)$$

ODE No. 1138

$$y(x)(2m+4n-x)+4my'(x)+4xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0204381 (sec), leaf count = 38

```
DSolve[(2*m + 4*n - x)*y[x] + 4*m*Derivative[1][y][x] + 4*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to c_1 e^{-x/2}U(-n,m,x)+c_2 e^{-x/2}L_n^{m-1}(x)\}\}$$

✓ **Maple** : cpu = 0.067 (sec), leaf count = 26

```
dsolve(4*x*diff(diff(y(x),x),x)+4*m*diff(y(x),x)-(x-2*m-4*n)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{x}{2}}\left(\mathrm{KummerU}\left(-n,m,x\right)c_2+\mathrm{KummerM}\left(-n,m,x\right)c_1\right)$$

ODE No. 1139

$$(-a-x)y(x)+16xy''(x)+8y'(x)=0$$

✓ **Mathematica** : cpu = 0.0098161 (sec), leaf count = 74

```
DSolve[(-a - x)*y[x] + 8*Derivative[1][y][x] + 16*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 e^{\frac{1}{4}(2\log(x)-x)}U\left(\frac{a+6}{8},\frac{3}{2},\frac{x}{2}\right)+c_2 e^{\frac{1}{4}(2\log(x)-x)}L^{\frac{1}{2}}_{\frac{1}{8}(-a-6)}\left(\frac{x}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.08 (sec), leaf count = 37

```
dsolve(16*x*diff(diff(y(x),x),x)+8*diff(y(x),x)-(x+a)*y(x)=0,y(x))
```

$$y(x)=\sqrt{x}\,\mathrm{e}^{-\frac{x}{4}}\left(\mathrm{KummerU}\left(\frac{a}{8}+\frac{3}{4},\frac{3}{2},\frac{x}{2}\right)c_2+\mathrm{KummerM}\left(\frac{a}{8}+\frac{3}{4},\frac{3}{2},\frac{x}{2}\right)c_1\right)$$

ODE No. 1140

$$axy''(x) + by'(x) + cy(x) = 0$$

✓ **Mathematica** : cpu = 0.0351387 (sec), leaf count = 190

```
DSolve[c*y[x] + b*Derivative[1][y][x] + a*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 a^{\frac{1}{2}\left(\frac{b}{a}-1\right)} c^{\frac{1}{2}\left(1-\frac{b}{a}\right)} x^{\frac{1}{2}\left(1-\frac{b}{a}\right)} \Gamma\left(\frac{b}{a}\right) J_{\frac{b}{a}-1}\left(\frac{2\sqrt{c}\sqrt{x}}{\sqrt{a}}\right) + c_2 a^{\frac{1}{2}\left(1-\frac{b}{a}\right)-\frac{a-b}{a}} c^{\frac{a-b}{a}+\frac{1}{2}\left(\frac{b}{a}-1\right)} x^{\frac{a-b}{a}+\frac{1}{2}\left(\frac{b}{a}-1\right)} \Gamma\left(2\right.\right.$$

✓ **Maple** : cpu = 0.021 (sec), leaf count = 66

```
dsolve(a*x*diff(diff(y(x),x),x)+b*diff(y(x),x)+c*y(x)=0,y(x))
```

$$y(x) = x^{\frac{a-b}{2a}} \left(\text{BesselY}\left(\frac{-a+b}{a}, 2\sqrt{\frac{c}{a}}\sqrt{x}\right) c_2 + \text{BesselJ}\left(\frac{-a+b}{a}, 2\sqrt{\frac{c}{a}}\sqrt{x}\right) c_1\right)$$

ODE No. 1141

$$(3a+bx)y'(x)+axy''(x)+3by(x)=0$$

✓ **Mathematica** : cpu = 0.116849 (sec), leaf count = 79

```
DSolve[3*b*y[x] + (3*a + b*x)*Derivative[1][y][x] + a*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 e^{-\frac{bx}{a}}-\frac{c_2 e^{-\frac{bx}{a}}\left(a^2 e^{\frac{bx}{a}}-b^2x^2\text{Ei}\left(\frac{bx}{a}\right)+abxe^{\frac{bx}{a}}\right)}{2a^2x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 55

```
dsolve(a*x*diff(diff(y(x),x),x)+(b*x+3*a)*diff(y(x),x)+3*b*y(x)=0,y(x))
```

$$y(x)=\frac{\text{expIntegral}\left(1,-\frac{bx}{a}\right)\mathrm{e}^{-\frac{bx}{a}}c_2b^2x^2+c_1\mathrm{e}^{-\frac{bx}{a}}x^2+ac_2(bx+a)}{x^2}$$

ODE No. 1142

$$cy(x)\sqrt[5]{ax+b}+5(ax+b)y''(x)+8ay'(x)=0$$

✓ **Mathematica** : cpu = 0.0342383 (sec), leaf count = 108

```
DSolve[c*(b + a*x)^(1/5)*y[x] + 8*a*Derivative[1][y][x] + 5*(b + a*x)*Derivative[2][y][x] ==
```

$$\left\{\left\{y(x)\to \frac{6ac_1\cos\left(\frac{\sqrt{5}\sqrt{c}(ax+b)^{3/5}}{3a}\right)}{\sqrt{5}\sqrt{c}(ax+b)^{3/5}}+\frac{3ac_2\sin\left(\frac{\sqrt{5}\sqrt{c}(ax+b)^{3/5}}{3a}\right)}{\sqrt{5}\sqrt{c}(ax+b)^{3/5}}\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (sec), leaf count = 53

```
dsolve(5*(a*x+b)*diff(diff(y(x),x),x)+8*a*diff(y(x),x)+c*(a*x+b)^(1/5)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\cosh\left(\frac{(ax+b)^{\frac{3}{5}}\sqrt{-5c}}{3a}\right)+c_1\sinh\left(\frac{(ax+b)^{\frac{3}{5}}\sqrt{-5c}}{3a}\right)}{(ax+b)^{\frac{3}{5}}}$$

ODE No. 1143

$$(a+bx)y'(x)+2axy''(x)+cy(x)=0$$

✓ **Mathematica** : cpu = 0.0252607 (sec), leaf count = 93

```
DSolve[c*y[x] + (a + b*x)*Derivative[1][y][x] + 2*a*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 e^{\frac{a\log(x)-bx}{2a}} U\left(-\frac{c-b}{b},\frac{3}{2},\frac{bx}{2a}\right)+c_2 e^{\frac{a\log(x)-bx}{2a}} L^{\frac{1}{2}}_{\frac{c-b}{b}}\left(\frac{bx}{2a}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.098 (sec), leaf count = 57

```
dsolve(2*a*x*diff(diff(y(x),x),x)+(b*x+a)*diff(y(x),x)+c*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{bx}{2a}}\sqrt{x}\left(\mathrm{KummerU}\left(\frac{b-c}{b},\frac{3}{2},\frac{bx}{2a}\right)c_2+\mathrm{KummerM}\left(\frac{b-c}{b},\frac{3}{2},\frac{bx}{2a}\right)c_1\right)$$

ODE No. 1144

$$(3a+bx)y'(x)+2axy''(x)+cy(x)=0$$

✓ **Mathematica** : cpu = 0.0242014 (sec), leaf count = 88

```
DSolve[c*y[x] + (3*a + b*x)*Derivative[1][y][x] + 2*a*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 e^{-\frac{bx}{2a}} U\left(-\frac{2c-3b}{2b},\frac{3}{2},\frac{bx}{2a}\right)+c_2 e^{-\frac{bx}{2a}} L^{\frac{1}{2}}_{\frac{2c-3b}{2b}}\left(\frac{bx}{2a}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.084 (sec), leaf count = 60

```
dsolve(2*a*x*diff(diff(y(x),x),x)+(b*x+3*a)*diff(y(x),x)+c*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{bx}{2a}}\left(\mathrm{KummerU}\left(\frac{3b-2c}{2b},\frac{3}{2},\frac{bx}{2a}\right)c_2+\mathrm{KummerM}\left(\frac{3b-2c}{2b},\frac{3}{2},\frac{bx}{2a}\right)c_1\right)$$

ODE No. 1145

$$y(x)(\mathrm{a0}x+\mathrm{b0})+(\mathrm{a1}x+\mathrm{b1})y'(x)+(\mathrm{a2}x+\mathrm{b2})y''(x)=0$$

✓ **Mathematica** : cpu = 0.232455 (sec), leaf count = 386

```
DSolve[(b0 + a0*x)*y[x] + (b1 + a1*x)*Derivative[1][y][x] + (b2 + a2*x)*Derivative[2][y][x] =
```

$$\left\{\left\{y(x)\to c_1 U\left(-\frac{\mathrm{b2a1}^2-\mathrm{a2b1a1}-\sqrt{\mathrm{a1}^2-4\mathrm{a0a2}}\mathrm{b2a1}+2\mathrm{a2}^2\mathrm{b0}+\mathrm{a2}\sqrt{\mathrm{a1}^2-4\mathrm{a0a2}}\mathrm{b1}-2\mathrm{a0a2b2}-2\mathrm{a2}\right.}{2\mathrm{a2}^2\sqrt{\mathrm{a1}^2-4\mathrm{a0a2}}}\right.\right.$$

✓ **Maple** : cpu = 0.189 (sec), leaf count = 248

```
dsolve((a2*x+b2)*diff(diff(y(x),x),x)+(a1*x+b1)*diff(y(x),x)+(a0*x+b0)*y(x)=0,y(x))
```

$$y(x)=(a2x+b2)^{\frac{a1\,b2+a2^2-a2\,b1}{a2^2}}\,\mathrm{e}^{-\frac{\left(\sqrt{-4a0\,a2+a1^2}+a1\right)x}{2a2}}\left(\mathrm{KummerM}\left(\frac{(a1\,b2+2a2^2-a2\,b1)\sqrt{-4a0\,a2+a1^2}-\right.\right.$$

ODE No. 1146

$$x^2 y''(x) - 6y(x) = 0$$

✓ **Mathematica** : cpu = 0.0037514 (sec), leaf count = 18

```
DSolve[-6*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 x^3 + \frac{c_1}{x^2}\right\}\right\}$$

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

```
dsolve(x^2*diff(diff(y(x),x),x)-6*y(x)=0,y(x))
```

$$y(x) = \frac{x^5 c_1 + c_2}{x^2}$$

ODE No. 1147

$$x^2 y''(x) - 12y(x) = 0$$

✓ **Mathematica** : cpu = 0.0041034 (sec), leaf count = 18

```
DSolve[-12*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 x^4 + \frac{c_1}{x^3}\right\}\right\}$$

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

```
dsolve(x^2*diff(diff(y(x),x),x)-12*y(x)=0,y(x))
```

$$y(x) = \frac{x^7 c_2 + c_1}{x^3}$$

ODE No. 1148

$$a y(x) + x^2 y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0077609 (sec), leaf count = 77

```
DSolve[a*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x^{\frac{1}{2}\left(\frac{1}{\sqrt{a}}-\frac{\sqrt{1-4a}}{\sqrt{a}}\right)\sqrt{a}} + c_2 x^{\frac{1}{2}\left(\frac{\sqrt{1-4a}}{\sqrt{a}}+\frac{1}{\sqrt{a}}\right)\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.011 (sec), leaf count = 35

```
dsolve(x^2*diff(diff(y(x),x),x)+a*y(x)=0,y(x))
```

$$y(x) = c_1 x^{\frac{1}{2}+\frac{\sqrt{1-4a}}{2}} + c_2 x^{\frac{1}{2}-\frac{\sqrt{1-4a}}{2}}$$

ODE No. 1149

$$y(x)(ax+b)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0455905 (sec), leaf count = 212

```
DSolve[(b + a*x)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2a^{\frac{1}{2}(\sqrt{1-4b}+1)-\frac{1}{2}\sqrt{1-4b}}x^{\frac{1}{2}(\sqrt{1-4b}+1)-\frac{1}{2}\sqrt{1-4b}}\Gamma\left(\sqrt{1-4b}+1\right)J_{\sqrt{1-4b}}\left(2\sqrt{a}\sqrt{x}\right)+c_1a^{\frac{1}{2}(1-\sqrt{1-4b})+\frac{1}{2}\sqrt{1-}\right.\right.$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 45

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x+b)*y(x)=0,y(x))
```

$$y(x)=\sqrt{x}\left(\text{BesselY}\left(\sqrt{1-4b},2\sqrt{a}\,\sqrt{x}\right)c_2+\text{BesselJ}\left(\sqrt{1-4b},2\sqrt{a}\,\sqrt{x}\right)c_1\right)$$

ODE No. 1150

$$x^2 y''(x) + \left(x^2 - 2\right) y(x) = 0$$

✓ **Mathematica** : cpu = 0.0069983 (sec), leaf count = 53

```
DSolve[(-2 + x^2)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \sqrt{\frac{2}{\pi}} c_2 \left(-\sin(x) - \frac{\cos(x)}{x}\right) + \sqrt{\frac{2}{\pi}} c_1 \left(\frac{\sin(x)}{x} - \cos(x)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 27

```
dsolve(x^2*diff(diff(y(x),x),x)+(x^2-2)*y(x)=0,y(x))
```

$$y(x) = \frac{\left(c_1 x + c_2\right) \cos\left(x\right) + \sin\left(x\right) \left(x c_2 - c_1\right)}{x}$$

ODE No. 1151

$$\left(-ax^2-2\right)y(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0112511 (sec), leaf count = 129

```
DSolve[(-2 - a*x^2)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt{\frac{2}{\pi}}c_2\sqrt{x}\left(i\sinh\left(\sqrt{a}x\right)-\frac{i\cosh\left(\sqrt{a}x\right)}{\sqrt{a}x}\right)}{\sqrt{-i\sqrt{a}x}}+\frac{\sqrt{\frac{2}{\pi}}c_1\sqrt{x}\left(\frac{\sinh\left(\sqrt{a}x\right)}{\sqrt{a}x}-\cosh\left(\sqrt{a}x\right)\right)}{\sqrt{-i\sqrt{a}x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.089 (sec), leaf count = 43

```
dsolve(x^2*diff(diff(y(x),x),x)-(a*x^2+2)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\left(ax+\sqrt{a}\right)\mathrm{e}^{-\sqrt{a}\,x}-c_1\mathrm{e}^{\sqrt{a}\,x}\left(ax-\sqrt{a}\right)}{x}$$

ODE No. 1152

$$\left(a^2x^2-6\right)y(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0136581 (sec), leaf count = 114

```
DSolve[(-6 + a^2*x^2)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt{\frac{2}{\pi}}c_1\sqrt{x}\left(\frac{3\sin(ax)}{a^2x^2}-\sin(ax)-\frac{3\cos(ax)}{ax}\right)}{\sqrt{ax}}+\frac{\sqrt{\frac{2}{\pi}}c_2\sqrt{x}\left(-\frac{3\cos(ax)}{a^2x^2}-\frac{3\sin(ax)}{ax}+\cos(ax)\right)}{\sqrt{ax}}\right\}\right\}$$

✓ **Maple** : cpu = 0.21 (sec), leaf count = 53

```
dsolve(x^2*diff(diff(y(x),x),x)+(a^2*x^2-6)*y(x)=0,y(x))
```

$$y(x)=\frac{\left(a^2x^2c_1+3axc_2-3c_1\right)\cos\left(ax\right)+\sin\left(ax\right)\left(a^2x^2c_2-3axc_1-3c_2\right)}{x^2}$$

ODE No. 1153

$$y(x)\left(ax^2+(1-v)v\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0214315 (sec), leaf count = 56

```
DSolve[((1 - v)*v + a*x^2)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\sqrt{x}J_{\frac{1}{2}(2v-1)}\left(\sqrt{a}x\right)+c_2\sqrt{x}Y_{\frac{1}{2}(2v-1)}\left(\sqrt{a}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.031 (sec), leaf count = 31

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x^2-v*(v-1))*y(x)=0,y(x))
```

$$y(x)=\sqrt{x}\left(\text{BesselY}\left(v-\frac{1}{2},\sqrt{a}\,x\right)c_2+\text{BesselJ}\left(v-\frac{1}{2},\sqrt{a}\,x\right)c_1\right)$$

ODE No. 1154

$$y(x)\left(ax^2+bx+c\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0139399 (sec), leaf count = 88

```
DSolve[(c + b*x + a*x^2)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 M_{-\frac{ib}{2\sqrt{a}},-\frac{1}{2}i\sqrt{4c-1}}\left(2i\sqrt{a}x\right)+c_2 W_{-\frac{ib}{2\sqrt{a}},-\frac{1}{2}i\sqrt{4c-1}}\left(2i\sqrt{a}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.112 (sec), leaf count = 57

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x^2+b*x+c)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{WhittakerM}\left(-\frac{ib}{2\sqrt{a}},\frac{\sqrt{1-4c}}{2},2i\sqrt{a}\,x\right)+c_2\,\text{WhittakerW}\left(-\frac{ib}{2\sqrt{a}},\frac{\sqrt{1-4c}}{2},2i\sqrt{a}\,x\right)$$

ODE No. 1155

$$y(x)\left(ax^k+(1-b)b\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0361444 (sec), leaf count = 225

```
DSolve[((1 - b)*b + a*x^k)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1k^{-\frac{2(1-b)}{k}-\frac{2b}{k}+\frac{1}{k}}a^{\frac{1-b}{k}+\frac{1}{2}\left(\frac{2b}{k}-\frac{1}{k}\right)}\left(x^k\right)^{\frac{1-b}{k}+\frac{1}{2}\left(\frac{2b}{k}-\frac{1}{k}\right)}\Gamma\left(-\frac{2b}{k}+\frac{1}{k}+1\right)J_{\frac{1-2b}{k}}\left(\frac{2\sqrt{a}\sqrt{x^k}}{k}\right)+c_2k^{-1/k}a^{\frac{k}{k}}\right.\right.$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 67

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x^k-b*(b-1))*y(x)=0,y(x))
```

$$y(x)=\sqrt{x}\left(\text{BesselY}\left(\frac{\sqrt{(2b-1)^2}}{k},\frac{2\sqrt{a}\,x^{\frac{k}{2}}}{k}\right)c_2+\text{BesselJ}\left(\frac{\sqrt{(2b-1)^2}}{k},\frac{2\sqrt{a}\,x^{\frac{k}{2}}}{k}\right)c_1\right)$$

ODE No. 1156

$$x^2 y''(x) + \frac{y(x)}{\log(x)} - e^x x(x \log(x) + 2) = 0$$

✓ **Mathematica** : cpu = 0.0781277 (sec), leaf count = 32

```
DSolve[-(E^x*x*(2 + x*Log[x])) + y[x]/Log[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 \log(x)\left(\text{li}(x) - \frac{x}{\log(x)}\right) + e^x \log(x) + c_1 \log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.144 (sec), leaf count = 71

```
dsolve(x^2*diff(diff(y(x),x),x)+y(x)/ln(x)-x*exp(x)*(2+x*ln(x))=0,y(x))
```

$$y(x) = c_2 \ln(x) - (\text{expIntegral}(1, -\ln(x)) \ln(x) + x)\, c_1 - \ln(x)\left(-\left(\int \frac{(\text{expIntegral}(1, -\ln(x)) \ln(x) + x}{x}\right.\right.$$

ODE No. 1157

$$ay'(x) + x^2y''(x) - xy(x) = 0$$

✗ **Mathematica** : cpu = 0.49723 (sec), leaf count = 0

```
DSolve[-(x*y[x]) + a*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

, DifferentialRoot result

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

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^2*diff(diff(y(x),x),x)+a*diff(y(x),x)-x*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x) + \frac{a\left(\frac{d}{dx}\_Y(x)\right)}{x^2} - \frac{\_Y(x)}{x}\right\}, \{\_Y(x)\}\right)$$

ODE No. 1158

$$y(x)\left(-ab-b^2x^2\right)+ay'(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.16868 (sec), leaf count = 43

```
DSolve[(-(a*b) - b^2*x^2)*y[x] + a*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2e^{bx}\int_1^x e^{\frac{a}{K[1]}-2bK[1]}dK[1]+c_1e^{bx}\right\}\right\}$$

✓ **Maple** : cpu = 0.201 (sec), leaf count = 178

```
dsolve(x^2*diff(diff(y(x),x),x)+a*diff(y(x),x)-(b^2*x^2+a*b)*y(x)=0,y(x))
```

$$y(x)=\sqrt{x}\left(\mathrm{e}^{bx}HD\left(-4\sqrt{2}\sqrt{ab},-1-4\sqrt{2}\sqrt{ab},8\sqrt{2}\sqrt{ab},-4\sqrt{2}\sqrt{ab}+1,\frac{\sqrt{2}\sqrt{ab}\,x-a}{\sqrt{2}\sqrt{ab}\,x+a}\right)c_2+HD\left(4\sqrt{2}\right.\right.$$

ODE No. 1159

$$-ax^2 + x^2 y''(x) + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0059742 (sec), leaf count = 24

```
DSolve[-(a*x^2) - y[x] + x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{ax^2}{3} + c_2 x + \frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.015 (sec), leaf count = 19

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x)-a*x^2=0,y(x))
```

$$y(x) = xc_2 + \frac{a\,x^2}{3} + \frac{c_1}{x}$$

ODE No. 1160

$$ay(x) + x^2 y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0073201 (sec), leaf count = 30

```
DSolve[a*y[x] + x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 \cos\left(\sqrt{a}\log(x)\right) + c_2 \sin\left(\sqrt{a}\log(x)\right)\}\}$$

✓ **Maple** : cpu = 0.015 (sec), leaf count = 23

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = c_1 \sin\left(\sqrt{a}\,\ln(x)\right) + c_2 \cos\left(\sqrt{a}\,\ln(x)\right)$$

ODE No. 1161

$$(-a-x)y(x)+x^2y''(x)+xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0355606 (sec), leaf count = 78

```
DSolve[(-a - x)*y[x] + x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to (-1)^{-\sqrt{a}}c_1\Gamma\left(1-2\sqrt{a}\right)I_{-2\sqrt{a}}\left(2\sqrt{x}\right)+(-1)^{\sqrt{a}}c_2\Gamma\left(2\sqrt{a}+1\right)I_{2\sqrt{a}}\left(2\sqrt{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.012 (sec), leaf count = 31

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)-(x+a)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{BesselI}\left(2\sqrt{a},2\sqrt{x}\right)+c_2\,\text{BesselK}\left(2\sqrt{a},2\sqrt{x}\right)$$

ODE No. 1162

$$\left(x^2-v^2\right)y(x)+x^2y''(x)+xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0419328 (sec), leaf count = 18

```
DSolve[(-v^2 + x^2)*y[x] + x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to c_1J_v(x)+c_2Y_v(x)\}\}$$

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

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)+(-v^2+x^2)*y(x)=0,y(x))
```

$$y(x)=c_1\,\mathrm{BesselJ}\left(v,x\right)+c_2\,\mathrm{BesselY}\left(v,x\right)$$

ODE No. 1163

$$-f(x)+\left(x^2-v^2\right)y(x)+x^2y''(x)+xy'(x)=0$$

✓ **Mathematica** : cpu = 0.108728 (sec), leaf count = 72

```
DSolve[-f[x] + (-v^2 + x^2)*y[x] + x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],
```

$$\left\{\left\{y(x)\to J_v(x)\int_1^x-\frac{\pi Y_v(K[1])f(K[1])}{2K[1]}dK[1]+Y_v(x)\int_1^x\frac{\pi J_v(K[2])f(K[2])}{2K[2]}dK[2]+c_1J_v(x)+c_2Y_v(x)\right\}\right.$$

✓ **Maple** : cpu = 0.038 (sec), leaf count = 49

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)+(-v^2+x^2)*y(x)-f(x)=0,y(x))
```

$$y(x)=-\frac{\text{BesselJ}\left(v,x\right)\pi\left(\int\frac{\text{BesselY}(v,x)f(x)}{x}dx\right)}{2}+\frac{\text{BesselY}\left(v,x\right)\pi\left(\int\frac{\text{BesselJ}(v,x)f(x)}{x}dx\right)}{2}+\text{BesselJ}\left(v,x\right)c_2+\text{Bes}$$

ODE No. 1164

$$y(x)\left(lx^2-v^2\right)+x^2y''(x)+xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0147168 (sec), leaf count = 30

```
DSolve[(-v^2 + l*x^2)*y[x] + x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 J_v\left(\sqrt{l}x\right)+c_2 Y_v\left(\sqrt{l}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 23

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)+(l*x^2-v^2)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{BesselJ}\left(v,\sqrt{l}\,x\right)+c_2\,\text{BesselY}\left(v,\sqrt{l}\,x\right)$$

ODE No. 1165

$$(a+x)y'(x)+x^2y''(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.097122 (sec), leaf count = 26

```
DSolve[-y[x] + (a + x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2(a+x)}{a^2}+c_1 x e^{a/x}\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 19

```
dsolve(x^2*diff(diff(y(x),x),x)+(x+a)*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x)=(x+a)\,c_1+c_2 \mathrm{e}^{\frac{a}{x}}x$$

ODE No. 1166

$$-3x^3 + x^2y''(x) - xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0098336 (sec), leaf count = 23

```
DSolve[-3*x^3 + y[x] - x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{3x^3}{4} + c_1 x + c_2 x \log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 21

```
dsolve(x^2*diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x)-3*x^3=0,y(x))
```

$$y(x) = \frac{x(4c_1 \ln(x) + 3x^2 + 4c_2)}{4}$$

ODE No. 1167

$$y(x)\left(ax^m+b\right)+x^2y''(x)-xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0549623 (sec), leaf count = 326

```
DSolve[(b + a*x^m)*y[x] - x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 m^{-\frac{2(m-i\sqrt{b-1}m)}{m^2}-\frac{2i\sqrt{b-1}}{m}} a^{\frac{m-i\sqrt{b-1}m}{m^2}+\frac{i\sqrt{b-1}}{m}} \left(x^m\right)^{\frac{m-i\sqrt{b-1}m}{m^2}+\frac{i\sqrt{b-1}}{m}} \Gamma\left(1-\frac{2i\sqrt{b-1}}{m}\right) J_{-\frac{2i\sqrt{b-1}}{m}}\left(\frac{2\sqrt{a}\sqrt{x}}{m}\right.\right.\right.$$

✓ **Maple** : cpu = 0.038 (sec), leaf count = 63

```
dsolve(x^2*diff(diff(y(x),x),x)-x*diff(y(x),x)+(a*x^m+b)*y(x)=0,y(x))
```

$$y(x)=x\left(\text{BesselY}\left(\frac{2\sqrt{1-b}}{m},\frac{2\sqrt{a}\,x^{\frac{m}{2}}}{m}\right)c_2+\text{BesselJ}\left(\frac{2\sqrt{1-b}}{m},\frac{2\sqrt{a}\,x^{\frac{m}{2}}}{m}\right)c_1\right)$$

ODE No. 1168

$$x^2 y''(x) + 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0150971 (sec), leaf count = 15

```
DSolve[2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 - \frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.008 (sec), leaf count = 11

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)=0,y(x))
```

$$y(x) = c_1 + \frac{c_2}{x}$$

ODE No. 1169

$$y(x)\left(ax-b^2\right)+x^2y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.050154 (sec), leaf count = 236

```
DSolve[(-b^2 + a*x)*y[x] + 2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1a^{\frac{1}{2}\left(-\sqrt{4b^2+1}-1\right)+\frac{1}{2}\sqrt{4b^2+1}}x^{\frac{1}{2}\left(-\sqrt{4b^2+1}-1\right)+\frac{1}{2}\sqrt{4b^2+1}}\Gamma\left(1-\sqrt{4b^2+1}\right)J_{-\sqrt{4b^2+1}}\left(2\sqrt{a}\sqrt{x}\right)+c_2a^{\frac{1}{2}\left(\sqrt{4b}\right.}\right.$$

✓ **Maple** : cpu = 0.032 (sec), leaf count = 49

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)+(a*x-b^2)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\,\mathrm{BesselY}\left(\sqrt{4b^2+1},2\sqrt{a}\,\sqrt{x}\right)+c_1\,\mathrm{BesselJ}\left(\sqrt{4b^2+1},2\sqrt{a}\,\sqrt{x}\right)}{\sqrt{x}}$$

ODE No. 1170

$$y(x)\left(ax^2+b\right)+x^2y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0155376 (sec), leaf count = 58

```
DSolve[(b + a*x^2)*y[x] + 2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 j_{\frac{1}{2}\left(\sqrt{1-4b}-1\right)}\left(\sqrt{a}x\right)+c_2 y_{\frac{1}{2}\left(\sqrt{1-4b}-1\right)}\left(\sqrt{a}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 43

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)+(a*x^2+b)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\,\mathrm{BesselY}\left(\frac{\sqrt{1-4b}}{2},\sqrt{a}\,x\right)+c_1\,\mathrm{BesselJ}\left(\frac{\sqrt{1-4b}}{2},\sqrt{a}\,x\right)}{\sqrt{x}}$$

ODE No. 1171

$$y(x)\left(ax+lx^2-n(n+1)\right)+x^2y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0368403 (sec), leaf count = 142

```
DSolve[(-(n*(1 + n)) + a*x + l*x^2)*y[x] + 2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x]
```

$$\left\{\left\{y(x)\to c_1e^{n\log(x)-i\sqrt{l}x}U\left(\frac{i\left(a-2i\sqrt{l}n-2i\sqrt{l}\right)}{2\sqrt{l}},2n+2,2i\sqrt{l}x\right)+c_2e^{n\log(x)-i\sqrt{l}x}L^{2n+1}_{-\frac{i\left(a-2i\sqrt{l}n-2i\sqrt{l}\right)}{2\sqrt{l}}}\left(2i\sqrt{\right.\right.\right.$$

✓ **Maple** : cpu = 0.118 (sec), leaf count = 49

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)+(l*x^2+a*x-n*(n+1))*y(x)=0,y(x))
```

$$y(x)=\frac{c_1\,\text{WhittakerM}\left(-\frac{ia}{2\sqrt{l}},n+\frac{1}{2},2i\sqrt{l}\,x\right)+c_2\,\text{WhittakerW}\left(-\frac{ia}{2\sqrt{l}},n+\frac{1}{2},2i\sqrt{l}\,x\right)}{x}$$

ODE No. 1172

$$ay(x) + x^2 y''(x) + 2(x-1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0598896 (sec), leaf count = 158

```
DSolve[a*y[x] + 2*(-1 + x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to 2^{\frac{1}{2}\left(1-\sqrt{1-4a}\right)} c_1 \left(\frac{1}{x}\right)^{\frac{1}{2}\left(1-\sqrt{1-4a}\right)} {}_1F_1\left(\frac{1}{2} - \frac{1}{2}\sqrt{1-4a}; 1-\sqrt{1-4a}; -\frac{2}{x}\right) + 2^{\frac{1}{2}\left(\sqrt{1-4a}+1\right)} c_2 \left(\frac{1}{x}\right)^{\frac{1}{2}(\sqrt{}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 47

```
dsolve(x^2*diff(diff(y(x),x),x)+2*(x-1)*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{-\frac{1}{x}} \sqrt{\frac{1}{x}} \left(\mathrm{BesselK}\left(\frac{\sqrt{1-4a}}{2}, \frac{1}{x}\right) c_2 + \mathrm{BesselI}\left(\frac{\sqrt{1-4a}}{2}, \frac{1}{x}\right) c_1\right)$$

ODE No. 1173

$$2(a+x)y'(x)+(1-b)by(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.1112 (sec), leaf count = 74

```
DSolve[(1 - b)*b*y[x] + 2*(a + x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to (-2)^{1-b}c_1a^{1-b}\left(\frac{1}{x}\right)^{1-b}\,{}_1F_1\left(1-b;2-2b;\frac{2a}{x}\right)+(-2)^bc_2a^b\left(\frac{1}{x}\right)^b\,{}_1F_1\left(b;2b;\frac{2a}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.077 (sec), leaf count = 37

```
dsolve(x^2*diff(diff(y(x),x),x)+2*(x+a)*diff(y(x),x)-b*(b-1)*y(x)=0,y(x))
```

$$y(x)=\frac{\mathrm{e}^{\frac{a}{x}}\left(\text{BesselK}\left(b-\frac{1}{2},\frac{a}{x}\right)c_2+\text{BesselI}\left(b-\frac{1}{2},\frac{a}{x}\right)c_1\right)}{\sqrt{x}}$$

ODE No. 1174

$$x^5(-\log(x)) + x^2 y''(x) - 2xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0072403 (sec), leaf count = 33

```
DSolve[-(x^5*Log[x]) + 2*y[x] - 2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x) \to \frac{1}{144}\left(12x^5 \log(x) - 7x^5\right) + c_2 x^2 + c_1 x\right\}\right\}$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 25

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+2*y(x)-x^5*ln(x)=0,y(x))
```

$$y(x) = \frac{x^5 \ln(x)}{12} - \frac{7x^5}{144} + x^2 c_2 + c_1 x$$

ODE No. 1175

$$\left(-ax^2-12a-4\right)\cos(x)+x^2y''(x)-2xy'(x)-4y(x)-x\sin(x)=0$$

✓ **Mathematica** : cpu = 0.186913 (sec), leaf count = 38

```
DSolve[(-4 - 12*a - a*x^2)*Cos[x] - x*Sin[x] - 4*y[x] - 2*x*Derivative[1][y][x] + x^2*Derivat
```

$$\left\{\left\{y(x)\to \frac{-2a\sin(x)-ax\cos(x)-\sin(x)}{x}+c_2x^4+\frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.061 (sec), leaf count = 29

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)-4*y(x)-x*sin(x)-(a*x^2+12*a+4)*cos(x)=0,y(x)
```

$$y(x)=\frac{(-2a-1)\sin(x)+x^5c_2-ax\cos(x)+c_1}{x}$$

ODE No. 1176

$$x^2 y''(x) + \left(x^2 + 2\right) y(x) - 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.014443 (sec), leaf count = 33

```
DSolve[(2 + x^2)*y[x] - 2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{-ix} x - \frac{1}{2} i c_2 e^{ix} x\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 15

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+(x^2+2)*y(x)=0,y(x))
```

$$y(x) = x(\sin(x)\, c_1 + c_2 \cos(x))$$

ODE No. 1177

$$x^2 y''(x) + \left(x^2+2\right) y'(x) + x^2(-\sec(x)) - 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.703511 (sec), leaf count = 141

```
DSolve[-(x^2*Sec[x]) - 2*x*Derivative[1][y][x] + (2 + x^2)*Derivative[1][y][x] + x^2*Derivati
```

$$\left\{\left\{y(x) \to \int_1^x e^{\frac{2}{K[1]}-K[1]} K[1]^2 dK[1] \int_1^x \frac{e^{K[3]-\frac{2}{K[3]}} \sec(K[3])}{K[3]^2} dK[3] + \int_1^x -\frac{e^{K[2]-\frac{2}{K[2]}} \sec(K[2]) \int_1^{K[2]} e^{\frac{2}{K[1]}-K}}{K[2]^2}\right.\right.$$

✓ **Maple** : cpu = 0.087 (sec), leaf count = 34

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+(x^2+2)*y(x)-x^2/cos(x)=0,y(x))
```

$$y(x) = \left(-\cos(x)\left(\int \frac{\sin(x)}{x\cos(x)} dx\right) + \cos(x)\, c_1 + \sin(x)\left(c_2 + \ln(x)\right)\right) x$$

ODE No. 1178

$$x^3(-\sec(x)) + x^2 y''(x) + \left(x^2+2\right) y(x) - 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0345741 (sec), leaf count = 74

```
DSolve[-(x^3*Sec[x]) + (2 + x^2)*y[x] - 2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] ==
```

$$\left\{\left\{y(x) \to \frac{1}{2}e^{-ix}x\left(e^{2ix}\log\left(1+e^{-2ix}\right)+\log\left(1+e^{2ix}\right)\right)+c_1 e^{-ix}x-\frac{1}{2}ic_2 e^{ix}x\right\}\right\}$$

✓ **Maple** : cpu = 0.031 (sec), leaf count = 23

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+(x^2+2)*y(x)-x^3/cos(x)=0,y(x))
```

$$y(x) = x(\cos(x)\ln(\cos(x)) + \cos(x)\,c_1 + \sin(x)\,(x+c_2))$$

ODE No. 1179

$$\left(a^2x^2+2\right)y(x)+x^2y''(x)-2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0167402 (sec), leaf count = 38

```
DSolve[(2 + a^2*x^2)*y[x] - 2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1xe^{-iax}-\frac{ic_2xe^{iax}}{2a}\right\}\right\}$$

✓ **Maple** : cpu = 0.032 (sec), leaf count = 19

```
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))
```

$$y(x)=x(\cos(ax)\,c_2+\sin(ax)\,c_1)$$

ODE No. 1180

$$-f(x)+\left(-v^2+x^2+1\right)y(x)+x^2y''(x)+3xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0596752 (sec), leaf count = 75

```
DSolve[-f[x] + (1 - v^2 + x^2)*y[x] + 3*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,
```

$$\left\{\left\{y(x)\to \frac{J_v(x)\int_1^x -\frac{1}{2}\pi Y_v(K[1])f(K[1])dK[1]+Y_v(x)\int_1^x \frac{1}{2}\pi J_v(K[2])f(K[2])dK[2]}{x}+\frac{c_1J_v(x)}{x}+\frac{c_2Y_v(x)}{x}\right.\right.$$

✓ **Maple** : cpu = 0.047 (sec), leaf count = 49

```
dsolve(x^2*diff(diff(y(x),x),x)+3*x*diff(y(x),x)+(-v^2+x^2+1)*y(x)-f(x)=0,y(x))
```

$$y(x)=\frac{-\operatorname{BesselJ}(v,x)\,\pi\left(\int \operatorname{BesselY}(v,x)\,f(x)\,dx\right)+\operatorname{BesselY}(v,x)\,\pi\left(\int \operatorname{BesselJ}(v,x)\,f(x)\,dx\right)+2\,\operatorname{BesselJ}}{2x}$$

ODE No. 1181

$$x^2y''(x) + (3x-1)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0438649 (sec), leaf count = 37

```
DSolve[y[x] + (-1 + 3*x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1 e^{-1/x}}{x} - \frac{c_2 e^{-1/x}\text{Ei}\left(\frac{1}{x}\right)}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.022 (sec), leaf count = 25

```
dsolve(x^2*diff(diff(y(x),x),x)+(3*x-1)*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = \frac{\left(c_1 \operatorname{expIntegral}\left(1, -\frac{1}{x}\right) + c_2\right) \mathrm{e}^{-\frac{1}{x}}}{x}$$

ODE No. 1182

$$x^2y''(x) - 3xy'(x) + 4y(x) - 5x = 0$$

✓ **Mathematica** : cpu = 0.010677 (sec), leaf count = 24

```
DSolve[-5*x + 4*y[x] - 3*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1x^2 + 2c_2x^2\log(x) + 5x\}\}$$

✓ **Maple** : cpu = 0.012 (sec), leaf count = 20

```
dsolve(x^2*diff(diff(y(x),x),x)-3*x*diff(y(x),x)+4*y(x)-5*x=0,y(x))
```

$$y(x) = x^2c_2 + x^2\ln(x)c_1 + 5x$$

ODE No. 1183

$$x^2 y''(x) + x^2(-\log(x)) - 3xy'(x) - 5y(x) = 0$$

✓ **Mathematica** : cpu = 0.0078372 (sec), leaf count = 27

```
DSolve[-(x^2*Log[x]) - 5*y[x] - 3*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x) \to c_2 x^5 - \frac{1}{9}x^2 \log(x) + \frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.013 (sec), leaf count = 22

```
dsolve(x^2*diff(diff(y(x),x),x)-3*x*diff(y(x),x)-5*y(x)-x^2*ln(x)=0,y(x))
```

$$y(x) = x^5 c_2 + \frac{c_1}{x} - \frac{x^2 \ln(x)}{9}$$

ODE No. 1184

$$-x^4 + x^2 y''(x) + x^2 - 4xy'(x) + 6y(x) = 0$$

✓ **Mathematica** : cpu = 0.0066318 (sec), leaf count = 38

```
DSolve[x^2 - x^4 + 6*y[x] - 4*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 x^3 + c_1 x^2 + \frac{1}{2}\left(x^4 + 2x^2 + 2x^2 \log(x)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.023 (sec), leaf count = 25

```
dsolve(x^2*diff(diff(y(x),x),x)-4*x*diff(y(x),x)+6*y(x)-x^4+x^2=0,y(x))
```

$$y(x) = \frac{x^2(2c_1 x + x^2 + 2\ln(x) + 2c_2 + 2)}{2}$$

ODE No. 1185

$$\left(4-2x^3\right)y(x)+x^2y''(x)+5xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0284057 (sec), leaf count = 67

```
DSolve[(4 - 2*x^3)*y[x] + 5*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{3\sqrt[3]{6}c_2K_0\left(\frac{2}{3}\sqrt{2}x^{3/2}\right)}{x^2}-\frac{3\sqrt[3]{-3}c_1I_0\left(\frac{2}{3}\sqrt{2}x^{3/2}\right)}{2^{2/3}x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 33

```
dsolve(x^2*diff(diff(y(x),x),x)+5*x*diff(y(x),x)-(2*x^3-4)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\,\mathrm{BesselK}\left(0,\frac{2\sqrt{2}\,x^{\frac{3}{2}}}{3}\right)+c_1\,\mathrm{BesselI}\left(0,\frac{2\sqrt{2}\,x^{\frac{3}{2}}}{3}\right)}{x^2}$$

ODE No. 1186

$$x^3(-\sin(x)) + x^2 y''(x) - 5xy'(x) + 8y(x) = 0$$

✓ **Mathematica** : cpu = 0.014115 (sec), leaf count = 42

```
DSolve[-(x^3*Sin[x]) + 8*y[x] - 5*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x) \to \frac{1}{2}\left(x^4 \text{Ci}(x) - x^3 \sin(x) + x^2 \cos(x)\right) + c_2 x^4 + c_1 x^2\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 36

```
dsolve(x^2*diff(diff(y(x),x),x)-5*x*diff(y(x),x)+8*y(x)-sin(x)*x^3=0,y(x))
```

$$y(x) = \frac{x^4 \,\text{cosineIntegral}\,(x)}{2} - \frac{\sin(x)\, x^3}{2} + \frac{x^2(2c_1 x^2 + 2c_2 + \cos(x))}{2}$$

ODE No. 1187

$$axy'(x) + by(x) + x^2y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0092728 (sec), leaf count = 99

```
DSolve[b*y[x] + a*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x^{\frac{1}{2}\sqrt{b}\left(-\frac{\sqrt{a^2-2a-4b+1}}{\sqrt{b}}-\frac{a-1}{\sqrt{b}}\right)} + c_2 x^{\frac{1}{2}\sqrt{b}\left(\frac{\sqrt{a^2-2a-4b+1}}{\sqrt{b}}-\frac{a-1}{\sqrt{b}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.011 (sec), leaf count = 53

```
dsolve(x^2*diff(diff(y(x),x),x)+a*x*diff(y(x),x)+b*y(x)=0,y(x))
```

$$y(x) = c_1 x^{-\frac{a}{2}+\frac{1}{2}+\frac{\sqrt{a^2-2a-4b+1}}{2}} + c_2 x^{-\frac{a}{2}+\frac{1}{2}-\frac{\sqrt{a^2-2a-4b+1}}{2}}$$

ODE No. 1188

$$(ax+b)y'(x)+cy(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.14887 (sec), leaf count = 266

```
DSolve[c*y[x] + (b + a*x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 i^{-\sqrt{a^2-2a-4c+1}+a-1} b^{\frac{1}{2}\left(-\sqrt{a^2-2a-4c+1}+a-1\right)} \left(\frac{1}{x}\right)^{\frac{1}{2}\left(-\sqrt{a^2-2a-4c+1}+a-1\right)} {}_1F_1\left(\frac{a}{2}-\frac{1}{2}\sqrt{a^2-2a-4c\right.\right.$$

✓ **Maple** : cpu = 0.157 (sec), leaf count = 114

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x+b)*diff(y(x),x)+c*y(x)=0,y(x))
```

$$y(x)=x^{-\frac{\sqrt{a^2-2a-4c+1}}{2}-\frac{a}{2}+\frac{1}{2}}\left(\text{KummerM}\left(-\frac{1}{2}+\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2},1+\sqrt{a^2-2a-4c+1},\frac{b}{x}\right)c_1+\text{K}\right.$$

ODE No. 1189

$$axy'(x)+y(x)\left(bx^m+c\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0516641 (sec), leaf count = 445

```
DSolve[(c + b*x^m)*y[x] + a*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 m^{-\frac{-\sqrt{a^2-2a-4c+1}-a+1}{m}-\frac{\sqrt{a^2-2a-4c+1}}{m}} b^{\frac{-\sqrt{a^2-2a-4c+1}-a+1}{2m}+\frac{\sqrt{a^2-2a-4c+1}}{2m}} \left(x^m\right)^{\frac{-\sqrt{a^2-2a-4c+1}-a+1}{2m}+\frac{\sqrt{a^2-2a-4c+1}}{2m}} \mathrm{I}\right.\right.$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 79

```
dsolve(x^2*diff(diff(y(x),x),x)+a*x*diff(y(x),x)+(b*x^m+c)*y(x)=0,y(x))
```

$$y(x)=x^{-\frac{a}{2}+\frac{1}{2}}\left(\mathrm{BesselY}\left(\frac{\sqrt{a^2-2a-4c+1}}{m},\frac{2\sqrt{b}\,x^{\frac{m}{2}}}{m}\right)c_2+\mathrm{BesselJ}\left(\frac{\sqrt{a^2-2a-4c+1}}{m},\frac{2\sqrt{b}\,x^{\frac{m}{2}}}{m}\right)c_1\right)$$

ODE No. 1190

$$y(x)(ax+b)+x^2y''(x)+x^2y'(x)=0$$

✓ **Mathematica** : cpu = 0.0211523 (sec), leaf count = 122

```
DSolve[(b + a*x)*y[x] + x^2*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 e^{\frac{1}{2}\left(\left(\sqrt{1-4b}+1\right)\log(x)-2x\right)}U\left(\frac{1}{2}\left(-2a+\sqrt{1-4b}+1\right),\sqrt{1-4b}+1,x\right)+c_2 e^{\frac{1}{2}\left(\left(\sqrt{1-4b}+1\right)\log(x)-2x\right)}L\right.\right.$$

✓ **Maple** : cpu = 0.087 (sec), leaf count = 38

```
dsolve(x^2*diff(diff(y(x),x),x)+x^2*diff(y(x),x)+(a*x+b)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{x}{2}}\left(\mathrm{WhittakerW}\left(a,\frac{\sqrt{1-4b}}{2},x\right)c_2+\mathrm{WhittakerM}\left(a,\frac{\sqrt{1-4b}}{2},x\right)c_1\right)$$

ODE No. 1191

$$x^2 y''(x) + x^2 y'(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0075275 (sec), leaf count = 110

```
DSolve[-2*y[x] + x^2*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{2c_2 e^{\frac{1}{2}(\log(x)-x)}\left(i\sinh\left(\frac{x}{2}\right) - \frac{2i\cosh\left(\frac{x}{2}\right)}{x}\right)}{\sqrt{\pi}\sqrt{-ix}} + \frac{2c_1 e^{\frac{1}{2}(\log(x)-x)}\left(\frac{2\sinh\left(\frac{x}{2}\right)}{x} - \cosh\left(\frac{x}{2}\right)\right)}{\sqrt{\pi}\sqrt{-ix}}\right\}\right\}$$

✓ **Maple** : cpu = 0.017 (sec), leaf count = 23

```
dsolve(x^2*diff(diff(y(x),x),x)+x^2*diff(y(x),x)-2*y(x)=0,y(x))
```

$$y(x) = \frac{c_2(x+2)\,\mathrm{e}^{-x} + c_1(x-2)}{x}$$

ODE No. 1192

$$x^2 y''(x) + \left(x^2 - 1\right) y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0742317 (sec), leaf count = 40

```
DSolve[-y[x] + (-1 + x^2)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 e^{-x} \int_1^x e^{K[1] - \frac{1}{K[1]}} dK[1] + c_1 e^{-x}\right\}\right\}$$

✓ **Maple** : cpu = 0.126 (sec), leaf count = 51

```
dsolve(x^2*diff(diff(y(x),x),x)+(x^2-1)*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = \sqrt{x}\left(\mathrm{e}^{-x} HD\left(4, 3, -8, 5, \frac{x-1}{1+x}\right) c_1 + \mathrm{e}^{-\frac{1}{x}} HD\left(-4, 3, -8, 5, \frac{x-1}{1+x}\right) c_2\right)$$

ODE No. 1193

$$x^2y''(x)+(x+1)xy'(x)+(x-9)y(x)=0$$

✓ **Mathematica** : cpu = 0.185065 (sec), leaf count = 44

```
DSolve[(-9 + x)*y[x] + x*(1 + x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1((x-8)x+20)}{x^3}-\frac{c_2e^{-x}(x^3+9x^2+36x+60)}{x^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 38

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(1+x)*diff(y(x),x)+(x-9)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2(x^3+9x^2+36x+60)\,\mathrm{e}^{-x}+c_1(x^2-8x+20)}{x^3}$$

ODE No. 1194

$$x^2y''(x)+(x+1)xy'(x)+(3x-1)y(x)=0$$

✓ **Mathematica** : cpu = 0.0891578 (sec), leaf count = 65

```
DSolve[(-1 + 3*x)*y[x] + x*(1 + x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{-x}(x-3)x-\frac{c_2e^{-x}(x^3(-\text{Ei}(x))+3x^2\text{Ei}(x)+e^xx^2-2e^xx-e^x)}{6x}\right\}\right\}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 48

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(1+x)*diff(y(x),x)+(3*x-1)*y(x)=0,y(x))
```

$$y(x)=\frac{x^2c_2\mathrm{e}^{-x}(x-3)\,\text{expIntegral}\left(1,-x\right)+c_1x^2(x-3)\,\mathrm{e}^{-x}+c_2(x^2-2x-1)}{x}$$

ODE No. 1195

$$x^2y''(x)+(x+3)xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0211191 (sec), leaf count = 80

```
DSolve[-y[x] + x*(3 + x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 U\left(2+\sqrt{2},1+2\sqrt{2},x\right)e^{\left(\sqrt{2}-1\right)\log(x)-x}+c_2 L^{2\sqrt{2}}_{-2-\sqrt{2}}(x)e^{\left(\sqrt{2}-1\right)\log(x)-x}\right\}\right\}$$

✓ **Maple** : cpu = 0.097 (sec), leaf count = 93

```
dsolve(x^2*diff(diff(y(x),x),x)+(x+3)*x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x)=-\frac{\mathrm{e}^{-\frac{x}{2}}\left(-c_1\left(\sqrt{2}+x+1\right)\mathrm{BesselI}\left(-\frac{1}{2}+\sqrt{2},\frac{x}{2}\right)-c_1\left(-\sqrt{2}+x+1\right)\mathrm{BesselI}\left(\frac{1}{2}+\sqrt{2},\frac{x}{2}\right)+\left(\left(-x-\sqrt{}\right.\right.\right.}{\sqrt{x}}$$

ODE No. 1196

$$x^2y''(x) - (x-1)xy'(x) + (x-1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0251719 (sec), leaf count = 37

```
DSolve[(-1 + x)*y[x] - (-1 + x)*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2(x^2\text{Ei}(x) - e^x x - e^x)}{2x} + c_1 x\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 31

```
dsolve(x^2*diff(diff(y(x),x),x)-x*(x-1)*diff(y(x),x)+(x-1)*y(x)=0,y(x))
```

$$y(x) = \frac{\text{expIntegral}\left(1,-x\right) c_2 x^2 + c_2(1+x)\,\mathrm{e}^x + c_1 x^2}{x}$$

ODE No. 1197

$$(-a-x)y(x)+x^2y''(x)-\left(x^2-2x\right)y'(x)=0$$

✓ **Mathematica** : cpu = 0.0131615 (sec), leaf count = 78

```
DSolve[(-a - x)*y[x] - (-2*x + x^2)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x)\to c_1e^{\frac{1}{2}(x-\log(x))}J_{\frac{1}{2}\sqrt{4a+1}}\left(-\frac{ix}{2}\right)+c_2e^{\frac{1}{2}(x-\log(x))}Y_{\frac{1}{2}\sqrt{4a+1}}\left(-\frac{ix}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 43

```
dsolve(x^2*diff(diff(y(x),x),x)-(x^2-2*x)*diff(y(x),x)-(x+a)*y(x)=0,y(x))
```

$$y(x)=\frac{\mathrm{e}^{\frac{x}{2}}\left(\mathrm{BesselK}\left(\frac{\sqrt{4a+1}}{2},\frac{x}{2}\right)c_2+\mathrm{BesselI}\left(\frac{\sqrt{4a+1}}{2},\frac{x}{2}\right)c_1\right)}{\sqrt{x}}$$

ODE No. 1198

$$x^2 y''(x) - (x^2 - 2x)\, y'(x) + (-3x - 2)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0328546 (sec), leaf count = 41

```
DSolve[(-2 - 3*x)*y[x] - (-2*x + x^2)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x) \to c_1 e^x x - \frac{c_2(e^x x^3 \text{Ei}(-x) + x^2 - x + 2)}{6x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 37

```
dsolve(x^2*diff(diff(y(x),x),x)-(x^2-2*x)*diff(y(x),x)-(3*x+2)*y(x)=0,y(x))
```

$$y(x) = \frac{\text{expIntegral}\,(1, x)\, \mathrm{e}^x c_2 x^3 + c_1 x^3 \mathrm{e}^x - c_2(x^2 - x + 2)}{x^2}$$

ODE No. 1199

$$x^2y''(x) - (x+4)xy'(x) + 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.0128615 (sec), leaf count = 41

```
DSolve[4*y[x] - x*(4 + x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 e^x x^4 - \frac{1}{6}c_1 x\left(e^x x^3 \mathrm{Ei}(-x) + x^2 - x + 2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 35

```
dsolve(x^2*diff(diff(y(x),x),x)-x*(x+4)*diff(y(x),x)+4*y(x)=0,y(x))
```

$$y(x) = \left(\mathrm{expIntegral}\left(1, x\right) \mathrm{e}^x c_2 x^3 + c_1 x^3 \mathrm{e}^x - c_2\left(x^2 - x + 2\right)\right) x$$

ODE No. 1200

$$(1-v)vy(x)+x^2y''(x)+2x^2y'(x)=0$$

✓ **Mathematica** : cpu = 0.0148909 (sec), leaf count = 62

```
DSolve[(1 - v)*v*y[x] + 2*x^2*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{-x}\sqrt{x}J_{\frac{1}{2}(2v-1)}(-ix)+c_2e^{-x}\sqrt{x}Y_{\frac{1}{2}(2v-1)}(-ix)\right\}\right\}$$

✓ **Maple** : cpu = 0.015 (sec), leaf count = 27

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x^2*diff(y(x),x)-v*(v-1)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-x}\sqrt{x}\left(\mathrm{BesselK}\left(v-\frac{1}{2},x\right)c_2+\mathrm{BesselI}\left(v-\frac{1}{2},x\right)c_1\right)$$

ODE No. 1201

$$x^2y''(x) + (2x+1)xy'(x) - 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.102871 (sec), leaf count = 44

```
DSolve[-4*y[x] + x*(1 + 2*x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1 e^{-2x}(2x+3)}{2x^2} + \frac{c_2(2x^2-4x+3)}{4x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 34

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(2*x+1)*diff(y(x),x)-4*y(x)=0,y(x))
```

$$y(x) = \frac{c_1(2x^2-4x+3)}{x^2} + \frac{c_2 \mathrm{e}^{-2x}(2x+3)}{x^2}$$

ODE No. 1202

$$x^2y''(x) - 2(x+1)xy'(x) + 2(x+1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0110352 (sec), leaf count = 22

```
DSolve[2*(1 + x)*y[x] - 2*x*(1 + x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x) \to c_1 x + \frac{1}{2}c_2 e^{2x} x\right\}\right\}$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 14

```
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))
```

$$y(x) = x\left(\mathrm{e}^{2x}c_2 + c_1\right)$$

ODE No. 1203

$$ax^2y'(x)+x^2y''(x)-2y(x)=0$$

✓ **Mathematica** : cpu = 0.0147202 (sec), leaf count = 124

```
DSolve[-2*y[x] + a*x^2*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{2c_2e^{\frac{1}{2}(\log(x)-ax)}\left(i\sinh\left(\frac{ax}{2}\right)-\frac{2i\cosh\left(\frac{ax}{2}\right)}{ax}\right)}{\sqrt{\pi}\sqrt{-iax}}+\frac{2c_1e^{\frac{1}{2}(\log(x)-ax)}\left(\frac{2\sinh\left(\frac{ax}{2}\right)}{ax}-\cosh\left(\frac{ax}{2}\right)\right)}{\sqrt{\pi}\sqrt{-iax}}\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 28

```
dsolve(x^2*diff(diff(y(x),x),x)+a*x^2*diff(y(x),x)-2*y(x)=0,y(x))
```

$$y(x)=\frac{c_2(ax+2)\,\mathrm{e}^{-ax}+c_1(ax-2)}{x}$$

ODE No. 1204

$$x^2(a+2b)y'(x)+y(x)\left(bx^2(a+b)-2\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0146681 (sec), leaf count = 132

```
DSolve[(-2 + b*(a + b)*x^2)*y[x] + (a + 2*b)*x^2*Derivative[1][y][x] + x^2*Derivative[2][y][x
```

$$\left\{\left\{y(x)\to \frac{2c_2e^{\frac{1}{2}(-ax-2bx+\log(x))}\left(i\sinh\left(\frac{ax}{2}\right)-\frac{2i\cosh\left(\frac{ax}{2}\right)}{ax}\right)}{\sqrt{\pi}\sqrt{-iax}}+\frac{2c_1e^{\frac{1}{2}(-ax-2bx+\log(x))}\left(\frac{2\sinh\left(\frac{ax}{2}\right)}{ax}-\cosh\left(\frac{ax}{2}\right)\right)}{\sqrt{\pi}\sqrt{-iax}}\right\}\right.$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 35

```
dsolve(x^2*diff(diff(y(x),x),x)+(a+2*b)*x^2*diff(y(x),x)+((a+b)*b*x^2-2)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2(ax+2)\,\mathrm{e}^{-(a+b)x}+c_1\mathrm{e}^{-bx}(ax-2)}{x}$$

ODE No. 1205

$$ax^2y'(x) + f(x)y(x) + x^2y''(x) = 0$$

✗ **Mathematica** : cpu = 0.242396 (sec), leaf count = 0

```
DSolve[f[x]*y[x] + a*x^2*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[f[x]*y[x] + a*x^2*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^2*diff(diff(y(x),x),x)+a*x^2*diff(y(x),x)+f(x)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{f(x)\_Y(x)}{x^2} + a\left(\frac{d}{dx}\_Y(x)\right) + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

ODE No. 1206

$$y(x)\left(abx+cx^2+d\right)+x(2ax+b)y'(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0693041 (sec), leaf count = 120

```
DSolve[(d + a*b*x + c*x^2)*y[x] + x*(b + 2*a*x)*Derivative[1][y][x] + x^2*Derivative[2][y][x]
```

$$\left\{\left\{y(x)\to c_1e^{\frac{1}{2}(-2ax-(b-1)\log(x))}J_{\frac{1}{2}\sqrt{b^2-2b-4d+1}}\left(-i\sqrt{a^2-c}x\right)+c_2e^{\frac{1}{2}(-2ax-(b-1)\log(x))}Y_{\frac{1}{2}\sqrt{b^2-2b-4d+1}}\left(-i\sqrt{a^2-\right.\right.\right.$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 76

```
dsolve(x^2*diff(diff(y(x),x),x)+(2*a*x+b)*x*diff(y(x),x)+(a*b*x+c*x^2+d)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-ax}x^{-\frac{b}{2}+\frac{1}{2}}\left(\mathrm{BesselY}\left(\frac{\sqrt{b^2-2b-4d+1}}{2},\sqrt{-a^2+c}\,x\right)c_2+\mathrm{BesselJ}\left(\frac{\sqrt{b^2-2b-4d+1}}{2},\sqrt{-a^2+\right.\right.$$

ODE No. 1207

$$x(ax+b)y'(x)+y(x)\left(\mathrm{a1}x^2+\mathrm{b1}x+\mathrm{c1}\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0796519 (sec), leaf count = 294

```
DSolve[(c1 + b1*x + a1*x^2)*y[x] + x*(b + a*x)*Derivative[1][y][x] + x^2*Derivative[2][y][x]
```

$$\left\{\left\{y(x)\to c_1 U\left(-\frac{-ab+2\mathrm{b1}-\sqrt{a^2-4\mathrm{a1}}-\sqrt{a^2-4\mathrm{a1}}\sqrt{b^2-2b-4\mathrm{c1}+1}}{2\sqrt{a^2-4\mathrm{a1}}},\sqrt{b^2-2b-4\mathrm{c1}+1}+1,\sqrt{a^2}\right.\right.$$

✓ **Maple** : cpu = 0.227 (sec), leaf count = 110

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x+b)*diff(y(x),x)*x+(a1*x^2+b1*x+c1)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{ax}{2}}x^{-\frac{b}{2}}\left(\mathrm{WhittakerW}\left(-\frac{ab-2b1}{2\sqrt{a^2-4a1}},\frac{\sqrt{b^2-2b-4c1+1}}{2},\sqrt{a^2-4a1}\,x\right)c_2+\mathrm{WhittakerM}\left(-\right.\right.$$

ODE No. 1208

$$x^3 y'(x) + x^2 y''(x) + \left(x^2 - 2\right) y(x) = 0$$

✓ **Mathematica** : cpu = 0.043866 (sec), leaf count = 59

```
DSolve[(-2 + x^2)*y[x] + x^3*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2 e^{-\frac{x^2}{2}} \left(\sqrt{2\pi} e^{\frac{x^2}{2}} \operatorname{erf}\left(\frac{x}{\sqrt{2}}\right) - 2x\right)}{2x} + \frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 35

```
dsolve(x^2*diff(diff(y(x),x),x)+x^3*diff(y(x),x)+(x^2-2)*y(x)=0,y(x))
```

$$y(x) = \frac{\sqrt{\pi}\sqrt{2}\ \operatorname{erf}\left(\frac{\sqrt{2}x}{2}\right) c_2 - 2\,\mathrm{e}^{-\frac{x^2}{2}} c_2 x + c_1}{x}$$

ODE No. 1209

$$x^2 y''(x) + \left(x^2 + 2\right) x y'(x) + \left(x^2 - 2\right) y(x) = 0$$

✓ **Mathematica** : cpu = 0.0150351 (sec), leaf count = 67

```
DSolve[(-2 + x^2)*y[x] + x*(2 + x^2)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],
```

$$\left\{\left\{y(x) \to \frac{c_1 e^{-\frac{x^2}{2}} \left(e^{\frac{x^2}{2}} x - \sqrt{\frac{\pi}{2}} \text{erfi}\left(\frac{x}{\sqrt{2}}\right)\right)}{x^2} + \frac{c_2 e^{-\frac{x^2}{2}}}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.057 (sec), leaf count = 41

```
dsolve(x^2*diff(diff(y(x),x),x)+(x^2+2)*x*diff(y(x),x)+(x^2-2)*y(x)=0,y(x))
```

$$y(x) = \frac{\left(-\pi \operatorname{erf}\left(\frac{i\sqrt{2}\,x}{2}\right) c_2 + c_1\right) \mathrm{e}^{-\frac{x^2}{2}} + i\sqrt{\pi}\,\sqrt{2}\,c_2 x}{x^2}$$

ODE No. 1210

$$y(x)\left(a((-1)^n-1)+2nx^2\right)-2x\left(x^2-a\right)y'(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.193953 (sec), leaf count = 252

```
DSolve[((-1 + (-1)^n)*a + 2*n*x^2)*y[x] - 2*x*(-a + x^2)*Derivative[1][y][x] + x^2*Derivative
```

$$\left\{\left\{y(x)\to c_1(-1)^{\frac{1}{4}\left(-\sqrt{4a^2-4a(-1)^n+1}-2a+1\right)}x^{\frac{1}{2}\left(-\sqrt{4a^2-4a(-1)^n+1}-2a+1\right)}\,{}_1F_1\left(-\frac{a}{2}-\frac{n}{2}-\frac{1}{4}\sqrt{4a^2-4(-1)^n a+1}\right.\right.$$

✓ **Maple** : cpu = 0.181 (sec), leaf count = 81

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*(x^2-a)*diff(y(x),x)+(2*n*x^2+((-1)^n-1)*a)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{\frac{x^2}{2}}x^{-\frac{1}{2}-a}\left(\text{WhittakerW}\left(\frac{n}{2}+\frac{a}{2}+\frac{1}{4},\frac{\sqrt{1-4(-1)^n a+4a^2}}{4},x^2\right)c_2+\text{WhittakerM}\left(\frac{n}{2}+\frac{a}{2}+\frac{1}{4},\right.\right.$$

ODE No. 1211

$$4x^3y'(x)+x^2y''(x)+\left(4x^4+2x^2+1\right)y(x)=0$$

✓ **Mathematica** : cpu = 0.0399339 (sec), leaf count = 68

```
DSolve[(1 + 2*x^2 + 4*x^4)*y[x] + 4*x^3*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[
```

$$\left\{\left\{y(x)\to c_1e^{-x^2}x^{\frac{1}{2}-\frac{i\sqrt{3}}{2}}-\frac{ic_2e^{-x^2}x^{\frac{1}{2}+\frac{i\sqrt{3}}{2}}}{\sqrt{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.057 (sec), leaf count = 36

```
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))
```

$$y(x)=\mathrm{e}^{-x^2}\left(x^{\frac{1}{2}-\frac{i\sqrt{3}}{2}}c_2+x^{\frac{1}{2}+\frac{i\sqrt{3}}{2}}c_1\right)$$

ODE No. 1212

$$x\left(ax^2+b\right)y'(x)+f(x)y(x)+x^2y''(x)=0$$

✗ **Mathematica** : cpu = 0.443892 (sec), leaf count = 0

```
DSolve[f[x]*y[x] + x*(b + a*x^2)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[f[x]*y[x] + x*(b + a*x^2)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0, y[
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x^2+b)*x*diff(y(x),x)+f(x)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{f(x)\_Y(x)}{x^2}+\frac{\left(a\,x^2+b\right)\left(\frac{d}{dx}\_Y(x)\right)}{x}+\frac{d^2}{dx^2}\_Y(x)\right\},\{\_Y(x)\}\right)$$

ODE No. 1213

$$\left(x^3+1\right) xy'(x)+x^2y''(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0781649 (sec), leaf count = 54

```
DSolve[-y[x] + x*(1 + x^3)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{3}c_1\, {}_1F_1\left(-\frac{1}{3};\frac{1}{3};-\frac{x^3}{3}\right)}{x}+\frac{c_2x\, {}_1F_1\left(\frac{1}{3};\frac{5}{3};-\frac{x^3}{3}\right)}{\sqrt[3]{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.053 (sec), leaf count = 53

```
dsolve(x^2*diff(diff(y(x),x),x)+(x^3+1)*x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x)=x^{\frac{3}{2}}\left(c_1\,\mathrm{BesselI}\left(-\frac{1}{6},\frac{x^3}{6}\right)+c_1\,\mathrm{BesselI}\left(\frac{5}{6},\frac{x^3}{6}\right)-c_2\left(\mathrm{BesselK}\left(\frac{1}{6},\frac{x^3}{6}\right)-\mathrm{BesselK}\left(\frac{5}{6},\frac{x^3}{6}\right)\right)\right)\mathrm{e}^{-\frac{x^3}{6}}$$

ODE No. 1214

$$y(x)\left(-a^2+x^2(2a+2n+1)+a(-1)^n-x^4\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.200588 (sec), leaf count = 260

```
DSolve[((-1)^n*a - a^2 + (1 + 2*a + 2*n)*x^2 - x^4)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],
```

$$\left\{\left\{y(x)\to \frac{c_1 e^{-\frac{x^2}{2}} 2^{\frac{1}{4}\left(\sqrt{4a^2-4a(-1)^n+1}+2\right)} (x^2)^{\frac{1}{4}\left(\sqrt{4a^2-4a(-1)^n+1}+2\right)} U\left(\frac{1}{4}\left(-2a-2n+\sqrt{4a^2-4(-1)^n a+1}+\right.\right.\right.}{\sqrt{x}}$$

✓ **Maple** : cpu = 0.156 (sec), leaf count = 71

```
dsolve(x^2*diff(diff(y(x),x),x)+(-x^4+(2*n+2*a+1)*x^2+(-1)^n*a-a^2)*y(x)=0,y(x))
```

$$y(x)=\frac{\text{WhittakerW}\left(\frac{n}{2}+\frac{a}{2}+\frac{1}{4},\frac{\sqrt{1-4(-1)^n a+4a^2}}{4},x^2\right)c_2+\text{WhittakerM}\left(\frac{n}{2}+\frac{a}{2}+\frac{1}{4},\frac{\sqrt{1-4(-1)^n a+4a^2}}{4},x^2\right)c_1}{\sqrt{x}}$$

ODE No. 1215

$$xy'(x)\left(ax^n+b\right)+y(x)\left(\text{a1}x^{2n}+\text{b1}x^n+\text{c1}\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.108877 (sec), leaf count = 664

```
DSolve[(c1 + b1*x^n + a1*x^(2*n))*y[x] + x*(b + a*x^n)*Derivative[1][y][x] + x^2*Derivative[2
```

$$\left\{\left\{y(x)\to c_1x^{\frac{1-n}{2}}2^{\frac{\sqrt{b^2n^2-2bn^2-4\text{c1}n^2+n^2}+n^2}{2n^2}}\left(x^n\right)^{\frac{\sqrt{b^2n^2-2bn^2-4\text{c1}n^2+n^2}+n^2}{2n^2}}\exp\left(\frac{1}{2}\left(-\frac{ax^n}{n}-b\log(x)\right)-\frac{\sqrt{a^2-4\text{a1}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.175 (sec), leaf count = 148

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x^n+b)*diff(y(x),x)*x+(a1*x^(2*n)+b1*x^n+c1)*y(x)=0,y(x))
```

$$y(x)=x^{-\frac{b}{2}-\frac{n}{2}+\frac{1}{2}}\mathrm{e}^{-\frac{a\,x^n}{2n}}\left(\text{WhittakerW}\left(-\frac{(b+n-1)\,a-2b1}{2\sqrt{a^2-4a1}\,n},\frac{\sqrt{b^2-2b-4c1+1}}{2n},\frac{\sqrt{a^2-4a1}\,x^n}{n}\right)c_2+\text{W}\right.$$

ODE No. 1216

$$xy'(x)\left(ax^{\mathrm{a1}}+b\right)+y(x)\left(Ax^{2\mathrm{a1}}+Bx^{\mathrm{a1}}+Cx^{\mathrm{b1}}+\mathrm{DD}\right)+x^2y''(x)=0$$

✗ **Mathematica** : cpu = 1.09888 (sec), leaf count = 0

```
DSolve[(DD + B*x^a1 + A*x^(2*a1) + C*x^b1)*y[x] + x*(b + a*x^a1)*Derivative[1][y][x] + x^2*De
```

, could not solve

```
DSolve[(DD + B*x^a1 + A*x^(2*a1) + C*x^b1)*y[x] + x*(b + a*x^a1)*Derivative[1][y][x] +
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x^a1+b)*x*diff(y(x),x)+(A*x^(2*a1)+B*x^a1+C*x^b1+DD)*y(x)=
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^2}{dx^2}_Y(x)+\frac{\left(a\,x^{a1}+b\right)\left(\frac{d}{dx}_Y(x)\right)}{x}+\frac{\left(A\,x^{2a1}+B\,x^{a1}+C\,x^{b1}+DD\right)_Y(x)}{x^2}\right\},\{_Y(x

ODE No. 1217

$$y(x)(-a - x\tan(x)) + x^2 y''(x) - \left(2x^2\tan(x) - x\right) y'(x) = 0$$

✓ **Mathematica** : cpu = 0.106272 (sec), leaf count = 30

```
DSolve[(-a - x*Tan[x])*y[x] - (-x + 2*x^2*Tan[x])*Derivative[1][y][x] + x^2*Derivative[2][y][
```

$$\left\{\left\{y(x) \to c_1 \sec(x) J_{\sqrt{a}}(x) + c_2 \sec(x) Y_{\sqrt{a}}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.045 (sec), leaf count = 24

```
dsolve(x^2*diff(diff(y(x),x),x)-(2*x^2*tan(x)-x)*diff(y(x),x)-(x*tan(x)+a)*y(x)=0,y(x))
```

$$y(x) = \frac{c_2 \operatorname{BesselY}\left(\sqrt{a}, x\right) + c_1 \operatorname{BesselJ}\left(\sqrt{a}, x\right)}{\cos(x)}$$

ODE No. 1218

$$y(x)(a+x\cot(x))+x^2y''(x)+\left(2x^2\cot(x)+x\right)y'(x)=0$$

✓ **Mathematica** : cpu = 0.107503 (sec), leaf count = 38

```
DSolve[(a + x*Cot[x])*y[x] + (x + 2*x^2*Cot[x])*Derivative[1][y][x] + x^2*Derivative[2][y][x]
```

$$\left\{\left\{y(x)\to c_1\csc(x)J_{i\sqrt{a}}(x)+c_2\csc(x)Y_{i\sqrt{a}}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 30

```
dsolve(x^2*diff(diff(y(x),x),x)+(2*x^2*cot(x)+x)*diff(y(x),x)+(x*cot(x)+a)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\,\mathrm{BesselY}\left(i\sqrt{a},x\right)+c_1\,\mathrm{BesselJ}\left(i\sqrt{a},x\right)}{\sin(x)}$$

ODE No. 1219

$$y(x)\left(ax^2+bx+c+xf'(x)+f(x)^2-f(x)\right)+2xf(x)y'(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.104074 (sec), leaf count = 218

```
DSolve[y[x]*(c + b*x + a*x^2 - f[x] + f[x]^2 + x*Derivative[1][f][x]) + 2*x*f[x]*Derivative[1
```

$$\left\{\left\{y(x)\to c_1 U\left(-\frac{-ib-\sqrt{a}-\sqrt{a}\sqrt{1-4c}}{2\sqrt{a}},\sqrt{1-4c}+1,2i\sqrt{a}x\right)\exp\left(\int_1^x \frac{-2f(K[1])-2i\sqrt{a}K[1]+\sqrt{1}}{2K[1]}\right.\right.$$

✓ **Maple** : cpu = 0.092 (sec), leaf count = 69

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x*f(x)*diff(y(x),x)+(x*diff(f(x),x)+f(x)^2-f(x)+a*x^2+b*x+c
```

$$y(x)=\mathrm{e}^{-\left(\int \frac{f(x)}{x}dx\right)}\left(c_1\,\mathrm{WhittakerM}\left(-\frac{ib}{2\sqrt{a}},\frac{\sqrt{1-4c}}{2},2i\sqrt{a}\,x\right)+c_2\,\mathrm{WhittakerW}\left(-\frac{ib}{2\sqrt{a}},\frac{\sqrt{1-4c}}{2},2i\sqrt{a}\right.\right.$$

ODE No. 1220

$$y(x)\left(x^2\left(a+f'(x)+f(x)^2\right)+(1-v)v\right)+2x^2f(x)y'(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0442464 (sec), leaf count = 98

```
DSolve[y[x]*((1 - v)*v + x^2*(a + f[x]^2 + Derivative[1][f][x])) + 2*x^2*f[x]*Derivative[1][y
```

$$\left\{\left\{y(x)\to c_1 J_{\frac{1}{2}(2v-1)}\left(\sqrt{a}x\right)\exp\left(\int_1^x \frac{1-2f(K[1])K[1]}{2K[1]}dK[1]\right)+c_2 Y_{\frac{1}{2}(2v-1)}\left(\sqrt{a}x\right)\exp\left(\int_1^x \frac{1-2f(K[1])}{2K[1]}\right.\right.$$

✓ **Maple** : cpu = 0.021 (sec), leaf count = 40

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x^2*f(x)*diff(y(x),x)+(x^2*(diff(f(x),x)+f(x)^2+a)-v*(v-1))
```

$$y(x)=\sqrt{x}\,\mathrm{e}^{-\frac{\left(\int 2f(x)dx\right)}{2}}\left(\mathrm{BesselY}\left(v-\frac{1}{2},\sqrt{a}\,x\right)c_2+\mathrm{BesselJ}\left(v-\frac{1}{2},\sqrt{a}\,x\right)c_1\right)$$

ODE No. 1221

$$y(x)\left(x^2\left(-f'(x)+f(x)^2+1\right)-xf(x)-v^2\right)+\left(x-2x^2f(x)\right)y'(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0234528 (sec), leaf count = 42

```
DSolve[y[x]*(-v^2 - x*f[x] + x^2*(1 + f[x]^2 - Derivative[1][f][x])) + (x - 2*x^2*f[x])*Deriv
```

$$\left\{\left\{y(x)\to c_1 J_v(x)\exp\left(\int_1^x f(K[1])dK[1]\right)+c_2 Y_v(x)\exp\left(\int_1^x f(K[1])dK[1]\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 35

```
dsolve(x^2*diff(diff(y(x),x),x)+(x-2*x^2*f(x))*diff(y(x),x)+(x^2*(1+f(x)^2-diff(f(x),x))-x*f(
```

$$y(x)=\mathrm{e}^{-\frac{\left(\int\frac{-2xf(x)+1}{x}dx\right)}{2}}\sqrt{x}\left(c_1\,\mathrm{BesselJ}\left(v,x\right)+c_2\,\mathrm{BesselY}\left(v,x\right)\right)$$

ODE No. 1222

$$\left(x^2+1\right) y''(x)+xy'(x)+2y(x)=0$$

✓ **Mathematica** : cpu = 0.01394 (sec), leaf count = 30

```
DSolve[2*y[x] + x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 \cos\left(\sqrt{2}\sinh^{-1}(x)\right)+c_2 \sin\left(\sqrt{2}\sinh^{-1}(x)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 23

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+x*diff(y(x),x)+2*y(x)=0,y(x))
```

$$y(x)=c_1 \sin\left(\sqrt{2}\ \text{arcsinh}\left(x\right)\right)+c_2 \cos\left(\sqrt{2}\ \text{arcsinh}\left(x\right)\right)$$

ODE No. 1223

$$\left(x^2+1\right) y''(x)+xy'(x)-9y(x)=0$$

✓ **Mathematica** : cpu $=0.0132501$ (sec), leaf count $=25$

```
DSolve[-9*y[x] + x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to ic_2 \sinh \left(3 \sinh ^{-1}(x)\right)+c_1 \cosh \left(3 \sinh ^{-1}(x)\right)\right\}\right\}$$

✓ **Maple** : cpu $=0.018$ (sec), leaf count $=19$

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+x*diff(y(x),x)-9*y(x)=0,y(x))
```

$$y(x)=c_1 \sinh \left(3 \operatorname{arcsinh}(x)\right)+c_2 \cosh \left(3 \operatorname{arcsinh}(x)\right)$$

ODE No. 1224

$$ay(x) + \left(x^2 + 1\right) y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0129596 (sec), leaf count = 30

```
DSolve[a*y[x] + x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \cos\left(\sqrt{a}\sinh^{-1}(x)\right) + c_2 \sin\left(\sqrt{a}\sinh^{-1}(x)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 23

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+x*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = c_1 \sin\left(\sqrt{a}\ \operatorname{arcsinh}(x)\right) + c_2 \cos\left(\sqrt{a}\ \operatorname{arcsinh}(x)\right)$$

ODE No. 1225

$$\left(x^2+1\right) y''(x) - xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0204058 (sec), leaf count = 29

```
DSolve[y[x] - x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2\left(x \sinh^{-1}(x) - \sqrt{x^2+1}\right) + c_1 x\right\}\right\}$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 23

```
dsolve((x^2+1)*diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = -\sqrt{x^2+1}\, c_2 + x(c_2 \operatorname{arcsinh}(x) + c_1)$$

ODE No. 1226

$$(1-v)vy(x)+\left(x^2+1\right)y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0107046 (sec), leaf count = 30

```
DSolve[(1 - v)*v*y[x] + 2*x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to c_1P_{v-1}(ix)+c_2Q_{v-1}(ix)\}\}$$

✓ **Maple** : cpu = 0.041 (sec), leaf count = 25

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-v*(v-1)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{LegendreP}\left(v-1,ix\right)+c_2\,\text{LegendreQ}\left(v-1,ix\right)$$

ODE No. 1227

$$\left(x^2+1\right) y''(x) - 2xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0240507 (sec), leaf count = 21

```
DSolve[2*y[x] - 2*x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 x - c_1 (x-i)^2\right\}\right\}$$

✓ **Maple** : cpu = 0.011 (sec), leaf count = 16

```
dsolve((x^2+1)*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+2*y(x)=0,y(x))
```

$$y(x) = x^2 c_2 + c_1 x - c_2$$

ODE No. 1228

$$ay(x)+\left(x^2+1\right)y''(x)+3xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0110828 (sec), leaf count = 82

```
DSolve[a*y[x] + 3*x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1 P^{\frac{1}{2}}_{\frac{1}{2}\left(2\sqrt{1-a}-1\right)}(ix)}{\sqrt[4]{x^2+1}}+\frac{c_2 Q^{\frac{1}{2}}_{\frac{1}{2}\left(2\sqrt{1-a}-1\right)}(ix)}{\sqrt[4]{x^2+1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.093 (sec), leaf count = 53

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+3*x*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\left(x+\sqrt{x^2+1}\right)^{-\sqrt{1-a}}+c_1\left(x+\sqrt{x^2+1}\right)^{\sqrt{1-a}}}{\sqrt{x^2+1}}$$

ODE No. 1229

$$\left(x^2+1\right) y''(x)+4xy'(x)+2y(x)+2x-2\cos(x)=0$$

✓ **Mathematica** : cpu = 0.0284726 (sec), leaf count = 48

```
DSolve[2*x - 2*Cos[x] + 2*y[x] + 4*x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0
```

$$\left\{\left\{y(x)\to \frac{c_1}{x^2+1}+\frac{c_2 x}{x^2+1}+\frac{-x^3-6\cos(x)}{3\left(x^2+1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 31

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+4*x*diff(y(x),x)+2*y(x)-2*cos(x)+2*x=0,y(x))
```

$$y(x)=\frac{-x^3+3c_1x-6\cos\left(x\right)+3c_2}{3x^2+3}$$

ODE No. 1230

$$axy'(x) + (a-2)y(x) + \left(x^2+1\right)y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0183044 (sec), leaf count = 82

```
DSolve[(-2 + a)*y[x] + a*x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1\left(x^2+1\right)^{\frac{2-a}{4}} P^{\frac{a-2}{2}}_{\frac{a-4}{2}}(ix) + c_2\left(x^2+1\right)^{\frac{2-a}{4}} Q^{\frac{a-2}{2}}_{\frac{a-4}{2}}(ix)\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (sec), leaf count = 36

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+a*x*diff(y(x),x)+(a-2)*y(x)=0,y(x))
```

$$y(x) = c_1\left(x^2+1\right)^{1-\frac{a}{2}} + c_2\,\text{hypergeom}\left(\left[1, \frac{a}{2}-\frac{1}{2}\right], \left[\frac{3}{2}\right], -x^2\right)x$$

ODE No. 1231

$$\left(x^2-1\right)y''(x)-v(v+1)y(x)=0$$

✓ **Mathematica** : cpu = 0.0540609 (sec), leaf count = 58

```
DSolve[-(v*(1 + v)*y[x]) + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(-\frac{v}{2}-\frac{1}{2},\frac{v}{2};\frac{1}{2};x^2\right)+ic_2x\,{}_2F_1\left(\frac{v}{2}+\frac{1}{2},-\frac{v}{2};\frac{3}{2};x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.045 (sec), leaf count = 52

```
dsolve((x^2-1)*diff(diff(y(x),x),x)-v*(v+1)*y(x)=0,y(x))
```

$$y(x)=-(x-1)\,(1+x)\left(\text{hypergeom}\left(\left[1-\frac{v}{2},\frac{3}{2}+\frac{v}{2}\right],\left[\frac{3}{2}\right],x^2\right)c_2x+c_1\,\text{hypergeom}\left(\left[1+\frac{v}{2},\frac{1}{2}-\frac{v}{2}\right],\left[\right.\right.\right.$$

ODE No. 1232

$$\frac{nxP_n(x)-nP_{n-1}(x)}{x^2-1}-n(n+1)y(x)+\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 5.9798 (sec), leaf count = 6628

```
DSolve[(-(n*LegendreP[-1 + n, x]) + n*x*LegendreP[n, x])/(-1 + x^2) - n*(1 + n)*y[x] + (-1 +
```

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(-\frac{n}{2}-\frac{1}{2},\frac{n}{2};\frac{1}{2};x^2\right)+\int_1^x\left(\frac{}{4\left({}_2F_1\left(\frac{1}{2}(-n-1),\frac{n}{2};\frac{1}{2};K[1]^2\right)\,{}_2F_1\left(1-\frac{n}{2},\frac{n+3}{2};\frac{5}{2};K[1]^2\right)n\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.152 (sec), leaf count = 409

```
dsolve((x^2-1)*diff(diff(y(x),x),x)-n*(n+1)*y(x)+Diff(LegendreP(n,x),x)=0,y(x))
```

$$y(x)=3(1+x)\,(x-1)\left(-\text{hypergeom}\left(\left[\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2}\right],\left[\frac{1}{2}\right],x^2\right)(n+1)\left(\int\frac{}{3\left(\left(\text{hypergeom}\left(\left[\frac{n}{2}+1\right.\right.\right.\right.\right.\right.$$

ODE No. 1233

$$\frac{nxQ_n(x) - nQ_{n-1}(x)}{x^2-1} - n(n+1)y(x) + \left(x^2-1\right)y''(x) = 0$$

✓ **Mathematica** : cpu = 0.461723 (sec), leaf count = 6628

```
DSolve[(-(n*LegendreQ[-1 + n, x]) + n*x*LegendreQ[n, x])/(-1 + x^2) - n*(1 + n)*y[x] + (-1 +
```

$$\left\{\left\{y(x) \to c_1\, {}_2F_1\left(-\frac{n}{2}-\frac{1}{2},\frac{n}{2};\frac{1}{2};x^2\right) + \int_1^x \left(\frac{}{4\left({}_2F_1\left(\frac{1}{2}(-n-1),\frac{n}{2};\frac{1}{2};K[1]^2\right)\ {}_2F_1\left(1-\frac{n}{2},\frac{n+3}{2};\frac{5}{2};K[1]^2\right) n\right.}\right.\right.$$

✓ **Maple** : cpu = 0.122 (sec), leaf count = 409

```
dsolve((x^2-1)*diff(diff(y(x),x),x)-n*(n+1)*y(x)+Diff(LegendreQ(n,x),x)=0,y(x))
```

$$y(x) = -3\left(-\text{hypergeom}\left(\left[\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2}\right],\left[\frac{1}{2}\right],x^2\right)(n+1)\left(\int -\frac{}{3\left(1+x\right)^3\left(x-1\right)^3\left(\left(\text{hypergeom}\left(\right.\right.\right.\right.\right.\right.$$

ODE No. 1234

$$\left(x^2-1\right) y''(x)+xy'(x)+2=0$$

✓ **Mathematica** : cpu = 0.0670308 (sec), leaf count = 48

```
DSolve[2 + x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2-\frac{1}{4}\left(\log\left(1-\frac{x}{\sqrt{x^2-1}}\right)-\log\left(\frac{x}{\sqrt{x^2-1}}+1\right)+c_1\right)^2\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+x*diff(y(x),x)+2=0,y(x))
```

, could not solve

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+x*diff(y(x),x)+2=0,y(x))
```

ODE No. 1235

$$ay(x) + \left(x^2 - 1\right) y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0340617 (sec), leaf count = 97

```
DSolve[a*y[x] + x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \cos\left(\frac{1}{2}\sqrt{a}\left(\log\left(1 - \frac{x}{\sqrt{x^2-1}}\right) - \log\left(\frac{x}{\sqrt{x^2-1}} + 1\right)\right)\right) - c_2 \sin\left(\frac{1}{2}\sqrt{a}\left(\log\left(1 - \frac{x}{\sqrt{x^2-1}}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 45

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+x*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = \left(c_1\left(x + \sqrt{x^2-1}\right)^{2i\sqrt{a}} + c_2\right)\left(x + \sqrt{x^2-1}\right)^{-i\sqrt{a}}$$

ODE No. 1236

$$f(x)y(x) + \left(x^2 - 1\right) y''(x) + xy'(x) = 0$$

✗ **Mathematica** : cpu = 0.437619 (sec), leaf count = 0

```
DSolve[f[x]*y[x] + x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[f[x]*y[x] + x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0, y[x], x
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+x*diff(y(x),x)+f(x)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{f(x)\_Y(x)}{x^2-1} + \frac{x\left(\frac{d}{dx}\_Y(x)\right)}{x^2-1} + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

ODE No. 1237

$$\left(x^2-1\right) y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.021277 (sec), leaf count = 30

```
DSolve[2*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\left(\frac{1}{2}\log(1-x)-\frac{1}{2}\log(x+1)\right)+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 20

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)=0,y(x))
```

$$y(x)=c_1-\frac{\left(-\ln\left(x-1\right)+\ln\left(1+x\right)\right)c_2}{2}$$

ODE No. 1238

$$-a + \left(x^2 - 1\right) y''(x) + 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0267852 (sec), leaf count = 36

```
DSolve[-a + 2*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{2}(a + c_1)\log(1 - x) + \frac{1}{2}(a - c_1)\log(x + 1) + c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 26

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-a=0,y(x))
```

$$y(x) = \frac{(a - c_1)\ln(1 + x)}{2} + \frac{(a + c_1)\ln(x - 1)}{2} + c_2$$

ODE No. 1239

$$-ly(x) + \left(x^2 - 1\right) y''(x) + 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0098678 (sec), leaf count = 46

```
DSolve[-(l*y[x]) + 2*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 P_{\frac{1}{2}\left(\sqrt{4l+1}-1\right)}(x) + c_2 Q_{\frac{1}{2}\left(\sqrt{4l+1}-1\right)}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 35

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-l*y(x)=0,y(x))
```

$$y(x) = c_1 \,\text{LegendreP}\left(\frac{\sqrt{1+4l}}{2} - \frac{1}{2}, x\right) + c_2 \,\text{LegendreQ}\left(\frac{\sqrt{1+4l}}{2} - \frac{1}{2}, x\right)$$

ODE No. 1240

$$-v(v+1)y(x)+\left(x^2-1\right)y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0126103 (sec), leaf count = 18

```
DSolve[-(v*(1 + v)*y[x]) + 2*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x]
```

$$\{\{y(x)\to c_1P_v(x)+c_2Q_v(x)\}\}$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 15

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-v*(v+1)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{LegendreP}\left(v,x\right)+c_2\,\text{LegendreQ}\left(v,x\right)$$

ODE No. 1241

$$(1-v)(v+2)y(x)+\left(x^2-1\right)y''(x)-2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0113988 (sec), leaf count = 30

```
DSolve[(1 - v)*(2 + v)*y[x] - 2*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y
```

$$\left\{\left\{y(x)\to c_1\left(x^2-1\right)P_v^2(x)+c_2\left(x^2-1\right)Q_v^2(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 24

```
dsolve((x^2-1)*diff(diff(y(x),x),x)-2*x*diff(y(x),x)-(v+2)*(v-1)*y(x)=0,y(x))
```

$$y(x)=(x-1)(1+x)\left(c_2\,\text{LegendreQ}\left(v,2,x\right)+c_1\,\text{LegendreP}\left(v,2,x\right)\right)$$

ODE No. 1242

$$\left(x^2-1\right)y''(x)+\left(x-x^2\right)y(x)-(3x+1)y'(x)=0$$

✓ **Mathematica** : cpu = 0.192991 (sec), leaf count = 68

```
DSolve[(x - x^2)*y[x] - (1 + 3*x)*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y
```

$$\left\{\left\{y(x)\to c_1e^{-x}(x+1)^2-c_2e^{-x-2}\left(x^2(-\text{Ei}(2(x+1)))-2x\text{Ei}(2(x+1))-\text{Ei}(2(x+1))+2e^{2x+2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 41

```
dsolve((x^2-1)*diff(diff(y(x),x),x)-(3*x+1)*diff(y(x),x)-(x^2-x)*y(x)=0,y(x))
```

$$y(x)=c_2\mathrm{e}^{-2-x}(1+x)^2\,\text{expIntegral}\left(1,-2x-2\right)+c_1\mathrm{e}^{-x}(1+x)^2+2c_2\mathrm{e}^{x}$$

ODE No. 1243

$$\left(x^2-1\right) y''(x)+\left(x^2+1\right) y(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0226523 (sec), leaf count = 45

```
DSolve[(1 + x^2)*y[x] + 4*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1 e^{-ix}}{x^2-1}-\frac{ic_2 e^{ix}}{2\left(x^2-1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 21

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+4*x*diff(y(x),x)+(x^2+1)*y(x)=0,y(x))
```

$$y(x)=\frac{\sin(x)\,c_1+c_2\cos(x)}{x^2-1}$$

ODE No. 1244

$$(n-v)(n+v+1)y(x)+2(n+1)xy'(x)+\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.0203905 (sec), leaf count = 42

```
DSolve[(n - v)*(1 + n + v)*y[x] + 2*(1 + n)*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][
```

$$\left\{\left\{y(x)\to c_1\left(x^2-1\right)^{-n/2}P_v^n(x)+c_2\left(x^2-1\right)^{-n/2}Q_v^n(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.059 (sec), leaf count = 27

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+2*(n+1)*x*diff(y(x),x)-(v+n+1)*(v-n)*y(x)=0,y(x))
```

$$y(x)=\left(x^2-1\right)^{-\frac{n}{2}}\left(\text{LegendreQ}\left(v,n,x\right)c_2+\text{LegendreP}\left(v,n,x\right)c_1\right)$$

ODE No. 1245

$$(n-v-1)(n+v)y(x)-2(n-1)xy'(x)+\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.0176256 (sec), leaf count = 42

```
DSolve[(-1 + n - v)*(n + v)*y[x] - 2*(-1 + n)*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2
```

$$\left\{\left\{y(x)\to c_1\left(x^2-1\right)^{n/2}P_v^n(x)+c_2\left(x^2-1\right)^{n/2}Q_v^n(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.049 (sec), leaf count = 27

```
dsolve((x^2-1)*diff(diff(y(x),x),x)-2*(n-1)*x*diff(y(x),x)-(v-n+1)*(v+n)*y(x)=0,y(x))
```

$$y(x)=\left(x^2-1\right)^{\frac{n}{2}}\left(\text{LegendreQ}\left(v,n,x\right)c_2+\text{LegendreP}\left(v,n,x\right)c_1\right)$$

ODE No. 1246

$$-2(v-1)xy'(x)-2vy(x)+\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.0142028 (sec), leaf count = 42

```
DSolve[-2*v*y[x] - 2*(-1 + v)*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x
```

$$\left\{\left\{y(x)\to c_1\left(x^2-1\right)^{v/2}P_v^v(x)+c_2\left(x^2-1\right)^{v/2}Q_v^v(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.125 (sec), leaf count = 28

```
dsolve((x^2-1)*diff(diff(y(x),x),x)-2*(v-1)*x*diff(y(x),x)-2*v*y(x)=0,y(x))
```

$$y(x)=\left(x^2-1\right)^v\left(\text{hypergeom}\left(\left[\frac{1}{2},v+1\right],\left[\frac{3}{2}\right],x^2\right)c_2x+c_1\right)$$

ODE No. 1247

$$2axy'(x) + (a-1)ay(x) + \left(x^2-1\right)y''(x) = 0$$

✓ **Mathematica** : cpu = 0.156767 (sec), leaf count = 128

```
DSolve[(-1 + a)*a*y[x] + 2*a*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x) \to \frac{c_2\sqrt{1-x^2}(x+1)^{\sqrt{(a-1)^2}}\left(x^2-1\right)^{-a/2}(1-x)^{-\sqrt{(a-1)^2}}e^{-\sqrt{(a-1)^2}\tanh^{-1}(x)}}{2\sqrt{(a-1)^2}} + c_1\sqrt{1-x^2}\left(x^2-1\right)^{-a}\right.\right.$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 27

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+2*a*x*diff(y(x),x)+a*(a-1)*y(x)=0,y(x))
```

$$y(x) = c_1(1+x)^{1-a} + c_2(x-1)^{1-a}$$

ODE No. 1248

$$axy'(x)+y(x)\left(bx^2+cx+d\right)+\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.250225 (sec), leaf count = 238

```
DSolve[(d + c*x + b*x^2)*y[x] + a*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0
```

$$\left\{\left\{y(x)\to c_2\left(\frac{x}{2}-\frac{1}{2}\right)^{a/4}\left(x^2-1\right)^{-a/4}\left(\frac{x}{2}+\frac{1}{2}\right)^{1-\frac{a}{4}}e^{\sqrt{-b}x}\text{HeunC}\left[\frac{1}{4}a\left(a-4\sqrt{-b}-2\right)-b+4\sqrt{-b}+c-\right.\right.$$

✓ **Maple** : cpu = 0.177 (sec), leaf count = 134

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+a*x*diff(y(x),x)+(b*x^2+c*x+d)*y(x)=0,y(x))
```

$$y(x)=\left(x^2-1\right)^{-\frac{a}{4}}\mathrm{e}^{\sqrt{-b}\,x}\left(\left(-\frac{1}{2}+\frac{x}{2}\right)^{\frac{a}{4}}\text{HeunC}\left(4\sqrt{-b},1-\frac{a}{2},\frac{a}{2}-1,2c,d-c-\frac{a^2}{8}+b+\frac{1}{2},\frac{1}{2}+\frac{x}{2}\right)\left(\frac{1}{2}\right.\right.$$

ODE No. 1249

$$(ax+b)y'(x)+cy(x)+\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.113164 (sec), leaf count = 193

```
DSolve[c*y[x] + (b + a*x)*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2 2^{\frac{1}{2}(a+b-2)}(x-1)^{\frac{1}{2}(-a-b+2)}\,{}_2F_1\left(-\frac{b}{2}-\frac{1}{2}\sqrt{a^2-2a-4c+1}+\frac{1}{2},-\frac{b}{2}+\frac{1}{2}\sqrt{a^2-2a-4c+1}+\right.\right.$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 134

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+(a*x+b)*diff(y(x),x)+c*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{1}{2}+\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2},-\frac{1}{2}-\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2}\right],\left[\frac{a}{2}-\frac{b}{2}\right],\frac{1}{2}+\frac{x}{2}\right)$$

ODE No. 1250

$$\left(x^2-a^2\right)y''(x)+8xy'(x)+12y(x)=0$$

✓ **Mathematica** : cpu = 0.0364992 (sec), leaf count = 41

```
DSolve[12*y[x] + 8*x*Derivative[1][y][x] + (-a^2 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2(a^2+3x^2)}{3(a-x)^3(a+x)^3}+\frac{c_1}{(a+x)^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.021 (sec), leaf count = 41

```
dsolve((-a^2+x^2)*diff(diff(y(x),x),x)+8*x*diff(y(x),x)+12*y(x)=0,y(x))
```

$$y(x)=\frac{3a^2xc_2+x^3c_2+a^2c_1+3c_1x^2}{(a-x)^3(x+a)^3}$$

ODE No. 1251

$$x(x+1)y''(x) - (x-1)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0255507 (sec), leaf count = 25

```
DSolve[y[x] - (-1 + x)*Derivative[1][y][x] + x*(1 + x)*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1(x-1) + c_2(x\log(x) - \log(x) - 4)\}\}$$

✓ **Maple** : cpu = 0.023 (sec), leaf count = 20

```
dsolve(x*(1+x)*diff(diff(y(x),x),x)-(x-1)*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = c_2(x-1)\ln(x) - 4c_2 + c_1(x-1)$$

ODE No. 1252

$$(ax+b)y'(x)+cy(x)+x(x+1)y''(x)=0$$

✓ **Mathematica** : cpu = 0.105979 (sec), leaf count = 151

```
DSolve[c*y[x] + (b + a*x)*Derivative[1][y][x] + x*(1 + x)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2 x^{1-b}\,{}_2F_1\left(\frac{a}{2}-b-\frac{1}{2}\sqrt{a^2-2a-4c+1}+\frac{1}{2},\frac{a}{2}-b+\frac{1}{2}\sqrt{a^2-2a-4c+1}+\frac{1}{2};2-b;-x\right)+\right.\right.$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 124

```
dsolve(x*(1+x)*diff(diff(y(x),x),x)+(a*x+b)*diff(y(x),x)+c*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{1}{2}+\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2},-\frac{1}{2}-\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2}\right],[a-b],1+x\right)+c$$

ODE No. 1253

$$x(x+1)y''(x)+(3x+2)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.0193547 (sec), leaf count = 34

```
DSolve[y[x] + (2 + 3*x)*Derivative[1][y][x] + x*(1 + x)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt{2}c_1}{x}+\frac{c_2\log(2x+2)}{\sqrt{2}x}\right\}\right\}$$

✓ **Maple** : cpu = 0.007 (sec), leaf count = 16

```
dsolve(x*(1+x)*diff(diff(y(x),x),x)+(3*x+2)*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x)=\frac{\ln(1+x)\,c_1+c_2}{x}$$

ODE No. 1254

$$\left(x^2+x-2\right)y''(x)+\left(x^2-x\right)y'(x)+\left(-6x^2-7x\right)y(x)=0$$

✓ **Mathematica** : cpu = 0.132401 (sec), leaf count = 69

```
DSolve[(-7*x - 6*x^2)*y[x] + (-x + x^2)*Derivative[1][y][x] + (-2 + x + x^2)*Derivative[2][y]
```

$$\left\{\left\{y(x)\to \frac{1}{5}c_2e^{-3x-5}\left(195e^{5x}x\text{Ei}(5-5x)-195e^{5x}\text{Ei}(5-5x)+e^5x+44e^5\right)-c_1e^{2x}(x-1)\right\}\right\}$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 43

```
dsolve((x^2+x-2)*diff(diff(y(x),x),x)+(x^2-x)*diff(y(x),x)-(6*x^2+7*x)*y(x)=0,y(x))
```

$$y(x)=195c_2\mathrm{e}^{-5+2x}(x-1)\,\text{expIntegral}\left(1,5x-5\right)-c_2(x+44)\,\mathrm{e}^{-3x}+c_1\mathrm{e}^{2x}(x-1)$$

ODE No. 1255

$$ay'(x)+(x-1)xy''(x)-2y(x)=0$$

✓ **Mathematica** : cpu = 0.622205 (sec), leaf count = 360

```
DSolve[-2*y[x] + a*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2 x^a\left(a^2+2ax-a+2x^2-2x\right)(1-x)^{-a}\left(-\frac{a\,{}_2F_1\left(1,-a;1-a;\frac{\left(-a+\sqrt{1-a^2}+1\right)(x-1)}{\left(-a+\sqrt{1-a^2}-1\right)x}\right)}{\left(1-a^2\right)^{3/2}}+\frac{a\,{}_2F_1\left(1,-a;1-a;\frac{\left(a+\right.\right.}{(1-a^2)}\right.}{2a^2}\right.\right.$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 42

```
dsolve(x*(x-1)*diff(diff(y(x),x),x)+a*diff(y(x),x)-2*y(x)=0,y(x))
```

$$y(x)=\left(a^2+a(2x-1)+2x^2-2x\right)c_1+c_2(x-1)^{-a}(x-1)\,x^a x$$

ODE No. 1256

$$-v(v+1)y(x)+(x-1)xy''(x)+(2x-1)y'(x)=0$$

✓ **Mathematica** : cpu = 0.0172269 (sec), leaf count = 26

```
DSolve[-(v*(1 + v)*y[x]) + (-1 + 2*x)*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] ==
```

$$\{\{y(x)\to c_1 P_v(2x-1)+c_2 Q_v(2x-1)\}\}$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 51

```
dsolve(x*(x-1)*diff(diff(y(x),x),x)+(2*x-1)*diff(y(x),x)-v*(v+1)*y(x)=0,y(x))
```

$$y(x)=c_1 \operatorname{hypergeom}\left([-v,-v],[-2v],\frac{1}{x}\right)x^{v}+c_2 \operatorname{hypergeom}\left([v+1,v+1],[2v+2],\frac{1}{x}\right)x^{-v-1}$$

ODE No. 1257

$$((a+1)x+b)y'(x)+(x-1)xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0402535 (sec), leaf count = 33

```
DSolve[(b + (1 + a)*x)*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1 x^{b+1}\,{}_2F_1(b+1,a+b+1;b+2;x)}{b+1}+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.184 (sec), leaf count = 27

```
dsolve(x*(x-1)*diff(diff(y(x),x),x)+((a+1)*x+b)*diff(y(x),x)=0,y(x))
```

$$y(x)=c_1+\text{hypergeom}\left([b+1,a+b+1],[b+2],x\right)x^{b+1}c_2$$

ODE No. 1258

$$(ax+b)y'(x)+cy(x)+(x-1)xy''(x)=0$$

✓ **Mathematica** : cpu = 0.108355 (sec), leaf count = 146

```
DSolve[c*y[x] + (b + a*x)*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to (-1)^{b+1}c_2x^{b+1}\,{}_2F_1\left(\frac{a}{2}+b-\frac{1}{2}\sqrt{a^2-2a-4c+1}+\frac{1}{2},\frac{a}{2}+b+\frac{1}{2}\sqrt{a^2-2a-4c+1}+\frac{1}{2};b+2;\right.\right.\right.$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 110

```
dsolve(x*(x-1)*diff(diff(y(x),x),x)+(a*x+b)*diff(y(x),x)+c*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{1}{2}+\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2},-\frac{1}{2}-\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2}\right],[-b],x\right)+c_2x^{b+1}\,$$

ODE No. 1259

$$((a+1)x+b)y'(x)-ly(x)+(x-1)xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0988282 (sec), leaf count = 120

```
DSolve[-(l*y[x]) + (b + (1 + a)*x)*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] == 0,
```

$$\left\{\left\{y(x)\to (-1)^{b+1}c_2x^{b+1}\,{}_2F_1\left(\frac{a}{2}+b-\frac{1}{2}\sqrt{a^2+4l}+1,\frac{a}{2}+b+\frac{1}{2}\sqrt{a^2+4l}+1;b+2;x\right)+c_1\,{}_2F_1\left(\frac{a}{2}-\frac{1}{2}\sqrt{}\right.\right.$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 92

```
dsolve(x*(x-1)*diff(diff(y(x),x),x)+((a+1)*x+b)*diff(y(x),x)-l*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[\frac{a}{2}-\frac{\sqrt{a^2+4l}}{2},\frac{a}{2}+\frac{\sqrt{a^2+4l}}{2}\right],[-b],x\right)+c_2x^{b+1}\,\text{hypergeom}\left(\left[\frac{a}{2}-\frac{\sqrt{a^2+4l}}{2}+b\right.\right.$$

ODE No. 1260

$$y'(x)(x(\text{a1}+\text{b1}+1)-\text{d1})+\text{a1b1d1}+(x-1)xy''(x)=0$$

✓ **Mathematica** : cpu = 0.221147 (sec), leaf count = 65

```
DSolve[a1*b1*d1 + (-d1 + (1 + a1 + b1)*x)*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x
```

$$\left\{\left\{y(x)\to \text{a1b1}x\Gamma(\text{d1}+1)\,{}_3\tilde{F}_2(1,\text{a1}+\text{b1}+1,1;\text{d1}+1,2;x)-\frac{c_1x^{1-\text{d1}}\,{}_2F_1(1-\text{d1},\text{a1}+\text{b1}-\text{d1}+1;2-\right.\right.$$
$$\text{d1}-1$$

✓ **Maple** : cpu = 0.485 (sec), leaf count = 76

```
dsolve(x*(x-1)*diff(diff(y(x),x),x)+((a1+b1+1)*x-d1)*diff(y(x),x)+a1*b1*d1=0,y(x))
```

$$y(x)=\int\left(-\text{signum}(x-1)^{a1+b1-d1}\,(-\text{signum}(x-1))^{-a1-b1+d1}\,\text{hypergeom}\left([d1,-a1-b1+d1],[1+d\right.\right.$$

ODE No. 1261

$$y(x)(2lx(-n+p-1)+2lp+m)+2\left(x(-2l+n+1)-lx^2+n+1\right)y'(x)+x(x+2)y''(x)=0$$

✓ **Mathematica** : cpu = 0.407143 (sec), leaf count = 148

```
DSolve[(m + 2*l*p + 2*l*(-1 - n + p)*x)*y[x] + 2*(1 + n + (1 - 2*l + n)*x - l*x^2)*Derivative
```

$$\left\{\left\{y(x)\to c_2\left(-\frac{x}{2}-1\right)^{\frac{n}{2}+\frac{1}{2}}x^{-n}(x+2)^{-\frac{n}{2}-\frac{1}{2}}\text{HeunC}\left[-4ln-2lp-m+n^2+n,-4l(p-1),1-n,n+1,4l\right.\right.$$

✓ **Maple** : cpu = 0.174 (sec), leaf count = 105

```
dsolve(x*(x+2)*diff(diff(y(x),x),x)+2*(n+1+(n+1-2*l)*x-l*x^2)*diff(y(x),x)+(2*l*(p-n-1)*x+2*p
```

$$y(x)=(x+2)^{-\frac{n}{2}-\frac{1}{2}}\left(-\frac{x}{2}-1\right)^{\frac{n}{2}+\frac{1}{2}}\left(\text{HeunC}\left(4l,-n,n,-4pl,\frac{(4n+4p+4)\,l}{2}-\frac{n^2}{2}+m-n,-\frac{x}{2}\right)x^{-n}c_2+\right.$$

ODE No. 1262

$$\left(x^2+x-1\right)y'(x)+(x+1)^2y''(x)+(-x-2)y(x)=0$$

✓ **Mathematica** : cpu = 0.23933 (sec), leaf count = 88

```
DSolve[(-2 - x)*y[x] + (-1 + x + x^2)*Derivative[1][y][x] + (1 + x)^2*Derivative[2][y][x] ==
```

$$\left\{\left\{y(x)\to c_2e^{-x}\int_1^x\exp\left(-\frac{K[1]^2}{K[1]+1}-\frac{K[1]}{K[1]+1}+2K[1]-\frac{1}{K[1]+1}\right)(K[1]+1)^{\frac{K[1]}{K[1]+1}+\frac{1}{K[1]+1}}dK[1]+c_1\right.\right.$$

✓ **Maple** : cpu = 0.214 (sec), leaf count = 53

```
dsolve((1+x)^2*diff(diff(y(x),x),x)+(x^2+x-1)*diff(y(x),x)-(x+2)*y(x)=0,y(x))
```

$$y(x)=(1+x)\left(c_1\mathrm{e}^{-x}HD\left(4,4,-8,12,\frac{x}{x+2}\right)+c_2HD\left(-4,4,-8,12,\frac{x}{x+2}\right)\mathrm{e}^{\frac{x-1}{2x+2}}\right)$$

ODE No. 1263

$$(-20x-30)\left(x^2+3x\right)^{7/3}+x(x+3)y''(x)+(3x-1)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.37 (sec), leaf count = 276

```
DSolve[(-30 - 20*x)*(3*x + x^2)^(7/3) + y[x] + (-1 + 3*x)*Derivative[1][y][x] + x*(3 + x)*Der
```

$$\left\{\left\{y(x)\to \frac{4x^{4/3}\int_1^x \left(45\sqrt[3]{3}\,{}_2F_1\left(-\frac{4}{3},-\frac{4}{3};-\frac{1}{3};-\frac{K[1]}{3}\right)\sqrt[3]{K[1](K[1]+3)}K[1]^{11/3}+\frac{675}{2}\sqrt[3]{3}\,{}_2F_1\left(-\frac{4}{3},-\frac{4}{3};-\frac{1}{3};\right.\right.\right.$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 52

```
dsolve(x*(x+3)*diff(diff(y(x),x),x)+(3*x-1)*diff(y(x),x)+y(x)-(20*x+30)*(x^2+3*x)^(7/3)=0,y(x
```

$$y(x)=\frac{\left(c_2+\int \frac{\left(c_1+3\left(x^2+3x\right)^{\frac{7}{3}}x(x+3)\right)(x+3)^{\frac{7}{3}}}{x^{\frac{4}{3}}\left(x^2+3x\right)}dx\right)x^{\frac{4}{3}}}{(x+3)^{\frac{7}{3}}}$$

ODE No. 1264

$$\left(x^2+3x+4\right)y''(x)+\left(x^2+x+1\right)y'(x)+(-2x-3)y(x)=0$$

✓ **Mathematica** : cpu = 0.0516655 (sec), leaf count = 23

```
DSolve[(-3 - 2*x)*y[x] + (1 + x + x^2)*Derivative[1][y][x] + (4 + 3*x + x^2)*Derivative[2][y]
```

$$\left\{\left\{y(x)\to c_2\left(x^2+x+3\right)+c_1e^{-x}\right\}\right\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 19

```
dsolve((x^2+3*x+4)*diff(diff(y(x),x),x)+(x^2+x+1)*diff(y(x),x)-(2*x+3)*y(x)=0,y(x))
```

$$y(x)=c_1\mathrm{e}^{-x}+c_2\left(x^2+x+3\right)$$

ODE No. 1265

$$(x-2)(x-1)y''(x)-(2x-3)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.0322662 (sec), leaf count = 64

```
DSolve[y[x] - (-3 + 2*x)*Derivative[1][y][x] + (-2 + x)*(-1 + x)*Derivative[2][y][x] == 0,y[x
```

$$\left\{\left\{y(x)\to c_1\left(x^2-3x+2\right)P^2_{\frac{1}{2}\left(-1+\sqrt{5}\right)}(2x-3)+c_2\left(x^2-3x+2\right)Q^2_{\frac{1}{2}\left(-1+\sqrt{5}\right)}(2x-3)\right\}\right\}$$

✓ **Maple** : cpu = 0.609 (sec), leaf count = 93

```
dsolve((x-1)*(x-2)*diff(diff(y(x),x),x)-(2*x-3)*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x)=(x-2)^2\left(c_2\,\text{hypergeom}\left(\left[\frac{5}{2}+\frac{\sqrt{5}}{2},\frac{1}{2}+\frac{\sqrt{5}}{2}\right],\left[\sqrt{5}+1\right],\frac{1}{x-1}\right)(x-1)^{-\frac{1}{2}-\frac{\sqrt{5}}{2}}+c_1\,\text{hypergeom}\left(\right.\right.$$

ODE No. 1266

$$(x-2)^2 y''(x) - (x-2)y'(x) - 3y(x) = 0$$

✓ **Mathematica** : cpu = 0.0213387 (sec), leaf count = 22

```
DSolve[-3*y[x] - (-2 + x)*Derivative[1][y][x] + (-2 + x)^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 (x-2)^3 + \frac{c_2}{x-2}\right\}\right\}$$

✓ **Maple** : cpu = 0.009 (sec), leaf count = 19

```
dsolve((x-2)^2*diff(diff(y(x),x),x)-(x-2)*diff(y(x),x)-3*y(x)=0,y(x))
```

$$y(x) = \frac{c_1 + c_2 (x-2)^4}{x-2}$$

ODE No. 1267

$$-\left(l+2x^2-5x\right)y'(x)+2x^2y''(x)+(1-4x)y(x)=0$$

✓ **Mathematica** : cpu = 0.35718 (sec), leaf count = 166

```
DSolve[(1 - 4*x)*y[x] - (l - 5*x + 2*x^2)*Derivative[1][y][x] + 2*x^2*Derivative[2][y][x] ==
```

$$\left\{\left\{y(x)\to \frac{c_1 e^{x-\frac{l}{2x}}}{\sqrt{x}}-\frac{\sqrt{\frac{\pi}{2}}c_2 e^{-\frac{l}{2x}-\sqrt{2}\sqrt{-l}+x}\left(\text{erf}\left(\frac{\sqrt{-l}}{\sqrt{2}\sqrt{x}}-\sqrt{x}\right)+e^{2\sqrt{2}\sqrt{-l}}\text{erf}\left(\frac{\sqrt{-l}}{\sqrt{2}\sqrt{x}}+\sqrt{x}\right)-e^{2\sqrt{2}\sqrt{-l}}+1\right)}{\sqrt{-l}\sqrt{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.113 (sec), leaf count = 41

```
dsolve(2*x^2*diff(diff(y(x),x),x)-(2*x^2+l-5*x)*diff(y(x),x)-(4*x-1)*y(x)=0,y(x))
```

$$y(x)=\frac{\left(c_1\left(\int \frac{\mathrm{e}^{-x}\mathrm{e}^{\frac{l}{2x}}}{2x^{\frac{3}{2}}}dx\right)+c_2\right)\mathrm{e}^{x}\mathrm{e}^{-\frac{l}{2x}}}{\sqrt{x}}$$

ODE No. 1268

$$y(x)(ax+b)+2(x-1)xy''(x)+(2x-1)y'(x)=0$$

✓ **Mathematica** : cpu = 0.098089 (sec), leaf count = 50

```
DSolve[(b + a*x)*y[x] + (-1 + 2*x)*Derivative[1][y][x] + 2*(-1 + x)*x*Derivative[2][y][x] ==
```

$$\left\{\left\{y(x)\to c_1\text{MathieuC}\left[-a-2b,\frac{a}{2},\cos^{-1}\left(\sqrt{x}\right)\right]+c_2\text{MathieuS}\left[-a-2b,\frac{a}{2},\cos^{-1}\left(\sqrt{x}\right)\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.101 (sec), leaf count = 39

```
dsolve(2*x*(x-1)*diff(diff(y(x),x),x)+(2*x-1)*diff(y(x),x)+(a*x+b)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{MathieuC}\left(-a-2b,\frac{a}{2},\arccos\left(\sqrt{x}\right)\right)+c_2\,\text{MathieuS}\left(-a-2b,\frac{a}{2},\arccos\left(\sqrt{x}\right)\right)$$

ODE No. 1269

$$((2v+5)x-2v-3)y'(x)+(v+1)y(x)+2(x-1)xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0628042 (sec), leaf count = 60

```
DSolve[(1 + v)*y[x] + (-3 - 2*v + (5 + 2*v)*x)*Derivative[1][y][x] + 2*(-1 + x)*x*Derivative[
```

$$\left\{\left\{y(x)\to c_2 i^{-2v-1}x^{\frac{1}{2}(-2v-1)}\,{}_2F_1\left(\frac{1}{2},-v;\frac{1}{2}-v;x\right)+c_1\,{}_2F_1\left(\frac{1}{2},v+1;v+\frac{3}{2};x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.074 (sec), leaf count = 40

```
dsolve(2*x*(x-1)*diff(diff(y(x),x),x)+((2*v+5)*x-2*v-3)*diff(y(x),x)+(v+1)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[\frac{1}{2},v+1\right],\left[\frac{3}{2}+v\right],x\right)+c_2x^{-\frac{1}{2}-v}\,\text{hypergeom}\left(\left[\frac{1}{2},-v\right],\left[\frac{1}{2}-v\right],x\right)$$

ODE No. 1270

$$\left(2x^2+6x+4\right)y''(x)+\left(10x^2+21x+8\right)y'(x)+\left(12x^2+17x+8\right)y(x)=0$$

✓ **Mathematica** : cpu = 1.65887 (sec), leaf count = 58

```
DSolve[(8 + 17*x + 12*x^2)*y[x] + (8 + 21*x + 10*x^2)*Derivative[1][y][x] + (4 + 6*x + 2*x^2)
```

$$\left\{\left\{y(x)\to c_2e^{-3x}(x+2)^4\int_1^x\frac{e^{K[1]}(K[1]+1)^{3/2}}{(K[1]+2)^5}dK[1]+c_1e^{-3x}(x+2)^4\right\}\right\}$$

✓ **Maple** : cpu = 0.148 (sec), leaf count = 46

```
dsolve((2*x^2+6*x+4)*diff(diff(y(x),x),x)+(10*x^2+21*x+8)*diff(y(x),x)+(12*x^2+17*x+8)*y(x)=0
```

$$y(x)=\mathrm{e}^{-2x}(x+2)^4\left(c_2\,\mathrm{HeunC}\left(-1,\frac{5}{2},4,-\frac{7}{4},\frac{7}{2},-1-x\right)(1+x)^{\frac{5}{2}}+c_1\,\mathrm{HeunC}\left(-1,-\frac{5}{2},4,-\frac{7}{4},\frac{7}{2},-1-\right.\right.$$

ODE No. 1271

$$4x^2y''(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0086119 (sec), leaf count = 27

```
DSolve[y[x] + 4*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1\sqrt{x} + \frac{1}{2}c_2\sqrt{x}\log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.006 (sec), leaf count = 14

```
dsolve(4*x^2*diff(diff(y(x),x),x)+y(x)=0,y(x))
```

$$y(x) = \sqrt{x}\,(c_2 \ln(x) + c_1)$$

ODE No. 1272

$$\left(4a^2x^2+1\right)y(x)+4x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0089455 (sec), leaf count = 32

```
DSolve[(1 + 4*a^2*x^2)*y[x] + 4*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\sqrt{x}J_0(ax)+c_2\sqrt{x}Y_0(ax)\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 23

```
dsolve(4*x^2*diff(diff(y(x),x),x)+(4*a^2*x^2+1)*y(x)=0,y(x))
```

$$y(x)=\sqrt{x}\left(\text{BesselY}\left(0,ax\right)c_2+\text{BesselJ}\left(0,ax\right)c_1\right)$$

ODE No. 1273

$$y(x)\left(4kx-4m^2-x^2+1\right)+4x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0120468 (sec), leaf count = 20

```
DSolve[(1 - 4*m^2 + 4*k*x - x^2)*y[x] + 4*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to c_1M_{k,m}(x)+c_2W_{k,m}(x)\}\}$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 17

```
dsolve(4*x^2*diff(diff(y(x),x),x)-(-4*k*x+4*m^2+x^2-1)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{WhittakerM}\left(k,m,x\right)+c_2\,\text{WhittakerW}\left(k,m,x\right)$$

ODE No. 1274

$$\left(x-v^2\right)y(x)+4x^2y''(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0315361 (sec), leaf count = 38

```
DSolve[(-v^2 + x)*y[x] + 4*x*Derivative[1][y][x] + 4*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\Gamma(1-v)J_{-v}\left(\sqrt{x}\right)+c_2\Gamma(v+1)J_v\left(\sqrt{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 19

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)+(-v^2+x)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{BesselJ}\left(v,\sqrt{x}\right)+c_2\,\text{BesselY}\left(v,\sqrt{x}\right)$$

ODE No. 1275

$$y(x)\left(2x(2l-m+1)-m^2-x^2+1\right)+4x^2y''(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0252521 (sec), leaf count = 120

```
DSolve[(1 - m^2 + 2*(1 + 2*l - m)*x - x^2)*y[x] + 4*x*Derivative[1][y][x] + 4*x^2*Derivative[
```

$$\left\{\left\{y(x)\to c_1 e^{\frac{1}{2}\left(\sqrt{m^2-1}\log(x)-x\right)}U\left(\frac{1}{2}\left(-2l+m+\sqrt{m^2-1}\right),\sqrt{m^2-1}+1,x\right)+c_2 e^{\frac{1}{2}\left(\sqrt{m^2-1}\log(x)-x\right)}L^{\sqrt{m^2-}}_{\frac{1}{2}\left(2l-\right.}\right.$$

✓ **Maple** : cpu = 0.139 (sec), leaf count = 53

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)+(-x^2+2*(1-m+2*l)*x-m^2+1)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\,\text{WhittakerW}\left(l-\frac{m}{2}+\frac{1}{2},\frac{\sqrt{m-1}\sqrt{m+1}}{2},x\right)+c_1\,\text{WhittakerM}\left(l-\frac{m}{2}+\frac{1}{2},\frac{\sqrt{m-1}\sqrt{m+1}}{2},x\right)}{\sqrt{x}}$$

ODE No. 1276

$$-4e^x\sqrt{x^3}+4x^2y''(x)-\left(4x^2+1\right)y(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0296561 (sec), leaf count = 55

```
DSolve[-4*E^x*Sqrt[x^3] - (1 + 4*x^2)*y[x] + 4*x*Derivative[1][y][x] + 4*x^2*Derivative[2][y]
```

$$\left\{\left\{y(x)\to \frac{e^x\sqrt{x^3}(2x-1)}{4x^2}+\frac{c_1e^{-x}}{\sqrt{x}}+\frac{c_2e^x}{2\sqrt{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.06 (sec), leaf count = 31

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)-(4*x^2+1)*y(x)-4*(x^3)^(1/2)*exp(x)=0,y(x)
```

$$y(x)=\frac{\sinh\left(x\right)c_2}{\sqrt{x}}+\frac{\cosh\left(x\right)c_1}{\sqrt{x}}+\frac{\sqrt{x^3}\,\mathrm{e}^x}{2x}$$

ODE No. 1277

$$\left(-ax^2-1\right)y(x)+4x^2y''(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0205306 (sec), leaf count = 51

```
DSolve[(-1 - a*x^2)*y[x] + 4*x*Derivative[1][y][x] + 4*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1 e^{-\frac{\sqrt{a}x}{2}}}{\sqrt{x}}+\frac{c_2 e^{\frac{\sqrt{a}x}{2}}}{\sqrt{a}\sqrt{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.055 (sec), leaf count = 27

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)-(a*x^2+1)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\cosh\left(\frac{\sqrt{a}\,x}{2}\right)+c_1\sinh\left(\frac{\sqrt{a}\,x}{2}\right)}{\sqrt{x}}$$

ODE No. 1278

$$f(x)y(x) + 4x^2y''(x) + 4xy'(x) = 0$$

✗ **Mathematica** : cpu = 0.368554 (sec), leaf count = 0

```
DSolve[f[x]*y[x] + 4*x*Derivative[1][y][x] + 4*x^2*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[f[x]*y[x] + 4*x*Derivative[1][y][x] + 4*x^2*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x*diff(y(x),x)+f(x)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{f(x)\_Y(x)}{4x^2} + \frac{\frac{d}{dx}\_Y(x)}{x} + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

ODE No. 1279

$$4x^2y''(x) + 5xy'(x) - y(x) - \log(x) = 0$$

✓ **Mathematica** : cpu = 0.103935 (sec), leaf count = 74

```
DSolve[-Log[x] - y[x] + 5*x*Derivative[1][y][x] + 4*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 x^{\frac{1}{2}\left(\frac{\sqrt{17}}{4}-\frac{1}{4}\right)} + c_1 x^{\frac{1}{2}\left(-\frac{1}{4}-\frac{\sqrt{17}}{4}\right)} - \frac{256(\log(x)+1)}{\left(\sqrt{17}-1\right)^2\left(1+\sqrt{17}\right)^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.149 (sec), leaf count = 32

```
dsolve(4*x^2*diff(diff(y(x),x),x)+5*x*diff(y(x),x)-y(x)-ln(x)=0,y(x))
```

$$y(x) = x^{-\frac{1}{8}+\frac{\sqrt{17}}{8}} c_2 + x^{-\frac{1}{8}-\frac{\sqrt{17}}{8}} c_1 - \ln(x) - 1$$

ODE No. 1280

$$4x^2y''(x) + \left(-4x^2 - 12x - 3\right) y(x) + 8xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0426504 (sec), leaf count = 52

```
DSolve[(-3 - 12*x - 4*x^2)*y[x] + 8*x*Derivative[1][y][x] + 4*x^2*Derivative[2][y][x] == 0,y[
```

$$\left\{\left\{y(x) \to \frac{c_2 e^{-x}(4e^{2x}x^2\text{Ei}(-2x) + 2x - 1)}{2x^{3/2}} + c_1 e^x \sqrt{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 40

```
dsolve(4*x^2*diff(diff(y(x),x),x)+8*x*diff(y(x),x)-(4*x^2+12*x+3)*y(x)=0,y(x))
```

$$y(x) = \frac{-4\,\text{expIntegral}\left(1, 2x\right)\mathrm{e}^{x}c_2x^2 + c_2(2x - 1)\,\mathrm{e}^{-x} + c_1x^2\mathrm{e}^{x}}{x^{\frac{3}{2}}}$$

ODE No. 1281

$$4x^2y''(x) + \left(4x^2 - 4x - 1\right)y(x) - 4(2x-1)xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0145978 (sec), leaf count = 28

```
DSolve[(-1 - 4*x + 4*x^2)*y[x] - 4*x*(-1 + 2*x)*Derivative[1][y][x] + 4*x^2*Derivative[2][y][
```

$$\left\{\left\{y(x) \to \frac{c_1 e^x}{\sqrt{x}} + c_2 e^x \sqrt{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 15

```
dsolve(4*x^2*diff(diff(y(x),x),x)-4*x*(2*x-1)*diff(y(x),x)+(4*x^2-4*x-1)*y(x)=0,y(x))
```

$$y(x) = \frac{\mathrm{e}^x(xc_2 + c_1)}{\sqrt{x}}$$

ODE No. 1282

$$4x^3y'(x)+4x^2y''(x)+\left(x^2-4\right)\left(x^2+6\right)y(x)=0$$

✓ **Mathematica** : cpu = 0.015777 (sec), leaf count = 39

```
DSolve[(-4 + x^2)*(6 + x^2)*y[x] + 4*x^3*Derivative[1][y][x] + 4*x^2*Derivative[2][y][x] == 0
```

$$\left\{\left\{y(x)\to \frac{c_1e^{-\frac{x^2}{4}}}{x^2}+\frac{1}{5}c_2e^{-\frac{x^2}{4}}x^3\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 21

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x^3*diff(y(x),x)+(x^2+6)*(x^2-4)*y(x)=0,y(x))
```

$$y(x)=\frac{\mathrm{e}^{-\frac{x^2}{4}}\left(x^5c_2+c_1\right)}{x^2}$$

ODE No. 1283

$$4x^2y''(x) + 4x^2\log(x)y'(x) + y(x)\left(x^2\log^2(x) + 2x - 8\right) - 4\sqrt{e^x x^{-x}}x^2 = 0$$

✓ **Mathematica** : cpu = 0.060708 (sec), leaf count = 90

```
DSolve[-4*x^2*Sqrt[E^x/x^x] + (-8 + 2*x + x^2*Log[x]^2)*y[x] + 4*x^2*Log[x]*Derivative[1][y][
```

$$\left\{\left\{y(x) \to c_1 e^{x/2}x^{-\frac{x}{2}-1} + \frac{1}{3}c_2 e^{x/2}x^{2-\frac{x}{2}} + \frac{1}{9}\left(3x^2\sqrt{e^x x^{-x}}\log(x) - x^2\sqrt{e^x x^{-x}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.119 (sec), leaf count = 48

```
dsolve(4*x^2*diff(diff(y(x),x),x)+4*x^2*ln(x)*diff(y(x),x)+(x^2*ln(x)^2+2*x-8)*y(x)-4*x^2*(ex
```

$$y(x) = \frac{\left(\ln(x) - \frac{1}{3}\right)x^2\sqrt{x^{-x}\mathrm{e}^x}}{3} + \mathrm{e}^{\frac{x}{2}}\left(c_1 x^{-\frac{x}{2}+2} + c_2 x^{-\frac{x}{2}-1}\right)$$

ODE No. 1284

$$(2x+1)^2 y''(x) - 2(2x+1)y'(x) - 12y(x) - 3x - 1 = 0$$

✓ **Mathematica** : cpu = 0.0287067 (sec), leaf count = 47

```
DSolve[-1 - 3*x - 12*y[x] - 2*(1 + 2*x)*Derivative[1][y][x] + (1 + 2*x)^2*Derivative[2][y][x]
```

$$\left\{\left\{y(x) \to \frac{-72x^2 - 56x - 7}{192(2x+1)} + c_1(2x+1)^3 + \frac{c_2}{2x+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 41

```
dsolve((2*x+1)^2*diff(diff(y(x),x),x)-2*(2*x+1)*diff(y(x),x)-12*y(x)-3*x-1=0,y(x))
```

$$y(x) = \frac{c_1}{2x+1} + (2x+1)^3 c_2 + \frac{-72x^2 - 56x - 7}{384x + 192}$$

ODE No. 1285

$$((4a+2)x-a)y'(x)+(a-1)ay(x)+x(4x-1)y''(x)=0$$

✓ **Mathematica** : cpu = 1.0577 (sec), leaf count = 269

```
DSolve[(-1 + a)*a*y[x] + (-a + (2 + 4*a)*x)*Derivative[1][y][x] + x*(-1 + 4*x)*Derivative[2][
```

$$\left\{\left\{y(x)\to c_2 x^{-a/2}\left(\sqrt{4x-1}+i\right)^{\frac{1}{2}+\frac{1}{2}i\sqrt{-(a-1)^2}}\left(-\sqrt{4x-1}+i\right)^{\frac{1}{2}-\frac{1}{2}i\sqrt{-(a-1)^2}}\int_1^x -\frac{\left(i-\sqrt{4K[1]-1}\right)^{i\sqrt{-(a}}}{\sqrt{1-4K[}\right.\right.$$

✓ **Maple** : cpu = 0.094 (sec), leaf count = 52

```
dsolve(x*(4*x-1)*diff(diff(y(x),x),x)+((4*a+2)*x-a)*diff(y(x),x)+a*(a-1)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[\frac{a}{2},\frac{a}{2}-\frac{1}{2}\right],[a],4x\right)+c_2x^{1-a}\,\text{hypergeom}\left(\left[1-\frac{a}{2},-\frac{a}{2}+\frac{1}{2}\right],[-a+2],4x\right)$$

ODE No. 1286

$$(3x-1)^2y''(x)+3(3x-1)y'(x)-9y(x)-\log^2(3x-1)=0$$

✓ **Mathematica** : cpu = 0.0860394 (sec), leaf count = 101

```
DSolve[-Log[-1 + 3*x]^2 - 9*y[x] + 3*(-1 + 3*x)*Derivative[1][y][x] + (-1 + 3*x)^2*Derivative
```

$$\left\{\left\{y(x)\to \frac{-6x-3x\log^2(3x-1)+\log^2(3x-1)+\log(3x-1)-\log(1-3x)+1}{9(3x-1)}+\frac{c_1((1-3x)^2+1)}{2(1-3x)}+\right.\right.$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 32

```
dsolve((3*x-1)^2*diff(diff(y(x),x),x)+3*(3*x-1)*diff(y(x),x)-9*y(x)-ln(3*x-1)^2=0,y(x))
```

$$y(x)=\frac{c_1}{3x-1}+(3x-1)\,c_2-\frac{\ln(3x-1)^2}{9}-\frac{2}{9}$$

ODE No. 1287

$$9(x-1)xy''(x)+3(2x-1)y'(x)-20y(x)=0$$

✓ **Mathematica** : cpu = 0.0131003 (sec), leaf count = 83

```
DSolve[-20*y[x] + 3*(-1 + 2*x)*Derivative[1][y][x] + 9*(-1 + x)*x*Derivative[2][y][x] == 0,y[
```

$$\left\{\left\{y(x)\to c_2\sqrt[3]{1-x}\sqrt[3]{x}Q_1^{\frac{2}{3}}(2x-1)-\frac{c_1(2-2x)^{2/3}\sqrt[3]{1-x}x^{2/3}(6x-5)}{3\ 2^{2/3}(x-1)\Gamma\left(\frac{4}{3}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 27

```
dsolve(9*x*(x-1)*diff(diff(y(x),x),x)+3*(2*x-1)*diff(y(x),x)-20*y(x)=0,y(x))
```

$$y(x)=c_1(6x-5)\,x^{\frac{2}{3}}+c_2(6x-1)\,(x-1)^{\frac{2}{3}}$$

ODE No. 1288

$$16x^2y''(x) + (4x+3)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0251443 (sec), leaf count = 47

```
DSolve[(3 + 4*x)*y[x] + 16*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{i\sqrt{x}}\sqrt[4]{x} + ic_2 e^{-i\sqrt{x}}\sqrt[4]{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.022 (sec), leaf count = 21

```
dsolve(16*x^2*diff(diff(y(x),x),x)+(4*x+3)*y(x)=0,y(x))
```

$$y(x) = x^{\frac{1}{4}}\left(\cos\left(\sqrt{x}\right)c_2 + \sin\left(\sqrt{x}\right)c_1\right)$$

ODE No. 1289

$$16x^2y''(x) + 32xy'(x) + (-4x - 5)y(x) = 0$$

✓ **Mathematica** : cpu = 0.104253 (sec), leaf count = 53

```
DSolve[(-5 - 4*x)*y[x] + 32*x*Derivative[1][y][x] + 16*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2 e^{-\sqrt{x}}\left(\sqrt{x}+1\right)}{x^{5/4}} - \frac{c_1 e^{\sqrt{x}}\left(\sqrt{x}-1\right)}{x^{5/4}}\right\}\right\}$$

✓ **Maple** : cpu = 0.089 (sec), leaf count = 33

```
dsolve(16*x^2*diff(diff(y(x),x),x)+32*x*diff(y(x),x)-(4*x+5)*y(x)=0,y(x))
```

$$y(x) = \frac{c_2\left(\sqrt{x}+1\right)\mathrm{e}^{-\sqrt{x}} + c_1\mathrm{e}^{\sqrt{x}}\left(\sqrt{x}-1\right)}{x^{\frac{5}{4}}}$$

ODE No. 1290

$$\left(27x^2+4\right)y''(x)+27xy'(x)-3y(x)=0$$

✓ **Mathematica** : cpu = 0.10836 (sec), leaf count = 103

```
DSolve[-3*y[x] + 27*x*Derivative[1][y][x] + (4 + 27*x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cosh\left(\frac{\sqrt{-27x^2-4}\tan^{-1}\left(\frac{3x}{\sqrt{-9x^2-\frac{4}{3}}}\right)}{3\sqrt{27x^2+4}}\right)+ic_2\sinh\left(\frac{\sqrt{-27x^2-4}\tan^{-1}\left(\frac{3x}{\sqrt{-9x^2-\frac{4}{3}}}\right)}{3\sqrt{27x^2+4}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (sec), leaf count = 29

```
dsolve((27*x^2+4)*diff(diff(y(x),x),x)+27*x*diff(y(x),x)-3*y(x)=0,y(x))
```

$$y(x)=c_1\sinh\left(\frac{\operatorname{arcsinh}\left(\frac{3\sqrt{3}\,x}{2}\right)}{3}\right)+c_2\cosh\left(\frac{\operatorname{arcsinh}\left(\frac{3\sqrt{3}\,x}{2}\right)}{3}\right)$$

ODE No. 1291

$$48(x-1)xy''(x)+(152x-40)y'(x)+53y(x)=0$$

✓ **Mathematica** : cpu = 0.0596154 (sec), leaf count = 92

```
DSolve[53*y[x] + (-40 + 152*x)*Derivative[1][y][x] + 48*(-1 + x)*x*Derivative[2][y][x] == 0,y
```

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(\frac{13}{12}-\frac{\sqrt{\frac{5}{2}}}{6},\frac{13}{12}+\frac{\sqrt{\frac{5}{2}}}{6};\frac{5}{6};x\right)+\sqrt[6]{-1}c_2\sqrt[6]{x}\,{}_2F_1\left(\frac{5}{4}-\frac{\sqrt{\frac{5}{2}}}{6},\frac{5}{4}+\frac{\sqrt{\frac{5}{2}}}{6};\frac{7}{6};x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 50

```
dsolve(48*x*(x-1)*diff(diff(y(x),x),x)+(152*x-40)*diff(y(x),x)+53*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[\frac{13}{12}-\frac{\sqrt{10}}{12},\frac{13}{12}+\frac{\sqrt{10}}{12}\right],\left[\frac{5}{6}\right],x\right)+c_2x^{\frac{1}{6}}\,\text{hypergeom}\left(\left[\frac{5}{4}-\frac{\sqrt{10}}{12},\frac{5}{4}+\frac{\sqrt{10}}{12}\right],\left[\frac{7}{6}\right]\right.$$

ODE No. 1292

$$50(x-1)xy''(x)+25(2x-1)y'(x)-2y(x)=0$$

✓ **Mathematica** : cpu = 0.0323796 (sec), leaf count = 42

```
DSolve[-2*y[x] + 25*(-1 + 2*x)*Derivative[1][y][x] + 50*(-1 + x)*x*Derivative[2][y][x] == 0,y
```

$$\left\{\left\{y(x)\to c_2 \sin\left(\frac{2}{5}\sin^{-1}\left(\sqrt{1-x}\right)\right)+c_1\cos\left(\frac{2}{5}\sin^{-1}\left(\sqrt{1-x}\right)\right)\right\}\right\}$$

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

```
dsolve(50*x*(x-1)*diff(diff(y(x),x),x)+25*(2*x-1)*diff(y(x),x)-2*y(x)=0,y(x))
```

$$y(x)=\frac{c_1\left(\sqrt{x}+\sqrt{x-1}\right)^{\frac{4}{5}}+c_2}{\left(\sqrt{x}+\sqrt{x-1}\right)^{\frac{2}{5}}}$$

ODE No. 1293

$$144(x-1)xy''(x)+(120x-48)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.245093 (sec), leaf count = 44

```
DSolve[y[x] + (-48 + 120*x)*Derivative[1][y][x] + 144*(-1 + x)*x*Derivative[2][y][x] == 0,y[x
```

$$\left\{\left\{y(x)\to (-1)^{2/3}c_2x^{2/3}\,{}_2F_1\left(\frac{7}{12},\frac{7}{12};\frac{5}{3};x\right)+c_1\,{}_2F_1\left(-\frac{1}{12},-\frac{1}{12};\frac{1}{3};x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.052 (sec), leaf count = 33

```
dsolve(144*x*(x-1)*diff(diff(y(x),x),x)+(120*x-48)*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x)=x^{\frac{1}{3}}\left(\text{LegendreQ}\left(-\frac{1}{2},\frac{2}{3},\sqrt{1-x}\right)c_2+\text{LegendreP}\left(-\frac{1}{2},\frac{2}{3},\sqrt{1-x}\right)c_1\right)$$

ODE No. 1294

$$144(x-1)xy''(x)+(168x-96)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.0561246 (sec), leaf count = 44

```
DSolve[y[x] + (-96 + 168*x)*Derivative[1][y][x] + 144*(-1 + x)*x*Derivative[2][y][x] == 0,y[x
```

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(\frac{1}{12},\frac{1}{12};\frac{2}{3};x\right)+\sqrt[3]{-1}c_2\sqrt[3]{x}\,{}_2F_1\left(\frac{5}{12},\frac{5}{12};\frac{4}{3};x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.051 (sec), leaf count = 33

```
dsolve(144*x*(x-1)*diff(diff(y(x),x),x)+(168*x-96)*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x)=x^{\frac{1}{6}}\left(\text{LegendreQ}\left(-\frac{1}{2},\frac{1}{3},\sqrt{1-x}\right)c_2+\text{LegendreP}\left(-\frac{1}{2},\frac{1}{3},\sqrt{1-x}\right)c_1\right)$$

ODE No. 1295

$$ax^2y''(x)+bxy'(x)+y(x)\left(cx^2+dx+f\right)=0$$

✓ **Mathematica** : cpu = 0.16512 (sec), leaf count = 310

```
DSolve[(f + d*x + c*x^2)*y[x] + b*x*Derivative[1][y][x] + a*x^2*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\to c_1 U\left(-\frac{-\sqrt{c}a-id\sqrt{a}-\sqrt{c}\sqrt{a^2-2ba-4fa+b^2}}{2a\sqrt{c}},\frac{\sqrt{a^2-2ba-4fa+b^2}}{a}+1,\frac{2i\sqrt{c}x}{\sqrt{a}}\right)\exp\left(\right.\right.$$

✓ **Maple** : cpu = 0.277 (sec), leaf count = 106

```
dsolve(a*x^2*diff(diff(y(x),x),x)+b*x*diff(y(x),x)+(c*x^2+d*x+f)*y(x)=0,y(x))
```

$$y(x)=x^{-\frac{b}{2a}}\left(\text{WhittakerM}\left(-\frac{id}{2\sqrt{a}\sqrt{c}},\frac{\sqrt{a^2+(-2b-4f)a+b^2}}{2a},\frac{2i\sqrt{c}x}{\sqrt{a}}\right)c_1+\text{WhittakerW}\left(-\frac{id}{2\sqrt{a}\sqrt{c}}\right.\right.$$

ODE No. 1296

$$y(x)\left(\mathrm{a0}x^2+\mathrm{b0}x+\mathrm{c0}\right)+\left(\mathrm{a1}x^2+\mathrm{b1}x\right)y'(x)+\mathrm{a2}x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.320354 (sec), leaf count = 356

```
DSolve[(c0 + b0*x + a0*x^2)*y[x] + (b1*x + a1*x^2)*Derivative[1][y][x] + a2*x^2*Derivative[2]
```

$$\left\{\left\{y(x)\to c_1U\left(-\frac{2\mathrm{b0a2}-\sqrt{\mathrm{a1}^2-4\mathrm{a0a2}}\mathrm{a2}-\mathrm{a1b1}-\sqrt{\mathrm{a1}^2-4\mathrm{a0a2}}\sqrt{\mathrm{a2}^2-2\mathrm{b1a2}-4\mathrm{c0a2}+\mathrm{b1}^2}}{2\mathrm{a2}\sqrt{\mathrm{a1}^2-4\mathrm{a0a2}}},\frac{\sqrt{\mathrm{a2}^2}}{}\right.\right.$$

✓ **Maple** : cpu = 0.312 (sec), leaf count = 150

```
dsolve(a2*x^2*diff(diff(y(x),x),x)+(a1*x^2+b1*x)*diff(y(x),x)+(a0*x^2+b0*x+c0)*y(x)=0,y(x))
```

$$y(x)=x^{-\frac{b1}{2a2}}\mathrm{e}^{-\frac{a1x}{2a2}}\left(\mathrm{WhittakerW}\left(-\frac{a1\,b1-2a2\,b0}{2a2\sqrt{-4a0\,a2+a1^2}},\frac{\sqrt{a2^2+(-2b1-4c0)\,a2+b1^2}}{2a2},\frac{\sqrt{-4a0\,a2+}}{a2}\right.\right.$$

ODE No. 1297

$$\left(ax^2+1\right)y''(x)+axy'(x)+by(x)=0$$

✓ **Mathematica** : cpu = 0.0236036 (sec), leaf count = 52

```
DSolve[b*y[x] + a*x*Derivative[1][y][x] + (1 + a*x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cos\left(\frac{\sqrt{b}\sinh^{-1}\left(\sqrt{a}x\right)}{\sqrt{a}}\right)+c_2\sin\left(\frac{\sqrt{b}\sinh^{-1}\left(\sqrt{a}x\right)}{\sqrt{a}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.041 (sec), leaf count = 63

```
dsolve((a*x^2+1)*diff(diff(y(x),x),x)+a*x*diff(y(x),x)+b*y(x)=0,y(x))
```

$$y(x)=\left(c_1\left(\sqrt{a}\,x+\sqrt{a\,x^2+1}\right)^{\frac{2i\sqrt{b}}{\sqrt{a}}}+c_2\right)\left(\sqrt{a}\,x+\sqrt{a\,x^2+1}\right)^{-\frac{i\sqrt{b}}{\sqrt{a}}}$$

ODE No. 1298

$$\left(ax^2+1\right)y''(x)+bxy'(x)+cy(x)=0$$

✓ **Mathematica** : cpu = 0.0514049 (sec), leaf count = 162

```
DSolve[c*y[x] + b*x*Derivative[1][y][x] + (1 + a*x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\left(ax^2+1\right)^{\frac{2a-b}{4a}}P^{\frac{b-2a}{2a}}_{\frac{\sqrt{a^2-2ba-4ca+b^2}-a}{2a}}\left(i\sqrt{a}x\right)+c_2\left(ax^2+1\right)^{\frac{2a-b}{4a}}Q^{\frac{b-2a}{2a}}_{\frac{\sqrt{a^2-2ba-4ca+b^2}-a}{2a}}\left(i\sqrt{a}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.11 (sec), leaf count = 124

```
dsolve((a*x^2+1)*diff(diff(y(x),x),x)+b*x*diff(y(x),x)+c*y(x)=0,y(x))
```

$$y(x)=\left(a\,x^2+1\right)^{\frac{2a-b}{4a}}\left(\text{LegendreP}\left(\frac{\sqrt{a^2+(-2b-4c)\,a+b^2}-a}{2a},\frac{2a-b}{2a},\sqrt{-a}\,x\right)c_1+\text{LegendreQ}\left(\frac{\sqrt{a}\right.\right.$$

ODE No. 1299

$$\left(a^2x^2-1\right)y''(x)+2a^2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.025621 (sec), leaf count = 19

```
DSolve[2*a^2*x*Derivative[1][y][x] + (-1 + a^2*x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2-\frac{c_1\tanh^{-1}(ax)}{a}\right\}\right\}$$

✓ **Maple** : cpu = 0.013 (sec), leaf count = 27

```
dsolve((a^2*x^2-1)*diff(diff(y(x),x),x)+2*a^2*x*diff(y(x),x)=0,y(x))
```

$$y(x)=c_1-\frac{\left(\ln\left(ax+1\right)-\ln\left(ax-1\right)\right)c_2}{2a}$$

ODE No. 1300

$$\left(a^2x^2-1\right)y''(x)+2a^2xy'(x)-2a^2y(x)=0$$

✓ **Mathematica** : cpu = 0.0105568 (sec), leaf count = 41

```
DSolve[-2*a^2*y[x] + 2*a^2*x*Derivative[1][y][x] + (-1 + a^2*x^2)*Derivative[2][y][x] == 0,y[
```

$$\left\{\left\{y(x)\to ac_1x+c_2\left(ax\left(\frac{1}{2}\log(ax+1)-\frac{1}{2}\log(1-ax)\right)-1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.031 (sec), leaf count = 31

```
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))
```

$$y(x)=-\frac{c_2a\ln\left(ax+1\right)x}{2}+\frac{c_2a\ln\left(ax-1\right)x}{2}+c_1x+c_2$$

ODE No. 1301

$$\left(ax^2+bx\right)y''(x)-2ay(x)+2by'(x)=0$$

✓ **Mathematica** : cpu = 0.02294 (sec), leaf count = 31

```
DSolve[-2*a*y[x] + 2*b*Derivative[1][y][x] + (b*x + a*x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2(ax+b)^3}{3ax}+\frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 19

```
dsolve((a*x^2+b*x)*diff(diff(y(x),x),x)+2*b*diff(y(x),x)-2*a*y(x)=0,y(x))
```

$$y(x)=\frac{c_1+c_2(ax+b)^3}{x}$$

ODE No. 1302

$$\mathrm{A0}y(x)(ax+b)+\mathrm{A1}(ax+b)y'(x)+\mathrm{A2}(ax+b)^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0593741 (sec), leaf count = 243

```
DSolve[A0*(b + a*x)*y[x] + A1*(b + a*x)*Derivative[1][y][x] + A2*(b + a*x)^2*Derivative[2][y]
```

$$\left\{\left\{y(x)\to c_1\left(\frac{2b}{a}+2x\right)^{\frac{\mathrm{A1}}{2a\mathrm{A2}}}(2a\mathrm{A2}x+2\mathrm{A2}b)^{-\frac{\mathrm{A1}}{2a\mathrm{A2}}}\left(-\frac{\mathrm{A0}\left(\frac{b}{a}+x\right)}{a\mathrm{A2}}\right)^{\frac{1}{2}-\frac{\mathrm{A1}}{2a\mathrm{A2}}}I_{\frac{\mathrm{A1}}{a\mathrm{A2}}-1}\left(2\sqrt{-\frac{\mathrm{A0}\left(\frac{b}{a}+x\right)}{a\mathrm{A2}}}\right)+\right.\right.$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 98

```
dsolve(A2*(a*x+b)^2*diff(diff(y(x),x),x)+A1*(a*x+b)*diff(y(x),x)+A0*(a*x+b)*y(x)=0,y(x))
```

$$y(x)=(ax+b)^{-\frac{-aA2+A1}{2aA2}}\left(\mathrm{BesselY}\left(\frac{aA2-A1}{aA2},2\sqrt{A0}\sqrt{\frac{ax+b}{a^2A2}}\right)c_2+\mathrm{BesselJ}\left(\frac{aA2-A1}{aA2},2\sqrt{A0}\sqrt{\frac{ax}{a^2}}\right.\right.$$

ODE No. 1303

$$y''(x)\left(ax^2+bx+c\right)+(dx+f)y'(x)+gy(x)=0$$

✓ **Mathematica** : cpu = 4.22215 (sec), leaf count = 498

```
DSolve[g*y[x] + (f + d*x)*Derivative[1][y][x] + (c + b*x + a*x^2)*Derivative[2][y][x] == 0,y[
```

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(-\frac{a-d+\sqrt{(a-d)^2-4ag}}{2a},\frac{-a+d+\sqrt{(a-d)^2-4ag}}{2a};\frac{\left(b+\sqrt{b^2-4ac}\right)d-2af}{2a\sqrt{b^2-4ac}};\frac{b+\right.\right.\right.$$

✓ **Maple** : cpu = 0.17 (sec), leaf count = 501

```
dsolve((a*x^2+b*x+c)*diff(diff(y(x),x),x)+(d*x+f)*diff(y(x),x)+g*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{a-d+\sqrt{a^2+(-2d-4g)\,a+d^2}}{2a},\frac{-a+d+\sqrt{a^2+(-2d-4g)\,a+d^2}}{2a}\right],\left[\frac{d\sqrt{}\right.\right.$$

ODE No. 1304

$$x^3y''(x)+xy'(x)+(-2x-3)y(x)=0$$

✓ **Mathematica** : cpu = 0.0491631 (sec), leaf count = 50

```
DSolve[(-3 - 2*x)*y[x] + x*Derivative[1][y][x] + x^3*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2\left(e^{\frac{1}{x}}\text{Ei}\left(-\frac{1}{x}\right)+2x^3-x^2+x\right)}{6x}+\frac{c_1e^{\frac{1}{x}}}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.031 (sec), leaf count = 38

```
dsolve(x^3*diff(diff(y(x),x),x)+x*diff(y(x),x)-(2*x+3)*y(x)=0,y(x))
```

$$y(x)=\frac{\text{expIntegral}\left(1,\frac{1}{x}\right)\mathrm{e}^{\frac{1}{x}}c_2+c_1\mathrm{e}^{\frac{1}{x}}-2\left(x^2-\frac{1}{2}x+\frac{1}{2}\right)c_2x}{x}$$

ODE No. 1305

$$x^3 y''(x) + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0748979 (sec), leaf count = 47

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + x^3*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 G_{1,2}^{2,0}\left(-\frac{2}{x}\middle| \begin{matrix} \frac{1}{2} \\ -1, 0 \end{matrix}\right) + c_1 e^{\frac{1}{x}}\left(I_0\left(\frac{1}{x}\right) - I_1\left(\frac{1}{x}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 44

```
dsolve(x^3*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = \left(-c_2 \operatorname{BesselK}\left(1, -\frac{1}{x}\right) + c_2 \operatorname{BesselK}\left(0, -\frac{1}{x}\right) + c_1\left(\operatorname{BesselI}\left(0, \frac{1}{x}\right) - \operatorname{BesselI}\left(1, \frac{1}{x}\right)\right)\right) \mathrm{e}^{\frac{1}{x}}$$

ODE No. 1306

$$y(x)\left(ax^2+a+bx\right)+x^3y''(x)+x^2y'(x)=0$$

✗ **Mathematica** : cpu = 0.849996 (sec), leaf count = 0

```
DSolve[(a + b*x + a*x^2)*y[x] + x^2*Derivative[1][y][x] + x^3*Derivative[2][y][x] == 0,y[x],x
```

, DifferentialRoot result

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

✓ **Maple** : cpu = 0.143 (sec), leaf count = 69

```
dsolve(x^3*diff(diff(y(x),x),x)+x^2*diff(y(x),x)+(a*x^2+b*x+a)*y(x)=0,y(x))
```

$$y(x)=HD\left(0,8a+4b,0,8a-4b,\frac{1+x}{x-1}\right)\left(\left(\int\frac{1}{xHD\left(0,8a+4b,0,8a-4b,\frac{1+x}{x-1}\right)^2}dx\right)c_2+c_1\right)$$

ODE No. 1307

$$x^3y''(x)+(x+1)xy'(x)-2y(x)=0$$

✓ **Mathematica** : cpu = 0.101345 (sec), leaf count = 54

```
DSolve[-2*y[x] + x*(1 + x)*Derivative[1][y][x] + x^3*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1e^{\frac{1}{x}}(x+1)}{x}-\frac{c_2\left(e^{\frac{1}{x}}x\text{Ei}\left(-\frac{1}{x}\right)+e^{\frac{1}{x}}\text{Ei}\left(-\frac{1}{x}\right)+x\right)}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 36

```
dsolve(x^3*diff(diff(y(x),x),x)+x*(1+x)*diff(y(x),x)-2*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\mathrm{e}^{\frac{1}{x}}(1+x)\,\text{expIntegral}\left(1,\frac{1}{x}\right)+c_1(1+x)\,\mathrm{e}^{\frac{1}{x}}-xc_2}{x}$$

ODE No. 1308

$$x^3 y''(x) - x^2 y'(x) + x y(x) - \log^3(x) = 0$$

✓ **Mathematica** : cpu = 0.0129971 (sec), leaf count = 41

```
DSolve[-Log[x]^3 + x*y[x] - x^2*Derivative[1][y][x] + x^3*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{2\log^3(x) + 6\log^2(x) + 9\log(x) + 6}{8x} + c_1 x + c_2 x \log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 40

```
dsolve(x^3*diff(diff(y(x),x),x)-x^2*diff(y(x),x)+x*y(x)-ln(x)^3=0,y(x))
```

$$y(x) = \frac{2\ln(x)^3 + 6\ln(x)^2 + (8c_1 x^2 + 9)\ln(x) + 8x^2 c_2 + 6}{8x}$$

ODE No. 1309

$$x^3 y''(x) - \left(x^2 - 1\right) y'(x) + x y(x) = 0$$

✓ **Mathematica** : cpu = 0.086244 (sec), leaf count = 84

```
DSolve[x*y[x] - (-1 + x^2)*Derivative[1][y][x] + x^3*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 G_{1,2}^{2,0}\left(-\frac{1}{2x^2}\middle| \begin{matrix} 1 \\ -\frac{1}{2}, -\frac{1}{2} \end{matrix}\right) + \sqrt{2} c_1 e^{\frac{1}{4x^2}} x \left(\left(1 - \frac{1}{2x^2}\right) I_0\left(\frac{1}{4x^2}\right) + \frac{I_1\left(\frac{1}{4x^2}\right)}{2x^2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.089 (sec), leaf count = 85

```
dsolve(x^3*diff(diff(y(x),x),x)-(x^2-1)*diff(y(x),x)+x*y(x)=0,y(x))
```

$$y(x) = \frac{c_1 \mathrm{e}^{\frac{1}{4x^2}} \left(2\,\mathrm{BesselI}\left(0, \frac{1}{4x^2}\right) x^2 - \mathrm{BesselI}\left(0, \frac{1}{4x^2}\right) + \mathrm{BesselI}\left(1, \frac{1}{4x^2}\right)\right)}{x} + \frac{c_2 \mathrm{e}^{\frac{1}{4x^2}} \left(2\,\mathrm{BesselK}\left(0, -\frac{1}{4x^2}\right) x^2 - \mathrm{B}\right.}{}$$

ODE No. 1310

$$x^3y''(x)+3x^2y'(x)+xy(x)-1=0$$

✓ **Mathematica** : cpu = 0.008389 (sec), leaf count = 31

```
DSolve[-1 + x*y[x] + 3*x^2*Derivative[1][y][x] + x^3*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\log^2(x)}{2x}+\frac{c_1}{x}+\frac{c_2\log(x)}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.012 (sec), leaf count = 20

```
dsolve(x^3*diff(diff(y(x),x),x)+3*x^2*diff(y(x),x)+x*y(x)-1=0,y(x))
```

$$y(x)=\frac{c_1\ln(x)+\frac{\ln(x)^2}{2}+c_2}{x}$$

ODE No. 1311

$$-v(v+1)xy(x)+x\left(x^2+1\right)y''(x)+\left(2x^2+1\right)y'(x)=0$$

✓ **Mathematica** : cpu = 0.0909222 (sec), leaf count = 63

```
DSolve[-(v*(1 + v)*x*y[x]) + (1 + 2*x^2)*Derivative[1][y][x] + x*(1 + x^2)*Derivative[2][y][x
```

$$\left\{\left\{y(x)\to c_2 G^{2,0}_{2,2}\left(-x^2\middle|\begin{matrix}\frac{1-v}{2},\frac{v+2}{2}\\0,0\end{matrix}\right)+c_1\,{}_2F_1\left(\frac{v}{2}+\frac{1}{2},-\frac{v}{2};1;-x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.122 (sec), leaf count = 52

```
dsolve(x*(x^2+1)*diff(diff(y(x),x),x)+(2*x^2+1)*diff(y(x),x)-v*(v+1)*x*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{v}{2},\frac{1}{2}+\frac{v}{2}\right],\left[\frac{1}{2}\right],x^2+1\right)+c_2\sqrt{x^2+1}\,\text{hypergeom}\left(\left[1+\frac{v}{2},\frac{1}{2}-\frac{v}{2}\right],\left[\frac{3}{2}\right],x^2+1\right.$$

ODE No. 1312

$$x\left(x^2+1\right)y''(x)+2\left(x^2-1\right)y'(x)-2xy(x)=0$$

✓ **Mathematica** : cpu = 0.0163646 (sec), leaf count = 32

```
DSolve[-2*x*y[x] + 2*(-1 + x^2)*Derivative[1][y][x] + x*(1 + x^2)*Derivative[2][y][x] == 0,y[
```

$$\left\{\left\{y(x)\to \frac{c_1}{x^2+1}+\frac{c_2x^3}{3\left(x^2+1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 19

```
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))
```

$$y(x)=\frac{x^3c_2+c_1}{x^2+1}$$

ODE No. 1313

$$x(n-v)(n+v+1)y(x)+\left(2(n+1)x^2+2n+1\right)y'(x)+x\left(x^2+1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.149839 (sec), leaf count = 87

```
DSolve[(n - v)*(1 + n + v)*x*y[x] + (1 + 2*n + 2*(1 + n)*x^2)*Derivative[1][y][x] + x*(1 + x^
```

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(\frac{n}{2}-\frac{v}{2},\frac{n}{2}+\frac{v}{2}+\frac{1}{2};n+1;-x^2\right)+c_2x^{-2n}\,{}_2F_1\left(-\frac{n}{2}-\frac{v}{2},-\frac{n}{2}+\frac{v}{2}+\frac{1}{2};1-n;-x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.078 (sec), leaf count = 35

```
dsolve(x*(x^2+1)*diff(diff(y(x),x),x)+(2*(n+1)*x^2+2*n+1)*diff(y(x),x)-(v-n)*(v+n+1)*x*y(x)=0
```

$$y(x)=x^{-n}\left(\text{LegendreQ}\left(v,n,\sqrt{x^2+1}\right)c_2+\text{LegendreP}\left(v,n,\sqrt{x^2+1}\right)c_1\right)$$

ODE No. 1314

$$x(n-v-1)(n+v)y(x)-\left(2(n-1)x^2+2n-1\right)y'(x)+x\left(x^2+1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.137336 (sec), leaf count = 87

```
DSolve[(-1 + n - v)*(n + v)*x*y[x] - (-1 + 2*n + 2*(-1 + n)*x^2)*Derivative[1][y][x] + x*(1 +
```

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(-\frac{n}{2}-\frac{v}{2},-\frac{n}{2}+\frac{v}{2}+\frac{1}{2};1-n;-x^2\right)+c_2x^{2n}\,{}_2F_1\left(\frac{n}{2}-\frac{v}{2},\frac{n}{2}+\frac{v}{2}+\frac{1}{2};n+1;-x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 33

```
dsolve(x*(x^2+1)*diff(diff(y(x),x),x)-(2*(n-1)*x^2+2*n-1)*diff(y(x),x)+(v+n)*(-v+n-1)*x*y(x)=
```

$$y(x)=x^n\left(\text{LegendreQ}\left(v,n,\sqrt{x^2+1}\right)c_2+\text{LegendreP}\left(v,n,\sqrt{x^2+1}\right)c_1\right)$$

ODE No. 1315

$$ax^3y(x)+\left(x^2-1\right)xy''(x)+y'(x)=0$$

✓ **Mathematica** : cpu = 0.0186166 (sec), leaf count = 44

```
DSolve[a*x^3*y[x] + Derivative[1][y][x] + x*(-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cos\left(\sqrt{a}\sqrt{x^2-1}\right)+c_2\sin\left(\sqrt{a}\sqrt{x^2-1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 45

```
dsolve(x*(x^2-1)*diff(diff(y(x),x),x)+diff(y(x),x)+y(x)*a*x^3=0,y(x))
```

$$y(x)=c_1\sin\left(\frac{(x-1)(1+x)\sqrt{a}}{\sqrt{x^2-1}}\right)+c_2\cos\left(\frac{(x-1)(1+x)\sqrt{a}}{\sqrt{x^2-1}}\right)$$

ODE No. 1316

$$x\left(x^2-1\right)y''(x)+\left(x^2-1\right)y'(x)-xy(x)=0$$

✓ **Mathematica** : cpu = 0.06609 (sec), leaf count = 38

```
DSolve[-(x*y[x]) + (-1 + x^2)*Derivative[1][y][x] + x*(-1 + x^2)*Derivative[2][y][x] == 0,y[x
```

$$\left\{\left\{y(x)\to c_2 G^{2,0}_{2,2}\left(x^2\middle|\begin{matrix}\frac{1}{2},\frac{3}{2}\\ 0,0\end{matrix}\right)+\frac{2c_1E(x^2)}{\pi}\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 18

```
dsolve(x*(x^2-1)*diff(diff(y(x),x),x)+(x^2-1)*diff(y(x),x)-x*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{EllipticE}\left(x\right)+c_2(\text{EllipticCE}\left(x\right)-\text{EllipticCK}\left(x\right))$$

ODE No. 1317

$$x\left(x^2-1\right)y''(x)+\left(3x^2-1\right)y'(x)+xy(x)=0$$

✓ **Mathematica** : cpu = 0.0743607 (sec), leaf count = 38

```
DSolve[x*y[x] + (-1 + 3*x^2)*Derivative[1][y][x] + x*(-1 + x^2)*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\to c_2 G^{2,0}_{2,2}\left(x^2\middle|\begin{matrix}\frac{1}{2},\frac{1}{2}\\0,0\end{matrix}\right)+\frac{2c_1K(x^2)}{\pi}\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 13

```
dsolve(x*(x^2-1)*diff(diff(y(x),x),x)+(3*x^2-1)*diff(y(x),x)+x*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{EllipticK}\left(x\right)+c_2\,\text{EllipticCK}\left(x\right)$$

ODE No. 1318

$$\left(ax^2+b\right)y'(x)+cxy(x)+x\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.194653 (sec), leaf count = 172

```
DSolve[c*x*y[x] + (b + a*x^2)*Derivative[1][y][x] + x*(-1 + x^2)*Derivative[2][y][x] == 0,y[x
```

$$\left\{\left\{y(x)\to c_1\,{}_2F_1\left(\frac{a}{4}-\frac{1}{4}\sqrt{a^2-2a-4c+1}-\frac{1}{4},\frac{a}{4}+\frac{1}{4}\sqrt{a^2-2a-4c+1}-\frac{1}{4};\frac{1}{2}-\frac{b}{2};x^2\right)+i^{b+1}c_2x^{b+1}\,{}_2F_1\right.\right.$$

✓ **Maple** : cpu = 0.101 (sec), leaf count = 122

```
dsolve(x*(x^2-1)*diff(diff(y(x),x),x)+(a*x^2+b)*diff(y(x),x)+c*x*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{1}{4}+\frac{a}{4}+\frac{\sqrt{a^2-2a-4c+1}}{4},-\frac{1}{4}+\frac{a}{4}-\frac{\sqrt{a^2-2a-4c+1}}{4}\right],\left[-\frac{b}{2}+\frac{1}{2}\right],x^2\right)+$$

ODE No. 1319

$$x\left(x^2+2\right)y''(x)-y'(x)-6xy(x)=0$$

✓ **Mathematica** : cpu = 0.0462461 (sec), leaf count = 60

```
DSolve[-6*x*y[x] - Derivative[1][y][x] + x*(2 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1x^{3/2}\left(x^2+2\right)^{3/4}-\frac{c_2\left(x^2+2\right)^{3/4}\ {}_2F_1\left(-\frac{3}{4},\frac{7}{4};\frac{1}{4};-\frac{x^2}{2}\right)}{3\ 2^{3/4}}\right\}\right\}$$

✓ **Maple** : cpu = 0.09 (sec), leaf count = 31

```
dsolve(x*(x^2+2)*diff(diff(y(x),x),x)-diff(y(x),x)-6*x*y(x)=0,y(x))
```

$$y(x)=\left(x^2+2\right)^{\frac{3}{4}}\left(x^{\frac{3}{2}}c_1+\text{hypergeom}\left(\left[-\frac{3}{4},\frac{7}{4}\right],\left[\frac{1}{4}\right],-\frac{x^2}{2}\right)c_2\right)$$

ODE No. 1320

$$x\left(x^2-2\right)y''(x)+\left(x^2+4x+2\right)y(x)-\left(x^3+3x^2-2x-2\right)y'(x)=0$$

✓ **Mathematica** : cpu = 0.063869 (sec), leaf count = 21

```
DSolve[(2 + 4*x + x^2)*y[x] - (-2 - 2*x + 3*x^2 + x^3)*Derivative[1][y][x] + x*(-2 + x^2)*Der
```

$$\{\{y(x)\to c_1e^xx^2+c_2(x-1)\}\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 17

```
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))
```

$$y(x)=c_1(x-1)+c_2\mathrm{e}^xx^2$$

ODE No. 1321

$$(x+1)x^2y''(x)-(2x+1)xy'(x)+(2x+1)y(x)=0$$

✓ **Mathematica** : cpu = 0.0185286 (sec), leaf count = 18

```
DSolve[(1 + 2*x)*y[x] - x*(1 + 2*x)*Derivative[1][y][x] + x^2*(1 + x)*Derivative[2][y][x] ==
```

$$\{\{y(x)\to c_1x+c_2x(x+\log(x))\}\}$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 15

```
dsolve(x^2*(1+x)*diff(diff(y(x),x),x)-x*(2*x+1)*diff(y(x),x)+(2*x+1)*y(x)=0,y(x))
```

$$y(x)=x(c_2\ln(x)+xc_2+c_1)$$

ODE No. 1322

$$(x+1)x^2y''(x)+2(3x+2)xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0366021 (sec), leaf count = 44

```
DSolve[2*x*(2 + 3*x)*Derivative[1][y][x] + x^2*(1 + x)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\left(-\frac{1}{3x^3}+\frac{1}{x^2}-\frac{3}{x}-\frac{1}{x+1}-4\log(x)+4\log(x+1)\right)+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 44

```
dsolve(x^2*(1+x)*diff(diff(y(x),x),x)+2*x*(3*x+2)*diff(y(x),x)=0,y(x))
```

$$y(x)=c_1+\left(-4\ln(x)+4\ln(1+x)-\frac{12x^3+6x^2-2x+1}{3(1+x)x^3}\right)c_2$$

ODE No. 1323

$$y''(x) = \frac{2(x+1)y(x)}{(x-1)x} - \frac{2(x-2)y'(x)}{(x-1)x}$$

✗ **Mathematica** : cpu = 0.671548 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == (2*(1 + x)*y[x])/((-1 + x)*x) - (2*(-2 + x)*Derivative[1][y][x]
```

, DifferentialRoot result

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

✓ **Maple** : cpu = 0.015 (sec), leaf count = 17

```
dsolve(diff(diff(y(x),x),x) = -2/x*(x-2)/(x-1)*diff(y(x),x)+2/x^2*(1+x)/(x-1)*y(x),y(x))
```

$$y(x) = \frac{c_1 + c_2(x-1)^3}{x^2}$$

ODE No. 1324

$$y''(x) = \frac{(5x-4)y'(x)}{(x-1)x} - \frac{(9x-6)y(x)}{(x-1)x^2}$$

✓ **Mathematica** : cpu = 0.0203757 (sec), leaf count = 25

```
DSolve[Derivative[2][y][x] == -(((-6 + 9*x)*y[x])/((-1 + x)*x^2)) + ((-4 + 5*x)*Derivative[1]
```

$$\{\{y(x) \to c_1 x^3 - c_2 x^2 (x \log(x) + 1)\}\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 18

```
dsolve(diff(diff(y(x),x),x) = 1/x*(5*x-4)/(x-1)*diff(y(x),x)-(9*x-6)/x^2/(x-1)*y(x),y(x))
```

$$y(x) = x^2(\ln(x)\, c_2 x + c_1 x + c_2)$$

ODE No. 1325

$$y''(x) = -\frac{y(x)(abx - \alpha\beta)}{(x-1)x^2} - \frac{y'(x)(x(a+b+1)+\alpha+\beta-1)}{(x-1)x}$$

✓ **Mathematica** : cpu = 0.179876 (sec), leaf count = 52

```
DSolve[Derivative[2][y][x] == -(((-(alpha*beta) + a*b*x)*y[x])/((-1 + x)*x^2)) - ((-1 + alpha
```

$$\{\{y(x) \to (-1)^{\alpha} c_1 x^{\alpha}\, {}_2F_1(a+\alpha, \alpha+b; \alpha-\beta+1; x) + (-1)^{\beta} c_2 x^{\beta}\, {}_2F_1(a+\beta, b+\beta; -\alpha+\beta+1; x)\}\}$$

✓ **Maple** : cpu = 0.107 (sec), leaf count = 86

```
dsolve(diff(diff(y(x),x),x) = -((a+b+1)*x+alpha+beta-1)/x/(x-1)*diff(y(x),x)-(a*b*x-alpha*bet
```

$$y(x) = (x-1)^{1-a-\alpha-b-\beta} \left(x^{\alpha}\, \text{hypergeom}\left([1-b-\beta, 1-a-\beta], [1-\beta+\alpha], x\right) c_1 + x^{\beta}\, \text{hypergeom}\left([1-\alpha\right.\right.$$

ODE No. 1326

$$y''(x) = -\frac{y'(x)}{x+1} - \frac{y(x)}{x(x+1)^2}$$

✓ **Mathematica** : cpu = 0.0176472 (sec), leaf count = 29

```
DSolve[Derivative[2][y][x] == -(y[x]/(x*(1 + x)^2)) - Derivative[1][y][x]/(1 + x),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1 x}{x+1} + \frac{c_2(x\log(x)-1)}{x+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 22

```
dsolve(diff(diff(y(x),x),x) = -1/(1+x)*diff(y(x),x)-1/x/(1+x)^2*y(x),y(x))
```

$$y(x) = \frac{\ln(x)\, c_2 x + c_1 x - c_2}{1+x}$$

ODE No. 1327

$$y''(x) = \frac{2y'(x)}{(x-2)x} - \frac{y(x)}{(x-2)x^2}$$

✓ **Mathematica** : cpu = 0.126153 (sec), leaf count = 104

```
DSolve[Derivative[2][y][x] == -(y[x]/((-2 + x)*x^2)) + (2*Derivative[1][y][x])/((-2 + x)*x),y
```

$$\left\{\left\{y(x) \to \left(-\frac{1}{2}\right)^{-\frac{1}{\sqrt{2}}} c_1 x^{-\frac{1}{\sqrt{2}}} {}_2F_1\left(-\frac{1}{\sqrt{2}}, -1-\frac{1}{\sqrt{2}}; 1-\sqrt{2}; \frac{x}{2}\right) + \left(-\frac{1}{2}\right)^{\frac{1}{\sqrt{2}}} c_2 x^{\frac{1}{\sqrt{2}}} {}_2F_1\left(\frac{1}{\sqrt{2}}, -1+\frac{1}{\sqrt{2}}; 1-\right.\right.$$

✓ **Maple** : cpu = 0.472 (sec), leaf count = 81

```
dsolve(diff(diff(y(x),x),x) = 2/x/(x-2)*diff(y(x),x)-1/x^2/(x-2)*y(x),y(x))
```

$$y(x) = (x-2)^2 \left(c_1 \operatorname{hypergeom}\left(\left[2-\frac{\sqrt{2}}{2}, 1-\frac{\sqrt{2}}{2}\right], \left[1-\sqrt{2}\right], \frac{x}{2}\right) x^{-\frac{\sqrt{2}}{2}} + c_2 \operatorname{hypergeom}\left(\left[2+\frac{\sqrt{2}}{2}, 1+\right.\right.$$

ODE No. 1328

$$y''(x) = \frac{2y(x)}{(x-1)^2 x}$$

✓ **Mathematica** : cpu = 0.0156954 (sec), leaf count = 36

```
DSolve[Derivative[2][y][x] == (2*y[x])/((-1 + x)^2*x),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2(-x^2 + 2x\log(x) + 1)}{x-1} - \frac{c_1 x}{x-1}\right\}\right\}$$

✓ **Maple** : cpu = 0.022 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x) = 2/x/(x-1)^2*y(x),y(x))
```

$$y(x) = \frac{2\ln(x)\, c_2 x - x^2 c_2 + c_1 x + c_2}{x-1}$$

ODE No. 1329

$$y''(x) = -\frac{y'(x)\left(-x(a(\delta+\text{gamma1})+\alpha+\beta-\delta+1)+a\text{gamma1}+x^2(\alpha+\beta+1)\right)}{(x-1)x(x-a)} - \frac{y(x)(\alpha\beta x-q)}{(x-1)x(x-a)}$$

✓ **Mathematica** : cpu = 0.591775 (sec), leaf count = 67

```
DSolve[Derivative[2][y][x] == -(((-q + alpha*beta*x)*y[x])/((-1 + x)*x*(-a + x))) - ((a*gamma
```

$$\{\{y(x) \to c_2 x^{1-\text{gamma1}}\text{HeunG}[a, q-(\text{gamma1}-1)((a-1)\delta+\alpha+\beta-\text{gamma1}+1), \beta-\text{gamma1}+1, \alpha$$

✓ **Maple** : cpu = 0.243 (sec), leaf count = 64

```
dsolve(diff(diff(y(x),x),x) = -((alpha+beta+1)*x^2-(alpha+beta+1+a*(gamma1+delta)-delta)*x+a*
```

$$y(x) = c_1 HG(a,q,\alpha,\beta,\gamma1,\delta,x)+c_2 x^{1-\gamma1} HG(a, q-(-1+\gamma1)(\delta(a-1)+\alpha+\beta-\gamma1+1), \beta+1-\gamma1, \alpha -$$

ODE No. 1330

$$y''(x) = -\frac{y'(x)\,(Ax^2+Bx+C)}{(x-a)(x-b)(x-c)} - \frac{(\mathrm{DD}x+e)y(x)}{(x-a)(x-b)(x-c)}$$

✓ **Mathematica** : cpu = 3.25431 (sec), leaf count = 1176

```
DSolve[Derivative[2][y][x] == -(((E + DD*x)*y[x])/((-a + x)*(-b + x)*(-c + x))) - ((C + B*x +
```

$$\left\{\left\{y(x) \to c_2 \mathrm{HeunG}\left[\frac{a-c}{a-b}, \frac{A^2ba^4+B^2a^3+A(b^2-ab+(a+b)B+2C)\,a^3+(a-b)^2(a\mathrm{DD}+e)a^2-2(a\right.\right.\right.$$

✓ **Maple** : cpu = 0.816 (sec), leaf count = 1147

```
dsolve(diff(diff(y(x),x),x) = -(A*x^2+B*x+C)/(x-a)/(x-b)/(x-c)*diff(y(x),x)-(DD*x+E)/(x-a)/(x
```

$$y(x) = c_1 HG\left(\frac{a-c}{a-b}, \frac{DDa+E}{a-b}, \frac{A}{2}-\frac{1}{2}+\frac{\sqrt{A^2-2A-4DD+1}}{2}, \frac{(A(b-c)\,a-Abc-Bc-C)\sqrt{A^2-2A}}{2\,(b-c)\,(a-c}\right.$$

ODE No. 1331

$$y''(x) = \frac{(x-4)y'(x)}{2(x-2)x} - \frac{(x-3)y(x)}{2(x-2)x^2}$$

✓ **Mathematica** : cpu = 0.0314324 (sec), leaf count = 55

```
DSolve[Derivative[2][y][x] == -1/2*((-3 + x)*y[x])/((-2 + x)*x^2) + ((-4 + x)*Derivative[1][y
```

$$\left\{\left\{y(x) \to \frac{c_1 \sqrt[4]{x-2}\sqrt{x}}{\sqrt[4]{2-x}} + \frac{2c_2(x-2)^{3/4}\sqrt{x}}{\sqrt[4]{2-x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 19

```
dsolve(diff(diff(y(x),x),x) = 1/2/x*(x-4)/(x-2)*diff(y(x),x)-1/2*(x-3)/x^2/(x-2)*y(x),y(x))
```

$$y(x) = c_1\sqrt{x} + c_2\sqrt{x\,(x-2)}$$

ODE No. 1332

$$y''(x) = \frac{y'(x)}{x+1} - \frac{(3x+1)y(x)}{4x^2(x+1)}$$

✓ **Mathematica** : cpu = 0.01802 (sec), leaf count = 26

```
DSolve[Derivative[2][y][x] == -1/4*((1 + 3*x)*y[x])/(x^2*(1 + x)) + Derivative[1][y][x]/(1 +
```

$$\{\{y(x) \to c_1\sqrt{x} + c_2\sqrt{x}(x + \log(x))\}\}$$

✓ **Maple** : cpu = 0.015 (sec), leaf count = 17

```
dsolve(diff(diff(y(x),x),x) = 1/(1+x)*diff(y(x),x)-1/4*(3*x+1)/x^2/(1+x)*y(x),y(x))
```

$$y(x) = \sqrt{x}\,(c_2 \ln(x) + xc_2 + c_1)$$

ODE No. 1333

$$y''(x) = \frac{v(v+1)y(x)}{4x^2} - \frac{(3x-1)y'(x)}{2(x-1)x}$$

✓ **Mathematica** : cpu = 0.0763024 (sec), leaf count = 70

```
DSolve[Derivative[2][y][x] == (v*(1 + v)*y[x])/(4*x^2) - ((-1 + 3*x)*Derivative[1][y][x])/(2*
```

$$\left\{\left\{y(x) \to c_1 i^{-v} x^{-v/2}\, {}_2F_1\left(\frac{1}{2}, -v; \frac{1}{2} - v; x\right) + c_2 i^{v+1} x^{\frac{v+1}{2}}\, {}_2F_1\left(\frac{1}{2}, v+1; v+\frac{3}{2}; x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 45

```
dsolve(diff(diff(y(x),x),x) = -1/2/x*(3*x-1)/(x-1)*diff(y(x),x)+1/4*v*(v+1)/x^2*y(x),y(x))
```

$$y(x) = c_1 x^{-\frac{v}{2}}\, \text{hypergeom}\left(\left[\frac{1}{2}, -v\right], \left[\frac{1}{2} - v\right], x\right) + c_2 x^{\frac{1}{2}+\frac{v}{2}}\, \text{hypergeom}\left(\left[\frac{1}{2}, v+1\right], \left[\frac{3}{2} + v\right], x\right)$$

ODE No. 1334

$$y''(x) = -\frac{y(x)\left(x(a^2-b^2)+c^2\right)}{4(x-1)x^2} - \frac{((a+1)x-1)y'(x)}{(x-1)x}$$

✓ **Mathematica** : cpu = 0.147618 (sec), leaf count = 114

```
DSolve[Derivative[2][y][x] == -1/4*((c^2 + (a^2 - b^2)*x)*y[x])/((-1 + x)*x^2) - ((-1 + (1 +
```

$$\left\{\left\{y(x) \to i^{-c}c_1 x^{-c/2}\,{}_2F_1\left(\frac{a}{2}-\frac{b}{2}-\frac{c}{2},\frac{a}{2}+\frac{b}{2}-\frac{c}{2};1-c;x\right) + i^{c}c_2 x^{c/2}\,{}_2F_1\left(\frac{a}{2}-\frac{b}{2}+\frac{c}{2},\frac{a}{2}+\frac{b}{2}+\frac{c}{2};c+1;\right.\right.$$

✓ **Maple** : cpu = 0.072 (sec), leaf count = 89

```
dsolve(diff(diff(y(x),x),x) = -((a+1)*x-1)/x/(x-1)*diff(y(x),x)-1/4*((a^2-b^2)*x+c^2)/x^2/(x-
```

$$y(x) = (x-1)^{1-a}\left(x^{-\frac{c}{2}}\,\text{hypergeom}\left(\left[-\frac{a}{2}-\frac{b}{2}-\frac{c}{2}+1,-\frac{a}{2}+\frac{b}{2}-\frac{c}{2}+1\right],[-c+1],x\right)c_2 + x^{\frac{c}{2}}\,\text{hypergeo}$$

ODE No. 1335

$$y''(x) = -\frac{y(x)(ax+b)}{4(x-1)^2 x} - \frac{(3x-1)y'(x)}{2(x-1)x}$$

✓ **Mathematica** : cpu = 0.22539 (sec), leaf count = 893

```
DSolve[Derivative[2][y][x] == -1/4*((b + a*x)*y[x])/((-1 + x)^2*x) - ((-1 + 3*x)*Derivative[1
```

$$\left\{\left\{y(x) \to e^{\frac{1}{4}(-2\log(1-x)-\log(x))}\sqrt[4]{x}c_1\,{}_2F_1\left(\frac{1}{4}\left(\sqrt{-8a-4b-4\sqrt{4a^2+4ba-a-b}+1}+1\right), \frac{(-8a-4b-4}{}\right.\right.$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 57

```
dsolve(diff(diff(y(x),x),x) = -1/2/x*(3*x-1)/(x-1)*diff(y(x),x)-1/4*(a*x+b)/x/(x-1)^2*y(x),y(
```

$$y(x) = c_1 \,\text{LegendreP}\left(\frac{\sqrt{1-4a}}{2} - \frac{1}{2}, \sqrt{-a-b}, \sqrt{x}\right) + c_2 \,\text{LegendreQ}\left(\frac{\sqrt{1-4a}}{2} - \frac{1}{2}, \sqrt{-a-b}, \sqrt{x}\right)$$

ODE No. 1336

$$y''(x) = -\frac{(1-3x)y(x)}{(x-1)(2x-1)^2}$$

✓ **Mathematica** : cpu = 0.037068 (sec), leaf count = 70

```
DSolve[Derivative[2][y][x] == -(((1 - 3*x)*y[x])/((-1 + x)*(-1 + 2*x)^2)),y[x],x]
```

$$\{\{y(x) \to c_2\sqrt{1-2x}(2x\log(2(x-1)+1) - 2\log(2(x-1)+1) - 2x\log(x-1) + 2\log(x-1) - 1) - c_1\sqrt$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 42

```
dsolve(diff(diff(y(x),x),x) = -(-3*x+1)/(x-1)/(2*x-1)^2*y(x),y(x))
```

$$y(x) = (-2c_2(x-1)\ln(2x-1) + 2c_2(x-1)\ln(x-1) + c_1x - c_1 + c_2)\sqrt{2x-1}$$

ODE No. 1337

$$y''(x) = -\frac{(a+2b+3x)y'(x)}{2(a+x)(b+x)} - \frac{(a-b)y(x)}{4(a+x)^2(b+x)}$$

✓ **Mathematica** : cpu = 0.0552439 (sec), leaf count = 62

```
DSolve[Derivative[2][y][x] == -1/4*((a - b)*y[x])/((a + x)^2*(b + x)) - ((a + 2*b + 3*x)*Deri
```

$$\left\{\left\{y(x) \to \frac{c_1}{\sqrt{\frac{b+x}{a-b}+1}} + \frac{c_2\sqrt{b+x}}{\sqrt{a-b}\sqrt{\frac{b+x}{a-b}+1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x) = -1/2/(x+a)*(3*x+a+2*b)/(x+b)*diff(y(x),x)-1/4*(a-b)/(x+a)^2/(x+
```

$$y(x) = \frac{\sqrt{x+b}\,c_1 + c_2}{\sqrt{\frac{x+a}{a-b}}}$$

ODE No. 1338

$$y''(x) = \frac{y(x)}{3(x-2)x^2} + \frac{(6x-1)y'(x)}{3(x-2)x}$$

✓ **Mathematica** : cpu = 0.0394114 (sec), leaf count = 40

```
DSolve[Derivative[2][y][x] == y[x]/(3*(-2 + x)*x^2) + ((-1 + 6*x)*Derivative[1][y][x])/(3*(-2
```

$$\left\{\left\{y(x) \to \frac{3}{935}c_2 x\left(18x^2 - 102x + 187\right) + c_1 \sqrt[6]{x}(2-x)^{17/6}\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x) = 1/3/x*(6*x-1)/(x-2)*diff(y(x),x)+1/3/x^2/(x-2)*y(x),y(x))
```

$$y(x) = c_2(x-2)^{\frac{17}{6}} x^{\frac{1}{6}} + 18\left(x^2 - \frac{17}{3}x + \frac{187}{18}\right)c_1 x$$

ODE No. 1339

$$y''(x) = -\frac{y'(x)\left(a(b+2)x^2 + x(c-d+1)\right)}{x^2(ax+1)} - \frac{y(x)(abx-cd)}{x^2(ax+1)}$$

✓ **Mathematica** : cpu = 0.180147 (sec), leaf count = 66

```
DSolve[Derivative[2][y][x] == -(((-(c*d) + a*b*x)*y[x])/(x^2*(1 + a*x))) - (((1 + c - d)*x +
```

$$\left\{\left\{y(x) \to c_1 a^{-c} x^{-c}\, {}_2F_1(1-c, b-c; -c-d+1; -ax) + c_2 a^d x^d\, {}_2F_1(d+1, b+d; c+d+1; -ax)\right\}\right\}$$

✓ **Maple** : cpu = 0.111 (sec), leaf count = 76

```
dsolve(diff(diff(y(x),x),x) = -(a*(b+2)*x^2+(c-d+1)*x)/(a*x+1)/x^2*diff(y(x),x)-(a*b*x-c*d)/(
```

$$y(x) = (ax+1)^{-b+c-d}\left(\text{hypergeom}\left([c, 1-b+c], [1+d+c], -ax\right) x^d c_1 + \text{hypergeom}\left([-d, 1-b-d], [1-\right.\right.$$

ODE No. 1340

$$y''(x) = \frac{2(ax+2b)y'(x)}{x(ax+b)} - \frac{y(x)(2ax+6b)}{x^2(ax+b)}$$

✓ **Mathematica** : cpu = 0.0246461 (sec), leaf count = 32

```
DSolve[Derivative[2][y][x] == -(((6*b + 2*a*x)*y[x])/(x^2*(b + a*x))) + (2*(2*b + a*x)*Deriva
```

$$\left\{\left\{y(x) \to \frac{c_2 x^3}{ax+b} + \frac{c_1 x^2}{ax+b}\right\}\right\}$$

✓ **Maple** : cpu = 0.022 (sec), leaf count = 20

```
dsolve(diff(diff(y(x),x),x) = 2/x*(a*x+2*b)/(a*x+b)*diff(y(x),x)-(2*a*x+6*b)/(a*x+b)/x^2*y(x)
```

$$y(x) = \frac{x^2(xc_2 + c_1)}{ax+b}$$

ODE No. 1341

$$y''(x) = -\frac{y(x)(avx-b)}{x^2(ax+b)} - \frac{(2ax+b)y'(x)}{x(ax+b)} + Ax$$

✓ **Mathematica** : cpu = 61.5978 (sec), leaf count = 2924

```
DSolve[Derivative[2][y][x] == A*x - ((-b + a*v*x)*y[x])/(x^2*(b + a*x)) - ((b + 2*a*x)*Deriva
```

$$\left\{\left\{y(x) \to \frac{axc_1\,{}_2F_1\left(\frac{3}{2}-\frac{1}{2}\sqrt{1-4v},\frac{1}{2}\sqrt{1-4v}+\frac{3}{2};3;-\frac{ax}{b}\right)}{b} + c_2 G^{2,0}_{2,2}\left(-\frac{ax}{b}\middle|\begin{matrix}\frac{1}{2}\left(1-\sqrt{1-4v}\right),\frac{1}{2}\left(\sqrt{1-4v}\right.\\ -1,1\end{matrix}\right.\right.$$

✓ **Maple** : cpu = 0.15 (sec), leaf count = 201

```
dsolve(diff(diff(y(x),x),x) = -1/x*(2*a*x+b)/(a*x+b)*diff(y(x),x)-(a*v*x-b)/(a*x+b)/x^2*y(x)+
```

$$y(x) = \frac{x^{-\frac{1}{2}+\frac{\sqrt{1-4v}}{2}} a^2 c_2 (v+6)(v+2)(v+12)\,\text{hypergeom}\left(\left[\frac{3}{2}-\frac{\sqrt{1-4v}}{2},-\frac{1}{2}-\frac{\sqrt{1-4v}}{2}\right],\left[1-\sqrt{1-4v}\right],-\frac{b}{xa}\right)}{}$$

ODE No. 1342

$$y''(x) = -\frac{a y(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.081132 (sec), leaf count = 52

```
DSolve[Derivative[2][y][x] == -((a*y[x])/x^4),y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x e^{\frac{i\sqrt{a}}{x}} - \frac{i c_2 x e^{-\frac{i\sqrt{a}}{x}}}{2\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 31

```
dsolve(diff(diff(y(x),x),x) = -a/x^4*y(x),y(x))
```

$$y(x) = x\left(\cosh\left(\frac{\sqrt{-a}}{x}\right) c_2 + \sinh\left(\frac{\sqrt{-a}}{x}\right) c_1\right)$$

ODE No. 1343

$$y''(x) = -\frac{y(x)\left((1-a)ax^2 - b(b+x)\right)}{x^4}$$

✓ **Mathematica** : cpu = 0.162695 (sec), leaf count = 73

```
DSolve[Derivative[2][y][x] == -((((1 - a)*a*x^2 - b*(b + x))*y[x])/x^4),y[x],x]
```

$$\left\{\left\{y(x) \to c_1\left(2\left(ax+\frac{b}{2}\right)I_a\left(\frac{b}{x}\right) + bI_{a+1}\left(\frac{b}{x}\right)\right) + c_2\left(2\left(ax+\frac{b}{2}\right)K_a\left(\frac{b}{x}\right) - bK_{a+1}\left(\frac{b}{x}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.086 (sec), leaf count = 58

```
dsolve(diff(diff(y(x),x),x) = -(x^2*a*(1-a)-b*(x+b))/x^4*y(x),y(x))
```

$$y(x) = \text{BesselI}\left(a+1, \frac{b}{x}\right)c_1 b - \text{BesselK}\left(a+1, \frac{b}{x}\right)c_2 b + 2\left(c_1\,\text{BesselI}\left(a, \frac{b}{x}\right) + c_2\,\text{BesselK}\left(a, \frac{b}{x}\right)\right)\left(ax -\right.$$

ODE No. 1344

$$y''(x) = -\frac{\left(e^{2/x} - v^2\right) y(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.442009 (sec), leaf count = 173

```
DSolve[Derivative[2][y][x] == -(((E^(2/x) - v^2)*y[x])/x^4),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1 2^{v+\frac{v+1}{2}} \left(e^{2/x}\right)^{\frac{v+1}{2}-\frac{1}{2}} \left(-e^{2/x}\right)^{\frac{1}{2}(-v-1)+\frac{1}{2}} I_v\left(\sqrt{-e^{2/x}}\right)}{\log\left(e^{2/x}\right)} + \frac{c_2(-1)^{-v}2^{v+\frac{v+1}{2}} \left(e^{2/x}\right)^{\frac{v+1}{2}-\frac{1}{2}} \left(-e^{2/x}\right)^{\frac{1}{2}(-v-1)+\frac{1}{2}} I_{-v}\left(\sqrt{-e^{2/x}}\right)}{\log\left(e^{2/x}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.06 (sec), leaf count = 23

```
dsolve(diff(diff(y(x),x),x) = -(exp(2/x)-v^2)/x^4*y(x),y(x))
```

$$y(x) = x\left(\text{BesselY}\left(v, \mathrm{e}^{\frac{1}{x}}\right) c_2 + \text{BesselJ}\left(v, \mathrm{e}^{\frac{1}{x}}\right) c_1\right)$$

ODE No. 1345

$$y''(x) = \frac{2y(x)}{x^4} - \frac{y'(x)}{x^3}$$

✓ **Mathematica** : cpu = 0.049563 (sec), leaf count = 52

```
DSolve[Derivative[2][y][x] == (2*y[x])/x^4 - Derivative[1][y][x]/x^3,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{\frac{1}{2x^2}} x - \sqrt{\frac{\pi}{2}} c_2 e^{\frac{1}{2x^2}} x \text{erf}\left(\frac{1}{\sqrt{2}x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 25

```
dsolve(diff(diff(y(x),x),x) = -1/x^3*diff(y(x),x)+2/x^4*y(x),y(x))
```

$$y(x) = x\,\mathrm{e}^{\frac{1}{2x^2}}\left(\mathrm{erf}\left(\frac{\sqrt{2}}{2x}\right)c_2 + c_1\right)$$

ODE No. 1346

$$y''(x) = \frac{(a+b)y'(x)}{x^2} - \frac{y(x)(x(a+b)+ab)}{x^4}$$

✓ **Mathematica** : cpu = 0.082218 (sec), leaf count = 37

```
DSolve[Derivative[2][y][x] == -(((a*b + (a + b)*x)*y[x])/x^4) + ((a + b)*Derivative[1][y][x])
```

$$\left\{\left\{y(x) \to \frac{c_2 x e^{-\frac{a}{x}}}{a-b} + c_1 x e^{-\frac{b}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.05 (sec), leaf count = 25

```
dsolve(diff(diff(y(x),x),x) = 1/x^2*(a+b)*diff(y(x),x)-((a+b)*x+a*b)/x^4*y(x),y(x))
```

$$y(x) = x\left(e^{-\frac{b}{x}} c_2 + e^{-\frac{a}{x}} c_1\right)$$

ODE No. 1347

$$y''(x) = -\frac{y(x)}{x^4} - \frac{y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.077891 (sec), leaf count = 31

```
DSolve[Derivative[2][y][x] == -(y[x]/x^4) - Derivative[1][y][x]/x,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 J_0\left(\frac{1}{x}\right) + \frac{c_1 K_0\left(\frac{i}{x}\right)}{\sqrt{\pi}}\right\}\right\}$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 19

```
dsolve(diff(diff(y(x),x),x) = -1/x*diff(y(x),x)-1/x^4*y(x),y(x))
```

$$y(x) = c_1 \,\text{BesselJ}\left(0, \frac{1}{x}\right) + c_2 \,\text{BesselY}\left(0, \frac{1}{x}\right)$$

ODE No. 1348

$$y''(x) = -\frac{y(x)\left(a(x^4+1)+bx^2\right)}{x^4} - \frac{y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.337471 (sec), leaf count = 34

```
DSolve[Derivative[2][y][x] == -(((b*x^2 + a*(1 + x^4))*y[x])/x^4) - Derivative[1][y][x]/x,y[x
```

$$\{\{y(x) \to c_1 \text{MathieuC}[-b, a, i\log(x)] + c_2 \text{MathieuS}[-b, a, i\log(x)]\}\}$$

✓ **Maple** : cpu = 0.188 (sec), leaf count = 73

```
dsolve(diff(diff(y(x),x),x) = -1/x*diff(y(x),x)-(b*x^2+a*(x^4+1))/x^4*y(x),y(x))
```

$$y(x) = HD\left(0, 2a+b, 0, 2a-b, \frac{x^2+1}{x^2-1}\right)\left(\left(\int \frac{1}{xHD\left(0, 2a+b, 0, 2a-b, \frac{x^2+1}{x^2-1}\right)^2} dx\right) c_2 + c_1\right)$$

ODE No. 1349

$$y''(x) = -\frac{y(x)}{x^4} - \frac{(x^2+1)\,y'(x)}{x^3}$$

✓ **Mathematica** : cpu = 0.0938821 (sec), leaf count = 76

```
DSolve[Derivative[2][y][x] == -(y[x]/x^4) - ((1 + x^2)*Derivative[1][y][x])/x^3,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 G^{2,0}_{1,2}\left(-\frac{1}{2x^2}\middle|\begin{matrix}\frac{3}{2}\\ 0,0\end{matrix}\right) + c_1 e^{\frac{1}{4x^2}}\left(\left(1-\frac{1}{2x^2}\right) I_0\left(\frac{1}{4x^2}\right) + \frac{I_1\left(\frac{1}{4x^2}\right)}{2x^2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.067 (sec), leaf count = 85

```
dsolve(diff(diff(y(x),x),x) = -(x^2+1)/x^3*diff(y(x),x)-1/x^4*y(x),y(x))
```

$$y(x) = \frac{c_1 \mathrm{e}^{\frac{1}{4x^2}}\left(2\,\mathrm{BesselI}\left(0,\frac{1}{4x^2}\right)x^2 - \mathrm{BesselI}\left(0,\frac{1}{4x^2}\right) + \mathrm{BesselI}\left(1,\frac{1}{4x^2}\right)\right)}{x^2} + \frac{c_2 \mathrm{e}^{\frac{1}{4x^2}}\left(2\,\mathrm{BesselK}\left(0,-\frac{1}{4x^2}\right)x^2 - \mathrm{B}\right.}{}$$

ODE No. 1350

$$y''(x) = -\frac{a^2 y(x)}{x^4} - \frac{2y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0072914 (sec), leaf count = 25

```
DSolve[Derivative[2][y][x] == -((a^2*y[x])/x^4) - (2*Derivative[1][y][x])/x,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \cos\left(\frac{a}{x}\right) - c_2 \sin\left(\frac{a}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.011 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x) = -2/x*diff(y(x),x)-a^2/x^4*y(x),y(x))
```

$$y(x) = c_1 \sin\left(\frac{a}{x}\right) + c_2 \cos\left(\frac{a}{x}\right)$$

ODE No. 1351

$$y''(x) = \frac{y(x)}{x^4} - \frac{(2x^2+1)\,y'(x)}{x^3}$$

✓ **Mathematica** : cpu = 0.0426879 (sec), leaf count = 50

```
DSolve[Derivative[2][y][x] == y[x]/x^4 - ((1 + 2*x^2)*Derivative[1][y][x])/x^3,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{\frac{1}{2x^2}} - \sqrt{\frac{\pi}{2}} c_2 e^{\frac{1}{2x^2}} \operatorname{erf}\left(\frac{1}{\sqrt{2}x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (sec), leaf count = 24

```
dsolve(diff(diff(y(x),x),x) = -(2*x^2+1)/x^3*diff(y(x),x)+1/x^4*y(x),y(x))
```

$$y(x) = \mathrm{e}^{\frac{1}{2x^2}} \left(\operatorname{erf}\left(\frac{\sqrt{2}}{2x} \right) c_2 + c_1 \right)$$

ODE No. 1352

$$y''(x) = -\frac{2(a+x)y'(x)}{x^2} - \frac{by(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.0098702 (sec), leaf count = 89

```
DSolve[Derivative[2][y][x] == -((b*y[x])/x^4) - (2*(a + x)*Derivative[1][y][x])/x^2,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{-\frac{\sqrt{b}\left(-\frac{\sqrt{a^2-b}}{\sqrt{b}}-\frac{a}{\sqrt{b}}\right)}{x}} + c_2 e^{-\frac{\sqrt{b}\left(\frac{\sqrt{a^2-b}}{\sqrt{b}}-\frac{a}{\sqrt{b}}\right)}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 43

```
dsolve(diff(diff(y(x),x),x) = -2/x^2*(x+a)*diff(y(x),x)-b/x^4*y(x),y(x))
```

$$y(x) = c_1 \mathrm{e}^{\frac{-\sqrt{a^2-b}+a}{x}} + c_2 \mathrm{e}^{\frac{\sqrt{a^2-b}+a}{x}}$$

ODE No. 1353

$$y''(x) = \frac{(2x^2-1)\,y'(x)}{x^3} - \frac{y(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.731211 (sec), leaf count = 119

```
DSolve[Derivative[2][y][x] == -(y[x]/x^4) + ((-1 + 2*x^2)*Derivative[1][y][x])/x^3,y[x],x]
```

$$\left\{\left\{y(x) \to c_1\left(x^3+2x-\frac{1}{x}\right) - \frac{c_2\left(\sqrt{2\pi}x^4\operatorname{erfi}\left(\frac{1}{\sqrt{2}x}\right)+2\sqrt{2\pi}x^2\operatorname{erfi}\left(\frac{1}{\sqrt{2}x}\right)-\sqrt{2\pi}\operatorname{erfi}\left(\frac{1}{\sqrt{2}x}\right)+2e^{\frac{1}{2x^2}}x-2e^{\right.}\right.}{16x}\right.$$

✓ **Maple** : cpu = 0.217 (sec), leaf count = 66

```
dsolve(diff(diff(y(x),x),x) = 1/x^3*(2*x^2-1)*diff(y(x),x)-1/x^4*y(x),y(x))
```

$$y(x) = \frac{c_1\sqrt{2}\,\sqrt{\pi}\,(x^4+2x^2-1)\operatorname{erfi}\left(\frac{\sqrt{2}}{2x}\right)+(-2x^3c_1+2c_1x)\,\mathrm{e}^{\frac{1}{2x^2}}+c_2(x^4+2x^2-1)}{x}$$

ODE No. 1354

$$y''(x) = \frac{(2x^2-1)\,y'(x)}{x^3} - \frac{2y(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.212802 (sec), leaf count = 108

```
DSolve[Derivative[2][y][x] == (-2*y[x])/x^4 + ((-1 + 2*x^2)*Derivative[1][y][x])/x^3,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2\left(-5\sqrt{2\pi}x^2\text{erfi}\left(\frac{1}{\sqrt{2}x}\right) + \sqrt{2\pi}\text{erfi}\left(\frac{1}{\sqrt{2}x}\right) - 2e^{\frac{1}{2x^2}}x + 4e^{\frac{1}{2x^2}}x^5 + 8e^{\frac{1}{2x^2}}x^3\right)}{12x^2} + c_1\left(1 - \frac{1}{5x^2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.271 (sec), leaf count = 33

```
dsolve(diff(diff(y(x),x),x) = 1/x^3*(2*x^2-1)*diff(y(x),x)-2/x^4*y(x),y(x))
```

$$y(x) = \frac{c_2\,\text{hypergeom}\left(\left[-\frac{5}{2}\right],\left[-\frac{1}{2}\right],\frac{1}{2x^2}\right)x^5 + 5c_1x^2 - c_1}{x^2}$$

ODE No. 1355

$$y''(x) = \frac{xy(x)}{x^3+1} - \frac{(x^3-1)\,y'(x)}{x\,(x^3+1)}$$

✓ **Mathematica** : cpu = 0.247059 (sec), leaf count = 51

```
DSolve[Derivative[2][y][x] == (x*y[x])/(1 + x^3) - ((-1 + x^3)*Derivative[1][y][x])/(x*(1 + x
```

$$\left\{\left\{y(x) \to \frac{1}{2}c_2\sqrt[3]{x^3+1}x^2\,{}_2F_1\left(\frac{2}{3},\frac{4}{3};\frac{5}{3};-x^3\right) + c_1\sqrt[3]{x^3+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.101 (sec), leaf count = 30

```
dsolve(diff(diff(y(x),x),x) = -(x^3-1)/x/(x^3+1)*diff(y(x),x)+x/(x^3+1)*y(x),y(x))
```

$$y(x) = \left(x^3+1\right)^{\frac{1}{3}}\left(\text{hypergeom}\left(\left[\frac{2}{3},\frac{4}{3}\right],\left[\frac{5}{3}\right],-x^3\right)c_1x^2 + c_2\right)$$

ODE No. 1356

$$y''(x) = -\frac{y(x)\left(-n^2 - v(v+1)x^2\right)}{x^2\left(x^2+1\right)} - \frac{\left(2x^2+1\right)y'(x)}{x\left(x^2+1\right)}$$

✓ **Mathematica** : cpu = 0.205962 (sec), leaf count = 90

```
DSolve[Derivative[2][y][x] == -(((-n^2 - v*(1 + v)*x^2)*y[x])/(x^2*(1 + x^2))) - ((1 + 2*x^2)
```

$$\left\{\left\{y(x) \to c_1 x^{-n}\, {}_2F_1\left(-\frac{n}{2}-\frac{v}{2}, -\frac{n}{2}+\frac{v}{2}+\frac{1}{2}; 1-n; -x^2\right) + c_2 x^n\, {}_2F_1\left(\frac{n}{2}-\frac{v}{2}, \frac{n}{2}+\frac{v}{2}+\frac{1}{2}; n+1; -x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 29

```
dsolve(diff(diff(y(x),x),x) = -(2*x^2+1)/x/(x^2+1)*diff(y(x),x)-(-v*(v+1)*x^2-n^2)/x^2/(x^2+1
```

$$y(x) = \text{LegendreQ}\left(v, n, \sqrt{x^2+1}\right) c_2 + \text{LegendreP}\left(v, n, \sqrt{x^2+1}\right) c_1$$

ODE No. 1357

$$y''(x) = -\frac{(ax^2+a-1)\,y'(x)}{x\,(x^2+1)} - \frac{y(x)\,(bx^2+c)}{x^2\,(x^2+1)}$$

✓ **Mathematica** : cpu = 0.482 (sec), leaf count = 288

```
DSolve[Derivative[2][y][x] == -(((c + b*x^2)*y[x])/(x^2*(1 + x^2))) - ((-1 + a + a*x^2)*Deriv
```

$$\left\{\left\{y(x) \to c_1 x^{\frac{1}{2}\left(-\sqrt{a^2-4a-4c+4}-a+2\right)}\,{}_2F_1\left(-\frac{1}{4}\sqrt{a^2-2a-4b+1}-\frac{1}{4}\sqrt{a^2-4a-4c+4}+\frac{1}{4},\frac{1}{4}\sqrt{a^2-2a-4\right.\right.$$

✓ **Maple** : cpu = 0.102 (sec), leaf count = 97

```
dsolve(diff(diff(y(x),x),x) = -1/x*(a*x^2+a-1)/(x^2+1)*diff(y(x),x)-(b*x^2+c)/x^2/(x^2+1)*y(x
```

$$y(x) = x^{1-\frac{a}{2}}\left(\text{LegendreP}\left(-\frac{1}{2}+\frac{\sqrt{a^2-2a-4b+1}}{2},\frac{\sqrt{a^2-4a-4c+4}}{2},\sqrt{x^2+1}\right)c_1+\text{LegendreQ}\left(-\frac{1}{2}\right.\right.$$

ODE No. 1358

$$y''(x) = \frac{(x^2-2)\,y'(x)}{x\,(x^2-1)} - \frac{(x^2-2)\,y(x)}{x^2\,(x^2-1)}$$

✓ **Mathematica** : cpu = 0.0420857 (sec), leaf count = 89

```
DSolve[Derivative[2][y][x] == -(((-2 + x^2)*y[x])/(x^2*(-1 + x^2))) + ((-2 + x^2)*Derivative[
```

$$\left\{\left\{y(x) \to \frac{c_1 x \sqrt[4]{x^2-1}}{\sqrt[4]{1-x^2}} - \frac{c_2 x \sqrt[4]{x^2-1}\left(\log\left(1-\frac{x}{\sqrt{x^2-1}}\right) - \log\left(\frac{x}{\sqrt{x^2-1}}+1\right)\right)}{2\sqrt[4]{1-x^2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 20

```
dsolve(diff(diff(y(x),x),x) = 1/x*(x^2-2)/(x^2-1)*diff(y(x),x)-(x^2-2)/x^2/(x^2-1)*y(x),y(x))
```

$$y(x) = x\left(\ln\left(x+\sqrt{x^2-1}\right)c_2 + c_1\right)$$

ODE No. 1359

$$y''(x) = -\frac{v(v+1)y(x)}{x^2\left(x^2-1\right)} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.0706361 (sec), leaf count = 86

```
DSolve[Derivative[2][y][x] == -((v*(1 + v)*y[x])/(x^2*(-1 + x^2))) - (2*x*Derivative[1][y][x]
```

$$\left\{\left\{y(x) \to c_1 i^{-v} x^{-v}\, {}_2F_1\left(\frac{1}{2}-\frac{v}{2},-\frac{v}{2};\frac{1}{2}-v;x^2\right) + c_2 i^{v+1} x^{v+1}\, {}_2F_1\left(\frac{v}{2}+\frac{1}{2},\frac{v}{2}+1;v+\frac{3}{2};x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 57

```
dsolve(diff(diff(y(x),x),x) = -2*x/(x^2-1)*diff(y(x),x)-v*(v+1)/x^2/(x^2-1)*y(x),y(x))
```

$$y(x) = c_1 \,\mathrm{hypergeom}\left(\left[-\frac{v}{2},\frac{1}{2}-\frac{v}{2}\right],\left[\frac{1}{2}-v\right],x^2\right) x^{-v} + c_2 \,\mathrm{hypergeom}\left(\left[1+\frac{v}{2},\frac{1}{2}+\frac{v}{2}\right],\left[\frac{3}{2}+v\right],x^2\right) x^{v}$$

ODE No. 1360

$$y''(x) = \frac{v(v+1)y(x)}{x^2} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.0663703 (sec), leaf count = 68

```
DSolve[Derivative[2][y][x] == (v*(1 + v)*y[x])/x^2 - (2*x*Derivative[1][y][x])/(-1 + x^2),y[x
```

$$\left\{\left\{y(x) \to c_1 i^{-v} x^{-v}\, {}_2F_1\left(\frac{1}{2}, -v; \frac{1}{2} - v; x^2\right) + c_2 i^{v+1} x^{v+1}\, {}_2F_1\left(\frac{1}{2}, v+1; v+\frac{3}{2}; x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 47

```
dsolve(diff(diff(y(x),x),x) = -2*x/(x^2-1)*diff(y(x),x)+v*(v+1)/x^2*y(x),y(x))
```

$$y(x) = c_1 \,\text{hypergeom}\left(\left[\frac{1}{2}, -v\right], \left[\frac{1}{2} - v\right], x^2\right) x^{-v} + c_2 \,\text{hypergeom}\left(\left[\frac{1}{2}, v+1\right], \left[\frac{3}{2} + v\right], x^2\right) x^{v+1}$$

ODE No. 1361

$$y''(x) = \frac{2xy'(x)}{x^2-1} - \frac{(a(a+1) - a(a+3)x^2)\,y(x)}{x^2\,(x^2-1)}$$

✓ **Mathematica** : cpu = 0.330668 (sec), leaf count = 38

```
DSolve[Derivative[2][y][x] == -(((a*(1 + a) - a*(3 + a)*x^2)*y[x])/(x^2*(-1 + x^2))) + (2*x*D
```

$$\{\{y(x) \to c_1 x^{-a} + c_2\left(-2ax^2 + 2a - x^2 + 3\right) x^{a+1}\}\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 33

```
dsolve(diff(diff(y(x),x),x) = 2*x/(x^2-1)*diff(y(x),x)-(a*(a+1)-a*x^2*(a+3))/x^2/(x^2-1)*y(x)
```

$$y(x) = c_1 x^{-a} + c_2 x^{a+1}\left(2a\,x^2 + x^2 - 2a - 3\right)$$

ODE No. 1362

$$y''(x) = \frac{2xy'(x)}{x^2-1} - \frac{y(x)\left(\left(x^2-1\right)x^2(a-n)(a+n+1)+2ax^2+n(n+1)\left(x^2-1\right)\right)}{x^2\left(x^2-1\right)}$$

✗ **Mathematica** : cpu = 8.48271 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -(((2*a*x^2 + n*(1 + n)*(-1 + x^2) + (a - n)*(1 + a + n)*x^2*(-
```

, DifferentialRoot result

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

✓ **Maple** : cpu = 0.201 (sec), leaf count = 109

```
dsolve(x^2*(x^2-1)*diff(diff(y(x),x),x)-2*x^3*diff(y(x),x)-((a-n)*(a+n+1)*x^2*(x^2-1)+2*a*x^2
```

$$y(x) = c_1 \operatorname{HeunC}\left(0, -n-\frac{1}{2}, -2, -\frac{1}{4}a^2+\frac{1}{4}n^2-\frac{1}{4}a+\frac{1}{4}n, -\frac{1}{4}n^2-\frac{1}{4}n+\frac{3}{4}+\frac{1}{4}a^2-\frac{1}{4}a, x^2\right) x^{-n} + c_2 \operatorname{Heun}$$

ODE No. 1363

$$y''(x) = -\frac{(ax^2+a-2)\,y'(x)}{x\,(x^2-1)} - \frac{by(x)}{x^2}$$

✓ **Mathematica** : cpu = 0.51673 (sec), leaf count = 236

```
DSolve[Derivative[2][y][x] == -((b*y[x])/x^2) - ((-2 + a + a*x^2)*Derivative[1][y][x])/(x*(-1
```

$$\left\{\left\{y(x) \to c_1(-1)^{\frac{1}{4}\left(-\sqrt{a^2-2a-4b+1}+a-1\right)} x^{\frac{1}{2}\left(-\sqrt{a^2-2a-4b+1}+a-1\right)}\, {}_2F_1\left(\frac{a}{2}-\frac{1}{2},\frac{a}{2}-\frac{1}{2}\sqrt{a^2-2a-4b+1}-\frac{1}{2};1-\right.\right.$$

✓ **Maple** : cpu = 0.11 (sec), leaf count = 161

```
dsolve(diff(diff(y(x),x),x) = -1/x*(a*x^2+a-2)/(x^2-1)*diff(y(x),x)-b/x^2*y(x),y(x))
```

$$y(x) = \left(x^2-1\right)^{-a+2}\left(x^{\frac{a}{2}-\frac{1}{2}-\frac{\sqrt{a^2-2a-4b+1}}{2}}\,\text{hypergeom}\left(\left[-\frac{a}{2}+\frac{3}{2},-\frac{a}{2}+\frac{3}{2}-\frac{\sqrt{a^2-2a-4b+1}}{2}\right],\left[1-\frac{\sqrt{a^2}\right.\right.\right.$$

ODE No. 1364

$$y''(x) = \frac{y'(x)\left(2(a-1)x^2 - 2a + 2bc(x^2-1)\,x^c\right)}{x\left(x^2-1\right)} - \frac{y(x)\left(bc(2a-c-1)x^{c+2} - bc(2a-c+1)x^c + x^2((a-1$$
$$x^2\left(x^2-1\right)$$

✓ **Mathematica** : cpu = 0.108569 (sec), leaf count = 42

```
DSolve[Derivative[2][y][x] == -(((-(a*(1 + a)) + ((-1 + a)*a - v*(1 + v))*x^2 - b*(1 + 2*a -
```

$$\left\{\left\{y(x) \to c_1 P_v(x) e^{a\log(x)+bx^c} + c_2 Q_v(x) e^{a\log(x)+bx^c}\right\}\right\}$$

✓ **Maple** : cpu = 0.1 (sec), leaf count = 25

```
dsolve(diff(diff(y(x),x),x) = 1/x*(2*b*c*x^c*(x^2-1)+2*(a-1)*x^2-2*a)/(x^2-1)*diff(y(x),x)-(b
```

$$y(x) = \mathrm{e}^{b\,x^c} x^a (c_1\,\mathrm{LegendreP}\left(v,x\right) + c_2\,\mathrm{LegendreQ}\left(v,x\right))$$

ODE No. 1365

$$y''(x) = -\frac{ay(x)}{(x^2+1)^2}$$

✓ **Mathematica** : cpu = 0.0659549 (sec), leaf count = 104

```
DSolve[Derivative[2][y][x] == -((a*y[x])/(1 + x^2)^2),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{ic_2\sqrt{x^2+1}(1-ix)^{\sqrt{a+1}}(1+ix)^{-\sqrt{a+1}}e^{i\sqrt{a+1}\tan^{-1}(x)}}{2\sqrt{a+1}} + c_1\sqrt{x^2+1}e^{i\sqrt{a+1}\tan^{-1}(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 59

```
dsolve(diff(diff(y(x),x),x) = -a/(x^2+1)^2*y(x),y(x))
```

$$y(x) = \sqrt{x^2+1}\left(\left(\frac{x+i}{-x+i}\right)^{-\frac{\sqrt{a+1}}{2}}c_2 + \left(\frac{x+i}{-x+i}\right)^{\frac{\sqrt{a+1}}{2}}c_1\right)$$

ODE No. 1366

$$y''(x) = -\frac{2xy'(x)}{x^2+1} - \frac{y(x)}{(x^2+1)^2}$$

✓ **Mathematica** : cpu = 0.0162712 (sec), leaf count = 31

```
DSolve[Derivative[2][y][x] == -(y[x]/(1 + x^2)^2) - (2*x*Derivative[1][y][x])/(1 + x^2),y[x],
```

$$\left\{\left\{y(x) \to \frac{c_1}{\sqrt{x^2+1}} + \frac{c_2 x}{\sqrt{x^2+1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 17

```
dsolve(diff(diff(y(x),x),x) = -2/(x^2+1)*x*diff(y(x),x)-1/(x^2+1)^2*y(x),y(x))
```

$$y(x) = \frac{c_1 x + c_2}{\sqrt{x^2+1}}$$

ODE No. 1367

$$y''(x) = -\frac{y(x)\left(a^2(x^2+1)^2 + m^2 - n(n+1)(x^2+1)\right)}{(x^2+1)^2} - \frac{2xy'(x)}{x^2+1}$$

✓ **Mathematica** : cpu = 0.208025 (sec), leaf count = 229

```
DSolve[Derivative[2][y][x] == -(((m^2 - n*(1 + n)*(1 + x^2) + a^2*(1 + x^2)^2)*y[x])/(1 + x^2
```

$$\left\{\left\{y(x) \to c_1 (x^2+1)^{\frac{\sqrt{m^2}}{2}} \text{HeunC}\left[\frac{1}{4}\left(-a^2 - \sqrt{m^2}\left(\sqrt{m^2}+1\right) + \frac{1}{4}\left(\sqrt{(2n+1)^2}-1\right)^2 + \frac{1}{2}\left(\sqrt{(2n+1)^2} -\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.198 (sec), leaf count = 88

```
dsolve(diff(diff(y(x),x),x) = -2/(x^2+1)*x*diff(y(x),x)-(a^2*(x^2+1)^2-n*(n+1)*(x^2+1)+m^2)/(
```

$$y(x) = (x^2+1)^{\frac{m}{2}}\left(\text{HeunC}\left(0, \frac{1}{2}, m, -\frac{a^2}{4}, \frac{1}{4} + \frac{1}{4}a^2 + \frac{1}{4}m^2 - \frac{1}{4}n^2 - \frac{1}{4}n, -x^2\right) c_2 x + \text{HeunC}\left(0, -\frac{1}{2}, m, -\right.\right.$$

ODE No. 1368

$$y''(x) = -\frac{axy'(x)}{x^2+1} - \frac{by(x)}{(x^2+1)^2}$$

✓ **Mathematica** : cpu = 0.0186901 (sec), leaf count = 106

```
DSolve[Derivative[2][y][x] == -((b*y[x])/(1 + x^2)^2) - (a*x*Derivative[1][y][x])/(1 + x^2),y
```

$$\left\{\left\{y(x) \to c_1 \left(x^2+1\right)^{\frac{2-a}{4}} P^{\frac{1}{2}\sqrt{a^2-4a+4b+4}}_{\frac{a-2}{2}}(ix) + c_2 \left(x^2+1\right)^{\frac{2-a}{4}} Q^{\frac{1}{2}\sqrt{a^2-4a+4b+4}}_{\frac{a-2}{2}}(ix)\right\}\right\}$$

✓ **Maple** : cpu = 0.068 (sec), leaf count = 71

```
dsolve(diff(diff(y(x),x),x) = -a*x/(x^2+1)*diff(y(x),x)-b/(x^2+1)^2*y(x),y(x))
```

$$y(x) = \left(x^2+1\right)^{\frac{1}{2}-\frac{a}{4}} \left(\text{LegendreQ}\left(\frac{a}{2}-1, \frac{\sqrt{a^2-4a+4b+4}}{2}, ix\right) c_2 + \text{LegendreP}\left(\frac{a}{2}-1, \frac{\sqrt{a^2-4a+4b}}{2}\right.\right.$$

ODE No. 1369

$$y''(x) = -\frac{a y(x)}{\left(x^2-1\right)^2}$$

✓ **Mathematica** : cpu = 0.0700843 (sec), leaf count = 106

```
DSolve[Derivative[2][y][x] == -((a*y[x])/(-1 + x^2)^2),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2 \sqrt{1-x^2}(x+1)^{\sqrt{1-a}}(1-x)^{-\sqrt{1-a}} e^{-\sqrt{1-a}\tanh^{-1}(x)}}{2\sqrt{1-a}} + c_1 \sqrt{1-x^2} e^{-\sqrt{1-a}\tanh^{-1}(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.049 (sec), leaf count = 55

```
dsolve(diff(diff(y(x),x),x) = -a/(x^2-1)^2*y(x),y(x))
```

$$y(x) = \sqrt{x^2-1}\left(\left(\frac{x-1}{1+x}\right)^{-\frac{\sqrt{1-a}}{2}} c_2 + \left(\frac{x-1}{1+x}\right)^{\frac{\sqrt{1-a}}{2}} c_1\right)$$

ODE No. 1370

$$y''(x) = \frac{a^2 y(x)}{(x^2-1)^2} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.0196346 (sec), leaf count = 53

```
DSolve[Derivative[2][y][x] == (a^2*y[x])/(-1 + x^2)^2 - (2*x*Derivative[1][y][x])/(-1 + x^2),
```

$$\left\{\left\{y(x) \to c_1 \cosh\left(\frac{1}{2}a(\log(1-x) - \log(x+1))\right) + ic_2 \sinh\left(\frac{1}{2}a(\log(1-x) - \log(x+1))\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 19

```
dsolve(diff(diff(y(x),x),x) = -2*x/(x^2-1)*diff(y(x),x)+a^2/(x^2-1)^2*y(x),y(x))
```

$$y(x) = c_1 \sinh(a \operatorname{arctanh}(x)) + c_2 \cosh(a \operatorname{arctanh}(x))$$

ODE No. 1371

$$y''(x) = -\frac{y(x)\left(-a^2-\lambda(x^2-1)\right)}{\left(x^2-1\right)^2} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.0149352 (sec), leaf count = 48

```
DSolve[Derivative[2][y][x] == -(((-a^2 - lambda*(-1 + x^2))*y[x])/(-1 + x^2)^2) - (2*x*Deriva
```

$$\left\{\left\{y(x) \to c_1 P^a_{\frac{1}{2}\left(\sqrt{4\lambda+1}-1\right)}(x) + c_2 Q^a_{\frac{1}{2}\left(\sqrt{4\lambda+1}-1\right)}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.053 (sec), leaf count = 37

```
dsolve(diff(diff(y(x),x),x) = -2*x/(x^2-1)*diff(y(x),x)-(-a^2-lambda*(x^2-1))/(x^2-1)^2*y(x),
```

$$y(x) = c_1 \,\text{LegendreP}\left(\frac{\sqrt{1+4\lambda}}{2} - \frac{1}{2}, a, x\right) + c_2 \,\text{LegendreQ}\left(\frac{\sqrt{1+4\lambda}}{2} - \frac{1}{2}, a, x\right)$$

ODE No. 1372

$$y''(x) = -\frac{y(x)\left(\left(x^2-1\right)\left(ax^2+bx+c\right)-k^2\right)}{\left(x^2-1\right)^2} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.242671 (sec), leaf count = 202

```
DSolve[Derivative[2][y][x] == -(((-k^2 + (-1 + x^2)*(c + b*x + a*x^2))*y[x])/(-1 + x^2)^2) -
```

$$\left\{\left\{y(x) \to c_1 e^{\sqrt{-a}x}\left(x^2-1\right)^{k/2}\,\text{HeunC}\left[(k+1)\left(2\sqrt{-a}-k\right)-a+b-c, 2\left(2\sqrt{-a}(k+1)+b\right), k+1, k+1\right.\right.$$

✓ **Maple** : cpu = 0.239 (sec), leaf count = 110

```
dsolve(diff(diff(y(x),x),x) = -2*x/(x^2-1)*diff(y(x),x)-((x^2-1)*(a*x^2+b*x+c)-k^2)/(x^2-1)^2
```

$$y(x) = \mathrm{e}^{\sqrt{-a}\,x}\left(\text{HeunC}\left(4\sqrt{-a}, -k, k, 2b, \frac{k^2}{2}+a-b+c, \frac{1}{2}+\frac{x}{2}\right)\sqrt{2x-2}\,(1+x)^{-\frac{k}{2}}\,(x-1)^{\frac{k}{2}-\frac{1}{2}}\,c_2 + \text{Heun}\right.$$

ODE No. 1373

$$y''(x) = -\frac{y(x)\left(-a^2(x^2-1)^2 - m^2 - n(n+1)(x^2-1)\right)}{(x^2-1)^2} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.199011 (sec), leaf count = 113

```
DSolve[Derivative[2][y][x] == -(((-m^2 - n*(1 + n)*(-1 + x^2) - a^2*(-1 + x^2)^2)*y[x])/(-1 +
```

$$\left\{\left\{y(x) \to c_1 (x^2-1)^{m/2}\,\text{HeunC}\left[\frac{1}{4}\left(-a^2 - m(m+1) + n^2 + n\right), -\frac{a^2}{4}, \frac{1}{2}, m+1, 0, x^2\right] + c_2 x (x^2-1)^{m/2}\,\text{H}\right.\right.$$

✓ **Maple** : cpu = 0.174 (sec), leaf count = 84

```
dsolve(diff(diff(y(x),x),x) = -2*x/(x^2-1)*diff(y(x),x)-(-a^2*(x^2-1)^2-n*(n+1)*(x^2-1)-m^2)/
```

$$y(x) = (x^2-1)^{\frac{m}{2}}\left(\text{HeunC}\left(0, \frac{1}{2}, m, -\frac{a^2}{4}, \frac{1}{4} + \frac{1}{4}a^2 + \frac{1}{4}m^2 - \frac{1}{4}n^2 - \frac{1}{4}n, x^2\right) c_2 x + \text{HeunC}\left(0, -\frac{1}{2}, m, -\frac{a^2}{4}\right.\right.$$

ODE No. 1374

$$y''(x) = \frac{2(2a-1)xy'(x)}{x^2-1} - \frac{y(x)\left(x^2(2a(2a-1)-v(v+1))+2a+v(v+1)\right)}{\left(x^2-1\right)^2}$$

✓ **Mathematica** : cpu = 0.0288032 (sec), leaf count = 32

```
DSolve[Derivative[2][y][x] == -(((2*a + v*(1 + v) + (2*a*(-1 + 2*a) - v*(1 + v))*x^2)*y[x])/(
```

$$\left\{\left\{y(x) \to c_1\left(x^2-1\right)^a P_v(x) + c_2\left(x^2-1\right)^a Q_v(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.051 (sec), leaf count = 23

```
dsolve(diff(diff(y(x),x),x) = 2*x*(2*a-1)/(x^2-1)*diff(y(x),x)-(x^2*(2*a*(2*a-1)-v*(v+1))+2*a
```

$$y(x) = \left(x^2-1\right)^a \left(c_1 \operatorname{LegendreP}\left(v,x\right) + c_2 \operatorname{LegendreQ}\left(v,x\right)\right)$$

ODE No. 1375

$$y''(x) = -\frac{y(x)\left(4ax^2(a-n) - \left(x^2-1\right)\left(2a + (v-n)(n+v+1)\right)\right)}{\left(x^2-1\right)^2} - \frac{2x(-2a+n+1)y'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.0325643 (sec), leaf count = 54

```
DSolve[Derivative[2][y][x] == -(((4*a*(a - n)*x^2 - (2*a + (-n + v)*(1 + n + v))*(-1 + x^2))*
```

$$\left\{\left\{y(x) \to c_1 \left(x^2-1\right)^{\frac{1}{2}(2a-n)} P_v^n(x) + c_2 \left(x^2-1\right)^{\frac{1}{2}(2a-n)} Q_v^n(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.059 (sec), leaf count = 29

```
dsolve(diff(diff(y(x),x),x) = -2*x/(x^2-1)*(n+1-2*a)*diff(y(x),x)-(4*a*x^2*(a-n)-(x^2-1)*(2*a
```

$$y(x) = \left(x^2-1\right)^{a-\frac{n}{2}} \left(\text{LegendreQ}\left(v,n,x\right) c_2 + \text{LegendreP}\left(v,n,x\right) c_1\right)$$

ODE No. 1376

$$y''(x) = -\frac{by(x)}{x^2\left(a+x^2\right)} - \frac{\left(a+2x^2\right)y'(x)}{x\left(a+x^2\right)}$$

✓ **Mathematica** : cpu = 0.0294589 (sec), leaf count = 69

```
DSolve[Derivative[2][y][x] == -((b*y[x])/(x^2*(a + x^2))) - ((a + 2*x^2)*Derivative[1][y][x])
```

$$\left\{\left\{y(x) \to c_1 \cos\left(\frac{\sqrt{b}\tanh^{-1}\left(\frac{\sqrt{a+x^2}}{\sqrt{a}}\right)}{\sqrt{a}}\right) - c_2 \sin\left(\frac{\sqrt{b}\tanh^{-1}\left(\frac{\sqrt{a+x^2}}{\sqrt{a}}\right)}{\sqrt{a}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.05 (sec), leaf count = 73

```
dsolve(diff(diff(y(x),x),x) = -1/x*(2*x^2+a)/(x^2+a)*diff(y(x),x)-b/x^2/(x^2+a)*y(x),y(x))
```

$$y(x) = \left(c_2\left(\frac{2a+2\sqrt{a}\sqrt{x^2+a}}{x}\right)^{\frac{2i\sqrt{b}}{\sqrt{a}}} + c_1\right)\left(\frac{2a+2\sqrt{a}\sqrt{x^2+a}}{x}\right)^{-\frac{i\sqrt{b}}{\sqrt{a}}}$$

ODE No. 1377

$$y''(x) = -\frac{b^2 y(x)}{\left(a^2+x^2\right)^2}$$

✓ **Mathematica** : cpu = 0.16716 (sec), leaf count = 163

```
DSolve[Derivative[2][y][x] == -((b^2*y[x])/(a^2 + x^2)^2),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{ic_2\sqrt{a^2+x^2}\left(1-\frac{ix}{a}\right)^{\sqrt{\frac{a^2+b^2}{a^2}}}\left(1+\frac{ix}{a}\right)^{-\sqrt{\frac{a^2+b^2}{a^2}}} e^{i\sqrt{\frac{a^2+b^2}{a^2}}\tan^{-1}\left(\frac{x}{a}\right)}}{2a\sqrt{\frac{a^2+b^2}{a^2}}} + c_1\sqrt{a^2+x^2}e^{i\sqrt{\frac{b^2}{a^2}+1}\tan^{-1}\left(\frac{x}{a}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.119 (sec), leaf count = 83

```
dsolve(diff(diff(y(x),x),x) = -b^2/(a^2+x^2)^2*y(x),y(x))
```

$$y(x) = \sqrt{a^2+x^2}\left(\left(\frac{ix-a}{ix+a}\right)^{\frac{\sqrt{a^2+b^2}}{2a}} c_1 + \left(\frac{ix-a}{ix+a}\right)^{-\frac{\sqrt{a^2+b^2}}{2a}} c_2\right)$$

ODE No. 1378

$$y''(x) = -\frac{2(x^2-1)\,y'(x)}{(x-1)^2 x} - \frac{(-2x^2+2x+2)\,y(x)}{(x-1)^2 x^2}$$

✓ **Mathematica** : cpu = 0.0366335 (sec), leaf count = 65

```
DSolve[Derivative[2][y][x] == -(((2 + 2*x - 2*x^2)*y[x])/((-1 + x)^2*x^2)) - (2*(-1 + x^2)*De
```

$$\left\{\left\{y(x) \to \frac{c_1 x^2}{1-x} + \frac{c_2 x(2x^2\log(1-x) - 2x^2\log(x) + 2x - 2x\log(1-x) + 2x\log(x) - 1)}{(x-1)^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 48

```
dsolve(diff(diff(y(x),x),x) = -2/x*(x^2-1)/(x-1)^2*diff(y(x),x)-(-2*x^2+2*x+2)/x^2/(x-1)^2*y(
```

$$y(x) = \frac{\left(-c_2 x(x-1)\ln(x-1) + c_2 x(x-1)\ln(x) + c_1 x^2 + (-c_1 - c_2)\,x + \frac{c_2}{2}\right)x}{(x-1)^2}$$

ODE No. 1379

$$y''(x) = \frac{12y(x)}{(x+1)^2\left(x^2+2x+3\right)}$$

✓ **Mathematica** : cpu = 0.0514419 (sec), leaf count = 99

```
DSolve[Derivative[2][y][x] == (12*y[x])/((1 + x)^2*(3 + 2*x + x^2)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2\left(2x^3+4x^2-3\sqrt{2}x^2\tan^{-1}\left(\frac{x+1}{\sqrt{2}}\right)+8x-6\sqrt{2}x\tan^{-1}\left(\frac{x+1}{\sqrt{2}}\right)-9\sqrt{2}\tan^{-1}\left(\frac{x+1}{\sqrt{2}}\right)+2\right)}{2(x+1)^2}+c_1\right.\right.$$

✓ **Maple** : cpu = 0.051 (sec), leaf count = 60

```
dsolve(diff(diff(y(x),x),x) = 12/(1+x)^2/(x^2+2*x+3)*y(x),y(x))
```

$$y(x) = \frac{3c_2(x^2+2x+3)\arctan\left(\frac{(1+x)\sqrt{2}}{2}\right)-c_2(x^3+2x^2+4x+1)\sqrt{2}+c_1(x^2+2x+3)}{(1+x)^2}$$

ODE No. 1380

$$y''(x) = -\frac{by(x)}{x^2(x-a)^2}$$

✓ **Mathematica** : cpu = 0.178819 (sec), leaf count = 132

```
DSolve[Derivative[2][y][x] == -((b*y[x])/(x^2*(-a + x)^2)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2(x-a)^{\frac{1}{2}\sqrt{\frac{a^2-4b}{a^2}}+\frac{1}{2}}x^{\frac{1}{2}-\frac{1}{2}\sqrt{\frac{a^2-4b}{a^2}}}}{a\sqrt{\frac{a^2-4b}{a^2}}} + c_1(x-a)^{\frac{1}{2}-\frac{1}{2}\sqrt{1-\frac{4b}{a^2}}}x^{\frac{1}{2}\sqrt{1-\frac{4b}{a^2}}+\frac{1}{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.076 (sec), leaf count = 67

```
dsolve(diff(diff(y(x),x),x) = -b/x^2/(x-a)^2*y(x),y(x))
```

$$y(x) = \sqrt{x\,(a-x)}\left(\left(\frac{x}{a-x}\right)^{\frac{\sqrt{a^2-4b}}{2a}}c_2 + \left(\frac{a-x}{x}\right)^{\frac{\sqrt{a^2-4b}}{2a}}c_1\right)$$

ODE No. 1381

$$y''(x) = c - \frac{by(x)}{x^2(x-a)^2}$$

✓ **Mathematica** : cpu = 0.219583 (sec), leaf count = 589

```
DSolve[Derivative[2][y][x] == c - (b*y[x])/(x^2*(-a + x)^2),y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{2cx^2(a-x)\left(1-\frac{x}{a}\right)^{-\frac{1}{2}\sqrt{\frac{a^2-4b}{a^2}}}\left(\sqrt{\frac{a^2-4b}{a^2}}\left(1-\frac{x}{a}\right)^{\sqrt{\frac{a^2-4b}{a^2}}}\,{}_2F_1\left(\frac{1}{2}\sqrt{1-\frac{4b}{a^2}}-\frac{1}{2},\frac{1}{2}\sqrt{1-\frac{4b}{a^2}}+\frac{3}{2};\frac{1}{2}\sqrt{\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.167 (sec), leaf count = 175

```
dsolve(diff(diff(y(x),x),x) = -b/x^2/(x-a)^2*y(x)+c,y(x))
```

$$y(x) = \frac{\left(\left(c_2\sqrt{a^2-4b}-\left(\int\sqrt{x\,(a-x)}\left(\frac{a-x}{x}\right)^{-\frac{\sqrt{a^2-4b}}{2a}}dx\right)c\right)\left(\frac{a-x}{x}\right)^{\frac{\sqrt{a^2-4b}}{2a}}+\left(\left(\int\sqrt{x\,(a-x)}\left(\frac{x}{a-x}\right)^{-\frac{\sqrt{a^2-4}}{2a}}\right.\right.\right.}{\sqrt{a^2-4b}}$$

ODE No. 1382

$$y''(x) = \frac{cy(x)}{(x-a)^2(x-b)^2}$$

✓ **Mathematica** : cpu = 0.409161 (sec), leaf count = 154

```
DSolve[Derivative[2][y][x] == (c*y[x])/((-a + x)^2*(-b + x)^2),y[x],x]
```

$$\left\{\left\{y(x) \to c_1 (x-a)^{\frac{1}{2}\left(\sqrt{\frac{4c}{(a-b)^2}+1}+1\right)} (x-b)^{\frac{1}{2}\left(1-\sqrt{\frac{4c}{(a-b)^2}+1}\right)} - \frac{c_2 (x-a)^{\frac{1}{2}-\frac{1}{2}\sqrt{\frac{4c}{(a-b)^2}+1}} (x-b)^{\frac{1}{2}\sqrt{\frac{4c}{(a-b)^2}+1}+\frac{1}{2}}}{(a-b)\sqrt{\frac{4c}{(a-b)^2}+1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.12 (sec), leaf count = 104

```
dsolve(diff(diff(y(x),x),x) = c/(x-a)^2/(x-b)^2*y(x),y(x))
```

$$y(x) = \sqrt{(a-x)(b-x)}\left(\left(\frac{a-x}{b-x}\right)^{\frac{\sqrt{a^2-2ab+b^2+4c}}{2a-2b}} c_1 + \left(\frac{a-x}{b-x}\right)^{-\frac{\sqrt{a^2-2ab+b^2+4c}}{2a-2b}} c_2\right)$$

ODE No. 1383

$$y''(x) = -\frac{y'(x)\left((x-a)^2(\alpha+\beta+1)(x-b)+(x-a)(-\alpha-\beta+1)(x-b)^2\right)}{(x-a)^2(x-b)^2} - \frac{\alpha\beta(a-b)^2 y(x)}{(x-a)^2(x-b)^2}$$

✓ **Mathematica** : cpu = 0.100762 (sec), leaf count = 50

```
DSolve[Derivative[2][y][x] == -((alpha*(a - b)^2*beta*y[x])/((-a + x)^2*(-b + x)^2)) - (((1 +
```

$$\left\{\left\{y(x) \to c_1 e^{\alpha(\log(x-a)-\log(x-b))} + c_2 e^{\beta(\log(x-a)-\log(x-b))}\right\}\right\}$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x) = -((alpha+beta+1)*(x-a)^2*(x-b)+(1-alpha-beta)*(x-b)^2*(x-a))/(x
```

$$y(x) = c_1\left(\frac{a-x}{b-x}\right)^{\beta} + c_2\left(\frac{a-x}{b-x}\right)^{\alpha}$$

ODE No. 1384

$$y''(x) = -\frac{y(x)\left(-(a^2-1)\,x^2+2(a+3)bx-b^2\right)}{4x^2}$$

✓ **Mathematica** : cpu = 0.020784 (sec), leaf count = 110

```
DSolve[Derivative[2][y][x] == -1/4*((-b^2 + 2*(3 + a)*b*x - (-1 + a^2)*x^2)*y[x])/x^2,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 M_{\frac{(a+3)b}{2\sqrt{a^2-1}},\frac{\sqrt{b\left(b^2+1\right)}}{2\sqrt{b}}}\left(\sqrt{a^2-1}x\right)+c_2 W_{\frac{(a+3)b}{2\sqrt{a^2-1}},\frac{\sqrt{b\left(b^2+1\right)}}{2\sqrt{b}}}\left(\sqrt{a^2-1}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.234 (sec), leaf count = 73

```
dsolve(diff(diff(y(x),x),x) = -1/4*(-x^2*(a^2-1)+2*(a+3)*b*x-b^2)/x^2*y(x),y(x))
```

$$y(x) = c_1\,\text{WhittakerM}\left(\frac{b(a+3)}{2\sqrt{a^2-1}},\frac{\sqrt{b^2+1}}{2},\sqrt{a^2-1}\,x\right)+c_2\,\text{WhittakerW}\left(\frac{b(a+3)}{2\sqrt{a^2-1}},\frac{\sqrt{b^2+1}}{2},\sqrt{a^2-1}\,x\right)$$

ODE No. 1385

$$y''(x) = -\frac{(ax^2 + a - 3)\, y(x)}{4\,(x^2+1)^2}$$

✓ **Mathematica** : cpu = 0.0129023 (sec), leaf count = 78

```
DSolve[Derivative[2][y][x] == -1/4*((-3 + a + a*x^2)*y[x])/(1 + x^2)^2,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \sqrt{x^2+1}\, P^{\frac{1}{2}}_{\frac{1}{2}\left(\sqrt{1-a}-1\right)}(ix) + c_2 \sqrt{x^2+1}\, Q^{\frac{1}{2}}_{\frac{1}{2}\left(\sqrt{1-a}-1\right)}(ix)\right\}\right\}$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 55

```
dsolve(diff(diff(y(x),x),x) = -1/4*(a*x^2+a-3)/(x^2+1)^2*y(x),y(x))
```

$$y(x) = \left(x^2+1\right)^{\frac{1}{4}} \left(\left(x + \sqrt{x^2+1}\right)^{-\frac{\sqrt{1-a}}{2}} c_2 + \left(x + \sqrt{x^2+1}\right)^{\frac{\sqrt{1-a}}{2}} c_1 \right)$$

ODE No. 1386

$$y''(x) = \frac{18y(x)}{(2x+1)^2(x^2+x+1)}$$

✓ **Mathematica** : cpu = 0.0585625 (sec), leaf count = 108

```
DSolve[Derivative[2][y][x] == (18*y[x])/((1 + 2*x)^2*(1 + x + x^2)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1(x^2+x+1)}{(2x+1)^2} + \frac{c_2\left(16x^3+24x^2-12\sqrt{3}x^2\tan^{-1}\left(\frac{2x+1}{\sqrt{3}}\right)+30x-12\sqrt{3}x\tan^{-1}\left(\frac{2x+1}{\sqrt{3}}\right)-12\sqrt{}\right.}{(2x+1)^2}\right.\right.$$

✓ **Maple** : cpu = 0.049 (sec), leaf count = 58

```
dsolve(diff(diff(y(x),x),x) = 18/(2*x+1)^2/(x^2+x+1)*y(x),y(x))
```

$$y(x) = \frac{-36c_2(x^2+x+1)\arctan\left(\frac{(2x+1)\sqrt{3}}{3}\right)+16c_2\left(x^3+x^2+\frac{11}{8}x+\frac{3}{16}\right)\sqrt{3}+c_1(x^2+x+1)}{(2x+1)^2}$$

ODE No. 1387

$$y''(x) = \frac{3y(x)}{4\left(x^2+x+1\right)^2}$$

✓ **Mathematica** : cpu = 0.024178 (sec), leaf count = 50

```
DSolve[Derivative[2][y][x] == (3*y[x])/(4*(1 + x + x^2)^2),y[x],x]
```

$$\left\{\left\{y(x) \to c_1\sqrt{x^2+x+1} + \frac{2c_2\sqrt{x^2+x+1}\tan^{-1}\left(\frac{2x+1}{\sqrt{3}}\right)}{\sqrt{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.022 (sec), leaf count = 28

```
dsolve(diff(diff(y(x),x),x) = 3/4/(x^2+x+1)^2*y(x),y(x))
```

$$y(x) = \sqrt{x^2+x+1}\left(\arctan\left(\frac{(2x+1)\sqrt{3}}{3}\right)c_2 + c_1\right)$$

ODE No. 1388

$$y''(x) = -\frac{y(x)\left(v(v+1)(x-1)-a^2x\right)}{4(x-1)^2x^2} - \frac{(3x-1)y'(x)}{2(x-1)x}$$

✓ **Mathematica** : cpu = 0.221395 (sec), leaf count = 235

```
DSolve[Derivative[2][y][x] == -1/4*((v*(1 + v)*(-1 + x) - a^2*x)*y[x])/((-1 + x)^2*x^2) - ((-
```

$$\left\{\left\{y(x) \to c_2(-1)^{\frac{1}{2}(-2v-3)+1}x^{\frac{1}{4}(-2v-3)+1}e^{\frac{1}{4}(-2\log(1-x)-\log(x))}(x-1)^{\frac{1}{2}\left(\frac{1}{2}(a+v+1)+\frac{1}{2}(a+v+2)+\frac{1}{2}(-2v-3)+1\right)}\,{}_2F_1\left(\frac{1}{2}(-\right.\right.$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 76

```
dsolve(diff(diff(y(x),x),x) = -1/2/x*(3*x-1)/(x-1)*diff(y(x),x)-1/4*(v*(v+1)*(x-1)-a^2*x)/x^2
```

$$y(x) = (x-1)^{-\frac{a}{2}}\left(x^{-\frac{v}{2}}\,\text{hypergeom}\left(\left[-\frac{v}{2}-\frac{a}{2},\frac{1}{2}-\frac{v}{2}-\frac{a}{2}\right],\left[\frac{1}{2}-v\right],x\right)c_1 + x^{\frac{1}{2}+\frac{v}{2}}\,\text{hypergeom}\left(\left[1+\frac{v}{2}\right.\right.\right.$$

ODE No. 1389

$$y''(x) = -\frac{y(x)\left(-4n^2x - v(v+1)(x-1)^2\right)}{4(x-1)^2x^2} - \frac{(3x-1)y'(x)}{2(x-1)x}$$

✓ **Mathematica** : cpu = 0.274974 (sec), leaf count = 217

```
DSolve[Derivative[2][y][x] == -1/4*((-(v*(1 + v)*(-1 + x)^2) - 4*n^2*x)*y[x])/((-1 + x)^2*x^2
```

$$\left\{\left\{y(x) \to c_2(-1)^{\frac{1}{2}(-2v-3)+1}x^{\frac{1}{4}(-2v-3)+1}e^{\frac{1}{4}(-2\log(1-x)-\log(x))}(x-1)^{\frac{1}{2}\left(n+\frac{1}{2}(2n+1)+\frac{1}{2}(-2v-3)+v+2\right)}\,{}_2F_1\left(\frac{1}{2}(2n+1)\right.\right.\right.$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 68

```
dsolve(diff(diff(y(x),x),x) = -1/2/x*(3*x-1)/(x-1)*diff(y(x),x)-1/4*(-v*(v+1)*(x-1)^2-4*n^2*x
```

$$y(x) = (x-1)^{-n}\left(x^{-\frac{v}{2}}\,\text{hypergeom}\left(\left[-v-n, -n+\frac{1}{2}\right], \left[\frac{1}{2}-v\right], x\right)c_1 + x^{\frac{1}{2}+\frac{v}{2}}\,\text{hypergeom}\left(\left[v-n+1,\right.\right.\right.$$

ODE No. 1390

$$y''(x) = -\frac{3y(x)}{16(x-1)^2x^2}$$

✓ **Mathematica** : cpu = 0.0230288 (sec), leaf count = 41

```
DSolve[Derivative[2][y][x] == (-3*y[x])/(16*(-1 + x)^2*x^2),y[x],x]
```

$$\left\{\left\{y(x) \to 2c_2\sqrt[4]{1-x}x^{3/4} + c_1(1-x)^{3/4}\sqrt[4]{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (sec), leaf count = 25

```
dsolve(diff(diff(y(x),x),x) = -3/16/x^2/(x-1)^2*y(x),y(x))
```

$$y(x) = c_1(x-1)^{\frac{1}{4}}x^{\frac{3}{4}} + c_2(x-1)^{\frac{3}{4}}x^{\frac{1}{4}}$$

ODE No. 1391

$$y''(x) = \frac{(7ax^2+5)\,y'(x)}{x\,(ax^2+1)} - \frac{(15ax^2+5)\,y(x)}{x^2\,(ax^2+1)}$$

✓ **Mathematica** : cpu = 0.0382677 (sec), leaf count = 27

```
DSolve[Derivative[2][y][x] == -(((5 + 15*a*x^2)*y[x])/(x^2*(1 + a*x^2))) + ((5 + 7*a*x^2)*Der
```

$$\left\{\left\{y(x) \to c_1 x^5 - \frac{1}{4}c_2 x\left(2ax^2+1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 20

```
dsolve(diff(diff(y(x),x),x) = 1/x*(7*a*x^2+5)/(a*x^2+1)*diff(y(x),x)-(15*a*x^2+5)/x^2/(a*x^2+
```

$$y(x) = x^5 c_1 + 2a\,x^3 c_2 + x c_2$$

ODE No. 1392

$$y''(x) = -\frac{bxy'(x)}{a\left(x^2-1\right)} - \frac{y(x)\left(cx^2+dx+e\right)}{a\left(x^2-1\right)^2}$$

✓ **Mathematica** : cpu = 50.3879 (sec), leaf count = 1763961

```
DSolve[Derivative[2][y][x] == -(((e + d*x + c*x^2)*y[x])/(a*(-1 + x^2)^2)) - (b*x*Derivative[
```

Too large to display

✓ **Maple** : cpu = 0.181 (sec), leaf count = 561

```
dsolve(diff(diff(y(x),x),x) = -b*x/(x^2-1)/a*diff(y(x),x)-(c*x^2+d*x+e)/a/(x^2-1)^2*y(x),y(x)
```

$$y(x) = \left(-\frac{1}{2}+\frac{x}{2}\right)^{\frac{2a+\sqrt{4a^2+(-4b-4c-4d-4e)a+b^2}}{4a}} \left(x^2-1\right)^{-\frac{b}{4a}} \left(\text{hypergeom}\left(\left[-\frac{-\sqrt{4a^2+(-4b-4c-4d-4e)}}{}\right.\right.\right.$$

ODE No. 1393

$$y''(x) = -\frac{y(x)\left(bx^2+cx+d\right)}{a(x-1)^2x^2}$$

✓ **Mathematica** : cpu = 11.6066 (sec), leaf count = 413606

```
DSolve[Derivative[2][y][x] == -(((d + c*x + b*x^2)*y[x])/(a*(-1 + x)^2*x^2)),y[x],x]
```

Too large to display

✓ **Maple** : cpu = 0.122 (sec), leaf count = 272

```
dsolve(diff(diff(y(x),x),x) = -(b*x^2+c*x+d)/a/x^2/(x-1)^2*y(x),y(x))
```

$$y(x) = (x-1)^{-\frac{\sqrt{a-4b-4c-4d}-\sqrt{a}}{2\sqrt{a}}}\left(\text{hypergeom}\left(\left[-\frac{\sqrt{a-4b-4c-4d}-\sqrt{a}-\sqrt{a-4d}+\sqrt{a-4b}}{2\sqrt{a}},\frac{-\sqrt{a-4}\right.\right.\right.$$

ODE No. 1394

$$y''(x) = -\frac{cy(x)}{x^2(ax+b)^2} - \frac{2y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0337502 (sec), leaf count = 115

```
DSolve[Derivative[2][y][x] == -((c*y[x])/(x^2*(b + a*x)^2)) - (2*Derivative[1][y][x])/x,y[x],
```

$$\left\{\left\{y(x) \to c_1 \exp\left(\frac{\sqrt{c}\left(-\frac{\sqrt{b^2-4c}}{\sqrt{c}} - \frac{b}{\sqrt{c}}\right)(\log(x) - \log(ax+b))}{2b}\right) + c_2 \exp\left(\frac{\sqrt{c}\left(\frac{\sqrt{b^2-4c}}{\sqrt{c}} - \frac{b}{\sqrt{c}}\right)(\log(x) - \text{lo}\right.\right.\right.$$

✓ **Maple** : cpu = 0.095 (sec), leaf count = 79

```
dsolve(diff(diff(y(x),x),x) = -2/x*diff(y(x),x)-c/x^2/(a*x+b)^2*y(x),y(x))
```

$$y(x) = \sqrt{\frac{ax+b}{x}}\left(\left(\frac{x}{ax+b}\right)^{-\frac{\sqrt{\frac{b^2-4c}{a^2}}\,a}{2b}} c_2 + \left(\frac{x}{ax+b}\right)^{\frac{\sqrt{\frac{b^2-4c}{a^2}}\,a}{2b}} c_1\right)$$

ODE No. 1395

$$y''(x) = -\frac{y(x)}{(ax+b)^4}$$

✓ **Mathematica** : cpu = 0.0650199 (sec), leaf count = 59

```
DSolve[Derivative[2][y][x] == -(y[x]/(b + a*x)^4),y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{\frac{i}{a(ax+b)}}(ax+b) - \frac{1}{2}ic_2 e^{-\frac{i}{a(ax+b)}}(ax+b)\right\}\right\}$$

✓ **Maple** : cpu = 0.059 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x) = -1/(a*x+b)^4*y(x),y(x))
```

$$y(x) = (ax+b)\left(c_2 \cos\left(\frac{1}{a\,(ax+b)}\right) + c_1 \sin\left(\frac{1}{a\,(ax+b)}\right)\right)$$

ODE No. 1396

$$y''(x) = -\frac{Ay(x)}{(ax^2+bx+c)^2}$$

✓ **Mathematica** : cpu = 0.864956 (sec), leaf count = 211

```
DSolve[Derivative[2][y][x] == -((A*y[x])/(c + b*x + a*x^2)^2),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2\sqrt{ax^2+bx+c}\exp\left(-\frac{\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\tan^{-1}\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)}{\sqrt{b^2-4ac}\sqrt{1-\frac{4A}{b^2-4ac}}} + c_1\sqrt{x(ax+b)+c}\exp\left(\frac{\sqrt{4ac-b}\right.\right.\right.$$

✓ **Maple** : cpu = 0.183 (sec), leaf count = 178

```
dsolve(diff(diff(y(x),x),x) = -A/(a*x^2+b*x+c)^2*y(x),y(x))
```

$$y(x) = \sqrt{a\,x^2+bx+c}\left(\left(\frac{i\sqrt{4ca-b^2}-2ax-b}{2ax+b+i\sqrt{4ca-b^2}}\right)^{\frac{a\sqrt{\frac{-4ca+b^2-4A}{a^2}}}{2\sqrt{-4ca+b^2}}} c_1 + \left(\frac{i\sqrt{4ca-b^2}-2ax-b}{2ax+b+i\sqrt{4ca-b^2}}\right)^{-\frac{a\sqrt{\frac{-4ca+b^2-4}}{a^2}}{2\sqrt{-4ca+b^2}}}\right.$$

ODE No. 1397

$$y''(x) = \frac{y(x)}{x^5} - \frac{y'(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.0537966 (sec), leaf count = 38

```
DSolve[Derivative[2][y][x] == y[x]/x^5 - Derivative[1][y][x]/x^4,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2 \Gamma\left(\frac{1}{3}, -\frac{1}{3x^3}\right)}{3^{2/3}\sqrt[3]{-\frac{1}{x^3}}} + c_1 x\right\}\right\}$$

✓ **Maple** : cpu = 0.097 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x) = -1/x^4*diff(y(x),x)+1/x^5*y(x),y(x))
```

$$y(x) = x\left(-\sqrt{3}\,\Gamma\left(\frac{2}{3}\right)\Gamma\left(\frac{1}{3}, -\frac{1}{3x^3}\right)c_2 + 2\pi c_2 + c_1\right)$$

ODE No. 1398

$$y''(x) = -\frac{(-(2v+1)^2 + x^2 - 1)\, y(x)}{(x^2-1)^2} - \frac{(3x^2-1)\, y'(x)}{x\,(x^2-1)}$$

✓ **Mathematica** : cpu = 0.123707 (sec), leaf count = 72

```
DSolve[Derivative[2][y][x] == -(((-1 - (1 + 2*v)^2 + x^2)*y[x])/(-1 + x^2)^2) - ((-1 + 3*x^2)
```

$$\left\{\left\{y(x) \to c_1 \left(x^2-1\right)^{-v-\frac{1}{2}}\ {}_2F_1\left(-v,-v;-2v;1-x^2\right) + c_2 \left(x^2-1\right)^{v+\frac{1}{2}}\ {}_2F_1\left(v+1,v+1;2v+2;1-x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.155 (sec), leaf count = 69

```
dsolve(diff(diff(y(x),x),x) = -1/(x^2-1)*(3*x^2-1)/x*diff(y(x),x)-(x^2-1-(2*v+1)^2)/(x^2-1)^2
```

$$y(x) = c_1 \left(x^2-1\right)^{-\frac{1}{2}-v} \operatorname{hypergeom}\left([-v,-v],[-2v],-x^2+1\right) + c_2 \left(x^2-1\right)^{v+\frac{1}{2}} \operatorname{hypergeom}\left([v+1,v+1],[2
$$

ODE No. 1399

$$y''(x) = \frac{(3x+1)y'(x)}{(x-1)(x+1)} - \frac{36(x+1)^2 y(x)}{(x-1)^2(3x+5)^2}$$

✓ **Mathematica** : cpu = 0.0333284 (sec), leaf count = 72

```
DSolve[Derivative[2][y][x] == (-36*(1 + x)^2*y[x])/((-1 + x)^2*(5 + 3*x)^2) + ((1 + 3*x)*Deri
```

$$\left\{\left\{y(x) \to c_1 e^{\frac{1}{2}(3\log(1-x)+\log(3x+5))} + \frac{1}{2}c_2 e^{\frac{1}{2}(3\log(1-x)+\log(3x+5))}(3\log(1-x)+\log(3x+5))\right\}\right\}$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 34

```
dsolve(diff(diff(y(x),x),x) = 1/(x-1)*(3*x+1)/(1+x)*diff(y(x),x)-36*(1+x)^2/(x-1)^2/(3*x+5)^2
```

$$y(x) = (x-1)^{\frac{3}{2}}\sqrt{3x+5}\,(3c_2\ln(x-1) + c_2\ln(3x+5) + c_1)$$

ODE No. 1400

$$y''(x) = \frac{y'(x)}{x} - \frac{a y(x)}{x^6}$$

✓ **Mathematica** : cpu = 0.0927283 (sec), leaf count = 60

```
DSolve[Derivative[2][y][x] == -((a*y[x])/x^6) + Derivative[1][y][x]/x,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x^2 e^{\frac{i\sqrt{a}}{2x^2}} - \frac{i c_2 x^2 e^{-\frac{i\sqrt{a}}{2x^2}}}{2\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.045 (sec), leaf count = 35

```
dsolve(diff(diff(y(x),x),x) = 1/x*diff(y(x),x)-a/x^6*y(x),y(x))
```

$$y(x) = x^2\left(\cosh\left(\frac{\sqrt{-a}}{2x^2}\right)c_2 + \sinh\left(\frac{\sqrt{-a}}{2x^2}\right)c_1\right)$$

ODE No. 1401

$$y''(x) = -\frac{(a+3x^2)\,y'(x)}{x^3} - \frac{by(x)}{x^6}$$

✓ **Mathematica** : cpu = 0.0097342 (sec), leaf count = 93

```
DSolve[Derivative[2][y][x] == -((b*y[x])/x^6) - ((a + 3*x^2)*Derivative[1][y][x])/x^3,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{-\frac{\sqrt{b}\left(-\frac{\sqrt{a^2-4b}}{\sqrt{b}}-\frac{a}{\sqrt{b}}\right)}{4x^2}} + c_2 e^{-\frac{\sqrt{b}\left(\frac{\sqrt{a^2-4b}}{\sqrt{b}}-\frac{a}{\sqrt{b}}\right)}{4x^2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.052 (sec), leaf count = 45

```
dsolve(diff(diff(y(x),x),x) = -1/x^3*(3*x^2+a)*diff(y(x),x)-b/x^6*y(x),y(x))
```

$$y(x) = c_1 \mathrm{e}^{-\frac{-a+\sqrt{a^2-4b}}{4x^2}} + c_2 \mathrm{e}^{\frac{a+\sqrt{a^2-4b}}{4x^2}}$$

ODE No. 1402

$$y''(x) = -\frac{y(x)\left(4a(a+1)x^4 - 2a(x^2-1)x^2 + (x^2-1)^2(x^2-v^2)\right)}{x^2(x^2-1)^2} - \frac{((1-4a)x^2-1)y'(x)}{x(x^2-1)}$$

✓ **Mathematica** : cpu = 0.808127 (sec), leaf count = 86

```
DSolve[Derivative[2][y][x] == -(((4*a*(1 + a)*x^4 - 2*a*x^2*(-1 + x^2) + (-1 + x^2)^2*(-v^2 +
```

$$\left\{\left\{y(x) \to c_2\left(x^2-1\right)^{a+1} x^{-v}\text{HeunC}\left[-\frac{a}{2}+v-\frac{3}{4},\frac{1}{4},1-v,2,0,x^2\right] + c_1\left(x^2-1\right)^{a+1} x^{v}\text{HeunC}\left[\frac{1}{4}(-2a-4\right.\right.$$

✓ **Maple** : cpu = 0.229 (sec), leaf count = 58

```
dsolve(diff(diff(y(x),x),x) = -1/x/(x^2-1)*((1-4*a)*x^2-1)*diff(y(x),x)-((-v^2+x^2)*(x^2-1)^2
```

$$y(x) = \left(x^2-1\right)^a\left(x^2-1\right)\left(c_1 x^v\,\text{HeunC}\left(0,v,1,\frac{1}{4},\frac{a}{2}+\frac{1}{4},x^2\right) + c_2 x^{-v}\,\text{HeunC}\left(0,-v,1,\frac{1}{4},\frac{a}{2}+\frac{1}{4},x^2\right)\right)$$

ODE No. 1403

$$y''(x) = -y'(x)\left(\frac{-\text{a1}-\text{b1}+1}{x-\text{c1}}+\frac{-\text{a2}-\text{b2}+1}{x-\text{c2}}+\frac{-\text{a3}-\text{b3}+1}{x-\text{c3}}\right)-\frac{y(x)\left(\frac{\text{a1b1(c1-c2)(c1-c3)}}{x-\text{c1}}+\frac{\text{a2b2(c2-}}{x}\right.}{(x-\text{c1})(x-\text{c}}$$

✓ **Mathematica** : cpu = 14.3933 (sec), leaf count = 316

```
DSolve[Derivative[2][y][x] == -((((a1*b1*(c1 - c2)*(c1 - c3))/(-c1 + x) + (a2*b2*(-c1 + c2)*(
```

$$\left\{\left\{y(x)\to c_1(x-\text{c1})^{\text{a1}}(x-\text{c2})^{\text{a2}}(x-\text{c3})^{\text{b3}}\text{HeunG}\left[\frac{\text{c1}-\text{c3}}{\text{c1}-\text{c2}},\frac{\text{a1(c1}(-\text{a3}-2\text{b1}-\text{b2}+2)+\text{c2(a3}+\text{b1}-1\right.\right.\right.$$

✓ **Maple** : cpu = 0.615 (sec), leaf count = 298

```
dsolve(diff(diff(y(x),x),x) = -((1-a1-b1)/(x-c1)+(1-a2-b2)/(x-c2)+(1-a3-b3)/(x-c3))*diff(y(x)
```

$$y(x)=(x-c2)^{a2}\,(x-c3)^{b3}\left((x-c1)^{a1}\,HG\left(\frac{c1-c3}{c1-c2},\frac{((-a3-2b1-b2+2)\,c1+(a3+b1-1)\,c2+}{}\right.\right.$$

ODE No. 1404

$$y''(x) = -\frac{(1-2x^2)\,y(x)}{4x^6} - \frac{(2x^2+1)\,y'(x)}{x^3}$$

✓ **Mathematica** : cpu = 0.0163308 (sec), leaf count = 33

```
DSolve[Derivative[2][y][x] == -1/4*((1 - 2*x^2)*y[x])/x^6 - ((1 + 2*x^2)*Derivative[1][y][x])
```

$$\left\{\left\{y(x) \to \frac{c_1 e^{\frac{1}{4x^2}}}{x} + c_2 e^{\frac{1}{4x^2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.037 (sec), leaf count = 19

```
dsolve(diff(diff(y(x),x),x) = -(2*x^2+1)/x^3*diff(y(x),x)-1/4*(-2*x^2+1)/x^6*y(x),y(x))
```

$$y(x) = \frac{\mathrm{e}^{\frac{1}{4x^2}}(c_1 x + c_2)}{x}$$

ODE No. 1405

$$y''(x) = \frac{(2x^2+1)\,y'(x)}{x^3} - \frac{(ax^4+10x^2+1)\,y(x)}{4x^6}$$

✓ **Mathematica** : cpu = 0.0478268 (sec), leaf count = 77

```
DSolve[Derivative[2][y][x] == -1/4*((1 + 10*x^2 + a*x^4)*y[x])/x^6 + ((1 + 2*x^2)*Derivative[
```

$$\left\{\left\{y(x) \to c_1 e^{-\frac{1}{4x^2}} x^{\frac{3}{2}-\frac{\sqrt{9-a}}{2}} + \frac{c_2 e^{-\frac{1}{4x^2}} x^{\frac{\sqrt{9-a}}{2}+\frac{3}{2}}}{\sqrt{9-a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 42

```
dsolve(diff(diff(y(x),x),x) = (2*x^2+1)/x^3*diff(y(x),x)-1/4*(a*x^4+10*x^2+1)/x^6*y(x),y(x))
```

$$y(x) = \mathrm{e}^{-\frac{1}{4x^2}}\left(x^{\frac{3}{2}-\frac{\sqrt{-a+9}}{2}} c_2 + x^{\frac{3}{2}+\frac{\sqrt{-a+9}}{2}} c_1\right)$$

ODE No. 1406

$$y''(x) = -\frac{27xy(x)}{16\left(x^3-1\right)^2}$$

✓ **Mathematica** : cpu = 1.47195 (sec), leaf count = 258

```
DSolve[Derivative[2][y][x] == (-27*x*y[x])/(16*(-1 + x^3)^2),y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt{2}c_2(1-x)^{3/4}\sqrt[4]{x^2+x+1}\int_1^x \frac{\sqrt{\sqrt{3}K[1]+\sqrt{2K[1]-i\sqrt{3}+1}\sqrt{2K[1]+i\sqrt{3}+1}+\sqrt{3}}}{2(1-K[1])^{3/2}\sqrt{K[1]^2+K[1]+1}}dK[1]}{\sqrt[4]{\sqrt{3}x+\sqrt{2x-i\sqrt{3}+1}\sqrt{2x+i\sqrt{3}+1}+\sqrt{3}}} + \frac{\sqrt{2}c_1(1\right.\right.$$
$$\left.\left.\sqrt[4]{\sqrt{3}x+\sqrt{2x-\right.\right.$$

✓ **Maple** : cpu = 0.137 (sec), leaf count = 44

```
dsolve(diff(diff(y(x),x),x) = -27/16*x/(x^3-1)^2*y(x),y(x))
```

$$y(x) = \sqrt{x}\left(x^3-1\right)^{\frac{1}{4}}\left(\text{LegendreP}\left(-\frac{1}{6},\frac{1}{3},\sqrt{-x^3+1}\right)c_1 + \text{LegendreQ}\left(-\frac{1}{6},\frac{1}{3},\sqrt{-x^3+1}\right)c_2\right)$$

ODE No. 1407

$$y''(x) = -y'(x)\left(\frac{\text{b1}(-\text{al1}-\text{bl1}+1)}{\text{b1}x-\text{a1}}+\frac{\text{b2}(-\text{al2}-\text{bl2}+1)}{\text{b2}x-\text{a2}}+\frac{\text{b3}(-\text{al3}-\text{bl3}+1)}{\text{b3}x-\text{a3}}\right)-\frac{y(x)\left(\frac{\text{al1bl1}(\text{a1b2}-\text{a}}{\text{b1}}\right.}$$

✓ **Mathematica** : cpu = 84.1822 (sec), leaf count = 2002

```
DSolve[Derivative[2][y][x] == -((((al1*(-(a2*b1) + a1*b2)*(a3*b1 - a1*b3)*bl1)/(-a1 + b1*x) +
```

$$\left\{\left\{y(x)\to\left(x-\frac{\text{a2}}{\text{b2}}\right)^{\frac{1}{2}\left(\text{al2}+\text{bl2}-\sqrt{\text{al2}^2+6\text{bl2al2}+\text{bl2}^2}\right)}\left(x-\frac{\text{a3}}{\text{b3}}\right)^{\frac{1}{2}\left(\text{al3}+\text{bl3}+\sqrt{\text{al3}^2+6\text{bl3al3}+\text{bl3}^2}\right)}c_1\text{HeunG}\left[\frac{\frac{\text{a1}}{\text{b1}}-\frac{\text{a3}}{\text{b3}}}{\frac{\text{a1}}{\text{b1}}-\frac{\text{a2}}{\text{b2}}}\right.\right.\right.$$

✓ **Maple** : cpu = 1.764 (sec), leaf count = 2607

```
dsolve(diff(diff(y(x),x),x) = -((1-al1-bl1)*b1/(b1*x-a1)+(1-al2-bl2)*b2/(b2*x-a2)+(1-al3-bl3)
```

Expression too large to display

ODE No. 1408

$$y''(x) = -\frac{y(x)\,(Ax^2+B)}{x\,(x^2-\text{a1})\,(x^2-\text{a2})\,(x^2-\text{a3})} - \frac{y'(x)\,(x^2((x^2-\text{a1})\,(x^2-\text{a2})+(x^2-\text{a1})\,(x^2-\text{a3})+(x^2-\text{a2})}{x\,(x^2-\text{a1})\,(x^2-\text{a2})\,(x^2}$$

✗ **Mathematica** : cpu = 41.3765 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -(((B + A*x^2)*y[x])/(x*(-a1 + x^2)*(-a2 + x^2)*(-a3 + x^2))) -
```

, DifferentialRoot result

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

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x) = -(x^2*((x^2-a1)*(x^2-a2)+(x^2-a2)*(x^2-a3)+(x^2-a3)*(x^2-a1))-(
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x) + \frac{(x^2((x^2-a1)\,(x^2-a2)+(x^2-a2)\,(x^2-a3)+(x^2-a3)\,(x^2-a1))-(x}{x\,(x^2-a1)\,(x^2-a2)\,(x^2-a3)}\right.\right.$$

ODE No. 1409

$$y''(x) = -b^2 x^{-2a} y(x) - \frac{a y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0183538 (sec), leaf count = 43

```
DSolve[Derivative[2][y][x] == -((b^2*y[x])/x^(2*a)) - (a*Derivative[1][y][x])/x,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \cos\left(\frac{b x^{1-a}}{a-1}\right) - c_2 \sin\left(\frac{b x^{1-a}}{a-1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x) = -a*x^(2*a-1)/(x^(2*a))*diff(y(x),x)-b^2/(x^(2*a))*y(x),y(x))
```

$$y(x) = c_1 \sin\left(\frac{x^{1-a} b}{a-1}\right) + c_2 \cos\left(\frac{x^{1-a} b}{a-1}\right)$$

ODE No. 1410

$$y''(x) = -\frac{y'(x)\left(apx^b+q\right)}{x\left(ax^b-1\right)} - \frac{y(x)\left(arx^b+s\right)}{x^2\left(ax^b-1\right)}$$

✓ **Mathematica** : cpu = 0.0865379 (sec), leaf count = 481

```
DSolve[Derivative[2][y][x] == -(((s + a*r*x^b)*y[x])/(x^2*(-1 + a*x^b))) - ((q + a*p*x^b)*Der
```

$$\left\{\left\{y(x) \to c_1 i^{\frac{-\sqrt{q^2+2q+4s+1}+q+1}{b}} a^{\frac{-\sqrt{q^2+2q+4s+1}+q+1}{2b}} \left(x^b\right)^{\frac{-\sqrt{q^2+2q+4s+1}+q+1}{2b}} {}_2F_1\left(\frac{p}{2b}+\frac{q}{2b}-\frac{\sqrt{p^2-2p-4r+1}}{2b}-\frac{\sqrt{}}{}\right.\right.$$

✓ **Maple** : cpu = 0.239 (sec), leaf count = 253

```
dsolve(diff(diff(y(x),x),x) = -(a*p*x^b+q)/x/(a*x^b-1)*diff(y(x),x)-(a*r*x^b+s)/x^2/(a*x^b-1)
```

$$y(x) = c_1 \,\text{hypergeom}\left(\left[\frac{p+q+\sqrt{q^2+2q+4s+1}+\sqrt{p^2-2p-4r+1}}{2b}, \frac{p+q+\sqrt{q^2+2q+4s+1}-\sqrt{p}\right.\right.$$

ODE No. 1411

$$y''(x) = \frac{y(x)}{e^x + 1}$$

✓ **Mathematica** : cpu = 0.285257 (sec), leaf count = 42

```
DSolve[Derivative[2][y][x] == y[x]/(1 + E^x),y[x],x]
```

$$\{\{y(x) \to c_1 \left(e^{-x} + 1\right) + c_2 e^{-x} (e^x \log\left(e^x + 1\right) + \log\left(e^x + 1\right) + 1)\}\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x) = 1/(exp(x)+1)*y(x),y(x))
```

$$y(x) = \left(c_1 (\mathrm{e}^x + 1) \ln\left(\mathrm{e}^x + 1\right) + c_2 \mathrm{e}^x + c_1 + c_2\right) \mathrm{e}^{-x}$$

ODE No. 1412

$$y''(x) = \frac{y'(x)}{x \log(x)} + y(x) \log^2(x)$$

✓ **Mathematica** : cpu = 0.0118503 (sec), leaf count = 29

```
DSolve[Derivative[2][y][x] == Log[x]^2*y[x] + Derivative[1][y][x]/(x*Log[x]),y[x],x]
```

$$\{\{y(x) \to c_1 \cosh(x(\log(x) - 1)) + ic_2 \sinh(x(\log(x) - 1))\}\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 23

```
dsolve(diff(diff(y(x),x),x) = 1/x/ln(x)*diff(y(x),x)+ln(x)^2*y(x),y(x))
```

$$y(x) = c_1 \sinh\left(x(\ln(x) - 1)\right) + c_2 \cosh\left(x(\ln(x) - 1)\right)$$

ODE No. 1413

$$y''(x) = \frac{y'(x)}{x(\log(x)-1)} - \frac{y(x)}{x^2(\log(x)-1)}$$

✓ **Mathematica** : cpu = 0.0444213 (sec), leaf count = 16

```
DSolve[Derivative[2][y][x] == -(y[x]/(x^2*(-1 + Log[x]))) + Derivative[1][y][x]/(x*(-1 + Log[
```

$$\{\{y(x) \to c_1 x - c_2 \log(x)\}\}$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 12

```
dsolve(diff(diff(y(x),x),x) = 1/x/(ln(x)-1)*diff(y(x),x)-1/x^2/(ln(x)-1)*y(x),y(x))
```

$$y(x) = c_1 x + c_2 \ln(x)$$

ODE No. 1414

$$y''(x) = y(x)\left(-\operatorname{csch}^2(x)\right)\left((1-n)n - a^2\sinh^2(x)\right)$$

✓ **Mathematica** : cpu = 0.774143 (sec), leaf count = 231

```
DSolve[Derivative[2][y][x] == -(Csch[x]^2*((1 - n)*n - a^2*Sinh[x]^2)*y[x]),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2(-1)^{\frac{1}{2}(-2n-1)+1}\tanh^2(x)^{\frac{1}{4}(-2n-1)+1}\left(\tanh^2(x)-1\right)^{\frac{1}{2}\left(\frac{a+n}{2}+\frac{1}{2}(a+n+1)+\frac{1}{2}(-2n-1)+1\right)-\frac{1}{2}}\ {}_2F_1\left(\frac{1}{2}(-2n-\right.}{\sqrt{\tanh(x)}}\right.$$

✓ **Maple** : cpu = 0.237 (sec), leaf count = 97

```
dsolve(diff(diff(y(x),x),x) = -(-a^2*sinh(x)^2-n*(n-1))/sinh(x)^2*y(x),y(x))
```

$$y(x) = c_1(\sinh^n(x))\,\text{hypergeom}\left(\left[-\frac{a}{2}+\frac{n}{2},\frac{a}{2}+\frac{n}{2}\right],\left[\frac{1}{2}\right],\frac{\cosh(2x)}{2}+\frac{1}{2}\right)+\frac{c_2(2\cosh(2x)+2)^{\frac{3}{4}}\ \text{hypergeo}}{}$$

ODE No. 1415

$$y''(x) = \left(a^2 - n^2\right) y(x) - 2n \coth(x) y'(x)$$

✓ **Mathematica** : cpu = 0.659368 (sec), leaf count = 273

```
DSolve[Derivative[2][y][x] == (a^2 - n^2)*y[x] - 2*n*Coth[x]*Derivative[1][y][x],y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2(-1)^{\frac{1}{2}(-2n-1)+1} \tanh^2(x)^{\frac{1}{4}(-2n-1)+1} \left(\tanh^2(x)-1\right)^{\frac{1}{2}\left(\frac{a+n}{2}+\frac{1}{2}(a+n+1)+\frac{1}{2}(-2n-1)+1\right)} {}_2F_1\left(\frac{1}{2}(-2n-1\right.\right.\right.$$

✓ **Maple** : cpu = 0.135 (sec), leaf count = 36

```
dsolve(diff(diff(y(x),x),x) = -2*n/sinh(x)*cosh(x)*diff(y(x),x)-(-a^2+n^2)*y(x),y(x))
```

$$y(x) = \left(\sinh^{-n+\frac{1}{2}}(x)\right)\left(\text{LegendreP}\left(a-\frac{1}{2},n-\frac{1}{2},\cosh(x)\right)c_1 + \text{LegendreQ}\left(a-\frac{1}{2},n-\frac{1}{2},\cosh(x)\right)c_2\right.$$

ODE No. 1416

$$y''(x) = (n-v)(n+v+1)y(x) - (2n+1)\cot(x)y'(x)$$

✓ **Mathematica** : cpu = 0.163673 (sec), leaf count = 46

```
DSolve[Derivative[2][y][x] == (n - v)*(1 + n + v)*y[x] - (1 + 2*n)*Cot[x]*Derivative[1][y][x]
```

$$\left\{\left\{y(x) \to c_1 \left(\cos^2(x)-1\right)^{-n/2} P_v^n(\cos(x)) + c_2 \left(\cos^2(x)-1\right)^{-n/2} Q_v^n(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.167 (sec), leaf count = 26

```
dsolve(diff(diff(y(x),x),x) = -(2*n+1)*cos(x)/sin(x)*diff(y(x),x)-(v+n+1)*(v-n)*y(x),y(x))
```

$$y(x) = \left(\sin^{-n}(x)\right)\left(\text{LegendreQ}\left(v, n, \cos(x)\right) c_2 + \text{LegendreP}\left(v, n, \cos(x)\right) c_1\right)$$

ODE No. 1417

$$y''(x) = -\csc(x)y'(x)\left(\sin^2(x) - \cos(x)\right) - y(x)\sin^2(x)$$

✓ **Mathematica** : cpu = 0.128542 (sec), leaf count = 52

```
DSolve[Derivative[2][y][x] == -(Sin[x]^2*y[x]) - Csc[x]*(-Cos[x] + Sin[x]^2)*Derivative[1][y]
```

$$\left\{\left\{y(x) \to c_1 e^{\frac{\cos(x)}{2}} \cos\left(\frac{1}{2}\sqrt{3}\cos(x)\right) + c_2 e^{\frac{\cos(x)}{2}} \sin\left(\frac{1}{2}\sqrt{3}\cos(x)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.133 (sec), leaf count = 31

```
dsolve(diff(diff(y(x),x),x) = -(sin(x)^2-cos(x))/sin(x)*diff(y(x),x)-y(x)*sin(x)^2,y(x))
```

$$y(x) = \mathrm{e}^{\frac{\cos(x)}{2}}\left(\sin\left(\frac{\sqrt{3}\,\cos(x)}{2}\right)c_1 + \cos\left(\frac{\sqrt{3}\,\cos(x)}{2}\right)c_2\right)$$

ODE No. 1418

$$y''(x) = \frac{y(x)\sin(x)}{x\cos(x) - \sin(x)} - \frac{x\sin(x)y'(x)}{x\cos(x) - \sin(x)}$$

✓ **Mathematica** : cpu = 0.115556 (sec), leaf count = 15

```
DSolve[Derivative[2][y][x] == (Sin[x]*y[x])/(x*Cos[x] - Sin[x]) - (x*Sin[x]*Derivative[1][y][
```

$$\{\{y(x) \to c_1 x + c_2 \sin(x)\}\}$$

✓ **Maple** : cpu = 4.603 (sec), leaf count = 59

```
dsolve(diff(diff(y(x),x),x) = -x*sin(x)/(cos(x)*x-sin(x))*diff(y(x),x)+sin(x)/(cos(x)*x-sin(x
```

$$y(x) = \sin(x)\left(\left(\int e^{\int \frac{-2\left(\cos^3(x)\right)x+3\left(\cos^2(x)\right)\sin(x)-\sin(x)}{\cos(x)(\cos(x)x-\sin(x))\sin(x)}dx}\cos(x)\,dx\right)c_2 + c_1\right)$$

ODE No. 1419

$$y''(x) = -\frac{\sec(x)y'(x)\left(x^2\sin(x) - 2x\cos(x)\right)}{x^2} \_ \frac{y(x)\sec(x)(2x\cos(x) - x\sin(x))}{x^2}$$

✗ **Mathematica** : cpu = 1.08084 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -((Sec[x]*(2*x*Cos[x] - x*Sin[x])*y[x])/x^2) - (Sec[x]*(-2*x*Co
```

, could not solve

```
DSolve[Derivative[2][y][x] == -((Sec[x]*(2*x*Cos[x] - x*Sin[x])*y[x])/x^2) - (Sec[x]*(-
2*x*Cos[x] + x^2*Sin[x])*Derivative[1][y][x])/x^2, y[x], x]
```

✓ **Maple** : cpu = 0.19 (sec), leaf count = 12

```
dsolve(diff(diff(y(x),x),x) = -(x^2*sin(x)-2*cos(x)*x)/x^2/cos(x)*diff(y(x),x)-(2*cos(x)-x*si
```

$$y(x) = x(\sin(x)c_2 + c_1)$$

ODE No. 1420

$$y(x)\left(-a\cos^2(x)-(n-1)n\right)+\cos^2(x)y''(x)=0$$

✓ **Mathematica** : cpu = 0.378629 (sec), leaf count = 134

```
DSolve[(-((-1 + n)*n) - a*Cos[x]^2)*y[x] + Cos[x]^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 i^{1-n}\cos^{1-n}(x)\,{}_2F_1\left(-\frac{n}{2}-\frac{i\sqrt{a}}{2}+\frac{1}{2},-\frac{n}{2}+\frac{i\sqrt{a}}{2}+\frac{1}{2};\frac{3}{2}-n;\cos^2(x)\right)+c_2 i^n\cos^n(x)\,{}_2F_1\left(\frac{n}{2}-\right.\right.\right.$$

✓ **Maple** : cpu = 0.298 (sec), leaf count = 123

```
dsolve(cos(x)^2*diff(diff(y(x),x),x)-(a*cos(x)^2+n*(n-1))*y(x),y(x))
```

$$y(x)=c_1\sin(2x)\left(\cos^{-n}(x)\right)\text{hypergeom}\left(\left[1-\frac{i\sqrt{a}}{2}-\frac{n}{2},1+\frac{i\sqrt{a}}{2}-\frac{n}{2}\right],\left[\frac{3}{2}-n\right],\frac{\cos(2x)}{2}+\frac{1}{2}\right)+\frac{c_2(-2}{}$$

ODE No. 1421

$$y''(x) = -a^2 n y(x) \sec^2(ax) \left((n-1)\sin^2(ax) + \cos^2(ax)\right) - a(n-1)\sin(2ax)\sec^2(ax) y'(x)$$

✓ **Mathematica** : cpu = 0.153011 (sec), leaf count = 81

```
DSolve[Derivative[2][y][x] == -(a^2*n*Sec[a*x]^2*(Cos[a*x]^2 + (-1 + n)*Sin[a*x]^2)*y[x]) - a
```

$$\left\{\left\{y(x) \to c_1 e^{-iax} \cos^{n-1}(ax) - \frac{i c_2 e^{2iax}\left(\frac{1}{2}e^{-iax} + \frac{1}{2}e^{iax}\right)^n}{a\left(1+e^{2iax}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.104 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x) = -a*(n-1)*sin(2*a*x)/cos(a*x)^2*diff(y(x),x)-n*a^2*((n-1)*sin(a*
```

$$y(x) = c_1\left(\cos^n(ax)\right) + c_2\left(\cos^{n-1}(ax)\right)\sin(ax)$$

ODE No. 1422

$$y''(x) = 2y(x)\csc^2(x)$$

✓ **Mathematica** : cpu = 0.0769327 (sec), leaf count = 58

```
DSolve[Derivative[2][y][x] == 2*Csc[x]^2*y[x],y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1 \cos(x)}{\sqrt{\cos^2(x)-1}} + \frac{c_2\left(\cos(x)\left(-\sin^{-1}(\cos(x))\right) - \sqrt{1-\cos^2(x)}\right)}{\sqrt{1-\cos^2(x)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.209 (sec), leaf count = 50

```
dsolve(diff(diff(y(x),x),x) = 2/sin(x)^2*y(x),y(x))
```

$$y(x) = \frac{-i\sin(2x)\ln(\cos(2x)+i\sin(2x))c_2 + c_1\sin(2x) + 2c_2(\cos(2x)-1)}{\cos(2x)-1}$$

ODE No. 1423

$$y''(x) = -ay(x)\csc^2(x)$$

✓ **Mathematica** : cpu = 0.0562062 (sec), leaf count = 70

```
DSolve[Derivative[2][y][x] == -(a*Csc[x]^2*y[x]),y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \sqrt[4]{\cos^2(x)-1}P^{\frac{1}{2}\sqrt{1-4a}}_{-\frac{1}{2}}(\cos(x)) + c_2 \sqrt[4]{\cos^2(x)-1}Q^{\frac{1}{2}\sqrt{1-4a}}_{-\frac{1}{2}}(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.25 (sec), leaf count = 132

```
dsolve(diff(diff(y(x),x),x) = -a/sin(x)^2*y(x),y(x))
```

$$y(x) = \frac{\sqrt{-2\cos(2x)+2}\,(2\cos(2x)+2)^{\frac{1}{4}}\left(\frac{\cos(2x)}{2}-\frac{1}{2}\right)^{\frac{\sqrt{1-4a}}{4}}\left(\text{hypergeom}\left(\left[\frac{\sqrt{1-4a}}{4}+\frac{3}{4},\frac{\sqrt{1-4a}}{4}+\frac{3}{4}\right],\left[\frac{3}{2}\right],\frac{c}{\sqrt{\sin(2x)}}\right.\right.$$

ODE No. 1424

$$y(x)\left(-a\sin^2(x)-(n-1)n\right)+\sin^2(x)y''(x)=0$$

✓ **Mathematica** : cpu = 0.190951 (sec), leaf count = 90

```
DSolve[(-((-1 + n)*n) - a*Sin[x]^2)*y[x] + Sin[x]^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\sqrt[4]{\cos^2(x)-1}P^{\frac{1}{2}(2n-1)}_{\frac{1}{2}i(2\sqrt{a}+i)}(\cos(x))+c_2\sqrt[4]{\cos^2(x)-1}Q^{\frac{1}{2}(2n-1)}_{\frac{1}{2}i(2\sqrt{a}+i)}(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.258 (sec), leaf count = 120

```
dsolve(sin(x)^2*diff(diff(y(x),x),x)-(a*sin(x)^2+n*(n-1))*y(x),y(x))
```

$$y(x)=\frac{\left(\frac{\cos(2x)}{2}-\frac{1}{2}\right)^{\frac{n}{2}}\left((-2\cos(2x)+2)^{\frac{1}{4}}\,\text{hypergeom}\left(\left[\frac{1}{2}+\frac{i\sqrt{a}}{2}+\frac{n}{2},\frac{1}{2}-\frac{i\sqrt{a}}{2}+\frac{n}{2}\right],\left[\frac{3}{2}\right],\frac{\cos(2x)}{2}+\frac{1}{2}\right)(2\cos$$
$$\sqrt{\sin(2x)}$$

ODE No. 1425

$$y''(x) = y(x)\csc^2(x)\left(a^2\cos^2(x) + (3-2a)\cos(x) - 3a + 3\right)$$

✓ **Mathematica** : cpu = 0.752464 (sec), leaf count = 236

```
DSolve[Derivative[2][y][x] == (3 - 3*a + (3 - 2*a)*Cos[x] + a^2*Cos[x]^2)*Csc[x]^2*y[x],y[x],
```

$$\left\{\left\{y(x) \to \frac{c_2\sqrt{1-\cos(x)}\left(-\frac{(2a-1)(\cos(x)+1)}{-2a\cos(x)+\cos(x)+2}\right)^{a+\frac{1}{2}}(-2a\cos(x)+\cos(x)+2)\left(1-\cos^2(x)\right)^{-a}\left(\frac{(2a-1)(\cos(x)}{(2a-1)\cos(x)}\right.\right.\right.$$

✓ **Maple** : cpu = 0.415 (sec), leaf count = 91

```
dsolve(diff(diff(y(x),x),x) = -(-a^2*cos(x)^2-(3-2*a)*cos(x)-3+3*a)/sin(x)^2*y(x),y(x))
```

$$y(x) = \frac{(2\cos(x)+2)^{\frac{1}{4}}\left(c_2\,\text{hypergeom}\left(\left[a-\frac{1}{2},-\frac{1}{2}-a\right],\left[\frac{3}{2}-a\right],\frac{\cos(x)}{2}+\frac{1}{2}\right)(\cos(x)+1)^{-\frac{1}{4}-\frac{a}{2}}\sqrt{2\cos(x)}\right.}{(-2\cos(x)+2)^{\frac{3}{4}}}$$

ODE No. 1426

$$y(x)\left(-a^2\cos^2(x)-\frac{b^2}{(2a-3)^2}-3a-b\cos(x)-2\right)+\sin^2(x)y''(x)=0$$

✓ **Mathematica** : cpu = 4.11309 (sec), leaf count = 4128

```
DSolve[(-2 - 3*a - b^2/(-3 + 2*a)^2 - b*Cos[x] - a^2*Cos[x]^2)*y[x] + Sin[x]^2*Derivative[2][
```

$$\left\{\left\{y(x)\to c_1(\cos(x)+1)^{\frac{1}{2}\left(-\frac{8a^2}{-16a^2+48a-36}+\frac{24a}{-16a^2+48a-36}+a-\frac{-32a^2+96a+\sqrt{\left(32a^2-96a+72\right)^2-4\left(-16a^2+48a-36\right)\left(16a^4+16ba^2-88a^2-\right.}}{2\left(-16a^2+48a-36\right)}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.515 (sec), leaf count = 549

```
dsolve(sin(x)^2*diff(diff(y(x),x),x)-(a^2*cos(x)^2+b*cos(x)+b^2/(2*a-3)^2+3*a+2)*y(x),y(x))
```

$$y(x)=\left(\frac{\cos(x)}{2}-\frac{1}{2}\right)^{\frac{4a-6+\sqrt{4b^2+16\left(a-\frac{3}{2}\right)^2b+16a^4-72a^2+81}}{8a-12}}\left(\text{hypergeom}\left(\left[\frac{8a^2+\sqrt{4b^2+16\left(a-\frac{3}{2}\right)^2b+16a^4-72a^2+81}-\sqrt{4b^2-16(a-}\right.\right.\right.$$

ODE No. 1427

$$y''(x) = y(x)\left(-\csc^2(x)\right)\left(-\left(\left(a^2b^2-(a+1)^2\right)\sin^2(x)\right)-a(a+1)b\sin(2x)+(1-a)a\right)$$

✓ **Mathematica** : cpu = 0.715982 (sec), leaf count = 129

```
DSolve[Derivative[2][y][x] == -(Csc[x]^2*((1 - a)*a - (-(1 + a)^2 + a^2*b^2)*Sin[x]^2 - a*(1
```

$$\left\{\left\{y(x)\to c_2\left(e^{-abx}\sin^{-a-1}(x)+\frac{(2a+1)\left(-1+e^{2ix}\right)e^{-abx}\sin^{a-2(a+1)}(x)\,{}_2F_1(1,ia(b+i);iba+a+2;e^{2ix}}{2(a(b-i)-i)}\right.\right.$$

✓ **Maple** : cpu = 1.224 (sec), leaf count = 203

```
dsolve(diff(diff(y(x),x),x) = -(-(a^2*b^2-(a+1)^2)*sin(x)^2-a*(a+1)*b*sin(2*x)-a*(a-1))/sin(x
```

$$y(x)=\frac{e^{\int\frac{\left(a\,b^2-a-2\right)\left(\cos^2(2x)\right)+(-2b(a+1)\sin(2x)-2a-1)\cos(2x)+(-2a-1)b\sin(2x)-a\,b^2-a+1}{(\cos(2x)+1)(\cos(2x)b-\sin(2x)-b)}dx}\left(\left(\int -2\,e^{-2\left(\int\frac{\left(a\,b^2-a-2\right)\left(\cos^2(2x)\right)+(-2b(}{(\cos}\right.\right.}{\sqrt{\sin(2x)}}$$

ODE No. 1428

$$y''(x) = y(x)\left(-\csc^2(x)\right)\left(a\cos^2(x) + b\sin^2(x) + c\right)$$

✓ **Mathematica** : cpu = 0.34127 (sec), leaf count = 104

```
DSolve[Derivative[2][y][x] == -(Csc[x]^2*(c + a*Cos[x]^2 + b*Sin[x]^2)*y[x]),y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \sqrt[4]{\cos^2(x)-1}\, P^{\frac{1}{2}\sqrt{-4a-4c+1}}_{\frac{1}{2}\left(2\sqrt{b-a}-1\right)}(\cos(x)) + c_2 \sqrt[4]{\cos^2(x)-1}\, Q^{\frac{1}{2}\sqrt{-4a-4c+1}}_{\frac{1}{2}\left(2\sqrt{b-a}-1\right)}(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.284 (sec), leaf count = 183

```
dsolve(diff(diff(y(x),x),x) = -(a*cos(x)^2+b*sin(x)^2+c)/sin(x)^2*y(x),y(x))
```

$$y(x) = \frac{\sqrt{-2\cos(2x)+2}\,(2\cos(2x)+2)^{\frac{1}{4}}\left(\frac{\cos(2x)}{2}-\frac{1}{2}\right)^{\frac{\sqrt{-4a+1-4c}}{4}}\left(\text{hypergeom}\left(\left[\frac{\sqrt{-4a+1-4c}}{4}+\frac{\sqrt{-a+b}}{2}+\frac{3}{4},\sqrt{}\right.\right.\right.$$

ODE No. 1429

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

✓ **Mathematica** : cpu = 0.0387498 (sec), leaf count = 51

```
DSolve[Derivative[2][y][x] == Csc[x]^2*y[x] - Cot[x]*Derivative[1][y][x],y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \cosh\left(\log\left(\cos\left(\frac{x}{2}\right)\right) - \log\left(\sin\left(\frac{x}{2}\right)\right)\right) - ic_2 \sinh\left(\log\left(\cos\left(\frac{x}{2}\right)\right) - \log\left(\sin\left(\frac{x}{2}\right)\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 25

```
dsolve(diff(diff(y(x),x),x) = -1/sin(x)*cos(x)*diff(y(x),x)+1/sin(x)^2*y(x),y(x))
```

$$y(x) = \frac{\sin(x)\,c_1}{\cos(x) - 1} + \frac{(\cos(x) - 1)\,c_2}{\sin(x)}$$

ODE No. 1430

$$y''(x) = -\left(y(x)\csc^2(x)\left(v(v+1)\sin^2(x) - n^2\right)\right) - \cot(x)y'(x)$$

✓ **Mathematica** : cpu = 0.370555 (sec), leaf count = 22

```
DSolve[Derivative[2][y][x] == -(Csc[x]^2*(-n^2 + v*(1 + v)*Sin[x]^2)*y[x]) - Cot[x]*Derivativ
```

$$\{\{y(x) \to c_1 P_v^n(\cos(x)) + c_2 Q_v^n(\cos(x))\}\}$$

✓ **Maple** : cpu = 0.27 (sec), leaf count = 85

```
dsolve(diff(diff(y(x),x),x) = -1/sin(x)*cos(x)*diff(y(x),x)-(v*(v+1)*sin(x)^2-n^2)/sin(x)^2*y
```

$$y(x) = \left(\frac{\cos(2x)}{2} - \frac{1}{2}\right)^{\frac{n}{2}} \left(\sqrt{\cos(2x)+1}\ \text{hypergeom}\left(\left[1 + \frac{v}{2} + \frac{n}{2}, \frac{1}{2} - \frac{v}{2} + \frac{n}{2}\right], \left[\frac{3}{2}\right], \frac{\cos(2x)}{2} + \frac{1}{2}\right) c_2 +$$

ODE No. 1431

$$y''(x) = \cot(2x)y'(x) - 2y(x)$$

✓ **Mathematica** : cpu = 0.147114 (sec), leaf count = 80

```
DSolve[Derivative[2][y][x] == -2*y[x] + Cot[2*x]*Derivative[1][y][x],y[x],x]
```

$$\left\{\left\{y(x) \to c_1\left(\cos^2(x) - \frac{1}{2}\right) - \frac{2}{3}c_2\cos^{\frac{3}{2}}(x)\left(2\cos^2(x)\,{}_2F_1\left(\frac{1}{4},\frac{3}{4};\frac{7}{4};\cos^2(x)\right) - {}_2F_1\left(\frac{1}{4},\frac{3}{4};\frac{7}{4};\cos^2(x)\right) + 3\right.\right.$$

✓ **Maple** : cpu = 0.183 (sec), leaf count = 30

```
dsolve(diff(diff(y(x),x),x) = cos(2*x)/sin(2*x)*diff(y(x),x)-2*y(x),y(x))
```

$$y(x) = \left(\sin^{\frac{3}{4}}(2x)\right)\left(\text{LegendreP}\left(\frac{1}{4},\frac{3}{4},\cos(2x)\right)c_1 + \text{LegendreQ}\left(\frac{1}{4},\frac{3}{4},\cos(2x)\right)c_2\right)$$

ODE No. 1432

$$y''(x) = -\cot(x)y'(x) - \frac{1}{4}y(x)\left(-17\sin^2(x) - 1\right)\csc^2(x)$$

✓ **Mathematica** : cpu = 0.0638446 (sec), leaf count = 37

```
DSolve[Derivative[2][y][x] == -1/4*(Csc[x]^2*(-1 - 17*Sin[x]^2)*y[x]) - Cot[x]*Derivative[1][
```

$$\left\{\left\{y(x) \to \frac{c_1 e^{-2x}}{\sqrt{\sin(x)}} + \frac{c_2 e^{2x}}{4\sqrt{\sin(x)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 22

```
dsolve(diff(diff(y(x),x),x) = -1/sin(x)*cos(x)*diff(y(x),x)-1/4*(-17*sin(x)^2-1)/sin(x)^2*y(x
```

$$y(x) = \frac{c_2\cosh(2x) + c_1\sinh(2x)}{\sqrt{\sin(x)}}$$

ODE No. 1433

$$y''(x) = -\frac{y(x)\sec^2(x)\left(2x^2 + x^2\sin^2(x) - 24\cos^2(x)\right)}{4x^2} - \tan(x)y'(x) + \sqrt{\cos(x)}$$

✓ **Mathematica** : cpu = 0.140711 (sec), leaf count = 46

```
DSolve[Derivative[2][y][x] == Sqrt[Cos[x]] - (Sec[x]^2*(2*x^2 - 24*Cos[x]^2 + x^2*Sin[x]^2)*y
```

$$\left\{\left\{y(x) \to \frac{1}{5}c_2 x^3\sqrt{\cos(x)} - \frac{1}{4}x^2\sqrt{\cos(x)} + \frac{c_1\sqrt{\cos(x)}}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.104 (sec), leaf count = 28

```
dsolve(diff(diff(y(x),x),x) = -sin(x)/cos(x)*diff(y(x),x)-1/4*(2*x^2+x^2*sin(x)^2-24*cos(x)^2
```

$$y(x) = \frac{\left(\sqrt{\cos}(x)\right)\left(4x^5c_1 - x^4 + 4c_2\right)}{4x^2}$$

ODE No. 1434

$$y''(x) = -\frac{b\cot(x)y'(x)}{a} - \frac{y(x)\csc^2(x)\left(c\cos^2(x) + d\cos(x) + e\right)}{a}$$

✓ **Mathematica** : cpu = 56.9564 (sec), leaf count = 1596424

```
DSolve[Derivative[2][y][x] == -(((e + d*Cos[x] + c*Cos[x]^2)*Csc[x]^2*y[x])/a) - (b*Cot[x]*De
```

Too large to display

✓ **Maple** : cpu = 0.561 (sec), leaf count = 517

```
dsolve(diff(diff(y(x),x),x) = -b/sin(x)*cos(x)/a*diff(y(x),x)-(c*cos(x)^2+d*cos(x)+e)/a/sin(x
```

$$y(x) = \left(\sin^{-\frac{a+b}{2a}}(x)\right)\left(\frac{\cos(x)}{2} - \frac{1}{2}\right)^{\frac{2a+\sqrt{a^2+(-2b-4c-4d-4e)a+b^2}}{4a}}\left(\text{hypergeom}\left(\left[\frac{\sqrt{a^2+(-2b-4c-4d-4e)a}}{}\right.\right.\right.$$

ODE No. 1435

$$y''(x) = -4y(x)\sin(3x)\csc^3(x)$$

✓ **Mathematica** : cpu = 0.125628 (sec), leaf count = 70

```
DSolve[Derivative[2][y][x] == -4*Csc[x]^3*Sin[3*x]*y[x],y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \sqrt[4]{\cos^2(x)-1}\, P^{\frac{i\sqrt{47}}{2}}_{-\frac{1}{2}+4i}(\cos(x)) + c_2 \sqrt[4]{\cos^2(x)-1}\, Q^{\frac{i\sqrt{47}}{2}}_{-\frac{1}{2}+4i}(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.134 (sec), leaf count = 38

```
dsolve(diff(diff(y(x),x),x) = -4*sin(3*x)/sin(x)^3*y(x),y(x))
```

$$y(x) = \left(\sqrt{\sin(x)}\right)\left(\text{LegendreP}\left(-\frac{1}{2}+4i, \frac{i\sqrt{47}}{2}, \cos(x)\right)c_1 + \text{LegendreQ}\left(-\frac{1}{2}+4i, \frac{i\sqrt{47}}{2}, \cos(x)\right)c_2\right)$$

ODE No. 1436

$$y''(x) = -\frac{1}{4}y(x)\csc^2(x)\left(-4n^2 + 4v(v+1)\sin^2(x) - \cos^2(x) + 2\right)$$

✓ **Mathematica** : cpu = 0.460635 (sec), leaf count = 42

```
DSolve[Derivative[2][y][x] == -1/4*(Csc[x]^2*(2 - 4*n^2 - Cos[x]^2 + 4*v*(1 + v)*Sin[x]^2)*y[
```

$$\left\{\left\{y(x) \to c_1 \sqrt[4]{\cos^2(x) - 1} P_v^n(\cos(x)) + c_2 \sqrt[4]{\cos^2(x) - 1} Q_v^n(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.246 (sec), leaf count = 113

```
dsolve(diff(diff(y(x),x),x) = -1/4*(4*v*(v+1)*sin(x)^2-cos(x)^2+2-4*n^2)/sin(x)^2*y(x),y(x))
```

$$y(x) = \frac{\sqrt{-2\cos(2x)+2}\,(2\cos(2x)+2)^{\frac{1}{4}}\left(\frac{\cos(2x)}{2} - \frac{1}{2}\right)^{\frac{n}{2}}\left(\text{hypergeom}\left(\left[1 + \frac{v}{2} + \frac{n}{2}, \frac{1}{2} - \frac{v}{2} + \frac{n}{2}\right], \left[\frac{3}{2}\right], \frac{\cos(2x)}{2}\right.\right.}{\sqrt{\sin(2x)}}$$

ODE No. 1437

$$y''(x) = \left(3\sin^2(x) + 1\right)\csc(x)\sec(x)y'(x) + y(x)\tan^2(x)$$

✓ **Mathematica** : cpu = 0.237698 (sec), leaf count = 42

```
DSolve[Derivative[2][y][x] == Tan[x]^2*y[x] + Csc[x]*Sec[x]*(1 + 3*Sin[x]^2)*Derivative[1][y]
```

$$\left\{\left\{y(x) \to c_2 \cos^{\frac{1}{2}\left(\sqrt{13}-3\right)}(x) + c_1 \cos^{\frac{1}{2}\left(-3-\sqrt{13}\right)}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.167 (sec), leaf count = 29

```
dsolve(diff(diff(y(x),x),x) = (3*sin(x)^2+1)/cos(x)/sin(x)*diff(y(x),x)+sin(x)^2/cos(x)^2*y(x
```

$$y(x) = c_1\left(\cos^{-\frac{3}{2}+\frac{\sqrt{13}}{2}}(x)\right) + c_2\left(\cos^{-\frac{3}{2}-\frac{\sqrt{13}}{2}}(x)\right)$$

ODE No. 1438

$$y''(x) = y(x) \left(-\csc^2(x)\right) \sec^2(x) \left(-a \sin^2(x) \cos^2(x) - (m-1)m \sin^2(x) + (1-n)n \cos^2(x)\right)$$

✓ **Mathematica** : cpu = 0.850535 (sec), leaf count = 615

```
DSolve[Derivative[2][y][x] == -(Csc[x]^2*Sec[x]^2*((1 - n)*n*Cos[x]^2 - (-1 + m)*m*Sin[x]^2 -
```

$$\left\{\left\{y(x) \to \frac{c_2(-1)^{\frac{1}{2}(-2m-1)+1} \cos^2(x)^{\frac{1}{4}(-2m-1)+1} \left(\cos^2(x)-1\right)^{\frac{1}{2}\left(\frac{4am+4\sqrt{-a}n^2+4an-4\sqrt{-a}n+4(-a)^{3/2}+8\sqrt{-a}a+\sqrt{-a}+4mn^2-}{8a+8n^2-8n+2}\right.}}{\right.\right.$$

✓ **Maple** : cpu = 0.171 (sec), leaf count = 102

```
dsolve(diff(diff(y(x),x),x) = -(-a*cos(x)^2*sin(x)^2-m*(m-1)*sin(x)^2-n*(n-1)*cos(x)^2)/cos(x
```

$$y(x) = \left(\sin^n(x)\right) \left(\left(\cos^m(x)\right) \text{hypergeom}\left(\left[\frac{n}{2}+\frac{m}{2}+\frac{i\sqrt{a}}{2}, \frac{n}{2}+\frac{m}{2}-\frac{i\sqrt{a}}{2}\right], \left[\frac{1}{2}+m\right], \cos^2(x)\right) c_1 + (\cos$$

ODE No. 1439

$$y''(x) = \frac{\phi'(x)y'(x)}{\phi(x)-\phi(a)} - \frac{y(x)\left(\phi''(a) - n(n+1)(\phi(x)-\phi(a))^2\right)}{\phi(x)-\phi(a)}$$

✗ **Mathematica** : cpu = 0.648182 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == (Derivative[1][phi][x]*Derivative[1][y][x])/(-phi[a] + phi[x])
```

, could not solve

```
DSolve[Derivative[2][y][x] == (Derivative[1][phi][x]*Derivative[1][y][x])/(-
phi[a] + phi[x]) - (y[x]*(-(n*(1 + n)*(-phi[a] + phi[x])^2) + Derivative[2][phi][a]))/(
phi[a] + phi[x]), y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x) = diff(phi(x),x)/(phi(x)-phi(a))*diff(y(x),x)-(-n*(n+1)*(phi(x)-p
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{d^2}{dx^2}_Y(x) - \frac{\left(\frac{d}{dx}\phi(x)\right)\left(\frac{d}{dx}_Y(x)\right)}{\phi(x)-\phi(a)} + \frac{\left(-n(n+1)(\phi(x)-\phi(a))^2 + \frac{d^2}{da^2}\phi(a)\right)_Y(x)}{\phi(x)-\phi(a)}\right\}, \{

ODE No. 1440

$$y''(x) = -\frac{y'(x)\left(-\phi''(x) - \phi(x)\phi'(x) + \phi(x^3)\right)}{\phi'(x) + \phi(x)^2} \_ \frac{y(x)\left(-\phi(x)\phi''(x) + \phi(x)^2\left(-\phi'(x)\right) + \phi'(x)^2\right)}{\phi'(x) + \phi(x)^2}$$

✗ **Mathematica** : cpu = 0.65428 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -((Derivative[1][y][x]*(phi[x^3] - phi[x]*Derivative[1][phi][x]
```

, could not solve

```
DSolve[Derivative[2][y][x] == -((Derivative[1][y][x]*(phi[x^3] - phi[x]*Derivative[1][p
(phi[x]^2*Derivative[1][phi][x]) + Derivative[1][phi][x]^2 - phi[x]*Derivative[2][phi][
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x) = -(phi(x^3)-phi(x)*diff(phi(x),x)-diff(diff(phi(x),x),x))/(diff(
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{\left(\left(\frac{d}{dx}\phi(x)\right)^2 - \phi(x)^2\left(\frac{d}{dx}\phi(x)\right) - \phi(x)\left(\frac{d^2}{dx^2}\phi(x)\right)\right) \_ Y(x)}{\frac{d}{dx}\phi(x) + \phi(x)^2} + \frac{\left(\phi(x^3) - \phi(x)\left(\frac{d}{dx}\phi(x)\right) - \frac{d}{dx}\right.}{\frac{d}{dx}\phi(x) + \phi(}\right.$$

ODE No. 1441

$$y''(x) = -\frac{y'(x)(-\mathrm{cn}(x|k)\mathrm{dn}(x|k) - 2\mathrm{sn}(x|k))}{\mathrm{sn}(x|k)^2 - \mathrm{sn}(a|k)^2} - \frac{y(x)\left(6k^2\mathrm{sn}(a|k)^4 - 4(k^2+1)\,\mathrm{sn}(a|k)^2 + 2\right)}{\mathrm{sn}(x|k)^2 - \mathrm{sn}(a|k)^2} - \frac{1}{\mathrm{sn}(x|k)^2 - \mathrm{sn}}$$

✗ **Mathematica** : cpu = 1.11897 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -(-JacobiSN[a, k]^2 + JacobiSN[x, k]^2)^(-1) - ((2 - 4*(1 + k^2
```

, could not solve

```
DSolve[Derivative[2][y][x] == -(-JacobiSN[a, k]^2 + JacobiSN[x, k]^2)^(-1) - ((2 - 4*(1
JacobiSN[a, k]^2 + JacobiSN[x, k]^2) - ((-(JacobiCN[x, k]*JacobiDN[x, k]) - 2*JacobiSN[
JacobiSN[a, k]^2 + JacobiSN[x, k]^2), y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x) = (2*JacobiSN(x,k)*JacobiCN(x,k)*JacobiDN(x,k)*diff(y(x),x)-2*(1-
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x) - \frac{2\,\mathrm{sn}(x|k)\,\mathrm{cn}(x|k)\,\mathrm{dn}(x|k)\left(\frac{d}{dx}\_Y(x)\right)}{\mathrm{sn}\left(x|k\right)^2 - \mathrm{sn}\left(a|k\right)} - \frac{\left(-2 + 4(k^2+1)\,\mathrm{sn}(a|k)^2 - 6k^2\mathrm{sn}(a\right.}{\mathrm{sn}\left(x|k\right)^2 - \mathrm{sn}\left(a|k\right)}\right.$$

ODE No. 1442

$$y''(x) = \frac{y(x)}{f(x)} - \frac{xy'(x)}{f(x)}$$

✓ **Mathematica** : cpu = 0.051898 (sec), leaf count = 46

```
DSolve[Derivative[2][y][x] == y[x]/f[x] - (x*Derivative[1][y][x])/f[x],y[x],x]
```

$$\left\{\left\{y(x) \to c_2 x \int_1^x \frac{\exp\left(-\int_1^{K[2]} \frac{K[1]}{f(K[1])} dK[1]\right)}{K[2]^2} dK[2] + c_1 x\right\}\right\}$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 30

```
dsolve(diff(diff(y(x),x),x) = -x/f(x)*diff(y(x),x)+1/f(x)*y(x),y(x))
```

$$y(x) = x\left(\left(\int \mathrm{e}^{\int \frac{-2-\frac{x^2}{f(x)}}{x} dx} dx\right) c_1 + c_2\right)$$

ODE No. 1443

$$y''(x) = -\frac{f'(x)y'(x)}{2f(x)} - \frac{g(x)y(x)}{f(x)}$$

✗ **Mathematica** : cpu = 0.297395 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -((g[x]*y[x])/f[x]) - (Derivative[1][f][x]*Derivative[1][y][x])
```

, could not solve

```
DSolve[Derivative[2][y][x] == -((g[x]*y[x])/f[x]) - (Derivative[1][f][x]*Derivative[1][
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x) = -1/2*diff(f(x),x)*diff(y(x),x)/f(x)-g(x)/f(x)*y(x),y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{g(x)\_Y(x)}{f(x)} + \frac{\left(\frac{d}{dx}f(x)\right)\left(\frac{d}{dx}\_Y(x)\right)}{2f(x)} + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

ODE No. 1444

$$y''(x) = -by(x)f(x)^{2a} - \frac{af'(x)y'(x)}{f(x)}$$

✗ **Mathematica** : cpu = 1.08347 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -(b*f[x]^(2*a)*y[x]) - (a*Derivative[1][f][x]*Derivative[1][y][
```

, could not solve

```
DSolve[Derivative[2][y][x] == -(b*f[x]^(2*a)*y[x]) - (a*Derivative[1][f][x]*Derivative[
```

✓ **Maple** : cpu = 0.02 (sec), leaf count = 37

```
dsolve(diff(diff(y(x),x),x) = a*diff(f(x),x)/f(x)*diff(y(x),x)-b*f(x)^(2*a+1)/f(x)*y(x),y(x))
```

$$y(x) = c_1 \mathrm{e}^{\int i f(x)^a \sqrt{b} dx} + c_2 \mathrm{e}^{-\left(\int i f(x)^a \sqrt{b} dx\right)}$$

ODE No. 1445

$$y''(x) = -\frac{y'(x)\left(2f(x)g(x)g'(x)^2 - \left(g(x)^2-1\right)\left(2f'(x)g'(x) + f(x)g''(x)\right)\right)}{f(x)\left(g(x)^2-1\right)g'(x)} - \frac{y(x)\left(\left(g(x)^2-1\right)\left(f'(x)\left(2f'(x\right.\right.\right.$$

✓ **Mathematica** : cpu = 0.148845 (sec), leaf count = 24

```
DSolve[Derivative[2][y][x] == -((Derivative[1][y][x]*(2*f[x]*g[x]*Derivative[1][g][x]^2 - (-1
```

$$\{\{y(x) \to c_1 f(x) P_v(g(x)) + c_2 f(x) Q_v(g(x))\}\}$$

✓ **Maple** : cpu = 0.27 (sec), leaf count = 20

```
dsolve(diff(diff(y(x),x),x) = -(2*f(x)*diff(g(x),x)^2*g(x)-(g(x)^2-1)*(f(x)*diff(diff(g(x),x)
```

$$y(x) = f(x)\left(\text{LegendreP}\left(v, g(x)\right) c_1 + \text{LegendreQ}\left(v, g(x)\right) c_2\right)$$

ODE No. 1446

$$y''(x) = -\frac{(x-1)y(x)}{x^4} - \frac{y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0401863 (sec), leaf count = 33

```
DSolve[Derivative[2][y][x] == -(((-1 + x)*y[x])/x^4) - Derivative[1][y][x]/x,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{-1/x} - c_2 e^{-1/x} \text{Ei}\left(\frac{2}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 22

```
dsolve(diff(diff(y(x),x),x) = -1/x*diff(y(x),x)-(x-1)/x^4*y(x),y(x))
```

$$y(x) = \mathrm{e}^{-\frac{1}{x}} \left(\text{expIntegral}\left(1, -\frac{2}{x}\right) c_2 + c_1\right)$$

ODE No. 1447

$$y''(x) = -\frac{(-x-1)y(x)}{x^4} - \frac{y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.039288 (sec), leaf count = 29

```
DSolve[Derivative[2][y][x] == -(((-1 - x)*y[x])/x^4) - Derivative[1][y][x]/x,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{\frac{1}{x}} - c_2 e^{\frac{1}{x}} \text{Ei}\left(-\frac{2}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.051 (sec), leaf count = 20

```
dsolve(diff(diff(y(x),x),x) = -1/x*diff(y(x),x)-(-1-x)/x^4*y(x),y(x))
```

$$y(x) = \mathrm{e}^{\frac{1}{x}}\left(\text{expIntegral}\left(1, \frac{2}{x}\right) c_2 + c_1\right)$$

ODE No. 1448

$$y''(x) = -\frac{b^2 y(x)}{\left(x^2 - a^2\right)^2}$$

✓ **Mathematica** : cpu = 0.194675 (sec), leaf count = 149

```
DSolve[Derivative[2][y][x] == -((b^2*y[x])/(-a^2 + x^2)^2),y[x],x]
```

$$\left\{\left\{y(x) \to c_1 (x-a)^{\frac{1}{2}\sqrt{1-\frac{b^2}{a^2}}+\frac{1}{2}} (a+x)^{\frac{1}{2}-\frac{1}{2}\sqrt{1-\frac{b^2}{a^2}}} - \frac{c_2 (x-a)^{\frac{1}{2}-\frac{1}{2}\sqrt{\frac{a^2-b^2}{a^2}}} (a+x)^{\frac{1}{2}\sqrt{\frac{a^2-b^2}{a^2}}+\frac{1}{2}}}{2a\sqrt{\frac{a^2-b^2}{a^2}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (sec), leaf count = 77

```
dsolve(diff(diff(y(x),x),x) = -b^2/(-a^2+x^2)^2*y(x),y(x))
```

$$y(x) = \sqrt{(a-x)(x+a)}\left(\left(\frac{a-x}{x+a}\right)^{-\frac{\sqrt{a^2-b^2}}{2a}} c_2 + \left(\frac{a-x}{x+a}\right)^{\frac{\sqrt{a^2-b^2}}{2a}} c_1\right)$$

ODE No. 1449

$$y^{(3)}(x) - \lambda y(x) = 0$$

✓ **Mathematica** : cpu = 0.0066122 (sec), leaf count = 53

```
DSolve[-(lambda*y[x]) + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{(-1)^{2/3}\sqrt[3]{\lambda}x} + c_2 e^{-\sqrt[3]{-1}\sqrt[3]{\lambda}x} + c_3 e^{\sqrt[3]{\lambda}x}\right\}\right\}$$

✓ **Maple** : cpu = 0.025 (sec), leaf count = 47

```
dsolve(diff(diff(diff(y(x),x),x),x)-lambda*y(x)=0,y(x))
```

$$y(x) = c_1 \mathrm{e}^{-\frac{\lambda^{\frac{1}{3}}\left(1+i\sqrt{3}\right)x}{2}} + c_2 \mathrm{e}^{\frac{\lambda^{\frac{1}{3}}\left(i\sqrt{3}-1\right)x}{2}} + c_3 \mathrm{e}^{\lambda^{\frac{1}{3}}x}$$

ODE No. 1450

$$ax^3 y(x) - bx + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 4.07642 (sec), leaf count = 3595

```
DSolve[-(b*x) + a*x^3*y[x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{6}\sqrt[3]{a}c_3\,{}_0F_2\left(;\frac{7}{6},\frac{4}{3};-\frac{ax^6}{216}\right)x^2 + \frac{\sqrt[6]{a}c_2\,{}_0F_2\left(;\frac{5}{6},\frac{7}{6};-\frac{ax^6}{216}\right)x}{\sqrt{6}} + c_1\,{}_0F_2\left(;\frac{2}{3},\frac{5}{6};-\frac{ax^6}{216}\right) + \frac{1}{6}\left(\sqrt[3]{a}\,{}_0F_{}\right.\right.\right.$$

✓ **Maple** : cpu = 0.218 (sec), leaf count = 1616

```
dsolve(diff(diff(diff(y(x),x),x),x)+y(x)*a*x^3-b*x=0,y(x))
```

Expression too large to display

ODE No. 1451

$$y^{(3)}(x) - ax^b y(x) = 0$$

✓ **Mathematica** : cpu = 0.0146767 (sec), leaf count = 168

```
DSolve[-(a*x^b*y[x]) + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to (-1)^{\frac{1}{b+3}}(b+3)^{-\frac{3}{b+3}} c_2 x a^{\frac{1}{b+3}}\, {}_0F_2\left(;1-\frac{1}{b+3},1+\frac{1}{b+3};\frac{ax^{b+3}}{(b+3)^3}\right) + (-1)^{\frac{2}{b+3}}(b+3)^{-\frac{6}{b+3}} c_3 x^2 a^{\frac{2}{b+3}}$$

✓ **Maple** : cpu = 0.1 (sec), leaf count = 114

```
dsolve(diff(diff(diff(y(x),x),x),x)-a*x^b*y(x)=0,y(x))
```

$$y(x) = c_1 \,\text{hypergeom}\left([],\left[\frac{b+1}{b+3},\frac{b+2}{b+3}\right],\frac{a\,x^{b+3}}{(b+3)^3}\right) + c_2 x \,\text{hypergeom}\left([],\left[\frac{b+2}{b+3},\frac{b+4}{b+3}\right],\frac{a\,x^{b+3}}{(b+3)^3}\right) + c_3 x^2$$

ODE No. 1452

$$y^{(3)}(x) + 3y'(x) - 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.0055018 (sec), leaf count = 54

```
DSolve[-4*y[x] + 3*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_3 e^x + c_2 e^{-x/2} \cos\left(\frac{\sqrt{15}x}{2}\right) + c_1 e^{-x/2} \sin\left(\frac{\sqrt{15}x}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 35

```
dsolve(diff(diff(diff(y(x),x),x),x)+3*diff(y(x),x)-4*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^x c_1 + c_2 \mathrm{e}^{-\frac{x}{2}} \sin\left(\frac{\sqrt{15}\,x}{2}\right) + c_3 \mathrm{e}^{-\frac{x}{2}} \cos\left(\frac{\sqrt{15}\,x}{2}\right)$$

ODE No. 1453

$$a^2(-y'(x)) - e^{2ax}\sin^2(x) + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 1.01629 (sec), leaf count = 128

```
DSolve[-(E^(2*a*x)*Sin[x]^2) - a^2*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{e^{-ax}(-9(a^2-4)\,a^4e^{3ax}\cos(2x) - 3(11a^2-4)\,a^3e^{3ax}\sin(2x) + (9a^6+49a^4+56a^2+16)\,(12a^2c_1}{12a^3\,(9a^6+49a^4+56a^2+16)}\right.\right.$$

✓ **Maple** : cpu = 0.139 (sec), leaf count = 122

```
dsolve(diff(diff(diff(y(x),x),x),x)-a^2*diff(y(x),x)-exp(2*a*x)*sin(x)^2=0,y(x))
```

$$y(x) = \frac{((-9a^6+36a^4)\cos(2x) + (-33a^5+12a^3)\sin(2x) + 9a^6+49a^4+56a^2+16)\,e^{2ax} + 108(a^2+4)\,(a}{108a^9+588a^7+672a^5+192a^3}$$

ODE No. 1454

$$2axy'(x) + ay(x) + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0062971 (sec), leaf count = 79

```
DSolve[a*y[x] + 2*a*x*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \text{Ai}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}x\right)^2 + c_3 \text{Bi}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}x\right)^2 + c_2 \text{Ai}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}x\right) \text{Bi}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.053 (sec), leaf count = 55

```
dsolve(diff(diff(diff(y(x),x),x),x)+2*a*x*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = c_1 \,\text{AiryAi}\left(-\frac{2^{\frac{2}{3}}a^{\frac{1}{3}}x}{2}\right)^2 + c_2 \,\text{AiryBi}\left(-\frac{2^{\frac{2}{3}}a^{\frac{1}{3}}x}{2}\right)^2 + c_3 \,\text{AiryAi}\left(-\frac{2^{\frac{2}{3}}a^{\frac{1}{3}}x}{2}\right) \text{AiryBi}\left(-\frac{2^{\frac{2}{3}}a^{\frac{1}{3}}x}{2}\right)$$

ODE No. 1455

$$x(a+b-1)y'(x)-aby(x)+x^2(-y''(x))+y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.0194908 (sec), leaf count = 127

```
DSolve[-(a*b*y[x]) + (-1 + a + b)*x*Derivative[1][y][x] - x^2*Derivative[2][y][x] + Derivativ
```

$$\left\{\left\{y(x)\to \sqrt[3]{-\frac{1}{3}}c_2 x\,{}_2F_2\left(\frac{1}{3}-\frac{a}{3},\frac{1}{3}-\frac{b}{3};\frac{2}{3},\frac{4}{3};\frac{x^3}{3}\right)+c_1\,{}_2F_2\left(-\frac{a}{3},-\frac{b}{3};\frac{1}{3},\frac{2}{3};\frac{x^3}{3}\right)+\left(-\frac{1}{3}\right)^{2/3}c_3x^2\,{}_2F_2\left(\frac{2}{3}-\right.\right.$$

✓ **Maple** : cpu = 0.113 (sec), leaf count = 71

```
dsolve(diff(diff(diff(y(x),x),x),x)-x^2*diff(diff(y(x),x),x)+(a+b-1)*x*diff(y(x),x)-b*y(x)*a=
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{a}{3},-\frac{b}{3}\right],\left[\frac{1}{3},\frac{2}{3}\right],\frac{x^3}{3}\right)+c_2x^2\,\text{hypergeom}\left(\left[-\frac{a}{3}+\frac{2}{3},-\frac{b}{3}+\frac{2}{3}\right],\left[\frac{4}{3},\frac{5}{3}\right],\frac{x^3}{3}\right)+c_3\,\text{h}$$

ODE No. 1456

$$x^{2c-2}y'(x)+(c-1)x^{2c-3}y(x)+y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.0247922 (sec), leaf count = 183

```
DSolve[(-1 + c)*x^(-3 + 2*c)*y[x] + x^(-2 + 2*c)*Derivative[1][y][x] + Derivative[3][y][x] ==
```

$$\left\{\left\{y(x)\to c_1\,{}_1F_2\left(\frac{1}{2}-\frac{1}{2c};1-\frac{1}{c},1-\frac{1}{2c};-\frac{x^{2c}}{4c^2}\right)+4^{-1/c}c^{-2/c}c_3\left(x^{2c}\right)^{\frac{1}{c}}\,{}_1F_2\left(\frac{1}{2}+\frac{1}{2c};1+\frac{1}{2c},1+\frac{1}{c};-\frac{x^{2c}}{4c^2}\right)\right.\right.$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 73

```
dsolve(diff(diff(diff(y(x),x),x),x)+x^(2*c-2)*diff(y(x),x)+(c-1)*x^(2*c-3)*y(x)=0,y(x))
```

$$y(x)=x\left(\text{BesselY}\left(\frac{1}{2c},\frac{x^c}{2c}\right)^2c_2+\text{BesselY}\left(\frac{1}{2c},\frac{x^c}{2c}\right)\text{BesselJ}\left(\frac{1}{2c},\frac{x^c}{2c}\right)c_3+\text{BesselJ}\left(\frac{1}{2c},\frac{x^c}{2c}\right)^2c_1\right)$$

ODE No. 1457

$$-3y'(x)(a+2\wp(x;\mathrm{g2},\mathrm{g3}))+by(x)+y^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 0.0147535 (sec), leaf count = 0

```
DSolve[b*y[x] - 3*(a + 2*WeierstrassP[x, {g2, g3}])*Derivative[1][y][x] + Derivative[3][y][x]
```

, could not solve

```
DSolve[b*y[x] - 3*(a + 2*WeierstrassP[x, {g2, g3}])*Derivative[1][y][x] + Derivative[3]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)-3*(2*WeierstrassP(x,g2,g3)+a)*diff(y(x),x)+b*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^3}{dx^3}\_Y(x)+(-6\,\mathrm{WeierstrassP}\,(x,g2,g3)-3a)\left(\frac{d}{dx}\_Y(x)\right)+b\_Y(x)\right\},\{\_Y(x)\}\right)$$

ODE No. 1458

$$\frac{1}{2}y(x)\left(\left(1-n^2\right)\wp'(x;\mathrm{g2},\mathrm{g3})-a\right)+\left(1-n^2\right)y'(x)\wp(x;\mathrm{g2},\mathrm{g3})+y^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 0.0156251 (sec), leaf count = 0

```
DSolve[((-a + (1 - n^2)*WeierstrassPPrime[x, {g2, g3}])*y[x])/2 + (1 - n^2)*WeierstrassP[x, {
```

, could not solve

```
DSolve[((-a + (1 - n^2)*WeierstrassPPrime[x, {g2, g3}])*y[x])/2 + (1 - n^2)*Weierstrass
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)+(-n^2+1)*WeierstrassP(x,g2,g3)*diff(y(x),x)+1/2*((-n^2+1)
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^3}{dx^3}\_Y(x)+\left(-n^2\,\mathrm{WeierstrassP}\left(x,g2,g3\right)+\mathrm{WeierstrassP}\left(x,g2,g3\right)\right)\left(\frac{d}{dx}\_Y(x)\right)+\left(\right.\right.\right.$$

ODE No. 1459

$$-y'(x)(a+4n(n+1)\wp(x;\mathrm{g2},\mathrm{g3}))-2n(n+1)y(x)\wp'(x;\mathrm{g2},\mathrm{g3})+y^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 0.0151853 (sec), leaf count = 0

```
DSolve[-2*n*(1 + n)*WeierstrassPPrime[x, {g2, g3}]*y[x] - (a + 4*n*(1 + n)*WeierstrassP[x, {g
```

, could not solve

```
DSolve[-2*n*(1 + n)*WeierstrassPPrime[x, {g2, g3}]*y[x] - (a + 4*n*(1 + n)*WeierstrassP
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)-(4*n*(n+1)*WeierstrassP(x,g2,g3)+a)*diff(y(x),x)-2*n*(n+1
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^2}{dx^2}_Y(x)+\left(-n^2\,\mathrm{WeierstrassP}\left(x,g2,g3\right)-n\,\mathrm{WeierstrassP}\left(x,g2,g3\right)-\frac{a}{4}\right)_Y(x)\right\},
$$

ODE No. 1460

$$y'(x)(a + A\wp(x; \mathrm{g2}, \mathrm{g3})) + By(x)\wp'(x; \mathrm{g2}, \mathrm{g3}) + y^{(3)}(x) = 0$$

✗ **Mathematica** : cpu = 0.0116189 (sec), leaf count = 0

```
DSolve[B*WeierstrassPPrime[x, {g2, g3}]*y[x] + (a + A*WeierstrassP[x, {g2, g3}])*Derivative[1
```

, could not solve

```
DSolve[B*WeierstrassPPrime[x, {g2, g3}]*y[x] + (a + A*WeierstrassP[x, {g2, g3}])*Deriva
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)+(A*WeierstrassP(x,g2,g3)+a)*diff(y(x),x)+B*WeierstrassPPr
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{d^3}{dx^3}_Y(x) + (A\,\mathrm{WeierstrassP}\,(x, g2, g3) + a)\left(\frac{d}{dx}_Y(x)\right) + B\mathcal{P}'(x; g2, g3)_Y(x)\right\}, \{_

ODE No. 1461

$$-y'(x)\left(a+3k^2\mathrm{sn}(z|x)^2\right)+y(x)\left(b+c\mathrm{sn}(z|x)^2-3k^2\mathrm{cn}(z|x)\mathrm{dn}(z|x)\mathrm{sn}(z|x)\right)+y^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 0.0238438 (sec), leaf count = 0

```
DSolve[(b - 3*k^2*JacobiCN[z, x]*JacobiDN[z, x]*JacobiSN[z, x] + c*JacobiSN[z, x]^2)*y[x] - (
```

, could not solve

```
DSolve[(b - 3*k^2*JacobiCN[z, x]*JacobiDN[z, x]*JacobiSN[z, x] + c*JacobiSN[z, x]^2)*y[
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)-(3*k^2*JacobiSN(z,x)^2+a)*diff(y(x),x)+(b+c*JacobiSN(z,x)
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^3}{dx^3}\_Y(x)+\left(-3k^2\mathrm{sn}(z|x)^2-a\right)\left(\frac{d}{dx}\_Y(x)\right)+\left(b+c\mathrm{sn}(z|x)^2-3k^2\mathrm{sn}(z|x)\,\mathrm{cn}(z|x)\,\mathrm{dn}(\right.\right.$$

ODE No. 1462

$$-y'(x)\left(a+6k^2\sin^2(x)\right)+by(x)+y^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 0.0414677 (sec), leaf count = 0

```
DSolve[b*y[x] - (a + 6*k^2*Sin[x]^2)*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[b*y[x] - (a + 6*k^2*Sin[x]^2)*Derivative[1][y][x] + Derivative[3][y][x] == 0, y[
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)-(6*k^2*sin(x)^2+a)*diff(y(x),x)+b*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^3}{dx^3}\_Y(x)+\left(-6k^2\left(\sin^2(x)\right)-a\right)\left(\frac{d}{dx}\_Y(x)\right)+b\_Y(x)\right\},\{\_Y(x)\}\right)$$

ODE No. 1463

$$y(x)f'(x) + 2f(x)y'(x) + y^{(3)}(x) = 0$$

✗ **Mathematica** : cpu = 0.0455153 (sec), leaf count = 0

```
DSolve[y[x]*Derivative[1][f][x] + 2*f[x]*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],
```

, could not solve

```
DSolve[y[x]*Derivative[1][f][x] + 2*f[x]*Derivative[1][y][x] + Derivative[3][y][x] == 0
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
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))
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{\frac{d^2}{dx^2}\_Y(x) + \frac{f(x)\_Y(x)}{2}\right\}, \{\_Y(x)\}\right)^2$$

ODE No. 1464

$$y^{(3)}(x) - 2y''(x) - 3y'(x) + 10y(x) = 0$$

✓ **Mathematica** : cpu = 0.0046838 (sec), leaf count = 34

```
DSolve[10*y[x] - 3*Derivative[1][y][x] - 2*Derivative[2][y][x] + Derivative[3][y][x] == 0,y[x
```

$$\{\{y(x) \to c_3 e^{-2x} + c_2 e^{2x} \cos(x) + c_1 e^{2x} \sin(x)\}\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 27

```
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))
```

$$y(x) = c_1 \mathrm{e}^{-2x} + c_2 \mathrm{e}^{2x} \sin(x) + c_3 \mathrm{e}^{2x} \cos(x)$$

ODE No. 1465

$$-a^2 y'(x) + 2a^2 y(x) + y^{(3)}(x) - 2y''(x) - \sinh(x) = 0$$

✓ **Mathematica** : cpu = 0.0816891 (sec), leaf count = 95

```
DSolve[-Sinh[x] + 2*a^2*y[x] - a^2*Derivative[1][y][x] - 2*Derivative[2][y][x] + Derivative[3
```

$$\left\{\left\{y(x) \to \frac{e^{-x}(3a^2e^{2x} - a^2 - 3e^{2x} - 12e^x \sinh(x) - 6e^x \cosh(x) + 1)}{6(a-2)(a+2)(a^2-1)} + c_1 e^{-ax} + c_3 e^{ax} + c_2 e^{2x}\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (sec), leaf count = 113

```
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
```

$$y(x) = \frac{(6a^4c_3 - 30a^2c_3 + 24c_3)\,\mathrm{e}^{-ax} + 6(a-1)\left(c_1a^2 + \frac{\sinh(3x)}{6} - 4c_1 - \frac{\cosh(3x)}{6}\right)(a+1)\,\mathrm{e}^{2x} + (6a^4c_2 - 30a^{\cdots}}{6a^4 - 30a^2 + 24}$$

ODE No. 1466

$$a^3(-y(x)) + 3a^2y'(x) - 3ay''(x) - e^{ax} + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0081311 (sec), leaf count = 46

```
DSolve[-E^(a*x) - a^3*y[x] + 3*a^2*Derivative[1][y][x] - 3*a*Derivative[2][y][x] + Derivative
```

$$\left\{\left\{y(x) \to \frac{1}{6}x^3e^{ax} + c_3x^2e^{ax} + c_2xe^{ax} + c_1e^{ax}\right\}\right\}$$

✓ **Maple** : cpu = 0.025 (sec), leaf count = 27

```
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(
```

$$y(x) = \frac{\mathrm{e}^{ax}(x^3 + 6x^2c_3 + 6xc_2 + 6c_1)}{6}$$

ODE No. 1467

$$\mathrm{a0}y(x) + \mathrm{a1}y'(x) + \mathrm{a2}y''(x) + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 0.004626 (sec), leaf count = 84

```
DSolve[a0*y[x] + a1*Derivative[1][y][x] + a2*Derivative[2][y][x] + Derivative[3][y][x] == 0,y
```

$$\left\{\left\{y(x) \to c_1 e^{x\mathrm{Root}[\#1^3+\#1^2\mathrm{a2}+\#1\mathrm{a1}+\mathrm{a0}\&,1]} + c_2 e^{x\mathrm{Root}[\#1^3+\#1^2\mathrm{a2}+\#1\mathrm{a1}+\mathrm{a0}\&,2]} + c_3 e^{x\mathrm{Root}[\#1^3+\#1^2\mathrm{a2}+\#1\mathrm{a1}+\mathrm{a0}\&,3]}\right\}\right.$$

✓ **Maple** : cpu = 0.031 (sec), leaf count = 590

```
dsolve(diff(diff(diff(y(x),x),x),x)+a2*diff(diff(y(x),x),x)+a1*diff(y(x),x)+a0*y(x)=0,y(x))
```

$$y(x) = c_1 \mathrm{e}^{-\frac{\left(\left(\frac{i\sqrt{3}}{12}+\frac{1}{12}\right)\left(36a1\,a2-108a0-8a2^3+12\sqrt{12a0\,a2^3-3a1^2a2^2-54a1\,a2\,a0+12a1^3+81a0^2}\right)^{\frac{2}{3}}+\frac{a2\left(36a1\,a2-108a0-8a2^3+12\sqrt{12a0\,a2^3-3a1^2a2^2-\cdots}\right.}{3}\cdots\right.}{\left(36a1\,a2-108a0-8a2^3+12\sqrt{12a0\,a2^3-3a1^2a2^2-54a1\,a2\,a0+12a1^3+81a0^2}\right)^{\frac{1}{3}}}}$$

ODE No. 1468

$$2\left(2a+4x^2-1\right)y'(x)-8axy(x)+y^{(3)}(x)-6xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0546179 (sec), leaf count = 57

```
DSolve[-8*a*x*y[x] + 2*(-1 + 2*a + 4*x^2)*Derivative[1][y][x] - 6*x*Derivative[2][y][x] + Der
```

$$\left\{\left\{y(x)\to c_2 H_{\frac{a}{2}}(x)\,{}_1F_1\left(-\frac{a}{4};\frac{1}{2};x^2\right)+c_1 H_{\frac{a}{2}}(x)^2+c_3\,{}_1F_1\left(-\frac{a}{4};\frac{1}{2};x^2\right)^2\right\}\right\}$$

✓ **Maple** : cpu = 0.094 (sec), leaf count = 59

```
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
```

$$y(x)=x^2\left(\text{KummerU}\left(\frac{1}{2}-\frac{a}{4},\frac{3}{2},x^2\right)^2 c_2+\text{KummerU}\left(\frac{1}{2}-\frac{a}{4},\frac{3}{2},x^2\right)\text{KummerM}\left(\frac{1}{2}-\frac{a}{4},\frac{3}{2},x^2\right)c_3+\text{K}\right.$$

ODE No. 1469

$$a^3x^3y(x)+3a^2x^2y'(x)+3axy''(x)+y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.012493 (sec), leaf count = 72

```
DSolve[a^3*x^3*y[x] + 3*a^2*x^2*Derivative[1][y][x] + 3*a*x*Derivative[2][y][x] + Derivative[
```

$$\left\{\left\{y(x)\to c_1e^{-\frac{ax^2}{2}}+c_2e^{-\frac{ax^2}{2}-\sqrt{3}\sqrt{a}x}+c_3e^{\sqrt{3}\sqrt{a}x-\frac{ax^2}{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 37

```
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
```

$$y(x)=\mathrm{e}^{-\frac{a\,x^2}{2}}\left(c_1+c_2\mathrm{e}^{\sqrt{3}\,\sqrt{a}\,x}+c_3\mathrm{e}^{-\sqrt{3}\,\sqrt{a}\,x}\right)$$

ODE No. 1470

$$y^{(3)}(x) - \sin(x)y''(x) - 2\cos(x)y'(x) + y(x)\sin(x) - \log(x) = 0$$

✓ **Mathematica** : cpu = 2.40225 (sec), leaf count = 64

```
DSolve[-Log[x] + Sin[x]*y[x] - 2*Cos[x]*Derivative[1][y][x] - Sin[x]*Derivative[2][y][x] + De
```

$$\left\{\left\{y(x) \to e^{-\cos(x)} \int_1^x \frac{1}{4} e^{\cos(K[1])} \left(2\log(K[1])K[1]^2 - 3K[1]^2 + 4c_1 K[1] + 4c_2\right) dK[1] + c_3 e^{-\cos(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.082 (sec), leaf count = 36

```
dsolve(diff(diff(diff(y(x),x),x),x)-diff(diff(y(x),x),x)*sin(x)-2*cos(x)*diff(y(x),x)+y(x)*si
```

$$y(x) = \left(c_3 + \int \left(2c_1 x + c_2 - \frac{3x^2}{4} + \frac{x^2 \ln(x)}{2}\right) \mathrm{e}^{\cos(x)} dx\right) \mathrm{e}^{-\cos(x)}$$

ODE No. 1471

$$f(x)y''(x)+f(x)y(x)+y^{(3)}(x)+y'(x)=0$$

✓ **Mathematica** : cpu = 0.0778437 (sec), leaf count = 84

```
DSolve[f[x]*y[x] + Derivative[1][y][x] + f[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0,
```

$$\left\{\left\{y(x)\to c_3e^{ix}\int_1^x e^{-2iK[3]}\int_1^{K[3]}\exp\left(\int_1^{K[2]}(i-f(K[1]))dK[1]\right)dK[2]dK[3]+c_1e^{ix}+\frac{1}{2}ic_2e^{-ix}\right\}\right\}$$

✓ **Maple** : cpu = 0.143 (sec), leaf count = 36

```
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))
```

$$y(x)=\mathrm{e}^{ix}\left(\int \mathrm{e}^{-2ix}\left(\int c_3\mathrm{e}^{\int(-f(x)+i)dx}dx+c_2\right)dx+c_1\right)$$

ODE No. 1472

$$f(x)\left(x^2y''(x)-2xy'(x)+2y(x)\right)+y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.0924054 (sec), leaf count = 88

```
DSolve[f[x]*(2*y[x] - 2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x]) + Derivative[3][y][x
```

$$\left\{\left\{y(x)\to c_3x\left(\int_1^x\frac{\exp\left(-\int_1^{K[2]}f(K[1])K[1]^2dK[1]\right)}{K[2]^2}dK[2]-x\int_1^x\frac{\exp\left(-\int_1^{K[3]}f(K[1])K[1]^2dK[1]\right)}{K[3]^3}dK\right.\right.\right.$$

✓ **Maple** : cpu = 0.143 (sec), leaf count = 33

```
dsolve(diff(diff(diff(y(x),x),x),x)+f(x)*(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+2*y(x))=0
```

$$y(x)=\left(\int\left(c_1+c_2\left(\int \mathrm{e}^{-\left(\int\left(x^2f(x)+\frac{3}{x}\right)dx\right)}dx\right)\right)dx+c_3\right)x$$

ODE No. 1473

$$y(x)\left(f(x)g(x)+g'(x)\right)+f(x)y''(x)+g(x)y'(x)+y^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 0.0106054 (sec), leaf count = 0

```
DSolve[y[x]*(f[x]*g[x] + Derivative[1][g][x]) + g[x]*Derivative[1][y][x] + f[x]*Derivative[2]
```

, could not solve

```
DSolve[y[x]*(f[x]*g[x] + Derivative[1][g][x]) + g[x]*Derivative[1][y][x] + f[x]*Derivat
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)+f(x)*diff(diff(y(x),x),x)+g(x)*diff(y(x),x)+(f(x)*g(x)+di
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^3}{dx^3}_Y(x)+f(x)\left(\frac{d^2}{dx^2}_Y(x)\right)+g(x)\left(\frac{d}{dx}_Y(x)\right)+\left(f(x)\,g(x)+\frac{d}{dx}g(x)\right)_Y(x)\right\},
$$

ODE No. 1474

$$y'(x)\left(f'(x)+2f(x)^2+4g(x)\right)+y(x)\left(4f(x)g(x)+2g'(x)\right)+3f(x)y''(x)+y^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 0.0125156 (sec), leaf count = 0

```
DSolve[y[x]*(4*f[x]*g[x] + 2*Derivative[1][g][x]) + (2*f[x]^2 + 4*g[x] + Derivative[1][f][x])
```

, could not solve

```
DSolve[y[x]*(4*f[x]*g[x] + 2*Derivative[1][g][x]) + (2*f[x]^2 + 4*g[x] + Derivative[1][
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)+3*f(x)*diff(diff(y(x),x),x)+(diff(f(x),x)+2*f(x)^2+4*g(x)
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{g(x)\_Y(x)+f(x)\left(\frac{d}{dx}\_Y(x)\right)+\frac{d^2}{dx^2}\_Y(x)\right\},\{\_Y(x)\}\right)^2$$

ODE No. 1475

$$4y^{(3)}(x) - 8y''(x) - 11y'(x) - 3y(x) + 18e^x = 0$$

✓ **Mathematica** : cpu = 0.0244776 (sec), leaf count = 38

```
DSolve[18*E^x - 3*y[x] - 11*Derivative[1][y][x] - 8*Derivative[2][y][x] + 4*Derivative[3][y][
```

$$\{\{y(x) \to e^x + c_1 e^{-x/2} + c_2 e^{-x/2} x + c_3 e^{3x}\}\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 23

```
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)
```

$$y(x) = (xc_3 + c_2)\,\mathrm{e}^{-\frac{x}{2}} + c_1\mathrm{e}^{3x} + \mathrm{e}^x$$

ODE No. 1476

$$-36n^2y'(x)\wp(x;\mathrm{g2},\mathrm{g3})-2(n+3)(4n-3)ny(x)\phi'(x)+27y^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 0.0828251 (sec), leaf count = 0

```
DSolve[-2*n*(3 + n)*(-3 + 4*n)*y[x]*Derivative[1][phi][x] - 36*n^2*WeierstrassP[x, {g2, g3}]*
```

, could not solve

```
DSolve[-2*n*(3 + n)*(-3 + 4*n)*y[x]*Derivative[1][phi][x] - 36*n^2*WeierstrassP[x, {g2,
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(27*diff(diff(diff(y(x),x),x),x)-36*n^2*WeierstrassP(x,g2,g3)*diff(y(x),x)-2*n*(n+3)*(4
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{27\frac{d^3}{dx^3}\_Y(x)-36n^2\,\mathrm{WeierstrassP}\left(x,g2,g3\right)\left(\frac{d}{dx}\_Y(x)\right)+\left(-8\mathcal{P}'(x;g2,g3)\,n^3-18\mathcal{P}'\right.\right.\right.$$

ODE No. 1477

$$x y^{(3)}(x) + 3y''(x) + x y(x) = 0$$

✓ **Mathematica** : cpu = 0.129006 (sec), leaf count = 48

```
DSolve[x*y[x] + 3*Derivative[2][y][x] + x*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_1 e^{-x}}{x} + \frac{c_2 e^{\sqrt[3]{-1}x}}{x} + \frac{c_3 e^{-(-1)^{2/3}x}}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (sec), leaf count = 41

```
dsolve(x*diff(diff(diff(y(x),x),x),x)+3*diff(diff(y(x),x),x)+x*y(x)=0,y(x))
```

$$y(x) = \frac{c_1 \mathrm{e}^{-x} + c_2 \mathrm{e}^{\frac{x}{2}} \sin\left(\frac{\sqrt{3}x}{2}\right) + c_3 \mathrm{e}^{\frac{x}{2}} \cos\left(\frac{\sqrt{3}x}{2}\right)}{x}$$

ODE No. 1478

$$-ax^2y(x)+xy^{(3)}(x)+3y''(x)=0$$

✓ **Mathematica** : cpu = 0.0242987 (sec), leaf count = 104

```
DSolve[-(a*x^2*y[x]) + 3*Derivative[2][y][x] + x*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{2(-1)^{3/4}\sqrt{2}c_1\,{}_0F_2\left(;\frac{1}{2},\frac{3}{4};\frac{ax^4}{64}\right)}{\sqrt[4]{a}x}+c_2\,{}_0F_2\left(;\frac{3}{4},\frac{5}{4};\frac{ax^4}{64}\right)+\frac{\sqrt[4]{-1}\sqrt[4]{a}c_3x\,{}_0F_2\left(;\frac{5}{4},\frac{3}{2};\frac{ax^4}{64}\right)}{2\sqrt{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.097 (sec), leaf count = 48

```
dsolve(x*diff(diff(diff(y(x),x),x),x)+3*diff(diff(y(x),x),x)-a*x^2*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left([],\left[\frac{3}{4},\frac{5}{4}\right],\frac{a\,x^4}{64}\right)+\frac{c_2\,\text{hypergeom}\left([],\left[\frac{1}{2},\frac{3}{4}\right],\frac{a\,x^4}{64}\right)}{x}+c_3x\,\text{hypergeom}\left([],\left[\frac{5}{4},\frac{3}{2}\right],\frac{a\,x^4}{64}\right.$$

ODE No. 1479

$$(a+b)y''(x) - ay(x) + xy^{(3)}(x) - xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.107786 (sec), leaf count = 153

```
DSolve[-(a*y[x]) - x*Derivative[1][y][x] + (a + b)*Derivative[2][y][x] + x*Derivative[3][y][x
```

$$\left\{\left\{y(x) \to \frac{1}{2}ic_2 x\,{}_1F_2\left(\frac{a}{2}+\frac{1}{2};\frac{3}{2},\frac{a}{2}+\frac{b}{2}+\frac{1}{2};\frac{x^2}{4}\right)+c_1\,{}_1F_2\left(\frac{a}{2};\frac{1}{2},\frac{a}{2}+\frac{b}{2};\frac{x^2}{4}\right)+c_3\left(\frac{i}{2}\right)^{-a-b+2}x^{-a-b+2}\,{}_1F_2\right.\right.$$

✓ **Maple** : cpu = 0.175 (sec), leaf count = 92

```
dsolve(x*diff(diff(diff(y(x),x),x),x)+(a+b)*diff(diff(y(x),x),x)-x*diff(y(x),x)-a*y(x)=0,y(x)
```

$$y(x) = c_1 \,\text{hypergeom}\left(\left[\frac{a}{2}\right],\left[\frac{1}{2},\frac{a}{2}+\frac{b}{2}\right],\frac{x^2}{4}\right)+c_2 x\,\text{hypergeom}\left(\left[\frac{1}{2}+\frac{a}{2}\right],\left[\frac{3}{2},\frac{a}{2}+\frac{b}{2}+\frac{1}{2}\right],\frac{x^2}{4}\right)+c_3 x^{-a-b}$$

ODE No. 1480

$$-(2v+x)y''(x)-(-2v+x-1)y'(x)+xy^{(3)}(x)+(x-1)y(x)=0$$

✓ **Mathematica** : cpu = 0.172087 (sec), leaf count = 93

```
DSolve[(-1 + x)*y[x] - (-1 - 2*v + x)*Derivative[1][y][x] - (2*v + x)*Derivative[2][y][x] + x
```

$$\left\{\left\{y(x)\to \frac{c_3 e^x x^{2v+2}\Gamma\left(v+\frac{3}{2}\right)\ {}_1\tilde{F}_1\left(v+\frac{3}{2};2v+3;-2x\right)}{\Gamma\left(\frac{1}{2}-v\right)}+c_2 2^{-2v-2}e^x G^{2,1}_{2,3}\left(2x\left|\begin{array}{c}1,v+\frac{3}{2}\\ 1,2(v+1),0\end{array}\right.\right)+c_1 e^x\right\}\right\}$$

✓ **Maple** : cpu = 0.186 (sec), leaf count = 35

```
dsolve(x*diff(diff(diff(y(x),x),x),x)-(x+2*v)*diff(diff(y(x),x),x)-(x-2*v-1)*diff(y(x),x)+(x-
```

$$y(x)=\mathrm{e}^x c_1+c_2 x^{v+1}\,\mathrm{BesselI}\left(-v-1,x\right)+c_3 x^{v+1}\,\mathrm{BesselK}\left(v+1,x\right)$$

ODE No. 1481

$$-f(x)+\left(x^2-3\right)y''(x)+xy^{(3)}(x)+4xy'(x)+2y(x)=0$$

✓ **Mathematica** : cpu = 0.374578 (sec), leaf count = 432

```
DSolve[-f[x] + 2*y[x] + 4*x*Derivative[1][y][x] + (-3 + x^2)*Derivative[2][y][x] + x*Derivati
```

$$\left\{\left\{y(x)\to -\frac{1}{240}e^{-\frac{x^2}{2}}\left(-240x^5\int_1^x\left(-\frac{1}{240}\left(15\text{Ei}\left(\frac{K[1]^2}{2}\right)+16e^{\frac{K[1]^2}{2}}\right)f(K[1])+\frac{1}{15}\sqrt{\frac{\pi}{2}}\text{erfi}\left(\frac{K[1]}{\sqrt{2}}\right)K[1]\right.\right.\right.$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 44

```
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)-f(
```

$$y(x)=\left(c_3+\int\frac{\left(2c_1x+c_2-\left(\int\int -f(x)\,dxdx\right)\right)\mathrm{e}^{\frac{x^2}{2}}}{x^6}dx\right)\mathrm{e}^{-\frac{x^2}{2}}x^5$$

ODE No. 1482

$$axy(x) - b + 2xy^{(3)}(x) + 3y''(x) = 0$$

✓ **Mathematica** : cpu = 6.62774 (sec), leaf count = 3629

```
DSolve[-b + a*x*y[x] + 3*Derivative[2][y][x] + 2*x*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1\, {}_0F_2\left(;\frac{2}{3},\frac{5}{6};-\frac{ax^3}{54}\right) + \frac{\sqrt[6]{a}\sqrt{x}c_2\, {}_0F_2\left(;\frac{5}{6},\frac{7}{6};-\frac{ax^3}{54}\right)}{\sqrt[6]{2}\sqrt{3}} + \frac{\sqrt[3]{a}xc_3\, {}_0F_2\left(;\frac{7}{6},\frac{4}{3};-\frac{ax^3}{54}\right)}{3\sqrt[3]{2}} + \frac{1}{6}\left(6\, {}_0F_2\left(;\frac{2}{3}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.286 (sec), leaf count = 1616

```
dsolve(2*x*diff(diff(diff(y(x),x),x),x)+3*diff(diff(y(x),x),x)+a*x*y(x)-b=0,y(x))
```

Expression too large to display

ODE No. 1483

$$-4(\nu+x-1)y''(x)+(6\nu+2x-5)y'(x)+(1-2\nu)y(x)+2xy^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.112306 (sec), leaf count = 112

```
DSolve[(1 - 2*nu)*y[x] + (-5 + 6*nu + 2*x)*Derivative[1][y][x] - 4*(-1 + nu + x)*Derivative[2
```

$$\left\{\left\{y(x)\to \frac{c_3 e^x x\Gamma\left(\frac{5}{2}-3\nu\right)\left(\frac{2\,{}_1\tilde{F}_1\left(\frac{3}{2}-3\nu;1-2\nu;-x\right)}{3(2\nu-1)x}+\frac{2}{3x\Gamma(2-2\nu)}\right)}{\Gamma\left(\frac{3}{2}-\nu\right)}+c_2 e^x G^{2,1}_{2,3}\left(x\left|\begin{array}{c}1,3\nu-\frac{1}{2}\\1,2\nu,0\end{array}\right.\right)+c_1 e^x\right\}\right\}$$

✓ **Maple** : cpu = 0.205 (sec), leaf count = 37

```
dsolve(2*x*diff(diff(diff(y(x),x),x),x)-4*(x+nu-1)*diff(diff(y(x),x),x)+(2*x+6*nu-5)*diff(y(x
```

$$y(x)=\mathrm{e}^x c_1+c_2\mathrm{e}^{\frac{x}{2}}x^\nu\,\mathrm{BesselI}\left(\nu,\frac{x}{2}\right)+c_3\mathrm{e}^{\frac{x}{2}}x^\nu\,\mathrm{BesselK}\left(\nu,\frac{x}{2}\right)$$

ODE No. 1484

$$6y'(x)(ak+bx)+3(2ax+k)y''(x)+y(x)(3bk+2cx)+2xy^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 61.7903 (sec), leaf count = 0

```
DSolve[(3*b*k + 2*c*x)*y[x] + 6*(a*k + b*x)*Derivative[1][y][x] + 3*(k + 2*a*x)*Derivative[2]
```

, DifferentialRoot result

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

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*x*diff(diff(diff(y(x),x),x),x)+3*(2*a*x+k)*diff(diff(y(x),x),x)+6*(a*k+b*x)*diff(y(x
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{(3bk+2cx)_Y(x)+(6ak+6bx)\left(\frac{d}{dx}_Y(x)\right)+(6ax+3k)\left(\frac{d^2}{dx^2}_Y(x)\right)+2x\left(\frac{d^3}{dx^3}_

ODE No. 1485

$$(x-2)xy^{(3)}(x)-(x-2)xy''(x)-2y'(x)+2y(x)=0$$

✓ **Mathematica** : cpu = 0.159635 (sec), leaf count = 64

```
DSolve[2*y[x] - 2*Derivative[1][y][x] - (-2 + x)*x*Derivative[2][y][x] + (-2 + x)*x*Derivativ
```

$$\left\{\left\{y(x)\to \frac{1}{4}c_3x^2\left(-\frac{4e^{x-2}\text{Ei}(2-x)}{x^2}+\frac{2}{x^2}+\frac{2}{x}+\log(2-x)-\log(x)\right)+c_1x^2+c_2e^x\right\}\right\}$$

✓ **Maple** : cpu = 0.278 (sec), leaf count = 51

```
dsolve((x-2)*x*diff(diff(diff(y(x),x),x),x)-(x-2)*x*diff(diff(y(x),x),x)-2*diff(y(x),x)+2*y(x
```

$$y(x)=c_3\,\text{expIntegral}\left(1,x-2\right)\mathrm{e}^{x-2}+\frac{c_3x^2\ln\left(x-2\right)}{4}+c_2\mathrm{e}^x-\frac{c_3x^2\ln\left(x\right)}{4}+\frac{\left(2x+2\right)c_3}{4}+c_1x^2$$

ODE No. 1486

$$(2x-1)y^{(3)}(x)-8xy'(x)+8y(x)=0$$

✓ **Mathematica** : cpu = 0.283482 (sec), leaf count = 65

```
DSolve[8*y[x] - 8*x*Derivative[1][y][x] + (-1 + 2*x)*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{4}c_3 x\left(\frac{e^{2x-2}\text{Ei}(2-4x)}{x}-\frac{2\text{Ei}(1-2x)}{e}-\frac{e^{-2x}}{x}\right)+c_1 x-c_2 e^{2x}\right\}\right\}$$

✓ **Maple** : cpu = 0.188 (sec), leaf count = 51

```
dsolve((2*x-1)*diff(diff(diff(y(x),x),x),x)-8*x*diff(y(x),x)+8*y(x)=0,y(x))
```

$$y(x)=c_1 x+\mathrm{e}^{2x}c_2-\frac{c_3(2x\,\mathrm{e}^{-1}\,\mathrm{expIntegral}\,(1,2x-1)-\mathrm{expIntegral}\,(1,4x-2)\,\mathrm{e}^{2x-2}-\mathrm{e}^{-2x})}{4}$$

ODE No. 1487

$$(2x-1)y^{(3)}(x)+(x+4)y''(x)+2y'(x)=0$$

✓ **Mathematica** : cpu = 0.649309 (sec), leaf count = 87

```
DSolve[2*Derivative[1][y][x] + (4 + x)*Derivative[2][y][x] + (-1 + 2*x)*Derivative[3][y][x] =
```

$$\left\{\left\{y(x)\to \int_1^x \left(\frac{e^{-\frac{K[1]}{2}}c_1\left(1+\frac{1}{4\left(\frac{K[1]}{2}-\frac{1}{4}\right)}\right)}{\sqrt[4]{\frac{K[1]}{2}-\frac{1}{4}}}+e^{-\frac{K[1]}{2}}c_2 L_{-\frac{1}{4}}^{\frac{5}{4}}\left(\frac{K[1]}{2}-\frac{1}{4}\right)\right)dK[1]+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.124 (sec), leaf count = 38

```
dsolve((2*x-1)*diff(diff(diff(y(x),x),x),x)+(x+4)*diff(diff(y(x),x),x)+2*diff(y(x),x)=0,y(x))
```

$$y(x)=\frac{\left(c_3+\int \frac{(2c_1x+c_2)\mathrm{e}^{\frac{x}{2}}}{(2x-1)^{\frac{3}{4}}}dx\right)\mathrm{e}^{-\frac{x}{2}}}{(2x-1)^{\frac{1}{4}}}$$

ODE No. 1488

$$ax^2y(x)+x^2y^{(3)}(x)-6y'(x)=0$$

✓ **Mathematica** : cpu = 0.400154 (sec), leaf count = 102

```
DSolve[a*x^2*y[x] - 6*Derivative[1][y][x] + x^2*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1e^{-\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2\right)}{x}+\frac{c_2e^{\sqrt[3]{-1}\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2(-1)^{2/3}\right)}{x}+\frac{c_3e^{-(-1)^{2/3}\sqrt[3]{a}x}\left(\sqrt[3]{a}x-2\sqrt[3]{-1}\right)}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.451 (sec), leaf count = 135

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-6*diff(y(x),x)+a*x^2*y(x)=0,y(x))
```

$$y(x)=\frac{-c_2\left(\left(-i-\sqrt{3}\right)\left(-a^4\right)^{\frac{2}{3}}+ia^3x\right)\mathrm{e}^{\frac{i\left(i-\sqrt{3}\right)\left(-a^4\right)^{\frac{1}{3}}x}{2a}}-\left(\left(-i+\sqrt{3}\right)\left(-a^4\right)^{\frac{2}{3}}+ia^3x\right)c_3\mathrm{e}^{\frac{i\left(\sqrt{3}+i\right)\left(-a^4\right)^{\frac{1}{3}}x}{2a}}+c_1}{x}$$

ODE No. 1489

$$x^2 y^{(3)}(x) + (x+1) y''(x) - y(x) = 0$$

✗ **Mathematica** : cpu = 0.554268 (sec), leaf count = 0

```
DSolve[-y[x] + (1 + x)*Derivative[2][y][x] + x^2*Derivative[3][y][x] == 0,y[x],x]
```

, DifferentialRoot result

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

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)+(1+x)*diff(diff(y(x),x),x)-y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = DESol\left(\left\{-\_Y(x) + (1+x)\left(\frac{d^2}{dx^2}\_Y(x)\right) + x^2\left(\frac{d^3}{dx^3}\_Y(x)\right)\right\}, \{\_Y(x)\}\right)$$

ODE No. 1490

$$x^2 y^{(3)}(x) + \left(x^2+1\right) y'(x) - x y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0263506 (sec), leaf count = 33

```
DSolve[(1 + x^2)*Derivative[1][y][x] - x*Derivative[2][y][x] + x^2*Derivative[3][y][x] == 0,y
```

$$\left\{\left\{y(x) \to \frac{1}{2} c_1 x^2 \, {}_0\tilde{F}_1\left(;2;-\frac{x^2}{4}\right) + c_2 x Y_1(x) + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 18

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-x*diff(diff(y(x),x),x)+(x^2+1)*diff(y(x),x)=0,y(x))
```

$$y(x) = c_1 + c_2 x \,\text{BesselJ}\left(1,x\right) + c_3 x \,\text{BesselY}\left(1,x\right)$$

ODE No. 1491

$$\left(-4a^2\nu^2+4a^2x^{2a}+1\right)y'(x)+x^2y^{(3)}(x)+3xy''(x)=4a^3x^{2a-1}y(x)$$

✓ **Mathematica** : cpu = 0.0315956 (sec), leaf count = 102

```
DSolve[(1 - 4*a^2*nu^2 + 4*a^2*x^(2*a))*Derivative[1][y][x] + 3*x*Derivative[2][y][x] + x^2*D
```

$$\left\{\left\{y(x)\to c_2\left(x^{2a}\right)^{-\nu}\ {}_1F_2\left(-\nu-\frac{1}{2};1-2\nu,1-\nu;-x^{2a}\right)+c_3\left(x^{2a}\right)^{\nu}\ {}_1F_2\left(\nu-\frac{1}{2};\nu+1,2\nu+1;-x^{2a}\right)+c_1\right.\right.$$

✓ **Maple** : cpu = 0.076 (sec), leaf count = 88

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)+3*x*diff(diff(y(x),x),x)+(4*a^2*x^(2*a)+1-4*nu^2*a^2)
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{1}{2}\right],[-\nu+1,\nu+1],-x^{2a}\right)+c_2x^{-2a\nu}\,\text{hypergeom}\left(\left[-\frac{1}{2}-\nu\right],[1-2\nu,-\nu+1],-\right.$$

ODE No. 1492

$$\left(4x(n-m)+m(2m-1)+2x^2\right)y'(x)-2n(-2m+2x+1)y(x)-3x(x-m)y''(x)+x^2y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.272117 (sec), leaf count = 43

```
DSolve[-2*n*(1 - 2*m + 2*x)*y[x] + (m*(-1 + 2*m) + 4*(-m + n)*x + 2*x^2)*Derivative[1][y][x]
```

$$\left\{\left\{y(x)\to c_2U(-n,m,x)L_n^{m-1}(x)+c_1U(-n,m,x)^2+c_3L_n^{m-1}(x)^2\right\}\right\}$$

✓ **Maple** : cpu = 0.104 (sec), leaf count = 39

```
dsolve(x^2*diff(diff(diff(y(x),x),x)-3*(x-m)*x*diff(diff(y(x),x),x)+(2*x^2+4*(n-m)*x+m*(2*
```

$$y(x)=c_1\,\text{KummerM}\left(-n,m,x\right)^2+c_2\,\text{KummerU}\left(-n,m,x\right)^2+c_3\,\text{KummerM}\left(-n,m,x\right)\text{KummerU}\left(-n,m,x\right.$$

ODE No. 1493

$$-f(x)+x^2y^{(3)}(x)+\left(x^2+2\right)y'(x)+4xy''(x)+3xy(x)=0$$

✓ **Mathematica** : cpu = 1.01232 (sec), leaf count = 2585

```
DSolve[-f[x] + 3*x*y[x] + (2 + x^2)*Derivative[1][y][x] + 4*x*Derivative[2][y][x] + x^2*Deriv
```

$$\left\{\left\{y(x)\to J_0(x)c_1+2Y_0(x)c_2+\frac{2c_3\,{}_1F_2\left(1;\frac{1}{2},\frac{1}{2};-\frac{x^2}{4}\right)}{x}+\frac{xJ_0(x)\int_1^x\left(\frac{-16J_1(K[1])Y_0(K[1])^2f(K[1])\,{}_1F_2(3;\frac{5}{2},\frac{5}{2};-\frac{1}{4}K[1\right.\right.\right.$$

✓ **Maple** : cpu = 0.3 (sec), leaf count = 1033

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)+4*x*diff(diff(y(x),x),x)+(x^2+2)*diff(y(x),x)+3*x*y(x
```

Expression too large to display

ODE No. 1494

$$x^2 y^{(3)}(x) + 5x y''(x) + 4y'(x) - \log(x) = 0$$

✓ **Mathematica** : cpu = 0.0190875 (sec), leaf count = 43

```
DSolve[-Log[x] + 4*Derivative[1][y][x] + 5*x*Derivative[2][y][x] + x^2*Derivative[3][y][x] ==
```

$$\left\{\left\{y(x) \to -\frac{x}{2} + \frac{1}{4}x\log(x) - \frac{c_1}{x} - \frac{2c_2}{x} - \frac{2c_2\log(x)}{x} + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 32

```
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)=0,y(x))
```

$$y(x) = \frac{(x^2 + 4c_2)\ln(x) - 2x^2 + 4c_1 x + 4c_3}{4x}$$

ODE No. 1495

$$x^2 y^{(3)}(x) + 6xy''(x) + 6y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0057978 (sec), leaf count = 24

```
DSolve[6*Derivative[1][y][x] + 6*x*Derivative[2][y][x] + x^2*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{c_1}{2x^2} - \frac{c_2}{x} + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.012 (sec), leaf count = 16

```
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))
```

$$y(x) = c_1 + \frac{c_2}{x} + \frac{c_3}{x^2}$$

ODE No. 1496

$$ax^2y(x)+x^2y^{(3)}(x)+6xy''(x)+6y'(x)=0$$

✓ **Mathematica** : cpu = 0.194448 (sec), leaf count = 63

```
DSolve[a*x^2*y[x] + 6*Derivative[1][y][x] + 6*x*Derivative[2][y][x] + x^2*Derivative[3][y][x]
```

$$\left\{\left\{y(x)\to \frac{c_1e^{-\sqrt[3]{a}x}}{x^2}+\frac{c_2e^{\sqrt[3]{-1}\sqrt[3]{a}x}}{x^2}+\frac{c_3e^{-(-1)^{2/3}\sqrt[3]{a}x}}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 57

```
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,
```

$$y(x)=\frac{c_1\mathrm{e}^{\frac{(-a)^{\frac{1}{3}}\left(i\sqrt{3}-1\right)x}{2}}+c_2\mathrm{e}^{-\frac{(-a)^{\frac{1}{3}}\left(1+i\sqrt{3}\right)x}{2}}+c_3\mathrm{e}^{(-a)^{\frac{1}{3}}x}}{x^2}$$

ODE No. 1497

$$-3x(p+q)y''(x)+3p(3q+1)y'(x)+x^2y^{(3)}(x)+x^2(-y(x))=0$$

✓ **Mathematica** : cpu = 0.361604 (sec), leaf count = 135

```
DSolve[-(x^2*y[x]) + 3*p*(1 + 3*q)*Derivative[1][y][x] - 3*(p + q)*x*Derivative[2][y][x] + x^
```

$$\left\{\left\{y(x)\to c_1\,{}_0F_2\left(;\frac{2}{3}-p,\frac{1}{3}-q;\frac{x^3}{27}\right)+c_2(-1)^{\frac{1}{3}(3p+1)}3^{-3p-1}x^{3p+1}\,{}_0F_2\left(;p+\frac{4}{3},p-q+\frac{2}{3};\frac{x^3}{27}\right)+c_3(-1)^{\frac{1}{3}(\right.\right.$$

✓ **Maple** : cpu = 0.194 (sec), leaf count = 77

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-3*(p+q)*x*diff(diff(y(x),x),x)+3*p*(3*q+1)*diff(y(x),
```

$$y(x)=c_1\,\text{hypergeom}\left([],\left[-q+\frac{1}{3},-p+\frac{2}{3}\right],\frac{x^3}{27}\right)+c_2x^{3p+1}\,\text{hypergeom}\left([],\left[p+\frac{4}{3},\frac{2}{3}-q+p\right],\frac{x^3}{27}\right)+c_3x^{3}$$

ODE No. 1498

$$\left(ax^2+6n\right)y'(x)-2axy(x)-2(n+1)xy''(x)+x^2y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 8.40185 (sec), leaf count = 584

```
DSolve[-2*a*x*y[x] + (6*n + a*x^2)*Derivative[1][y][x] - 2*(1 + n)*x*Derivative[2][y][x] + x^
```

$$\left\{\left\{y(x)\to -\frac{\pi c_3 2^{-n-\frac{3}{2}}x\left(\sqrt{a}x\right)^{-n-\frac{1}{2}}\left(-a^{3/2}2^{2n}x^3\sec(\pi n)\Gamma\left(\frac{3}{2}-n\right)\Gamma\left(n+\frac{3}{2}\right)J_{\frac{1}{2}(2n+1)}\left(\sqrt{a}x\right)\ {}_1\tilde{F}_2\left(\frac{3}{2}-n;\frac{1}{2}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.197 (sec), leaf count = 53

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-2*(n+1)*x*diff(diff(y(x),x),x)+(a*x^2+6*n)*diff(y(x),
```

$$y(x)=c_1x^{n+\frac{1}{2}}\,\text{BesselJ}\left(-n-\frac{1}{2},\sqrt{a}\,x\right)+c_2x^{n+\frac{1}{2}}\,\text{BesselY}\left(-n-\frac{1}{2},\sqrt{a}\,x\right)+c_3\left(a\,x^2+4n-2\right)$$

ODE No. 1499

$$-\left(\nu^2+x^2-\frac{1}{4}\right)y'(x)+\left(\nu^2+x^2-2x-\frac{1}{4}\right)y(x)+x^2y^{(3)}(x)-\left(x^2-2x\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.188554 (sec), leaf count = 97

```
DSolve[(-1/4 + nu^2 - 2*x + x^2)*y[x] - (-1/4 + nu^2 + x^2)*Derivative[1][y][x] - (-2*x + x^2
```

$$\left\{\left\{y(x)\to \frac{c_3e^x x^{\nu+\frac{1}{2}}\Gamma\left(\nu+\frac{1}{2}\right)\ {}_1\tilde{F}_1\left(\nu+\frac{1}{2};2\nu+1;-2x\right)}{\Gamma\left(\frac{3}{2}-\nu\right)}+c_2 2^{-\nu-\frac{1}{2}}e^x G^{2,1}_{2,3}\left(2x\left|\begin{array}{c}1,0\\ \frac{1}{2}-\nu,\nu+\frac{1}{2},0\end{array}\right.\right)+c_1e^x\right\}\right\}$$

✓ **Maple** : cpu = 0.191 (sec), leaf count = 25

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-(x^2-2*x)*diff(diff(y(x),x),x)-(x^2+nu^2-1/4)*diff(y(
```

$$y(x)=\mathrm{e}^x c_1+c_2\sqrt{x}\ \mathrm{BesselI}\left(\nu,x\right)+c_3\sqrt{x}\ \mathrm{BesselK}\left(\nu,x\right)$$

ODE No. 1500

$$\nu(2x+1)y'(x)-\nu(x+1)y(x)-x(v+x)y''(x)+x^2y^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 29.1946 (sec), leaf count = 0

```
DSolve[-(nu*(1 + x)*y[x]) + nu*(1 + 2*x)*Derivative[1][y][x] - x*(v + x)*Derivative[2][y][x]
```

, DifferentialRoot result

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

✓ **Maple** : cpu = 0.162 (sec), leaf count = 55

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-(x+nu)*x*diff(diff(y(x),x),x)+nu*(2*x+1)*diff(y(x),x)
```

$$y(x)=\mathrm{e}^{x}c_1+c_2x^{\frac{\nu}{2}+\frac{1}{2}}\,\mathrm{BesselJ}\left(-\nu-1,2\sqrt{\nu}\,\sqrt{x}\right)+c_3x^{\frac{\nu}{2}+\frac{1}{2}}\,\mathrm{BesselY}\left(-\nu-1,2\sqrt{\nu}\,\sqrt{x}\right)$$

ODE No. 1501

$$\left(-\nu^2+x^2-2x+\frac{1}{4}\right)y'(x)+\left(\nu^2-\frac{1}{4}\right)y(x)+x^2y^{(3)}(x)-2\left(x^2-x\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.157331 (sec), leaf count = 86

```
DSolve[(-1/4 + nu^2)*y[x] + (1/4 - nu^2 - 2*x + x^2)*Derivative[1][y][x] - 2*(-x + x^2)*Deriv
```

$$\left\{\left\{y(x)\to \frac{c_3e^x x^{\nu+\frac{1}{2}}\Gamma\left(\nu+\frac{1}{2}\right)\ {}_1\tilde{F}_1\left(\nu+\frac{1}{2};2\nu+1;-x\right)}{\Gamma\left(\frac{3}{2}-\nu\right)}+c_2e^xG^{2,1}_{2,3}\left(x\left|\begin{array}{c}1,0\\ \frac{1}{2}-\nu,\nu+\frac{1}{2},0\end{array}\right.\right)+c_1e^x\right\}\right\}$$

✓ **Maple** : cpu = 0.168 (sec), leaf count = 37

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-2*(x^2-x)*diff(diff(y(x),x),x)+(x^2-2*x+1/4-nu^2)*dif
```

$$y(x)=\mathrm{e}^x c_1+c_2\mathrm{e}^{\frac{x}{2}}\sqrt{x}\ \mathrm{BesselI}\left(\nu,\frac{x}{2}\right)+c_3\mathrm{e}^{\frac{x}{2}}\sqrt{x}\ \mathrm{BesselK}\left(\nu,\frac{x}{2}\right)$$

ODE No. 1502

$$-\left(x^4-6x\right)y''(x)-\left(2x^3-6\right)y'(x)+x^2y^{(3)}(x)+2x^2y(x)=0$$

✓ **Mathematica** : cpu = 0.0709371 (sec), leaf count = 98

```
DSolve[2*x^2*y[x] - (-6 + 2*x^3)*Derivative[1][y][x] - (-6*x + x^4)*Derivative[2][y][x] + x^2
```

$$\left\{\left\{y(x)\to \frac{c_2\Gamma\left(\frac{1}{3}\right)\ {}_2F_2\left(-\frac{2}{3},\frac{1}{3};\frac{2}{3},\frac{4}{3};\frac{x^3}{3}\right)}{3x\Gamma\left(\frac{4}{3}\right)}+\frac{\sqrt[3]{-\frac{1}{3}}c_3\Gamma\left(\frac{2}{3}\right)\ {}_2F_2\left(-\frac{1}{3},\frac{2}{3};\frac{4}{3},\frac{5}{3};\frac{x^3}{3}\right)}{3\Gamma\left(\frac{5}{3}\right)}+\frac{c_1}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.366 (sec), leaf count = 104

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-(x^4-6*x)*diff(diff(y(x),x),x)-(2*x^3-6)*diff(y(x),x)
```

$$y(x)=\frac{c_3\left(\int -\mathrm{e}^{\frac{x^3}{6}}\sqrt{x}\left(-\operatorname{BesselK}\left(\frac{5}{6},-\frac{x^3}{6}\right)x^3+\operatorname{BesselK}\left(\frac{1}{6},-\frac{x^3}{6}\right)x^3-2\operatorname{BesselK}\left(\frac{1}{6},-\frac{x^3}{6}\right)\right)dx\right)+c_2\left(\int \mathrm{e}\right.}{x^2}$$

ODE No. 1503

$$\left(x^2+1\right) y^{(3)}(x)+\frac{1}{x^2}+8 x y''(x)+10 y'(x)-2 \log(x)-3=0$$

✓ **Mathematica** : cpu = 0.393338 (sec), leaf count = 258

```
DSolve[-3 + x^(-2) - 2*Log[x] + 10*Derivative[1][y][x] + 8*x*Derivative[2][y][x] + (1 + x^2)*
```

$$\left\{\left\{y(x)\to \frac{1}{225}\left(-\frac{51 x}{x^2+1}-\frac{34 x}{\left(x^2+1\right)^2}-\frac{225 c_2 x}{x^2+1}-\frac{150 c_2 x}{\left(x^2+1\right)^2}-\frac{225 c_1}{4\left(x^2+1\right)^2}-9 x+\frac{47}{x-i}+\frac{47}{x+i}+45 x \log\right.\right.$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 67

```
dsolve((x^2+1)*diff(diff(diff(y(x),x),x),x)+8*x*diff(diff(y(x),x),x)+10*diff(y(x),x)-3+1/x^2-
```

$$y(x)=\frac{\left(45 x^5+150 x^3+225 x\right) \ln(x)-9 x^5+225 c_1 x^4+\left(225 c_2-50\right) x^3+450 c_1 x^2+\left(675 c_2-225\right) x+225}{225\left(x^2+1\right)^2}$$

ODE No. 1504

$$\left(x^2+2\right) y^{(3)}(x)+\left(x^2+2\right) y'(x)-2xy''(x)-2xy(x)=0$$

✓ **Mathematica** : cpu = 0.102681 (sec), leaf count = 43

```
DSolve[-2*x*y[x] + (2 + x^2)*Derivative[1][y][x] - 2*x*Derivative[2][y][x] + (2 + x^2)*Deriva
```

$$\left\{\left\{y(x)\to \frac{c_1 x^2}{2}+\frac{1}{2}ic_2 e^{-ix}-\frac{1}{4}c_3 e^{ix}\right\}\right\}$$

✓ **Maple** : cpu = 0.169 (sec), leaf count = 18

```
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
```

$$y(x)=c_1 x^2+c_2\cos(x)+c_3\sin(x)$$

ODE No. 1505

$$(2ax+b)y'(x)+ay(x)+2(x-1)xy^{(3)}(x)+3(2x-1)y''(x)=0$$

✓ **Mathematica** : cpu = 60.2859 (sec), leaf count = 115

```
DSolve[a*y[x] + (b + 2*a*x)*Derivative[1][y][x] + 3*(-1 + 2*x)*Derivative[2][y][x] + 2*(-1 +
```

$$\left\{\left\{y(x)\to c_3\text{MathieuC}\left[-\frac{a}{2}-\frac{b}{2}+1,\frac{a}{4},\cos^{-1}\left(\sqrt{x}\right)\right]\text{MathieuS}\left[-\frac{a}{2}-\frac{b}{2}+1,\frac{a}{4},\cos^{-1}\left(\sqrt{x}\right)\right]+c_1\text{Mathieu}\right.\right.$$

✓ **Maple** : cpu = 0.144 (sec), leaf count = 79

```
dsolve(2*x*(x-1)*diff(diff(diff(y(x),x),x),x)+3*(2*x-1)*diff(diff(y(x),x),x)+(2*a*x+b)*diff(y
```

$$y(x)=c_1\,\text{MathieuC}\left(-\frac{a}{2}-\frac{b}{2}+1,\frac{a}{4},\arccos\left(\sqrt{x}\right)\right)^2+c_2\,\text{MathieuS}\left(-\frac{a}{2}-\frac{b}{2}+1,\frac{a}{4},\arccos\left(\sqrt{x}\right)\right)^2+c_3\,\text{M}$$

ODE No. 1506

$$4x^2y^{(3)}(x)+\left(x^2+14x-1\right)y''(x)+4(x+1)y'(x)+2y(x)=0$$

✓ **Mathematica** : cpu = 0.270907 (sec), leaf count = 150

```
DSolve[2*y[x] + 4*(1 + x)*Derivative[1][y][x] + (-1 + 14*x + x^2)*Derivative[2][y][x] + 4*x^2
```

$$\left\{\left\{y(x)\to c_2e^{\frac{1}{4}\left(-x-\frac{1}{x}+2\log(x)\right)}\int_1^x e^{\frac{K[1]^2-10\log(K[1])K[1]+1}{4K[1]}}dK[1]-\sqrt{\pi}c_3\left(e\text{erfi}\left(\frac{1-x}{2\sqrt{x}}\right)+\text{erfi}\left(\frac{x+1}{2\sqrt{x}}\right)-i(e-\right.\right.\right.$$

✓ **Maple** : cpu = 0.159 (sec), leaf count = 43

```
dsolve(4*x^2*diff(diff(diff(y(x),x),x),x)+(x^2+14*x-1)*diff(diff(y(x),x),x)+4*(1+x)*diff(y(x)
```

$$y(x)=\left(c_3+\int\frac{(2c_1x+c_2)\,\mathrm{e}^{\frac{x}{4}}\mathrm{e}^{\frac{1}{4x}}}{4x^{\frac{5}{2}}}dx\right)\mathrm{e}^{-\frac{x}{4}}\mathrm{e}^{-\frac{1}{4x}}\sqrt{x}$$

ODE No. 1507

$$xy^{(3)}(x)(ax+b)+(\alpha x+\beta)y''(x)-f(x)+xy'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 3.62287 (sec), leaf count = 70099

```
DSolve[-f[x] + y[x] + x*Derivative[1][y][x] + (beta + alpha*x)*Derivative[2][y][x] + x*(b + a
```

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✓ **Maple** : cpu = 0.663 (sec), leaf count = 1209

```
dsolve((a*x+b)*x*diff(diff(diff(y(x),x),x),x)+(alpha*x+beta)*diff(diff(y(x),x),x)+x*diff(y(x)
```

$$y(x)=-\left(\left(\left(\int \frac{}{\left((-2b+\beta)\,\text{HeunC}\left(0,\frac{-2b+\beta}{b},\frac{(2b+\beta)a-\alpha b}{ab},-\frac{b}{a^2},\frac{(4a-\alpha)b^2-\alpha\beta b+a\,\beta^2}{2a\,b^2},-\frac{ax}{b}\right)-a\,\text{HeunCPrime}\left(\right.\right.\right.\right.$$

ODE No. 1508

$$y(x)\left(ax^3+\nu^2-1\right)+\left(1-\nu^2\right)xy'(x)+x^3y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.591846 (sec), leaf count = 143

```
DSolve[(-1 + nu^2 + a*x^3)*y[x] + (1 - nu^2)*x*Derivative[1][y][x] + x^3*Derivative[3][y][x]
```

$$\left\{\left\{y(x)\to c_2 3^{\nu-1}a^{\frac{1-\nu}{3}}x^{1-\nu}\,{}_0F_2\left(;1-\frac{2\nu}{3},1-\frac{\nu}{3};-\frac{ax^3}{27}\right)+c_3 3^{-\nu-1}a^{\frac{\nu+1}{3}}x^{\nu+1}\,{}_0F_2\left(;\frac{\nu}{3}+1,\frac{2\nu}{3}+1;-\frac{ax^3}{27}\right)+\right.\right.$$

✓ **Maple** : cpu = 0.121 (sec), leaf count = 81

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+(-nu^2+1)*x*diff(y(x),x)+(a*x^3+nu^2-1)*y(x)=0,y(x))
```

$$y(x)=c_1x\,\text{hypergeom}\left([],\left[-\frac{\nu}{3}+1,\frac{\nu}{3}+1\right],-\frac{a\,x^3}{27}\right)+c_2x^{-\nu+1}\,\text{hypergeom}\left([],\left[1-\frac{2\nu}{3},-\frac{\nu}{3}+1\right],-\frac{a\,x^3}{27}\right)$$

ODE No. 1509

$$\left(\left(1-4\nu^2\right)x+4x^3\right)y'(x)+\left(4\nu^2-1\right)y(x)+x^3y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.0077945 (sec), leaf count = 34

```
DSolve[(-1 + 4*nu^2)*y[x] + ((1 - 4*nu^2)*x + 4*x^3)*Derivative[1][y][x] + x^3*Derivative[3][
```

$$\left\{\left\{y(x)\to c_1xJ_\nu(x)^2+c_3xY_\nu(x)^2+c_2xJ_\nu(x)Y_\nu(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 29

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+(4*x^3+(-4*nu^2+1)*x)*diff(y(x),x)+(4*nu^2-1)*y(x)=0,
```

$$y(x)=x\left(\text{BesselY}\left(\nu,x\right)^2c_2+\text{BesselY}\left(\nu,x\right)\text{BesselJ}\left(\nu,x\right)c_3+\text{BesselJ}\left(\nu,x\right)^2c_1\right)$$

ODE No. 1510

$$y(x)\left(a(\nu-1)x^{2\nu}+bx^{3\nu}+\nu^2-1\right)+x\left(ax^{2\nu}-\nu^2+1\right)y'(x)+x^3y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.0339249 (sec), leaf count = 102

```
DSolve[(-1 + nu^2 + a*(-1 + nu)*x^(2*nu) + b*x^(3*nu))*y[x] + x*(1 - nu^2 + a*x^(2*nu))*Deriv
```

$$\left\{\left\{y(x)\to c_1x^{1-\nu}e^{\frac{x^\nu \text{Root}\left[\#1^3+\#1a+b\&,1\right]}{\nu}}+c_2x^{1-\nu}e^{\frac{x^\nu \text{Root}\left[\#1^3+\#1a+b\&,2\right]}{\nu}}+c_3x^{1-\nu}e^{\frac{x^\nu \text{Root}\left[\#1^3+\#1a+b\&,3\right]}{\nu}}\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+(a*x^(2*nu)+1-nu^2)*x*diff(y(x),x)+(b*x^(3*nu)+a*(nu-
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{x^3\left(\frac{d^3}{dx^3}\_Y(x)\right)+\left(x^{2\nu}ax-\nu^2x+x\right)\left(\frac{d}{dx}\_Y(x)\right)+\left(x^{2\nu}a\nu-a\,x^{2\nu}+b\,x^{3\nu}+\nu^2-1\right)\_\right.$$

ODE No. 1511

$$x^3 y^{(3)}(x) + (x+8)x^3 - 6(x-1)x^3 \log(x) + 3x^2 y''(x) - 2xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0451298 (sec), leaf count = 51

```
DSolve[x^3*(8 + x) - 6*(-1 + x)*x^3*Log[x] + 2*y[x] - 2*x*Derivative[1][y][x] + 3*x^2*Derivat
```

$$\left\{\left\{y(x) \to \frac{c_1}{x^2} + \frac{1}{450}\left(-50x^4 + 50x^4 \log(x) - 18x^3 - 135x^3 \log(x)\right) + c_2 x + c_3 x \log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 49

```
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)-6*
```

$$y(x) = \frac{\left(50x^6 - 135x^5 + 450x^3 c_3\right)\ln(x) - 50x^6 - 18x^5 + 450c_1 x^3 + 450c_2}{450x^2}$$

ODE No. 1512

$$\left(1-a^2\right) xy'(x)+x^3y^{(3)}(x)+3x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0291181 (sec), leaf count = 29

```
DSolve[(1 - a^2)*x*Derivative[1][y][x] + 3*x^2*Derivative[2][y][x] + x^3*Derivative[3][y][x]
```

$$\left\{\left\{y(x)\to -\frac{c_1x^{-a}}{a}+\frac{c_2x^a}{a}+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.012 (sec), leaf count = 18

```
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,
```

$$y(x)=c_1+c_2x^a+c_3x^{-a}$$

ODE No. 1513

$$x^3 y^{(3)}(x) - 4x^2 y''(x) + \left(x^2+8\right) x y'(x) - 2\left(x^2+4\right) y(x) = 0$$

✓ **Mathematica** : cpu = 0.0718615 (sec), leaf count = 25

```
DSolve[-2*(4 + x^2)*y[x] + x*(8 + x^2)*Derivative[1][y][x] - 4*x^2*Derivative[2][y][x] + x^3*
```

$$\left\{\left\{y(x) \to c_1 x^2 + c_3 x \cos(x) - c_2 x \sin(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.149 (sec), leaf count = 18

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)-4*x^2*diff(diff(y(x),x),x)+(x^2+8)*x*diff(y(x),x)-2*(
```

$$y(x) = x(\cos(x)\, c_3 + \sin(x)\, c_2 + c_1 x)$$

ODE No. 1514

$$\left(ax^3-12\right)y(x)+x^3y^{(3)}(x)+6x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.525427 (sec), leaf count = 102

```
DSolve[(-12 + a*x^3)*y[x] + 6*x^2*Derivative[2][y][x] + x^3*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1e^{-\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2\right)}{x^3}+\frac{c_2e^{\sqrt[3]{-1}\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2(-1)^{2/3}\right)}{x^3}+\frac{c_3e^{-(-1)^{2/3}\sqrt[3]{a}x}\left(\sqrt[3]{a}x-2\sqrt[3]{-1}\right)}{x^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.424 (sec), leaf count = 135

```
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))
```

$$y(x)=\frac{-c_2\left(\left(-i-\sqrt{3}\right)\left(-a^4\right)^{\frac{2}{3}}+ia^3x\right)\mathrm{e}^{\frac{i\left(i-\sqrt{3}\right)\left(-a^4\right)^{\frac{1}{3}}x}{2a}}-\left(\left(-i+\sqrt{3}\right)\left(-a^4\right)^{\frac{2}{3}}+ia^3x\right)c_3\mathrm{e}^{\frac{i\left(\sqrt{3}+i\right)\left(-a^4\right)^{\frac{1}{3}}x}{2a}}+c_1}{x^3}$$

ODE No. 1515

$$y(x)\left(a\left(4c^2\nu^2-a^2\right)+4b^2c^2(c-a)x^{2c}\right)+y'(x)\left(3(a-1)ax+4b^2c^2x^{2c+1}-4c^2\nu^2+1\right)+3(1-a)x^2y''(x)+x^3y$$

✗ **Mathematica** : cpu = 0.146808 (sec), leaf count = 0

```
DSolve[(a*(-a^2 + 4*c^2*nu^2) + 4*b^2*c^2*(-a + c)*x^(2*c))*y[x] + (1 - 4*c^2*nu^2 + 3*(-1 +
```

, could not solve

```
DSolve[(a*(-a^2 + 4*c^2*nu^2) + 4*b^2*c^2*(-a + c)*x^(2*c))*y[x] + (1 - 4*c^2*nu^2 + 3*
1 + a)*a*x + 4*b^2*c^2*x^(1 + 2*c))*Derivative[1][y][x] + 3*(1 - a)*x^2*Derivative[2][y
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+3*(1-a)*x^2*diff(diff(y(x),x),x)+(4*b^2*c^2*x^(2*c+1)
```

, exception

```
cannot mix numeric and boolean arguments to max
```

ODE No. 1516

$$x^3 y^{(3)}(x) + (x+3)x^2 y''(x) + 5(x-6)xy'(x) + (4x+30)y(x) = 0$$

✓ **Mathematica** : cpu = 261.508 (sec), leaf count = 15142

```
DSolve[(30 + 4*x)*y[x] + 5*(-6 + x)*x*Derivative[1][y][x] + x^2*(3 + x)*Derivative[2][y][x] +
```

Too large to display

✓ **Maple** : cpu = 0.332 (sec), leaf count = 188

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+(x+3)*x^2*diff(diff(y(x),x),x)+5*(x-6)*x*diff(y(x),x)
```

$$y(x) = \frac{c_3 \mathrm{e}^{-x}(x^8 + 28x^7 + 450x^6 + 5100x^5 + 42900x^4 + 267120x^3 + 1179360x^2 + 3326400x + 4536000)\exp}{}$$

ODE No. 1517

$$x^3 y^{(3)}(x) - 2x^3 + x^2 y''(x) + 2xy'(x) - y(x) + \log(x) = 0$$

✓ **Mathematica** : cpu = 0.257549 (sec), leaf count = 30686

```
DSolve[-2*x^3 + Log[x] - y[x] + 2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] + x^3*Deriv
```

Too large to display

✓ **Maple** : cpu = 0.387 (sec), leaf count = 866

```
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)-
```

$$y(x) = -\left(\int -\frac{x^{\frac{\left(11-3\sqrt{69}\right)\left(44+12\sqrt{69}\right)^{\frac{2}{3}}}{600}+\frac{\left(44+12\sqrt{69}\right)^{\frac{1}{3}}}{6}+\frac{4}{3}}\left(3\sqrt{69}\left(44+12\sqrt{69}\right)^{\frac{1}{3}}-11\left(44+12\sqrt{69}\right)^{\frac{1}{3}}+100\right)\left(\cos\right.}{} \right.$$

ODE No. 1518

$$x\left(x^2+1\right)y^{(3)}(x)+3\left(2x^2+1\right)y''(x)-12y(x)=0$$

✓ **Mathematica** : cpu = 0.229447 (sec), leaf count = 104

```
DSolve[-12*y[x] + 3*(1 + 2*x^2)*Derivative[2][y][x] + x*(1 + x^2)*Derivative[3][y][x] == 0,y[
```

$$\left\{\left\{y(x)\to \frac{1}{3}c_1\left(2x^2+1\right)+\frac{1}{3}c_2x\sqrt{x^2+1}-\frac{c_3(2x^2+1)\left(3(x^4+x^2)\tanh^{-1}\left(\sqrt{x^2+1}\right)-\sqrt{x^2+1}(3x^2+1)\right.}{6\sqrt{x^2+1}\left(2x^3+x\right)}\right.\right.$$

✓ **Maple** : cpu = 0.341 (sec), leaf count = 60

```
dsolve((x^2+1)*x*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)
```

$$y(x)=\frac{3\operatorname{arctanh}\left(\frac{1}{\sqrt{x^2+1}}\right)\sqrt{x^2+1}\,c_2x^2+c_1x^2\sqrt{x^2+1}+2x^3c_3-3x^2c_2+c_3x-c_2}{x}$$

ODE No. 1519

$$(x+3)x^2y^{(3)}(x) - 3(x+2)xy''(x) + 6(x+1)y'(x) - 6y(x) = 0$$

✓ **Mathematica** : cpu = 0.0236776 (sec), leaf count = 65

```
DSolve[-6*y[x] + 6*(1 + x)*Derivative[1][y][x] - 3*x*(2 + x)*Derivative[2][y][x] + x^2*(3 + x
```

$$\left\{\left\{y(x) \to \frac{1}{4}c_1\left(x^3 - 3x^2 + 3x + 3\right) + \frac{1}{2}c_2\left(-x^3 + 3x^2 - x - 1\right) + \frac{1}{8}c_3\left(3x^3 - 5x^2 + x + 1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.119 (sec), leaf count = 19

```
dsolve((x+3)*x^2*diff(diff(diff(y(x),x),x),x)-3*x*(x+2)*diff(diff(y(x),x),x)+6*(1+x)*diff(y(x
```

$$y(x) = x^3c_2 + c_1x^2 + c_3x + c_3$$

ODE No. 1520

$$y''(x)\left(-6x(\text{a1}+\text{a2}+\text{a3})+3\text{a1a2}+3\text{a1a3}+3\text{a2a3}+9x^2\right)+2(x-\text{a1})(x-\text{a2})(x-\text{a3})y^{(3)}(x)-2\left(b+\left(n^2+n\right.\right.$$

✓ **Mathematica** : cpu = 4.22051 (sec), leaf count = 534

```
DSolve[-(n*(1 + n)*y[x]) - 2*(b + (-3 + n + n^2)*x)*Derivative[1][y][x] + (3*a1*a2 + 3*a1*a3
```

$$\left\{\left\{y(x)\to c_1\text{HeunG}\left[\frac{\text{a3}-\text{a1}}{\text{a2}-\text{a1}},\frac{\frac{1}{4}(\text{a1}+\text{a2}+\text{a3}-b)+\frac{1}{4}\text{a1}(-n^2-n)}{\text{a1}-\text{a2}},\frac{1}{2}\left(\frac{1}{2}-\sqrt{n^2+n+\frac{1}{4}}\right),\frac{1}{2}\left(\sqrt{n^2+\right.\right.\right.$$

✓ **Maple** : cpu = 0.371 (sec), leaf count = 288

```
dsolve(2*(x-a1)*(x-a2)*(x-a3)*diff(diff(diff(y(x),x),x),x)+(9*x^2-6*(a1+a2+a3)*x+3*a1*a2+3*a1
```

$$y(x)=-c_2(x-a1)\,HG\left(\frac{-a3+a1}{-a2+a1},\frac{\left(-n^2-n+3\right)a1-b}{-4a2+4a1},\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2},\frac{3}{2},\frac{1}{2},\frac{-x+a1}{-a2+a1}\right)^2+c_3HG\left(\frac{-}{-}\right.$$

ODE No. 1521

$$(x+1)x^3y^{(3)}(x)-(4x+2)x^2y''(x)+(10x+4)xy'(x)-4(3x+1)y(x)=0$$

✓ **Mathematica** : cpu = 0.0475839 (sec), leaf count = 35

```
DSolve[-4*(1 + 3*x)*y[x] + x*(4 + 10*x)*Derivative[1][y][x] - x^2*(2 + 4*x)*Derivative[2][y][
```

$$\left\{\left\{y(x)\to c_1x^2+c_3x^2\left(x+\frac{1}{x}+\log^2(x)\right)+c_2x^2\log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.305 (sec), leaf count = 28

```
dsolve((1+x)*x^3*diff(diff(diff(y(x),x),x),x)-(4*x+2)*x^2*diff(diff(y(x),x),x)+(10*x+4)*x*dif
```

$$y(x)=x\left(\ln(x)^2c_3x+\ln(x)c_2x+c_3x^2+c_1x+c_3\right)$$

ODE No. 1522

$$4x^4y^{(3)}(x) - 4x^3y''(x) + 4x^2y'(x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.014232 (sec), leaf count = 44

```
DSolve[-1 + 4*x^2*Derivative[1][y][x] - 4*x^3*Derivative[2][y][x] + 4*x^4*Derivative[3][y][x]
```

$$\left\{\left\{y(x) \to \frac{c_1x^2}{2} - \frac{c_2x^2}{4} + \frac{1}{2}c_2x^2\log(x) - \frac{1}{36x} + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.046 (sec), leaf count = 34

```
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=0,y
```

$$y(x) = \frac{18x^3c_1\ln(x) - 1 + (-9c_1 + 18c_2)x^3 + 36c_3x}{36x}$$

ODE No. 1523

$$-\left(4x^2+2\right)x^2y''(x)+\left(10x^2+4\right)xy'(x)-4\left(3x^2+1\right)y(x)+\left(x^2+1\right)x^3y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.275438 (sec), leaf count = 74

```
DSolve[-4*(1 + 3*x^2)*y[x] + x*(4 + 10*x^2)*Derivative[1][y][x] - x^2*(2 + 4*x^2)*Derivative[
```

$$\left\{\left\{y(x)\to c_1\left(-x^3+3x^2-x\right)+\frac{1}{2}c_2\left(x^3-2x^2+x\right)-\frac{c_3x(-x^3+3x^2-x)\left(\log(x)+1\right)}{2\left(x^2-3x+1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.311 (sec), leaf count = 23

```
dsolve((x^2+1)*x^3*diff(diff(diff(y(x),x),x),x)-(4*x^2+2)*x^2*diff(diff(y(x),x),x)+(10*x^2+4)
```

$$y(x)=\left(\ln\left(x\right)c_2x+c_3x^2+\left(c_1+c_2\right)x+c_3\right)x$$

ODE No. 1524

$$x^6 y^{(3)}(x) + x^2 y''(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.156564 (sec), leaf count = 96

```
DSolve[-2*y[x] + x^2*Derivative[2][y][x] + x^6*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\left(-\frac{1}{3}\right)^{2/3} c_2 x \Gamma\left(\frac{1}{3}\right)\ {}_2F_2\left(-\frac{2}{3},\frac{1}{3};\frac{2}{3},\frac{4}{3};\frac{1}{3x^3}\right)}{3\Gamma\left(\frac{4}{3}\right)} + \frac{c_3 \Gamma\left(\frac{2}{3}\right)\ {}_2F_2\left(-\frac{1}{3},\frac{2}{3};\frac{4}{3},\frac{5}{3};\frac{1}{3x^3}\right)}{9\Gamma\left(\frac{5}{3}\right)} + c_1 x^2\right\}\right\}$$

✓ **Maple** : cpu = 0.408 (sec), leaf count = 98

```
dsolve(x^6*diff(diff(diff(y(x),x),x),x)+x^2*diff(diff(y(x),x),x)-2*y(x)=0,y(x))
```

$$y(x) = x^2\left(\left(\int \frac{e^{\frac{1}{6x^3}}\left(2x^3\,\text{BesselI}\left(\frac{1}{6},-\frac{1}{6x^3}\right) - \text{BesselI}\left(\frac{1}{6},-\frac{1}{6x^3}\right) - \text{BesselI}\left(-\frac{5}{6},-\frac{1}{6x^3}\right)\right)}{x^{\frac{11}{2}}} dx\right) c_3 + \left(\int \frac{e^{\frac{1}{6x^3}}(2}{}\right.$$

ODE No. 1525

$$a y(x) + x^6 y^{(3)}(x) + 6x^5 y''(x) = 0$$

✓ **Mathematica** : cpu = 0.331787 (sec), leaf count = 102

```
DSolve[a*y[x] + 6*x^5*Derivative[2][y][x] + x^6*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{\frac{\sqrt[3]{a}}{x}} \left(2x - \sqrt[3]{a}\right) + c_2 e^{\frac{(-1)^{2/3}\sqrt[3]{a}}{x}} \left(x - \frac{1}{2}(-1)^{2/3}\sqrt[3]{a}\right) + c_3 e^{-\frac{\sqrt[3]{-1}\sqrt[3]{a}}{x}} \left(\frac{1}{2}\sqrt[3]{-1}\sqrt[3]{a} + x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.543 (sec), leaf count = 291

```
dsolve(x^6*diff(diff(diff(y(x),x),x),x)+6*x^5*diff(diff(y(x),x),x)+a*y(x)=0,y(x))
```

$$y(x) = \frac{c_1(-8x^3+a)^4 \mathrm{e}^{-\frac{\left(-a^4\right)^{\frac{1}{3}}}{ax}}}{\left(2ax + \left(-a^4\right)^{\frac{1}{3}}\right)^3 \left(4a^2x^2 - 2x\left(-a^4\right)^{\frac{1}{3}} a + \left(-a^4\right)^{\frac{2}{3}}\right)^4} + \frac{c_2(-8x^3+a)^4 \mathrm{e}}{\left(-4ixa + i\left(-a^4\right)^{\frac{1}{3}} - \left(-a^4\right)^{\frac{1}{3}}\sqrt{3}\right)^3 \left(\left(-a^4\right)^{\frac{1}{3}}\right.}$$

ODE No. 1526

$$\left(x^4+2x^2+2x+1\right)x^2y^{(3)}(x)-\left(2x^6+3x^4-6x^2-6x-1\right)y''(x)+\left(x^6-6x^3-15x^2-12x-2\right)y'(x)+\left(x^4$$

✓ **Mathematica** : cpu = 130.222 (sec), leaf count = 27

```
DSolve[(1 + 6*x + 8*x^2 + 4*x^3 + x^4)*y[x] + (-2 - 12*x - 15*x^2 - 6*x^3 + x^6)*Derivative[1
```

$$\left\{\left\{y(x)\to c_1e^x+c_2e^xx+c_3e^{\frac{1}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.187 (sec), leaf count = 19

```
dsolve(x^2*(x^4+2*x^2+2*x+1)*diff(diff(diff(y(x),x),x),x)-(2*x^6+3*x^4-6*x^2-6*x-1)*diff(diff
```

$$y(x)=c_2\mathrm{e}^{\frac{1}{x}}+\mathrm{e}^x(c_3x+c_1)$$

ODE No. 1527

$$(x-a)^3(x-b)^3y^{(3)}(x)-cy(x)=0$$

✓ **Mathematica** : cpu = 130.115 (sec), leaf count = 165

```
DSolve[-(c*y[x]) + (-a + x)^3*(-b + x)^3*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1(x-b)^2\left(\frac{x-a}{x-b}\right)^{\text{Root}\left[-\#1^3+3\#1^2-2\#1+\frac{c}{(a-b)^3}\&,1\right]}+c_2(x-b)^2\left(\frac{x-a}{x-b}\right)^{\text{Root}\left[-\#1^3+3\#1^2-2\#1+\frac{c}{(a-b}\right.}\right.$$

✓ **Maple** : cpu = 0.621 (sec), leaf count = 437

```
dsolve((x-a)^3*(x-b)^3*diff(diff(diff(y(x),x),x),x)-c*y(x)=0,y(x))
```

$$y(x)=(x-a)^{-\frac{2b}{a-b}}(x-b)^{\frac{2a}{a-b}}\left((b-x)^{-\frac{\text{RootOf}\left(\_Z^3+(-3a-3b)\_Z^2+\left(2a^2+8ab+2b^2\right)\_Z-4a^2b-4ab^2-c,index=3\right)}{a-b}}(a-x)^{\frac{\text{RootOf}\left(\_}\right.$$

ODE No. 1528

$$y^{(3)}(x)\sin(x)+(2\cos(x)+1)y''(x)-\sin(x)y'(x)-\cos(x)=0$$

✓ **Mathematica** : cpu = 0.842109 (sec), leaf count = 72

```
DSolve[-Cos[x] - Sin[x]*Derivative[1][y][x] + (1 + 2*Cos[x])*Derivative[2][y][x] + Sin[x]*Der
```

$$\left\{\left\{y(x)\to \frac{\sin\left(\frac{x}{2}\right)\left(-2\cos\left(\frac{x}{2}\right)\sin^{-1}(\cos(x))+\sqrt{2}\left(c_2 x\sin\left(\frac{x}{2}\right)+\cos\left(\frac{x}{2}\right)\left(c_2\log(2(\cos(x)+1))+2c_1\right)\right)\right)}{\cos(x)-1}+\right.$$

✓ **Maple** : cpu = 0.219 (sec), leaf count = 71

```
dsolve(diff(diff(diff(y(x),x),x),x)*sin(x)+(2*cos(x)+1)*diff(diff(y(x),x),x)-sin(x)*diff(y(x)
```

$$y(x)=\frac{\left(\sin^2(x)\right)\ln\left(\frac{-\cos(x)+1}{\sin(x)}\right)c_1-\left(\sin^2(x)\right)\ln(\sin(x))\,c_1+\left(\sin^2(x)\right)c_3+(\cos(x)-1)\left(c_1 x+c_2+1\right)\sin$$
$$\sin(x)\left(\cos(x)-1\right)$$

ODE No. 1529

$$y^{(3)}(x)(x+\sin(x))+3(\cos(x)+1)y''(x)-3\sin(x)y'(x)-y(x)\cos(x)+\sin(x)=0$$

✓ **Mathematica** : cpu = 0.0844902 (sec), leaf count = 47

```
DSolve[Sin[x] - Cos[x]*y[x] - 3*Sin[x]*Derivative[1][y][x] + 3*(1 + Cos[x])*Derivative[2][y][
```

$$\left\{\left\{y(x)\to \frac{c_3x^2}{x+\sin(x)}-\frac{\cos(x)}{x+\sin(x)}+\frac{c_2x}{x+\sin(x)}+\frac{c_1}{x+\sin(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.091 (sec), leaf count = 25

```
dsolve((sin(x)+x)*diff(diff(diff(y(x),x),x),x)+3*(cos(x)+1)*diff(diff(y(x),x),x)-3*sin(x)*dif
```

$$y(x)=\frac{c_3+c_1x^2+xc_2-\cos(x)}{\sin(x)+x}$$

ODE No. 1530

$$y'(x)\left(4\nu(\nu+1)\sin^2(x)+\cos(2x)\right)+2\nu(\nu+1)y(x)\sin(2x)+y^{(3)}(x)\sin^2(x)+3\sin(x)\cos(x)y''(x)=0$$

✓ **Mathematica** : cpu = 0.0731833 (sec), leaf count = 35

```
DSolve[2*nu*(1 + nu)*Sin[2*x]*y[x] + (Cos[2*x] + 4*nu*(1 + nu)*Sin[x]^2)*Derivative[1][y][x]
```

$$\{\{y(x)\to c_3 P_\nu(\cos(x))Q_\nu(\cos(x))+c_1 P_\nu(\cos(x))^2+c_2 Q_\nu(\cos(x))^2\}\}$$

✓ **Maple** : cpu = 0.216 (sec), leaf count = 113

```
dsolve(diff(diff(diff(y(x),x),x),x)*sin(x)^2+3*diff(diff(y(x),x),x)*sin(x)*cos(x)+(cos(2*x)+4
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{\nu}{2},\frac{\nu}{2}+\frac{1}{2}\right],\left[\frac{1}{2}\right],\frac{\cos(2x)}{2}+\frac{1}{2}\right)^2+c_2(\cos(2x)+1)\,\text{hypergeom}\left(\left[1+\frac{\nu}{2},\frac{1}{2}-\frac{\nu}{2}\right]\right.$$

ODE No. 1531

$A(x)\left(f(x)y''(x)+g(x)y'(x)+h(x)y(x)\right)+f'(x)y''(x)+f(x)y^{(3)}(x)+g'(x)y'(x)+g(x)y''(x)+y(x)h'(x)+h(x)$

✗ **Mathematica** : cpu = 0.0241145 (sec), leaf count = 0

```
DSolve[y[x]*Derivative[1][h][x] + h[x]*Derivative[1][y][x] + Derivative[1][g][x]*Derivative[1
```

, could not solve

```
DSolve[y[x]*Derivative[1][h][x] + h[x]*Derivative[1][y][x] + Derivative[1][g][x]*Deriva
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(f(x),x)*diff(diff(y(x),x),x)+f(x)*diff(diff(diff(y(x),x),x),x)+diff(g(x),x)*diff(
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{f(x)\left(\frac{d^3}{dx^3}\_Y(x)\right)+\left(\frac{d}{dx}f(x)+g(x)+A(x)\,f(x)\right)\left(\frac{d^2}{dx^2}\_Y(x)\right)+\left(\frac{d}{dx}g(x)+h(x)+\right.\right.$$

ODE No. 1532

$$ny(x)+y^{(3)}(x)+xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0118426 (sec), leaf count = 103

```
DSolve[n*y[x] + x*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2 x\,{}_1F_2\left(\frac{n}{3}+\frac{1}{3};\frac{2}{3},\frac{4}{3};-\frac{x^3}{9}\right)}{3^{2/3}}+c_1\,{}_1F_2\left(\frac{n}{3};\frac{1}{3},\frac{2}{3};-\frac{x^3}{9}\right)+\frac{c_3 x^2\,{}_1F_2\left(\frac{n}{3}+\frac{2}{3};\frac{4}{3},\frac{5}{3};-\frac{x^3}{9}\right)}{3\sqrt[3]{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.083 (sec), leaf count = 58

```
dsolve(diff(diff(diff(y(x),x),x),x)+x*diff(y(x),x)+n*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[\frac{n}{3}\right],\left[\frac{1}{3},\frac{2}{3}\right],-\frac{x^3}{9}\right)+c_2 x\,\text{hypergeom}\left(\left[\frac{1}{3}+\frac{n}{3}\right],\left[\frac{2}{3},\frac{4}{3}\right],-\frac{x^3}{9}\right)+c_3 x^2\,\text{hypergeom}\left(\right.$$

ODE No. 1533

$$-ny(x)+y^{(3)}(x)-xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0123103 (sec), leaf count = 113

```
DSolve[-(n*y[x]) - x*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{-1}c_2 x\,{}_1F_2\left(\frac{n}{3}+\frac{1}{3};\frac{2}{3},\frac{4}{3};\frac{x^3}{9}\right)}{3^{2/3}}+c_1\,{}_1F_2\left(\frac{n}{3};\frac{1}{3},\frac{2}{3};\frac{x^3}{9}\right)+\frac{(-1)^{2/3}c_3x^2\,{}_1F_2\left(\frac{n}{3}+\frac{2}{3};\frac{4}{3},\frac{5}{3};\frac{x^3}{9}\right)}{3\sqrt[3]{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.082 (sec), leaf count = 58

```
dsolve(diff(diff(diff(y(x),x),x),x)-x*diff(y(x),x)-n*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[\frac{n}{3}\right],\left[\frac{1}{3},\frac{2}{3}\right],\frac{x^3}{9}\right)+c_2x\,\text{hypergeom}\left(\left[\frac{1}{3}+\frac{n}{3}\right],\left[\frac{2}{3},\frac{4}{3}\right],\frac{x^3}{9}\right)+c_3x^2\,\text{hypergeom}\left(\left[\frac{2}{3}\right.\right.$$

ODE No. 1534

$$y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0032823 (sec), leaf count = 24

```
DSolve[Derivative[4][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_4 x^3 + c_3 x^2 + c_2 x + c_1\}\}$$

✓ **Maple** : cpu = 0.013 (sec), leaf count = 21

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)=0,y(x))
```

$$y(x) = \frac{1}{6} x^3 c_1 + \frac{1}{2} x^2 c_2 + c_3 x + c_4$$

ODE No. 1535

$$-f(x)+y^{(4)}(x)+4y(x)=0$$

✓ **Mathematica** : cpu = 0.337047 (sec), leaf count = 223

```
DSolve[-f[x] + 4*y[x] + Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to e^{-x}\left(\cos(x)\int_1^x\frac{1}{8}e^{K[1]}f(K[1])(\cos(K[1])-\sin(K[1]))\left(\cos^2(K[1])+\sin^2(K[1])\right)dK[1]+\sin(x)\right.\right.$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 36

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+4*y(x)-f=0,y(x))
```

$$y(x)=\frac{f}{4}+c_1\mathrm{e}^{x}\cos\left(x\right)+c_2\mathrm{e}^{x}\sin\left(x\right)+c_3\mathrm{e}^{-x}\cos\left(x\right)+c_4\mathrm{e}^{-x}\sin\left(x\right)$$

ODE No. 1536

$$\lambda y(x) + y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0041609 (sec), leaf count = 76

```
DSolve[lambda*y[x] + Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{(-1)^{3/4}\sqrt[4]{\lambda}x} + c_2 e^{-\sqrt[4]{-1}\sqrt[4]{\lambda}x} + c_3 e^{-(-1)^{3/4}\sqrt[4]{\lambda}x} + c_4 e^{\sqrt[4]{-1}\sqrt[4]{\lambda}x}\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 50

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+lambda*y(x)=0,y(x))
```

$$y(x) = c_1 \mathrm{e}^{-i(-\lambda)^{\frac{1}{4}}x} + c_2 \mathrm{e}^{i(-\lambda)^{\frac{1}{4}}x} + c_3 \mathrm{e}^{-(-\lambda)^{\frac{1}{4}}x} + c_4 \mathrm{e}^{(-\lambda)^{\frac{1}{4}}x}$$

ODE No. 1537

$$-16e^{x^2}x^4 + y^{(4)}(x) - 12y''(x) + 12y(x) = 0$$

✓ **Mathematica** : cpu = 0.888141 (sec), leaf count = 1722

```
DSolve[-16*E^x^2*x^4 + 12*y[x] - 12*Derivative[2][y][x] + Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{12}e^{-\left(\left(\sqrt{2\left(3-\sqrt{6}\right)}-x\right)x\right)-\sqrt{2\left(3+\sqrt{6}\right)}x-\sqrt{2\left(3-\sqrt{6}\right)}x}\left(-2\sqrt{3+\sqrt{6}}e^{\sqrt{2\left(3+\sqrt{6}\right)}x+2\sqrt{2\left(3-\sqrt{6}\right)}x}x^3+2\sqrt{3+\right.\right.\right.$$

✓ **Maple** : cpu = 0.125 (sec), leaf count = 67

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-12*diff(diff(y(x),x),x)+12*y(x)-16*x^4*exp(x^2)=0
```

$$y(x) = \mathrm{e}^{x^2} + c_1\mathrm{e}^{\sqrt{6-2\sqrt{6}}x} + c_2\mathrm{e}^{\sqrt{6+2\sqrt{6}}x} + c_3\mathrm{e}^{-\sqrt{6-2\sqrt{6}}x} + c_4\mathrm{e}^{-\sqrt{6+2\sqrt{6}}x}$$

ODE No. 1538

$$a^4 y(x) + 2a^2 y''(x) - \cosh(ax) + y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.1603 (sec), leaf count = 66

```
DSolve[-Cosh[a*x] + a^4*y[x] + 2*a^2*Derivative[2][y][x] + Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\cos^2(ax)\cosh(ax) + \sin^2(ax)\cosh(ax)}{4a^4} + c_1 \cos(ax) + c_2 x \cos(ax) + c_3 \sin(ax) + c_4 x \sin(ax)\right\}\right\}$$

✓ **Maple** : cpu = 0.649 (sec), leaf count = 49

```
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)=0,y
```

$$y(x) = \frac{(1 + \mathrm{e}^{2ax})\,\mathrm{e}^{-ax} + 8((c_3 x + c_1)\cos(ax) + \sin(ax)(x c_4 + c_2))\,a^4}{8a^4}$$

ODE No. 1539

$$a^4\lambda y(x)+a^2(\lambda+1)y''(x)+y^{(4)}(x)=0$$

✓ **Mathematica** : cpu = 0.0053249 (sec), leaf count = 44

```
DSolve[a^4*lambda*y[x] + a^2*(1 + lambda)*Derivative[2][y][x] + Derivative[4][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\to c_1\cos\left(a\sqrt{\lambda}x\right)+c_2\sin\left(a\sqrt{\lambda}x\right)+c_3\cos(ax)+c_4\sin(ax)\right\}\right\}$$

✓ **Maple** : cpu = 0.032 (sec), leaf count = 35

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+(lambda+1)*a^2*diff(diff(y(x),x),x)+lambda*a^4*y(
```

$$y(x)=c_1\sin(ax)+c_2\cos(ax)+c_3\sin\left(a\sqrt{\lambda}\,x\right)+c_4\cos\left(a\sqrt{\lambda}\,x\right)$$

ODE No. 1540

$$a(bx-1)y''(x)+aby'(x)+\lambda y(x)+y^{(4)}(x)=0$$

✗ **Mathematica** : cpu = 0.295317 (sec), leaf count = 0

```
DSolve[lambda*y[x] + a*b*Derivative[1][y][x] + a*(-1 + b*x)*Derivative[2][y][x] + Derivative[
```

, DifferentialRoot result

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

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+a*(b*x-1)*diff(diff(y(x),x),x)+a*b*diff(y(x),x)+l
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\lambda\_Y(x)+ab\left(\frac{d}{dx}\_Y(x)\right)+a(bx-1)\left(\frac{d^2}{dx^2}\_Y(x)\right)+\frac{d^4}{dx^4}\_Y(x)\right\},\{\_Y(x)\}\right)$$

ODE No. 1541

$$y''(x)\left(ax^2+b\lambda+c\right)+y(x)\left(ax^2+\beta\lambda+\gamma\right)+y^{(4)}(x)=0$$

✗ **Mathematica** : cpu = 80.164 (sec), leaf count = 0

```
DSolve[(EulerGamma + beta*lambda + a*x^2)*y[x] + (c + b*lambda + a*x^2)*Derivative[2][y][x] +
```

, DifferentialRoot result

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

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+(a*x^2+b*lambda+c)*diff(diff(y(x),x),x)+(a*x^2+be
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\left(a\,x^2+\beta\lambda+\gamma\right)\_Y(x)+\left(a\,x^2+b\lambda+c\right)\left(\frac{d^2}{dx^2}\_Y(x)\right)+\frac{d^4}{dx^4}\_Y(x)\right\},\{\_Y(x)\}\right)$$

ODE No. 1542

$$ay''(x)\wp(x;\mathrm{g2},\mathrm{g3})+by'(x)\wp'(x;\mathrm{g2},\mathrm{g3})+y(x)\left(c\left(6\wp(x;\mathrm{g2},\mathrm{g3})^2-\frac{\mathrm{g2}}{2}\right)+d\right)+y^{(4)}(x)=0$$

✗ **Mathematica** : cpu = 0.0245882 (sec), leaf count = 0

```
DSolve[(d + c*(-1/2*g2 + 6*WeierstrassP[x, {g2, g3}]^2))*y[x] + b*WeierstrassPPrime[x, {g2, g
```

, could not solve

```
DSolve[(d + c*(-1/2*g2 + 6*WeierstrassP[x, {g2, g3}]^2))*y[x] + b*WeierstrassPPrime[x,
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+a*WeierstrassP(x,g2,g3)*diff(diff(y(x),x),x)+b*We
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^4}{dx^4}\_Y(x)+a\,\mathrm{WeierstrassP}\left(x,g2,g3\right)\left(\frac{d^2}{dx^2}\_Y(x)\right)+b\mathcal{P}'(x;g2,g3)\left(\frac{d}{dx}\_Y(x)\right)+\left(\right.\right.\right.$$

ODE No. 1543

$$-y''(x)\left(a+12k^2\mathrm{sn}(z|x)^2\right)+y(x)\left(\alpha\mathrm{sn}(z|x)^2+\beta\right)+by'(x)+y^{(4)}(x)=0$$

✗ **Mathematica** : cpu = 0.0663008 (sec), leaf count = 0

```
DSolve[(beta + alpha*JacobiSN[z, x]^2)*y[x] + b*Derivative[1][y][x] - (a + 12*k^2*JacobiSN[z,
```

, could not solve

```
DSolve[(beta + alpha*JacobiSN[z, x]^2)*y[x] + b*Derivative[1][y][x] - (a + 12*k^2*Jacob
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-(12*k^2*JacobiSN(z,x)^2+a)*diff(diff(y(x),x),x)+b
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^4}{dx^4}\_Y(x)+\left(-12k^2\mathrm{sn}(z|x)^2-a\right)\left(\frac{d^2}{dx^2}\_Y(x)\right)+b\left(\frac{d}{dx}\_Y(x)\right)+\left(\alpha\mathrm{sn}(z|x)^2+\beta\right)\_Y\right.\right.$$

ODE No. 1544

$$y(x)\left(3f''(x)+3f(x)^2\right)+10f'(x)y'(x)+10f(x)y''(x)+y^{(4)}(x)=0$$

✗ **Mathematica** : cpu = 0.0146281 (sec), leaf count = 0

```
DSolve[10*Derivative[1][f][x]*Derivative[1][y][x] + y[x]*(3*f[x]^2 + 3*Derivative[2][f][x]) +
```

, could not solve

```
DSolve[10*Derivative[1][f][x]*Derivative[1][y][x] + y[x]*(3*f[x]^2 + 3*Derivative[2][f]
```

✓ **Maple** : cpu = 0.016 (sec), leaf count = 41

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+10*f*diff(diff(y(x),x),x)+10*df*diff(y(x),x)+(3*f
```

$$y(x)=\sum_{\_a=1}^{4}\mathrm{e}^{\mathrm{RootOf}\left(\_Z^4+10f\_Z^2+10df\_Z+3f^2+3ddf,index=\_a\right)x}\_C_{\_a}$$

ODE No. 1545

$$y^{(4)}(x) + 2y^{(3)}(x) - 3y''(x) - 4y'(x) + 4y(x) - 32\sin(2x) + 24\cos(2x) = 0$$

✓ **Mathematica** : cpu = 0.588775 (sec), leaf count = 40

```
DSolve[24*Cos[2*x] - 32*Sin[2*x] + 4*y[x] - 4*Derivative[1][y][x] - 3*Derivative[2][y][x] + 2
```

$$\{\{y(x) \to \sin(2x) + c_1 e^{-2x} + c_2 e^{-2x} x + c_3 e^{x} + c_4 e^{x} x\}\}$$

✓ **Maple** : cpu = 0.111 (sec), leaf count = 27

```
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
```

$$y(x) = (xc_4 + c_2)\,\mathrm{e}^{-2x} + \sin(2x) + (xc_3 + c_1)\,\mathrm{e}^{x}$$

ODE No. 1546

$$a^4x^4y(x)+4a^3x^3y'(x)+6a^2x^2y''(x)+4axy^{(3)}(x)+y^{(4)}(x)=0$$

✓ **Mathematica** : cpu = 0.459712 (sec), leaf count = 300

```
DSolve[a^4*x^4*y[x] + 4*a^3*x^3*Derivative[1][y][x] + 6*a^2*x^2*Derivative[2][y][x] + 4*a*x*D
```

$$\left\{\left\{y(x)\to \frac{2\left(\sqrt{6}-3\right)\sqrt{-\left(\left(\sqrt{6}-3\right)a\right)}c_3\exp\left(-\frac{ax^2}{2}-\sqrt{-\left(\left(\sqrt{6}-3\right)a\right)}x-\frac{\left(-3+\sqrt{3}+\sqrt{6}\right)ax}{\sqrt{-\left(\left(\sqrt{6}-3\right)a\right)}}\right)}{\left(-3-\sqrt{3}+\sqrt{6}\right)\left(-3+\sqrt{3}+\sqrt{6}\right)a}-\frac{2\left(\sqrt{6}-\right.\right.\right.$$

✓ **Maple** : cpu = 0.053 (sec), leaf count = 73

```
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
```

$$y(x)=\mathrm{e}^{-\frac{a\,x^2}{2}}\left(c_2\mathrm{e}^{\sqrt{-a\left(\sqrt{6}-3\right)}\,x}+c_4\mathrm{e}^{\sqrt{\left(3+\sqrt{6}\right)a}\,x}+c_1\mathrm{e}^{-\sqrt{-a\left(\sqrt{6}-3\right)}\,x}+c_3\mathrm{e}^{-\sqrt{\left(3+\sqrt{6}\right)a}\,x}\right)$$

ODE No. 1547

$$3y(x)\left(2g(x)f'(x)+5f(x)g'(x)+6f(x)^2g(x)+g''(x)+3g(x)^2\right)+y''(x)\left(4f'(x)+11f(x)^2+10g(x)\right)+y'(x)$$

✗ **Mathematica** : cpu = 0.242293 (sec), leaf count = 0

```
DSolve[Derivative[1][y][x]*(6*f[x]^3 + 30*f[x]*g[x] + 7*f[x]*Derivative[1][f][x] + 10*Derivat
```

, could not solve

```
DSolve[Derivative[1][y][x]*(6*f[x]^3 + 30*f[x]*g[x] + 7*f[x]*Derivative[1][f][x] + 10*D
```

✓ **Maple** : cpu = 0.02 (sec), leaf count = 87

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+6*f*diff(diff(diff(y(x),x),x),x)+(11*f^2+4*df+10*
```

$$y(x)=\sum_{\_a=1}^{4}\mathrm{e}^{\mathrm{RootOf}\left(\_Z^4+6f\_Z^3+\left(11f^2+4df+10g\right)\_Z^2+\left(6f^3+7dff+30fg+ddf+10dg\right)\_Z+18f^2g+6dfg+15dgf+9g^2+3ddg,index=\_a\right)}$$

ODE No. 1548

$$4y^{(4)}(x) - 12y^{(3)}(x) + 11y''(x) - 3y'(x) - 4\cos(x) = 0$$

✓ **Mathematica** : cpu = 0.0739802 (sec), leaf count = 50

```
DSolve[-4*Cos[x] - 3*Derivative[1][y][x] + 11*Derivative[2][y][x] - 12*Derivative[3][y][x] +
```

$$\left\{\left\{y(x) \to \frac{18\sin(x)}{65} - \frac{14\cos(x)}{65} + 2c_1 e^{x/2} + \frac{2}{3}c_2 e^{3x/2} + c_3 e^{x} + c_4\right\}\right\}$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 32

```
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(
```

$$y(x) = 2c_2 \mathrm{e}^{\frac{x}{2}} + \frac{2c_3 \mathrm{e}^{\frac{3x}{2}}}{3} + \mathrm{e}^{x} c_1 + \frac{18\sin(x)}{65} - \frac{14\cos(x)}{65} + c_4$$

ODE No. 1549

$$x y^{(4)}(x) + 5 y^{(3)}(x) - 24 = 0$$

✓ **Mathematica** : cpu = 0.0191738 (sec), leaf count = 34

```
DSolve[-24 + 5*Derivative[3][y][x] + x*Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{4x^3}{5} + c_4 x^2 - \frac{c_1}{24x^2} + c_3 x + c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 26

```
dsolve(x*diff(diff(diff(diff(y(x),x),x),x),x)+5*diff(diff(diff(y(x),x),x),x)-24=0,y(x))
```

$$y(x) = \frac{x^2 c_2}{2} + \frac{4x^3}{5} - \frac{c_1}{24x^2} + x c_3 + c_4$$

ODE No. 1550

$$12x^3y''(x)-\left(6x^2+1\right)y^{(3)}(x)-\left(9x^2-7\right)x^2y'(x)+2\left(x^2-3\right)x^3y(x)+xy^{(4)}(x)=0$$

✓ **Mathematica** : cpu = 2.90353 (sec), leaf count = 270

```
DSolve[2*x^3*(-3 + x^2)*y[x] - x^2*(-7 + 9*x^2)*Derivative[1][y][x] + 12*x^3*Derivative[2][y]
```

$$\left\{\left\{y(x)\to c_3e^{\frac{x^2}{2}}\int_1^x\frac{e^{\frac{K[1]^2}{2}}\left(\int\frac{\exp\left(\frac{1}{4}\sqrt{5}K[1]^2+\frac{1}{2}\left(-\frac{1}{2}K[1]^2-2\log(K[1])\right)\right)U\left(-\frac{-9+\sqrt{5}}{4\sqrt{5}},-\frac{1}{2},-\frac{1}{2}\sqrt{5}K[1]^2\right)}{\sqrt{K[1]}\sqrt[4]{K[1]^2}}dK[1]\right)K[1]}{\sqrt[4]{2}}dK[1]+\right.\right.$$

✓ **Maple** : cpu = 2.023 (sec), leaf count = 157

```
dsolve(x*diff(diff(diff(diff(y(x),x),x),x),x)-(6*x^2+1)*diff(diff(diff(y(x),x),x),x)+12*x^3*d
```

$$y(x)=\left(\int\frac{\text{WhittakerW}\left(\frac{9\sqrt{5}}{20},\frac{3}{4},\frac{\sqrt{5}x^2}{2}\right)\mathrm{e}^{\frac{x^2}{4}}}{x^{\frac{3}{2}}}dx\right)\mathrm{e}^{\frac{x^2}{2}}c_4-\left(\int\frac{\text{WhittakerW}\left(\frac{9\sqrt{5}}{20},\frac{3}{4},\frac{\sqrt{5}x^2}{2}\right)\mathrm{e}^{-\frac{x^2}{4}}}{x^{\frac{3}{2}}}dx\right)\mathrm{e}^{x^2}c_4-$$

ODE No. 1551

$$-2\left(\nu^2x^2+6\right)y''(x)+\nu^2\left(\nu^2x^2+4\right)y(x)+x^2y^{(4)}(x)=0$$

✓ **Mathematica** : cpu = 0.289472 (sec), leaf count = 110

```
DSolve[nu^2*(4 + nu^2*x^2)*y[x] - 2*(6 + nu^2*x^2)*Derivative[2][y][x] + x^2*Derivative[4][y]
```

$$\left\{\left\{y(x)\to \frac{c_3(1-x)e^{-\nu x}(\nu^2x^2+\nu^2x+\nu^2+6\nu x+6\nu+15)}{x}+\frac{c_4(1-x)e^{\nu x}(\nu^2x^2+\nu^2x+\nu^2-6\nu x-6\nu -\right.\right.$$

✓ **Maple** : cpu = 0.203 (sec), leaf count = 62

```
dsolve(x^2*diff(diff(diff(diff(y(x),x),x),x),x)-2*(nu^2*x^2+6)*diff(diff(y(x),x),x)+nu^2*(nu^
```

$$y(x)=\frac{\left(\nu^2x^3c_4+6\nu\,x^2c_4+15xc_4+c_2\right)\mathrm{e}^{-\nu x}+\mathrm{e}^{\nu x}(\nu^2x^3c_3-6\nu\,x^2c_3+15xc_3+c_1)}{x}$$

ODE No. 1552

$$a y(x) - b x^2 + x^2 y^{(4)}(x) + 2 x y^{(3)}(x) = 0$$

✗ **Mathematica** : cpu = 300.003 (sec), leaf count = 0

```
DSolve[-(b*x^2) + a*y[x] + 2*x*Derivative[3][y][x] + x^2*Derivative[4][y][x] == 0,y[x],x]
```

, timed out

```
$Aborted
```

✓ **Maple** : cpu = 0.069 (sec), leaf count = 89

```
dsolve(x^2*diff(diff(diff(diff(y(x),x),x),x),x)+2*x*diff(diff(diff(y(x),x),x),x)+a*y(x)-b*x^2
```

$$y(x) = \frac{b x^2}{a} + c_1 \sqrt{x}\ \text{BesselJ}\left(1, 2(-a)^{\frac{1}{4}} \sqrt{x}\right) + c_2 \sqrt{x}\ \text{BesselY}\left(1, 2(-a)^{\frac{1}{4}} \sqrt{x}\right) + c_3 \sqrt{x}\ \text{BesselJ}\left(1, 2\sqrt{-\sqrt{-a}}\right.$$

ODE No. 1553

$$x^2 y^{(4)}(x) + 4x y^{(3)}(x) + 2y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0082554 (sec), leaf count = 29

```
DSolve[2*Derivative[2][y][x] + 4*x*Derivative[3][y][x] + x^2*Derivative[4][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_2(-x) + c_4 x + c_2 x \log(x) - c_1 \log(x) + c_3\}\}$$

✓ **Maple** : cpu = 0.011 (sec), leaf count = 17

```
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(
```

$$y(x) = (xc_4 + c_2)\ln(x) + xc_3 + c_1$$

ODE No. 1554

$$x^2 y^{(4)}(x) + 6x y^{(3)}(x) + 6y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0083563 (sec), leaf count = 29

```
DSolve[6*Derivative[2][y][x] + 6*x*Derivative[3][y][x] + x^2*Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_4 x + \frac{1}{2}\left(\frac{c_1}{x} - 2c_2 \log(x)\right) + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.013 (sec), leaf count = 18

```
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(
```

$$y(x) = c_1 + c_2 \ln(x) + \frac{c_3}{x} + x c_4$$

ODE No. 1555

$$\lambda^2(-y(x)) + x^2 y^{(4)}(x) + 6xy^{(3)}(x) + 6y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0457962 (sec), leaf count = 156

```
DSolve[-(lambda^2*y[x]) + 6*Derivative[2][y][x] + 6*x*Derivative[3][y][x] + x^2*Derivative[4]
```

$$\left\{\left\{y(x) \to c_4 G^{2,0}_{0,4}\left(\frac{\lambda^2 x^2}{16}\middle| \begin{matrix} & \\ -\frac{1}{2}, \frac{1}{2}, 0, 0 & \end{matrix}\right) + c_2 G^{2,0}_{0,4}\left(\frac{\lambda^2 x^2}{16}\middle| \begin{matrix} & \\ 0, 0, -\frac{1}{2}, \frac{1}{2} & \end{matrix}\right) + \frac{c_1\left(J_1\left(2\sqrt{\lambda}\sqrt{x}\right) + I_1\left(2\sqrt{\lambda}\sqrt{x}\right)\right)}{2\sqrt{\lambda}\sqrt{x}}\right.$$

✓ **Maple** : cpu = 0.131 (sec), leaf count = 61

```
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(
```

$$y(x) = \frac{c_2 \operatorname{BesselY}\left(1, 2\sqrt{\lambda}\sqrt{x}\right) + c_1 \operatorname{BesselJ}\left(1, 2\sqrt{\lambda}\sqrt{x}\right) + c_3 \operatorname{BesselJ}\left(1, 2\sqrt{-\lambda}\sqrt{x}\right) + c_4 \operatorname{BesselY}\left(1, 2\sqrt{-}\right.}{\sqrt{x}}$$

ODE No. 1556

$$x^2 y^{(4)}(x) + 8x y^{(3)}(x) + 12 y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0090727 (sec), leaf count = 30

```
DSolve[12*Derivative[2][y][x] + 8*x*Derivative[3][y][x] + x^2*Derivative[4][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x) \to \frac{1}{6}\left(\frac{c_1}{x^2} + \frac{3c_2}{x}\right) + c_4 x + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 19

```
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
```

$$y(x) = c_1 + \frac{c_2}{x} + x c_3 + \frac{c_4}{x^2}$$

ODE No. 1557

$$\lambda^2(-y(x)) + x^2 y^{(4)}(x) + 8xy^{(3)}(x) + 12y''(x) = 0$$

✓ **Mathematica** : cpu = 0.048755 (sec), leaf count = 146

```
DSolve[-(lambda^2*y[x]) + 12*Derivative[2][y][x] + 8*x*Derivative[3][y][x] + x^2*Derivative[4
```

$$\left\{\left\{y(x) \to c_4 G^{2,0}_{0,4}\left(\frac{\lambda^2 x^2}{16}\middle| \begin{matrix} & -1, 0, -\frac{1}{2}, \frac{1}{2} \end{matrix}\right) + c_2 G^{2,0}_{0,4}\left(\frac{\lambda^2 x^2}{16}\middle| \begin{matrix} & -\frac{1}{2}, \frac{1}{2}, -1, 0 \end{matrix}\right) - \frac{3ic_1\left(I_2\left(2\sqrt{\lambda}\sqrt{x}\right) - J_2\left(2\sqrt{\lambda}\right.\right.\right.}{4\lambda x}$$

✓ **Maple** : cpu = 0.091 (sec), leaf count = 61

```
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
```

$$y(x) = \frac{c_3 \operatorname{BesselJ}\left(2, 2\sqrt{-\lambda}\sqrt{x}\right) + c_1 \operatorname{BesselJ}\left(2, 2\sqrt{\lambda}\sqrt{x}\right) + c_4 \operatorname{BesselY}\left(2, 2\sqrt{-\lambda}\sqrt{x}\right) + c_2 \operatorname{BesselY}\left(2, 2\sqrt{\right.}}{x}$$

ODE No. 1558

$$-\frac{1}{16}b^4y(x)+x(2n-2\nu+4)y^{(3)}(x)+(n-\nu+1)(n-\nu+2)y''(x)+x^2y^{(4)}(x)=0$$

✓ **Mathematica** : cpu = 0.114711 (sec), leaf count = 319

```
DSolve[-1/16*(b^4*y[x]) + (1 + n - nu)*(2 + n - nu)*Derivative[2][y][x] + (4 + 2*n - 2*nu)*x*
```

$$\left\{\left\{y(x)\to c_4 i^{-n+\nu+1}2^{3n-3\nu-3}b^{2(-n+\nu+1)+n-\nu-2}x^{\frac{1}{2}(n-\nu-2)-n+\nu+1}\Gamma(-n+\nu+2)\left(I_{\nu-n}\left(b\sqrt{x}\right)-J_{\nu-n}\left(b\sqrt{x}\right)\right)+\right.\right.$$

✓ **Maple** : cpu = 0.123 (sec), leaf count = 67

```
dsolve(x^2*diff(diff(diff(diff(y(x),x),x),x),x)+(2*n-2*nu+4)*x*diff(diff(diff(y(x),x),x),x)+(
```

$$y(x)=x^{-\frac{n}{2}+\frac{\nu}{2}}\left(\text{BesselK}\left(n-\nu,b\sqrt{x}\right)c_3+\text{BesselI}\left(n-\nu,b\sqrt{x}\right)c_1+\text{BesselJ}\left(n-\nu,b\sqrt{x}\right)c_2+\text{BesselY}\left(n-\right.\right.$$

ODE No. 1559

$$a^4(-x^3)\,y(x)+x^3y^{(4)}(x)+2x^2y^{(3)}(x)-xy''(x)+y'(x)=0$$

✓ **Mathematica** : cpu = 0.199962 (sec), leaf count = 100

```
DSolve[-(a^4*x^3*y[x]) + Derivative[1][y][x] - x*Derivative[2][y][x] + 2*x^2*Derivative[3][y]
```

$$\left\{\left\{y(x)\to c_4G_{0,4}^{2,0}\left(\frac{a^4x^4}{256}\middle|\ 0,0,\tfrac{1}{2},\tfrac{1}{2}\right)+c_2G_{0,4}^{2,0}\left(\frac{a^4x^4}{256}\middle|\ \tfrac{1}{2},\tfrac{1}{2},0,0\right)+\frac{1}{8}ic_1(I_0(ax)-J_0(ax))+\frac{1}{2}c_3(J_0(ax)+\right.\right.$$

✓ **Maple** : cpu = 0.13 (sec), leaf count = 33

```
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(dif
```

$$y(x)=c_1\,\mathrm{BesselI}\,(0,ax)+c_2\,\mathrm{BesselJ}\,(0,ax)+c_3\,\mathrm{BesselK}\,(0,ax)+c_4\,\mathrm{BesselY}\,(0,ax)$$

ODE No. 1560

$$x^3 y^{(4)}(x) + 6x^2 y^{(3)}(x) + 6x y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0073414 (sec), leaf count = 29

```
DSolve[6*x*Derivative[2][y][x] + 6*x^2*Derivative[3][y][x] + x^3*Derivative[4][y][x] == 0,y[x
```

$$\left\{\left\{y(x) \to c_4 x + \frac{1}{2}\left(\frac{c_1}{x} - 2c_2 \log(x)\right) + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.012 (sec), leaf count = 18

```
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(d
```

$$y(x) = c_1 + c_2 \ln(x) + \frac{c_3}{x} + x c_4$$

ODE No. 1561

$$y(x)\left(ax^4+(n-2)n(n+1)(n+3)\right)-2n(n+1)x^2y''(x)+4n(n+1)xy'(x)+x^4y^{(4)}(x)=0$$

✓ **Mathematica** : cpu = 2.85719 (sec), leaf count = 400

```
DSolve[((-2 + n)*n*(1 + n)*(3 + n) + a*x^4)*y[x] + 4*n*(1 + n)*x*Derivative[1][y][x] - 2*n*(1
```

$$\left\{\left\{y(x)\to c_1\left(-2^{n-\frac{5}{2}}\right)\sqrt{x}a^{\frac{2-n}{4}+\frac{1}{4}\left(n-\frac{3}{2}\right)}\Gamma\left(\frac{3}{2}-n\right)\left(\cos\left(\frac{3}{4}\pi\left(\frac{3}{2}-n\right)\right)\text{ber}_{-n-\frac{1}{2}}\left(\sqrt[4]{a}x\right)+\sin\left(\frac{3}{4}\pi\left(\frac{3}{2}-n\right)\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.26 (sec), leaf count = 69

```
dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)-2*n*(n+1)*x^2*diff(diff(y(x),x),x)+4*n*(n+1)*
```

$$y(x)=\sqrt{x}\left(\text{BesselY}\left(n+\frac{1}{2},(-a)^{\frac{1}{4}}x\right)c_2+\text{BesselJ}\left(n+\frac{1}{2},(-a)^{\frac{1}{4}}x\right)c_1+\text{BesselY}\left(n+\frac{1}{2},\sqrt{-\sqrt{-a}}x\right)\right.$$

ODE No. 1562

$$-\left(4n^2-1\right)x^2y''(x)+\left(4n^2-1\right)xy'(x)+x^4y^{(4)}(x)-4x^4y(x)+4x^3y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.80731 (sec), leaf count = 140

```
DSolve[-4*x^4*y[x] + (-1 + 4*n^2)*x*Derivative[1][y][x] - (-1 + 4*n^2)*x^2*Derivative[2][y][x
```

$$\left\{\left\{y(x)\to c_1\,{}_0F_3\left(;\frac{1}{2},1-\frac{n}{2},\frac{n}{2}+1;\frac{x^4}{64}\right)+\frac{1}{8}ic_2x^2\,{}_0F_3\left(;\frac{3}{2},\frac{3}{2}-\frac{n}{2},\frac{n}{2}+\frac{3}{2};\frac{x^4}{64}\right)+c_3\left(\frac{i}{2}\right)^{-n}\Gamma(1-n)^2\,(\text{be}\right.\right.$$

✓ **Maple** : cpu = 0.315 (sec), leaf count = 77

```
dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)+4*x^3*diff(diff(diff(y(x),x),x),x)-(4*n^2-1)*
```

$$y(x)=\left(\text{BesselY}\left(n,\left(\frac{1}{2}-\frac{i}{2}\right)\sqrt{2}\,x\right)c_3+c_1\,\text{BesselJ}\left(n,\left(\frac{1}{2}-\frac{i}{2}\right)\sqrt{2}\,x\right)\right)\text{BesselJ}\left(n,\left(\frac{1}{2}+\frac{i}{2}\right)\sqrt{2}\,x\right)+$$

ODE No. 1563

$$\left(4n^2-4x^4-1\right)y(x)-\left(4n^2-1\right)x^2y''(x)-\left(4n^2-1\right)xy'(x)+x^4y^{(4)}(x)+4x^3y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 1.48094 (sec), leaf count = 232

```
DSolve[(-1 + 4*n^2 - 4*x^4)*y[x] - (-1 + 4*n^2)*x*Derivative[1][y][x] - (-1 + 4*n^2)*x^2*Deri
```

$$\left\{\left\{y(x)\to \frac{\sqrt[4]{-1}c_2x\,{}_0F_3\left(;\frac{3}{2},1-\frac{n}{2},\frac{n}{2}+1;\frac{x^4}{64}\right)}{2\sqrt{2}}-\frac{2(-1)^{3/4}\sqrt{2}c_1\,{}_0F_3\left(;\frac{1}{2},\frac{1}{2}-\frac{n}{2},\frac{n}{2}+\frac{1}{2};\frac{x^4}{64}\right)}{x}+c_3(-1)^{\frac{1}{4}(1-2n)}\right.\right.$$

✓ **Maple** : cpu = 0.217 (sec), leaf count = 87

```
dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)+4*x^3*diff(diff(diff(y(x),x),x),x)-(4*n^2-1)*
```

$$y(x)=\frac{c_4\,\text{hypergeom}\left([],\left[\frac{1}{2},\frac{n}{2}+\frac{1}{2},-\frac{n}{2}+\frac{1}{2}\right],\frac{x^4}{64}\right)+x^2\left(\text{hypergeom}\left([],\left[\frac{3}{2},-\frac{n}{2}+1,\frac{n}{2}+1\right],\frac{x^4}{64}\right)c_3+c_2\,bei_{-}\right.}{x}$$

ODE No. 1564

$$\left(-12n^2-4x^4+3\right)y(x)-\left(4n^2+3\right)x^2y''(x)+\left(12n^2-3\right)xy'(x)+x^4y^{(4)}(x)+4x^3y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 1.00688 (sec), leaf count = 230

```
DSolve[(3 - 12*n^2 - 4*x^4)*y[x] + (-3 + 12*n^2)*x*Derivative[1][y][x] - (3 + 4*n^2)*x^2*Deri
```

$$\left\{\left\{y(x)\to \frac{\sqrt[4]{-1}c_1x\,{}_0F_3\left(;\frac{1}{2},\frac{3}{2}-\frac{n}{2},\frac{n}{2}+\frac{3}{2};\frac{x^4}{64}\right)}{2\sqrt{2}}+c_3(-1)^{\frac{1}{4}(-2n-1)}2^{2n+\frac{1}{2}(2n+1)+1}x^{-2n-1}\,{}_0F_3\left(;1-n,\frac{1}{2}-\frac{n}{2},-\right.\right.$$

✓ **Maple** : cpu = 0.203 (sec), leaf count = 88

```
dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)+4*x^3*diff(diff(diff(y(x),x),x),x)-(4*n^2+3)*
```

$$y(x)=\frac{c_4x^2\,\text{hypergeom}\left([],\left[\frac{1}{2},\frac{3}{2}-\frac{n}{2},\frac{n}{2}+\frac{3}{2}\right],\frac{x^4}{64}\right)+c_3x^4\,\text{hypergeom}\left([],\left[\frac{3}{2},-\frac{n}{2}+2,\frac{n}{2}+2\right],\frac{x^4}{64}\right)+c_2bei_{-r}}{x}$$

ODE No. 1565

$$\left(x\left(-\rho^2-\sigma^2+1\right)+16x^3\right)y'(x)+y(x)\left(\rho^2\sigma^2+8x^2\right)+\left(x^2\left(-\rho^2-\sigma^2+7\right)+4x^4\right)y''(x)+x^4y^{(4)}(x)+6x^3y^{(3)}(x$$

✓ **Mathematica** : cpu = 0.380372 (sec), leaf count = 242

```
DSolve[(rho^2*sigma^2 + 8*x^2)*y[x] + ((1 - rho^2 - sigma^2)*x + 16*x^3)*Derivative[1][y][x]
```

$$\left\{\left\{y(x)\to c_1x^{-\rho}\,{}_2F_3\left(\frac{1}{2}-\frac{\rho}{2},1-\frac{\rho}{2};1-\rho,-\frac{\rho}{2}-\frac{\sigma}{2}+1,-\frac{\rho}{2}+\frac{\sigma}{2}+1;-x^2\right)+c_3x^{-\sigma}\,{}_2F_3\left(\frac{1}{2}-\frac{\sigma}{2},1-\frac{\sigma}{2};1\right.\right.\right.$$

✓ **Maple** : cpu = 0.301 (sec), leaf count = 71

```
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^4+(-r
```

$$y(x)=\left(\text{BesselY}\left(\frac{\rho}{2}-\frac{\sigma}{2},x\right)c_2+c_1\,\text{BesselJ}\left(\frac{\rho}{2}-\frac{\sigma}{2},x\right)\right)\text{BesselJ}\left(\frac{\rho}{2}+\frac{\sigma}{2},x\right)+\text{BesselY}\left(\frac{\rho}{2}+\frac{\sigma}{2},x\right)\left(\text{Besse}\right.$$

ODE No. 1566

$$\left(x\left(-2\mu^2-2\nu^2+1\right)+16x^3\right)y'(x)+y(x)\left(\left(\mu^2-\nu^2\right)^2+8x^2\right)+\left(x^2\left(-2\mu^2-2\nu^2+7\right)+4x^4\right)y''(x)+x^4y^{(4)}(x$$

✓ **Mathematica** : cpu = 0.448934 (sec), leaf count = 238

```
DSolve[((mu^2 - nu^2)^2 + 8*x^2)*y[x] + ((1 - 2*mu^2 - 2*nu^2)*x + 16*x^3)*Derivative[1][y][x
```

$$\left\{\left\{y(x)\to c_1x^{-\mu-\nu}\,{}_2F_3\left(-\frac{\mu}{2}-\frac{\nu}{2}+\frac{1}{2},-\frac{\mu}{2}-\frac{\nu}{2}+1;1-\mu,1-\nu,-\mu-\nu+1;-x^2\right)+c_2x^{\mu-\nu}\,{}_2F_3\left(\frac{\mu}{2}-\frac{\nu}{2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.272 (sec), leaf count = 35

```
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^4+(-2
```

$$y(x)=(\text{BesselY}(\mu,x)\,c_2+c_1\,\text{BesselJ}(\mu,x))\,\text{BesselJ}(\nu,x)+\text{BesselY}(\nu,x)\,(\text{BesselY}(\mu,x)\,c_4+c_3\,\text{BesselJ}(\mu$$

ODE No. 1567

$$x^4 y^{(4)}(x) + 8x^3 y^{(3)}(x) + 12x^2 y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0071578 (sec), leaf count = 30

```
DSolve[12*x^2*Derivative[2][y][x] + 8*x^3*Derivative[3][y][x] + x^4*Derivative[4][y][x] == 0,
```

$$\left\{\left\{y(x) \to \frac{1}{6}\left(\frac{c_1}{x^2} + \frac{3c_2}{x}\right) + c_4 x + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 19

```
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*dif
```

$$y(x) = c_1 + \frac{c_2}{x} + x c_3 + \frac{c_4}{x^2}$$

ODE No. 1568

$$ay(x)+x^4y^{(4)}(x)+8x^3y^{(3)}(x)+12x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0092596 (sec), leaf count = 122

```
DSolve[a*y[x] + 12*x^2*Derivative[2][y][x] + 8*x^3*Derivative[3][y][x] + x^4*Derivative[4][y]
```

$$\left\{\left\{y(x)\to c_1x^{\frac{1}{2}\left(-\sqrt{5-4\sqrt{1-a}}-1\right)}+c_2x^{\frac{1}{2}\left(\sqrt{5-4\sqrt{1-a}}-1\right)}+c_3x^{\frac{1}{2}\left(-\sqrt{4\sqrt{1-a}+5}-1\right)}+c_4x^{\frac{1}{2}\left(\sqrt{4\sqrt{1-a}+5}-1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 89

```
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*dif
```

$$y(x)=c_1x^{-\frac{1}{2}-\frac{\sqrt{5-4\sqrt{1-a}}}{2}}+c_2x^{-\frac{1}{2}+\frac{\sqrt{5-4\sqrt{1-a}}}{2}}+c_3x^{-\frac{1}{2}-\frac{\sqrt{5+4\sqrt{1-a}}}{2}}+c_4x^{-\frac{1}{2}+\frac{\sqrt{5+4\sqrt{1-a}}}{2}}$$

ODE No. 1569

$$xy'(x)\left((2a-1)\mathrm{C0}+4b^2\mathrm{B0}c^2x^{2c}\right)+(6-4a)x^3y^{(3)}(x)+x^2y''(x)\left(\mathrm{A0}+4b^2c^2x^{2c}\right)+y(x)\left(4b^2c^2\mathrm{D0}x^{2c}+\mathrm{E0}\right)+x$$

✗ **Mathematica** : cpu = 300.85 (sec), leaf count = 0

```
DSolve[(E0 + 4*b^2*c^2*D0*x^(2*c))*y[x] + x*((-1 + 2*a)*C0 + 4*b^2*B0*c^2*x^(2*c))*Derivative
```

, timed out

```
$Aborted
```

✓ **Maple** : cpu = 0.363 (sec), leaf count = 63

```
dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)+(6-4*a)*x^3*diff(diff(diff(y(x),x),x),x)+(4*b
```

$$y(x)=x^a\left(\left(\mathrm{BesselJ}\left(\mu,b\,x^c\right)c_2+\mathrm{BesselY}\left(\mu,b\,x^c\right)c_3\right)\mathrm{BesselJ}\left(\nu,b\,x^c\right)+\mathrm{BesselY}\left(\nu,b\,x^c\right)\left(c_4\,\mathrm{BesselY}\left(\mu,b\,x^c\right)\right.\right.$$

ODE No. 1570

$$y(x)\left(\left(a^2-c^2\nu^2\right)\left(a^2+4ac-c^2\nu^2+4c^2\right)-b^4c^4x^{4c}\right)+x^2\left(2a^2+4(a+c-1)^2+4(a-1)(c-1)-2c^2\nu^2-\right.$$

✓ **Mathematica** : cpu = 0.0989139 (sec), leaf count = 470

```
DSolve[((a^2 - c^2*nu^2)*(a^2 + 4*a*c + 4*c^2 - c^2*nu^2) - b^4*c^4*x^(4*c))*y[x] + (-1 + 2*a
```

$$\left\{\left\{y(x)\to c_1\Gamma(1-\nu)(-1)^{\frac{a-c\nu}{4c}}2^{-\frac{2(a-c\nu)}{c}-\nu-1}b^{\frac{a-c\nu}{c}+\nu}\left(x^{4c}\right)^{\frac{a-c\nu}{4c}+\frac{\nu}{4}}\left(J_{-\nu}\left(b\sqrt[4]{x^{4c}}\right)+I_{-\nu}\left(b\sqrt[4]{x^{4c}}\right)\right)+c_2\Gamma(2-\nu)\right.\right.$$

✓ **Maple** : cpu = 0.094 (sec), leaf count = 49

```
dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)+(6-4*a-4*c)*x^3*diff(diff(diff(y(x),x),x),x)+
```

$$y(x)=x^a(\text{BesselY}\left(\nu,ib\,x^c\right)c_4+\text{BesselY}\left(\nu,b\,x^c\right)c_2+\text{BesselJ}\left(\nu,ib\,x^c\right)c_3+\text{BesselJ}\left(\nu,b\,x^c\right)c_1)$$

ODE No. 1571

$$-\frac{1}{16}b^4x^{2/v}y(x)+\nu^4x^4y^{(4)}(x)+\nu^3(4\nu-2)x^3y^{(3)}(x)+(\nu-1)\nu^2(2\nu-1)x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0622124 (sec), leaf count = 390

```
DSolve[-1/16*(b^4*x^(2/v)*y[x]) + (-1 + nu)*nu^2*(-1 + 2*nu)*x^2*Derivative[2][y][x] + nu^3*(
```

$$\left\{\left\{y(x)\to c_1\,{}_0F_3\left(;1-\frac{v}{2},1-\frac{v}{2\nu},-\frac{v}{2\nu}-\frac{v}{2}+1;\frac{b^4v^4x^{2/v}}{256\nu^4}\right)+c_2\left(\frac{i}{16}\right)^v v^{2v}b^{2v}\nu^{-2v}\left(x^{2/v}\right)^{v/2}\,{}_0F_3\left(;\frac{v}{2}+1,1\right.\right.\right.$$

✓ **Maple** : cpu = 0.234 (sec), leaf count = 143

```
dsolve(nu^4*x^4*diff(diff(diff(diff(y(x),x),x),x),x)+(4*nu-2)*nu^3*x^3*diff(diff(diff(y(x),x)
```

$$y(x)=\sqrt{x}\left(\text{BesselJ}\left(\frac{1}{\lfloor\frac{1}{\nu}\rfloor},\frac{\sqrt{\frac{b^2}{\nu^2}}\,x^{\frac{\lfloor\frac{1}{\nu}\rfloor}{2}}}{\lfloor\frac{1}{\nu}\rfloor}\right)c_1+\text{BesselY}\left(\frac{1}{\lfloor\frac{1}{\nu}\rfloor},\frac{\sqrt{\frac{b^2}{\nu^2}}\,x^{\frac{\lfloor\frac{1}{\nu}\rfloor}{2}}}{\lfloor\frac{1}{\nu}\rfloor}\right)c_2+\text{BesselJ}\left(\frac{1}{\lfloor\frac{1}{\nu}\rfloor},\frac{\sqrt{-\frac{b^2}{\nu^2}}\,x^{\frac{\lfloor\frac{1}{\nu}\rfloor}{2}}}{\lfloor\frac{1}{\nu}\rfloor}\right.\right.$$

ODE No. 1572

$$\left(-2\left(x^2-1\right)\left(\mu(\mu+1)+\nu(\nu+1)\right)+24x^3-8\right)y''(x)-6x(\mu(\mu+1)+\nu(\nu+1)-2)y'(x)+\left((\mu(\mu+1)-\nu(\nu+$$

✗ **Mathematica** : cpu = 86.1436 (sec), leaf count = 0

```
DSolve[(-2*mu*(1 + mu) - 2*nu*(1 + nu) + (mu*(1 + mu) - nu*(1 + nu))^2)*y[x] - 6*(-2 + mu*(1
```

, DifferentialRoot result

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

✓ **Maple** : cpu = 0.345 (sec), leaf count = 35

```
dsolve((x^2-1)^2*diff(diff(diff(diff(y(x),x),x),x),x)+10*x*(x^2-1)*diff(diff(diff(y(x),x),x),
```

$$y(x)=(\text{LegendreQ}(\mu,x)\,c_2+c_1\,\text{LegendreP}(\mu,x))\,\text{LegendreP}(\nu,x)+\text{LegendreQ}(\nu,x)\,(\text{LegendreQ}(\mu,x)\,c$$

ODE No. 1573

$$-\frac{1}{x^5}+(2x+e^x)\,y^{(4)}(x)+4(e^x+2)\,y^{(3)}(x)+6e^x y''(x)+4e^x y'(x)+e^x y(x)=0$$

✓ **Mathematica** : cpu = 0.133231 (sec), leaf count = 77

```
DSolve[-x^(-5) + E^x*y[x] + 4*E^x*Derivative[1][y][x] + 6*E^x*Derivative[2][y][x] + 4*(2 + E^
```

$$\left\{\left\{y(x)\to \frac{c_4 x^3}{2x+e^x}+\frac{c_3 x^2}{2x+e^x}+\frac{1}{24\,(2x+e^x)\,x}+\frac{c_2 x}{2x+e^x}+\frac{c_1}{2x+e^x}\right\}\right\}$$

✓ **Maple** : cpu = 0.038 (sec), leaf count = 41

```
dsolve((exp(x)+2*x)*diff(diff(diff(diff(y(x),x),x),x),x)+4*(exp(x)+2)*diff(diff(diff(y(x),x),
```

$$y(x)=\frac{24x^4c_1+24x^3c_2+24x^2c_3+24xc_4+1}{24\,(\mathrm{e}^x+2x)\,x}$$

ODE No. 1574

$$y(x)\left(a^4\sin^4(x)-3\right)+y^{(4)}(x)\sin^4(x)+2y^{(3)}(x)\sin^3(x)\cos(x)+\left(\sin^2(x)-3\right)\sin^2(x)y''(x)+\left(2\sin^2(x)+3\right)\si$$

✓ **Mathematica** : cpu = 0.161204 (sec), leaf count = 270

```
DSolve[(-3 + a^4*Sin[x]^4)*y[x] + Cos[x]*Sin[x]*(3 + 2*Sin[x]^2)*Derivative[1][y][x] + Sin[x]
```

$$\left\{\left\{y(x)\to c_1\sin(x)\,{}_2F_1\left(\frac{1}{4}\left(3-\sqrt{5-4\sqrt{1-a^4}}\right),\frac{1}{4}\left(\sqrt{5-4\sqrt{1-a^4}}+3\right);\frac{1}{2};\cos^2(x)\right)+c_3\sin(x)\cos(\right.\right.$$

✓ **Maple** : cpu = 0.67 (sec), leaf count = 252

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)*sin(x)^4+2*diff(diff(diff(y(x),x),x),x)*sin(x)^3*
```

$$y(x)=\sin(x)\left(\text{hypergeom}\left(\left[\frac{3}{4}+\frac{\sqrt{-4\sqrt{-(a-1)(a+1)(a^2+1)}+5}}{4},\frac{3}{4}-\frac{\sqrt{-4\sqrt{-(a-1)(a+1)(a}}{4}\right.\right.\right.$$

ODE No. 1575

$$-f(x)+y^{(4)}(x)\sin^6(x)+4y^{(3)}(x)\sin^5(x)\cos(x)-6\sin^6(x)y''(x)-4\sin^5(x)\cos(x)y'(x)+y(x)\sin^6(x)=0$$

✓ **Mathematica** : cpu = 7.53617 (sec), leaf count = 138

```
DSolve[-f[x] + Sin[x]^6*y[x] - 4*Cos[x]*Sin[x]^5*Derivative[1][y][x] - 6*Sin[x]^6*Derivative[
```

$$\left\{\left\{y(x)\to x^3\csc(x)\int_1^x\frac{1}{6}\csc^5(K[4])f(K[4])dK[4]+x^2\csc(x)\int_1^x-\frac{1}{2}\csc^5(K[3])f(K[3])K[3]dK[3]+x\csc\right.\right.$$

✓ **Maple** : cpu = 0.469 (sec), leaf count = 638

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)*sin(x)^6+4*diff(diff(diff(y(x),x),x),x)*sin(x)^5*
```

$$y(x)=\frac{12\left(x^2+\frac{20}{3}\right)x\left(e^{2ix}-\frac{3e^{4ix}}{2}+e^{6ix}-\frac{e^{8ix}}{4}-\frac{1}{4}\right)f\ln\left(1-e^{ix}\right)-80i\left(e^{2ix}-\frac{3e^{4ix}}{2}+e^{6ix}-\frac{e^{8ix}}{4}-\frac{1}{4}\right)f\,\mathrm{pc}}{}$$

ODE No. 1576

$$2f'(x)\left(y^{(3)}(x)-a^2y'(x)\right)+f(x)\left(a^4y(x)-2a^2y''(x)+y^{(4)}(x)\right)=0$$

✗ **Mathematica** : cpu = 0.159509 (sec), leaf count = 0

```
DSolve[2*Derivative[1][f][x]*(-(a^2*Derivative[1][y][x]) + Derivative[3][y][x]) + f[x]*(a^4*y
```

, could not solve

```
DSolve[2*Derivative[1][f][x]*(-(a^2*Derivative[1][y][x]) + Derivative[3][y][x]) + f[x]*
```

✓ **Maple** : cpu = 0.02 (sec), leaf count = 67

```
dsolve(f*(diff(diff(diff(diff(y(x),x),x),x),x)-2*a^2*diff(diff(y(x),x),x)+a^4*y(x))+2*df*(dif
```

$$y(x)=c_1\mathrm{e}^{-ax}+c_2\mathrm{e}^{ax}+c_3\mathrm{e}^{\frac{\left(-df+\sqrt{a^2f^2+df^2}\right)x}{f}}+c_4\mathrm{e}^{-\frac{\left(df+\sqrt{a^2f^2+df^2}\right)x}{f}}$$

ODE No. 1577

$$f''(x)y''(x) + 2y^{(3)}(x)f'(x) + f(x)y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0605761 (sec), leaf count = 46

```
DSolve[Derivative[2][f][x]*Derivative[2][y][x] + 2*Derivative[1][f][x]*Derivative[3][y][x] +
```

$$\left\{\left\{y(x) \to \int_1^x \int_1^{K[2]} \left(\frac{c_1}{f(K[1])} + \frac{c_2 K[1]}{f(K[1])}\right) dK[1]dK[2] + c_4 x + c_3\right\}\right\}$$

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

```
dsolve(f*diff(diff(diff(diff(y(x),x),x),x),x)=0,y(x))
```

$$y(x) = \frac{1}{6}x^3 c_1 + \frac{1}{2}x^2 c_2 + x c_3 + c_4$$

ODE No. 1578

$$a^4 y(x) - \lambda(ax-b)\left(y''(x) - a^2 y(x)\right) - 2a^2 y''(x) + y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 40.7573 (sec), leaf count = 141

```
DSolve[a^4*y[x] - 2*a^2*Derivative[2][y][x] - lambda*(-b + a*x)*(-(a^2*y[x]) + Derivative[2][
```

$$\left\{\left\{y(x) \to c_3 e^{-ax} \int_1^x 2a e^{2aK[1]} \int e^{-aK[1]} \text{Ai}\left(\frac{a^2 + \lambda K[1] a - b\lambda}{(a\lambda)^{2/3}}\right) dK[1] dK[1] + c_4 e^{-ax} \int_1^x 2a e^{2aK[2]} \int e^{-aK}\right.\right.$$

✓ **Maple** : cpu = 0.398 (sec), leaf count = 89

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)-2*a^2*diff(diff(y(x),x),x)+a^4*y(x)-lambda*(a*x-b
```

$$y(x) = \mathrm{e}^{ax}\left(\int \mathrm{e}^{-2ax}\left(\int \mathrm{e}^{ax}\left(c_4 \,\text{AiryBi}\left(-\frac{(\lambda(ax-b)+a^2)\,(-a\lambda)^{\frac{1}{3}}}{a\lambda}\right) + c_3 \,\text{AiryAi}\left(-\frac{(\lambda(ax-b)+a^2)\,(-\right.\right.\right.\right.$$

ODE No. 1579

$$-ax - b\sin(x) - c\cos(x) + y^{(n)}(x) + 2y^{(3)}(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.82157 (sec), leaf count = 80

```
DSolve[-(a*x) - c*Cos[x] - b*Sin[x] + Derivative[1][y][x] + 2*Derivative[3][y][x] + Derivativ
```

$$\left\{\left\{y(x) \to \frac{1}{16}\left(8ax^2 + \cos(x)\left(b\left(2x^2-9\right) - 2(5cx + 8(c_4x - c_2 + c_3))\right) + \sin(x)\left(-6bx + c\left(13 - 2x^2\right) + 16\right.\right.\right.$$

✓ **Maple** : cpu = 0.419 (sec), leaf count = 69

```
dsolve(diff(diff(diff(diff(diff(y(x),x),x),x),x)+2*diff(diff(diff(y(x),x),x),x)+diff(y(x),
```

$$y(x) = \frac{\left(b\,x^2 + \left(-4c - 8c_4\right)x - 6b - 8c_2 + 8c_3\right)\cos(x)}{8} + \frac{\left(-c\,x^2 + \left(-4b + 8c_3\right)x + 6c + 8c_1 + 8c_4\right)\sin(x)}{8} +$$

ODE No. 1580

$$y^{(6)}(x) + y(x) - \sin\left(\frac{x}{2}\right)\sin\left(\frac{3x}{2}\right) = 0$$

✓ **Mathematica** : cpu = 2.09384 (sec), leaf count = 234

```
DSolve[-(Sin[x/2]*Sin[(3*x)/2]) + y[x] + Derivative[6][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{504}\left(-42\sin^2\left(\frac{x}{2}\right) - 42\sin^2(x) + 42x\sin(x) + 42\sin\left(\frac{x}{2}\right)\sin\left(\frac{3x}{2}\right) + 21\sin(x)\sin(2x) - 24\si\right.\right.$$

✓ **Maple** : cpu = 1.096 (sec), leaf count = 79

```
dsolve(diff(diff(diff(diff(diff(diff(y(x),x),x),x),x),x)+y(x)-sin(3/2*x)*sin(1/2*x)=0,y(x)
```

$$y(x) = \frac{\left(504\cos\left(\frac{x}{2}\right)c_3 + 504\sin\left(\frac{x}{2}\right)c_4\right)\mathrm{e}^{-\frac{\sqrt{3}x}{2}}}{504} + \frac{\left(504\cos\left(\frac{x}{2}\right)c_5 + 504\sin\left(\frac{x}{2}\right)c_6\right)\mathrm{e}^{\frac{\sqrt{3}x}{2}}}{504} + \frac{\cos(2x)}{126} + \frac{(504c_1 +}{5}$$

ODE No. 1581

$$-axy(x) - b + y^{(5)}(x) = 0$$

✗ **Mathematica** : cpu = 0.156862 (sec), leaf count = 0

```
DSolve[-b - a*x*y[x] + Derivative[5][y][x] == 0,y[x],x]
```

, DifferentialRoot result

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

✓ **Maple** : cpu = 793.276 (sec), leaf count = 207155

```
dsolve(diff(diff(diff(diff(diff(y(x),x),x),x),x),x)-a*x*y(x)-b=0,y(x))
```

Too large to display

ODE No. 1582

$$a\nu x^{\nu-1}y(x)+ax^{\nu}y'(x)+y^{(5)}(x)=0$$

✓ **Mathematica** : cpu = 0.107851 (sec), leaf count = 787

```
DSolve[a*nu*x^(-1 + nu)*y[x] + a*x^nu*Derivative[1][y][x] + Derivative[5][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_5\left(\frac{4}{\nu}+1\right)^{-\frac{16}{\nu+4}}\nu^{-\frac{16}{\nu+4}}a^{\frac{4}{\nu+4}}(x^{\nu})^{\frac{4\left(\frac{4}{\nu}+1\right)}{\nu+4}}\ {}_1F_4\left(\frac{4}{\nu\left(1+\frac{4}{\nu}\right)}+\frac{1}{1+\frac{4}{\nu}};1+\frac{1}{\left(1+\frac{4}{\nu}\right)\nu},1+\frac{2}{\left(1+\frac{4}{\nu}\right)\nu},1+\right.\right.$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(diff(diff(y(x),x),x),x),x)+a*x^nu*diff(y(x),x)+a*nu*x^(nu-1)*y(x)=0,
```

, result contains DESol or ODESolStruc

$$y(x)=DESol\left(\left\{\frac{d^5}{dx^5}\_Y(x)+a\,x^{\nu}\left(\frac{d}{dx}\_Y(x)\right)+a\nu\,x^{\nu-1}\_Y(x)\right\},\{\_Y(x)\}\right)$$

ODE No. 1583

$$ay^{(4)}(x) - f(x) + y^{(5)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0973807 (sec), leaf count = 92

```
DSolve[-f[x] + a*Derivative[4][y][x] + Derivative[5][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \int_1^x \int_1^{K[5]} \int_1^{K[4]} \int_1^{K[3]} \left(e^{-aK[2]}c_1 + e^{-aK[2]} \int_1^{K[2]} e^{aK[1]} f(K[1])dK[1]\right) dK[2]dK[3]dK[4]dK[5]\right.$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 40

```
dsolve(diff(diff(diff(diff(diff(y(x),x),x),x),x)+a*diff(diff(diff(diff(y(x),x)
```

$$y(x) = \frac{x^2 c_3}{2} + \frac{x^3 c_2}{6} + \frac{c_1 \mathrm{e}^{-ax}}{a^4} + \frac{f\, x^4}{24a} + x c_4 + c_5$$

ODE No. 1584

$$axy(x) - 5my^{(4)}(x) + xy^{(5)}(x) = 0$$

✓ **Mathematica** : cpu = 2.06916 (sec), leaf count = 216

```
DSolve[a*x*y[x] - 5*m*Derivative[4][y][x] + x*Derivative[5][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_5 5^{-5m-4} a^{\frac{1}{5}(5m+4)} x^{5m+4}\, {}_0F_4\left(;m+\frac{6}{5},m+\frac{7}{5},m+\frac{8}{5},m+\frac{9}{5};-\frac{ax^5}{3125}\right) + \frac{1}{125}a^{3/5}c_4 x^3\, {}_0F_4\left(;\frac{6}{5},\frac{7}{5}\right.\right.$$

✓ **Maple** : cpu = 0.271 (sec), leaf count = 118

```
dsolve(x*diff(diff(diff(diff(diff(y(x),x),x),x),x),x)-5*m*diff(diff(diff(diff(y(x),x),x),x),x
```

$$y(x) = c_1 \operatorname{hypergeom}\left([],\left[\frac{2}{5},\frac{3}{5},\frac{4}{5},\frac{1}{5}-m\right],-\frac{x^5 a}{3125}\right) + c_2 x \operatorname{hypergeom}\left([],\left[\frac{3}{5},\frac{4}{5},\frac{6}{5},\frac{2}{5}-m\right],-\frac{x^5 a}{3125}\right) + c_3$$

ODE No. 1585

$$xy(x)\left(ay'(x)+by''(x)+cy^{(3)}(x)+ey^{(4)}(x)\right)=0$$

✓ **Mathematica** : cpu = 0.148925 (sec), leaf count = 214

```
DSolve[x*y[x]*(a*Derivative[1][y][x] + b*Derivative[2][y][x] + c*Derivative[3][y][x] + e*Deri
```

$$\left\{\{y(x)\to 0\},\left\{y(x)\to \frac{c_1 e^{x\text{Root}\left[\#1^3+\frac{\#1^2 c}{e}+\frac{\#1 b}{e}+\frac{a}{e}\&,1\right]}}{\text{Root}\left[\#1^3+\frac{\#1^2 c}{e}+\frac{\#1 b}{e}+\frac{a}{e}\&,1\right]}+\frac{c_2 e^{x\text{Root}\left[\#1^3+\frac{\#1^2 c}{e}+\frac{\#1 b}{e}+\frac{a}{e}\&,2\right]}}{\text{Root}\left[\#1^3+\frac{\#1^2 c}{e}+\frac{\#1 b}{e}+\frac{a}{e}\&,2\right]}+\frac{}{\text{Roo}}\right.\right.$$

✓ **Maple** : cpu = 0.037 (sec), leaf count = 679

```
dsolve(x*(a*diff(y(x),x)+b*diff(diff(y(x),x),x)+c*diff(diff(diff(y(x),x),x),x)+e*diff(diff(di
```

$$y(x)=0$$

ODE No. 1586

$$-y^{(4)}(x)(x(aA(5)-A(4))+A(5))-y^{(3)}(x)(x(aA(4)-A(3))+A(4))-(x(aA(3)-A(2))+A(3))y''(x)-(x(aA(2$$

✗ **Mathematica** : cpu = 82.7583 (sec), leaf count = 0

```
DSolve[-A[1] - x*(-A[0] + a*A[1]) - (A[2] + x*(-A[1] + a*A[2]))*Derivative[1][y][x] - (A[3] +
```

, DifferentialRoot result

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

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x*diff(diff(diff(diff(diff(y(x),x),x),x),x),x)-(a*A[1]-A[0])*x-A[1]-((a*A[2]-A[1])*x+A
```

, result contains DESol or ODESolStruc

$$y(x) = \int DESol\left(\left\{-\frac{(axA_2 - xA_1 + A_2)\_Y(x)}{x} - \frac{(axA_3 - xA_2 + A_3)\left(\frac{d}{dx}\_Y(x)\right)}{x} - \frac{(axA_4 - xA_3 + A_4}{x}\right.\right.$$

ODE No. 1587

$$x^5 y^{(10)}(x) - a y(x) = 0$$

✓ **Mathematica** : cpu = 0.265763 (sec), leaf count = 492

```
DSolve[-(a*y[x]) + x^5*Derivative[10][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{(-1)^{4/5} a^{9/5} c_1 x^9 \, {}_0F_9\left(;\frac{6}{5},\frac{7}{5},\frac{8}{5},\frac{9}{5},2,\frac{11}{5},\frac{12}{5},\frac{13}{5},\frac{14}{5};\frac{a x^5}{9765625}\right)}{3814697265625} + \frac{(-1)^{3/5} a^{8/5} c_3 x^8 \, {}_0F_9\left(;\frac{4}{5},\frac{6}{5},\frac{7}{5},\frac{8}{5},\frac{9}{5},2,\right.}{152587890625}\right.$$

✓ **Maple** : cpu = 0.462 (sec), leaf count = 154

```
dsolve(x^5*diff(diff(diff(diff(diff(diff(diff(diff(diff(diff(y(x),x),x),x),x),x),x),x),x),x),x),
```

$$y(x) = x^{\frac{5}{2}}\left(c_9 \, \text{BesselY}\left(5, 2(-1)^{\frac{7}{10}} a^{\frac{1}{10}} \sqrt{x}\right) + c_{10} \, \text{BesselY}\left(5, 2(-1)^{\frac{9}{10}} a^{\frac{1}{10}} \sqrt{x}\right) + c_5 \, \text{BesselJ}\left(5, 2(-1)^{\frac{7}{10}} a^{\frac{1}{10}} \sqrt{\right.}\right.$$

ODE No. 1588

$$x^{10}y^{(5)}(x) - ay(x) = 0$$

✓ **Mathematica** : cpu = 9.39229 (sec), leaf count = 114

```
DSolve[-(a*y[x]) + x^10*Derivative[5][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x^4 e^{-\frac{\sqrt[5]{a}}{x}} + c_2 x^4 e^{\frac{\sqrt[5]{-1}\sqrt[5]{a}}{x}} + c_3 x^4 e^{-\frac{(-1)^{2/5}\sqrt[5]{a}}{x}} + c_4 x^4 e^{\frac{(-1)^{3/5}\sqrt[5]{a}}{x}} + c_5 x^4 e^{-\frac{(-1)^{4/5}\sqrt[5]{a}}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.147 (sec), leaf count = 90

```
dsolve(x^10*diff(diff(diff(diff(diff(y(x),x),x),x),x),x)-a*y(x)=0,y(x))
```

$$y(x) = c_1 \,\text{hypergeom}\left([], \left[\frac{6}{5}, \frac{7}{5}, \frac{8}{5}, \frac{9}{5}\right], -\frac{a}{3125x^5}\right) + c_2 x \,\text{hypergeom}\left([], \left[\frac{4}{5}, \frac{6}{5}, \frac{7}{5}, \frac{8}{5}\right], -\frac{a}{3125x^5}\right) + c_3 x^2 \,\text{hyp}$$

ODE No. 1589

$$x^{11/2} y^{(11)}(x) - a y(x) = 0$$

✓ **Mathematica** : cpu = 0.0312694 (sec), leaf count = 670

```
DSolve[-(a*y[x]) + x^(11/2)*Derivative[11][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{4}{121}(-1)^{2/11} a^{2/11} c_2 x \, {}_0F_{10}\left(;-\frac{7}{11},-\frac{5}{11},-\frac{3}{11},-\frac{1}{11},\frac{1}{11},\frac{3}{11},\frac{5}{11},\frac{7}{11},\frac{9}{11},\frac{13}{11};\frac{2048 a x^{11/2}}{285311670611}\right) - \frac{1}{-}\right.\right.$$

✓ **Maple** : cpu = 8.096 (sec), leaf count = 3977

```
dsolve(x^(11/2)*diff(diff(diff(diff(diff(diff(diff(diff(diff(diff(diff(y(x),x),x),x),x),x),x),x),x),x),x),x),x)
```

Expression too large to display

ODE No. 1590

$$(x-a)^5(x-b)^5y^{(5)}(x)-cy(x)=0$$

✓ **Mathematica** : cpu = 270.838 (sec), leaf count = 331

```
DSolve[-(c*y[x]) + (-a + x)^5*(-b + x)^5*Derivative[5][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1(x-b)^4\left(\frac{x-a}{x-b}\right)^{\text{Root}\left[-\#1^5+10\#1^4-35\#1^3+50\#1^2-24\#1+\frac{c}{(a-b)^5}\&,1\right]}+c_2(x-b)^4\left(\frac{x-a}{x-b}\right)^{\text{Root}\left[-\#1^5-\right.}\right.$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((x-a)^5*(x-b)^5*diff(diff(diff(diff(diff(y(x),x),x),x),x),x)-c*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

Expression too large to display

ODE No. 1591

$$y''(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0323262 (sec), leaf count = 26

```
DSolve[-y[x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \sqrt[3]{6}\wp\left(\frac{x+c_1}{\sqrt[3]{6}};0,c_2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.753 (sec), leaf count = 12

```
dsolve(diff(diff(y(x),x),x)-y(x)^2=0,y(x))
```

$$y(x) = 6\,\text{WeierstrassP}\left(x + c_1, 0, c_2\right)$$

ODE No. 1592

$$y''(x) - 6y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0659079 (sec), leaf count = 14

```
DSolve[-6*y[x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to \wp(x + c_1; 0, c_2)\}\}$$

✓ **Maple** : cpu = 0.861 (sec), leaf count = 10

```
dsolve(diff(diff(y(x),x),x)-6*y(x)^2=0,y(x))
```

$$y(x) = \text{WeierstrassP}\left(x + c_1, 0, c_2\right)$$

ODE No. 1593

$$y''(x) - 6y(x)^2 - x = 0$$

✗ **Mathematica** : cpu = 17.9108 (sec), leaf count = 0

```
DSolve[-x - 6*y[x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-x - 6*y[x]^2 + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-6*y(x)^2-x=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)-6*y(x)^2-x=0,y(x))
```

ODE No. 1594

$$y''(x) - 6y(x)^2 + 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.395956 (sec), leaf count = 373

```
DSolve[4*y[x] - 6*y[x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{4\left(\text{Root}\left[4\#1^3-4\#1^2+c_1\&,2\right]-\text{Root}\left[4\#1^3-4\#1^2+c_1\&,3\right]\right)\left(y(x)-\text{Root}\left[4\#1^3-4\#1^2+c_1\&\right.\right.}{(4y(x)^3-4y(x)^2+c_1)\,(\text{Ro}}\right.$$

✓ **Maple** : cpu = 0.792 (sec), leaf count = 59

```
dsolve(diff(diff(y(x),x),x)-6*y(x)^2+4*y(x)=0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{4\_a^3-4\_a^2+c_1}}d\_a - x - c_2 = 0$$

ODE No. 1595

$$ay(x)^2 + bx + c + y''(x) = 0$$

✗ **Mathematica** : cpu = 20.1059 (sec), leaf count = 0

```
DSolve[c + b*x + a*y[x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[c + b*x + a*y[x]^2 + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a*y(x)^2+b*x+c=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+a*y(x)^2+b*x+c=0,y(x))
```

ODE No. 1596

$$a + y''(x) - 2y(x)^3 - xy(x) = 0$$

✗ **Mathematica** : cpu = 20.4332 (sec), leaf count = 0

```
DSolve[a - x*y[x] - 2*y[x]^3 + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[a - x*y[x] - 2*y[x]^3 + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-2*y(x)^3-x*y(x)+a=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)-2*y(x)^3-x*y(x)+a=0,y(x))
```

ODE No. 1597

$$y''(x) - ay(x)^3 = 0$$

✓ **Mathematica** : cpu = 1.76122 (sec), leaf count = 242

```
DSolve[-(a*y[x]^3) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt[4]{2}\sqrt{c_1}\sqrt{\frac{i\sqrt{a}}{\sqrt{c_1}}}\text{sn}\left(\frac{(-1)^{3/4}\sqrt{\sqrt{2}\sqrt{a}\sqrt{c_1}x^2+2\sqrt{2}\sqrt{a}\sqrt{c_1}c_2x+\sqrt{2}\sqrt{a}\sqrt{c_1}c_2{}^2}}{\sqrt{2}}\middle| -1\right)}{\sqrt{a}}\right\}, \left\{y(x) \to \frac{\sqrt[4]{2}\sqrt{c_1}\sqrt{\frac{i\sqrt{a}}{\sqrt{c_1}}}\right.$$

✓ **Maple** : cpu = 0.783 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x)-a*y(x)^3=0,y(x))
```

$$y(x) = c_2 \text{sn}\left(\left(\frac{\sqrt{-2a}\,x}{2} + c_1\right) c_2 | i\right)$$

ODE No. 1598

$$-2a^2y(x)^3 + 2abxy(x) - b + y''(x) = 0$$

✗ **Mathematica** : cpu = 21.8427 (sec), leaf count = 0

```
DSolve[-b + 2*a*b*x*y[x] - 2*a^2*y[x]^3 + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-b + 2*a*b*x*y[x] - 2*a^2*y[x]^3 + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-2*a^2*y(x)^3+2*a*b*x*y(x)-b=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)-2*a^2*y(x)^3+2*a*b*x*y(x)-b=0,y(x))
```

ODE No. 1599

$$ay(x)^3 + bxy(x) + cy(x) + d + y''(x) = 0$$

✗ **Mathematica** : cpu = 20.6665 (sec), leaf count = 0

```
DSolve[d + c*y[x] + b*x*y[x] + a*y[x]^3 + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[d + c*y[x] + b*x*y[x] + a*y[x]^3 + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+d+b*x*y(x)+c*y(x)+a*y(x)^3=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+d+b*x*y(x)+c*y(x)+a*y(x)^3=0,y(x))
```

ODE No. 1600

$$ay(x)^3 + by(x)^2 + cy(x) + d + y''(x) = 0$$

✓ **Mathematica** : cpu = 1.83146 (sec), leaf count = 1017

```
DSolve[d + c*y[x] + b*y[x]^2 + a*y[x]^3 + Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{4F\left(\sin^{-1}\left(\sqrt{\frac{\left(\text{Root}\left[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,2\right]-\text{Root}\left[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,4\right]\right)(y(}{\left(\text{Root}\left[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,1\right]-\text{Root}\left[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,4\right]\right)(y(}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.751 (sec), leaf count = 89

```
dsolve(diff(diff(y(x),x),x)+d+b*y(x)^2+c*y(x)+a*y(x)^3=0,y(x))
```

$$\int^{y(x)} -\frac{6}{\sqrt{-18a\_a^4 - 24b\_a^3 - 36c\_a^2 - 72d\_a + 36c_1}} d\_a - x - c_2 = 0$$

ODE No. 1601

$$ax^r y(x)^n + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.0338408 (sec), leaf count = 0

```
DSolve[a*x^r*y[x]^n + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[a*x^r*y[x]^n + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a*x^r*y(x)^n=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a\, \mathrm{e}^{\int \_b(\_a) d\_a + c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a) = \frac{(\_a^n a\, n^2 - 2\_a^n an + \_arn + \_a r^2 + \_a^n a + 2\_a}{(r+2)^2}\right.\right.$$

ODE No. 1602

$$(n+1)a^{2n}y(x)^{2n+1}+y''(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.135807 (sec), leaf count = 47

```
DSolve[-y[x] + a^(2*n)*(1 + n)*y[x]^(1 + 2*n) + Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\frac{1}{\sqrt{c_1-K[1]^2\left(a^{2n}K[1]^{2n}-1\right)}}dK[1]^2=(x+c_2)^2,y(x)\right]$$

✓ **Maple** : cpu = 0.257 (sec), leaf count = 73

```
dsolve(diff(diff(y(x),x),x)+(n+1)*a^(2*n)*y(x)^(2*n+1)-y(x)=0,y(x))
```

$$\int^{y(x)}\frac{1}{\sqrt{-a^{2n}\_a^{2n+2}+\_a^2+c_1}}d\_a-x-c_2=0$$

ODE No. 1603

$$y''(x) - \frac{1}{(ay(x)^2 + bxy(x) + cx^2 + dy(x) + ex + k)^{3/2}} = 0$$

✗ **Mathematica** : cpu = 60.4097 (sec), leaf count = 0

```
DSolve[-(k + e*x + c*x^2 + d*y[x] + b*x*y[x] + a*y[x]^2)^(-3/2) + Derivative[2][y][x] == 0,y[
```

, could not solve

```
DSolve[-(k + e*x + c*x^2 + d*y[x] + b*x*y[x] + a*y[x]^2)^(-3/2) + Derivative[2][y][x] =
```

✓ **Maple** : cpu = 42.077 (sec), leaf count = 8413

```
dsolve(diff(diff(y(x),x),x)-1/(a*y(x)^2+b*x*y(x)+c*x^2+alpha*y(x)+beta*x+gamma)^(3/2)=0,y(x))
```

Expression too large to display

ODE No. 1604

$$y''(x) - e^{y(x)} = 0$$

✓ **Mathematica** : cpu = 0.0404187 (sec), leaf count = 34

```
DSolve[-E^y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \log\left(\frac{1}{2}c_1\left(-1+\tanh^2\left(\frac{1}{2}\sqrt{c_1(x+c_2)^2}\right)\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.231 (sec), leaf count = 23

```
dsolve(diff(diff(y(x),x),x)-exp(y(x))=0,y(x))
```

$$y(x) = \ln\left(\frac{\tan^2\left(\frac{x+c_2}{2c_1}\right)+1}{2c_1^2}\right)$$

ODE No. 1605

$$ae^x \sqrt{y(x)} + y''(x) = 0$$

✗ **Mathematica** : cpu = 20.1664 (sec), leaf count = 0

```
DSolve[a*E^x*Sqrt[y[x]] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[a*E^x*Sqrt[y[x]] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a*exp(x)*y(x)^(1/2)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a\, \mathrm{e}^{\int 2\_b(\_a) d\_a + 2c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a) = (a\sqrt{\_a} + 4\_a)\, \_b(\_a)^3 + 4\_b(\_a)^2\right\}, \left\{\_a = y(x\right.\right.$$

ODE No. 1606

$$y''(x) + e^x \sin(y(x)) = 0$$

✗ **Mathematica** : cpu = 20.5759 (sec), leaf count = 0

```
DSolve[E^x*Sin[y[x]] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[E^x*Sin[y[x]] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+exp(x)*sin(y(x))=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+exp(x)*sin(y(x))=0,y(x))
```

ODE No. 1607

$$a \sin(y(x)) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0799782 (sec), leaf count = 79

```
DSolve[a*Sin[y[x]] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -2\text{am}\left(\frac{1}{2}\sqrt{(2a+c_1)(x+c_2)^2}|\frac{4a}{2a+c_1}\right)\right\}, \left\{y(x) \to 2\text{am}\left(\frac{1}{2}\sqrt{(2a+c_1)(x+c_2)^2}|\frac{4a}{2a+c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.163 (sec), leaf count = 49

```
dsolve(diff(diff(y(x),x),x)+a*sin(y(x))=0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{2a\cos(\_a) + c_1}} d\_a - x - c_2 = 0$$

ODE No. 1608

$$a^2 \sin(y(x)) - b \sin(x) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.0374634 (sec), leaf count = 0

```
DSolve[-(b*Sin[x]) + a^2*Sin[y[x]] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-(b*Sin[x]) + a^2*Sin[y[x]] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a^2*sin(y(x))-b*sin(x)=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+a^2*sin(y(x))-b*sin(x)=0,y(x))
```

ODE No. 1609

$$a^2 \sin(y(x)) - bf(x) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.0280358 (sec), leaf count = 0

```
DSolve[-(b*f[x]) + a^2*Sin[y[x]] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-(b*f[x]) + a^2*Sin[y[x]] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a^2*sin(y(x))-b*f(x)=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+a^2*sin(y(x))-b*f(x)=0,y(x))
```

ODE No. 1610

$$y''(x) - \frac{h\left(\frac{y(x)}{\sqrt{x}}\right)}{x^{3/2}} = 0$$

✓ **Mathematica** : cpu = 3.43107 (sec), leaf count = 754

```
DSolve[-(h[y[x]/Sqrt[x]]/x^(3/2)) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\int_1^{y(x)} \frac{2}{\sqrt{x}\sqrt{\frac{K[3]^2+4xc_1+8x\int_1^{\frac{K[3]}{\sqrt{x}}} h(K[2])dK[2]}{x}}} dK[3] - \int_1^{x} \left(\frac{2\left(\frac{y(x)}{2\sqrt{K[4]}} - \frac{\sqrt{\frac{y(x)^2}{2K[4]}+2c_1+4\int_1^{\frac{y(x)}{\sqrt{K[4]}}} h(K[2])dK[2]}}{\sqrt{2}} \right)}{K[4]\sqrt{\frac{y(x)^2+4c_1K[4]+8K[4]\int_1^{\frac{y(x)}{\sqrt{K[4]}}} h(K[2])dK[2]}{K[4]}}} \right)\right.\right.$$

✓ **Maple** : cpu = 0.224 (sec), leaf count = 92

```
dsolve(diff(diff(y(x),x),x)-1/x^(3/2)*h(y(x)/x^(1/2))=0,y(x))
```

$$y(x) = \text{RootOf}\left(\_Z x^{\frac{3}{2}} + 4h\left(\frac{\_Z}{\sqrt{x}}\right) x^2 \right)$$

ODE No. 1611

$$y''(x) - 3y'(x) - y(x)^2 - 2y(x) = 0$$

✗ **Mathematica** : cpu = 2.92369 (sec), leaf count = 0

```
DSolve[-2*y[x] - y[x]^2 - 3*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-2*y[x] - y[x]^2 - 3*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-3*diff(y(x),x)-y(x)^2-2*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a \textbf{\textit{where}} \left[\left\{ \left(\frac{d}{d\_a} \_b(\_a) \right) \_b(\_a) - 3\_b(\_a) - \_a^2 - 2\_a = 0 \right\}, \left\{ \_a = y(x), \_b(\_a) = \frac{d}{dx} y \right. \right.$$

ODE No. 1612

$$y''(x) - 7y'(x) - y(x)^{3/2} + 12y(x) = 0$$

✗ **Mathematica** : cpu = 21.2092 (sec), leaf count = 0

```
DSolve[12*y[x] - y[x]^(3/2) - 7*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[12*y[x] - y[x]^(3/2) - 7*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-7*diff(y(x),x)-y(x)^(3/2)+12*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a \textbf{\textit{where}} \left[\left\{ \left(\frac{d}{d\_a} \_b(\_a) \right) \_b(\_a) - 7\_b(\_a) - \_a^{\frac{3}{2}} + 12\_a = 0 \right\}, \left\{ \_a = y(x), \_b(\_a) = \frac{d}{dx} \right. \right.$$

ODE No. 1613

$$6a^2y(x)+5ay'(x)+y''(x)-6y(x)^2=0$$

✓ **Mathematica** : cpu = 1.18197 (sec), leaf count = 35

```
DSolve[6*a^2*y[x] - 6*y[x]^2 + 5*a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to a^2{c_1}^2e^{-2ax}\wp\left(e^{-ax}c_1+c_2;0,-1\right)\}\}$$

✓ **Maple** : cpu = 0.844 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x)+5*a*diff(y(x),x)-6*y(x)^2+6*a^2*y(x)=0,y(x))
```

$$y(x)=\text{WeierstrassP}\left(-\frac{\mathrm{e}^{-ax}}{a}+c_1,0,c_2\right)\mathrm{e}^{-2ax}$$

ODE No. 1614

$$2a^2y(x)+3ay'(x)+y''(x)-2y(x)^3=0$$

✓ **Mathematica** : cpu = 0.866439 (sec), leaf count = 32

```
DSolve[2*a^2*y[x] - 2*y[x]^3 + 3*a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to -iac_1e^{-ax}\text{sn}\left(e^{-ax}c_1+c_2\middle|-1\right)\}\}$$

✓ **Maple** : cpu = 0.903 (sec), leaf count = 33

```
dsolve(diff(diff(y(x),x),x)+3*a*diff(y(x),x)-2*y(x)^3+2*a^2*y(x)=0,y(x))
```

$$y(x)=c_2\text{sn}\left(\left(-\frac{\sqrt{-\mathrm{e}^{-2ax}}}{a}+c_1\right)c_2|i\right)\mathrm{e}^{-ax}$$

ODE No. 1615

$$-\frac{2(n+1)(n+2)y(x)\left(y(x)^{\frac{n}{n+1}}-1\right)}{n^2}-\frac{(3n+4)y'(x)}{n}+y''(x)=0$$

✗ **Mathematica** : cpu = 60.1188 (sec), leaf count = 0

```
DSolve[(-2*(1 + n)*(2 + n)*y[x]*(-1 + y[x]^(n/(1 + n))))/n^2 - ((4 + 3*n)*Derivative[1][y][x]
```

, could not solve

```
DSolve[(-2*(1 + n)*(2 + n)*y[x]*(-1 + y[x]^(n/(1 + n))))/n^2 - ((4 + 3*n)*Derivative[1]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-(3*n+4)/n*diff(y(x),x)-2*(n+1)*(n+2)/n^2*y(x)*(y(x)^(n/(n+1))-1)=
```

, result contains DESol or ODESolStruc

$$y(x)=\_a \textbf{\textit{where}}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a)-\frac{2\_a^{\frac{n}{n+1}}\_a n^2+6\_a^{\frac{n}{n+1}}\_a n+3\_b(\_a)\,n^2-2\_a n^2+4\_a}{n^2}\right.\right.$$

ODE No. 1616

$$\frac{1}{4}\left(a^2-1\right)y(x)+ay'(x)+by(x)^n+y''(x)=0$$

✗ **Mathematica** : cpu = 12.9175 (sec), leaf count = 0

```
DSolve[((-1 + a^2)*y[x])/4 + b*y[x]^n + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x]
```

, could not solve

```
DSolve[((-1 + a^2)*y[x])/4 + b*y[x]^n + a*Derivative[1][y][x] + Derivative[2][y][x] ==
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*y(x)^n+1/4*(a^2-1)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=\_a \textbf{\textit{where}}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a)+a\_b(\_a)+b\_a^n+\frac{\_a\,a^2}{4}-\frac{\_a}{4}=0\right\},\left\{\_a=y(x),\_b(\_\right.\right.$$

ODE No. 1617

$$ay'(x) + bx^r y(x)^n + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.0383648 (sec), leaf count = 0

```
DSolve[b*x^r*y[x]^n + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[b*x^r*y[x]^n + a*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*x^r*y(x)^n=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*x^r*y(x)^n=0,y(x))
```

ODE No. 1618

$$ay'(x) - 2a + be^{y(x)} + y''(x) = 0$$

✗ **Mathematica** : cpu = 25.4111 (sec), leaf count = 0

```
DSolve[-2*a + b*E^y[x] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-2*a + b*E^y[x] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*exp(y(x))-2*a=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a \textbf{\textit{where}} \left[\left\{ \left(\frac{d}{d\_a} \_b(\_a) \right) \_b(\_a) + a\_b(\_a) + b\,\mathrm{e}^{-a} - 2a = 0 \right\}, \left\{ \_a = y(x), \_b(\_a) = \frac{d}{dx} y(\right.$$

ODE No. 1619

$$ay'(x) + f(x)\sin(y(x)) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.0441315 (sec), leaf count = 0

```
DSolve[f[x]*Sin[y[x]] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[f[x]*Sin[y[x]] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+f(x)*sin(y(x))=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+f(x)*sin(y(x))=0,y(x))
```

ODE No. 1620

$$y''(x) + y(x)y'(x) - y(x)^3 = 0$$

✓ **Mathematica** : cpu = 2.92562 (sec), leaf count = 492

```
DSolve[-y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{2}{\frac{e^{6c_1}K[1]^4}{\sqrt[3]{e^{18c_1}K[1]^6 - 2e^{12c_1} + 2\sqrt{e^{24c_1} - e^{30c_1}K[1]^6}}} - K[1]^2 + e^{-6c_1}\sqrt[3]{e^{18c_1}K}\right.\right.\right.$$

✓ **Maple** : cpu = 0.88 (sec), leaf count = 291

```
dsolve(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3=0,y(x))
```

$$\int^{y(x)} \frac{2}{\frac{\_a^4}{\left(\_a^6+2c_1+2\sqrt{\_a^6c_1+c_1^2}\right)^{\frac{1}{3}}} - \_a^2 + \left(\_a^6 + 2c_1 + 2\sqrt{\_a^6c_1 + c_1^2}\right)^{\frac{1}{3}}} d\_a - x - c_2 = 0$$

ODE No. 1621

$$ay(x) + y''(x) + y(x)y'(x) - y(x)^3 = 0$$

✓ **Mathematica** : cpu = 7.99959 (sec), leaf count = 990

```
DSolve[a*y[x] - y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{}{\frac{e^{6c_1}(a-K[1]^2)^2}{\sqrt[3]{2}\sqrt[3]{e^{18c_1}K[1]^6 - 3ae^{18c_1}K[1]^4 + 3a^2e^{18c_1}K[1]^2 - 2e^{12c_1} - a^3e^{18c_1} + 2\sqrt{-}}}}\right.\right.$$

✓ **Maple** : cpu = 2.071 (sec), leaf count = 108

```
dsolve(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3+a*y(x)=0,y(x))
```

$$\int^{y(x)} \frac{4\,\text{RootOf}\left((-4\_a^6 + 12a\_a^4 - 12\_a^2a^2 + 4a^3 + 320c_1)\_Z^9 + (-189\_a^6 + 567a\_a^4 - 567\_a^2a^2 + \right.}{-63\_a^2 + 63a}$$

ODE No. 1622

$$2a^2y(x)+(3a+y(x))y'(x)+ay(x)^2+y''(x)-y(x)^3=0$$

✓ **Mathematica** : cpu = 23.6609 (sec), leaf count = 88

```
DSolve[2*a^2*y[x] + a*y[x]^2 - y[x]^3 + (3*a + y[x])*Derivative[1][y][x] + Derivative[2][y][x
```

$$\left\{\left\{y(x)\to \begin{cases} \frac{c_1\wp'(xc_1+c_2;0,1)}{\wp(xc_1+c_2;0,1)} & a=0 \\ -\frac{e^{-ax}c_1\wp'\left(\frac{e^{-ax}c_1}{a}+c_2;0,1\right)}{\wp\left(\frac{e^{-ax}c_1}{a}+c_2;0,1\right)} & \text{True} \end{cases}\right\}\right\}$$

✓ **Maple** : cpu = 1.063 (sec), leaf count = 415

```
dsolve(diff(diff(y(x),x),x)+(y(x)+3*a)*diff(y(x),x)-y(x)^3+a*y(x)^2+2*a^2*y(x)=0,y(x))
```

$$y(x)=\text{RootOf}\left(\left(\int^{\_Z}\frac{\_f^8-c_1\_f^2+\left(\left(-\_f^6+c_1\right)^2\left(\sqrt{\frac{c_1}{-\_f^6+c_1}}-1\right)\right)^{\frac{2}{3}}}{\left(-\_f^6+c_1\right)\left(\left(-\_f^6+c_1\right)^2\left(\sqrt{\frac{c_1}{-\_f^6+c_1}}-1\right)\right)^{\frac{1}{3}}}d\_f\right)a+c_2a+\mathrm{e}^{-ax}\right)\mathrm{e}^{-ax}$$

ODE No. 1623

$$y(x)\left(f'(x)+2f(x)^2\right)+(3f(x)+y(x))y'(x)+f(x)y(x)^2+y''(x)-y(x)^3=0$$

✗ **Mathematica** : cpu = 0.158585 (sec), leaf count = 0

```
DSolve[f[x]*y[x]^2 - y[x]^3 + y[x]*(2*f[x]^2 + Derivative[1][f][x]) + (3*f[x] + y[x])*Derivat
```

, could not solve

```
DSolve[f[x]*y[x]^2 - y[x]^3 + y[x]*(2*f[x]^2 + Derivative[1][f][x]) + (3*f[x] + y[x])*D
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+(y(x)+3*f(x))*diff(y(x),x)-y(x)^3+f(x)*y(x)^2+y(x)*(diff(f(x),x)+
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+(y(x)+3*f(x))*diff(y(x),x)-y(x)^3+f(x)*y(x)^2+y(x)*(diff(f(
```

ODE No. 1624

$$y(x)\left(af(x)^2-\frac{f''(x)}{f(x)}+3f'(x)+\frac{3f'(x)^2}{f(x)^2}\right)+bf(x)^3-\left(\frac{f'(x)}{f(x)}+f(x)\right)\left(3y'(x)+y(x)^2\right)+y''(x)+y(x)y'(x)-$$

✗ **Mathematica** : cpu = 0.747487 (sec), leaf count = 0

```
DSolve[b*f[x]^3 - y[x]^3 + y[x]*Derivative[1][y][x] - (f[x] + Derivative[1][f][x]/f[x])*(y[x]
```

, could not solve

```
DSolve[b*f[x]^3 - y[x]^3 + y[x]*Derivative[1][y][x] - (f[x] + Derivative[1][f][x]/f[x])
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3-(diff(f(x),x)/f(x)+f(x))*(3*diff(y(x),x)
```

, result contains DESol or ODESolStruc

$$y(x)=\left(f\left(\text{RootOf}\left(\int \_b(\_a)\,d\_a+c_1-\left(\int^{-Z} f(\_f)\,d\_f\right)\right)\right)\_a\right)\ \textbf{\textit{where}}\left[\left\{\frac{d}{d\_a}\_\text{b}(\_a)=(-\_a^3-\right.\right.$$

ODE No. 1625

$$y'(x)\left(y(x)-\frac{3f'(x)}{2f(x)}\right)-\frac{y(x)^2f'(x)}{2f(x)}+y(x)\left(-\frac{f''(x)}{2f(x)}+\frac{f'(x)^2}{f(x)^2}+f(x)\right)+y''(x)-y(x)^3=0$$

✗ **Mathematica** : cpu = 0.416648 (sec), leaf count = 0

```
DSolve[-y[x]^3 - (y[x]^2*Derivative[1][f][x])/(2*f[x]) + (y[x] - (3*Derivative[1][f][x])/(2*f
```

, could not solve

```
DSolve[-y[x]^3 - (y[x]^2*Derivative[1][f][x])/(2*f[x]) + (y[x] - (3*Derivative[1][f][x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+(y(x)-3/2*diff(f(x),x)/f(x))*diff(y(x),x)-y(x)^3-1/2*diff(f(x),x)
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+(y(x)-3/2*diff(f(x),x)/f(x))*diff(y(x),x)-y(x)^3-
1/2*diff(f(x),x)/f(x)*y(x)^2+1/2*(f(x)+diff(f(x),x)^2/f(x)^2-diff(diff(f(x),x),x))/f(x)
```

ODE No. 1626

$$y(x)f'(x) + f(x)y'(x) + y''(x) + 2y(x)y'(x) = 0$$

✗ **Mathematica** : cpu = 30.3794 (sec), leaf count = 0

```
DSolve[y[x]*Derivative[1][f][x] + f[x]*Derivative[1][y][x] + 2*y[x]*Derivative[1][y][x] + Der
```

, could not solve

```
DSolve[y[x]*Derivative[1][f][x] + f[x]*Derivative[1][y][x] + 2*y[x]*Derivative[1][y][x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+2*y(x)*diff(y(x),x)+f(x)*diff(y(x),x)+diff(f(x),x)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_b(\_a) \textbf{\textit{ where}} \left[\left\{ \frac{d}{d\_a} \_b(\_a) = -f(\_a)\,\_b(\_a) - \_b(\_a)^2 - c_1 \right\}, \{\_a = x, \_b(\_a) = y(x)\}, \{x \right.$$

ODE No. 1627

$$f(x)\left(y'(x)+y(x)^2\right)-g(x)+y''(x)+2y(x)y'(x)=0$$

✗ **Mathematica** : cpu = 0.137363 (sec), leaf count = 0

```
DSolve[-g[x] + 2*y[x]*Derivative[1][y][x] + f[x]*(y[x]^2 + Derivative[1][y][x]) + Derivative[
```

, could not solve

```
DSolve[-g[x] + 2*y[x]*Derivative[1][y][x] + f[x]*(y[x]^2 + Derivative[1][y][x]) + Deriv
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+2*y(x)*diff(y(x),x)+f(x)*(diff(y(x),x)+y(x)^2)-g(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=_b(_a)\,\textbf{\textit{where}}\left[\left\{_b(_a)^2\,\mathrm{e}^{\int f(_a)d_a}+\mathrm{e}^{\int f(_a)d_a}\left(\frac{d}{d_a}\mathrm{b}(_a)\right)-\left(\int \mathrm{e}^{\int f(_a)d_a}g(_a)\,d_a\right)+
$$

ODE No. 1628

$$f(x)y(x) - g(x) + y''(x) + 3y(x)y'(x) + y(x)^3 = 0$$

✗ **Mathematica** : cpu = 2.54445 (sec), leaf count = 0

```
DSolve[-g[x] + f[x]*y[x] + y[x]^3 + 3*y[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x
```

, could not solve

```
DSolve[-g[x] + f[x]*y[x] + y[x]^3 + 3*y[x]*Derivative[1][y][x] + Derivative[2][y][x] ==
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+3*y(x)*diff(y(x),x)+y(x)^3+f(x)*y(x)-g(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \frac{\frac{d}{dx} DESol\left(\left\{-g(x)\_Y(x) + f(x)\left(\frac{d}{dx}\_Y(x)\right) + \frac{d^3}{dx^3}\_Y(x)\right\}, \{\_Y(x)\}\right)}{DESol\left(\left\{-g\left(x\right)\_Y(x) + f\left(x\right)\left(\frac{d}{dx}\_Y(x)\right) + \frac{d^3}{dx^3}\_Y(x)\right\}, \{\_Y(x)\}\right)}$$

ODE No. 1629

$$(f(x)+3y(x))y'(x)+f(x)y(x)^2+y''(x)+y(x)^3=0$$

✓ **Mathematica** : cpu = 0.0597272 (sec), leaf count = 75

```
DSolve[f[x]*y[x]^2 + y[x]^3 + (f[x] + 3*y[x])*Derivative[1][y][x] + Derivative[2][y][x] == 0,
```

$$\left\{\left\{y(x)\to \frac{\int_1^x \exp\left(-\int_1^{K[2]} f(K[1])dK[1]\right)c_1 dK[2]+c_2}{\int_1^x \int_1^{K[5]} \exp\left(-\int_1^{K[4]} f(K[3])dK[3]\right)c_1 dK[4]dK[5]+c_2 x+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 38

```
dsolve(diff(diff(y(x),x),x)+(3*y(x)+f(x))*diff(y(x),x)+y(x)^3+f(x)*y(x)^2=0,y(x))
```

$$y(x)=\frac{\int c_1 \mathrm{e}^{-\left(\int f(x)dx\right)}dx+c_2}{\int\int c_1 \mathrm{e}^{-\left(\int f(x)dx\right)}dxdx+xc_2+1}$$

ODE No. 1630

$$-4a^2y(x) - 3ay(x)^2 - b + y''(x) - 3y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 6.73247 (sec), leaf count = 3227

```
DSolve[-b - 4*a^2*y[x] - 3*a*y[x]^2 - 3*y[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y
```

$$\left\{\left\{y(x) \to -\frac{2\left((-1)^{\frac{a^{3/2}\sqrt{4a^3-3b}-2a^3}{4a^3}+1}2^{-\frac{3\left(a^{3/2}\sqrt{4a^3-3b}-2a^3\right)}{4a^3}+\frac{3\sqrt{4a^6-3a^3b}}{4a^3}+1}3^{\frac{a^{3/2}\sqrt{4a^3-3b}-2a^3}{4a^3}-\frac{\sqrt{4a^6-3a^3b}}{4a^3}}a^{-\frac{a^{3/2}\sqrt{4a^3-3b}-}{2a^3}}\right.\right.\right.$$

✓ **Maple** : cpu = 1.345 (sec), leaf count = 783

```
dsolve(diff(diff(y(x),x),x)-3*y(x)*diff(y(x),x)-3*a*y(x)^2-4*a^2*y(x)-b=0,y(x))
```

$$\int^{y(x)} -\frac{}{-12\_a\,a^3 - 9\_a^2a^2 + \text{RootOf}\left(2\,\text{BesselK}\left(\frac{4a^3-3b}{2a\sqrt{4a^4-3ab}}, -\frac{\_Z}{2a^2}\right)c_1a^2 + 3\,\text{BesselK}\left(\frac{4a^3-3b}{2a\sqrt{4a^4-3ab}}, -\frac{\_Z}{2a^2}\right)\right.}$$

ODE No. 1631

$$-(f(x)+3y(x))y'(x)+f(x)y(x)^2+y''(x)+y(x)^3=0$$

✓ **Mathematica** : cpu = 0.0516968 (sec), leaf count = 75

```
DSolve[f[x]*y[x]^2 + y[x]^3 - (f[x] + 3*y[x])*Derivative[1][y][x] + Derivative[2][y][x] == 0,
```

$$\left\{\left\{y(x)\to \frac{-\int_1^x \exp\left(\int_1^{K[2]} f(K[1])dK[1]\right)c_1 dK[2]-c_2}{\int_1^x \int_1^{K[5]} \exp\left(\int_1^{K[4]} f(K[3])dK[3]\right)c_1 dK[4]dK[5]+c_2 x+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 38

```
dsolve(diff(diff(y(x),x),x)-(3*y(x)+f(x))*diff(y(x),x)+y(x)^3+f(x)*y(x)^2=0,y(x))
```

$$y(x)=\frac{-\left(\int c_1 \mathrm{e}^{\int f(x)dx}dx\right)-c_2}{\int\int c_1 \mathrm{e}^{\int f(x)dx}dxdx+xc_2+1}$$

ODE No. 1632

$$y''(x) - 2ay(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0590823 (sec), leaf count = 46

```
DSolve[-2*a*y[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\sqrt{c_1}\tan\left(\sqrt{a}\sqrt{c_1}x + \sqrt{a}\sqrt{c_1}c_2\right)}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.893 (sec), leaf count = 23

```
dsolve(diff(diff(y(x),x),x)-2*a*y(x)*diff(y(x),x)=0,y(x))
```

$$y(x) = \frac{\tan\left(\sqrt{c_1 a}\,(x + c_2)\right)\sqrt{c_1 a}}{a}$$

ODE No. 1633

$$ay(x)y'(x) + by(x)^3 + y''(x) = 0$$

✓ **Mathematica** : cpu = 32.3944 (sec), leaf count = 92

```
DSolve[b*y[x]^3 + a*y[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \frac{1}{K[2]^2 \text{InverseFunction}\left[\frac{1}{4}\left(\log(b+\#1(a+2\#1)) - \frac{2a\tan^{-1}\left(\frac{a+4\#1}{\sqrt{8b-a^2}}\right)}{\sqrt{8b-a^2}}\right)\&\right][c_1 - \log(K[2])]} dK\right.$$

✓ **Maple** : cpu = 1.038 (sec), leaf count = 97

```
dsolve(diff(diff(y(x),x),x)+a*y(x)*diff(y(x),x)+b*y(x)^3=0,y(x))
```

$$\int^{y(x)} \frac{1}{\text{RootOf}\left(-2a\_a^2 \operatorname{arctanh}\left(\frac{\_a^2 a+4\_Z}{\sqrt{\_a^4(a^2-8b)}}\right) - \ln\left(\_a^4 b + \_Z\_a^2 a + 2\_Z^2\right)\sqrt{\_a^4\left(a^2-8b\right)} + c_1\sqrt{\_a^4}\right.$$

ODE No. 1634

$$y'(x)h(x,y(x)) + j(x,y(x)) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.123468 (sec), leaf count = 0

```
DSolve[j[x, y[x]] + h[x, y[x]]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[j[x, y[x]] + h[x, y[x]]*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+h(x,y(x))*diff(y(x),x)+j(x,y(x))=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+h(x,y(x))*diff(y(x),x)+j(x,y(x))=0,y(x))
```

ODE No. 1635

$$ay'(x)^2 + by(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.530574 (sec), leaf count = 104

```
DSolve[b*y[x] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} -\frac{\sqrt{2}a}{\sqrt{2e^{-2aK[1]}c_1a^2 - 2bK[1]a + b}}dK[1]\&\right][x + c_2]\right\}, \left\{y(x) \to \text{InverseFu}\right.\right.$$

✓ **Maple** : cpu = 1.043 (sec), leaf count = 79

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)^2+b*y(x)=0,y(x))
```

$$\int^{y(x)} -\frac{2a}{\sqrt{4\,\mathrm{e}^{-2a\_a}c_1a^2 - 4\_aab + 2b}}d\_a - x - c_2 = 0$$

ODE No. 1636

$$ay'(x)\,|y'(x)| + by'(x) + cy(x) + y''(x) = 0$$

✗ **Mathematica** : cpu = 6.41161 (sec), leaf count = 0

```
DSolve[c*y[x] + b*Derivative[1][y][x] + a*Abs[Derivative[1][y][x]]*Derivative[1][y][x] + Deri
```

, could not solve

```
DSolve[c*y[x] + b*Derivative[1][y][x] + a*Abs[Derivative[1][y][x]]*Derivative[1][y][x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)*abs(diff(y(x),x))+b*diff(y(x),x)+c*y(x)=0,y(x))
```

, exception

```
numeric exception: division by zero
```

ODE No. 1637

$$ay'(x)^2 + by'(x) + cy(x) + y''(x) = 0$$

✗ **Mathematica** : cpu = 16.2402 (sec), leaf count = 0

```
DSolve[c*y[x] + b*Derivative[1][y][x] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0,y[
```

, could not solve

```
DSolve[c*y[x] + b*Derivative[1][y][x] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] =
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)^2+b*diff(y(x),x)+c*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = _a \textbf{\textit{where}} \left[\left\{ \left(\frac{d}{d_a} _b(_a) \right) _b(_a) + a _b(_a)^2 + _b(_a)\, b + c _a = 0 \right\}, \left\{ _a = y(x), _b(_a) =
$$

ODE No. 1638

$$ay'(x)^2 + b\sin(y(x)) + y''(x) = 0$$

✓ **Mathematica** : cpu = 3.87742 (sec), leaf count = 146

```
DSolve[b*Sin[y[x]] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} -\frac{\sqrt{4a^2+1}}{\sqrt{4e^{-2aK[1]}c_1a^2 - 4b\sin(K[1])a + e^{-2aK[1]}c_1 + 2b\cos(K[1])}}dK[1]\&\right]\right.\right.$$

✓ **Maple** : cpu = 0.227 (sec), leaf count = 115

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)^2+b*sin(y(x))=0,y(x))
```

$$\int^{y(x)} \frac{4a^2+1}{\sqrt{16c_1\left(a^2+\frac{1}{4}\right)^2 \mathrm{e}^{-2a\_a} - 16b\left(a\sin(\_a) - \frac{\cos(\_a)}{2}\right)\left(a^2+\frac{1}{4}\right)}} d\_a - x - c_2 = 0$$

ODE No. 1639

$$a y'(x) |y'(x)| + b \sin(y(x)) + y''(x) = 0$$

✗ **Mathematica** : cpu = 38.7453 (sec), leaf count = 0

```
DSolve[b*Sin[y[x]] + a*Abs[Derivative[1][y][x]]*Derivative[1][y][x] + Derivative[2][y][x] ==
```

, could not solve

```
DSolve[b*Sin[y[x]] + a*Abs[Derivative[1][y][x]]*Derivative[1][y][x] + Derivative[2][y][
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)*abs(diff(y(x),x))+b*sin(y(x))=0,y(x))
```

, exception

```
numeric exception: division by zero
```

ODE No. 1640

$$ay(x)y'(x)^2 + by(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.452445 (sec), leaf count = 96

```
DSolve[b*y[x] + a*y[x]*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} -\frac{\sqrt{a}}{\sqrt{e^{2ac_1 - aK[1]^2} - b}}dK[1]\&\right][x + c_2]\right\}, \left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1}\right.\right.$$

✓ **Maple** : cpu = 0.987 (sec), leaf count = 70

```
dsolve(diff(diff(y(x),x),x)+a*y(x)*diff(y(x),x)^2+b*y(x)=0,y(x))
```

$$\int^{y(x)} \frac{a}{\sqrt{a\left(\mathrm{e}^{-a^2 a}c_1 a - b\right)}}d\_a - x - c_2 = 0$$

ODE No. 1641

$$g(x)y'(x) + h(y(x))y'(x)^2 + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0526153 (sec), leaf count = 61

```
DSolve[g[x]*Derivative[1][y][x] + h[y[x]]*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0,y[
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \exp\left(-\int_1^{K[4]} -h(K[1])dK[1]\right) dK[4]\&\right]\left[\int_1^{x} -\exp\left(-\int_1^{K[5]} g(K[2])d\right.\right.\right.$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 29

```
dsolve(diff(diff(y(x),x),x)+h(y(x))*diff(y(x),x)^2+g(x)*diff(y(x),x)=0,y(x))
```

$$\int^{y(x)} \mathrm{e}^{\int h(\_b)d\_b} d\_b - c_1\left(\int \mathrm{e}^{-(\int g(x)dx)} dx\right) - c_2 = 0$$

ODE No. 1642

$$f(x)h(y(x)) + g(x)y'(x) - \frac{j(y(x))y'(x)^2}{h(y(x))} + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.396447 (sec), leaf count = 0

```
DSolve[f[x]*h[y[x]] + g[x]*Derivative[1][y][x] - (j[y[x]]*Derivative[1][y][x]^2)/h[y[x]] + De
```

, could not solve

```
DSolve[f[x]*h[y[x]] + g[x]*Derivative[1][y][x] - (j[y[x]]*Derivative[1][y][x]^2)/h[y[x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-j(y(x))/h(y(x))*diff(y(x),x)^2+g(x)*diff(y(x),x)+f(x)*h(y(x))=0,y
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)-j(y(x))/h(y(x))*diff(y(x),x)^2+g(x)*diff(y(x),x)+f(x)*h(y(x
```

ODE No. 1643

$$f(x)y'(x) + g(x)j(y(x)) + h(y(x))y'(x)^2 + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.150663 (sec), leaf count = 0

```
DSolve[g[x]*j[y[x]] + f[x]*Derivative[1][y][x] + h[y[x]]*Derivative[1][y][x]^2 + Derivative[2
```

, could not solve

```
DSolve[g[x]*j[y[x]] + f[x]*Derivative[1][y][x] + h[y[x]]*Derivative[1][y][x]^2 + Deriva
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((1-D(j)(y(x)))/j(y(x))*diff(y(x),x)^2+f(x)*diff(y(x),x)+diff(diff(y(x),x),x)+g(x)*j(y(
```

, could not solve

```
dsolve((1-D(j)(y(x)))/j(y(x))*diff(y(x),x)^2+f(x)*diff(y(x),x)+diff(diff(y(x),x),x)+g(x
```

ODE No. 1644

$$h(y(x))y'(x)^2 + j(y(x))y'(x) + k(y(x)) + y''(x) = 0$$

✗ **Mathematica** : cpu = 34.6286 (sec), leaf count = 0

```
DSolve[k[y[x]] + j[y[x]]*Derivative[1][y][x] + h[y[x]]*Derivative[1][y][x]^2 + Derivative[2][
```

, could not solve

```
DSolve[k[y[x]] + j[y[x]]*Derivative[1][y][x] + h[y[x]]*Derivative[1][y][x]^2 + Derivati
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+h(y(x))*diff(y(x),x)^2+j(y(x))*diff(y(x),x)+k(y(x))=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a \textbf{\textit{where}} \left[\left\{ \left(\frac{d}{d\_a} \_b(\_a) \right) \_b(\_a) + h(\_a) \_b(\_a)^2 + j(\_a) \_b(\_a) + k(\_a) = 0 \right\}, \left\{ \_a = y(x \right.\right.$$

ODE No. 1645

$$\left(y'(x)^2+1\right)\left(y'(x)h(x,y(x))+j(x,y(x))\right)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.0820018 (sec), leaf count = 0

```
DSolve[(j[x, y[x]] + h[x, y[x]]*Derivative[1][y][x])*(1 + Derivative[1][y][x]^2) + Derivative
```

, could not solve

```
DSolve[(j[x, y[x]] + h[x, y[x]]*Derivative[1][y][x])*(1 + Derivative[1][y][x]^2) + Deri
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+(diff(y(x),x)^2+1)*(h(x,y(x))*diff(y(x),x)+j(x,y(x)))=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+(diff(y(x),x)^2+1)*(h(x,y(x))*diff(y(x),x)+j(x,y(x)))=0,y(x
```

ODE No. 1646

$$ay(x)\left(y'(x)^2+1\right)^2+y''(x)=0$$

✓ **Mathematica** : cpu = 10.5829 (sec), leaf count = 262

```
DSolve[a*y[x]*(1 + Derivative[1][y][x]^2)^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt{\frac{\#1^2(-a)+1+2c_1}{1+2c_1}}\sqrt{2\#1^2a-4c_1}E\left(\sin^{-1}\left(\sqrt{\frac{a}{2c_1+1}}\#1\right)|1+\frac{1}{2c_1}\right)}{\sqrt{\frac{a}{1+2c_1}}\sqrt{\#1^2(-a)+1+2c_1}\sqrt{2-\frac{\#1^2a}{c_1}}}\&\right][x+c_2]\right\}\right\}$$

✓ **Maple** : cpu = 0.991 (sec), leaf count = 94

```
dsolve(diff(diff(y(x),x),x)+a*y(x)*(diff(y(x),x)^2+1)^2=0,y(x))
```

$$\int^{y(x)}\frac{a(\_a^2+2c_1)}{\sqrt{-\left(-1+a\left(\_a^2+2c_1\right)\right)a\left(\_a^2+2c_1\right)}}d\_a-x-c_2=0$$

ODE No. 1647

$$y''(x) - a(xy'(x) - y(x))^r = 0$$

✓ **Mathematica** : cpu = 0.443676 (sec), leaf count = 91

```
DSolve[-(a*(-y[x] + x*Derivative[1][y][x])^r) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to x\left(c_2 - x\left(2 - \frac{a(r-1)x^2}{c_1}\right)^{\frac{1}{r-1}}\left(x^{2r-2}\left(-a(r-1)x^2 + 2c_1\right)\right)^{\frac{1}{1-r}}\, {}_2F_1\left(-\frac{1}{2}, \frac{1}{r-1}; \frac{1}{2}; \frac{a(r-1)x^2}{2c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.563 (sec), leaf count = 60

```
dsolve(diff(diff(y(x),x),x)-a*(x*diff(y(x),x)-y(x))^r=0,y(x))
```

$$y(x) = \left(\int -\frac{\left(x^2(r-1)\,a - c_1\right)\left(-\frac{1}{x^2(r-1)a - c_1}\right)^{\frac{r}{r-1}} 2^{\frac{r}{r-1}}}{2x^2} dx + c_2\right) x$$

ODE No. 1648

$$y''(x) - kx^a y(x)^b y'(x)^c = 0$$

✗ **Mathematica** : cpu = 0.0645049 (sec), leaf count = 0

```
DSolve[-(k*x^a*y[x]^b*Derivative[1][y][x]^c) + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-(k*x^a*y[x]^b*Derivative[1][y][x]^c) + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-k*x^a*y(x)^b*diff(y(x),x)^c=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a\, \mathrm{e}^{\int \_b(\_a) d\_a + c_1}\right) \textbf{\textit{where}} \left[\left\{ \frac{d}{d\_a}\_\mathrm{b}(\_a) = -\frac{\left(\_a^b \left(-\frac{(a-c+2)(\_a\_b(\_a)+1)}{\_b(\_a)(b+c-1)}\right)^c b^2 k + 2\_a^b \left(-\frac{(a-c\right.\right.\right.$$

ODE No. 1649

$$h(x,y(x))\left(y'(x)-\frac{y(x)}{x}\right)^a+y''(x)=0$$

✗ **Mathematica** : cpu = 2.16492 (sec), leaf count = 0

```
DSolve[h[x, y[x]]*(-(y[x]/x) + Derivative[1][y][x])^a + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[h[x, y[x]]*(-(y[x]/x) + Derivative[1][y][x])^a + Derivative[2][y][x] == 0, y[x],
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+(diff(y(x),x)-y(x)/x)^a*h(x,y(x))=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+(diff(y(x),x)-y(x)/x)^a*h(x,y(x))=0,y(x))
```

ODE No. 1650

$$y''(x) - a\sqrt{y'(x)^2 + 1} = 0$$

✓ **Mathematica** : cpu = 0.10916 (sec), leaf count = 30

```
DSolve[-(a*Sqrt[1 + Derivative[1][y][x]^2]) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\cosh(c_1)\cosh(ax)}{a} + \frac{\sinh(c_1)\sinh(ax)}{a} + c_2\right\}\right\}$$

✓ **Maple** : cpu = 2.038 (sec), leaf count = 16

```
dsolve(diff(diff(y(x),x),x)-a*(diff(y(x),x)^2+1)^(1/2)=0,y(x))
```

$$y(x) = \frac{\cosh\left(a(x + c_1)\right)}{a} + c_2$$

ODE No. 1651

$$a\left(-\sqrt{y'(x)^2+1}\right)-b+y''(x)=0$$

✓ **Mathematica** : cpu = 0.318829 (sec), leaf count = 414

```
DSolve[-b - a*Sqrt[1 + Derivative[1][y][x]^2] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to a\text{InverseFunction}\left[\frac{\frac{b\tan^{-1}\left(\frac{\#1_b}{\sqrt{\#1^2{}_{+1}\sqrt{a^2-b^2}}}\right)}{\sqrt{a^2-b^2}}-\frac{b\tan^{-1}\left(\frac{\#1_a}{\sqrt{a^2-b^2}}\right)}{\sqrt{a^2-b^2}}+\sinh^{-1}(\#1)}{a}\&\right][x+c_1]^2-b\sqrt{1+\text{Inver}}\right.\right.$$

$$a^2$$

✓ **Maple** : cpu = 1.779 (sec), leaf count = 31

```
dsolve(diff(diff(y(x),x),x)-a*(diff(y(x),x)^2+1)^(1/2)-b=0,y(x))
```

$$y(x)=\int \text{RootOf}\left(x-\left(\int^{\_Z}\frac{1}{a\sqrt{\_f^2+1}+b}d\_f\right)+c_1\right)dx+c_2$$

ODE No. 1652

$$y''(x) - a\sqrt{by(x)^2 + y'(x)^2} = 0$$

✓ **Mathematica** : cpu = 0.429875 (sec), leaf count = 76

```
DSolve[-(a*Sqrt[b*y[x]^2 + Derivative[1][y][x]^2]) + Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \frac{1}{\text{InverseFunction}\left[\int \frac{\#1}{K[1]\left(\frac{\#1^2}{K[1]^2} - a\sqrt{\frac{\#1^2}{K[1]^2} + b}\right)} d\frac{\#1}{K[1]}\&\right][c_1 - \log(K[1])]} dK[1] = x - c_2, y(x)\right]$$

✓ **Maple** : cpu = 1.95 (sec), leaf count = 36

```
dsolve(diff(diff(y(x),x),x)-a*(b*y(x)^2+diff(y(x),x)^2)^(1/2)=0,y(x))
```

$$y(x) = \mathrm{e}^{\int \text{RootOf}\left(x - \left(\int^{-Z} \frac{1}{-\_f^2 + a\sqrt{\_f^2 + b}} d\_f\right) + c_1\right) dx + c_2}$$

ODE No. 1653

$$y''(x) - a\left(y'(x)^2 + 1\right)^{3/2} = 0$$

✓ **Mathematica** : cpu = 0.154454 (sec), leaf count = 75

```
DSolve[-(a*(1 + Derivative[1][y][x]^2)^(3/2)) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 - \frac{i\sqrt{a^2x^2 + 2ac_1x - 1 + {c_1}^2}}{a}\right\}, \left\{y(x) \to \frac{i\sqrt{a^2x^2 + 2ac_1x - 1 + {c_1}^2}}{a} + c_2\right\}\right\}$$

✓ **Maple** : cpu = 1.751 (sec), leaf count = 41

```
dsolve(diff(diff(y(x),x),x)-a*(diff(y(x),x)^2+1)^(3/2)=0,y(x))
```

$$y(x) = \frac{\left(-1 + (x + c_1)^2 a^2\right)\sqrt{-\frac{1}{-1+(x+c_1)^2a^2}} + c_2 a}{a}$$

ODE No. 1654

$$y''(x) - 2ax\left(y'(x)^2 + 1\right)^{3/2} = 0$$

✓ **Mathematica** : cpu = 0.447012 (sec), leaf count = 308

```
DSolve[-2*a*x*(1 + Derivative[1][y][x]^2)^(3/2) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 - \frac{\sqrt{\frac{ax^2-1+c_1}{-1+c_1}}\sqrt{\frac{ax^2+1+c_1}{1+c_1}}\left(F\left(i\sinh^{-1}\left(x\sqrt{\frac{a}{c_1+1}}\right)|\frac{c_1+1}{c_1-1}\right) + (-1+c_1)E\left(i\sinh^{-1}\left(x\sqrt{\frac{a}{c_1+1}}\right)|\frac{c_1}{c_1}\right.\right.\right.}{\sqrt{\frac{a}{1+c_1}}\sqrt{a^2x^4 + 2ac_1x^2 - 1 + {c_1}^2}}\right\}\right\}$$

✓ **Maple** : cpu = 1.818 (sec), leaf count = 38

```
dsolve(diff(diff(y(x),x),x)-2*a*x*(diff(y(x),x)^2+1)^(3/2)=0,y(x))
```

$$y(x) = \int \sqrt{-\frac{1}{-1 + \left(x^2 + 2c_1\right)^2 a^2}}\, a\left(x^2 + 2c_1\right) dx + c_2$$

ODE No. 1655

$$y''(x) - ay(x)\left(y'(x)^2+1\right)^{3/2} = 0$$

✓ **Mathematica** : cpu = 0.779438 (sec), leaf count = 350

```
DSolve[-(a*y[x]*(1 + Derivative[1][y][x]^2)^(3/2)) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{\sqrt{\frac{\#1^2 a-2+2c_1}{-1+c_1}}\sqrt{\frac{\#1^2 a+2+2c_1}{1+c_1}}\left(F\left(i\sinh^{-1}\left(\sqrt{\frac{a}{2c_1+2}}\#1\right)|\frac{c_1+1}{c_1-1}\right)+(-1+c_1)E\right.\right.\right.$$
$$\left.\left.\left.\frac{}{\sqrt{\frac{a}{2+2c_1}}\sqrt{\#1^4 a^2+4\#1^2 a c_1-4+4{c_1}^2}}\right.\right.\right.$$

✓ **Maple** : cpu = 1.878 (sec), leaf count = 84

```
dsolve(diff(diff(y(x),x),x)-a*y(x)*(diff(y(x),x)^2+1)^(3/2)=0,y(x))
```

$$\int^{y(x)} \frac{(\_a^2+2c_1)\,a}{\sqrt{4-a^2\,(\_a^2+2c_1)^2}} d\_a - x - c_2 = 0$$

ODE No. 1656

$$y''(x) - a\left(y'(x)^2 + 1\right)^{3/2}(bx + c + y(x)) = 0$$

✓ **Mathematica** : cpu = 37.0914 (sec), leaf count = 9706

```
DSolve[-(a*(c + b*x + y[x])*(1 + Derivative[1][y][x]^2)^(3/2)) + Derivative[2][y][x] == 0,y[x
```

$$\left\{\text{Solve}\left[\int_1^x \left(\frac{1}{b^2+1} - \frac{b\sqrt{-a^2\left(c^2+2bK[1]c+2y(x)c+b^2K[1]^2+y(x)^2-2c_1+2bK[1]y(x)\right)^2\left(a^2c^4+4a\right.}}{\left(b^2+1\right)\left(a^2c^4+4a^2bK[1]c^3+4a^2y(x)c^3+6a^2b^2K\right.}\right.\right.$$

✓ **Maple** : cpu = 2.336 (sec), leaf count = 771

```
dsolve(diff(diff(y(x),x),x)-a*(c+b*x+y(x))*(diff(y(x),x)^2+1)^(3/2)=0,y(x))
```

$$y(x) = -bx + \text{RootOf}\left(-x + \int^{\_Z} \frac{4a^2b^2c^2\_f^2 + 4a^2b^2c\_f^3 + a^2b^2\_f^4 - 8c_1a^2b^2c\_f - 4c_1a^2b^2\_f^2 + 4c_1^2a^2b^2}{\right.$$

ODE No. 1657

$$y''(x) + y(x)^3 y'(x) - y(x)y'(x)\sqrt{4y'(x) + y(x)^4} = 0$$

✓ **Mathematica** : cpu = 0.351765 (sec), leaf count = 192

```
DSolve[y[x]^3*Derivative[1][y][x] - y[x]*Derivative[1][y][x]*Sqrt[y[x]^4 + 4*Derivative[1][y]
```

$$\left\{\left\{y(x) \to -\frac{i(\cosh(c_1)+\sinh(c_1))(\cos(2(x+c_2)(\cosh(3c_1)+\sinh(3c_1))) + i\sin(2(x+c_2)(\cosh(3c_1)+\sin}{\cos(2(x+c_2)(\cosh(3c_1)+\sinh(3c_1))) + i\sin(2(x+c_2)(\cosh(3c_1)+\sinh(3c_1))) +}\right.\right.$$

✓ **Maple** : cpu = 1.815 (sec), leaf count = 35

```
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/
```

$$y(x) = \frac{\tan\left(\frac{x+c_2}{(c_1^2)^{\frac{3}{2}}}\right)}{c_1}$$

ODE No. 1658

$$y''(x) - h(y'(x), ax + by(x)) = 0$$

✗ **Mathematica** : cpu = 0.181984 (sec), leaf count = 0

```
DSolve[-h[Derivative[1][y][x], a*x + b*y[x]] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-h[Derivative[1][y][x], a*x + b*y[x]] + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-h(diff(y(x),x),a*x+b*y(x))=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(-\frac{a\left(\int \_b(\_a)\, d\_a + c_1\right) - b\_a}{b} \right) \textbf{\textit{where}} \left[\left\{ \frac{d}{d\_a}\_\mathrm{b}(\_a) = -h\left(-\frac{a\_b(\_a) - b}{b\_b(\_a)}, b\_a \right) \_b(\_a)^3 \right\} \right.$$

ODE No. 1659

$$y''(x) - y(x)h\left(x, \frac{y'(x)}{y(x)}\right) = 0$$

✗ **Mathematica** : cpu = 5.42883 (sec), leaf count = 0

```
DSolve[-(h[x, Derivative[1][y][x]/y[x]]*y[x]) + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-(h[x, Derivative[1][y][x]/y[x]]*y[x]) + Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-y(x)*h(x,diff(y(x),x)/y(x))=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\mathrm{e}^{\int \_b(\_a)d\_a + c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\mathrm{b}(\_a) = -\_b(\_a)^2 + h(\_a, \_b(\_a))\right\}, \left\{\_a = x, \_b(\_a) = \frac{\frac{d}{dx}y}{y(}\right.\right.$$

ODE No. 1660

$$y''(x) - x^{n-2} h\left(x^{-n} y(x), x^{1-n} y'(x)\right) = 0$$

✗ **Mathematica** : cpu = 2.48613 (sec), leaf count = 0

```
DSolve[-(x^(-2 + n)*h[y[x]/x^n, x^(1 - n)*Derivative[1][y][x]]) + Derivative[2][y][x] == 0,y[
```

, could not solve

```
DSolve[-(x^(-2 + n)*h[y[x]/x^n, x^(1 - n)*Derivative[1][y][x]]) + Derivative[2][y][x] =
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-x^(n-2)*h(y(x)/(x^n),diff(y(x),x)/(x^(n-1)))=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a \, \mathrm{e}^{\left(\int \_b(\_a) d\_a + c_1\right) n}\right) \textbf{\textit{where}} \left[\left\{ \frac{d}{d\_a} \_\mathrm{b}(\_a) = \left(\_a n^2 - \_a n - h\left(\_a, \frac{\_b(\_a) \_a n + 1}{\_b(\_a)}\right)\right) \_b(\right.\right.$$

ODE No. 1661

$$8y''(x) + 9y'(x)^4 = 0$$

✓ **Mathematica** : cpu = 0.0775424 (sec), leaf count = 92

```
DSolve[9*Derivative[1][y][x]^4 + 8*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 - \frac{1}{3}\sqrt[3]{-\frac{1}{3}}(9x - 8c_1)^{2/3}\right\}, \left\{y(x) \to \frac{(9x - 8c_1)^{2/3}}{3\sqrt[3]{3}} + c_2\right\}, \left\{y(x) \to \frac{(-1)^{2/3}(9x - 8c_1)^{2/3}}{3\sqrt[3]{3}} + c\right.\right.$$

✓ **Maple** : cpu = 0.979 (sec), leaf count = 51

```
dsolve(8*diff(diff(y(x),x),x)+9*diff(y(x),x)^4=0,y(x))
```

$$y(x) = (x + c_1)^{\frac{2}{3}} + c_2$$

ODE No. 1662

$$ay''(x) + cy(x) + h(y'(x)) = 0$$

✗ **Mathematica** : cpu = 0.762194 (sec), leaf count = 0

```
DSolve[h[Derivative[1][y][x]] + c*y[x] + a*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[h[Derivative[1][y][x]] + c*y[x] + a*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(a*diff(diff(y(x),x),x)+h(diff(y(x),x))+c*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a \textbf{\textit{where}} \left[\left\{ \left(\frac{d}{d\_a} \_b(\_a) \right) \_b(\_a) + \frac{h(\_b(\_a)) + c\_a}{a} = 0 \right\}, \left\{ \_a = y(x), \_b(\_a) = \frac{d}{dx} y(x) \right\} \right]$$

ODE No. 1663

$$-xy(x)^n + xy''(x) + 2y'(x) = 0$$

✗ **Mathematica** : cpu = 0.0287274 (sec), leaf count = 0

```
DSolve[-(x*y[x]^n) + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-(x*y[x]^n) + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)-x*y(x)^n=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a\, \mathrm{e}^{\int \_b(\_a) d\_a + c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a) = \left(-\frac{n^2 \_a^n}{4} + \frac{n \_a^n}{2} - \frac{\_an}{2} - \frac{\_a^n}{4} + \frac{3\_a}{2}\right) \_b(\_a)\right.\right.$$

ODE No. 1664

$$ax^m y(x)^n + xy''(x) + 2y'(x) = 0$$

✗ **Mathematica** : cpu = 0.178765 (sec), leaf count = 0

```
DSolve[a*x^m*y[x]^n + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

, 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 = 0. (sec), leaf count = 0

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+a*x^m*y(x)^n=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a\, \mathrm{e}^{\int \_b(\_a) d\_a + c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a) = \frac{(\_a^n a\, n^2 - 2\_a^n an + \_a\, m^2 - \_amn + \_a^n a + 3\_}{(m+1)^2}\right.\right.$$

ODE No. 1665

$$x y''(x) + 2y'(x) + x e^{y(x)} = 0$$

✗ **Mathematica** : cpu = 0.106819 (sec), leaf count = 0

```
DSolve[E^y[x]*x + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[E^y[x]*x + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+x*exp(y(x))=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a - 2\left(\int \_b(\_a)\, d\_a \right) - 2c_1 \right) \textbf{\textit{where}} \left[\left\{ \frac{d}{d\_a} \_b(\_a) = (e^{-\_a} - 2)\, \_b(\_a)^3 + \_b(\_a)^2 \right\}, \left\{ \_a \right.$$

ODE No. 1666

$$ay'(x) + bxe^{y(x)} + xy''(x) = 0$$

✗ **Mathematica** : cpu = 0.260383 (sec), leaf count = 0

```
DSolve[b*E^y[x]*x + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

, 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. (sec), leaf count = 0

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x)+b*x*exp(y(x))=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(_a - 2\left(\int _b(_a)\, d_a\right) - 2c_1\right) \textbf{\textit{where}} \left[\left\{ \frac{d}{d_a}_\mathrm{b}(_a) = (b\,\mathrm{e}^{-a} - 2a + 2)\,_b(_a)^3 + (a-1)\,_b

ODE No. 1667

$$bx^{5-2a}e^{y(x)} + ay'(x) + xy''(x) = 0$$

✗ **Mathematica** : cpu = 0.319961 (sec), leaf count = 0

```
DSolve[b*E^y[x]*x^(5 - 2*a) + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[b*E^y[x]*x^(5 - 2*a) + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x],
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x)+b*x^(5-2*a)*exp(y(x))=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(_a + 2a\left(\int _b(_a)\, d_a + c_1\right) - 6\left(\int _b(_a)\, d_a\right) - 6c_1\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d_a}_\mathrm{b}(_a) = (b\,\mathrm{e}^{-a} +

ODE No. 1668

$$xy''(x) + (y(x) - 1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0552813 (sec), leaf count = 60

```
DSolve[(-1 + y[x])*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to 2 + \sqrt{2}\sqrt{2 + c_1} \tanh\left(\frac{1}{2}\left(\sqrt{2}\sqrt{2 + c_1}\log(x) - 2\sqrt{2}\sqrt{2 + c_1}c_2\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.934 (sec), leaf count = 24

```
dsolve(x*diff(diff(y(x),x),x)-(1-y(x))*diff(y(x),x)=0,y(x))
```

$$y(x) = \frac{2c_1 + \tanh\left(\frac{\ln(x) - c_2}{2c_1}\right)}{c_1}$$

ODE No. 1669

$$-x^2y'(x)^2+xy''(x)+2y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.442446 (sec), leaf count = 160

```
DSolve[y[x]^2 + 2*Derivative[1][y][x] - x^2*Derivative[1][y][x]^2 + x*Derivative[2][y][x] ==
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{x}{e^{xK[1]}c_1+2xK[1]+1}dK[1]-\int_1^x\left(\int_1^{y(x)}\left(\frac{\left(e^{K[1]K[2]}c_1K[1]+2K[1]\right)K[2]}{\left(e^{K[1]K[2]}c_1+2K[1]K[2]+1\right)^2}-\frac{1}{e^{K[1]K[2]}c_1+2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.899 (sec), leaf count = 32

```
dsolve(x*diff(diff(y(x),x),x)-x^2*diff(y(x),x)^2+2*diff(y(x),x)+y(x)^2=0,y(x))
```

$$y(x)=\frac{\text{RootOf}\left(-\ln(x)+c_2+\int^{-Z}-\frac{1}{e^{\_f}c_1-2\_f-1}d\_f\right)}{x}$$

ODE No. 1670

$$a(xy'(x)-y(x))^2-b+xy''(x)=0$$

✓ **Mathematica** : cpu = 6.76141 (sec), leaf count = 51

```
DSolve[-b + a*(-y[x] + x*Derivative[1][y][x])^2 + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to x\left(\int_1^x \frac{\sqrt{-\frac{b}{a}}\tan\left(c_1-a\sqrt{-\frac{b}{a}}K[2]\right)}{K[2]^2}dK[2]+c_2\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.332 (sec), leaf count = 35

```
dsolve(x*diff(diff(y(x),x),x)+a*(x*diff(y(x),x)-y(x))^2-b=0,y(x))
```

$$y(x)=\left(\int \frac{i\tan\left(-i\sqrt{a}\,\sqrt{b}\,x+c_1\right)\sqrt{b}}{\sqrt{a}\,x^2}dx+c_2\right)x$$

ODE No. 1671

$$2xy''(x) + y'(x)^3 + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.109059 (sec), leaf count = 59

```
DSolve[Derivative[1][y][x] + Derivative[1][y][x]^3 + 2*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 - 2ie^{c_1}\sqrt{-x + e^{2c_1}}\right\}, \left\{y(x) \to 2ie^{c_1}\sqrt{-x + e^{2c_1}} + c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.895 (sec), leaf count = 35

```
dsolve(2*x*diff(diff(y(x),x),x)+diff(y(x),x)^3+diff(y(x),x)=0,y(x))
```

$$y(x) = \frac{2\sqrt{c_1 x - 1}}{c_1} + c_2$$

ODE No. 1672

$$x^2 y''(x) - a(y(x)^n - y(x)) = 0$$

✗ **Mathematica** : cpu = 9.74427 (sec), leaf count = 0

```
DSolve[-(a*(-y[x] + y[x]^n)) + x^2*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-(a*(-y[x] + y[x]^n)) + x^2*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^2*diff(diff(y(x),x),x)-a*(y(x)^n-y(x))=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a \textbf{\textit{where}} \left[\left\{ \frac{d}{d\_a} \_b(\_a) = (-\_a^n a + a \_a) \_b(\_a)^3 - \_b(\_a)^2 \right\}, \left\{ \_a = y(x), \_b(\_a) = \frac{1}{x \left(\frac{d}{dx} \right.} \right.$$

ODE No. 1673

$$a\left(e^{y(x)}-1\right)+x^2y''(x)=0$$

✗ **Mathematica** : cpu = 22.8509 (sec), leaf count = 0

```
DSolve[a*(-1 + E^y[x]) + x^2*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[a*(-1 + E^y[x]) + x^2*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^2*diff(diff(y(x),x),x)+a*(exp(y(x))-1)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=\_a \textbf{\textit{where}}\left[\left\{\frac{d}{d\_a}\_b(\_a)=(a\,\mathrm{e}^{-a}-a)\,\_b(\_a)^3-\_b(\_a)^2\right\},\left\{\_a=y(x),\_b(\_a)=\frac{1}{x\left(\frac{d}{dx}y(x)\right)}\right.\right.$$

ODE No. 1674

$$y(x)\left(a(a+b)+b^2c^2x^{2b}\right)-x(2a+b-1)y'(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0426711 (sec), leaf count = 106

```
DSolve[(a*(a + b) + b^2*c^2*x^(2*b))*y[x] - (-1 + 2*a + b)*x*Derivative[1][y][x] + x^2*Deriva
```

$$\left\{\left\{y(x)\to c_1 2^{-\frac{a}{b}} c^{a/b}\left(x^{2b}\right)^{\frac{a}{2b}}\cos\left(c\sqrt{x^{2b}}\right)+c_2 2^{-\frac{a+b}{b}} c^{\frac{a+b}{b}-1}\left(x^{2b}\right)^{\frac{a+b}{2b}-\frac{1}{2}}\sin\left(c\sqrt{x^{2b}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.077 (sec), leaf count = 25

```
dsolve(x^2*diff(diff(y(x),x),x)-(2*a+b-1)*x*diff(y(x),x)+(c^2*b^2*x^(2*b)+a*(a+b))*y(x)=0,y(x
```

$$y(x)=x^a\left(\cos\left(c\,x^b\right)c_2+\sin\left(c\,x^b\right)c_1\right)$$

ODE No. 1675

$$x^k\left(-h\left(x^k y(x), k y(x)+x y'(x)\right)\right)+(a+1) x y'(x)+x^2 y''(x)=0$$

✗ **Mathematica** : cpu = 1.8589 (sec), leaf count = 0

```
DSolve[-(x^k*h[x^k*y[x], k*y[x] + x*Derivative[1][y][x]]) + (1 + a)*x*Derivative[1][y][x] + x
```

, could not solve

```
DSolve[-(x^k*h[x^k*y[x], k*y[x] + x*Derivative[1][y][x]]) + (1 + a)*x*Derivative[1][y][
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^2*diff(diff(y(x),x),x)+(a+1)*x*diff(y(x),x)-x^k*h(x^k*y(x),x*diff(y(x),x)+k*y(x))=0,
```

, could not solve

```
dsolve(x^2*diff(diff(y(x),x),x)+(a+1)*x*diff(y(x),x)-x^k*h(x^k*y(x),x*diff(y(x),x)+k*y(
```

ODE No. 1676

$$a(xy'(x)-y(x))^2-bx^2+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.315033 (sec), leaf count = 134

```
DSolve[-(b*x^2) + a*(-y[x] + x*Derivative[1][y][x])^2 + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to x\left(\int_1^x \frac{i\sqrt{a}\sqrt{b}Y_1\left(-i\sqrt{a}\sqrt{b}K[2]\right)-i\sqrt{a}\sqrt{b}J_1\left(i\sqrt{a}\sqrt{b}K[2]\right)c_1}{a\left(Y_0\left(-i\sqrt{a}\sqrt{b}K[2]\right)+J_0\left(i\sqrt{a}\sqrt{b}K[2]\right)c_1\right)K[2]}dK[2]+c_2\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.085 (sec), leaf count = 72

```
dsolve(x^2*diff(diff(y(x),x),x)+a*(x*diff(y(x),x)-y(x))^2-b*x^2=0,y(x))
```

$$y(x)=\left(\int -\frac{\sqrt{-ab}\left(c_1\,\mathrm{BesselY}\left(1,\sqrt{-ab}\,x\right)+\mathrm{BesselJ}\left(1,\sqrt{-ab}\,x\right)\right)}{ax\left(c_1\,\mathrm{BesselY}\left(0,\sqrt{-ab}\,x\right)+\mathrm{BesselJ}\left(0,\sqrt{-ab}\,x\right)\right)}dx+c_2\right)x$$

ODE No. 1677

$$ay(x)y'(x)^2 + bx + x^2y''(x) = 0$$

✗ **Mathematica** : cpu = 31.0361 (sec), leaf count = 0

```
DSolve[b*x + a*y[x]*Derivative[1][y][x]^2 + x^2*Derivative[2][y][x] == 0,y[x],x]
```

, 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 = 0. (sec), leaf count = 0

```
dsolve(x^2*diff(diff(y(x),x),x)+a*y(x)*diff(y(x),x)^2+b*x=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a\, \mathrm{e}^{\int \_b(\_a) d\_a + c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a) = \left(a\_a^3 + b\right)\_b(\_a)^3 + \left(2\_a^2 a + 1\right)\_b(\_a)^2 + \_a\_\right.\right.$$

ODE No. 1678

$$x^2 y''(x) - \sqrt{a x^2 y'(x)^2 + b y(x)^2} = 0$$

✗ **Mathematica** : cpu = 0.800732 (sec), leaf count = 0

```
DSolve[-Sqrt[b*y[x]^2 + a*x^2*Derivative[1][y][x]^2] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-Sqrt[b*y[x]^2 + a*x^2*Derivative[1][y][x]^2] + x^2*Derivative[2][y][x] == 0, y[
```

✓ **Maple** : cpu = 1.86 (sec), leaf count = 60

```
dsolve(x^2*diff(diff(y(x),x),x)-(a*x^2*diff(y(x),x)^2+b*y(x)^2)^(1/2)=0,y(x))
```

$$y(x) - \mathrm{e}^{\int^{\ln(x)} \mathrm{RootOf}\left(\int^{\_Z} -\frac{y(x)}{\_a^2 y(x) - \_a y(x) - \sqrt{y(x)^2\left(\_a^2 a + b\right)}}\, d\_a - \_b + c_1\right) d\_b + c_2} = 0$$

ODE No. 1679

$$\left(x^2+1\right) y''(x)+y'(x)^2+1=0$$

✓ **Mathematica** : cpu = 0.168383 (sec), leaf count = 33

```
DSolve[1 + Derivative[1][y][x]^2 + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -x\cot(c_1)+\csc^2(c_1)\log(-x\sin(c_1)-\cos(c_1))+c_2\right\}\right\}$$

✓ **Maple** : cpu = 1.01 (sec), leaf count = 27

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+diff(y(x),x)^2+1=0,y(x))
```

$$y(x)=\frac{x}{c_1}+\ln\left(c_1x-1\right)+\frac{\ln\left(c_1x-1\right)}{c_1^2}+c_2$$

ODE No. 1680

$$x^4\left(-y'(x)^2\right)+4x^2y''(x)+4y(x)=0$$

✗ **Mathematica** : cpu = 6.05655 (sec), leaf count = 0

```
DSolve[4*y[x] - x^4*Derivative[1][y][x]^2 + 4*x^2*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[4*y[x] - x^4*Derivative[1][y][x]^2 + 4*x^2*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(4*x^2*diff(diff(y(x),x),x)-x^4*diff(y(x),x)^2+4*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=\left(\_a\,\mathrm{e}^{\int -2\_b(\_a)d\_a-2c_1}\right)\textbf{\textit{where}}\left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a)=\left(-\_a^2+7\_a\right)\_b(\_a)^3+(\_a-5)\_b(\_a)^2-=\right.\right.$$

ODE No. 1681

$$ay(x)^3 + 9x^2y''(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 2.25154 (sec), leaf count = 41

```
DSolve[2*y[x] + a*y[x]^3 + 9*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 \sqrt[3]{x} \text{sn}\left(\left(c_1 + \frac{\sqrt{ax^{20/3}}}{\sqrt{2}x^3}\right) c_2 \middle| -1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.858 (sec), leaf count = 31

```
dsolve(9*x^2*diff(diff(y(x),x),x)+a*y(x)^3+2*y(x)=0,y(x))
```

$$y(x) = c_2 \text{sn}\left(\left(\frac{\sqrt{2}\sqrt{x^{\frac{20}{3}}a}}{2x^3} + c_1\right) c_2 | i\right) x^{\frac{1}{3}}$$

ODE No. 1682

$$x^3\left(y''(x)+y(x)y'(x)-y(x)^3\right)+12xy(x)+24=0$$

✓ **Mathematica** : cpu = 21.7398 (sec), leaf count = 41

```
DSolve[24 + 12*x*y[x] + x^3*(-y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x]) == 0,y
```

$$\left\{\left\{y(x)\to \frac{2+x^3\wp'(x+c_1;0,c_2)}{x\left(-1+x^2\wp(x+c_1;0,c_2)\right)}\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
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))
```

, result contains DESol or ODESolStruc

$$y(x)=\left(\_a\,\mathrm{e}^{\int \_b(\_a)d\_a+c_1}\right)\textbf{\textit{ where}}\left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a)=\left(-\_a^3-\_a^2+14\_a+24\right)\_b(\_a)^3+(-\_a+3)\_\right.\right.$$

ODE No. 1683

$$x^3 y''(x) - a(xy'(x) - y(x))^2 = 0$$

✓ **Mathematica** : cpu = 0.0686158 (sec), leaf count = 26

```
DSolve[-(a*(-y[x] + x*Derivative[1][y][x])^2) + x^3*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{x \log\left(a\left(-\frac{c_1}{x} - c_2\right)\right)}{a}\right\}\right\}$$

✓ **Maple** : cpu = 0.885 (sec), leaf count = 23

```
dsolve(x^3*diff(diff(y(x),x),x)-a*(x*diff(y(x),x)-y(x))^2=0,y(x))
```

$$y(x) = -\frac{\ln\left(\frac{a(c_1 x - c_2)}{x}\right) x}{a}$$

ODE No. 1684

$$xy(x)\left(a-2x^2y(x)^2+3xy(x)\right)+b+2x^3y''(x)+x^2(2xy(x)+9)y'(x)=0$$

✗ **Mathematica** : cpu = 45.0503 (sec), leaf count = 0

```
DSolve[b + x*y[x]*(a + 3*x*y[x] - 2*x^2*y[x]^2) + x^2*(9 + 2*x*y[x])*Derivative[1][y][x] + 2*
```

, could not solve

```
DSolve[b + x*y[x]*(a + 3*x*y[x] - 2*x^2*y[x]^2) + x^2*(9 + 2*x*y[x])*Derivative[1][y][x
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*x^3*diff(diff(y(x),x),x)+x^2*(9+2*x*y(x))*diff(y(x),x)+b+x*y(x)*(a+3*x*y(x)-2*x^2*y(
```

, result contains DESol or ODESolStruc

$$y(x)=\left(\_a\,\mathrm{e}^{\int -b(\_a)d\_a+c_1}\right)\textbf{\textit{where}}\left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a)=\left(-\_a^3+\frac{1}{2}\_a^2+\frac{1}{2}a\_a-\frac{5}{2}\_a+\frac{1}{2}b\right)\_b(\_a)^3+\left(\right.\right.\right.$$

ODE No. 1685

$$axy(x)+b-\left(kx^{k-1}-12x^2\right)\left(3y'(x)+y(x)^2\right)+2\left(4x^3-x^k\right)\left(y''(x)+y(x)y'(x)-y(x)^3\right)=0$$

✗ **Mathematica** : cpu = 2.30031 (sec), leaf count = 0

```
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 -
```

, 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*
y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x]) == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
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*d
```

, 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),x)+y(x)^2)+a*x*y(x)+b=0,y(x))
```

ODE No. 1686

$$a^2 y(x)^n + x^4 y''(x) = 0$$

✗ **Mathematica** : cpu = 0.0309196 (sec), leaf count = 0

```
DSolve[a^2*y[x]^n + x^4*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[a^2*y[x]^n + x^4*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^4*diff(diff(y(x),x),x)+a^2*y(x)^n=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a\, \mathrm{e}^{\int -\_b(\_a) d\_a + c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a) = \left(\frac{a^2 n^2 \_a^n}{4} - \frac{a^2 n \_a^n}{2} + \frac{a^2 \_a^n}{4} - \frac{\_an}{2} + \frac{3\_a}{2}\right) \_b\right.\right.$$

ODE No. 1687

$$x^4 y''(x) - x\left(x^2 + 2y(x)\right) y'(x) + 4y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0715044 (sec), leaf count = 262

```
DSolve[4*y[x]^2 - x*(x^2 + 2*y[x])*Derivative[1][y][x] + x^4*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{x^3\left(i\left(\frac{i}{\sqrt{c_1}} - \frac{\sqrt{-1-c_1}}{\sqrt{c_1}}\right)\sqrt{c_1}c_2 x^{-1+i\left(\frac{i}{\sqrt{c_1}} - \frac{\sqrt{-1-c_1}}{\sqrt{c_1}}\right)\sqrt{c_1}} + i\left(\frac{\sqrt{-1-c_1}}{\sqrt{c_1}} + \frac{i}{\sqrt{c_1}}\right)\sqrt{c_1} x^{-1+i\left(\frac{\sqrt{-1-c_1}}{\sqrt{c_1}} + \frac{i}{\sqrt{c_1}}\right)}\right.}{c_2 x^{i\left(\frac{i}{\sqrt{c_1}} - \frac{\sqrt{-1-c_1}}{\sqrt{c_1}}\right)\sqrt{c_1}} + x^{i\left(\frac{\sqrt{-1-c_1}}{\sqrt{c_1}} + \frac{i}{\sqrt{c_1}}\right)\sqrt{c_1}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.906 (sec), leaf count = 21

```
dsolve(x^4*diff(diff(y(x),x),x)-x*(x^2+2*y(x))*diff(y(x),x)+4*y(x)^2=0,y(x))
```

$$y(x) = x^2(\tanh\left(c_1(c_2 - \ln\left(x\right))\right)c_1 + 1)$$

ODE No. 1688

$$x^4 y''(x) - x^2 y'(x)\left(y'(x) + x\right) + 4y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.516153 (sec), leaf count = 189

```
DSolve[4*y[x]^2 - x^2*Derivative[1][y][x]*(x + Derivative[1][y][x]) + x^4*Derivative[2][y][x]
```

$$\text{Solve}\left[\int_1^{y(x)} \frac{1}{-e^{\frac{K[1]}{x^2}} c_1 x^2 + 2x^2 + 4K[1]}\, dK[1] - \int_1^{x} \left(\frac{K[2]\left(e^{\frac{y(x)}{K[2]^2}} c_1 + 2\left(-\frac{y(x)}{K[2]^2} - 1\right)\right)}{-e^{\frac{y(x)}{K[2]^2}} c_1 K[2]^2 + 2K[2]^2 + 4y(x)} + \int_1^{y(x)} -\frac{\frac{2e^{\frac{K[1]}{K[2]^2}} c}{K[2]}}{\left(-e^{\frac{K[1]}{K[2]}}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.926 (sec), leaf count = 32

```
dsolve(x^4*diff(diff(y(x),x),x)-x^2*(x+diff(y(x),x))*diff(y(x),x)+4*y(x)^2=0,y(x))
```

$$y(x) = \text{RootOf}\left(-\ln(x) + c_2 - \left(\int^{-Z} \frac{1}{\mathrm{e}^{-f} c_1 + 4\_f + 2}\, d\_f\right)\right) x^2$$

ODE No. 1689

$$x^4 y''(x) + (xy'(x) - y(x))^3 = 0$$

✓ **Mathematica** : cpu = 0.269586 (sec), leaf count = 104

```
DSolve[(-y[x] + x*Derivative[1][y][x])^3 + x^4*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -ix \log\left(\frac{\frac{e^{c_2}}{x} - \frac{\sqrt{e^{2c_2} - 8ic_1x^2}}{x}}{4c_1}\right)\right\}, \left\{y(x) \to -ix \log\left(\frac{\frac{\sqrt{e^{2c_2} - 8ic_1x^2}}{x} + \frac{e^{c_2}}{x}}{4c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.949 (sec), leaf count = 37

```
dsolve(x^4*diff(diff(y(x),x),x)+(x*diff(y(x),x)-y(x))^3=0,y(x))
```

$$y(x) = \left(-\arctan\left(\frac{1}{\sqrt{c_1x^2 - 1}}\right) + c_2\right)x$$

ODE No. 1690

$$\sqrt{x}y''(x) - y(x)^{3/2} = 0$$

✗ **Mathematica** : cpu = 21.4743 (sec), leaf count = 0

```
DSolve[-y[x]^(3/2) + Sqrt[x]*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-y[x]^(3/2) + Sqrt[x]*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*x^(1/2)-y(x)^(3/2)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a\, \mathrm{e}^{\int -3\_b(\_a) d\_a - 3c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\mathrm{b}(\_a) = \left(-\_a^{\frac{3}{2}} + 12\_a\right)\_b(\_a)^3 - 7\_b(\_a)^2\right\}, \left\{\_a =\right.\right.$$

ODE No. 1691

$$y''(x)\left(ax^2+bx+c\right)^{3/2}-f\left(\frac{y(x)}{\sqrt{ax^2+bx+c}}\right)=0$$

✓ **Mathematica** : cpu = 60.8995 (sec), leaf count = 251

```
DSolve[-f[y[x]/Sqrt[c + b*x + a*x^2]] + (c + b*x + a*x^2)^(3/2)*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\text{Solve}\left[2a\tan^{-1}\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)+2\sqrt{4ac-b^2}\int_1^{\frac{y(x)}{\sqrt{c+x(b+ax)}}}\frac{a}{\sqrt{4c_1a^2+\left(b^2-4ac\right)K[2]^2+8\int_1^{K[2]}f(K[1])dK}}\right.\right.$$

✓ **Maple** : cpu = 0.804 (sec), leaf count = 254

```
dsolve((a*x^2+b*x+c)^(3/2)*diff(diff(y(x),x),x)-F(y(x)/(a*x^2+b*x+c)^(1/2))=0,y(x))
```

$$y(x)=\text{RootOf}\left(4\_Zac-\_Zb^2-4F\left(\frac{\_Z}{\sqrt{a\,x^2+bx+c}}\right)\sqrt{a\,x^2+bx+c}\right)$$

ODE No. 1692

$$x^{\frac{n}{n+1}} y''(x) - y(x)^{\frac{2n+1}{n+1}} = 0$$

✗ **Mathematica** : cpu = 0.0639184 (sec), leaf count = 0

```
DSolve[-y[x]^((1 + 2*n)/(1 + n)) + x^(n/(1 + n))*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-y[x]^((1 + 2*n)/(1 + n)) + x^(n/(1 + n))*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^(n/(n+1))*diff(diff(y(x),x),x)-y(x)^((2*n+1)/(n+1))=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a \, \mathrm{e}^{-\frac{(\int \_b(\_a) d\_a + c_1)(n+2)}{n}} \right) \textbf{\textit{where}} \left[\left\{ \frac{d}{d\_a} \_\mathrm{b}(\_a) = -\frac{\left(\_a^{\frac{2n+1}{n+1}} n^2 - 2\_a n^2 - 6\_a n - 4\_a \right) \_b(\_$$

ODE No. 1693

$$-h(y(x), f(x)y'(x)) + f(x)f'(x)y'(x) + f(x)^2 y''(x) = 0$$

✗ **Mathematica** : cpu = 0.720399 (sec), leaf count = 0

```
DSolve[-h[y[x], f[x]*Derivative[1][y][x]] + f[x]*Derivative[1][f][x]*Derivative[1][y][x] + f[
```

, could not solve

```
DSolve[-h[y[x], f[x]*Derivative[1][y][x]] + f[x]*Derivative[1][f][x]*Derivative[1][y][x
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(f(x)^2*diff(diff(y(x),x),x)+f(x)*diff(f(x),x)*diff(y(x),x)-h(y(x),f(x)*diff(y(x),x))=0
```

, result contains DESol or ODESolStruc

$$y(x) = \_a \textbf{\textit{where}} \left[\left\{ \frac{d}{d\_a} \_b(\_a) = -h\left(\_a, \frac{1}{\_b(\_a)}\right) \_b(\_a)^3 \right\}, \left\{ \_a = y(x), \_b(\_a) = \frac{1}{f(x)\left(\frac{d}{dx} y(x)\right.} \right.\right.$$

ODE No. 1694

$$y(x)y''(x) - a = 0$$

✓ **Mathematica** : cpu = 0.11843 (sec), leaf count = 115

```
DSolve[-a + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \exp\left(\frac{-2a\text{erf}^{-1}\left(-i\sqrt{\frac{2}{\pi}}\sqrt{ae^{\frac{c_1}{a}}(x+c_2)^2}\right)^2 - c_1}{2a}\right)\right\}, \left\{y(x) \to \exp\left(\frac{-2a\text{erf}^{-1}\left(i\sqrt{\frac{2}{\pi}}\sqrt{ae^{\frac{c_1}{a}}(x\right.\right.\right.$$

✓ **Maple** : cpu = 0.963 (sec), leaf count = 54

```
dsolve(diff(diff(y(x),x),x)*y(x)-a=0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{2\ln(\_a)\,a - 2c_1 a}} d\_a - x - c_2 = 0$$

ODE No. 1695

$$y(x)y''(x) - ax = 0$$

✗ **Mathematica** : cpu = 15.2584 (sec), leaf count = 0

```
DSolve[-(a*x) + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-(a*x) + y[x]*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-a*x=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a\left(\mathrm{e}^{\int \_b(\_a)d\_a+c_1}\right)^{\frac{3}{2}}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a) = \frac{(3\_a^2 - 4a)\,\_b(\_a)^3}{4\_a} + 2\_b(\_a)^2\right\}, \left\{\_a = \frac{y(}{x}\right.\right.$$

ODE No. 1696

$$y(x)y''(x) - ax^2 = 0$$

✗ **Mathematica** : cpu = 14.0384 (sec), leaf count = 0

```
DSolve[-(a*x^2) + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-(a*x^2) + y[x]*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-a*x^2=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a\, \mathrm{e}^{\int 2\_b(\_a)d\_a+2c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\mathrm{b}(\_a) = \frac{(2\_a^2 - a)\,\_b(\_a)^3}{\_a} + 3\_b(\_a)^2\right\}, \left\{\_a = \frac{y(x)}{x^2},\right.\right.$$

ODE No. 1697

$$-a + y(x)y''(x) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.182406 (sec), leaf count = 94

```
DSolve[-a + Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{a^2x^2 + 2a^2c_2x + a^2c_2{}^2 - e^{2c_1}}}{\sqrt{a}}\right\}, \left\{y(x) \to \frac{\sqrt{a^2x^2 + 2a^2c_2x + a^2c_2{}^2 - e^{2c_1}}}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.894 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x)*y(x)+diff(y(x),x)^2-a=0,y(x))
```

$$y(x) = \sqrt{a\,x^2 - 2c_1x + 2c_2}$$

ODE No. 1698

$$-ax - b + y(x)y''(x) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0317402 (sec), leaf count = 72

```
DSolve[-b - a*x + Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{ax^3 + 3bx^2 + 3c_2x + 6c_1}}{\sqrt{3}}\right\}, \left\{y(x) \to \frac{\sqrt{ax^3 + 3bx^2 + 3c_2x + 6c_1}}{\sqrt{3}}\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)+y(x)^2-a*x-b=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)*y(x)+y(x)^2-a*x-b=0,y(x))
```

ODE No. 1699

$$y(x)y''(x) + y'(x)^2 - y'(x) = 0$$

✓ **Mathematica** : cpu = 0.130471 (sec), leaf count = 40

```
DSolve[-Derivative[1][y][x] + Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1\left(-W\left(-\frac{e^{-\frac{x}{c_1}-1-\frac{c_2}{c_1}}}{c_1}\right)\right) - c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.987 (sec), leaf count = 33

```
dsolve(diff(diff(y(x),x),x)*y(x)+diff(y(x),x)^2-diff(y(x),x)=0,y(x))
```

$$y(x) = -c_1\left(\text{LambertW}\left(-\frac{\mathrm{e}^{-1}\mathrm{e}^{-\frac{c_2}{c_1}}\mathrm{e}^{-\frac{x}{c_1}}}{c_1}\right) + 1\right)$$

ODE No. 1700

$$y(x)y''(x) - y'(x)^2 + 1 = 0$$

✓ **Mathematica** : cpu = 0.176879 (sec), leaf count = 44

```
DSolve[1 - Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -e^{-c_1} \sinh\left(e^{c_1}(x + c_2)\right)\right\}, \left\{y(x) \to e^{-c_1} \sinh\left(e^{c_1}(x + c_2)\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.13 (sec), leaf count = 86

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+1=0,y(x))
```

$$y(x) = \frac{\left(-c_1 \mathrm{e}^{\frac{2x}{c_1}} \mathrm{e}^{\frac{2c_2}{c_1}} + c_1\right) \mathrm{e}^{-\frac{c_2}{c_1}} \mathrm{e}^{-\frac{x}{c_1}}}{2}$$

ODE No. 1701

$$y(x)y''(x) - y'(x)^2 - 1 = 0$$

✓ **Mathematica** : cpu = 0.202521 (sec), leaf count = 80

```
DSolve[-1 - Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{e^{-c_1}\tanh\left(e^{c_1}(x+c_2)\right)}{\sqrt{-1+\tanh^2\left(e^{c_1}(x+c_2)\right)}}\right\}, \left\{y(x) \to \frac{e^{-c_1}\tanh\left(e^{c_1}(x+c_2)\right)}{\sqrt{-1+\tanh^2\left(e^{c_1}(x+c_2)\right)}}\right\}\right\}$$

✓ **Maple** : cpu = 1.08 (sec), leaf count = 42

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-1=0,y(x))
```

$$y(x) = \frac{c_1\left(\mathrm{e}^{\frac{2c_2}{c_1}}\mathrm{e}^{\frac{2x}{c_1}}+1\right)\mathrm{e}^{-\frac{c_2}{c_1}}\mathrm{e}^{-\frac{x}{c_1}}}{2}$$

ODE No. 1702

$$e^{2x}\left(ay(x)^4+b\right)+e^x y(x)\left(cy(x)^2+d\right)+y(x)y''(x)-y'(x)^2=0$$

✗ **Mathematica** : cpu = 1.14947 (sec), leaf count = 0

```
DSolve[E^x*y[x]*(d + c*y[x]^2) + E^(2*x)*(b + a*y[x]^4) - Derivative[1][y][x]^2 + y[x]*Deriva
```

, could not solve

```
DSolve[E^x*y[x]*(d + c*y[x]^2) + E^(2*x)*(b + a*y[x]^4) - Derivative[1][y][x]^2 + y[x]*
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+exp(x)*y(x)*(c*y(x)^2+d)+exp(2*x)*(b+a*y(x)^4
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+exp(x)*y(x)*(c*y(x)^2+d)+exp(2*x)*(b+a*
```

ODE No. 1703

$$y(x)y''(x) - y'(x)^2 + y(x)^2(-\log(y(x))) = 0$$

✓ **Mathematica** : cpu = 0.351419 (sec), leaf count = 77

```
DSolve[-(Log[y[x]]*y[x]^2) - Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \exp\left(-\frac{1}{2}\sqrt{c_1}e^{-x-c_2}\left(-1+e^{2x+2c_2}\right)\right)\right\}, \left\{y(x) \to \exp\left(\frac{1}{2}\sqrt{c_1}e^{-x-c_2}\left(-1+e^{2x+2c_2}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.139 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-y(x)^2*ln(y(x))=0,y(x))
```

$$y(x) = \mathrm{e}^{\frac{\mathrm{e}^{-2x}c_1\mathrm{e}^{x}}{2}}\mathrm{e}^{-\frac{c_2\mathrm{e}^{x}}{2}}$$

ODE No. 1704

$$y(x)^2 \left(\frac{f''(x)}{f(x)} - \frac{f'(x)^2}{f(x)^2} \right) + f(x)y(x)^3 + y(x)y''(x) - y'(x)^2 - y'(x) = 0$$

✗ **Mathematica** : cpu = 9.01233 (sec), leaf count = 0

```
DSolve[f[x]*y[x]^3 - Derivative[1][y][x] - Derivative[1][y][x]^2 + y[x]^2*(-(Derivative[1][f]
```

, could not solve

```
DSolve[f[x]*y[x]^3 - Derivative[1][y][x] - Derivative[1][y][x]^2 + y[x]^2*(-
(Derivative[1][f][x]^2/f[x]^2) + Derivative[2][f][x]/f[x]) + y[x]*Derivative[2][y][x] =
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-diff(y(x),x)+f(x)*y(x)^3+y(x)^2*(diff(diff(f(
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-diff(y(x),x)+f(x)*y(x)^3+y(x)^2*(diff(d
diff(f(x),x)^2/f(x)^2)=0,y(x))
```

ODE No. 1705

$$-y(x)f'(x)+f(x)y'(x)+y(x)y''(x)-y'(x)^2-y(x)^3=0$$

✓ **Mathematica** : cpu = 0.279539 (sec), leaf count = 252

```
DSolve[-y[x]^3 - y[x]*Derivative[1][f][x] + f[x]*Derivative[1][y][x] - Derivative[1][y][x]^2
```

$$\left\{\left\{y(x)\to -\frac{\exp\left(c_2-\int_1^x \frac{y(K[3])^3+{c_1}^2 y(K[3])^2+\int_1^{K[3]} \frac{-y(K[1])^3-f'(K[1])y(K[1])+f(K[1])y'(K[1])}{y(K[1])^2}dK[1]^2 y(K[3])^2+2c_1 \int_1^{K[3]} \frac{-y(K[1])}{}}{y(K[3])^2\left(c_1+\int_1^{K[3]} \frac{-y(K[1])^3-f'(K[1])y(K[1])+}{y(K[1])^2}\right.}\right)}{\int_1^x \frac{-y(K[1])^3-f'(K[1])y(K[1])+f(K[1])y'(K[1]}{y(K[1])^2}}\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+f(x)*diff(y(x),x)-diff(f(x),x)*y(x)-y(x)^3=0,
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+f(x)*diff(y(x),x)-diff(f(x),x)*y(x)-
y(x)^3=0,y(x))
```

ODE No. 1706

$$-y(x)f''(x)+f'(x)y'(x)+f(x)y(x)^3+y(x)y''(x)-y'(x)^2-y(x)^4=0$$

✓ **Mathematica** : cpu = 0.510345 (sec), leaf count = 308

```
DSolve[f[x]*y[x]^3 - y[x]^4 + Derivative[1][f][x]*Derivative[1][y][x] - Derivative[1][y][x]^2
```

$$\left\{\left\{y(x)\to -\frac{\exp\left(c_2-\int_1^x \frac{y(K[3])^4-f(K[3])y(K[3])^3+{c_1}^2y(K[3])^2+\int_1^{K[3]} \frac{-y(K[1])^4+f(K[1])y(K[1])^3-f''(K[1])y(K[1])+f'(K[1])y'(K[1])}{y(K[1])^2}}{y(K[3])^2\left(c_1+\int_1^{K[3]} \frac{-y(K[1]}{\int_1^x \frac{-y(K[1])^4+f(K[1])y(K[1]}\right.\right.\right.\right.$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+diff(f(x),x)*diff(y(x),x)-diff(diff(f(x),x),x
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+diff(f(x),x)*diff(y(x),x)-diff(diff(f(x
y(x)^4=0,y(x))
```

ODE No. 1707

$$ay(x)y'(x) + by(x)^2 + y(x)y''(x) - y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0664731 (sec), leaf count = 31

```
DSolve[b*y[x]^2 + a*y[x]*Derivative[1][y][x] - Derivative[1][y][x]^2 + y[x]*Derivative[2][y][
```

$$\left\{\left\{y(x) \to c_2 e^{-\frac{bx}{a} - \frac{c_1 e^{-ax}}{a}}\right\}\right\}$$

✓ **Maple** : cpu = 1.037 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+a*y(x)*diff(y(x),x)+b*y(x)^2=0,y(x))
```

$$y(x) = \mathrm{e}^{\frac{c_1 \mathrm{e}^{-ax}}{a}} \mathrm{e}^{-\frac{bx}{a}} \mathrm{e}^{-\frac{c_2}{a}} \mathrm{e}^{\frac{b}{a^2}}$$

ODE No. 1708

$$ay(x)y'(x) - 2ay(x)^2 + by(x)^3 + y(x)y''(x) - y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 37.6568 (sec), leaf count = 0

```
DSolve[-2*a*y[x]^2 + b*y[x]^3 + a*y[x]*Derivative[1][y][x] - Derivative[1][y][x]^2 + y[x]*Der
```

, could not solve

```
DSolve[-2*a*y[x]^2 + b*y[x]^3 + a*y[x]*Derivative[1][y][x] - Derivative[1][y][x]^2 + y[
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+a*y(x)*diff(y(x),x)-2*a*y(x)^2+b*y(x)^3=0,y(x
```

, result contains DESol or ODESolStruc

$$y(x) = \_a \textbf{\textit{where}} \left[\left\{ \left(\frac{d}{d\_a} \_b(\_a) \right) \_b(\_a) - \frac{\_b(\_a)^2 - \_a \_b(\_a)\, a - b \_a^3 + 2 \_a^2 a}{\_a} = 0 \right\}, \left\{ \_a = y(\right.$$

ODE No. 1709

$$2a^2y(x)^2-(ay(x)-1)y'(x)+ay(x)-2b^2y(x)^3+y(x)y''(x)-y'(x)^2=0$$

✓ **Mathematica** : cpu = 52.4583 (sec), leaf count = 543

```
DSolve[a*y[x] + 2*a^2*y[x]^2 - 2*b^2*y[x]^3 - (-1 + a*y[x])*Derivative[1][y][x] - Derivative[
```

$$\left\{\left\{y(x)\to -\frac{1}{2a}+e^{2ax}\left(\frac{e^{-2ax}\left(c_1\left(\sqrt{a^3+2b^2}-a^{3/2}\right)\Gamma\left(1-\frac{\sqrt{a^3+2b^2}}{2a^{3/2}}\right)J_{-\frac{\sqrt{a^3+2b^2}}{2a^{3/2}}}\left(\frac{\sqrt{ab^2e^{2ax}c_2}}{a^{3/2}}\right)+2c_1\Gamma\left(1-\right.\right.\right.\right.$$

$$\left.\left.\left.\left.\frac{}{4a\left(bc_1\Gamma\left(1\right.\right.\right.\right.\right.\right.\right.\right.$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-(-1+a*y(x))*diff(y(x),x)+2*a^2*y(x)^2-2*b^2*y
```

, result contains DESol or ODESolStruc

$$y(x)=\_a \textbf{\textit{where}}\left[\left\{\left(\frac{d}{d\_a}\_\mathrm{b}(\_a)\right)\_b(\_a)-\frac{2b^2\_a^3-2\_a^2a^2+\_a\_b(\_a)\,a+\_b(\_a)^2-a\_a-\_b(\_\right.\right.$$

$$\left.\left.\frac{}{\_a}\right.\right.$$

ODE No. 1710

$$-y(x)(y(x)+1)\left(b^2y(x)^2-a^2\right)+(ay(x)-1)y'(x)+y(x)y''(x)-y'(x)^2=0$$

✗ **Mathematica** : cpu = 62.5363 (sec), leaf count = 0

```
DSolve[-(y[x]*(1 + y[x])*(-a^2 + b^2*y[x]^2)) + (-1 + a*y[x])*Derivative[1][y][x] - Derivativ
```

, could not solve

```
DSolve[-(y[x]*(1 + y[x])*(-a^2 + b^2*y[x]^2)) + (-1 + a*y[x])*Derivative[1][y][x] - Der
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+(-1+a*y(x))*diff(y(x),x)-y(x)*(1+y(x))*(b^2*y
```

, result contains DESol or ODESolStruc

$$y(x)=\_a \textbf{\textit{where}}\left[\left\{\left(\frac{d}{d\_a}\_\mathrm{b}(\_a)\right)\_b(\_a)-\frac{\_a^4b^2+b^2\_a^3-\_a^2a^2-\_a\_b(\_a)\,a-\_a\,a^2+\_b(\_a)^2}{\_a}\right.\right.$$

ODE No. 1711

$$y(x)^2 \log(y(x)) \left(\cos^2(x) - n^2 \cot^2(x)\right) + y(x)y''(x) - y'(x)^2 + y(x)y'(x)(\tan(x) + \cot(x)) = 0$$

✓ **Mathematica** : cpu = 21.0527 (sec), leaf count = 9987

```
DSolve[(Cos[x]^2 - n^2*Cot[x]^2)*Log[y[x]]*y[x]^2 + (Cot[x] + Tan[x])*y[x]*Derivative[1][y][x
```

$$\left\{\left\{y(x) \to \frac{(-1)^{1-n}2^{n-}}{c_1 + \int_1^x \frac{(-1)^{1-n}2^{n-2}(\cos^2(K[1])-1)^{-\frac{n}{2}-\frac{1}{2}} \sec(K[1])\left(12\sqrt{2}n^2 K_n\left(\sqrt{\cos^2(K[1])-1}\right) \cos^3(K[1]) \log(y(K[1]))y(K[1])(2\cos^2(K\right.}\right.\right.$$

✓ **Maple** : cpu = 0.611 (sec), leaf count = 81

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+(tan(x)+cot(x))*y(x)*diff(y(x),x)+(cos(x)^2-n
```

$$y(x) = e^{-\frac{\text{BesselY}(n,\sin(x))c_2}{\sin(x)(\text{BesselJ}(n+1,\sin(x))\,\text{BesselY}(n,\sin(x))-\text{BesselY}(n+1,\sin(x))\,\text{BesselJ}(n,\sin(x)))}} e^{\frac{\text{BesselJ}(n,\sin(x))c_1}{\sin(x)(\text{BesselJ}(n+1,\sin(x))\,\text{BesselY}(n,\sin(x))-\text{BesselY}(n+1,\sin(x))}}$$

ODE No. 1712

$$-f(x)y(x)y'(x) - g(x)y(x)^2 + y(x)y''(x) - y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0668785 (sec), leaf count = 75

```
DSolve[-(g[x]*y[x]^2) - f[x]*y[x]*Derivative[1][y][x] - Derivative[1][y][x]^2 + y[x]*Derivati
```

$$\left\{\left\{y(x) \to c_2 \exp\left(\int_1^x \left(\exp\left(\int_1^{K[3]} f(K[1])dK[1]\right)c_1 + \exp\left(\int_1^{K[3]} f(K[1])dK[1]\right)\int_1^{K[3]} \exp\left(-\int_1^{K[2\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.189 (sec), leaf count = 61

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-f(x)*y(x)*diff(y(x),x)-g(x)*y(x)^2=0,y(x))
```

$$y(x) = \mathrm{e}^{\left(\int \mathrm{e}^{\int f(x)dx}dx\right)\left(\int \mathrm{e}^{\int -f(x)dx}g(x)dx\right)}\mathrm{e}^{\int -c_1\mathrm{e}^{\int f(x)dx}dx}\mathrm{e}^{\int\left(\int -\mathrm{e}^{\int f(x)dx}dx\right)\mathrm{e}^{\int -f(x)dx}g(x)dx}c_2$$

ODE No. 1713

$$-y(x)\left(g'(x)-y(x)^2 f'(x)\right)+y'(x)\left(f(x)y(x)^2+g(x)\right)+y(x)y''(x)-y'(x)^2=0$$

✗ **Mathematica** : cpu = 20.8017 (sec), leaf count = 0

```
DSolve[-(y[x]*(-(y[x]^2*Derivative[1][f][x]) + Derivative[1][g][x])) + (g[x] + f[x]*y[x]^2)*D
```

, could not solve

```
DSolve[-(y[x]*(-(y[x]^2*Derivative[1][f][x]) + Derivative[1][g][x])) + (g[x] + f[x]*y[x
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+(g(x)+f(x)*y(x)^2)*diff(y(x),x)-y(x)*(diff(g(
```

, result contains DESol or ODESolStruc

$$y(x)=_b(_a)\ \textbf{\textit{where}}\left[\left\{\frac{\frac{d}{d_a}_b(_a)}{_b(_a)}-\frac{-f(_a)_b(_a)^2-c_1_b(_a)+g(_a)}{_b(_a)}=0\right\},\{_a=x,_b(_a)=
$$

ODE No. 1714

$$y(x)y''(x) + 3y(x)y'(x) - 3y'(x)^2 - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.131868 (sec), leaf count = 25

```
DSolve[-y[x]^2 + 3*y[x]*Derivative[1][y][x] - 3*Derivative[1][y][x]^2 + y[x]*Derivative[2][y]
```

$$\left\{\left\{y(x) \to \frac{c_2 e^x}{\sqrt{1 - 2e^{x+c_1}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.912 (sec), leaf count = 68

```
dsolve(diff(diff(y(x),x),x)*y(x)-3*diff(y(x),x)^2+3*y(x)*diff(y(x),x)-y(x)^2=0,y(x))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{(\mathrm{e}^x c_1 - c_2)\,\mathrm{e}^{2x}}}{2\,\mathrm{e}^x c_1 - 2c_2}$$

ODE No. 1715

$$y(x)y''(x) - ay'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.117388 (sec), leaf count = 26

```
DSolve[-(a*Derivative[1][y][x]^2) + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2(-ax + x - c_1)^{\frac{1}{1-a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.912 (sec), leaf count = 25

```
dsolve(diff(diff(y(x),x),x)*y(x)-a*diff(y(x),x)^2=0,y(x))
```

$$y(x) = \left(\frac{1}{(1-a)(c_1 x + c_2)}\right)^{\frac{1}{a-1}}$$

ODE No. 1716

$$a\left(y'(x)^2+1\right)+y(x)y''(x)=0$$

✓ **Mathematica** : cpu = 0.529864 (sec), leaf count = 172

```
DSolve[a*(1 + Derivative[1][y][x]^2) + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\#1\sqrt{1-e^{2c_1}\#1^{-2a}}\,{}_2F_1\left(\frac{1}{2},-\frac{1}{2a};1-\frac{1}{2a};e^{2c_1}\#1^{-2a}\right)}{\sqrt{-1+e^{2c_1}\#1^{-2a}}}\&\right][x+c_2]\right\},\left\{y(x)\to\right.$$

✓ **Maple** : cpu = 1.119 (sec), leaf count = 68

```
dsolve(diff(diff(y(x),x),x)*y(x)+a*(diff(y(x),x)^2+1)=0,y(x))
```

$$\int^{y(x)}\frac{\_a^a}{\sqrt{-\_a^{2a}+c_1}}d\_a-x-c_2=0$$

ODE No. 1717

$$ay'(x)^2 + by(x)^3 + y(x)y''(x) = 0$$

✓ **Mathematica** : cpu = 50.889 (sec), leaf count = 277

```
DSolve[b*y[x]^3 + a*Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{y(x)\sqrt{(2a+3)y(x)^{2a}}\sqrt{1-\frac{2by(x)^{2a+3}}{2ac_1+3c_1}}\,{}_2F_1\left(\frac{1}{2},\frac{a+1}{2a+3};\frac{a+1}{2a+3}+1;\frac{2by(x)^{2a+3}}{2ac_1+3c_1}\right)}{(a+1)\sqrt{-2by(x)^{2a+3}+2ac_1+3c_1}} = -x+c_2, y(x) \right], \text{Solve}\left[y \right.$$

✓ **Maple** : cpu = 1.13 (sec), leaf count = 107

```
dsolve(diff(diff(y(x),x),x)*y(x)+a*diff(y(x),x)^2+b*y(x)^3=0,y(x))
```

$$\int^{y(x)} \frac{\_a^{2a}(2a+3)}{\sqrt{-\_a^{2a}\,(2a+3)\,(2b\_a^{2a+3}-c_1)}} d\_a - x - c_2 = 0$$

ODE No. 1718

$$dy(x)^{1-a} + ay'(x)^2 + by(x)y'(x) + cy(x)^2 + y(x)y''(x) = 0$$

✓ **Mathematica** : cpu = 1.25899 (sec), leaf count = 744

```
DSolve[c*y[x]^2 + d*y[x]^(1 - a) + b*y[x]*Derivative[1][y][x] + a*Derivative[1][y][x]^2 + y[x
```

$$\left\{\left\{y(x) \to \left(-\frac{ad\exp\left(\frac{1}{2}x\left(\sqrt{-4ac+b^2-4c}+b\right)-\frac{x\left(b\sqrt{-4ac+b^2-4c}-4(a+1)c+b^2\right)}{\sqrt{-4ac+b^2-4c}+b}-\frac{2(a+1)cx}{\sqrt{-4ac+b^2-4c}+b}\right)}{(a+1)c}-\frac{d\exp\right.\right.\right.$$

✓ **Maple** : cpu = 0.302 (sec), leaf count = 133

```
dsolve(diff(diff(y(x),x)*y(x)+a*diff(y(x),x)^2+b*y(x)*diff(y(x),x)+c*y(x)^2+d*y(x)^(1-a)=0
```

$$y(x) = \mathrm{e}^{-\frac{x\sqrt{(-4a-4)c+b^2}}{2a+2}}\mathrm{e}^{-\frac{bx}{2a+2}}\left(\frac{(-4a-4)c^3+b^2c^2}{\left(d\,\mathrm{e}^{\frac{\left(b+\sqrt{(-4a-4)c+b^2}\right)x}{2}}\sqrt{(-4a-4)c+b^2}+\left(\mathrm{e}^{x\sqrt{(-4a-4)c+b^2}}c_1-c_2\right)c(a+1)\right)}\right.$$

ODE No. 1719

$$ay'(x)^2 + f(x)y(x)y'(x) + g(x)y(x)^2 + y(x)y''(x) = 0$$

✗ **Mathematica** : cpu = 41.8062 (sec), leaf count = 0

```
DSolve[g[x]*y[x]^2 + f[x]*y[x]*Derivative[1][y][x] + a*Derivative[1][y][x]^2 + y[x]*Derivativ
```

, 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]*Der
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)+a*diff(y(x),x)^2+f(x)*y(x)*diff(y(x),x)+g(x)*y(x)^2=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\mathrm{e}^{\int \_b(\_a)d\_a+c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a) = (-a-1)\_b(\_a)^2 - f(\_a)\_b(\_a) - g(\_a)\right\}, \left\{\_a = \right.\right.$$

ODE No. 1720

$$ay'(x)^2+by(x)^2y'(x)+cy(x)^4+y(x)y''(x)=0$$

✓ **Mathematica** : cpu = 64.4369 (sec), leaf count = 105

```
DSolve[c*y[x]^4 + b*y[x]^2*Derivative[1][y][x] + a*Derivative[1][y][x]^2 + y[x]*Derivative[2]
```

$$\text{Solve}\left[\int_1^{y(x)}\frac{1}{K[2]^2\text{InverseFunction}\left[\frac{\log(c+\#1(b+(a+2)\#1))-\frac{2b\tan^{-1}\left(\frac{b+2(a+2)\#1}{\sqrt{4(a+2)c-b^2}}\right)}{\sqrt{4(a+2)c-b^2}}}{2(a+2)}\&\right][c_1-\log(K[2])]}dK[2]=x\right.$$

✓ **Maple** : cpu = 1.225 (sec), leaf count = 173

```
dsolve(diff(diff(y(x),x),x)*y(x)+a*diff(y(x),x)^2+b*y(x)^2*diff(y(x),x)+c*y(x)^4=0,y(x))
```

$$\int^{y(x)}\frac{2a+}{\tan\left(\text{RootOf}\left(2\_Zb\_a^2-2a\ln(\_a)\sqrt{4\_a^4ac-\_a^4b^2+8c\_a^4}-\ln\left(\frac{\_a^4\left(\tan^2\left(\_Z\right)+1\right)(4ca-b^2+8c)}{4a+8}\right)\right.\right.}$$

ODE No. 1721

$$-\frac{ay(x)^3 f'(x)}{a+2}+\frac{af(x)^2 y(x)^4}{(a+2)^2}-\frac{(a-1)y'(x)^2}{a}-f(x)y(x)^2 y'(x)+y(x)y''(x)=0$$

✓ **Mathematica** : cpu = 21.1075 (sec), leaf count = 41

```
DSolve[(a*f[x]^2*y[x]^4)/(2 + a)^2 - (a*y[x]^3*Derivative[1][f][x])/(2 + a) - f[x]*y[x]^2*Der
```

$$\left\{\left\{y(x)\to -\frac{(a+2)(x+c_1)^a}{a\int_1^x f(K[3])(c_1+K[3])^a dK[3]+c_2}\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-(a-1)/a*diff(y(x),x)^2-f(x)*y(x)^2*diff(y(x),x)+a/(a+2)^2*f(
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)*y(x)-(a-1)/a*diff(y(x),x)^2-f(x)*y(x)^2*diff(y(x),x)+a/(a+2
a/(a+2)*diff(f(x),x)*y(x)^3=0,y(x))
```

ODE No. 1722

$$-2ay(x)\left(y'(x)^2+1\right)^{3/2}+y(x)y''(x)-y'(x)^2-1=0$$

✓ **Mathematica** : cpu = 1.27014 (sec), leaf count = 697

```
DSolve[-1 - Derivative[1][y][x]^2 - 2*a*y[x]*(1 + Derivative[1][y][x]^2)^(3/2) + y[x]*Derivat
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt{1-\frac{2\#1^2a^2}{-2ac_1+\sqrt{1-4ac_1}+1}}\sqrt{1+\frac{2\#1^2a^2}{2ac_1+\sqrt{1-4ac_1}-1}}\left(\left(-2ac_1+\sqrt{1-4ac_1}+1\right)E\left(i\right.\right.\right.\right.$$

✓ **Maple** : cpu = 2.223 (sec), leaf count = 98

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-1-2*a*y(x)*(diff(y(x),x)^2+1)^(3/2)=0,y(x))
```

$$\int^{y(x)}\frac{\_a^2a+c_1}{\sqrt{-a^2\_a^4-2\_a^2ac_1+\_a^2-c_1^2}}d\_a-x-c_2=0$$

ODE No. 1723

$$(y(x)+x)y''(x)+y'(x)^2-y'(x)=0$$

✓ **Mathematica** : cpu = 0.695624 (sec), leaf count = 130

```
DSolve[-Derivative[1][y][x] + Derivative[1][y][x]^2 + (x + y[x])*Derivative[2][y][x] == 0,y[x
```

$$\left\{\left\{y(x)\to \frac{1}{2}\left(2x-\sqrt{2}e^{-2c_1}\sqrt{4e^{3c_1}x+e^{2c_1}+4e^{3c_1}c_2}+e^{-c_1}+4c_2\right)\right\},\left\{y(x)\to \frac{1}{2}\left(2x+\sqrt{2}e^{-2c_1}\sqrt{4e^{3c_1}x-\right.\right.$$

✓ **Maple** : cpu = 0.976 (sec), leaf count = 16

```
dsolve(diff(diff(y(x),x),x)*(y(x)+x)+diff(y(x),x)^2-diff(y(x),x)=0,y(x))
```

$$y(x)=\sqrt{c_1+2x}\,c_2+c_1+x$$

ODE No. 1724

$$(x - y(x))y''(x) + 2y'(x)\,(y'(x) + 1) = 0$$

✓ **Mathematica** : cpu = 0.369755 (sec), leaf count = 38

```
DSolve[2*Derivative[1][y][x]*(1 + Derivative[1][y][x]) + (x - y[x])*Derivative[2][y][x] == 0,
```

$$\left\{\left\{y(x) \to -\frac{e^{-c_1}\left(e^{c_1}c_2 x + 1 + e^{c_1}{c_2}^2\right)}{x + c_2}\right\}\right\}$$

✓ **Maple** : cpu = 1.575 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x)*(x-y(x))+2*diff(y(x),x)*(diff(y(x),x)+1)=0,y(x))
```

$$y(x) = \frac{-xc_2 + c_2^2 + c_1}{c_2 - x}$$

ODE No. 1725

$$(x-y(x))y''(x)+(-y'(x)-1)\left(y'(x)^2+1\right)=0$$

✓ **Mathematica** : cpu = 1.69358 (sec), leaf count = 75

```
DSolve[(-1 - Derivative[1][y][x])*(1 + Derivative[1][y][x]^2) + (x - y[x])*Derivative[2][y][x
```

$$\left\{\left\{y(x)\to -\sqrt{-x^2-2c_2x+e^{2c_1}-{c_2}^2}-c_2\right\},\left\{y(x)\to \sqrt{-x^2-2c_2x+e^{2c_1}-{c_2}^2}-c_2\right\}\right\}$$

✓ **Maple** : cpu = 1.332 (sec), leaf count = 105

```
dsolve(diff(diff(y(x),x),x)*(x-y(x))-(diff(y(x),x)+1)*(diff(y(x),x)^2+1)=0,y(x))
```

$$y(x)=x+\text{RootOf}\left(-x+\int^{-Z}-\frac{c_1^2\_f^2-1}{c_1^2\_f^2+c_1\sqrt{-c_1^2\_f^2+2}\,\_f-2}d\_f+c_2\right)$$

ODE No. 1726

$$(x - y(x))y''(x) - h(y'(x)) = 0$$

✓ **Mathematica** : cpu = 0.307738 (sec), leaf count = 82

```
DSolve[-h[Derivative[1][y][x]] + (x - y[x])*Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x = \int \frac{\exp\left(-\int_1^{K[4]} \frac{K[3]-1}{h(K[3])} dK[3] - c_1\right)}{h(K[4])} dK[4] + c_2, y(x) = x - \exp\left(-\int_1^{K[4]} \frac{K[3]-1}{h(K[3])} dK[3] - c_1\right.\right.$$

✓ **Maple** : cpu = 0.155 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x)*(x-y(x))-h(diff(y(x),x))=0,y(x))
```

$$y(x) = x + \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{-1 + \text{RootOf}\left(\int^{\_Z} \frac{\_a - 1}{h(\_a)} d\_a + \ln(-\_g) + c_1\right)} d\_g + c_2\right)$$

ODE No. 1727

$$2y(x)y''(x) + y'(x)^2 + 1 = 0$$

✓ **Mathematica** : cpu = 0.365993 (sec), leaf count = 166

```
DSolve[1 + Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{\sqrt{\#1}(\#1 - e^{2c_1}) + e^{3c_1}\sqrt{1 - \#1 e^{-2c_1}}\,\sin^{-1}\left(\sqrt{\#1}e^{-c_1}\right)}{\sqrt{-\#1 + e^{2c_1}}}\&\right][x + c_2]\right\}, \left\{y(x)\right.$$

✓ **Maple** : cpu = 1.251 (sec), leaf count = 823

```
dsolve(2*diff(diff(y(x),x),x)*y(x)+diff(y(x),x)^2+1=0,y(x))
```

$$y(x) = \frac{\tan\left(\text{RootOf}\left(\left(\tan^2(\_Z)\right)c_1^2\_Z^2 - 4\left(\tan^2(\_Z)\right)c_1c_2\_Z - 4\left(\tan^2(\_Z)\right)c_1x\_Z + 4\left(\tan^2(\_Z)\right)c_2^2 +\right.\right.}{}$$

ODE No. 1728

$$a + 2y(x)y''(x) - y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0047571 (sec), leaf count = 31

```
DSolve[a - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{x^2(-a + {c_1}^2)}{4c_2} + c_1 x + c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.91 (sec), leaf count = 24

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+a=0,y(x))
```

$$y(x) = \frac{(c_1^2 - a)\, x^2}{4c_2} + c_1 x + c_2$$

ODE No. 1729

$$a + f(x)y(x)^2 + 2y(x)y''(x) - y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 0.0220812 (sec), leaf count = 0

```
DSolve[a + f[x]*y[x]^2 - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[a + f[x]*y[x]^2 - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0, y[x],
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+f(x)*y(x)^2+a=0,y(x))
```

, could not solve

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+f(x)*y(x)^2+a=0,y(x))
```

ODE No. 1730

$$2y(x)y''(x) - y'(x)^2 - 8y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.750248 (sec), leaf count = 135

```
DSolve[-8*y[x]^3 - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{2\sqrt{\#1}\sqrt{1+\frac{4\#1^2}{c_1}}\,{}_2F_1\left(\frac{1}{4},\frac{1}{2};\frac{5}{4};-\frac{4\#1^2}{c_1}\right)}{\sqrt{4\#1^2+c_1}}\&\right][x+c_2]\right\},\left\{y(x) \to \text{InverseFu}\right.\right.$$

✓ **Maple** : cpu = 0.942 (sec), leaf count = 53

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-8*y(x)^3=0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{4\_a^3 + \_ac_1}} d\_a - x - c_2 = 0$$

ODE No. 1731

$$2y(x)y''(x) - y'(x)^2 - 8y(x)^3 - 4y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.961679 (sec), leaf count = 351

```
DSolve[-4*y[x]^2 - 8*y[x]^3 - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{i\#1\sqrt{4+\frac{2c_1}{\#1-\#1\sqrt{1-c_1}}}\sqrt{2+\frac{c_1}{\#1+\#1\sqrt{1-c_1}}}F\left(i\sinh^{-1}\left(\frac{\sqrt{\frac{c_1}{2\sqrt{1-c_1}+2}}}{\sqrt{\#1}}\right)|\frac{\sqrt{1-c_1}}{1-\sqrt{1-c_1}}\right.\right.\right.\right.$$

$$\left.\left.\left.\left.\frac{}{\sqrt{\frac{c_1}{1+\sqrt{1-c_1}}}\sqrt{4\#1^2+4\#1+c_1}}\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.944 (sec), leaf count = 61

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-8*y(x)^3-4*y(x)^2=0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{4\_a^3+4\_a^2+\_ac_1}} d\_a - x - c_2 = 0$$

ODE No. 1732

$$2y(x)y''(x) - y'(x)^2 - 4(2y(x) + x)y(x)^2 = 0$$

✗ **Mathematica** : cpu = 0.894641 (sec), leaf count = 0

```
DSolve[-4*y[x]^2*(x + 2*y[x]) - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],
```

, could not solve

```
DSolve[-4*y[x]^2*(x + 2*y[x]) - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-4*(x+2*y(x))*y(x)^2=0,y(x))
```

, could not solve

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-4*(x+2*y(x))*y(x)^2=0,y(x))
```

ODE No. 1733

$$y(x)^2(ay(x)+b)+2y(x)y''(x)-y'(x)^2=0$$

✓ **Mathematica** : cpu = 1.77729 (sec), leaf count = 437

```
DSolve[y[x]^2*(b + a*y[x]) - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{i\sqrt{2}\#1^{3/2}\sqrt{2+\frac{4c_1}{\#1\left(-b+\sqrt{b^2+2ac_1}\right)}}\sqrt{1-\frac{2c_1}{\#1\left(b+\sqrt{b^2+2ac_1}\right)}}F\left(i\sinh^{-1}\left(\frac{\sqrt{2}\sqrt{-}}{\sqrt{}}\right.\right.\right.\right.$$

$$\left.\left.\left.\left.\sqrt{\frac{c_1}{-b+\sqrt{b^2+2ac_1}}}\sqrt{-\#1\left(\#1^2a+2\#1b-2c_1\right)}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.932 (sec), leaf count = 71

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+(a*y(x)+b)*y(x)^2=0,y(x))
```

$$\int^{y(x)} -\frac{2}{\sqrt{-2a\_a^3-4b\_a^2+4\_ac_1}}d\_a-x-c_2=0$$

ODE No. 1734

$$ay(x)^3+2y(x)y''(x)-y'(x)^2+2xy(x)^2+1=0$$

✗ **Mathematica** : cpu = 1.17334 (sec), leaf count = 0

```
DSolve[1 + 2*x*y[x]^2 + a*y[x]^3 - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[
```

, could not solve

```
DSolve[1 + 2*x*y[x]^2 + a*y[x]^3 - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] =
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+1+2*x*y(x)^2+a*y(x)^3=0,y(x))
```

, could not solve

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+1+2*x*y(x)^2+a*y(x)^3=0,y(x))
```

ODE No. 1735

$$y(x)^2(ay(x)+bx)+2y(x)y''(x)-y'(x)^2=0$$

✗ **Mathematica** : cpu = 0.735699 (sec), leaf count = 0

```
DSolve[y[x]^2*(b*x + a*y[x]) - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x
```

, could not solve

```
DSolve[y[x]^2*(b*x + a*y[x]) - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+(a*y(x)+b*x)*y(x)^2=0,y(x))
```

, could not solve

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+(a*y(x)+b*x)*y(x)^2=0,y(x))
```

ODE No. 1736

$$2y(x)y''(x) - y'(x)^2 - 3y(x)^4 = 0$$

✓ **Mathematica** : cpu = 6.42151 (sec), leaf count = 129

```
DSolve[-3*y[x]^4 - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{2\sqrt{\#1}\sqrt{1+\frac{\#1^3}{c_1}}\,{}_2F_1\left(\frac{1}{6},\frac{1}{2};\frac{7}{6};-\frac{\#1^3}{c_1}\right)}{\sqrt{\#1^3+c_1}}\&\right][x+c_2]\right\},\left\{y(x) \to \text{InverseFun}\right.\right.$$

✓ **Maple** : cpu = 0.941 (sec), leaf count = 49

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-3*y(x)^4=0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{\_a^4 + \_a c_1}} d\_a - x - c_2 = 0$$

ODE No. 1737

$$-4\left(a+x^2\right)y(x)^2+b+2y(x)y''(x)-y'(x)^2-3y(x)^4-8xy(x)^3=0$$

✗ **Mathematica** : cpu = 20.7427 (sec), leaf count = 0

```
DSolve[b - 4*(a + x^2)*y[x]^2 - 8*x*y[x]^3 - 3*y[x]^4 - Derivative[1][y][x]^2 + 2*y[x]*Deriva
```

, could not solve

```
DSolve[b - 4*(a + x^2)*y[x]^2 - 8*x*y[x]^3 - 3*y[x]^4 - Derivative[1][y][x]^2 + 2*y[x]*
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+b-4*(x^2+a)*y(x)^2-8*x*y(x)^3-3*y(x)^4=0,y(
```

, could not solve

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+b-4*(x^2+a)*y(x)^2-8*x*y(x)^3-
3*y(x)^4=0,y(x))
```

ODE No. 1738

$$2y(x)^2\left(f'(x)+f(x)^2\right)+3f(x)y(x)y'(x)+2y(x)y''(x)-y'(x)^2-8y(x)^3=0$$

✗ **Mathematica** : cpu = 0.469584 (sec), leaf count = 0

```
DSolve[-8*y[x]^3 + 2*y[x]^2*(f[x]^2 + Derivative[1][f][x]) + 3*f[x]*y[x]*Derivative[1][y][x]
```

, could not solve

```
DSolve[-8*y[x]^3 + 2*y[x]^2*(f[x]^2 + Derivative[1][f][x]) + 3*f[x]*y[x]*Derivative[1][
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+3*f(x)*y(x)*diff(y(x),x)+2*(f(x)^2+diff(f(x
```

, could not solve

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+3*f(x)*y(x)*diff(y(x),x)+2*(f(x)^2+di
8*y(x)^3=0,y(x))
```

ODE No. 1739

$$f(x)y(x)^2+2y(x)y''(x)+4y(x)^2y'(x)-y'(x)^2+y(x)^4+1=0$$

✗ **Mathematica** : cpu = 0.0423371 (sec), leaf count = 0

```
DSolve[1 + f[x]*y[x]^2 + y[x]^4 + 4*y[x]^2*Derivative[1][y][x] - Derivative[1][y][x]^2 + 2*y[
```

, could not solve

```
DSolve[1 + f[x]*y[x]^2 + y[x]^4 + 4*y[x]^2*Derivative[1][y][x] - Derivative[1][y][x]^2
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+4*y(x)^2*diff(y(x),x)+1+f(x)*y(x)^2+y(x)^4=
```

, could not solve

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+4*y(x)^2*diff(y(x),x)+1+f(x)*y(x)^2+y
```

ODE No. 1740

$$2y(x)y''(x) - 3y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.105101 (sec), leaf count = 16

```
DSolve[-3*Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2}{(x+2c_1)^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.956 (sec), leaf count = 13

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-3*diff(y(x),x)^2=0,y(x))
```

$$y(x) = \frac{4}{(c_1 x + c_2)^2}$$

ODE No. 1741

$$2y(x)y''(x) - 3y'(x)^2 - 4y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.12082 (sec), leaf count = 17

```
DSolve[-4*y[x]^2 - 3*Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_2 \sec^2(x + 2c_1)\}\}$$

✓ **Maple** : cpu = 0.938 (sec), leaf count = 34

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-3*diff(y(x),x)^2-4*y(x)^2=0,y(x))
```

$$y(x) = \frac{4}{(c_1^2 - c_2^2)\left(\sin^2(x)\right) - 2c_1c_2\sin(x)\cos(x) + c_2^2}$$

ODE No. 1742

$$f(x)y(x)^2+2y(x)y''(x)-3y'(x)^2=0$$

✗ **Mathematica** : cpu = 6.98205 (sec), leaf count = 0

```
DSolve[f[x]*y[x]^2 - 3*Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[f[x]*y[x]^2 - 3*Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0, y[x], x
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-3*diff(y(x),x)^2+f(x)*y(x)^2=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=\left(\mathrm{e}^{\int _b(_a)d_a+c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d_a}_\mathrm{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\},\{

ODE No. 1743

$$y(x)^2 \left(ay(x)^3+1\right)+2y(x)y''(x)-6y'(x)^2=0$$

✓ **Mathematica** : cpu = 20.5057 (sec), leaf count = 2761

```
DSolve[y[x]^2*(1 + a*y[x]^3) - 6*Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\text{Solve}\left[-\frac{4\left(F\left(\sin^{-1}\left(\sqrt{\frac{\left(\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,2\right]-\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,4\right]\right)\left(y(x)-\text{Root}\left[4c_1\#1^4+4a\#1^3+\right.\right.}{\left(\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,1\right]-\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,4\right]\right)\left(y(x)-\text{Root}\left[4c_1\#1^4+4a\#1^3+\right.\right.}}\right.\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.937 (sec), leaf count = 71

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-6*diff(y(x),x)^2+(1+a*y(x)^3)*y(x)^2=0,y(x))
```

$$\int^{y(x)} -\frac{2}{\sqrt{4_a^4c_1+4a_a^3+1}_a}d_a-x-c_2=0$$

ODE No. 1744

$$2y(x)y''(x) - y'(x)^2\left(y'(x)^2+1\right) = 0$$

✓ **Mathematica** : cpu = 0.564417 (sec), leaf count = 155

```
DSolve[-(Derivative[1][y][x]^2*(1 + Derivative[1][y][x]^2)) + 2*y[x]*Derivative[2][y][x] == 0
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-ie^{-c_1}\sqrt{-1+\#1e^{2c_1}}\left(\sqrt{\#1}+\frac{e^{-c_1}\sin^{-1}\left(\sqrt{\#1}e^{c_1}\right)}{\sqrt{1-\#1e^{2c_1}}}\right)\&\right][x+c_2]\right\},\left\{y(x)\right.\right.$$

✓ **Maple** : cpu = 1.232 (sec), leaf count = 823

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2*(diff(y(x),x)^2+1)=0,y(x))
```

$$y(x) = \frac{\tan\left(\text{RootOf}\left(\left(\tan^2\left(\_Z\right)\right)c_1^2\_Z^2 - 4\left(\tan^2\left(\_Z\right)\right)c_1c_2\_Z - 4\left(\tan^2\left(\_Z\right)\right)c_1x\_Z + 4\left(\tan^2\left(\_Z\right)\right)c_2^2 +\right.\right.}{}$$

ODE No. 1745

$$2(y(x)-a)y''(x)+y'(x)^2+1=0$$

✓ **Mathematica** : cpu = 0.688712 (sec), leaf count = 251

```
DSolve[1 + Derivative[1][y][x]^2 + 2*(-a + y[x])*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{2\sqrt{a-\#1}(2\#1-2a+e^{2c_1})-\sqrt{2}e^{3c_1}\sqrt{e^{-2c_1}\left(2\#1-2a+e^{2c_1}\right)}\sin^{-1}\left(\sqrt{2}e\right.\right.\right.$$
$$\left.\left.\left.\frac{}{2\sqrt{2}\sqrt{2\#1-2a+e^{2c_1}}}\right.\right.\right.$$

✓ **Maple** : cpu = 1.405 (sec), leaf count = 117

```
dsolve(2*(y(x)-a)*diff(diff(y(x),x),x)+diff(y(x),x)^2+1=0,y(x))
```

$$\frac{\arctan\left(\frac{y(x)-a-\frac{c_1}{2}}{\sqrt{-(-y(x)+a)(a+c_1-y(x))}}\right)c_1}{2}-x-c_2-\sqrt{-\left(-y\left(x\right)+a\right)\left(a+c_1-y\left(x\right)\right)}=0$$

ODE No. 1746

$$-ax^2 - bx - c + 3y(x)y''(x) - 2y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.124793 (sec), leaf count = 118

```
DSolve[-c - b*x - a*x^2 - 2*Derivative[1][y][x]^2 + 3*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int \frac{y(x)^{2/3}}{(ax^2+bx+c)\sqrt{-\frac{2(ax^2+bx+c)^3}{y(x)^2}+\frac{c_1(ax^2+bx+c)}{y(x)^{2/3}}+9\left(b^2-4ac\right)}}d\frac{ax^2+bx+c}{y(x)^{2/3}} = -\int \frac{1}{3\left(ax^2+bx+c\right.}\right.$$

✓ **Maple** : cpu = 1.24 (sec), leaf count = 207

```
dsolve(3*diff(diff(y(x),x),x)*y(x)-2*diff(y(x),x)^2-a*x^2-b*x-c=0,y(x))
```

$$y(x) = \text{RootOf}\left(-2\left(\int^{-Z} \frac{b}{\sqrt{4\_f^{\frac{4}{3}}c_1b^2 - 36c\_f^2a + 9b^2\_f^2 - 2}}d\_f\right)\sqrt{4ca-b^2} + c_2\sqrt{4ca-b^2} - 2b\arctan\right.$$

ODE No. 1747

$$3y(x)y''(x) - 5y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.107037 (sec), leaf count = 20

```
DSolve[-5*Derivative[1][y][x]^2 + 3*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2}{(2x+3c_1)^{3/2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.87 (sec), leaf count = 17

```
dsolve(3*diff(diff(y(x),x),x)*y(x)-5*diff(y(x),x)^2=0,y(x))
```

$$-\frac{3}{2y\,(x)^{\frac{2}{3}}} - c_1 x - c_2 = 0$$

ODE No. 1748

$$4y(x)y''(x) - 3y'(x)^2 + 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.227886 (sec), leaf count = 43

```
DSolve[4*y[x] - 3*Derivative[1][y][x]^2 + 4*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\left(c_1{}^2x^2 + 2c_2c_1{}^2x - 64 + c_2{}^2c_1{}^2\right)^2}{256c_1{}^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.962 (sec), leaf count = 67

```
dsolve(4*diff(diff(y(x),x),x)*y(x)-3*diff(y(x),x)^2+4*y(x)=0,y(x))
```

$$y(x) = 0$$

ODE No. 1749

$$4y(x)y''(x) - 3y'(x)^2 - 12y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.462985 (sec), leaf count = 153

```
DSolve[-12*y[x]^3 - 3*Derivative[1][y][x]^2 + 4*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{4\#1\sqrt{1+\frac{4\#1^{3/2}}{c_1}}\,{}_2F_1\left(\frac{1}{6},\frac{1}{2};\frac{7}{6};-\frac{4\#1^{3/2}}{c_1}\right)}{\sqrt{\#1^{3/2}\left(4\#1^{3/2}+c_1\right)}}\&\right][x+c_2]\right\},\left\{y(x) \to \text{InverseF}\right.$$

✓ **Maple** : cpu = 1.522 (sec), leaf count = 57

```
dsolve(4*diff(diff(y(x),x),x)*y(x)-3*diff(y(x),x)^2-12*y(x)^3=0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{c_1\_a^{\frac{3}{2}} + 4\_a^3}} d\_a - x - c_2 = 0$$

ODE No. 1750

$$ay(x)^3 + by(x)^2 + cy(x) + 4y(x)y''(x) - 3y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 3.81569 (sec), leaf count = 2281

```
DSolve[c*y[x] + b*y[x]^2 + a*y[x]^3 - 3*Derivative[1][y][x]^2 + 4*y[x]*Derivative[2][y][x] ==
```

$$\left\{\text{Solve}\left[-\frac{4F\left(\sin^{-1}\left(\sqrt{\frac{\left(\text{Root}\left[a\#1^4+3b\#1^2-3c_1\#1-3c\&,2\right]-\text{Root}\left[a\#1^4+3b\#1^2-3c_1\#1-3c\&,4\right]\right)\left(\sqrt{y(x)}-\text{Root}\left[a\#\right.\right.}{\left(\text{Root}\left[a\#1^4+3b\#1^2-3c_1\#1-3c\&,1\right]-\text{Root}\left[a\#1^4+3b\#1^2-3c_1\#1-3c\&,4\right]\right)\left(\sqrt{y(x)}-\text{Root}\left[a\#\right.\right.}}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 1.436 (sec), leaf count = 87

```
dsolve(4*diff(diff(y(x),x),x)*y(x)-3*diff(y(x),x)^2+a*y(x)^3+b*y(x)^2+c*y(x)=0,y(x))
```

$$y(x) = 0$$

ODE No. 1751

$$y'(x)\left(6y(x)^2-\frac{2y(x)f'(x)}{f(x)}\right)+f(x)y(x)+g(x)y(x)^2+4y(x)y''(x)-2y(x)^2y'(x)-3y'(x)^2+y(x)^4=0$$

✗ **Mathematica** : cpu = 8.97425 (sec), leaf count = 0

```
DSolve[f[x]*y[x] + g[x]*y[x]^2 + y[x]^4 - 2*y[x]^2*Derivative[1][y][x] + (6*y[x]^2 - (2*y[x]*
```

, could not solve

```
DSolve[f[x]*y[x] + g[x]*y[x]^2 + y[x]^4 - 2*y[x]^2*Derivative[1][y][x] + (6*y[x]^2 - (2
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(4*diff(diff(y(x),x),x)*y(x)-3*diff(y(x),x)^2+(6*y(x)^2-2*diff(f(x),x)*y(x)/f(x))*diff(
```

, could not solve

```
dsolve(4*diff(diff(y(x),x),x)*y(x)-3*diff(y(x),x)^2+(6*y(x)^2-2*diff(f(x),x)*y(x)/f(x))
2*y(x)^2*diff(y(x),x)+g(x)*y(x)^2+f(x)*y(x)=0,y(x))
```

ODE No. 1752

$$ay(x)^2 + 4y(x)y''(x) - 5y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.173768 (sec), leaf count = 26

```
DSolve[a*y[x]^2 - 5*Derivative[1][y][x]^2 + 4*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 \text{sech}^4\left(\frac{1}{4}\sqrt{a}(x - 4c_1)\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.084 (sec), leaf count = 33

```
dsolve(4*diff(diff(y(x),x),x)*y(x)-5*diff(y(x),x)^2+a*y(x)^2=0,y(x))
```

$$y(x) = \frac{16\, e^{\sqrt{a}\, x} a^2}{\left(e^{\frac{\sqrt{a}\, x}{2}} c_1 - c_2\right)^4}$$

ODE No. 1753

$$12y(x)y''(x) - 15y'(x)^2 + 8y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.479988 (sec), leaf count = 43

```
DSolve[8*y[x]^3 - 15*Derivative[1][y][x]^2 + 12*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{2304{c_1}^2}{\left(3{c_1}^2x^2 + 6c_2{c_1}^2x + 128 + 3{c_2}^2{c_1}^2\right)^2}\right\}\right\}$$

✓ **Maple** : cpu = 1.003 (sec), leaf count = 147

```
dsolve(12*diff(diff(y(x),x),x)*y(x)-15*diff(y(x),x)^2+8*y(x)^3=0,y(x))
```

$$-\frac{12y(x)\left(8\sqrt{y(x)} - c_1\right)\sqrt{8y(x) - c_1\sqrt{y(x)}}}{\sqrt{-24y(x)^3 + 3c_1y(x)^{\frac{5}{2}}}\,c_1\sqrt{\sqrt{y(x)}\left(8\sqrt{y(x)} - c_1\right)}} - x - c_2 = 0$$

ODE No. 1754

$$ny(x)y''(x) + (1-n)y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.122622 (sec), leaf count = 17

```
DSolve[(1 - n)*Derivative[1][y][x]^2 + n*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_2(x - c_1 n)^n\}\}$$

✓ **Maple** : cpu = 0.915 (sec), leaf count = 15

```
dsolve(n*y(x)*diff(diff(y(x),x),x)-(n-1)*diff(y(x),x)^2=0,y(x))
```

$$y(x) = \left(\frac{c_1 x + c_2}{n}\right)^n$$

ODE No. 1755

$$ay(x)y''(x) + by'(x)^2 + \mathrm{c0} + \mathrm{c1}y(x) + \mathrm{c2}y(x)^2 + \mathrm{c3}y(x)^3 + \mathrm{c4}y(x)^4 = 0$$

✓ **Mathematica** : cpu = 5.13686 (sec), leaf count = 716

```
DSolve[c0 + c1*y[x] + c2*y[x]^2 + c3*y[x]^3 + c4*y[x]^4 + b*Derivative[1][y][x]^2 + a*y[x]*De
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} -\frac{}{\sqrt{4b^5c_1K[1]^{-\frac{2b}{a}} + 20ab^4c_1K[1]^{-\frac{2b}{a}} + 35a^2b^3c_1K[1]^{-\frac{2b}{a}} + 25a^3b^2c_1K[1]}}\right.\right.$$

✓ **Maple** : cpu = 1.138 (sec), leaf count = 418

```
dsolve(a*y(x)*diff(diff(y(x),x),x)+b*diff(y(x),x)^2+c4*y(x)^4+c3*y(x)^3+c2*y(x)^2+c1*y(x)+c0=
```

$$\int^{y(x)} \frac{\_a^{\frac{2b}{a}} b(3a+2b)\,(2a}{\sqrt{-36\left(a+\frac{2b}{3}\right)b\left(\frac{2b(a+2b)(a+b)\left(a+\frac{b}{2}\right)c3\_a^{\frac{3a+2b}{a}}}{3} + \left(b\,(a+2b)\,c2\,\left(a+\frac{b}{2}\right)\_a^{\frac{2b+2a}{a}} + \left(\frac{bc4\,(a+2b)\_a^{\frac{2b+4a}{a}}}{2} -\right.\right.\right.}}$$

ODE No. 1756

$$ay(x)y''(x)+by'(x)^2-\frac{y(x)y'(x)}{\sqrt{c^2+x^2}}=0$$

✓ **Mathematica** : cpu = 0.637251 (sec), leaf count = 211

```
DSolve[-((y[x]*Derivative[1][y][x])/Sqrt[c^2 + x^2]) + b*Derivative[1][y][x]^2 + a*y[x]*Deriv
```

$$\left\{\left\{y(x)\to c_2 \exp\left(\int_1^x -\frac{\left(\frac{K[2]}{\sqrt{c^2+K[2]^2}}+1\right)^{\frac{1}{2}/a}}{\left(1-\frac{K[2]}{\sqrt{c^2+K[2]^2}}\right)^{\frac{1}{2}/a}\int_1^{K[2]}\frac{\exp\left(\frac{\frac{1}{2}\log\left(\frac{K[1]}{\sqrt{c^2+K[1]^2}}+1\right)-\frac{1}{2}\log\left(1-\frac{K[1]}{\sqrt{c^2+K[1]^2}}\right)}{a}\right)\left(-\sqrt{c^2+K[1]^2}a-b\sqrt{}\right.}{a\sqrt{c^2+K[1]^2}}}\right.\right.\right.$$

✓ **Maple** : cpu = 1.903 (sec), leaf count = 75

```
dsolve(a*y(x)*diff(diff(y(x),x),x)+b*diff(y(x),x)^2-y(x)*diff(y(x),x)/(c^2+x^2)^(1/2)=0,y(x))
```

$$y(x)=\left(\frac{a}{(a+b)\left(\frac{c_1 2^{\frac{1}{a}} a\, x^{\frac{1}{a}+1}\,\text{hypergeom}\left(\left[-\frac{1}{2a},-\frac{1}{2a}-\frac{1}{2}\right],\left[1-\frac{1}{a}\right],-\frac{c^2}{x^2}\right)}{a+1}+c_2\right)}\right)^{-\frac{a}{a+b}}$$

ODE No. 1757

$$(a+2)f(x)y(x)^2y'(x)+ay(x)y''(x)+ay(x)^3y'(x)-(a-1)y'(x)^2+f(x)^2y(x)^4=0$$

✗ **Mathematica** : cpu = 9.13743 (sec), leaf count = 0

```
DSolve[f[x]^2*y[x]^4 + (2 + a)*f[x]*y[x]^2*Derivative[1][y][x] + a*y[x]^3*Derivative[1][y][x]
```

, could not solve

```
DSolve[f[x]^2*y[x]^4 + (2 + a)*f[x]*y[x]^2*Derivative[1][y][x] + a*y[x]^3*Derivative[1]
1 + a)*Derivative[1][y][x]^2 + a*y[x]*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(a*y(x)*diff(diff(y(x),x),x)-(a-1)*diff(y(x),x)^2+(a+2)*f(x)*y(x)^2*diff(y(x),x)+f(x)^2
```

, could not solve

```
dsolve(a*y(x)*diff(diff(y(x),x),x)-(a-1)*diff(y(x),x)^2+(a+2)*f(x)*y(x)^2*diff(y(x),x)+
```

ODE No. 1758

$$y''(x)(ay(x)+b)+cy'(x)^2=0$$

✓ **Mathematica** : cpu = 0.325383 (sec), leaf count = 36

```
DSolve[c*Derivative[1][y][x]^2 + (b + a*y[x])*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{-b+(-(c_1(a+c)(-x-c_2)))^{\frac{a}{a+c}}}{a}\right\}\right\}$$

✓ **Maple** : cpu = 0.916 (sec), leaf count = 42

```
dsolve((a*y(x)+b)*diff(diff(y(x),x),x)+c*diff(y(x),x)^2=0,y(x))
```

$$y(x)=\frac{(c_1x+c_2)\,(a+c)\left(\frac{1}{(a+c)(c_1x+c_2)}\right)^{\frac{c}{a+c}}-b}{a}$$

ODE No. 1759

$$xy(x)y''(x) + xy'(x)^2 - y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.144771 (sec), leaf count = 18

```
DSolve[-(y[x]*Derivative[1][y][x]) + x*Derivative[1][y][x]^2 + x*y[x]*Derivative[2][y][x] ==
```

$$\left\{\left\{y(x) \to c_2\sqrt{x^2 + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.875 (sec), leaf count = 31

```
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))
```

$$y(x) = \sqrt{c_1 x^2 + 2c_2}$$

ODE No. 1760

$$ay(x)y'(x) + f(x) + xy(x)y''(x) + xy'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.080541 (sec), leaf count = 108

```
DSolve[f[x] + a*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 + x*y[x]*Derivative[2][y][
```

$$\left\{\left\{y(x) \to -\sqrt{2}\sqrt{\int_1^x -K[2]^{-a}\left(c_1 + \int_1^{K[2]} f(K[1])K[1]^{a-1}dK[1]\right)dK[2] + c_2}\right\}, \left\{y(x) \to \sqrt{2}\sqrt{\int_1^x -K\right.\right.$$

✓ **Maple** : cpu = 0.086 (sec), leaf count = 114

```
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))
```

$$y(x) = \frac{\sqrt{2}\sqrt{(a-1)\left(x^{1-a}\left(\int \frac{x^a f(x)}{x}dx\right) + x^{1-a}c_1 - \left(\int f(x)\,dx\right) - c_2\right)}}{a-1}$$

ODE No. 1761

$$x\left(ay(x)^4+d\right)+y(x)\left(by(x)^2+c\right)+xy(x)y''(x)-xy'(x)^2+y(x)y'(x)=0$$

✗ **Mathematica** : cpu = 1.09373 (sec), leaf count = 0

```
DSolve[y[x]*(c + b*y[x]^2) + x*(d + a*y[x]^4) + y[x]*Derivative[1][y][x] - x*Derivative[1][y]
```

, could not solve

```
DSolve[y[x]*(c + b*y[x]^2) + x*(d + a*y[x]^4) + y[x]*Derivative[1][y][x] - x*Derivative
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x*y(x)*diff(diff(y(x),x),x)-x*diff(y(x),x)^2+y(x)*diff(y(x),x)+x*(d+a*y(x)^4)+y(x)*(c+
```

, 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*(d+a*y(x)^4)+y(
```

ODE No. 1762

$$ay(x)y'(x) + bxy(x)^3 + xy(x)y''(x) - xy'(x)^2 = 0$$

✗ **Mathematica** : cpu = 47.9779 (sec), leaf count = 0

```
DSolve[b*x*y[x]^3 + a*y[x]*Derivative[1][y][x] - x*Derivative[1][y][x]^2 + x*y[x]*Derivative[
```

, could not solve

```
DSolve[b*x*y[x]^3 + a*y[x]*Derivative[1][y][x] - x*Derivative[1][y][x]^2 + x*y[x]*Deriv
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x*y(x)*diff(diff(y(x),x),x)-x*diff(y(x),x)^2+a*y(x)*diff(y(x),x)+b*x*y(x)^3=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(_a\, \mathrm{e}^{\int -2_b(_a) d_a - 2c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d_a}_\mathrm{b}(_a) = _a(b_a - 2a + 2)_b(_a)^3 + (a-1)_b(_a)^2 -
```
```

ODE No. 1763

$$ay(x)y'(x) + xy(x)y''(x) + 2xy'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.234885 (sec), leaf count = 40

```
DSolve[a*y[x]*Derivative[1][y][x] + 2*x*Derivative[1][y][x]^2 + x*y[x]*Derivative[2][y][x] ==
```

$$\left\{\left\{y(x) \to c_2 \left(3x^{1-a} - (a-1)c_1\right)^{-\frac{a-1}{3(1-a)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.938 (sec), leaf count = 148

```
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))
```

$$y(x) = \frac{x^{-a} 3^{\frac{1}{3}} \left((a-1)^2 \left(c_2(a-1)\, x^a - c_1 x\right) x^{2a}\right)^{\frac{1}{3}}}{a-1}$$

ODE No. 1764

$$xy(x)y''(x) - 2xy'(x)^2 + (y(x)+1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0629456 (sec), leaf count = 52

```
DSolve[(1 + y[x])*Derivative[1][y][x] - 2*x*Derivative[1][y][x]^2 + x*y[x]*Derivative[2][y][x
```

$$\left\{\left\{y(x) \to \frac{\tan\left(\frac{1}{2}\left(\sqrt{2}\sqrt{c_1}\log(x) - \sqrt{2}\sqrt{c_1}c_2\right)\right)}{\sqrt{2}\sqrt{c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 1.043 (sec), leaf count = 18

```
dsolve(x*y(x)*diff(diff(y(x),x),x)-2*x*diff(y(x),x)^2+(1+y(x))*diff(y(x),x)=0,y(x))
```

$$y(x) = c_1 \tanh\left(\frac{\ln(x) - c_2}{2c_1}\right)$$

ODE No. 1765

$$ay(x)y'(x) + xy(x)y''(x) - 2xy'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.254411 (sec), leaf count = 34

```
DSolve[a*y[x]*Derivative[1][y][x] - 2*x*Derivative[1][y][x]^2 + x*y[x]*Derivative[2][y][x] ==
```

$$\left\{\left\{y(x) \to c_2 \left(x^{1-a} + (a-1)c_1\right)^{\frac{a-1}{1-a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.915 (sec), leaf count = 27

```
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))
```

$$y(x) = -\frac{x^a(a-1)}{c_2\,(a-1)\,x^a - c_1 x}$$

ODE No. 1766

$$xy(x)y''(x) - 4xy'(x)^2 + 4y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.158832 (sec), leaf count = 21

```
DSolve[4*y[x]*Derivative[1][y][x] - 4*x*Derivative[1][y][x]^2 + x*y[x]*Derivative[2][y][x] ==
```

$$\left\{\left\{y(x) \to \frac{c_2 x}{\sqrt[3]{1+c_1 x^3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.919 (sec), leaf count = 64

```
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))
```

$$y(x) = \frac{x}{(-3x^3 c_2 + c_1)^{\frac{1}{3}}}$$

ODE No. 1767

$$\left(\frac{ax}{\sqrt{b^2-x^2}}-x\right)y'(x)^2+xy(x)y''(x)-y(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.301961 (sec), leaf count = 55

```
DSolve[-(y[x]*Derivative[1][y][x]) + (-x + (a*x)/Sqrt[b^2 - x^2])*Derivative[1][y][x]^2 + x*y
```

$$\left\{\left\{y(x)\to c_2\exp\left(\frac{\sqrt{b^2-x^2}}{a}+\frac{c_1\log\left(a\sqrt{b^2-x^2}-c_1\right)}{a^2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 2.059 (sec), leaf count = 50

```
dsolve(x*y(x)*diff(diff(y(x),x),x)+(a*x/(b^2-x^2)^(1/2)-x)*diff(y(x),x)^2-y(x)*diff(y(x),x)=0
```

$$y(x)=c_2\mathrm{e}^{\int-\frac{x\sqrt{b^2-x^2}}{c_1\sqrt{b^2-x^2}+a\left(b^2-x^2\right)}dx}$$

ODE No. 1768

$$x(y(x)+x)y''(x)+xy'(x)^2+(x-y(x))y'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.044719 (sec), leaf count = 53

```
DSolve[-y[x] + (x - y[x])*Derivative[1][y][x] + x*Derivative[1][y][x]^2 + x*(x + y[x])*Deriva
```

$$\left\{\left\{y(x)\to -x-\sqrt{x^2+2c_2x^2+c_1}\right\},\left\{y(x)\to -x+\sqrt{x^2+2c_2x^2+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.925 (sec), leaf count = 43

```
dsolve(x*(y(x)+x)*diff(diff(y(x),x),x)+x*diff(y(x),x)^2+(x-y(x))*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x)=-x-\sqrt{(-c_2+1)\,x^2+c_1}$$

ODE No. 1769

$$2xy(x)y''(x) - xy'(x)^2 + y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.149939 (sec), leaf count = 18

```
DSolve[y[x]*Derivative[1][y][x] - x*Derivative[1][y][x]^2 + 2*x*y[x]*Derivative[2][y][x] == 0
```

$$\{\{y(x) \to c_2\left(\sqrt{x} + c_1\right)^2\}\}$$

✓ **Maple** : cpu = 0.989 (sec), leaf count = 21

```
dsolve(2*x*y(x)*diff(diff(y(x),x),x)-x*diff(y(x),x)^2+y(x)*diff(y(x),x)=0,y(x))
```

$$y(x) = c_1\sqrt{x}\,c_2 + c_1^2 x + \frac{c_2^2}{4}$$

ODE No. 1770

$$x^2(y(x)-1)y''(x)-2x^2y'(x)^2-2x(y(x)-1)y'(x)-2(y(x)-1)^2y(x)=0$$

✓ **Mathematica** : cpu = 0.671995 (sec), leaf count = 28

```
DSolve[-2*(-1 + y[x])^2*y[x] - 2*x*(-1 + y[x])*Derivative[1][y][x] - 2*x^2*Derivative[1][y][x
```

$$\left\{\left\{y(x)\to 1+\frac{1}{x^2\left(-\frac{1}{x^2}-\frac{c_1}{x}+c_2\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.939 (sec), leaf count = 26

```
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
```

$$y(x)=\frac{x(c_1x-c_2)}{c_1x^2-xc_2-1}$$

ODE No. 1771

$$x^2(y(x)+x)y''(x)-(xy'(x)-y(x))^2=0$$

✓ **Mathematica** : cpu = 0.106334 (sec), leaf count = 21

```
DSolve[-(-y[x] + x*Derivative[1][y][x])^2 + x^2*(x + y[x])*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -x+c_2 x e^{\frac{c_1}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 1.038 (sec), leaf count = 22

```
dsolve(x^2*(y(x)+x)*diff(diff(y(x),x),x)-(x*diff(y(x),x)-y(x))^2=0,y(x))
```

$$y(x)=-\frac{x\left(-\mathrm{e}^{-1}\mathrm{e}^{\frac{c_2}{x}}+c_1\right)}{c_1}$$

ODE No. 1772

$$a(xy'(x)-y(x))^2+x^2(x-y(x))y''(x)=0$$

✓ **Mathematica** : cpu = 0.611169 (sec), leaf count = 37

```
DSolve[a*(-y[x] + x*Derivative[1][y][x])^2 + x^2*(x - y[x])*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to x\left(1+\left((a-1)\left(\frac{(-1)^{a+1}c_1}{x}-c_2\right)\right)^{\frac{1}{1-a}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.042 (sec), leaf count = 42

```
dsolve(x^2*(x-y(x))*diff(diff(y(x),x),x)+a*(x*diff(y(x),x)-y(x))^2=0,y(x))
```

$$y(x)=-\text{RootOf}\left(-c_2ax\_Z^a+c_1a\_Z^a+c_2x\_Z^a-c_1\_Z^a-\_Zx^a\right)+x$$

ODE No. 1773

$$2x^2y(x)y''(x) - \left(x^2\left(y'(x)^2+1\right)\right) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.377853 (sec), leaf count = 44

```
DSolve[y[x]^2 - x^2*(1 + Derivative[1][y][x]^2) + 2*x^2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{x\left({c_1}^2 \log^2(x) - 2c_2{c_1}^2 \log(x) + 4 + {c_2}^2{c_1}^2\right)}{4c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.916 (sec), leaf count = 30

```
dsolve(2*x^2*y(x)*diff(diff(y(x),x),x)-x^2*(diff(y(x),x)^2+1)+y(x)^2=0,y(x))
```

$$y(x) = \frac{x\left(4c_2^2 \ln(x)^2 + 4c_1 \ln(x) c_2 + c_1^2 + 1\right)}{4c_2}$$

ODE No. 1774

$$ax^2y(x)y''(x)+bx^2y'(x)^2+cxy(x)y'(x)+dy(x)^2=0$$

✓ **Mathematica** : cpu = 1.18864 (sec), leaf count = 92

```
DSolve[d*y[x]^2 + c*x*y[x]*Derivative[1][y][x] + b*x^2*Derivative[1][y][x]^2 + a*x^2*y[x]*Der
```

$$\left\{\left\{y(x)\to c_2\exp\left(-\frac{\log(x)\left(a\left(\sqrt{\frac{a^2-2a(c+2d)-4bd+c^2}{a^2}}-1\right)+c\right)-2a\log\left(x^{\sqrt{\frac{a^2-2a(c+2d)-4bd+c^2}{a^2}}}+c_1\right)}{2(a+b)}\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.184 (sec), leaf count = 136

```
dsolve(a*x^2*y(x)*diff(diff(y(x),x),x)+b*x^2*diff(y(x),x)^2+c*x*y(x)*diff(y(x),x)+d*y(x)^2=0,
```

$$y(x)=x^{-\frac{\sqrt{(-4a-4b)d+(a-c)^2}}{2b+2a}}x^{\frac{a}{2b+2a}}x^{-\frac{c}{2b+2a}}\left(\frac{a^2+(-2c-4d)a-4bd+c^2}{(a+b)^2\left(x^{\frac{\sqrt{(-4a-4b)d+(a-c)^2}}{a}}c_1-c_2\right)^2}\right)^{-\frac{a}{2b+2a}}$$

ODE No. 1775

$$-a(x+2)y(x)^2+x(x+1)^2y(x)y''(x)-x(x+1)^2y'(x)^2+2(x+1)^2y(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.165047 (sec), leaf count = 29

```
DSolve[-(a*(2 + x)*y[x]^2) + 2*(1 + x)^2*y[x]*Derivative[1][y][x] - x*(1 + x)^2*Derivative[1]
```

$$\left\{\left\{y(x)\to c_2 e^{a\log(x+1)+\frac{-a-c_1}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 1.096 (sec), leaf count = 31

```
dsolve(x*(1+x)^2*y(x)*diff(diff(y(x),x),x)-x*(1+x)^2*diff(y(x),x)^2+2*(1+x)^2*y(x)*diff(y(x),
```

$$y(x)=\frac{(1+x)^a\,\mathrm{e}^{-a}\mathrm{e}^{\frac{c_2}{x}}\,\mathrm{e}^{-\frac{a}{x}}}{c_1}$$

ODE No. 1776

$$8(1-x^3)\,y(x)y''(x)-4(1-x^3)\,y'(x)^2-12x^2y(x)y'(x)+3xy(x)^2=0$$

✓ **Mathematica** : cpu = 6.63326 (sec), leaf count = 1743

```
DSolve[3*x*y[x]^2 - 12*x^2*y[x]*Derivative[1][y][x] - 4*(1 - x^3)*Derivative[1][y][x]^2 + 8*(
```

$$\left\{\left\{y(x)\to e^{\int_1^x -\frac{2\left(-\frac{3(1-K[2])^{3/4}\sqrt[4]{K[2]^2+K[2]+1}\int_1^{K[2]}\frac{\sqrt{\sqrt{3}K[1]+\sqrt{2K[1]-i\sqrt{3}+1}\sqrt{2K[1]+i\sqrt{3}+1}+\sqrt{3}}}{2(1-K[1])^{3/2}\sqrt{K[1]^2+K[1]+1}}dK[1]K[2]^2}{2\sqrt{2}\left(K[2]^3-1\right)^{5/4}\sqrt[4]{\sqrt{3}K[2]+\sqrt{2K[2]-i\sqrt{3}+1}\sqrt{2K[2]+i\sqrt{3}+1}+\sqrt{3}}}+c_1\left(-\frac{3(1-\ldots}{2\sqrt{2}\left(K[2]^3-1\right)^{5/4}\sqrt[4]{\ldots}}\right.\right.}{\ldots}}\right.\right.$$

✓ **Maple** : cpu = 1.175 (sec), leaf count = 49

```
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
```

$$y(x)=\frac{\left(c_1\operatorname{LegendreQ}\left(-\frac{1}{6},\frac{1}{3},\sqrt{-(x-1)(x^2+x+1)}\right)+\frac{c_2\operatorname{LegendreP}\left(-\frac{1}{6},\frac{1}{3},\sqrt{-(x-1)(x^2+x+1)}\right)}{2}\right)^2 x}{c_1}$$

ODE No. 1777

$$\mathrm{f0}(x)y(x)y''(x)+\mathrm{f1}(x)y'(x)^2+\mathrm{f2}(x)y(x)y'(x)+\mathrm{f3}(x)y(x)^2=0$$

✗ **Mathematica** : cpu = 44.9543 (sec), leaf count = 0

```
DSolve[f3[x]*y[x]^2 + f2[x]*y[x]*Derivative[1][y][x] + f1[x]*Derivative[1][y][x]^2 + f0[x]*y[
```

, 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
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
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
```

, result contains DESol or ODESolStruc

$$y(x)=\left(\mathrm{e}^{\int \_b(\_a)d\_a+c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a)=-\frac{(f1(\_a)+f0(\_a))\,\_b(\_a)^2}{f0\,(\_a)}-\frac{f2(\_a)\,\_b(\_a)}{f0\,(\_a)}-\frac{f3(\_}{f0\,(}\right.\right.$$

ODE No. 1778

$$y(x)^2 y''(x) - a = 0$$

✓ **Mathematica** : cpu = 0.238176 (sec), leaf count = 65

```
DSolve[-a + y[x]^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\left(\frac{y(x)\sqrt{-\frac{2a}{y(x)}+c_1}}{c_1}+\frac{2a\tanh^{-1}\left(\frac{\sqrt{-\frac{2a}{y(x)}+c_1}}{\sqrt{c_1}}\right)}{{c_1}^{3/2}}\right)^2=(x+c_2)^2,y(x)\right]$$

✓ **Maple** : cpu = 1.525 (sec), leaf count = 245

```
dsolve(y(x)^2*diff(diff(y(x),x),x)-a=0,y(x))
```

$$y(x)=\frac{c_1\left(c_1 a+\mathrm{e}^{\text{RootOf}\left(\text{csgn}\left(\frac{1}{c_1}\right)c_1^4a^2-2\_Zc_1^3a\,\mathrm{e}^{-Z}-\text{csgn}\left(\frac{1}{c_1}\right)\mathrm{e}^{2\_Z}c_1^2-2\,\text{csgn}\left(\frac{1}{c_1}\right)\mathrm{e}^{-Z}c_2-2\,\text{csgn}\left(\frac{1}{c_1}\right)\mathrm{e}^{-Z}x\right)}\right)^2\mathrm{e}^{-\text{RootOf}\left(\text{csgn}\left(\frac{1}{c_1}\right.\right.}}{2}$$

ODE No. 1779

$$ax + y(x)^2 y''(x) + y(x) y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 22.351 (sec), leaf count = 0

```
DSolve[a*x + y[x]*Derivative[1][y][x]^2 + y[x]^2*Derivative[2][y][x] == 0,y[x],x]
```

, 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 = 1.525 (sec), leaf count = 117

```
dsolve(y(x)^2*diff(diff(y(x),x),x)+y(x)*diff(y(x),x)^2+a*x=0,y(x))
```

$$\ln(x) - \frac{\sqrt{3}\left(\int^{\frac{y(x)}{x}} \frac{3\_g^2\left(\frac{a}{\_g^3}\right)^{\frac{1}{3}} \tan\left(\text{RootOf}\left(-2\_Z\sqrt{3}+\ln\left(\frac{\tan^2(\_Z)+1}{\tan^2(\_Z)+2\sqrt{3}\tan(\_Z)+3}\right)+6c_1+6\left(\int \frac{\left(\frac{a}{\_g^3}\right)^{\frac{2}{3}}\_g^2}{\_g^3+a} d\_g\right)\right)\right)}{\_g^3+a}\right)}{6}$$

ODE No. 1780

$$-ax - b + y(x)^2 y''(x) + y(x)y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 20.3118 (sec), leaf count = 0

```
DSolve[-b - a*x + y[x]*Derivative[1][y][x]^2 + y[x]^2*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-b - a*x + y[x]*Derivative[1][y][x]^2 + y[x]^2*Derivative[2][y][x] == 0, y[x], x
```

✓ **Maple** : cpu = 1.566 (sec), leaf count = 161

```
dsolve(y(x)^2*diff(diff(y(x),x),x)+y(x)*diff(y(x),x)^2-a*x-b=0,y(x))
```

$$\frac{b\ln(ax+b)}{a}+\frac{\sqrt{3}\left(\int^{\frac{y(x)}{ax+b}}\frac{-3b^2\_g^2\left(-\frac{a}{\_g^3b^3}\right)^{\frac{1}{3}}\tan\left(\text{RootOf}\left(6b^2\left(\int\frac{\left(-\frac{a}{\_g^3b^3}\right)^{\frac{2}{3}}\_g^2}{\_g^3a^2-1}d\_g\right)-2\_Z\sqrt{3}+\ln\left(\frac{\tan^2\left(\_Z\right)}{\tan^2\left(\_Z\right)+2\sqrt{3}\,\text{ta}}\right.\right.\right.}{\_g^3a^2-1}\right.}{6}$$

ODE No. 1781

$$\left(y(x)^2+1\right)y''(x)+(1-2y(x))y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.218294 (sec), leaf count = 46

```
DSolve[(1 - 2*y[x])*Derivative[1][y][x]^2 + (1 + y[x]^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{i(1-{c_1}^{2i}(x+c_2)^{2i})}{1+{c_1}^{2i}(x+c_2)^{2i}}\right\}\right\}$$

✓ **Maple** : cpu = 0.903 (sec), leaf count = 11

```
dsolve((y(x)^2+1)*diff(diff(y(x),x),x)+(1-2*y(x))*diff(y(x),x)^2=0,y(x))
```

$$y(x)=\tan\left(\ln\left(c_1x+c_2\right)\right)$$

ODE No. 1782

$$\left(y(x)^2+1\right)y''(x)-3y(x)y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.185829 (sec), leaf count = 93

```
DSolve[-3*y[x]*Derivative[1][y][x]^2 + (1 + y[x]^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{ic_1(x+c_2)}{\sqrt{{c_1}^2x^2+2c_2{c_1}^2x-1+{c_2}^2{c_1}^2}}\right\},\left\{y(x)\to \frac{ic_1(x+c_2)}{\sqrt{{c_1}^2x^2+2c_2{c_1}^2x-1+{c_2}^2{c_1}^2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.956 (sec), leaf count = 33

```
dsolve((y(x)^2+1)*diff(diff(y(x),x),x)-3*y(x)*diff(y(x),x)^2=0,y(x))
```

$$y(x)=\sqrt{-\frac{1}{x^2c_1^2+2xc_1c_2+c_2^2-1}}\left(c_1x+c_2\right)$$

ODE No. 1783

$$\left(y(x)^2+x\right)y''(x)-2\left(x-y(x)^2\right)y'(x)^3+\left(4y(x)y'(x)+1\right)y'(x)=0$$

✓ **Mathematica** : cpu = 1.09975 (sec), leaf count = 26

```
DSolve[-2*(x - y[x]^2)*Derivative[1][y][x]^3 + Derivative[1][y][x]*(1 + 4*y[x]*Derivative[1][
```

$$\text{Solve}\left[x=-y(x)^2+c_2e^{e^{-c_1}y(x)},y(x)\right]$$

✓ **Maple** : cpu = 1.031 (sec), leaf count = 23

```
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)*dif
```

$$\frac{-c_1y(x)+\ln\left(x+y(x)^2\right)+c_2+2}{y\left(x\right)}=0$$

ODE No. 1784

$$\left(x^2+y(x)^2\right)y''(x)+\left(y(x)-xy'(x)\right)\left(y'(x)^2+1\right)=0$$

✓ **Mathematica** : cpu = 0.294842 (sec), leaf count = 74

```
DSolve[(y[x] - x*Derivative[1][y][x])*(1 + Derivative[1][y][x]^2) + (x^2 + y[x]^2)*Derivative
```

$$\text{Solve}\left[\frac{1}{2}\left(\log\left(1-\frac{iy(x)}{x}\right)+\log\left(1+\frac{iy(x)}{x}\right)+i\cot(c_1)\left(\log\left(1-\frac{iy(x)}{x}\right)-\log\left(1+\frac{iy(x)}{x}\right)\right)\right)=-\log\right.$$

✓ **Maple** : cpu = 1.488 (sec), leaf count = 82

```
dsolve((y(x)^2+x^2)*diff(diff(y(x),x),x)-(diff(y(x),x)^2+1)*(x*diff(y(x),x)-y(x))=0,y(x))
```

$$y(x)=\tan\left(\text{RootOf}\left(-\mathrm{e}^{\frac{2ic_1\_Z}{-1+c_1}}\mathrm{e}^{\frac{2c_1c_2}{-1+c_1}}x^{\frac{2c_1}{-1+c_1}}\mathrm{e}^{\frac{2i\_Z}{-1+c_1}}+\left(\cos^2(\_Z)\right)\mathrm{e}^{\frac{2c_2}{-1+c_1}}x^{\frac{2}{-1+c_1}}\right)\right)x$$

ODE No. 1785

$$\left(x^2+y(x)^2\right)y''(x)-2(xy'(x)-y(x))\left(y'(x)^2+1\right)=0$$

✓ **Mathematica** : cpu = 0.359683 (sec), leaf count = 95

```
DSolve[-2*(-y[x] + x*Derivative[1][y][x])*(1 + Derivative[1][y][x]^2) + (x^2 + y[x]^2)*Deriva
```

$$\left\{\left\{y(x)\to \frac{1}{2}\left(-\sqrt{4x\left(-x+e^{c_2}\right)+e^{2c_2}\cot^2(c_1)}-e^{c_2}\cot(c_1)\right)\right\},\left\{y(x)\to \frac{1}{2}\left(\sqrt{4x\left(-x+e^{c_2}\right)+e^{2c_2}\cot^2(\right.\right.$$

✓ **Maple** : cpu = 1.275 (sec), leaf count = 83

```
dsolve((y(x)^2+x^2)*diff(diff(y(x),x),x)-2*(diff(y(x),x)^2+1)*(x*diff(y(x),x)-y(x))=0,y(x))
```

$$y(x)=\frac{c_1-\sqrt{c_1^2+\left(4ic_2x+2\right)c_1-4c_2^2x^2-4ic_2x+1}+1}{2c_2}$$

ODE No. 1786

$$f(x)(1-y(x))y(x)y'(x)+2(1-y(x))y(x)y''(x)-\left((1-2y(x))y'(x)^2\right)=0$$

✓ **Mathematica** : cpu = 0.062119 (sec), leaf count = 53

```
DSolve[f[x]*(1 - y[x])*y[x]*Derivative[1][y][x] - (1 - 2*y[x])*Derivative[1][y][x]^2 + 2*(1 -
```

$$\left\{\left\{y(x)\to 1-\sin^2\left(\frac{1}{2}\left(-\int_1^x-\exp\left(-\int_1^{K[3]}\frac{1}{2}f(K[1])dK[1]\right)c_1dK[3]-c_2\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.166 (sec), leaf count = 42

```
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)
```

$$y(x)=\frac{\left(2\,\mathrm{e}^{c_1\left(\int \mathrm{e}^{-\frac{\left(\int f(x)dx\right)}{2}}dx\right)}c_2+1\right)^2\mathrm{e}^{\int -c_1\mathrm{e}^{\int -\frac{f(x)}{2}dx}dx}}{8c_2}$$

ODE No. 1787

$$h(y(x)) + 2(1 - y(x))y(x)y''(x) - \left((1 - 3y(x))y'(x)^2\right) = 0$$

✓ **Mathematica** : cpu = 0.84575 (sec), leaf count = 170

```
DSolve[h[y[x]] - (1 - 3*y[x])*Derivative[1][y][x]^2 + 2*(1 - y[x])*y[x]*Derivative[2][y][x] =
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} -\frac{1}{(K[2]-1)\sqrt{K[2]}\sqrt{c_1 + 2\int_1^{K[2]} \frac{e^{-2\left(\log(1-K[1])+\frac{1}{2}\log(K[1])\right)} h(K[1])}{2(K[1]-1)K[1]} dK[1]}} dK[2\right.\right.$$

✓ **Maple** : cpu = 0.263 (sec), leaf count = 80

```
dsolve(2*y(x)*(1-y(x))*diff(diff(y(x),x),x)-(1-3*y(x))*diff(y(x),x)^2+h(y(x))=0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{\_b\left(c_1 + \int \frac{h(\_b)}{(\_b-1)^3 \_b^2} d\_b\right)(\_b-1)}} d\_b - x - c_2 = 0$$

ODE No. 1788

$$-4(1-y(x))y(x)^2\left(-f'(x)-f(x)^2-g'(x)+g(x)^2\right)+4y(x)y'(x)(f(x)y(x)+g(x))-2(1-y(x))y(x)y''(x)+(1$$

✗ **Mathematica** : cpu = 1.2117 (sec), leaf count = 0

```
DSolve[-4*(1 - y[x])*y[x]^2*(-f[x]^2 + g[x]^2 - Derivative[1][f][x] - Derivative[1][g][x]) +
```

, could not solve

```
DSolve[-4*(1 - y[x])*y[x]^2*(-f[x]^2 + g[x]^2 - Derivative[1][f][x] - Derivative[1][g][
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*y(x)*(-1+y(x))*diff(diff(y(x),x),x)-(3*y(x)-1)*diff(y(x),x)^2+4*y(x)*diff(y(x),x)*(f
```

, result contains DESol or ODESolStruc

$$\sqrt{y(x)}-\frac{2\left(\frac{\partial}{\partial x}DESol\left(\left\{-\frac{e^{2\left(\int g(x)dx\right)-2\left(\int f(x)dx\right)}c_1^2\_Y(x)}{4}-2g(x)\left(\frac{d}{dx}\_Y(x)\right)+\frac{d^2}{dx^2}\_Y(x)\right\},\{\_Y(x)\}\right)\right)e^{\int(f(x)-g}}{DESol\left(\left\{-\frac{e^{2\left(\int g(x)dx\right)-2\left(\int f(x)dx\right)}c_1^2\_Y(x)}{4}-2g(x)\left(\frac{d}{dx}\_Y(x)\right)+\frac{d^2}{dx^2}\_Y(x)\right\},\{\_Y(x)\}\right)c_1}$$

ODE No. 1789

$4y(x)^2(1-y(x))\left(-f'(x)+f(x)^2-g'(x)-g(x)^2\right)-4y(x)y'(x)(f(x)y(x)+g(x))+(1-y(x))^3\left(\text{f0}(x)^2y(x)^2-\right.$

✗ **Mathematica** : cpu = 2.99821 (sec), leaf count = 0

```
DSolve[(1 - y[x])^3*(-f1[x]^2 + f0[x]^2*y[x]^2) + 4*(1 - y[x])*y[x]^2*(f[x]^2 - g[x]^2 - Deri
```

, could not solve

```
DSolve[(1 - y[x])^3*(-f1[x]^2 + f0[x]^2*y[x]^2) + 4*(1 - y[x])*y[x]^2*(f[x]^2 - g[x]^2
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
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)*diff(y(x),x)*(f
```

, 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)*diff(y(x)
y(x))^3*(f0(x)^2*y(x)^2-f1(x)^2)+4*y(x)^2*(1-y(x))*(f(x)^2-g(x)^2-diff(g(x),x)-
diff(f(x),x))=0,y(x))
```

ODE No. 1790

$$-h(y(x))+3(1-y(x))y(x)y''(x)-2(1-2y(x))y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.592316 (sec), leaf count = 186

```
DSolve[-h[y[x]] - 2*(1 - 2*y[x])*Derivative[1][y][x]^2 + 3*(1 - y[x])*y[x]*Derivative[2][y][x
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1} -\frac{1}{(1-K[2])^{2/3}K[2]^{2/3}\sqrt{c_1+2\int_1^{K[2]} -\frac{\exp\left(-2\left(\frac{2}{3}\log(1-K[1])+\frac{2}{3}\log(K[1])\right)\right)h(K[1]}{3(K[1]-1)K[1]}}}\right.\right.$$

✓ **Maple** : cpu = 0.253 (sec), leaf count = 119

```
dsolve(3*y(x)*(1-y(x))*diff(diff(y(x),x),x)-2*(1-2*y(x))*diff(y(x),x)^2-h(y(x))=0,y(x))
```

$$\int^{y(x)} -\frac{\sqrt{9}}{3\sqrt{(\_b-1)\left(c_1-\frac{2\left(\int \frac{h(\_b)}{\left(\_b^2-\_b\right)^{\frac{4}{3}}\_b(\_b-1)}d\_b\right)}{3}\right)\_b\left(\_b(\_b-1)\right)^{\frac{1}{3}}}}d\_b-x-c_2=0$$

ODE No. 1791

$$-h(y(x)) + (1 - y(x))y''(x) - 3(1 - 2y(x))y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.681475 (sec), leaf count = 168

```
DSolve[-h[y[x]] - 3*(1 - 2*y[x])*Derivative[1][y][x]^2 + (1 - y[x])*Derivative[2][y][x] == 0,
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} -\frac{e^{\frac{1}{2}(12-12K[2])}}{(K[2]-1)^3\sqrt{c_1 + 2\int_1^{K[2]} -\frac{\exp(-2(6(K[1]-1)+3\log(K[1]-1)))h(K[1])}{K[1]-1}dK[1]}}dK\right.\right.$$

✓ **Maple** : cpu = 0.289 (sec), leaf count = 90

```
dsolve((1-y(x))*diff(diff(y(x),x),x)-3*(1-2*y(x))*diff(y(x),x)^2-h(y(x))=0,y(x))
```

$$\int^{y(x)} \frac{\mathrm{e}^{-6\_b}}{\sqrt{-2\left(\int \frac{\mathrm{e}^{-12\_b} h(\_b)}{(\_b-1)^7} d\_b\right) + c_1\,(\_b-1)^3}} d\_b - x - c_2 = 0$$

ODE No. 1792

$$a(y(x)-1)y(x)y''(x)+y'(x)^2(by(x)+c)+h(y(x))=0$$

✓ **Mathematica** : cpu = 0.992295 (sec), leaf count = 226

```
DSolve[h[y[x]] + (c + b*y[x])*Derivative[1][y][x]^2 + a*(-1 + y[x])*y[x]*Derivative[2][y][x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1} -\frac{(1-K[2])^{\frac{1}{2}\left(\frac{2b}{a}+\frac{2c}{a}\right)}K[2]^{-\frac{c}{a}}}{\sqrt{c_1+2\int_1^{K[2]} -\frac{\exp\left(-\frac{2(c\log(K[1])-(b+c)\log(1-K[1]))}{a}\right)h(K[1])}{a(K[1]-1)K[1]}dK[1]}}dK[2]\&\right][x-\right.\right.$$

✓ **Maple** : cpu = 0.415 (sec), leaf count = 194

```
dsolve(a*y(x)*(-1+y(x))*diff(diff(y(x),x),x)+(b*y(x)+c)*diff(y(x),x)^2+h(y(x))=0,y(x))
```

$$\int^{y(x)} \frac{a\_b^{-\frac{c}{a}}(\_b-1)^{-\frac{-b-c}{a}}}{\sqrt{a\left(c_1 a-2\left(\int \frac{\_b^{-\frac{2c}{a}}(\_b-1)^{\frac{2b}{a}}(\_b-1)^{\frac{2c}{a}}h(\_b)}{\_b(\_b-1)}d\_b\right)\right)}}d\_b-x-c_2=0$$

ODE No. 1793

$$a(y(x)-1)y(x)y''(x)-\left((a-1)(2y(x)-1)y'(x)^2\right)+f(x)(y(x)-1)y(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.123336 (sec), leaf count = 83

```
DSolve[f[x]*(-1 + y[x])*y[x]*Derivative[1][y][x] - (-1 + a)*(-1 + 2*y[x])*Derivative[1][y][x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[a\#1^{-1/a}(-((\#1-1)\#1))^{\frac{1}{a}}\,{}_2F_1\left(\frac{1}{a},\frac{a-1}{a};1+\frac{1}{a};1-\#1\right)\&\right]\left[\int_1^x \exp\left(-\int\right.\right.\right.$$

✓ **Maple** : cpu = 0.071 (sec), leaf count = 40

```
dsolve(a*y(x)*(-1+y(x))*diff(diff(y(x),x),x)-(a-1)*(2*y(x)-1)*diff(y(x),x)^2+f*y(x)*(-1+y(x))
```

$$c_1 e^{-\frac{fx}{a}}-c_2+\int^{y(x)}\frac{(\_a(\_a-1))^{\frac{1}{a}}}{\_a(\_a-1)}d\_a=0$$

ODE No. 1794

$$ab(y(x)-1)y(x)y''(x)-\left(y'(x)^2((2ab-a-b)y(x)+(1-a)b)\right)+f(x)(y(x)-1)y(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.141123 (sec), leaf count = 69

```
DSolve[f[x]*(-1 + y[x])*y[x]*Derivative[1][y][x] - ((1 - a)*b + (-a - b + 2*a*b)*y[x])*Deriva
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-a\#1^{\frac{1}{a}}\,{}_2F_1\left(\frac{1}{a},1-\frac{1}{b};1+\frac{1}{a};\#1\right)\&\right]\left[\int_1^x \exp\left(-\int_1^{K[3]}\frac{f(K[1])}{ab}dK[1]\right)c_1 a\right.\right.$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 46

```
dsolve(a*b*y(x)*(-1+y(x))*diff(diff(y(x),x),x)-((2*a*b-a-b)*y(x)+(1-a)*b)*diff(y(x),x)^2+f*y(
```

$$c_1 \mathrm{e}^{-\frac{fx}{ba}}-c_2+\int^{y(x)}\frac{\_a^{\frac{1}{a}}(\_a-1)^{\frac{1}{b}}}{\_a(\_a-1)}d\_a=0$$

ODE No. 1795

$$xy(x)^2y''(x) - a = 0$$

✓ **Mathematica** : cpu = 0.284857 (sec), leaf count = 116

```
DSolve[-a + x*y[x]^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[-\frac{\sqrt{-\frac{2ay(x)}{x} - \frac{2c_1 y(x)^2}{x^2}}}{2c_1} - \frac{a\tan^{-1}\left(\frac{\sqrt{2}\sqrt{c_1}\left(\frac{y(x)}{x}+\frac{a}{2c_1}\right)}{\sqrt{-\frac{2ay(x)}{x}-\frac{2c_1 y(x)^2}{x^2}}}\right)}{2\sqrt{2}{c_1}^{3/2}} - \frac{1}{x} - c_2 = 0, y(x)\right]$$

✓ **Maple** : cpu = 1.511 (sec), leaf count = 529

```
dsolve(x*y(x)^2*diff(diff(y(x),x),x)-a=0,y(x))
```

$$y(x) = \frac{\left(9c_1 a + \mathrm{e}^{\text{RootOf}\left(243\,\text{csgn}\left(\frac{1}{c_1}\right)c_1^4 a^2 x - 54\_Z\mathrm{e}^{-Z}axc_1^3 - 3\,\mathrm{e}^{2-Z}\text{csgn}\left(\frac{1}{c_1}\right)c_1^2 x - 6\,\mathrm{e}^{-Z}\text{csgn}\left(\frac{1}{c_1}\right)c_2 x - 2\,\mathrm{e}^{-Z}\text{csgn}\left(\frac{1}{c_1}\right)\right)}\right)^2 xc_1\mathrm{e}^{-\text{Roo}}}{2}$$

ODE No. 1796

$$\left(a^2-x^2\right)\left(a^2-y(x)^2\right)y''(x)+\left(a^2-x^2\right)y(x)y'(x)^2-x\left(a^2-y(x)^2\right)y'(x)=0$$

✓ **Mathematica** : cpu = 0.250782 (sec), leaf count = 363

```
DSolve[-(x*(a^2 - y[x]^2)*Derivative[1][y][x]) + (a^2 - x^2)*y[x]*Derivative[1][y][x]^2 + (a^
```

$$\left\{\left\{y(x)\to -\frac{1}{2}e^{-c_2}\left(1-\frac{x}{\sqrt{x^2-a^2}}\right)^{-\frac{c_1}{2}}\left(\frac{x}{\sqrt{x^2-a^2}}+1\right)^{-\frac{c_1}{2}}\sqrt{2a^2e^{2c_2}\left(1-\frac{x}{\sqrt{x^2-a^2}}\right)^{c_1}\left(\frac{x}{\sqrt{x^2-a^2}}+1\right.}\right.\right.$$

✓ **Maple** : cpu = 0.209 (sec), leaf count = 51

```
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)^
```

$$y(x)=\frac{\left(\left(x+\sqrt{-a^2+x^2}\right)^{2c_1}c_2^2+a^2\right)\left(x+\sqrt{-a^2+x^2}\right)^{-c_1}}{2c_2}$$

ODE No. 1797

$$(y(x)-1)^3\left(ay(x)^2+b\right)+cxy(x)^2(y(x)-1)+dx^2y(x)^2(y(x)+1)+2x^2y(x)(y(x)-1)y''(x)-x^2(3y(x)-1)y'(x)^2$$

✗ **Mathematica** : cpu = 11.2645 (sec), leaf count = 0

```
DSolve[c*x*(-1 + y[x])*y[x]^2 + d*x^2*y[x]^2*(1 + y[x]) + (-1 + y[x])^3*(b + a*y[x]^2) + 2*x*
```

, could not solve

```
DSolve[c*x*(-1 + y[x])*y[x]^2 + d*x^2*y[x]^2*(1 + y[x]) + (-1 + y[x])^3*(b + a*y[x]^2)
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** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*x^2*y(x)*(-1+y(x))*diff(diff(y(x),x),x)-x^2*(3*y(x)-1)*diff(y(x),x)^2+2*x*y(x)*(-1+y
```

, could not solve

```
dsolve(2*x^2*y(x)*(-1+y(x))*diff(diff(y(x),x),x)-x^2*(3*y(x)-1)*diff(y(x),x)^2+2*x*y(x)
1+y(x))*diff(y(x),x)+(a*y(x)^2+b)*(-1+y(x))^3+c*x*y(x)^2*(-1+y(x))+d*x^2*y(x)^2*(1+y(x)
```

ODE No. 1798

$$x^3 y(x)^2 y''(x) + (y(x) + x)\left(x y'(x) - y(x)\right)^3 = 0$$

✓ **Mathematica** : cpu = 35.2336 (sec), leaf count = 248

```
DSolve[(x + y[x])*(-y[x] + x*Derivative[1][y][x])^3 + x^3*y[x]^2*Derivative[2][y][x] == 0,y[x
```

$$\text{Solve}\left[-\int_1^{\frac{y(x)}{x}} \frac{i\sqrt{3}\sqrt{K[2]}J_{i\sqrt{3}}\left(2\sqrt{K[2]}\right) + \sqrt{K[2]}J_{i\sqrt{3}}\left(2\sqrt{K[2]}\right) - 2J_{1+i\sqrt{3}}\left(2\sqrt{K[2]}\right)K[2] - 2Y_{1+i\sqrt{3}}\left(2\right.}{\left(J_{i\sqrt{3}}\left(2\sqrt{K[2]}\right) + Y_{i\sqrt{3}}\left(2\sqrt{K\right.}\right.}\right.$$

✓ **Maple** : cpu = 0.21 (sec), leaf count = 166

```
dsolve(x^3*y(x)^2*diff(diff(y(x),x),x)+(y(x)+x)*(x*diff(y(x),x)-y(x))^3=0,y(x))
```

$$y(x) = \text{RootOf}\left(-2\ln(x) - \left(\int^{-Z} \frac{i\sqrt{3}\ \text{BesselY}\left(i\sqrt{3}, 2\sqrt{\_f}\right)c_1\sqrt{\_f} + i\sqrt{3}\ \text{BesselJ}\left(i\sqrt{3}, 2\sqrt{\_f}\right)\sqrt{\_f} + \right.\right.$$

ODE No. 1799

$$y(x)^3 y''(x) - a = 0$$

✓ **Mathematica** : cpu = 1.48374 (sec), leaf count = 88

```
DSolve[-a + y[x]^3*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{a + {c_1}^2 x^2 + 2 {c_2} {c_1}^2 x + {c_2}^2 {c_1}^2}}{\sqrt{c_1}}\right\}, \left\{y(x) \to \frac{\sqrt{a + {c_1}^2 x^2 + 2 {c_2} {c_1}^2 x + {c_2}^2 {c_1}^2}}{\sqrt{c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.298 (sec), leaf count = 46

```
dsolve(y(x)^3*diff(diff(y(x),x),x)-a=0,y(x))
```

$$y(x) = \frac{\sqrt{\left((x + c_2)^2 c_1^2 + a\right) c_1}}{c_1}$$

ODE No. 1800

$$y(x)\left(y(x)^2+1\right)y''(x)+\left(1-3y(x)^2\right)y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.518905 (sec), leaf count = 84

```
DSolve[(1 - 3*y[x]^2)*Derivative[1][y][x]^2 + y[x]*(1 + y[x]^2)*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{-2c_1x-1-2c_2c_1}}{\sqrt{2}\sqrt{c_1x+c_2c_1}}\right\},\left\{y(x)\to \frac{\sqrt{-2c_1x-1-2c_2c_1}}{\sqrt{2}\sqrt{c_1x+c_2c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.052 (sec), leaf count = 60

```
dsolve(y(x)*(y(x)^2+1)*diff(diff(y(x),x),x)+(1-3*y(x)^2)*diff(y(x),x)^2=0,y(x))
```

$$y(x)=-\frac{\sqrt{-4\left(c_1x+c_2+\frac{1}{2}\right)\left(c_1x+c_2\right)}}{2c_1x+2c_2}$$

ODE No. 1801

$$-a^2xy(x)^2+2y(x)^3y''(x)+y(x)^4-1=0$$

✗ **Mathematica** : cpu = 5.69583 (sec), leaf count = 0

```
DSolve[-1 - a^2*x*y[x]^2 + y[x]^4 + 2*y[x]^3*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-1 - a^2*x*y[x]^2 + y[x]^4 + 2*y[x]^3*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*y(x)^3*diff(diff(y(x),x),x)+y(x)^4-a^2*x*y(x)^2-1=0,y(x))
```

, could not solve

```
dsolve(2*y(x)^3*diff(diff(y(x),x),x)+y(x)^4-a^2*x*y(x)^2-1=0,y(x))
```

ODE No. 1802

$$-ax^2 - bx - c + 2y(x)^3 y''(x) + y(x)^2 y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 0.279093 (sec), leaf count = 0

```
DSolve[-c - b*x - a*x^2 + y[x]^2*Derivative[1][y][x]^2 + 2*y[x]^3*Derivative[2][y][x] == 0,y[
```

, could not solve

```
DSolve[-c - b*x - a*x^2 + y[x]^2*Derivative[1][y][x]^2 + 2*y[x]^3*Derivative[2][y][x] =
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*y(x)^3*diff(diff(y(x),x),x)+y(x)^2*diff(y(x),x)^2-a*x^2-b*x-c=0,y(x))
```

, could not solve

```
dsolve(2*y(x)^3*diff(diff(y(x),x),x)+y(x)^2*diff(y(x),x)^2-a*x^2-b*x-c=0,y(x))
```

ODE No. 1803

$$-\text{a0}(a-y(x))^2(b-y(x))^2(c-y(x))^2-\text{a2}(a-y(x))^2(c-y(x))^2-\text{a3}(a-y(x))^2(b-y(x))^2+2(a-y(x))(b-y(x))(c$$

✓ **Mathematica** : cpu = 20.1451 (sec), leaf count = 10387

```
DSolve[-(a3*(a - y[x])^2*(b - y[x])^2) - a2*(a - y[x])^2*(c - y[x])^2 - a1*(b - y[x])^2*(c -
```

$$\left\{\text{Solve}\left[-\frac{2F\left(\sin^{-1}\left(\sqrt{\frac{(\text{Root}\left[\text{a0}\#1^4+(-a\text{a0}-b\text{a0}-c\text{a0}-c_1)\#1^3+(-\text{a1}-\text{a2}-\text{a3}+a\text{a0}b+a\text{a0}c+\text{a0}bc+ac_1+bc_1+cc_1)\#1^2+\right.\right.\right.}{(\text{Root}\left[\text{a0}\#1^4+(-a\text{a0}-b\text{a0}-c\text{a0}-c_1)\#1^3+(-\text{a1}-\text{a2}-\text{a3}+a\text{a0}b+a\text{a0}c+\text{a0}bc+ac_1+bc_1+cc_1)\#1^2+\right.}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 1.624 (sec), leaf count = 115620

```
dsolve(2*(c-y(x))*(-y(x)+b)*(-y(x)+a)*diff(diff(y(x),x),x)+((-y(x)+a)*(-y(x)+b)+(c-y(x))*(-y(
```

Too large to display

ODE No. 1804

$$y''(x)\left(-ay(x)-b+4y(x)^3\right)+\left(\frac{a}{2}-6y(x)^2\right)y'(x)^2=0$$

✓ **Mathematica** : cpu = 2.53847 (sec), leaf count = 415

```
DSolve[(a/2 - 6*y[x]^2)*Derivative[1][y][x]^2 + (-b - a*y[x] + 4*y[x]^3)*Derivative[2][y][x]
```

$$\text{Solve}\left[\frac{2\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}}\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,2\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]-\text{Root}\left[4\#1^3-\#1a-b\&,2\right]}}\left(y(x\right.}{c_1\sqrt{2ay(x)+2}}\right.$$

✓ **Maple** : cpu = 0.038 (sec), leaf count = 31

```
dsolve((4*y(x)^3-a*y(x)-b)*diff(diff(y(x),x),x)-(6*y(x)^2-1/2*a)*diff(y(x),x)^2=0,y(x))
```

$$\int^{y(x)}\frac{1}{\sqrt{4\_a^3-a\_a-b}}d\_a-c_1x-c_2=0$$

ODE No. 1805

$$\left(-ay(x)-b+4y(x)^3\right)\left(f(x)y'(x)+y''(x)\right)+\left(\frac{a}{2}-6y(x)^2\right)y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.393584 (sec), leaf count = 438

```
DSolve[(a/2 - 6*y[x]^2)*Derivative[1][y][x]^2 + (-b - a*y[x] + 4*y[x]^3)*(f[x]*Derivative[1][
```

$$\text{Solve}\left[\frac{2\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}}\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,2\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]-\text{Root}\left[4\#1^3-\#1a-b\&,2\right]}}\left(y(x\right.}{\sqrt{ay(x)+b-}}\right.$$

✓ **Maple** : cpu = 0.055 (sec), leaf count = 34

```
dsolve((4*y(x)^3-a*y(x)-b)*(diff(diff(y(x),x),x)+f*diff(y(x),x))-(6*y(x)^2-1/2*a)*diff(y(x),x
```

$$c_1\mathrm{e}^{-fx}-c_2+\int^{y(x)}\frac{1}{\sqrt{4\_a^3-a\_a-b}}d\_a=0$$

ODE No. 1806

$$-f(x)((y(x)-1)y(x)(y(x)-x))^{3/2}+2(1-y(x))\left(x^2-2xy(x)+y(x)\right)y(x)y'(x)-2(1-x)x(1-y(x))(x-y(x))$$

✗ **Mathematica** : cpu = 14.0072 (sec), leaf count = 0

```
DSolve[-((1 - y[x])^2*y[x]^2) - f[x]*((-1 + y[x])*y[x]*(-x + y[x]))^(3/2) + 2*(1 - y[x])*y[x]
```

, could not solve

```
DSolve[-((1 - y[x])^2*y[x]^2) - f[x]*((-1 + y[x])*y[x]*(-x + y[x]))^(3/2) + 2*(1 - y[x]
```

✓ **Maple** : cpu = 2.529 (sec), leaf count = 733

```
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(
```

$$-\frac{c_1\left(\int \frac{e^{\int \frac{\text{EllipticE}(\sqrt{x})}{x(x-1)\,\text{EllipticK}(\sqrt{x})}dx}\left(\int \frac{\left(\int \frac{\sqrt{-y(y-1)(x-y)}}{y(y-1)(x-y)^2}dy\right)e^{-\frac{\left(\int \frac{\text{EllipticE}(\sqrt{x})}{x(x-1)\,\text{EllipticK}(\sqrt{x})}dx\right)}{2}}}{\sqrt{x}}dx\right)}{x-1}dx\Big|_{\{y=y(x)\}}\right)}{2}+c_1\left(\int e^{\int \frac{\text{EllipticE}(\sqrt{x}}{x(x-1)\,\text{EllipticK}}\right.$$

ODE No. 1807

$a(1-y(x))^2(x-y(x))^2y(x)^2+bx(1-y(x))^2(x-y(x))^2-c(1-x)(x-y(x))^2y(x)^2-d(1-x)x(1-y(x))^2y(x)^2+2($

✗ **Mathematica** : cpu = 22.0235 (sec), leaf count = 0

```
DSolve[b*x*(1 - y[x])^2*(x - y[x])^2 - d*(1 - x)*x*(1 - y[x])^2*y[x]^2 - c*(1 - x)*(x - y[x])
```

, could not solve

```
DSolve[b*x*(1 - y[x])^2*(x - y[x])^2 - d*(1 - x)*x*(1 - y[x])^2*y[x]^2 - c*(1 - x)*(x -
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
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(
```

, could not solve

```
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))*(x^2+y(x)-2*x*y(x))*di
y(x))^2*(x-y(x))^2-c*(1-x)*y(x)^2*(x-y(x))^2-d*x*y(x)^2*(1-x)*(1-y(x))^2+a*y(x)^2*(x-
y(x))^2*(1-y(x))^2=0,y(x))
```

ODE No. 1808

$$b\sqrt{(1-y(x)^2)\left(1-a^2y(x)^2\right)}y'(x)^2+\left(y(x)^2-1\right)\left(a^2y(x)^2-1\right)y''(x)+y(x)\left(-2a^2y(x)^2+a^2+1\right)y'(x)^2=0$$

✓ **Mathematica** : cpu = 1.01734 (sec), leaf count = 124

```
DSolve[y[x]*(1 + a^2 - 2*a^2*y[x]^2)*Derivative[1][y][x]^2 + b*Sqrt[(1 - y[x]^2)*(1 - a^2*y[x
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}\frac{\exp\left(\frac{b\sqrt{1-K[1]^2}\sqrt{1-a^2K[1]^2}F\left(\sin^{-1}(K[1])|a^2\right)}{\sqrt{(K[1]^2-1)(a^2K[1]^2-1)}}+\frac{1}{2}(-\log(1-K[1])-\log(K[1]\right.\right.\right.}{c_1}$$

✓ **Maple** : cpu = 0.123 (sec), leaf count = 72

```
dsolve((y(x)^2-1)*(a^2*y(x)^2-1)*diff(diff(y(x),x),x)+b*((1-y(x)^2)*(1-a^2*y(x)^2))^(1/2)*dif
```

$$\int^{y(x)} \mathrm{e}^{\int \frac{-2\_b^3a^2+\_b\,a^2+b\sqrt{\left(\_b^2-1\right)\left(\_b^2a^2-1\right)}+\_b}{\left(\_b^2-1\right)\left(\_b^2a^2-1\right)}d\_b}d\_b-c_1x-c_2=0$$

ODE No. 1809

$$y''(x)\left(ax^2+2bx+c+y(x)^2\right)^2+dy(x)=0$$

✓ **Mathematica** : cpu = 19.8382 (sec), leaf count = 260

```
DSolve[d*y[x] + (c + 2*b*x + a*x^2 + y[x]^2)^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\text{Solve}\left[a\tan^{-1}\left(\frac{ax+b}{\sqrt{ac-b^2}}\right)+\sqrt{ac-b^2}\int_1^{\frac{y(x)}{\sqrt{c+x(2b+ax)}}}\frac{a(K[2]^2+1)}{\sqrt{(K[2]^2+1)\left(d+(K[2]^2+1)\left(c_1a^2+(b^2-ac)K[2\right.\right.\right.$$

✓ **Maple** : cpu = 0.419 (sec), leaf count = 336

```
dsolve((c+2*b*x+a*x^2+y(x)^2)^2*diff(diff(y(x),x),x)+d*y(x)=0,y(x))
```

$$y(x)=\text{RootOf}\left(-a\arctan\left(\frac{ax+b}{\sqrt{ca-b^2}}\right)+\left(\int^{-Z}\frac{\sqrt{(\_f^2+1)\left(-\_f^4ac+\_f^4b^2+\_f^2a^2c_1-c\_f^2a+b^2\_\right.}}{-\_f^4ac+\_f^4b^2+\_f^2a^2c_1-c\_f^2a+b^2\_f^2+c}\right.\right.$$

ODE No. 1810

$$\sqrt{y(x)}y''(x) - a = 0$$

✓ **Mathematica** : cpu = 0.0736745 (sec), leaf count = 1677

```
DSolve[-a + Sqrt[y[x]]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{3{c_1}^2}{16a^2} + \frac{\sqrt[3]{-\frac{221184{c_1}^6}{a^6} + \frac{159252480x^2{c_1}^3}{a^2} + \frac{159252480{c_2}^2{c_1}^3}{a^2} + \frac{318504960xc_2{c_1}^3}{a^2} + 22932357}}{\right.\right.$$

✓ **Maple** : cpu = 0.122 (sec), leaf count = 91

```
dsolve(y(x)^(1/2)*diff(diff(y(x),x),x)-a=0,y(x))
```

$$\frac{-3c_1\sqrt{4a\sqrt{y\left(x\right)}-c_1}-\left(4a\sqrt{y\left(x\right)}-c_1\right)^{\frac{3}{2}}}{12a^2}-x-c_2=0$$

ODE No. 1811

$$\sqrt{x^2+y(x)^2}y''(x)-a\left(y'(x)^2+1\right)^{3/2}=0$$

✗ **Mathematica** : cpu = 300.161 (sec), leaf count = 0

```
DSolve[-(a*(1 + Derivative[1][y][x]^2)^(3/2)) + Sqrt[x^2 + y[x]^2]*Derivative[2][y][x] == 0,y
```

, timed out

```
$Aborted
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((y(x)^2+x^2)^(1/2)*diff(diff(y(x),x),x)-a*(diff(y(x),x)^2+1)^(3/2)=0,y(x))
```

, exception

```
time expired
```

ODE No. 1812

$$y(x)y''(x)(1-\log(y(x)))+y'(x)^2(\log(y(x))+1)=0$$

✓ **Mathematica** : cpu = 0.286573 (sec), leaf count = 29

```
DSolve[(1 + Log[y[x]])*Derivative[1][y][x]^2 + (1 - Log[y[x]])*y[x]*Derivative[2][y][x] == 0,
```

$$\left\{\left\{y(x)\to e^{\frac{c_1 x-1+c_2 c_1}{c_1(x+c_2)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.124 (sec), leaf count = 19

```
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))
```

$$y(x)=\mathrm{e}^{\frac{c_1 x+c_2-1}{c_1 x+c_2}}$$

ODE No. 1813

$$Ay(x)\left(a\sin^2(y(x))+c\right)+y''(x)\left(a\sin^2(y(x))+b\right)+ay'(x)^2\sin(y(x))\cos(y(x))=0$$

✓ **Mathematica** : cpu = 25.2689 (sec), leaf count = 176

```
DSolve[A*(c + a*Sin[y[x]]^2)*y[x] + a*Cos[y[x]]*Sin[y[x]]*Derivative[1][y][x]^2 + (b + a*Sin[
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1} -\frac{\sqrt{2}\sqrt{\cos(2K[1])a-a-2b}}{\sqrt{2aAK[1]^2+4AcK[1]^2-2aA\sin(2K[1])K[1]+2c_1-aA\cos(2K[1])}}\right.\right.$$

✓ **Maple** : cpu = 0.45 (sec), leaf count = 133

```
dsolve((b+a*sin(y(x))^2)*diff(diff(y(x),x),x)+a*diff(y(x),x)^2*cos(y(x))*sin(y(x))+A*y(x)*(c+
```

$$\int^{y(x)} -\frac{2(b+a(\sin^2(\_a)))}{\sqrt{-2\left(b+a\left(\sin^2(\_a)\right)\right)\left(Aa\left(\sin^2(\_a)\right)-2Aa\_a\sin(\_a)\cos(\_a)+\_a^2(a+2c)A-2c_1\right)}}d\_a-x$$

ODE No. 1814

$$ah(y(x))y'(x)^2 + h(y(x))y''(x) + j(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.362357 (sec), leaf count = 120

```
DSolve[j[y[x]] + a*h[y[x]]*Derivative[1][y][x]^2 + h[y[x]]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} -\frac{e^{aK[2]}}{\sqrt{c_1 + 2\int_1^{K[2]} -\frac{e^{2aK[1]}j(K[1])}{h(K[1])}dK[1]}}dK[2]\&\right][x + c_2]\right\}, \left\{y(x) \to \text{Inver}\right.\right.$$

✓ **Maple** : cpu = 0.157 (sec), leaf count = 87

```
dsolve(h(y(x))*diff(diff(y(x),x),x)+a*D(h)(y(x))*diff(y(x),x)^2+j(y(x))=0,y(x))
```

$$\int^{y(x)} \frac{h(\_b)^a}{\sqrt{-2\left(\int \frac{h(\_b)^{2a}}{h(\_b)}d\_b\right) + c_1}}d\_b - x - c_2 = 0$$

ODE No. 1815

$$h(y(x))^2 \left(-j\left(x, \frac{y'(x)}{h(y(x))}\right)\right) + h(y(x))y''(x) - h(y(x))y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 1.23206 (sec), leaf count = 0

```
DSolve[-(h[y[x]]^2*j[x, Derivative[1][y][x]/h[y[x]]]) - h[y[x]]*Derivative[1][y][x]^2 + h[y[x
```

, could not solve

```
DSolve[-(h[y[x]]^2*j[x, Derivative[1][y][x]/h[y[x]]]) - h[y[x]]*Derivative[1][y][x]^2 +
```

✓ **Maple** : cpu = 0.125 (sec), leaf count = 25

```
dsolve(h(y(x))*diff(diff(y(x),x),x)-D(h)(y(x))*diff(y(x),x)^2-h(y(x))^2=0,y(x))
```

$$-c_1 x + \frac{x^2}{2} + \int^{y(x)} -\frac{1}{h\left(\_a\right)} d\_a + c_2 = 0$$

ODE No. 1816

$$x^2(-y(x))y'(x) + y'(x)y''(x) - xy(x)^2 = 0$$

✗ **Mathematica** : cpu = 51.4343 (sec), leaf count = 0

```
DSolve[-(x*y[x]^2) - x^2*y[x]*Derivative[1][y][x] + Derivative[1][y][x]*Derivative[2][y][x] =
```

, could not solve

```
DSolve[-(x*y[x]^2) - x^2*y[x]*Derivative[1][y][x] + Derivative[1][y][x]*Derivative[2][y
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)*diff(diff(y(x),x),x)-x^2*y(x)*diff(y(x),x)-x*y(x)^2=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = _b(_a)\ \textbf{\textit{where}}\left[\left\{-_b(_a)^2\,_a^2 + \left(\frac{d}{d_a}_b(_a)\right)^2 + c_1 = 0\right\}, \{_a = x, _b(_a) = y(x)\}, \{x = _
$$

ODE No. 1817

$$4y'(x)^2 + (xy'(x) - y(x))\,y''(x) = 0$$

✓ **Mathematica** : cpu = 12.2777 (sec), leaf count = 41

```
DSolve[4*Derivative[1][y][x]^2 + (-y[x] + x*Derivative[1][y][x])*Derivative[2][y][x] == 0,y[x
```

$$\left\{\left\{y(x) \to \frac{1}{2}c_2 e^{-2-W\left(\frac{2x}{e^2 c_1}\right)}\left(2 + W\left(\frac{2x}{e^2 c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.267 (sec), leaf count = 40

```
dsolve((x*diff(y(x),x)-y(x))*diff(diff(y(x),x),x)+4*diff(y(x),x)^2=0,y(x))
```

$$y(x) = \mathrm{e}^{\int^{\ln(x)} \left(\mathrm{e}^{\mathrm{RootOf}\left(\ln\left(\mathrm{e}^{-Z}-1\right)\mathrm{e}^{-Z}+c_1\mathrm{e}^{-Z}-\_Z\mathrm{e}^{-Z}-\_b\,\mathrm{e}^{-Z}+2\right)}-1\right)d\_b+c_2}$$

ODE No. 1818

$$(xy'(x) - y(x))\,y''(x) - \left(y'(x)^2 + 1\right)^2 = 0$$

✗ **Mathematica** : cpu = 0.897119 (sec), leaf count = 0

```
DSolve[-(1 + Derivative[1][y][x]^2)^2 + (-y[x] + x*Derivative[1][y][x])*Derivative[2][y][x] =
```

, could not solve

```
DSolve[-(1 + Derivative[1][y][x]^2)^2 + (-y[x] + x*Derivative[1][y][x])*Derivative[2][y
```

✓ **Maple** : cpu = 0.398 (sec), leaf count = 66

```
dsolve((x*diff(y(x),x)-y(x))*diff(diff(y(x),x),x)-(diff(y(x),x)^2+1)^2=0,y(x))
```

$$y(x) = \text{RootOf}\left(-\ln(x) + \int^{\_Z} \frac{-\_f + \text{RootOf}\left(-c_1 \tan\left(\frac{1}{\_Z}\right)\_Z + \_f c_1 \tan\left(\frac{1}{\_Z}\right) + c_1 \_Z \_f + \tan\left(-\right.\right.\right.}{\_f^2 + 1}$$

ODE No. 1819

$$ax^3y'(x)y''(x) + by(x)^2 = 0$$

✗ **Mathematica** : cpu = 1.12828 (sec), leaf count = 0

```
DSolve[b*y[x]^2 + a*x^3*Derivative[1][y][x]*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[b*y[x]^2 + a*x^3*Derivative[1][y][x]*Derivative[2][y][x] == 0, y[x], x]
```

✓ **Maple** : cpu = 0.071 (sec), leaf count = 42

```
dsolve(a*x^3*diff(y(x),x)*diff(diff(y(x),x),x)+b*y(x)^2=0,y(x))
```

$$y(x) = \mathrm{e}^{\int^{\ln(x)} \mathrm{RootOf}\left(-\left(\int^{\_Z} \frac{\_a \_a}{\_a \_a^3 - \_a^2 a + b} d\_a\right) - \_b + c_1\right) d\_b + c_2}$$

ODE No. 1820

$$y''(x)\left(\mathrm{f1}(x)y'(x)+\mathrm{f2}(x)y(x)\right)+\mathrm{f3}(x)y'(x)^2+\mathrm{f4}(x)y(x)y'(x)+\mathrm{f5}(x)y(x)^2=0$$

✗ **Mathematica** : cpu = 302.556 (sec), leaf count = 0

```
DSolve[f5[x]*y[x]^2 + f4[x]*y[x]*Derivative[1][y][x] + f3[x]*Derivative[1][y][x]^2 + (f2[x]*y
```

, timed out

```
$Aborted
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((f1*diff(y(x),x)+f2*y(x))*diff(diff(y(x),x),x)+f3*diff(y(x),x)^2+f4(x)*y(x)*diff(y(x),
```

, result contains DESol or ODESolStruc

$$y(x)=\left(\mathrm{e}^{\int \_b(\_a)d\_a+c_1}\right)\textbf{\textit{where}}\left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a)=-\frac{\_b(\_a)^3\,f1+(f2+f3)\,\_b(\_a)^2+f4\,(\_a)\,\_b(\_a)+f}{\_b\,(\_a)\,f1+f2}\right.\right.$$

ODE No. 1821

$$\left(x^2+2y(x)^2y'(x)\right)y''(x)+2y(x)y'(x)^3+3xy'(x)+y(x)=0$$

✗ **Mathematica** : cpu = 41.8143 (sec), leaf count = 0

```
DSolve[y[x] + 3*x*Derivative[1][y][x] + 2*y[x]*Derivative[1][y][x]^3 + (x^2 + 2*y[x]^2*Deriva
```

, 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*
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((2*y(x)^2*diff(y(x),x)+x^2)*diff(diff(y(x),x),x)+2*y(x)*diff(y(x),x)^3+3*x*diff(y(x),x
```

, result contains DESol or ODESolStruc

$$y(x)=_b(_a)\ \textbf{\textit{where}}\left[\left\{_b(_a)^2\left(\frac{d}{d_a}_b(_a)\right)^2+_a^2\left(\frac{d}{d_a}_b(_a)\right)+_a_b(_a)+c_1=0\right\},\{_a=
$$

ODE No. 1822

$$\left(y'(x)^2+y(x)^2\right)y''(x)+y(x)^3=0$$

✓ **Mathematica** : cpu = 0.824806 (sec), leaf count = 371

```
DSolve[y[x]^3 + (y[x]^2 + Derivative[1][y][x]^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2\exp\left(\frac{1}{12}\left(-2\sqrt{3}\tan^{-1}\left(\frac{1+2\text{InverseFunction}\left[\frac{\left(\sqrt{3}-i\right)\tan^{-1}\left(\frac{\#1}{\sqrt{\frac{1}{2}\left(1-i\sqrt{3}\right)}}\right)}{\sqrt{6\left(1-i\sqrt{3}\right)}}+\frac{\left(\sqrt{3}+i\right)\tan^{-1}\left(\frac{\#}{\sqrt{\frac{1}{2}(1}}\right.}{\sqrt{6\left(1+i\sqrt{3}\right)}}\right.}{\sqrt{3}}\right.\right.\right.\right.\right.$$

✓ **Maple** : cpu = 1.571 (sec), leaf count = 293

```
dsolve((diff(y(x),x)^2+y(x)^2)*diff(diff(y(x),x),x)+y(x)^3=0,y(x))
```

$$y(x)=\left(1+\tan^2\left(\sqrt{3}\,x\right)\right)^{-\frac{c_1^2}{4c_1^2+4}}\left(c_1+\tan\left(\sqrt{3}\,x\right)\right)^{\frac{c_1^2}{2c_1^2+2}}\mathrm{e}^{\int-\frac{\sqrt{4c_1^2+2c_1\tan\left(\sqrt{3}\,x\right)+4\left(\tan^2\left(\sqrt{3}\,x\right)\right)+3c_1^2\left(\tan^2\left(\sqrt{3}\,x\right)\right)+3}}{2\left(c_1+\tan\left(\sqrt{3}\,x\right)\right)}dx}\left(1\right.$$

ODE No. 1823

$$y''(x)\left(a(xy'(x)-y(x))+y'(x)^2\right)-b=0$$

✓ **Mathematica** : cpu = 0.265547 (sec), leaf count = 281

```
DSolve[-b + (Derivative[1][y][x]^2 + a*(-y[x] + x*Derivative[1][y][x]))*Derivative[2][y][x] =
```

$$\left\{\text{Solve}\left[-\int \frac{a\left(\frac{ax^2}{4}+y(x)\right)+\sqrt{4b\left(\frac{ax^2}{4}+y(x)\right)-2c_1}}{\sqrt{\left(a^2\left(\frac{ax^2}{4}+y(x)\right)^2-4b\left(\frac{ax^2}{4}+y(x)\right)+2c_1\right)\left(a\left(\frac{ax^2}{4}+y(x)\right)+\sqrt{4b\left(\frac{ax^2}{4}+y(x)\right)-2c_1}\right)}}d\right.\right.$$

✓ **Maple** : cpu = 0.458 (sec), leaf count = 289

```
dsolve((diff(y(x),x)^2+a*(x*diff(y(x),x)-y(x)))*diff(diff(y(x),x),x)-b=0,y(x))
```

$$y(x)=-\frac{a\,x^2}{4}+\text{RootOf}\left(-x+\int^{\_Z}\frac{\sqrt{\left(\_f^2a^2-4\_fb+2c_1\right)\left(\_fa+\sqrt{4\_fb-2c_1}\right)}}{\_f^2a^2-4\_fb+2c_1}d\_f+c_2\right)$$

ODE No. 1824

$$y''(x)\left(a\sqrt{y'(x)^2+1}-xy'(x)\right)-y'(x)^2-1=0$$

✓ **Mathematica** : cpu = 0.638173 (sec), leaf count = 347

```
DSolve[-1 - Derivative[1][y][x]^2 + (-(x*Derivative[1][y][x]) + a*Sqrt[1 + Derivative[1][y][x
```

$$\left\{\left\{y(x)\to \frac{-2\sqrt{x^2\left(a^2-x^2+{c_1}^2\right)}+c_1 x\log\left(-c_1\left(\sqrt{x^2\left(a^2-x^2+{c_1}^2\right)}+c_1 x\right)+a^2(-x)+ax^2\right)+c_1 x\log\right.\right.$$

✓ **Maple** : cpu = 1.095 (sec), leaf count = 96

```
dsolve((a*(diff(y(x),x)^2+1)^(1/2)-x*diff(y(x),x))*diff(diff(y(x),x),x)-diff(y(x),x)^2-1=0,y(
```

$$y(x)=\int\frac{-c_1a^2+x\sqrt{a^2\left(a^2-x^2+c_1^2\right)}}{a^3-a\,x^2}dx+c_2$$

ODE No. 1825

$$f(x)+y''(x)h(y'(x))+j(y(x))y'(x)=0$$

✗ **Mathematica** : cpu = 0.0331447 (sec), leaf count = 0

```
DSolve[f[x] + j[y[x]]*Derivative[1][y][x] + h[Derivative[1][y][x]]*Derivative[2][y][x] == 0,y
```

, could not solve

```
DSolve[f[x] + j[y[x]]*Derivative[1][y][x] + h[Derivative[1][y][x]]*Derivative[2][y][x]
```

✓ **Maple** : cpu = 0.084 (sec), leaf count = 26

```
dsolve(h(diff(y(x),x))*diff(diff(y(x),x),x)+5*diff(y(x),x)+f=0,y(x))
```

$$y(x)=\int \text{RootOf}\left(x+\int^{-Z}\frac{h(\_f)}{5\_f+f}d\_f+c_1\right)dx+c_2$$

ODE No. 1826

$$-ay(x) - b + y''(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.76088 (sec), leaf count = 201

```
DSolve[-b - a*y[x] + Derivative[2][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{(ay(x)+b)^2 \left(1 - \frac{4(ay(x)+b)^{3/2}}{3ac_1}\right) {}_2F_1\left(\frac{1}{2}, \frac{2}{3}; \frac{5}{3}; \frac{4(b+ay(x))^{3/2}}{3ac_1}\right)^2}{a^2 \left(-\frac{4(ay(x)+b)^{3/2}}{3a} + c_1\right)} = (x+c_2)^2, y(x) \right], \text{Solve}\left[\frac{(ay(x)+b)^2}{} \right.$$

✓ **Maple** : cpu = 0.559 (sec), leaf count = 173

```
dsolve(diff(diff(y(x),x),x)^2-a*y(x)-b=0,y(x))
```

$$y(x) = -\frac{b}{a}$$

ODE No. 1827

$$a^2 y''(x)^2 - 2axy''(x) + y'(x) = 0$$

✗ **Mathematica** : cpu = 0.937468 (sec), leaf count = 0

```
DSolve[Derivative[1][y][x] - 2*a*x*Derivative[2][y][x] + a^2*Derivative[2][y][x]^2 == 0,y[x],
```

, could not solve

```
DSolve[Derivative[1][y][x] - 2*a*x*Derivative[2][y][x] + a^2*Derivative[2][y][x]^2 == 0
```

✓ **Maple** : cpu = 2.88 (sec), leaf count = 81

```
dsolve(a^2*diff(diff(y(x),x),x)^2-2*a*x*diff(diff(y(x),x),x)+diff(y(x),x)=0,y(x))
```

$$y(x) = \int \text{RootOf}\left(-\left(\int_{\_g}^{\_Z} \frac{1}{x\sqrt{x^2 - \_f} - x^2 + 2\_fa} d\_f\right) + c_1\right) dx + c_2$$

ODE No. 1828

$$2\left(x^2+1\right)y''(x)^2+2y'(x)\left(y'(x)+x\right)-x(4y'(x)+x)\,y''(x)-2y(x)=0$$

✓ **Mathematica** : cpu = 0.0079407 (sec), leaf count = 32

```
DSolve[-2*y[x] + 2*Derivative[1][y][x]*(x + Derivative[1][y][x]) - x*(x + 4*Derivative[1][y][
```

$$\left\{\left\{y(x)\to -\frac{1}{2}\sqrt{c_2-{c_1}^2}x^2+c_1x+c_2\right\}\right\}$$

✓ **Maple** : cpu = 1.013 (sec), leaf count = 59

```
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
```

$$y(x)=\frac{\left(c_1+\frac{\operatorname{arcsinh}(x)}{4}\right)x\sqrt{x^2+1}}{2}-\frac{3x^2}{16}+c_1^2+\frac{c_1\operatorname{arcsinh}(x)}{2}+\frac{\operatorname{arcsinh}(x)^2}{16}$$

ODE No. 1829

$$3x^2y''(x)^2+4y'(x)^2-2(3xy'(x)+y(x))\,y''(x)=0$$

✓ **Mathematica** : cpu = 0.0052926 (sec), leaf count = 24

```
DSolve[4*Derivative[1][y][x]^2 - 2*(y[x] + 3*x*Derivative[1][y][x])*Derivative[2][y][x] + 3*x
```

$$\left\{\left\{y(x)\to \frac{{c_1}^2x^2}{c_2}+c_1x+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.589 (sec), leaf count = 36

```
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
```

$$y(x)=x^{\frac{2\sqrt{3}}{3}}c_1x$$

ODE No. 1830

$$(2-9x)x^2y''(x)^2+6y(x)y''(x)-36xy'(x)^2-6(1-6x)xy'(x)y''(x)=0$$

✓ **Mathematica** : cpu = 0.0238162 (sec), leaf count = 24

```
DSolve[-36*x*Derivative[1][y][x]^2 + 6*y[x]*Derivative[2][y][x] - 6*(1 - 6*x)*x*Derivative[1]
```

$$\left\{\left\{y(x)\to \frac{{c_1}^2x^3}{c_2}+c_1x+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.772 (sec), leaf count = 308

```
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*dif
```

$$y(x)=\frac{27c_1\left((9x-1)\sqrt{9}+9\sqrt{9x^2-2x}\right)^{-\frac{5\sqrt{9}}{18}}\sqrt{5}\sqrt{4}\sqrt{\frac{\frac{4}{5}+\frac{\sqrt{16}\left(x-\frac{1}{5}\right)}{\sqrt{9x^2-2x}}}{\sqrt{-\frac{(4x-1)^2}{9x^2-2x}}}}\left((9x-1)\sqrt{9}+9\sqrt{9x^2-2x}\right)^{-\frac{2\sqrt{9}}{9}}\sqrt{4x}$$

ODE No. 1831

$y(x)(xF(0,2)+xF(2,0))y''(x)+xF(2,2)y''(x)^2+xF(1,1)y''(x)+y'(x)\left((xF(1,2)+xF(2,1))y''(x)+y(x)(x\right.$

✗ **Mathematica** : cpu = 71.5522 (sec), leaf count = 0

```
DSolve[x*F[0, 0]*y[x]^2 + x*F[1, 1]*Derivative[2][y][x] + (x*F[0, 2] + x*F[2, 0])*y[x]*Deriva
```

, could not solve

```
DSolve[x*F[0, 0]*y[x]^2 + x*F[1, 1]*Derivative[2][y][x] + (x*F[0, 2] + x*F[2, 0])*y[x]*
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(F[1,1](x)*diff(y(x),x)^2+((F[2,1](x)+F[1,2](x))*diff(diff(y(x),x),x)+y(x)*(F[1,0](x)+F
```

, result contains DESol or ODESolStruc

$$y(x)=\left(\mathrm{e}^{\int \_b(\_a)d\_a+c_1}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a)=-\_b(\_a)^2-\frac{\left(F_{2,1}(\_a)+F_{1,2}(\_a)\right)\_b(\_a)}{2F_{2,2}(\_a)}-\frac{F_{2,0}(\_a)}{}\right.\right.$$

ODE No. 1832

$$y(x)y''(x)^2 - ae^{2x} = 0$$

✗ **Mathematica** : cpu = 20.252 (sec), leaf count = 0

```
DSolve[-(a*E^(2*x)) + y[x]*Derivative[2][y][x]^2 == 0,y[x],x]
```

, could not solve

```
DSolve[-(a*E^(2*x)) + y[x]*Derivative[2][y][x]^2 == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(y(x)*diff(diff(y(x),x),x)^2-a*exp(2*x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a\, \mathrm{e}^{\int \frac{2\_b(\_a)}{3} d\_a + \frac{2c_1}{3}}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_a}\_\mathrm{b}(\_a) = -\frac{\left(-4\_a^2 + 9\sqrt{a\_a}\right)\_b(\_a)^3}{9\_a} + \frac{4\_b(\_a)^2}{3}\right\}, \left\{-\right.\right.$$

ODE No. 1833

$$y''(x)^2 \left(a^2 y(x)^2 - b^2\right) + y'(x)^2 \left(a^2 y'(x)^2 - 1\right) - 2a^2 y(x) y'(x)^2 y''(x) = 0$$

✓ **Mathematica** : cpu = 118.439 (sec), leaf count = 451

```
DSolve[Derivative[1][y][x]^2*(-1 + a^2*Derivative[1][y][x]^2) - 2*a^2*y[x]*Derivative[1][y][x
```

$$\left\{\left\{y(x) \to \frac{b\left(e^{\frac{\sqrt{-1+a^2 {c_1}^2}(x+c_2)}{b}} - c_1\right)}{\sqrt{-1+a^2 {c_1}^2}}\right\}, \left\{y(x) \to c_1 e^{c_2 x} - \frac{\sqrt{b^2 + \frac{1}{{c_2}^2}}}{a}\right\}, \left\{y(x) \to \frac{\exp\left(-\frac{i(x+c_2)(4a^2 \cos(\frac{c_1}{b})}{b(-4a^2 \cos(\frac{c_1}{b})-4}\right.\right.$$

✓ **Maple** : cpu = 6.695 (sec), leaf count = 162

```
dsolve((a^2*y(x)^2-b^2)*diff(diff(y(x),x),x)^2-2*a^2*y(x)*diff(y(x),x)^2*diff(diff(y(x),x),x)
```

$$y(x) = \frac{\tan\left(\frac{\sqrt{a^2}\,(-x+c_1)}{ab}\right) b}{\sqrt{\tan^2\left(\frac{\sqrt{a^2}\,(-x+c_1)}{ab}\right) + 1}\, a}$$

ODE No. 1834

$$\left(x^2 y(x) y''(x) + x^2\left(-y'(x)^2\right) + y(x)^2\right)^2 - 4xy(x)\left(xy'(x) - y(x)\right)^3 = 0$$

✓ **Mathematica** : cpu = 18.574 (sec), leaf count = 19

```
DSolve[-4*x*y[x]*(-y[x] + x*Derivative[1][y][x])^3 + (y[x]^2 - x^2*Derivative[1][y][x]^2 + x^
```

$$\left\{\left\{y(x) \to c_1 x e^{\frac{1}{-x+c_2}}\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
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
```

, result contains DESol or ODESolStruc

$$y(x) = c_1 x$$

ODE No. 1835

$$32y''(x)\left(xy''(x)-y'(x)\right)^3+\left(2y(x)y''(x)-y'(x)^2\right)^3=0$$

✓ **Mathematica** : cpu = 0.0734405 (sec), leaf count = 143

```
DSolve[32*Derivative[2][y][x]*(-Derivative[1][y][x] + x*Derivative[2][y][x])^3 + (-Derivative
```

$$\left\{\left\{y(x)\to\frac{1}{4}\left(-\frac{8{c_1}^3}{\sqrt[3]{3}\sqrt[3]{\sqrt{3}\sqrt{27{c_1}^{10}{c_2}^{10}-64{c_1}^9{c_2}^9}-9{c_1}^5{c_2}^5}}+\frac{{c_1}^2}{c_2}-\frac{2\sqrt[3]{\sqrt{3}\sqrt{27{c_1}^{10}{c_2}^{10}-64{c_1}^9{c_2}^9}-9{c_1}^5}}{3^{2/3}{c_2}^3}\right.\right.$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2)^3+32*diff(diff(y(x),x),x)*(x*diff(diff(y(
```

, exception

```
time expired
```

ODE No. 1836

$$\sqrt{ay''(x)^2 + by'(x)^2} + cy(x)y''(x) + dy'(x)^2 = 0$$

✗ **Mathematica** : cpu = 8.27662 (sec), leaf count = 0

```
DSolve[d*Derivative[1][y][x]^2 + c*y[x]*Derivative[2][y][x] + Sqrt[b*Derivative[1][y][x]^2 +
```

, could not solve

```
DSolve[d*Derivative[1][y][x]^2 + c*y[x]*Derivative[2][y][x] + Sqrt[b*Derivative[1][y][x
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((a*diff(diff(y(x),x),x)^2+b*diff(y(x),x)^2)^(1/2)+c*y(x)*diff(diff(y(x),x),x)+d*diff(y
```

, result contains DESol or ODESolStruc

$$y(x) = c_1$$

ODE No. 1837

$$y^{(3)}(x) - a^2\left(y'(x)^5 + 2y'(x)^3 + y'(x)\right) = 0$$

✓ **Mathematica** : cpu = 10.1927 (sec), leaf count = 145

```
DSolve[-(a^2*(Derivative[1][y][x] + 2*Derivative[1][y][x]^3 + Derivative[1][y][x]^5)) + Deriv
```

$$\left\{\left\{y(x) \to \int_1^x \text{InverseFunction}\left[-3\int \frac{1}{\sqrt{3\left(a^2\right)^2 \#1^6 + 9\left(a^2\right)^2 \#1^4 + 9\left(a^2\right)^2 \#1^2 + 9c_1}} d\#1\&\right]\left[c_2 - K[1]\right]\right.\right.$$

✓ **Maple** : cpu = 0.479 (sec), leaf count = 95

```
dsolve(diff(diff(diff(y(x),x),x),x)-a^2*(diff(y(x),x)^5+2*diff(y(x),x)^3+diff(y(x),x))=0,y(x)
```

$$y(x) = \int \text{RootOf}\left(3\left(\int^{-Z} \frac{1}{\sqrt{3a^2\_f^6 + 9\_f^4 a^2 + 9\_f^2 a^2 + 9c_1}} d\_f\right) + x + c_2\right) dx + c_3$$

ODE No. 1838

$$y^{(3)}(x) + y(x)y''(x) - y'(x)^2 + 1 = 0$$

✗ **Mathematica** : cpu = 0.0306784 (sec), leaf count = 0

```
DSolve[1 - Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0,y[x],x
```

, could not solve

```
DSolve[1 - Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0,
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)+diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+1=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = _a \textbf{\textit{where}} \left[\left\{ \left(\frac{d^2}{d_a^2} _b(_a) \right) _b(_a)^2 + \left(\frac{d}{d_a} _b(_a) \right)^2 _b(_a) + \left(\frac{d}{d_a} _b(_a) \right) _b(_a) _a -
$$

ODE No. 1839

$$y^{(3)}(x) - y(x)y''(x) + y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 0.0300715 (sec), leaf count = 0

```
DSolve[Derivative[1][y][x]^2 - y[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[Derivative[1][y][x]^2 - y[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0, y[x
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)-diff(diff(y(x),x),x)*y(x)+diff(y(x),x)^2=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(e^{\int \_g(\_f) d\_f + c_2}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_f}\_g(\_f) = (6\_f - 1)\,\_g(\_f)^3 + \frac{(7\_f - 1)\,\_g(\_f)^2}{\_f} + \frac{\_g(\_f)}{\_f}\right\}, \left\{\_\right.\right.$$

ODE No. 1840

$$a y(x) y''(x) + y^{(3)}(x) = 0$$

✗ **Mathematica** : cpu = 0.0290372 (sec), leaf count = 0

```
DSolve[a*y[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[a*y[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)+a*y(x)*diff(diff(y(x),x),x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\mathrm{e}^{\int \_g(\_f) d\_f + c_2}\right) \textbf{\textit{where}} \left[\left\{\frac{d}{d\_f}\_g(\_f) = (6\_f + 2a)\,\_g(\_f)^3 + \frac{(7\_f + a)\,\_g(\_f)^2}{\_f} + \frac{\_g(\_f)}{\_f}\right\}, \left\{-\right.\right.$$

ODE No. 1841

$$-f(x)+x^2y^{(3)}(x)+xy''(x)+(2xy(x)-1)y'(x)+y(x)^2=0$$

✗ **Mathematica** : cpu = 0.103107 (sec), leaf count = 0

```
DSolve[-f[x] + y[x]^2 + (-1 + 2*x*y[x])*Derivative[1][y][x] + x*Derivative[2][y][x] + x^2*Der
```

, could not solve

```
DSolve[-f[x] + y[x]^2 + (-1 + 2*x*y[x])*Derivative[1][y][x] + x*Derivative[2][y][x] + x
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)+x*diff(diff(y(x),x),x)+(2*x*y(x)-1)*diff(y(x),x)+y(x)
```

, result contains DESol or ODESolStruc

$$y(x)=\_b(\_a)\,\textbf{\textit{where}}\left[\left\{\_a^2\left(\frac{d^2}{d\_a^2}\_b(\_a)\right)+\_a\_b(\_a)^2-\_a\left(\frac{d}{d\_a}\_b(\_a)\right)-\left(\int f(\_a)\,d\_a\right)+c\right.\right.$$

ODE No. 1842

$$x^2 y^{(3)}(x) + x(y(x) - 1)y''(x) + xy'(x)^2 + (1 - y(x))y'(x) = 0$$

✓ **Mathematica** : cpu = 0.166297 (sec), leaf count = 286

```
DSolve[(1 - y[x])*Derivative[1][y][x] + x*Derivative[1][y][x]^2 + x*(-1 + y[x])*Derivative[2]
```

$$\left\{\left\{y(x) \to \frac{2x\left(c_3\left(J_{\frac{\sqrt{c_2+2}}{\sqrt{2}}}\left(-\frac{1}{2}ix\sqrt{c_1}\right) - \frac{1}{4}i\sqrt{c_1}x\left(J_{\frac{\sqrt{c_2+2}}{\sqrt{2}}-1}\left(-\frac{1}{2}ix\sqrt{c_1}\right) - J_{\frac{\sqrt{c_2+2}}{\sqrt{2}}+1}\left(-\frac{1}{2}ix\sqrt{c_1}\right)\right)\right) + Y_{\frac{\sqrt{c_2+2}}{\sqrt{2}}}\right.\right.}{c_3 x J_{\frac{\sqrt{c_2+2}}{\sqrt{2}}}\left(-\frac{1}{2}ix\sqrt{c_1}\right) + xY_{\frac{\sqrt{c_2+2}}{\sqrt{2}}}(}$$

✓ **Maple** : cpu = 0.721 (sec), leaf count = 190

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)+x*(-1+y(x))*diff(diff(y(x),x),x)+x*diff(y(x),x)^2+(1-
```

$$\ln(x) + 2\left(\int^{y(x)} \frac{}{2\,\text{RootOf}\left(-2\sqrt{4+c_1}\,\text{BesselY}\left(\frac{\sqrt{4+c_1}}{2}, \frac{\sqrt{2}\_Z}{2}\right)c_2 + 2\,\text{BesselY}\left(\frac{\sqrt{4+c_1}}{2}, \frac{\sqrt{2}\_Z}{2}\right)c_2\_h - 4\,\text{B}\right.}\right.$$

ODE No. 1843

$$y^{(3)}(x)y(x)+y(x)^3y'(x)-y'(x)y''(x)=0$$

✓ **Mathematica** : cpu = 2.0153 (sec), leaf count = 409

```
DSolve[y[x]^3*Derivative[1][y][x] - Derivative[1][y][x]*Derivative[2][y][x] + y[x]*Derivative
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{2i\sqrt{1+\frac{\#1^2}{2\left(\sqrt{{c_2}^2-c_1}-c_2\right)}}\sqrt{1-\frac{\#1^2}{2\left(c_2+\sqrt{{c_2}^2-c_1}\right)}}F\left(i\sinh^{-1}\left(\frac{\sqrt{\frac{1}{\sqrt{{c_2}^2-c_1}-c_2}}\#1}{\sqrt{2}}\right)\right|\frac{c}{c}\right.\right.\right.$$

✓ **Maple** : cpu = 0.439 (sec), leaf count = 77

```
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
```

$$\int^{y(x)} -\frac{2}{\sqrt{-\_a^4+4\_a^2c_2-4c_2^2+4c_1}}d\_a-x-c_3=0$$

ODE No. 1844

$$4y(x)^2y^{(3)}(x)+15y'(x)^3-18y(x)y'(x)y''(x)=0$$

✓ **Mathematica** : cpu = 0.0997155 (sec), leaf count = 20

```
DSolve[15*Derivative[1][y][x]^3 - 18*y[x]*Derivative[1][y][x]*Derivative[2][y][x] + 4*y[x]^2*
```

$$\left\{\left\{y(x)\to \frac{1}{\left(c_3x^2+c_2x+c_1\right)^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.534 (sec), leaf count = 22

```
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*dif
```

$$y(x)=\frac{c_3}{\left(x^2+2xc_2+c_2^2-4c_1\right)^2}$$

ODE No. 1845

$$9y(x)^2y^{(3)}(x) + 40y'(x)^3 - 45y(x)y'(x)y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0968421 (sec), leaf count = 22

```
DSolve[40*Derivative[1][y][x]^3 - 45*y[x]*Derivative[1][y][x]*Derivative[2][y][x] + 9*y[x]^2*
```

$$\left\{\left\{y(x) \to \frac{1}{\left(c_3x^2 + c_2x + c_1\right)^{3/2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.526 (sec), leaf count = 22

```
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*dif
```

$$y(x) = \frac{c_3}{\left(x^2 + 2xc_2 + c_2^2 - 9c_1\right)^{\frac{3}{2}}}$$

ODE No. 1846

$$2y^{(3)}(x)y'(x) - 3y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0332201 (sec), leaf count = 51

```
DSolve[-3*Derivative[1][y][x]^2 + 2*Derivative[1][y][x]*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\{y(x) \to c_1\}, \left\{y(x) \to \sqrt{\frac{2}{3}} e^{-\sqrt{\frac{3}{2}}x}\left(c_1 e^{\sqrt{6}x} - c_2\right) + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.015 (sec), leaf count = 28

```
dsolve(2*diff(y(x),x)*diff(diff(diff(y(x),x),x),x)-3*diff(y(x),x)^2=0,y(x))
```

$$y(x) = c_1 + c_2 \mathrm{e}^{\frac{\sqrt{6}x}{2}} + c_3 \mathrm{e}^{-\frac{\sqrt{6}x}{2}}$$

ODE No. 1847

$$y^{(3)}(x)\left(y'(x)^2+1\right)-3y'(x)y''(x)^2=0$$

✓ **Mathematica** : cpu = 0.204956 (sec), leaf count = 95

```
DSolve[-3*Derivative[1][y][x]*Derivative[2][y][x]^2 + (1 + Derivative[1][y][x]^2)*Derivative[
```

$$\left\{\left\{y(x)\to c_3-\frac{i\sqrt{{c_1}^2x^2+2c_2{c_1}^2x-1+{c_2}^2{c_1}^2}}{c_1}\right\},\left\{y(x)\to\frac{i\sqrt{{c_1}^2x^2+2c_2{c_1}^2x-1+{c_2}^2{c_1}^2}}{c_1}+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.336 (sec), leaf count = 49

```
dsolve((diff(y(x),x)^2+1)*diff(diff(diff(y(x),x),x),x)-3*diff(y(x),x)*diff(diff(y(x),x),x)^2=
```

$$y(x)=-\sqrt{-x^2-2xc_2-c_2^2+c_1}+c_3$$

ODE No. 1848

$$y''(x)^2 \left(-a-3y'(x)\right)+y^{(3)}(x) \left(y'(x)^2+1\right)=0$$

✓ **Mathematica** : cpu = 0.409356 (sec), leaf count = 187

```
DSolve[(-a - 3*Derivative[1][y][x])*Derivative[2][y][x]^2 + (1 + Derivative[1][y][x]^2)*Deriv
```

$$\left\{\left\{y(x)\to c_3-\frac{\left(1-i\text{InverseFunction}\left[\frac{(\#1-a)e^{-a\tan^{-1}(\#1)}}{\sqrt{\#1^2+1}(a^2+1)c_1}\&\right][x+c_2]\right)^{-\frac{1}{2}-\frac{ia}{2}}\left(1+i\text{InverseFunction}\left[\frac{(\#1\right.\right.\right.}{(a^2+}$$

✓ **Maple** : cpu = 1.308 (sec), leaf count = 789

```
dsolve((diff(y(x),x)^2+1)*diff(diff(diff(y(x),x),x),x)-(3*diff(y(x),x)+a)*diff(diff(y(x),x),x
```

$$y(x)=\int \frac{\sin\left(\text{RootOf}\left(e^{2a\_Z}c_1^2c_2^2a^4+2\,e^{2a\_Z}c_1^2c_2a^4x+e^{2a\_Z}c_1^2a^4x^2+2\,e^{2a\_Z}c_1^2c_2^2a^2+4\,e^{2a\_Z}c_1^2c_2a^2x+2\,e^{2a\_Z}\right.\right.\right.}{\cos\left(\text{RootOf}\left(e^{2a\_Z}c_1^2c_2^2a^4+2\,e^{2a\_Z}c_1^2c_2a^4x+e^{2a\_Z}c_1^2a^4x^2+2\,e^{2a\_Z}c_1^2c_2^2a^2+4\,e^{2a\_Z}c_1^2c_2a^2x+2\,e^{2a\_Z}\right.\right.\right.}$$

ODE No. 1849

$$y^{(3)}(x)y''(x) - a\sqrt{b^2y''(x)^2+1} = 0$$

✓ **Mathematica** : cpu = 0.551446 (sec), leaf count = 426

```
DSolve[-(a*Sqrt[1 + b^2*Derivative[2][y][x]^2]) + Derivative[2][y][x]*Derivative[3][y][x] ==
```

$$\left\{\left\{y(x) \to \frac{(a^2b^4x^2+2ab^4c_1x+b^4{c_1}^2-1)^{3/2}}{3ab^2} + \frac{\sqrt{a^2b^4x^2+2ab^4c_1x+b^4{c_1}^2-1}}{ab^2} - \frac{c_1\log\left(\sqrt{a^2b^4x^2+2ab^4c_1x+b^4{c_1}^2-1}+ab^2x+b^2c_1\right)}{a} - x\,\mathrm{l}\right.\right.$$
$$\overline{\qquad\qquad 2ab^3 \qquad\qquad}$$

✓ **Maple** : cpu = 0.308 (sec), leaf count = 197

```
dsolve(diff(diff(y(x),x),x)*diff(diff(diff(y(x),x),x),x)-a*(b^2*diff(diff(y(x),x),x)^2+1)^(1/
```

$$y(x) = xc_2 + \int \frac{-\frac{\ln\left(\sqrt{(1+b^2(x+c_1)a)(-1+b^2(x+c_1)a)}+\frac{(x+c_1)b^4a^2}{\sqrt{a^2b^4}}\right)}{\sqrt{a^2b^4}} + \sqrt{\left(1+b^2\left(x+c_1\right)a\right)\left(-1+b^2\left(x+c_1\right)a\right)}\,(x+c}{2b}$$

ODE No. 1850

$$y^{(4)}(x)y'(x) - y^{(3)}(x)y''(x) + y^{(3)}(x)y'(x)^3 = 0$$

✗ **Mathematica** : cpu = 0.120246 (sec), leaf count = 0

```
DSolve[Derivative[1][y][x]^3*Derivative[3][y][x] - Derivative[2][y][x]*Derivative[3][y][x] +
```

, could not solve

```
DSolve[Derivative[1][y][x]^3*Derivative[3][y][x] - Derivative[2][y][x]*Derivative[3][y]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)*diff(diff(diff(diff(y(x),x),x),x),x)-diff(diff(y(x),x),x)*diff(diff(diff(
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\int \frac{\mathrm{e}^{\int -\_j(\_h)d\_h - c_2} \_j(\_h)}{\_h} d\_h + c_3 \right) \textbf{\textit{where}} \left[\left\{ \frac{d}{d\_h} \_j(\_h) = (12\_h + 3)\,\_j(\_h)^3 + \frac{(10\_h + 1)}{\_h} \right. \right.$$

ODE No. 1851

$$y'(x)^3 \left(f'(x)y'(x)+f(x)y''(x)\right)-y''(x) \left(f''(x)y'(x)+2f'(x)y''(x)+f(x)y^{(3)}(x)\right)+y'(x) \left(f^{(3)}(x)y'(x)+3f''$$

✗ **Mathematica** : cpu = 0.571521 (sec), leaf count = 0

```
DSolve[2*q[x]*Sin[y[x]]*Derivative[1][y][x]^2 + Derivative[1][y][x]^3*(Derivative[1][f][x]*De
```

, could not solve

```
DSolve[2*q[x]*Sin[y[x]]*Derivative[1][y][x]^2 + Derivative[1][y][x]^3*(Derivative[1][f]
(Derivative[1][q][x]*Derivative[1][y][x]) + q[x]*Derivative[2][y][x]) - Derivative[2][y
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)*(diff(diff(diff(f(x),x),x)*diff(y(x),x)+3*diff(diff(f(x),x),x)*diff(di
```

, could not solve

```
dsolve(diff(y(x),x)*(diff(diff(diff(f(x),x),x)*diff(y(x),x)+3*diff(diff(f(x),x),x)*d
diff(diff(y(x),x),x)*f*diff(diff(diff(y(x),x),x),x)+diff(y(x),x)^3*(diff(f(x),x)*diff(y
diff(q(x),x)*diff(y(x),x))*cos(y(x))=0,y(x))
```

ODE No. 1852

$$3y^{(4)}(x)y''(x) - 5y^{(3)}(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.114694 (sec), leaf count = 28

```
DSolve[-5*Derivative[3][y][x]^2 + 3*Derivative[2][y][x]*Derivative[4][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_2\left(-\sqrt{2x+3c_1}\right) + c_4 x + c_3\}\}$$

✓ **Maple** : cpu = 0.341 (sec), leaf count = 28

```
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
```

$$y(x) = 3(x+c_2)\sqrt{6}\,c_1\sqrt{-\frac{c_1}{x+c_2}} + c_3 x + c_4$$

ODE No. 1853

$$40y^{(3)}(x)^3 + 9y^{(5)}(x)y''(x)^2 - 45y^{(4)}(x)y^{(3)}(x)y''(x) = 0$$

✓ **Mathematica** : cpu = 0.123873 (sec), leaf count = 43

```
DSolve[40*Derivative[3][y][x]^3 - 45*Derivative[2][y][x]*Derivative[3][y][x]*Derivative[4][y]
```

$$\left\{\left\{y(x) \to c_5 x - \frac{4\sqrt{x(c_3 x + c_2) + c_1}}{{c_2}^2 - 4c_1 c_3} + c_4\right\}\right\}$$

✓ **Maple** : cpu = 0.921 (sec), leaf count = 110

```
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
```

$$y(x) = \int \int \text{RootOf}\left(-\left(\int^{-Z} \frac{}{\text{RootOf}\left(-20\ln(\_f) + \int^{-Z} \_k\left(\mathrm{e}^{\text{RootOf}(81\_k^2 \mathrm{e}^{-Z} + 20\,\mathrm{e}^{-Z}\ln(\mathrm{e}^{-Z}+27) - 40\,\mathrm{e}^{-Z}\ln(2) -}\right.\right.\right.\right.$$

ODE No. 1854

$$y^{(n)}(x) - f\left(\frac{\partial^{n-1} y(x)}{\partial x^{n-1}}\right) = 0$$

✗ **Mathematica** : cpu = 0.0315339 (sec), leaf count = 0

```
DSolve[-f[D[y[x], {x, -1 + n}]] + Derivative[n][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-f[D[y[x], {x, -1 + n}]] + Derivative[n][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),[x $ n])-f(diff(y(x),[x $ n-1]))=0,y(x))
```

, exception

```
unable to handle ODEs of undefined differential order
```

ODE No. 1855

$$y^{(n)}(x) - f\left(\frac{\partial^{n-2} y(x)}{\partial x^{n-2}}\right) = 0$$

✗ **Mathematica** : cpu = 0.0030398 (sec), leaf count = 0

```
DSolve[-f[D[y[x], {x, -2 + n}]] + Derivative[n][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[-f[D[y[x], {x, -2 + n}]] + Derivative[n][y][x] == 0, y[x], x]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),[x $ n]) = f(diff(y(x),[x $ n-2]))=0,y(x))
```

, exception

```
unable to handle ODEs of undefined differential order
```

ODE No. 1856

$$\{x'(t) = ax(t), y'(t) = b\}$$

✓ **Mathematica** : cpu = 0.0162797 (sec), leaf count = 22

```
DSolve[{Derivative[1][x][t] == a*x[t], Derivative[1][y][t] == b},{x[t], y[t]},t]
```

$$\{\{x(t) \to c_1 e^{at}, y(t) \to bt + c_2\}\}$$

✓ **Maple** : cpu = 0.051 (sec), leaf count = 19

```
dsolve({diff(x(t),t) = a*x(t), diff(y(t),t) = b})
```

$$\{x(t) = c_1 \mathrm{e}^{at}, y(t) = bt + c_2\}$$

ODE No. 1857

$$\{x'(t) = ay(t), y'(t) = -ax(t)\}$$

✓ **Mathematica** : cpu = 0.0091008 (sec), leaf count = 39

```
DSolve[{Derivative[1][x][t] == a*y[t], Derivative[1][y][t] == -(a*x[t])},{x[t], y[t]},t]
```

$$\{\{x(t) \to c_1 \cos(at) + c_2 \sin(at), y(t) \to c_2 \cos(at) - c_1 \sin(at)\}\}$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 35

```
dsolve({diff(x(t),t) = a*y(t), diff(y(t),t) = -a*x(t)})
```

$$\{x(t) = c_1 \sin(at) + c_2 \cos(at), y(t) = \cos(at) c_1 - \sin(at) c_2\}$$

ODE No. 1858

$$\{x'(t) = ay(t), y'(t) = bx(t)\}$$

✓ **Mathematica** : cpu = 0.0077861 (sec), leaf count = 182

```
DSolve[{Derivative[1][x][t] == a*y[t], Derivative[1][y][t] == b*x[t]},{x[t], y[t]},t]
```

$$\left\{\left\{x(t) \to \frac{1}{2}c_1 e^{-\sqrt{a}\sqrt{b}t}\left(e^{2\sqrt{a}\sqrt{b}t}+1\right)+\frac{\sqrt{a}c_2 e^{-\sqrt{a}\sqrt{b}t}\left(e^{2\sqrt{a}\sqrt{b}t}-1\right)}{2\sqrt{b}}, y(t) \to \frac{\sqrt{b}c_1 e^{-\sqrt{a}\sqrt{b}t}\left(e^{2\sqrt{a}\sqrt{b}t}-1\right)}{2\sqrt{a}}+\frac{1}{2}\right.\right.$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 64

```
dsolve({diff(x(t),t) = a*y(t), diff(y(t),t) = b*x(t)})
```

$$\left\{x(t) = c_1 \mathrm{e}^{\sqrt{a}\sqrt{b}t} + c_2 \mathrm{e}^{-\sqrt{a}\sqrt{b}t}, y(t) = \frac{\sqrt{b}\left(c_1 \mathrm{e}^{\sqrt{a}\sqrt{b}t} - c_2 \mathrm{e}^{-\sqrt{a}\sqrt{b}t}\right)}{\sqrt{a}}\right\}$$

ODE No. 1859

$$\{x'(t) = ax(t) - y(t), y'(t) = ay(t) + x(t)\}$$

✓ **Mathematica** : cpu = 0.0044125 (sec), leaf count = 51

```
DSolve[{Derivative[1][x][t] == a*x[t] - y[t], Derivative[1][y][t] == x[t] + a*y[t]},{x[t], y[
```

$$\{\{x(t) \to c_1 e^{at} \cos(t) - c_2 e^{at} \sin(t), y(t) \to c_2 e^{at} \cos(t) + c_1 e^{at} \sin(t)\}\}$$

✓ **Maple** : cpu = 0.047 (sec), leaf count = 37

```
dsolve({diff(x(t),t) = a*x(t)-y(t), diff(y(t),t) = x(t)+a*y(t)})
```

$$\{x(t) = \mathrm{e}^{at}(c_1 \sin(t) + c_2 \cos(t)), y(t) = \mathrm{e}^{at}(\sin(t) c_2 - \cos(t) c_1)\}$$

ODE No. 1860

$$\{x'(t) = ax(t) + by(t), y'(t) = by(t) + cx(t)\}$$

✓ **Mathematica** : cpu = 0.0299104 (sec), leaf count = 696

```
DSolve[{Derivative[1][x][t] == a*x[t] + b*y[t], Derivative[1][y][t] == c*x[t] + b*y[t]},{x[t]
```

$$\left\{\left\{x(t) \to \frac{c_1\left(a\left(-e^{\frac{1}{2}t\left(-\sqrt{a^2-2ab+b^2+4bc}+a+b\right)}\right)+ae^{\frac{1}{2}t\left(\sqrt{a^2-2ab+b^2+4bc}+a+b\right)}+be^{\frac{1}{2}t\left(-\sqrt{a^2-2ab+b^2+4bc}+a+b\right)}+\sqrt{c}\right.\right.\right.$$

✓ **Maple** : cpu = 0.078 (sec), leaf count = 177

```
dsolve({diff(x(t),t) = a*x(t)+b*y(t), diff(y(t),t) = c*x(t)+b*y(t)})
```

$$\left\{x(t) = c_1 \mathrm{e}^{\frac{\left(a+b+\sqrt{b^2+(-2a+4c)b+a^2}\right)t}{2}} + c_2 \mathrm{e}^{\frac{\left(a+b-\sqrt{b^2+(-2a+4c)b+a^2}\right)t}{2}}, y(t) = \frac{-c_2\left(a-b+\sqrt{b^2+(-2a+4c)\,b+a^2}\right.\right.$$

ODE No. 1861

$$\{ax'(t)+by'(t)=\alpha x(t)+\beta y(t), bx'(t)-ay'(t)=\beta x(t)-\alpha y(t)\}$$

✓ **Mathematica** : cpu = 0.0089771 (sec), leaf count = 183

```
DSolve[{a*Derivative[1][x][t] + b*Derivative[1][y][t] == alpha*x[t] + beta*y[t], b*Derivative
```

$$\left\{\left\{x(t)\to c_1 e^{\frac{t(a\alpha+b\beta)}{a^2+b^2}}\cos\left(\frac{t(a\beta-\alpha b)}{a^2+b^2}\right)+c_2 e^{\frac{t(a\alpha+b\beta)}{a^2+b^2}}\sin\left(\frac{t(a\beta-\alpha b)}{a^2+b^2}\right), y(t)\to c_2 e^{\frac{t(a\alpha+b\beta)}{a^2+b^2}}\cos\left(\frac{t(a\beta-\alpha b)}{a^2+b^2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.099 (sec), leaf count = 152

```
dsolve({a*diff(x(t),t)+b*diff(y(t),t) = alpha*x(t)+beta*y(t), b*diff(x(t),t)-a*diff(y(t),t) =
```

$$\left\{x(t)=c_1 \mathrm{e}^{\frac{((i\beta+\alpha)a-b(i\alpha-\beta))t}{a^2+b^2}}+c_2 \mathrm{e}^{-\frac{t((i\beta-\alpha)a-b(i\alpha+\beta))}{a^2+b^2}}, y(t)=i\left(c_1 \mathrm{e}^{\frac{((i\beta+\alpha)a-b(i\alpha-\beta))t}{a^2+b^2}}-c_2 \mathrm{e}^{-\frac{t((i\beta-\alpha)a-b(i\alpha+\beta))}{a^2+b^2}}\right)\right\}$$

ODE No. 1862

$$\{x'(t) = -y(t), y'(t) = 2x(t) + 2y(t)\}$$

✓ **Mathematica** : cpu = 0.0110795 (sec), leaf count = 52

```
DSolve[{Derivative[1][x][t] == -y[t], Derivative[1][y][t] == 2*x[t] + 2*y[t]},{x[t], y[t]},t]
```

$$\{\{x(t) \to c_1 e^t(\cos(t) - \sin(t)) - c_2 e^t \sin(t), y(t) \to 2c_1 e^t \sin(t) + c_2 e^t(\sin(t) + \cos(t))\}\}$$

✓ **Maple** : cpu = 0.045 (sec), leaf count = 39

```
dsolve({diff(x(t),t) = -y(t), diff(y(t),t) = 2*x(t)+2*y(t)})
```

$$\{x(t) = \mathrm{e}^t(c_1 \sin(t) + c_2 \cos(t)), y(t) = -((c_1 + c_2)\cos(t) + \sin(t)(c_1 - c_2))\mathrm{e}^t\}$$

ODE No. 1863

$$\{x'(t)+3x(t)+4y(t)=0,2x(t)+y'(t)+5y(t)=0\}$$

✓ **Mathematica** : cpu = 0.0057566 (sec), leaf count = 84

```
DSolve[{3*x[t] + 4*y[t] + Derivative[1][x][t] == 0, 2*x[t] + 5*y[t] + Derivative[1][y][t] ==
```

$$\left\{\left\{x(t)\to \frac{1}{3}c_1e^{-7t}\left(2e^{6t}+1\right)-\frac{2}{3}c_2e^{-7t}\left(e^{6t}-1\right),y(t)\to \frac{1}{3}c_2e^{-7t}\left(e^{6t}+2\right)-\frac{1}{3}c_1e^{-7t}\left(e^{6t}-1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.046 (sec), leaf count = 35

```
dsolve({diff(x(t),t)+3*x(t)+4*y(t) = 0, diff(y(t),t)+2*x(t)+5*y(t) = 0})
```

$$\left\{x(t)=c_1\mathrm{e}^{-t}+c_2\mathrm{e}^{-7t},y(t)=-\frac{c_1\mathrm{e}^{-t}}{2}+c_2\mathrm{e}^{-7t}\right\}$$

ODE No. 1864

$$\{x'(t) = -5x(t) - 2y(t), y'(t) = x(t) - 7y(t)\}$$

✓ **Mathematica** : cpu = 0.0089104 (sec), leaf count = 59

```
DSolve[{Derivative[1][x][t] == -5*x[t] - 2*y[t], Derivative[1][y][t] == x[t] - 7*y[t]},{x[t],
```

$$\{\{x(t) \to c_1 e^{-6t}(\sin(t) + \cos(t)) - 2c_2 e^{-6t}\sin(t), y(t) \to c_1 e^{-6t}\sin(t) + c_2 e^{-6t}(\cos(t) - \sin(t))\}\}$$

✓ **Maple** : cpu = 0.046 (sec), leaf count = 44

```
dsolve({diff(x(t),t) = -5*x(t)-2*y(t), diff(y(t),t) = x(t)-7*y(t)})
```

$$\left\{x(t) = \mathrm{e}^{-6t}(c_1 \sin(t) + c_2 \cos(t)), y(t) = -\frac{\mathrm{e}^{-6t}((c_1 - c_2)\cos(t) - \sin(t)(c_1 + c_2))}{2}\right\}$$

ODE No. 1865

$$\{x'(t) = \text{a1}x(t) + \text{b1}y(t) + \text{c1}, y'(t) = \text{a2}x(t) + \text{b2}y(t) + \text{c2}\}$$

✓ **Mathematica** : cpu = 0.735832 (sec), leaf count = 2062

```
DSolve[{Derivative[1][x][t] == c1 + a1*x[t] + b1*y[t], Derivative[1][y][t] == c2 + a2*x[t] +
```

$$\left\{\left\{x(t) \to -\frac{\text{b1}e^{-\frac{1}{2}\left(\text{a1}+\text{b2}+\sqrt{\text{a1}^2-2\text{b2a1}+\text{b2}^2+4\text{a2b1}}\right)t}\left(\frac{2\left(\left(\text{a1}-\text{b2}+\sqrt{\text{a1}^2-2\text{b2a1}+\text{b2}^2+4\text{a2b1}}\right)\text{c2}-2\text{a2c1}\right)e^{\sqrt{\text{a1}^2-2\text{b2a1}}}}{-\text{a1}-\text{b2}+\sqrt{\text{a1}^2-2\text{b2a1}+\text{b2}^2+4\text{a2b1}}}\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.109 (sec), leaf count = 224

```
dsolve({diff(x(t),t) = a1*x(t)+b1*y(t)+c1, diff(y(t),t) = a2*x(t)+b2*y(t)+c2})
```

$$\left\{x(t) = \text{e}^{\frac{\left(a1+b2+\sqrt{a1^2-2a1\,b2+4b1\,a2+b2^2}\right)t}{2}}c_2 + \text{e}^{\frac{\left(a1+b2-\sqrt{a1^2-2a1\,b2+4b1\,a2+b2^2}\right)t}{2}}c_1 + \frac{c2\,b1 - b2\,c1}{a1\,b2 - b1\,a2}, y(t) = \frac{-c_1(a1\,b2 -}{}\right.$$

ODE No. 1866

$$\{x'(t)+2y(t)=3t, y'(t)-2x(t)=4\}$$

✓ **Mathematica** : cpu = 0.0369737 (sec), leaf count = 132

```
DSolve[{2*y[t] + Derivative[1][x][t] == 3*t, -2*x[t] + Derivative[1][y][t] == 4},{x[t], y[t]}
```

$$\left\{\left\{x(t)\to \cos(2t)\left(\frac{3}{2}t\sin(2t)-\frac{5}{4}\cos(2t)\right)-\sin(2t)\left(\frac{5}{4}\sin(2t)+\frac{3}{2}t\cos(2t)\right)+c_1\cos(2t)-c_2\sin(2t), y(t\right.\right.$$

✓ **Maple** : cpu = 0.046 (sec), leaf count = 39

```
dsolve({diff(x(t),t)+2*y(t) = 3*t, diff(y(t),t)-2*x(t) = 4})
```

$$\left\{x(t)=\sin(2t)\,c_2+\cos(2t)\,c_1-\frac{5}{4}, y(t)=-\cos(2t)\,c_2+\sin(2t)\,c_1+\frac{3t}{2}\right\}$$

ODE No. 1867

$$\left\{-t^2+x'(t)+y(t)+6t+1=0, y'(t)-x(t)=-3t^2+3t+1\right\}$$

✓ **Mathematica** : cpu = 0.0820949 (sec), leaf count = 124

```
DSolve[{1 + 6*t - t^2 + y[t] + Derivative[1][x][t] == 0, -x[t] + Derivative[1][y][t] == 1 + 3
```

$$\left\{\left\{x(t)\to \cos(t)\left(\left(3t^2-t-13\right)\cos(t)+(t-12)t\sin(t)\right)-\sin(t)\left(\left(-3t^2+t+13\right)\sin(t)+(t-12)t\cos(t)\right.\right.\right.$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 42

```
dsolve({diff(y(t),t)-x(t) = -3*t^2+3*t+1, diff(x(t),t)+y(t)-t^2+6*t+1 = 0})
```

$$\left\{x(t)=\sin(t)\,c_2+\cos(t)\,c_1+3t^2-t-13, y(t)=t^2-c_2\cos(t)+c_1\sin(t)-12t\right\}$$

ODE No. 1868

$$\{x'(t)+3x(t)-y(t)=e^{2t},x(t)+y'(t)+5y(t)=e^{t}\}$$

✓ **Mathematica** : cpu = 0.0779975 (sec), leaf count = 162

```
DSolve[{3*x[t] - y[t] + Derivative[1][x][t] == E^(2*t), x[t] + 5*y[t] + Derivative[1][y][t] =
```

$$\left\{\left\{x(t)\to -e^t(t+1)\left(\frac{t}{5}+\frac{1}{36}e^t(6t-7)-\frac{1}{25}\right)+e^t t\left(\frac{t}{5}+\frac{1}{36}e^t(6t-1)+\frac{4}{25}\right)+c_1e^{-4t}(t+1)+c_2e^{-4t}t,\right.\right.$$

✓ **Maple** : cpu = 0.083 (sec), leaf count = 64

```
dsolve({diff(x(t),t)+3*x(t)-y(t) = exp(2*t), diff(y(t),t)+x(t)+5*y(t) = exp(t)})
```

$$\left\{x(t)=\mathrm{e}^{-4t}c_2+\mathrm{e}^{-4t}tc_1+\frac{\mathrm{e}^t}{25}+\frac{7\,\mathrm{e}^{2t}}{36},y(t)=-\frac{\mathrm{e}^{2t}}{36}-\mathrm{e}^{-4t}c_2-\mathrm{e}^{-4t}tc_1+\mathrm{e}^{-4t}c_1+\frac{4\,\mathrm{e}^t}{25}\right\}$$

ODE No. 1869

$$\{x'(t)+2x(t)+y'(t)+y(t)=t+e^{2t},x'(t)-x(t)+y'(t)+3y(t)=e^t-1\}$$

✓ **Mathematica** : cpu = 0.0911166 (sec), leaf count = 118

```
DSolve[{2*x[t] + y[t] + Derivative[1][x][t] + Derivative[1][y][t] == E^(2*t) + t, -x[t] + 3*y
```

$$\left\{\left\{x(t)\to \frac{1}{5}\left(t-e^t+e^{2t}+1\right)+\frac{5}{72}\left(\frac{12\left(5712t+833e^t+2352e^{2t}-5508\right)}{20825}+c_1e^{-7t/5}\right),y(t)\to \frac{1}{5}\left(-t+e^t-\right.\right.\right.$$

✓ **Maple** : cpu = 0.071 (sec), leaf count = 51

```
dsolve({diff(x(t),t)+diff(y(t),t)-x(t)+3*y(t) = exp(t)-1, diff(x(t),t)+diff(y(t),t)+2*x(t)+y(
```

$$\left\{x(t)=\frac{3t}{7}-\frac{1}{49}-\frac{e^t}{6}+\frac{5\,e^{2t}}{17}+e^{-\frac{7t}{5}}c_1,y(t)=-\frac{e^{2t}}{17}+\frac{t}{7}-\frac{26}{49}+\frac{e^t}{4}+\frac{3\,e^{-\frac{7t}{5}}c_1}{2}\right\}$$

ODE No. 1870

$$\{x'(t)+y'(t)-y(t)=e^t, 2x'(t)+y'(t)+2y(t)=\cos(t)\}$$

✓ **Mathematica** : cpu = 0.133942 (sec), leaf count = 122

```
DSolve[{-y[t] + Derivative[1][x][t] + Derivative[1][y][t] == E^t, 2*y[t] + 2*Derivative[1][x]
```

$$\left\{\left\{x(t)\to -\frac{3}{4}c_2\left(e^{4t}-1\right)+\frac{1}{68}e^{-4t}\left(e^{4t}-1\right)\left(34e^t+3\sin(t)-12\cos(t)\right)+\frac{1}{4}\left(2e^{-3t}+2e^t+\frac{3}{17}e^{-4t}\sin(t)-\right.\right.$$

✓ **Maple** : cpu = 0.13 (sec), leaf count = 47

```
dsolve({diff(x(t),t)+diff(y(t),t)-y(t) = exp(t), 2*diff(x(t),t)+diff(y(t),t)+2*y(t) = cos(t)}
```

$$\left\{x(t)=\frac{\mathrm{e}^{4t}c_1}{4}+\frac{5\sin(t)}{17}-\frac{3\cos(t)}{17}+\mathrm{e}^t+c_2, y(t)=-\frac{\mathrm{e}^{4t}c_1}{3}+\frac{4\cos(t)}{17}-\frac{\sin(t)}{17}-\frac{2\,\mathrm{e}^t}{3}\right\}$$

ODE No. 1871

$$\left\{4x'(t)+2x(t)+9y'(t)+31y(t)=e^t, 3x'(t)+x(t)+7y'(t)+24y(t)=3\right\}$$

✓ **Mathematica** : cpu = 0.305766 (sec), leaf count = 180

```
DSolve[{2*x[t] + 31*y[t] + 4*Derivative[1][x][t] + 9*Derivative[1][y][t] == E^t, x[t] + 24*y[
```

$$\left\{\left\{x(t)\to \frac{1}{442}\left(3\left(153e^t-754\right)\sin(t)+31\left(17e^t-78\right)\cos(t)\right)(\cos(t)-\sin(t))+\frac{1}{221}\sin(t)\left((493e^t-2340\right)\right.\right.$$

✓ **Maple** : cpu = 0.098 (sec), leaf count = 62

```
dsolve({3*diff(x(t),t)+7*diff(y(t),t)+x(t)+24*y(t) = 3, 4*diff(x(t),t)+9*diff(y(t),t)+2*x(t)+
```

$$\left\{x(t)=\mathrm{e}^{-4t}\sin(t)\,c_2+\mathrm{e}^{-4t}\cos(t)\,c_1-\frac{93}{17}+\frac{31\,\mathrm{e}^t}{26}, y(t)=\frac{((-221c_1-221c_2)\cos(t)+221\sin(t)\,(c_1-c_2))}{221}\right.$$

ODE No. 1872

$$\left\{4x'(t)+11x(t)+9y'(t)+31y(t)=e^{t},3x'(t)+8x(t)+7y'(t)+24y(t)=e^{2t}\right\}$$

✓ **Mathematica** : cpu = 0.109811 (sec), leaf count = 162

```
DSolve[{11*x[t] + 31*y[t] + 4*Derivative[1][x][t] + 9*Derivative[1][y][t] == E^t, 8*x[t] + 24
```

$$\left\{\left\{x(t)\to -e^t t\left(-\frac{4t}{5}+\frac{1}{36}e^t(30t+19)-\frac{11}{25}\right)-e^t(t-1)\left(\frac{4t}{5}-\frac{1}{36}e^t(30t+49)+\frac{31}{25}\right)-c_1e^{-4t}(t-1)-\right.\right.$$

✓ **Maple** : cpu = 0.078 (sec), leaf count = 65

```
dsolve({3*diff(x(t),t)+7*diff(y(t),t)+8*x(t)+24*y(t) = exp(2*t), 4*diff(x(t),t)+9*diff(y(t),t
```

$$\left\{x(t)=\mathrm{e}^{-4t}c_2+\mathrm{e}^{-4t}tc_1+\frac{31\,\mathrm{e}^t}{25}-\frac{49\,\mathrm{e}^{2t}}{36},y(t)=\frac{19\,\mathrm{e}^{2t}}{36}-\mathrm{e}^{-4t}c_2-\mathrm{e}^{-4t}tc_1-\mathrm{e}^{-4t}c_1-\frac{11\,\mathrm{e}^t}{25}\right\}$$

ODE No. 1873

$$\left\{4x'(t)+44x(t)+9y'(t)+49y(t)=t, 3x'(t)+34x(t)+7y'(t)+38y(t)=e^t\right\}$$

✓ **Mathematica** : cpu = 0.087659 (sec), leaf count = 322

```
DSolve[{44*x[t] + 49*y[t] + 4*Derivative[1][x][t] + 9*Derivative[1][y][t] == t, 34*x[t] + 38*
```

$$\left\{\left\{x(t)\to -\frac{1}{5}e^{-6t}\left(e^{5t}-1\right)\left(\frac{16}{5}e^{6t}\left(\frac{t}{6}-\frac{1}{36}\right)+4e^{2t}-\frac{4e^{7t}}{7}-\frac{31}{5}e^t(t-1)\right)+\frac{1}{25}e^{-6t}\left(4e^{5t}+1\right)\left(e^{6t}\left(\frac{2t}{3}-\right.\right.\right.$$

✓ **Maple** : cpu = 0.074 (sec), leaf count = 52

```
dsolve({3*diff(x(t),t)+7*diff(y(t),t)+34*x(t)+38*y(t) = exp(t), 4*diff(x(t),t)+9*diff(y(t),t)
```

$$\left\{x(t)=\mathrm{e}^{-t}c_2+\mathrm{e}^{-6t}c_1-\frac{29\,\mathrm{e}^t}{7}+\frac{19t}{3}-\frac{56}{9}, y(t)=-\mathrm{e}^{-t}c_2+4\,\mathrm{e}^{-6t}c_1+\frac{24\,\mathrm{e}^t}{7}+\frac{55}{9}-\frac{17t}{3}\right\}$$

ODE No. 1874

$$\{x'(t) = f(t)x(t) + g(t)y(t), y'(t) = f(t)y(t) - g(t)x(t)\}$$

✓ **Mathematica** : cpu = 0.0075882 (sec), leaf count = 115

```
DSolve[{Derivative[1][x][t] == f[t]*x[t] + g[t]*y[t], Derivative[1][y][t] == -(g[t]*x[t]) + f
```

$$\left\{\left\{x(t) \to c_1 \exp\left(\int_1^t f(K[2])dK[2]\right) \cos\left(\int_1^t g(K[1])dK[1]\right) + c_2 \exp\left(\int_1^t f(K[2])dK[2]\right) \sin\left(\int_1^t g(K[\right.\right.\right.$$

✓ **Maple** : cpu = 0.457 (sec), leaf count = 57

```
dsolve({diff(x(t),t) = x(t)*f(t)+y(t)*g(t), diff(y(t),t) = -x(t)*g(t)+y(t)*f(t)})
```

$$\{x(t) = \mathrm{e}^{\int (\tan(c_1 - (\int g(t)dt))g(t) + f(t))dt} c_2, y(t) = \mathrm{e}^{\int (\tan(c_1 - (\int g(t)dt))g(t) + f(t))dt} c_2 \tan\left(c_1 - \left(\int g(t)\,dt\right)\right)\}$$

ODE No. 1875

$$\{f(t)(ax(t)+by(t))+x'(t)=g(t), f(t)(cx(t)+dy(t))+y'(t)=h(t)\}$$

✓ **Mathematica** : cpu = 1.4733 (sec), leaf count = 3181

```
DSolve[{f[t]*(a*x[t] + b*y[t]) + Derivative[1][x][t] == g[t], f[t]*(c*x[t] + d*y[t]) + Deriva
```

$$\left\{\left\{x(t)\to \frac{\left(-a+d+\sqrt{a^2-2da+d^2+4bc}\right)e^{\int_1^t -\frac{1}{2}\left(a+d-\sqrt{a^2-2da+d^2+4bc}\right)f(K[1])dK[1]}c_1}{2\sqrt{a^2-2da+d^2+4bc}}+\frac{\left(a-d+\sqrt{a^2-2d\right.}\right.\right.$$

✓ **Maple** : cpu = 2.962 (sec), leaf count = 2606

```
dsolve({diff(x(t),t)+(a*x(t)+b*y(t))*f(t) = g(t), diff(y(t),t)+(c*x(t)+d*y(t))*f(t) = h(t)})
```

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ODE No. 1876

$$\{x'(t) = x(t)\cos(t), y'(t) = x(t)e^{-\sin(t)}\}$$

✓ **Mathematica** : cpu = 0.0202381 (sec), leaf count = 39

```
DSolve[{Derivative[1][x][t] == Cos[t]*x[t], Derivative[1][y][t] == x[t]/E^sin[t]},{x[t], y[t]
```

$$\left\{\left\{x(t) \to c_1 e^{\sin(t)}, y(t) \to c_1 \int_1^t e^{\sin(K[1])-\sin(K[1])} dK[1] + c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.171 (sec), leaf count = 18

```
dsolve({diff(x(t),t) = x(t)*cos(t), diff(y(t),t) = x(t)*exp(-sin(t))})
```

$$\{x(t) = c_2 \mathrm{e}^{\sin(t)}, y(t) = tc_2 + c_1\}$$

ODE No. 1877

$$\{tx'(t)+y(t)=0, x(t)+ty'(t)=0\}$$

✓ **Mathematica** : cpu = 0.0040598 (sec), leaf count = 31

```
DSolve[{y[t] + t*Derivative[1][x][t] == 0, x[t] + t*Derivative[1][y][t] == 0},{x[t], y[t]},t]
```

$$\left\{\left\{x(t)\to c_1 t+\frac{c_2}{t}, y(t)\to \frac{c_2}{t}-c_1 t\right\}\right\}$$

✓ **Maple** : cpu = 0.045 (sec), leaf count = 31

```
dsolve({t*diff(x(t),t)+y(t) = 0, t*diff(y(t),t)+x(t) = 0})
```

$$\left\{x(t)=\frac{t^2 c_2+c_1}{t}, y(t)=\frac{-t^2 c_2+c_1}{t}\right\}$$

ODE No. 1878

$$\{tx'(t)+2x(t)=t,-((t+2)x(t))+ty'(t)-ty(t)=-t\}$$

✓ **Mathematica** : cpu = 0.0094017 (sec), leaf count = 39

```
DSolve[{2*x[t] + t*Derivative[1][x][t] == t, -((2 + t)*x[t]) - t*y[t] + t*Derivative[1][y][t]
```

$$\left\{\left\{x(t)\to \frac{t}{3}+\frac{c_1}{t^2},y(t)\to -\frac{c_1}{t^2}-\frac{t}{3}+c_2e^t\right\}\right\}$$

✓ **Maple** : cpu = 0.069 (sec), leaf count = 39

```
dsolve({t*diff(x(t),t)+2*x(t) = t, t*diff(y(t),t)-(t+2)*x(t)-t*y(t) = -t})
```

$$\left\{x(t)=\frac{t}{3}+\frac{c_2}{t^2},y(t)=\frac{3c_1\mathrm{e}^t t^2-t^3-3c_2}{3t^2}\right\}$$

ODE No. 1879

$$\{tx'(t)+2(x(t)-y(t))=t, x(t)+ty'(t)+5y(t)=t^2\}$$

✓ **Mathematica** : cpu = 0.0201635 (sec), leaf count = 58

```
DSolve[{2*(x[t] - y[t]) + t*Derivative[1][x][t] == t, x[t] + 5*y[t] + t*Derivative[1][y][t] =
```

$$\left\{\left\{x(t)\to \frac{c_1}{t^4}+\frac{c_2}{t^3}+\frac{1}{30}t(2t+9), y(t)\to -\frac{c_1}{t^4}-\frac{c_2}{2t^3}+\frac{1}{60}t(8t-3)\right\}\right\}$$

✓ **Maple** : cpu = 0.057 (sec), leaf count = 54

```
dsolve({t*diff(x(t),t)+2*x(t)-2*y(t) = t, t*diff(y(t),t)+x(t)+5*y(t) = t^2})
```

$$\left\{x(t)=\frac{2t^6+9t^5+30tc_1+30c_2}{30t^4}, y(t)=\frac{8t^6-3t^5-30tc_1-60c_2}{60t^4}\right\}$$

ODE No. 1880

$$\left\{t^2(1-\sin(t))x'(t) = t^2y(t) + tx(t)(1-2\sin(t)), t^2(1-\sin(t))y'(t) = x(t)(t\cos(t)-\sin(t)) + ty(t)(1-t\,c\right.$$

✓ **Mathematica** : cpu = 0.0158174 (sec), leaf count = 29

```
DSolve[{t^2*(1 - Sin[t])*Derivative[1][x][t] == t*(1 - 2*Sin[t])*x[t] + t^2*y[t], t^2*(1 - Si
```

$$\left\{\left\{x(t) \to c_1t^2 + c_2t, y(t) \to c_1t + c_2\sin(t)\right\}\right\}$$

✓ **Maple** : cpu = 0.091 (sec), leaf count = 23

```
dsolve({t^2*(1-sin(t))*diff(x(t),t) = t*(1-2*sin(t))*x(t)+t^2*y(t), t^2*(1-sin(t))*diff(y(t),
```

$$\left\{x(t) = t(tc_1 + c_2), y(t) = \sin(t)\,c_2 + tc_1\right\}$$

ODE No. 1881

$$\{x'(t)+y'(t)+y(t)=f(t),x''(t)+x(t)+y''(t)+y'(t)+y(t)=g(t)\}$$

✓ **Mathematica** : cpu = 0.008374 (sec), leaf count = 44

```
DSolve[{y[t] + Derivative[1][x][t] + Derivative[1][y][t] == f[t], x[t] + y[t] + Derivative[1]
```

$$\{\{x(t)\to -f''(t)-f'(t)-f(t)+g'(t)+g(t),y(t)\to f''(t)+f(t)-g'(t)\}\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 48

```
dsolve({diff(x(t),t)+diff(y(t),t)+y(t) = f(t), diff(diff(x(t),t),t)+diff(diff(y(t),t),t)+diff
```

$$\{x(t)=-\frac{d}{dt}f(t)+g(t)-f(t)-\frac{d^2}{dt^2}f(t)+\frac{d}{dt}g(t),y(t)=f(t)+\frac{d^2}{dt^2}f(t)-\frac{d}{dt}g(t)\}$$

ODE No. 1882

$$\left\{2x'(t)-3x(t)+y'(t)=0, x''(t)+y'(t)-2y(t)=e^{2t}\right\}$$

✓ **Mathematica** : cpu = 1.47438 (sec), leaf count = 928

```
DSolve[{-3*x[t] + 2*Derivative[1][x][t] + Derivative[1][y][t] == 0, -2*y[t] + Derivative[1][y
```

$$\left\{\left\{x(t)\to \frac{1}{46}e^{t/2}c_1\left(23\cos\left(\frac{\sqrt{23}t}{2}\right)+23e^{t/2}-3\sqrt{23}\sin\left(\frac{\sqrt{23}t}{2}\right)\right)+\frac{e^{3t/2}\left(23e^{t/2}\cos\left(\frac{\sqrt{23}t}{2}\right)-7\sqrt{23}e^{t/}\right.\right.$$

✓ **Maple** : cpu = 0.09 (sec), leaf count = 99

```
dsolve({diff(diff(x(t),t),t)+diff(y(t),t)-2*y(t) = exp(2*t), 2*diff(x(t),t)+diff(y(t),t)-3*x(
```

$$\left\{x(t)=\frac{\mathrm{e}^{2t}}{4}+c_1\mathrm{e}^{t}+c_2\mathrm{e}^{\frac{t}{2}}\cos\left(\frac{\sqrt{23}\,t}{2}\right)+c_3\mathrm{e}^{\frac{t}{2}}\sin\left(\frac{\sqrt{23}\,t}{2}\right), y(t)=-\frac{7\left(\frac{c_3\sqrt{23}}{7}+c_2\right)\mathrm{e}^{\frac{t}{2}}\cos\left(\frac{\sqrt{23}\,t}{2}\right)}{4}+\frac{\mathrm{e}^{\frac{t}{2}}(c\right.$$

ODE No. 1883

$$\{x'(t)+x(t)-y'(t)=2t, x''(t)-9x(t)+y'(t)+3y(t)=\sin(2t)\}$$

✓ **Mathematica** : cpu = 0.878258 (sec), leaf count = 602

```
DSolve[{x[t] + Derivative[1][x][t] - Derivative[1][y][t] == 2*t, -9*x[t] + 3*y[t] + Derivativ
```

$$\left\{\left\{x(t)\to \frac{e^{-4t}(20e^{4t}t+7e^{4t}+9)\left(10400(t^2+2t+2)+(260t-225e^{4t}-351)\sin(2t)+2(260t+75e^{4t}-9\right.\right.\right.}{83200}$$

✓ **Maple** : cpu = 0.121 (sec), leaf count = 80

```
dsolve({diff(x(t),t)-diff(y(t),t)+x(t) = 2*t, diff(diff(x(t),t),t)+diff(y(t),t)-9*x(t)+3*y(t)
```

$$\left\{x(t)=4+2t-\frac{36\sin(2t)}{325}-\frac{2\cos(2t)}{325}+c_1\mathrm{e}^{t}+c_2\mathrm{e}^{-3t}+c_3\mathrm{e}^{t}t, y(t)=-\frac{37\sin(2t)}{325}+\frac{16\cos(2t)}{325}+2c_1\mathrm{e}^{t}+\right.$$

ODE No. 1884

$$\{x'(t) - x(t) + 2y(t) = 0, x''(t) - 2y'(t) = 2t - \cos(2t)\}$$

✓ **Mathematica** : cpu = 0.404414 (sec), leaf count = 224

```
DSolve[{-x[t] + 2*y[t] + Derivative[1][x][t] == 0, -2*Derivative[1][y][t] + Derivative[2][x][
```

$$\left\{\left\{x(t) \to 7\left(t^2 - \frac{1}{2}\sin(2t) + c_2\right) + 8\left(\frac{1}{136}e^{-t/2}\left(2e^{t/2}\cos(2t) - 4\left(34e^{t/2}t^2 + 17e^{t/2}(t+2) - 15e^{t/2}\sin(2t)\right)\right.\right.\right.$$

✓ **Maple** : cpu = 0.134 (sec), leaf count = 69

```
dsolve({diff(diff(x(t),t),t)-2*diff(y(t),t) = 2*t-cos(2*t), diff(x(t),t)-x(t)+2*y(t) = 0})
```

$$\left\{x(t) = 2c_1 \mathrm{e}^{\frac{t}{2}} - t^2 + \frac{\sin(2t)}{34} + \frac{2\cos(2t)}{17} - 4t + c_2, y(t) = \frac{c_1 \mathrm{e}^{\frac{t}{2}}}{2} - t + \frac{\cos(2t)}{34} + \frac{9\sin(2t)}{68} + 2 - \frac{t^2}{2} + \frac{c_2}{2}\right.$$

ODE No. 1885

$$\{tx'(t) - ty'(t) - 2y(t) = 0, tx''(t) + 2x'(t) + tx(t) = 0\}$$

✓ **Mathematica** : cpu = 0.0168701 (sec), leaf count = 66

```
DSolve[{-2*y[t] + t*Derivative[1][x][t] - t*Derivative[1][y][t] == 0, t*x[t] + 2*Derivative[1
```

$$\left\{\left\{x(t) \to \frac{c_2 \cos(t)}{t} + \frac{c_3 \sin(t)}{t}, y(t) \to \frac{c_1}{t^2} + c_2\left(\frac{\cos(t)}{t} - \frac{2\sin(t)}{t^2}\right) + c_3\left(\frac{2\cos(t)}{t^2} + \frac{\sin(t)}{t}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.12 (sec), leaf count = 47

```
dsolve({t*diff(diff(x(t),t),t)+2*diff(x(t),t)+t*x(t) = 0, t*diff(x(t),t)-t*diff(y(t),t)-2*y(t
```

$$\left\{x(t) = \frac{\sin(t)\, c_2 + c_3 \cos(t)}{t}, y(t) = \frac{(tc_3 + 2c_2)\cos(t) + (tc_2 - 2c_3)\sin(t) + c_1}{t^2}\right\}$$

ODE No. 1886

$$\{ay(t)+x''(t)=0, y''(t)-a^2y(t)=0\}$$

✓ **Mathematica** : cpu = 0.0144492 (sec), leaf count = 115

```
DSolve[{a*y[t] + Derivative[2][x][t] == 0, -(a^2*y[t]) + Derivative[2][y][t] == 0},{x[t], y[t
```

$$\left\{\left\{x(t)\to -\frac{c_4e^{-at}(-2ate^{at}+e^{2at}-1)}{2a^2}-\frac{c_3e^{-at}(e^{at}-1)^2}{2a}+c_2t+c_1, y(t)\to \frac{1}{2}c_3e^{-at}\left(e^{2at}+1\right)+\frac{c_4e^{-at}(e\right.\right.$$

✓ **Maple** : cpu = 0.074 (sec), leaf count = 49

```
dsolve({diff(diff(x(t),t),t)+a*y(t) = 0, diff(diff(y(t),t),t)-a^2*y(t) = 0})
```

$$\left\{x(t)=\frac{-c_4\mathrm{e}^{-at}-c_3\mathrm{e}^{at}+a(tc_1+c_2)}{a}, y(t)=c_3\mathrm{e}^{at}+c_4\mathrm{e}^{-at}\right\}$$

ODE No. 1887

$$\{x''(t) = ax(t) + by(t), y''(t) = cx(t) + dy(t)\}$$

✓ **Mathematica** : cpu = 0.311969 (sec), leaf count = 5748

```
DSolve[{Derivative[2][x][t] == a*x[t] + b*y[t], Derivative[2][y][t] == c*x[t] + d*y[t]},{x[t]
```

$$\left\{\left\{x(t) \to \frac{e^{-\frac{\sqrt{a+d-\sqrt{a^2-2da+d^2+4bct}}}{\sqrt{2}}-\frac{\sqrt{a+d+\sqrt{a^2-2da+d^2+4bct}}}{\sqrt{2}}}\left(e^{\frac{\sqrt{a+d-\sqrt{a^2-2da+d^2+4bct}}}{\sqrt{2}}}a-e^{\frac{\sqrt{a+d+\sqrt{a^2-2da+d^2+4bct}}}{\sqrt{2}}}a-e^{\sqrt{2}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.12 (sec), leaf count = 360

```
dsolve({diff(diff(x(t),t),t) = a*x(t)+b*y(t), diff(diff(y(t),t),t) = c*x(t)+d*y(t)})
```

$$\left\{x(t) = c_1 e^{-\frac{\sqrt{-2\sqrt{a^2-2da+4bc+d^2}+2a+2d}\,t}{2}} + c_2 e^{\frac{\sqrt{-2\sqrt{a^2-2da+4bc+d^2}+2a+2d}\,t}{2}} + c_3 e^{-\frac{\sqrt{2\sqrt{a^2-2da+4bc+d^2}+2a+2d}\,t}{2}} + c_4 e^{\frac{\sqrt{2\sqrt{a^2-2da}}}{}}\right.$$

ODE No. 1888

$$\{x''(t) = \mathrm{a1}x(t) + \mathrm{b1}y(t) + \mathrm{c1}, y''(t) = \mathrm{a2}x(t) + \mathrm{b2}y(t) + \mathrm{c2}\}$$

✓ **Mathematica** : cpu = 8.4505 (sec), leaf count = 15664

```
DSolve[{Derivative[2][x][t] == c1 + a1*x[t] + b1*y[t], Derivative[2][y][t] == c2 + a2*x[t] +
```

Too large to display

✓ **Maple** : cpu = 0.186 (sec), leaf count = 457

```
dsolve({diff(diff(x(t),t),t) = a1*x(t)+b1*y(t)+c1, diff(diff(y(t),t),t) = a2*x(t)+b2*y(t)+c2}
```

$$\left\{ x(t) = c_4 \mathrm{e}^{\frac{\sqrt{2\sqrt{a1^2-2a1\,b2+4b1\,a2+b2^2}+2a1+2b2}\,t}{2}} + c_3 \mathrm{e}^{-\frac{\sqrt{2\sqrt{a1^2-2a1\,b2+4b1\,a2+b2^2}+2a1+2b2}\,t}{2}} + c_2 \mathrm{e}^{\frac{\sqrt{2a1+2b2-2\sqrt{a1^2-2a1\,b2+4b1\,a2+b2^2}}}{2}}
```
```

ODE No. 1889

$$\{x''(t)+x(t)+y(t)=-5,-4x(t)+y''(t)-3y(t)=-3\}$$

✓ **Mathematica** : cpu = 0.197421 (sec), leaf count = 554

```
DSolve[{x[t] + y[t] + Derivative[2][x][t] == -5, -4*x[t] - 3*y[t] + Derivative[2][y][t] == -3
```

$$\left\{\left\{x(t)\to -\frac{1}{8}e^{-t}\left(e^{-t}(-13t-10)+e^{t}(10-13t)\right)\left(e^{2t}t+t-e^{2t}+1\right)-\frac{1}{8}e^{-t}\left(e^{2t}-1\right)t\left(e^{-t}(-13t-23)+\right.\right.\right.$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 60

```
dsolve({diff(diff(x(t),t),t)+x(t)+y(t) = -5, diff(diff(y(t),t),t)-4*x(t)-3*y(t) = -3})
```

$$\{x(t)=(tc_4+c_2)\,\mathrm{e}^{-t}+18+(tc_3+c_1)\,\mathrm{e}^{t},y(t)=((-2t+2)\,c_4-2c_2)\,\mathrm{e}^{-t}-23+((-2t-2)\,c_3-2c_1)\,\mathrm{e}^{t}\}$$

ODE No. 1890

$$\left\{x''(t) = c^2x(t)\left(3\cos^2(at+b)-1\right)+\frac{3}{2}c^2y(t)\sin(2abt), y''(t) = \frac{3}{2}c^2x(t)\sin(2abt)+c^2y(t)\left(3\sin^2(at+b)-\right.\right.$$

✗ **Mathematica** : cpu = 1.69863 (sec), leaf count = 0

```
DSolve[{Derivative[2][x][t] == c^2*(-1 + 3*Cos[b + a*t]^2)*x[t] + (3*c^2*Sin[2*a*b*t]*y[t])/2
```

, could not solve

```
DSolve[{Derivative[2][x][t] == c^2*(-1 + 3*Cos[b + a*t]^2)*x[t] + (3*c^2*Sin[2*a*b*t]*y
1 + 3*Sin[b + a*t]^2)*y[t]}, {x[t], y[t]}, t]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(diff(x(t),t),t) = (3*cos(a*t+b)^2-1)*c^2*x(t)+3/2*c^2*y(t)*sin(2*a*t*b), diff(di
```

, result contains DESol or ODESolStruc

$$\left\{x(t) = DESol\left(\left\{\frac{d^4}{dt^4}\_Y(t)+\left(\frac{2\sin(atb)\,ab}{\cos(atb)}-\frac{2\cos(atb)\,ab}{\sin(atb)}\right)\left(\frac{d^3}{dt^3}\_Y(t)\right)+\left(\frac{2(\sin^2(atb))\,a^2b^2}{\cos(atb)^2}+\frac{2(\mathrm{co}}{}\right.\right.\right.$$

ODE No. 1891

$$\{x''(t)+6x(t)+7y(t)=0,3x(t)+y''(t)+2y(t)=2t\}$$

✓ **Mathematica** : cpu = 0.871432 (sec), leaf count = 742

```
DSolve[{6*x[t] + 7*y[t] + Derivative[2][x][t] == 0, 3*x[t] + 2*y[t] + Derivative[2][y][t] ==
```

$$\left\{\left\{x(t)\to -\frac{7}{200}e^{-t}\left(e^{2t}-2e^{t}\cos(3t)+1\right)\left(-7e^{-t}\left(e^{2t}(t-1)+t+1\right)-\frac{2}{9}\sin(3t)+\frac{2}{3}t\cos(3t)\right)+\frac{7}{600}e^{-t}\right.\right.$$

✓ **Maple** : cpu = 0.061 (sec), leaf count = 64

```
dsolve({diff(diff(x(t),t),t)+6*x(t)+7*y(t) = 0, diff(diff(y(t),t),t)+3*x(t)+2*y(t) = 2*t})
```

$$\left\{x(t)=\frac{14t}{9}+c_1\mathrm{e}^{t}+c_2\cos(3t)+c_3\mathrm{e}^{-t}+c_4\sin(3t),y(t)=-c_1\mathrm{e}^{t}+\frac{3c_2\cos(3t)}{7}-c_3\mathrm{e}^{-t}+\frac{3c_4\sin(3t)}{7}-\frac{4}{3}\right.$$

ODE No. 1892

$$\{-ay'(t)+bx(t)+x''(t)=0, ax'(t)+by(t)+y''(t)=0\}$$

✓ **Mathematica** : cpu = 0.239395 (sec), leaf count = 4815

```
DSolve[{b*x[t] - a*Derivative[1][y][t] + Derivative[2][x][t] == 0, b*y[t] + a*Derivative[1][x
```

$$\left\{\left\{x(t)\to e^{-\frac{\sqrt{-a^2-2b-\sqrt{a^2\left(a^2+4b\right)}}t}{\sqrt{2}}-\frac{\sqrt{-a^2-2b+\sqrt{a^2\left(a^2+4b\right)}}t}{\sqrt{2}}}\left(e^{\frac{\sqrt{-a^2-2b-\sqrt{a^2\left(a^2+4b\right)}}t}{\sqrt{2}}}a^2-e^{\frac{\sqrt{-a^2-2b+\sqrt{a^2\left(a^2+4b\right)}}t}{\sqrt{2}}}a^2-e^{\sqrt{2}\sqrt{}\right.\right.\right.$$

✓ **Maple** : cpu = 0.126 (sec), leaf count = 463

```
dsolve({diff(diff(x(t),t),t)-a*diff(y(t),t)+b*x(t) = 0, diff(diff(y(t),t),t)+a*diff(x(t),t)+b
```

$$\left\{x(t)=c_1\mathrm{e}^{-\frac{\sqrt{-2a^2-2\sqrt{a^2\left(a^2+4b\right)}-4bt}}{2}}+c_2\mathrm{e}^{\frac{\sqrt{-2a^2-2\sqrt{a^2\left(a^2+4b\right)}-4bt}}{2}}+c_3\mathrm{e}^{-\frac{\sqrt{-2a^2+2\sqrt{a^2\left(a^2+4b\right)}-4bt}}{2}}+c_4\mathrm{e}^{\frac{\sqrt{-2a^2+2\sqrt{a^2\left(a^2+4b\right)}}}{2}}\right.$$

ODE No. 1893

$$\{-\mathrm{A0}y'(t)+\mathrm{a1}x''(t)+\mathrm{b1}x'(t)+\mathrm{c1}x(t)=\mathrm{B0}e^{i\omega t},\mathrm{A0}x'(t)+\mathrm{a2}y''(t)+\mathrm{b2}y'(t)+\mathrm{c2}y(t)=0\}$$

✓ **Mathematica** : cpu = 0.404543 (sec), leaf count = 5546

```
DSolve[{c1*x[t] + b1*Derivative[1][x][t] - A0*Derivative[1][y][t] + a1*Derivative[2][x][t] ==
```

Expression too large to display

✓ **Maple** : cpu = 0.855 (sec), leaf count = 1579

```
dsolve({a1*diff(diff(x(t),t),t)+b1*diff(x(t),t)+c1*x(t)-A*diff(y(t),t) = B*exp(I*omega*t), a2
```

Expression too large to display

ODE No. 1894

$$\{a(x'(t)-y'(t))+\mathrm{b1}x(t)+x''(t)=\mathrm{c1}e^{i\omega t},a(y'(t)-x'(t))+\mathrm{b2}y(t)+y''(t)=\mathrm{c2}e^{i\omega t}\}$$

✓ **Mathematica** : cpu = 0.428017 (sec), leaf count = 3386

```
DSolve[{b1*x[t] + a*(Derivative[1][x][t] - Derivative[1][y][t]) + Derivative[2][x][t] == c1*E
```

$$\left\{\left\{x(t)\to -a\mathrm{b2}c_3\text{RootSum}\left[\#1^4+2a\#1^3+\mathrm{b1}\#1^2+\mathrm{b2}\#1^2+a\mathrm{b1}\#1+a\mathrm{b2}\#1+\mathrm{b1b2}\&,\frac{}{4\#1^3+6a\#1^2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.786 (sec), leaf count = 1056

```
dsolve({diff(diff(x(t),t),t)+a*(diff(x(t),t)-diff(y(t),t))+b1*x(t) = c1*exp(I*omega*t), diff(
```

$$\left\{x(t)=\frac{(-c1\,\omega^2+i(c1+c2)\,a\omega+b2\,c1)\,\mathrm{e}^{i\omega t}}{\omega^4-2ia\,\omega^3+(-b1-b2)\,\omega^2+ia\,(b1+b2)\,\omega+b1\,b2}+c_1\mathrm{e}^{\text{RootOf}(\_Z^4+2a\_Z^3+(b1+b2)\_Z^2+(b1a+b2a)\_}\right.$$

ODE No. 1895

$$\{\mathrm{a11}x''(t)+\mathrm{a12}y''(t)+\mathrm{b11}x'(t)+\mathrm{b12}y'(t)+\mathrm{c11}x(t)+\mathrm{c12}y(t)=0,\mathrm{a21}x''(t)+\mathrm{a22}y''(t)+\mathrm{b21}x'(t)+\mathrm{b22}$$

✓ **Mathematica** : cpu = 0.20708 (sec), leaf count = 7517

```
DSolve[{c11*x[t] + c12*y[t] + b11*Derivative[1][x][t] + b12*Derivative[1][y][t] + a11*Derivat
```

✓ **Maple** : cpu = 0.19 (sec), leaf count = 1008

```
dsolve({a11*diff(diff(x(t),t),t)+b11*diff(x(t),t)+c11*x(t)+a12*diff(diff(y(t),t),t)+b12*diff(
```

$$\left\{x(t)=\sum_{\_a=1}^{4}\mathrm{e}^{\mathrm{RootOf}\left((a22a11-a21a12)\_Z^4+(a11b22-a12b21-a21b12+a22b11)\_Z^3+(a11c22-a12c21-a21c12+a22c11+b22b11-\right.}\right.$$

ODE No. 1896

$$\left\{x''(t)-2x'(t)-y'(t)+y(t)=0,2x'(t)-x(t)+y^{(3)}(t)-y''(t)=t\right\}$$

✓ **Mathematica** : cpu = 0.467105 (sec), leaf count = 1132

```
DSolve[{y[t] - 2*Derivative[1][x][t] - Derivative[1][y][t] + Derivative[2][x][t] == 0, -x[t]
```

$$\left\{\left\{x(t)\to \frac{1}{64}e^{-t}\left(2e^{2t}t^2-6e^{2t}t+7e^{2t}+1\right)\left(e^t(1-t)+e^{-t}\left(-2t^3-8t^2-17t-17\right)\right)+\frac{1}{64}e^{-t}\left(2e^{2t}t^2+6e^{2t}\right.\right.\right.$$

✓ **Maple** : cpu = 0.069 (sec), leaf count = 67

```
dsolve({diff(diff(diff(y(t),t),t),t)-diff(diff(y(t),t),t)+2*diff(x(t),t)-x(t) = t, diff(diff(
```

$$\left\{x(t)=-\frac{2\,\mathrm{e}^{-t}c_2}{3}+\frac{\left(-9t^2c_5-6tc_4-3c_3-18c_5\right)\mathrm{e}^t}{3}-t-2,y(t)=\mathrm{e}^{-t}c_2-2+\left(t^3c_5+t^2c_4+tc_3+c_1\right)\mathrm{e}^t\right\}$$

ODE No. 1897

$$\{x''(t)+y''(t)+y'(t)=\sinh(2t),2x''(t)+y''(t)=2t\}$$

✓ **Mathematica** : cpu = 0.210661 (sec), leaf count = 280

```
DSolve[{Derivative[1][y][t] + Derivative[2][x][t] + Derivative[2][y][t] == Sinh[2*t], 2*Deriv
```

$$\left\{\left\{x(t)\to t\left(\frac{t^2}{2}+\frac{t}{2}-\frac{e^{4t}}{8}+e^{2t}\left(\frac{t}{2}-\frac{1}{4}\right)\right)+\frac{1}{48}\left(-4\left(4t^2-3t+3\right)t-12e^{2t}t-6e^{-2t}+3e^{4t}\right)+\frac{1}{4}e^{-2t}\left(-2\right.\right.\right.$$

✓ **Maple** : cpu = 0.28 (sec), leaf count = 90

```
dsolve({2*diff(diff(x(t),t),t)+diff(diff(y(t),t),t) = 2*t, diff(diff(x(t),t),t)+diff(diff(y(t
```

$$\left\{x(t)=\frac{(6c_2-6t-9)\cosh(2t)}{24}+\frac{(-6c_2+6t+6)\sinh(2t)}{24}+\frac{t^3}{6}+\frac{t^2}{4}+tc_3+c_4,y(t)=\frac{(-2c_2+2t+3)\,c\right.$$

ODE No. 1898

$$\{x''(t) - x'(t) + y'(t) = 0, x''(t) - x(t) + y''(t) = 0\}$$

✓ **Mathematica** : cpu = 0.0252624 (sec), leaf count = 420

```
DSolve[{-Derivative[1][x][t] + Derivative[1][y][t] + Derivative[2][x][t] == 0, -x[t] + Deriva
```

$$\left\{\left\{x(t) \to -\frac{1}{5}c_1 e^{\frac{t}{2}-\frac{\sqrt{5}t}{2}}\left(\sqrt{5}e^{\sqrt{5}t} - 5e^{\frac{\sqrt{5}t}{2}+\frac{t}{2}} - \sqrt{5}\right) + \frac{c_2 e^{\frac{t}{2}-\frac{\sqrt{5}t}{2}}\left(e^{\sqrt{5}t}-1\right)}{\sqrt{5}} - \frac{1}{10}c_4 e^{\frac{t}{2}-\frac{\sqrt{5}t}{2}}\left(5e^{\sqrt{5}t} + \sqrt{5}e^{\sqrt{5}t} -\right.\right.$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 71

```
dsolve({diff(diff(x(t),t),t)+diff(diff(y(t),t),t)-x(t) = 0, diff(diff(x(t),t),t)-diff(x(t),t)
```

$$\left\{x(t) = \frac{c_4\left(\sqrt{5}-1\right)\mathrm{e}^{-\frac{\left(\sqrt{5}-1\right)t}{2}}}{2} - \frac{c_3\left(\sqrt{5}+1\right)\mathrm{e}^{\frac{\left(\sqrt{5}+1\right)t}{2}}}{2} + c_1\mathrm{e}^{t}, y(t) = c_2 + c_3\mathrm{e}^{\frac{\left(\sqrt{5}+1\right)t}{2}} + c_4\mathrm{e}^{-\frac{\left(\sqrt{5}-1\right)t}{2}}\right\}$$

ODE No. 1899

$$\{x'(t) = 2x(t), y'(t) = 3x(t) - 2y(t), z'(t) = 2y(t) + 3z(t)\}$$

✓ **Mathematica** : cpu = 0.007828 (sec), leaf count = 112

```
DSolve[{Derivative[1][x][t] == 2*x[t], Derivative[1][y][t] == 3*x[t] - 2*y[t], Derivative[1][
```

$$\left\{\left\{x(t) \to c_1 e^{2t}, y(t) \to \frac{3}{4}c_1 e^{-2t}\left(e^{4t} - 1\right) + c_2 e^{-2t}, z(t) \to \frac{3}{10}c_1 e^{-2t}\left(2e^{t} + 3e^{2t} + 4e^{3t} + 1\right)\left(e^{t} - 1\right)^2 + \frac{2}{5}c_2 e\right.\right.$$

✓ **Maple** : cpu = 0.098 (sec), leaf count = 52

```
dsolve({diff(x(t),t) = 2*x(t), diff(y(t),t) = 3*x(t)-2*y(t), diff(z(t),t) = 2*y(t)+3*z(t)})
```

$$\left\{x(t) = c_3 \mathrm{e}^{2t}, y(t) = \frac{3c_3 \mathrm{e}^{2t}}{4} + c_2 \mathrm{e}^{-2t}, z(t) = c_1 \mathrm{e}^{3t} - \frac{3c_3 \mathrm{e}^{2t}}{2} - \frac{2c_2 \mathrm{e}^{-2t}}{5}\right\}$$

ODE No. 1900

$$\{x'(t) = 4x(t), y'(t) = x(t) - 2y(t), z'(t) = x(t) - 4y(t) + z(t)\}$$

✓ **Mathematica** : cpu = 0.00739 (sec), leaf count = 94

```
DSolve[{Derivative[1][x][t] == 4*x[t], Derivative[1][y][t] == x[t] - 2*y[t], Derivative[1][z]
```

$$\left\{\left\{x(t) \to c_1 e^{4t}, y(t) \to \frac{1}{6}c_1 e^{-2t}\left(e^{6t} - 1\right) + c_2 e^{-2t}, z(t) \to \frac{1}{9}c_1 e^{-2t}\left(e^{3t} + e^{6t} - 2\right) - \frac{4}{3}c_2 e^{-2t}\left(e^{3t} - 1\right) + c_3 e^{t}\right.\right.$$

✓ **Maple** : cpu = 0.103 (sec), leaf count = 50

```
dsolve({diff(x(t),t) = 4*x(t), diff(y(t),t) = x(t)-2*y(t), diff(z(t),t) = x(t)-4*y(t)+z(t)})
```

$$\left\{x(t) = c_3 \mathrm{e}^{4t}, y(t) = \frac{c_3 \mathrm{e}^{4t}}{6} + c_2 \mathrm{e}^{-2t}, z(t) = \frac{c_3 \mathrm{e}^{4t}}{9} + c_1 \mathrm{e}^{t} + \frac{4c_2 \mathrm{e}^{-2t}}{3}\right\}$$

ODE No. 1901

$$\{x'(t) = y(t) - z(t), y'(t) = x(t) + y(t), z'(t) = x(t) + z(t)\}$$

✓ **Mathematica** : cpu = 0.0079731 (sec), leaf count = 105

```
DSolve[{Derivative[1][x][t] == y[t] - z[t], Derivative[1][y][t] == x[t] + y[t], Derivative[1]
```

$$\{\{x(t) \to c_2\left(e^t - 1\right) + c_3\left(1 - e^t\right) + c_1, y(t) \to c_1\left(e^t - 1\right) + c_2\left(e^t t + 1\right) + c_3\left(-e^t t + e^t - 1\right), z(t) \to c_1\left(e^t -$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 43

```
dsolve({diff(x(t),t) = y(t)-z(t), diff(y(t),t) = x(t)+y(t), diff(z(t),t) = x(t)+z(t)})
```

$$\{x(t) = c_2 + c_3 \mathrm{e}^t, y(t) = (t c_3 + c_1)\,\mathrm{e}^t - c_2, z(t) = ((t-1)\,c_3 + c_1)\,\mathrm{e}^t - c_2\}$$

ODE No. 1902

$$\{x'(t)-y(t)+z(t)=0,-x(t)+y'(t)-y(t)=t,-x(t)+z'(t)-z(t)=t\}$$

✓ **Mathematica** : cpu = 0.0165535 (sec), leaf count = 226

```
DSolve[{-y[t] + z[t] + Derivative[1][x][t] == 0, -x[t] - y[t] + Derivative[1][y][t] == t, -x[
```

$$\{\{x(t)\to e^{-t}\left(1-e^t\right)(-t-1)+e^{-t}\left(e^t-1\right)(-t-1)+c_2\left(e^t-1\right)+c_3\left(1-e^t\right)+c_1,y(t)\to e^{-t}(-t-1)($$

✓ **Maple** : cpu = 0.081 (sec), leaf count = 51

```
dsolve({diff(x(t),t)-y(t)+z(t) = 0, diff(y(t),t)-x(t)-y(t) = t, diff(z(t),t)-x(t)-z(t) = t})
```

$$\{x(t)=c_2+c_3\mathrm{e}^t,y(t)=(tc_3+c_1)\,\mathrm{e}^t-t-c_2-1,z(t)=((t-1)\,c_3+c_1)\,\mathrm{e}^t-t-c_2-1\}$$

ODE No. 1903

$$\{ax'(t) = bc(y(t) - z(t)), by'(t) = ac(z(t) - x(t)), cz'(t) = ab(x(t) - y(t))\}$$

✓ **Mathematica** : cpu = 0.0668711 (sec), leaf count = 1304

```
DSolve[{a*Derivative[1][x][t] == b*c*(y[t] - z[t]), b*Derivative[1][y][t] == a*c*(-x[t] + z[t
```

$$\left\{\left\{x(t) \to \frac{e^{-i\sqrt{a^2+b^2+c^2}t}\left(2e^{i\sqrt{a^2+b^2+c^2}t}a^2 + b^2e^{2i\sqrt{a^2+b^2+c^2}t} + c^2e^{2i\sqrt{a^2+b^2+c^2}t} + b^2 + c^2\right)c_1}{2\left(a^2+b^2+c^2\right)} - \frac{be^{-i\sqrt{a^2+b^2+c^2}t}\left(\right.\right.\right.$$

✓ **Maple** : cpu = 0.143 (sec), leaf count = 299

```
dsolve({a*diff(x(t),t) = b*c*(y(t)-z(t)), b*diff(y(t),t) = c*a*(z(t)-x(t)), c*diff(z(t),t) =
```

$$\left\{x(t) = c_1 + c_2 \sin\left(\sqrt{a^2+b^2+c^2}\,t\right) + c_3 \cos\left(\sqrt{a^2+b^2+c^2}\,t\right), y(t) = \frac{c_1b^3 + \left(\left(-c_2 \sin\left(\sqrt{a^2+b^2+c^2}\,t\right)\right.\right.\right.$$

ODE No. 1904

$$\{x'(t) = cy(t) - bz(t), y'(t) = az(t) - cx(t), z'(t) = bx(t) - ay(t)\}$$

✓ **Mathematica** : cpu = 0.044396 (sec), leaf count = 1445

```
DSolve[{Derivative[1][x][t] == c*y[t] - b*z[t], Derivative[1][y][t] == -(c*x[t]) + a*z[t], De
```

$$\left\{\left\{x(t) \to \frac{e^{-\sqrt{-a^2-b^2-c^2}t}\left(2e^{\sqrt{-a^2-b^2-c^2}t}a^2 + b^2e^{2\sqrt{-a^2-b^2-c^2}t} + c^2e^{2\sqrt{-a^2-b^2-c^2}t} + b^2 + c^2\right)c_1}{2\left(a^2+b^2+c^2\right)} - \frac{e^{-\sqrt{-a^2-b^2-c^2}t}}{}\right.\right.$$

✓ **Maple** : cpu = 0.1 (sec), leaf count = 257

```
dsolve({diff(x(t),t) = c*y(t)-b*z(t), diff(y(t),t) = a*z(t)-c*x(t), diff(z(t),t) = b*x(t)-a*y
```

$$\left\{x(t) = c_1 + c_2\sin\left(\sqrt{a^2+b^2+c^2}\,t\right) + c_3\cos\left(\sqrt{a^2+b^2+c^2}\,t\right), y(t) = \frac{\left(-c_3a^2b + \sqrt{a^2+b^2+c^2}\,c_2ac\right)\cos}{}\right.$$

ODE No. 1905

$$\{x'(t) = h(t)y(t) - g(t)z(t), y'(t) = f(t)z(t) - h(t)x(t), z'(t) = g(t)x(t) - f(t)y(t)\}$$

✗ **Mathematica** : cpu = 0.132107 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == h[t]*y[t] - g[t]*z[t], Derivative[1][y][t] == -(h[t]*x[t]) + f
```

, could not solve

```
DSolve[{Derivative[1][x][t] == h[t]*y[t] - g[t]*z[t], Derivative[1][y][t] == -
(h[t]*x[t]) + f[t]*z[t], Derivative[1][z][t] == g[t]*x[t] - f[t]*y[t]}, {x[t], y[t], z[
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = h(t)*y(t)-g(t)*z(t), diff(y(t),t) = f(t)*z(t)-h(t)*x(t), diff(z(t),t)
```

, result contains DESol or ODESolStruc

Expression too large to display

ODE No. 1906

$$\{x'(t) = x(t) + y(t) - z(t), y'(t) = -x(t) + y(t) + z(t), z'(t) = x(t) - y(t) + z(t)\}$$

✓ **Mathematica** : cpu = 0.0391274 (sec), leaf count = 278

```
DSolve[{Derivative[1][x][t] == x[t] + y[t] - z[t], Derivative[1][y][t] == -x[t] + y[t] + z[t]
```

$$\left\{\left\{x(t) \to \frac{1}{3}c_1 e^t\left(2\cos\left(\sqrt{3}t\right)+1\right) - \frac{1}{3}c_2 e^t\left(-\sqrt{3}\sin\left(\sqrt{3}t\right)+\cos\left(\sqrt{3}t\right)-1\right) - \frac{1}{3}c_3 e^t\left(\sqrt{3}\sin\left(\sqrt{3}t\right)+\right.\right.\right.$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 120

```
dsolve({diff(x(t),t) = x(t)+y(t)-z(t), diff(y(t),t) = y(t)+z(t)-x(t), diff(z(t),t) = z(t)+x(t
```

$$\left\{x(t) = \mathrm{e}^t\left(\sin\left(\sqrt{3}\,t\right)c_2 + \cos\left(\sqrt{3}\,t\right)c_3 + c_1\right), y(t) = \frac{\mathrm{e}^t\left(c_2\sqrt{3} - c_3\right)\cos\left(\sqrt{3}\,t\right)}{2} + \frac{\mathrm{e}^t\left(-c_3\sqrt{3} - c_2\right)\sin\left(\sqrt{\right.}\right.}{2}$$

ODE No. 1907

$$\{x'(t) = -3x(t) + 48y(t) - 28z(t), y'(t) = -4x(t) + 40y(t) - 22z(t), z'(t) = -6x(t) + 57y(t) - 31z(t)\}$$

✓ **Mathematica** : cpu = 0.0096629 (sec), leaf count = 179

```
DSolve[{Derivative[1][x][t] == -3*x[t] + 48*y[t] - 28*z[t], Derivative[1][y][t] == -4*x[t] +
```

$$\{\{x(t) \to c_1\left(-e^t\right)\left(2e^{2t} - 3\right) + 6c_2e^t\left(2e^t + 3e^{2t} - 5\right) - 2c_3e^t\left(4e^t + 5e^{2t} - 9\right), y(t) \to -2c_1e^t\left(e^{2t} - 1\right) + c_2e$$

✓ **Maple** : cpu = 0.071 (sec), leaf count = 66

```
dsolve({diff(x(t),t) = -3*x(t)+48*y(t)-28*z(t), diff(y(t),t) = -4*x(t)+40*y(t)-22*z(t), diff(
```

$$\left\{x(t) = c_1\mathrm{e}^{2t} + c_2\mathrm{e}^t + c_3\mathrm{e}^{3t}, y(t) = \frac{c_1\mathrm{e}^{2t}}{4} + \frac{2c_2\mathrm{e}^t}{3} + c_3\mathrm{e}^{3t}, z(t) = \frac{c_1\mathrm{e}^{2t}}{4} + c_2\mathrm{e}^t + \frac{3c_3\mathrm{e}^{3t}}{2}\right\}$$

ODE No. 1908

$$\{x'(t) = 6x(t) - 72y(t) + 44z(t), y'(t) = 4x(t) - 4y(t) + 26z(t), z'(t) = 6x(t) - 63y(t) + 38z(t)\}$$

✓ **Mathematica** : cpu = 0.0344443 (sec), leaf count = 551

```
DSolve[{Derivative[1][x][t] == 6*x[t] - 72*y[t] + 44*z[t], Derivative[1][y][t] == 4*x[t] - 4*
```

$$\left\{\left\{x(t) \to -36c_2\text{RootSum}\left[\#1^3 - 40\#1^2 + 1714\#1 + 1404\&, \frac{2\#1e^{\#1t} + e^{\#1t}}{3\#1^2 - 80\#1 + 1714}\&\right] + 4c_3\text{RootSum}\left[\#\right.\right.$$

✓ **Maple** : cpu = 1.155 (sec), leaf count = 1129

```
dsolve({diff(x(t),t) = 6*x(t)-72*y(t)+44*z(t), diff(y(t),t) = 4*x(t)-4*y(t)+26*z(t), diff(z(t
```

$$\left\{ x(t) = c_2 \mathrm{e}^{\frac{\left(-3542+\left(263474+18\sqrt{351406311}\right)^{\frac{2}{3}}+80\left(263474+18\sqrt{351406311}\right)^{\frac{1}{3}}\right)t}{6\left(263474+18\sqrt{351406311}\right)^{\frac{1}{3}}}} \sin\left(\frac{\left(\left(263474+18\sqrt{351406311}\right)^{\frac{2}{3}}+3542\right)t\sqrt{}}{1580844+108\sqrt{35}}\right.\right.$$

ODE No. 1909

$$\{x'(t) = ax(t) + \beta z(t) + gy(t), y'(t) = \alpha z(t) + by(t) + gx(t), z'(t) = \alpha y(t) + \beta x(t) + cz(t)\}$$

✓ **Mathematica** : cpu = 0.0466862 (sec), leaf count = 1630

```
DSolve[{Derivative[1][x][t] == a*x[t] + g*y[t] + beta*z[t], Derivative[1][y][t] == g*x[t] + b
```

$$\left\{\left\{x(t) \to -c_2 \text{RootSum}\left[\#1^3 - a\#1^2 - b\#1^2 - c\#1^2 - \alpha^2\#1 - \beta^2\#1 - g^2\#1 + ab\#1 + ac\#1 + bc\#1 +\right.\right.\right.$$

✓ **Maple** : cpu = 12.424 (sec), leaf count = 33085

```
dsolve({diff(x(t),t) = a*x(t)+g*y(t)+beta*z(t), diff(y(t),t) = g*x(t)+b*y(t)+alpha*z(t), diff
```

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ODE No. 1910

$$\left\{tx'(t) = 2x(t) - t, t^3y'(t) = t^2y(t) - x(t) + t, t^4z'(t) = t^3z(t) - t^2y(t) - x(t) + t\right\}$$

✓ **Mathematica** : cpu = 0.0074979 (sec), leaf count = 39

```
DSolve[{t*Derivative[1][x][t] == -t + 2*x[t], t^3*Derivative[1][y][t] == t - x[t] + t^2*y[t],
```

$$\left\{\left\{x(t) \to t + c_3t^2, y(t) \to c_2t + c_3, z(t) \to c_1t + \frac{c_3}{t} + c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.107 (sec), leaf count = 37

```
dsolve({t*diff(x(t),t) = 2*x(t)-t, t^3*diff(y(t),t) = -x(t)+t^2*y(t)+t, t^4*diff(z(t),t) = -x
```

$$\left\{x(t) = t^2c_3 + t, y(t) = tc_2 + c_3, z(t) = \frac{t^2c_1 + tc_2 + c_3}{t}\right\}$$

ODE No. 1911

$$\{atx'(t) = bc(y(t) - z(t)), bty'(t) = ac(z(t) - x(t)), ctz'(t) = ab(x(t) - y(t))\}$$

✓ **Mathematica** : cpu = 0.0250552 (sec), leaf count = 1148

```
DSolve[{a*t*Derivative[1][x][t] == b*c*(y[t] - z[t]), b*t*Derivative[1][y][t] == a*c*(-x[t] +
```

$$\left\{\left\{x(t) \to \frac{\left(2a^2 t^{i\sqrt{a^2+b^2+c^2}} + b^2\left(t^{2i\sqrt{a^2+b^2+c^2}} + 1\right) + c^2\left(t^{2i\sqrt{a^2+b^2+c^2}} + 1\right)\right) c_1 t^{-i\sqrt{a^2+b^2+c^2}}}{2\left(a^2+b^2+c^2\right)} - \frac{b\left(t^{i\sqrt{a^2+b^2+c^2}} -\right.\right.\right.$$

✓ **Maple** : cpu = 0.141 (sec), leaf count = 308

```
dsolve({a*t*diff(x(t),t) = b*c*(y(t)-z(t)), b*t*diff(y(t),t) = c*a*(z(t)-x(t)), c*t*diff(z(t)
```

$$\left\{x(t) = c_1 + c_2 \sin\left(\sqrt{a^2+b^2+c^2}\,\ln(t)\right) + c_3 \cos\left(\sqrt{a^2+b^2+c^2}\,\ln(t)\right), y(t) = \frac{\cos\left(\sqrt{a^2+b^2+c^2}\,\ln(t)\right.\right.$$

ODE No. 1912

$$\{\mathrm{x1}'(t) = a\mathrm{x2}(t) + b\mathrm{x3}(t)\cos(ct) + b\mathrm{x4}(t)\sin(ct), \mathrm{x2}'(t) = -a\mathrm{x1}(t) + b\mathrm{x3}(t)\sin(ct) - b\mathrm{x4}(t)\cos(ct), \mathrm{x3}'(t) =$$

✓ **Mathematica** : cpu = 0.0099564 (sec), leaf count = 798

```
DSolve[{Derivative[1][x1][t] == a*x2[t] + b*Cos[c*t]*x3[t] + b*Sin[c*t]*x4[t], Derivative[1][
```

$$\left\{\left\{\mathrm{x1}(t) \to c_3 \cos\left(\left(\frac{c}{2} - \frac{1}{2}\sqrt{4b^2 + (2a+c)^2}\right)t\right) + c_1 \cos\left(\left(\frac{c}{2} + \frac{1}{2}\sqrt{4b^2 + (2a+c)^2}\right)t\right) + c_4 \sin\left(\left(\frac{c}{2} -\right.\right.\right.$$

✓ **Maple** : cpu = 1.161 (sec), leaf count = 2788

```
dsolve({diff(x1(t),t) = a*x2(t)+b*x3(t)*cos(c*t)+b*x4(t)*sin(c*t), diff(x2(t),t) = -a*x1(t)+b
```

$$\left\{x1(t) = c_2 + c_3 \sin(ct) + c_4 \cos(ct), x2(t) = -\cos(ct) c_3 + \sin(ct) c_4 + c_1, x3(t) = \frac{b(\cos(ct) c_1 a - \sin(ct}{a(a+}\right.$$

ODE No. 1913

$$\{x'(t) = -x(t)(x(t) + y(t)), y'(t) = y(t)(x(t) + y(t))\}$$

✓ **Mathematica** : cpu = 0.0320421 (sec), leaf count = 64

```
DSolve[{Derivative[1][x][t] == -(x[t]*(x[t] + y[t])), Derivative[1][y][t] == y[t]*(x[t] + y[t
```

$$\{\{y(t) \to -\sqrt{c_1}\cot\left(\sqrt{c_1}t - \sqrt{c_1}c_2\right), x(t) \to -\sqrt{c_1}\tan\left(\sqrt{c_1}t - \sqrt{c_1}c_2\right)\}\}$$

✓ **Maple** : cpu = 0.147 (sec), leaf count = 57

```
dsolve({diff(x(t),t) = -x(t)*(x(t)+y(t)), diff(y(t),t) = y(t)*(x(t)+y(t))})
```

$$\left[\{x(t) = 0\}, \left\{y(t) = \frac{1}{c_1 - t}\right\}\right]$$

ODE No. 1914

$$\{x'(t) = x(t)(ay(t) + b), y'(t) = y(t)(cx(t) + d)\}$$

✓ **Mathematica** : cpu = 0.28613 (sec), leaf count = 204

```
DSolve[{Derivative[1][x][t] == x[t]*(b + a*y[t]), Derivative[1][y][t] == (d + c*x[t])*y[t]},{
```

$$\left\{\left\{y(t) \to \frac{bW\left(\frac{a\text{InverseFunction}\left[\int_1^{\#1}\frac{1}{K[1]\left(W\left(\frac{ae^{\frac{c_1}{b}+\frac{cK[1]}{b}}K[1]^{\frac{d}{b}}}{b}\right)+1\right)}dK[1]\&\right][bt+c_2]^{\frac{d}{b}}\exp\left(\frac{c\text{InverseFunction}\left[\int_1^{\#1}\frac{\quad}{K[1}\right.}{\quad}\right.}{b}\right.}{a}\right.\right.$$

✓ **Maple** : cpu = 0.46 (sec), leaf count = 92

```
dsolve({diff(x(t),t) = (a*y(t)+b)*x(t), diff(y(t),t) = (c*x(t)+d)*y(t)})
```

$$[\{x(t) = 0\}, \{y(t) = c_1 e^{dt}\}]$$

ODE No. 1915

$$\{x'(t) = x(t)(a(px(t) + qy(t)) + \alpha), y'(t) = y(t)(b(px(t) + qy(t)) + \beta)\}$$

✗ **Mathematica** : cpu = 300.01 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == x[t]*(alpha + a*(p*x[t] + q*y[t])), Derivative[1][y][t] == y[t
```

, timed out

```
$Aborted
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = x(t)*(a*(p*x(t)+q*y(t))+alpha), diff(y(t),t) = y(t)*(beta+b*(p*x(t)+q*
```

, result contains DESol or ODESolStruc

$$\left[\{x(t) = 0\}, \left\{y(t) = \frac{\beta}{\mathrm{e}^{-\beta t} c_1 \beta - bq}\right\}\right]$$

ODE No. 1916

$$\{x'(t) = h(a - x(t))(c - x(t) - y(t)), y'(t) = k(b - y(t))(c - x(t) - y(t))\}$$

✓ **Mathematica** : cpu = 0.34347 (sec), leaf count = 557

```
DSolve[{Derivative[1][x][t] == h*(a - x[t])*(c - x[t] - y[t]), Derivative[1][y][t] == k*(b -
```

$$\left\{\left\{y(t) \to b\left(ah - h\text{InverseFunction}\left[\int_1^{\#1} \frac{(h(a-K[1]))^{\frac{k}{h}}}{(a-K[1])\left(c_1(ah-hK[1])^{\frac{k}{h}}(h(a-K[1]))^{\frac{k}{h}} - c(h(a-K[1]))\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.527 (sec), leaf count = 180

```
dsolve({diff(x(t),t) = h*(a-x(t))*(c-x(t)-y(t)), diff(y(t),t) = k*(b-y(t))*(c-x(t)-y(t))})
```

$$\left[\{x(t) = a\}, \left\{y(t) = \frac{(c-a)\,\mathrm{e}^{k(t+c_1)(-c+a+b)} - b}{-1 + \mathrm{e}^{k(t+c_1)(-c+a+b)}}\right\}\right]$$

ODE No. 1917

$$\{x'(t) = y(t)^2 - \cos(x(t)), y'(t) = y(t)(-\sin(x(t)))\}$$

✓ **Mathematica** : cpu = 202.221 (sec), leaf count = 3406

```
DSolve[{Derivative[1][x][t] == -Cos[x[t]] + y[t]^2, Derivative[1][y][t] == -(Sin[x[t]]*y[t])}
```

$$\left\{\left\{y(t) \to \frac{3\sqrt[3]{2}\cos\left(\text{InverseFunction}\left[\int_1^{\#1} \frac{}{2\ 2^{2/3}\cos^2(K[1])+2\left(3c_1+\sqrt{9c_1{}^2-4\cos^3(K[1])}\right.}\right.\right.}{\sqrt[3]{81c_1+\sqrt{6561c_1{}^2-2916\cos^3\left(\text{InverseFunction}\left[\int_1^{\#1} \frac{}{2\ 2^{2/3}\cos^2(K[1])+2\left(3c_1+\sqrt{9c_1{}^2-\right.}\right.}\right.}}\right.\right.\right.$$

✓ **Maple** : cpu = 1.166 (sec), leaf count = 108

```
dsolve({diff(x(t),t) = y(t)^2-cos(x(t)), diff(y(t),t) = -y(t)*sin(x(t))})
```

$$\left[\left\{x(t) = \text{RootOf}\left(-2\left(\int^{\_Z} \frac{1}{-\tan\left(\text{RootOf}\left(-3\sqrt{-\left(\cos^2\left(\_f\right)\right)}\ln\left(\frac{9\left(\cos^2\left(\_f\right)\right)}{4\cos\left(\_Z\right)^2}\right)+3c_1\sqrt{-\left(\cos^2\left(\_f\right)\right.}\right.\right.\right.\right.\right.\right.\right.$$

ODE No. 1918

$$\left\{x'(t) = -x(t)y(t)^2 + x(t) + y(t), y'(t) = x(t)^2 y(t) - x(t) - y(t)\right\}$$

✗ **Mathematica** : cpu = 0.380222 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == x[t] + y[t] - x[t]*y[t]^2, Derivative[1][y][t] == -x[t] - y[t]
```

, could not solve

```
DSolve[{Derivative[1][x][t] == x[t] + y[t] - x[t]*y[t]^2, Derivative[1][y][t] == -
x[t] - y[t] + x[t]^2*y[t]}, {x[t], y[t]}, t]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = -x(t)*y(t)^2+x(t)+y(t), diff(y(t),t) = x(t)^2*y(t)-x(t)-y(t)})
```

, result contains DESol or ODESolStruc

$$[\{x(t) = 0\}, \{y(t) = 0\}]$$

ODE No. 1919

$$\left\{x'(t) = -\left(x(t)\left(x(t)^2 + y(t)^2\right)\right) + x(t) + y(t), y'(t) = -y(t)\left(x(t)^2 + y(t)^2\right) - x(t) + y(t)\right\}$$

✗ **Mathematica** : cpu = 0.401214 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == x[t] + y[t] - x[t]*(x[t]^2 + y[t]^2), Derivative[1][y][t] == -
```

, could not solve

```
DSolve[{Derivative[1][x][t] == x[t] + y[t] - x[t]*(x[t]^2 + y[t]^2), Derivative[1][y][t
x[t] + y[t] - y[t]*(x[t]^2 + y[t]^2)}, {x[t], y[t]}, t]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = x(t)+y(t)-x(t)*(x(t)^2+y(t)^2), diff(y(t),t) = -x(t)+y(t)-y(t)*(x(t)^2
```

, result contains DESol or ODESolStruc

$$[\{x(t) = 0\}, \{y(t) = 0\}]$$

ODE No. 1920

$$\left\{x'(t) = x(t)\left(x(t)^2 + y(t)^2 - 1\right) - y(t), y'(t) = y(t)\left(x(t)^2 + y(t)^2 - 1\right) + x(t)\right\}$$

✗ **Mathematica** : cpu = 0.213963 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == -y[t] + x[t]*(-1 + x[t]^2 + y[t]^2), Derivative[1][y][t] == x[
```

, could not solve

```
DSolve[{Derivative[1][x][t] == -y[t] + x[t]*(-1 + x[t]^2 + y[t]^2), Derivative[1][y][t]
1 + x[t]^2 + y[t]^2)}, {x[t], y[t]}, t]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = -y(t)+x(t)*(x(t)^2+y(t)^2-1), diff(y(t),t) = x(t)+y(t)*(x(t)^2+y(t)^2-
```

, result contains DESol or ODESolStruc

$$[\{x(t) = 0\}, \{y(t) = 0\}]$$

ODE No. 1921

$$\left\{x'(t) = -y(t)\left(x(t)^2 + y(t)^2\right), y'(t) = \left(\{ \begin{array}{cc} x(t)^2 + y(t)^2 & x(t)^2 + y(t)^2 \geq 2x(t) \\ \left(x(t)^2 + y(t)^2\right)\left(\frac{x(t)}{2} - \frac{y(t)^2}{2x(t)}\right) & \text{True} \end{array} \right)\right\}$$

✗ **Mathematica** : cpu = 1.98532 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == -(y[t]*(x[t]^2 + y[t]^2)), Derivative[1][y][t] == Piecewise[{{
```

, could not solve

```
DSolve[{Derivative[1][x][t] == -(y[t]*(x[t]^2 + y[t]^2)), Derivative[1][y][t] == Piecew
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = -y(t)*(x(t)^2+y(t)^2), diff(y(t),t) = piecewise(2*x(t) <= x(t)^2+y(t)^
```

, could not solve

```
dsolve({diff(x(t),t) = -y(t)*(x(t)^2+y(t)^2), diff(y(t),t) = piecewise(2*x(t) <= x(t)^2
1/2*y(t)^2/x(t))*(x(t)^2+y(t)^2))})
```

ODE No. 1922

$$\left\{x'(t)=\left(\begin{cases}\sin\left(\frac{1}{x(t)^2+y(t)^2}\right)x(t)\left(x(t)^2+y(t)^2-1\right) & x(t)^2+y(t)^2\neq 1\\ 0 & \text{True}\end{cases}\right)-y(t), y'(t)=\left(\begin{cases}\sin\left(\right.\right.\end{cases}\right.$$

✗ **Mathematica** : cpu = 8.57945 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == Piecewise[{{Sin[(x[t]^2 + y[t]^2)^(-1)]*x[t]*(-1 + x[t]^2 + y[
```

, could not solve

```
DSolve[{Derivative[1][x][t] == Piecewise[{{Sin[(x[t]^2 + y[t]^2)^(-1)]*x[t]*(-
1 + x[t]^2 + y[t]^2), x[t]^2 + y[t]^2 != 1}}, 0] - y[t], Derivative[1][y][t] == Piecewi
1)]*y[t]*(-1 + x[t]^2 + y[t]^2), x[t]^2 + y[t]^2 != 1}}, 0] + x[t]}, {x[t], y[t]}, t]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = -y(t)+piecewise(x(t)^2+y(t)^2 <> 1,x(t)*(x(t)^2+y(t)^2-1)*sin(1/(x(t)^
```

, exception

```
time expired
```

ODE No. 1923

$$\left\{\left(t^2+1\right)x'(t)=y(t)-tx(t),\left(t^2+1\right)y'(t)=-x(t)-ty(t)\right\}$$

✓ **Mathematica** : cpu = 0.0094575 (sec), leaf count = 53

```
DSolve[{(1 + t^2)*Derivative[1][x][t] == -(t*x[t]) + y[t], (1 + t^2)*Derivative[1][y][t] == -
```

$$\left\{\left\{x(t)\to \frac{c_1}{t^2+1}+\frac{c_2 t}{t^2+1},y(t)\to \frac{c_2}{t^2+1}-\frac{c_1 t}{t^2+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.047 (sec), leaf count = 35

```
dsolve({(t^2+1)*diff(x(t),t) = -t*x(t)+y(t), (t^2+1)*diff(y(t),t) = -x(t)-t*y(t)})
```

$$\left\{x(t)=\frac{tc_1+c_2}{t^2+1},y(t)=\frac{-tc_2+c_1}{t^2+1}\right\}$$

ODE No. 1924

$$\left\{\left(-t^2+x(t)^2+y(t)^2\right)x'(t)=-2tx(t),\left(-t^2+x(t)^2+y(t)^2\right)y'(t)=-2ty(t)\right\}$$

✓ **Mathematica** : cpu = 0.0661912 (sec), leaf count = 191

```
DSolve[{(-t^2 + x[t]^2 + y[t]^2)*Derivative[1][x][t] == -2*t*x[t], (-t^2 + x[t]^2 + y[t]^2)*D
```

$$\left\{\left\{y(t)\to \frac{c_1\left(e^{c_2}-\sqrt{-4t^2-4{c_1}^2t^2+e^{2c_2}}\right)}{2\left(1+{c_1}^2\right)},x(t)\to \frac{e^{c_2}-\sqrt{-4t^2-4{c_1}^2t^2+e^{2c_2}}}{2\left(1+{c_1}^2\right)}\right\},\left\{y(t)\to \frac{c_1\left(\sqrt{-4t^2-\right.}\right.$$

✓ **Maple** : cpu = 0.319 (sec), leaf count = 180

```
dsolve({(x(t)^2+y(t)^2-t^2)*diff(x(t),t) = -2*t*x(t), (x(t)^2+y(t)^2-t^2)*diff(y(t),t) = -2*t
```

$$\left[\{x(t)=0\},\left\{y(t)=\frac{1+\sqrt{-4t^2c_1^2+1}}{2c_1},y(t)=\frac{1-\sqrt{-4t^2c_1^2+1}}{2c_1}\right\}\right]$$

ODE No. 1925

$$\left\{ay'(t)+tx'(t)-x(t)+y'(t)^2=0, x'(t)y'(t)+ty'(t)-y(t)=0\right\}$$

✓ **Mathematica** : cpu = 0.0168313 (sec), leaf count = 31

```
DSolve[{-x[t] + t*Derivative[1][x][t] + a*Derivative[1][y][t] + Derivative[1][y][t]^2 == 0, -
```

$$\left\{\left\{x(t)\to ac_2+c_1t+{c_2}^2, y(t)\to c_2t+c_1c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.274 (sec), leaf count = 194

```
dsolve({diff(x(t),t)*diff(y(t),t)+t*diff(y(t),t)-y(t) = 0, diff(x(t),t)^2+t*diff(x(t),t)+a*di
```

$$\left[\left\{x(t)=-\frac{t^2}{3}\right\},\left\{y(t)=-\frac{t^3}{27a}\right\}\right]$$

ODE No. 1926

$$\{x(t) = f(x'(t), y'(t)) + tx'(t), y(t) = g(x'(t), y'(t)) + ty'(t)\}$$

✓ **Mathematica** : cpu = 0.0055711 (sec), leaf count = 28

```
DSolve[{x[t] == f[Derivative[1][x][t], Derivative[1][y][t]] + t*Derivative[1][x][t], y[t] ==
```

$$\{\{x(t) \to f(c_1, c_2) + c_1 t, y(t) \to g(c_1, c_2) + c_2 t\}\}$$

✓ **Maple** : cpu = 0.211 (sec), leaf count = 96

```
dsolve({x(t) = t*diff(x(t),t)+f(diff(x(t),t),diff(y(t),t)), y(t) = t*diff(y(t),t)+g(diff(x(t)
```

$$[\{\int \text{RootOf}\left(g\left(\_Z, \frac{d}{dt}y(t)\right) - y(t) + t\left(\frac{d}{dt}y(t)\right)\right) dt + c_1 = t\,\text{RootOf}\left(g\left(\_Z, \frac{d}{dt}y(t)\right) - y(t) + t\left(\frac{d}{dt}y(t)\right)\right.$$

ODE No. 1927

$$\left\{x''(t) = a e^{2x(t)} + e^{-2x(t)} \cos^2(y(t)) - e^{-x(t)}, y''(t) = e^{-2x(t)} \sin(y(t)) \cos(y(t)) - \tan(y(t)) \sec^2(y(t))\right\}$$

✗ **Mathematica** : cpu = 0.0072982 (sec), leaf count = 0

```
DSolve[{Derivative[2][x][t] == -E^(-x[t]) + a*E^(2*x[t]) + Cos[y[t]]^2/E^(2*x[t]), Derivative
```

, could not solve

```
DSolve[{Derivative[2][x][t] == -E^(-x[t]) + a*E^(2*x[t]) + Cos[y[t]]^2/E^(2*x[t]), Deri
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(diff(x(t),t),t) = a*exp(2*x(t))-exp(-x(t))+exp(-2*x(t))*cos(y(t))^2, diff(diff(y
```

, could not solve

```
dsolve({diff(diff(x(t),t),t) = a*exp(2*x(t))-exp(-x(t))+exp(-2*x(t))*cos(y(t))^2, diff(
2*x(t))*sin(y(t))*cos(y(t))-sin(y(t))/cos(y(t))^3})
```

ODE No. 1928

$$\left\{x''(t)=\frac{kx(t)}{\left(x(t)^2+y(t)^2\right)^{3/2}},y''(t)=\frac{ky(t)}{\left(x(t)^2+y(t)^2\right)^{3/2}}\right\}$$

✗ **Mathematica** : cpu = 0.0058821 (sec), leaf count = 0

```
DSolve[{Derivative[2][x][t] == (k*x[t])/(x[t]^2 + y[t]^2)^(3/2), Derivative[2][y][t] == (k*y[
```

, could not solve

```
DSolve[{Derivative[2][x][t] == (k*x[t])/(x[t]^2 + y[t]^2)^(3/2), Derivative[2][y][t] ==
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(diff(x(t),t),t) = k*x(t)/(x(t)^2+y(t)^2)^(3/2), diff(diff(y(t),t),t) = k*y(t)/(x
```

, exception

```
time expired
```

ODE No. 1929

$$\left\{x''(t)=-\frac{cy(t)x'(t)f\left(\sqrt{x'(t)^2+y'(t)^2}\right)}{\sqrt{x'(t)^2+y'(t)^2}},y''(t)=-\frac{cy(t)y'(t)f\left(\sqrt{x'(t)^2+y'(t)^2}\right)}{\sqrt{x'(t)^2+y'(t)^2}}-g\right\}$$

✗ **Mathematica** : cpu = 0.0068803 (sec), leaf count = 0

```
DSolve[{Derivative[2][x][t] == -((c*f[Sqrt[Derivative[1][x][t]^2 + Derivative[1][y][t]^2]]*y[
```

, could not solve

```
DSolve[{Derivative[2][x][t] == -((c*f[Sqrt[Derivative[1][x][t]^2 + Derivative[1][y][t]^
g - (c*f[Sqrt[Derivative[1][x][t]^2 + Derivative[1][y][t]^2]]*y[t]*Derivative[1][y][t])
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(diff(x(t),t),t) = -C(y(t))*f((diff(y(t),t)^2)^(1/2))/(diff(y(t),t)^2)^(1/2)*diff
```

, result contains DESol or ODESolStruc

$$\left[\left\{y(t)=\_a\textbf{\textit{where}}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a)+\frac{C(\_a)f\left(\sqrt{\_b(\_a)^2}\right)\_b(\_a)+g\sqrt{\_b(\_a)^2}}{\sqrt{\_b(\_a)^2}}=0\right\},\right.\right.$$

ODE No. 1930

$$\left\{x'(t) = y(t) - z(t), y'(t) = x(t)^2 + y(t), z'(t) = x(t)^2 + z(t)\right\}$$

✓ **Mathematica** : cpu = 0.0329601 (sec), leaf count = 308

```
DSolve[{Derivative[1][x][t] == y[t] - z[t], Derivative[1][y][t] == x[t]^2 + y[t], Derivative[
```

$$\left\{\left\{x(t) \to e^{-c_3}\left(e^t + e^{c_3}c_1\right), y(t) \to c_2\left(e^{-c_3}\left(e^t + e^{c_3}c_1\right) - c_1\right) + \left(e^{-c_3}\left(e^t + e^{c_3}c_1\right) - c_1\right)\left(-\frac{{c_1}^2}{e^{-c_3}\left(e^t + e^{c_3}c_1\right)}\right.\right.$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 45

```
dsolve({diff(x(t),t) = y(t)-z(t), diff(y(t),t) = x(t)^2+y(t), diff(z(t),t) = x(t)^2+z(t)})
```

$$[\{x(t) = c_2 + c_3 \mathrm{e}^t\}, \{y(t) = \left(\int x(t)^2 \mathrm{e}^{-t} dt + c_1\right) \mathrm{e}^t\}, \{z(t) = -\frac{d}{dt}x(t) + y(t)\}]$$

ODE No. 1931

$$\{ax'(t) = (b-c)y(t)z(t), by'(t) = (c-a)x(t)z(t), cz'(t) = (a-b)x(t)y(t)\}$$

✓ **Mathematica** : cpu = 3.70285 (sec), leaf count = 10101

```
DSolve[{a*Derivative[1][x][t] == (b - c)*y[t]*z[t], b*Derivative[1][y][t] == (-a + c)*x[t]*z[
```

$$\left\{\left\{x(t) \to \frac{\sqrt{2}b^2\sqrt{a(a-c)}c_1 \text{sn}\left(\frac{\frac{\sqrt{2}\sqrt{a}\sqrt{a-c}c\sqrt{c_2}t}{\sqrt{b}\sqrt{b-c}} - \frac{\sqrt{2}\sqrt{a}\sqrt{b}\sqrt{a-c}\sqrt{c_2}t}{\sqrt{b-c}} - \frac{\sqrt{2}\sqrt{a}\sqrt{a-c}c\sqrt{c_2}c_3}{\sqrt{b}\sqrt{b-c}} + \frac{\sqrt{2}\sqrt{a}\sqrt{b}\sqrt{a-c}\sqrt{c_2}c_3}{\sqrt{b-c}}}{a} \middle| -\frac{(a-b)bc_1}{(a-c)cc_2}\right)}{(a-c)\sqrt{b(b-c)c_1}} - \frac{\sqrt{2}b\sqrt{a(a-}}{a}\right\}\right\}$$

✓ **Maple** : cpu = 1.096 (sec), leaf count = 1117

```
dsolve({a*diff(x(t),t) = (b-c)*y(t)*z(t), b*diff(y(t),t) = (c-a)*z(t)*x(t), c*diff(z(t),t) =
```

$$[\{x(t) = 0\}, \{y(t) = 0\}, \{z(t) = c_1\}]$$

ODE No. 1932

$$\{x'(t) = x(t)(y(t) - z(t)), y'(t) = y(t)(z(t) - x(t)), z'(t) = z(t)(x(t) - y(t))\}$$

✗ **Mathematica** : cpu = 2.21659 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == x[t]*(y[t] - z[t]), Derivative[1][y][t] == y[t]*(-x[t] + z[t])
```

, could not solve

```
DSolve[{Derivative[1][x][t] == x[t]*(y[t] - z[t]), Derivative[1][y][t] == y[t]*(-
x[t] + z[t]), Derivative[1][z][t] == (x[t] - y[t])*z[t]}, {x[t], y[t], z[t]}, t]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = x(t)*(y(t)-z(t)), diff(y(t),t) = y(t)*(z(t)-x(t)), diff(z(t),t) = z(t)
```

, result contains DESol or ODESolStruc

$$[\{x(t) = 0\}, \{y(t) = 0\}, \{z(t) = c_1\}]$$

ODE No. 1933

$$\{x'(t)+y'(t)=x(t)y(t), y'(t)+z'(t)=y(t)z(t), x'(t)+z'(t)=x(t)z(t)\}$$

✗ **Mathematica** : cpu = 124.617 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] + Derivative[1][y][t] == x[t]*y[t], Derivative[1][y][t] + Derivat
```

, could not solve

```
DSolve[{Derivative[1][x][t] + Derivative[1][y][t] == x[t]*y[t], Derivative[1][y][t] + D
```

✓ **Maple** : cpu = 1.433 (sec), leaf count = 4259

```
dsolve({diff(x(t),t)+diff(y(t),t) = x(t)*y(t), diff(x(t),t)+diff(z(t),t) = x(t)*z(t), diff(y(
```

$$\left[\left\{x(t)=-\frac{2}{-2c_2+t}\right\},\{y(t)=x(t)\},\left\{z(t)=\left(\int -\frac{x(t)^2\,\mathrm{e}^{-\left(\int x(t)dt\right)}}{2}dt+c_1\right)\mathrm{e}^{\int x(t)dt}\right\}\right]$$

ODE No. 1934

$$\left\{x'(t)=\frac{x(t)^2}{2}-\frac{y(t)}{24},y'(t)=2x(t)y(t)-3z(t),z'(t)=3x(t)z(t)-\frac{y(t)^2}{6}\right\}$$

✗ **Mathematica** : cpu = 61.4015 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == x[t]^2/2 - y[t]/24, Derivative[1][y][t] == 2*x[t]*y[t] - 3*z[t
```

, could not solve

```
DSolve[{Derivative[1][x][t] == x[t]^2/2 - y[t]/24, Derivative[1][y][t] == 2*x[t]*y[t] -
1/6*y[t]^2 + 3*x[t]*z[t]}, {x[t], y[t], z[t]}, t]
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = 1/2*x(t)^2-1/24*y(t), diff(y(t),t) = 2*x(t)*y(t)-3*z(t), diff(z(t),t)
```

, result contains DESol or ODESolStruc

$$\left[\{y(t)=0\},\left\{x(t)=\frac{2}{2c_1-t}\right\},\{z(t)=0\}\right]$$

ODE No. 1935

$$\left\{x'(t) = x(t)\left(y(t)^2 - z(t)^2\right), y'(t) = y(t)\left(z(t)^2 - x(t)^2\right), z'(t) = z(t)\left(x(t)^2 - y(t)^2\right)\right\}$$

✗ **Mathematica** : cpu = 0.0401661 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == x[t]*(y[t]^2 - z[t]^2), Derivative[1][y][t] == y[t]*(-x[t]^2 +
```

, could not solve

```
DSolve[{Derivative[1][x][t] == x[t]*(y[t]^2 - z[t]^2), Derivative[1][y][t] == y[t]*(-
x[t]^2 + z[t]^2), Derivative[1][z][t] == (x[t]^2 - y[t]^2)*z[t]}, {x[t], y[t], z[t]}, t
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = x(t)*(y(t)^2-z(t)^2), diff(y(t),t) = y(t)*(z(t)^2-x(t)^2), diff(z(t),t
```

, result contains DESol or ODESolStruc

$$[\{x(t) = 0\}, \{y(t) = 0\}, \{z(t) = c_1\}]$$

ODE No. 1936

$$\left\{x'(t) = x(t)\left(y(t)^2 - z(t)^2\right), y'(t) = -y(t)\left(x(t)^2 + z(t)^2\right), z'(t) = z(t)\left(x(t)^2 + y(t)^2\right)\right\}$$

✗ **Mathematica** : cpu = 0.0395462 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == x[t]*(y[t]^2 - z[t]^2), Derivative[1][y][t] == -(y[t]*(x[t]^2
```

, could not solve

```
DSolve[{Derivative[1][x][t] == x[t]*(y[t]^2 - z[t]^2), Derivative[1][y][t] == -
(y[t]*(x[t]^2 + z[t]^2)), Derivative[1][z][t] == (x[t]^2 + y[t]^2)*z[t]}, {x[t], y[t],
```

✓ **Maple** : cpu = 0.879 (sec), leaf count = 710

```
dsolve({diff(x(t),t) = x(t)*(y(t)^2-z(t)^2), diff(y(t),t) = -y(t)*(z(t)^2+x(t)^2), diff(z(t),
```

$$[\{x(t) = 0\}, \{y(t) = 0\}, \{z(t) = c_1\}]$$

ODE No. 1937

$$\{x'(t) = -x(t)y(t)^2 + x(t) + y(t), y'(t) = x(t)^2 y(t) - x(t) - y(t), z'(t) = y(t)^2 - x(t)^2\}$$

✗ **Mathematica** : cpu = 0.700261 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == x[t] + y[t] - x[t]*y[t]^2, Derivative[1][y][t] == -x[t] - y[t]
```

, could not solve

```
DSolve[{Derivative[1][x][t] == x[t] + y[t] - x[t]*y[t]^2, Derivative[1][y][t] == -
x[t] - y[t] + x[t]^2*y[t], Derivative[1][z][t] == -x[t]^2 + y[t]^2}, {x[t], y[t], z[t]}
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = -x(t)*y(t)^2+x(t)+y(t), diff(y(t),t) = x(t)^2*y(t)-x(t)-y(t), diff(z(t
```

, result contains DESol or ODESolStruc

$$[\{x(t) = 0\}, \{y(t) = 0\}, \{z(t) = c_1\}]$$

ODE No. 1938

$$\left\{x''(t)=\frac{x(t)f'(r)}{r},y''(t)=\frac{y(t)f'(r)}{r},z''(t)=\frac{z(t)f'(r)}{r}\right\}$$

✓ **Mathematica** : cpu = 0.0075644 (sec), leaf count = 137

```
DSolve[{Derivative[2][x][t] == (x[t]*Derivative[1][f][r])/r, Derivative[2][y][t] == (y[t]*Der
```

$$\left\{\left\{x(t)\to c_1e^{-\frac{t\sqrt{f'(r)}}{\sqrt{r}}}+c_2e^{\frac{t\sqrt{f'(r)}}{\sqrt{r}}},y(t)\to c_3e^{-\frac{t\sqrt{f'(r)}}{\sqrt{r}}}+c_4e^{\frac{t\sqrt{f'(r)}}{\sqrt{r}}},z(t)\to c_5e^{-\frac{t\sqrt{f'(r)}}{\sqrt{r}}}+c_6e^{\frac{t\sqrt{f'(r)}}{\sqrt{r}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.136 (sec), leaf count = 101

```
dsolve({diff(diff(x(t),t),t) = D(F)(r)/r*x(t), diff(diff(y(t),t),t) = D(F)(r)/r*y(t), diff(di
```

$$\left\{x(t)=c_5\mathrm{e}^{\frac{\sqrt{\frac{d}{dr}F(r)}t}{\sqrt{r}}}+c_6\mathrm{e}^{-\frac{\sqrt{\frac{d}{dr}F(r)}t}{\sqrt{r}}},y(t)=c_3\mathrm{e}^{\frac{\sqrt{\frac{d}{dr}F(r)}t}{\sqrt{r}}}+c_4\mathrm{e}^{-\frac{\sqrt{\frac{d}{dr}F(r)}t}{\sqrt{r}}},z(t)=c_1\mathrm{e}^{\frac{\sqrt{\frac{d}{dr}F(r)}t}{\sqrt{r}}}+c_2\mathrm{e}^{-\frac{\sqrt{\frac{d}{dr}F(r)}t}{\sqrt{r}}}\right\}$$

ODE No. 1939

$\{(x(t)-y(t))(x(t)-z(t))x'(t)=f(t),(y(t)-x(t))(y(t)-z(t))y'(t)=f(t),(z(t)-x(t))(z(t)-y(t))z'(t)$

✓ **Mathematica** : cpu = 0.263005 (sec), leaf count = 2168

```
DSolve[{(x[t] - y[t])*(x[t] - z[t])*Derivative[1][x][t] == f[t], (-x[t] + y[t])*(y[t] - z[t])
```

$$\left\{\left\{x(t)\to \frac{c_1}{3}+\frac{\sqrt[3]{2c_1{}^3-9c_2c_1+27c_3+27\int_1^t f(K[1])dK[1]+\sqrt{4\left(3c_2-c_1{}^2\right){}^3+\left(2c_1{}^3-9c_2c_1+27c_3+\right.}}}{3\sqrt[3]{2}}\right.\right.$$

✓ **Maple** : cpu = 1.512 (sec), leaf count = 899

```
dsolve({(x(t)-y(t))*(x(t)-z(t))*diff(x(t),t) = f(t), (y(t)-x(t))*(y(t)-z(t))*diff(y(t),t) = f
```

$$\left[\left\{x(t)=\int \frac{3\left(\left(-i\sqrt{3}-1\right)\left(\left(1+108\sqrt{\frac{\left(\int f(t)dt-c_2\right)^2}{c_1^3+11664c_2^2-23328c_2\left(\int f(t)dt\right)+11664\left(\int f(t)dt\right)^2}}\right)\left(c_1^3+11664c_2^2-23328c_{}\right.\right.\right.}{\left(\left(1+108\sqrt{\frac{\left(\int f(t)dt-c_2\right)^2}{c_1^3+11664c_2^2-23328c_2\left(\int f(t)dt\right)+11664\left(\int f(t)dt\right)^2}}\right)\left(c_1^3+11664c_2^2-23328\right.\right.}\right.$$

ODE No. 1940

$\{x1'(t)\sin(x2(t)) = x4(t)\sin(x3(t)) + x5(t)\cos(x3(t)), x2'(t) = x4(t)\cos(x3(t)) - x5(t)\sin(x3(t)), x1'(t)\,co$

✗ **Mathematica** : cpu = 0.0070427 (sec), leaf count = 0

```
DSolve[{Sin[x2[t]]*Derivative[1][x1][t] == Sin[x3[t]]*x4[t] + Cos[x3[t]]*x5[t], Derivative[1]
```

, could not solve

```
DSolve[{Sin[x2[t]]*Derivative[1][x1][t] == Sin[x3[t]]*x4[t] + Cos[x3[t]]*x5[t], Derivat
(a*(1 - lambda)*x5[t]) + Derivative[1][x4][t] == -(m*Cos[x3[t]]*Sin[x2[t]]), a*(1 - lam
```

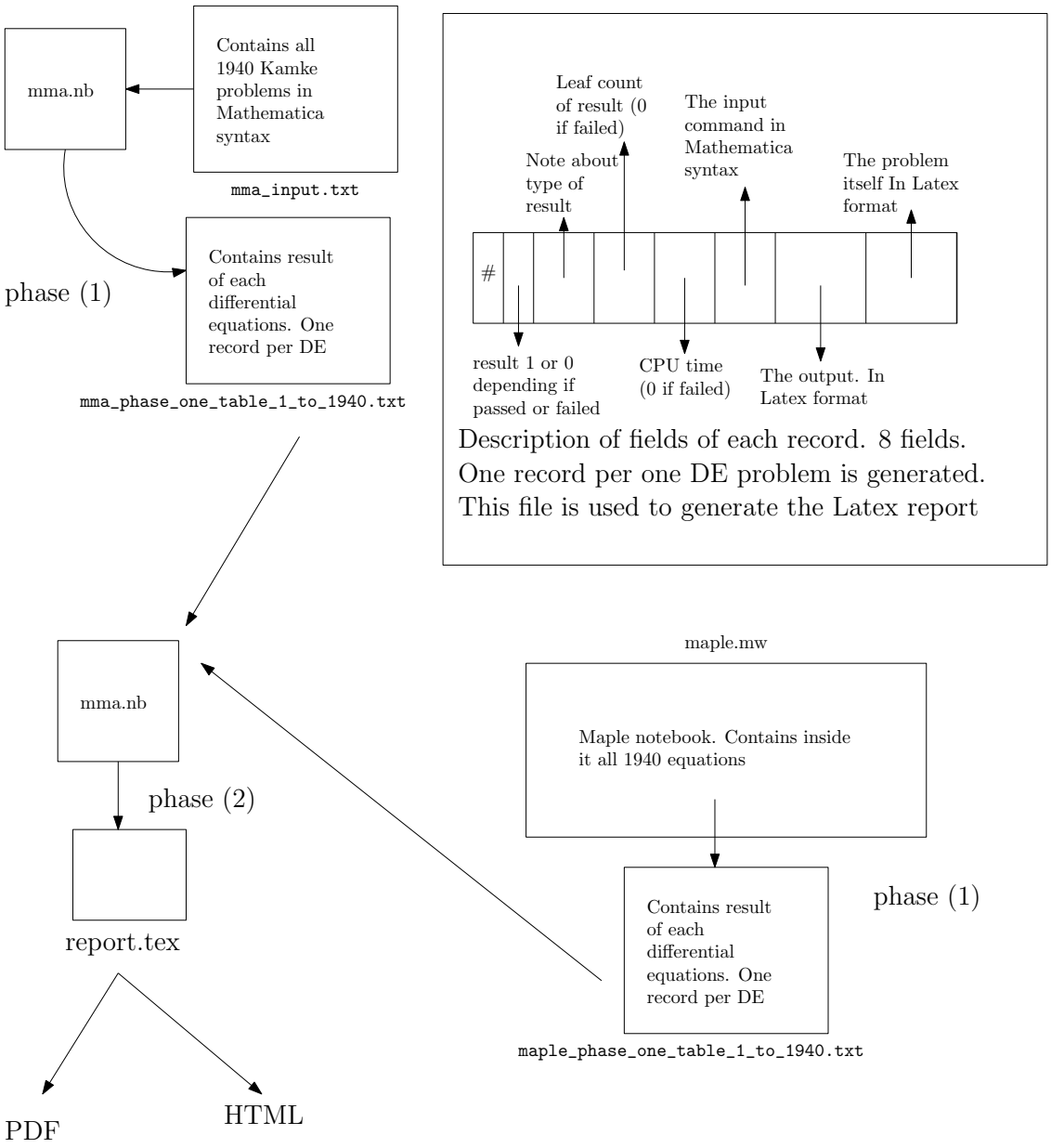
✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x1(t),t)*sin(x2(t)) = x4(t)*sin(x3(t))+x5(t)*cos(x3(t)), diff(x3(t),t)+diff(x1(t
```

, exception

```
time expired
```

3 Design of test program



Kamke Differential equations build process

Nasser M. Abbasi (design.ipe)