Kamke differential equations. Mathematica 14 and Maple 2024

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Contents

1 Introduction and summary of results 49

2 Problems table lookup 54

2.1 ODE No. 1 139
2.2 ODE No. 2 140
2.3 ODE No. 3 142
2.4 ODE No. 4 144
2.5 ODE No. 5 145
2.6 ODE No. 6 146
2.7 ODE No. 7 147
2.8 ODE No. 8 148
2.9 ODE No. 9 149
2.10 ODE No. 10 151
2.11 ODE No. 11 152
2.12 ODE No. 12 153
2.13 ODE No. 13 155
2.14 ODE No. 14 157
2.15 ODE No. 15 160
2.16 ODE No. 16 162
2.17 ODE No. 17 164
2.18 ODE No. 18 166
2.19 ODE No. 19 168
2.20 ODE No. 20 169
2.21 ODE No. 21 171
2.22 ODE No. 22 173
2.23 ODE No. 23 177
2.24 ODE No. 24 178
2.25 ODE No. 25 181
2.26 ODE No. 26 182
2.27 ODE No. 27 184

2.28 ODE No. 28 186
2.29 ODE No. 29 188
2.30 ODE No. 30 190
2.31 ODE No. 31 196
2.32 ODE No. 32 198
2.33 ODE No. 33 200
2.34 ODE No. 34 201
2.35 ODE No. 35 203
2.36 ODE No. 36 206
2.37 ODE No. 37 209
2.38 ODE No. 38 210
2.39 ODE No. 39 212
2.40 ODE No. 40 213
2.41 ODE No. 41 214
2.42 ODE No. 42 215
2.43 ODE No. 43 216
2.44 ODE No. 44 217
2.45 ODE No. 45 219
2.46 ODE No. 46 220
2.47 ODE No. 47 221
2.48 ODE No. 48 222
2.49 ODE No. 49 223
2.50 ODE No. 50 224
2.51 ODE No. 51 225
2.52 ODE No. 52 226
2.53 ODE No. 53 227
2.54 ODE No. 54 228
2.55 ODE No. 55 229
2.56 ODE No. 56 230
2.57 ODE No. 57 231
2.58 ODE No. 58 232
2.59 ODE No. 59 233
2.60 ODE No. 60 234
2.61 ODE No. 61 236
2.62 ODE No. 62 237
2.63 ODE No. 63 240
2.64 ODE No. 64 241
2.65 ODE No. 65 242
2.66 ODE No. 66 243
2.67 ODE No. 67 244
2.68 ODE No. 68 245

2.69 ODE No. 69 246
2.70 ODE No. 70 247
2.71 ODE No. 71 248
2.72 ODE No. 72 249
2.73 ODE No. 73 250
2.74 ODE No. 74 251
2.75 ODE No. 75 252
2.76 ODE No. 76 254
2.77 ODE No. 77 257
2.78 ODE No. 78 259
2.79 ODE No. 79 262
2.80 ODE No. 80 263
2.81 ODE No. 81 264
2.82 ODE No. 82 265
2.83 ODE No. 83 266
2.84 ODE No. 84 267
2.85 ODE No. 85 268
2.86 ODE No. 86 269
2.87 ODE No. 87 270
2.88 ODE No. 88 271
2.89 ODE No. 89 273
2.90 ODE No. 90 276
2.91 ODE No. 91 278
2.92 ODE No. 92 279
2.93 ODE No. 93 280
2.94 ODE No. 94 281
2.95 ODE No. 95 283
2.96 ODE No. 96 285
2.97 ODE No. 97 287
2.98 ODE No. 98 289
2.99 ODE No. 99 290
2.100 ODE No. 100 291
2.101 ODE No. 101 293
2.102 ODE No. 102 295
2.103 ODE No. 103 297
2.104 ODE No. 104 300
2.105 ODE No. 105 302
2.106 ODE No. 106 303
2.107 ODE No. 107 304
2.108 ODE No. 108 305
2.109 ODE No. 109 307

2.110 ODE No. 110 309
2.111 ODE No. 111 311
2.112 ODE No. 112 312
2.113 ODE No. 113 314
2.114 ODE No. 114 316
2.115 ODE No. 115 318
2.116 ODE No. 116 320
2.117 ODE No. 117 321
2.118 ODE No. 118 322
2.119 ODE No. 119 323
2.120 ODE No. 120 324
2.121 ODE No. 121 325
2.122 ODE No. 122 326
2.123 ODE No. 123 327
2.124 ODE No. 124 328
2.125 ODE No. 125 329
2.126 ODE No. 126 330
2.127 ODE No. 127 331
2.128 ODE No. 128 332
2.129 ODE No. 129 333
2.130 ODE No. 130 334
2.131 ODE No. 131 335
2.132 ODE No. 132 336
2.133 ODE No. 133 337
2.134 ODE No. 134 338
2.135 ODE No. 135 339
2.136 ODE No. 136 340
2.137 ODE No. 137 341
2.138 ODE No. 138 342
2.139 ODE No. 139 343
2.140 ODE No. 140 344
2.141 ODE No. 141 345
2.142 ODE No. 142 346
2.143 ODE No. 143 347
2.144 ODE No. 144 348
2.145 ODE No. 145 349
2.146 ODE No. 146 350
2.147 ODE No. 147 351
2.148 ODE No. 148 352
2.149 ODE No. 149 353
2.150 ODE No. 150 354

2.151 ODE No. 151 . . . 355
2.152 ODE No. 152 . . . 356
2.153 ODE No. 153 . . . 357
2.154 ODE No. 154 . . . 358
2.155 ODE No. 155 . . . 359
2.156 ODE No. 156 . . . 360
2.157 ODE No. 157 . . . 361
2.158 ODE No. 158 . . . 362
2.159 ODE No. 159 . . . 363
2.160 ODE No. 160 . . . 364
2.161 ODE No. 161 . . . 365
2.162 ODE No. 162 . . . 366
2.163 ODE No. 163 . . . 367
2.164 ODE No. 164 . . . 368
2.165 ODE No. 165 . . . 369
2.166 ODE No. 166 . . . 370
2.167 ODE No. 167 . . . 371
2.168 ODE No. 168 . . . 372
2.169 ODE No. 169 . . . 373
2.170 ODE No. 170 . . . 374
2.171 ODE No. 171 . . . 375
2.172 ODE No. 172 . . . 376
2.173 ODE No. 173 . . . 377
2.174 ODE No. 174 . . . 378
2.175 ODE No. 175 . . . 379
2.176 ODE No. 176 . . . 380
2.177 ODE No. 177 . . . 381
2.178 ODE No. 178 . . . 382
2.179 ODE No. 179 . . . 383
2.180 ODE No. 180 . . . 384
2.181 ODE No. 181 . . . 385
2.182 ODE No. 182 . . . 386
2.183 ODE No. 183 . . . 387
2.184 ODE No. 184 . . . 388
2.185 ODE No. 185 . . . 389
2.186 ODE No. 186 . . . 390
2.187 ODE No. 187 . . . 391
2.188 ODE No. 188 . . . 392
2.189 ODE No. 189 . . . 393
2.190 ODE No. 190 . . . 394
2.191 ODE No. 191 . . . 395

2.192 ODE No. 192 . . . 396
2.193 ODE No. 193 . . . 397
2.194 ODE No. 194 . . . 398
2.195 ODE No. 195 . . . 399
2.196 ODE No. 196 . . . 400
2.197 ODE No. 197 . . . 401
2.198 ODE No. 198 . . . 402
2.199 ODE No. 199 . . . 403
2.200 ODE No. 200 . . . 404
2.201 ODE No. 201 . . . 405
2.202 ODE No. 202 . . . 406
2.203 ODE No. 203 . . . 407
2.204 ODE No. 204 . . . 408
2.205 ODE No. 205 . . . 409
2.206 ODE No. 206 . . . 410
2.207 ODE No. 207 . . . 411
2.208 ODE No. 208 . . . 412
2.209 ODE No. 209 . . . 413
2.210 ODE No. 210 . . . 414
2.211 ODE No. 211 . . . 415
2.212 ODE No. 212 . . . 416
2.213 ODE No. 213 . . . 417
2.214 ODE No. 214 . . . 418
2.215 ODE No. 215 . . . 419
2.216 ODE No. 216 . . . 420
2.217 ODE No. 217 . . . 421
2.218 ODE No. 218 . . . 422
2.219 ODE No. 219 . . . 423
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2.221 ODE No. 221 . . . 425
2.222 ODE No. 222 . . . 426
2.223 ODE No. 223 . . . 427
2.224 ODE No. 224 . . . 428
2.225 ODE No. 225 . . . 429
2.226 ODE No. 226 . . . 430
2.227 ODE No. 227 . . . 431
2.228 ODE No. 228 . . . 432
2.229 ODE No. 229 . . . 433
2.230 ODE No. 230 . . . 434
2.231 ODE No. 231 . . . 435
2.232 ODE No. 232 . . . 436

2.233 ODE No. 233 437
2.234 ODE No. 234 438
2.235 ODE No. 235 439
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2.237 ODE No. 237 441
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2.259 ODE No. 259 463
2.260 ODE No. 260 464
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2.273 ODE No. 273 477

2.274 ODE No. 274 . . . 478
2.275 ODE No. 275 . . . 479
2.276 ODE No. 276 . . . 480
2.277 ODE No. 277 . . . 481
2.278 ODE No. 278 . . . 482
2.279 ODE No. 279 . . . 483
2.280 ODE No. 280 . . . 484
2.281 ODE No. 281 . . . 485
2.282 ODE No. 282 . . . 486
2.283 ODE No. 283 . . . 487
2.284 ODE No. 284 . . . 488
2.285 ODE No. 285 . . . 489
2.286 ODE No. 286 . . . 490
2.287 ODE No. 287 . . . 491
2.288 ODE No. 288 . . . 492
2.289 ODE No. 289 . . . 493
2.290 ODE No. 290 . . . 494
2.291 ODE No. 291 . . . 495
2.292 ODE No. 292 . . . 496
2.293 ODE No. 293 . . . 497
2.294 ODE No. 294 . . . 498
2.295 ODE No. 295 . . . 499
2.296 ODE No. 296 . . . 500
2.297 ODE No. 297 . . . 501
2.298 ODE No. 298 . . . 502
2.299 ODE No. 299 . . . 503
2.300 ODE No. 300 . . . 504
2.301 ODE No. 301 . . . 505
2.302 ODE No. 302 . . . 506
2.303 ODE No. 303 . . . 507
2.304 ODE No. 304 . . . 508
2.305 ODE No. 305 . . . 509
2.306 ODE No. 306 . . . 510
2.307 ODE No. 307 . . . 511
2.308 ODE No. 308 . . . 512
2.309 ODE No. 309 . . . 513
2.310 ODE No. 310 . . . 514
2.311 ODE No. 311 . . . 515
2.312 ODE No. 312 . . . 516
2.313 ODE No. 313 . . . 517
2.314 ODE No. 314 . . . 518

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2.363 ODE No. 363 567
2.364 ODE No. 364 568
2.365 ODE No. 365 569
2.366 ODE No. 366 570
2.367 ODE No. 367 571
2.368 ODE No. 368 572
2.369 ODE No. 369 573
2.370 ODE No. 370 574
2.371 ODE No. 371 575
2.372 ODE No. 372 576
2.373 ODE No. 373 577
2.374 ODE No. 374 578
2.375 ODE No. 375 579
2.376 ODE No. 376 580
2.377 ODE No. 377 581
2.378 ODE No. 378 582
2.379 ODE No. 379 583
2.380 ODE No. 380 584
2.381 ODE No. 381 585
2.382 ODE No. 382 586
2.383 ODE No. 383 587
2.384 ODE No. 384 588
2.385 ODE No. 385 589
2.386 ODE No. 386 590
2.387 ODE No. 387 591
2.388 ODE No. 388 592
2.389 ODE No. 389 593
2.390 ODE No. 390 594
2.391 ODE No. 391 595
2.392 ODE No. 392 596
2.393 ODE No. 393 597
2.394 ODE No. 394 598
2.395 ODE No. 395 599
2.396 ODE No. 396 600

2.397 ODE No. 397 601
2.398 ODE No. 398 602
2.399 ODE No. 399 603
2.400 ODE No. 400 604
2.401 ODE No. 401 605
2.402 ODE No. 402 606
2.403 ODE No. 403 607
2.404 ODE No. 404 608
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2.406 ODE No. 406 610
2.407 ODE No. 407 611
2.408 ODE No. 408 612
2.409 ODE No. 409 613
2.410 ODE No. 410 614
2.411 ODE No. 411 615
2.412 ODE No. 412 616
2.413 ODE No. 413 617
2.414 ODE No. 414 618
2.415 ODE No. 415 619
2.416 ODE No. 416 620
2.417 ODE No. 417 621
2.418 ODE No. 418 622
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2.420 ODE No. 420 624
2.421 ODE No. 421 625
2.422 ODE No. 422 626
2.423 ODE No. 423 627
2.424 ODE No. 424 628
2.425 ODE No. 425 629
2.426 ODE No. 426 630
2.427 ODE No. 427 631
2.428 ODE No. 428 632
2.429 ODE No. 429 633
2.430 ODE No. 430 634
2.431 ODE No. 431 635
2.432 ODE No. 432 636
2.433 ODE No. 433 637
2.434 ODE No. 434 638
2.435 ODE No. 435 639
2.436 ODE No. 436 640
2.437 ODE No. 437 641

2.438 ODE No. 438 642
2.439 ODE No. 439 643
2.440 ODE No. 440 644
2.441 ODE No. 441 645
2.442 ODE No. 442 646
2.443 ODE No. 443 647
2.444 ODE No. 444 648
2.445 ODE No. 445 649
2.446 ODE No. 446 650
2.447 ODE No. 447 651
2.448 ODE No. 448 652
2.449 ODE No. 449 653
2.450 ODE No. 450 654
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2.452 ODE No. 452 656
2.453 ODE No. 453 657
2.454 ODE No. 454 658
2.455 ODE No. 455 659
2.456 ODE No. 456 660
2.457 ODE No. 457 661
2.458 ODE No. 458 662
2.459 ODE No. 459 663
2.460 ODE No. 460 664
2.461 ODE No. 461 665
2.462 ODE No. 462 666
2.463 ODE No. 463 667
2.464 ODE No. 464 668
2.465 ODE No. 465 669
2.466 ODE No. 466 670
2.467 ODE No. 467 671
2.468 ODE No. 468 672
2.469 ODE No. 469 673
2.470 ODE No. 470 674
2.471 ODE No. 471 675
2.472 ODE No. 472 676
2.473 ODE No. 473 677
2.474 ODE No. 474 678
2.475 ODE No. 475 679
2.476 ODE No. 476 680
2.477 ODE No. 477 681
2.478 ODE No. 478 682

2.479 ODE No. 479 683
2.480 ODE No. 480 684
2.481 ODE No. 481 685
2.482 ODE No. 482 686
2.483 ODE No. 483 687
2.484 ODE No. 484 688
2.485 ODE No. 485 689
2.486 ODE No. 486 690
2.487 ODE No. 487 691
2.488 ODE No. 488 692
2.489 ODE No. 489 693
2.490 ODE No. 490 694
2.491 ODE No. 491 695
2.492 ODE No. 492 696
2.493 ODE No. 493 697
2.494 ODE No. 494 698
2.495 ODE No. 495 699
2.496 ODE No. 496 700
2.497 ODE No. 497 701
2.498 ODE No. 498 702
2.499 ODE No. 499 703
2.500 ODE No. 500 704
2.501 ODE No. 501 705
2.502 ODE No. 502 706
2.503 ODE No. 503 707
2.504 ODE No. 504 708
2.505 ODE No. 505 709
2.506 ODE No. 506 710
2.507 ODE No. 507 711
2.508 ODE No. 508 712
2.509 ODE No. 509 713
2.510 ODE No. 510 714
2.511 ODE No. 511 715
2.512 ODE No. 512 716
2.513 ODE No. 513 717
2.514 ODE No. 514 718
2.515 ODE No. 515 719
2.516 ODE No. 516 720
2.517 ODE No. 517 721
2.518 ODE No. 518 722
2.519 ODE No. 519 723

2.520 ODE No. 520 . . . 724
2.521 ODE No. 521 . . . 725
2.522 ODE No. 522 . . . 726
2.523 ODE No. 523 . . . 727
2.524 ODE No. 524 . . . 728
2.525 ODE No. 525 . . . 729
2.526 ODE No. 526 . . . 730
2.527 ODE No. 527 . . . 731
2.528 ODE No. 528 . . . 732
2.529 ODE No. 529 . . . 733
2.530 ODE No. 530 . . . 734
2.531 ODE No. 531 . . . 735
2.532 ODE No. 532 . . . 736
2.533 ODE No. 533 . . . 737
2.534 ODE No. 534 . . . 738
2.535 ODE No. 535 . . . 739
2.536 ODE No. 536 . . . 740
2.537 ODE No. 537 . . . 741
2.538 ODE No. 538 . . . 742
2.539 ODE No. 539 . . . 743
2.540 ODE No. 540 . . . 744
2.541 ODE No. 541 . . . 745
2.542 ODE No. 542 . . . 746
2.543 ODE No. 543 . . . 747
2.544 ODE No. 544 . . . 748
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2.546 ODE No. 546 . . . 750
2.547 ODE No. 547 . . . 751
2.548 ODE No. 548 . . . 752
2.549 ODE No. 549 . . . 753
2.550 ODE No. 550 . . . 754
2.551 ODE No. 551 . . . 755
2.552 ODE No. 552 . . . 756
2.553 ODE No. 553 . . . 757
2.554 ODE No. 554 . . . 758
2.555 ODE No. 555 . . . 759
2.556 ODE No. 556 . . . 760
2.557 ODE No. 557 . . . 761
2.558 ODE No. 558 . . . 762
2.559 ODE No. 559 . . . 763
2.560 ODE No. 560 . . . 764

2.561 ODE No. 561 765
2.562 ODE No. 562 766
2.563 ODE No. 563 767
2.564 ODE No. 564 768
2.565 ODE No. 565 769
2.566 ODE No. 566 770
2.567 ODE No. 567 771
2.568 ODE No. 568 772
2.569 ODE No. 569 773
2.570 ODE No. 570 774
2.571 ODE No. 571 775
2.572 ODE No. 572 776
2.573 ODE No. 573 777
2.574 ODE No. 574 778
2.575 ODE No. 575 779
2.576 ODE No. 576 780
2.577 ODE No. 577 781
2.578 ODE No. 578 782
2.579 ODE No. 579 783
2.580 ODE No. 580 784
2.581 ODE No. 581 785
2.582 ODE No. 582 786
2.583 ODE No. 583 787
2.584 ODE No. 584 788
2.585 ODE No. 585 789
2.586 ODE No. 586 790
2.587 ODE No. 587 791
2.588 ODE No. 588 792
2.589 ODE No. 589 793
2.590 ODE No. 590 794
2.591 ODE No. 591 795
2.592 ODE No. 592 796
2.593 ODE No. 593 797
2.594 ODE No. 594 798
2.595 ODE No. 595 799
2.596 ODE No. 596 800
2.597 ODE No. 597 801
2.598 ODE No. 598 802
2.599 ODE No. 599 803
2.600 ODE No. 600 804
2.601 ODE No. 601 805

2.602 ODE No. 602 . . . 806
2.603 ODE No. 603 . . . 807
2.604 ODE No. 604 . . . 808
2.605 ODE No. 605 . . . 809
2.606 ODE No. 606 . . . 810
2.607 ODE No. 607 . . . 811
2.608 ODE No. 608 . . . 812
2.609 ODE No. 609 . . . 813
2.610 ODE No. 610 . . . 814
2.611 ODE No. 611 . . . 815
2.612 ODE No. 612 . . . 816
2.613 ODE No. 613 . . . 817
2.614 ODE No. 614 . . . 818
2.615 ODE No. 615 . . . 819
2.616 ODE No. 616 . . . 820
2.617 ODE No. 617 . . . 821
2.618 ODE No. 618 . . . 822
2.619 ODE No. 619 . . . 823
2.620 ODE No. 620 . . . 824
2.621 ODE No. 621 . . . 825
2.622 ODE No. 622 . . . 826
2.623 ODE No. 623 . . . 827
2.624 ODE No. 624 . . . 828
2.625 ODE No. 625 . . . 829
2.626 ODE No. 626 . . . 830
2.627 ODE No. 627 . . . 831
2.628 ODE No. 628 . . . 832
2.629 ODE No. 629 . . . 833
2.630 ODE No. 630 . . . 834
2.631 ODE No. 631 . . . 835
2.632 ODE No. 632 . . . 836
2.633 ODE No. 633 . . . 837
2.634 ODE No. 634 . . . 838
2.635 ODE No. 635 . . . 839
2.636 ODE No. 636 . . . 840
2.637 ODE No. 637 . . . 841
2.638 ODE No. 638 . . . 842
2.639 ODE No. 639 . . . 843
2.640 ODE No. 640 . . . 844
2.641 ODE No. 641 . . . 845
2.642 ODE No. 642 . . . 846

2.643 ODE No. 643 847
2.644 ODE No. 644 848
2.645 ODE No. 645 849
2.646 ODE No. 646 850
2.647 ODE No. 647 851
2.648 ODE No. 648 852
2.649 ODE No. 649 853
2.650 ODE No. 650 854
2.651 ODE No. 651 855
2.652 ODE No. 652 856
2.653 ODE No. 653 857
2.654 ODE No. 654 858
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2.1848 ODE No. 1848 2086
2.1849 ODE No. 1849 2087
2.1850 ODE No. 1850 2088
2.1851 ODE No. 1851 2089
2.1852 ODE No. 1852 2090
2.1853 ODE No. 1853 2091
2.1854 ODE No. 1854 2092
2.1855 ODE No. 1855 2093
2.1856 ODE No. 1856 2094
2.1857 ODE No. 1857 2095
2.1858 ODE No. 1858 2096
2.1859 ODE No. 1859 2097
2.1860 ODE No. 1860 2098
2.1861 ODE No. 1861 2099
2.1862 ODE No. 1862 2100
2.1863 ODE No. 1863 2101
2.1864 ODE No. 1864 2102
2.1865 ODE No. 1865 2103
2.1866 ODE No. 1866 2104
2.1867 ODE No. 1867 2105
2.1868 ODE No. 1868 2106
2.1869 ODE No. 1869 2107
2.1870 ODE No. 1870 2108
2.1871 ODE No. 1871 2109
2.1872 ODE No. 1872 2110

2.1873 ODE No. 1873 2111
2.1874 ODE No. 1874 2112
2.1875 ODE No. 1875 2113
2.1876 ODE No. 1876 2114
2.1877 ODE No. 1877 2115
2.1878 ODE No. 1878 2116
2.1879 ODE No. 1879 2117
2.1880 ODE No. 1880 2118
2.1881 ODE No. 1881 2119
2.1882 ODE No. 1882 2120
2.1883 ODE No. 1883 2121
2.1884 ODE No. 1884 2122
2.1885 ODE No. 1885 2123
2.1886 ODE No. 1886 2124
2.1887 ODE No. 1887 2125
2.1888 ODE No. 1888 2126
2.1889 ODE No. 1889 2127
2.1890 ODE No. 1890 2128
2.1891 ODE No. 1891 2129
2.1892 ODE No. 1892 2130
2.1893 ODE No. 1893 2131
2.1894 ODE No. 1894 2132
2.1895 ODE No. 1895 2133
2.1896 ODE No. 1896 2134
2.1897 ODE No. 1897 2135
2.1898 ODE No. 1898 2136
2.1899 ODE No. 1899 2137
2.1900 ODE No. 1900 2138
2.1901 ODE No. 1901 2139
2.1902 ODE No. 1902 2140
2.1903 ODE No. 1903 2141
2.1904 ODE No. 1904 2142
2.1905 ODE No. 1905 2143
2.1906 ODE No. 1906 2144
2.1907 ODE No. 1907 2145
2.1908 ODE No. 1908 2146
2.1909 ODE No. 1909 2147
2.1910 ODE No. 1910 2148
2.1911 ODE No. 1911 2149
2.1912 ODE No. 1912 2150
2.1913 ODE No. 1913 2151

2.1914 ODE No. 1914 2152
2.1915 ODE No. 1915 2154
2.1916 ODE No. 1916 2155
2.1917 ODE No. 1917 2156
2.1918 ODE No. 1918 2157
2.1919 ODE No. 1919 2158
2.1920 ODE No. 1920 2159
2.1921 ODE No. 1921 2160
2.1922 ODE No. 1922 2161
2.1923 ODE No. 1923 2162
2.1924 ODE No. 1924 2163
2.1925 ODE No. 1925 2164
2.1926 ODE No. 1926 2165
2.1927 ODE No. 1927 2166
2.1928 ODE No. 1928 2167
2.1929 ODE No. 1929 2168
2.1930 ODE No. 1930 2169
2.1931 ODE No. 1931 2170
2.1932 ODE No. 1932 2171
2.1933 ODE No. 1933 2172
2.1934 ODE No. 1934 2173
2.1935 ODE No. 1935 2174
2.1936 ODE No. 1936 2175
2.1937 ODE No. 1937 2176
2.1938 ODE No. 1938 2177
2.1939 ODE No. 1939 2178
2.1940 ODE No. 1940 2179

3 Design of test program **2180**

1 Introduction and summary of results

This report gives the result of solving the 1,940 differential equations from Kamke book in Mathematica and Maple on windows 10, 64 bit OS. PC with 128 GB RAM.

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 size
Mathematica	87.99	2.42	1626.19	68.72	2775902
Maple	88.56	0.45	133.47	12.77	229301

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, 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, 1434, 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, 1776, 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, 452, 460, 461, 480, 482, 485, 503, 506, 510, 513, 531, 537, 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, 1581, 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, 1815, 1816, 1820, 1821, 1825, 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, 452, 485, 513, 537, 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, 1434, 1444, 1500, 1544, 1547, 1552, 1569, 1572, 1576, 1603, 1678, 1776, 1779, 1780, 1806, 1811, 1818, 1819, 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, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 204, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 235, 236, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 251, 252, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 266, 267, 268, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 332, 333, 334, 335, 336, 337, 338, 339, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 369, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 453, 454, 455, 456, 457, 458, 459, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 481, 483, 484, 486, 487, 488, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 504, 505, 507, 508, 509, 511, 512, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 532, 533, 534, 535, 536, 538, 539, 540, 541, 542, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 573, 574, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 836, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 886, 887, 888, 889, 890, 891, 892, 893, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 913, 914, 915, 916, 917, 918, 919, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000, 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 1014, 1016, 1017, 1018, 1020, 1021, 1022, 1023, 1024, 1025, 1027, 1029, 1033, 1034, 1035, 1036, 1037, 1039, 1040, 1041, 1042, 1043, 1044, 1045, 1046, 1047, 1048, 1049, 1050, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1058, 1059, 1060, 1061, 1062, 1063, 1064, 1065, 1066, 1067, 1068, 1069, 1070, 1071, 1078, 1079, 1080, 1084, 1085, 1086, 1087, 1088, 1089, 1090, 1091, 1092, 1093, 1094, 1095, 1096, 1097, 1098, 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1111, 1112, 1113, 1114, 1115, 1116, 1117, 1118, 1119, 1120, 1121, 1122, 1123, 1124, 1125, 1127, 1128, 1129, 1130, 1131, 1132, 1133, 1134, 1135, 1136, 1137, 1138, 1139, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1150, 1151, 1152, 1153, 1154, 1155, 1156, 1158, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1176, 1177, 1178, 1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1198, 1199, 1200, 1201, 1202, 1203, 1204, 1206, 1207, 1208, 1209, 1210, 1211, 1213, 1214, 1215, 1217, 1218, 1219, 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228, 1229, 1230, 1231, 1232, 1233, 1235, 1237, 1238, 1239, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 1249, 1250, 1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, 1277, 1279, 1280, 1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1290, 1291, 1292, 1293, 1294, 1295, 1296, 1297, 1298, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1307, 1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1320, 1321, 1322, 1324, 1325, 1326, 1327, 1328, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, 1337, 1338, 1339, 1340, 1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1357, 1358, 1359, 1360, 1361, 1363, 1364, 1365, 1366, 1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, 1390, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1409, 1410, 1411, 1412, 1413, 1414, 1415, 1416, 1417, 1418, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, 1430, 1431, 1432, 1433, 1435, 1436, 1437, 1438, 1442, 1445, 1446, 1447, 1448, 1449, 1450, 1451, 1452, 1453, 1454, 1455, 1456, 1464, 1465, 1466, 1467, 1468, 1469, 1470, 1471, 1472, 1475, 1477, 1478, 1479, 1480, 1481, 1482, 1483, 1485, 1486, 1487, 1488, 1490, 1491, 1492, 1493, 1494, 1495, 1496, 1497, 1498, 1499, 1501, 1502, 1503, 1504, 1505, 1506, 1507, 1508, 1509, 1511, 1512, 1513, 1514, 1516, 1517, 1518, 1519, 1520, 1521, 1522, 1523, 1524, 1525, 1526, 1527, 1528, 1529, 1530, 1532, 1533, 1534, 1535, 1536, 1537, 1538, 1539, 1545, 1546, 1548, 1549, 1550, 1551, 1553, 1554, 1555, 1556, 1557, 1558, 1559, 1560, 1561, 1562, 1563, 1564, 1565, 1566, 1567, 1568, 1570, 1571, 1573, 1574, 1575, 1577, 1578, 1579, 1580, 1583, 1584, 1585, 1587, 1588, 1589, 1591, 1592, 1594, 1597, 1600, 1602, 1604, 1607, 1610, 1613, 1614, 1620, 1621, 1622, 1629, 1630, 1631, 1632, 1633, 1635, 1638, 1640, 1641, 1646, 1647, 1650, 1651, 1652, 1653, 1654, 1655, 1656, 1657, 1661, 1668, 1669, 1670, 1671, 1674, 1676, 1679, 1681, 1683, 1687, 1688, 1689, 1691, 1694, 1697, 1699, 1700, 1701, 1703, 1707, 1711, 1712, 1714, 1715, 1716, 1717, 1718, 1720, 1722, 1723, 1724, 1725, 1726, 1727, 1728, 1730, 1731, 1733, 1736, 1740, 1741, 1743, 1744, 1745, 1746, 1747, 1748, 1749, 1750, 1752, 1753, 1754, 1755, 1756, 1758, 1759, 1760, 1763, 1764, 1765, 1766, 1767, 1768, 1769, 1770, 1771, 1772, 1773, 1774, 1775, 1778, 1781, 1782, 1783, 1784, 1785, 1786, 1787, 1790, 1791, 1792, 1793, 1794, 1795, 1796, 1798, 1799, 1800, 1803, 1804, 1805, 1808, 1809, 1810, 1812, 1813, 1814, 1817, 1822, 1823, 1824, 1826, 1828, 1829, 1830, 1833, 1837, 1842, 1843, 1844, 1845, 1846, 1847, 1848, 1849, 1852, 1853, 1856, 1857, 1858, 1859, 1860, 1861, 1862, 1863, 1864, 1865, 1866, 1867, 1868, 1869, 1870, 1871, 1872, 1873, 1874, 1875, 1876, 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1916, 1917, 1923, 1924, 1925, 1926, 1930, 1931, 1938, 1939

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, 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, 1581, 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, 1815, 1816, 1820, 1821, 1825, 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	✓	10.282	1117	✓	0.02	1089	Linear first order, To Do
Kamke 2	✓	0.035	34	✓	0.007	25	Linear first order, integrating factor $y'(x) + ay(x) = f(x)$
Kamke 3	✓	0.038	40	✓	0.033	37	Linear first order, integrating factor $y'(x) + ay(x) = f(x)$
Kamke 4	✓	0.025	30	✓	0.005	18	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 5	✓	0.37	39	✓	0.052	21	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 6	✓	0.027	18	✓	0.034	15	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 7	✓	0.061	23	✓	0.005	13	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 8	✓	0.027	17	✓	0.015	13	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 9	✓	0.025	19	✓	0.013	14	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 10	✓	0.022	18	✓	0.01	15	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 11	✓	0.023	66	✓	0.015	24	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 12	✓	0.059	34	✓	0.027	8	Non-linear first order, Riccati, separable $y'(x) + y^2(x) = 1$
Kamke 13	✓	0.076	79	✓	0.125	79	Non-linear first order, Riccati, transform to second order Airy ODE using $y = -\frac{u'(x)}{uR(x)}$
Kamke 14	✓	0.117	602	✓	0.063	187	Non-linear first order, Riccati, transform to second order Airy ODE using $y = -\frac{u'(x)}{uR(x)}$
Kamke 15	✓	0.057	25	✓	0.114	35	Non-linear first order, Riccati, transform to separable first order
Kamke 16	✓	0.041	186	✓	0.05	49	Non-linear first order, Riccati, transform to first order separable using $y = y_p + \frac{1}{u}$
Kamke 17	✓	0.047	34	✓	0.077	24	Non-linear first order, Riccati, transform to second order standard ODE using $y = -\frac{u'(x)}{uR(x)}$

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 18	✓	0.066	50	✓	0.04	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	✓	0.045	14	✓	0.033	16	Non-linear first order, Riccati, transform to first order separable
Kamke 20	✓	0.085	49	✓	0.045	34	Non-linear first order, Riccati, transform to Bernoulli first order non-linear first order then solve Bernoulli
Kamke 21	✓	0.331	71	✓	0.131	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	✓	0.544	113	✓	0.39	97	Non-linear first order, Riccati, transform to first order ODE solved using integrating factor using transformtion $y = y_p + \frac{1}{u}$
Kamke 23	✓	0.056	43	✓	0.028	23	Non-linear first order, Riccati, Separable
Kamke 24	✓	0.102	733	✓	0.043	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	✓	0.245	1835	✓	0.272	348	Non-linear first order, Riccati. To do

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 26	✓	0.137	68	✓	0.256	45	Non-Linear first order, Riccati, transform to second order standard ODE using $y=-\frac{u'(x)}{uR(x)}$
Kamke 27	✓	0.263	120	✓	0.122	72	Non-linear first order, Riccati, transform to Bernoulli first order non-linear first order then solve Bernoulli
Kamke 28	✓	0.112	96	✓	0.059	51	Non-linear first order, Riccati, transform to Bernoulli first order non-linear first order then solve Bernoulli
Kamke 29	✓	0.057	39	✓	0.007	19	Non-linear first order, Bernoulli
Kamke 30	✓	0.124	230	✓	0.051	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	✓	0.128	21	✓	0.042	23	Non-Linear first order, Riccati, separable
Kamke 32	✓	0.353	34	✓	0.193	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	✓	0.296	160	✓	0.348	58	Non-Linear first order, Riccati. Complicated algebra, will do later
Kamke 34	✓	0.073	54	✓	0.016	28	Non-Linear first order, Bernoulli. Standard method.

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 35	✓	0.091	61	✓	0.031	35	Non-Linear first order, Riccati. Transform to second order ODE using $y(x) = -\frac{u'(x)}{u(x)R(x)}$
Kamke 36	✓	0.234	195	✓	0.052	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	✓	0.679	78	✓	0.063	50	To Do
Kamke 38	✓	0.314	320	✓	0.02	34	Non-Linear first order. smart transformation makes it proper Abel first kind
Kamke 39	✓	0.095	54	✓	0.009	30	To Do
Kamke 40	✓	0.31	185	✓	0.039	48	To Do
Kamke 41	✓	0.188	103	✓	0.208	103	To Do
Kamke 42	✓	0.747	485	✓	0.019	40	To Do
Kamke 43	✓	4.052	490	✓	1.075	373	To Do
Kamke 44	✓	0.076	72	✓	0.01	53	Non-Linear first order Bernoulli. Solved using standard method of solving Bernoulli.
Kamke 45	✓	0.404	133	✓	0.104	108	To Do
Kamke 46	✓	0.194	228	✓	0.077	690	To Do
Kamke 47	✗	0	0	✗	0	0	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 48	✗	0	0	✗	0	0	To Do
Kamke 49	✗	0	0	✗	0	0	To Do
Kamke 50	✗	0	0	✗	0	0	To Do
Kamke 51	✓	1.085	355	✓	1.33	648	To Do
Kamke 52	✓	0.289	117	✓	0.352	54	To Do
Kamke 53	✓	0.366	96	✓	0.204	214	To Do
Kamke 54	✓	0.307	74	✓	0.134	38	To Do
Kamke 55	✗	0	0	✗	0	0	To Do
Kamke 56	✗	0	0	✗	0	0	To Do
Kamke 57	✓	0.044	26	✓	0.049	31	To Do
Kamke 58	✓	0.254	119	✓	0.053	68	To Do
Kamke 59	✓	0.252	84	✓	0.048	26	To Do
Kamke 60	✓	0.095	173	✓	0.017	29	Non-Linear first order, separable.
Kamke 61	✓	0.15	79	✓	0.009	50	To Do
Kamke 62	✓	1.76	44	✓	0.277	34	Non-Linear first order, special transformation makes it exact differential.
Kamke 63	✓	0.094	48	✓	7.04	35	To Do
Kamke 64	✓	0.351	269	✓	0.102	124	To Do
Kamke 65	✓	51.744	312	✓	0.062	47	To Do
Kamke 66	✓	0.127	67	✓	0.085	40	To Do
Kamke 67	✓	20.174	14	✓	0.02	51	To Do
Kamke 68	✓	20.514	373	✓	0.06	77	To Do
Kamke 69	✓	27.33	1163	✓	0.149	111	To Do
Kamke 70	✓	22.507	81	✓	0.144	113	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 71	✓	2.17	2237	✓	0.101	113	To Do
Kamke 72	✓	0.125	89	✓	0.011	64	To Do
Kamke 73	✓	1.108	733	✓	0.39	91	To Do
Kamke 74	✗	0	0	✗	0	0	To Do
Kamke 75	✓	0.121	18	✓	0.104	20	Non-Linear first order, Separable
Kamke 76	✓	0.15	116	✓	0.074	41	Non-Linear first order, Separable, integral requires the tangent half-angle substitution (Weierstrass substitution)
Kamke 77	✓	0.321	124	✓	0.086	54	Non-Linear first order, transform to Separable, becomes same as problem 76 above. Transform back after soluion.
Kamke 78	✓	0.896	1317	✓	0.117	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	✓	0.042	72	✓	1.374	41	To Do
Kamke 81	✓	1.202	220	✓	1.052	78	To Do
Kamke 82	✗	0	0	✗	0	0	To Do
Kamke 83	✓	0.284	69	✓	0.257	44	To Do
Kamke 84	✓	0.209	248	✓	0.026	37	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 85	✓	0.314	238	✓	0.368	153	To Do
Kamke 86	✓	0.462	184	✓	0.196	52	To Do
Kamke 87	✗	0	0	✗	0	0	To Do
Kamke 88	✓	0.355	2831	✓	0.166	256	Non-Linear first order, Riccati, Solved using $y = -\frac{u'}{uR(x)}$ substitution. Convert to second order Bessel ODE
Kamke 89	✓	0.03	42	✓	0.017	56	Linear first order, separable. Integration tricky. requires tangent half-angle substitution
Kamke 90	✓	0.022	24	✓	0.018	17	Linear first order, separable. integrating factor
Kamke 91	✓	0.02	15	✓	0.004	11	To Do
Kamke 92	✓	0.016	15	✓	0.005	12	Linear first order, separable. integrating factor
Kamke 93	✓	0.033	16	✓	0.017	12	To Do
Kamke 94	✓	0.026	25	✓	0.008	23	Linear first order, separable. integrating factor
Kamke 95	✓	0.057	32	✓	0.036	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	✓	0.047	33	✓	0.029	11	Non-Linear first order, Riccati, but it is separable, so easy to solve by direct integration

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 97	✓	0.082	46	✓	0.029	25	Non-Linear first order, Riccati, smart substitution transfer it to separable first order, so easy to solve by direct integration
Kamke 98	✓	0.133	442	✓	0.062	38	To Do
Kamke 99	✓	0.135	244	✓	0.079	171	To Do
Kamke 100	✓	0.081	199	✓	0.046	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	✓	0.056	18	✓	0.007	16	Non-Linear first order, Bernoulli, standard method of solving Bernoulli
Kamke 102	✓	0.065	36	✓	0.027	22	Non-Linear first order, Riccati, but transformed using smart substitution $y = xv$ to separable first order which is easily solved
Kamke 103	✓	0.11	90	✓	0.021	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
Kamke 104	✓	0.084	43	✓	0.039	63	Non-Linear first order, Riccati, conversion using smart transformation to separable first order

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 105	✓	0.155	473	✓	0.218	844	To Do
Kamke 106	✓	0.15	40	✓	0.055	41	To Do
Kamke 107	✓	0.242	1415	✓	0.189	174	To Do
Kamke 108	✓	0.056	15	✓	0.01	13	Non-Linear first order, Bernoulli, standard method of solving Bernoulli, leads to first order separable
Kamke 109	✓	0.057	17	✓	0.008	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	✓	0.336	55	✓	0.089	53	To Do
Kamke 112	✓	0.099	27	✓	0.042	27	Non-Linear first order, smart transformation $y(x) = xv(x)$ makes it separable
Kamke 113	✓	0.103	36	✓	0.021	33	Non-Linear first order, very similar to 112. Smart transformation $y(x) = xv(x)$ makes it separable
Kamke 114	✓	0.092	32	✓	5.681	28	Non-Linear first order, very similar to 113. Smart transformation $y(x) = xv(x)$ makes it separable

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 115	✓	0.242	104	✓	0.189	49	Non-Linear first order, Smart transformation $y(x) = xv(x)$ makes it separable
Kamke 116	✓	3.147	121	✓	0.237	86	To Do
Kamke 117	✓	0.124	28	✓	0.076	20	To Do
Kamke 118	✓	0.054	13	✓	0.054	8	To Do
Kamke 119	✓	0.074	17	✓	0.04	14	To Do
Kamke 120	✓	0.074	20	✓	0.115	17	To Do
Kamke 121	✗	0	0	✗	0	0	To Do
Kamke 122	✓	0.209	21	✓	0.327	16	To Do
Kamke 123	✓	0.063	32	✓	0.071	44	To Do
Kamke 124	✓	0.066	16	✓	0.028	12	To Do
Kamke 125	✓	0.134	16	✓	0.038	14	To Do
Kamke 126	✓	0.196	115	✓	0.019	29	To Do
Kamke 127	✓	0.332	186	✓	0.081	39	To Do
Kamke 128	✓	1.935	41	✓	0.206	33	To Do
Kamke 129	✓	0.15	44	✓	0.031	33	To Do
Kamke 130	✓	0.013	21	✓	0.004	15	To Do
Kamke 131	✓	0.141	20	✓	0.143	31	To Do
Kamke 132	✓	0.065	115	✓	0.056	153	To Do
Kamke 133	✓	0.013	27	✓	0.008	16	To Do
Kamke 134	✓	0.029	27	✓	0.004	17	To Do
Kamke 135	✓	0.013	14	✓	0.004	11	To Do
Kamke 136	✓	0.056	28	✓	0.01	18	To Do
Kamke 137	✓	0.053	16	✓	0.005	14	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 138	✓	0.051	13	✓	0.022	11	To Do
Kamke 139	✓	0.154	821	✓	0.105	217	To Do
Kamke 140	✓	0.058	17	✓	0.065	20	To Do
Kamke 141	✓	0.092	67	✓	0.055	51	To Do
Kamke 142	✓	0.152	122	✓	0.065	52	To Do
Kamke 143	✓	0.068	51	✓	0.036	41	To Do
Kamke 144	✓	0.171	1787	✓	0.085	219	To Do
Kamke 145	✓	0.428	267	✓	0.065	117	To Do
Kamke 146	✓	0.609	78	✓	0.142	84	To Do
Kamke 147	✓	0.592	343	✓	0.158	178	To Do
Kamke 148	✓	0.023	43	✓	0.006	16	To Do
Kamke 149	✓	0.016	27	✓	0.008	20	To Do
Kamke 150	✓	0.014	30	✓	0.005	23	To Do
Kamke 151	✓	0.409	203	✓	0.036	76	To Do
Kamke 152	✓	0.277	40	✓	0.621	142	To Do
Kamke 153	✓	0.033	21	✓	0.009	20	To Do
Kamke 154	✓	0.017	26	✓	0.006	19	To Do
Kamke 155	✓	0.095	46	✓	0.058	14	To Do
Kamke 156	✓	0.061	21	✓	0.01	20	To Do
Kamke 157	✓	0.132	158	✓	0.149	231	To Do
Kamke 158	✓	0.109	31	✓	0.01	22	To Do
Kamke 159	✓	0.067	22	✓	0.082	13	To Do
Kamke 160	✓	0.088	27	✓	0.018	21	To Do
Kamke 161	✓	0.019	53	✓	0.008	27	To Do
Kamke 162	✓	0.298	133	✓	0.145	54	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 163	✓	0.073	43	✓	0.047	27	To Do
Kamke 164	✓	0.098	131	✓	0.144	102	To Do
Kamke 165	✓	0.084	22	✓	0.011	17	To Do
Kamke 166	✓	0.109	71	✓	0.104	97	To Do
Kamke 167	✓	0.063	35	✓	0.02	20	To Do
Kamke 168	✓	0.133	234	✓	0.114	140	To Do
Kamke 169	✓	1.435	149	✓	0.128	153	To Do
Kamke 170	✓	0.062	43	✓	0.007	23	To Do
Kamke 171	✓	0.05	17	✓	0.006	15	To Do
Kamke 172	✓	0.063	35	✓	0.241	26	To Do
Kamke 173	✓	0.067	29	✓	0.069	27	To Do
Kamke 174	✓	0.012	17	✓	0.003	13	To Do
Kamke 175	✓	0.021	24	✓	0.009	20	To Do
Kamke 176	✓	0.139	82	✓	0.053	30	To Do
Kamke 177	✓	0.079	22	✓	0.013	17	To Do
Kamke 178	✓	10.127	49	✓	0.167	61	To Do
Kamke 179	✓	0.4	2833	✓	0.094	107	To Do
Kamke 180	✓	0.2	132	✓	0.067	58	To Do
Kamke 181	✓	0.121	146	✓	0.042	27	To Do
Kamke 182	✓	0.154	96	✓	0.079	18	To Do
Kamke 183	✓	0.019	22	✓	0.009	18	To Do
Kamke 184	✓	0.808	704	✓	0.358	493	To Do
Kamke 185	✓	0.313	123	✓	0.028	63	To Do
Kamke 186	✓	0.164	19	✓	0.026	17	To Do
Kamke 187	✓	0.16	328	✓	0.069	60	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 188	✗	0	0	✓	0.026	32	To Do
Kamke 189	✓	0.367	91	✓	0.62	60	To Do
Kamke 190	✓	0.089	173	✓	0.006	29	To Do
Kamke 191	✓	0.123	79	✓	0.012	16	To Do
Kamke 192	✓	4.078	103	✓	0.014	36	To Do
Kamke 193	✓	0.018	16	✓	0.004	14	To Do
Kamke 194	✓	0.134	98	✓	0.015	23	To Do
Kamke 195	✓	0.117	27	✓	0.082	28	To Do
Kamke 196	✓	0.324	53	✓	0.03	29	To Do
Kamke 197	✓	0.083	104	✓	0.138	237	To Do
Kamke 198	✓	0.025	15	✓	0.012	13	To Do
Kamke 199	✓	0.074	45	✓	0.521	105	To Do
Kamke 200	✓	0.19	77	✓	0.102	53	To Do
Kamke 201	✓	0.1	39	✓	0.028	23	To Do
Kamke 202	✗	0	0	✗	0	0	To Do
Kamke 203	✗	0	0	✗	0	0	To Do
Kamke 204	✓	0.09	70	✓	0.233	92	To Do
Kamke 205	✗	0	0	✗	0	0	To Do
Kamke 206	✗	0	0	✗	0	0	To Do
Kamke 207	✓	0.076	47	✓	0.014	37	To Do
Kamke 208	✓	0.147	118	✓	0.135	106	To Do
Kamke 209	✓	0.091	84	✓	0.008	21	To Do
Kamke 210	✓	0.062	47	✓	0.013	33	To Do
Kamke 211	✓	0.178	41	✓	0.032	31	To Do
Kamke 212	✓	0.242	95	✓	0.083	30	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 213	✓	0.099	71	✓	0.802	66	To Do
Kamke 214	✓	0.109	78	✓	0.129	48	To Do
Kamke 215	✓	0.111	80	✓	0.168	51	To Do
Kamke 216	✓	0.102	82	✓	0.151	51	To Do
Kamke 217	✓	0.019	29	✓	0.022	23	To Do
Kamke 218	✓	0.092	257	✓	0.254	57	To Do
Kamke 219	✗	0	0	✗	0	0	To Do
Kamke 220	✓	0.079	57	✓	0.013	43	To Do
Kamke 221	✓	0.021	35	✓	0.061	21	To Do
Kamke 222	✓	0.059	65	✓	0.053	32	To Do
Kamke 223	✓	0.022	55	✓	0.119	51	To Do
Kamke 224	✓	0.019	29	✓	0.066	35	To Do
Kamke 225	✓	0.019	33	✓	0.052	20	To Do
Kamke 226	✓	0.018	35	✓	0.048	21	To Do
Kamke 227	✓	0.016	107	✓	0.128	33	To Do
Kamke 228	✓	0.167	3357	✓	0.229	264	To Do
Kamke 229	✓	0.016	121	✓	0.12	32	To Do
Kamke 230	✓	0.12	98	✓	0.046	100	To Do
Kamke 231	✓	1.501	252	✓	0.179	178	To Do
Kamke 232	✓	0.058	56	✓	0.01	39	To Do
Kamke 233	✓	0.099	38	✓	0.015	30	To Do
Kamke 234	✗	0	0	✗	0	0	To Do
Kamke 235	✓	0.076	40	✓	0.03	30	To Do
Kamke 236	✓	0.089	114	✓	0.045	141	To Do
Kamke 237	✗	0	0	✗	0	0	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 238	✓	0.177	192	✓	0.05	91	To Do
Kamke 239	✓	0.084	54	✓	0.125	59	To Do
Kamke 240	✓	0.07	41	✓	0.011	34	To Do
Kamke 241	✓	0.065	41	✓	0.007	33	To Do
Kamke 242	✓	0.056	60	✓	0.009	39	To Do
Kamke 243	✓	7.928	487	✓	0.137	391	To Do
Kamke 244	✓	7.902	484	✓	0.117	391	To Do
Kamke 245	✓	0.308	1453	✓	0.928	31	To Do
Kamke 246	✓	0.105	80	✓	0.05	63	To Do
Kamke 247	✓	6.98	693	✓	0.204	517	To Do
Kamke 248	✓	0.121	110	✓	0.012	75	To Do
Kamke 249	✓	2.319	115	✓	0.148	202	To Do
Kamke 250	✗	0	0	✗	0	0	To Do
Kamke 251	✓	0.093	60	✓	0.01	51	To Do
Kamke 252	✓	7.766	819	✓	0.605	1322	To Do
Kamke 253	✗	0	0	✗	0	0	To Do
Kamke 254	✓	0.094	99	✓	0.016	59	To Do
Kamke 255	✓	6.239	30	✓	0.171	74	To Do
Kamke 256	✓	0.021	21	✓	0.103	31	To Do
Kamke 257	✓	0.281	39	✓	0.072	98	To Do
Kamke 258	✓	0.078	43	✓	0.013	33	To Do
Kamke 259	✓	0.177	50	✓	0.014	51	To Do
Kamke 260	✓	0.089	80	✓	0.015	59	To Do
Kamke 261	✓	0.458	32	✓	0.079	18	To Do
Kamke 262	✓	0.119	101	✓	0.21	65	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 263	✓	0.095	181	✓	0.146	179	To Do
Kamke 264	✓	0.276	680	✓	0.276	37	To Do
Kamke 265	✗	0	0	✗	0	0	To Do
Kamke 266	✓	2.976	69	✓	1.826	103	To Do
Kamke 267	✓	0.204	36	✓	0.03	32	To Do
Kamke 268	✓	0.111	146	✓	0.058	118	To Do
Kamke 269	✗	0	0	✗	0	0	To Do
Kamke 270	✓	0.1	327	✓	0.035	314	To Do
Kamke 271	✓	0.192	370	✓	0.164	349	To Do
Kamke 272	✓	0.113	42	✓	0.111	42	To Do
Kamke 273	✓	0.126	297	✓	0.029	397	To Do
Kamke 274	✓	0.13	411	✓	0.049	653	To Do
Kamke 275	✓	0.083	18	✓	0.057	30	To Do
Kamke 276	✓	0.1	61	✓	0.405	47	To Do
Kamke 277	✓	0.079	53	✓	0.286	41	To Do
Kamke 278	✓	0.15	39	✓	0.038	28	To Do
Kamke 279	✓	0.335	107	✓	0.095	110	To Do
Kamke 280	✓	0.098	21	✓	0.035	24	To Do
Kamke 281	✓	0.136	75	✓	0.586	55	To Do
Kamke 282	✓	0.156	2129	✓	0.466	71	To Do
Kamke 283	✓	0.265	477	✓	0.071	407	To Do
Kamke 284	✓	0.082	59	✓	0.078	21	To Do
Kamke 285	✓	0.115	402	✓	0.082	429	To Do
Kamke 286	✓	0.181	3501	✓	1.005	1337	To Do
Kamke 287	✓	1.385	77	✓	0.051	56	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 288	✓	0.155	534	✓	0.046	575	To Do
Kamke 289	✓	0.135	115	✓	0.028	115	To Do
Kamke 290	✓	0.328	831	✓	0.243	1386	To Do
Kamke 291	✓	0.669	39	✓	0.11	50	To Do
Kamke 292	✓	29.595	1716	✓	0.029	115	To Do
Kamke 293	✓	0.133	661	✓	0.167	35	To Do
Kamke 294	✓	0.186	71	✓	0.056	112	To Do
Kamke 295	✓	0.179	31	✓	0.158	29	To Do
Kamke 296	✓	0.29	102	✓	0.482	61	To Do
Kamke 297	✓	0.118	216	✓	0.237	29	To Do
Kamke 298	✓	0.064	72	✓	0.016	73	To Do
Kamke 299	✓	0.086	371	✓	0.161	276	To Do
Kamke 300	✓	0.061	99	✓	0.019	83	To Do
Kamke 301	✓	0.099	64	✓	0.135	25	To Do
Kamke 302	✓	0.069	70	✓	0.213	133	To Do
Kamke 303	✓	0.094	25	✓	0.131	34	To Do
Kamke 304	✓	0.257	44	✓	0.187	44	To Do
Kamke 305	✓	0.128	1277	✓	0.012	21	To Do
Kamke 306	✓	0.097	201	✓	0.546	225	To Do
Kamke 307	✓	0.164	149	✓	0.03	113	To Do
Kamke 308	✓	0.012	55	✓	0.009	37	To Do
Kamke 309	✓	0.077	151	✓	0.027	113	To Do
Kamke 310	✓	0.124	159	✓	0.073	125	To Do
Kamke 311	✓	0.161	2201	✓	0.086	50	To Do
Kamke 312	✓	0.903	204	✓	1.201	240	To Do

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 313	✓	0.216	537	✓	0.153	748	To Do
Kamke 314	✓	0.117	188	✓	0.062	158	To Do
Kamke 315	✓	0.214	368	✓	0.088	374	To Do
Kamke 316	✓	0.133	48	✓	0.033	53	To Do
Kamke 317	✓	0.193	23	✓	0.113	29	To Do
Kamke 318	✓	0.155	4284	✓	0.015	28	To Do
Kamke 319	✓	0.113	302	✓	0.022	35	To Do
Kamke 320	✓	0.098	76	✓	0.079	78	To Do
Kamke 321	✓	0.28	47	✓	0.114	42	To Do
Kamke 322	✓	0.186	2077	✓	0.016	29	To Do
Kamke 323	✓	0.18	463	✓	0.095	630	To Do
Kamke 324	✓	0.086	723	✓	0.097	811	To Do
Kamke 325	✓	0.143	139	✓	0.431	124	To Do
Kamke 326	✓	1.395	13289	✓	0.694	160	To Do
Kamke 327	✓	0.175	669	✓	0.149	579	To Do
Kamke 328	✓	0.197	42	✓	0.162	33	To Do
Kamke 329	✓	0.575	118	✓	0.395	72	To Do
Kamke 330	✓	0.092	52	✓	0.02	22	To Do
Kamke 331	✗	0	0	✓	0.155	78	To Do
Kamke 332	✓	0.187	29	✓	0.011	33	To Do
Kamke 333	✓	0.292	72	✓	0.062	33	To Do
Kamke 334	✓	0.087	39	✓	0.017	19	To Do
Kamke 335	✓	0.093	79	✓	0.006	50	To Do
Kamke 336	✓	0.406	80	✓	0.023	41	To Do
Kamke 337	✓	0.141	52	✓	0.069	28	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 338	✓	5.834	116	✓	0.725	129	To Do
Kamke 339	✓	0.258	27	✓	0.106	25	To Do
Kamke 340	✗	0	0	✗	0	0	To Do
Kamke 341	✓	0.187	33	✓	0.039	33	To Do
Kamke 342	✓	0.399	163	✓	0.026	17	To Do
Kamke 343	✓	0.116	35	✓	0.053	27	To Do
Kamke 344	✓	0.133	23	✓	0.037	19	To Do
Kamke 345	✓	0.134	35	✓	0.055	36	To Do
Kamke 346	✓	0.297	24	✓	0.177	19	To Do
Kamke 347	✓	0.335	32	✓	0.184	12	To Do
Kamke 348	✓	0.149	17	✓	0.066	15	To Do
Kamke 349	✓	0.157	15	✓	0.035	17	To Do
Kamke 350	✓	0.414	53	✓	1.102	221	To Do
Kamke 351	✓	0.35	61	✓	0.356	55	To Do
Kamke 352	✓	0.408	43	✓	0.191	33	To Do
Kamke 353	✓	0.063	14	✓	0.019	12	To Do
Kamke 354	✓	0.123	145	✓	0.066	108	To Do
Kamke 355	✓	0.141	17	✓	0.057	15	To Do
Kamke 356	✓	0.193	21	✓	0.07	19	To Do
Kamke 357	✓	0.392	35	✓	0.467	13	To Do
Kamke 358	✓	0.112	29	✓	0.058	11	To Do
Kamke 359	✓	0.226	45	✓	0.071	28	To Do
Kamke 360	✓	13.886	369	✓	0.056	46	To Do
Kamke 361	✓	0.553	31	✓	0.181	22	To Do
Kamke 362	✓	0.246	23	✓	0.147	23	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 363	✓	0.25	33	✓	0.05	35	To Do
Kamke 364	✓	0.31	31	✓	0.137	23	To Do
Kamke 365	✓	0.281	156	✓	0.093	42	To Do
Kamke 366	✓	0.191	91	✓	0.078	45	To Do
Kamke 367	✗	0	0	✗	0	0	To Do
Kamke 368	✓	0.478	581	✗	0	0	To Do
Kamke 369	✓	0.054	107	✓	0.093	68	To Do
Kamke 370	✗	0	0	✗	0	0	To Do
Kamke 371	✓	0.048	37	✓	0.071	20	To Do
Kamke 372	✓	0.003	27	✓	0.036	227	To Do
Kamke 373	✓	0.202	185	✓	0.168	49	To Do
Kamke 374	✓	0.252	99	✓	0.019	85	To Do
Kamke 375	✓	0.018	71	✓	0.019	49	To Do
Kamke 376	✓	0.2	114	✓	0.625	279	To Do
Kamke 377	✓	0.003	19	✓	0.018	24	To Do
Kamke 378	✓	0.003	18	✓	0.018	20	To Do
Kamke 379	✓	0.003	18	✓	0.014	22	To Do
Kamke 380	✓	0.152	1193	✓	0.033	589	To Do
Kamke 381	✓	0.163	1169	✓	0.025	553	To Do
Kamke 382	✓	0.445	207	✓	0.02	146	To Do
Kamke 383	✓	0.895	1085	✗	0	0	To Do
Kamke 384	✓	0.004	24	✓	0.459	50	To Do
Kamke 385	✓	0.444	6145	✓	0.523	161	To Do
Kamke 386	✓	0.952	62	✓	0.831	27	To Do
Kamke 387	✓	0.686	138	✓	1.439	118	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 388	✓	0.695	74	✓	0.473	223	To Do
Kamke 389	✓	0.062	55	✓	0.983	71	To Do
Kamke 390	✓	2.038	161	✓	0.452	281	To Do
Kamke 391	✓	0.012	29	✓	0.006	22	To Do
Kamke 392	✓	0.134	27	✓	0.383	50	To Do
Kamke 393	✓	0.072	31	✓	1.088	77	To Do
Kamke 394	✓	0.244	89	✓	4.301	109	To Do
Kamke 395	✗	0	0	✗	0	0	To Do
Kamke 396	✓	0.044	29	✓	0.007	20	To Do
Kamke 397	✓	0.655	163	✓	0.776	128	To Do
Kamke 398	✓	11.421	696	✓	1.979	138	To Do
Kamke 399	✓	0.003	20	✓	0.453	22	To Do
Kamke 400	✓	1.236	202	✓	0.638	37	To Do
Kamke 401	✓	0.164	1211	✓	0.251	554	To Do
Kamke 402	✓	0.763	105	✓	0.605	51	To Do
Kamke 403	✓	0.178	118	✓	1.103	247	To Do
Kamke 404	✓	1.802	308	✓	0.416	389	To Do
Kamke 405	✓	0.561	79	✓	0.653	378	To Do
Kamke 406	✓	1.336	71	✓	0.539	262	To Do
Kamke 407	✓	0.022	51	✓	0.237	39	To Do
Kamke 408	✓	0.204	97	✓	0.523	73	To Do
Kamke 409	✓	1.358	50	✓	0.54	63	To Do
Kamke 410	✓	30.491	90	✓	0.279	64	To Do
Kamke 411	✓	0.21	97	✓	0.476	65	To Do
Kamke 412	✓	0.291	6457	✓	0.515	146	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 413	✓	0.081	673	✓	0.375	269	To Do
Kamke 414	✓	0.095	107	✓	0.594	269	To Do
Kamke 415	✓	0.151	49	✓	0.619	95	To Do
Kamke 416	✓	0.31	1493	✓	0.29	136	To Do
Kamke 417	✓	0.003	16	✓	0.487	35	To Do
Kamke 418	✓	0.934	168	✓	0.514	42	To Do
Kamke 419	✓	0.638	9073	✓	0.255	109	To Do
Kamke 420	✓	0.154	1559	✓	0.492	689	To Do
Kamke 421	✓	0.052	53	✓	0.49	32	To Do
Kamke 422	✓	0.072	81	✓	0.256	30	To Do
Kamke 423	✓	0.095	59	✓	0.49	44	To Do
Kamke 424	✓	0.744	423	✓	0.759	193	To Do
Kamke 425	✓	0.004	21	✓	0.251	45	To Do
Kamke 426	✓	0.004	28	✓	0.497	51	To Do
Kamke 427	✓	0.005	24	✓	0.512	60	To Do
Kamke 428	✓	0.004	22	✓	0.267	66	To Do
Kamke 429	✓	0.004	30	✓	0.495	72	To Do
Kamke 430	✓	218.475	507	✓	2.454	1602	To Do
Kamke 431	✓	0.041	81	✓	0.128	62	To Do
Kamke 432	✓	0.899	82	✓	8.938	78	To Do
Kamke 433	✓	0.632	22	✓	0.381	34	To Do
Kamke 434	✓	0.052	53	✓	0.004	7	To Do
Kamke 435	✓	0.053	61	✓	0.211	22	To Do
Kamke 436	✓	0.081	62	✓	0.74	61	To Do
Kamke 437	✓	0.183	47	✓	0.031	36	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 438	✓	0.019	21	✓	0.008	17	To Do
Kamke 439	✓	0.034	49	✓	0.036	33	To Do
Kamke 440	✓	0.018	19	✓	0.009	15	To Do
Kamke 441	✓	0.081	65	✓	0.922	137	To Do
Kamke 442	✓	0.021	28	✓	0.013	21	To Do
Kamke 443	✓	0.264	3049	✓	1.402	192	To Do
Kamke 444	✓	0.199	52	✓	0.775	120	To Do
Kamke 445	✓	0.045	49	✓	0.009	35	To Do
Kamke 446	✓	0.027	45	✓	0.033	57	To Do
Kamke 447	✓	0.005	89	✓	0.023	33	To Do
Kamke 448	✓	0.065	349	✓	10.39	166	To Do
Kamke 449	✓	0.021	27	✓	0.01	23	To Do
Kamke 450	✓	0.207	26	✓	0.544	51	To Do
Kamke 451	✓	0.036	51	✓	0.047	78	To Do
Kamke 452	✓	0.012	23	✗	0	0	To Do
Kamke 453	✓	0.498	223	✓	0.693	229	To Do
Kamke 454	✓	0.255	241	✓	0.105	106	To Do
Kamke 455	✓	0.403	57	✓	0.294	66	To Do
Kamke 456	✓	0.204	145	✓	0.402	33	To Do
Kamke 457	✓	0.241	118	✓	0.624	45	To Do
Kamke 458	✓	0.028	120	✓	0.042	90	To Do
Kamke 459	✓	12.159	545	✓	0.493	113	To Do
Kamke 460	✗	0	0	✗	0	0	To Do
Kamke 461	✗	0	0	✗	0	0	To Do
Kamke 462	✓	0.021	43	✓	0.021	27	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 463	✓	0.033	47	✓	0.067	50	To Do
Kamke 464	✓	0.057	103	✓	0.489	70	To Do
Kamke 465	✓	0.037	107	✓	0.074	210	To Do
Kamke 466	✓	0.342	157	✓	0.411	71	To Do
Kamke 467	✓	0.159	226	✓	0.072	148	To Do
Kamke 468	✓	2.59	753	✓	0.087	181	To Do
Kamke 469	✓	0.223	157	✓	0.25	264	To Do
Kamke 470	✓	0.595	218	✓	0.344	87	To Do
Kamke 471	✓	0.012	47	✓	0.012	33	To Do
Kamke 472	✓	0.316	127	✓	0.404	121	To Do
Kamke 473	✓	0.283	165	✓	0.836	71	To Do
Kamke 474	✓	0.161	135	✓	0.851	115	To Do
Kamke 475	✓	0.065	113	✓	0.506	67	To Do
Kamke 476	✓	0.589	218	✓	0.341	87	To Do
Kamke 477	✓	0.203	142	✓	0.372	622	To Do
Kamke 478	✓	0.136	141	✓	0.297	211	To Do
Kamke 479	✓	4.826	576	✓	0.265	929	To Do
Kamke 480	✗	0	0	✗	0	0	To Do
Kamke 481	✓	0.019	49	✓	0.014	35	To Do
Kamke 482	✗	0	0	✗	0	0	To Do
Kamke 483	✓	0.157	145	✓	0.079	103	To Do
Kamke 484	✓	0.142	157	✓	0.073	115	To Do
Kamke 485	✓	0.037	29	✗	0	0	To Do
Kamke 486	✓	0.042	117	✓	0.126	54	To Do
Kamke 487	✓	1.241	247	✓	0.31	100	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 488	✓	0.213	85	✓	0.299	72	To Do
Kamke 489	✗	0	0	✓	1.214	549	To Do
Kamke 490	✓	0.283	70	✓	0.274	83	To Do
Kamke 491	✓	0.485	79	✓	0.48	88	To Do
Kamke 492	✓	0.082	97	✓	0.378	122	To Do
Kamke 493	✓	23.067	403	✓	0.811	109	To Do
Kamke 494	✓	0.084	49	✓	0.168	159	To Do
Kamke 495	✓	0.152	83	✓	0.371	61	To Do
Kamke 496	✓	26.23	18407	✓	0.22	130	To Do
Kamke 497	✓	0.094	151	✓	0.395	187	To Do
Kamke 498	✓	0.11	127	✓	0.259	99	To Do
Kamke 499	✓	0.19	423	✓	0.16	191	To Do
Kamke 500	✓	0.569	100	✓	0.787	662	To Do
Kamke 501	✓	30.613	975	✓	2.562	44	To Do
Kamke 502	✓	0.703	100	✓	0.313	196	To Do
Kamke 503	✗	0	0	✗	0	0	To Do
Kamke 504	✓	0.047	36	✓	0.984	247	To Do
Kamke 505	✓	0.074	73	✓	0.017	52	To Do
Kamke 506	✗	0	0	✗	0	0	To Do
Kamke 507	✓	44.417	395	✓	2.57	203	To Do
Kamke 508	✓	1.446	88	✓	0.524	60	To Do
Kamke 509	✓	0.197	34	✓	0.467	212	To Do
Kamke 510	✗	0	0	✗	0	0	To Do
Kamke 511	✓	21.04	229	✓	9.009	199	To Do
Kamke 512	✓	24.002	305	✓	6.133	139	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 513	✓	0.054	81	✗	0	0	To Do
Kamke 514	✓	7.01	605	✓	6.255	87	To Do
Kamke 515	✓	2.127	1922	✓	1.058	117	To Do
Kamke 516	✓	0.432	253	✓	1.153	70	To Do
Kamke 517	✓	0.43	283	✓	1.159	78	To Do
Kamke 518	✓	0.409	236	✓	0.216	126	To Do
Kamke 519	✓	10.439	353	✓	0.579	197	To Do
Kamke 520	✓	0.022	330	✓	0.153	249	To Do
Kamke 521	✓	0.003	14	✓	0.026	33	To Do
Kamke 522	✓	0.003	20	✓	0.031	44	To Do
Kamke 523	✓	166.731	392	✓	0.074	253	To Do
Kamke 524	✓	0.012	422	✓	0.063	257	To Do
Kamke 525	✓	0.072	133	✓	0.057	122	To Do
Kamke 526	✓	0.046	45	✓	0.01	32	To Do
Kamke 527	✓	0.012	20	✓	0.665	43	To Do
Kamke 528	✓	0.553	398	✓	0.075	86	To Do
Kamke 529	✓	24.415	1758	✓	0.058	1236	To Do
Kamke 530	✓	23.495	648	✓	0.105	376	To Do
Kamke 531	✗	0	0	✗	0	0	To Do
Kamke 532	✓	0.021	1057	✓	0.326	944	To Do
Kamke 533	✓	0.004	16	✓	0.03	76	To Do
Kamke 534	✓	0.042	114	✓	0.048	84	To Do
Kamke 535	✓	0.031	49	✓	0.042	51	To Do
Kamke 536	✓	0.008	64	✓	0.03	52	To Do
Kamke 537	✓	0.024	16	✗	0	0	To Do

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 538	✓	2.026	179	✓	3.818	1725	To Do
Kamke 539	✓	0.022	32	✓	0.052	32	To Do
Kamke 540	✓	0.025	69	✓	0.072	109	To Do
Kamke 541	✓	0.022	39	✓	0.438	103	To Do
Kamke 542	✓	0.022	20	✓	0.467	107	To Do
Kamke 543	✓	0.016	55	✗	0	0	To Do
Kamke 544	✓	0.049	22	✓	3.023	4200	To Do
Kamke 545	✓	0.496	323	✓	0.158	144	To Do
Kamke 546	✓	0.028	113	✓	0.068	171	To Do
Kamke 547	✓	19.457	503	✓	0.214	118	To Do
Kamke 548	✓	0.744	479	✓	0.379	250	To Do
Kamke 549	✓	19.103	376	✓	1.006	545	To Do
Kamke 550	✓	0.931	488	✓	0.283	64	To Do
Kamke 551	✓	0.172	84	✓	0.664	55	To Do
Kamke 552	✓	0.038	41	✓	0.071	43	To Do
Kamke 553	✓	0.192	56	✓	0.053	36	To Do
Kamke 554	✓	0.111	54	✓	0.237	40	To Do
Kamke 555	✓	0.005	20	✓	0.034	15	To Do
Kamke 556	✓	3.202	78	✓	0.44	581	To Do
Kamke 557	✓	0.032	39	✓	0.063	105	To Do
Kamke 558	✓	0.336	223	✓	0.365	223	To Do
Kamke 559	✓	0.176	423	✓	0.171	215	To Do
Kamke 560	✓	27.597	110	✓	1.044	1058	To Do
Kamke 561	✓	2.124	2138	✓	2.103	50	To Do
Kamke 562	✓	0.09	84	✓	0.229	3288	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 563	✓	0.14	59	✓	0.204	66	To Do
Kamke 564	✓	0.004	17	✓	0.02	32	To Do
Kamke 565	✓	0.032	25	✓	0.247	17	To Do
Kamke 566	✓	0.035	38	✓	0.025	16	To Do
Kamke 567	✓	0.066	49	✓	0.035	18	To Do
Kamke 568	✓	0.078	34	✓	0.059	32	To Do
Kamke 569	✓	0.071	59	✓	0.271	139	To Do
Kamke 570	✓	1.196	58	✓	0.043	30	To Do
Kamke 571	✓	0.104	124	✓	0.81	169	To Do
Kamke 572	✗	0	0	✗	0	0	To Do
Kamke 573	✓	0.019	42	✓	0.084	24	To Do
Kamke 574	✓	0.025	102	✓	0.111	41	To Do
Kamke 575	✗	0	0	✗	0	0	To Do
Kamke 576	✗	0	0	✗	0	0	To Do
Kamke 577	✓	0.293	243	✓	0.034	28	To Do
Kamke 578	✓	0.175	100	✓	0.035	22	To Do
Kamke 579	✓	0.217	514	✓	0.043	35	To Do
Kamke 580	✓	0.249	203	✓	0.054	31	To Do
Kamke 581	✓	0.245	144	✓	0.078	32	To Do
Kamke 582	✓	0.295	142	✓	0.148	30	To Do
Kamke 583	✓	0.26	126	✓	0.112	31	To Do
Kamke 584	✓	0.24	115	✓	0.067	35	To Do
Kamke 585	✓	0.206	205	✓	1.086	120	To Do
Kamke 586	✓	0.892	975	✓	0.232	39	To Do
Kamke 587	✓	0.251	123	✓	0.103	29	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 588	✓	0.18	109	✓	0.116	53	To Do
Kamke 589	✓	0.225	245	✓	0.149	38	To Do
Kamke 590	✓	0.227	94	✓	0.118	28	To Do
Kamke 591	✓	0.5	253	✓	0.228	108	To Do
Kamke 592	✓	0.525	241	✓	0.149	33	To Do
Kamke 593	✓	0.285	221	✓	0.213	35	To Do
Kamke 594	✓	0.412	236	✓	0.129	67	To Do
Kamke 595	✓	0.247	204	✓	0.155	72	To Do
Kamke 596	✓	0.264	156	✓	0.092	26	To Do
Kamke 597	✓	0.331	130	✓	0.276	37	To Do
Kamke 598	✓	0.136	37	✓	0.017	29	To Do
Kamke 599	✓	0.137	95	✓	0.079	57	To Do
Kamke 600	✓	0.231	246	✓	0.151	38	To Do
Kamke 601	✓	0.231	182	✓	0.109	61	To Do
Kamke 602	✓	0.417	167	✓	0.125	33	To Do
Kamke 603	✓	0.319	117	✓	0.095	27	To Do
Kamke 604	✓	0.381	143	✓	0.122	30	To Do
Kamke 605	✓	0.744	145	✓	0.122	29	To Do
Kamke 606	✓	0.45	361	✓	0.431	34	To Do
Kamke 607	✓	0.213	121	✓	0.066	22	To Do
Kamke 608	✓	0.479	274	✓	0.145	40	To Do
Kamke 609	✓	0.259	117	✓	0.26	22	To Do
Kamke 610	✓	0.07	25	✓	0.014	20	To Do
Kamke 611	✓	0.283	191	✓	0.065	28	To Do
Kamke 612	✓	0.343	199	✓	0.089	27	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 613	✓	0.23	226	✓	0.076	23	To Do
Kamke 614	✓	0.305	177	✓	0.306	60	To Do
Kamke 615	✓	0.251	77	✓	0.092	26	To Do
Kamke 616	✓	0.378	177	✓	0.065	26	To Do
Kamke 617	✓	0.863	615	✓	0.203	47	To Do
Kamke 618	✓	0.154	25	✓	0.537	34	To Do
Kamke 619	✓	0.542	330	✓	0.302	81	To Do
Kamke 620	✓	0.821	205	✓	0.235	37	To Do
Kamke 621	✓	0.047	445	✓	0.321	59	To Do
Kamke 622	✓	0.224	140	✓	0.351	68	To Do
Kamke 623	✓	0.149	77	✓	0.304	51	To Do
Kamke 624	✓	18.635	9837	✓	0.442	46	To Do
Kamke 625	✓	0.193	56	✓	0.276	55	To Do
Kamke 626	✓	0.155	88	✓	0.441	115	To Do
Kamke 627	✓	0.578	43	✓	0.154	35	To Do
Kamke 628	✓	0.127	33	✓	0.241	23	To Do
Kamke 629	✓	0.566	92	✓	0.168	62	To Do
Kamke 630	✓	0.33	101	✓	0.346	98	To Do
Kamke 631	✓	0.144	31	✓	0.237	23	To Do
Kamke 632	✓	0.155	65	✓	0.359	54	To Do
Kamke 633	✓	0.169	85	✓	1.135	52	To Do
Kamke 634	✓	0.171	33	✓	0.337	26	To Do
Kamke 635	✓	0.136	33	✓	0.225	22	To Do
Kamke 636	✓	0.081	24	✓	0.224	19	To Do
Kamke 637	✓	7.086	62	✓	0.169	84	To Do

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 638	✓	0.094	41	✓	0.372	34	To Do
Kamke 639	✓	0.128	53	✓	0.339	46	To Do
Kamke 640	✓	0.207	53	✓	0.657	47	To Do
Kamke 641	✓	0.153	35	✓	0.344	26	To Do
Kamke 642	✓	0.124	105	✓	0.283	281	To Do
Kamke 643	✓	0.129	31	✓	0.207	22	To Do
Kamke 644	✓	0.247	34	✓	0.386	27	To Do
Kamke 645	✓	0.065	20	✓	0.174	14	To Do
Kamke 646	✓	0.199	35	✓	0.319	23	To Do
Kamke 647	✓	0.255	115	✓	0.31	460	To Do
Kamke 648	✓	0.371	128	✓	0.887	49	To Do
Kamke 649	✓	0.269	37	✓	0.262	27	To Do
Kamke 650	✓	0.323	40	✓	0.296	35	To Do
Kamke 651	✓	0.074	16	✓	0.099	13	To Do
Kamke 652	✓	0.64	101	✓	0.132	27	To Do
Kamke 653	✓	0.242	34	✓	0.25	24	To Do
Kamke 654	✓	0.199	37	✓	0.283	23	To Do
Kamke 655	✓	9.295	89	✓	0.888	66	To Do
Kamke 656	✓	0.078	20	✓	0.099	15	To Do
Kamke 657	✓	0.349	37	✓	0.224	26	To Do
Kamke 658	✓	0.558	45	✓	0.327	28	To Do
Kamke 659	✓	0.761	87	✓	1.118	177	To Do
Kamke 660	✓	0.198	42	✓	0.247	29	To Do
Kamke 661	✓	0.355	93	✓	0.296	39	To Do
Kamke 662	✓	0.342	37	✓	0.253	26	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 663	✓	0.708	101	✓	0.128	27	To Do
Kamke 664	✓	0.15	36	✓	0.217	25	To Do
Kamke 665	✓	0.315	41	✓	0.628	30	To Do
Kamke 666	✓	0.103	29	✓	0.275	24	To Do
Kamke 667	✓	2.562	95	✓	0.232	82	To Do
Kamke 668	✓	0.51	73	✓	0.977	58	To Do
Kamke 669	✓	0.505	264	✓	0.163	72	To Do
Kamke 670	✓	0.38	62	✓	0.29	70	To Do
Kamke 671	✓	0.223	192	✓	0.247	237	To Do
Kamke 672	✓	12.349	4512	✓	0.151	36	To Do
Kamke 673	✓	0.215	23	✓	0.362	17	To Do
Kamke 674	✓	0.225	40	✓	0.317	27	To Do
Kamke 675	✓	0.245	48	✓	0.065	37	To Do
Kamke 676	✓	0.737	206	✓	0.638	43	To Do
Kamke 677	✓	0.131	80	✓	0.083	48	To Do
Kamke 678	✓	2.02	115	✓	0.398	37	To Do
Kamke 679	✓	0.113	59	✓	0.053	37	To Do
Kamke 680	✓	0.317	39	✓	0.333	28	To Do
Kamke 681	✓	0.144	84	✓	0.082	45	To Do
Kamke 682	✓	0.218	39	✓	0.177	28	To Do
Kamke 683	✓	0.718	84	✓	0.07	45	To Do
Kamke 684	✓	0.104	36	✓	5.805	30	To Do
Kamke 685	✓	0.103	87	✓	0.082	48	To Do
Kamke 686	✓	7.17	68	✓	0.167	85	To Do
Kamke 687	✓	0.108	130	✓	0.132	39	To Do

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 688	✓	0.267	82	✓	0.102	42	To Do
Kamke 689	✓	0.268	60	✓	0.053	25	To Do
Kamke 690	✓	0.655	115	✓	0.426	40	To Do
Kamke 691	✓	0.222	21	✓	0.498	17	To Do
Kamke 692	✓	0.103	40	✓	5.313	30	To Do
Kamke 693	✓	2.668	1121	✓	0.083	36	To Do
Kamke 694	✓	0.587	64	✓	0.5	30	To Do
Kamke 695	✓	0.175	34	✓	0.056	39	To Do
Kamke 696	✓	0.756	51	✓	0.059	32	To Do
Kamke 697	✓	0.226	114	✓	0.077	40	To Do
Kamke 698	✓	0.22	108	✓	0.065	34	To Do
Kamke 699	✓	0.437	47	✓	0.403	36	To Do
Kamke 700	✓	0.14	76	✓	0.099	62	To Do
Kamke 701	✓	1.056	88	✓	6.017	71	To Do
Kamke 702	✓	2.815	37	✓	0.066	35	To Do
Kamke 703	✓	0.409	101	✓	0.184	44	To Do
Kamke 704	✓	26.878	66	✓	0.11	38	To Do
Kamke 705	✓	0.112	30	✓	0.207	24	To Do
Kamke 706	✓	4.53	610	✓	0.902	65	To Do
Kamke 707	✓	4.611	1391	✓	0.605	105	To Do
Kamke 708	✓	0.254	89	✓	55.304	229	To Do
Kamke 709	✓	1.608	217	✓	0.191	39	To Do
Kamke 710	✓	0.794	38	✓	2.527	31	To Do
Kamke 711	✓	0.172	28	✓	0.215	31	To Do
Kamke 712	✓	0.594	49	✓	0.411	38	To Do

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 713	✓	0.075	649	✓	0.395	116	To Do
Kamke 714	✓	1.058	162	✓	0.25	96	To Do
Kamke 715	✓	0.596	50	✓	0.398	39	To Do
Kamke 716	✓	1.506	133	✓	0.225	37	To Do
Kamke 717	✓	0.31	46	✓	0.394	33	To Do
Kamke 718	✓	0.231	127	✓	0.062	44	To Do
Kamke 719	✓	0.37	49	✓	0.104	34	To Do
Kamke 720	✓	1.911	372	✓	0.164	48	To Do
Kamke 721	✓	0.086	27	✓	0.059	19	To Do
Kamke 722	✓	17.138	490	✓	0.415	70	To Do
Kamke 723	✓	0.153	663	✓	0.12	852	To Do
Kamke 724	✓	10.941	422	✓	0.042	18	To Do
Kamke 725	✓	0.234	19	✓	1.288	25	To Do
Kamke 726	✓	0.076	625	✓	0.372	93	To Do
Kamke 727	✓	0.28	29	✓	0.191	25	To Do
Kamke 728	✓	0.199	72	✓	0.396	50	To Do
Kamke 729	✓	0.183	327	✓	0.105	400	To Do
Kamke 730	✓	0.229	83	✓	1.084	41	To Do
Kamke 731	✓	0.3	47	✓	0.129	42	To Do
Kamke 732	✓	0.755	56	✓	0.418	43	To Do
Kamke 733	✓	8.765	73	✗	0	0	To Do
Kamke 734	✓	0.194	37	✓	0.299	39	To Do
Kamke 735	✓	1.134	573	✓	0.069	78	To Do
Kamke 736	✓	0.146	31	✓	0.125	43	To Do
Kamke 737	✓	0.028	36	✓	0.214	29	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 738	✓	0.275	1347	✓	0.546	1048	To Do
Kamke 739	✓	0.246	39	✓	0.142	35	To Do
Kamke 740	✓	0.087	74	✓	0.083	72	To Do
Kamke 741	✓	0.828	175	✓	0.881	246	To Do
Kamke 742	✓	2.123	3913	✓	1.473	239	To Do
Kamke 743	✓	0.074	406	✓	0.743	296	To Do
Kamke 744	✓	0.108	510	✓	0.19	619	To Do
Kamke 745	✓	1.18	546	✓	0.062	77	To Do
Kamke 746	✓	0.064	274	✓	0.607	232	To Do
Kamke 747	✓	3.278	88	✓	0.513	75	To Do
Kamke 748	✓	0.162	285	✓	0.112	398	To Do
Kamke 749	✓	0.119	126	✓	0.14	186	To Do
Kamke 750	✓	0.183	72	✓	0.437	49	To Do
Kamke 751	✓	0.127	30	✓	0.149	26	To Do
Kamke 752	✓	0.156	849	✓	1.724	723	To Do
Kamke 753	✓	0.122	41	✓	0.207	38	To Do
Kamke 754	✓	0.088	47	✓	0.019	26	To Do
Kamke 755	✓	0.201	2633	✓	0.089	71	To Do
Kamke 756	✓	1.127	95	✓	0.037	37	To Do
Kamke 757	✓	0.026	36	✓	0.097	26	To Do
Kamke 758	✓	0.514	459	✓	0.22	41	To Do
Kamke 759	✓	0.068	498	✓	0.958	305	To Do
Kamke 760	✓	0.489	112	✓	1.944	99	To Do
Kamke 761	✓	0.024	33	✓	0.08	18	To Do
Kamke 762	✓	0.122	26	✓	0.162	22	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 763	✓	0.114	22	✓	0.095	14	To Do
Kamke 764	✓	0.126	50	✓	0.18	36	To Do
Kamke 765	✓	0.222	138	✓	0.132	48	To Do
Kamke 766	✓	0.34	129	✓	0.558	89	To Do
Kamke 767	✓	0.027	38	✓	0.094	26	To Do
Kamke 768	✓	1.079	66	✓	0.134	26	To Do
Kamke 769	✓	0.068	360	✓	0.74	246	To Do
Kamke 770	✓	0.146	705	✓	0.15	1096	To Do
Kamke 771	✓	0.032	46	✓	0.296	84	To Do
Kamke 772	✓	0.111	21	✓	0.163	18	To Do
Kamke 773	✓	0.14	61	✓	0.293	48	To Do
Kamke 774	✓	0.028	45	✓	0.184	51	To Do
Kamke 775	✓	0.118	943	✓	0.083	44	To Do
Kamke 776	✓	0.434	133	✓	0.585	96	To Do
Kamke 777	✓	0.178	39	✓	0.142	51	To Do
Kamke 778	✓	1.12	95	✓	0.036	37	To Do
Kamke 779	✓	0.119	57	✓	0.104	50	To Do
Kamke 780	✓	0.135	48	✓	0.97	27	To Do
Kamke 781	✓	0.272	82	✓	0.484	61	To Do
Kamke 782	✓	3.189	115	✓	3.588	96	To Do
Kamke 783	✓	4.938	88	✓	0.511	75	To Do
Kamke 784	✓	7.117	27	✓	10.424	24	To Do
Kamke 785	✓	5.552	29	✓	33.448	24	To Do
Kamke 786	✓	2.949	61	✓	0.085	33	To Do
Kamke 787	✓	17.642	488	✓	0.576	191	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 788	✓	18.483	348	✓	0.589	108	To Do
Kamke 789	✓	42.484	120	✗	0	0	To Do
Kamke 790	✓	49.842	127	✗	0	0	To Do
Kamke 791	✓	5.86	110	✓	9.707	306	To Do
Kamke 792	✓	2.668	157	✓	0.586	116	To Do
Kamke 793	✓	9.406	399	✓	2.847	32	To Do
Kamke 794	✓	0.146	67	✓	0.388	32	To Do
Kamke 795	✓	0.308	111	✓	0.025	37	To Do
Kamke 796	✓	7.485	109	✓	2.308	143	To Do
Kamke 797	✓	1.241	307	✓	1.303	168	To Do
Kamke 798	✓	0.313	27	✓	0.128	30	To Do
Kamke 799	✓	0.831	64	✓	0.321	147	To Do
Kamke 800	✓	0.317	128	✓	0.024	41	To Do
Kamke 801	✓	0.312	126	✓	0.071	45	To Do
Kamke 802	✓	0.094	101	✓	0.135	27	To Do
Kamke 803	✓	0.245	637	✓	0.471	65	To Do
Kamke 804	✓	0.419	43	✓	0.856	38	To Do
Kamke 805	✓	0.191	88	✓	1.707	42	To Do
Kamke 806	✓	0.313	22	✓	0.525	22	To Do
Kamke 807	✓	0.196	59	✓	0.429	43	To Do
Kamke 808	✓	1.441	149	✓	0.142	45	To Do
Kamke 809	✓	0.235	128	✓	0.028	41	To Do
Kamke 810	✓	0.084	40	✓	0.039	16	To Do
Kamke 811	✓	1.198	33	✓	1.308	32	To Do
Kamke 812	✓	0.283	70	✓	0.365	30	To Do

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 813	✓	0.423	66	✓	0.798	40	To Do
Kamke 814	✓	0.098	72	✓	0.036	38	To Do
Kamke 815	✓	7.81	103	✓	1.47	168	To Do
Kamke 816	✓	0.177	74	✓	0.503	190	To Do
Kamke 817	✓	0.428	63	✓	0.848	27	To Do
Kamke 818	✓	0.152	34	✓	0.111	34	To Do
Kamke 819	✓	0.228	65	✓	0.351	30	To Do
Kamke 820	✓	0.355	63	✓	0.83	27	To Do
Kamke 821	✓	0.146	2093	✓	0.106	27	To Do
Kamke 822	✓	0.24	32	✓	0.098	25	To Do
Kamke 823	✓	0.241	39	✓	0.285	38	To Do
Kamke 824	✓	0.173	68	✓	0.542	61	To Do
Kamke 825	✓	1.363	148	✓	0.113	48	To Do
Kamke 826	✓	0.276	70	✓	0.567	51	To Do
Kamke 827	✓	0.175	104	✓	0.239	49	To Do
Kamke 828	✓	0.359	56	✓	0.335	54	To Do
Kamke 829	✓	0.295	74	✓	0.49	34	To Do
Kamke 830	✓	0.268	37	✓	0.284	38	To Do
Kamke 831	✓	1.9	145	✓	0.235	35	To Do
Kamke 832	✓	1.265	2497	✓	0.135	31	To Do
Kamke 833	✓	0.17	104	✓	0.2	49	To Do
Kamke 834	✓	0.321	90	✓	0.635	60	To Do
Kamke 835	✗	0	0	✗	0	0	To Do
Kamke 836	✓	9.216	379	✓	0.368	73	To Do
Kamke 837	✗	0	0	✗	0	0	To Do

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 838	✓	0.136	31	✓	0.131	25	To Do
Kamke 839	✓	0.205	28	✓	0.072	19	To Do
Kamke 840	✓	0.26	30	✓	0.065	19	To Do
Kamke 841	✓	0.714	236	✓	0.288	97	To Do
Kamke 842	✓	0.15	186	✓	0.03	43	To Do
Kamke 843	✓	0.144	198	✓	0.033	43	To Do
Kamke 844	✓	9.654	386	✓	0.369	97	To Do
Kamke 845	✓	2.163	227	✓	0.178	44	To Do
Kamke 846	✓	0.507	365	✓	0.213	40	To Do
Kamke 847	✓	0.282	69	✓	0.398	34	To Do
Kamke 848	✓	0.143	157	✓	0.608	22	To Do
Kamke 849	✓	0.264	68	✓	0.372	33	To Do
Kamke 850	✓	0.204	1485	✓	0.982	27	To Do
Kamke 851	✓	2.595	902	✓	0.058	42	To Do
Kamke 852	✓	2.48	902	✓	0.063	42	To Do
Kamke 853	✓	0.12	76	✓	0.035	63	To Do
Kamke 854	✓	0.102	24	✓	0.329	51	To Do
Kamke 855	✓	0.102	24	✓	0.34	51	To Do
Kamke 856	✓	0.408	103	✓	0.316	65	To Do
Kamke 857	✓	0.394	69	✓	0.388	32	To Do
Kamke 858	✓	2.556	902	✓	0.059	42	To Do
Kamke 859	✓	0.55	105	✓	0.275	63	To Do
Kamke 860	✓	0.252	33	✓	1.612	27	To Do
Kamke 861	✓	0.914	158	✓	0.15	26	To Do
Kamke 862	✗	0	0	✓	0.157	27	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 863	✓	0.173	60	✓	10.867	38	To Do
Kamke 864	✓	0.225	137	✓	0.073	162	To Do
Kamke 865	✓	0.325	87	✓	0.292	23	To Do
Kamke 866	✓	0.381	74	✓	0.408	37	To Do
Kamke 867	✓	0.147	77	✓	0.057	30	To Do
Kamke 868	✓	0.124	79	✓	0.052	28	To Do
Kamke 869	✓	0.034	42	✓	0.237	37	To Do
Kamke 870	✓	0.984	35	✓	0.462	30	To Do
Kamke 871	✓	0.158	22	✓	0.064	26	To Do
Kamke 872	✓	0.043	215	✓	0.05	49	To Do
Kamke 873	✓	0.47	53	✓	0.193	50	To Do
Kamke 874	✓	0.172	101	✓	0.058	40	To Do
Kamke 875	✓	0.188	242	✓	0.263	73	To Do
Kamke 876	✓	0.125	135	✓	0.043	41	To Do
Kamke 877	✓	0.112	49	✓	0.036	73	To Do
Kamke 878	✓	0.248	130	✓	61.309	73	To Do
Kamke 879	✓	0.223	128	✓	0.23	55	To Do
Kamke 880	✓	0.326	131	✓	0.082	41	To Do
Kamke 881	✓	0.123	75	✓	0.036	77	To Do
Kamke 882	✓	0.186	119	✓	0.069	41	To Do
Kamke 883	✓	0.783	164	✓	0.721	352	To Do
Kamke 884	✓	0.461	71	✓	0.5	105	To Do
Kamke 885	✗	0	0	✗	0	0	To Do
Kamke 886	✓	0.139	82	✓	0.04	42	To Do
Kamke 887	✓	0.161	106	✓	0.041	72	To Do

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 888	✓	0.119	78	✓	0.053	79	To Do
Kamke 889	✓	1.11	68	✓	0.675	49	To Do
Kamke 890	✓	0.135	103	✓	0.543	34	To Do
Kamke 891	✓	0.135	135	✓	0.052	56	To Do
Kamke 892	✓	3.248	1283	✓	0.757	40	To Do
Kamke 893	✓	0.134	80	✓	0.035	41	To Do
Kamke 894	✗	0	0	✗	0	0	To Do
Kamke 895	✓	0.164	81	✓	0.05	79	To Do
Kamke 896	✓	0.2	106	✓	0.43	63	To Do
Kamke 897	✓	0.153	79	✓	0.067	87	To Do
Kamke 898	✓	0.138	106	✓	0.043	87	To Do
Kamke 899	✓	0.157	106	✓	0.045	47	To Do
Kamke 900	✓	0.122	381	✓	0.056	48	To Do
Kamke 901	✓	0.403	33	✓	0.496	31	To Do
Kamke 902	✓	0.156	295	✓	0.201	177	To Do
Kamke 903	✓	0.074	30	✓	0.166	51	To Do
Kamke 904	✓	0.065	46	✓	0.13	61	To Do
Kamke 905	✓	0.171	85	✓	0.046	46	To Do
Kamke 906	✓	0.097	326	✓	0.197	37	To Do
Kamke 907	✓	0.19	22	✓	0.178	20	To Do
Kamke 908	✓	0.453	1269	✓	0.362	1726	To Do
Kamke 909	✓	0.106	64	✓	0.463	84	To Do
Kamke 910	✓	1.151	98	✓	0.037	42	To Do
Kamke 911	✓	0.636	106	✓	0.909	30	To Do
Kamke 912	✓	0.639	201	✗	0	0	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 913	✓	0.517	716	✓	0.072	43	To Do
Kamke 914	✓	0.519	401	✓	1.562	71	To Do
Kamke 915	✓	0.562	724	✓	0.072	43	To Do
Kamke 916	✓	0.151	43	✓	0.369	73	To Do
Kamke 917	✓	0.133	28	✓	0.308	38	To Do
Kamke 918	✓	0.355	720	✓	0.648	41	To Do
Kamke 919	✓	0.221	251	✓	0.122	193	To Do
Kamke 920	✓	0.281	301	✗	0	0	To Do
Kamke 921	✓	0.227	92	✓	0.304	30	To Do
Kamke 922	✓	0.592	882	✓	0.145	47	To Do
Kamke 923	✓	2.612	432	✓	0.367	36	To Do
Kamke 924	✓	0.245	80	✓	0.114	46	To Do
Kamke 925	✓	12.283	228	✓	0.319	38	To Do
Kamke 926	✓	0.139	128	✓	0.048	67	To Do
Kamke 927	✓	0.409	112	✓	0.102	45	To Do
Kamke 928	✓	0.664	23	✓	0.213	20	To Do
Kamke 929	✓	0.513	683	✓	0.042	42	To Do
Kamke 930	✓	0.914	39	✓	0.292	36	To Do
Kamke 931	✓	0.127	80	✓	0.033	73	To Do
Kamke 932	✓	2.812	3303	✓	0.104	54	To Do
Kamke 933	✓	1.192	99	✓	0.059	39	To Do
Kamke 934	✓	0.222	102	✓	0.059	39	To Do
Kamke 935	✓	37.054	248	✓	0.303	55	To Do
Kamke 936	✓	0.195	99	✓	0.063	39	To Do
Kamke 937	✓	0.195	124	✓	0.069	79	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 938	✓	0.173	108	✓	0.043	39	To Do
Kamke 939	✓	0.371	136	✓	0.082	70	To Do
Kamke 940	✓	0.151	80	✓	0.056	63	To Do
Kamke 941	✓	0.271	53	✓	0.043	35	To Do
Kamke 942	✓	3.012	349	✓	0.707	43	To Do
Kamke 943	✓	0.309	53	✓	0.046	40	To Do
Kamke 944	✓	17.968	233	✓	0.062	47	To Do
Kamke 945	✓	17.667	213	✓	0.051	41	To Do
Kamke 946	✓	0.437	150	✓	0.098	85	To Do
Kamke 947	✓	0.289	30	✓	0.414	44	To Do
Kamke 948	✓	0.425	39	✓	0.167	68	To Do
Kamke 949	✓	0.15	76	✓	0.039	81	To Do
Kamke 950	✓	6.318	920	✓	0.07	42	To Do
Kamke 951	✓	6.281	906	✓	0.063	41	To Do
Kamke 952	✓	0.271	164	✓	0.283	62	To Do
Kamke 953	✓	0.16	36	✓	0.451	145	To Do
Kamke 954	✓	0.254	115	✓	0.09	53	To Do
Kamke 955	✓	0.246	112	✓	0.082	101	To Do
Kamke 956	✓	0.916	28	✓	0.082	79	To Do
Kamke 957	✓	0.908	28	✓	0.065	79	To Do
Kamke 958	✓	0.258	82	✓	0.069	40	To Do
Kamke 959	✓	0.168	20	✓	0.149	16	To Do
Kamke 960	✓	0.125	14	✓	0.122	16	To Do
Kamke 961	✓	29.039	813	✓	0.445	45	To Do
Kamke 962	✓	2.034	1191	✓	0.933	79	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 963	✓	0.346	108	✓	0.196	39	To Do
Kamke 964	✓	1.902	264	✓	1.74	80	To Do
Kamke 965	✓	0.198	29	✓	0.273	25	To Do
Kamke 966	✓	0.486	292	✓	0.443	50	To Do
Kamke 967	✓	1.378	151	✓	0.086	91	To Do
Kamke 968	✓	0.266	30	✓	0.328	29	To Do
Kamke 969	✓	0.177	19	✓	0.306	26	To Do
Kamke 970	✓	0.426	66	✓	0.463	181	To Do
Kamke 971	✓	0.213	157	✓	0.436	84	To Do
Kamke 972	✓	0.028	32	✓	0.228	27	To Do
Kamke 973	✓	0.99	1225	✓	0.573	132	To Do
Kamke 974	✓	0.067	39	✓	0.033	57	To Do
Kamke 975	✓	0.062	47	✓	0.033	59	To Do
Kamke 976	✓	1.125	101	✓	0.392	57	To Do
Kamke 977	✓	0.27	139	✓	0.333	122	To Do
Kamke 978	✓	0.129	60	✓	0.318	71	To Do
Kamke 979	✓	0.072	37	✓	0.046	49	To Do
Kamke 980	✓	0.082	43	✓	0.013	35	To Do
Kamke 981	✓	0.106	49	✓	0.017	41	To Do
Kamke 982	✓	0.292	132	✓	0.569	142	To Do
Kamke 983	✓	1.519	238	✓	0.727	187	To Do
Kamke 984	✓	7.631	428	✓	0.442	40	To Do
Kamke 985	✓	0.242	103	✓	0.047	43	To Do
Kamke 986	✓	0.084	44	✓	0.031	36	To Do
Kamke 987	✓	0.107	41	✓	0.045	22	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 988	✓	0.143	107	✓	0.036	29	To Do
Kamke 989	✓	0.111	56	✓	0.05	29	To Do
Kamke 990	✓	0.125	58	✓	0.671	44	To Do
Kamke 991	✓	0.118	104	✓	0.036	29	To Do
Kamke 992	✓	0.084	43	✓	0.045	25	To Do
Kamke 993	✓	1.059	73	✓	0.033	35	To Do
Kamke 994	✓	0.143	198	✓	0.033	43	To Do
Kamke 995	✓	0.127	17	✓	0.079	14	To Do
Kamke 996	✓	0.081	17	✓	0.069	15	To Do
Kamke 997	✓	0.083	18	✓	0.061	16	To Do
Kamke 998	✓	0.337	27	✓	0.377	27	To Do
Kamke 999	✓	0.135	24	✓	0.052	36	To Do
Kamke 1000	✓	0.656	351	✓	0.22	19	To Do
Kamke 1001	✓	0.003	12	✓	0.001	9	Linear second order, homogeneous, constant coefficient. First problem. Direct integration
Kamke 1002	✓	0.003	16	✓	0.003	13	Linear second order, homogeneous, constant coefficient. Direct method
Kamke 1003	✓	0.084	45	✓	0.191	26	Linear second order, Non-homogeneous, constant coefficient. variation of parameters
Kamke 1004	✓	0.009	30	✓	0.189	27	Linear second order, Non-homogeneous, constant coefficient. variation of parameters

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1005	✓	0.298	1163	✓	0.385	82	Linear second order, Non-homogeneous, constant coefficient. variation of parameters
Kamke 1006	✓	0.003	20	✓	0.004	15	Linear second order, homogeneous, constant coefficient
Kamke 1007	✓	0.094	135	✓	0.01	26	Linear second order, Non-homogeneous, constant coefficient. variation of parameters
Kamke 1008	✓	0.046	48	✓	0.138	37	To Do
Kamke 1009	✓	0.004	28	✓	0.014	21	To Do
Kamke 1010	✓	0.005	46	✓	0.029	31	Linear second order, homogeneous, variable coefficient. Airy ODE with plus sign, series solution
Kamke 1011	✓	0.005	33	✓	0.026	17	Linear second order, homogeneous, variable coefficient. power series solution
Kamke 1012	✓	0.005	47	✓	0.112	29	To Do
Kamke 1013	✓	0.009	43	✓	0.034	22	To Do
Kamke 1014	✓	0.015	170	✓	0.223	63	To Do
Kamke 1015	✗	0	0	✗	0	0	To Do
Kamke 1016	✓	0.075	312	✓	0.362	91	To Do
Kamke 1017	✓	0.015	46	✓	0.032	17	To Do
Kamke 1018	✓	0.013	55	✓	0.105	39	To Do
Kamke 1019	✗	0	0	✗	0	0	To Do
Kamke 1020	✓	0.353	180	✓	0.298	58	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1021	✓	0.017	44	✓	0.355	39	To Do
Kamke 1022	✓	0.016	28	✓	0.355	21	To Do
Kamke 1023	✓	0.008	44	✓	0.346	29	To Do
Kamke 1024	✓	0.197	58	✓	0.172	28	To Do
Kamke 1025	✓	0.627	615	✓	0.286	102	To Do
Kamke 1026	✗	0	0	✗	0	0	To Do
Kamke 1027	✓	0.584	235	✓	0.704	69	To Do
Kamke 1028	✗	0	0	✗	0	0	To Do
Kamke 1029	✓	0.017	58	✓	0.127	22	To Do
Kamke 1030	✗	0	0	✗	0	0	To Do
Kamke 1031	✗	0	0	✗	0	0	To Do
Kamke 1032	✗	0	0	✓	0.11	48	To Do
Kamke 1033	✓	0.014	37	✓	0.016	27	Linear second order, homogeneous, variable coefficient. smart substitution turns it to second order with constant coefficient
Kamke 1034	✓	0.009	20	✓	0.014	15	Linear second order, homogeneous, variable coefficient. smart substitution turns it to second order with constant coefficient
Kamke 1035	✓	0.004	58	✓	0.01	41	To Do
Kamke 1036	✓	0.085	209	✓	0.108	134	To Do
Kamke 1037	✓	0.015	101	✓	0.126	64	To Do
Kamke 1038	✗	0	0	✗	0	0	To Do
Kamke 1039	✓	0.02	47	✓	0.01	25	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1040	✓	0.057	53	✓	0.043	33	To Do
Kamke 1041	✓	0.006	55	✓	0.094	41	To Do
Kamke 1042	✓	0.006	61	✓	0.085	41	To Do
Kamke 1043	✓	0.167	69	✓	0.255	39	Linear second order, homogeneous, variable coefficient. power series solution
Kamke 1044	✓	0.006	39	✓	0.092	35	To Do
Kamke 1045	✓	0.024	39	✓	0.013	21	To Do
Kamke 1046	✓	0.005	31	✓	0.1	31	To Do
Kamke 1047	✓	0.008	27	✓	0.022	16	Linear second order, homogeneous, variable coefficient. power series solution
Kamke 1048	✓	0.007	45	✓	0.082	37	To Do
Kamke 1049	✓	0.061	109	✓	0.194	66	To Do
Kamke 1050	✓	0.008	23	✓	0.017	14	To Do
Kamke 1051	✓	0.021	44	✓	0.028	27	To Do
Kamke 1052	✓	0.011	78	✓	0.109	58	To Do
Kamke 1053	✓	0.021	57	✓	0.04	35	To Do
Kamke 1054	✓	0.024	172	✓	0.046	98	To Do
Kamke 1055	✓	0.098	421	✓	0.239	262	To Do
Kamke 1056	✓	0.05	41	✓	0.082	45	To Do
Kamke 1057	✓	0.047	56	✓	0.223	50	To Do
Kamke 1058	✓	0.057	56	✓	0.357	29	To Do
Kamke 1059	✓	0.072	39	✓	0.066	55	To Do
Kamke 1060	✓	0.02	83	✓	0.314	81	To Do
Kamke 1061	✓	0.059	70	✓	0.123	28	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1062	✓	0.014	35	✓	0.023	19	To Do
Kamke 1063	✓	0.031	28	✓	1.181	34	To Do
Kamke 1064	✓	0.305	1400	✓	0.45	134	To Do
Kamke 1065	✓	0.097	114	✓	0.292	60	To Do
Kamke 1066	✓	0.03	18	✓	0.096	15	To Do
Kamke 1067	✓	0.029	21	✓	0.04	17	To Do
Kamke 1068	✓	0.079	20	✓	0.309	45	To Do
Kamke 1069	✓	0.031	19	✓	0.125	15	To Do
Kamke 1070	✓	0.181	143	✓	0.227	60	To Do
Kamke 1071	✓	0.05	44	✓	0.066	22	To Do
Kamke 1072	✗	0	0	✗	0	0	To Do
Kamke 1073	✗	0	0	✗	0	0	To Do
Kamke 1074	✗	0	0	✓	0.03	21	To Do
Kamke 1075	✗	0	0	✗	0	0	To Do
Kamke 1076	✗	0	0	✗	0	0	To Do
Kamke 1077	✗	0	0	✗	0	0	To Do
Kamke 1078	✓	0.026	76	✓	0.033	33	To Do
Kamke 1079	✓	0.179	315	✓	0.022	37	To Do
Kamke 1080	✓	0.042	49	✓	0.624	74	To Do
Kamke 1081	✗	0	0	✗	0	0	To Do
Kamke 1082	✗	0	0	✓	0.184	74	To Do
Kamke 1083	✗	0	0	✓	0.117	31	To Do
Kamke 1084	✓	0.107	36	✓	0.102	20	To Do
Kamke 1085	✓	0.1	32	✓	0.09	24	To Do
Kamke 1086	✓	0.004	42	✓	0.019	29	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1087	✓	0.005	36	✓	0.115	33	To Do
Kamke 1088	✓	0.052	180	✓	0.185	31	To Do
Kamke 1089	✓	0.024	99	✓	0.049	58	To Do
Kamke 1090	✓	0.022	50	✓	0.037	40	To Do
Kamke 1091	✓	0.016	41	✓	0.12	35	To Do
Kamke 1092	✓	0.049	72	✓	0.047	29	To Do
Kamke 1093	✓	0.011	13	✓	0.006	10	To Do
Kamke 1094	✓	0.013	41	✓	0.01	29	To Do
Kamke 1095	✓	0.005	30	✓	0.026	23	To Do
Kamke 1096	✓	0.008	61	✓	0.089	39	To Do
Kamke 1097	✓	0.016	46	✓	0.01	31	To Do
Kamke 1098	✓	0.006	41	✓	0.012	27	To Do
Kamke 1099	✗	0	0	✓	0.083	25	To Do
Kamke 1100	✓	0.012	44	✓	0.024	23	Linear second order, non-homogeneous, variable coefficient. Singularity, Frobenius series solution and also using smart transformation. Variation of parameters.
Kamke 1101	✓	0.011	52	✓	0.033	29	Linear second order, homogeneous, variable coefficient. Singularity, Frobenius series solution and also using smart transformation

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 1102	✓	0.005	42	✓	0.036	33	Linear second order, homogeneous, variable coefficient. Use smart transformation to convert to Emden-Fowler then use Power series solution
Kamke 1103	✓	0.016	64	✓	0.01	33	To Do
Kamke 1104	✓	0.021	104	✓	0.017	41	To Do
Kamke 1105	✓	0.011	64	✓	0.038	39	To Do
Kamke 1106	✓	0.028	441	✓	0.181	71	To Do
Kamke 1107	✓	0.015	40	✓	0.096	30	To Do
Kamke 1108	✓	0.017	37	✓	0.095	26	To Do
Kamke 1109	✓	0.151	45	✓	0.038	33	To Do
Kamke 1110	✓	0.025	36	✓	0.038	23	To Do
Kamke 1111	✓	0.02	20	✓	0.017	13	Linear second order, homogeneous, variable coefficient. Solved using Laplace transform instead of series method
Kamke 1112	✓	0.013	30	✓	0.022	22	To Do
Kamke 1113	✓	0.009	24	✓	0.078	17	To Do
Kamke 1114	✓	0.031	39	✓	0.046	34	To Do
Kamke 1115	✓	0.034	76	✓	1.642	47	To Do
Kamke 1116	✓	0.026	43	✓	0.102	31	To Do
Kamke 1117	✓	0.04	107	✓	0.141	82	To Do
Kamke 1118	✓	0.038	51	✓	0.117	39	To Do
Kamke 1119	✓	0.068	77	✓	0.036	20	To Do
Kamke 1120	✓	0.025	168	✓	0.247	109	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1121	✓	0.197	41	✓	0.03	23	To Do
Kamke 1122	✓	0.327	57	✓	0.263	28	To Do
Kamke 1123	✓	0.008	91	✓	0.053	45	To Do
Kamke 1124	✓	0.046	65	✓	0.115	29	To Do
Kamke 1125	✓	0.115	84	✓	0.039	36	To Do
Kamke 1126	✗	0	0	✓	0.028	19	To Do
Kamke 1127	✓	0.02	36	✓	0.026	21	To Do
Kamke 1128	✓	0.016	40	✓	0.276	32	To Do
Kamke 1129	✓	0.082	42	✓	0.023	30	To Do
Kamke 1130	✓	0.007	46	✓	0.016	31	To Do
Kamke 1131	✓	0.007	58	✓	0.102	33	To Do
Kamke 1132	✓	0.007	48	✓	0.102	29	To Do
Kamke 1133	✓	0.116	52	✓	0.129	37	To Do
Kamke 1134	✓	0.055	78	✓	0.035	21	To Do
Kamke 1135	✓	0.006	27	✓	0.011	17	To Do
Kamke 1136	✓	0.02	30	✓	0.023	16	To Do
Kamke 1137	✓	0.052	74	✓	0.047	25	To Do
Kamke 1138	✓	0.014	38	✓	0.087	26	To Do
Kamke 1139	✓	0.008	74	✓	0.101	37	To Do
Kamke 1140	✓	0.025	190	✓	0.023	66	To Do
Kamke 1141	✓	0.129	79	✓	0.038	55	To Do
Kamke 1142	✓	0.027	108	✓	0.181	53	To Do
Kamke 1143	✓	0.02	93	✓	0.132	57	To Do
Kamke 1144	✓	0.017	88	✓	0.12	60	To Do
Kamke 1145	✓	0.185	386	✓	0.194	248	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1146	✓	0.003	18	✓	0.004	15	To Do
Kamke 1147	✓	0.003	18	✓	0.006	15	To Do
Kamke 1148	✓	0.006	77	✓	0.019	35	To Do
Kamke 1149	✓	0.033	212	✓	0.016	45	To Do
Kamke 1150	✓	0.008	21	✓	0.061	27	To Do
Kamke 1151	✓	0.01	129	✓	0.075	42	To Do
Kamke 1152	✓	0.012	114	✓	0.171	53	To Do
Kamke 1153	✓	0.015	56	✓	0.032	31	To Do
Kamke 1154	✓	0.011	88	✓	0.173	57	To Do
Kamke 1155	✓	0.025	225	✓	0.05	67	To Do
Kamke 1156	✓	0.055	32	✓	0.151	71	To Do
Kamke 1157	✗	0	0	✗	0	0	To Do
Kamke 1158	✓	0.133	43	✓	0.359	178	To Do
Kamke 1159	✓	0.006	24	✓	0.018	19	To Do
Kamke 1160	✓	0.005	30	✓	0.007	23	To Do
Kamke 1161	✓	0.025	78	✓	0.013	31	To Do
Kamke 1162	✓	0.029	18	✓	0.008	15	To Do
Kamke 1163	✓	0.068	72	✓	0.036	49	To Do
Kamke 1164	✓	0.011	30	✓	0.023	23	To Do
Kamke 1165	✓	0.071	26	✓	0.015	19	To Do
Kamke 1166	✓	0.008	23	✓	0.01	21	To Do
Kamke 1167	✓	0.04	326	✓	0.048	63	To Do
Kamke 1168	✓	0.011	15	✓	0.004	11	To Do
Kamke 1169	✓	0.037	236	✓	0.036	49	To Do
Kamke 1170	✓	0.011	58	✓	0.043	43	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1171	✓	0.024	142	✓	0.184	49	To Do
Kamke 1172	✓	0.043	158	✓	0.046	47	To Do
Kamke 1173	✓	0.083	74	✓	0.111	37	To Do
Kamke 1174	✓	0.007	33	✓	0.026	25	To Do
Kamke 1175	✓	0.232	38	✓	0.13	29	To Do
Kamke 1176	✓	0.012	33	✓	0.021	15	To Do
Kamke 1177	✓	0.468	141	✓	0.358	30	To Do
Kamke 1178	✓	0.031	74	✓	0.047	23	To Do
Kamke 1179	✓	0.016	38	✓	0.03	19	To Do
Kamke 1180	✓	0.039	75	✓	0.044	49	To Do
Kamke 1181	✓	0.034	37	✓	0.035	25	To Do
Kamke 1182	✓	0.008	24	✓	0.009	20	To Do
Kamke 1183	✓	0.008	27	✓	0.018	22	To Do
Kamke 1184	✓	0.006	38	✓	0.026	25	To Do
Kamke 1185	✓	0.028	67	✓	0.02	33	To Do
Kamke 1186	✓	0.013	42	✓	0.05	32	To Do
Kamke 1187	✓	0.007	99	✓	0.016	53	To Do
Kamke 1188	✓	0.112	266	✓	0.203	114	To Do
Kamke 1189	✓	0.034	445	✓	0.051	79	To Do
Kamke 1190	✓	0.016	122	✓	0.118	38	To Do
Kamke 1191	✓	0.006	110	✓	0.018	23	To Do
Kamke 1192	✓	0.053	40	✓	0.244	51	To Do
Kamke 1193	✓	0.098	44	✓	0.026	38	To Do
Kamke 1194	✓	0.067	65	✓	0.038	48	To Do
Kamke 1195	✓	0.015	80	✓	0.111	93	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1196	✓	0.026	37	✓	0.029	31	To Do
Kamke 1197	✓	0.011	78	✓	0.048	43	To Do
Kamke 1198	✓	0.032	41	✓	0.03	37	To Do
Kamke 1199	✓	0.008	41	✓	0.025	35	To Do
Kamke 1200	✓	0.011	62	✓	0.017	27	To Do
Kamke 1201	✓	0.17	44	✓	0.02	31	To Do
Kamke 1202	✓	0.009	22	✓	0.02	14	To Do
Kamke 1203	✓	0.011	124	✓	0.02	28	To Do
Kamke 1204	✓	0.011	132	✓	0.036	35	To Do
Kamke 1205	✗	0	0	✗	0	0	To Do
Kamke 1206	✓	0.041	120	✓	0.06	76	To Do
Kamke 1207	✓	0.055	294	✓	0.273	110	To Do
Kamke 1208	✓	0.047	59	✓	0.046	35	To Do
Kamke 1209	✓	0.026	67	✓	0.059	41	To Do
Kamke 1210	✓	0.133	252	✓	0.21	81	To Do
Kamke 1211	✓	0.029	68	✓	0.044	36	To Do
Kamke 1212	✗	0	0	✗	0	0	To Do
Kamke 1213	✓	0.054	54	✓	0.062	53	To Do
Kamke 1214	✓	0.132	260	✓	0.177	71	To Do
Kamke 1215	✓	0.077	674	✓	0.23	148	To Do
Kamke 1216	✗	0	0	✗	0	0	To Do
Kamke 1217	✓	0.087	30	✓	0.052	22	To Do
Kamke 1218	✓	0.082	38	✓	0.058	28	To Do
Kamke 1219	✓	0.06	218	✓	0.128	69	To Do
Kamke 1220	✓	0.067	98	✓	0.023	40	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1221	✓	0.017	42	✓	0.029	35	To Do
Kamke 1222	✓	0.015	55	✓	0.017	23	To Do
Kamke 1223	✓	0.013	49	✓	0.029	31	To Do
Kamke 1224	✓	0.015	55	✓	0.022	23	To Do
Kamke 1225	✓	0.036	42	✓	0.028	23	To Do
Kamke 1226	✓	0.008	30	✓	0.061	25	To Do
Kamke 1227	✓	0.019	21	✓	0.011	16	To Do
Kamke 1228	✓	0.009	82	✓	0.089	53	To Do
Kamke 1229	✓	0.035	48	✓	0.025	31	To Do
Kamke 1230	✓	0.013	82	✓	0.247	36	To Do
Kamke 1231	✓	0.039	58	✓	0.083	52	To Do
Kamke 1232	✓	4.324	6628	✓	0.214	409	To Do
Kamke 1233	✓	0.694	6628	✓	0.173	409	To Do
Kamke 1234	✓	0.044	48	✗	0	0	To Do
Kamke 1235	✓	0.024	97	✓	0.032	45	To Do
Kamke 1236	✗	0	0	✗	0	0	To Do
Kamke 1237	✓	0.016	30	✓	0.015	20	To Do
Kamke 1238	✓	0.02	36	✓	0.028	26	To Do
Kamke 1239	✓	0.008	46	✓	0.067	35	To Do
Kamke 1240	✓	0.01	18	✓	0.06	15	To Do
Kamke 1241	✓	0.009	30	✓	0.065	24	To Do
Kamke 1242	✓	0.267	68	✓	0.049	41	To Do
Kamke 1243	✓	0.016	45	✓	0.03	21	To Do
Kamke 1244	✓	0.013	42	✓	0.085	27	To Do
Kamke 1245	✓	0.015	42	✓	0.076	27	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1246	✓	0.011	42	✓	0.172	28	To Do
Kamke 1247	✓	0.2	132	✓	0.031	27	To Do
Kamke 1248	✓	0.178	238	✓	0.365	134	To Do
Kamke 1249	✓	0.088	193	✓	0.104	134	To Do
Kamke 1250	✓	0.028	41	✓	0.022	41	To Do
Kamke 1251	✓	0.022	25	✓	0.022	20	To Do
Kamke 1252	✓	0.091	151	✓	0.099	124	To Do
Kamke 1253	✓	0.016	34	✓	0.007	16	To Do
Kamke 1254	✓	0.242	69	✓	0.052	43	To Do
Kamke 1255	✓	0.273	118	✓	0.018	42	To Do
Kamke 1256	✓	0.012	26	✓	0.165	51	To Do
Kamke 1257	✓	0.063	33	✓	0.183	27	To Do
Kamke 1258	✓	0.083	146	✓	0.093	110	To Do
Kamke 1259	✓	0.072	120	✓	0.099	92	To Do
Kamke 1260	✓	0.28	65	✓	0.5	76	To Do
Kamke 1261	✓	0.297	148	✓	0.319	97	To Do
Kamke 1262	✓	0.242	88	✓	0.365	53	To Do
Kamke 1263	✓	10.437	179	✓	0.092	52	To Do
Kamke 1264	✓	0.05	23	✓	0.03	19	To Do
Kamke 1265	✓	0.023	64	✓	2.064	93	To Do
Kamke 1266	✓	0.015	22	✓	0.006	19	To Do
Kamke 1267	✓	0.127	76	✓	0.264	41	To Do
Kamke 1268	✓	0.082	50	✓	0.237	39	To Do
Kamke 1269	✓	0.049	60	✓	0.145	40	To Do
Kamke 1270	✓	2.617	58	✓	0.316	46	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1271	✓	0.007	27	✓	0.005	14	To Do
Kamke 1272	✓	0.007	32	✓	0.027	23	To Do
Kamke 1273	✓	0.01	20	✓	0.073	17	To Do
Kamke 1274	✓	0.023	38	✓	0.006	19	To Do
Kamke 1275	✓	0.018	120	✓	0.179	53	To Do
Kamke 1276	✓	0.136	55	✓	0.062	31	To Do
Kamke 1277	✓	0.02	51	✓	0.062	27	To Do
Kamke 1278	✗	0	0	✗	0	0	To Do
Kamke 1279	✓	0.071	74	✓	0.127	32	To Do
Kamke 1280	✓	0.034	52	✓	0.037	40	To Do
Kamke 1281	✓	0.011	28	✓	0.037	15	To Do
Kamke 1282	✓	0.012	39	✓	0.029	21	To Do
Kamke 1283	✓	0.042	90	✓	0.128	48	To Do
Kamke 1284	✓	0.021	47	✓	0.022	41	To Do
Kamke 1285	✓	0.208	195	✓	0.099	52	To Do
Kamke 1286	✓	0.067	101	✓	0.022	32	To Do
Kamke 1287	✓	0.011	83	✓	0.022	27	To Do
Kamke 1288	✓	0.025	47	✓	0.02	21	To Do
Kamke 1289	✓	0.079	53	✓	0.093	33	To Do
Kamke 1290	✓	0.068	103	✓	0.028	29	To Do
Kamke 1291	✓	0.042	92	✓	1.002	50	To Do
Kamke 1292	✓	0.039	57	✓	0.051	31	To Do
Kamke 1293	✓	0.154	44	✓	0.1	33	To Do
Kamke 1294	✓	0.037	44	✓	0.101	33	To Do
Kamke 1295	✓	0.103	310	✓	0.372	106	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1296	✓	0.212	356	✓	0.354	150	To Do
Kamke 1297	✓	0.063	84	✓	0.041	63	To Do
Kamke 1298	✓	0.032	162	✓	0.148	124	To Do
Kamke 1299	✓	0.019	19	✓	0.013	27	To Do
Kamke 1300	✓	0.008	41	✓	0.033	31	To Do
Kamke 1301	✓	0.017	31	✓	0.015	19	To Do
Kamke 1302	✓	0.042	243	✓	0.088	98	To Do
Kamke 1303	✓	2.44	498	✓	0.257	501	To Do
Kamke 1304	✓	0.038	50	✓	0.028	38	To Do
Kamke 1305	✓	0.05	47	✓	0.063	44	To Do
Kamke 1306	✗	0	0	✓	0.277	69	To Do
Kamke 1307	✓	0.114	54	✓	0.04	36	To Do
Kamke 1308	✓	0.014	41	✓	0.018	40	To Do
Kamke 1309	✓	0.061	84	✓	0.109	65	To Do
Kamke 1310	✓	0.007	31	✓	0.016	20	To Do
Kamke 1311	✓	0.067	63	✓	0.219	52	To Do
Kamke 1312	✓	0.014	32	✓	0.017	19	To Do
Kamke 1313	✓	0.107	87	✓	0.128	35	To Do
Kamke 1314	✓	0.097	87	✓	0.125	33	To Do
Kamke 1315	✓	0.016	44	✓	0.027	45	To Do
Kamke 1316	✓	0.05	38	✓	0.045	18	To Do
Kamke 1317	✓	0.05	38	✓	0.066	13	To Do
Kamke 1318	✓	0.146	172	✓	0.168	122	To Do
Kamke 1319	✓	10.041	60	✓	0.126	31	To Do
Kamke 1320	✓	0.072	21	✓	0.028	17	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1321	✓	0.019	18	✓	0.019	15	To Do
Kamke 1322	✓	0.027	44	✓	0.019	44	To Do
Kamke 1323	✗	0	0	✓	0.014	17	To Do
Kamke 1324	✓	0.017	25	✓	0.021	18	To Do
Kamke 1325	✓	0.121	52	✓	0.161	86	To Do
Kamke 1326	✓	0.016	29	✓	0.022	22	To Do
Kamke 1327	✓	0.094	104	✓	1.943	81	To Do
Kamke 1328	✓	0.012	36	✓	0.024	27	To Do
Kamke 1329	✓	0.409	67	✓	0.473	64	To Do
Kamke 1330	✓	2.23	1176	✓	0.911	1147	To Do
Kamke 1331	✓	0.023	55	✓	0.023	19	To Do
Kamke 1332	✓	0.014	26	✓	0.02	17	To Do
Kamke 1333	✓	0.05	70	✓	0.142	45	To Do
Kamke 1334	✓	0.107	114	✓	0.122	89	To Do
Kamke 1335	✓	0.26	893	✓	0.078	57	To Do
Kamke 1336	✓	0.029	70	✓	0.03	42	To Do
Kamke 1337	✓	0.069	62	✓	0.035	27	To Do
Kamke 1338	✓	1.185	40	✓	0.023	27	To Do
Kamke 1339	✓	0.124	66	✓	0.158	76	To Do
Kamke 1340	✓	0.019	32	✓	0.021	20	To Do
Kamke 1341	✓	11.256	2921	✓	0.256	201	To Do
Kamke 1342	✓	0.058	52	✓	0.029	31	To Do
Kamke 1343	✓	0.128	73	✓	0.105	58	To Do
Kamke 1344	✓	0.338	173	✓	0.099	23	To Do
Kamke 1345	✓	0.038	52	✓	0.039	25	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1346	✓	0.064	37	✓	0.033	25	To Do
Kamke 1347	✓	0.056	31	✓	0.024	19	To Do
Kamke 1348	✓	0.243	34	✓	0.442	73	To Do
Kamke 1349	✓	0.067	76	✓	0.095	65	To Do
Kamke 1350	✓	0.006	25	✓	0.013	21	To Do
Kamke 1351	✓	0.012	50	✓	0.032	24	To Do
Kamke 1352	✓	0.008	89	✓	0.039	43	To Do
Kamke 1353	✓	0.554	119	✓	0.291	65	To Do
Kamke 1354	✓	0.086	108	✓	0.306	33	To Do
Kamke 1355	✓	3.937	51	✓	0.153	30	To Do
Kamke 1356	✓	0.163	90	✓	0.128	29	To Do
Kamke 1357	✓	0.371	288	✓	0.168	97	To Do
Kamke 1358	✓	0.029	89	✓	0.04	20	To Do
Kamke 1359	✓	0.05	86	✓	0.17	57	To Do
Kamke 1360	✓	0.047	68	✓	0.163	47	To Do
Kamke 1361	✓	0.24	38	✓	0.027	33	To Do
Kamke 1362	✗	0	0	✓	0.421	109	To Do
Kamke 1363	✓	0.355	236	✓	0.185	161	To Do
Kamke 1364	✓	0.087	52	✓	0.115	25	To Do
Kamke 1365	✓	0.051	104	✓	0.063	59	To Do
Kamke 1366	✓	1.016	31	✓	0.01	17	To Do
Kamke 1367	✓	0.163	229	✓	0.379	88	To Do
Kamke 1368	✓	0.013	106	✓	0.102	71	To Do
Kamke 1369	✓	0.115	110	✓	0.056	55	To Do
Kamke 1370	✓	1.016	53	✓	0.013	19	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1371	✓	0.012	48	✓	0.073	37	To Do
Kamke 1372	✓	0.195	202	✓	0.447	101	To Do
Kamke 1373	✓	0.154	113	✓	0.358	84	To Do
Kamke 1374	✓	0.016	32	✓	0.078	23	To Do
Kamke 1375	✓	0.02	54	✓	0.088	29	To Do
Kamke 1376	✓	0.036	69	✓	0.063	73	To Do
Kamke 1377	✓	0.415	109	✓	0.112	83	To Do
Kamke 1378	✓	0.029	65	✓	0.032	48	To Do
Kamke 1379	✓	0.038	99	✓	0.043	60	To Do
Kamke 1380	✓	0.245	132	✓	0.086	67	To Do
Kamke 1381	✓	0.417	589	✓	0.228	175	To Do
Kamke 1382	✓	0.637	154	✓	0.14	104	To Do
Kamke 1383	✓	1.067	50	✓	0.049	39	To Do
Kamke 1384	✓	0.016	96	✓	0.261	73	To Do
Kamke 1385	✓	0.011	78	✓	0.056	55	To Do
Kamke 1386	✓	0.05	108	✓	0.042	58	To Do
Kamke 1387	✓	0.019	50	✓	0.023	28	To Do
Kamke 1388	✓	0.158	235	✓	0.116	76	To Do
Kamke 1389	✓	0.176	217	✓	0.114	68	To Do
Kamke 1390	✓	0.033	41	✓	0.026	25	To Do
Kamke 1391	✓	0.031	27	✓	0.023	20	To Do
Kamke 1392	✓	186.749	1763961	✓	0.247	561	To Do
Kamke 1393	✓	112.325	413606	✓	0.213	299	To Do
Kamke 1394	✓	1.026	115	✓	0.112	79	To Do
Kamke 1395	✓	0.054	59	✓	0.048	39	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1396	✓	0.56	211	✓	0.152	178	To Do
Kamke 1397	✓	0.037	38	✓	0.111	27	To Do
Kamke 1398	✓	0.098	72	✓	0.263	69	To Do
Kamke 1399	✓	1.028	72	✓	0.036	34	To Do
Kamke 1400	✓	0.068	60	✓	0.04	35	To Do
Kamke 1401	✓	0.008	93	✓	0.049	45	To Do
Kamke 1402	✓	0.621	86	✓	0.531	59	To Do
Kamke 1403	✓	8.655	316	✓	0.777	298	To Do
Kamke 1404	✓	0.012	33	✓	0.032	19	To Do
Kamke 1405	✓	0.035	77	✓	0.06	42	To Do
Kamke 1406	✓	31.941	2622	✓	0.095	44	To Do
Kamke 1407	✓	80.267	2002	✓	1.629	2829	To Do
Kamke 1408	✗	0	0	✗	0	0	To Do
Kamke 1409	✓	0.013	43	✓	0.02	39	To Do
Kamke 1410	✓	0.07	481	✓	0.349	253	To Do
Kamke 1411	✓	0.211	42	✓	0.024	27	To Do
Kamke 1412	✓	0.01	29	✓	0.016	23	To Do
Kamke 1413	✓	0.047	16	✓	0.076	12	To Do
Kamke 1414	✓	0.531	231	✓	0.399	82	To Do
Kamke 1415	✓	0.468	273	✓	0.188	36	To Do
Kamke 1416	✓	0.113	46	✓	0.224	26	To Do
Kamke 1417	✓	0.096	52	✓	0.165	31	To Do
Kamke 1418	✓	0.084	15	✓	3.937	47	To Do
Kamke 1419	✗	0	0	✓	0.253	12	To Do
Kamke 1420	✓	0.273	134	✓	0.454	114	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1421	✓	0.107	81	✓	0.091	28	To Do
Kamke 1422	✓	0.071	67	✓	0.283	50	To Do
Kamke 1423	✓	0.044	70	✓	0.386	110	To Do
Kamke 1424	✓	0.138	90	✓	0.39	102	To Do
Kamke 1425	✓	21.545	236	✓	0.61	87	To Do
Kamke 1426	✓	3.073	4128	✓	0.743	558	To Do
Kamke 1427	✓	0.598	166	✓	0.839	98	To Do
Kamke 1428	✓	0.249	104	✓	0.424	161	To Do
Kamke 1429	✓	0.022	41	✓	0.028	21	To Do
Kamke 1430	✓	0.266	22	✓	0.387	79	To Do
Kamke 1431	✓	10.114	80	✓	0.253	30	To Do
Kamke 1432	✓	0.058	37	✓	0.054	22	To Do
Kamke 1433	✓	0.123	46	✓	0.122	28	To Do
Kamke 1434	✗	0	0	✓	0.827	513	To Do
Kamke 1435	✓	0.091	70	✓	0.199	38	To Do
Kamke 1436	✓	0.323	42	✓	0.391	91	To Do
Kamke 1437	✓	0.181	42	✓	0.221	29	To Do
Kamke 1438	✓	0.613	615	✓	0.279	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	✓	0.04	46	✓	0.055	30	To Do
Kamke 1443	✗	0	0	✗	0	0	To Do
Kamke 1444	✗	0	0	✓	0.015	37	To Do
Kamke 1445	✓	0.101	24	✓	0.289	20	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1446	✓	0.035	33	✓	0.03	22	To Do
Kamke 1447	✓	0.03	29	✓	0.03	20	To Do
Kamke 1448	✓	0.301	149	✓	0.095	77	To Do
Kamke 1449	✓	0.01	53	✓	0.015	47	To Do
Kamke 1450	✓	12.576	3592	✓	0.339	1616	To Do
Kamke 1451	✓	0.013	168	✓	0.133	114	To Do
Kamke 1452	✓	0.005	54	✓	0.004	35	To Do
Kamke 1453	✓	3.104	128	✓	0.286	124	To Do
Kamke 1454	✓	0.006	79	✓	0.039	55	To Do
Kamke 1455	✓	0.016	127	✓	0.118	71	To Do
Kamke 1456	✓	0.019	183	✓	0.086	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
Kamke 1462	✗	0	0	✗	0	0	To Do
Kamke 1463	✗	0	0	✗	0	0	To Do
Kamke 1464	✓	0.004	34	✓	0.005	27	To Do
Kamke 1465	✓	0.066	95	✓	0.214	101	To Do
Kamke 1466	✓	0.011	46	✓	0.013	27	To Do
Kamke 1467	✓	0.004	84	✓	0.048	590	To Do
Kamke 1468	✓	0.039	57	✓	0.112	59	To Do
Kamke 1469	✓	0.011	72	✓	0.02	37	To Do
Kamke 1470	✓	2.276	64	✓	0.125	36	To Do

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 1471	✓	0.063	84	✓	0.109	36	To Do
Kamke 1472	✓	0.071	88	✓	0.141	33	To Do
Kamke 1473	✗	0	0	✗	0	0	To Do
Kamke 1474	✗	0	0	✗	0	0	To Do
Kamke 1475	✓	0.006	38	✓	0.012	23	To Do
Kamke 1476	✗	0	0	✗	0	0	To Do
Kamke 1477	✓	0.091	48	✓	0.017	39	To Do
Kamke 1478	✓	0.018	104	✓	0.062	48	To Do
Kamke 1479	✓	0.076	153	✓	0.126	92	To Do
Kamke 1480	✓	0.126	93	✓	0.13	35	To Do
Kamke 1481	✓	0.319	432	✓	0.099	44	To Do
Kamke 1482	✓	14.066	3626	✓	0.452	1616	To Do
Kamke 1483	✓	0.082	112	✓	0.146	37	To Do
Kamke 1484	✗	0	0	✗	0	0	To Do
Kamke 1485	✓	0.191	64	✓	0.18	51	To Do
Kamke 1486	✓	0.366	65	✓	0.139	51	To Do
Kamke 1487	✓	0.684	87	✓	0.234	38	To Do
Kamke 1488	✓	0.28	102	✓	0.526	135	To Do
Kamke 1489	✗	0	0	✗	0	0	To Do
Kamke 1490	✓	0.019	33	✓	0.037	18	To Do
Kamke 1491	✓	0.022	102	✓	0.079	88	To Do
Kamke 1492	✓	0.185	43	✓	0.106	39	To Do
Kamke 1493	✓	1.08	479	✓	0.371	1032	To Do
Kamke 1494	✓	0.018	43	✓	0.024	32	To Do
Kamke 1495	✓	0.006	24	✓	0.007	16	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1496	✓	0.138	63	✓	0.017	57	To Do
Kamke 1497	✓	0.255	135	✓	0.145	77	To Do
Kamke 1498	✓	6.028	584	✓	0.138	53	To Do
Kamke 1499	✓	0.139	97	✓	0.13	25	To Do
Kamke 1500	✗	0	0	✓	0.124	55	To Do
Kamke 1501	✓	0.117	86	✓	0.118	37	To Do
Kamke 1502	✓	0.073	98	✓	0.365	103	To Do
Kamke 1503	✓	0.324	258	✓	0.028	67	To Do
Kamke 1504	✓	0.181	43	✓	0.101	18	To Do
Kamke 1505	✓	60.236	115	✓	0.264	79	To Do
Kamke 1506	✓	0.236	150	✓	0.303	43	To Do
Kamke 1507	✓	2.674	56731	✓	0.783	1213	To Do
Kamke 1508	✓	0.421	143	✓	0.087	81	To Do
Kamke 1509	✓	0.006	34	✓	0.039	29	To Do
Kamke 1510	✓	0.022	102	✗	0	0	To Do
Kamke 1511	✓	0.034	51	✓	0.023	49	To Do
Kamke 1512	✓	0.025	29	✓	0.008	18	To Do
Kamke 1513	✓	0.077	25	✓	0.099	18	To Do
Kamke 1514	✓	0.377	102	✓	0.405	135	To Do
Kamke 1515	✗	0	0	✗	0	0	To Do
Kamke 1516	✓	261.518	15142	✓	0.24	188	To Do
Kamke 1517	✓	0.378	601	✓	0.419	866	To Do
Kamke 1518	✓	0.288	104	✓	0.217	60	To Do
Kamke 1519	✓	0.016	65	✓	0.076	19	To Do
Kamke 1520	✓	2.781	534	✓	0.561	288	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1521	✓	0.035	35	✓	0.198	28	To Do
Kamke 1522	✓	0.011	44	✓	0.04	34	To Do
Kamke 1523	✓	0.313	74	✓	0.202	23	To Do
Kamke 1524	✓	0.114	96	✓	0.366	98	To Do
Kamke 1525	✓	0.217	102	✓	0.497	291	To Do
Kamke 1526	✓	130.18	27	✓	0.121	19	To Do
Kamke 1527	✓	130.096	165	✓	0.5	437	To Do
Kamke 1528	✓	1.316	72	✓	0.341	68	To Do
Kamke 1529	✓	0.07	47	✓	0.1	25	To Do
Kamke 1530	✓	0.054	35	✓	0.285	105	To Do
Kamke 1531	✗	0	0	✗	0	0	To Do
Kamke 1532	✓	0.01	103	✓	0.055	58	To Do
Kamke 1533	✓	0.01	113	✓	0.05	58	To Do
Kamke 1534	✓	0.003	24	✓	0.019	21	To Do
Kamke 1535	✓	0.184	223	✓	0.013	36	To Do
Kamke 1536	✓	0.004	76	✓	0.01	50	To Do
Kamke 1537	✓	0.846	1722	✓	0.113	67	To Do
Kamke 1538	✓	0.117	66	✓	1.026	49	To Do
Kamke 1539	✓	0.004	44	✓	0.023	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	✓	0.01	41	To Do
Kamke 1545	✓	0.009	40	✓	0.27	27	To Do

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 1546	✓	0.439	300	✓	0.039	73	To Do
Kamke 1547	✗	0	0	✓	0.01	87	To Do
Kamke 1548	✓	0.071	50	✓	0.092	32	To Do
Kamke 1549	✓	0.014	34	✓	0.03	26	To Do
Kamke 1550	✓	1.172	270	✓	3.32	157	To Do
Kamke 1551	✓	0.197	110	✓	0.137	62	To Do
Kamke 1552	✗	0	0	✓	0.062	89	To Do
Kamke 1553	✓	0.008	29	✓	0.006	17	To Do
Kamke 1554	✓	0.007	29	✓	0.007	18	To Do
Kamke 1555	✓	0.032	156	✓	0.118	61	To Do
Kamke 1556	✓	0.008	30	✓	0.007	19	To Do
Kamke 1557	✓	0.032	146	✓	0.071	61	To Do
Kamke 1558	✓	0.079	319	✓	0.095	67	To Do
Kamke 1559	✓	0.135	100	✓	0.084	33	To Do
Kamke 1560	✓	0.006	29	✓	0.007	18	To Do
Kamke 1561	✓	2.04	400	✓	0.262	69	To Do
Kamke 1562	✓	0.558	140	✓	0.248	77	To Do
Kamke 1563	✓	1.052	232	✓	0.158	87	To Do
Kamke 1564	✓	0.697	230	✓	0.152	88	To Do
Kamke 1565	✓	0.257	242	✓	0.229	71	To Do
Kamke 1566	✓	0.304	238	✓	0.197	35	To Do
Kamke 1567	✓	0.006	30	✓	0.009	19	To Do
Kamke 1568	✓	0.009	122	✓	0.019	89	To Do
Kamke 1569	✗	0	0	✓	0.283	63	To Do
Kamke 1570	✓	0.066	470	✓	0.057	49	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1571	✓	0.042	390	✓	0.352	143	To Do
Kamke 1572	✗	0	0	✓	0.309	35	To Do
Kamke 1573	✓	0.091	77	✓	0.034	41	To Do
Kamke 1574	✓	0.143	270	✓	0.805	252	To Do
Kamke 1575	✓	4.959	138	✓	0.517	647	To Do
Kamke 1576	✗	0	0	✓	0.013	67	To Do
Kamke 1577	✓	0.038	46	✓	0.019	21	To Do
Kamke 1578	✓	25.221	141	✓	0.425	89	To Do
Kamke 1579	✓	0.746	80	✓	0.952	69	To Do
Kamke 1580	✓	3.928	234	✓	2.691	71	To Do
Kamke 1581	✗	0	0	✗	0	0	To Do
Kamke 1582	✓	10.11	787	✗	0	0	To Do
Kamke 1583	✓	0.069	92	✓	0.052	40	To Do
Kamke 1584	✓	1.321	216	✓	0.151	118	To Do
Kamke 1585	✓	30.11	214	✓	0.057	675	To Do
Kamke 1586	✗	0	0	✗	0	0	To Do
Kamke 1587	✓	0.163	492	✓	0.434	154	To Do
Kamke 1588	✓	6.419	114	✓	0.087	90	To Do
Kamke 1589	✓	0.024	670	✓	25.329	4039	To Do
Kamke 1590	✓	270.626	331	✗	0	0	To Do
Kamke 1591	✓	0.027	26	✓	0.02	12	To Do
Kamke 1592	✓	0.03	14	✓	0.021	10	To Do
Kamke 1593	✗	0	0	✗	0	0	To Do
Kamke 1594	✓	0.289	373	✓	0.077	59	To Do
Kamke 1595	✗	0	0	✗	0	0	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1596	✗	0	0	✗	0	0	To Do
Kamke 1597	✓	1.187	242	✓	0.028	21	To Do
Kamke 1598	✗	0	0	✗	0	0	To Do
Kamke 1599	✗	0	0	✗	0	0	To Do
Kamke 1600	✓	1.32	1017	✓	0.066	89	To Do
Kamke 1601	✗	0	0	✗	0	0	To Do
Kamke 1602	✓	0.089	47	✓	0.185	73	To Do
Kamke 1603	✗	0	0	✓	28.97	7206	To Do
Kamke 1604	✓	0.034	34	✓	0.341	23	To Do
Kamke 1605	✗	0	0	✗	0	0	To Do
Kamke 1606	✗	0	0	✗	0	0	To Do
Kamke 1607	✓	0.059	79	✓	0.102	49	To Do
Kamke 1608	✗	0	0	✗	0	0	To Do
Kamke 1609	✗	0	0	✗	0	0	To Do
Kamke 1610	✓	3.439	754	✓	0.228	92	To Do
Kamke 1611	✗	0	0	✗	0	0	To Do
Kamke 1612	✗	0	0	✗	0	0	To Do
Kamke 1613	✓	0.871	35	✓	0.032	27	To Do
Kamke 1614	✓	0.632	32	✓	0.094	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	✓	20.301	492	✓	0.105	291	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1621	✓	35.125	990	✓	2.214	108	To Do
Kamke 1622	✓	22.321	88	✓	0.473	416	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	✓	0.037	75	✓	0.04	38	To Do
Kamke 1630	✓	4.432	3223	✓	0.553	783	To Do
Kamke 1631	✓	0.04	75	✓	0.069	38	To Do
Kamke 1632	✓	0.041	46	✓	0.1	23	To Do
Kamke 1633	✓	28.485	92	✓	0.353	97	To Do
Kamke 1634	✗	0	0	✗	0	0	To Do
Kamke 1635	✓	0.468	104	✓	0.2	79	To Do
Kamke 1636	✗	0	0	✗	0	0	To Do
Kamke 1637	✗	0	0	✗	0	0	To Do
Kamke 1638	✓	3.548	146	✓	0.257	115	To Do
Kamke 1639	✗	0	0	✗	0	0	To Do
Kamke 1640	✓	0.535	96	✓	0.252	70	To Do
Kamke 1641	✓	0.031	61	✓	0.036	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

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 1646	✓	7.562	262	✓	0.171	94	To Do
Kamke 1647	✓	0.381	60	✓	4.752	60	To Do
Kamke 1648	✗	0	0	✗	0	0	To Do
Kamke 1649	✗	0	0	✗	0	0	To Do
Kamke 1650	✓	0.119	36	✓	0.758	16	To Do
Kamke 1651	✓	0.381	972	✓	0.154	31	To Do
Kamke 1652	✓	0.334	76	✓	0.992	33	To Do
Kamke 1653	✓	0.127	75	✓	0.191	41	To Do
Kamke 1654	✓	0.273	308	✓	0.207	38	To Do
Kamke 1655	✓	0.522	350	✓	0.346	84	To Do
Kamke 1656	✓	31.161	9706	✓	1.059	768	To Do
Kamke 1657	✓	0.302	33	✓	0.316	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	✓	0.049	92	✓	0.083	51	To Do
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	✓	0.045	60	✓	0.15	24	To Do
Kamke 1669	✓	0.488	160	✓	0.134	32	To Do
Kamke 1670	✓	5.134	51	✓	0.84	35	To Do

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 1671	✓	0.073	59	✓	0.086	35	To Do
Kamke 1672	✗	0	0	✗	0	0	To Do
Kamke 1673	✗	0	0	✗	0	0	To Do
Kamke 1674	✓	0.033	106	✓	0.089	25	To Do
Kamke 1675	✗	0	0	✗	0	0	To Do
Kamke 1676	✓	0.239	134	✓	0.237	72	To Do
Kamke 1677	✗	0	0	✗	0	0	To Do
Kamke 1678	✗	0	0	✓	0.312	60	To Do
Kamke 1679	✓	0.118	33	✓	0.122	26	To Do
Kamke 1680	✗	0	0	✗	0	0	To Do
Kamke 1681	✓	1.593	41	✓	0.054	31	To Do
Kamke 1682	✓	21.115	41	✗	0	0	To Do
Kamke 1683	✓	0.052	26	✓	0.07	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
Kamke 1687	✓	0.085	262	✓	0.111	21	To Do
Kamke 1688	✓	0.736	189	✓	0.119	32	To Do
Kamke 1689	✓	0.193	104	✓	0.137	37	To Do
Kamke 1690	✗	0	0	✗	0	0	To Do
Kamke 1691	✓	16.239	251	✓	0.929	254	To Do
Kamke 1692	✗	0	0	✗	0	0	To Do
Kamke 1693	✗	0	0	✗	0	0	To Do
Kamke 1694	✓	0.086	115	✓	0.096	53	To Do
Kamke 1695	✗	0	0	✗	0	0	To Do

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 1696	✗	0	0	✗	0	0	To Do
Kamke 1697	✓	0.131	94	✓	0.049	39	To Do
Kamke 1698	✓	0.021	72	✗	0	0	To Do
Kamke 1699	✓	0.087	40	✓	0.201	33	To Do
Kamke 1700	✓	0.203	85	✓	0.556	86	To Do
Kamke 1701	✓	0.13	80	✓	0.504	42	To Do
Kamke 1702	✗	0	0	✗	0	0	To Do
Kamke 1703	✓	0.249	77	✓	0.178	21	To Do
Kamke 1704	✗	0	0	✗	0	0	To Do
Kamke 1705	✓	0.264	252	✗	0	0	To Do
Kamke 1706	✓	0.403	308	✗	0	0	To Do
Kamke 1707	✓	0.05	31	✓	0.273	39	To Do
Kamke 1708	✗	0	0	✗	0	0	To Do
Kamke 1709	✓	48.888	543	✗	0	0	To Do
Kamke 1710	✗	0	0	✗	0	0	To Do
Kamke 1711	✓	14.431	10168	✓	0.622	23	To Do
Kamke 1712	✓	0.041	75	✓	0.302	37	To Do
Kamke 1713	✗	0	0	✗	0	0	To Do
Kamke 1714	✓	0.099	28	✓	0.086	68	To Do
Kamke 1715	✓	0.079	26	✓	0.064	25	To Do
Kamke 1716	✓	0.432	172	✓	0.302	68	To Do
Kamke 1717	✓	47.727	277	✓	0.408	107	To Do
Kamke 1718	✓	0.831	744	✓	0.399	136	To Do
Kamke 1719	✗	0	0	✗	0	0	To Do
Kamke 1720	✓	74.018	105	✓	0.572	155	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1721	✓	20.991	41	✗	0	0	To Do
Kamke 1722	✓	0.949	697	✓	0.483	98	To Do
Kamke 1723	✓	0.488	130	✓	0.128	16	To Do
Kamke 1724	✓	0.319	38	✓	2.553	21	To Do
Kamke 1725	✓	27.897	18840	✓	0.693	106	To Do
Kamke 1726	✓	0.199	82	✓	0.178	39	To Do
Kamke 1727	✓	0.336	129	✓	0.547	823	To Do
Kamke 1728	✓	0.004	31	✓	0.041	24	To Do
Kamke 1729	✗	0	0	✗	0	0	To Do
Kamke 1730	✓	0.528	135	✓	0.09	53	To Do
Kamke 1731	✓	0.673	351	✓	0.083	61	To Do
Kamke 1732	✗	0	0	✗	0	0	To Do
Kamke 1733	✓	1.225	437	✓	0.089	71	To Do
Kamke 1734	✗	0	0	✗	0	0	To Do
Kamke 1735	✗	0	0	✗	0	0	To Do
Kamke 1736	✓	4.272	129	✓	0.1	49	To Do
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	✓	0.073	16	✓	0.138	13	To Do
Kamke 1741	✓	0.084	17	✓	0.5	34	To Do
Kamke 1742	✗	0	0	✗	0	0	To Do
Kamke 1743	✓	17.586	2761	✓	0.094	71	To Do
Kamke 1744	✓	0.56	161	✓	0.477	823	To Do
Kamke 1745	✓	0.342	195	✓	0.671	117	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1746	✓	0.08	118	✓	0.415	207	To Do
Kamke 1747	✓	0.072	20	✓	0.023	17	To Do
Kamke 1748	✓	0.177	43	✓	0.117	67	To Do
Kamke 1749	✓	0.329	153	✓	2.046	57	To Do
Kamke 1750	✓	0.593	107	✓	1.032	87	To Do
Kamke 1751	✗	0	0	✗	0	0	To Do
Kamke 1752	✓	0.118	26	✓	0.309	33	To Do
Kamke 1753	✓	0.377	43	✓	0.123	147	To Do
Kamke 1754	✓	0.087	17	✓	0.051	15	To Do
Kamke 1755	✓	4.325	716	✓	0.503	418	To Do
Kamke 1756	✓	4.676	211	✓	0.267	78	To Do
Kamke 1757	✗	0	0	✗	0	0	To Do
Kamke 1758	✓	0.242	36	✓	0.076	42	To Do
Kamke 1759	✓	0.1	18	✓	0.031	31	To Do
Kamke 1760	✓	0.048	108	✓	0.104	114	To Do
Kamke 1761	✗	0	0	✗	0	0	To Do
Kamke 1762	✗	0	0	✗	0	0	To Do
Kamke 1763	✓	0.164	40	✓	0.117	148	To Do
Kamke 1764	✓	0.046	52	✓	0.155	18	To Do
Kamke 1765	✓	0.173	34	✓	0.049	27	To Do
Kamke 1766	✓	0.11	21	✓	0.041	64	To Do
Kamke 1767	✓	0.215	55	✓	0.347	50	To Do
Kamke 1768	✓	0.031	53	✓	0.058	43	To Do
Kamke 1769	✓	0.104	18	✓	0.135	21	To Do
Kamke 1770	✓	0.432	28	✓	0.074	26	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1771	✓	0.054	21	✓	0.188	22	To Do
Kamke 1772	✓	0.4	36	✓	0.164	42	To Do
Kamke 1773	✓	0.271	44	✓	0.042	30	To Do
Kamke 1774	✓	0.783	92	✓	0.396	106	To Do
Kamke 1775	✓	0.107	29	✓	0.265	31	To Do
Kamke 1776	✗	0	0	✓	0.276	49	To Do
Kamke 1777	✗	0	0	✗	0	0	To Do
Kamke 1778	✓	0.165	65	✓	0.779	245	To Do
Kamke 1779	✗	0	0	✓	0.92	113	To Do
Kamke 1780	✗	0	0	✓	1.245	171	To Do
Kamke 1781	✓	0.138	46	✓	0.054	11	To Do
Kamke 1782	✓	0.121	93	✓	0.068	33	To Do
Kamke 1783	✓	0.803	26	✓	0.158	23	To Do
Kamke 1784	✓	0.199	74	✓	1.067	82	To Do
Kamke 1785	✓	0.226	95	✓	7.96	83	To Do
Kamke 1786	✓	0.07	99	✓	0.283	42	To Do
Kamke 1787	✓	0.596	170	✓	0.244	80	To Do
Kamke 1788	✗	0	0	✗	0	0	To Do
Kamke 1789	✗	0	0	✗	0	0	To Do
Kamke 1790	✓	0.468	186	✓	0.267	111	To Do
Kamke 1791	✓	0.462	168	✓	0.27	90	To Do
Kamke 1792	✓	0.815	232	✓	0.54	194	To Do
Kamke 1793	✓	0.101	83	✓	0.132	40	To Do
Kamke 1794	✓	0.125	69	✓	0.09	46	To Do
Kamke 1795	✓	0.187	116	✓	1.596	529	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1796	✓	0.159	363	✓	0.371	51	To Do
Kamke 1797	✗	0	0	✗	0	0	To Do
Kamke 1798	✓	33.81	248	✓	0.245	166	To Do
Kamke 1799	✓	0.961	88	✓	0.375	46	To Do
Kamke 1800	✓	0.346	84	✓	0.054	60	To Do
Kamke 1801	✗	0	0	✗	0	0	To Do
Kamke 1802	✗	0	0	✗	0	0	To Do
Kamke 1803	✓	17.101	10387	✓	0.917	304	To Do
Kamke 1804	✓	11.761	416	✓	0.035	31	To Do
Kamke 1805	✓	10.273	438	✓	0.062	34	To Do
Kamke 1806	✗	0	0	✓	2.646	726	To Do
Kamke 1807	✗	0	0	✗	0	0	To Do
Kamke 1808	✓	10.705	124	✓	0.155	72	To Do
Kamke 1809	✓	23.411	260	✓	0.454	336	To Do
Kamke 1810	✓	0.054	1677	✓	0.109	91	To Do
Kamke 1811	✗	0	0	✓	2.068	88	To Do
Kamke 1812	✓	0.199	29	✓	0.176	19	To Do
Kamke 1813	✓	17.917	176	✓	0.534	138	To Do
Kamke 1814	✓	0.245	120	✓	0.139	87	To Do
Kamke 1815	✗	0	0	✗	0	0	To Do
Kamke 1816	✗	0	0	✗	0	0	To Do
Kamke 1817	✓	9.135	41	✓	0.365	40	To Do
Kamke 1818	✗	0	0	✓	0.645	66	To Do
Kamke 1819	✗	0	0	✓	0.076	42	To Do
Kamke 1820	✗	0	0	✗	0	0	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1821	✗	0	0	✗	0	0	To Do
Kamke 1822	✓	0.549	371	✓	1.597	159	To Do
Kamke 1823	✓	0.182	281	✓	0.3	289	To Do
Kamke 1824	✓	0.581	331	✓	0.902	96	To Do
Kamke 1825	✗	0	0	✗	0	0	To Do
Kamke 1826	✓	0.605	201	✓	0.885	173	To Do
Kamke 1827	✗	0	0	✓	5.834	1364	To Do
Kamke 1828	✓	0.007	32	✓	1.289	59	To Do
Kamke 1829	✓	0.004	24	✓	0.762	36	To Do
Kamke 1830	✓	0.016	24	✓	0.918	302	To Do
Kamke 1831	✗	0	0	✗	0	0	To Do
Kamke 1832	✗	0	0	✗	0	0	To Do
Kamke 1833	✓	1.987	1	✓	2.542	162	To Do
Kamke 1834	✓	41.374	19	✗	0	0	To Do
Kamke 1835	✓	0.047	143	✗	0	0	To Do
Kamke 1836	✗	0	0	✗	0	0	To Do
Kamke 1837	✓	10.061	145	✓	0.324	105	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	✓	0.151	286	✓	0.687	190	To Do
Kamke 1843	✓	1.38	409	✓	0.389	77	To Do
Kamke 1844	✓	0.114	20	✓	0.443	75	To Do
Kamke 1845	✓	0.119	22	✓	0.434	81	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1846	✓	0.025	51	✓	0.01	28	To Do
Kamke 1847	✓	0.143	95	✓	0.167	49	To Do
Kamke 1848	✓	0.299	187	✓	1.289	359	To Do
Kamke 1849	✓	0.379	426	✓	0.357	197	To Do
Kamke 1850	✗	0	0	✗	0	0	To Do
Kamke 1851	✗	0	0	✗	0	0	To Do
Kamke 1852	✓	0.08	28	✓	0.369	28	To Do
Kamke 1853	✓	0.061	43	✓	0.998	110	To Do
Kamke 1854	✗	0	0	✗	0	0	To Do
Kamke 1855	✗	0	0	✗	0	0	To Do
Kamke 1856	✓	0.01	22	✓	0.033	19	To Do
Kamke 1857	✓	0.009	39	✓	0.039	35	To Do
Kamke 1858	✓	0.006	182	✓	0.036	64	To Do
Kamke 1859	✓	0.003	51	✓	0.036	37	To Do
Kamke 1860	✓	0.019	696	✓	0.073	177	To Do
Kamke 1861	✓	0.007	183	✓	0.094	118	To Do
Kamke 1862	✓	0.02	52	✓	0.031	39	To Do
Kamke 1863	✓	0.004	84	✓	0.034	35	To Do
Kamke 1864	✓	0.006	59	✓	0.033	44	To Do
Kamke 1865	✓	0.799	2062	✓	0.092	224	To Do
Kamke 1866	✓	0.127	132	✓	0.033	39	To Do
Kamke 1867	✓	0.162	124	✓	0.036	42	To Do
Kamke 1868	✓	0.106	162	✓	0.064	56	To Do
Kamke 1869	✓	0.122	118	✓	0.05	51	To Do
Kamke 1870	✓	0.118	122	✓	0.177	47	To Do

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Table 3 – continued from previous page

#	Mathematica solved	Mathematica cpu	Mathematica leaf	Maple solved	Maple cpu	Maple leaf	note on solution
Kamke 1871	✓	0.282	180	✓	0.122	60	To Do
Kamke 1872	✓	0.183	162	✓	0.059	56	To Do
Kamke 1873	✓	0.146	322	✓	0.054	52	To Do
Kamke 1874	✓	0.01	115	✓	0.559	57	To Do
Kamke 1875	✓	0.756	3181	✓	3.255	3237	To Do
Kamke 1876	✓	0.014	39	✓	0.231	18	To Do
Kamke 1877	✓	0.003	31	✓	0.03	31	To Do
Kamke 1878	✓	0.026	39	✓	0.06	39	To Do
Kamke 1879	✓	0.019	58	✓	0.044	54	To Do
Kamke 1880	✓	0.011	29	✓	0.06	23	To Do
Kamke 1881	✓	0.01	44	✓	0.028	48	To Do
Kamke 1882	✓	3.281	928	✓	0.068	99	To Do
Kamke 1883	✓	1.817	602	✓	0.155	77	To Do
Kamke 1884	✓	0.64	224	✓	0.174	69	To Do
Kamke 1885	✓	0.012	66	✓	0.133	47	To Do
Kamke 1886	✓	0.01	115	✓	0.059	49	To Do
Kamke 1887	✓	0.199	5748	✓	0.086	360	To Do
Kamke 1888	✓	19.832	15664	✓	0.149	457	To Do
Kamke 1889	✓	0.347	554	✓	0.038	60	To Do
Kamke 1890	✗	0	0	✗	0	0	To Do
Kamke 1891	✓	0.77	742	✓	0.045	64	To Do
Kamke 1892	✓	0.151	4815	✓	0.085	463	To Do
Kamke 1893	✓	0.228	5546	✓	0.675	1565	To Do
Kamke 1894	✓	0.297	3386	✓	0.628	1040	To Do
Kamke 1895	✓	0.121	7517	✓	0.168	1008	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1896	✓	0.45	1132	✓	0.049	66	To Do
Kamke 1897	✓	0.243	280	✓	0.85	88	To Do
Kamke 1898	✓	0.02	420	✓	0.066	71	To Do
Kamke 1899	✓	0.009	112	✓	0.086	52	To Do
Kamke 1900	✓	0.006	94	✓	0.086	50	To Do
Kamke 1901	✓	0.005	105	✓	0.066	43	To Do
Kamke 1902	✓	0.016	226	✓	0.062	51	To Do
Kamke 1903	✓	0.048	1304	✓	0.109	299	To Do
Kamke 1904	✓	0.029	1445	✓	0.074	257	To Do
Kamke 1905	✗	0	0	✗	0	0	To Do
Kamke 1906	✓	0.03	278	✓	0.059	110	To Do
Kamke 1907	✓	0.011	179	✓	0.05	66	To Do
Kamke 1908	✓	0.028	551	✓	0.315	1145	To Do
Kamke 1909	✓	0.023	1630	✓	12.006	32449	To Do
Kamke 1910	✓	0.006	39	✓	0.085	37	To Do
Kamke 1911	✓	0.017	1148	✓	0.108	308	To Do
Kamke 1912	✓	0.007	798	✓	0.885	2783	To Do
Kamke 1913	✓	0.025	64	✓	0.119	57	To Do
Kamke 1914	✓	0.221	204	✓	0.528	92	To Do
Kamke 1915	✗	0	0	✗	0	0	To Do
Kamke 1916	✓	0.476	557	✓	0.75	180	To Do
Kamke 1917	✓	104.356	3406	✓	1.474	101	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

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Table 3 – continued from previous page

#	Mathematica solved	cpu	leaf	Maple solved	cpu	leaf	note on solution
Kamke 1921	✗	0	0	✗	0	0	To Do
Kamke 1922	✗	0	0	✗	0	0	To Do
Kamke 1923	✓	0.009	53	✓	0.043	35	To Do
Kamke 1924	✓	0.046	191	✓	0.934	180	To Do
Kamke 1925	✓	0.012	31	✓	0.306	144	To Do
Kamke 1926	✓	0.004	28	✓	0.253	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	✓	0.022	308	✓	0.046	45	To Do
Kamke 1931	✓	2.522	10101	✓	1.615	1117	To Do
Kamke 1932	✗	0	0	✗	0	0	To Do
Kamke 1933	✗	0	0	✓	1.343	4310	To Do
Kamke 1934	✗	0	0	✗	0	0	To Do
Kamke 1935	✗	0	0	✗	0	0	To Do
Kamke 1936	✗	0	0	✓	0.82	704	To Do
Kamke 1937	✗	0	0	✗	0	0	To Do
Kamke 1938	✓	0.006	137	✓	0.113	101	To Do
Kamke 1939	✓	0.139	2168	✓	1.825	899	To Do
Kamke 1940	✗	0	0	✗	0	0	To Do

2.1 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 = 10.2818 (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]
```

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

✓ **Maple** : cpu = 0.02 (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

$$y' - \frac{1}{\sqrt{a_0 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4}} = 0 \tag{1}$$

To Do.

2.2 ODE No. 2

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

✓ **Mathematica** : cpu = 0.0353794 (sec), leaf count = 34

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

$$\left\{\left\{y(x)\to \frac{ce^{x(a+b)-ax}}{a+b}+c_1e^{-ax}\right\}\right\}$$

✓ **Maple** : cpu = 0.007 (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

$$\begin{aligned}\frac{d}{dx}(\mu y(x))&=\mu ce^{bx}\\ \mu y(x)&=\int \mu ce^{bx}dx+C\end{aligned}$$

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

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

2.3 ODE No. 3

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

✓ **Mathematica** : cpu = 0.0377452 (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 = 0.033 (sec), leaf count = 37

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

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

Hand solution

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

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

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

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

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

Therefore (2) becomes

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

2.4 ODE No. 4

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

✓ **Mathematica** : cpu = 0.0253589 (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 = 0.005 (sec), leaf count = 18

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

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

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

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

Integrating both sides

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

2.5 ODE No. 5

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

✓ **Mathematica** : cpu = 0.370415 (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 = 0.052 (sec), leaf count = 21

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

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

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

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

2.6 ODE No. 6

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

✓ **Mathematica** : cpu = 0.0271892 (sec), leaf count = 18

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

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

✓ **Maple** : cpu = 0.034 (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

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

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

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

2.7 ODE No. 7

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

✓ **Mathematica** : cpu = 0.0608231 (sec), leaf count = 23

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

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

✓ **Maple** : cpu = 0.005 (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

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

2.8 ODE No. 8

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

✓ **Mathematica** : cpu = 0.0273487 (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 = 0.015 (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

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

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

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

2.9 ODE No. 9

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

✓ **Mathematica** : cpu = 0.0253244 (sec), leaf count = 19

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

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

✓ **Maple** : cpu = 0.013 (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

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

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

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

2.10 ODE No. 10

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

✓ **Mathematica** : cpu = 0.0222469 (sec), leaf count = 18

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

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

✓ **Maple** : cpu = 0.01 (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

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

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

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

2.11 ODE No. 11

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

✓ **Mathematica** : cpu = 0.0230685 (sec), leaf count = 66

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

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

✓ **Maple** : cpu = 0.015 (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

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

2.12 ODE No. 12

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

✓ **Mathematica** : cpu = 0.058582 (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 = 0.027 (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

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

This is separable. Hence

$$\begin{aligned} \frac{dy}{dx}\frac{1}{1 - y^2(x)} &= 1 \\ \frac{dy}{1 - y^2(x)} &= dx \end{aligned}$$

Integrating

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

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 $\int \frac{dy}{1-y^2(x)} = \tanh^{-1}(y)$ and the above becomes

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

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

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

2.13 ODE No. 13

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

✓ **Mathematica** : cpu = 0.0760734 (sec), leaf count = 79

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

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{a}\,\text{AiryBiPrime}\left(\frac{b+ax}{a^{2/3}}\right)+\sqrt[3]{a}c_1\,\text{AiryAiPrime}\left(\frac{b+ax}{a^{2/3}}\right)}{-\text{AiryBi}\left(\frac{b+ax}{a^{2/3}}\right)-c_1\,\text{AiryAi}\left(\frac{b+ax}{a^{2/3}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.125 (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

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

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

2.14 ODE No. 14

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

✓ **Mathematica** : cpu = 0.116882 (sec), leaf count = 602

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

$$\left\{\left\{y(x) \to -\frac{\frac{1}{2}(m+2)^{-\frac{1}{m+2}} a^{\frac{1}{2(m+2)}+\frac{1}{2}} x^{\frac{m+2}{2}-\frac{\frac{m}{2}+1}{m+2}} \text{Gamma}\left(1+\frac{1}{m+2}\right)\left(\text{BesselJ}\left(\frac{1}{m+2}-1, \frac{2\sqrt{a}x^{\frac{m+2}{2}}}{m+2}\right) - \text{BesselJ}\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 187

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

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

Hand solution

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

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

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

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

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

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

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

2.15 ODE No. 15

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

✓ **Mathematica** : cpu = 0.0567622 (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 = 0.114 (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))
```

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

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

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

To obtain same solution as Maple, we divide by C_1

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

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

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

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

2.16 ODE No. 16

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

✓ **Mathematica** : cpu = 0.0412629 (sec), leaf count = 186

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

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

✓ **Maple** : cpu = 0.05 (sec), leaf count = 49

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

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

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

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

2.17 ODE No. 17

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

✓ **Mathematica** : cpu = 0.046689 (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 = 0.077 (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 $\frac{-b\pm\sqrt{b^2-4ac}}{2a} = \frac{3\pm\sqrt{9+16}}{2} = \frac{3\pm5}{2} = \{4, -1\}$, hence

$$u(x) = c_1e^{4x} + c_2e^{-x}$$

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

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

2.18 ODE No. 18

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

✓ **Mathematica** : cpu = 0.0659815 (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 = 0.04 (sec), leaf count = 39

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

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

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

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

2.19 ODE No. 19

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

✓ **Mathematica** : cpu = 0.0451652 (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 = 0.033 (sec), leaf count = 16

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

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

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

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

Since $u = y + x$ then

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

2.20 ODE No. 20

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

✓ **Mathematica** : cpu = 0.0845581 (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 = 0.045 (sec), leaf count = 34

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

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

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

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

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

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

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

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

2.21 ODE No. 21

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

✓ **Mathematica** : cpu = 0.331349 (sec), leaf count = 71

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

$$\left\{\left\{y(x)\to -\frac{-\sin(x)e^{\cos(x)}+c_1\left(1-\sin(x)e^{\cos(x)}\int_1^x e^{-\cos(K[1])}dK[1]\right)}{e^{\cos(x)}+c_1e^{\cos(x)}\int_1^x e^{-\cos(K[1])}dK[1]}\right\}\right\}$$

✓ **Maple** : cpu = 0.131 (sec), leaf count = 25

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

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

Hand solution

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

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

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

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

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

2.22 ODE No. 22

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

✓ **Mathematica** : cpu = 0.543886 (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 = 0.39 (sec), leaf count = 97

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

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

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

I·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

2.23 ODE No. 23

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

✓ **Mathematica** : cpu = 0.0562934 (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 = 0.028 (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

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

Separable,

$$\begin{aligned}\frac{dy}{b - ay^2} &= dx\\ \int \frac{dy}{b - ay^2} &= \int dx\end{aligned}$$

But

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

Hence

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

2.24 ODE No. 24

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

✓ **Mathematica** : cpu = 0.10206 (sec), leaf count = 733

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

$$\left\{\left\{y(x) \to \frac{\frac{1}{2}(-1)^{\frac{1}{\nu+2}}(\nu+2)^{-\frac{1}{\nu+2}}a^{\frac{1}{2(\nu+2)}+\frac{1}{2}}b^{\frac{1}{2(\nu+2)}+\frac{1}{2}}x^{\frac{\nu+2}{2}-\frac{\frac{\nu}{2}+1}{\nu+2}}\,\text{Gamma}\left(1+\frac{1}{\nu+2}\right)\left(\text{BesselI}\left(\frac{1}{\nu+2}-1, \frac{2\sqrt{a}\sqrt{b}x^{\frac{\nu+2}{2}}}{\nu+2}\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 214

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

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

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 $ab>0$

2.25 ODE No. 25

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

✓ **Mathematica** : cpu = 0.244886 (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]
```

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

✓ **Maple** : cpu = 0.272 (sec), leaf count = 348

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

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

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.

2.26 ODE No. 26

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

✓ **Mathematica** : cpu = 0.13651 (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 = 0.256 (sec), leaf count = 45

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

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

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
```

2.27 ODE No. 27

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

✓ **Mathematica** : cpu = 0.262738 (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 = 0.122 (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 $e^{-\int ax dx} = e^{-a\frac{x^2}{2}}$, 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
```

2.28 ODE No. 28

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

✓ **Mathematica** : cpu = 0.112447 (sec), leaf count = 96

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

$$\left\{\left\{y(x)\to \frac{\frac{1}{2}\sqrt{\pi}e^{\frac{x^4}{4}}x^3\text{erf}\left(\frac{x^2}{2}\right)+c_1e^{\frac{x^4}{4}}x^3+x}{x\left(\frac{1}{2}\sqrt{\pi}e^{\frac{x^4}{4}}\text{erf}\left(\frac{x^2}{2}\right)+c_1e^{\frac{x^4}{4}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.059 (sec), leaf count = 51

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

$$y(x) = \frac{\text{erf}\left(\frac{x^2}{2}\right)\sqrt{\pi}\,c_1x^2 + x^2\sqrt{\pi} + 2\,e^{-\frac{x^4}{4}}c_1}{\sqrt{\pi}\left(\text{erf}\left(\frac{x^2}{2}\right)c_1+1\right)}$$

Hand solution

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

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
```

2.29 ODE No. 29

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

✓ **Mathematica** : cpu = 0.0574116 (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 = 0.007 (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
```

2.30 ODE No. 30

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

✓ **Mathematica** : cpu = 0.123609 (sec), leaf count = 230

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

$$\left\{\left\{y(x)\to \frac{x^{a+1}\left(-\frac{1}{2}(-1)^{-a}ax^{-\frac{a}{2}-1}\,\mathrm{Gamma}(1-a)\,\mathrm{BesselI}\left(-a,2\sqrt{x}\right)+\frac{1}{2}(-1)^{-a}x^{-\frac{a}{2}-\frac{1}{2}}\,\mathrm{Gamma}(1-a)\left(\mathrm{Bessel}\right.\right.}{(-1)^{-a}x^{-a/2}}\right.\right.$$

✓ **Maple** : cpu = 0.051 (sec), leaf count = 54

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

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

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

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

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 $n\geq 1$

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

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

$$\begin{aligned}u_{r=0}(x)&=\sum_{n=1}^{\infty}c_n x^n\\ &=c_0+c_1x+c_2x^2+\cdots\\ &=c_0x^0+\frac{c_0}{1\ +\ a}x+\frac{c_0}{1\ +\ a}\frac{1}{2(2\ +a)}x^2+\frac{c_0}{1\ +\ a}\frac{1}{2(2\ +a)}\frac{1}{3(3\ +a)}x^3+\cdots\\ &=c_0\left(x^0+\frac{1}{1\ +\ a}x+\frac{1}{(1\ +\ a)}\frac{1}{2(2\ +a)}x^2+\frac{1}{(1\ +\ a)}\frac{1}{2(2\ +a)}\frac{1}{3(3\ +a)}x^3+\cdots\right)\end{aligned}\tag{5}$$

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

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

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

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

Hence

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

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

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

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

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

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

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

Modified Bessel function of second kind is $\text{BesselK}(a,z) = \frac{\pi}{2}\frac{1}{\sin(a\pi)}(\text{BesselI}(-a,z) - \text{BesselI}(a,z))$. 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

$$
\begin{aligned}
\frac{d}{dx}\frac{1}{\sqrt{x^a}}\operatorname{BesselI}\left(a,2\sqrt{x}\right) &= \frac{1}{\sqrt{x^{1+a}}}\operatorname{BesselI}\left(1+a,2\sqrt{x}\right)\\
\frac{d}{dx}\frac{1}{\sqrt{x^a}}\operatorname{BesselI}\left(a,2\sqrt{x}\right) &= -\frac{1}{\sqrt{x^{1+a}}}\operatorname{BesselK}\left(1+a,2\sqrt{x}\right)
\end{aligned}
$$

Hence

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

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

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

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

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

Or

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

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
```

2.31 ODE No. 31

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

✓ **Mathematica** : cpu = 0.128223 (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 = 0.042 (sec), leaf count = 23

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

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

Hand solution

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

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

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

Integrating

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

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
```

2.32 ODE No. 32

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

✓ **Mathematica** : cpu = 0.352956 (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 = 0.193 (sec), leaf count = 28

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

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

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

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

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
```

2.33 ODE No. 33

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

✓ **Mathematica** : cpu = 0.296287 (sec), leaf count = 160

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

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

✓ **Maple** : cpu = 0.348 (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

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

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

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

To do.

2.34 ODE No. 34

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

✓ **Mathematica** : cpu = 0.0733697 (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 = 0.016 (sec), leaf count = 28

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

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

Hand solution

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

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

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

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
```

2.35 ODE No. 35

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

✓ **Mathematica** : cpu = 0.0912469 (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 = 0.031 (sec), leaf count = 35

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

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

Hand solution

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

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

$$
\begin{aligned}
u''(x) - \frac{(u'(x))^2}{u(x)} - \frac{u'(x)\,f'(x)}{f(x)} &= -2au'(x)\,f(x) - u(x)\,bf^2(x) - \frac{u'(x)^2}{u(x)} \\
u''(x) - \frac{u'(x)\,f'(x)}{f(x)} &= -2au'(x)\,f(x) - u(x)\,bf^2(x)
\end{aligned}
$$

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

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

$$
\begin{aligned}
u'(x) = {} & \frac{C_1\,f(x)\sqrt{-b}}{b}\left(\sqrt{\frac{-a^2+b}{b}}b + \sqrt{-b}a\right)e^{\frac{\int f(x)\sqrt{-b}\,\mathrm{d}x}{b}\left(\sqrt{\frac{-a^2+b}{b}}b+\sqrt{-b}a\right)} \\
& + \frac{C_2\,f(x)\sqrt{-b}}{b}\left(-\sqrt{\frac{-a^2+b}{b}}b + \sqrt{-b}a\right)e^{\frac{\int f(x)\sqrt{-b}\,\mathrm{d}x}{b}\left(-\sqrt{\frac{-a^2+b}{b}}b+\sqrt{-b}a\right)}
\end{aligned}
$$

Therefore

$$
\begin{aligned}
y &= \frac{u'(x)}{u(x)\,f(x)} \\
&= \frac{\frac{C_1\,f(x)\sqrt{-b}}{b}\left(\sqrt{\frac{-a^2+b}{b}}b + \sqrt{-b}a\right)e^{\frac{\int f(x)\sqrt{-b}\,\mathrm{d}x}{b}\left(\sqrt{\frac{-a^2+b}{b}}b+\sqrt{-b}a\right)} + \frac{C_2\,f(x)\sqrt{-b}}{b}\left(-\sqrt{\frac{-a^2+b}{b}}b + \sqrt{-b}a\right)e^{\frac{\int f(x)\sqrt{-b}\,\mathrm{d}x}{b}\left(-\sqrt{\frac{-a^2+b}{b}}b+\sqrt{-b}a\right)}}{f(x)\left[C_1 \exp\left(\frac{\int f(x)\sqrt{-b}dx\left(\sqrt{\frac{b-a^2}{b}}b+a\sqrt{-b}\right)}{b}\right) + C_2 \exp\left(\frac{\int f(x)\sqrt{-b}dx\left(-\sqrt{\frac{b-a^2}{b}}b+a\sqrt{-b}\right)}{b}\right)\right]}
\end{aligned}
$$

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
```

2.36 ODE No. 36

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

✓ **Mathematica** : cpu = 0.234234 (sec), leaf count = 195

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

$$\text{Solve}\left[\frac{\text{AiryAiPrime}\left(\frac{\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}}{y(x)} - \frac{1}{2}\sqrt[3]{-\frac{1}{2}}a^{4/3}x^2\right) - \left(-\frac{1}{2}\right)^{2/3}a^{2/3}x\,\text{AiryAi}\left(\frac{\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}}{y(x)} - \frac{1}{2}\sqrt[3]{-\frac{1}{2}}a^{4/3}x^2\right)}{\text{AiryBiPrime}\left(\frac{\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}}{y(x)} - \frac{1}{2}\sqrt[3]{-\frac{1}{2}}a^{4/3}x^2\right) - \left(-\frac{1}{2}\right)^{2/3}a^{2/3}x\,\text{AiryBi}\left(\frac{\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}}{y(x)} - \frac{1}{2}\sqrt[3]{-\frac{1}{2}}a^{4/3}x^2\right)} + c_1 = 0, y\right.$$

✓ **Maple** : cpu = 0.052 (sec), leaf count = 62

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

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

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

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

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

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

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

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

We now go back to (3) and find x

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

Since

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

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.

2.37 ODE No. 37

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

✓ **Mathematica** : cpu = 0.67887 (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 = 0.063 (sec), leaf count = 50

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

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

2.38 ODE No. 38

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

✓ **Mathematica** : cpu = 0.31404 (sec), leaf count = 320

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

$$\text{Solve}\left[\frac{2}{3}ab^2\text{RootSum}\left[8\#1^9ab^2+24\#1^6ab^2+24\#1^3ab^2+\#1^3+8ab^2\&,\frac{4\#1^6\log\left(y(x)\sqrt[3]{\frac{ax^{3/2}}{b}}-\#1\right)+2\#1^4\right.\right.$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 34

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

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

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.

2.39 ODE No. 39

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

✓ **Mathematica** : cpu = 0.095104 (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 = 0.009 (sec), leaf count = 30

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

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

2.40 ODE No. 40

$$3ay(x)^3 + 6axy(x)^2 + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.309808 (sec), leaf count = 185

```
DSolve[6*a*x*y[x]^2 + 3*a*y[x]^3 + Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{\sqrt[3]{-3}\sqrt[3]{a}x\,\text{AiryAi}\left((-3)^{2/3}a^{2/3}x^2-\frac{(-1)^{2/3}}{\sqrt[3]{3}\sqrt[3]{a}y(x)}\right)+\text{AiryAiPrime}\left((-3)^{2/3}a^{2/3}x^2-\frac{(-1)^{2/3}}{\sqrt[3]{3}\sqrt[3]{a}y(x)}\right)}{\sqrt[3]{-3}\sqrt[3]{a}x\,\text{AiryBi}\left((-3)^{2/3}a^{2/3}x^2-\frac{(-1)^{2/3}}{\sqrt[3]{3}\sqrt[3]{a}y(x)}\right)+\text{AiryBiPrime}\left((-3)^{2/3}a^{2/3}x^2-\frac{(-1)^{2/3}}{\sqrt[3]{3}\sqrt[3]{a}y(x)}\right)}+c_1=0,y(x$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 48

```
dsolve(diff(y(x),x)+3*a*y(x)^3+6*a*x*y(x)^2 = 0,y(x))
```

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

2.41 ODE No. 41

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

✓ **Mathematica** : cpu = 0.187793 (sec), leaf count = 103

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

$$\text{Solve}\left[-\frac{b^2\left(\frac{2\arctan\left(\frac{-2axy(x)-b}{b\sqrt{-\frac{4a}{b^2}-1}}\right)}{\sqrt{-\frac{4a}{b^2}-1}}-\log\left(\frac{a(-x)y(x)(-axy(x)-b)-a}{a^2x^2y(x)^2}\right)\right)}{2a}=-\frac{b^2\log(x)}{a}+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.208 (sec), leaf count = 103

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

$$y(x)=\frac{e^{\text{RootOf}\left(2\sqrt{b^2+4a}\,b\,\text{arctanh}\left(\frac{2a\,e^{\_Z}+b}{\sqrt{b^2+4a}}\right)-\ln\left(x^2\left(a\,e^{2\_Z}+b\,e^{\_Z}-1\right)\right)b^2+2c_1b^2+2\_Zb^2-4\ln\left(x^2\left(a\,e^{2\_Z}+b\,e^{\_Z}-1\right)\right)a+8c_1a+8\_Za\right)}}{x}$$

2.42 ODE No. 42

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

✓ **Mathematica** : cpu = 0.747098 (sec), leaf count = 485

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

$$\text{Solve}\left[c_1 = -\frac{\frac{i\sqrt{\frac{2}{\pi}}\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}\left(\frac{\sinh\left(\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}\right)}{\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}}-\cosh\left(\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}\right)\right)}{\sqrt{-i\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}}} - \frac{i\sqrt{\frac{2}{\pi}}\left(\frac{x+1}{2}+\frac{1}{2}\right)\sinh\left(\sqrt{\frac{1}{2y(x)}+\frac{1}{4}\right.}{\sqrt{-i\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2}}}}{\frac{i\sqrt{\frac{2}{\pi}}\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}\left(i\sinh\left(\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}\right)-\frac{i\cosh\left(\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}\right)}{\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}}\right)}{\sqrt{-i\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)^2-\frac{1}{4}}}} - \frac{\sqrt{\frac{2}{\pi}}\left(\frac{x+1}{2}+\frac{1}{2}\right)\cosh\left(\sqrt{\frac{1}{2y(x)}+\right.}{\sqrt{-i\sqrt{\frac{1}{2y(x)}+\frac{1}{4}(x+1)}}}}\right.$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 40

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

$$c_1 + \operatorname{arctanh}\left(\frac{\sqrt{y(x)}\,x}{\sqrt{x(x+2)\,y(x)+2}}\right) + \frac{\sqrt{x(x+2)\,y(x)+2}}{2\sqrt{y(x)}} = 0$$

2.43 ODE No. 43

$$y(x)^3\left(4a^2x+3ax^2+b\right)+y'(x)+3xy(x)^2=0$$

✓ **Mathematica** : cpu = 4.05225 (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]
```

$$\text{Solve}\left[c_1=-\frac{i\sqrt{-\frac{4a^3-3b}{4a^3}-\frac{3}{2a^2y(x)}+\frac{(-2a-3x)^2}{4a^2}}\,\text{BesselJ}\left(\frac{1}{2}\sqrt{\frac{4a^3-3b}{a^3}}+1,-i\sqrt{\frac{(-2a-3x)^2}{4a^2}-\frac{4a^3-3b}{4a^3}-\frac{3}{2a^2y(x)}}\right)+\left(\right.}{i\sqrt{-\frac{4a^3-3b}{4a^3}-\frac{3}{2a^2y(x)}+\frac{(-2a-3x)^2}{4a^2}}\,\text{BesselY}\left(\frac{1}{2}\sqrt{\frac{4a^3-3b}{a^3}}+1,-i\sqrt{\frac{(-2a-3x)^2}{4a^2}-\frac{4a^3-3b}{4a^3}-\frac{3}{2a^2y(x)}}\right)+\left(\right.}\right.$$

✓ **Maple** : cpu = 1.075 (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))
```

$$c_1+\frac{-\text{BesselK}\left(\frac{\sqrt{\frac{4a^3-3b}{a^3}}}{2}+1,-\frac{\sqrt{3}\sqrt{\frac{4y(x)a^2x+3y(x)a\,x^2+by(x)-2a}{a^3y(x)}}}{2}\right)\sqrt{3}\sqrt{\frac{4y(x)a^2x+3y(x)a\,x^2+by(x)-2a}{a^3y(x)}}\,a-\left(a\sqrt{\frac{4a^3-3b}{a^3}}-2\right.}{\text{BesselI}\left(\frac{\sqrt{\frac{4a^3-3b}{a^3}}}{2}+1,-\frac{\sqrt{3}\sqrt{\frac{4y(x)a^2x+3y(x)a\,x^2+by(x)-2a}{a^3y(x)}}}{2}\right)\sqrt{3}\sqrt{\frac{4y(x)a^2x+3y(x)a\,x^2+by(x)-2a}{a^3y(x)}}\,a-\left(a\sqrt{\frac{4a^3-3b}{a^3}}-2a\right.}$$

2.44 ODE No. 44

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

✓ **Mathematica** : cpu = 0.0758141 (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 = 0.01 (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 $e^{-4\int x dx} = e^{-2x^2}$ 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
```

2.45 ODE No. 45

$$2y(x)^3\left(a^2x^3-b^2x\right)+3by(x)^2+y'(x)=0$$

✓ **Mathematica** : cpu = 0.403762 (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]
```

$$\text{Solve}\left[c_1=\sqrt[4]{\left(\frac{b}{ax}-\frac{1}{ax^2y(x)}\right)^2-1}\left(-\frac{\left(\frac{b}{ax}-\frac{1}{ax^2y(x)}\right)\text{Hypergeometric2F1}\left(\frac{1}{2},\frac{3}{4},\frac{3}{2},\left(\frac{b}{ax}-\frac{1}{ax^2y(x)}\right)^2\right)}{2\sqrt[4]{1-\left(\frac{b}{ax}-\frac{1}{ax^2y(x)}\right)^2}}-\frac{ax}{b}\right)\right.$$

✓ **Maple** : cpu = 0.104 (sec), leaf count = 108

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

$$c_1+\frac{\left(-1+a^2\left(\frac{x}{b}+\frac{1}{b^2y(x)-\frac{b}{x}}\right)^2\right)^{\frac{1}{4}}ax}{b\left(bxy\left(x\right)-1\right)\sqrt{a\left(\frac{x}{b}+\frac{1}{b^2y(x)-\frac{b}{x}}\right)}}-\left(\int^{\frac{a\,x^2y(x)}{bxy(x)-1}}\frac{\left(\_a^2-1\right)^{\frac{1}{4}}}{\sqrt{\_a}}d\_a\right)=0$$

2.46 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 = 0.194197 (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,y[x],x]
```

$$\left\{\left\{y(x)\to x^{-a}-\frac{e^{-\frac{2x^{1-a}}{1-a}}}{\sqrt{-\frac{2^{\frac{2(a+1)}{a-1}+1}x^{a+1}\left(\frac{x^{1-a}}{1-a}\right)^{\frac{a+1}{a-1}}\Gamma\left(\frac{a+1}{1-a},-\frac{4x^{1-a}}{a-1}\right)}{a-1}+c_1}}\right\},\left\{y(x)\to x^{-a}+\frac{e^{-\frac{2x^{1-a}}{1-a}}}{\sqrt{-\frac{2^{\frac{2(a+1)}{a-1}+1}x^{a+1}\left(\frac{x^{1-a}}{1-a}\right)^{\frac{a+1}{a-1}}}{a-1}}}\right.$$

✓ **Maple** : cpu = 0.077 (sec), leaf count = 690

```
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))
```

$$y(x)=-\frac{\mathrm{e}^{\frac{2x\,x^{-}}{a-1}}}{\sqrt{c_1-\frac{2\,2^{\frac{-2a-2}{1-a}}\left(\frac{1}{1-a}\right)^{\frac{-a-1}{1-a}}(1-a)\mathrm{e}^{\frac{2x^{1-a}}{a-1}}x^{-\frac{a^2}{1-a}+\frac{1}{1-a}-1+a}\left(\frac{1}{1-a}\right)^{\frac{a+1}{1-a}}\left(\frac{x^{1-a}}{1-a}\right)^{\frac{1}{a-1}}\left(2\,\mathrm{WhittakerM}\left(-\frac{a}{a-1},-\frac{1}{a-1}+\frac{1}{2},-\frac{4x^{1-a}}{a-1}\right.\right.}{(-3+}}}$$

2.47 ODE No. 47

$$-a(x^n - x)\,y(x)^3 + y'(x) - y(x)^2 = 0$$

✗ **Mathematica** : cpu = 25.8865 (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))

2.48 ODE No. 48

$$-(y(x)^3(ax^n+bx))-cy(x)^2+y'(x)=0$$

✗ **Mathematica** : cpu = 27.2861 (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))

2.49 ODE No. 49

$$a y(x)^3 \phi'(x)+\frac{(2a+1)y(x)\phi''(x)}{\phi'(x)}+6a\phi(x)y(x)^2+2a+y'(x)+2=0$$

✗ **Mathematica** : cpu = 23.4363 (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] + ((1 + 2*a
```

, 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][x] +`

✗ **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),
```

, 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(phi(x),`

2.50 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 = 55.9197 (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[x], x

✗ **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))

2.51 ODE No. 51

$$-h(x)(y(x)-f(x))(y(x)-g(x))\left(y(x)-\frac{af(x)+bg(x)}{a+b}\right)-\frac{f'(x)(y(x)-g(x))}{f(x)-g(x)}-\frac{(y(x)-f(x))g'(x)}{g(x)-f(x)}+y'(x)=0$$

✓ **Mathematica** : cpu = 1.08546 (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] + y[x])*
```

$$\text{Solve}\left[-\frac{1}{3}(a-b)^{2/3}(2a+b)^{2/3}(a+2b)^{2/3}\text{RootSum}\left[\#1^3(a-b)^{2/3}(2a+b)^{2/3}(a+2b)^{2/3}-3\#1a^2-3\#1ab-3\#\right.\right.$$

✓ **Maple** : cpu = 1.33 (sec), leaf count = 648

```
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)*(
```

$$y(x)=\frac{(f(x)-g(x))\,(a+2b)\,\mathrm{e}^{\text{RootOf}\left(3c_1a^3b+6c_1a^2b^2+3c_1ab^3-2a^3b\left(\int h(x)f(x)g(x)dx\right)-2a^2b^2\left(\int h(x)f(x)g(x)dx\right)-2ab^3\left(\int h(x)f(\right.\right.}}{}$$

2.52 ODE No. 52

$$-ay(x)^n - bx^{\frac{n}{1-n}} + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.289315 (sec), leaf count = 117

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

$$\text{Solve}\left[\int_1^{\left(\frac{ax^{-\frac{n}{1-n}}}{b}\right)^{\frac{1}{n}} y(x)} \frac{1}{K[1]^n - \left(\frac{(-1)^n b^{1-n}(n-1)^{-n}}{a}\right)^{\frac{1}{n}} K[1] + 1} dK[1] = \int_1^x bK[2]^{\frac{n}{1-n}} \left(\frac{aK[2]^{-\frac{n}{1-n}}}{b}\right)^{\frac{1}{n}} dK[2] + c\right.$$

✓ **Maple** : cpu = 0.352 (sec), leaf count = 54

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

$$\int_{\_b}^{y(x)} \frac{x^{\frac{n}{n-1}}}{\left(ax\,(n-1)\,\_a^n + \_a\right) x^{\frac{n}{n-1}} + bx\,(n-1)} d\_a - c_1 = 0$$

2.53 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 = 0.365672 (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*Derivativ
```

$$\text{Solve}\left[\int_1^{\left(f(x)^{-n}(b+ag(x))^{-n}\right)^{\frac{1}{n}}y(x)}\frac{1}{K[1]^n-(a^n)^{\frac{1}{n}}K[1]+1}dK[1]=\frac{f(x)(ag(x)+b)\log(ag(x)+b)\left(f(x)^{-n}(ag(x)+\right.}{a}\right.$$

✓ **Maple** : cpu = 0.204 (sec), leaf count = 214

```
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
```

$$y(x)=\frac{\text{RootOf}\left(-f(x)^n\left(ag(x)+b\right)^n\left(\left(\frac{d}{dx}g(x)\right)^3nf(x)^{2-n}a(ag(x)+b)^{-n-1}\right)^n\left(\int^{-Z}\frac{}{\_af(x)^n(ag(x)+b)^n\left(\left(\frac{d}{dx}g(x)\right)\right.}\right.\right.}{}$$

2.54 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 = 0.30716 (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]^n*Deriva
```

$$\text{Solve}\left[y(x)\left(a^n f(x)^{-n}\right)^{\frac{1}{n}} \text{Hypergeometric2F1}\left(1, \frac{1}{n}, 1+\frac{1}{n}, -\left(\left(a^n f(x)^{-n}\right)^{\frac{1}{n}} y(x)\right)^n\right) = f(x) g(x)\left(a^n f(x)^{-n}\right)^{\frac{1}{n}} +\right.$$

✓ **Maple** : cpu = 0.134 (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)
```

$$\frac{a y(x) \operatorname{LerchPhi}\left(-\left(\frac{a y(x)}{f(x)}\right)^n, 1, \frac{1}{n}\right)}{n f(x)} - a g(x) + c_1 = 0$$

2.55 ODE No. 55

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

✗ **Mathematica** : cpu = 2.36625 (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))`

2.56 ODE No. 56

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

✗ **Mathematica** : cpu = 0.871168 (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))
```

2.57 ODE No. 57

$$y'(x) - \sqrt{|y(x)|} = 0$$

✓ **Mathematica** : cpu = 0.0440468 (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 = 0.049 (sec), leaf count = 31

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

$$x - \left(\begin{cases} -2\sqrt{-y(x)} & y(x) \leq 0 \\ 2\sqrt{y(x)} & 0 < y(x) \end{cases}\right) + c_1 = 0$$

2.58 ODE No. 58

$$a\left(-\sqrt{y(x)}\right) - bx + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.25421 (sec), leaf count = 119

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

$$\text{Solve}\left[\frac{a^2\left(-\frac{2a\operatorname{arctanh}\left(\frac{a^2-4b\sqrt{\frac{a^2y(x)}{b^2x^2}}}{a\sqrt{a^2+8b}}\right)}{\sqrt{a^2+8b}} - \log\left(a^2\left(\sqrt{\frac{a^2y(x)}{b^2x^2}}+1\right) - \frac{2a^2y(x)}{bx^2}\right)\right)}{2b} = \frac{a^2\log(x)}{b} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.053 (sec), leaf count = 68

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

$$-\frac{\ln\left(\sqrt{y(x)}\,ax + b\,x^2 - 2y(x)\right)}{2} + \frac{a\sqrt{y(x)}\operatorname{arctanh}\left(\frac{a\sqrt{y(x)}+2bx}{\sqrt{y(x)(a^2+8b)}}\right)}{\sqrt{y(x)(a^2+8b)}} + c_1 = 0$$

2.59 ODE No. 59

$$a\left(-\sqrt{y(x)^2+1}\right)-b+y'(x)=0$$

✓ **Mathematica** : cpu = 0.251578 (sec), leaf count = 84

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

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{\frac{2b\arctan\left(\frac{\left(\sqrt{\#1^2+1}-\#1\right)a+b}{\sqrt{a^2-b^2}}\right)}{\sqrt{a^2-b^2}}-\log\left(\sqrt{\#1^2+1}-\#1\right)}{a}\&\right][x+c_1]\right\}\right\}$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 26

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

$$x-\left(\int^{y(x)}\frac{1}{a\sqrt{\_a^2+1}+b}d\_a\right)+c_1=0$$

2.60 ODE No. 60

$$y'(x) - \frac{\sqrt{y(x)^2-1}}{\sqrt{x^2-1}} = 0$$

✓ **Mathematica** : cpu = 0.0950992 (sec), leaf count = 173

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

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

✓ **Maple** : cpu = 0.017 (sec), leaf count = 29

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

$$\ln\left(x+\sqrt{x^2-1}\right) - \ln\left(y(x)+\sqrt{y(x)^2-1}\right) + c_1 = 0$$

Hand solution

$$y' = \pm\frac{\sqrt{y^2-1}}{\sqrt{x^2-1}} \tag{1}$$

Separable. For the positive case

$$\begin{aligned}\frac{dy}{dx}\frac{1}{\sqrt{y^2-1}} &= \frac{1}{\sqrt{x^2-1}}\\ \frac{dy}{(y^2-1)^{\frac{1}{2}}} &= \frac{dx}{(x^2-1)^{\frac{1}{2}}}\end{aligned}$$

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

$$\ln\left(y+\sqrt{y^2-1}\right) = \ln\left(x+\sqrt{x^2-1}\right) + C$$

For the negative case

$$\begin{aligned}\frac{dy}{dx}\frac{1}{\sqrt{y^2-1}} &= -\frac{1}{\sqrt{x^2-1}}\\ \frac{dy}{(y^2-1)^{\frac{1}{2}}} &= -\frac{dx}{(x^2-1)^{\frac{1}{2}}}\end{aligned}$$

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

$$\ln\left(y+\sqrt{y^2-1}\right) = \pm\ln\left(x+\sqrt{x^2-1}\right) + C$$

2.61 ODE No. 61

$$y'(x) - \frac{\sqrt{x^2-1}}{\sqrt{y(x)^2-1}} = 0$$

✓ **Mathematica** : cpu = 0.150148 (sec), leaf count = 79

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

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{1}{2}\#1\sqrt{\#1^2-1} - \operatorname{arctanh}\left(\frac{\sqrt{\#1^2-1}}{\#1-1}\right)\&\right]\left[-\operatorname{arctanh}\left(\frac{\sqrt{x^2-1}}{x-1}\right) + \frac{1}{2}\sqrt{x^2-1}x\right.\right.\right.$$

✓ **Maple** : cpu = 0.009 (sec), leaf count = 50

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

$$c_1 + x\sqrt{x^2-1} - \ln\left(x+\sqrt{x^2-1}\right) - y(x)\sqrt{y(x)^2-1} + \ln\left(y(x)+\sqrt{y(x)^2-1}\right) = 0$$

2.62 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 = 1.76024 (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][x] == 0,
```

$$\text{Solve}\left[-\arctan\left(\frac{\sqrt{x^2 - y(x)^2}}{y(x)}\right) + \frac{x^2}{2} + \frac{y(x)^2}{2} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.277 (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))
```

$$\frac{y(x)^2}{2} + \arctan\left(\frac{y(x)}{\sqrt{x^2 - y(x)^2}}\right) + \frac{x^2}{2} - c_1 = 0$$

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 $M=x\left(1+u^2\right), N=\left(x^2u+\frac{1}{\sqrt{1-u^2}}\right)$.

$$
\begin{aligned}
\frac{\partial M}{\partial u} &= 2xu\\
\frac{\partial N}{\partial x} &= 2xu
\end{aligned}
$$

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

$$U(x,u) = \frac{x^2}{2}(1+u^2) + \arcsin(u)$$

Since $dU = 0$ then

$$\begin{aligned}
\frac{x^2}{2}(1+u^2) + \arcsin(u) &= C \\
\frac{x^2}{2}(1+u^2) + \arcsin(u) - C &= 0
\end{aligned}$$

Since $y = ux$ then the above can be written as

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

Hence

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

2.63 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 = 0.0944744 (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,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{\left|K[1] + \sqrt{K[1]+1}\right|}{K[1]^2+1} dK[1]\&\right]\left[-\frac{2}{\sqrt{x+1}} + c_1\right]\right\}\right\}$$

✓ **Maple** : cpu = 7.04 (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))
```

$$-\frac{2}{\sqrt{1+x}} - \left(\int^{y(x)} \frac{|\_a + \sqrt{\_a+1}|}{\_a^2+1} d\_a\right) + c_1 = 0$$

2.64 ODE No. 64

$$y'(x) - \sqrt{\frac{ay(x)^2 + by(x) + c}{ax^2 + bx + c}} = 0$$

✓ **Mathematica** : cpu = 0.351179 (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]
```

$$\left\{\left\{y(x) \to \frac{e^{-\sqrt{a}c_1}\left(-8a^{3/2}c\sqrt{ax^2+bx+c} + 8a^{3/2}ce^{2\sqrt{a}c_1}\sqrt{ax^2+bx+c} + 8a^2cx + 8a^2cxe^{2\sqrt{a}c_1} + 2b^3e^{\sqrt{a}c_1} - b^3\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.102 (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))
```

$$-\frac{\sqrt{\frac{ay(x)^2+by(x)+c}{a\,x^2+bx+c}}\,\sqrt{a\,x^2+bx+c}\,\ln\left(\frac{2\sqrt{a\,x^2+bx+c}\,\sqrt{a}+2ax+b}{2\sqrt{a}}\right)}{\sqrt{ay\left(x\right)^2+by\left(x\right)+c}\,\sqrt{a}} + \frac{\ln\left(\sqrt{ay\left(x\right)^2+by\left(x\right)+c}+\frac{2ay(x)+b}{2\sqrt{a}}\right)}{\sqrt{a}} + c_1 = 0$$

2.65 ODE No. 65

$$y'(x) - \sqrt{\frac{y(x)^3 + 1}{x^3 + 1}} = 0$$

✓ **Mathematica** : cpu = 51.7435 (sec), leaf count = 312

```
DSolve[-Sqrt[(1 + y[x]^3)/(1 + x^3)] + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\frac{i(\#1+1)\sqrt{1+\frac{6i}{\left(\sqrt{3}-3i\right)(\#1+1)}}\sqrt{\frac{2}{3}-\frac{4i}{\left(\sqrt{3}+3i\right)(\#1+1)}}\,\text{EllipticF}\left(i\text{arcsinh}\left(\frac{\sqrt{-\frac{6i}{3i+\sqrt{3}}}}{\sqrt{\#1+1}}\right)\right.}{\sqrt{-\frac{i}{\sqrt{3}+3i}}\sqrt{\#1^2-\#1+1}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 47

```
dsolve(diff(y(x),x)-((y(x)^3+1)/(x^3+1))^(1/2) = 0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{\_a^3+1}} d\_a + \int^{x} -\frac{\sqrt{\frac{y(x)^3+1}{\_a^3+1}}}{\sqrt{y(x)^3+1}} d\_a + c_1 = 0$$

2.66 ODE No. 66

$$y'(x) - \frac{\sqrt{|(1-y(x))y(x)(1-ay(x))|}}{\sqrt{|(1-x)x(1-ax)|}} = 0$$

✓ **Mathematica** : cpu = 0.12691 (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[1][y][x
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{\sqrt{|(1-K[1])K[1](1-aK[1])|}} dK[1]\&\right]\left[\int_1^x \frac{1}{\sqrt{|(1-K[2])K[2](1-aK[2])|}} d\right.\right.\right.$$

✓ **Maple** : cpu = 0.085 (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
```

$$\int \frac{1}{\sqrt{|x(x-1)(ax-1)|}} dx - \left(\int^{y(x)} \frac{1}{\sqrt{|\_a(\_a-1)(\_aa-1)|}} d\_a\right) + c_1 = 0$$

2.67 ODE No. 67

$$y'(x) - \frac{\sqrt{1 - y(x)^4}}{\sqrt{1 - x^4}} = 0$$

✓ **Mathematica** : cpu = 20.1741 (sec), leaf count = 14

```
DSolve[-(Sqrt[1 - y[x]^4]/Sqrt[1 - x^4]) + Derivative[1][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to \mathrm{sn}(c_1 + \mathrm{EllipticF}(\arcsin(x), -1)| - 1)\}\}$$

✓ **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))
```

$$\frac{\sqrt{-x^2+1}\sqrt{x^2+1}\,\mathrm{EllipticF}(x, i)}{\sqrt{-x^4+1}} - \left(\int^{y(x)} \frac{1}{\sqrt{-\_a^4+1}} d\_a\right) + c_1 = 0$$

2.68 ODE No. 68

$$y'(x) - \sqrt{\frac{ay(x)^4 + by(x)^2 + 1}{ax^4 + bx^2 + 1}} = 0$$

✓ **Mathematica** : cpu = 20.5135 (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]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{i\sqrt{\frac{2\#1^2 a+\sqrt{b^2-4a}+b}{\sqrt{b^2-4a}+b}}\sqrt{\frac{2\#1^2 a}{b-\sqrt{b^2-4a}}+1}\,\text{EllipticF}\left(i\text{arcsinh}\left(\sqrt{2}\sqrt{\frac{a}{b+\sqrt{b^2-4a}}}\#1\right), \frac{b+\sqrt{}}{b-\sqrt{}}\right.}{\sqrt{2}\sqrt{\frac{a}{\sqrt{b^2-4a}+b}}\sqrt{\#1^4 a+\#1^2 b+1}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.06 (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))
```

$$\int^{y(x)} \frac{1}{\sqrt{\_a^4 a + \_a^2 b + 1}} d\_a + \int^{x} -\frac{\sqrt{\frac{ay(x)^4+by(x)^2+1}{\_a^4 a+\_a^2 b+1}}}{\sqrt{ay\left(x\right)^4 + by\left(x\right)^2 + 1}} d\_a + c_1 = 0$$

2.69 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 = 27.3302 (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 + b4*y[x]^4
```

$$\text{Solve}\left[-\frac{2\,\text{EllipticF}\left(\arcsin\left(\sqrt{\frac{(\text{Root}[\text{b4}\#1^4+\text{b3}\#1^3+\text{b2}\#1^2+\text{b1}\#1+\text{b0}\&,2]-\text{Root}[\text{b4}\#1^4+\text{b3}\#1^3+\text{b2}\#1^2+\text{b1}\#1+\text{b0}\&,4])(y(x)-}{(\text{Root}[\text{b4}\#1^4+\text{b3}\#1^3+\text{b2}\#1^2+\text{b1}\#1+\text{b0}\&,1]-\text{Root}[\text{b4}\#1^4+\text{b3}\#1^3+\text{b2}\#1^2+\text{b1}\#1+\text{b0}\&,4])(y(x)-}}\right.\right.}{}\right.$$

✓ **Maple** : cpu = 0.149 (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+a
```

$$\int^{y(x)} \frac{1}{\sqrt{\_a^4\,\mathrm{b4}+\_a^3\,\mathrm{b3}+\_a^2\,\mathrm{b2}+\_a\,\mathrm{b1}+\mathrm{b0}}}d\_a+\int^{x} -\frac{\sqrt{\left(\mathrm{b4}\,y(x)^4+\mathrm{b3}\,y(x)^3+\mathrm{b2}\,y(x)^2+\mathrm{b1}\,y(x)+\mathrm{b0}\right)(}}{\sqrt{\mathrm{b4}\,y(x)^4+\mathrm{b3}\,y(x)^3+\mathrm{b2}\,y(x)}}$$

2.70 ODE No. 70

$$y'(x) - \sqrt{\frac{\mathrm{a0} + \mathrm{a1}x + \mathrm{a2}x^2 + \mathrm{a3}x^3 + \mathrm{a4}x^4}{\mathrm{b0} + \mathrm{b1}y(x) + \mathrm{b2}y(x)^2 + \mathrm{b3}y(x)^3 + \mathrm{b4}y(x)^4}} = 0$$

✓ **Mathematica** : cpu = 22.5065 (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 + b4*y[x]^4
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \sqrt{\mathrm{b4}K[1]^4 + \mathrm{b3}K[1]^3 + \mathrm{b2}K[1]^2 + \mathrm{b1}K[1] + \mathrm{b0}}dK[1]\&\right]\left[\int_1^x \sqrt{\mathrm{a4}K[2]^4 + \mathrm{a3}K\right.\right.\right.$$

✓ **Maple** : cpu = 0.144 (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)+b
```

$$\int^{y(x)} \sqrt{\_a^4\,\mathrm{b4} + \_a^3\,\mathrm{b3} + \_a^2\,\mathrm{b2} + \_a\,\mathrm{b1} + \mathrm{b0}}d\_a + \int^x -\sqrt{\frac{\_a^4\,\mathrm{a4} + \_a^3\,\mathrm{a3} + \_a^2\,\mathrm{a2} + \_a\,\mathrm{a1} + \mathrm{a0}}{\mathrm{b4}\,y(x)^4 + \mathrm{b3}\,y(x)^3 + \mathrm{b2}\,y(x)^2 + \mathrm{b1}\,y(x) + \mathrm{b0}}}\,\sqrt{\mathrm{b}$$

2.71 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 = 2.17014 (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 + a4*x^4
```

$$\text{Solve}\left[-\frac{2\,\text{EllipticF}\left(\arcsin\left(\sqrt{\frac{(\text{Root}[\text{b4}\#1^4+\text{b3}\#1^3+\text{b2}\#1^2+\text{b1}\#1+\text{b0}\&,2]-\text{Root}[\text{b4}\#1^4+\text{b3}\#1^3+\text{b2}\#1^2+\text{b1}\#1+\text{b0}\&,4])(y(x)-}{(\text{Root}[\text{b4}\#1^4+\text{b3}\#1^3+\text{b2}\#1^2+\text{b1}\#1+\text{b0}\&,1]-\text{Root}[\text{b4}\#1^4+\text{b3}\#1^3+\text{b2}\#1^2+\text{b1}\#1+\text{b0}\&,4])(y(x)-}}\right.\right.}{}\right.$$

✓ **Maple** : cpu = 0.101 (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+a
```

$$\int^{y(x)} \frac{1}{\sqrt{\_a^4\,\mathrm{b4}+\_a^3\,\mathrm{b3}+\_a^2\,\mathrm{b2}+\_a\,\mathrm{b1}+\mathrm{b0}}}d\_a + \int^{x} -\frac{\sqrt{\frac{\mathrm{b4}\,y(x)^4+\mathrm{b3}\,y(x)^3+\mathrm{b2}\,y(x)^2+\mathrm{b1}\,y(x)+\mathrm{b0}}{\_a^4\,\mathrm{a4}+\_a^3\,\mathrm{a3}+\_a^2\,\mathrm{a2}+\_a\,\mathrm{a1}+\mathrm{a0}}}}{\sqrt{\mathrm{b4}\,y(x)^4+\mathrm{b3}\,y(x)^3+\mathrm{b2}\,y(x)^2+\mathrm{b1}\,y(x)+\mathrm{b0}}}d\_a$$

2.72 ODE No. 72

$$y'(x) - \mathrm{R1}\left(x, \sqrt{\mathrm{a0} + \mathrm{a1}x + \mathrm{a2}x^2 + \mathrm{a3}x^3 + \mathrm{a4}x^4}\right)\mathrm{R2}\left(y(x), \sqrt{\mathrm{b0} + \mathrm{b1}y(x) + \mathrm{b2}y(x)^2 + \mathrm{b3}y(x)^3 + \mathrm{b4}y(x)^4}\right) = 0$$

✓ **Mathematica** : cpu = 0.125332 (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[x]^2 + b
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{1}{\mathrm{R2}\left(K[1], \sqrt{\mathrm{b4}K[1]^4 + \mathrm{b3}K[1]^3 + \mathrm{b2}K[1]^2 + \mathrm{b1}K[1] + \mathrm{b0}}\right)} dK[1]\&\right]\left[\int_1^x \mathrm{R1}\right.\right.\right.$$

✓ **Maple** : cpu = 0.011 (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+
```

$$\int \mathrm{R1}\left(x, \sqrt{\mathrm{a4}\ x^4 + \mathrm{a3}\ x^3 + \mathrm{a2}\ x^2 + \mathrm{a1}\ x + \mathrm{a0}}\right) dx - \left(\int^{y(x)} \frac{1}{\mathrm{R2}\left(\_a, \sqrt{\_a^4\,\mathrm{b4} + \_a^3\,\mathrm{b3} + \_a^2\,\mathrm{b2} + \_a\,\mathrm{b1} + \mathrm{b0}}\right)} d\_\right.$$

2.73 ODE No. 73

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

✓ **Mathematica** : cpu = 1.10842 (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) + Derivative[1][
```

$$\text{Solve}\left[\frac{3(\mathrm{a0} + y(x)(\mathrm{a1} + y(x)(\mathrm{a2} + \mathrm{a3}y(x))))^{2/3} \left(y(x) - \text{Root}\left[\#1^3\mathrm{a3} + \#1^2\mathrm{a2} + \#1\mathrm{a1} + \mathrm{a0}\&, 1\right]\right) \text{AppellF1}\left(\frac{5}{3}, -\right.}{5\left(\frac{y(x) - \text{Root}[\#1^3\mathrm{a3}+\#1^2\mathrm{a2}+\#1\mathrm{a1}+\mathrm{a0}\&,2]}{\text{Root}[\#1^3\mathrm{a3}+\#1^2\mathrm{a2}+\#1\mathrm{a1}+\mathrm{a0}\&,1] - \text{Root}[\#1^3\mathrm{a3}+\#1^2\mathrm{a2}+\#\mathrm{1}}\right.}\right.$$

✓ **Maple** : cpu = 0.39 (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
```

$$\int^{y(x)} \left(\_a^3\,\mathrm{a3} + \_a^2\,\mathrm{a2} + \_a\,\mathrm{a1} + \mathrm{a0}\right)^{\frac{2}{3}} d\_a + \int^{x} -\left(\frac{\_a^3\,\mathrm{a3} + \_a^2\,\mathrm{a2} + \_a\,\mathrm{a1} + \mathrm{a0}}{\mathrm{a3}\,y(x)^3 + \mathrm{a2}\,y(x)^2 + \mathrm{a1}\,y(x) + \mathrm{a0}}\right)^{\frac{2}{3}} \left(\mathrm{a3}\,y(x)^3 + \mathrm{a2}\,y(x)^2\right.$$

2.74 ODE No. 74

$$y'(x) - f(x)(y(x) - g(x))\sqrt{(y(x) - a)(y(x) - b)} = 0$$

✗ **Mathematica** : cpu = 1.36544 (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, y[x]
```

✗ **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))
```

2.75 ODE No. 75

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

✓ **Mathematica** : cpu = 0.121226 (sec), leaf count = 18

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

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

✓ **Maple** : cpu = 0.104 (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

$$\begin{aligned} -\int \frac{1}{u(u-1)} du &= \int \left(\frac{1}{u} - \frac{1}{u-1}\right) du \\ &= \ln u - \ln(u-1) \\ &= \ln e^{-y} - \ln\left(e^{-y} - 1\right) \\ &= -\left(\ln\left(e^{-y} - 1\right) - \ln e^{-y}\right) \end{aligned}$$

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 $\int e^x dx = e^x + C$

$$
\begin{aligned}
-\ln(1-e^y) &= e^x + C \\
\ln(1-e^y) &= -e^x + C_1
\end{aligned}
$$

Hence

$$
\begin{aligned}
1-e^y &= \exp(-e^x + C_1) \\
e^y &= 1-\exp(-e^x + C_1)
\end{aligned}
$$

Taking logs

$$
y = \ln(1-\exp(-e^x + C_1))
$$

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
```

2.76 ODE No. 76

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

✓ **Mathematica** : cpu = 0.150241 (sec), leaf count = 116

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

$$\left\{\left\{y(x) \to 2\arctan\left(\frac{a\tanh\left(\frac{1}{2}\left(x\sqrt{(a-b)(a+b)} - c_1\sqrt{(a-b)(a+b)}\right)\right)}{\sqrt{(a-b)(a+b)}} - \frac{b\tanh\left(\frac{1}{2}\left(x\sqrt{(a-b)(a+b)} - c_1\sqrt{\right.\right.}{\sqrt{(a-b)(a+b)}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.074 (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.

$$\begin{aligned}\frac{dy}{a\cos y + b} &= dx \\ \int \frac{dy}{a\cos y + b} &= x + C \end{aligned} \tag{1}$$

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
```

2.77 ODE No. 77

$$y'(x) - \cos(ay(x) + bx) = 0$$

✓ **Mathematica** : cpu = 0.320928 (sec), leaf count = 124

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

$$\left\{\left\{y(x)\to \frac{-bx-2\arctan\left(\frac{a\tanh\left(\frac{1}{2}\left(-x\sqrt{a^2-b^2}+c_1\sqrt{a^2-b^2}\right)\right)}{\sqrt{a^2-b^2}}+\frac{b\tanh\left(\frac{1}{2}\left(-x\sqrt{a^2-b^2}+c_1\sqrt{a^2-b^2}\right)\right)}{\sqrt{a^2-b^2}}\right)}{a}\right\}\right\}$$

✓ **Maple** : cpu = 0.086 (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

$$y' = \cos\left(ay+bx\right)$$

This is separable after transformation of $u = ay + bx$, hence $u' = ay' + b$ or $y' = \frac{1}{a}(u' - b)$. Therefore the above becomes

$$\begin{aligned}\frac{1}{a}\left(u'-b\right) &= \cos\left(u\right)\\ u' &= a\cos u + b\\ \frac{du}{a\cos u+b} &= dx\end{aligned}$$

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
```

2.78 ODE No. 78

$$a\sin(\alpha y(x)+\beta x)+b+y'(x)=0$$

✓ **Mathematica** : cpu = 0.896219 (sec), leaf count = 1317

```
DSolve[b + a*Sin[beta*x + alpha*y[x]] + Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{2\arctan\left(\frac{\frac{a^2\sqrt{-((a\alpha+b\alpha-\beta)(a\alpha-b\alpha+\beta))}\tan\left(\frac{1}{2}\left(\frac{a^2x\alpha^2}{\sqrt{-((a\alpha+b\alpha-\beta)(a\alpha-b\alpha+\beta))}}-\frac{b^2x\alpha^2}{\sqrt{-((a\alpha+b\alpha-\beta)(a\alpha-b\alpha+\beta))}}-\frac{a^2c_1\alpha^2}{\sqrt{-((a\alpha+b\alpha-\beta)(a\alpha-b\cdots}}\cdots\right.\right.}{\cdots}}{\cdots}\right)}{\cdots}\right.\right.$$

✓ **Maple** : cpu = 0.117 (sec), leaf count = 89

```
dsolve(diff(y(x),x)+a*sin(alpha*y(x)+beta*x)+b = 0,y(x))
```

$$y(x)=\frac{-\beta x+2\arctan\left(\frac{-\tan\left(\frac{\sqrt{(-a^2+b^2)\alpha^2-2\alpha b\beta+\beta^2}\,(x-c_1)}{2}\right)\sqrt{(-a^2+b^2)\alpha^2-2\alpha b\beta+\beta^2}-a\alpha}{b\alpha-\beta}\right)}{\alpha}$$

Hand solution

$$y'=-a\sin(\alpha y+\beta x)-b$$

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

$$\begin{aligned}\frac{1}{\alpha}(u'-\beta)&=-a\sin(u)-b\\ u'&=-\alpha(a\sin(u)+b)+\beta\\ \frac{du}{\beta-\alpha(a\sin(u)+b)}&=dx \qquad (1)\end{aligned}$$

Using half angle tan transformation where $\tan\left(\frac{u}{2}\right)=t, \sin(u)=\frac{2t}{t^2+1}, du=\frac{2}{1+t^2}dt$ then

$$
\begin{aligned}
\int \frac{du}{\beta-\alpha\left(a\sin(u)+b\right)} &= \int \frac{2}{1+t^2}\frac{dt}{\beta-\alpha\left(a\frac{2t}{t^2+1}+b\right)}\\
&= 2\int \frac{dt}{\beta\left(t^2+1\right)-\alpha\left(a2t+b\left(t^2+1\right)\right)}\\
&= 2\int \frac{dt}{t\beta^2+\beta-\left(\alpha a2t+t^2\alpha b+\alpha b\right)}\\
&= 2\int \frac{dt}{(\beta-\alpha b)\left(\frac{t\beta^2-\alpha a2t-t^2\alpha b}{(\beta-\alpha b)}+1\right)}\\
&= \frac{2}{(\beta-\alpha b)}\int \frac{dt}{\frac{t\beta^2-\alpha a2t-t^2\alpha b}{(\beta-\alpha b)}+1}\\
&= \frac{2}{(\beta-\alpha b)}\frac{-(\alpha b-\beta)}{\sqrt{\alpha^2a^2-(\alpha^2b^2+\beta^2-2\alpha b\beta)}}\tanh^{-1}\left(\frac{\left(t+\frac{a\alpha}{b\alpha-\beta}\right)(b\alpha-\beta)}{\sqrt{\alpha^2a^2-(\alpha^2b^2+\beta^2-2\alpha b\beta)}}\right)\\
&= \frac{2}{\sqrt{\alpha^2a^2-(\alpha^2b^2+\beta^2-2\alpha b\beta)}}\tanh^{-1}\left(\frac{t(b\alpha-\beta)+a\alpha}{\sqrt{\alpha^2a^2-(\alpha^2b^2+\beta^2-2\alpha b\beta)}}\right)
\end{aligned}
$$

But $t=\tan\left(\frac{u}{2}\right)$ therefore

$$
\int \frac{du}{\beta-\alpha\left(a\sin(u)+b\right)} = \frac{2}{\sqrt{\alpha^2a^2-(\alpha^2b^2+\beta^2-2\alpha b\beta)}}\tanh^{-1}\left(\frac{\tan\left(\frac{u}{2}\right)(b\alpha-\beta)+a\alpha}{\sqrt{\alpha^2a^2-(\alpha^2b^2+\beta^2-2\alpha b\beta)}}\right)
$$

But $u=\alpha y+\beta x$, and the above becomes

$$
\int \frac{du}{\beta-\alpha\left(a\sin(u)+b\right)} = \frac{2\tanh^{-1}\left(\frac{\tan\left(\frac{\alpha y+\beta x}{2}\right)(b\alpha-\beta)+a\alpha}{\sqrt{\alpha^2a^2-(\alpha^2b^2+\beta^2-2\alpha b\beta)}}\right)}{\sqrt{\alpha^2a^2-(\alpha^2b^2+\beta^2-2\alpha b\beta)}}
$$

Back to (1), therefore after integrating both sides

$$
\frac{2\tanh^{-1}\left(\frac{\tan\left(\frac{\alpha y+\beta x}{2}\right)(b\alpha-\beta)+a\alpha}{\sqrt{\alpha^2a^2-(\alpha^2b^2+\beta^2-2\alpha b\beta)}}\right)}{\sqrt{\alpha^2a^2-(\alpha^2b^2+\beta^2-2\alpha b\beta)}} = x+C
$$

Let

$$
A=\sqrt{\alpha^2a^2-(\alpha^2b^2+\beta^2-2\alpha b\beta)}
$$

Then

$$
\begin{aligned}
\tanh^{-1}\left(\frac{\tan\left(\frac{\alpha y+\beta x}{2}\right)(b\alpha-\beta)+a\alpha}{A}\right) &= \frac{1}{2}A(x+C) \\
\frac{\tan\left(\frac{\alpha y+\beta x}{2}\right)(b\alpha-\beta)+a\alpha}{A} &= \tanh\left(\frac{1}{2}A(x+C)\right) \\
\tan\left(\frac{\alpha y+\beta x}{2}\right)(b\alpha-\beta)+a\alpha &= A\tanh\left(\frac{1}{2}A(x+C)\right) \\
\tan\left(\frac{\alpha y+\beta x}{2}\right) &= \frac{A}{(b\alpha-\beta)}\tanh\left(\frac{1}{2}A(x+C)\right)-\frac{a\alpha}{(b\alpha-\beta)} \\
\frac{\alpha y+\beta x}{2} &= \arctan\left(\frac{A}{(b\alpha-\beta)}\tanh\left(\frac{1}{2}A(x+C)\right)-\frac{a\alpha}{(b\alpha-\beta)}\right) \\
y &= \frac{2}{\alpha}\arctan\left(\frac{A}{(b\alpha-\beta)}\tanh\left(\frac{1}{2}A(x+C)\right)-\frac{a\alpha}{(b\alpha-\beta)}\right)-\frac{\beta x}{\alpha}
\end{aligned}
$$

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
```

2.79 ODE No. 79

$$f(x)\cos(ay(x)) + g(x)\sin(ay(x)) + h(x) + y'(x) = 0$$

✗ **Mathematica** : cpu = 24.1011 (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))
```

2.80 ODE No. 80

$$(1 - f'(x))\cos(y(x)) - f'(x) + f(x)\sin(y(x)) + y'(x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.0419403 (sec), leaf count = 72

```
DSolve[-1 + f[x]*Sin[y[x]] + Cos[y[x]]*(1 - Derivative[1][f][x]) - Derivative[1][f][x] + Derivative[1
```

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

✓ **Maple** : cpu = 1.374 (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))
```

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

2.81 ODE No. 81

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

✓ **Mathematica** : cpu = 1.20226 (sec), leaf count = 220

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

$$\text{Solve}\left[c_1 = \frac{\frac{1}{2}\left(\frac{1}{\frac{i\tan(x)}{\tan^2(x)+1} - \frac{i\tan^2(x)\tan(y(x))}{\tan^2(x)+1}} + i\cot(x)\right)\sqrt[4]{1 - \left(\frac{1}{\frac{i\tan(x)}{\tan^2(x)+1} - \frac{i\tan^2(x)\tan(y(x))}{\tan^2(x)+1}} + i\cot(x)\right)^2}\ \text{Hypergeometric}}{\sqrt[4]{-1 + \left(\frac{1}{\frac{i\tan(x)}{\tan^2(x)+1} - \frac{i\tan^2(x)\tan(y(x))}{\tan^2(x)+1}} + i\cot(\right.}}\right.$$

✓ **Maple** : cpu = 1.052 (sec), leaf count = 78

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

$$c_1 + \frac{\tan(x)}{\left(\frac{\left(1+\tan(y(x))^2\right)\left(1+\tan(x)^2\right)}{(\tan(y(x))\tan(x)-1)^2}\right)^{\frac{1}{4}}} + \frac{(\tan(y(x)) + \tan(x))\,\text{hypergeom}\left(\left[\frac{1}{2}, \frac{5}{4}\right], \left[\frac{3}{2}\right], -\frac{(\tan(y(x))+\tan(x))^2}{(\tan(y(x))\tan(x)-1)^2}\right)}{2\tan(y(x))\tan(x) - 2} = 0$$

2.82 ODE No. 82

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

✗ **Mathematica** : cpu = 44.0402 (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))
```

2.83 ODE No. 83

$$y'(x) - \tan(xy(x)) = 0$$

✓ **Mathematica** : cpu = 0.283785 (sec), leaf count = 69

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

$$\text{Solve}\left[\frac{1}{2}\sqrt{\frac{\pi}{2}}e^{\frac{x^2}{2}}\left(\text{erfi}\left(\frac{y(x)-ix}{\sqrt{2}}\right)+\text{erfi}\left(\frac{y(x)+ix}{\sqrt{2}}\right)\right)=c_1e^{\frac{x^2}{2}},y(x)\right]$$

✓ **Maple** : cpu = 0.257 (sec), leaf count = 44

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

$$y(x) = -i\,\text{RootOf}\left(-\operatorname{erf}\left(\frac{(-x+\_Z)\sqrt{2}}{2}\right)\sqrt{\pi}-\operatorname{erf}\left(\frac{\sqrt{2}\,(x+\_Z)}{2}\right)\sqrt{\pi}+\sqrt{2}\,c_1\right)$$

2.84 ODE No. 84

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

✓ **Mathematica** : cpu = 0.208559 (sec), leaf count = 248

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

$$\text{Solve}\left[\int_1^{y(x)} -\frac{f(ax+bK[2]) \int_1^x \left(\frac{b^2 f'(aK[1]+bK[2])}{a+bf(aK[1]+bK[2])} - \frac{b^3 f(aK[1]+bK[2]) f'(aK[1]+bK[2])}{(a+bf(aK[1]+bK[2]))^2}\right) dK[1] b + b + a \int_1^x \left(\frac{b^2 f'(aK[1]}{a+bf(aK[1]}\right.}{a+bf(ax+bK[2])}\right.$$

✓ **Maple** : cpu = 0.026 (sec), leaf count = 37

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

$$y(x) = \frac{\text{RootOf}\left(\left(\int^{-Z} \frac{1}{f(\_ab)b+a} d\_a\right) b - x + c_1\right) b - ax}{b}$$

2.85 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 = 0.314192 (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]
```

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

✓ **Maple** : cpu = 0.368 (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))
```

$$y(x) = \left(-\frac{x^a b - \text{RootOf}\left(\left(\left(\int^{-Z}\frac{1}{-\left((-b+\_a)^{\frac{1}{b}}\right)^{-b}f\left(\frac{\left(a^{\frac{1}{a}}\right)^a b+\left((-b+\_a)^{\frac{1}{b}}\right)^b a}{ab}\right)\left(a^{\frac{1}{a}}\right)^a b+\left((-b+\_a)^{\frac{1}{b}}\right)^{-b}f\left(\frac{\left(a^{\frac{1}{a}}\right)^a b+\left((-b+\_a)\right.}{ab}\right.}\right.\right.\right.}{a}\right.$$

2.86 ODE No. 86

$$y'(x) - \frac{y(x) - xf\left(ay(x)^2 + x^2\right)}{ay(x)f\left(ay(x)^2 + x^2\right) + x} = 0$$

✓ **Mathematica** : cpu = 0.462457 (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] == 0,y
```

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

✓ **Maple** : cpu = 0.196 (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))
```

$$\frac{\arctan\left(\frac{\sqrt{a}\,x}{\sqrt{a^2y(x)^2}}\right)}{\sqrt{a}} - \frac{\left(\int^{y(x)^2+\frac{x^2}{a}}\frac{f(\_aa)}{\_a}d\_a\right)}{2} - c_1 = 0$$

2.87 ODE No. 87

$$y'(x) - \frac{cx^a y(x)^b + ay(x)f(x^c y(x))}{bxf(x^c y(x)) - x^a y(x)^b} = 0$$

✗ **Mathematica** : cpu = 8.72119 (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][y][x] ==
```

, 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)) + Derivative[1]
```

✗ **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,y(x))
```

2.88 ODE No. 88

$$-ce^{-2ax} - 4ay(x) - b + 2y'(x) - 3y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.355316 (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]
```

$$\left\{\left\{y(x) \to -\frac{2\left(-2^{-\frac{a\sqrt{4a^2-3b}-2a^2}{a^2}+\frac{\sqrt{4a^4-3a^2b}}{a^2}+1} 3^{\frac{a\sqrt{4a^2-3b}-2a^2}{4a^2}-\frac{\sqrt{4a^4-3a^2b}}{4a^2}} a^{-\frac{a\sqrt{4a^2-3b}-2a^2}{2a^2}+\frac{\sqrt{4a^4-3a^2b}}{2a^2}+1} b^{\frac{a\sqrt{4a^2-3b}-2a^2}{4a^2}-\sqrt{}}\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.166 (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))
```

$$y(x) = \frac{-\mathrm{e}^{-ax}\sqrt{3}\left(\mathrm{BesselY}\left(-\frac{\sqrt{4a^2-3b}-2a}{2a}, \frac{\sqrt{3}\sqrt{c}\,\mathrm{e}^{-ax}}{2a}\right)c_1 + \mathrm{BesselJ}\left(-\frac{\sqrt{4a^2-3b}-2a}{2a}, \frac{\sqrt{3}\sqrt{c}\,\mathrm{e}^{-ax}}{2a}\right)\right)\sqrt{c} - \left(\sqrt{4a^2-3b}\right.}{3\,\mathrm{BesselY}\left(-\frac{\sqrt{4a^2-3b}}{2a}, \frac{\sqrt{3}\sqrt{c}\,\mathrm{e}^{-ax}}{2a}\right)c_1 + 3\,\mathrm{BesselJ}\left(\right.}$$

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

$$
\begin{aligned}
\frac{-2}{3}\left(\frac{u''}{u}-\frac{(u')^2}{u^2}\right) &= \frac{1}{2}b+\frac{1}{2}ce^{-2ax}+2a\left(\frac{-2}{3}\frac{u'}{u}\right)+\frac{3}{2}\left(\frac{-2}{3}\frac{u'}{u}\right)^2\\
\frac{-2}{3}\frac{u''}{u}+\frac{2}{3}\frac{(u')^2}{u^2} &= \frac{1}{2}b+\frac{1}{2}ce^{-2ax}-\frac{4}{3}a\frac{u'}{u}+\frac{2}{3}\frac{(u')^2}{u^2}\\
\frac{-2}{3}\frac{u''}{u} &= \frac{1}{2}b+\frac{1}{2}ce^{-2ax}-\frac{4}{3}a\frac{u'}{u}\\
\frac{u''}{u} &= -\frac{3}{4}b-\frac{3}{4}ce^{-2ax}+2a\frac{u'}{u}\\
u'' &= -\left(\frac{3}{4}b+\frac{3}{4}ce^{-2ax}\right)u+2au'
\end{aligned}
$$

$$
u''-2au'+\frac{3}{4}\left(b+ce^{-2ax}\right)u=0
$$

This is second order linear ODE with varying coefficient. Solved using power series method giving solutions using special functions (Bessel functions). Let $A=\frac{\sqrt{4a^2-3b}}{a}, B=\frac{\sqrt{3c}e^{-ax}}{a}$ then

$$
u(x)=C_1e^{ax}\operatorname{BesselJ}\left(-\frac{1}{2}\frac{\sqrt{4a^2-3b}}{a},\frac{1}{2}\frac{\sqrt{3c}e^{-ax}}{a}\right)+C_2e^{ax}\operatorname{BesselY}\left(-\frac{1}{2}\frac{\sqrt{4a^2-3b}}{a},\frac{1}{2}\frac{\sqrt{3c}e^{-ax}}{a}\right)
$$

But

$$
\begin{aligned}
u'(x) &= C_1\,a\exp(ax)\operatorname{BesselJ}\left(-1/2\,\frac{\sqrt{4\,a^2-3\,b}}{a},1/2\,\frac{\sqrt{3}\sqrt{c}\exp(-ax)}{a}\right)\\
&-1/2\,C_1\exp(ax)\left(-\operatorname{BesselJ}\left(-1/2\,\frac{\sqrt{4\,a^2-3\,b}}{a}+1,1/2\,\frac{\sqrt{3}\sqrt{c}\exp(-ax)}{a}\right)-1/3\,\frac{\sqrt{3}\sqrt{4\,a^2-3\,b}}{\sqrt{c}\exp(-ax)}\operatorname{BesselJ}\left(-1/2\,\frac{\sqrt{4\,a^2-3\,b}}{a},1/2\,\frac{\sqrt{3}\right.\right.\\
&+C_2\,a\exp(ax)\operatorname{BesselY}\left(-1/2\,\frac{\sqrt{4\,a^2-3\,b}}{a},1/2\,\frac{\sqrt{3}\sqrt{c}\exp(-ax)}{a}\right)\\
&-1/2\,C_1\,\exp(ax)\left(-\operatorname{BesselY}\left(-1/2\,\frac{\sqrt{4\,a^2-3\,b}}{a}+1,1/2\,\frac{\sqrt{3}\sqrt{c}\exp(-ax)}{a}\right)-1/3\,\frac{\sqrt{3}\sqrt{4\,a^2-3\,b}}{\sqrt{c}\exp(-ax)}\operatorname{BesselY}\left(-1/2\,\frac{\sqrt{4\,a^2-3\,b}}{a},1/2\,\frac{\sqrt{}\right.\right.
\end{aligned}
$$

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
```

2.89 ODE No. 89

$$xy'(x) - \sqrt{a^2 - x^2} = 0$$

✓ **Mathematica** : cpu = 0.0295275 (sec), leaf count = 42

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

$$\left\{\left\{y(x) \to -a\text{arctanh}\left(\frac{\sqrt{a^2 - x^2}}{a}\right) + \sqrt{a^2 - x^2} + c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.017 (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

$$
\begin{aligned}
\int \frac{\sqrt{a^2-x^2}}{x} dx &= \int \frac{\sqrt{a^2-a^2\sin^2 u}}{a\sin u} a\cos(u)\, du \\
&= \int \frac{a\sqrt{1-\sin^2 u}}{a\sin u} a\cos(u)\, du \\
&= a\int \frac{\cos u}{\sin u} \cos(u)\, du \\
&= a\int \frac{\cos^2 u}{\sin u} du \\
&= a\int \frac{1-\sin^2 u}{\sin u} du \\
&= a\left(\int \frac{1}{\sin u} du - \int \sin u du\right) \\
&= a\left(\int \frac{1}{\sin u} du + \cos u\right) \qquad (1)
\end{aligned}
$$

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.

2.90 ODE No. 90

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

✓ **Mathematica** : cpu = 0.0222962 (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 = 0.018 (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

$$\begin{aligned} d(\mu y) &= \mu \sin x \\ xy &= \int x \sin x dx + C \end{aligned}$$

Using integration by parts. $\int u dv = uv - \int v du$. 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

$$\begin{aligned} xy &= -x\cos x + \sin x + C \\ y &= \frac{\sin x}{x} - \cos x + \frac{C}{x} \end{aligned}$$

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
```

2.91 ODE No. 91

$$xy'(x) - y(x) - \frac{x}{\log(x)} = 0$$

✓ **Mathematica** : cpu = 0.0202825 (sec), leaf count = 15

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

$$\{\{y(x) \to x\log(\log(x)) + c_1x\}\}$$

✓ **Maple** : cpu = 0.004 (sec), leaf count = 11

```
dsolve(x*diff(y(x),x)-y(x)-x/ln(x) = 0,y(x))
```

$$y(x) = (\ln(\ln(x)) + c_1)\, x$$

2.92 ODE No. 92

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

✓ **Mathematica** : cpu = 0.0160681 (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 = 0.005 (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
```

2.93 ODE No. 93

$$xy'(x) - y(x) - \frac{x\cos(\log(\log(x)))}{\log(x)} = 0$$

✓ **Mathematica** : cpu = 0.0334346 (sec), leaf count = 16

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

$$\{\{y(x) \to x\sin(\log(\log(x))) + c_1x\}\}$$

✓ **Maple** : cpu = 0.017 (sec), leaf count = 12

```
dsolve(x*diff(y(x),x)-y(x)-x*cos(ln(ln(x)))/ln(x) = 0,y(x))
```

$$y(x) = (\sin(\ln(\ln(x))) + c_1)\,x$$

2.94 ODE No. 94

$$ay(x) + bx^n + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0259713 (sec), leaf count = 25

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

$$\left\{\left\{y(x)\to -\frac{bx^n}{a+n}+c_1x^{-a}\right\}\right\}$$

✓ **Maple** : cpu = 0.008 (sec), leaf count = 23

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

$$y(x) = -\frac{b\,x^n}{a+n} + x^{-a}c_1$$

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

$$\begin{aligned} x^a y &= -\frac{b x^{a+n}}{a+n} + C \\ y &= -b\frac{x^n}{a+n} + Cx^{-a} \end{aligned}$$

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
```

2.95 ODE No. 95

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

✓ **Mathematica** : cpu = 0.0568126 (sec), leaf count = 32

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

$$\left\{\left\{y(x) \to \frac{x(-\text{BesselY}(1,x) - c_1 \text{BesselJ}(1,x))}{\text{BesselY}(0,x) + c_1 \text{BesselJ}(0,x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 27

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

$$y(x) = -\frac{(c_1 \text{BesselY}(1,x) + \text{BesselJ}(1,x))\, x}{c_1 \text{BesselY}(0,x) + \text{BesselJ}(0,x)}$$

Hand solution

$$xy' + y^2 + x^2 = 0$$

This is Riccati first order non-linear. Writing it in standard form and for $x \neq 0$

$$\begin{aligned} y' &= -x - \frac{1}{x} y^2 && (1) \\ &= f_0 + f_1 y + f_2 y^2 \end{aligned}$$

Where $f_0 = -x, f_1 = 0, f_2 = -\frac{1}{x}$. Using standard substitution $y = \frac{-u'}{uf_2}$ 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

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

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

$$
u = C_1 \operatorname{BesselJ}(0,x) + C_2 \operatorname{BesselY}(0,x)
$$

But $\frac{d}{dx}\operatorname{BesselJ}(0,x) = -\operatorname{BesselJ}(1,x)$ and $\frac{d}{dx}\operatorname{BesselY}(0,x) = -\operatorname{BesselY}(1,x)$, hence

$$
u'(x) = -C_1 \operatorname{BesselJ}(1,x) - C_2 \operatorname{BesselY}(1,x)
$$

And from (2) the solution is

$$
\begin{aligned}
y &= \frac{xu'}{u}\\
&= x\frac{[-C_1 \operatorname{BesselJ}(1,x) - C_2 \operatorname{BesselY}(1,x)]}{C_1 \operatorname{BesselJ}(0,x) + C_2 \operatorname{BesselY}(0,x)}\\
&= -x\frac{C_1 \operatorname{BesselJ}(1,x) + C_2 \operatorname{BesselY}(1,x)}{C_1 \operatorname{BesselJ}(0,x) + C_2 \operatorname{BesselY}(0,x)}
\end{aligned}
$$

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

$$
y = -x\frac{C \operatorname{BesselJ}(1,x) + \operatorname{BesselY}(1,x)}{C \operatorname{BesselJ}(0,x) + \operatorname{BesselY}(0,x)}
$$

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
```

2.96 ODE No. 96

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

✓ **Mathematica** : cpu = 0.0467562 (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 = 0.029 (sec), leaf count = 11

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

$$y(x) = -\tanh(\ln(x) + c_1)$$

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

$$\begin{aligned}\frac{dy}{dx} &= \frac{y^2 - 1}{x}\\ \frac{dy}{y^2 - 1} &= \frac{dx}{x}\end{aligned}$$

Integrating

$$\begin{aligned}-\tanh^{-1}(y) &= \ln x + C\\ y &= -\tanh(\ln x + C)\end{aligned}$$

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
```

2.97 ODE No. 97

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

✓ **Mathematica** : cpu = 0.0824584 (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 = 0.029 (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
```

2.98 ODE No. 98

$$ay(x)^2 + cx^{2b} - by(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.133414 (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]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{-a}\sqrt{-c}x^b \left(-\frac{2\sqrt{\frac{2}{\pi}}\cos\left(\frac{\sqrt{-a}\sqrt{-c}x^b}{b}\right)}{\sqrt{\frac{\sqrt{-a}\sqrt{-c}x^b}{b}}} + \frac{\sqrt{\frac{2}{\pi}}c_1\sin\left(\frac{\sqrt{-a}\sqrt{-c}x^b}{b}\right)}{\sqrt{\frac{\sqrt{-a}\sqrt{-c}x^b}{b}}} - \frac{\sqrt{\frac{2}{\pi}}c_1\left(-\sin\left(\frac{\sqrt{-a}\sqrt{-c}x^b}{b}\right) - \frac{\sqrt{-a}b\sqrt{-c}x^{-b}\cos\left(\right.}{ac}\right.}{\sqrt{\frac{\sqrt{-a}\sqrt{-c}x^b}{b}}}\right.}{2a\left(\frac{\sqrt{\frac{2}{\pi}}\sin\left(\frac{\sqrt{-a}\sqrt{-c}x^b}{b}\right)}{\sqrt{\frac{\sqrt{-a}\sqrt{-c}x^b}{b}}} + \frac{\sqrt{\frac{2}{\pi}}c_1\cos\left(\frac{\sqrt{-a}\sqrt{-c}x^b}{b}\right)}{\sqrt{\frac{\sqrt{-a}\sqrt{-c}x^b}{b}}}\right)}\right.\right.$$

✓ **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))
```

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

2.99 ODE No. 99

$$ay(x)^2 - by(x) - cx^\beta + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.134711 (sec), leaf count = 244

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

$$\left\{\left\{y(x) \to -\frac{\sqrt{-a}\sqrt{c}x^{\beta/2}\left(-2\,\text{BesselJ}\left(\frac{b}{\beta}-1, \frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right) + c_1\,\text{BesselJ}\left(1-\frac{b}{\beta}, \frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right) - c_1\,\text{BesselJ}\left(-\frac{b+}{\beta}\right.\right.}{2a\left(\text{BesselJ}\left(\frac{b}{\beta}, \frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right) + c_1\,\text{BesselJ}\left(-\frac{b}{\beta}, \frac{2\sqrt{-a}\sqrt{cx}}{\beta}\right.\right.}\right.\right.$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 171

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

$$y(x) = \frac{-\sqrt{-ac}\left(\text{BesselY}\left(\frac{b+\beta}{\beta}, \frac{2\sqrt{-ac}\,x^{\frac{\beta}{2}}}{\beta}\right)c_1 + \text{BesselJ}\left(\frac{b+\beta}{\beta}, \frac{2\sqrt{-ac}\,x^{\frac{\beta}{2}}}{\beta}\right)\right)x^{\frac{\beta}{2}} + b\left(\text{BesselY}\left(\frac{b}{\beta}, \frac{2\sqrt{-ac}\,x^{\frac{\beta}{2}}}{\beta}\right)c_1 + \right.}{a\left(\text{BesselY}\left(\frac{b}{\beta}, \frac{2\sqrt{-ac}\,x^{\frac{\beta}{2}}}{\beta}\right)c_1 + \text{BesselJ}\left(\frac{b}{\beta}, \frac{2\sqrt{-ac}\,x^{\frac{\beta}{2}}}{\beta}\right)\right)}$$

2.100 ODE No. 100

$$a + xy'(x) + xy(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0812626 (sec), leaf count = 199

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

$$\left\{\left\{y(x) \to -\frac{\frac{i\sqrt{a}\,\text{BesselY}(1,2\sqrt{a}\sqrt{x})}{\sqrt{x}} + ia\left(\text{BesselY}\left(0,2\sqrt{a}\sqrt{x}\right) - \text{BesselY}\left(2,2\sqrt{a}\sqrt{x}\right)\right) + c_1\left(\frac{\sqrt{a}\,\text{BesselJ}(1,2\sqrt{a}\sqrt{x})}{2\sqrt{x}} + \frac{1}{2}\right.}{-2i\sqrt{a}\sqrt{x}\,\text{BesselY}\left(1,2\sqrt{a}\sqrt{x}\right) - \sqrt{a}c_1\sqrt{x}\,\text{BesselJ}\left(1,2\sqrt{\right.}}\right.\right.$$

✓ **Maple** : cpu = 0.046 (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
```

2.101 ODE No. 101

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

✓ **Mathematica** : cpu = 0.056477 (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 = 0.007 (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

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

This is of the form $y'=f_0+f_1y+f_2y^2$ 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

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

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
```

2.102 ODE No. 102

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

✓ **Mathematica** : cpu = 0.0654528 (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 = 0.027 (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
```

2.103 ODE No. 103

$$-x^3 - (2x^2+1)\,y(x) + xy'(x) + xy(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.109771 (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 = 0.021 (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

$$xy' - xy^2 - (2x^2+1)\,y - x^3 = 0$$

This is Riccati non-linear first order. Converting it to standard form

$$\begin{aligned} y' &= x^2 + \frac{(2x^2+1)}{x}y + y^2 \qquad (1)\\ &= f_0 + f_1 y + f_2 y^2 \end{aligned}$$

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

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

$$\begin{aligned} -u'' + \frac{(2x^2+1)}{x}u' - ux^2 &= 0\\ xu'' - (2x^2+1)\,u' + ux^3 &= 0 \qquad (2) \end{aligned}$$

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

$$\begin{aligned}
\sqrt{2t}\left(\frac{du}{dt}+2t\frac{d^2u}{dt^2}\right)-(2(2t)+1)\sqrt{2t}\frac{du}{dt}+u(2t)^{\frac{3}{2}} &= 0\\
\sqrt{2t}\frac{du}{dt}+\sqrt{2t}2t\frac{d^2u}{dt^2}-(4t+1)\sqrt{2t}\frac{du}{dt}+u\left(\sqrt{2t}\right)^3 &= 0\\
\frac{du}{dt}+2t\frac{d^2u}{dt^2}-(4t+1)\frac{du}{dt}+2tu &= 0\\
\frac{du}{dt}+2t\frac{d^2u}{dt^2}-4t\frac{du}{dt}-\frac{du}{dt}+2tu &= 0\\
2t\frac{d^2u}{dt^2}-4t\frac{du}{dt}+2tu &= 0\\
2t\left(\frac{d^2u}{dt^2}-2\frac{du}{dt}+u\right) &= 0
\end{aligned}$$

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
```

2.104 ODE No. 104

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

✓ **Mathematica** : cpu = 0.0837785 (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 = 0.039 (sec), leaf count = 63

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

$$y(x) = -\frac{-\frac{i\sqrt{a}\,\sqrt{b}\,x-1}{x}+\frac{\mathrm{e}^{-2i\sqrt{a}\,\sqrt{b}\,x}}{c_1-\frac{i\mathrm{e}^{-2i\sqrt{a}\,\sqrt{b}\,x}}{2\sqrt{a}\,\sqrt{b}}}}{a}$$

Hand solution

$xy' + axy^2 + 2y + bx = 0$This is Riccati non-linear first order. Converting it to standard form

$$\begin{aligned} y' &= -b - \frac{2}{x}y - ay^2 \qquad (1)\\ &= f_0 + f_1 y + f_2 y^2 \end{aligned}$$

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
```

2.105 ODE No. 105

$$axy(x)^2 + by(x) + cx + d + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.154772 (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]
```

$$\left\{\left\{y(x)\to \frac{c_1\left(i\sqrt{a}e^{-i\sqrt{a}\sqrt{c}x}\left(b(-\sqrt{c})-i\sqrt{a}d\right)\text{HypergeometricU}\left(1-\frac{-\sqrt{c}b-i\sqrt{a}d}{2\sqrt{c}},b+1,2i\sqrt{a}\sqrt{c}x\right)-i\sqrt{a}\sqrt{c}e^{-i}\right.}{a\left(c_1e^{-i\sqrt{a}\sqrt{c}x}\text{Hypergeometr}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.218 (sec), leaf count = 844

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

$$y(x) = -\frac{4\left(-\frac{c_1\left(a^3c^2d^2+a^2b^2c^3-2(-ac)^{\frac{3}{2}}abcd-2(-ac)^{\frac{5}{2}}bd\right)\text{KummerU}\left(\frac{(-ac)^{\frac{3}{2}}d+ac(2\sqrt{-ac}\,d+c(b+2))}{2c^2a},\frac{(-ac)^{\frac{3}{2}}d+ac(\sqrt{-ac}\,d+c(b}{c^2a}\right.}{4}\right.}{-c_1\left(a^2b^2c^4\sqrt{-ac}+2ac\,d^2\,(-ac)^{\frac{5}{2}}+(-ac)^{\frac{7}{2}}\,d^2\right)\text{KummerU}\left(\frac{(-ac)^{\frac{3}{2}}d+ac(2\sqrt{-ac}\,d+c(b+2))}{2c^2a},\frac{(-ac)^{\frac{3}{2}}d+ac(\sqrt{-}}{c^2a}\right.}$$

2.106 ODE No. 106

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

✓ **Mathematica** : cpu = 0.150042 (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 = 0.055 (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))
```

$$y(x)=-\tan\left(\frac{2x^{\frac{a}{2}+\frac{b}{2}}+c_1(a+b)}{a+b}\right)x^{-\frac{a}{2}+\frac{b}{2}}$$

2.107 ODE No. 107

$$a x^{\alpha} y(x)^2 + b y(x) - c x^{\beta} + x y'(x) = 0$$

✓ **Mathematica** : cpu = 0.242432 (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]
```

$$\left\{\left\{y(x) \to \frac{x^{1-\alpha}\left((-1)^{\frac{\alpha-b}{\alpha+\beta}} a^{\frac{\alpha-b}{\alpha+\beta}+\frac{1}{2}\left(\frac{b}{\alpha+\beta}-\frac{\alpha}{\alpha+\beta}\right)} (\alpha+\beta)^{\frac{\alpha}{\alpha+\beta}-\frac{b}{\alpha+\beta}+1} \left(\alpha^2+2\beta\alpha+\beta^2\right)^{-\frac{\alpha-b}{\alpha+\beta}} \left(\frac{\alpha-b}{\alpha+\beta}+\frac{1}{2}\left(\frac{b}{\alpha+\beta}-\frac{\alpha}{\alpha+\beta}\right)\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.189 (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))
```

$$y(x) = -\frac{\left(\operatorname{BesselY}\left(\frac{b+\beta}{\alpha+\beta}, \frac{2\sqrt{-ac}\, x^{\frac{\alpha}{2}+\frac{\beta}{2}}}{\alpha+\beta}\right) c_1 + \operatorname{BesselJ}\left(\frac{b+\beta}{\alpha+\beta}, \frac{2\sqrt{-ac}\, x^{\frac{\alpha}{2}+\frac{\beta}{2}}}{\alpha+\beta}\right)\right) x^{\frac{\alpha}{2}+\frac{\beta}{2}} \sqrt{-ac}\, x^{1-\alpha}}{\left(\operatorname{BesselY}\left(\frac{-\alpha+b}{\alpha+\beta}, \frac{2\sqrt{-ac}\, x^{\frac{\alpha}{2}+\frac{\beta}{2}}}{\alpha+\beta}\right) c_1 + \operatorname{BesselJ}\left(\frac{-\alpha+b}{\alpha+\beta}, \frac{2\sqrt{-ac}\, x^{\frac{\alpha}{2}+\frac{\beta}{2}}}{\alpha+\beta}\right)\right) a x}$$

2.108 ODE No. 108

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

✓ **Mathematica** : cpu = 0.0561024 (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 = 0.01 (sec), leaf count = 13

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

$$y(x) = \frac{1}{1 + xc_1 + \ln(x)}$$

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
```

2.109 ODE No. 109

$$xy'(x) - y(x)(2y(x)\log(x) - 1) = 0$$

✓ **Mathematica** : cpu = 0.0569894 (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 = 0.008 (sec), leaf count = 15

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

$$y(x) = \frac{1}{2 + xc_1 + 2\ln(x)}$$

Hand solution

$xy' + axy^2 + 2y + bx = 0$This is Riccati non-linear first order. Converting it to standard form

$$
\begin{aligned}
xy' - y(2y\ln x - 1) &= 0 \\
xy' &= y(2y\ln x - 1) \\
y' &= -\frac{1}{x}y + y^2\frac{2}{x}\ln x \qquad (1) \\
y' &= f_0 + f_1 y + f_2 y^2
\end{aligned}
$$

This is Bernoulli non-linear first order ODE since $f_0 = 0$. Dividing by y^2 gives

$$\frac{y'}{y^2} = -\frac{1}{x}\frac{1}{y} + \frac{2}{x}\ln x$$

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
```

2.110 ODE No. 110

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

✗ **Mathematica** : cpu = 9.76994 (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 $\mu = e^{\int \frac{1}{x} - 2f} = e^{\ln x} e^{-2\int f dx} = xe^{-2\int f dx}$, hence

$$\begin{aligned}
d(\mu u) &= -\mu \frac{f}{x} \\
d\left(xe^{-2\int f dx} u\right) &= -\left(xe^{-2\int f dx}\right)\frac{f}{x} \\
d\left(xe^{-2\int f dx} u\right) &= -f\left(e^{-2\int f dx}\right)
\end{aligned}$$

Integrating

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

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

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

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
```

2.111 ODE No. 111

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

✓ **Mathematica** : cpu = 0.336056 (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 = 0.089 (sec), leaf count = 53

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

$$c_1 - \frac{ie^{\frac{(3xy(x)-1)^2}{2y(x)^2}}}{3x} + \frac{\text{erf}\left(\frac{i(3xy(x)-1)\sqrt{2}}{2y(x)}\right)\sqrt{2}\sqrt{\pi}}{2} = 0$$

2.112 ODE No. 112

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

✓ **Mathematica** : cpu = 0.0992376 (sec), leaf count = 27

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

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

✓ **Maple** : cpu = 0.042 (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

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

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
```

2.113 ODE No. 113

$$a\sqrt{x^2+y(x)^2}+xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.102768 (sec), leaf count = 36

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

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

✓ **Maple** : cpu = 0.021 (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

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

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

$$y = x\sinh(C - a\ln x)$$

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
```

2.114 ODE No. 114

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

✓ **Mathematica** : cpu = 0.0916264 (sec), leaf count = 32

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

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

✓ **Maple** : cpu = 5.681 (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

$$\begin{aligned}\operatorname{arcsinh}(v) &= x+C\\v &= \sinh(x+C)\end{aligned}$$

Since $y = xv$ then

$$y = x \sinh (x + C)$$

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
```

2.115 ODE No. 115

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

✓ **Mathematica** : cpu = 0.242399 (sec), leaf count = 104

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

$$\left\{\left\{y(x)\to \frac{\sqrt{2}x\tanh^2\left(\frac{1}{4}\left(-\sqrt{2}x^2-2\sqrt{2}c_1\right)\right)-2x\tanh\left(\frac{1}{4}\left(-\sqrt{2}x^2-2\sqrt{2}c_1\right)\right)}{\sqrt{2}-2\tanh\left(\frac{1}{4}\left(-\sqrt{2}x^2-2\sqrt{2}c_1\right)\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.189 (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

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

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.

2.116 ODE No. 116

$$-x\sqrt{\left(y(x)^2-4x^2\right)\left(y(x)^2-x^2\right)}+xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 3.14698 (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]
```

$$\text{Solve}\left[\frac{\sqrt{\frac{\frac{y(x)}{x}+2}{\frac{y(x)}{x}-1}}\sqrt{\frac{\frac{y(x)}{x}+1}{\frac{2y(x)}{x}+4}}\,\text{EllipticF}\left(\arcsin\left(\sqrt{\frac{2}{3}}\sqrt{\frac{\frac{y(x)}{x}-2}{\frac{y(x)}{x}-1}}\right),\frac{9}{8}\right)}{\sqrt{\frac{\frac{y(x)}{x}+1}{\frac{y(x)}{x}-1}}}=\frac{x^2}{2}+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.237 (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))
```

$$\int_{\_b}^{x}\frac{\_a\sqrt{4\_a^4-5\_a^2y\left(x\right)^2+y\left(x\right)^4}+y(x)}{\sqrt{4\_a^4-5\_a^2y\left(x\right)^2+y\left(x\right)^4}}d\_a+\int^{y(x)}-\frac{\_b}{\sqrt{4\_b^4-5\_b^2\_f^2+\_f^4}}d\_f+c_1=0$$

2.117 ODE No. 117

$$xy'(x) + x\left(-e^{\frac{y(x)}{x}}\right) - y(x) - x = 0$$

✓ **Mathematica** : cpu = 0.123731 (sec), leaf count = 28

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

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

✓ **Maple** : cpu = 0.076 (sec), leaf count = 20

```
dsolve(x*diff(y(x),x)-x*exp(y(x)/x)-y(x)-x = 0,y(x))
```

$$y(x) = \left(\ln\left(-\frac{x}{-1 + x\,e^{c_1}}\right) + c_1\right)x$$

2.118 ODE No. 118

$$xy'(x) - y(x)\log(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.0541299 (sec), leaf count = 13

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

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

✓ **Maple** : cpu = 0.054 (sec), leaf count = 8

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

$$y(x) = \mathrm{e}^{xc_1}$$

2.119 ODE No. 119

$$xy'(x) - y(x)(\log(xy(x)) - 1) = 0$$

✓ **Mathematica** : cpu = 0.0742643 (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 = 0.04 (sec), leaf count = 14

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

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

2.120 ODE No. 120

$$xy'(x) - y(x)\left(x\log\left(\frac{x^2}{y(x)}\right) + 2\right) = 0$$

✓ **Mathematica** : cpu = 0.07408 (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 = 0.115 (sec), leaf count = 17

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

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

2.121 ODE No. 121

$$xy'(x) - \sin(x - y(x)) = 0$$

✗ **Mathematica** : cpu = 1.16653 (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))

2.122 ODE No. 122

$$\cos(y(x))\left(\sin(y(x)) - 3x^2\cos(y(x))\right) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.20853 (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]
```

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

✓ **Maple** : cpu = 0.327 (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))
```

$$y(x) = \arctan\left(\frac{x^3+2c_1}{x}\right)$$

2.123 ODE No. 123

$$xy'(x) - y(x) - x\sin\left(\frac{y(x)}{x}\right) = 0$$

✓ **Mathematica** : cpu = 0.063207 (sec), leaf count = 32

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

$$\{\{y(x) \to -x\arccos(-\tanh(\log(x) + c_1))\}, \{y(x) \to x\arccos(-\tanh(\log(x) + c_1))\}\}$$

✓ **Maple** : cpu = 0.071 (sec), leaf count = 44

```
dsolve(x*diff(y(x),x)-x*sin(y(x)/x)-y(x) = 0,y(x))
```

$$y(x) = \arctan\left(\frac{2xc_1}{x^2c_1^2+1}, \frac{-x^2c_1^2+1}{x^2c_1^2+1}\right)x$$

2.124 ODE No. 124

$$xy'(x) - y(x) + x\cos\left(\frac{y(x)}{x}\right) + x = 0$$

✓ **Mathematica** : cpu = 0.0662141 (sec), leaf count = 16

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

$$\{\{y(x) \to 2x\arctan(-\log(x) + c_1)\}\}$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 12

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

$$y(x) = -2\arctan(\ln(x) + c_1)\,x$$

2.125 ODE No. 125

$$x y'(x) - y(x) + x \tan\left(\frac{y(x)}{x}\right) = 0$$

✓ **Mathematica** : cpu = 0.134172 (sec), leaf count = 16

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

$$\left\{\left\{y(x) \to x \arcsin\left(\frac{e^{c_1}}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.038 (sec), leaf count = 14

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

$$y(x) = x \arcsin\left(\frac{1}{x c_1}\right)$$

2.126 ODE No. 126

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

✓ **Mathematica** : cpu = 0.195873 (sec), leaf count = 115

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

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

✓ **Maple** : cpu = 0.019 (sec), leaf count = 29

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

$$y(x) = \frac{\text{RootOf}\left(-\ln(x) + c_1 + \int^{\_Z} \frac{1}{\_a(1+f(\_a))} d\_a\right)}{x}$$

2.127 ODE No. 127

$$xy'(x) - y(x)f\left(x^a y(x)^b\right) = 0$$

✓ **Mathematica** : cpu = 0.332153 (sec), leaf count = 186

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

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

✓ **Maple** : cpu = 0.081 (sec), leaf count = 39

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

$$\int_{\_b}^{y(x)} \frac{1}{\left(f\left(x^a \_a^b\right)b+a\right)\_a} d\_a - \frac{\ln(x)}{b} - c_1 = 0$$

2.128 ODE No. 128

$$-f(x)g(x^a y(x)) + ay(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 1.93528 (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 = 0.206 (sec), leaf count = 33

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

$$y(x) = \text{RootOf}\left(-\left(\int f(x)\, x^{a-1} dx\right) + \int^{\_Z} \frac{1}{g(\_a)} d\_a + c_1\right) x^{-a}$$

2.129 ODE No. 129

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

✓ **Mathematica** : cpu = 0.149502 (sec), leaf count = 44

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

$$\left\{\left\{y(x) \to -\frac{e^{x+1}}{-x \,\text{ExpIntegralEi}(x+1) - \text{ExpIntegralEi}(x+1) + e^{x+1} - ec_1 x - ec_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.031 (sec), leaf count = 33

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

$$y(x) = \frac{\mathrm{e}^{x}}{-\mathrm{e}^{-1}\left(1+x\right)\mathrm{expIntegral}_{1}\left(-1-x\right) - \mathrm{e}^{x} + c_1\left(1+x\right)}$$

2.130 ODE No. 130

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

✓ **Mathematica** : cpu = 0.0127144 (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 = 0.004 (sec), leaf count = 15

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

$$y(x) = \frac{2x^3}{5} + \sqrt{x}\, c_1$$

2.131 ODE No. 131

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

✓ **Mathematica** : cpu = 0.141427 (sec), leaf count = 20

```
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 = 0.143 (sec), leaf count = 31

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

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

2.132 ODE No. 132

$$3xy'(x) - y(x) - 3xy(x)^4 \log(x) = 0$$

✓ **Mathematica** : cpu = 0.0646668 (sec), leaf count = 115

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

$$\left\{\left\{y(x)\to \frac{(-2)^{2/3}\sqrt[3]{x}}{\sqrt[3]{3x^2-6x^2\log(x)+4c_1}}\right\},\left\{y(x)\to \frac{2^{2/3}\sqrt[3]{x}}{\sqrt[3]{3x^2-6x^2\log(x)+4c_1}}\right\},\left\{y(x)\to -\frac{\sqrt[3]{-1}2^{2/3}\sqrt[3]{x}}{\sqrt[3]{3x^2-6x^2\log(x)+}}\right.\right.$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 153

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

$$y(x) = \frac{\left(-4x\left(6x^2\ln(x) - 3x^2 - 4c_1\right)^2\right)^{\frac{1}{3}}}{6x^2\ln(x) - 3x^2 - 4c_1}$$

2.133 ODE No. 133

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

✓ **Mathematica** : cpu = 0.012978 (sec), leaf count = 27

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

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

✓ **Maple** : cpu = 0.008 (sec), leaf count = 16

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

$$y(x) = \left(\operatorname{expIntegral}_1\left(\frac{1}{x}\right) + c_1\right) e^{\frac{1}{x}}$$

2.134 ODE No. 134

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

✓ **Mathematica** : cpu = 0.0289596 (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 = 0.004 (sec), leaf count = 17

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

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

2.135 ODE No. 135

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

✓ **Mathematica** : cpu = 0.0131295 (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 = 0.004 (sec), leaf count = 11

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

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

2.136 ODE No. 136

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

✓ **Mathematica** : cpu = 0.0564999 (sec), leaf count = 28

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

$$\left\{\left\{y(x)\to \frac{-x+x\log(x)-c_1x}{-\log(x)+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 18

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

$$y(x) = -\frac{x(\ln(x)+c_1-1)}{\ln(x)+c_1}$$

2.137 ODE No. 137

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

✓ **Mathematica** : cpu = 0.0531233 (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 = 0.005 (sec), leaf count = 14

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

$$y(x) = \frac{x}{-\ln(x) + c_1}$$

2.138 ODE No. 138

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

✓ **Mathematica** : cpu = 0.0513501 (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 = 0.022 (sec), leaf count = 11

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

$$y(x) = \tan(\ln(x) + c_1)\, x$$

2.139 ODE No. 139

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

✓ **Mathematica** : cpu = 0.153984 (sec), leaf count = 821

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

$$\left\{\left\{y(x) \to -\frac{a^{\frac{b}{k}+\frac{1}{2}\left(\frac{1}{k}-\frac{2b}{k}\right)} \left(\frac{b}{k}+\frac{1}{2}\left(\frac{1}{k}-\frac{2b}{k}\right)\right) x^{k-1} \left(x^k\right)^{\frac{b}{k}+\frac{1}{2}\left(\frac{1}{k}-\frac{2b}{k}\right)-1} \text{BesselJ}\left(\frac{2b-1}{k}, \frac{2\sqrt{a}\sqrt{x^k}}{k}\right) \text{Gamma}\left(\frac{2b}{k}-\frac{1}{k}+1\right)\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.105 (sec), leaf count = 217

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

$$y(x) = \frac{-\text{BesselJ}\left(\frac{\sqrt{(-1+2b)^2}+k}{k}, \frac{2\sqrt{a}\,x^{\frac{k}{2}}}{k}\right)\sqrt{a}\,x^{\frac{k}{2}} - \sqrt{a}\,\text{BesselY}\left(\frac{\sqrt{(-1+2b)^2}+k}{k}, \frac{2\sqrt{a}\,x^{\frac{k}{2}}}{k}\right) x^{\frac{k}{2}} c_1 + \left(\frac{1}{2} + \left(b-\frac{1}{2}\right)\text{csgn}\right.}{x\left(\text{BesselY}\left(\frac{\sqrt{(-1+2b)^2}}{k}, \frac{2\sqrt{a}\,x^{\frac{k}{2}}}{k}\right) c_1 + \text{BesselJ}\right.}$$

2.140 ODE No. 140

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

✓ **Mathematica** : cpu = 0.0582079 (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 = 0.065 (sec), leaf count = 20

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

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

2.141 ODE No. 141

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

✓ **Mathematica** : cpu = 0.0920669 (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 = 0.055 (sec), leaf count = 51

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

$$y(x)=\frac{-a+1-\tanh\left(\frac{\sqrt{a^2-2a-4b+1}\,(-\ln(x)+c_1)}{2}\right)\sqrt{a^2-2a-4b+1}}{2x}$$

2.142 ODE No. 142

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

✓ **Mathematica** : cpu = 0.151549 (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]
```

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

✓ **Maple** : cpu = 0.065 (sec), leaf count = 52

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

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

2.143 ODE No. 143

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

✓ **Mathematica** : cpu = 0.0676987 (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 = 0.036 (sec), leaf count = 41

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

$$y(x) = \frac{1-\tanh\left(\frac{\sqrt{4ab+1}\,(-\ln(x)+c_1)}{2}\right)\sqrt{4ab+1}}{2ax}$$

2.144 ODE No. 144

$$x^2\left(ay(x)^2+y'(x)\right)+bx^\alpha+c=0$$

✓ **Mathematica** : cpu = 0.171095 (sec), leaf count = 1787

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

$$\left\{\left\{y(x)\to\frac{a^{\frac{i\sqrt{4ac-1}\alpha+\alpha}{2\alpha^2}-\frac{\sqrt{\alpha^2-4a\alpha^2c}}{2\alpha^2}}\alpha^{-\frac{i\sqrt{4ac-1}\alpha+\alpha}{\alpha^2}+\frac{\sqrt{\alpha^2-4a\alpha^2c}}{\alpha^2}+1}b^{\frac{i\sqrt{4ac-1}\alpha+\alpha}{2\alpha^2}-\frac{\sqrt{\alpha^2-4a\alpha^2c}}{2\alpha^2}}\left(\frac{i\sqrt{4ac-1}\alpha+\alpha}{2\alpha^2}-\frac{\sqrt{\alpha^2-4a\alpha^2c}}{2\alpha^2}\right)(x^{\cdots}}{\cdots}\right.\right.$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 219

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

$$y(x)=\frac{-2\sqrt{ab}\left(\mathrm{BesselY}\left(\frac{\sqrt{-4ac+1}+\alpha}{\alpha},\frac{2\sqrt{ab}\,x^{\frac{\alpha}{2}}}{\alpha}\right)c_1+\mathrm{BesselJ}\left(\frac{\sqrt{-4ac+1}+\alpha}{\alpha},\frac{2\sqrt{ab}\,x^{\frac{\alpha}{2}}}{\alpha}\right)\right)x^{\frac{\alpha}{2}}+\left(\sqrt{-4ac+1}+1\right)\left(\mathrm{Be}\cdots\right.}{2xa\left(\mathrm{BesselY}\left(\frac{\sqrt{-4ac+1}}{\alpha},\frac{2\sqrt{ab}\,x^{\frac{\alpha}{2}}}{\alpha}\right)c_1+\mathrm{BesselJ}\left(\frac{\sqrt{-4ac+1}}{\alpha}\cdots\right.\right.}$$

2.145 ODE No. 145

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

✓ **Mathematica** : cpu = 0.428022 (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]
```

$$\text{Solve}\left[\frac{\left(-\frac{1}{2^{2/3}a^{2/3}y(x)}-\frac{\sqrt[3]{a}x}{2^{2/3}}\right)\text{AiryAi}\left(\left(-\frac{\sqrt[3]{a}x}{2^{2/3}}-\frac{1}{2^{2/3}a^{2/3}y(x)}\right)^2+\frac{1}{\sqrt[3]{2}\sqrt[3]{a}x}\right)+\text{AiryAiPrime}\left(\left(-\frac{\sqrt[3]{a}x}{2^{2/3}}-\frac{1}{2^{2/3}a^{2/3}y(x)}\right.\right.}{\left(-\frac{1}{2^{2/3}a^{2/3}y(x)}-\frac{\sqrt[3]{a}x}{2^{2/3}}\right)\text{AiryBi}\left(\left(-\frac{\sqrt[3]{a}x}{2^{2/3}}-\frac{1}{2^{2/3}a^{2/3}y(x)}\right)^2+\frac{1}{\sqrt[3]{2}\sqrt[3]{a}x}\right)+\text{AiryBiPrime}\left(\left(-\frac{\sqrt[3]{a}x}{2^{2/3}}-\frac{1}{2^{2/3}a^{2/3}y(x)}\right.\right.}\right.$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 117

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

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

2.146 ODE No. 146

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

✓ **Mathematica** : cpu = 0.608827 (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 = 0.142 (sec), leaf count = 84

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

$$\frac{\left(a\sqrt{\pi}\,\sqrt{2}\,\operatorname{erf}\left(\frac{\sqrt{2}\,(ay(x)+x)}{2y(x)x}\right)\mathrm{e}^{\frac{(ay(x)+x)^2}{2y(x)^2x^2}}+2x\right)\mathrm{e}^{-\frac{((x+a)y(x)+x)((a-x)y(x)+x)}{2y(x)^2x^2}}}{2}+c_1=0$$

2.147 ODE No. 147

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

✓ **Mathematica** : cpu = 0.591788 (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]
```

$$\text{Solve}\left[\frac{\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{a}x}+\frac{1}{2^{2/3}\sqrt[3]{a}\sqrt[3]{b}y(x)}\right)\text{AiryAi}\left(\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{a}x}+\frac{1}{2^{2/3}\sqrt[3]{a}y(x)\sqrt[3]{b}}\right)^2-\frac{\sqrt[3]{a}x}{\sqrt[3]{2}b^{2/3}}\right)+\text{AiryAiPrime}\left(\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{a}x}+\frac{}{2^{2}}\right.\right.}{\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{a}x}+\frac{1}{2^{2/3}\sqrt[3]{a}\sqrt[3]{b}y(x)}\right)\text{AiryBi}\left(\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{a}x}+\frac{1}{2^{2/3}\sqrt[3]{a}y(x)\sqrt[3]{b}}\right)^2-\frac{\sqrt[3]{a}x}{\sqrt[3]{2}b^{2/3}}\right)+\text{AiryBiPrime}\left(\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{a}x}+\frac{}{2^{2}}\right.\right.}\right.$$

✓ **Maple** : cpu = 0.158 (sec), leaf count = 178

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

$$y(x) = -\frac{2^{\frac{1}{3}}abx}{2^{\frac{1}{3}}ab^2 - 2\left(a^2b^2\right)^{\frac{2}{3}}\text{RootOf}\left(\text{AiryBi}\left(-\frac{a2^{\frac{2}{3}}x-2\_Z^2\left(a^2b^2\right)^{\frac{1}{3}}}{2\left(a^2b^2\right)^{\frac{1}{3}}}\right)c_1\_Z + \_Z\,\text{AiryAi}\left(-\frac{a2^{\frac{2}{3}}x-2\_Z^2\left(a^2b^2\right)^{\frac{1}{3}}}{2\left(a^2b^2\right)^{\frac{1}{3}}}\right)+A\right.}$$

2.148 ODE No. 148

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

✓ **Mathematica** : cpu = 0.0234728 (sec), leaf count = 43

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

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

✓ **Maple** : cpu = 0.006 (sec), leaf count = 16

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

$$y(x)=\frac{\operatorname{arcsinh}(x)+c_1}{\sqrt{x^2+1}}$$

2.149 ODE No. 149

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

✓ **Mathematica** : cpu = 0.01565 (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 = 0.008 (sec), leaf count = 20

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

$$y(x)=\frac{x^2}{3}+\frac{1}{3}+\frac{c_1}{\sqrt{x^2+1}}$$

2.150 ODE No. 150

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

✓ **Mathematica** : cpu = 0.0142171 (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 = 0.005 (sec), leaf count = 23

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

$$y(x)=\frac{2x^3+3c_1}{3x^2+3}$$

2.151 ODE No. 151

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

✓ **Mathematica** : cpu = 0.409314 (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]
```

$$\text{Solve}\left[c_1=\frac{\frac{1}{2}\left(\frac{1}{\frac{ix}{x^2+1}-\frac{ix^2y(x)}{x^2+1}}+\frac{i}{x}\right)\sqrt[4]{1-\left(\frac{1}{\frac{ix}{x^2+1}-\frac{ix^2y(x)}{x^2+1}}+\frac{i}{x}\right)^2}\,\text{Hypergeometric2F1}\left(\frac{1}{2},\frac{5}{4},\frac{3}{2},\left(\frac{1}{\frac{ix}{x^2+1}-\frac{ix^2y(x)}{x^2+1}}+\frac{i}{x}\right)^2\right.}{\sqrt[4]{-1+\left(\frac{1}{\frac{ix}{x^2+1}-\frac{ix^2y(x)}{x^2+1}}+\frac{i}{x}\right)^2}}\right.$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 76

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

$$c_1+\frac{x}{\left(1+\left(\frac{1}{x}+\frac{x^2(x^2+1)}{y(x)x^4-x^3}\right)^2\right)^{\frac{1}{4}}}+\frac{(y(x)+x)\,\text{hypergeom}\left(\left[\frac{1}{2},\frac{5}{4}\right],\left[\frac{3}{2}\right],-\frac{(y(x)+x)^2}{(xy(x)-1)^2}\right)}{2xy\left(x\right)-2}=0$$

2.152 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 = 0.276851 (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] == 0,y[x],x
```

$$\left\{\left\{y(x)\to \arctan\left(\frac{x^4+2x^2-6c_1\sqrt{x^2+1}+1}{3\left(x^2+1\right)}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.621 (sec), leaf count = 142

```
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))
```

$$y(x)=\frac{\arctan\left(\frac{6\sqrt{x^2+1}\left(\sqrt{x^2+1}\,x^2+\sqrt{x^2+1}+3c_1\right)}{10+6c_1\left(x^2+1\right)^{\frac{3}{2}}+x^6+3x^4+12x^2+9c_1^2},\frac{8+6\left(-x^2-1\right)c_1\sqrt{x^2+1}-x^6-3x^4+6x^2-9c_1^2}{10+6c_1\left(x^2+1\right)^{\frac{3}{2}}+x^6+3x^4+12x^2+9c_1^2}\right)}{2}$$

2.153 ODE No. 153

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

✓ **Mathematica** : cpu = 0.0330542 (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 = 0.009 (sec), leaf count = 20

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

$$y(x)=\sqrt{x-1}\,\sqrt{1+x}\,c_1+ax$$

2.154 ODE No. 154

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

✓ **Mathematica** : cpu = 0.017153 (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 = 0.006 (sec), leaf count = 19

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

$$y(x)=\frac{\sin\left(x\right)+c_1}{\left(x-1\right)\left(1+x\right)}$$

2.155 ODE No. 155

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

✓ **Mathematica** : cpu = 0.0945428 (sec), leaf count = 46

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

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

✓ **Maple** : cpu = 0.058 (sec), leaf count = 14

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

$$y(x)=x+\frac{1}{c_1-\operatorname{arctanh}(x)}$$

2.156 ODE No. 156

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

✓ **Mathematica** : cpu = 0.0610215 (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 = 0.01 (sec), leaf count = 20

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

$$y(x)=\frac{1}{\sqrt{x-1}\,\sqrt{1+x}\,c_1+x}$$

2.157 ODE No. 157

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

✓ **Mathematica** : cpu = 0.132398 (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]
```

$$\left\{\left\{y(x) \to \frac{(x^2-1)\left(c_1\left(ax(x^2-1)^{\frac{a}{2}-1}\,\text{LegendreP}(a-1,x) + (x^2-1)^{\frac{a}{2}-1}\,(a\,\text{LegendreP}(a,x) - ax\,\text{LegendreP}\right.\right.}{a\left((x^2-1)^{a/2}\,\text{LegendreQ}(a-\right.}\right.\right.$$

✓ **Maple** : cpu = 0.149 (sec), leaf count = 231

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

$$y(x) = \frac{8(1+x)\left(\left(a-\frac{1}{2}\right)x - \frac{a}{2} + \frac{1}{2}\right)c_1\,\text{HeunC}\left(0, -2a+1, 0, 0, a^2-a+\frac{1}{2}, \frac{2}{1+x}\right) - a(1+x)\left(-\frac{x}{2}-\frac{1}{2}\right)^{-2a+1}\text{Heu}}{4\,(1+x)\left(\text{HeunC}\left(0, -2a+\right.\right.}$$

2.158 ODE No. 158

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

✓ **Mathematica** : cpu = 0.10925 (sec), leaf count = 31

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

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

✓ **Maple** : cpu = 0.01 (sec), leaf count = 22

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

$$y(x) = \frac{1}{\sqrt{x-1}\,\sqrt{1+x}\,c_1 - a}$$

2.159 ODE No. 159

$$(x^2 - 1)\, y'(x) - 2xy(x) \log(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.0670883 (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 = 0.082 (sec), leaf count = 13

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

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

2.160 ODE No. 160

$$\left(x^2-4\right) y'(x)+(x+2)y(x)^2-4y(x)=0$$

✓ **Mathematica** : cpu = 0.0882708 (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 = 0.018 (sec), leaf count = 21

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

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

2.161 ODE No. 161

$$\left(x^2-5x+6\right)y'(x)+x^2+3xy(x)-8y(x)=0$$

✓ **Mathematica** : cpu = 0.0187703 (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 = 0.008 (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))
```

$$y(x)=\frac{-\frac{1}{4}x^4+\frac{2}{3}x^3+c_1}{(x-3)(x-2)^2}$$

2.162 ODE No. 162

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

✓ **Mathematica** : cpu = 0.29755 (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] == 0,y[x],x
```

$$\left\{\left\{y(x)\to -\frac{-ak-bk+2kx}{2(k+1)}+\frac{1}{2}\sqrt{\frac{-a^2k^2+2abk^2-b^2k^2}{(k+1)^2}}\tan\left(\frac{(k+1)\sqrt{\frac{-a^2k^2+2abk^2-b^2k^2}{(k+1)^2}}(\log(x-b)-\log(x\right.}{2(a-b)}\right.\right.$$

✓ **Maple** : cpu = 0.145 (sec), leaf count = 54

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

$$y(x)=\frac{\left((a-x)^{k+1}+c_1(b-x)^k(b-x)\right)k}{(k+1)\left(c_1(b-x)^k+(a-x)^k\right)}$$

2.163 ODE No. 163

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

✓ **Mathematica** : cpu = 0.0726304 (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 = 0.047 (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))
```

$$y(x) = -i\tan\left(\frac{2ia-\sqrt{x}\,c_1}{\sqrt{x}}\right)\sqrt{x}\,a$$

2.164 ODE No. 164

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

✓ **Mathematica** : cpu = 0.0976713 (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 = 0.144 (sec), leaf count = 102

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

$$y(x) = \frac{\left(-2\sqrt{-\frac{a^2}{x}}\,c_1x - x\right)\sin\left(2\sqrt{-\frac{a^2}{x}}\right) - x\left(c_1 - 2\sqrt{-\frac{a^2}{x}}\right)\cos\left(2\sqrt{-\frac{a^2}{x}}\right)}{2\cos\left(2\sqrt{-\frac{a^2}{x}}\right)c_1 + 2\sin\left(2\sqrt{-\frac{a^2}{x}}\right)}$$

2.165 ODE No. 165

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

✓ **Mathematica** : cpu = 0.084185 (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 = 0.011 (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))
```

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

2.166 ODE No. 166

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

✓ **Mathematica** : cpu = 0.108592 (sec), leaf count = 71

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

$$\left\{\left\{y(x)\to \frac{2x\left(-G_{2,2}^{2,0}\left(x\left|\begin{array}{c}-\frac{1}{2},\frac{1}{2}\\ -1,0\end{array}\right.\right)+\frac{c_1(\text{EllipticE}(x)-\text{EllipticK}(x))}{\pi x}\right)}{G_{2,2}^{2,0}\left(x\left|\begin{array}{c}\frac{1}{2},\frac{3}{2}\\ 0,0\end{array}\right.\right)+\frac{2c_1\,\text{EllipticE}(x)}{\pi}}\right\}\right\}$$

✓ **Maple** : cpu = 0.104 (sec), leaf count = 97

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

$$y(x)=\frac{x\left(\text{LegendreQ}\left(-\frac{1}{2},1,\frac{2-x}{x}\right)c_1-\text{LegendreQ}\left(\frac{1}{2},1,\frac{2-x}{x}\right)c_1+\text{LegendreP}\left(-\frac{1}{2},1,\frac{2-x}{x}\right)-\text{LegendreP}\left(\frac{1}{2},1,\frac{2-x}{x}\right)\right)}{2\left(\text{LegendreQ}\left(-\frac{1}{2},1,\frac{2-x}{x}\right)c_1+\text{LegendreP}\left(-\frac{1}{2},1,\frac{2-x}{x}\right)\right)(x-1)}$$

2.167 ODE No. 167

$$3x^2y'(x) - x^2 - 3xy(x) - 7y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0625858 (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 = 0.02 (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))
```

$$y(x) = \frac{\tan\left(\frac{(\ln(x)+c_1)\sqrt{7}}{3}\right)x\sqrt{7}}{7}$$

2.168 ODE No. 168

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

✓ **Mathematica** : cpu = 0.132948 (sec), leaf count = 234

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

$$\left\{\left\{y(x)\to \frac{3(x^2-4)\left(c_1\left(\frac{xP_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)}{6(x^2-4)^{11/12}}+\frac{\sqrt[12]{x^2-4}\left(\frac{1}{2}P_{\frac{5}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)-\frac{5}{12}xP_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)\right)}{2\left(\frac{x^2}{4}-1\right)}\right)+\frac{xQ_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)}{6(x^2-4)^{11/12}}+\frac{\sqrt[12]{x^2-4}\left(\frac{1}{2}Q_{\frac{5}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)-\frac{5}{12}xQ^{\frac{1}{3}}_{-}\right.}{2\left(\frac{x^2}{4}-1\right)}}{\sqrt[12]{x^2-4}Q_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)+c_1\sqrt[12]{x^2-4}P_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)}\right.\right.$$

✓ **Maple** : cpu = 0.114 (sec), leaf count = 140

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

$$y(x)=-\frac{3(x+2)\left(\mathrm{HeunC}\left(0,\frac{4}{3},-\frac{1}{3},0,\frac{25}{36},\frac{4}{x+2}\right)c_1-\right.}{4c_1\,(x+2)\left(x-\frac{5}{4}\right)\mathrm{HeunC}\left(0,\frac{4}{3},-\frac{1}{3},0,\frac{25}{36},\frac{4}{x+2}\right)-\left(-\frac{x}{4}-\frac{1}{2}\right)^{\frac{4}{3}}(x+2)\,\mathrm{HeunC}\left(0,-\frac{4}{3},-\frac{1}{3},0,\frac{25}{36},\frac{4}{x+2}\right)+}$$

2.169 ODE No. 169

$$(ax+b)^2y'(x)+y(x)^3(ax+b)+cy(x)^2=0$$

✓ **Mathematica** : cpu = 1.43536 (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 = 0.128 (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))
```

$$\frac{\left(\sqrt{2}\,\sqrt{\pi}\,\operatorname{erf}\left(\frac{(y(x)c+a(ax+b))\sqrt{2}}{2\sqrt{a}\,y(x)(ax+b)}\right)e^{\frac{(y(x)c+a(ax+b))^2}{2y(x)^2(ax+b)^2a}}ac+2a^{\frac{3}{2}}(ax+b)\right)e^{-\frac{((ax+b+c)y(x)+a(ax+b))((-ax-b+c)y(x)+a(ax+b))}{2y(x)^2(ax+b)^2a}}+2c_1}{2a^{\frac{5}{2}}}$$

2.170 ODE No. 170

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

✓ **Mathematica** : cpu = 0.0616441 (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 = 0.007 (sec), leaf count = 23

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

$$y(x) = \frac{x^2(\ln(x) - c_1 - 1)}{\ln(x) - c_1}$$

2.171 ODE No. 171

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

✓ **Mathematica** : cpu = 0.050495 (sec), leaf count = 17

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

$$\left\{\left\{y(x)\to \frac{x^2}{1+c_1x}\right\}\right\}$$

✓ **Maple** : cpu = 0.006 (sec), leaf count = 15

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

$$y(x) = \frac{x^2}{xc_1+1}$$

2.172 ODE No. 172

$$x^4(-y(x)^2) + x^3y'(x) + x^2y(x) + 20 = 0$$

✓ **Mathematica** : cpu = 0.0625231 (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 = 0.241 (sec), leaf count = 26

```
dsolve(x^3*diff(y(x),x)-y(x)^2*x^4+x^2*y(x)+20 = 0,y(x))
```

$$y(x) = \frac{5x^9+4c_1}{(-x^9+c_1)\,x^2}$$

2.173 ODE No. 173

$$x^6\left(-y(x)^2\right)+x^3y'(x)-(2x-3)x^2y(x)+3=0$$

✓ **Mathematica** : cpu = 0.0669253 (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 = 0.069 (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))
```

$$y(x)=\frac{-3\,\mathrm{e}^{4x}c_1-3}{x^3\left(\mathrm{e}^{4x}c_1-3\right)}$$

2.174 ODE No. 174

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

✓ **Mathematica** : cpu = 0.012192 (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 = 0.003 (sec), leaf count = 13

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

$$y(x)=\frac{c_1}{\sqrt{x^2+1}}$$

2.175 ODE No. 175

$$ax^3 + (x^2 - 1)\, xy'(x) - (2x^2 - 1)\, y(x) = 0$$

✓ **Mathematica** : cpu = 0.0214391 (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 = 0.009 (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))
```

$$y(x) = x\left(\sqrt{x-1}\,\sqrt{1+x}\,c_1 + a\right)$$

2.176 ODE No. 176

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

✓ **Mathematica** : cpu = 0.13892 (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]
```

$$\left\{\left\{y(x)\to \frac{x\left(-2xG_{2,2}^{2,0}\left(x^2\middle| \begin{array}{c} -\frac{1}{2},\frac{1}{2} \\ -1,0 \end{array} \right)+\frac{2c_1\left(\text{EllipticE}\left(x^2\right)-\text{EllipticK}\left(x^2\right)\right)}{\pi x}\right)}{G_{2,2}^{2,0}\left(x^2\middle| \begin{array}{c} \frac{1}{2},\frac{3}{2} \\ 0,0 \end{array} \right)+\frac{2c_1\text{EllipticE}\left(x^2\right)}{\pi}}\right\}\right\}$$

✓ **Maple** : cpu = 0.053 (sec), leaf count = 30

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

$$y(x)=\frac{c_1\,\text{EllipticCE}\left(x\right)+\text{EllipticE}\left(x\right)-\text{EllipticK}\left(x\right)}{c_1\,\text{EllipticCE}\left(x\right)-c_1\,\text{EllipticCK}\left(x\right)+\text{EllipticE}\left(x\right)}$$

2.177 ODE No. 177

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

✓ **Mathematica** : cpu = 0.0791285 (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 = 0.013 (sec), leaf count = 17

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

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

2.178 ODE No. 178

$$2(x^2-1)\,xy'(x)+2(x^2-1)\,y(x)^2-(3x^2-5)\,y(x)+x^2-3=0$$

✓ **Mathematica** : cpu = 10.1265 (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] == 0,y
```

$$\left\{\left\{y(x)\to 1+\frac{\sqrt{x}}{\sqrt{1-x^2}\left(2\sqrt{x}\,\text{Hypergeometric2F1}\left(\frac{1}{4},\frac{1}{2},\frac{5}{4},x^2\right)+c_1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.167 (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))
```

$$y(x)=1-\frac{2\sqrt{x}}{\sqrt{x-1}\,\sqrt{1+x}\left(c_1-\frac{2\,\text{EllipticF}\left(\sqrt{1+x},\frac{\sqrt{2}}{2}\right)\sqrt{-x}\,\sqrt{2}\,\sqrt{1-x}}{\sqrt{x-1}\,\sqrt{x}}\right)}$$

2.179 ODE No. 179

$$3x(x^2-1)\,y'(x)-(x^2+1)\,y(x)+xy(x)^2-3x=0$$

✓ **Mathematica** : cpu = 0.400296 (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]
```

$$\left\{\left\{y(x)\to \frac{3(x^2-1)\left(c_1\left(\frac{e^{\int_1^x \text{Root}\left[125K[1]^8-164K[1]^6+70K[1]^4-20K[1]^2+\left(1296K[1]^{12}-5184K[1]^{10}+7776K[1]^8-5184K[1]^6+1296K[1]^4\right)\#1^4+(\right.}}{}\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.094 (sec), leaf count = 107

```
dsolve(3*x*(x^2-1)*diff(y(x),x)+x*y(x)^2-(x^2+1)*y(x)-3*x = 0,y(x))
```

$$y(x)=\frac{5c_1\left(x^2-\frac{2}{5}\right)\text{hypergeom}\left(\left[\frac{5}{6},\frac{7}{6}\right],\left[\frac{4}{3}\right],x^2\right)+\frac{35(x^4-x^2)c_1\,\text{hypergeom}\left(\left[\frac{11}{6},\frac{13}{6}\right],\left[\frac{7}{3}\right],x^2\right)}{8}+\frac{15\left(-x^{\frac{4}{3}}+x^{\frac{10}{3}}\right)\text{hypergeom}\left(\left[\frac{3}{2},\right.\right.}{4}}{x^{\frac{1}{3}}\left(x^{\frac{2}{3}}\,\text{hypergeom}\left(\left[\frac{5}{6},\frac{7}{6}\right],\left[\frac{4}{3}\right],x^2\right)c_1+\text{hypergeom}\left(\left[\frac{1}{2},\frac{5}{6}\right],\left[\frac{2}{3}\right],\right.\right.}$$

2.180 ODE No. 180

$$\left(xy'(x)-y(x)\right)\left(ax^2+bx+c\right)+x^2-y(x)^2=0$$

✓ **Mathematica** : cpu = 0.199901 (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]
```

$$\left\{\left\{y(x)\to -\frac{x\left(-1+\exp\left(\frac{4\arctan\left(\frac{2ax}{\sqrt{4ac-b^2}}+\frac{b}{\sqrt{4ac-b^2}}\right)}{\sqrt{4ac-b^2}}+2c_1\right)\right)}{1+\exp\left(\frac{4\arctan\left(\frac{2ax}{\sqrt{4ac-b^2}}+\frac{b}{\sqrt{4ac-b^2}}\right)}{\sqrt{4ac-b^2}}+2c_1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.067 (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))
```

$$y(x)=-\tanh\left(\frac{c_1\sqrt{4ac-b^2}+2\arctan\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{4ac-b^2}}\right)x$$

2.181 ODE No. 181

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

✓ **Mathematica** : cpu = 0.120805 (sec), leaf count = 146

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

$$\left\{\left\{y(x)\to -\frac{-\frac{ie^{-\frac{i\sqrt{a}}{x}}}{2\sqrt{a}}+\frac{e^{-\frac{i\sqrt{a}}{x}}}{2x}+c_1\left(e^{\frac{i\sqrt{a}}{x}}-\frac{i\sqrt{a}e^{\frac{i\sqrt{a}}{x}}}{x}\right)}{\frac{ixe^{-\frac{i\sqrt{a}}{x}}}{2\sqrt{a}}-c_1xe^{\frac{i\sqrt{a}}{x}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 27

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

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

2.182 ODE No. 182

$$\left(x^3-1\right) x y'(x)+x^2-2 x y(x)^2+y(x)=0$$

✓ **Mathematica** : cpu = 0.153937 (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]
```

$$\left\{\left\{y(x)\to -\frac{\left(x^3-1\right)\left(\frac{x}{(1-x^3)^{2/3}}+\frac{x^4}{(1-x^3)^{5/3}}+\frac{2c_1x^2}{(1-x^3)^{5/3}}\right)}{2\left(\frac{x^2}{2(1-x^3)^{2/3}}+\frac{c_1}{(1-x^3)^{2/3}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.079 (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))
```

$$y(x)=\frac{x(x+c_1)}{x^2c_1+1}$$

2.183 ODE No. 183

$$\left(2x^4 - x\right) y'(x) - 2\left(x^3 - 1\right) y(x) = 0$$

✓ **Mathematica** : cpu = 0.0188898 (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 = 0.009 (sec), leaf count = 18

```
dsolve((2*x^4-x)*diff(y(x),x)-2*(x^3-1)*y(x) = 0,y(x))
```

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

2.184 ODE No. 184

$$\left(y'(x)+y(x)^2\right)\left(ax^2+bx+c\right)^2+A=0$$

✓ **Mathematica** : cpu = 0.808451 (sec), leaf count = 704

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

$$\left\{\left\{y(x)\to-\frac{-\frac{2a\sqrt{ax^2+bx+c}\exp\left(-\frac{\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\arctan\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)}{(b^2-4ac)\left(\frac{(2ax+b)^2}{4ac-b^2}+1\right)}+\frac{(2ax+b)\exp\left(-\frac{\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\arctan\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)}{2\sqrt{b^2-4ac}\sqrt{1-\frac{4A}{b^2-4ac}}\sqrt{ax^2+bx+c}}}{-\frac{\sqrt{ax^2+bx+c}\exp\left(-\frac{\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\arctan\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)}{\sqrt{b^2-4ac}\sqrt{1-\frac{4A}{b^2-4ac}}}}\right.\right.$$

✓ **Maple** : cpu = 0.358 (sec), leaf count = 493

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

$$y(x)=\frac{2a\left(c_1\left(i\sqrt{\frac{-4ac+b^2-4A}{a^2}}\,a\sqrt{4ac-b^2}-2\left(ax+\frac{b}{2}\right)\sqrt{-4ac+b^2}\right)\left(\frac{i\sqrt{4ac-b^2}-2ax-b}{2ax+b+i\sqrt{4ac-b^2}}\right)^{-\frac{a\sqrt{\frac{-4ac+b^2-4A}{a^2}}}{2\sqrt{-4ac+b^2}}}-\left(\frac{i\sqrt{4ac-}}{2ax+b+}\right.\right.}{\sqrt{-4ac+b^2}\left(2ax+b+i\sqrt{4ac-b^2}\right)\left(i\sqrt{4ac-b^2}-2ax-b\right)\left(c_1\left(\frac{i\sqrt{4ac-b^2}-2a}{2ax+b+i\sqrt{4ac}}\right.\right.}$$

2.185 ODE No. 185

$$x^7 y'(x) + 5x^3 y(x)^2 + 2(x^2+1)\, y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.312579 (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]
```

$$\text{Solve}\left[c_1 = \frac{\frac{1}{2}\sqrt[4]{1-\left(\frac{ix^2}{y(x)}+\frac{i}{x}\right)^2}\left(\frac{ix^2}{y(x)}+\frac{i}{x}\right)\text{Hypergeometric2F1}\left(\frac{1}{2},\frac{5}{4},\frac{3}{2},\left(\frac{ix^2}{y(x)}+\frac{i}{x}\right)^2\right)+ix}{\sqrt[4]{-1+\left(\frac{ix^2}{y(x)}+\frac{i}{x}\right)^2}}, y(x)\right]$$

✓ **Maple** : cpu = 0.028 (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))
```

$$c_1 + \frac{x}{\left(\left(\frac{1}{x}+\frac{x^2}{y(x)}\right)^2+1\right)^{\frac{1}{4}}} + \frac{(x^3+y(x))\,\text{hypergeom}\left(\left[\frac{1}{2},\frac{5}{4}\right],\left[\frac{3}{2}\right],-\frac{(x^3+y(x))^2}{x^2 y(x)^2}\right)}{2xy(x)} = 0$$

2.186 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 = 0.163836 (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 = 0.026 (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))
```

$$y(x)=\tan\left(-\ln\left(x\right)+c_1\right)x^{n-1}$$

2.187 ODE No. 187

$$-ay(x)^2-bx^{2n-2}+x^ny'(x)=0$$

✓ **Mathematica** : cpu = 0.159562 (sec), leaf count = 328

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

$$\left\{\left\{y(x)\to -\frac{x^n\left(\frac{1}{2}\sqrt{a}\sqrt{b}\left(\sqrt{\frac{(n-1)^2}{ab}-4}-\frac{n-1}{\sqrt{a}\sqrt{b}}\right)x^{\frac{1}{2}\sqrt{a}\sqrt{b}\left(\sqrt{\frac{(n-1)^2}{ab}-4}-\frac{n-1}{\sqrt{a}\sqrt{b}}\right)-1}+\frac{1}{2}\sqrt{a}\sqrt{b}c_1\left(-\frac{n-1}{\sqrt{a}\sqrt{b}}-\sqrt{\frac{(n-1)^2}{ab}\cdots}\right.\right.}{a\left(x^{\frac{1}{2}\sqrt{a}\sqrt{b}\left(\sqrt{\frac{(n-1)^2}{ab}-4}-\frac{n-1}{\sqrt{a}\sqrt{b}}\right)}+c_1x^{\frac{1}{2}\sqrt{a}\sqrt{b}\left(-\frac{n-1}{\sqrt{a}\sqrt{b}}-\sqrt{\frac{(n-1)^2}{ab}-4}\right)}\cdots\right)}\right.\right.$$

✓ **Maple** : cpu = 0.069 (sec), leaf count = 60

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

$$y(x)=\frac{x^{n-1}\left(n-1-\tan\left(\frac{\sqrt{4ab-n^2+2n-1}\,(-\ln(x)+c_1)}{2}\right)\sqrt{4ab-n^2+2n-1}\right)}{2a}$$

2.188 ODE No. 188

$$-ay(x)^3 - bnx^3 + x^{2n+1}y'(x) = 0$$

✗ **Mathematica** : cpu = 9.04544 (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 = 0.026 (sec), leaf count = 32

```
dsolve(x^(2*n+1)*diff(y(x),x)-a*y(x)^3-b*x^(3*n) = 0,y(x))
```

$$y(x) = \mathrm{RootOf}\left(-\ln(x) + c_1 + \int^{\_Z} \frac{1}{\_a^3 a - n\_a + b} d\_a\right) x^n$$

2.189 ODE No. 189

$$-ay(x)^n - bx^{(m+1)n} + x^{m(n-1)+n}y'(x) = 0$$

✓ **Mathematica** : cpu = 0.366758 (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]
```

$$\text{Solve}\left[\int_1^{\left(\frac{ax^{-((m+1)n)}}{b}\right)^{\frac{1}{n}}y(x)} \frac{1}{K[1]^n - \left(\frac{b^{1-n}(m+1)^n}{a}\right)^{\frac{1}{n}} K[1] + 1} dK[1] = bx^{m+1}\log(x)\left(\frac{ax^{-((m+1)n)}}{b}\right)^{\frac{1}{n}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.62 (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))
```

$$\int_{\_b}^{y(x)} -\frac{x^{mn}x^n}{(b\,x^m x - (m+1)\_a)\,x^n x^{mn} + a\,\_a^n x^m x} d\_a + \ln(x) - c_1 = 0$$

2.190 ODE No. 190

$$\sqrt{x^2-1}y'(x)-\sqrt{y(x)^2-1}=0$$

✓ **Mathematica** : cpu = 0.0885739 (sec), leaf count = 173

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

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

✓ **Maple** : cpu = 0.006 (sec), leaf count = 29

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

$$\ln\left(x+\sqrt{x^2-1}\right)-\ln\left(y(x)+\sqrt{y\left(x\right)^2-1}\right)+c_1=0$$

2.191 ODE No. 191

$$\sqrt{1-x^2}y'(x) - y(x)\sqrt{y(x)^2-1} = 0$$

✓ **Mathematica** : cpu = 0.122627 (sec), leaf count = 79

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

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

✓ **Maple** : cpu = 0.012 (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))
```

$$\arcsin(x) + \arctan\left(\frac{1}{\sqrt{y(x)^2-1}}\right) + c_1 = 0$$

2.192 ODE No. 192

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

✓ **Mathematica** : cpu = 4.07833 (sec), leaf count = 103

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

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

✓ **Maple** : cpu = 0.014 (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))
```

$$y(x)=\frac{a^2\ln \left(x+\sqrt{a^2+x^2}\right)+c_1}{x+\sqrt{a^2+x^2}}$$

2.193 ODE No. 193

$$-ax(\log(x) + 1) + x\log(x)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0178767 (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 = 0.004 (sec), leaf count = 14

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

$$y(x) = ax + \frac{c_1}{\ln(x)}$$

2.194 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 = 0.134269 (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,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{x\left(\frac{e^{\frac{\log^2(x)}{2}}\log(x)}{x}+\frac{e^{\frac{\log^2(x)}{2}}\log^3(x)}{2x}+\frac{c_1e^{\frac{\log^2(x)}{2}}\log(x)}{x}\right)}{\frac{1}{2}e^{\frac{\log^2(x)}{2}}\log^2(x)+c_1e^{\frac{\log^2(x)}{2}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.015 (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))
```

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

2.195 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 = 0.116528 (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],x]
```

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

✓ **Maple** : cpu = 0.082 (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))
```

$$y(x) = \frac{-4\,e^{5x}c_1 - 4}{\sin(x)\left(e^{5x}c_1 - 4\right)}$$

2.196 ODE No. 196

$$\cos(x)y'(x) + y(x) + (\sin(x) + 1)\cos(x) = 0$$

✓ **Mathematica** : cpu = 0.324484 (sec), leaf count = 53

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

$$\left\{\left\{y(x)\to e^{-2\text{arctanh}\left(\tan\left(\frac{x}{2}\right)\right)}\left(\sin(x)+4\log\left(\cos\left(\frac{x}{2}\right)-\sin\left(\frac{x}{2}\right)\right)\right)+c_1e^{-2\text{arctanh}\left(\tan\left(\frac{x}{2}\right)\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 29

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

$$y(x) = \frac{-2\ln\left(\sec\left(x\right)+\tan\left(x\right)\right)+2\ln\left(\cos\left(x\right)\right)+\sin\left(x\right)+c_1}{\sec\left(x\right)+\tan\left(x\right)}$$

2.197 ODE No. 197

$$\cos(x)y'(x) - y(x)^4 - y(x)\sin(x) = 0$$

✓ **Mathematica** : cpu = 0.0831675 (sec), leaf count = 104

```
DSolve[-(Sin[x]*y[x]) - y[x]^4 + Cos[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{\sqrt[3]{-\sin^3(x)+c_1\cos^3(x)-3\sin(x)\cos^2(x)}}\right\},\left\{y(x)\to -\frac{\sqrt[3]{-1}}{\sqrt[3]{-\sin^3(x)+c_1\cos^3(x)-3\sin(x)\cos^2(x)}}\right.$$

✓ **Maple** : cpu = 0.138 (sec), leaf count = 237

```
dsolve(cos(x)*diff(y(x),x)-y(x)^4-y(x)*sin(x) = 0,y(x))
```

$$y(x) = \frac{\left(\cos(x)\left(c_1\sin(x)^4+2\cos(x)\sin(x)^3-2c_1\sin(x)^2-3\sin(x)\cos(x)+c_1\right)^2\right)^{\frac{1}{3}}}{c_1\sin(x)^4+2\cos(x)\sin(x)^3-2c_1\sin(x)^2-3\sin(x)\cos(x)+c_1}$$

2.198 ODE No. 198

$$\sin(x)\cos(x)y'(x) - y(x) - \sin^3(x) = 0$$

✓ **Mathematica** : cpu = 0.0246007 (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 = 0.012 (sec), leaf count = 13

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

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

2.199 ODE No. 199

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

✓ **Mathematica** : cpu = 0.0737002 (sec), leaf count = 45

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

$$\left\{\left\{y(x)\to -\frac{1}{2}\arccos(-\tanh(\operatorname{arctanh}(\cos(2x))+2c_1))\right\},\left\{y(x)\to \frac{1}{2}\arccos(-\tanh(\operatorname{arctanh}(\cos(2x))+2c_1))\right\}\right\}$$

✓ **Maple** : cpu = 0.521 (sec), leaf count = 105

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

$$y(x) = \frac{\arctan\left(-\frac{2c_1(\sin(4x)+2\sin(2x))}{-3-c_1^2+c_1^2\cos(4x)-\cos(4x)-4\cos(2x)}, \frac{c_1^2\cos(4x)-c_1^2+4\cos(2x)+\cos(4x)+3}{-3-c_1^2+c_1^2\cos(4x)-\cos(4x)-4\cos(2x)}\right)}{2}$$

2.200 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 = 0.189659 (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],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 = 0.102 (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))
```

$$y(x)=\frac{-Aa\cos(2x)-2Axa\sin(2x)+2x^2(a+2c)A-8c_1}{4a\cos(2x)-4a-8b}$$

2.201 ODE No. 201

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

✓ **Mathematica** : cpu = 0.100064 (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,y[x],x]
```

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

✓ **Maple** : cpu = 0.028 (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))
```

$$y(x) = i\tan\left(-i\left(\int\sqrt{f(x)}dx\right) + c_1\right)\sqrt{f(x)}$$

2.202 ODE No. 202

$$f(x)y'(x) + g(x)\mathrm{tg}(y(x)) + h(x) = 0$$

✗ **Mathematica** : cpu = 20.174 (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))
```

2.203 ODE No. 203

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

✗ **Mathematica** : cpu = 1.0815 (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))

2.204 ODE No. 204

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

✓ **Mathematica** : cpu = 0.0895726 (sec), leaf count = 70

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

$$\text{Solve}\left[\frac{1}{2}\log\left(\frac{ay(x)}{x} + \frac{y(x)^2}{x^2} + 1\right) - \frac{a\arctan\left(\frac{a+\frac{2y(x)}{x}}{\sqrt{4-a^2}}\right)}{\sqrt{4-a^2}} = -\log(x) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.233 (sec), leaf count = 92

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

$$y(x) = \text{RootOf}\left(\_Z^2 - e^{\text{RootOf}\left(x^2\left(\tanh\left(\frac{\sqrt{(a-2)(a+2)}\,(2c_1+\_Z+2\ln(x))}{2a}\right)^2 a^2 - 4\tanh\left(\frac{\sqrt{(a-2)(a+2)}\,(2c_1+\_Z+2\ln(x))}{2a}\right)^2 - a^2 - 4\,e^{-\_Z} + 4\right.\right.}\right.$$

2.205 ODE No. 205

$$\frac{1}{4}\left(a^2-1\right)x+ay(x)+bx^n+y(x)y'(x)=0$$

✗ **Mathematica** : cpu = 9.92461 (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))

2.206 ODE No. 206

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

✗ **Mathematica** : cpu = 19.4186 (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))`

2.207 ODE No. 207

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

✓ **Mathematica** : cpu = 0.0761158 (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 = 0.014 (sec), leaf count = 37

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

$$y(x) = \sqrt{\mathrm{e}^{-2x} c_1 - 4x^2}$$

2.208 ODE No. 208

$$a y(x)^2 - b\cos(c+x) + y(x) y'(x) = 0$$

✓ **Mathematica** : cpu = 0.146726 (sec), leaf count = 118

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

$$\left\{\left\{y(x)\to -\frac{\sqrt{4a^2c_1e^{-2ax}+4ab\cos(c+x)+c_1e^{-2ax}+2b\sin(c+x)}}{\sqrt{4a^2+1}}\right\},\left\{y(x)\to \frac{\sqrt{4a^2c_1e^{-2ax}+4ab\cos(c+x}}{\sqrt{4a^2}}\right.\right.$$

✓ **Maple** : cpu = 0.135 (sec), leaf count = 106

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

$$y(x) = \frac{\sqrt{16c_1\left(a^2+\frac{1}{4}\right)^2 \mathrm{e}^{-2ax} + 16b\left(a\cos(x+c)+\frac{\sin(x+c)}{2}\right)\left(a^2+\frac{1}{4}\right)}}{4a^2+1}$$

2.209 ODE No. 209

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

✓ **Mathematica** : cpu = 0.0907084 (sec), leaf count = 84

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

$$\left\{\left\{y(x) \to -\frac{\sqrt{a^2x^2 + 2a^2c_1x + a^2c_1{}^2 - b}}{\sqrt{a}}\right\}, \left\{y(x) \to \frac{\sqrt{a^2x^2 + 2a^2c_1x + a^2c_1{}^2 - b}}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.008 (sec), leaf count = 21

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

$$x - \frac{\sqrt{ay\left(x\right)^2 + b}}{a} + c_1 = 0$$

2.210 ODE No. 210

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

✓ **Mathematica** : cpu = 0.0623186 (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 = 0.013 (sec), leaf count = 33

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

$$y(x) = \sqrt{e^{-x^2}c_1 + 4}$$

2.211 ODE No. 211

$$y(x)y'(x) - xe^{\frac{x}{y(x)}} = 0$$

✓ **Mathematica** : cpu = 0.178084 (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 = 0.032 (sec), leaf count = 31

```
dsolve(y(x)*diff(y(x),x)-x*exp(x/y(x)) = 0,y(x))
```

$$y(x) = \text{RootOf}\left(-\left(\int^{\_Z} \frac{\_a}{-\_a^2 + \mathrm{e}^{\frac{1}{\_a}}} d\_a\right) + \ln(x) + c_1\right) x$$

2.212 ODE No. 212

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

✓ **Mathematica** : cpu = 0.242289 (sec), leaf count = 95

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

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

✓ **Maple** : cpu = 0.083 (sec), leaf count = 30

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

$$\int_{\_b}^{y(x)}\frac{\_a}{f\left(\_a^2+x^2\right)}d\_a+\int g(x)\,dx-c_1=0$$

2.213 ODE No. 213

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

✓ **Mathematica** : cpu = 0.0989298 (sec), leaf count = 71

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

$$\text{Solve}\left[\frac{1}{2}\log\left(\frac{x^2-y(x)^2+(x-3)y(x)-x-1}{(x-1)^2}\right)+\log(1-x)=\frac{\operatorname{arctanh}\left(\frac{y(x)+2x-1}{\sqrt{5}(y(x)+1)}\right)}{\sqrt{5}}+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.802 (sec), leaf count = 66

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

$$-\frac{\ln\left(\frac{y(x)^2+(-x+3)y(x)-x^2+x+1}{(x-1)^2}\right)}{2}-\frac{\sqrt{5}\operatorname{arctanh}\left(\frac{(-2y(x)-3+x)\sqrt{5}}{5x-5}\right)}{5}-\ln(x-1)-c_1=0$$

2.214 ODE No. 214

$$(y(x)+x-1)y'(x)-y(x)+2x+3=0$$

✓ **Mathematica** : cpu = 0.108646 (sec), leaf count = 78

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

$$\text{Solve}\left[2\sqrt{2}\arctan\left(\frac{-y(x)+2x+3}{\sqrt{2}(y(x)+x-1)}\right)=2\log\left(\frac{6x^2+3y(x)^2-10y(x)+8x+11}{(3x+2)^2}\right)+4\log(3x+2)+3c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.129 (sec), leaf count = 48

```
dsolve((y(x)+x-1)*diff(y(x),x)-y(x)+2*x+3 = 0,y(x))
```

$$y(x)=\frac{5}{3}+\frac{(-3x-2)\sqrt{2}\tan\left(\mathrm{RootOf}\left(\sqrt{2}\ln\left(2\left(\tan(\_Z)^2+1\right)(3x+2)^2\right)+2\sqrt{2}c_1-2\_Z\right)\right)}{3}$$

2.215 ODE No. 215

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

✓ **Mathematica** : cpu = 0.111118 (sec), leaf count = 80

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

$$\text{Solve}\left[6\sqrt{3}\arctan\left(\frac{4-3y(x)}{\sqrt{3}(y(x)+2x-2)}\right)=3\log\left(\frac{3x^2+3y(x)^2+3(x-3)y(x)-6x+7}{(1-3x)^2}\right)+6\log(3x-1)+2c_1\right.$$

✓ **Maple** : cpu = 0.168 (sec), leaf count = 51

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

$$y(x)=\frac{3}{2}-\frac{x}{2}+\frac{\sqrt{3}\,(3x-1)\tan\left(\text{RootOf}\left(\sqrt{3}\,\ln\left(\frac{3\left(\tan(\_Z)^2+1\right)(3x-1)^2}{4}\right)+2\sqrt{3}\,c_1+6\_Z\right)\right)}{6}$$

2.216 ODE No. 216

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

✓ **Mathematica** : cpu = 0.101819 (sec), leaf count = 82

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

$$\text{Solve}\left[6\sqrt{3}\arctan\left(\frac{3y(x)+1}{\sqrt{3}(-y(x)+2x-1)}\right) = 3\log\left(\frac{3x^2+3y(x)^2-3(x-1)y(x)-3x+1}{(1-3x)^2}\right) + 6\log(3x-1) + 2c\right.$$

✓ **Maple** : cpu = 0.151 (sec), leaf count = 51

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

$$y(x) = \frac{(-3x+1)\sqrt{3}\tan\left(\text{RootOf}\left(\sqrt{3}\ln\left(\frac{3\left(\tan(\_Z)^2+1\right)(3x-1)^2}{4}\right) + 2\sqrt{3}\,c_1 + 6\_Z\right)\right)}{6} + \frac{x}{2} - \frac{1}{2}$$

2.217 ODE No. 217

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

✓ **Mathematica** : cpu = 0.0185016 (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 = 0.022 (sec), leaf count = 23

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

$$y(x)=x^2+\frac{\mathrm{LambertW}\left(-4c_1\mathrm{e}^{-2x^2-1}\right)}{2}+\frac{1}{2}$$

2.218 ODE No. 218

$$\left(y(x)-x^2\right)y'(x)+4xy(x)=0$$

✓ **Mathematica** : cpu = 0.0921825 (sec), leaf count = 257

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

$$\left\{\left\{y(x)\to x^2+\frac{1}{-\frac{1}{2x^2}-\frac{\frac{1}{2}-\frac{i}{2}}{\sqrt{2}x^2\sqrt{x^2\cosh\left(\frac{2c_1}{9}\right)+x^2\sinh\left(\frac{2c_1}{9}\right)-i}}}\right\},\left\{y(x)\to x^2+\frac{1}{-\frac{1}{2x^2}+\frac{\frac{1}{2}-\frac{i}{2}}{\sqrt{2}x^2\sqrt{x^2\cosh\left(\frac{2c_1}{9}\right)+x^2\sinh\left(\frac{2c_1}{9}\right)}}}\right.\right.$$

✓ **Maple** : cpu = 0.254 (sec), leaf count = 57

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

$$y(x)=\frac{c_1\sqrt{-4x^2+c_1^2}}{2}+\frac{c_1^2}{2}-x^2$$

2.219 ODE No. 219

$$-\mathrm{f0}(x) - \mathrm{f1}(x)y(x) - \mathrm{f2}(x)y(x)^2 + (g(x) + y(x))y'(x) = 0$$

✗ **Mathematica** : cpu = 300.698 (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))`

2.220 ODE No. 220

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

✓ **Mathematica** : cpu = 0.0787826 (sec), leaf count = 57

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

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

✓ **Maple** : cpu = 0.013 (sec), leaf count = 43

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

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

2.221 ODE No. 221

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

✓ **Mathematica** : cpu = 0.020931 (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 = 0.061 (sec), leaf count = 21

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

$$y(x)=-\frac{x}{2}+\frac{2\,\mathrm{LambertW}\left(\frac{\mathrm{e}^{-\frac{1}{4}}\mathrm{e}^{\frac{9x}{4}}c_1}{4}\right)}{3}+\frac{1}{6}$$

2.222 ODE No. 222

$$(2y(x) + x + 7)y'(x) - y(x) + 2x + 4 = 0$$

✓ **Mathematica** : cpu = 0.0589996 (sec), leaf count = 65

```
DSolve[4 + 2*x - y[x] + (7 + x + 2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[2\arctan\left(\frac{y(x)-2(x+2)}{2y(x)+x+7}\right)+2\log\left(\frac{4(x^2+y(x)^2+4y(x)+6x+13)}{5(x+3)^2}\right)+4\log(x+3)+5c_1=0,y(x)\right]$$

✓ **Maple** : cpu = 0.053 (sec), leaf count = 32

```
dsolve((2*y(x)+x+7)*diff(y(x),x)-y(x)+2*x+4 = 0,y(x))
```

$$y(x) = -2 + (-x-3)\tan\left(\text{RootOf}\left(\ln\left(\frac{1}{\cos(\_Z)^2}\right) - \_Z + 2\ln(x+3) + 2c_1\right)\right)$$

2.223 ODE No. 223

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

✓ **Mathematica** : cpu = 0.0224895 (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 = 0.119 (sec), leaf count = 51

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

$$y(x)=\frac{xc_1-\sqrt{5x^2c_1^2+4}}{2c_1}$$

2.224 ODE No. 224

$$(2y(x) - 6x)y'(x) - y(x) + 3x + 2 = 0$$

✓ **Mathematica** : cpu = 0.018603 (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 = 0.066 (sec), leaf count = 35

```
dsolve((2*y(x)-6*x)*diff(y(x),x)-y(x)+3*x+2 = 0,y(x))
```

$$y(x) = \frac{\mathrm{e}^{-\mathrm{LambertW}\left(-\frac{\mathrm{e}^{\frac{25x}{4}}\mathrm{e}^{-1}\mathrm{e}^{-\frac{25c_1}{4}}}{2}\right)+\frac{25x}{4}-1-\frac{25c_1}{4}}}{5} + 3x - \frac{2}{5}$$

2.225 ODE No. 225

$$(4y(x) + 2x + 3)y'(x) - 2y(x) - x - 1 = 0$$

✓ **Mathematica** : cpu = 0.0191263 (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 = 0.052 (sec), leaf count = 20

```
dsolve((4*y(x)+2*x+3)*diff(y(x),x)-2*y(x)-x-1 = 0,y(x))
```

$$y(x) = -\frac{x}{2} + \frac{\mathrm{LambertW}\left(e^5 e^{8x} c_1\right)}{8} - \frac{5}{8}$$

2.226 ODE No. 226

$$(4y(x) - 2x - 3)y'(x) + 2y(x) - x - 1 = 0$$

✓ **Mathematica** : cpu = 0.0179034 (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 = 0.048 (sec), leaf count = 21

```
dsolve((4*y(x)-2*x-3)*diff(y(x),x)+2*y(x)-x-1 = 0,y(x))
```

$$y(x) = \frac{x}{2} - \frac{\mathrm{LambertW}\left(-\mathrm{e}^{5}\mathrm{e}^{8x}c_1\right)}{8} + \frac{5}{8}$$

2.227 ODE No. 227

$$(4y(x) - 3x - 5)y'(x) - 3y(x) + 7x + 2 = 0$$

✓ **Mathematica** : cpu = 0.0163106 (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]
```

$$\left\{\left\{y(x) \to \frac{1}{4}(3x+5) - \frac{1}{2}i\sqrt{-2\left(-\frac{7x^2}{2} - 2x\right) - \frac{1}{4}(3x+5)^2 - 4c_1}\right\}, \left\{y(x) \to \frac{1}{4}(3x+5) + \frac{1}{2}i\sqrt{-2\left(-\frac{7x^2}{2} - 2\right.}\right.\right.$$

✓ **Maple** : cpu = 0.128 (sec), leaf count = 33

```
dsolve((4*y(x)-3*x-5)*diff(y(x),x)-3*y(x)+7*x+2 = 0,y(x))
```

$$y(x) = \frac{-\sqrt{4 - 6859\left(x - \frac{7}{19}\right)^2 c_1^2} + (57x + 95)\,c_1}{76c_1}$$

2.228 ODE No. 228

$$(4y(x)+11x-11)y'(x)-25y(x)-8x+62=0$$

✓ **Mathematica** : cpu = 0.167099 (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]
```

$$\left\{\left\{y(x)\to \frac{}{4\left(-\frac{}{81(9x-1)\left(81\cosh\left(\frac{3c_1}{8}\right)x^2+81\sinh\left(\frac{3c_1}{8}\right)x^2-18\cosh\left(\frac{3c_1}{8}\right)x-18\sinh\left(\frac{3c_1}{8}\right)x+\cosh\left(\frac{3c_1}{8}\right)+\sinh\left(\frac{3c_1}{8}\right)-1\right)\sqrt[3]{-25828032}}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.229 (sec), leaf count = 264

```
dsolve((4*y(x)+11*x-11)*diff(y(x),x)-25*y(x)-8*x+62 = 0,y(x))
```

$$y(x)=\frac{-4(-19x+7)\left(64-8748(9x-1)^2c_1+108\sqrt{43046721}\sqrt{c_1\left(x-\frac{1}{9}\right)^2\left(-\frac{32}{177147}+\left(x-\frac{1}{9}\right)^2c_1\right)}\right)^{\frac{1}{3}}+4(x}{16-8\left(64-8748\left(9x-1\right)^2c_1+108\sqrt{43046721}\sqrt{c_1\left(x-\frac{1}{9}\right)^2\left(-\frac{32}{177147}+\left(x-\frac{1}{9}\right)^2c_1\right)}\right)^{\frac{1}{3}}-}$$

2.229 ODE No. 229

$$(12y(x) - 5x - 8)y'(x) - 5y(x) + 2x + 3 = 0$$

✓ **Mathematica** : cpu = 0.0157186 (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]
```

$$\left\{\left\{y(x) \to \frac{1}{12}(5x+8) - \frac{i\sqrt{-24\left(-\frac{x^2}{12} - \frac{x}{4}\right) - \frac{1}{12}(5x+8)^2 - 12c_1}}{2\sqrt{3}}\right\}, \left\{y(x) \to \frac{1}{12}(5x+8) + \frac{i\sqrt{-24\left(-\frac{x^2}{12} - \frac{x}{4}\right.}}{}\right.\right.$$

✓ **Maple** : cpu = 0.12 (sec), leaf count = 32

```
dsolve((12*y(x)-5*x-8)*diff(y(x),x)-5*y(x)+2*x+3 = 0,y(x))
```

$$y(x) = \frac{-\sqrt{(x+4)^2 c_1^2 + 24} + (5x+8) c_1}{12c_1}$$

2.230 ODE No. 230

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

✓ **Mathematica** : cpu = 0.119752 (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 = 0.046 (sec), leaf count = 100

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

$$y(x) = \frac{\mathrm{e}^{-\frac{2bx}{a}}\sqrt{\mathrm{e}^{\frac{2bx}{a}}a\left(c_1a - 2\left(\int \mathrm{e}^{\frac{2bx}{a}}f(x)\,dx\right)\right)}}{a}$$

2.231 ODE No. 231

$$y'(x)(ay(x) + bx + c) + \alpha y(x) + \beta x + \gamma = 0$$

✓ **Mathematica** : cpu = 1.50112 (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]
```

$$\text{Solve}\left[\frac{(\alpha-b)^2\left(-\frac{2\arctan\left(\frac{\frac{2a(\beta x+\gamma)-2\alpha(bx+c)}{ay(x)+bx+c}+\alpha-b}{(\alpha-b)\sqrt{\frac{4(a\beta-\alpha b)}{(\alpha-b)^2}-1}}\right)}{\sqrt{\frac{4(a\beta-\alpha b)}{(\alpha-b)^2}-1}}-\log\left(\frac{(ay(x)+bx+c)^2\left(-\frac{(\alpha(bx+c)-a(\beta x+\gamma))\left(a(\alpha-b)y(x)+a(\beta x+\gamma)+b^2(-x)-bc\right.}{(ay(x)+bx+c)^2}\right.}{(\alpha(bx+c)-a(\beta x+\gamma))^2}\right.\right.}{2(a\beta-\alpha b)}\right.$$

✓ **Maple** : cpu = 0.179 (sec), leaf count = 178

```
dsolve((a*y(x)+b*x+c)*diff(y(x),x)+alpha*y(x)+beta*x+gamma = 0,y(x))
```

$$y(x) = \frac{-b\gamma+\beta c+\frac{(x(a\beta-b\alpha)+a\gamma-\alpha c)\left(\sqrt{4a\beta-\alpha^2-2b\alpha-b^2}\,\tan\left(\text{RootOf}\left(\sqrt{4a\beta-\alpha^2-2b\alpha-b^2}\,\ln\left(\frac{(a\beta x-\alpha bx+a\gamma-\alpha c)^2\left(\tan(\_Z)^2+1\right)\left(4a\right.}{4a}\right.\right.\right.\right.}{2a}}{-a\beta+b\alpha}$$

2.232 ODE No. 232

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

✓ **Mathematica** : cpu = 0.057745 (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 = 0.01 (sec), leaf count = 39

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

$$y(x) = -\frac{\sqrt{-2x^4+4c_1}}{2x}$$

2.233 ODE No. 233

$$a x^3 \cos(x) + x y(x) y'(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0988797 (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 = 0.015 (sec), leaf count = 30

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

$$y(x) = \sqrt{-2a\sin(x)+c_1}\,x$$

2.234 ODE No. 234

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

✗ **Mathematica** : cpu = 23.1423 (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))
```

2.235 ODE No. 235

$$(a + xy(x))y'(x) + by(x) = 0$$

✓ **Mathematica** : cpu = 0.0763504 (sec), leaf count = 40

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

$$\text{Solve}\left[x = -\frac{ae^{-\frac{y(x)}{b}}\,\text{ExpIntegralEi}\left(\frac{y(x)}{b}\right)}{b} + c_1e^{-\frac{y(x)}{b}}, y(x)\right]$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 30

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

$$c_1 + \frac{1}{-\mathrm{e}^{\frac{y(x)}{b}}bx + a\ \text{expIntegral}_1\left(-\frac{y(x)}{b}\right)} = 0$$

2.236 ODE No. 236

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

✓ **Mathematica** : cpu = 0.0886823 (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 = 0.045 (sec), leaf count = 141

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

$$y(x)=\frac{-(x+4)^{\frac{3}{2}}\sqrt{\frac{(x+4)c_1-4}{x+4}}\,x-16\sqrt{x}-4x^{\frac{3}{2}}}{-(x+4)^{\frac{3}{2}}\sqrt{\frac{(x+4)c_1-4}{x+4}}+4\sqrt{x}+x^{\frac{3}{2}}}$$

2.237 ODE No. 237

$$x(a+y(x))y'(x)+by(x)+cx=0$$

✗ **Mathematica** : cpu = 2.24859 (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))

2.238 ODE No. 238

$$(a + x(y(x) + x))y'(x) - b - y(x)(y(x) + x) = 0$$

✓ **Mathematica** : cpu = 0.176947 (sec), leaf count = 192

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

$$\left\{\left\{y(x) \to -\frac{a+x^2}{x} + \frac{1}{x\left(-\frac{a}{-a^2-ax^2-bx^2} - \frac{x}{(a^2+ax^2+bx^2)^{3/2}\sqrt{-\frac{1}{(a+b)\left(a^2+ax^2+bx^2\right)}+c_1}}\right)}\right\}, \left\{y(x) \to -\frac{a+x^2}{x} + \frac{}{x\left(\right.}\right.$$

✓ **Maple** : cpu = 0.05 (sec), leaf count = 91

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

$$y(x) = \frac{c_1abx + x + \sqrt{(-1 + (a\,x^2 + b\,x^2 + a^2)\,c_1)\,(a+b)}}{a^2c_1 - 1}$$

2.239 ODE No. 239

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

✓ **Mathematica** : cpu = 0.084292 (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 = 0.125 (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))
```

$$y(x)=\frac{x^2c_1-\sqrt{2x^4c_1^2+1}}{c_1x}$$

2.240 ODE No. 240

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

✓ **Mathematica** : cpu = 0.0701476 (sec), leaf count = 41

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

$$\left\{\left\{y(x)\to -\sqrt{-ax\log(x)+c_1x}\right\},\left\{y(x)\to \sqrt{-ax\log(x)+c_1x}\right\}\right\}$$

✓ **Maple** : cpu = 0.011 (sec), leaf count = 34

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

$$y(x) = \sqrt{-ax\ln(x) + xc_1}$$

2.241 ODE No. 241

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

✓ **Mathematica** : cpu = 0.0653454 (sec), leaf count = 41

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

$$\left\{\left\{y(x) \to -\sqrt{-ax^2 + c_1x}\right\}, \left\{y(x) \to \sqrt{-ax^2 + c_1x}\right\}\right\}$$

✓ **Maple** : cpu = 0.007 (sec), leaf count = 33

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

$$y(x) = \sqrt{-a\,x^2 + xc_1}$$

2.242 ODE No. 242

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

✓ **Mathematica** : cpu = 0.0563644 (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 = 0.009 (sec), leaf count = 39

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

$$y(x) = -\frac{\sqrt{-2x^2+4c_1}}{2x}$$

2.243 ODE No. 243

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

✓ **Mathematica** : cpu = 7.92775 (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]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{2}x}{\sqrt[3]{-27c_1{}^2x^2+\sqrt{108c_1{}^3x^3+(27c_1{}^2x-27c_1{}^2x^2)^2}+27c_1{}^2x}}+\frac{\sqrt[3]{-27c_1{}^2x^2+\sqrt{108c_1{}^3x^3+(27c_1{}^2x}}}{3\sqrt[3]{2}c_1}\right.\right.$$

✓ **Maple** : cpu = 0.137 (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))
```

$$y(x)=\frac{3\,5^{\frac{1}{3}}\left(x\left(\sqrt{5}\sqrt{\frac{80x^2c_1-160xc_1-x+80c_1}{c_1}}+20x-20\right)c_1^2\right)^{\frac{1}{3}}}{40c_1}+\frac{3x5^{\frac{2}{3}}}{40\left(x\left(\sqrt{5}\sqrt{\frac{80x^2c_1-160xc_1-x+80c_1}{c_1}}+20x-20\right)c_1^2\right)}$$

2.244 ODE No. 244

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

✓ **Mathematica** : cpu = 7.90168 (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]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt[3]{2}x}{\sqrt[3]{27c_1{}^2x^2 + \sqrt{(27c_1{}^2x^2 + 27c_1{}^2x)^2 - 108c_1{}^3x^3} + 27c_1{}^2x}} - \frac{\sqrt[3]{27c_1{}^2x^2 + \sqrt{(27c_1{}^2x^2 + 27c_1{}^2x)^2 -}}}{3\sqrt[3]{2}c_1}\right.\right.$$

✓ **Maple** : cpu = 0.117 (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))
```

$$y(x) = \frac{3\,5^{\frac{1}{3}}\left(x\left(\sqrt{5}\sqrt{\frac{80x^2c_1+160xc_1-x+80c_1}{c_1}} - 20x - 20\right)c_1^2\right)^{\frac{1}{3}}}{40c_1} + \frac{3x5^{\frac{2}{3}}}{40\left(x\left(\sqrt{5}\sqrt{\frac{80x^2c_1+160xc_1-x+80c_1}{c_1}} - 20x - 20\right)c_1^2\right)}$$

2.245 ODE No. 245

$$\left(4x^3 + 2xy(x)\right) y'(x) + 112x^2 y(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.307857 (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]
```

$$\left\{\left\{y(x) \to \text{Root}\left[-1521681143169024\#1x^{22} - 697437190619136\#1^2x^{20} - 145299414712320\#1^3x^{18} - 18162426\right.\right.\right.$$

✓ **Maple** : cpu = 0.928 (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))
```

$$y(x) = \frac{c_1}{x^{28}\,\text{RootOf}\left(x^{30}\_Z^{360} - 24x^{30}\_Z^{330} - c_1\right)^{330}}$$

2.246 ODE No. 246

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

✓ **Mathematica** : cpu = 0.10492 (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 = 0.05 (sec), leaf count = 63

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

$$y(x)=\frac{-4x^2c_1-\sqrt{-2x^4c_1^2+6}}{6xc_1}$$

2.247 ODE No. 247

$$-7x^2+(3x+2)(y(x)-2x-1)y'(x)+xy(x)-y(x)^2-9x-3=0$$

✓ **Mathematica** : cpu = 6.98001 (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] == 0,y[x
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{1458x^3+2916x^2+\sqrt{4\left(-81x^2-108x-36\right)^3+\left(1458x^3+2916x^2+1944x-324e^{2c_1}x+432-2\right.}}}{6\sqrt[3]{2}}\right.\right.$$

✓ **Maple** : cpu = 0.204 (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))
```

$$y(x)=-\frac{1}{3}+\frac{(3x+2)\left(7\left(-\frac{\left(2(3x+2)c_1-27(3x+2)^3c_1^3+2\sqrt{-27(3x+2)^4c_1^4+(3x+2)^2c_1^2}\right)^{\frac{1}{3}}}{4}-\frac{9(3x+2)^2c_1^2}{4\left(2(3x+2)c_1-27(3x+2)^3c_1^3+2\sqrt{-27(3\right.}}\right.\right.}{6\left(-\frac{\left(2(3x+2)c_1-27(3x+2)^3c_1^3+2\sqrt{-27(3x+2)^4c_1^4+(3x+2)^2c_1^2}\right)^{\frac{1}{3}}}{4}-\frac{9(3x+2)^2c_1^2}{4\left(2(3x+2)c_1-27(3x+2)^3c_1^3+2\sqrt{-27(3x+\right.}}\right.}$$

2.248 ODE No. 248

$$\left(x^2+6xy(x)+3\right)y'(x)+3y(x)^2+2xy(x)+2x=0$$

✓ **Mathematica** : cpu = 0.121222 (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]
```

$$\left\{\left\{y(x)\to \frac{-x^2-3}{6x}-\frac{\sqrt{-2x^3+\frac{1}{6}\left(x^2+3\right)^2+6c_1x}}{\sqrt{6}x}\right\},\left\{y(x)\to \frac{-x^2-3}{6x}+\frac{\sqrt{-2x^3+\frac{1}{6}\left(x^2+3\right)^2+6c_1x}}{\sqrt{6}x}\right\}\right\}$$

✓ **Maple** : cpu = 0.012 (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))
```

$$y(x)=\frac{-x^2-3+\sqrt{x^4-12x^3+6x^2-12xc_1+9}}{6x}$$

2.249 ODE No. 249

$$y'(x)\,(axy(x)+bx^n)+\alpha y(x)^3+\beta y(x)^2=0$$

✓ **Mathematica** : cpu = 2.31854 (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]
```

$$\text{Solve}\left[\frac{(a(-n)+a+\alpha y(x))y(x)^{\frac{a-an}{\beta}-1}(\alpha y(x)+\beta)^{\frac{a(n-1)}{\beta}}}{a^2(n-1)^2(a(n-1)+\beta)}+\frac{x^{1-n}\exp\left(-\frac{a(n-1)(\log(y(x))-\log(\alpha y(x)+\beta))}{\beta}\right)}{ab(1-n)(n-1)}=c_1,y(x)\right.$$

✓ **Maple** : cpu = 0.148 (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))
```

$$y(x)=\frac{\beta}{\text{RootOf}\left(-x^{1-n}\_Z^{\frac{a(n-1)}{\beta}}a^2\beta n+c_1a^2bn^2+x^{1-n}\_Z^{\frac{a(n-1)}{\beta}}a^2\beta-x^{1-n}\_Z^{\frac{a(n-1)}{\beta}}a\,\beta^2-\_Z^{\frac{an-a+\beta}{\beta}}\beta ban+\_\right.}$$

2.250 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 = 300.517 (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*x*y[x])
```

, 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)+gamma`

2.251 ODE No. 251

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

✓ **Mathematica** : cpu = 0.093136 (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 = 0.01 (sec), leaf count = 51

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

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

2.252 ODE No. 252

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

✓ **Mathematica** : cpu = 7.76552 (sec), leaf count = 819

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

$$\left\{\left\{y(x)\to\frac{6xc_1-x}{6c_1-1}+\frac{\sqrt[3]{-1944c_1{}^2x^3+648c_1x^3-54x^3+1944c_1{}^2-648c_1+\sqrt{4\left(54x^2c_1-9x^2\right)^3+\left(-1944c_1{}^2\right.}}}{3\sqrt[3]{2}(6c_1-1)}\right.\right.$$

✓ **Maple** : cpu = 0.605 (sec), leaf count = 1322

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

$$y(x)=\frac{\left(\left(-c_1+80\right)x^7-160x^4+80x\right)4^{\frac{1}{3}}\left(c_1\left(-\frac{1}{4}+\sqrt{\frac{-5x^6+10x^3-5}{-80+(c_1-80)x^6+160x^3}}\right)\left(-80+\left(c_1-80\right)x^6+160x^3\right)^2\right)^{\frac{1}{3}}}{\left(80+\left(-c_1+80\right)x^6-160x^3\right)4^{\frac{1}{3}}\left(c_1\left(-\frac{1}{4}+\sqrt{\frac{-5x^6+10x^3-5}{-80+(c_1-80)x^6+160x^3}}\right)\left(-80+\left(c_1-80\right)x^6+160x^3\right)^2\right)^{\frac{1}{3}}+x^2}$$

2.253 ODE No. 253

$$\left(x^2y(x)-1\right)y'(x)+8xy(x)^2-8=0$$

✗ **Mathematica** : cpu = 6.60615 (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))
```

2.254 ODE No. 254

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

✓ **Mathematica** : cpu = 0.093973 (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 = 0.016 (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))
```

$$y(x) = \frac{-1+\sqrt{1-4\ln(x)+4c_1}}{2(-\ln(x)+c_1)x}$$

2.255 ODE No. 255

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

✓ **Mathematica** : cpu = 6.23949 (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 = 0.171 (sec), leaf count = 74

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

$$y(x)=-\frac{3\,\mathrm{LambertW}\left(\frac{2\left(-\frac{x^2}{8}\right)^{\frac{1}{3}}c_1}{3}\right)}{x}$$

2.256 ODE No. 256

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

✓ **Mathematica** : cpu = 0.0206501 (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 = 0.103 (sec), leaf count = 31

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

$$y(x)=\mathrm{e}^{\frac{x\ln(x)-\mathrm{LambertW}\left(-x\,\mathrm{e}^{c_1+\frac{1}{x}}\right)x+xc_1+1}{x}}$$

2.257 ODE No. 257

$$x(x^4+xy(x)-1)\,y'(x)-y(x)\left(-x^4+xy(x)-1\right)=0$$

✓ **Mathematica** : cpu = 0.28101 (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 = 0.072 (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))
```

$$y(x)=\frac{\left(-c_1+\mathrm{e}^{\mathrm{RootOf}\left(-2\_Zx^4\mathrm{e}^{2\_Z}+2x^4\mathrm{e}^{2\_Z}-2\,\mathrm{e}^{\_Z}c_1x^4+\mathrm{e}^{2\_Z}-2\,\mathrm{e}^{\_Z}c_1+c_1^2\right)}\right)\mathrm{e}^{-\mathrm{RootOf}\left(-2\_Zx^4\mathrm{e}^{2\_Z}+2x^4\mathrm{e}^{2\_Z}-2\,\mathrm{e}^{\_Z}c_1x^4+\mathrm{e}^{2\_Z}\right.}}{x}$$

2.258 ODE No. 258

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

✓ **Mathematica** : cpu = 0.0781502 (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]
```

$$\left\{\left\{y(x)\to -\sqrt{x^2+c_1e^{\frac{1}{x}}}\right\},\left\{y(x)\to \sqrt{x^2+c_1e^{\frac{1}{x}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.013 (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))
```

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

2.259 ODE No. 259

$$2x^2y(x)y'(x) - e^{x-\frac{1}{x}}x^2 - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.176522 (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 = 0.014 (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))
```

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

2.260 ODE No. 260

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

✓ **Mathematica** : cpu = 0.0891553 (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 = 0.015 (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))
```

$$y(x)=\frac{-2+\sqrt{4-2\ln(x)+2c_1}}{2(\ln(x)-c_1)x}$$

2.261 ODE No. 261

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

✓ **Mathematica** : cpu = 0.457961 (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 = 0.079 (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))
```

$$y(x)=-\frac{1}{2\,\mathrm{LambertW}\left(-\frac{c_1}{2x^2}\right)x}$$

2.262 ODE No. 262

$$2x^3 + \left(2x^2y(x) - x^3\right) y'(x) - 4xy(x)^2 + y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.11867 (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 = 0.21 (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))
```

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

2.263 ODE No. 263

$$2x^3 + 3x^2y(x)^2 + y(x)y'(x) + 7 = 0$$

✓ **Mathematica** : cpu = 0.095222 (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]
```

$$\left\{\left\{y(x)\to -\sqrt{\frac{7\ 2^{2/3}e^{-2x^3}x\Gamma\left(\frac{1}{3},-2x^3\right)}{3\sqrt[3]{-x^3}}-\frac{2^{2/3}e^{-2x^3}x\Gamma\left(\frac{4}{3},-2x^3\right)}{3\sqrt[3]{-x^3}}+c_1e^{-2x^3}}\right\},\left\{y(x)\to \sqrt{\frac{7\ 2^{2/3}e^{-2x^3}x\Gamma\left(\frac{1}{3},-\right.}{3\sqrt[3]{-x^3}}}\right.\right.$$

✓ **Maple** : cpu = 0.146 (sec), leaf count = 179

```
dsolve(2*x^3+y(x)*diff(y(x),x)+3*y(x)^2*x^2+7 = 0,y(x))
```

$$y(x) = -\frac{2^{\frac{2}{3}}\sqrt{3}\sqrt{-80\left(\frac{9\Gamma\left(\frac{2}{3}\right)\left(-\frac{3\,\mathrm{e}^{-2x^3}c_1}{2}+x\right)2^{\frac{1}{3}}\left(-x^3\right)^{\frac{1}{3}}}{40}+x\,\mathrm{e}^{-2x^3}\left(\pi\sqrt{3}-\frac{3\Gamma\left(\frac{1}{3},-2x^3\right)\Gamma\left(\frac{2}{3}\right)}{2}\right)\right)\Gamma\left(\frac{2}{3}\right)2^{\frac{1}{3}}\left(-x^3\right)^{\frac{1}{3}}}}{18\left(-x^3\right)^{\frac{1}{3}}\Gamma\left(\frac{2}{3}\right)}$$

2.264 ODE No. 264

$$2x\left(x^3y(x)+1\right)y'(x)+y(x)\left(3x^3y(x)-1\right)=0$$

✓ **Mathematica** : cpu = 0.275625 (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]
```

$$\left\{\left\{y(x)\to \text{Root}\left[81\#1^7e^{\frac{21c_1}{2}}x^{12}+756\#1^6e^{\frac{21c_1}{2}}x^9+2646\#1^5e^{\frac{21c_1}{2}}x^6+4116\#1^4e^{\frac{21c_1}{2}}x^3+2401\#1^3e^{\frac{21c_1}{2}}-x^{3/2}\&\right.\right.\right.$$

✓ **Maple** : cpu = 0.276 (sec), leaf count = 37

```
dsolve(2*x*(x^3*y(x)+1)*diff(y(x),x)+(3*x^3*y(x)-1)*y(x) = 0,y(x))
```

$$y(x)=\frac{\text{RootOf}\left(\_Z^{98}c_1-14\_Z^{77}c_1+49\_Z^{56}c_1-9x^7\right)^{21}-7}{3x^3}$$

2.265 ODE No. 265

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

✗ **Mathematica** : cpu = 203.636 (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][x] ==
```

, 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])*Derivative[1][`

✗ **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))`

2.266 ODE No. 266

$$\sqrt{x^2+1}(y(x)-x)y'(x)-a\sqrt{(y(x)^2+1)^3}=0$$

✓ **Mathematica** : cpu = 2.97555 (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]
```

$$\text{Solve}\left[\left\{\frac{2a\arctan\left(\frac{1-a\tan\left(\frac{K[1]}{2}\right)}{\sqrt{a^2-1}}\right)}{\sqrt{a^2-1}}+K[1]+\arctan(x)=c_1,y(x)=\frac{\tan(K[1])+x}{1-x\tan(K[1])}\right\},\{K[1],y(x)\}\right]$$

✓ **Maple** : cpu = 1.826 (sec), leaf count = 103

```
dsolve((y(x)-x)*(x^2+1)^(1/2)*diff(y(x),x)-a*((y(x)^2+1)^3)^(1/2) = 0,y(x))
```

$$\frac{\arctan\left(\frac{\cos(\arctan(x)-\arctan(y(x)))}{\sqrt{a^2-1}}\right)\cos\left(\arctan\left(x\right)-\arctan\left(y(x)\right)\right)\sqrt{2}\sqrt{\frac{a^2}{1+\cos(2\arctan(x)-2\arctan(y(x)))}}+\arctan\left(\sqrt{a}\right.}{\sqrt{a^2-1}}$$

2.267 ODE No. 267

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

✓ **Mathematica** : cpu = 0.204185 (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 = 0.03 (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))
```

$$y(x) = \frac{\sqrt{2x+c_1}}{\sin(x)}$$

2.268 ODE No. 268

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

✓ **Mathematica** : cpu = 0.111182 (sec), leaf count = 146

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

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

✓ **Maple** : cpu = 0.058 (sec), leaf count = 118

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

$$y(x) = \mathrm{e}^{\int -\frac{2g(x)}{f(x)}dx}\sqrt{\mathrm{e}^{2\left(\int \frac{g(x)}{f(x)}dx\right)}\left(-2\left(\int \frac{\mathrm{e}^{\int \frac{2g(x)}{f(x)}dx}h(x)}{f(x)}dx\right)+c_1\right)}$$

2.269 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 = 302.12 (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][y][x] =
```

, 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))`

2.270 ODE No. 270

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

✓ **Mathematica** : cpu = 0.100135 (sec), leaf count = 327

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

$$\left\{\left\{y(x) \to -\frac{3\sqrt[3]{2}x}{\sqrt[3]{27x^3 + \sqrt{-2916x^3 + (27x^3 + 81c_1)^2} + 81c_1}} - \frac{\sqrt[3]{27x^3 + \sqrt{-2916x^3 + (27x^3 + 81c_1)^2} + 81c_1}}{3\sqrt[3]{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 314

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

$$y(x) = \frac{\left(-4x^3 - 12c_1 + 4\sqrt{x^6 + (6c_1 - 4)x^3 + 9c_1^2}\right)^{\frac{2}{3}} + 4x}{2\left(-4x^3 - 12c_1 + 4\sqrt{x^6 + (6c_1 - 4)x^3 + 9c_1^2}\right)^{\frac{1}{3}}}$$

2.271 ODE No. 271

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

✓ **Mathematica** : cpu = 0.191572 (sec), leaf count = 370

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

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{-4x^3 + \sqrt{20x^6 - 8e^{3c_1}x^3 + e^{6c_1}} + e^{3c_1}}}{\sqrt[3]{2}} - \frac{\sqrt[3]{2}x^2}{\sqrt[3]{-4x^3 + \sqrt{20x^6 - 8e^{3c_1}x^3 + e^{6c_1}} + e^{3c_1}}}\right\}, \left\{y(x) \to \frac{}{2^2}\right.\right.$$

✓ **Maple** : cpu = 0.164 (sec), leaf count = 349

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

$$y(x) = \frac{\frac{\left(4 - 16x^3c_1^{\frac{3}{2}} + 4\sqrt{20c_1^3x^6 - 8x^3c_1^{\frac{3}{2}} + 1}\right)^{\frac{1}{3}}}{2} - \frac{2c_1x^2}{\left(4 - 16x^3c_1^{\frac{3}{2}} + 4\sqrt{20c_1^3x^6 - 8x^3c_1^{\frac{3}{2}} + 1}\right)^{\frac{1}{3}}}}{\sqrt{c_1}}$$

2.272 ODE No. 272

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

✓ **Mathematica** : cpu = 0.11258 (sec), leaf count = 42

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

$$\text{Solve}\left[\frac{2\arctan\left(\frac{\frac{2y(x)}{x}-1}{\sqrt{3}}\right)}{\sqrt{3}}+\log\left(\frac{y(x)}{x}\right)=-\log(x)+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.111 (sec), leaf count = 42

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

$$y(x)=\mathrm{e}^{\frac{2\sqrt{3}\,\mathrm{RootOf}\left(\sqrt{3}\,x\,\mathrm{e}^{c_1}-3\tan(\_Z)x\,\mathrm{e}^{c_1}-2\sqrt{3}\,\mathrm{e}^{\frac{2\sqrt{3}\,\_Z}{3}}\right)}{3}-c_1}$$

2.273 ODE No. 273

$$\left(a+x^2+y(x)^2\right)y'(x)+2xy(x)=0$$

✓ **Mathematica** : cpu = 0.126417 (sec), leaf count = 297

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

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{\sqrt{2916\left(a+x^2\right)^3+6561c_1{}^2}+81c_1}}{3\sqrt[3]{2}}-\frac{3\sqrt[3]{2}\left(a+x^2\right)}{\sqrt[3]{\sqrt{2916\left(a+x^2\right)^3+6561c_1{}^2}+81c_1}}\right\},\left\{y(x)\to \frac{}{2^{2/3}\sqrt[3]{\sqrt{}}}\right.\right.$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 397

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

$$y(x)=\frac{\left(-12c_1+4\sqrt{4x^6+12a\,x^4+12a^2x^2+4a^3+9c_1^2}\right)^{\frac{2}{3}}-4x^2-4a}{2\left(-12c_1+4\sqrt{4x^6+12a\,x^4+12a^2x^2+4a^3+9c_1^2}\right)^{\frac{1}{3}}}$$

2.274 ODE No. 274

$$\left(a+x^2+y(x)^2\right)y'(x)+b+x^2+2xy(x)=0$$

✓ **Mathematica** : cpu = 0.130318 (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]
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{\sqrt{2916\left(a+x^2\right)^3+\left(-81bx-27x^3+81c_1\right)^2}-81bx-27x^3+81c_1}}{3\sqrt[3]{2}}-\frac{}{\sqrt[3]{\sqrt{2916\left(a+x^2\right)^3+\left(-81b\right.}}}\right.\right.$$

✓ **Maple** : cpu = 0.049 (sec), leaf count = 653

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

$$y(x)=\frac{\left(-4x^3-12bx-12c_1+4\sqrt{5x^6+6\left(2a+b\right)x^4+6x^3c_1+3\left(4a^2+3b^2\right)x^2+18bxc_1+4a^3+9c_1^2}\right)^{\frac{2}{3}}-4x^2}{2\left(-4x^3-12bx-12c_1+4\sqrt{5x^6+6\left(2a+b\right)x^4+6x^3c_1+3\left(4a^2+3b^2\right)x^2+18bxc_1+4a^3+9c_1^2}\right)^{\frac{1}{3}}}$$

2.275 ODE No. 275

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

✓ **Mathematica** : cpu = 0.0829021 (sec), leaf count = 18

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

$$\text{Solve}\left[y(x) - \arctan\left(\frac{x}{y(x)}\right) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.057 (sec), leaf count = 30

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

$$c_1 + \frac{e^{-2iy(x)}(y(x) + ix)}{2iy\,(x) + 2x} = 0$$

2.276 ODE No. 276

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

✓ **Mathematica** : cpu = 0.0998023 (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 = 0.405 (sec), leaf count = 47

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

$$y(x) = \frac{1 - \sqrt{-4x^2c_1^2 + 1}}{2c_1}$$

2.277 ODE No. 277

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

✓ **Mathematica** : cpu = 0.0792516 (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 = 0.286 (sec), leaf count = 41

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

$$y(x)=\frac{\sqrt{4x^4+c_1^2}}{2}+\frac{c_1}{2}$$

2.278 ODE No. 278

$$y'(x)\left(y(x)^2+4\sin(x)\right)-\cos(x)=0$$

✓ **Mathematica** : cpu = 0.149712 (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 = 0.038 (sec), leaf count = 28

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

$$\frac{\left(-8y(x)^2-4y(x)-32\sin(x)-1\right)e^{-4y(x)}}{32}+c_1=0$$

2.279 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 = 0.335497 (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,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{-x^2-\sqrt{\left(x^2-c_1x-1\right)^2+4(x-c_1)}+c_1x+1}{2(x-c_1)}\right\},\left\{y(x)\to \frac{-x^2+\sqrt{\left(x^2-c_1x-1\right)^2+4(x-c_1)}+\right.}{2(x-c_1)}\right.$$

✓ **Maple** : cpu = 0.095 (sec), leaf count = 110

```
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))
```

$$y(x)=\frac{x^2-xc_1+\sqrt{x^4-2x^3c_1+\left(c_1^2-2\right)x^2+\left(2c_1+4\right)x-4c_1+1}-1}{-2x+2c_1}$$

2.280 ODE No. 280

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

✓ **Mathematica** : cpu = 0.0978356 (sec), leaf count = 21

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

$$\text{Solve}\left[y(x)-a\arctan\left(\frac{y(x)+x}{a}\right)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 24

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

$$y(x)=a\,\text{RootOf}\left(\tan\left(\_Z\right)a-\_Za+c_1-x\right)-c_1$$

2.281 ODE No. 281

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

✓ **Mathematica** : cpu = 0.136269 (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 = 0.586 (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))
```

$$y(x)=\frac{1-\sqrt{-4x^2c_1^2+4xc_1+1}}{2c_1}$$

2.282 ODE No. 282

$$(y(x)+3x-1)^2y'(x)-(2y(x)-1)(4y(x)+6x-3)=0$$

✓ **Mathematica** : cpu = 0.155569 (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[x],x]
```

$$\left\{\left\{y(x)\to\frac{1}{6}(12x+4e^{c_1}+1)-\frac{1}{6}\sqrt{36x^2+96e^{c_1}x-12x-16e^{c_1}+16e^{2c_1}+3\ 2^{2/3}\sqrt[3]{-7776e^{c_1}x^5+6480e^{c_1}x^4-}}\right.\right.$$

✓ **Maple** : cpu = 0.466 (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))
```

$$-\ln\left(\frac{-6y(x)+4-6x}{6x-1}\right)-3\ln\left(\frac{-6y(x)+18x}{6x-1}\right)+3\ln\left(\frac{-6y(x)+3}{6x-1}\right)-\ln(6x-1)-c_1=0$$

2.283 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 = 0.265105 (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],x]
```

$$\left\{\left\{y(x)\to -\frac{e^{-2x}\sqrt[3]{\sqrt{-2916e^{12x}x^6+\left(-27e^{7x}+27c_1e^{4x}\right)^2}-27e^{7x}+27c_1e^{4x}}}{3\sqrt[3]{2}}-\frac{3\sqrt[3]{2}e}{\sqrt[3]{\sqrt{-2916e^{12x}x^6+\left(-27e^{7x}+\right.}}}\right.\right.$$

✓ **Maple** : cpu = 0.071 (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))
```

$$y(x)=\frac{\left(4x^2e^{4x}+\left(\left(4e^{3x}-4c_1+4\sqrt{-4x^6e^{4x}+e^{6x}-2e^{3x}c_1+c_1^2}\right)e^{4x}\right)^{\frac{2}{3}}\right)e^{-2x}}{2\left(-4\left(-e^{3x}+c_1-\sqrt{-4x^6e^{4x}+e^{6x}-2e^{3x}c_1+c_1^2}\right)e^{4x}\right)^{\frac{1}{3}}}$$

2.284 ODE No. 284

$$\left(x^2+4y(x)^2\right)y'(x)-xy(x)=0$$

✓ **Mathematica** : cpu = 0.0820677 (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 = 0.078 (sec), leaf count = 21

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

$$y(x)=\mathrm{e}^{\frac{\mathrm{LambertW}\left(\frac{\mathrm{e}^{2c_1}x^2}{4}\right)}{2}-c_1}$$

2.285 ODE No. 285

$$\left(3x^2+2xy(x)+4y(x)^2\right)y'(x)+2x^2+6xy(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.114606 (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],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{54x^3+\sqrt{3881196x^6+\left(54x^3+432e^{3c_1}\right)^2}+432e^{3c_1}}}{12\sqrt[3]{2}}-\frac{33x^2}{2\ 2^{2/3}\sqrt[3]{54x^3+\sqrt{3881196x^6+\left(54x^3+432\right.}}}\right.\right.$$

✓ **Maple** : cpu = 0.082 (sec), leaf count = 429

```
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))
```

$$y(x)=\frac{\frac{\left(x^3c_1^3+8+2\sqrt{333x^6c_1^6+4x^3c_1^3+16}\right)^{\frac{1}{3}}}{4}-\frac{11c_1^2x^2}{4\left(x^3c_1^3+8+2\sqrt{333x^6c_1^6+4x^3c_1^3+16}\right)^{\frac{1}{3}}}-\frac{xc_1}{4}}{c_1}$$

2.286 ODE No. 286

$$(2y(x) - 3x + 1)^2 y'(x) - (3y(x) - 2x - 4)^2 = 0$$

✓ **Mathematica** : cpu = 0.180879 (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 = 1.005 (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))
```

Expression too large to display

2.287 ODE No. 287

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

✓ **Mathematica** : cpu = 1.38496 (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]
```

$$\text{Solve}\left[\frac{y(x)}{2}+\frac{1}{196}\left(14y(x)-\left(8-9\sqrt{2}\right)\log\left(-7y(x)+14x+\sqrt{2}-4\right)-\left(8+9\sqrt{2}\right)\log\left(7y(x)-14x+\sqrt{2}+4\right)\right.\right.$$

✓ **Maple** : cpu = 0.051 (sec), leaf count = 56

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

$$-\frac{x}{7}-\frac{9\sqrt{2}\,\text{arctanh}\left(\frac{(7y(x)-14x+4)\sqrt{2}}{2}\right)}{98}-\frac{2\ln\left(7(y(x)-2x)^2+8y(x)-16x+2\right)}{49}+\frac{4y(x)}{7}-c_1=0$$

2.288 ODE No. 288

$$\left(-3x^2y(x)+6y(x)^2+1\right)y'(x)-3xy(x)^2+x=0$$

✓ **Mathematica** : cpu = 0.15538 (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]
```

$$\left\{\left\{y(x)\to \frac{x^2}{4}-\frac{\sqrt[3]{-9x^6+108x^2+4\sqrt{3}\sqrt{-27x^8-54c_1x^6+207x^4+648c_1x^2+32+432c_1{}^2+144c_1}}}{4\ 3^{2/3}}+\frac{}{3\sqrt[3]{3}\sqrt[3]{}}\right.\right.$$

✓ **Maple** : cpu = 0.046 (sec), leaf count = 575

```
dsolve((6*y(x)^2-3*x^2*y(x)+1)*diff(y(x),x)-3*x*y(x)^2+x = 0,y(x))
```

$$y(x)=\frac{\left(-324x^2-432c_1+27x^6+12\sqrt{-81x^8-162x^6c_1+621x^4+1944x^2c_1+1296c_1^2+96}\right)^{\frac{1}{3}}}{12}+\frac{}{4\left(-324x^2-4\right.}$$

2.289 ODE No. 289

$$a+(6y(x)-x)^2y'(x)-6y(x)^2+2xy(x)=0$$

✓ **Mathematica** : cpu = 0.135009 (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]
```

$$\left\{\left\{y(x)\to\frac{1}{6}\left(x+\sqrt[3]{-18ax-x^3+18c_1}\right)\right\},\left\{y(x)\to\frac{x}{6}-\frac{1}{12}\left(1-i\sqrt{3}\right)\sqrt[3]{-18ax-x^3+18c_1}\right\},\left\{y(x)\to\frac{x}{6}-\right.$$

✓ **Maple** : cpu = 0.028 (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))
```

$$y(x)=\frac{\left(-x^3-18ax-18c_1\right)^{\frac{1}{3}}}{6}+\frac{x}{6}$$

2.290 ODE No. 290

$$y'(x)\left(ay(x)^2 + 2bxy(x) + cx^2\right) + by(x)^2 + 2cxy(x) + dx^2 = 0$$

✓ **Mathematica** : cpu = 0.327923 (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] == 0,y[x],
```

$$\left\{\left\{y(x)\to -\frac{bx}{a} + \frac{\sqrt[3]{-54b^3x^3 + 81abcx^3 - 27a^2dx^3 + 27a^2e^{3c_1} + \sqrt{4\left(9acx^2 - 9b^2x^2\right)^3 + \left(-54b^3x^3 + 81abcx^3 - \right.}}}{3\sqrt[3]{2}a}\right.\right.$$

✓ **Maple** : cpu = 0.243 (sec), leaf count = 1386

```
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))
```

$$y(x) = \frac{\frac{\left(-4c_1^3a^2dx^3+12cx^3c_1^3ba-8b^3x^3c_1^3+4\sqrt{a^2d^2x^6c_1^6-6abcdx^6c_1^6+4ac^3x^6c_1^6+4b^3dx^6c_1^6-3b^2c^2x^6c_1^6-2c_1^3a^2dx^3+6cx^3c_1^3ba-4b^3x^3c_1^3+a^2}\right.}{2a}}{}$$

2.291 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 = 0.66872 (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*(alpha*x + b
```

$$\text{Solve}\left[\frac{a\beta\left(\log(ax+by(x))+\frac{1}{\alpha x+\beta y(x)}\right)}{a\beta-\alpha b}=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.11 (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-alph
```

$$y(x)=\frac{-ax+\mathrm{e}^{\mathrm{RootOf}\left(c_1a\beta x-c_1\alpha bx-\_Za\beta x+\_Z\alpha bx-c_1\beta\,\mathrm{e}^{-\_Z}+\mathrm{e}^{-\_Z}\_Z\beta+b\right)}}{b}$$

2.292 ODE No. 292

$$y'(x)(ay(x) + bx + c)^2 + (\alpha y(x) + \beta x + \gamma)^2 = 0$$

✓ **Mathematica** : cpu = 29.5953 (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[x],x]
```

$$\text{Solve}\left[(\alpha b - a\beta)\text{RootSum}\left[-cy(x)^2\alpha^3 - b\#1y(x)^2\alpha^3 + a\beta\#1y(x)^2\alpha^2 + a\gamma y(x)^2\alpha^2 - 2b\beta\#1^2y(x)\alpha^2 - 2\beta c\#1y(\right.\right.$$

✓ **Maple** : cpu = 0.029 (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))
```

$$y(x) = \frac{((bx + c)\alpha - a(\beta x + \gamma))\,\text{RootOf}\left(\int^{\_Z} \frac{(\_aa - b)^2}{\_a^3a^2 - 2\_a^2ab - \_a^2\alpha^2 + 2\_a\alpha\beta + \_ab^2 - \beta^2}d\_a + \ln(a\beta x - \alpha bx + a\gamma - \alpha\right.}{a\beta - b\alpha}$$

2.293 ODE No. 293

$$x\left(y(x)^2 - 3x\right)y'(x) + 2y(x)^3 - 5xy(x) = 0$$

✓ **Mathematica** : cpu = 0.133018 (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]
```

$$\left\{\left\{y(x) \to \text{Root}\left[-\#1^{15} - \frac{25\#1^2 e^{\frac{65c_1}{2}}}{x^{26}} + \frac{65e^{\frac{65c_1}{2}}}{x^{25}}\&, 1\right]\right\}, \left\{y(x) \to \text{Root}\left[-\#1^{15} - \frac{25\#1^2 e^{\frac{65c_1}{2}}}{x^{26}} + \frac{65e^{\frac{65c_1}{2}}}{x^{25}}\&, 2\right]\right.$$

✓ **Maple** : cpu = 0.167 (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))
```

$$\ln(x) - c_1 - \frac{2\ln\left(\frac{5y(x)^2 - 13x}{x}\right)}{65} + \frac{6\ln\left(\frac{y(x)}{\sqrt{x}}\right)}{13} = 0$$

2.294 ODE No. 294

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

✓ **Mathematica** : cpu = 0.185629 (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]
```

$$\left\{\left\{y(x)\to\frac{1}{2}\left(c_1x-\sqrt{-4a+4x^2+c_1{}^2x^2}\right)\right\},\left\{y(x)\to\frac{1}{2}\left(\sqrt{-4a+4x^2+c_1{}^2x^2}+c_1x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (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))
```

$$\frac{1}{\frac{1}{y(x)^2}-\frac{1}{-x^2+a}}=-\frac{\sqrt{x^2-a}\,x}{\sqrt{c_1+\frac{4a}{x^2-a}}}+\frac{x^2}{2}-\frac{a}{2}$$

2.295 ODE No. 295

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

✓ **Mathematica** : cpu = 0.17886 (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],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 = 0.158 (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))
```

$$y(x) = e^{\text{RootOf}\left(2\,e^{\_Z}\ln(x) + e^{2\_Z} + 2\,e^{\_Z} c_1 + \_Z\,e^{\_Z} + 1\right)} x$$

2.296 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 = 0.290192 (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[x],x]
```

$$\left\{\left\{y(x)\to -e^{-c_1}x^2 - e^{-c_1}\sqrt{x^4 - e^{c_1}x^4 + e^{2c_1}x^2}\right\},\left\{y(x)\to e^{-c_1}\sqrt{x^4 - e^{c_1}x^4 + e^{2c_1}x^2} - e^{-c_1}x^2\right\}\right\}$$

✓ **Maple** : cpu = 0.482 (sec), leaf count = 61

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

$$y(x) = -x^2 c_1 - \sqrt{x^4 c_1^2 - x^4 c_1 + x^2}$$

2.297 ODE No. 297

$$2x\left(5x^2+y(x)^2\right)y'(x)-x^2y(x)+y(x)^3=0$$

✓ **Mathematica** : cpu = 0.11828 (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]
```

$$\left\{\left\{y(x)\to \text{Root}\left[-\#1^5+\frac{\#1^2e^{3c_1}}{x^{3/2}}+3e^{3c_1}\sqrt{x}\&,1\right]\right\},\left\{y(x)\to \text{Root}\left[-\#1^5+\frac{\#1^2e^{3c_1}}{x^{3/2}}+3e^{3c_1}\sqrt{x}\&,2\right]\right\},\left\{y(x\right.\right.$$

✓ **Maple** : cpu = 0.237 (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))
```

$$y(x)=\text{RootOf}\left(\_Z^{45}x^9c_1-\_Z^{18}-6\_Z^9-9\right)^{\frac{9}{2}}x$$

2.298 ODE No. 298

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

✓ **Mathematica** : cpu = 0.0643819 (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 = 0.016 (sec), leaf count = 73

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

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

2.299 ODE No. 299

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

✓ **Mathematica** : cpu = 0.0858819 (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]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt[3]{\frac{2}{3}}x^2}{\sqrt[3]{9c_1x^2+\sqrt{3}\sqrt{-4x^9+27c_1{}^2x^4}}}-\frac{\sqrt[3]{9c_1x^2+\sqrt{3}\sqrt{-4x^9+27c_1{}^2x^4}}}{\sqrt[3]{2}3^{2/3}x}\right\},\left\{y(x)\to \frac{(1+}{2^{2/3}\sqrt[3]{3}\sqrt[3]{9c_1x^2+}}\right.\right.$$

✓ **Maple** : cpu = 0.161 (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))
```

$$y(x)=\frac{\left(\left(12\sqrt{-12x^5+81c_1^2}+108c_1\right)x^2\right)^{\frac{1}{3}}}{6x}+\frac{2x^2}{\left(\left(12\sqrt{-12x^5+81c_1^2}+108c_1\right)x^2\right)^{\frac{1}{3}}}$$

2.300 ODE No. 300

$$6xy(x)^2y'(x) + 2y(x)^3 + x = 0$$

✓ **Mathematica** : cpu = 0.0611889 (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 = 0.019 (sec), leaf count = 83

```
dsolve(6*x*y(x)^2*diff(y(x),x)+2*y(x)^3+x = 0,y(x))
```

$$y(x) = \frac{\left(-2\left(x^2-4c_1\right)x^2\right)^{\frac{1}{3}}}{2x}$$

2.301 ODE No. 301

$$\left(x^2+6xy(x)^2\right)y'(x)-y(x)\left(3y(x)^2-x\right)=0$$

✓ **Mathematica** : cpu = 0.0988623 (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 = 0.135 (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))
```

$$y(x)=\frac{e^{-\frac{\mathrm{LambertW}\left(\frac{6\,e^{3c_1}}{x^3}\right)}{2}+\frac{3c_1}{2}}}{x}$$

2.302 ODE No. 302

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

✓ **Mathematica** : cpu = 0.0690373 (sec), leaf count = 70

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

$$\left\{\left\{y(x)\to\frac{c_1x-\sqrt{x}\sqrt{4+c_1{}^2x}}{2x}\right\},\left\{y(x)\to\frac{c_1x+\sqrt{x}\sqrt{4+c_1{}^2x}}{2x}\right\}\right\}$$

✓ **Maple** : cpu = 0.213 (sec), leaf count = 133

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

$$y(x)=-\frac{\sqrt{-2xc_1\left(-2c_1-x+\sqrt{x\left(4c_1+x\right)}\right)}}{2xc_1}$$

2.303 ODE No. 303

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

✓ **Mathematica** : cpu = 0.0941716 (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 = 0.131 (sec), leaf count = 34

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

$$y(x)=\frac{\mathrm{e}^{\mathrm{RootOf}\left(-2\,\mathrm{e}^{\_Z}\ln(x)-\mathrm{e}^{2\_Z}+2\,\mathrm{e}^{\_Z}c_1+2\_Z\mathrm{e}^{\_Z}+1\right)}}{x}$$

2.304 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 = 0.25664 (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[x],x]
```

$$\text{Solve}\left[y(x)\sqrt{5x^2y(x)^2+2}e^{\frac{\arctan\left(\sqrt{\frac{5}{2}}xy(x)\right)}{\sqrt{10}}} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.187 (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))
```

$$y(x) = \frac{\tan\left(\text{RootOf}\left(\sqrt{10}\ln\left(\frac{4\tan(\_Z)^2\left(\tan(\_Z)^2+1\right)}{5x^2}\right) + 2\sqrt{10}\,c_1 + 2\_Z\right)\right)\sqrt{10}}{5x}$$

2.305 ODE No. 305

$$x^2 + \left(y(x)^3 - 3x\right) y'(x) - 3y(x) = 0$$

✓ **Mathematica** : cpu = 0.127766 (sec), leaf count = 1277

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

$$\left\{\left\{y(x) \to -\frac{1}{2}\sqrt{\frac{16\sqrt[3]{2}\left(x^3+3c_1\right)}{\sqrt[3]{104976x^2-\sqrt{11019960576x^4-4\left(144x^3+432c_1\right)^3}}} + \frac{\sqrt[3]{104976x^2-\sqrt{11019960576x^4-4}}}{9\sqrt[3]{2}}}\right.\right.$$

✓ **Maple** : cpu = 0.012 (sec), leaf count = 21

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

$$\frac{x^3}{3} - 3xy(x) + \frac{y(x)^4}{4} + c_1 = 0$$

2.306 ODE No. 306

$$\left(y(x)^3-x^3\right)y'(x)-x^2y(x)=0$$

✓ **Mathematica** : cpu = 0.0967775 (sec), leaf count = 201

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

$$\left\{\left\{y(x)\to\sqrt[3]{x^3-\sqrt{x^6-e^{6c_1}}}\right\},\left\{y(x)\to-\sqrt[3]{-1}\sqrt[3]{x^3-\sqrt{x^6-e^{6c_1}}}\right\},\left\{y(x)\to(-1)^{2/3}\sqrt[3]{x^3-\sqrt{x^6-e^{6c_1}}}\right\},$$

✓ **Maple** : cpu = 0.546 (sec), leaf count = 225

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

$$y(x)=\frac{x}{\left(x^3c_1\left(-x^3c_1+\sqrt{x^6c_1^2+1}\right)\right)^{\frac{1}{3}}}$$

2.307 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 = 0.163865 (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]
```

$$\left\{\left\{y(x)\to -\sqrt{-\sqrt{a^2+4ax^2+4c_1}-a-x^2}\right\},\left\{y(x)\to \sqrt{-\sqrt{a^2+4ax^2+4c_1}-a-x^2}\right\},\left\{y(x)\to -\sqrt{\sqrt{a^2 \cdot}\right.\right.$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 113

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

$$y(x)=\sqrt{-x^2-a-2\sqrt{a\,x^2-c_1}}$$

2.308 ODE No. 308

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

✓ **Mathematica** : cpu = 0.0116687 (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 = 0.009 (sec), leaf count = 37

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

$$y(x) = 0$$

2.309 ODE No. 309

$$-2x^3 + \left(2y(x)^3 + y(x)\right)y'(x) - x = 0$$

✓ **Mathematica** : cpu = 0.0770156 (sec), leaf count = 151

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

$$\left\{\left\{y(x)\to -\frac{\sqrt{-1-\sqrt{4x^4+4x^2+1+8c_1}}}{\sqrt{2}}\right\},\left\{y(x)\to \frac{\sqrt{-1-\sqrt{4x^4+4x^2+1+8c_1}}}{\sqrt{2}}\right\},\left\{y(x)\to -\frac{\sqrt{-1+\sqrt{}}}{}\right.\right.$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 113

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

$$y(x) = -\frac{\sqrt{-2-2\sqrt{4x^4+4x^2+8c_1+1}}}{2}$$

2.310 ODE No. 310

$$x^3 + \left(5x^2y(x) + 2y(x)^3\right)y'(x) + 5xy(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.124427 (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]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{-5x^2-\sqrt{23x^4+2e^{4c_1}}}}{\sqrt{2}}\right\},\left\{y(x)\to \frac{\sqrt{-5x^2-\sqrt{23x^4+2e^{4c_1}}}}{\sqrt{2}}\right\},\left\{y(x)\to -\frac{\sqrt{-5x^2+\sqrt{23x^4+}}}{\sqrt{2}}\right.\right.$$

✓ **Maple** : cpu = 0.073 (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))
```

$$y(x) = -\frac{\sqrt{-10x^2c_1 - 2\sqrt{23x^4c_1^2+2}}}{2\sqrt{c_1}}$$

2.311 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 = 0.161034 (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]^3)*Deriv
```

$$\left\{\left\{y(x) \to \frac{x}{20} + \frac{1}{2}\sqrt{-\frac{39x^2}{100} + \frac{\sqrt[3]{99x^6 + 351e^{c_1}x^2 + \sqrt{3}\sqrt{-67037x^{12} + 185406e^{c_1}x^8 - 83733e^{2c_1}x^4 + 32000e^{3c_1}}}}{5\sqrt[3]{2}3^{2/3}}}\right.\right.$$

✓ **Maple** : cpu = 0.086 (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
```

$$y(x) = \frac{\text{RootOf}\left(x^4c_1^4 + 3\_Zx^3c_1^3 + 3\_Z^2x^2c_1^2 - \_Z^3xc_1 + 5\_Z^4 - 1\right)}{c_1}$$

2.312 ODE No. 312

$$
(y(x)y'(x)+x)\left(\frac{x^2}{a}+\frac{y(x)^2}{b}\right)+\frac{(a-b)\left(y(x)y'(x)-x\right)}{a+b}=0
$$

✓ **Mathematica** : cpu = 0.903245 (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]*Derivative[1]
```

$$
\left\{\left\{y(x)\to -\frac{\sqrt{b}\sqrt{a^2+2a^2W\left(\frac{c_1(a+b)e^{\frac{bx^2}{2a^2}-\frac{b}{2a}-\frac{x^2}{2b}-\frac{1}{2}}}{2a^3b^2}\right)+ab-ax^2-bx^2}}{\sqrt{a}\sqrt{a+b}}\right\},\left\{y(x)\to \frac{\sqrt{b}\sqrt{a^2+2a^2W\left(\frac{c_1(a+b)e}{}\right.}}{\sqrt{}}\right.
$$

✓ **Maple** : cpu = 1.201 (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))
```

$$
y(x)=\frac{\sqrt{a\left(\mathrm{e}^{\frac{-2\,\mathrm{LambertW}\left(\frac{(a+b)\mathrm{e}^{-\frac{x^2}{2b}}\mathrm{e}^{\frac{b\,x^2}{2a^2}}\mathrm{e}^{-\frac{1}{2}}\mathrm{e}^{-\frac{b}{2a}}\mathrm{e}^{-\frac{c_1}{ab}}}{2a^2b}\right)a^2b+\left(-x^2-b\right)a^2+\left(-b^2-2c_1\right)a+b^2x^2}{2b\,a^2}}+b\left(-x^2+a\right)\right)}}{a}
$$

2.313 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 = 0.215925 (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]^3)*Der
```

$$\left\{\left\{y(x)\to\frac{\sqrt[3]{2}(3acx+3ac_1)}{3a\sqrt[3]{\sqrt{(27a^2bx^3+27a^2c_1x)^2+4(3acx+3ac_1)^3}+27a^2bx^3+27a^2c_1x}}-\frac{\sqrt[3]{\sqrt{(27a^2bx^3+27a^2c_1x)^2}}}{}\right.\right.$$

✓ **Maple** : cpu = 0.153 (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*y(x)*x^2+2*b
```

$$y(x)=\frac{(-12cx+12c_1)a+\left(\left(-108b\,x^3+108xc_1+12\sqrt{\frac{81a\,b^2x^6-162ab\,x^4c_1+12c^3x^3+81a\,x^2c_1^2-36c^2x^2c_1+36cxc_1^2-12c_1^3}{a}}\right)a}{6\left(\left(-108b\,x^3+108xc_1+12\sqrt{\frac{81a\,b^2x^6-162ab\,x^4c_1+12c^3x^3+81a\,x^2c_1^2-36c^2x^2c_1+36cxc_1^2-12c_1^3}{a}}\right)a^2\right)^{\frac{1}{3}}a}$$

2.314 ODE No. 314

$$xy(x)^3y'(x) + y(x)^4 - x\sin(x) = 0$$

✓ **Mathematica** : cpu = 0.116967 (sec), leaf count = 188

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

$$\left\{\left\{y(x)\to -\frac{\sqrt[4]{-4x^4\cos(x)+16x^3\sin(x)+48x^2\cos(x)-96x\sin(x)-96\cos(x)+c_1}}{x}\right\},\left\{y(x)\to -\frac{i\sqrt[4]{-4x^4\text{co}}}{}\right.\right.$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 158

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

$$y(x) = \frac{\left(4\left(-x^4+12x^2-24\right)\cos\left(x\right)+16\left(x^3-6x\right)\sin\left(x\right)+c_1\right)^{\frac{1}{4}}}{x}$$

2.315 ODE No. 315

$$\left(2xy(x)^3 - x^4\right) y'(x) + 2x^3 y(x) - y(x)^4 = 0$$

✓ **Mathematica** : cpu = 0.214055 (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]
```

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{\frac{2}{3}} e^{c_1} x}{\sqrt[3]{-9x^3 + \sqrt{3}\sqrt{27x^6 - 4e^{3c_1}x^3}}} + \frac{\sqrt[3]{-9x^3 + \sqrt{3}\sqrt{27x^6 - 4e^{3c_1}x^3}}}{\sqrt[3]{2}3^{2/3}}\right\}, \left\{y(x) \to -\frac{(1 + i\sqrt{3}}{2^{2/3}\sqrt[3]{3}\sqrt[3]{-9x^3 + \sqrt{}}}\right.\right.$$

✓ **Maple** : cpu = 0.088 (sec), leaf count = 374

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

$$y(x) = \frac{12^{\frac{1}{3}}\left(x 12^{\frac{1}{3}} c_1 + \left(x\left(-9x^2 c_1 + \sqrt{3}\sqrt{\frac{27x^4 c_1^3 - 4x}{c_1}}\right) c_1^2\right)^{\frac{2}{3}}\right)}{6c_1\left(x\left(-9x^2 c_1 + \sqrt{3}\sqrt{\frac{27x^4 c_1^3 - 4x}{c_1}}\right) c_1^2\right)^{\frac{1}{3}}}$$

2.316 ODE No. 316

$$\left(2xy(x)^3+y(x)\right)y'(x)+2y(x)^2=0$$

✓ **Mathematica** : cpu = 0.133308 (sec), leaf count = 48

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

$$\left\{\{y(x)\to 0\},\text{Solve}\left[x=-\frac{1}{4}e^{-\frac{1}{2}y(x)^2}\,\text{ExpIntegralEi}\left(\frac{y(x)^2}{2}\right)+c_1e^{-\frac{1}{2}y(x)^2},y(x)\right]\right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 53

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

$$y(x)=0$$

2.317 ODE No. 317

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

✓ **Mathematica** : cpu = 0.192669 (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 = 0.113 (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))
```

$$y(x)=\mathrm{e}^{\mathrm{RootOf}\left(-\mathrm{e}^{3\_Z}-\mathrm{e}^{\_Z}\ln(x)+\mathrm{e}^{\_Z}c_1-\_Z\mathrm{e}^{\_Z}+x\right)}$$

2.318 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 = 0.154598 (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]
```

$$\left\{\{y(x)\to 0\},\left\{y(x)\to -\sqrt{\frac{4\sqrt[3]{2}x^2}{3\sqrt[3]{16x^6+24x^5-27{c_1}^2x^4+12x^4+2x^3+3\sqrt{3}\sqrt{-32{c_1}^2x^{10}-48{c_1}^2x^9+27{c_1}^4x^8-}}}}\right.\right.$$

✓ **Maple** : cpu = 0.015 (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))
```

$$y(x) = 0$$

2.319 ODE No. 319

$$\left(7xy(x)^3+y(x)-5x\right)y'(x)+y(x)^4-5y(x)=0$$

✓ **Mathematica** : cpu = 0.112786 (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]
```

$$\left\{\left\{y(x)\to \text{Root}\left[10\#1^7x+2\#1^5-100\#1^4x-25\#1^2+250\#1x-10c_1\&,1\right]\right\},\left\{y(x)\to \text{Root}\left[10\#1^7x+2\#1^5-\right.\right.$$

✓ **Maple** : cpu = 0.022 (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))
```

$$x+\frac{2y(x)^5-25y(x)^2-10c_1}{10\left(y\left(x\right)^3-5\right)^2y\left(x\right)}=0$$

2.320 ODE No. 320

$$\left(x^2y(x)^3+xy(x)\right)y'(x)-1=0$$

✓ **Mathematica** : cpu = 0.0977867 (sec), leaf count = 76

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

$$\left\{\left\{y(x)\to -\frac{\sqrt{2xW\left(c_1e^{\frac{1}{2x}-1}\right)+2x-1}}{\sqrt{x}}\right\},\left\{y(x)\to \frac{\sqrt{2xW\left(c_1e^{\frac{1}{2x}-1}\right)+2x-1}}{\sqrt{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 78

```
dsolve((x^2*y(x)^3+x*y(x))*diff(y(x),x)-1 = 0,y(x))
```

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

2.321 ODE No. 321

$$\left(2x^2y(x)^3 + x^2y(x)^2 - 2x\right)y'(x) - 2y(x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.28043 (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 = 0.114 (sec), leaf count = 42

```
dsolve((2*x^2*y(x)^3+y(x)^2*x^2-2*x)*diff(y(x),x)-2*y(x)-1 = 0,y(x))
```

$$y(x) = \frac{e^{\text{RootOf}\left(x\,e^{3\_Z} - 4x\,e^{2\_Z} + 8xc_1e^{\_Z} + 2\_Zx\,e^{\_Z} + 3x\,e^{\_Z} + 16\right)}}{2} - \frac{1}{2}$$

2.322 ODE No. 322

$$\left(10x^2y(x)^3-3y(x)^2-2\right)y'(x)+5xy(x)^4+x=0$$

✓ **Mathematica** : cpu = 0.185845 (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]
```

$$\left\{\left\{y(x)\to -\frac{1}{2}\sqrt{\frac{4\sqrt[3]{2}\left(5x^4-10c_1x^2-2\right)}{5x^2\sqrt[3]{2268x^2-216c_1+\sqrt{\left(2160x^2+108\left(x^2-2c_1\right)\right)^2-4\left(60x^4-120c_1x^2-24\right)^3}}}+\frac{\sqrt[3]{2268x^2}}{}}\right.\right.$$

✓ **Maple** : cpu = 0.016 (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))
```

$$\frac{5y(x)^4x^2}{2}-y(x)^3+\frac{x^2}{2}-2y(x)+c_1=0$$

2.323 ODE No. 323

$$xy'(x)\left(axy(x)^3+c\right)+y(x)\left(bx^3y(x)+c\right)=0$$

✓ **Mathematica** : cpu = 0.179975 (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]
```

$$\left\{\left\{y(x)\to\frac{\sqrt[3]{54a^2cx^2+\sqrt{2916a^4c^2x^4+108a^3x^3\left(bx^3-2c_1x\right)^3}}}{3\sqrt[3]{2}ax}-\frac{\sqrt[3]{2}\left(bx^3-2c_1x\right)}{\sqrt[3]{54a^2cx^2+\sqrt{2916a^4c^2x^4+108a^3x^3\left(bx^3-\right.}}}\right.\right.$$

✓ **Maple** : cpu = 0.095 (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))
```

$$y(x)=\frac{\left(-3ab\,x^4+6c_1a\,x^2+\left(\left(27c+3\sqrt{\frac{3b^3x^8-18b^2x^6c_1+36b\,x^4c_1^2-24x^2c_1^3+81a\,c^2}{a}}\right)a^2x^2\right)^{\frac{2}{3}}\right)3^{\frac{2}{3}}}{9ax\left(\left(9c+\sqrt{\frac{3b^3x^8-18b^2x^6c_1+36b\,x^4c_1^2-24x^2c_1^3+81a\,c^2}{a}}\right)a^2x^2\right)^{\frac{1}{3}}}$$

2.324 ODE No. 324

$$\left(2x^3y(x)^3-x\right)y'(x)+2x^3y(x)^3-y(x)=0$$

✓ **Mathematica** : cpu = 0.0860968 (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]
```

$$\left\{\left\{y(x)\to -\frac{2x^3-c_1x^2}{6x^2}+\frac{\sqrt[3]{-8x^9+12c_1x^8-6c_1{}^2x^7+c_1{}^3x^6-27x^4+3\sqrt{3}\sqrt{16x^{13}-24c_1x^{12}+12c_1{}^2x^{11}-2c_1}}{6x^2}\right.\right.$$

✓ **Maple** : cpu = 0.097 (sec), leaf count = 811

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

$$y(x)=\frac{\left(\left(c_1^3x^2-6c_1^2x^3+12c_1x^4-8x^5+3\sqrt{48x^5-72c_1x^4+36c_1^2x^3-6c_1^3x^2+81}-27\right)x\right)^{\frac{1}{3}}}{6x}+\frac{}{6\left(\left(c_1^3x^2-6c_1^2x^3\right.\right.}$$

2.325 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 = 0.142715 (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]
```

$$\text{Solve}\left[\frac{1}{7}\text{RootSum}\left[\#1^4+\#1^3+3\#1^2+\#1+1\&,\frac{8\#1^3\log\left(\frac{y(x)}{x}-\#1\right)+9\#1^2\log\left(\frac{y(x)}{x}-\#1\right)+12\#1\log\left(\frac{y}{}\right.}{4\#1^3+3\#1^2+6\#1+1}\right.\right.$$

✓ **Maple** : cpu = 0.431 (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))
```

$$\frac{\ln\left(\frac{y(x)-x}{x}\right)}{7}-\frac{2\ln\left(\frac{4x^4+4x^3y(x)+12y(x)^2x^2+4xy(x)^3+4y(x)^4}{x^4}\right)}{7}-\frac{2\sqrt{3}\arctan\left(\frac{(x+2y(x))\sqrt{3}}{3x}\right)}{7}+\frac{2\sqrt{3}\arctan\left(\frac{\sqrt{3}\left(x^3+4x^2y(x\right.}{}\right.}{7}$$

2.326 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 = 1.3947 (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] == 0,y[x
```

Too large to display

✓ **Maple** : cpu = 0.694 (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))
```

$$y(x)=\frac{x\left(xc_1-b\,\mathrm{RootOf}\left(b^2\_Z^4-2bxc_1\_Z^3+\left(a^2x^2c_1^2+b^2x^2c_1^2+x^2c_1^2-a^2\right)\_Z^2-2b\,x^3c_1^3\_Z+x^4c_1^4\right)\right)}{a\,\mathrm{RootOf}\left(b^2\_Z^4-2bxc_1\_Z^3+\left(a^2x^2c_1^2+b^2x^2c_1^2+x^2c_1^2-a^2\right)\_Z^2-2b\,x^3c_1^3\_Z+x^4c_1^4\right)}$$

2.327 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 = 0.174625 (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]
```

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{27x^2 + 9c_1{}^2x^2 + 3\sqrt{3}\sqrt{-4c_1{}^3x^6 + 27x^4 - c_1{}^4x^4 + 18c_1{}^2x^4 + 4c_1{}^3x^2} + 2c_1{}^3}}{3\sqrt[3]{2}x} - \frac{}{3x\sqrt[3]{27x^2 + 9c_1{}^2x^2 -}}\right.\right.$$

✓ **Maple** : cpu = 0.149 (sec), leaf count = 579

```
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))
```

$$y(x) = \frac{\left(108c_1^3x^2 + 12\sqrt{3}\sqrt{27x^2c_1^4 + 4c_1x^4 + 18x^2c_1^2 - x^2 - 4c_1}\,xc_1 + 36x^2c_1 - 8\right)^{\frac{1}{3}}}{6xc_1} - \frac{}{3xc_1\left(108c_1^3x^2 + 12\sqrt{3}\sqrt{2}\right.}$$

2.328 ODE No. 328

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

✓ **Mathematica** : cpu = 0.196851 (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]
```

$$\text{Solve}\left[\frac{n(\log(x) - \log(-a x y(x)^n + n + 2))}{n+2} - \frac{2 n \log(y(x))}{n+2} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.162 (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))
```

$$(y(x)^n a x - n - 2)^n y(x)^{2n} x^{-n} - c_1 = 0$$

2.329 ODE No. 329

$$x^n y(x)^m \left(axy'(x)+by(x)\right)+\alpha xy'(x)+\beta y(x)=0$$

✓ **Mathematica** : cpu = 0.574842 (sec), leaf count = 118

```
DSolve[beta*y[x] + alpha*x*Derivative[1][y][x] + x^n*y[x]^m*(b*y[x] + a*x*Derivative[1][y][x]) == 0,y
```

$$\text{Solve}\left[\frac{m(n(a\beta-\alpha b)\log\left(x^n y(x)^m(bm-an)-\alpha n+\beta m\right)+\beta(bm-an)\log\left(nx^n(\alpha n-\beta m)\right))}{n(an-bm)(\alpha n-\beta m)}+\frac{\alpha m\log(\beta my(x}{\beta m-}\right.$$

✓ **Maple** : cpu = 0.395 (sec), leaf count = 72

```
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))
```

$$(y(x)^m)^{\alpha(an-bm)}\left(x^n(an-bm)\,y(x)^m-\beta m+\alpha n\right)^{-m(a\beta-b\alpha)}x^{\beta m(an-bm)}-c_1=0$$

2.330 ODE No. 330

$$(f(y(x)+x)+1)y'(x)+f(y(x)+x)=0$$

✓ **Mathematica** : cpu = 0.0922664 (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 = 0.02 (sec), leaf count = 22

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

$$y(x)=-x+\text{RootOf}\left(-x+\int^{\_Z}(1+f(\_a))\,d\_a+c_1\right)$$

2.331 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 = 51.933 (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][x] ==
```

, could not solve

```
DSolve[-Sum[y[x]^nu*g[nu][x], {nu, 1, q}] + Sum[y[x]^nu*f[nu][x], {nu, 1, p}]*Derivative[1][
```

✓ **Maple** : cpu = 0.155 (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(
```

$$\frac{y(x)^{p+1} \operatorname{LerchPhi}\left(-y(x)^{q}(-1)^{\operatorname{csgn}(iy(x)^{q})}, 1, \frac{p+1}{q}\right) - y(x) \operatorname{LerchPhi}\left(-y(x)^{q}(-1)^{\operatorname{csgn}(iy(x)^{q})}, 1, \frac{1}{q}\right) + q\left(\int \frac{g_{\nu}(x)}{f_{\nu}(x)} dx\right.}{q}$$

2.332 ODE No. 332

$$x\left(\sqrt{xy(x)}-1\right)y'(x)-y(x)\left(\sqrt{xy(x)}+1\right)=0$$

✓ **Mathematica** : cpu = 0.18656 (sec), leaf count = 29

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

$$\text{Solve}\left[\frac{2}{\sqrt{xy(x)}}+2\log(y(x))-\log(xy(x))=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.011 (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))
```

$$-\frac{1+\left(c_1-\ln(x)+\frac{\ln(xy(x))}{2}\right)\sqrt{xy(x)}}{\sqrt{xy(x)}}=0$$

2.333 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 = 0.292406 (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))*Derivative[1][y
```

$$\text{Solve}\left[\frac{2\sqrt{xy(x)}\log(y(x))}{\sqrt{x}\sqrt{y(x)}}-\frac{\sqrt{xy(x)}\left(3x^{3/2}y(x)^{3/2}\log(x)+6xy(x)-2\right)}{3x^2y(x)^2}=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 33

```
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
```

$$3\ln\left(y(x)\right)-\frac{3}{\sqrt{x}\sqrt{y(x)}}+\frac{1}{x^{\frac{3}{2}}y(x)^{\frac{3}{2}}}-\frac{3\ln(x)}{2}-c_1=0$$

2.334 ODE No. 334

$$\left(\sqrt{y(x)+x}+1\right)y'(x)+1=0$$

✓ **Mathematica** : cpu = 0.086851 (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 = 0.017 (sec), leaf count = 19

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

$$-y(x)-2\sqrt{y(x)+x}-c_1=0$$

2.335 ODE No. 335

$$\sqrt{y(x)^2-1}y'(x)-\sqrt{x^2-1}=0$$

✓ **Mathematica** : cpu = 0.0931046 (sec), leaf count = 79

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

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{1}{2}\#1\sqrt{\#1^2-1}-\text{arctanh}\left(\frac{\sqrt{\#1^2-1}}{\#1-1}\right)\&\right]\left[-\text{arctanh}\left(\frac{\sqrt{x^2-1}}{x-1}\right)+\frac{1}{2}\sqrt{x^2-1}x\right.\right.\right.$$

✓ **Maple** : cpu = 0.006 (sec), leaf count = 50

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

$$c_1+x\sqrt{x^2-1}-\ln\left(x+\sqrt{x^2-1}\right)-y(x)\sqrt{y(x)^2-1}+\ln\left(y(x)+\sqrt{y(x)^2-1}\right)=0$$

2.336 ODE No. 336

$$\left(ax + \sqrt{y(x)^2 + 1}\right) y'(x) + ay(x) + \sqrt{x^2 + 1} = 0$$

✓ **Mathematica** : cpu = 0.406152 (sec), leaf count = 80

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

$$\text{Solve}\left[axy(x) + \frac{1}{2}\sqrt{x^2+1}x - \frac{1}{2}\log\left(\sqrt{x^2+1} - x\right) + \frac{1}{2}y(x)\sqrt{y(x)^2+1} - \frac{1}{2}\log\left(\sqrt{y(x)^2+1} - y(x)\right) = c_1, y(x$$

✓ **Maple** : cpu = 0.023 (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))
```

$$\frac{x\sqrt{x^2+1}}{2} + \frac{\operatorname{arcsinh}(x)}{2} + axy(x) + \frac{y(x)\sqrt{y(x)^2+1}}{2} + \frac{\operatorname{arcsinh}(y(x))}{2} + c_1 = 0$$

2.337 ODE No. 337

$$\left(\sqrt{x^2+y(x)^2}+x\right)y'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.140514 (sec), leaf count = 52

```
DSolve[-y[x] + (x + Sqrt[x^2 + y[x]^2])*Derivative[1][y][x] == 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 = 0.069 (sec), leaf count = 28

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

$$-c_1+\frac{\sqrt{y(x)^2+x^2}}{y(x)^2}+\frac{x}{y(x)^2}=0$$

2.338 ODE No. 338

$$y'(x)\left(\sin(\alpha)\left(y(x)^2-x^2\right)-2x\cos(\alpha)y(x)+\sqrt{x^2+y(x)^2}y(x)\right)+\cos(\alpha)\left(y(x)^2-x^2\right)+2x\sin(\alpha)y(x)+x\sqrt{x^2+y$$

✓ **Mathematica** : cpu = 5.83406 (sec), leaf count = 116

```
DSolve[2*x*Sin[alpha]*y[x] + Cos[alpha]*(-x^2 + y[x]^2) + x*Sqrt[x^2 + y[x]^2] + (-2*x*Cos[alpha]*y[x
```

$$\text{Solve}\left[\sqrt{\cos^2(\alpha)}\sec(\alpha)\left(\log\left(\cos(\alpha)\left(\frac{\cos(\alpha)y(x)}{x}+\sin(\alpha)\right)\right)-\log\left(\frac{1}{2}\left(-2\sqrt{\cos^2(\alpha)}\sqrt{\frac{y(x)^2}{x^2}+1}-\frac{\sin(2\alpha)y(x}{x}\right.\right.\right.$$

✓ **Maple** : cpu = 0.725 (sec), leaf count = 129

```
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*
```

$$y(x)=\text{RootOf}\left(-\ln(x)+\int^{\_Z}\frac{\_a^3\cos(2\alpha)-3\_a^2\sin(2\alpha)-\_a^3+3\_a\cos(2\alpha)+\sin(2\alpha)+\sqrt{2}\sqrt{(\_a^2+}}{(\_a^2+1)(\_a^2\cos(2\alpha)+2\_a\sin(2\alpha)+}\right.$$

2.339 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 = 0.258419 (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 + x^2 +
```

$$\text{Solve}\left[\arctan\left(\frac{x}{y(x)}\right)+\sqrt{x^2+y(x)^2+1}=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.106 (sec), leaf count = 25

```
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*(
```

$$\arctan\left(\frac{x}{y\left(x\right)}\right)+\sqrt{x^2+y\left(x\right)^2+1}-c_1=0$$

2.340 ODE No. 340

$$y'(x)\left(\frac{\mathrm{e1}(a+x)}{((a+x)^2+y(x)^2)^{3/2}}+\frac{\mathrm{e2}(x-a)}{((x-a)^2+y(x)^2)^{3/2}}\right)-y(x)\left(\frac{\mathrm{e1}}{((a+x)^2+y(x)^2)^{3/2}}+\frac{\mathrm{e2}}{((x-a)^2+y(x)^2)^{3/2}}\right)$$

✗ **Mathematica** : cpu = 67.7085 (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 + x))/((-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))*Derivative[1]
```

✗ **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)*(
```

, exception

```
time expired
```

2.341 ODE No. 341

$$\left(xe^{y(x)}+e^{x}\right)y'(x)+e^{x}y(x)+e^{y(x)}=0$$

✓ **Mathematica** : cpu = 0.186761 (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 = 0.039 (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))
```

$$y(x)=\left(-\operatorname{LambertW}\left(x\,\mathrm{e}^{-x}\mathrm{e}^{-\mathrm{e}^{-x}c_1}\right)\mathrm{e}^{x}-c_1\right)\mathrm{e}^{-x}$$

2.342 ODE No. 342

$$x\left(2e^{-xy(x)}+3e^{xy(x)}\right)\left(xy'(x)+y(x)\right)+1=0$$

✓ **Mathematica** : cpu = 0.398731 (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]
```

$$\left\{\left\{y(x)\to -\frac{\operatorname{arccosh}\left(\frac{1}{24}\left(-5\sqrt{24+\log^2\left(\frac{c_1}{x}\right)}-\log\left(\frac{c_1}{x}\right)\right)\right)}{x}\right\},\left\{y(x)\to \frac{\operatorname{arccosh}\left(\frac{1}{24}\left(-5\sqrt{24+\log^2\left(\frac{c_1}{x}\right)}-\log\left(\right.\right.\right.}{x}\right.\right.$$

✓ **Maple** : cpu = 0.026 (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))
```

$$y(x)=\frac{\ln\left(-\frac{\ln(x)}{5}+\frac{c_1}{5}\right)}{x}$$

2.343 ODE No. 343

$$y'(x)(\log(y(x)) + x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.115919 (sec), leaf count = 35

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

$$\text{Solve}\left[x = e^{y(x)}\left(\text{ExpIntegralEi}(-y(x)) - e^{-y(x)}\log(y(x))\right) + c_1 e^{y(x)}, y(x)\right]$$

✓ **Maple** : cpu = 0.053 (sec), leaf count = 27

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

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-x - \_Z - \mathrm{e}^{\mathrm{e}^{\_Z}} \mathrm{expIntegral}_1\left(\mathrm{e}^{\_Z}\right) + \mathrm{e}^{\mathrm{e}^{\_Z}} c_1\right)}$$

2.344 ODE No. 344

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

✓ **Mathematica** : cpu = 0.133188 (sec), leaf count = 23

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

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

✓ **Maple** : cpu = 0.037 (sec), leaf count = 19

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

$$y(x) = \mathrm{e}^{-\operatorname{LambertW}\left(-2\,\mathrm{e}^{-2x} c_1\right)-2x}$$

2.345 ODE No. 345

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

✓ **Mathematica** : cpu = 0.133575 (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 = 0.055 (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))
```

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

2.346 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 = 0.297143 (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])*Derivative[1][y]
```

$$\text{Solve}[ax\log(xy(x)) - y(x)\log(xy(x)) = c_1, y(x)]$$

✓ **Maple** : cpu = 0.177 (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))
```

$$(xy(x))^{-ax+y(x)} - c_1 = 0$$

2.347 ODE No. 347

$$(\sin(x)+1)y'(x)\sin(y(x))+\cos(x)(\cos(y(x))-1)=0$$

✓ **Mathematica** : cpu = 0.335463 (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]
```

$$\left\{\{y(x)\to 0\},\left\{y(x)\to 2\arcsin\left(\frac{1}{4}c_1\left(\sin\left(\frac{x}{2}\right)+\cos\left(\frac{x}{2}\right)\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.184 (sec), leaf count = 12

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

$$y(x)=\arccos\left(\sin\left(x\right)c_1+c_1+1\right)$$

2.348 ODE No. 348

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

✓ **Mathematica** : cpu = 0.14884 (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 = 0.066 (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))
```

$$y(x)\sin(x) + x\sin(y(x)) + c_1 = 0$$

2.349 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 = 0.156979 (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]
```

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

✓ **Maple** : cpu = 0.035 (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))
```

$$y(x)=\arcsin\left(\frac{1}{2c_1+2\ln(x)}\right)x$$

2.350 ODE No. 350

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

✓ **Mathematica** : cpu = 0.414036 (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]
```

$$\left\{\left\{y(x)\to \csc^{-1}\left(\frac{1}{2}(-\sin(x)-\cos(x)-2c_1e^{-x})\right)\right\},\left\{y(x)\to -\csc^{-1}\left(\frac{1}{2}(\sin(x)+\cos(x)+2c_1e^{-x})\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.102 (sec), leaf count = 221

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

$$y(x) = \arctan\left(-\frac{2\,\mathrm{e}^{x}}{(\cos(x)+\sin(x))\,\mathrm{e}^{x}+2c_1}, \frac{4\sqrt{\left(\frac{(\sin(x)\cos(x)+\frac{1}{2})\mathrm{e}^{2x}}{2}+(\cos(x)+\sin(x))\,\mathrm{e}^{x}c_1+c_1^2\right)\left(\frac{(\sin(x)\cos(x)}{2}\right.}}{4c_1^2+4(\cos(x)+\sin(x))\,\mathrm{e}^{x}c_1+\mathrm{e}^{2x}(2\sin(}\right.$$

2.351 ODE No. 351

$$y'(x)\cos(y(x)) - \sin^3(y(x)) + x\sin(y(x))\cos^2(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.350497 (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 = 0.356 (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))
```

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

2.352 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 = 0.408017 (sec), leaf count = 43

```
DSolve[Cos[x]*(Cos[x] - Sin[alpha]*Sin[y[x]]) + Cos[y[x]]*(Cos[y[x]] - Sin[alpha]*Sin[x])*Derivative[
```

$$\text{Solve}\left[4\sin(\alpha)\sin(x)\sin(y(x))-4\left(\frac{y(x)}{2}+\frac{1}{4}\sin(2y(x))\right)-2x-\sin(2x)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.191 (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)))*co
```

$$\frac{(-2\sin(\alpha)\sin(x)+\cos(y(x)))\sin(y(x))}{2}+\frac{\sin(x)\cos(x)}{2}+\frac{x}{2}+c_1+\frac{y(x)}{2}=0$$

2.353 ODE No. 353

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

✓ **Mathematica** : cpu = 0.0631032 (sec), leaf count = 14

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

$$\left\{\left\{y(x)\to \arcsin\left(\frac{e^{c_1}}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 12

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

$$y(x) = \arcsin\left(\frac{1}{x c_1}\right)$$

2.354 ODE No. 354

$$y'(x)(x\sin(y(x))-1)+\cos(y(x))=0$$

✓ **Mathematica** : cpu = 0.123074 (sec), leaf count = 145

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

$$\left\{\left\{y(x)\to -\arccos\left(\frac{c_1x-\sqrt{-x^2+1+c_1{}^2}}{1+c_1{}^2}\right)\right\},\left\{y(x)\to \arccos\left(\frac{c_1x-\sqrt{-x^2+1+c_1{}^2}}{1+c_1{}^2}\right)\right\},\left\{y(x)\to -\text{arcco}\right.\right.$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 108

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

$$y(x)=\arctan\left(\frac{-c_1\sqrt{-x^2+c_1^2+1}+x}{c_1^2+1},\frac{xc_1+\sqrt{-x^2+c_1^2+1}}{c_1^2+1}\right)$$

2.355 ODE No. 355

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

✓ **Mathematica** : cpu = 0.141186 (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 = 0.057 (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))
```

$$y(x)\cos(x) + x\sin(y(x)) + c_1 = 0$$

2.356 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 = 0.192613 (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] == 0,y[x],
```

$$\text{Solve}\left[x^2\sin(y(x))+y(x)^2\sin(x)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.07 (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))
```

$$y(x)^2\sin(x)+\sin(y(x))\,x^2+c_1=0$$

2.357 ODE No. 357

$$x \log(x) y'(x) \sin(y(x)) + \cos(y(x))(1 - x\cos(y(x))) = 0$$

✓ **Mathematica** : cpu = 0.39176 (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 = 0.467 (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))
```

$$y(x) = \operatorname{arcsec}\left(\frac{x + c_1}{\ln(x)}\right)$$

2.358 ODE No. 358

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

✓ **Mathematica** : cpu = 0.111591 (sec), leaf count = 29

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

$$\left\{\left\{y(x)\to -\arccos\left(\frac{1}{2}c_1\sec(x)\right)\right\},\left\{y(x)\to \arccos\left(\frac{1}{2}c_1\sec(x)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 11

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

$$y(x) = \arccos\left(\frac{c_1}{\cos(x)}\right)$$

2.359 ODE No. 359

$$3\sin(x)y'(x)\sin(y(x)) + 5y(x)\cos^4(x) = 0$$

✓ **Mathematica** : cpu = 0.225773 (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 = 0.071 (sec), leaf count = 28

```
dsolve(3*diff(y(x),x)*sin(x)*sin(y(x))+5*cos(x)^4*y(x) = 0,y(x))
```

$$\frac{3\,\mathrm{Si}\left(y(x)\right)}{5}+c_1+\ln\left(\csc\left(x\right)-\cot\left(x\right)\right)+\frac{\cos\left(3x\right)}{12}+\frac{5\cos\left(x\right)}{4}=0$$

2.360 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 = 13.8861 (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]]*Derivative[1][
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{i(\cos(\#1a)+1)\sqrt{\frac{2c\cos(\#1a)+\cos(2\#1a)-1}{(\cos(\#1a)+1)^2}}\sqrt{\frac{c\tan^2\left(\frac{\#1a}{2}\right)+\sqrt{c^2+4}+2}{\sqrt{c^2+4}+2}}\sqrt{1-\frac{c\tan^2\left(\frac{\#1a}{2}\right)}{\sqrt{c^2+4}-2}}\left(\right.}{a\left(c^2-1\right)\sqrt{}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 46

```
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) =
```

$$x + c_1 - \left(\int^{y(x)} -\frac{2}{b\sqrt{-2 + 2\cos(2\_aa) + 4c\cos(\_aa)}\,(c - \sec(\_aa))} d\_a\right) = 0$$

2.361 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 = 0.552504 (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]])*Deriva
```

$$\text{Solve}[\cos(y(x))-\cos(xy(x))+\sin(x)\cos(y(x))+\cos(x)\sin(y(x))+\sin(x)=c_1,y(x)]$$

✓ **Maple** : cpu = 0.181 (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
```

$$-\cos(xy(x))+\sin(x)+\sin(y(x)+x)+\cos(y(x))+c_1=0$$

2.362 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 = 0.245997 (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,y[x],x]
```

$$\text{Solve}[-4\log(y(x)) - \cos(xy(x)) - \log(x) = c_1, y(x)]$$

✓ **Maple** : cpu = 0.147 (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))
```

$$y(x) = \frac{\text{RootOf}\left(-\_Z + e^{-\frac{\cos(\_Z)}{4}} c_1 x^{\frac{3}{4}}\right)}{x}$$

2.363 ODE No. 363

$$(xy'(x) - y(x))\cos^2\left(\frac{y(x)}{x}\right) + x = 0$$

✓ **Mathematica** : cpu = 0.249857 (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 = 0.05 (sec), leaf count = 35

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

$$-\frac{\cos\left(\frac{y(x)}{x}\right)\sin\left(\frac{y(x)}{x}\right)x + y(x)}{2x} - \ln(x) - c_1 = 0$$

2.364 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 = 0.309619 (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])*Derivativ
```

$$\text{Solve}\left[-\log\left(\frac{y(x)}{x}\right)-\log\left(\cos\left(\frac{y(x)}{x}\right)\right)=2\log(x)+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.137 (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)
```

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

2.365 ODE No. 365

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

✓ **Mathematica** : cpu = 0.281267 (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]
```

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

✓ **Maple** : cpu = 0.093 (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))
```

$$y(x)=\frac{x}{\tan\left(\operatorname{RootOf}\left(-2\_Z-\left(\int^{\frac{x^2\left(\tan(\_Z)^2+1\right)}{\tan(\_Z)^2}}\frac{f(\_a)}{\_a}d\_a\right)+2c_1\right)\right)}$$

2.366 ODE No. 366

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

✓ **Mathematica** : cpu = 0.19129 (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]) == 0,y[x],x
```

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

✓ **Maple** : cpu = 0.078 (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))
```

$$-\frac{ay(x)^2 x}{\sqrt{a^2y(x)^2}}-\left(\int^{-\frac{ay(x)^2}{2}-\frac{x^2}{2}}f(-2\_a)\,d\_a\right)+c_1=0$$

2.367 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 = 7.90099 (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][x]) ==
```

, 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*Derivative[1][
```

✗ **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)+y(x)*c) = 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)+y(x)*c) = 0,y(x))
```

2.368 ODE No. 368

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

✓ **Mathematica** : cpu = 0.477703 (sec), leaf count = 581

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

$$\left\{\text{Solve}\left[\text{RootSum}\left[\#1^4 - \#1^3 a + 2\#1^2 b + \#1 ab + b^2\&, \frac{2\#1^3 \log\left(\#1 x - \sqrt{-ay(x) - bx^2} + \sqrt{-ay(x)}\right) - 2\#1}{}\right.\right.\right.$$

✗ **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
```

2.369 ODE No. 369

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

✓ **Mathematica** : cpu = 0.0541631 (sec), leaf count = 107

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

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

✓ **Maple** : cpu = 0.093 (sec), leaf count = 68

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

$$y(x)=a$$

2.370 ODE No. 370

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

✗ **Mathematica** : cpu = 9.62 (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))
```

2.371 ODE No. 371

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

✓ **Mathematica** : cpu = 0.048079 (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 = 0.071 (sec), leaf count = 20

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

$$y(x) = 1$$

2.372 ODE No. 372

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

✓ **Mathematica** : cpu = 0.003235 (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 = 0.036 (sec), leaf count = 227

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

$$y(x) = \frac{\left(27b + 3\sqrt{-3a^3 + 81b^2}\right)^{\frac{2}{3}} + 3a}{6\left(27b + 3\sqrt{-3a^3 + 81b^2}\right)^{\frac{1}{3}}}$$

2.373 ODE No. 373

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

✓ **Mathematica** : cpu = 0.201648 (sec), leaf count = 185

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

$$\left\{\left\{y(x)\to\exp\left(-\frac{1}{2}\sqrt{-e^{2iax-2c_1}-e^{2c_1-2iax}+2}\right)\right\},\left\{y(x)\to\exp\left(\frac{1}{2}\sqrt{-e^{2iax-2c_1}-e^{2c_1-2iax}+2}\right)\right\},\left\{y(x)-\right.\right.$$

✓ **Maple** : cpu = 0.168 (sec), leaf count = 49

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

$$y(x)=\mathrm{e}^{\mathrm{RootOf}\left(a^2\mathrm{e}^{2\_Z}(\_Z^2-1)\right)}$$

2.374 ODE No. 374

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

✓ **Mathematica** : cpu = 0.251937 (sec), leaf count = 99

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

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt{\#1^2+1}+\#1\log\left(\sqrt{\#1^2+1}-\#1\right)+1}{\#1}\&\right][-x+c_1]\right\},\left\{y(x)\to \text{InverseFun}\right.\right.$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 85

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

$$x-\frac{1}{y(x)}-\frac{\left(y(x)^2+1\right)^{\frac{3}{2}}}{y(x)}+y(x)\sqrt{y(x)^2+1}+\operatorname{arcsinh}(y(x))-c_1=0$$

2.375 ODE No. 375

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

✓ **Mathematica** : cpu = 0.0176956 (sec), leaf count = 71

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

$$\left\{\left\{y(x)\to \frac{1}{2}\left(-\frac{\left(a^2-4bx\right)^{3/2}}{6b}-ax\right)+c_1\right\},\left\{y(x)\to \frac{1}{2}\left(\frac{\left(a^2-4bx\right)^{3/2}}{6b}-ax\right)+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 49

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

$$y(x) = -\frac{ax}{2}+\frac{\left(a^2-4bx\right)^{\frac{3}{2}}}{12b}+c_1$$

2.376 ODE No. 376

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

✓ **Mathematica** : cpu = 0.200489 (sec), leaf count = 114

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

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt{a^2-4\#1b}+a\log\left(b\left(a-\sqrt{a^2-4\#1b}\right)\right)}{2b}\&\right]\left[\frac{x}{2}+c_1\right]\right\},\left\{y(x)\to \text{InverseFu}\right.\right.$$

✓ **Maple** : cpu = 0.625 (sec), leaf count = 279

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

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

2.377 ODE No. 377

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

✓ **Mathematica** : cpu = 0.0031439 (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 = 0.018 (sec), leaf count = 24

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

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

2.378 ODE No. 378

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

✓ **Mathematica** : cpu = 0.0032141 (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 = 0.018 (sec), leaf count = 20

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

$$y(x)=-\frac{(x+a)^2}{4}$$

2.379 ODE No. 379

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

✓ **Mathematica** : cpu = 0.0030404 (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 = 0.014 (sec), leaf count = 22

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

$$y(x) = \frac{(1+x)^2}{4}$$

2.380 ODE No. 380

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

✓ **Mathematica** : cpu = 0.15208 (sec), leaf count = 1193

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

$$\left\{\left\{y(x) \to -\frac{x^2}{4} + \frac{1}{4}\sqrt[3]{-x^6 + 20e^{3c_1}x^3 + 8e^{6c_1} + 8\sqrt{-e^{3c_1}x^9 + 3e^{6c_1}x^6 - 3e^{9c_1}x^3 + e^{12c_1}}} - \frac{}{36\sqrt[3]{-x^6 + 20e^{3c_1}x^3}}\right.\right.$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 589

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

$$y(x) = \frac{\left(\frac{x^2}{\left(6c_1 - x^3 + 2\sqrt{-3x^3c_1 + 9c_1^2}\right)^{\frac{1}{3}}} - x + \left(6c_1 - x^3 + 2\sqrt{-3x^3c_1 + 9c_1^2}\right)^{\frac{1}{3}}\right)^2}{4} + x\left(\frac{x^2}{\left(6c_1 - x^3 + 2\sqrt{-3x^3c_1 + 9c_1^2}\right.}\right.$$

2.381 ODE No. 381

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

✓ **Mathematica** : cpu = 0.163325 (sec), leaf count = 1169

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

$$\left\{\left\{y(x) \to \frac{x^2}{4} + \frac{1}{4}\sqrt[3]{x^6 - 20e^{3c_1}x^3 - 8e^{6c_1} + 8\sqrt{-e^{3c_1}x^9 + 3e^{6c_1}x^6 - 3e^{9c_1}x^3 + e^{12c_1}}} - \frac{}{36\sqrt[3]{x^6 - 20e^{3c_1}x^3 - 8e^{6}}}\right.\right.$$

✓ **Maple** : cpu = 0.025 (sec), leaf count = 553

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

$$y(x) = -\frac{\left(\frac{x^2}{\left(-6c_1+x^3+2\sqrt{-3x^3c_1+9c_1^2}\right)^{\frac{1}{3}}} + x + \left(-6c_1 + x^3 + 2\sqrt{-3x^3c_1 + 9c_1^2}\right)^{\frac{1}{3}}\right)^2}{4} + x\left(\frac{x^2}{\left(-6c_1 + x^3 + 2\sqrt{-3x^3c_1\right.}}\right.$$

2.382 ODE No. 382

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

✓ **Mathematica** : cpu = 0.445394 (sec), leaf count = 207

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

$$\left\{\left\{y(x)\to \frac{1}{2}\left(-\frac{4c\arctan\left(\frac{x\sqrt{-a^2-4b}}{\sqrt{x^2(a^2+4b)+4c}-2\sqrt{c}}\right)}{\sqrt{-a^2-4b}}-\frac{1}{2}x\left(\sqrt{x^2\left(a^2+4b\right)+4c}+ax\right)\right)+c_1\right\},\left\{y(x)\to \frac{1}{2}\left(\frac{4c\,\mathrm{arct}}{}\right.\right.$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 146

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

$$y(x) = -\frac{x\sqrt{(a^2+4b)\,x^2+4c}}{4} - \frac{c\ln\left(\sqrt{a^2+4b}\,x + \sqrt{(a^2+4b)\,x^2+4c}\right)}{\sqrt{a^2+4b}} - \frac{a\,x^2}{4} + c_1$$

2.383 ODE No. 383

$$a x y'(x) + b y(x) + c x^2 + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.894982 (sec), leaf count = 1085

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

$$\left\{\text{Solve}\left[2\log(x)+\frac{1}{2}\log(y(x))-\log\left(2by(x)+\sqrt{-by(x)}\sqrt{\left(a^2-4c\right)x^2-4by(x)}\right)+\text{RootSum}\left[a^4-2\#1^2a^2-8\right.\right.\right.$$

✗ **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`

2.384 ODE No. 384

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

✓ **Mathematica** : cpu = 0.0038831 (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]
```

$$\left\{\left\{y(x) \to \frac{bc_1 + c + c_1{}^2}{a} + c_1 x\right\}\right\}$$

✓ **Maple** : cpu = 0.459 (sec), leaf count = 50

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

$$y(x) = \frac{-a^2x^2 - 2abx - b^2 + 4c}{4a}$$

2.385 ODE No. 385

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

✓ **Mathematica** : cpu = 0.443783 (sec), leaf count = 6145

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

$$\left\{\left\{y(x)\to -x^3\left(\frac{1}{2}\sqrt{\frac{2\left(e^{12c_1}x^{12}-8e^{6c_1}x^{18}\right)}{9x^{24}\sqrt[3]{\frac{64\sqrt{e^{12c_1}x^{60}+3e^{18c_1}x^{54}+3e^{24c_1}x^{48}+e^{30c_1}x^{42}}}{x^{36}}-\frac{64e^{6c_1}}{x^6}+\frac{160e^{12c_1}}{x^{12}}+\frac{8e^{18c_1}}{x^{18}}}}+\frac{1}{18}\sqrt[3]{\frac{64\sqrt{e^{12c_1}x}}{}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.523 (sec), leaf count = 161

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

$$y(x) = \frac{x^4 - \mathrm{RootOf}\left(x^{16} - 12\_Z^2x^{12} + 16\_Z^3x^{10} + 30\_Z^4x^8 - 96\_Z^5x^6 + 100\_Z^6x^4 - 48\_Z^7x^2 + 9\_Z^8 - 16c\right.}{2x}$$

2.386 ODE No. 386

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

✓ **Mathematica** : cpu = 0.951929 (sec), leaf count = 62

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

$$\left\{\left\{y(x)\to \frac{1}{8}e^{2c_1}\left(-2\sqrt{a}x^2+e^{2c_1}\right)\right\},\left\{y(x)\to 2e^{2c_1}\left(\sqrt{a}x^2+4e^{2c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.831 (sec), leaf count = 27

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

$$y(x) = -\frac{a\,x^4}{8}$$

2.387 ODE No. 387

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

✓ **Mathematica** : cpu = 0.686167 (sec), leaf count = 138

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

$$\left\{\text{Solve}\left[-\frac{e^{x/2}\sqrt{4y(x)+e^x} - 4y(x)\log\left(\sqrt{4y(x)+e^x} - e^{x/2}\right) + e^x}{2y(x)} = c_1, y(x)\right], \text{Solve}\left[2\log(y(x)) - \frac{-e^{x/2}\sqrt{4y}}{}\right.$$

✓ **Maple** : cpu = 1.439 (sec), leaf count = 118

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

$$2\ln(y(x)) + \frac{\sqrt{e^{2x} + 4y(x)e^x}}{y(x)} + 4\,\mathrm{arctanh}\left(\sqrt{e^{2x} + 4y(x)e^x}\,e^{-x}\right) - \frac{e^x}{y(x)} - c_1 = 0$$

2.388 ODE No. 388

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

✓ **Mathematica** : cpu = 0.69468 (sec), leaf count = 74

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

$$\text{Solve}\left[\left\{x=-\frac{K[1]\log\left(\sqrt{K[1]^2+1}-K[1]\right)}{2\sqrt{K[1]^2+1}}+\frac{c_1K[1]}{\sqrt{K[1]^2+1}},y(x)=\frac{K[1]}{2}-\frac{x}{K[1]}\right\},\{y(x),K[1]\}\right]$$

✓ **Maple** : cpu = 0.473 (sec), leaf count = 223

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

$$\frac{\frac{\left(y(x)-\sqrt{y(x)^2+2x}\right)\operatorname{arcsinh}\left(-y(x)+\sqrt{y(x)^2+2x}\right)}{2}+x\sqrt{2y(x)^2+2x-2y(x)\sqrt{y(x)^2+2x}+1}-2c_1y(x)+2c_1\sqrt{y(x)^2}}{\sqrt{2y(x)^2+2x-2y(x)\sqrt{y(x)^2+2x}+1}}$$

2.389 ODE No. 389

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

✓ **Mathematica** : cpu = 0.0623146 (sec), leaf count = 55

```
DSolve[y[x]*(1 + 4*y[x]) - (1 + 4*y[x])*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],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 = 0.983 (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))
```

$$y(x) = -\frac{1}{4}$$

2.390 ODE No. 390

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

✓ **Mathematica** : cpu = 2.03825 (sec), leaf count = 161

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

$$\text{Solve}\left[\left\{x = \left(\frac{a\log\left(\sqrt{b-aK[1]^2}-\sqrt{-a}K[1]\right)}{(-a)^{3/2}} - \frac{c\sqrt{b-aK[1]^2}}{bK[1]}\right)\exp\left(b\left(\frac{\log(K[1])}{b} - \frac{\log\left(b-aK[1]^2\right)}{2b}\right)\right) -\right.\right.$$

✓ **Maple** : cpu = 0.452 (sec), leaf count = 281

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

$$y(x) = \frac{2\,\mathrm{e}^{\mathrm{RootOf}\left(\sqrt{a}\,c_1 b\,\mathrm{e}^{2\_Z} - \mathrm{e}^{2\_Z}abx - \mathrm{e}^{2\_Z}\_Zb - \mathrm{e}^{2\_Z}ac + \sqrt{a}\,c_1 b^2 + a\,b^2 x - \_Z b^2 + abc\right)}\left(-\frac{\left(\mathrm{e}^{2\,\mathrm{RootOf}\left(\sqrt{a}\,c_1 b\,\mathrm{e}^{2\_Z} - \mathrm{e}^{2\_Z}abx - \mathrm{e}^{2\_Z}\_Zb - \mathrm{e}^{2\ldots}\right.}\right.}{}\right.}{a^{\frac{3}{2}}\left(\mathrm{e}^{2\,\mathrm{RootOf}\left(\sqrt{a}\,c_1 b\,\mathrm{e}^{2\_Z} - \mathrm{e}^{2\_Z}abx - \mathrm{e}^{2\_Z}\_\ldots\right.}\right.}$$

2.391 ODE No. 391

$$y'(x)(ay(x)+bx)+abxy(x)+y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.0116345 (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]
```

$$\left\{\left\{y(x)\to c_1e^{-ax}\right\},\left\{y(x)\to -\frac{bx^2}{2}+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.006 (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))
```

$$y(x)=c_1\mathrm{e}^{-ax}$$

2.392 ODE No. 392

$$y(x)^2 \log(ay(x)) - xy(x)y'(x) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.133769 (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 = 0.383 (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))
```

$$y(x) = \frac{e^{\frac{x^2}{4}}}{a}$$

2.393 ODE No. 393

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

✓ **Mathematica** : cpu = 0.072207 (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 = 1.088 (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))
```

$$y(x) = \frac{c_1\left(1+\tan(x)^2\right)\sqrt{\frac{\tan(x)^2}{1+\tan(x)^2}}}{\left(1+\sqrt{1+\tan(x)^2}\right)\tan(x)}$$

2.394 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 = 0.244038 (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]*Derivative[
```

$$\left\{\left\{y(x)\to e^{-\int_a^x f(K[1])\,dK[1]}\left(\begin{cases}\sin\left(c_1+\int_a^x\sqrt{g(K[1])-f(K[1])^2}\,dK[1]\right) & g(x)>f(x)^2\\ \cosh\left(c_1+\int_a^x\sqrt{f(K[1])^2-g(K[1])}\,dK[1]\right) & g(x)<f(x)^2\\ c_1 & \text{True}\end{cases}\right)\right\}\right\}$$

✓ **Maple** : cpu = 4.301 (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
```

$$y(x)=\tan\left(-\left(\int e^{\int_a^x 2f(\mathrm{xp})d\,\mathrm{xp}}\sqrt{\left(g(x)-f(x)^2\right)e^{\int_a^x -4f(\mathrm{xp})d\,\mathrm{xp}}}dx\right)+c_1\right)\sqrt{\frac{e^{-2(\int_a}}{\tan\left(-\left(\int e^{\int_a^x 2f(\mathrm{xp})d\,\mathrm{xp}}\sqrt{\left(g(x)-\right.}\right.\right.}}$$

2.395 ODE No. 395

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

✗ **Mathematica** : cpu = 26.0508 (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],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 == 0, y[
```

✗ **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))
```

2.396 ODE No. 396

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

✓ **Mathematica** : cpu = 0.0436386 (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]
```

$$\left\{\left\{y(x)\to \frac{1}{x-c_1}\right\},\left\{y(x)\to c_1e^{\frac{x^2}{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.007 (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))
```

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

2.397 ODE No. 397

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

✓ **Mathematica** : cpu = 0.654543 (sec), leaf count = 163

```
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]
```

$$\left\{\text{Solve}\left[-\frac{x\sqrt{x^4y(x)+4}y(x)^{3/2}\log\left(\sqrt{x^4y(x)+4}+x^2\sqrt{y(x)}\right)}{2\sqrt{x^2y(x)^3\left(x^4y(x)+4\right)}}-\frac{1}{4}\log(y(x))=c_1,y(x)\right],\text{Solve}\left[\frac{xy(x)^{3/2}\sqrt{x^4}}{}\right.\right.$$

✓ **Maple** : cpu = 0.776 (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))
```

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

2.398 ODE No. 398

$$y'(x)^2 - 3xy(x)^{2/3}y'(x) + 9y(x)^{5/3} = 0$$

✓ **Mathematica** : cpu = 11.4215 (sec), leaf count = 696

```
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]
```

$$\left\{\text{Solve}\left[\frac{8x^2\log(y(x)) - 6\sqrt{x^4}\log\left(x^2\sqrt{x^2-4\sqrt[3]{y(x)}}\right) - 3\sqrt{x^4}\log\left(4\sqrt[3]{y(x)}-x^2\right) + 6\left(\sqrt{x^4}-x^2\right)\log\left(16x^2\sqrt{\right.}}{}\right.\right.$$

✓ **Maple** : cpu = 1.979 (sec), leaf count = 138

```
dsolve(diff(y(x),x)^2-3*x*y(x)^(2/3)*diff(y(x),x)+9*y(x)^(5/3) = 0,y(x))
```

$$y(x) = \frac{x^6}{64}$$

2.399 ODE No. 399

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

✓ **Mathematica** : cpu = 0.0030474 (sec), leaf count = 20

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

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

✓ **Maple** : cpu = 0.453 (sec), leaf count = 22

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

$$y(x) = -\frac{(x-1)^2}{8}$$

2.400 ODE No. 400

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

✓ **Mathematica** : cpu = 1.23596 (sec), leaf count = 202

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

$$\left\{\text{Solve}\left[\frac{1}{3}\left(1-\frac{\sqrt{x^4-6xy(x)}}{\sqrt{x}\sqrt{x^3-6y(x)}}\right)\log(y(x))+\frac{2\sqrt{x^4-6xy(x)}\log\left(x^{3/2}+\sqrt{x^3-6y(x)}\right)}{3\sqrt{x}\sqrt{x^3-6y(x)}}=c_1,y(x)\right],\text{Solve}\left[\frac{1}{3}\right.\right.$$

✓ **Maple** : cpu = 0.638 (sec), leaf count = 37

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

$$y(x) = \frac{x^3}{6}$$

2.401 ODE No. 401

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

✓ **Mathematica** : cpu = 0.164492 (sec), leaf count = 1211

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

$$\left\{\left\{y(x) \to \frac{x^2}{12} + \frac{1}{12}\sqrt[3]{x^6 - 540e^{3c_1}x^3 - 5832e^{6c_1} + 24\sqrt{3}\sqrt{-e^{3c_1}x^9 + 81e^{6c_1}x^6 - 2187e^{9c_1}x^3 + 19683e^{12c_1}}} - \frac{}{12\sqrt[3]{}}\right.\right.$$

✓ **Maple** : cpu = 0.251 (sec), leaf count = 554

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

$$y(x) = -\frac{\left(\frac{x^2}{\left(-54c_1+x^3+6\sqrt{-3x^3c_1+81c_1^2}\right)^{\frac{1}{3}}} + x + \left(-54c_1 + x^3 + 6\sqrt{-3x^3c_1 + 81c_1^2}\right)^{\frac{1}{3}}\right)^2}{12} + \frac{x\left(\frac{x^2}{\left(-54c_1+x^3+6\sqrt{-3x^3c_1+\cdots}\right.}\right.}{}$$

2.402 ODE No. 402

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

✓ **Mathematica** : cpu = 0.762776 (sec), leaf count = 105

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

$$\left\{\left\{y(x) \to \frac{1}{12}\left(-3x^2 + 2x - 2e^{c_1}x + 1 - 2e^{c_1} + e^{2c_1}\right)\right\}, \left\{y(x) \to \frac{-3x^2 - 3x^2\tanh^2\left(\frac{c_1}{2}\right) + 6x^2\tanh\left(\frac{c_1}{2}\right) + 4x -}{12\left(1 - \tanh\left(\frac{c_1}{2}\right)\right)^2}\right.\right.$$

✓ **Maple** : cpu = 0.605 (sec), leaf count = 51

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

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

2.403 ODE No. 403

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

✓ **Mathematica** : cpu = 0.178401 (sec), leaf count = 118

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

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{\sqrt{4\#1a+b^2}+b\log\left(a\left(b-\sqrt{4\#1a+b^2}\right)\right)}{2a}\&\right]\left[\frac{x}{2a}+c_1\right]\right\},\left\{y(x)\to \text{InverseFun}\right.\right.$$

✓ **Maple** : cpu = 1.103 (sec), leaf count = 247

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

$$y(x) = \frac{e^{-\frac{2b\,\text{LambertW}\left(\frac{2\,e^{-\frac{c_1}{b}}\,e^{-1}\,e^{\frac{x}{b}}}{b\sqrt{\frac{1}{a}}}\right)+b\ln\left(\frac{1}{4a}\right)+2c_1+2b-2x}{2b}}\left(e^{-\frac{2b\,\text{LambertW}\left(\frac{2\,e^{-\frac{c_1}{b}}\,e^{-1}\,e^{\frac{x}{b}}}{b\sqrt{\frac{1}{a}}}\right)+b\ln\left(\frac{1}{4a}\right)+2c_1+2b-2x}{2b}}+2b\right)}{4a}$$

2.404 ODE No. 404

$$ay'(x)^2 + bx^2y'(x) + cxy(x) = 0$$

✓ **Mathematica** : cpu = 1.80238 (sec), leaf count = 308

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

$$\left\{\text{Solve}\left[\frac{-6b\operatorname{arctanh}\left(\frac{bx\sqrt{b^2x^4-4acxy(x)}}{b^2x^3-4acy(x)}\right)+(6b+4c)\operatorname{arctanh}\left(\frac{x^2(3b+2c)}{3\sqrt{b^2x^4-4acxy(x)}}\right)+(3b+2c)\log\left(9ay(x)+3bx^3+c\right.}{6(3b+c)}\right.\right.$$

✓ **Maple** : cpu = 0.416 (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))
```

$$\int_{\_b}^{x}\frac{-b\_a^2+\sqrt{\_a^4b^2-4\_aacy\left(x\right)}}{b\_a^3+6ay\left(x\right)-\sqrt{\_a^4b^2-4\_aacy\left(x\right)}\_a}d\_a+\int^{y(x)}\left(\frac{2a}{-b\,x^3+\sqrt{b^2x^4-4\_facx}\,x-6\_fa}-\left(\int_{\_b}^{x}-\frac{6a\left(\right.}{}\right.\right.$$

2.405 ODE No. 405

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

✓ **Mathematica** : cpu = 0.561314 (sec), leaf count = 79

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

$$\text{Solve}\left[\left\{x = -\frac{2aK[1]\arctan\left(\frac{\sqrt{1-K[1]^2}}{K[1]+1}\right)}{\sqrt{1-K[1]^2}} + \frac{c_1 K[1]}{\sqrt{1-K[1]^2}}, y(x) = \frac{x}{K[1]} - aK[1]\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.653 (sec), leaf count = 378

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

$$\frac{c_1\left(y(x) - \sqrt{4ax + y(x)^2}\right)}{\sqrt{\frac{-y(x)+\sqrt{4ax+y(x)^2}-2a}{a}}\sqrt{\frac{-y(x)+\sqrt{4ax+y(x)^2}+2a}{a}}} + x + \frac{\left(-y(x) + \sqrt{4ax + y(x)^2}\right)\ln\left(\frac{\sqrt{\frac{4ax+2y(x)^2-2y(x)\sqrt{4ax+y(x)^2}-4a^2}{a^2}}}{2a}\right.}{\sqrt{-\frac{2\left(y(x)\sqrt{4ax+y(x)^2}+2a^2-2ax-y(x)^2\right)}{a^2}}}$$

2.406 ODE No. 406

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

✓ **Mathematica** : cpu = 1.33578 (sec), leaf count = 71

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

$$\text{Solve}\left[\left\{x = -\frac{aK[1]\log\left(\sqrt{K[1]^2+1}-K[1]\right)}{\sqrt{K[1]^2+1}} + \frac{c_1 K[1]}{\sqrt{K[1]^2+1}}, y(x) = aK[1] - \frac{x}{K[1]}\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.539 (sec), leaf count = 262

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

$$\frac{-\frac{\sqrt{2}\left(y(x)+\sqrt{4ax+y(x)^2}\right)\operatorname{arcsinh}\left(\frac{y(x)+\sqrt{4ax+y(x)^2}}{2a}\right)}{2} + x\sqrt{\frac{y(x)\sqrt{4ax+y(x)^2}+2a^2+2ax+y(x)^2}{a^2}} + c_1 y(x) + c_1\sqrt{4ax+y(x)^2}}{\sqrt{\frac{y(x)\sqrt{4ax+y(x)^2}+y(x)^2+2a(x+a)}{a^2}}} =$$

2.407 ODE No. 407

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

✓ **Mathematica** : cpu = 0.0215616 (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 = 0.237 (sec), leaf count = 39

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

$$y(x) = 0$$

2.408 ODE No. 408

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

✓ **Mathematica** : cpu = 0.203934 (sec), leaf count = 97

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

$$\left\{\text{Solve}\left[\frac{2}{\sqrt{\frac{2y(x)}{x}-1}-1} - 2\log\left(\sqrt{\frac{2y(x)}{x}-1}-1\right) = \log(x) + c_1, y(x)\right], \text{Solve}\left[\frac{2}{\sqrt{\frac{2y(x)}{x}-1}+1} + 2\log\left(\sqrt{\frac{2y}{x}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.523 (sec), leaf count = 73

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

$$y(x) = \left(\frac{\left(\text{LambertW}\left(\frac{\sqrt{xc_1}}{c_1}\right)+1\right)^2}{2\,\text{LambertW}\left(\frac{\sqrt{xc_1}}{c_1}\right)^2} + \frac{1}{2}\right)x$$

2.409 ODE No. 409

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

✓ **Mathematica** : cpu = 1.3578 (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 = 0.54 (sec), leaf count = 63

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

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

2.410 ODE No. 410

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

✓ **Mathematica** : cpu = 30.4907 (sec), leaf count = 90

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

$$\text{Solve}\left[\left\{x = -\frac{2(2K[1] - y(K[1]))}{K[1]^2}, y(x) = 4\left(\frac{2}{K[1]} + \log(K[1])\right)\exp\left(-4\left(\frac{1}{2}\log(2 - K[1]) - \frac{1}{2}\log(K[1])\right)\right) + c\right.\right.$$

✓ **Maple** : cpu = 0.279 (sec), leaf count = 64

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

$$y(x) = \frac{e^{2\,\mathrm{RootOf}\left(-x\,e^{2\_Z}+4x\,e^{\_Z}-4\,e^{\_Z}+c_1+8\_Z-4x\right)}x}{2} + 2\,e^{\mathrm{RootOf}\left(-x\,e^{2\_Z}+4x\,e^{\_Z}-4\,e^{\_Z}+c_1+8\_Z-4x\right)}$$

2.411 ODE No. 411

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

✓ **Mathematica** : cpu = 0.210211 (sec), leaf count = 97

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

$$\left\{\text{Solve}\left[\frac{1}{\sqrt{\frac{4y(x)}{x}+1}-1} - \log\left(\sqrt{\frac{4y(x)}{x}+1}-1\right) = \frac{\log(x)}{2} + c_1, y(x)\right], \text{Solve}\left[\frac{1}{\sqrt{\frac{4y(x)}{x}+1}+1} + \log\left(\sqrt{\frac{4y(x)}{x}}\right.\right.$$

✓ **Maple** : cpu = 0.476 (sec), leaf count = 65

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

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

2.412 ODE No. 412

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

✓ **Mathematica** : cpu = 0.290513 (sec), leaf count = 6457

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

$$\left\{\left\{y(x) \to -\frac{1}{2}\sqrt{-\frac{16ax}{9} + \frac{\sqrt[3]{-131072a^6x^6 + 2560a^3e^{3c_1}x^3 + e^{6c_1} + \sqrt{-1073741824a^9e^{3c_1}x^9 + 3145728a^6e^{6c_1}x^6}}}{18\ 2^{2/3}ax}}\right.\right.$$

✓ **Maple** : cpu = 0.515 (sec), leaf count = 146

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

$$-\frac{c_1\left(\frac{-y(x)+\sqrt{y(x)^2-4ax}}{x}\right)^{\frac{3}{2}}x^2}{\left(-y\left(x\right)+\sqrt{y\left(x\right)^2-4ax}\right)^2} + x + \frac{4a\,x^2}{3\left(-y\left(x\right)+\sqrt{y\left(x\right)^2-4ax}\right)^2} = 0$$

2.413 ODE No. 413

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

✓ **Mathematica** : cpu = 0.0813099 (sec), leaf count = 673

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

$$\left\{\text{Solve}\left[\int \left(\frac{4\sqrt{4x^3+y(x)^2}x^2}{5y(x)\left(4x^3-15y(x)^2\right)} + \frac{16x^2}{5\left(4x^3-15y(x)^2\right)} - \frac{\sqrt{4x^3+y(x)^2}}{5y(x)x} + \frac{1}{5x}\right)dx + \int \left(\frac{8y(x)}{15y(x)^2-4x^3} - \int\right.\right.\right.$$

✓ **Maple** : cpu = 0.375 (sec), leaf count = 269

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

$$\int_{\_b}^{x} \frac{-y(x) + \sqrt{4\_a^3 + y(x)^2}}{\_a\left(4y(x) - \sqrt{4\_a^3 + y(x)^2}\right)} d\_a + \int^{y(x)} \frac{-2 + \left(48\_f - 12\sqrt{4x^3 + \_f^2}\right)\left(\int_{\_b}^{x} \frac{\_a^2}{\left(-4\_f + \sqrt{4\_a^3 + \_f^2}\right)^2 \sqrt{4\_a^3 + \_}}\right.}{4\_f - \sqrt{4x^3 + \_f^2}}$$

2.414 ODE No. 414

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

✓ **Mathematica** : cpu = 0.0945171 (sec), leaf count = 107

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

$$\left\{\left\{y(x)\to x^2\text{InverseFunction}\left[\int_1^{\#1}\frac{1}{5K[2]+\sqrt{K[2]^2-4}}dK[2]\&\right]\left[\int_1^x-\frac{1}{2K[3]}dK[3]+c_1\right]\right\},\left\{y(x)\to x^2\text{Inve}\right.\right.$$

✓ **Maple** : cpu = 0.594 (sec), leaf count = 269

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

$$\int_{\_b}^{x}\frac{-y(x)+\sqrt{-4\_a^4+y(x)^2}}{\_a\left(5y(x)-\sqrt{-4\_a^4+y(x)^2}\right)}d\_a+\int^{y(x)}\frac{-2+\left(-80\_f+16\sqrt{-4x^4+\_f^2}\right)\left(\int_{\_b}^{x}\frac{\_a^3}{\left(-5\_f+\sqrt{-4\_a^4+\_f^2}\right)^2\sqrt{}}\right.}{5\_f-\sqrt{-4x^4+\_f^2}}$$

2.415 ODE No. 415

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

✓ **Mathematica** : cpu = 0.151355 (sec), leaf count = 49

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

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

✓ **Maple** : cpu = 0.619 (sec), leaf count = 95

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

$$y(x) = -\frac{1}{2\sqrt{-x}}$$

2.416 ODE No. 416

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

✓ **Mathematica** : cpu = 0.310441 (sec), leaf count = 1493

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

$$\left\{\left\{y(x) \to -\frac{6912e^{4c_1} - \frac{4e^{8c_1}}{x^2}}{384\sqrt[3]{373248e^{4c_1}x - \frac{4320e^{8c_1}}{x} + \frac{48\sqrt{6}\sqrt{10077696e^{8c_1}x^6+139968e^{12c_1}x^4+648e^{16c_1}x^2+e^{20c_1}}}{x^2} - \frac{e^{12c_1}}{x^3}}} + \frac{1}{96}\sqrt[3]{373$$

✓ **Maple** : cpu = 0.29 (sec), leaf count = 136

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

$$y(x) = x$$

2.417 ODE No. 417

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

✓ **Mathematica** : cpu = 0.0034945 (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 = 0.487 (sec), leaf count = 35

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

$$y(x) = -2\sqrt{ax}$$

2.418 ODE No. 418

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

✓ **Mathematica** : cpu = 0.93424 (sec), leaf count = 168

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

$$\left\{\text{Solve}\left[\frac{-\sqrt{\frac{y(x)}{x}}\sqrt{\frac{y(x)}{x}-4a}-4a\log\left(\sqrt{\frac{y(x)}{x}-4a}-\sqrt{\frac{y(x)}{x}}\right)+\frac{y(x)}{x}}{4a}=-\frac{\log(x)}{2}+c_1,y(x)\right],\text{Solve}\left[-\frac{\sqrt{\frac{y(x)}{x}}\sqrt{y}\right.\right.$$

✓ **Maple** : cpu = 0.514 (sec), leaf count = 42

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

$$y(x) = 0$$

2.419 ODE No. 419

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

✓ **Mathematica** : cpu = 0.637542 (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 = 0.255 (sec), leaf count = 109

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

$$
x + \frac{\left(-\sqrt{y(x)^2 + x^2} + y(x)\right) c_1}{\left(\frac{2x^2 + 6y(x)^2 - 6y(x)\sqrt{y(x)^2 + x^2}}{x^2}\right)^{\frac{2}{3}} x} = 0
$$

2.420 ODE No. 420

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

✓ **Mathematica** : cpu = 0.15389 (sec), leaf count = 1559

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

$$\left\{\left\{y(x) \to -\frac{1}{4}a^2 e^{-\frac{3c_1}{2}} x^2 + \frac{1}{4} e^{-\frac{3c_1}{2}} \sqrt[3]{-a^6x^6 + 20a^3e^{3c_1}x^3 + 8e^{6c_1} + 8\sqrt{-a^9e^{3c_1}x^9 + 3a^6e^{6c_1}x^6 - 3a^3e^{9c_1}x^3 + e^{12}}}\right.\right.$$

✓ **Maple** : cpu = 0.492 (sec), leaf count = 689

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

$$y(x) = \frac{x\left(\frac{4x^2}{\left(-36ac_1^2+8x^3+12\sqrt{a\left(9ac_1^2-4x^3\right)}\,c_1\right)^{\frac{1}{3}}} + 2x + \left(-36ac_1^2 + 8x^3 + 12\sqrt{a\left(9ac_1^2 - 4x^3\right)}\,c_1\right)^{\frac{1}{3}}\right)}{12c_1} + \frac{}{\frac{4}{\left(-36ac_1^2+8x^3+12\right.}}$$

2.421 ODE No. 421

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

✓ **Mathematica** : cpu = 0.0515107 (sec), leaf count = 53

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

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

✓ **Maple** : cpu = 0.49 (sec), leaf count = 32

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

$$y(x) = -ix$$

2.422 ODE No. 422

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

✓ **Mathematica** : cpu = 0.0722611 (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 = 0.256 (sec), leaf count = 30

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

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

2.423 ODE No. 423

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

✓ **Mathematica** : cpu = 0.0949273 (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]
```

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

✓ **Maple** : cpu = 0.49 (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))
```

$$y(x) = \left(1-\sqrt{2}\right)x$$

2.424 ODE No. 424

$$ay(x)y'(x) + bx + xy'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.744455 (sec), leaf count = 423

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

$$\left\{\text{Solve}\left[-\frac{i\left(2\log\left(-i\sqrt{4b-\frac{a^2y(x)^2}{x^2}}+\frac{ay(x)}{x}+2i\sqrt{b}\right)+2(a+1)\log\left(i\sqrt{4b-\frac{a^2y(x)^2}{x^2}}+\frac{ay(x)}{x}-2i\sqrt{b}\right)-(a+2\right.}{4(a+1)}\right.\right.$$

✓ **Maple** : cpu = 0.759 (sec), leaf count = 193

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

$$\frac{-c_1\left(ay(x)-\sqrt{a^2y\left(x\right)^2-4b\,x^2}\right)\left(\frac{a\left(-y(x)(a+1)\sqrt{a^2y(x)^2-4b\,x^2}+(a^2+a)\,y(x)^2-2b\,x^2\right)}{2x^2}\right)^{\frac{-a-2}{2+2a}}+x^2}{x}=0$$

2.425 ODE No. 425

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

✓ **Mathematica** : cpu = 0.0039268 (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]
```

$$\left\{\left\{y(x)\to c_1x+\frac{c_1{}^2}{-1+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.251 (sec), leaf count = 45

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

$$y(x) = x+2-2\sqrt{1+x}$$

2.426 ODE No. 426

$$(3x+1)y'(x)^2 - 3(y(x)+2)y'(x) + 9 = 0$$

✓ **Mathematica** : cpu = 0.003685 (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 = 0.497 (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))
```

$$y(x) = -2 - 2\sqrt{3x+1}$$

2.427 ODE No. 427

$$(3x+5)y'(x)^2 - (3y(x)+x)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0050588 (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]
```

$$\left\{\left\{y(x)\to c_1x+\frac{5c_1{}^2}{-1+3c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.512 (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))
```

$$y(x)=\frac{x}{3}+\frac{10}{9}-\frac{2\sqrt{15x+25}}{9}$$

2.428 ODE No. 428

$$y'(x)(-ay(x)+bx+c)+axy'(x)^2-by(x)=0$$

✓ **Mathematica** : cpu = 0.0044275 (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[x],x]
```

$$\left\{\left\{y(x)\to \frac{cc_1}{b+ac_1}+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.267 (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))
```

$$y(x)=\frac{-bx+c-2\sqrt{-bcx}}{a}$$

2.429 ODE No. 429

$$-y'(x)(ay(x)-a+bx-b)+axy'(x)^2+by(x)=0$$

✓ **Mathematica** : cpu = 0.0043934 (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,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{ac_1+bc_1}{-b+ac_1}+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.495 (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))
```

$$y(x)=\frac{bx+a+b-2\sqrt{bx\,(a+b)}}{a}$$

2.430 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 = 218.475 (sec), leaf count = 507

```
DSolve[c0 + a0*x + b0*y[x] + (c1 + a1*x + b1*y[x])*Derivative[1][y][x] + (c2 + a2*x)*Derivative[1][y]
```

$$\text{Solve}\left[\left\{x = (\mathrm{b1}K[1] + \mathrm{b0})\exp\left(\frac{(\mathrm{b1}(\mathrm{b0}-\mathrm{a1}) + 2\mathrm{a2}\mathrm{b0})\arctan\left(\frac{2(\mathrm{a2}+\mathrm{b1})K[1]+\mathrm{a1}+\mathrm{b0}}{\sqrt{4\mathrm{a0}(\mathrm{a2}+\mathrm{b1})-\mathrm{a1}^2-2\mathrm{a1}\mathrm{b0}-\mathrm{b0}^2}}\right)}{(\mathrm{a2}+\mathrm{b1})\sqrt{4\mathrm{a0}(\mathrm{a2}+\mathrm{b1})-\mathrm{a1}^2-2\mathrm{a1}\mathrm{b0}-\mathrm{b0}^2}} - \frac{(2\mathrm{a2}+\mathrm{b1})\log(\ldots}{\ldots}\right.\right.\right.$$

✓ **Maple** : cpu = 2.454 (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))
```

Expression too large to display

2.431 ODE No. 431

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

✓ **Mathematica** : cpu = 0.0412945 (sec), leaf count = 81

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

$$\left\{\left\{y(x)\to -\sqrt{1+\tan^2(-\log(x)+c_1)}\right\},\left\{y(x)\to \sqrt{1+\tan^2(-\log(x)+c_1)}\right\},\left\{y(x)\to -\sqrt{1+\tan^2(\log(x)+\right.\right.$$

✓ **Maple** : cpu = 0.128 (sec), leaf count = 62

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

$$y(x) = -1$$

2.432 ODE No. 432

$$\left(a+xy'(x)\right)^2-2ay(x)+x^2=0$$

✓ **Mathematica** : cpu = 0.899446 (sec), leaf count = 82

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

$$\text{Solve}\left[\left\{y(x)=\frac{2axK[1]+x^2K[1]^2+a^2+x^2}{2a},x=\frac{a\log\left(\sqrt{K[1]^2+1}-K[1]\right)}{\sqrt{K[1]^2+1}}+\frac{c_1}{\sqrt{K[1]^2+1}}\right\},\{y(x),K[1]\}\right]$$

✓ **Maple** : cpu = 8.938 (sec), leaf count = 78

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

$$y(x)-\text{RootOf}\left(-a\ \text{arcsinh}\left(\frac{\text{RootOf}\left(-2ay(x)+a^2+x^2+2\_Za+\_Z^2\right)}{x}\right)-x\sqrt{\frac{a\left(-2\,\text{RootOf}\left(-2ay\left(x\right)+a^2\right.\right.}{}}\right.$$

2.433 ODE No. 433

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

✓ **Mathematica** : cpu = 0.632444 (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 = 0.381 (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))
```

$$y(x) = \frac{-x^2 - a}{x}$$

2.434 ODE No. 434

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

✓ **Mathematica** : cpu = 0.0519371 (sec), leaf count = 53

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

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

✓ **Maple** : cpu = 0.004 (sec), leaf count = 7

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

$$y(x) = x + c_1$$

2.435 ODE No. 435

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

✓ **Mathematica** : cpu = 0.0526614 (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[x],x]
```

$$\left\{\left\{y(x)\to\frac{1}{4}\left(4x+c_1{}^2x-4ic_1\sqrt{x}-4\right)\right\},\left\{y(x)\to\frac{1}{4}\left(4x+c_1{}^2x+4ic_1\sqrt{x}-4\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.211 (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))
```

$$y(x) = x$$

2.436 ODE No. 436

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

✓ **Mathematica** : cpu = 0.0814495 (sec), leaf count = 62

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

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

✓ **Maple** : cpu = 0.74 (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))
```

$$y(x) = -ix$$

2.437 ODE No. 437

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

✓ **Mathematica** : cpu = 0.183416 (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]
```

$$\left\{\left\{y(x)\to\frac{x-2\sqrt{a}c_1}{4c_1{}^2}\right\},\left\{y(x)\to\frac{x+2\sqrt{a}c_1}{4c_1{}^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.031 (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))
```

$$y(x)=-\frac{a}{4x}$$

2.438 ODE No. 438

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

✓ **Mathematica** : cpu = 0.0185317 (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 = 0.008 (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))
```

$$y(x) = \frac{c_1}{x}$$

2.439 ODE No. 439

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

✓ **Mathematica** : cpu = 0.033763 (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 = 0.036 (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))
```

$$y(x) = \frac{c_1 x^{-\frac{i\sqrt{3}}{2}}}{x^{\frac{3}{2}}}$$

2.440 ODE No. 440

$$x^2y'(x)^2 + 4xy(x)y'(x) - 5y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0181618 (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]
```

$$\left\{\left\{y(x)\to \frac{c_1}{x^5}\right\},\{y(x)\to c_1x\}\right\}$$

✓ **Maple** : cpu = 0.009 (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))
```

$$y(x) = xc_1$$

2.441 ODE No. 441

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

✓ **Mathematica** : cpu = 0.0811406 (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 == 0,y[x],x
```

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

✓ **Maple** : cpu = 0.922 (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))
```

$$y(x) = -2$$

2.442 ODE No. 442

$$x^2y'(x)^2 + (1-x)\left(y(x)^2 - x^2y(x)\right) + \left(x^3 + x^2y(x) - 2xy(x)\right)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0213269 (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*Derivat
```

$$\left\{\left\{y(x) \to c_1e^{-x}x\right\}, \left\{y(x) \to -x^2 + c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.013 (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
```

$$y(x) = (-x + c_1)\,x$$

2.443 ODE No. 443

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

✓ **Mathematica** : cpu = 0.264066 (sec), leaf count = 3049

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

$$\left\{\left\{y(x)\to -\frac{1}{2}\sqrt{\frac{16}{9}e^{-6c_1}x^2+\frac{2\sqrt[3]{512e^{-18c_1}x^{12}+160e^{-12c_1}x^6-e^{-6c_1}+e^{-36c_1}\sqrt{262144e^{42c_1}x^{18}+12288e^{48c_1}x^{1}}}}{9x^2}}\right.\right.$$

✓ **Maple** : cpu = 1.402 (sec), leaf count = 192

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

$$y(x)=\frac{\left(\mathrm{RootOf}\left(-729x^{12}c_1+\_Z^8-12\_Z^7+60\_Z^6-160\_Z^5+240\_Z^4-192\_Z^3+64\_Z^2\right)-2\right)\left(\mathrm{RootOf}\left(\right.\right.}{9x^2}$$

2.444 ODE No. 444

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

✓ **Mathematica** : cpu = 0.19891 (sec), leaf count = 52

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

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

✓ **Maple** : cpu = 0.775 (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))
```

$$y(x) = 4x$$

2.445 ODE No. 445

$$y'(x)\left(ax^2y(x)^3+b\right)+aby(x)^3+x^2y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.0449204 (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[x],x]
```

$$\left\{\left\{y(x)\to-\frac{1}{\sqrt{2ax-2c_1}}\right\},\left\{y(x)\to\frac{1}{\sqrt{2ax-2c_1}}\right\},\left\{y(x)\to\frac{b}{x}+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.009 (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))
```

$$y(x)=\frac{1}{\sqrt{2ax+c_1}}$$

2.446 ODE No. 446

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

✓ **Mathematica** : cpu = 0.027073 (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],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 = 0.033 (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))
```

$$y(x)=\sqrt{x^2+1}$$

2.447 ODE No. 447

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

✓ **Mathematica** : cpu = 0.0046514 (sec), leaf count = 89

```
DSolve[-1 + (-1 + x^2)*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{2}\log\left(1-\frac{x}{\sqrt{x^2-1}}\right)-\frac{1}{2}\log\left(\frac{x}{\sqrt{x^2-1}}+1\right)+c_1\right\},\left\{y(x)\to -\frac{1}{2}\log\left(1-\frac{x}{\sqrt{x^2-1}}\right)+\frac{1}{2}\log\left(\frac{x}{\sqrt{x^2-1}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.023 (sec), leaf count = 33

```
dsolve((x^2-1)*diff(y(x),x)^2-1 = 0,y(x))
```

$$y(x)=\ln\left(x+\sqrt{x^2-1}\right)+c_1$$

2.448 ODE No. 448

$$\left(x^2-1\right) y'(x)^2-y(x)^2+1=0$$

✓ **Mathematica** : cpu = 0.06461 (sec), leaf count = 349

```
DSolve[1 - y[x]^2 + (-1 + x^2)*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{1}{2}e^{-c_1}\sqrt{2x^2+2e^{4c_1}x^2-2\sqrt{(x-1)(x+1)}x+2e^{4c_1}\sqrt{(x-1)(x+1)}x-1+2e^{2c_1}-e^{4c_1}}\right\},\left\{y(x)\right.\right.$$

✓ **Maple** : cpu = 10.39 (sec), leaf count = 166

```
dsolve((x^2-1)*diff(y(x),x)^2-y(x)^2+1 = 0,y(x))
```

$$y(x)=-1$$

2.449 ODE No. 449

$$\left(x^2-a^2\right)y'(x)^2+2xy(x)y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.021257 (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 = 0.01 (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))
```

$$y(x)=\frac{c_1}{a-x}$$

2.450 ODE No. 450

$$\left(x^2-a^2\right)y'(x)^2-x^2-2xy(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.20681 (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 = 0.544 (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))
```

$$y(x)=\sqrt{a^2-x^2}$$

2.451 ODE No. 451

$$\left(a+x^2\right)y'(x)^2+b-2xy(x)y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.0356197 (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],x]
```

$$\left\{\left\{y(x)\to c_1x-\sqrt{-b-ac_1{}^2}\right\},\left\{y(x)\to \sqrt{-b-ac_1{}^2}+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.047 (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))
```

$$y(x)=\frac{\sqrt{-ab\left(x^2+a\right)}}{a}$$

2.452 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 = 0.0122318 (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)*Derivative[1][y
```

$$\left\{\left\{y(x)\to\frac{-c_1x+1+c_1{}^2}{x+c_1}\right\}\right\}$$

✗ **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))

2.453 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 = 0.497861 (sec), leaf count = 223

```
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 == 0,y[
```

$$\left\{\text{Solve}\left[\frac{2i\arctan\left(\frac{y(x)}{x\sqrt{a^2-\frac{y(x)^2}{x^2}-1}}\right)-2ia\arctan\left(\frac{ay(x)}{x\sqrt{a^2-\frac{y(x)^2}{x^2}-1}}\right)+a\log\left(\frac{y(x)^2}{x^2}+1\right)}{2a^2-2}=\frac{a\log\left(x-a^2x\right)}{1-a^2}+c_1,y(\right.\right.$$

✓ **Maple** : cpu = 0.693 (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))
```

$$\frac{-2c_1a+2a\ln(x)+\ln\left(\frac{y(x)^2+x^2}{x^2}\right)a-2\sqrt{-a^2}\arctan\left(\frac{a^2y(x)}{\sqrt{-a^2}\sqrt{\frac{y(x)^2+\left(-a^2+1\right)x^2}{x^2}}\,x}\right)+2\ln\left(\frac{\sqrt{\frac{-a^2x^2+x^2+y(x)^2}{x^2}}\,x+y(x)}{x}\right)}{2a}$$

2.454 ODE No. 454

$$a x^2 y'(x)^2 - (a-1) a x^2 - 2 a x y(x) y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.254565 (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]^2 == 0
```

$$\left\{\left\{y(x)\to -\frac{1}{2}\sqrt{a}e^{-c_1}x^{1-\sqrt{\frac{a-1}{a}}}\left(-x^{2\sqrt{\frac{a-1}{a}}}+e^{2c_1}\right)\right\},\left\{y(x)\to \frac{1}{2}\sqrt{a}e^{-c_1}x^{1-\sqrt{\frac{a-1}{a}}}\left(-x^{2\sqrt{\frac{a-1}{a}}}+e^{2c_1}\right)\right\},\left\{y(x)\right.\right.$$

✓ **Maple** : cpu = 0.105 (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))
```

$$y(x) = \sqrt{-a}\,x$$

2.455 ODE No. 455

$$a+x^3y'(x)^2+x^2y(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.402527 (sec), leaf count = 57

```
DSolve[a + x^2*y[x]*Derivative[1][y][x] + x^3*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{e^{-\frac{c_1}{2}}\left(x+4ae^{c_1}\right)}{2x}\right\},\left\{y(x)\to \frac{e^{-\frac{c_1}{2}}\left(x+4ae^{c_1}\right)}{2x}\right\}\right\}$$

✓ **Maple** : cpu = 0.294 (sec), leaf count = 66

```
dsolve(x^3*diff(y(x),x)^2+x^2*y(x)*diff(y(x),x)+a = 0,y(x))
```

$$y(x)=-\frac{2\sqrt{ax}}{x}$$

2.456 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 = 0.204008 (sec), leaf count = 145

```
DSolve[-x + x*y[x]^2 + 2*(1 - x^2)*y[x]*Derivative[1][y][x] + x*(-1 + x^2)*Derivative[1][y][x]^2 ==
```

$$\left\{\left\{y(x)\to\frac{x\left(1+\tanh^2\left(\frac{1}{2}\left(c_1-2i\arctan\left(\frac{\sqrt{x-1}}{\sqrt{x+1}}\right)\right)\right)\right)}{-1+\tanh^2\left(\frac{1}{2}\left(c_1-2i\arctan\left(\frac{\sqrt{x-1}}{\sqrt{x+1}}\right)\right)\right)}\right\},\left\{y(x)\to\frac{x\left(1+\tanh^2\left(\frac{1}{2}\left(2i\arctan\left(\frac{\sqrt{x-1}}{\sqrt{x+1}}\right)+c_1\right)\right)\right.}{-1+\tanh^2\left(\frac{1}{2}\left(2i\arctan\left(\frac{\sqrt{x-1}}{\sqrt{x+1}}\right)+c_1\right)\right)}\right.$$

✓ **Maple** : cpu = 0.402 (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))
```

$$y(x)=x$$

2.457 ODE No. 457

$$x^4y'(x)^2 - xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.24131 (sec), leaf count = 118

```
DSolve[-y[x] - x*Derivative[1][y][x] + x^4*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[-\frac{x\sqrt{4x^2y(x)+1}\text{arctanh}\left(\sqrt{4x^2y(x)+1}\right)}{\sqrt{4x^4y(x)+x^2}} - \frac{1}{2}\log(y(x)) = c_1, y(x)\right], \text{Solve}\left[\frac{x\sqrt{4x^2y(x)+1}\text{arctanh}\left(\sqrt{\right.}{\sqrt{4x^4y(x)+}}\right.$$

✓ **Maple** : cpu = 0.624 (sec), leaf count = 45

```
dsolve(x^4*diff(y(x),x)^2-x*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = -\frac{1}{4x^2}$$

2.458 ODE No. 458

$$x^2(x^2-a^2)\,y'(x)^2-1=0$$

✓ **Mathematica** : cpu = 0.0281195 (sec), leaf count = 120

```
DSolve[-1 + x^2*(-a^2 + x^2)*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{x\sqrt{x^2-a^2}\arctan\left(\frac{\sqrt{x^2-a^2}}{a}\right)}{a\sqrt{x^4-a^2x^2}}+c_1\right\},\left\{y(x)\to \frac{x\sqrt{x^2-a^2}\arctan\left(\frac{\sqrt{x^2-a^2}}{a}\right)}{a\sqrt{x^4-a^2x^2}}+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 90

```
dsolve(x^2*(-a^2+x^2)*diff(y(x),x)^2-1 = 0,y(x))
```

$$y(x)=-\frac{\ln\left(\frac{-2a^2+2\sqrt{-a^2}\,\sqrt{-a^2+x^2}}{x}\right)}{\sqrt{-a^2}}+c_1$$

2.459 ODE No. 459

$$-\left(y'(x)-1\right)^2+e^{-2x}y'(x)^2+e^{-2y(x)}=0$$

✓ **Mathematica** : cpu = 12.1587 (sec), leaf count = 545

```
DSolve[E^(-2*y[x]) - (-1 + Derivative[1][y][x])^2 + Derivative[1][y][x]^2/E^(2*x) == 0,y[x],x]
```

$$\left\{\text{Solve}\left[-\frac{\left(e^{2\text{arctanh}(1-2e^x)+x}+e^x-1\right)\sqrt{e^{2y(x)}+e^{2x}-1}e^{y(x)-2\text{arctanh}(1-2e^x)}\log\left(\sqrt{e^{2y(x)}+e^{2x}-1}+e^{y(x)}\right)}{\sqrt{e^{2(y(x)+x)}\left(e^{2y(x)}+e^{2x}-1\right)}}-y\right.\right.$$

✓ **Maple** : cpu = 0.493 (sec), leaf count = 113

```
dsolve(exp(-2*x)*diff(y(x),x)^2-(diff(y(x),x)-1)^2+exp(-2*y(x)) = 0,y(x))
```

$$y(x)=c_1-\ln\left(\frac{e^{-2x}e^{2c_1}-\sqrt{\left(e^{4c_1}-e^{2c_1}\right)e^{-2x}}}{-e^{-2x}e^{2c_1}+e^{2c_1}-1}\right)$$

2.460 ODE No. 460

$$\cos^4(x)\left(y'(x)^2+y(x)^2\right)-a^2=0$$

✗ **Mathematica** : cpu = 37.982 (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))`

2.461 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 = 300.064 (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[1][y][x
```

, 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)+2*e0
```

2.462 ODE No. 462

$$y(x)y'(x)^2 - 1 = 0$$

✓ **Mathematica** : cpu = 0.0207577 (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 = 0.021 (sec), leaf count = 27

```
dsolve(y(x)*diff(y(x),x)^2-1 = 0,y(x))
```

$$x - \frac{2y(x)^{\frac{3}{2}}}{3} - c_1 = 0$$

2.463 ODE No. 463

$$y(x)y'(x)^2 - e^{2x} = 0$$

✓ **Mathematica** : cpu = 0.0329347 (sec), leaf count = 47

```
DSolve[-E^(2*x) + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to\left(\frac{3}{2}\right)^{2/3}(-e^x+c_1)^{2/3}\right\},\left\{y(x)\to\left(\frac{3}{2}\right)^{2/3}(e^x+c_1)^{2/3}\right\}\right\}$$

✓ **Maple** : cpu = 0.067 (sec), leaf count = 50

```
dsolve(y(x)*diff(y(x),x)^2-exp(2*x) = 0,y(x))
```

$$-\frac{\sqrt{e^{2x}y(x)}}{\sqrt{y(x)}}+\frac{2y(x)^{\frac{3}{2}}}{3}+c_1=0$$

2.464 ODE No. 464

$$y(x)y'(x)^2 + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0571366 (sec), leaf count = 103

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -e^{\frac{c_1}{2}}\sqrt{-2x+e^{c_1}}\right\},\left\{y(x)\to e^{\frac{c_1}{2}}\sqrt{-2x+e^{c_1}}\right\},\left\{y(x)\to -e^{\frac{c_1}{2}}\sqrt{2x+e^{c_1}}\right\},\left\{y(x)\to e^{\frac{c_1}{2}}\sqrt{2x+e^{c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.489 (sec), leaf count = 70

```
dsolve(y(x)*diff(y(x),x)^2+2*x*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = -ix$$

2.465 ODE No. 465

$$y(x)y'(x)^2 + 2xy'(x) - 9y(x) = 0$$

✓ **Mathematica** : cpu = 0.0370774 (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]
```

$$\left\{\text{Solve}\left[\int \frac{y(x)}{x\left(\frac{y(x)^2}{x^2} - \sqrt{\frac{9y(x)^2}{x^2}+1}+1\right)}d\frac{y(x)}{x} = -\log(x)+c_1, y(x)\right], \text{Solve}\left[\int \frac{y(x)}{x\left(\frac{y(x)^2}{x^2} + \sqrt{\frac{9y(x)^2}{x^2}+1}+1\right)}d\right.\right.$$

✓ **Maple** : cpu = 0.074 (sec), leaf count = 210

```
dsolve(y(x)*diff(y(x),x)^2+2*x*diff(y(x),x)-9*y(x) = 0,y(x))
```

$$\frac{c_1 x\left(x+\sqrt{x^2+9y(x)^2}\right)\left(\frac{-x-\sqrt{x^2+9y(x)^2}}{y(x)}\right)^{\frac{2}{7}}}{\left(x\sqrt{x^2+9y(x)^2}+x^2+y(x)^2\right)\left(\frac{x\sqrt{x^2+9y(x)^2}+x^2+y(x)^2}{y(x)^2}\right)^{\frac{1}{7}}} + x = 0$$

2.466 ODE No. 466

$$y(x)y'(x)^2 - 2xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.342227 (sec), leaf count = 157

```
DSolve[y[x] - 2*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{1}{4}\left(\cosh\left(\frac{c_1}{2}\right)+\sinh\left(\frac{c_1}{2}\right)\right)\sqrt{-8ix+\cosh(c_1)+\sinh(c_1)}\right\},\left\{y(x)\to \frac{1}{4}\left(\cosh\left(\frac{c_1}{2}\right)+\sinh\left(\frac{c_1}{2}\right)\right)\sqrt{}\right.\right.$$

✓ **Maple** : cpu = 0.411 (sec), leaf count = 71

```
dsolve(y(x)*diff(y(x),x)^2-2*x*diff(y(x),x)+y(x) = 0,y(x))
```

$$y(x) = x$$

2.467 ODE No. 467

$$y(x)y'(x)^2 - 4xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.15902 (sec), leaf count = 226

```
DSolve[y[x] - 4*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to\sqrt{x^2+\frac{2^{2/3}{c_1}^3x}{\sqrt[3]{32x^6-40{c_1}^3x^3+\sqrt{-4096{c_1}^3x^9+768{c_1}^6x^6-48{c_1}^9x^3+{c_1}^{12}}-{c_1}^6}}+\frac{\sqrt[3]{32x^6-40{c_1}^3x^3+}}{}}\right.\right.$$

✓ **Maple** : cpu = 0.072 (sec), leaf count = 148

```
dsolve(y(x)*diff(y(x),x)^2-4*x*diff(y(x),x)+y(x) = 0,y(x))
```

$$-\frac{c_1x}{y(x)\left(\frac{x\sqrt{4x^2-y(x)^2}+2x^2-y(x)^2}{y(x)^2}\right)^{\frac{1}{3}}\left(\frac{2x+\sqrt{4x^2-y(x)^2}}{y(x)}\right)^{\frac{1}{3}}}+x=0$$

2.468 ODE No. 468

$$-4a^2xy'(x) + a^2y(x) + y(x)y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 2.58955 (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]
```

$$\left\{\text{Solve}\left[\frac{8\left(4a^2-\frac{y(x)^2}{x^2}\right)^{3/2}\operatorname{arcsinh}\left(\frac{\sqrt{\frac{y(x)}{x}-2a}}{2\sqrt{a}}\right)+\sqrt{a}\sqrt{\frac{y(x)}{ax}+2}\left(\sqrt{-\left(\frac{y(x)}{x}-2a\right)^2}\sqrt{2a+\frac{y(x)}{x}}\sqrt{4a^2-\frac{y(x)^2}{x^2}}\left(\log\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.087 (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))
```

$$-\frac{c_1 x}{y\left(x\right)a\left(\frac{a^2\left(2a^2x^2+\sqrt{4a^2x^2-y\left(x\right)^2}\,ax-y\left(x\right)^2\right)}{y\left(x\right)^2}\right)^{\frac{1}{3}}\left(\frac{\left(2ax+\sqrt{4a^2x^2-y\left(x\right)^2}\right)a}{y\left(x\right)}\right)^{\frac{1}{3}}}+x=0$$

2.469 ODE No. 469

$$a x y'(x) + b y(x) + y(x) y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.223276 (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]
```

$$\left\{\text{Solve}\left[\frac{a\log\left(\sqrt{a^2-\frac{4by(x)^2}{x^2}}+a\right)+(a+2b)\log\left(\sqrt{a^2-\frac{4by(x)^2}{x^2}}-a-2b\right)}{4(a+b)}=-\frac{\log(x)}{2}+c_1,y(x)\right],\text{Solve}\left[\frac{a\,\text{lo}}{}\right.\right.$$

✓ **Maple** : cpu = 0.25 (sec), leaf count = 264

```
dsolve(y(x)*diff(y(x),x)^2+a*x*diff(y(x),x)+b*y(x) = 0,y(x))
```

$$\frac{x\left(c_1\left(-\frac{ax+\sqrt{a^2x^2-4by(x)^2}}{2y(x)}\right)^{-\frac{a}{a+b}}\left(ax+\sqrt{a^2x^2-4by\left(x\right)^2}\right)\left(\frac{a\left(a\,x^2+\sqrt{a^2x^2-4by(x)^2}\,x+2y(x)^2\right)}{2y(x)^2}\right)^{\frac{-a-2b}{2a+2b}}+y(x)^2\right)}{y\left(x\right)^2}=$$

2.470 ODE No. 470

$$x^3y'(x) - x^2y(x) + y(x)y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.595484 (sec), leaf count = 218

```
DSolve[-(x^2*y[x]) + x^3*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\frac{\sqrt{x^6+4x^2y(x)^2}\log\left(\sqrt{x^4+4y(x)^2}+x^2\right)}{2x\sqrt{x^4+4y(x)^2}}+\frac{1}{2}\left(1-\frac{\sqrt{x^6+4x^2y(x)^2}}{x\sqrt{x^4+4y(x)^2}}\right)\log(y(x))=c_1,y(x)\right],\text{Solve}\left[\frac{1}{2}\right.\right.$$

✓ **Maple** : cpu = 0.344 (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))
```

$$y(x) = -\frac{ix^2}{2}$$

2.471 ODE No. 471

$$y(x)y'(x)^2 - (y(x) - x)y'(x) - x = 0$$

✓ **Mathematica** : cpu = 0.0118491 (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 = 0.012 (sec), leaf count = 33

```
dsolve(y(x)*diff(y(x),x)^2-(y(x)-x)*diff(y(x),x)-x = 0,y(x))
```

$$y(x) = \sqrt{-x^2 + c_1}$$

2.472 ODE No. 472

$$(y(x)+x)y'(x)^2+2xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.315538 (sec), leaf count = 127

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + (x + y[x])*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to\frac{1}{3}\left(-2\sqrt{e^{2c_1}-3e^{c_1}x}-e^{c_1}\right)\right\},\left\{y(x)\to\frac{1}{3}\left(2\sqrt{e^{2c_1}-3e^{c_1}x}-e^{c_1}\right)\right\},\left\{y(x)\to e^{c_1}-2\sqrt{e^{c_1}x+e^{2c_1}}\right\}\right.$$

✓ **Maple** : cpu = 0.404 (sec), leaf count = 121

```
dsolve((y(x)+x)*diff(y(x),x)^2+2*x*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x)=-\frac{\left(1+i\sqrt{3}\right)x}{2}$$

2.473 ODE No. 473

$$(y(x) - 2x)y'(x)^2 - 2(x-1)y'(x) + y(x) - 2 = 0$$

✓ **Mathematica** : cpu = 0.283215 (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,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{2}\left(-\sqrt{-4e^{c_1}x + 4e^{c_1} - e^{2c_1}} + 4 - e^{c_1}\right)\right\}, \left\{y(x) \to \frac{1}{2}\left(\sqrt{-4e^{c_1}x + 4e^{c_1} - e^{2c_1}} + 4 - e^{c_1}\right)\right\}, \left\{y(x) \to\right.\right.$$

✓ **Maple** : cpu = 0.836 (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))
```

$$y(x) = -\sqrt{2}\,x + \sqrt{2} + x + 1$$

2.474 ODE No. 474

$$2y(x)y'(x)^2 - (4x-5)y'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.161102 (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]
```

$$\left\{\left\{y(x)\to -i\sqrt{2}e^{\frac{c_1}{2}}\sqrt{4x-5+8e^{c_1}}\right\},\left\{y(x)\to i\sqrt{2}e^{\frac{c_1}{2}}\sqrt{4x-5+8e^{c_1}}\right\},\left\{y(x)\to -\frac{1}{4}ie^{\frac{c_1}{2}}\sqrt{8x-10+e^{c_1}}\right\},\left\{y\right.\right.$$

✓ **Maple** : cpu = 0.851 (sec), leaf count = 115

```
dsolve(2*y(x)*diff(y(x),x)^2-(4*x-5)*diff(y(x),x)+2*y(x) = 0,y(x))
```

$$y(x) = -x + \frac{5}{4}$$

2.475 ODE No. 475

$$4y(x)y'(x)^2 + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0654629 (sec), leaf count = 113

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + 4*y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{1}{2}e^{2c_1}\sqrt{-2x+e^{4c_1}}\right\},\left\{y(x)\to \frac{1}{2}e^{2c_1}\sqrt{-2x+e^{4c_1}}\right\},\left\{y(x)\to -\frac{1}{2}e^{2c_1}\sqrt{2x+e^{4c_1}}\right\},\left\{y(x)\to \frac{1}{2}e^{2c}\right.$$

✓ **Maple** : cpu = 0.506 (sec), leaf count = 67

```
dsolve(4*y(x)*diff(y(x),x)^2+2*x*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = -\frac{ix}{2}$$

2.476 ODE No. 476

$$4x^3y'(x) - 4x^2y(x) + 9y(x)y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.58932 (sec), leaf count = 218

```
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]
```

$$\left\{\text{Solve}\left[\frac{\sqrt{x^6+9x^2y(x)^2}\log\left(\sqrt{x^4+9y(x)^2}+x^2\right)}{2x\sqrt{x^4+9y(x)^2}}+\frac{1}{2}\left(1-\frac{\sqrt{x^6+9x^2y(x)^2}}{x\sqrt{x^4+9y(x)^2}}\right)\log(y(x))=c_1,y(x)\right],\text{Solve}\left[\frac{1}{2}\right.\right.$$

✓ **Maple** : cpu = 0.341 (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))
```

$$y(x) = -\frac{ix^2}{3}$$

2.477 ODE No. 477

$$ay(x)y'(x)^2 + (2x - b)y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.203136 (sec), leaf count = 142

```
DSolve[-y[x] + (-b + 2*x)*Derivative[1][y][x] + a*y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\sqrt{2}e^{\frac{c_1}{2}}\sqrt{2ae^{c_1}+b-2x}\right\},\left\{y(x)\to \sqrt{2}e^{\frac{c_1}{2}}\sqrt{2ae^{c_1}+b-2x}\right\},\left\{y(x)\to -\frac{e^{\frac{c_1}{2}}\sqrt{-2b+4x+e^{c_1}}}{2\sqrt{a}}\right\},\left\{\right.$$

✓ **Maple** : cpu = 0.372 (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))
```

$$y(x) = -\frac{-2x+b}{2\sqrt{-a}}$$

2.478 ODE No. 478

$$\left(y'(x)^2+1\right)(ay(x)+b)-c=0$$

✓ **Mathematica** : cpu = 0.136178 (sec), leaf count = 141

```
DSolve[-c + (b + a*y[x])*(1 + Derivative[1][y][x]^2) == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{c\arctan\left(\frac{\sqrt{\#1a+b}}{\sqrt{-\#1a-b+c}}\right)-\sqrt{\#1a+b}\sqrt{-\#1a-b+c}}{a}\&\right][-x+c_1]\right\},\left\{y(x)\to \text{Inve}\right.\right.$$

✓ **Maple** : cpu = 0.297 (sec), leaf count = 211

```
dsolve((a*y(x)+b)*(diff(y(x),x)^2+1)-c = 0,y(x))
```

$$y(x)=\frac{-b+c}{a}$$

2.479 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 = 4.82565 (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])*Deriva
```

$$\mathrm{Solve}\left[\left\{x = -\frac{-(K[2](\mathrm{b2}K[2] + \mathrm{b1}) + \mathrm{b0})\exp\left(\mathrm{RootSum}\left[\#1^3\mathrm{b2} + \#1^2\mathrm{a2} + \#1^2\mathrm{b1} + \#1\mathrm{a1} + \#1\mathrm{b0} + \mathrm{a0}\&, \frac{\#1}{}\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.265 (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
```

$$x - \mathrm{e}^{\int \frac{-\mathrm{a1}\,x - \mathrm{b1}\,y(x) - \sqrt{-4\,\mathrm{a0}\,\mathrm{a2}\,x^2 - 4\,\mathrm{a0}\,\mathrm{b2}\,xy(x) + \mathrm{a1}^2\,x^2 + 2\,\mathrm{a1}\,\mathrm{b1}\,xy(x) - 4\,\mathrm{a2}\,\mathrm{b0}\,xy(x) - 4\,\mathrm{b0}\,\mathrm{b2}\,y(x)^2 + \mathrm{b1}^2\,y(x)^2 - 4\,\mathrm{a0}\,\mathrm{c2}\,x + 2\,\mathrm{a1}\,\mathrm{c1}\,x - 4\,\mathrm{a2}\,\mathrm{c0}\,x - 4\,\mathrm{b0}\,\mathrm{c2}\,y(x) + 2\,\mathrm{b}}}{2\,\mathrm{b2}\,y(x) + 2\,\mathrm{a2}\,x + 2\,\mathrm{c2}}}$$

2.480 ODE No. 480

$$\left(ay(x)-x^2\right)y'(x)^2+2xy(x)y'(x)^2-y(x)^2=0$$

✗ **Mathematica** : cpu = 14.109 (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,y[x],x]
```

, 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 == 0
```

✗ **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))
```

2.481 ODE No. 481

$$\left(x^2+y(x)^2\right)y'(x)+xy(x)y'(x)^2+xy(x)=0$$

✓ **Mathematica** : cpu = 0.0192616 (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 = 0.014 (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))
```

$$y(x)=\frac{c_1}{x}$$

2.482 ODE No. 482

$$\left(a+x^{22}-y(x)^2\right)y'(x)+xy(x)y'(x)^2-xy(x)=0$$

✗ **Mathematica** : cpu = 49.0213 (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 == 0,y[x],x
```

, could not solve

DSolve[-(x*y[x]) + (a + x^22 - y[x]^2)*Derivative[1][y][x] + x*y[x]*Derivative[1][y][x]^2 ==

✗ **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))

2.483 ODE No. 483

$$\left(2xy(x)-x^2\right)y'(x)^2+2xy(x)y'(x)-y(x)^2+2xy(x)=0$$

✓ **Mathematica** : cpu = 0.157037 (sec), leaf count = 145

```
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][x]^2 ==
```

$$\left\{\left\{y(x)\to -\sqrt{-x^2-2e^{\frac{c_1}{2}}x}-e^{\frac{c_1}{2}}\right\},\left\{y(x)\to \sqrt{-x^2-2e^{\frac{c_1}{2}}x}-e^{\frac{c_1}{2}}\right\},\left\{y(x)\to e^{\frac{c_1}{2}}-\sqrt{-x^2+2e^{\frac{c_1}{2}}x}\right\},\left\{y(x)\right.$$

✓ **Maple** : cpu = 0.079 (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))
```

$$y(x)=0$$

2.484 ODE No. 484

$$\left(2xy(x) - x^2\right) y'(x)^2 - 6xy(x)y'(x) - y(x)^2 + 2xy(x) = 0$$

✓ **Mathematica** : cpu = 0.141872 (sec), leaf count = 157

```
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][x]^2 ==
```

$$\left\{\left\{y(x) \to -\sqrt{3x^2 - 2e^{\frac{c_1}{2}}x} + 2x - e^{\frac{c_1}{2}}\right\}, \left\{y(x) \to \sqrt{3x^2 - 2e^{\frac{c_1}{2}}x} + 2x - e^{\frac{c_1}{2}}\right\}, \left\{y(x) \to -\sqrt{3x^2 + 2e^{\frac{c_1}{2}}x} + 2x\right.$$

✓ **Maple** : cpu = 0.073 (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))
```

$$y(x) = 0$$

2.485 ODE No. 485

$$-y'(x)\left(ay(x)^2+bx^2+c\right)+axy(x)y'(x)^2+bxy(x)=0$$

✓ **Mathematica** : cpu = 0.0367107 (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 == 0,y
```

$$\left\{\left\{y(x)\to\sqrt{\frac{cc_1}{b-ac_1}+c_1x^2}\right\}\right\}$$

✗ **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`

2.486 ODE No. 486

$$-a^2 + y(x)^2 y'(x)^2 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0416651 (sec), leaf count = 117

```
DSolve[-a^2 + y[x]^2 + y[x]^2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{a^2 - x^2 - 2c_1 x - c_1{}^2}\right\}, \left\{y(x) \to \sqrt{a^2 - x^2 - 2c_1 x - c_1{}^2}\right\}, \left\{y(x) \to -\sqrt{a^2 - x^2 + 2c_1 x - c_1{}^2}\right\}, \cdot$$

✓ **Maple** : cpu = 0.126 (sec), leaf count = 54

```
dsolve(y(x)^2*diff(y(x),x)^2+y(x)^2-a^2 = 0,y(x))
```

$$y(x) = a$$

2.487 ODE No. 487

$$-6x^3y'(x) + 4x^2y(x) + y(x)^2y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 1.24053 (sec), leaf count = 247

```
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]
```

$$\left\{\text{Solve}\left[\frac{\sqrt{9x^6 - 4x^2y(x)^3}\log\left(\sqrt{9x^4 - 4y(x)^3} + 3x^2\right)}{2x\sqrt{9x^4 - 4y(x)^3}} - \frac{3}{4}\left(\frac{\sqrt{9x^6 - 4x^2y(x)^3}\log(y(x))}{x\sqrt{9x^4 - 4y(x)^3}} - \log(y(x))\right) = c_1, y(x$$

✓ **Maple** : cpu = 0.31 (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))
```

$$y(x) = \frac{18^{\frac{1}{3}}x^{\frac{4}{3}}}{2}$$

2.488 ODE No. 488

$$4a^2 - 4ay(x)y'(x) - 4ax + y(x)^2y'(x)^2 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.212979 (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 == 0,y[x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{16a^3x-4a^2x^2-4ac_1x-c_1{}^2}}{2a}\right\},\left\{y(x)\to \frac{\sqrt{16a^3x-4a^2x^2-4ac_1x-c_1{}^2}}{2a}\right\}\right\}$$

✓ **Maple** : cpu = 0.299 (sec), leaf count = 72

```
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))
```

$$y(x) = -2\sqrt{ax}$$

2.489 ODE No. 489

$$ay(x)^2 + bx + c + y(x)^2 y'(x)^2 + 2xy(x)y'(x) = 0$$

✗ **Mathematica** : cpu = 300.138 (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,y[x],x]
```

, timed out

`$Aborted`

✓ **Maple** : cpu = 1.214 (sec), leaf count = 549

```
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))
```

$$y(x) = -\frac{2\sqrt{a\left(a\left(ax - \frac{1}{2}b + x\right)^2 (a+1)^2 \operatorname{RootOf}\left(-b\ln\left(2ax - b + 2x\right) + 2\left(\int^{\_Z} - \frac{b\left(4\_a\,a^2 + \sqrt{-(4\_a\,a^3 + 8\_a\,a^2 + \right.}}{4\_a(4\_a\,a^2 + 8}\right.\right.\right.}}{}$$

2.490 ODE No. 490

$$a - x^2 - 2xy(x)y'(x) + y(x)^2y'(x)^2 + 2y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.283226 (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,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{-a-2x^2+8c_1x-4c_1{}^2}}{\sqrt{2}}\right\},\left\{y(x)\to \frac{\sqrt{-a-2x^2+8c_1x-4c_1{}^2}}{\sqrt{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.274 (sec), leaf count = 83

```
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))
```

$$y(x) = -\frac{\sqrt{4x^2-2a}}{2}$$

2.491 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 = 0.485385 (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*Derivative[1][y]
```

$$\left\{\left\{y(x)\to -\sqrt{-2ac_1x+ac_1{}^2+b-x^2+2c_1x-c_1{}^2}\right\},\left\{y(x)\to \sqrt{-2ac_1x+ac_1{}^2+b-x^2+2c_1x-c_1{}^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.48 (sec), leaf count = 88

```
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))
```

$$y(x) = \sqrt{-a\,x^2+b}$$

2.492 ODE No. 492

$$\left(y(x)^2-a^2\right)y'(x)^2+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.0822714 (sec), leaf count = 97

```
DSolve[y[x]^2 + (-a^2 + y[x]^2)*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\sqrt{a^2-\#1^2}-a\text{arctanh}\left(\frac{\sqrt{a^2-\#1^2}}{a}\right)\&\right][-x+c_1]\right\},\left\{y(x)\to \text{InverseFunction}\left[\right.\right.$$

✓ **Maple** : cpu = 0.378 (sec), leaf count = 122

```
dsolve((y(x)^2-a^2)*diff(y(x),x)^2+y(x)^2 = 0,y(x))
```

$$x-\sqrt{a^2-y(x)^2}+\frac{a^2\ln\left(\frac{2a^2+2\sqrt{a^2}\sqrt{a^2-y(x)^2}}{y(x)}\right)}{\sqrt{a^2}}-c_1=0$$

2.493 ODE No. 493

$$\left(a^2-2ax+y(x)^2\right)y'(x)^2+2ay(x)y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 23.0669 (sec), leaf count = 403

```
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 == 0,y[x]
```

$$\left\{\text{Solve}\left[\left\{y(x)=\frac{-\sqrt{-aK[1]^2\left(aK[1]^2-2xK[1]^2-2x\right)}-aK[1]}{K[1]^2+1},x=\frac{aK[1]^2\text{arctanh}\left(\sqrt{K[1]^2+1}\right)^2+a\text{arctan}\right.\right.\right.$$

✓ **Maple** : cpu = 0.811 (sec), leaf count = 109

```
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))
```

$$\left[x(\_T)=\frac{\text{arctanh}\left(\frac{1}{\sqrt{\_T^2+1}}\right)^2\sqrt{\_T^2+1}\,a^2+\left(-2ac_1\sqrt{\_T^2+1}-2a^2\right)\text{arctanh}\left(\frac{1}{\sqrt{\_T^2+1}}\right)+\left(a^2+c_1^2\right)\sqrt{\_T^2}}{2\sqrt{\_T^2+1}\,a}\right.$$

2.494 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 = 0.083586 (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][x]^2 ==
```

$$\left\{\left\{y(x)\to ac_1-\sqrt{-x^2+c_1{}^2}\right\},\left\{y(x)\to ac_1+\sqrt{-x^2+c_1{}^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.168 (sec), leaf count = 159

```
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))
```

$$y(x)=\sqrt{a^2-1}\,x$$

2.495 ODE No. 495

$$((1-a)x^2+y(x)^2)\,y'(x)^2+2axy(x)y'(x)+(1-a)y(x)^2+x^2=0$$

✓ **Mathematica** : cpu = 0.152065 (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)*Derivative[1][y
```

$$\left\{\text{Solve}\left[\sqrt{a-1}\arctan\left(\frac{y(x)}{x}\right)-\frac{1}{2}\log\left(\frac{y(x)^2}{x^2}+1\right)=\log(x)+c_1,y(x)\right],\text{Solve}\left[\sqrt{a-1}\arctan\left(\frac{y(x)}{x}\right)+\frac{1}{2}\log\right.\right.$$

✓ **Maple** : cpu = 0.371 (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))
```

$$y(x)=\tan\left(\text{RootOf}\left(-2\_Z\sqrt{a-1}-\ln\left(\frac{x^2}{\cos(\_Z)^2}\right)+2c_1\right)\right)x$$

2.496 ODE No. 496

$$(y(x)-x)^2\left(y'(x)^2+1\right)-a^2\left(y'(x)+1\right)^2=0$$

✓ **Mathematica** : cpu = 26.2298 (sec), leaf count = 18407

```
DSolve[-(a^2*(1 + Derivative[1][y][x])^2) + (-x + y[x])^2*(1 + Derivative[1][y][x]^2) == 0,y[x],x]
```

Too large to display

✓ **Maple** : cpu = 0.22 (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))
```

$$y(x)=x-\sqrt{2}\,a$$

2.497 ODE No. 497

$$-x^2 - 2xy(x)y'(x) + 3y(x)^2y'(x)^2 + 4y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0944001 (sec), leaf count = 151

```
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[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{-3x^2 - 4ie^{3c_1}x + e^{6c_1}}}{\sqrt{3}}\right\}, \left\{y(x) \to \frac{\sqrt{-3x^2 - 4ie^{3c_1}x + e^{6c_1}}}{\sqrt{3}}\right\}, \left\{y(x) \to -\frac{\sqrt{-3x^2 + 4ie^{3c_1}x + e^{6}}}{\sqrt{3}}\right.\right.$$

✓ **Maple** : cpu = 0.395 (sec), leaf count = 187

```
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))
```

$$y(x) = -\frac{\sqrt{3}\,x}{3}$$

2.498 ODE No. 498

$$(3y(x)-2)y'(x)^2+4y(x)-4=0$$

✓ **Mathematica** : cpu = 0.110474 (sec), leaf count = 127

```
DSolve[-4 + 4*y[x] + (-2 + 3*y[x])*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{\arctan\left(\frac{\sqrt{3\#1-2}}{\sqrt{3-3\#1}}\right)}{\sqrt{3}}-\sqrt{1-\#1}\sqrt{3\#1-2}\&\right][-2x+c_1]\right\},\left\{y(x)\to \text{InverseFuncti}\right.\right.$$

✓ **Maple** : cpu = 0.259 (sec), leaf count = 99

```
dsolve((3*y(x)-2)*diff(y(x),x)^2-4+4*y(x) = 0,y(x))
```

$$y(x)=1$$

2.499 ODE No. 499

$$a^2(-x^2) - 2a^2xy(x)y'(x) + (1-a^2)\,y(x)^2y'(x)^2 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.189678 (sec), leaf count = 423

```
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][y][x]^
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{a^6(-x^2)+3a^4x^2-3a^2x^2-2a^2xe^{a^2c_1-c_1}+2xe^{a^2c_1-c_1}+e^{2a^2c_1-2c_1}+x^2}}{\sqrt{a^6-3a^4+3a^2-1}}\right\},\left\{y(x)\to \frac{\sqrt{a^6(-x^2)}}{}\right.\right.$$

✓ **Maple** : cpu = 0.16 (sec), leaf count = 191

```
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))
```

$$y(x) = \frac{xa}{\sqrt{-a^2+1}}$$

2.500 ODE No. 500

$$(a-b)y(x)^2y'(x)^2-ab+ay(x)^2-bx^2-2bxy(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.569071 (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[1][y][x
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{-ab+ax^2-2ac_1x+ac_1{}^2+b^2-bx^2}}{\sqrt{b-a}}\right\},\left\{y(x)\to \frac{\sqrt{-ab+ax^2-2ac_1x+ac_1{}^2+b^2-bx^2}}{\sqrt{b-a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.787 (sec), leaf count = 662

```
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))
```

$$y(x)=\frac{\sqrt{b\left(x^2+a-b\right)(a-b)}}{a-b}$$

2.501 ODE No. 501

$$y'(x)^2\left(ay(x)^2+bx+c\right)-by(x)y'(x)+dy(x)^2=0$$

✓ **Mathematica** : cpu = 30.6125 (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 == 0,y[x],x
```

$$\left\{\text{Solve}\left[\left\{y(x)=\frac{bK[1]-\sqrt{-K[1]^2\left(-b^2+4axK[1]^2b+4dxb+4acK[1]^2+4cd\right)}}{2\left(aK[1]^2+d\right)},x=\frac{-b^2{c_1}^2d^4-ab^2{c_1}^2K[1]^2d\right.\right.\right.$$

✓ **Maple** : cpu = 2.562 (sec), leaf count = 44

```
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))
```

$$y(x)=-\frac{\sqrt{-ad}\,(bx+c)}{ab}$$

2.502 ODE No. 502

$$(ay(x)-bx)^2\left(a^2y'(x)^2+b^2\right)-c^2\left(ay'(x)+b\right)^2=0$$

✓ **Mathematica** : cpu = 0.702812 (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][x]^2) =
```

$$\left\{\left\{y(x)\to \frac{bc_1}{a}-\frac{\sqrt{b^2\left(-x^2\right)+2b^2c_1x-b^2c_1{}^2+c^2}}{a}\right\},\left\{y(x)\to \frac{\sqrt{b^2\left(-x^2\right)+2b^2c_1x-b^2c_1{}^2+c^2}}{a}+\frac{bc_1}{a}\right\}\right\}$$

✓ **Maple** : cpu = 0.313 (sec), leaf count = 196

```
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))
```

$$y(x)=\frac{bx-\sqrt{2}\,c}{a}$$

2.503 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 = 300.025 (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])^2*Deriva
```

, 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=0,y(x
```

2.504 ODE No. 504

$$-\left(-a+x^3+y(x)^3\right)y'(x)+x^2y(x)+xy(x)^2y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.0473701 (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 == 0,y[x],
```

$$\left\{y(x)\to \frac{\sqrt[3]{c_1}\sqrt[3]{a-x^3+c_1x^3}}{\sqrt[3]{-1+c_1}}\right\}$$

✓ **Maple** : cpu = 0.984 (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))
```

$$y(x)=\left(x^3+a-2x\sqrt{ax}\right)^{\frac{1}{3}}$$

2.505 ODE No. 505

$$-x^3 + xy(x)^2y'(x)^2 - 2y(x)^3y'(x) + 2xy(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0738925 (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,y[x],x]
```

$$\left\{\left\{y(x)\to -\sqrt{x^2+2c_1}\right\},\left\{y(x)\to \sqrt{x^2+2c_1}\right\},\left\{y(x)\to -\sqrt{x^2+c_1x^4}\right\},\left\{y(x)\to \sqrt{x^2+c_1x^4}\right\}\right\}$$

✓ **Maple** : cpu = 0.017 (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))
```

$$y(x) = \sqrt{x^2 + c_1}$$

2.506 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 = 46.516 (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*y[x]^2)
```

, 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(x)-1)=0,y(x))

2.507 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 = 44.4174 (sec), leaf count = 395

```
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)*Derivative[1
```

$$\left\{\text{Solve}\left[\left[\left\{x=\frac{a^2K[1]y(K[1])-\sqrt{a^2K[1]^2\left(K[1]^2+1\right)y(K[1])^4}}{a^2K[1]^2},y(x)=\frac{-4a\,\text{Hypergeometric2F1}\left(-\frac{1}{4},\frac{1}{4},\frac{3}{4},-K[\right.}{4\sqrt[4]{K[1]^2+1}}\right.\right.\right.$$

✓ **Maple** : cpu = 2.57 (sec), leaf count = 203

```
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))
```

$$y(x)-\text{RootOf}\left(\_Z\left(-\frac{a^2\left(2\,\text{RootOf}\left(\left(\left(-y(x)^4+a^2x^2\right)\_Z^2+a^2-y(x)^2-2\_Z a^2x\right)\_Z^2x-\_Z^2+x^2\right)}{\_Z^4-a^2x^2}\right)^{\frac{1}{4}}+\right.$$

2.508 ODE No. 508

$$\left(x^2y(x)^2-x^2+y(x)^4\right)y'(x)^2+2xy(x)y'(x)-y(x)^2=0$$

✓ **Mathematica** : cpu = 1.44571 (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][x]^2 ==
```

$$\text{Solve}\left[\frac{\sqrt{x^2+y(x)^2}y(x)\left(\log\left(\frac{x}{\sqrt{x^2+y(x)^2}}+1\right)-\log\left(1-\frac{x}{\sqrt{x^2+y(x)^2}}\right)\right)}{2x^2\sqrt{\frac{y(x)^2(x^2+y(x)^2)}{x^4}}}+y(x)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.524 (sec), leaf count = 60

```
dsolve((y(x)^4+y(x)^2*x^2-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)-y(x)^2=0,y(x))
```

$$y(x)=-ix$$

2.509 ODE No. 509

$$9\left(x^2-1\right)y(x)^4y'(x)^2-4x^2-6xy(x)^5y'(x)=0$$

✓ **Mathematica** : cpu = 0.196799 (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 == 0,y[x],
```

$$\left\{y(x)\to -\frac{\sqrt[3]{-\frac{1}{2}}\sqrt[3]{-4x^2+4+c_1{}^2}}{\sqrt[3]{c_1}}\right\}$$

✓ **Maple** : cpu = 0.467 (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))
```

$$y(x)=\left(-4x^2+4\right)^{\frac{1}{6}}$$

2.510 ODE No. 510

$$-\left(x^4y(x)^2-1\right)y(x)^2+x^2\left(x^2y(x)^4-1\right)y'(x)^2+2x^3\left(y(x)^2-x^2\right)y(x)^3y'(x)=0$$

✗ **Mathematica** : cpu = 47.3023 (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*(-1 + 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] + x^2*
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*(y(x)^4*x^2-1)*diff(y(x),x)^2+2*x^3*y(x)^3*(y(x)^2-x^2)*diff(y(x),x)-y(x)^2*(y(x)
```

, could not solve

```
dsolve(x^2*(y(x)^4*x^2-1)*diff(y(x),x)^2+2*x^3*y(x)^3*(y(x)^2-x^2)*diff(y(x),x)-
y(x)^2*(y(x)^2*x^4-1)=0,y(x))
```

2.511 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 = 21.0399 (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 + y[x]^
```

$$\left\{\text{Solve}\left[\arctan\left(\frac{x}{y(x)}\right)-\frac{2\sqrt{a^2\left(x^2+y(x)^2\right)\left(\sqrt{x^2+y(x)^2}-a^2\right)}\arctan\left(\frac{\sqrt{\sqrt{x^2+y(x)^2}-a^2}}{a}\right)}{a\sqrt{x^2+y(x)^2}\sqrt{\sqrt{x^2+y(x)^2}-a^2}}=c_1,y(x)\right],\text{Solve}\right.$$

✓ **Maple** : cpu = 9.009 (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
```

$$\arctan\left(\frac{x}{y\left(x\right)}\right)-\frac{2\sqrt{\left(-a^2+\sqrt{y\left(x\right)^2+x^2}\right)\left(y\left(x\right)^2+x^2\right)a^2}\arctan\left(\frac{\sqrt{-a^2+\sqrt{y(x)^2+x^2}}}{a}\right)}{a\sqrt{y\left(x\right)^2+x^2}\sqrt{-a^2+\sqrt{y\left(x\right)^2+x^2}}}-c_1=0$$

2.512 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 = 24.0023 (sec), leaf count = 305

```
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]^2)^(3/
```

$$\left\{\text{Solve}\left[\arctan\left(\frac{x}{y(x)}\right)-\frac{2\sqrt{a\left(x^2+y(x)^2\right)^2\left(-ax^2-ay(x)^2+\sqrt{x^2+y(x)^2}\right)}\arctan\left(\frac{\sqrt{a}\sqrt{x^2+y(x)^2}}{\sqrt{-ax^2-ay(x)^2+\sqrt{x^2+y(x)^2}}}\right.}{\sqrt{a}\left(x^2+y(x)^2\right)\sqrt{-ax^2-ay(x)^2+\sqrt{x^2+y(x)^2}}}\right.\right.$$

✓ **Maple** : cpu = 6.133 (sec), leaf count = 139

```
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)-
```

$$y(x)=\frac{x}{\tan\left(\text{RootOf}\left(-\_Z-\left(\int^{\frac{x^2\left(\tan(\_Z)^2+1\right)}{\tan(\_Z)^2}}\frac{\sqrt{-a\_a^{\frac{5}{2}}\left(\sqrt{\_a}\,a-1\right)\left(\sqrt{\_a}\,a+1\right)}}{2\_a^2\left(\_a\,a^2-1\right)}d\_a\right)+c_1\right)\right)}$$

2.513 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 = 0.0538633 (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[1][y][x
```

$$\left\{\left\{y(x)\to \arctan\left(2\left(-\frac{{c_1}^{3/2}}{\sqrt{x+c_1}}-\frac{\sqrt{c_1}x}{\sqrt{x+c_1}}\right)\right)\right\},\left\{y(x)\to \arctan\left(2\left(\frac{{c_1}^{3/2}}{\sqrt{x+c_1}}+\frac{\sqrt{c_1}x}{\sqrt{x+c_1}}\right)\right)\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
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))
```

, exception

```
time expired
```

2.514 ODE No. 514

$$y'(x)^2(a\cos(y(x))+b)-c\cos(y(x))+d=0$$

✓ **Mathematica** : cpu = 7.0104 (sec), leaf count = 605

```
DSolve[d - c*Cos[y[x]] + (b + a*Cos[y[x]])*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{4\sin^2\left(\frac{\#1}{2}\right)\csc(\#1)\sqrt{a\cos(\#1)+b}\sqrt{\frac{\cot^2\left(\frac{\#1}{2}\right)(c-d)}{c+d}}\sqrt{\frac{\csc^2\left(\frac{\#1}{2}\right)(a+b)(d-c\cos(\#1))}{ad+bc}}\left(c(a\right.}{}\right.\right.\right.$$

✓ **Maple** : cpu = 6.255 (sec), leaf count = 87

```
dsolve(diff(y(x),x)^2*(a*cos(y(x))+b)-c*cos(y(x))+d=0,y(x))
```

$$y(x)=\arccos\left(\frac{d}{c}\right)$$

2.515 ODE No. 515

$$f(x^2+y(x)^2)\left(y'(x)^2+1\right)-\left(xy'(x)-y(x)\right)^2=0$$

✓ **Mathematica** : cpu = 2.12689 (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,y[x],x]
```

$$\left\{\text{Solve}\left[\int_1^x\left(\frac{\sqrt{f\left(K[1]^2+y(x)^2\right)\left(K[1]^2+y(x)^2-f\left(K[1]^2+y(x)^2\right)\right)}K[1]}{f\left(K[1]^2+y(x)^2\right)\left(K[1]^2+y(x)^2\right)}-\frac{\sqrt{f\left(K[1]^2+y(x)^2\right)\left(K[1]^2+y(x\right.}}{f\left(K[1]^2+y(x)^2\right)\left(K[1]^2+y(x\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 1.058 (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))
```

$$y(x)=\frac{x}{\tan\left(\text{RootOf}\left(-2\_Z-\left(\int^{\frac{x^2\left(\tan(\_Z)^2+1\right)}{\tan(\_Z)^2}}\frac{\sqrt{-f(\_a)(f(\_a)-\_a)}}{\_a(f(\_a)-\_a)}d\_a\right)+2c_1\right)\right)}$$

2.516 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 = 0.431929 (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 + Derivative[1]
```

$$\left\{\text{Solve}\left[\int_1^{\frac{y(x)}{x}}\frac{f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)K[1]^2+f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)-1}{\sqrt{f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)}(K[1]-i)(K[1]+i)\left(\sqrt{f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)}K[1]+i\sqrt{f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)-1}\right)}dK[1]=-\text{lo}\right.\right.$$

✓ **Maple** : cpu = 1.153 (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
```

$$y(x)=\text{RootOf}\left(-\ln(x)+\int^{\_Z}-\frac{\_af\left(\frac{1}{\sqrt{\_a^2+1}}\right)+\sqrt{-f\left(\frac{1}{\sqrt{\_a^2+1}}\right)^2+f\left(\frac{1}{\sqrt{\_a^2+1}}\right)}}{\left(\_a^2+1\right)f\left(\frac{1}{\sqrt{\_a^2+1}}\right)}d\_a+c_1\right)x$$

2.517 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 = 0.430325 (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 + Derivative
```

$$\left\{\text{Solve}\left[\int_1^{\frac{y(x)}{x}} \frac{f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)K[1]^2+f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)-1}{\sqrt{f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)}(K[1]-i)(K[1]+i)\left(\sqrt{f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)}K[1]+i\sqrt{f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)-1}\right)}dK[1]=-\text{lo}\right.\right.$$

✓ **Maple** : cpu = 1.159 (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,
```

$$y(x)=\text{RootOf}\left(-\ln(x)+\int^{\_Z}-\frac{\_af\left(\frac{\_a}{\sqrt{\_a^2+1}}\right)+\sqrt{-f\left(\frac{\_a}{\sqrt{\_a^2+1}}\right)^2+f\left(\frac{\_a}{\sqrt{\_a^2+1}}\right)}}{\left(\_a^2+1\right)f\left(\frac{\_a}{\sqrt{\_a^2+1}}\right)}d\_a+c_1\right)x$$

2.518 ODE No. 518

$$y'(x)^3 - (y(x) - a)^2(y(x) - b)^2 = 0$$

✓ **Mathematica** : cpu = 0.409317 (sec), leaf count = 236

```
DSolve[-((-a + y[x])^2*(-b + y[x])^2) + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{3\sqrt[3]{a-\#1}\left(\frac{\#1-b}{a-b}\right)^{2/3}\text{Hypergeometric2F1}\left(\frac{1}{3},\frac{2}{3},\frac{4}{3},\frac{a-\#1}{a-b}\right)}{(b-\#1)^{2/3}}\&\right][x+c_1]\right\},\left\{y(x)\right.\right.$$

✓ **Maple** : cpu = 0.216 (sec), leaf count = 126

```
dsolve(diff(y(x),x)^3-(y(x)-a)^2*(y(x)-b)^2=0,y(x))
```

$$y(x) = a$$

2.519 ODE No. 519

$$y'(x)^3 - f(x)\left(ay(x)^2 + by(x) + c\right)^2 = 0$$

✓ **Mathematica** : cpu = 10.4389 (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]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\frac{\sqrt[3]{2}(2\#1a+b)\left(\frac{a(\#1(\#1a+b)+c)}{4ac-b^2}\right)^{2/3}\text{Hypergeometric2F1}\left(\frac{1}{2},\frac{2}{3},\frac{3}{2},\frac{(b+2a\#1)^2}{b^2-4ac}\right)}{a(\#1(\#1a+b)+c)^{2/3}}\&\right]\left[\int_1\right.\right.\right.$$

✓ **Maple** : cpu = 0.579 (sec), leaf count = 197

```
dsolve(diff(y(x),x)^3-f(x)*(a*y(x)^2+b*y(x)+c)^2=0,y(x))
```

$$\int^{y(x)}\frac{1}{(a\_a^2+\_ab+c)^{\frac{2}{3}}}d\_a+\int^{x}-\frac{\left(f(\_a)\left(ay(x)^2+by(x)+c\right)^2\right)^{\frac{1}{3}}}{\left(ay\left(x\right)^2+by\left(x\right)+c\right)^{\frac{2}{3}}}d\_a+c_1=0$$

2.520 ODE No. 520

$$y'(x)^3 + y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0218305 (sec), leaf count = 330

```
DSolve[-y[x] + Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int \frac{\sqrt[3]{\sqrt{729\#1^2+108}-27\#1}}{2^{2/3}\left(\sqrt{729\#1^2+108}-27\#1\right)^{2/3}-6\sqrt[3]{2}}d\#1\&\right]\left[-\frac{x}{6}+c_1\right]\right\}, \left\{y(x) \to \text{Inver}\right.\right.$$

✓ **Maple** : cpu = 0.153 (sec), leaf count = 249

```
dsolve(diff(y(x),x)^3+diff(y(x),x)-y(x)=0,y(x))
```

$$x - \left(\int^{y(x)} \frac{6\left(108\_a + 12\sqrt{81\_a^2+12}\right)^{\frac{1}{3}}}{\left(108\_a + 12\sqrt{81\_a^2+12}\right)^{\frac{2}{3}} - 12} d\_a\right) - c_1 = 0$$

2.521 ODE No. 521

$$y'(x)^3 + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0029791 (sec), leaf count = 14

```
DSolve[-y[x] + x*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x + c_1{}^3\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (sec), leaf count = 33

```
dsolve(diff(y(x),x)^3+x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = -\frac{2\sqrt{-3x}\,x}{9}$$

2.522 ODE No. 522

$$y'(x)^3 - (x+5)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0030577 (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 = 0.031 (sec), leaf count = 44

```
dsolve(diff(y(x),x)^3-(x+5)*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = -\frac{2\sqrt{3x+15}\,(x+5)}{9}$$

2.523 ODE No. 523

$$-axy'(x) + x^3 + y'(x)^3 = 0$$

✓ **Mathematica** : cpu = 166.731 (sec), leaf count = 392

```
DSolve[x^3 - a*x*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \int_1^x \left(\frac{\sqrt[3]{\frac{2}{3}}aK[1]}{\sqrt[3]{\sqrt{3}\sqrt{27K[1]^6-4a^3K[1]^3}-9K[1]^3}}+\frac{\sqrt[3]{\sqrt{3}\sqrt{27K[1]^6-4a^3K[1]^3}-9K[1]^3}}{\sqrt[3]{2}3^{2/3}}\right)dK[1]+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.074 (sec), leaf count = 253

```
dsolve(diff(y(x),x)^3-a*x*diff(y(x),x)+x^3=0,y(x))
```

$$y(x) = \int \frac{i\left(\left(\frac{i}{12}-\frac{\sqrt{3}}{12}\right)\left(-108x^3+12\sqrt{-12a^3x^3+81x^6}\right)^{\frac{2}{3}}+xa\left(\sqrt{3}+i\right)\right)}{\left(-108x^3+12\sqrt{-12a^3x^3+81x^6}\right)^{\frac{1}{3}}}dx + c_1$$

2.524 ODE No. 524

$$y'(x)^3 - 2y(x)y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.012119 (sec), leaf count = 422

```
DSolve[y[x]^2 - 2*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int \frac{\sqrt[3]{\sqrt{3}\sqrt{\#1^3(27\#1-32)}-9\#1^2}}{\sqrt[3]{2}\left(\sqrt{3}\sqrt{\#1^3(27\#1-32)}-9\#1^2\right)^{2/3}+4\sqrt[3]{3}\#1}d\#1\&\right]\left[\frac{x}{6^{2/3}}+c_1\right]\right\},\left\{y(x\right.\right.$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 257

```
dsolve(diff(y(x),x)^3-2*y(x)*diff(y(x),x)+y(x)^2=0,y(x))
```

$$x - \left(\int^{y(x)} \frac{6\left(-108\_a^2 + 12\sqrt{3}\sqrt{27\_a^4 - 32\_a^3}\right)^{\frac{1}{3}}}{\left(-108\_a^2 + 12\sqrt{3}\sqrt{27\_a^4 - 32\_a^3}\right)^{\frac{2}{3}} + 24\_a} d\_a\right) - c_1 = 0$$

2.525 ODE No. 525

$$-axy(x)y'(x)+2ay(x)^2+y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.0718204 (sec), leaf count = 133

```
DSolve[2*a*y[x]^2 - a*x*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\exp\left(\frac{1}{2}\left(\frac{ax^2}{2}-\frac{1}{2}\sqrt{a}x\sqrt{ax^2-8}-4\log\left(\sqrt{ax^2-8}-\sqrt{a}x\right)\right)\right)\right\},\left\{y(x)\to c_1\exp\left(\frac{1}{2}\left(\frac{ax^2}{2}+\frac{1}{2}\sqrt{\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.057 (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))
```

$$y(x)=c_1\left(\frac{x\,a^2}{\sqrt{a^2}}+\sqrt{a^2x^2-8a}\right)^{-\frac{2a}{\sqrt{a^2}}}\mathrm{e}^{\frac{x\left(ax+\sqrt{a^2x^2-8a}\right)}{4}}$$

2.526 ODE No. 526

$$-x^3y(x)^3-\left(x^2+xy(x)+y(x)^2\right)y'(x)^2+\left(x^3y(x)+x^2y(x)^2+xy(x)^3\right)y'(x)+y'(x)^3=0$$

✓ **Mathematica** : cpu = 0.0463804 (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] + y[x]^
```

$$\left\{\left\{y(x)\to\frac{1}{-x-c_1}\right\},\left\{y(x)\to c_1e^{\frac{x^2}{2}}\right\},\left\{y(x)\to\frac{x^3}{3}+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.01 (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+y(x)^2*x^2+x^3*y(x))*diff
```

$$y(x)=\frac{x^3}{3}+c_1$$

2.527 ODE No. 527

$$-xy(x)^4 y'(x) + y'(x)^3 - y(x)^5 = 0$$

✓ **Mathematica** : cpu = 0.0120087 (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 = 0.665 (sec), leaf count = 43

```
dsolve(diff(y(x),x)^3-x*y(x)^4*diff(y(x),x)-y(x)^5=0,y(x))
```

$$y(x) = -\frac{3\sqrt{3}}{2x^{\frac{3}{2}}}$$

2.528 ODE No. 528

$$abx + ay'(x)^2 + by(x) + y'(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.553169 (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]
```

$$\text{Solve}\left[\left\{x=-\frac{-a\left(\frac{\sqrt[3]{-2a^3+\sqrt{(-2a^3-27abx-27by(x))^2-4a^6}-27abx-27by(x)}}{3\sqrt[3]{2}}+\frac{\sqrt[3]{2}a^2}{3\sqrt[3]{-2a^3+\sqrt{(-2a^3-27abx-27by(x))^2-4a^6}-27abx-}}\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.075 (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))
```

$$y(x)=-ax-\frac{\left(e^{\mathrm{RootOf}\left(-2a^2\_Z-3\,e^{2\_Z}+8a\,e^{\_Z}+2c_1b-5a^2-2bx\right)}-a\right)^2 e^{\mathrm{RootOf}\left(-2a^2\_Z-3\,e^{2\_Z}+8a\,e^{\_Z}+2c_1b-5a^2-2bx\right)}}{b}$$

2.529 ODE No. 529

$$y'(x)^3 + xy'(x)^2 - y(x) = 0$$

✓ **Mathematica** : cpu = 24.4155 (sec), leaf count = 1758

```
DSolve[-y[x] + x*Derivative[1][y][x]^2 + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{2}\left(\frac{4\ 2^{2/3}x^4}{3\left(-16x^3 - 72x^2 - 108x + 216c_1 + \sqrt{4\left(-4x^2 - 12x - 9\right)^3 + \left(-16x^3 - 72x^2 - 108x + 216c_1 + 5\right.}\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 1236

```
dsolve(diff(y(x),x)^3+x*diff(y(x),x)^2-y(x)=0,y(x))
```

$$y(x) = 0$$

2.530 ODE No. 530

$$y'(x)^3 - y(x)y'(x)^2 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 23.4946 (sec), leaf count = 648

```
DSolve[y[x]^2 - y[x]*Derivative[1][y][x]^2 + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}\frac{\sqrt[3]{2K[1]^3-27K[1]^2+3\sqrt{3}\sqrt{-K[1]^4(}}}{2\sqrt[3]{2}K[1]^2+2\sqrt[3]{2K[1]^3-27K[1]^2+3\sqrt{3}\sqrt{-K[1]^4(4K[1]-27)}}K[1]+2^{2/3}\left(\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.105 (sec), leaf count = 376

```
dsolve(diff(y(x),x)^3-y(x)*diff(y(x),x)^2+y(x)^2=0,y(x))
```

$$y(x) = 0$$

2.531 ODE No. 531

$$-x^3y(x)^6 - \left(x^2 + y(x)^4 + xy(x)^2\right) y'(x)^2 + \left(x^3y(x)^2 + x^2y(x)^4 + xy(x)^6\right) y'(x) + y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 52.1138 (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[1][y][x
```

, 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] + Derivative
```

✗ **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+y(x)^4*x^2+x^3*y(x)^2)*
```

, 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+y(x)^4*x^2+x^3*y(x)^2)*
x^3*y(x)^6=0,y(x))
```

2.532 ODE No. 532

$$a y'(x)^3 + b y'(x)^2 + c y'(x) - d - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0213993 (sec), leaf count = 1057

```
DSolve[-d - y[x] + c*Derivative[1][y][x] + b*Derivative[1][y][x]^2 + a*Derivative[1][y][x]^3 == 0,y[x
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int \frac{\sqrt[3]{2b^3 - 9acb - 27a^2 d}}{2\sqrt[3]{2}b^2 + 2\sqrt[3]{2b^3 - 9acb - 27a^2 d - 27a^2\#1 + \sqrt{4\left(3ac - b^2\right)^3 + \left(2b^3 - 9acb - 27\right.}}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.326 (sec), leaf count = 944

```
dsolve(a*diff(y(x),x)^3+b*diff(y(x),x)^2+c*diff(y(x),x)-y(x)-d=0,y(x))
```

$$x - \left(\int^{y(x)} - \frac{3\, 6^{\frac{1}{3}} a 27^{\frac{1}{3}} \left(\left(\frac{\sqrt{27(d+\_a)^2 a^2 + 18c\left((d+\_a)b + \frac{2c}{9}\right.}}{3}\right.\right.}{3\, 6^{\frac{2}{3}} ac - 6^{\frac{2}{3}} b^2 + 6^{\frac{1}{3}} 27^{\frac{1}{3}} \left(\left(\frac{\sqrt{27(d+\_a)^2 a^2 + 18c\left((d+\_a)b + \frac{2c^2}{9}\right)a + (-4d - 4\_a)b^3 - b^2 c^2}\, a}{3} + \left(a^2\left(d + \_a\right) + \frac{abc}{3}\right.\right.\right.}\right.$$

2.533 ODE No. 533

$$a + xy'(x)^3 - y(x)y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0035224 (sec), leaf count = 16

```
DSolve[a - y[x]*Derivative[1][y][x]^2 + x*Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{a}{c_1{}^2}+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 76

```
dsolve(x*diff(y(x),x)^3-y(x)*diff(y(x),x)^2+a=0,y(x))
```

$$y(x) = \frac{3\,2^{\frac{1}{3}}\left(a\,x^2\right)^{\frac{1}{3}}}{2}$$

2.534 ODE No. 534

$$4xy'(x)^3 - 6y(x)y'(x)^2 + 3y(x) - x = 0$$

✓ **Mathematica** : cpu = 0.0415257 (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]
```

$$\left\{\left\{y(x) \to \frac{-\sqrt{2}\sqrt{c_1x^3 + 3c_1{}^2x^2 + 3c_1{}^3x + c_1{}^4} - c_1{}^2}{3c_1}\right\}, \left\{y(x) \to \frac{\sqrt{2}\sqrt{c_1x^3 + 3c_1{}^2x^2 + 3c_1{}^3x + c_1{}^4} - c_1{}^2}{3c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.048 (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))
```

$$y(x) = x$$

2.535 ODE No. 535

$$8xy'(x)^3 - 12y(x)y'(x)^2 + 9y(x) = 0$$

✓ **Mathematica** : cpu = 0.0313941 (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 = 0.042 (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))
```

$$y(x) = -\frac{3x}{2}$$

2.536 ODE No. 536

$$bx(x^2 - a^2)\,y'(x)^2 + (x^2 - a^2)\,y'(x)^3 + bx + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0082087 (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)*Derivative[1
```

$$\left\{\left\{y(x)\to -\frac{bx^2}{2}+c_1\right\},\left\{y(x)\to -\arctan\left(\frac{x}{\sqrt{a^2-x^2}}\right)+c_1\right\},\left\{y(x)\to \arctan\left(\frac{x}{\sqrt{a^2-x^2}}\right)+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (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))
```

$$y(x) = -\frac{b\,x^2}{2} + c_1$$

2.537 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 = 0.0235541 (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[1][y][x]
```

$$\left\{\left\{y(x)\to x\left(c_1x+c_1{}^3\right)\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
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
```

, exception

```
time expired
```

2.538 ODE No. 538

$$2\left(xy'(x)+y(x)\right)^3-y(x)y'(x)=0$$

✓ **Mathematica** : cpu = 2.02633 (sec), leaf count = 179

```
DSolve[-(y[x]*Derivative[1][y][x]) + 2*(y[x] + x*Derivative[1][y][x])^3 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\int_1^x \frac{\text{InverseFunction}\left[-\frac{2\sqrt{\#1^2-8\#1^3}\,\arctan\left(\sqrt{8\#1-1}\right)}{\#1\sqrt{8\#1-1}}-14\log\left(\#1^2(8\#1-1)\right)+\log\left(\#1^{14}(8\#1-1)^{15/2}\left(\#1-\sqrt{\#1^2-8\#1^3}\right)\right)+\log}{K[1]}}{x}\right.\right.$$

✓ **Maple** : cpu = 3.818 (sec), leaf count = 1725

```
dsolve(2*(x*diff(y(x),x)+y(x))^3-y(x)*diff(y(x),x)=0,y(x))
```

$$\int_{\_b}^{x}\frac{-6^{\frac{2}{3}}\left(-9\_a^2y(x)\left(-\frac{\sqrt{3}\sqrt{\frac{27\_ay(x)^2-2y(x)}{\_a}}}{9}+y(x)\right)\right)^{\frac{2}{3}}+6\_ay(x)\left(6^{\frac{1}{3}}\left(-9\_a^2y(x)\left(-\frac{\sqrt{3}\sqrt{\frac{27\_ay(x)^2-2y(x)}{\_a}}}{9}+y\right.\right.\right.}{6\_a^2y\left(x\right)+\_a6^{\frac{2}{3}}\left(-9\_a^2y\left(x\right)\left(-\frac{\sqrt{3}\sqrt{\frac{27\_ay(x)^2-2y(x)}{\_a}}}{9}+y\left(x\right)\right)\right)^{\frac{2}{3}}}$$

2.539 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 = 0.0223409 (sec), leaf count = 32

```
DSolve[Sin[x]*y[x] - (Sin[x] + Cos[x]^2*y[x])*Derivative[1][y][x] - (-Cos[x]^2 + Sin[x]*y[x])*Derivat
```

$$\{\{y(x) \to c_1 e^x\}, \{y(x) \to \operatorname{arctanh}(\cos(x)) + c_1\}, \{y(x) \to -\cos(x) + c_1\}\}$$

✓ **Maple** : cpu = 0.052 (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))*di
```

$$y(x) = c_1 e^x$$

2.540 ODE No. 540

$$2y(x)y'(x)^3 - y(x)y'(x)^2 + 2xy'(x) - x = 0$$

✓ **Mathematica** : cpu = 0.0254678 (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]^3 == 0,
```

$$\left\{\left\{y(x)\to \frac{x}{2}+c_1\right\},\left\{y(x)\to \frac{\left(3c_1-2ix^{3/2}\right)^{2/3}}{2^{2/3}}\right\},\left\{y(x)\to \frac{\left(2ix^{3/2}+3c_1\right)^{2/3}}{2^{2/3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.072 (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))
```

$$x+\frac{xc_1}{\left(\frac{-\sqrt{-xy(x)}+y(x)}{y(x)}\right)^{\frac{2}{3}}\left(\frac{-x+\sqrt{-xy(x)}+y(x)}{y(x)}\right)^{\frac{2}{3}}y(x)}=0$$

2.541 ODE No. 541

$$y(x)^2 y'(x)^3 + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0217726 (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]
```

$$\left\{\left\{y(x)\to -\sqrt{2c_1x+c_1{}^3}\right\},\left\{y(x)\to \sqrt{2c_1x+c_1{}^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.438 (sec), leaf count = 103

```
dsolve(y(x)^2*diff(y(x),x)^3+2*x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = -\frac{2\,2^{\frac{1}{4}}3^{\frac{1}{4}}\left(-x^3\right)^{\frac{1}{4}}}{3}$$

2.542 ODE No. 542

$$16y(x)^2y'(x)^3+2xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0223804 (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]
```

$$\left\{\left\{y(x)\to\sqrt{c_1x+2c_1{}^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.467 (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))
```

$$y(x)=-\frac{2^{\frac{1}{4}}3^{\frac{1}{4}}\left(-x^3\right)^{\frac{1}{4}}}{3}$$

2.543 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 = 0.015994 (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]^2*Deriva
```

$$\left\{\left\{y(x)\to -\sqrt{c_1x^2+\frac{c_1}{1+c_1{}^2}}\right\},\left\{y(x)\to \sqrt{c_1x^2+\frac{c_1}{1+c_1{}^2}}\right\}\right\}$$

✗ **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))
```

2.544 ODE No. 544

$$x^7y(x)^2y'(x)^3 - \left(3x^6y(x)^3 - 1\right)y'(x)^2 + 3x^5y(x)^4y'(x) - x^4y(x)^5 = 0$$

✓ **Mathematica** : cpu = 0.0490302 (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][x]^2 +
```

$$\left\{\left\{y(x) \to \sqrt[3]{c_1x^3 + c_1{}^{2/3}}\right\}\right\}$$

✓ **Maple** : cpu = 3.023 (sec), leaf count = 4200

```
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
```

$$y(x) = \frac{2^{\frac{2}{3}}}{3x^2}$$

2.545 ODE No. 545

$$y'(x)^4 - (y(x)-a)^3(y(x)-b)^2 = 0$$

✓ **Mathematica** : cpu = 0.495952 (sec), leaf count = 323

```
DSolve[-((-a + y[x])^3*(-b + y[x])^2) + Derivative[1][y][x]^4 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{4\sqrt[4]{a-\#1}\sqrt{\frac{\#1-b}{a-b}}\,\text{Hypergeometric2F1}\left(\frac{1}{4},\frac{1}{2},\frac{5}{4},\frac{a-\#1}{a-b}\right)}{\sqrt{b-\#1}}\&\right]\left[-\sqrt[4]{-1}x+c_1\right]\right\},\left\{y(\right.\right.$$

✓ **Maple** : cpu = 0.158 (sec), leaf count = 144

```
dsolve(diff(y(x),x)^4-(y(x)-a)^3*(y(x)-b)^2=0,y(x))
```

$$y(x) = a$$

2.546 ODE No. 546

$$y'(x)^4 + 3(x-1)y'(x)^2 - 3(2y(x)-1)y'(x) + 3x = 0$$

✓ **Mathematica** : cpu = 0.027664 (sec), leaf count = 113

```
DSolve[3*x - 3*(-1 + 2*y[x])*Derivative[1][y][x] + 3*(-1 + x)*Derivative[1][y][x]^2 + Derivative[1][y
```

$$\left\{\left\{y(x)\to\frac{1}{12}\left(-\sqrt{64x^3+48c_1{}^2x^2+12c_1{}^4x+c_1{}^6}-6c_1x+6-c_1{}^3+6c_1\right)\right\},\left\{y(x)\to\frac{1}{12}\left(\sqrt{64x^3+48c_1{}^2x^2+\right.\right.$$

✓ **Maple** : cpu = 0.068 (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))
```

$$y(x) = -x + \frac{5}{6}$$

2.547 ODE No. 547

$$y'(x)^4 - 4y(x)\left(xy'(x) - 2y(x)\right)^2 = 0$$

✓ **Mathematica** : cpu = 19.4573 (sec), leaf count = 503

```
DSolve[Derivative[1][y][x]^4 - 4*y[x]*(-2*y[x] + x*Derivative[1][y][x])^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\frac{\sqrt{\left(x^2+4\sqrt{y(x)}\right)y(x)}\log\left(\sqrt{x^2+4\sqrt{y(x)}}-x\right)}{\sqrt{x^2+4\sqrt{y(x)}}\sqrt{y(x)}}+\frac{1}{4}\left(\log(y(x))-\frac{\sqrt{x^2+4\sqrt{y(x)}}\sqrt{y(x)}\log(y(x))}{\sqrt{\left(x^2+4\sqrt{y(x)}\right)y(x)}}\right)\right.\right.$$

✓ **Maple** : cpu = 0.214 (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))
```

$$y(x) = \frac{x^4}{16}$$

2.548 ODE No. 548

$$y'(x)^6-(y(x)-a)^4(y(x)-b)^3=0$$

✓ **Mathematica** : cpu = 0.744384 (sec), leaf count = 479

```
DSolve[-((-a + y[x])^4*(-b + y[x])^3) + Derivative[1][y][x]^6 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{3\sqrt[3]{a-\#1}\sqrt{\frac{\#1-b}{a-b}}\,\text{Hypergeometric2F1}\left(\frac{1}{3},\frac{1}{2},\frac{4}{3},\frac{a-\#1}{a-b}\right)}{\sqrt{b-\#1}}\&\right][c_1-ix]\right\},\left\{y(x)\to \text{I}\right.\right.$$

✓ **Maple** : cpu = 0.379 (sec), leaf count = 250

```
dsolve(diff(y(x),x)^6-(y(x)-a)^4*(y(x)-b)^3=0,y(x))
```

$$y(x)=a$$

2.549 ODE No. 549

$$x^2 \left(y'(x)^2+1\right)^3-a^2=0$$

✓ **Mathematica** : cpu = 19.1034 (sec), leaf count = 376

```
DSolve[-a^2 + x^2*(1 + Derivative[1][y][x]^2)^3 == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\sqrt[3]{x}\sqrt{\frac{a^{2/3}}{x^{2/3}}-1}\left(a^{2/3}-x^{2/3}\right)+c_1\right\},\left\{y(x)\to \sqrt[3]{x}\sqrt{\frac{a^{2/3}}{x^{2/3}}-1}\left(a^{2/3}-x^{2/3}\right)+c_1\right\},\left\{y(x)\to c_1-\right.\right.$$

✓ **Maple** : cpu = 1.006 (sec), leaf count = 545

```
dsolve(x^2*(diff(y(x),x)^2+1)^3-a^2=0,y(x))
```

$$y(x)=\frac{\sqrt{-\frac{(a^2x)^{\frac{4}{3}}\left((a^2x)^{\frac{2}{3}}-a^2\right)}{a^4}}\left((a^2x)^{\frac{2}{3}}-a^2\right)}{(a^2x)^{\frac{2}{3}}}+c_1$$

2.550 ODE No. 550

$$-ay(x)^s - bx^{\frac{rs}{r-s}} + y'(x)^r = 0$$

✓ **Mathematica** : cpu = 0.931415 (sec), leaf count = 488

```
DSolve[-(b*x^((r*s)/(r - s))) - a*y[x]^s + Derivative[1][y][x]^r == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{r}{-rx\left(aK[2]^s+bx^{\frac{rs}{r-s}}\right)^{\frac{1}{r}}+sx\left(aK[2]^s+bx^{\frac{rs}{r-s}}\right)^{\frac{1}{r}}+rK[2]}-\int_1^x\left(\frac{asK[2]^{s-1}\left(a\right.}{rK[1]\left(aK[2]^s+bK[1]^{\frac{rs}{r-s}}\right)^{\frac{1}{r}}\cdots}\right.\right.\right.$$

✓ **Maple** : cpu = 0.283 (sec), leaf count = 64

```
dsolve(diff(y(x),x)^r-a*y(x)^s-b*x^(r*s/(r-s))=0,y(x))
```

$$-\left(\int_{\_b}^{y(x)}\frac{1}{x\left(r-s\right)\left(a\_a^s+b\,x^{\frac{rs}{r-s}}\right)^{\frac{1}{r}}-r\_a}d\_a\right)+\frac{\ln\left(x\right)}{r-s}-c_1=0$$

2.551 ODE No. 551

$$y'(x)^n - f(x)^n(y(x)-a)^{n+1}(y(x)-b)^{n-1} = 0$$

✓ **Mathematica** : cpu = 0.171662 (sec), leaf count = 84

```
DSolve[-(f[x]^n*(-a + y[x])^(1 + n)*(-b + y[x])^(-1 + n)) + Derivative[1][y][x]^n == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{-bn^n - a(a-b)^n\left(\int_1^x -(-1)^{\frac{1}{n}} f(K[1])dK[1] + c_1\right)^n}{-n^n - (a-b)^n\left(\int_1^x -(-1)^{\frac{1}{n}} f(K[1])dK[1] + c_1\right)^n}\right\}\right\}$$

✓ **Maple** : cpu = 0.664 (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))
```

$$y(x) = \frac{b\left(-\frac{n}{(a-b)\left(\int f(x)dx + c_1\right)}\right)^n - a}{-1 + \left(-\frac{n}{(a-b)\left(\int f(x)dx + c_1\right)}\right)^n}$$

2.552 ODE No. 552

$$y'(x)^n - f(x)g(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.0380237 (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 = 0.071 (sec), leaf count = 43

```
dsolve(diff(y(x),x)^n-f(x)*g(y(x))=0,y(x))
```

$$\int^{y(x)} g(\_a)^{-\frac{1}{n}}\,d\_a + \int^{x} -(f(\_a)\,g(y(x)))^{\frac{1}{n}}\,g(y(x))^{-\frac{1}{n}}\,d\_a + c_1 = 0$$

2.553 ODE No. 553

$$a y'(x)^m + b y'(x)^n - y(x) = 0$$

✓ **Mathematica** : cpu = 0.191615 (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 = 0.053 (sec), leaf count = 36

```
dsolve(a*diff(y(x),x)^m+b*diff(y(x),x)^n-y(x)=0,y(x))
```

$$y(x) = 0$$

2.554 ODE No. 554

$$x^{n-1}y'(x)^n - nxy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.111001 (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 = 0.237 (sec), leaf count = 40

```
dsolve(x^(n-1)*diff(y(x),x)^n-n*x*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x)=-\left(\frac{c_1\left(\frac{x}{c_1}\right)^{\frac{1}{n}}}{x}\right)^n x^{n-1}+nc_1\left(\frac{x}{c_1}\right)^{\frac{1}{n}}$$

2.555 ODE No. 555

$$xy'(x) + \sqrt{y'(x)^2 + 1} - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0045733 (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 = 0.034 (sec), leaf count = 15

```
dsolve((diff(y(x),x)^2+1)^(1/2)+x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = \sqrt{c_1^2 + 1} + xc_1$$

2.556 ODE No. 556

$$xy'(x)^2+\sqrt{y'(x)^2+1}+y(x)=0$$

✓ **Mathematica** : cpu = 3.20212 (sec), leaf count = 78

```
DSolve[y[x] + x*Derivative[1][y][x]^2 + Sqrt[1 + Derivative[1][y][x]^2] == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x=\frac{\log\left(\sqrt{K[1]^2+1}-K[1]\right)-\sqrt{K[1]^2+1}}{(K[1]+1)^2}+\frac{c_1}{(K[1]+1)^2},y(x)=-xK[1]^2-\sqrt{K[1]^2+1}\right\},\{y(x),K$$

✓ **Maple** : cpu = 0.44 (sec), leaf count = 581

```
dsolve((diff(y(x),x)^2+1)^(1/2)+x*diff(y(x),x)^2+y(x)=0,y(x))
```

$$\frac{x^2c_1}{\left(\sqrt{-4xy\left(x\right)+2+2\sqrt{4x^2-4xy\left(x\right)+1}}-2x\right)^2}+x+\frac{2x^2\left(\sqrt{2}\sqrt{\frac{2x^2-2xy(x)+\sqrt{4x^2-4xy(x)+1}+1}{x^2}}-2\,\text{arcsinh}\left(\frac{\sqrt{-4}}{}\right.\right.}{\left(\sqrt{-4xy\left(x\right)+2+2\sqrt{4x^2-4xy\left(x\right)+}}\right.}$$

2.557 ODE No. 557

$$x\left(y'(x)+\sqrt{y'(x)^2+1}\right)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0320678 (sec), leaf count = 39

```
DSolve[-y[x] + x*(Derivative[1][y][x] + Sqrt[1 + Derivative[1][y][x]^2]) == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\sqrt{-x^2+c_1x}\right\},\left\{y(x)\to \sqrt{-x^2+c_1x}\right\}\right\}$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 105

```
dsolve(x*((diff(y(x),x)^2+1)^(1/2)+diff(y(x),x))-y(x)=0,y(x))
```

$$y(x)=\frac{x\left(\sqrt{-\frac{c_1^2}{x(-2c_1+x)}}\sqrt{-x^2+2xc_1}+c_1-x\right)}{\sqrt{-x^2+2xc_1}}$$

2.558 ODE No. 558

$$ax\sqrt{y'(x)^2+1}+xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.335585 (sec), leaf count = 223

```
DSolve[-y[x] + x*Derivative[1][y][x] + a*x*Sqrt[1 + Derivative[1][y][x]^2] == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\frac{2i\arctan\left(\frac{y(x)}{x\sqrt{a^2-\frac{y(x)^2}{x^2}-1}}\right)-2ia\arctan\left(\frac{ay(x)}{x\sqrt{a^2-\frac{y(x)^2}{x^2}-1}}\right)+a\log\left(\frac{y(x)^2}{x^2}+1\right)}{2a^2-2}=\frac{a\log\left(x-a^2x\right)}{1-a^2}+c_1,y(\right.\right.$$

✓ **Maple** : cpu = 0.365 (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))
```

$$x-\frac{e^{\frac{\operatorname{arcsinh}\left(\frac{\sqrt{-a^2x^2+x^2+y(x)^2}\,a+y(x)}{(a^2-1)x}\right)}{a}}c_1}{\sqrt{\frac{-a^2x^2+a^2y(x)^2+2\sqrt{-a^2x^2+x^2+y(x)^2}\,ay(x)+x^2+y(x)^2}{(a^2-1)^2x^2}}}=0$$

2.559 ODE No. 559

$$-ay(x)y'(x) - ax + y(x)\sqrt{y'(x)^2 + 1} = 0$$

✓ **Mathematica** : cpu = 0.176103 (sec), leaf count = 423

```
DSolve[-(a*x) - a*y[x]*Derivative[1][y][x] + y[x]*Sqrt[1 + Derivative[1][y][x]^2] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{a^6\left(-x^2\right)+3a^4x^2-3a^2x^2-2a^2xe^{a^2c_1-c_1}+2xe^{a^2c_1-c_1}+e^{2a^2c_1-2c_1}+x^2}}{\sqrt{a^6-3a^4+3a^2-1}}\right\},\left\{y(x)\to \frac{\sqrt{a^6\left(-x^2\right)}}{}\right.\right.$$

✓ **Maple** : cpu = 0.171 (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))
```

$$-\mathrm{e}^{\int^{\frac{-a^2x+\sqrt{\left(a^2-1\right)y(x)^2+a^2x^2}}{\left(a^2-1\right)y(x)}}\frac{\left(a\sqrt{\_a^2+1}-\_a\right)a}{\sqrt{\_a^2+1}\left(\_aa-\sqrt{\_a^2+1}\right)\left(a\_a^2-\sqrt{\_a^2+1}\_a+a\right)}d\_a}c_1+x=0$$

2.560 ODE No. 560

$$ay(x)\sqrt{y'(x)^2+1}-x^2-2xy(x)y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 27.597 (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] == 0,y[x
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{a^2{c_1}^2\left(-x^2\right)-4a^2c_1x-4a^2+4x^2}}{\sqrt{-4+a^2{c_1}^2}}\right\},\left\{y(x)\to \frac{\sqrt{a^2{c_1}^2\left(-x^2\right)-4a^2c_1x-4a^2+4x^2}}{\sqrt{-4+a^2{c_1}^2}}\right\}\right\}$$

✓ **Maple** : cpu = 1.044 (sec), leaf count = 1058

```
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(y\left(x\right)^4-\left(-2_a^2+a^2\right)y\left(x\right)^2+_a^4\right)}}{-2a^2_ay\left(x\right)^2+2_a^5+4_a^3y\left(x\right)^2+2y\left(x\right)^4_a+_a^2\sqrt{a^2\left(y\left(x\right)^4-\left(-2_a^2+a^2\right)y\left(x\right)^2+_a^4\right)}-y\left(x\right)^2

2.561 ODE No. 561

$$f\left(x^2+y(x)^2\right)\sqrt{y'(x)^2+1}-xy'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 2.1243 (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[x],x]
```

$$\left\{\text{Solve}\left[\int_1^x\left(\frac{\sqrt{f\left(K[1]^2+y(x)^2\right)^2\left(-f\left(K[1]^2+y(x)^2\right)^2+K[1]^2+y(x)^2\right)}K[1]}{f\left(K[1]^2+y(x)^2\right)^2\left(K[1]^2+y(x)^2\right)}-\frac{\sqrt{f\left(K[1]^2+y(x)^2\right)^2\left(-f\left(K\right.\right.}}{f\left(K[1]^2+y(x)^2\right)^2\left(-f\left(\right.\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 2.103 (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))
```

$$y(x)=\frac{x}{\tan\left(\text{RootOf}\left(-2\_Z+\int^{\frac{x^2\left(\tan(\_Z)^2+1\right)}{\tan(\_Z)^2}}\frac{f(\_a)}{\sqrt{-f(\_a)^2+\_a}\,\_a}d\_a+2c_1\right)\right)}$$

2.562 ODE No. 562

$$a\sqrt[3]{y'(x)^3+1}+bxy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0898772 (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 = 0.229 (sec), leaf count = 3288

```
dsolve(a*(diff(y(x),x)^3+1)^(1/3)+b*x*diff(y(x),x)-y(x)=0,y(x))
```

Expression too large to display

2.563 ODE No. 563

$$ay(x) + b + xy'(x) + \log\left(y'(x)\right) = 0$$

✓ **Mathematica** : cpu = 0.139849 (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 = 0.204 (sec), leaf count = 66

```
dsolve(ln(diff(y(x),x))+x*diff(y(x),x)+a*y(x)+b=0,y(x))
```

$$-\left(\mathrm{e}^{-ay(x)-\mathrm{LambertW}\left(x\,\mathrm{e}^{-ay(x)-b}\right)-b}\right)^{-\frac{1}{a+1}}c_1+x-\frac{\mathrm{e}^{ay(x)+\mathrm{LambertW}\left(x\,\mathrm{e}^{-ay(x)-b}\right)+b}}{a}=0$$

2.564 ODE No. 564

$$a(xy'(x) - y(x)) + \log(y'(x)) = 0$$

✓ **Mathematica** : cpu = 0.0035055 (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 = 0.02 (sec), leaf count = 32

```
dsolve(ln(diff(y(x),x))+a*(x*diff(y(x),x)-y(x))=0,y(x))
```

$$y(x) = \frac{\ln\left(-\frac{1}{ax}\right) - 1}{a}$$

2.565 ODE No. 565

$$y'(x) + y(x)\log\left(y'(x)\right) - xy(x) - y(x)\log(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.0321817 (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,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{\frac{1}{2}W(e^x)^2+W(e^x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.247 (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))
```

$$y(x) = c_1\mathrm{e}^{\frac{\mathrm{LambertW}(\mathrm{e}^x)(\mathrm{LambertW}(\mathrm{e}^x)+2)}{2}}$$

2.566 ODE No. 566

$$y'(x) + \sin\left(y'(x)\right) - x = 0$$

✓ **Mathematica** : cpu = 0.0352246 (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 = 0.025 (sec), leaf count = 16

```
dsolve(sin(diff(y(x),x))+diff(y(x),x)-x=0,y(x))
```

$$y(x) = \int \text{RootOf}\left(\sin\left(\_Z\right) + \_Z - x\right) dx + c_1$$

2.567 ODE No. 567

$$a\cos(y'(x)) + by'(x) + x = 0$$

✓ **Mathematica** : cpu = 0.0656066 (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 = 0.035 (sec), leaf count = 18

```
dsolve(a*cos(diff(y(x),x))+b*diff(y(x),x)+x=0,y(x))
```

$$y(x) = \int \text{RootOf}\left(a\cos(\_Z) + \_Zb + x\right) dx + c_1$$

2.568 ODE No. 568

$$y'(x)^2 \sin (y'(x)) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0781063 (sec), leaf count = 34

```
DSolve[-y[x] + Sin[Derivative[1][y][x]]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\text{Solve}\left[\left\{x = K[1]\sin(K[1]) - \cos(K[1]) + c_1, y(x) = K[1]^2\sin(K[1])\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.059 (sec), leaf count = 32

```
dsolve(diff(y(x),x)^2*sin(diff(y(x),x))-y(x)=0,y(x))
```

$$y(x) = 0$$

2.569 ODE No. 569

$$\left(y'(x)^2+1\right)\sin^2\left(y(x)-xy'(x)\right)-1=0$$

✓ **Mathematica** : cpu = 0.0714154 (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]
```

$$\left\{\left\{y(x)\to c_1x-\frac{1}{2}\arccos\left(\frac{-1+c_1{}^2}{1+c_1{}^2}\right)\right\},\left\{y(x)\to\frac{1}{2}\arccos\left(\frac{-1+c_1{}^2}{1+c_1{}^2}\right)+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.271 (sec), leaf count = 139

```
dsolve((diff(y(x),x)^2+1)*sin(x*diff(y(x),x)-y(x))^2-1=0,y(x))
```

$$y(x)=-x\sqrt{\frac{1}{x}}\,\sqrt{1-x}-\arcsin\left(\frac{1}{\sqrt{\frac{1}{x}}}\right)$$

2.570 ODE No. 570

$$\left(y'(x)^2+1\right)\left(ax+\arctan\left(y'(x)\right)\right)+y'(x)=0$$

✓ **Mathematica** : cpu = 1.19628 (sec), leaf count = 58

```
DSolve[Derivative[1][y][x] + (a*x + ArcTan[Derivative[1][y][x]])*(1 + Derivative[1][y][x]^2) == 0,y[x
```

$$\text{Solve}\left[\left\{y(x)=\frac{1}{a\left(K[1]^2+1\right)}+c_1,x=\frac{K[1]^2(-\arctan(K[1]))-\arctan(K[1])-K[1]}{a\left(K[1]^2+1\right)}\right\},\{y(x),K[1]\}\right]$$

✓ **Maple** : cpu = 0.043 (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))
```

$$y(x)=\int\tan\left(\text{RootOf}\left(a\tan\left(\_Z\right)^2x+\tan\left(\_Z\right)^2\_Z+ax+\tan\left(\_Z\right)+\_Z\right)\right)dx+c_1$$

2.571 ODE No. 571

$$ax^n f(y'(x)) + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.104279 (sec), leaf count = 124

```
DSolve[a*x^n*f[Derivative[1][y][x]] - y[x] + x*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\left\{y(x) = ax^n f(K[1]) + xK[1], x = \left(nf(K[1])^{\frac{1}{n}-1}\int_1^{K[1]} -\frac{f(K[2])^{\frac{n-1}{n}-1}}{an}dK[2] - f(K[1])^{\frac{1}{n}-1}\int_1^{K[1]} -\frac{f(K$$

✓ **Maple** : cpu = 0.81 (sec), leaf count = 169

```
dsolve(a*x^n*f(diff(y(x),x))+x*diff(y(x),x)-y(x)=0,y(x))
```

$$\left[y(\_T) = a\left(\left(\frac{(1-n)\left(\int f(\_T)^{-\frac{1}{n}}d\_T\right) + c_1 an}{anf(\_T)}\right)^{\frac{1}{n-1}} f(\_T)^{\frac{1}{n(n-1)}}\right)^n f(\_T) + \left(\frac{(1-n)\left(\int f(\_T)^{-\frac{1}{n}}d\_T\right)}{anf(\_T)}\right.$$

2.572 ODE No. 572

$$f(y'(x))\left(xy'(x)-y(x)\right)^n+y(x)g(y'(x))+xh(y'(x))=0$$

✗ **Mathematica** : cpu = 0.0474105 (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] + x*Der
```

, 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,y(x)
```

2.573 ODE No. 573

$$f\left(xy'(x)^2\right) + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0186325 (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 = 0.084 (sec), leaf count = 24

```
dsolve(f(x*diff(y(x),x)^2)+2*x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = c_1 + 2\sqrt{x}\ \mathrm{RootOf}\left(-f\left(\_Z^2\right) - 2\_Z + c_1 + c_2\right)$$

2.574 ODE No. 574

$$f\left(x-\frac{3}{2}y'(x)^2\right)+y'(x)^3-y(x)=0$$

✓ **Mathematica** : cpu = 0.0249221 (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]
```

$$\left\{\left\{y(x)\to\frac{1}{9}\left(9f(c_1)+2\sqrt{6}x\sqrt{x-c_1}-2\sqrt{6}c_1\sqrt{x-c_1}\right),y(x)\to\frac{1}{9}\left(9f(c_1)-2\sqrt{6}x\sqrt{x-c_1}+2\sqrt{6}c_1\sqrt{x-c_1}\right)\right\}\right.$$

✓ **Maple** : cpu = 0.111 (sec), leaf count = 41

```
dsolve(f(x-3/2*diff(y(x),x)^2)+diff(y(x),x)^3-y(x)=0,y(x))
```

$$y(x)=f(c_1)-\frac{2\sqrt{6}\sqrt{(x-c_1)^3}}{9}$$

2.575 ODE No. 575

$$y'(x)f\left(xy(x)y'(x)-y(x)^2\right)+x^2\left(-y'(x)\right)+xy(x)=0$$

✗ **Mathematica** : cpu = 0.0274654 (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[1][y][x]
```

, could not solve

```
DSolve[x*y[x] - x^2*Derivative[1][y][x] + f[-y[x]^2 + x*y[x]*Derivative[1][y][x]]*Derivative
```

✗ **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))
```

2.576 ODE No. 576

$$\phi\big(f(x, y(x), y'(x)), g(x, y(x), y'(x))\big) = 0$$

✗ **Mathematica** : cpu = 0.0134092 (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], 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))
```

2.577 ODE No. 577

$$y'(x) = F\left(\frac{y(x)}{a+x}\right)$$

✓ **Mathematica** : cpu = 0.293297 (sec), leaf count = 243

```
DSolve[Derivative[1][y][x] == F[y[x]/(a + x)],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{1}{-aF\left(\frac{K[2]}{a+x}\right)-xF\left(\frac{K[2]}{a+x}\right)+K[2]}-\int_1^x\left(\frac{F'\left(\frac{K[2]}{a+K[1]}\right)}{(a+K[1])\left(aF\left(\frac{K[2]}{a+K[1]}\right)+K[1]F\left(\frac{K[2]}{a+K[1]}\right)-K[2]\right)}-\right.\right.\right.$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 28

```
dsolve(diff(y(x),x) = F(y(x)/(x+a)),y(x))
```

$$y(x) = -\operatorname{RootOf}\left(\int^{\_Z}\frac{1}{F(-\_a)+\_a}d\_a+\ln(x+a)+c_1\right)(x+a)$$

2.578 ODE No. 578

$$y'(x) = F\left(y(x) - x^2\right) + 2x$$

✓ **Mathematica** : cpu = 0.174633 (sec), leaf count = 100

```
DSolve[Derivative[1][y][x] == 2*x + F[-x^2 + y[x]],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(K[2]-x^2\right)\int_1^x -\frac{2K[1]F'\left(K[2]-K[1]^2\right)}{F(K[2]-K[1]^2)^2}dK[1]+1}{F\left(K[2]-x^2\right)}dK[2] + \int_1^x \left(\frac{2K[1]}{F\left(y(x)-K[1]^2\right)}+1\right)dK[1] = c_1,\right.$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = 2*x+F(y(x)-x^2),y(x))
```

$$y(x) = x^2 + \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{F\left(\_a\right)} d\_a + c_1\right)$$

2.579 ODE No. 579

$$y'(x) = F\left(\frac{ax^2}{4} + \frac{bx}{2} + y(x)\right) - \frac{ax}{2}$$

✓ **Mathematica** : cpu = 0.216944 (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 = 0.043 (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))
```

$$y(x) = -\frac{a\,x^2}{4} - \frac{bx}{2} + \text{RootOf}\left(-x + 2\left(\int^{\_Z}\frac{1}{2F(\_a)+b}d\_a\right) + c_1\right)$$

2.580 ODE No. 580

$$y'(x) = e^{bx}F\left(e^{-bx}y(x)\right)$$

✓ **Mathematica** : cpu = 0.248777 (sec), leaf count = 203

```
DSolve[Derivative[1][y][x] == E^(b*x)*F[y[x]/E^(b*x)],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{1}{bK[2]-e^{bx}F\left(e^{-bx}K[2]\right)}-\int_1^x\left(\frac{F'\left(e^{-bK[1]}K[2]\right)}{e^{bK[1]}F\left(e^{-bK[1]}K[2]\right)-bK[2]}-\frac{e^{bK[1]}F\left(e^{-bK[1]}K[2]\right)\left(F'\left(e^{-bK\right.\right.}{\left(e^{bK[1]}F\left(e^{-bK[1]}K[2]\right)-\right.}\right.\right.$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 31

```
dsolve(diff(y(x),x) = F(y(x)*exp(-b*x))*exp(b*x),y(x))
```

$$y(x) = \text{RootOf}\left(-x+\int^{\_Z}\frac{1}{F\left(\_a\right)-\_ab}d\_a+c_1\right)\mathrm{e}^{bx}$$

2.581 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 = 0.245338 (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 = 0.078 (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))
```

$$y(x) = \frac{4\,\text{RootOf}\left(\left(\int^{-Z}\frac{1}{F(\_a)}d\_a\right)x+xc_1+1\right)x^2-1}{4x^2}$$

2.582 ODE No. 582

$$y'(x) = \frac{ax^2 F\left(\frac{axy(x)+1}{ax}\right) + 1}{ax^2}$$

✓ **Mathematica** : cpu = 0.294985 (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]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(\frac{axK[2]+1}{ax}\right)\int_1^x \frac{F'\left(\frac{aK[1]K[2]+1}{aK[1]}\right)}{aF\left(\frac{aK[1]K[2]+1}{aK[1]}\right)^2 K[1]^2} dK[1] - 1}{F\left(\frac{axK[2]+1}{ax}\right)} dK[2] + \int_1^x \left(-1 - \frac{1}{aK[1]^2 F\left(\frac{aK[1]y(x)+1}{aK[1]}\right)}\right) dK[1$$

✓ **Maple** : cpu = 0.148 (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))
```

$$y(x) = \frac{\text{RootOf}\left(-x + \int^{\_Z} \frac{1}{F(\_a)} d\_a + c_1\right) ax - 1}{ax}$$

2.583 ODE No. 583

$$y'(x) = -\frac{1}{2}x\left(ax^2 - 2F\left(\frac{ax^4}{8} + y(x)\right)\right)$$

✓ **Mathematica** : cpu = 0.260122 (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]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(\frac{ax^4}{8}+K[2]\right)\int_1^x \frac{aK[1]^3F'\left(\frac{1}{8}aK[1]^4+K[2]\right)}{2F\left(\frac{1}{8}aK[1]^4+K[2]\right)^2}dK[1]+1}{F\left(\frac{ax^4}{8}+K[2]\right)}dK[2] + \int_1^x \left(K[1] - \frac{aK[1]^3}{2F\left(\frac{1}{8}aK[1]^4+y(x)\right)}\right) d$$

✓ **Maple** : cpu = 0.112 (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))
```

$$y(x) = -\frac{a\,x^4}{8} + \text{RootOf}\left(-x^2 + 2\left(\int^{\_Z} \frac{1}{F(\_a)}d\_a\right) + 2c_1\right)$$

2.584 ODE No. 584

$$y'(x) = \frac{2a}{2aF\left(y(x)^2 - 4ax\right) + y(x)}$$

✓ **Mathematica** : cpu = 0.239824 (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]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{K[2]}{4a^2F\left(K[2]^2-4ax\right)} - \frac{2a\int_1^x \frac{K[2]F'\left(K[2]^2-4aK[1]\right)}{aF\left(K[2]^2-4aK[1]\right)^2}dK[1]-1}{2a}\right)dK[2] + \int_1^x -\frac{1}{2aF\left(y(x)^2-4aK[1]\right)}\right.$$

✓ **Maple** : cpu = 0.067 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = 2*a/(y(x)+2*F(y(x)^2-4*a*x)*a),y(x))
```

$$\frac{y(x)}{2a} + \frac{\int^{y(x)^2-4ax} \frac{1}{F(\_a)} d\_a}{8a^2} - c_1 = 0$$

2.585 ODE No. 585

$$y'(x) = y(x)F(\log(\log(y(x))) - \log(x))$$

✓ **Mathematica** : cpu = 0.206238 (sec), leaf count = 205

```
DSolve[Derivative[1][y][x] == F[-Log[x] + Log[Log[y[x]]]]*y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{1}{K[2](xF(\log(\log(K[2]))-\log(x))-\log(K[2]))}-\int_1^x\left(\frac{F(\log(\log(K[2]))-\log(K[1]))\left(\frac{K[1]F'(\log}{F}\right.}{(F(\log(\log(K[2]))-\log(K[1]))F}\right.\right.\right.$$

✓ **Maple** : cpu = 1.086 (sec), leaf count = 120

```
dsolve(diff(y(x),x) = F(ln(ln(y(x)))-ln(x))*y(x),y(x))
```

$$\int_{\_b}^{x}\frac{F(\ln(\ln(y(x)))-\ln(\_a))}{-\_aF(\ln(\ln(y(x)))-\ln(\_a))+\ln(y(x))}d\_a+\int^{y(x)}\left(-\frac{1}{\_f(-xF(\ln(\ln(\_f))-\ln(x))+\ln(\_f))}-\left(\int_{\_b}^{x}\right.\right.$$

2.586 ODE No. 586

$$y'(x)=\frac{xF\left(\frac{y(x)}{\sqrt{x^2+1}}\right)}{\sqrt{x^2+1}}$$

✓ **Mathematica** : cpu = 0.892318 (sec), leaf count = 975

```
DSolve[Derivative[1][y][x] == (x*F[y[x]/Sqrt[1 + x^2]])/Sqrt[1 + x^2],y[x],x]
```

$$\text{Solve}\left[\int_1^x\left(-\frac{K[1]\sqrt{K[1]^2+1}F\left(\frac{y(x)}{\sqrt{K[1]^2+1}}\right)^3}{y(x)\left(K[1]^2F\left(\frac{y(x)}{\sqrt{K[1]^2+1}}\right)^2+F\left(\frac{y(x)}{\sqrt{K[1]^2+1}}\right)^2-y(x)^2\right)}-\frac{K[1]F\left(\frac{y(x)}{\sqrt{K[1]^2+1}}\right)^2}{K[1]^2F\left(\frac{y(x)}{\sqrt{K[1]^2+1}}\right)^2+F\left(\frac{y(x)}{\sqrt{K[1]^2+1}}\right)^2\right.\right.$$

✓ **Maple** : cpu = 0.232 (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))
```

$$y(x)=\text{RootOf}\left(-\ln\left(x^2+1\right)+2\left(\int^{\_Z}\frac{1}{F\left(\_a\right)-\_a}d\_a\right)+2c_1\right)\sqrt{x^2+1}$$

2.587 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 = 0.250966 (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]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(K[2]-\frac{x^3}{6}\right)\int_1^x -\frac{K[1]^2F'\left(K[2]-\frac{K[1]^3}{6}\right)}{2F\left(K[2]-\frac{K[1]^3}{6}\right)^2}dK[1]+1}{F\left(K[2]-\frac{x^3}{6}\right)}dK[2] + \int_1^x \left(\frac{K[1]^2}{2F\left(y(x)-\frac{K[1]^3}{6}\right)}+\sqrt{K[1]}\right) dK$$

✓ **Maple** : cpu = 0.103 (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))
```

$$\int_{\_b}^{y(x)} \frac{1}{F\left(\_a - \frac{x^3}{6}\right)} d\_a - \frac{2x^{\frac{3}{2}}}{3} - c_1 = 0$$

2.588 ODE No. 588

$$y'(x) = \frac{F((y(x)-x)(y(x)+x))+x}{y(x)}$$

✓ **Mathematica** : cpu = 0.180313 (sec), leaf count = 109

```
DSolve[Derivative[1][y][x] == (x + F[(-x + y[x])*(x + y[x])])/y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\frac{K[2]}{F((K[2]-x)(x+K[2]))}-\int_1^x -\frac{2K[1]K[2]F'((K[2]-K[1])(K[1]+K[2]))}{F((K[2]-K[1])(K[1]+K[2]))^2}dK[1]\right)dK[2]+\int_1^{\cdot}$$

✓ **Maple** : cpu = 0.116 (sec), leaf count = 53

```
dsolve(diff(y(x),x) = (x+F(-(x-y(x))*(y(x)+x)))/y(x),y(x))
```

$$y(x) = \sqrt{x^2 + \text{RootOf}\left(-2x + \int^{\_Z} \frac{1}{F(\_a)} d\_a + 2c_1\right)}$$

2.589 ODE No. 589

$$y'(x)=\frac{y(x)^2F\left(\frac{1-y(x)\log(x)}{y(x)}\right)}{x}$$

✓ **Mathematica** : cpu = 0.2254 (sec), leaf count = 245

```
DSolve[Derivative[1][y][x] == (F[(1 - Log[x]*y[x])/y[x]]*y[x]^2)/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{1}{\left(-F\left(\frac{1-K[2]\log(x)}{K[2]}\right)-1\right)K[2]^2}-\int_1^x\left(\frac{\left(-\frac{\log(K[1])}{K[2]}-\frac{1-K[2]\log(K[1])}{K[2]^2}\right)F'\left(\frac{1-K[2]\log(K[1])}{K[2]}\right)}{\left(F\left(\frac{1-K[2]\log(K[1])}{K[2]}\right)+1\right)K[1]}-\frac{F\left(1\right.}{}\right.\right.\right.$$

✓ **Maple** : cpu = 0.149 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = F(-(-1+y(x)*ln(x))/y(x))*y(x)^2/x,y(x))
```

$$\int_{\_b}^{y(x)}\frac{1}{\left(F\left(\frac{1-\_a\ln(x)}{\_a}\right)+1\right)\_a^2}d\_a-\ln(x)-c_1=0$$

2.590 ODE No. 590

$$y'(x) = \frac{x}{F\left(x^2 + y(x)^2\right) - y(x)}$$

✓ **Mathematica** : cpu = 0.226528 (sec), leaf count = 94

```
DSolve[Derivative[1][y][x] == x/(F[x^2 + y[x]^2] - y[x]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{K[2]}{F\left(x^2 + K[2]^2\right)} - \int_1^x \frac{2K[1]K[2]F'\left(K[1]^2 + K[2]^2\right)}{F\left(K[1]^2 + K[2]^2\right)^2} dK[1] + 1\right) dK[2] + \int_1^x -\frac{K[1]}{F\left(K[1]^2 + y(x)^2\right)}\right.$$

✓ **Maple** : cpu = 0.118 (sec), leaf count = 28

```
dsolve(diff(y(x),x) = x/(-y(x)+F(y(x)^2+x^2)),y(x))
```

$$-y(x) + \frac{\left(\int^{y(x)^2 + x^2} \frac{1}{F(\_a)} d\_a\right)}{2} - c_1 = 0$$

2.591 ODE No. 591

$$y'(x) = \frac{xF\left(\frac{ay(x)^2+bx^2}{a}\right)}{\sqrt{a}y(x)}$$

✓ **Mathematica** : cpu = 0.499532 (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]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{bK[2]}{b+\sqrt{a}F\left(\frac{bx^2+aK[2]^2}{a}\right)} - \int_1^x \left(\frac{2bK[1]K[2]F'\left(\frac{bK[1]^2+aK[2]^2}{a}\right)}{\sqrt{a}\left(b+\sqrt{a}F\left(\frac{bK[1]^2+aK[2]^2}{a}\right)\right)} - \frac{2bF\left(\frac{bK[1]^2+aK[2]^2}{a}\right)K[1]K[2]F}{\left(b+\sqrt{a}F\left(\frac{bK[1]^2+aK}{a}\right.\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.228 (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))
```

$$y(x) = \frac{\sqrt{a\left(-b\,x^2 + \mathrm{RootOf}\left(\left(\int^{-Z} \frac{1}{F(\_a)a+b\sqrt{a}}d\_a\right)b\,a^{\frac{3}{2}} - b\,x^2 + 2c_1a\right)a\right)}}{a}$$

2.592 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 = 0.524754 (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],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(-\frac{2x^3}{5} - 2\sqrt{x} + K[2]\right)\int_1^x \left(-\frac{6F'\left(-\frac{2}{5}K[1]^3 - 2\sqrt{K[1]} + K[2]\right)K[1]^2}{5F\left(-\frac{2}{5}K[1]^3 - 2\sqrt{K[1]} + K[2]\right)^2} - \frac{F'\left(-\frac{2}{5}K[1]^3 - 2\sqrt{K[1]} + K[2]\right)}{F\left(-\frac{2}{5}K[1]^3 - 2\sqrt{K[1]} + K[2]\right)^2\sqrt{K[1]}}\right) d}{F\left(-\frac{2x^3}{5} - 2\sqrt{x} + K[2]\right)}\right.$$

✓ **Maple** : cpu = 0.149 (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))
```

$$\int_{\_b}^{y(x)} \frac{1}{F\left(\_a - \frac{2x^3}{5} - 2\sqrt{x}\right)} d\_a - \ln(x) - c_1 = 0$$

2.593 ODE No. 593

$$y'(x) = \frac{e^x F\left(y(x)^{3/2} - \frac{3e^x}{2}\right)}{\sqrt{y(x)}}$$

✓ **Mathematica** : cpu = 0.284626 (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]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{\sqrt{K[2]}}{F\left(K[2]^{3/2} - \frac{3e^x}{2}\right) - 1} - \int_1^x \left(\frac{3e^{K[1]} F\left(K[2]^{3/2} - \frac{3e^{K[1]}}{2}\right) \sqrt{K[2]} F'\left(K[2]^{3/2} - \frac{3e^{K[1]}}{2}\right)}{2\left(F\left(K[2]^{3/2} - \frac{3e^{K[1]}}{2}\right) - 1\right)^2} - \frac{3e^{K[1]} \sqrt{}}{2\left(F\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.213 (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))
```

$$\int_{\_b}^{y(x)} \frac{\sqrt{\_a}}{F\left(\_a^{\frac{3}{2}} - \frac{3\,\mathrm{e}^x}{2}\right) - 1} d\_a - \mathrm{e}^x - c_1 = 0$$

2.594 ODE No. 594

$$y'(x)=\frac{xF\left(\frac{y(x)^2-b}{x^2}\right)}{y(x)}$$

✓ **Mathematica** : cpu = 0.411766 (sec), leaf count = 236

```
DSolve[Derivative[1][y][x] == (x*F[(-b + y[x]^2)/x^2])/y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\frac{K[2]}{-F\left(\frac{K[2]^2-b}{x^2}\right)x^2+K[2]^2-b}-\int_1^x\left(\frac{F\left(\frac{K[2]^2-b}{K[1]^2}\right)K[1]\left(2K[2]F'\left(\frac{K[2]^2-b}{K[1]^2}\right)-2K[2]\right)}{\left(F\left(\frac{K[2]^2-b}{K[1]^2}\right)K[1]^2-K[2]^2+b\right)^2}-\frac{\quad}{K[1]\left(\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.129 (sec), leaf count = 67

```
dsolve(diff(y(x),x) = F(-(-y(x)^2+b)/x^2)*x/y(x),y(x))
```

$$y(x)=\sqrt{\text{RootOf}\left(-2\ln(x)+\int^{\_Z}\frac{1}{F(\_a)-\_a}d\_a+2c_1\right)x^2+b}$$

2.595 ODE No. 595

$$y'(x) = \frac{F\left(\frac{xy(x)^2+1}{x}\right)}{x^2 y(x)}$$

✓ **Mathematica** : cpu = 0.247191 (sec), leaf count = 204

```
DSolve[Derivative[1][y][x] == F[(1 + x*y[x]^2)/x]/(x^2*y[x]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{K[2]}{2F\left(\frac{xK[2]^2+1}{x}\right)-1}-\int_1^x\left(\frac{4F\left(\frac{K[1]K[2]^2+1}{K[1]}\right)K[2]F'\left(\frac{K[1]K[2]^2+1}{K[1]}\right)}{\left(2F\left(\frac{K[1]K[2]^2+1}{K[1]}\right)-1\right)^2K[1]^2}-\frac{2K[2]F'\left(\frac{K[1]K[2]^2+1}{K[1]}\right)}{\left(2F\left(\frac{K[1]K[2]^2+1}{K[1]}\right)-1\right)K[1]\right.\right.\right.$$

✓ **Maple** : cpu = 0.155 (sec), leaf count = 72

```
dsolve(diff(y(x),x) = F((x*y(x)^2+1)/x)/y(x)/x^2,y(x))
```

$$y(x) = \frac{\sqrt{x\left(\operatorname{RootOf}\left(\left(\int^{-Z}\frac{1}{-1+2F(\_a)}d\_a\right)x+xc_1+1\right)x-1\right)}}{x}$$

2.596 ODE No. 596

$$y'(x) = \frac{F(x^2 + y(x) - x) - 2x^2 + x}{x}$$

✓ **Mathematica** : cpu = 0.263732 (sec), leaf count = 156

```
DSolve[Derivative[1][y][x] == (x - 2*x^2 + F[-x + x^2 + y[x]])/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(x^2 - x + K[2]\right) \int_1^x \left(\frac{2K[1]F'(K[1]^2 - K[1] + K[2])}{F(K[1]^2 - K[1] + K[2])^2} - \frac{F'(K[1]^2 - K[1] + K[2])}{F(K[1]^2 - K[1] + K[2])^2}\right) dK[1] + 1}{F\left(x^2 - x + K[2]\right)} dK[2] + \int_1^x \left(-\frac{}{F}\right.\right.$$

✓ **Maple** : cpu = 0.092 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = (-2*x^2+x+F(y(x)+x^2-x))/x,y(x))
```

$$y(x) = -x^2 + \text{RootOf}\left(-\ln(x) + \int^{\_Z} \frac{1}{F(\_a)} d\_a + c_1\right) + x$$

2.597 ODE No. 597

$$y'(x) = \frac{2a}{x^2\left(2aF\left(\frac{xy(x)^2-4a}{x}\right)-y(x)\right)}$$

✓ **Mathematica** : cpu = 0.330746 (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]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\frac{K[2]}{2aF\left(\frac{xK[2]^2-4a}{x}\right)}-\int_1^x \frac{2K[2]F'\left(\frac{K[1]K[2]^2-4a}{K[1]}\right)}{F\left(\frac{K[1]K[2]^2-4a}{K[1]}\right)^2 K[1]^2}dK[1]+1\right)dK[2]+\int_1^x -\frac{1}{F\left(\frac{K[1]y(x)^2-4a}{K[1]}\right)K[1$$

✓ **Maple** : cpu = 0.276 (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))
```

$$-\frac{y(x)}{2a}+\frac{\int^{y(x)^2-\frac{4a}{x}}\frac{1}{F(\_a)}d\_a}{8a^2}-c_1=0$$

2.598 ODE No. 598

$$y'(x) = \frac{F\left(\frac{y(x)}{x}\right) + y(x)}{x - 1}$$

✓ **Mathematica** : cpu = 0.135556 (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 = 0.017 (sec), leaf count = 29

```
dsolve(diff(y(x),x) = (y(x)+F(y(x)/x))/(x-1),y(x))
```

$$y(x) = \text{RootOf}\left(-\left(\int^{\_Z} \frac{1}{F(\_a) + \_a} d\_a\right) + \ln(x-1) - \ln(x) + c_1\right) x$$

2.599 ODE No. 599

$$y'(x) = \frac{F\left(x^2 + y(x)^2\right) - x}{y(x)}$$

✓ **Mathematica** : cpu = 0.136785 (sec), leaf count = 95

```
DSolve[Derivative[1][y][x] == (-x + F[x^2 + y[x]^2])/y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{K[2]}{F\left(x^2+K[2]^2\right)} - \int_1^x \frac{2K[1]K[2]F'\left(K[1]^2+K[2]^2\right)}{F\left(K[1]^2+K[2]^2\right)^2} dK[1]\right) dK[2] + \int_1^x \left(1 - \frac{K[1]}{F\left(K[1]^2+y(x)^2\right)}\right.\right.$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 57

```
dsolve(diff(y(x),x) = (-x+F(y(x)^2+x^2))/y(x),y(x))
```

$$y(x) = \sqrt{-x^2 + \text{RootOf}\left(-2x + \int^{\_Z} \frac{1}{F(\_a)} d\_a + 2c_1\right)}$$

2.600 ODE No. 600

$$y'(x) = \frac{y(x)^2 F\left(\frac{1-2y(x)\log(x)}{y(x)}\right)}{x}$$

✓ **Mathematica** : cpu = 0.231249 (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]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\int_1^x\left(\frac{2\left(-\frac{2\log(K[1])}{K[2]}-\frac{1-2K[2]\log(K[1])}{K[2]^2}\right)F'\left(\frac{1-2K[2]\log(K[1])}{K[2]}\right)}{\left(F\left(\frac{1-2K[2]\log(K[1])}{K[2]}\right)+2\right)K[1]}-\frac{2F\left(\frac{1-2K[1]\log(K[1])}{K[2]}\right)\left(-\frac{2\log(K[1]}{K[2]}\right.}{\left(F\left(\frac{1-2K[2]}{K}\right.\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.151 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = F(-(2*y(x)*ln(x)-1)/y(x))*y(x)^2/x,y(x))
```

$$\int_{\_b}^{y(x)}\frac{1}{\left(F\left(\frac{-2\_a\ln(x)+1}{\_a}\right)+2\right)\_a^2}d\_a-\ln(x)-c_1=0$$

2.601 ODE No. 601

$$y'(x) = \frac{xF((y(x) - x)(y(x) + x))}{y(x)}$$

✓ **Mathematica** : cpu = 0.230808 (sec), leaf count = 182

```
DSolve[Derivative[1][y][x] == (x*F[(-x + y[x])*(x + y[x])])/y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{K[2]}{F((K[2]-x)(x+K[2]))-1} - \int_1^x \left(\frac{2F((K[2]-K[1])(K[1]+K[2]))K[1]K[2]F'((K[2]-K[1])(\right.\right.\right.}{(F((K[2]-K[1])(K[1]+K[2]))-1)^2}$$

✓ **Maple** : cpu = 0.109 (sec), leaf count = 61

```
dsolve(diff(y(x),x) = F(-(x-y(x))*(y(x)+x))*x/y(x),y(x))
```

$$y(x) = \sqrt{x^2 + \text{RootOf}\left(-x^2 + \int^{\_Z} \frac{1}{F(\_a) - 1} d\_a + 2c_1\right)}$$

2.602 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 = 0.417424 (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]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\int_1^x -\frac{2\left(-\frac{K[1]^2-K[2]}{K[1]^2K[2]^2} - \frac{1}{K[1]^2K[2]}\right) F'\left(\frac{K[1]^2-K[2]}{K[1]^2K[2]}\right)}{F\left(\frac{K[1]^2-K[2]}{K[1]^2K[2]}\right)^2 K[1]^3} dK[1] - \frac{1}{F\left(\frac{x^2-K[2]}{x^2K[2]}\right) K[2]^2}\right) dK[2] + \int_1^x \left(\right.\right.$$

✓ **Maple** : cpu = 0.125 (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))
```

$$y(x) = \frac{x^2}{\text{RootOf}\left(-\ln(x) - \left(\int^{-Z} \frac{1}{F(\_a)} d\_a\right) + c_1\right) x^2 + 1}$$

2.603 ODE No. 603

$$y'(x) = \frac{2xF(y(x) + \log(2x+1)) + F(y(x) + \log(2x+1)) - 2}{2x+1}$$

✓ **Mathematica** : cpu = 0.319033 (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 + 2*x),y[
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F(K[2]+\log(2x+1)) \int_1^x -\frac{2F'(K[2]+\log(2K[1]+1))}{F(K[2]+\log(2K[1]+1))^2(2K[1]+1)} dK[1] - 1}{F(K[2]+\log(2x+1))} dK[2] + \int_1^x \left(\frac{}{F(\log(2K[1]+1)}\right.\right.$$

✓ **Maple** : cpu = 0.095 (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))
```

$$y(x) = -\ln(2x+1) + \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{F(\_a)} d\_a + c_1\right)$$

2.604 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 = 0.381232 (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]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\int_1^x \frac{\left(\frac{8K[1]}{K[2]}-\frac{2(4K[1]K[2]^2+1)}{K[2]^3}\right)F'\left(\frac{4K[1]K[2]^2+1}{K[2]^2}\right)}{F\left(\frac{4K[1]K[2]^2+1}{K[2]^2}\right)^2}dK[1]+\frac{1}{K[2]^2}+\frac{1}{2F\left(\frac{4xK[2]^2+1}{K[2]^2}\right)K[2]^3}\right)dK[2]\right.$$

✓ **Maple** : cpu = 0.122 (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))
```

$$-c_1 - \frac{1}{y(x)} - \frac{\left(\int^{4x+\frac{1}{y(x)^2}} \frac{1}{F(\_a)} d\_a\right)}{4} = 0$$

2.605 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 = 0.744098 (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]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\int_1^x \frac{2\left(-\frac{K[1]}{2K[2]} - \frac{1-\frac{1}{2}K[1]K[2]}{K[2]^2}\right) F'\left(\frac{1-\frac{1}{2}K[1]K[2]}{K[2]}\right)}{F\left(\frac{1-\frac{1}{2}K[1]K[2]}{K[2]}\right)^2} dK[1] - \frac{4}{F\left(\frac{1-\frac{1}{2}xK[2]}{K[2]}\right) K[2]^2}\right) dK[2] + \int_1^x \left(\frac{1}{K[\right.\right.$$

✓ **Maple** : cpu = 0.122 (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))
```

$$y(x) = \frac{2}{2\,\text{RootOf}\left(-\ln(x) - 4\left(\int^{-Z} \frac{1}{F(\_a)} d\_a\right) + c_1\right) + x}$$

2.606 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 = 0.450224 (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]
```

$$\text{Solve}\left[\int_1^{y(x)}-\frac{F\left(K[2]-\frac{1}{2}e^{-x^2}x^2\right)\int_1^x\left(\frac{e^{-K[1]^2}F'\left(K[2]-\frac{1}{2}e^{-K[1]^2}K[1]^2\right)K[1]^3}{F\left(K[2]-\frac{1}{2}e^{-K[1]^2}K[1]^2\right)^2}-\frac{e^{-K[1]^2}\left(e^{K[1]^2}F\left(K[2]-\frac{1}{2}e^{-K[1]^2}K[1]^2\right)+1\right)\ldots}{F\left(K[2]-\frac{1}{2}e^{-K[1]^2}K\ldots\right.}\ldots}{F\left(K[2]-\frac{1}{2}e^{-x^2}x^2\right)\ldots}\ldots\right.$$

✓ **Maple** : cpu = 0.431 (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))
```

$$y(x)=\frac{x^2\mathrm{e}^{-x^2}}{2}+\mathrm{RootOf}\left(x^2-2\left(\int^{\_Z}\frac{1}{F(\_a)}d\_a\right)+2c_1\right)$$

2.607 ODE No. 607

$$y'(x) = \frac{x^3 F\left(\frac{y(x)}{x^2}\right) + 2y(x)}{x}$$

✓ **Mathematica** : cpu = 0.212519 (sec), leaf count = 121

```
DSolve[Derivative[1][y][x] == (x^3*F[y[x]/x^2] + 2*y[x])/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F\left(\frac{K[2]}{x^2}\right)\int_1^x\left(\frac{2}{F\left(\frac{K[2]}{K[1]^2}\right)K[1]^3}-\frac{2K[2]F'\left(\frac{K[2]}{K[1]^2}\right)}{F\left(\frac{K[2]}{K[1]^2}\right)^2K[1]^5}\right)dK[1]x^2+1}{x^2F\left(\frac{K[2]}{x^2}\right)}dK[2]+\int_1^x\left(\frac{2y(x)}{F\left(\frac{y(x)}{K[1]^2}\right)K[1]^3}+1\right)d\right.$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = (2*y(x)+F(1/x^2*y(x))*x^3)/x,y(x))
```

$$y(x) = \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{F(\_a)} d\_a + c_1\right) x^2$$

2.608 ODE No. 608

$$y'(x)=\frac{\sqrt{y(x)}}{F\left(\frac{x-y(x)}{\sqrt{y(x)}}\right)+\sqrt{y(x)}}$$

✓ **Mathematica** : cpu = 0.478844 (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 = 0.145 (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))
```

$$\frac{\ln\left(y(x)\right)}{2}-\left(\int^{\frac{x}{\sqrt{y(x)}}-\sqrt{y(x)}}\frac{1}{2F\left(\_a\right)-\_a}d\_a\right)-c_1=0$$

2.609 ODE No. 609

$$y'(x) = \frac{F(x^3 y(x)) - 3x^2 y(x)}{x^3}$$

✓ **Mathematica** : cpu = 0.259406 (sec), leaf count = 117

```
DSolve[Derivative[1][y][x] == (F[x^3*y[x]] - 3*x^2*y[x])/x^3,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{x^3 + F(x^3 K[2]) \int_1^x \left(\frac{3K[1]^5 K[2] F'(K[1]^3 K[2])}{F(K[1]^3 K[2])^2} - \frac{3K[1]^2}{F(K[1]^3 K[2])}\right) dK[1]}{F(x^3 K[2])} dK[2] + \int_1^x \left(1 - \frac{3K[1]^2 y(x)}{F(K[1]^3 y(x))}\right.\right.$$

✓ **Maple** : cpu = 0.26 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = (-3*x^2*y(x)+F(x^3*y(x)))/x^3,y(x))
```

$$y(x) = \frac{\text{RootOf}\left(x - \left(\int^{-Z} \frac{1}{F(\_a)} d\_a\right) + c_1\right)}{x^3}$$

2.610 ODE No. 610

$$y'(x) = \frac{x^2 F\left(\frac{y(x)}{x}\right) + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.07006 (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 = 0.014 (sec), leaf count = 20

```
dsolve(diff(y(x),x) = (y(x)+F(y(x)/x)*x^2)/x,y(x))
```

$$y(x) = \text{RootOf}\left(x - \left(\int^{\_Z} \frac{1}{F(\_a)} d\_a\right) + c_1\right) x$$

2.611 ODE No. 611

$$y'(x) = \frac{F(x(y(x)+x)) - y(x) - 2x}{x}$$

✓ **Mathematica** : cpu = 0.282543 (sec), leaf count = 191

```
DSolve[Derivative[1][y][x] == (-2*x + F[x*(x + y[x])] - y[x])/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{x + F(x(x+K[2]))\int_1^x \left(\frac{2F'(K[1](K[1]+K[2]))K[1]^2}{F(K[1](K[1]+K[2]))^2} + \frac{(K[2]-F(K[1](K[1]+K[2])))F'(K[1](K[1]+K[2]))K[1]}{F(K[1](K[1]+K[2]))^2} - \right.}{F(x(x+K[2]))}\right.$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 28

```
dsolve(diff(y(x),x) = (-2*x-y(x)+F(x*(y(x)+x)))/x,y(x))
```

$$y(x) = \frac{-x^2 + \text{RootOf}\left(-x + \int^{-Z} \frac{1}{F(\_a)} d\_a + c_1\right)}{x}$$

2.612 ODE No. 612

$$y'(x)=\frac{1}{2}e^{\frac{x^2}{4}}\left(2F\left(e^{-\frac{x^2}{4}}y(x)\right)+e^{-\frac{x^2}{4}}xy(x)\right)$$

✓ **Mathematica** : cpu = 0.34263 (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]
```

$$\text{Solve}\left[\int_1^{y(x)}-\frac{e^{-\frac{x^2}{4}}\left(e^{\frac{x^2}{4}}F\left(e^{-\frac{x^2}{4}}K[2]\right)\int_1^x\left(\frac{e^{-\frac{1}{4}K[1]^2}K[1]}{2F\left(e^{-\frac{1}{4}K[1]^2}K[2]\right)}-\frac{e^{-\frac{1}{2}K[1]^2}K[1]K[2]F'\left(e^{-\frac{1}{4}K[1]^2}K[2]\right)}{2F\left(e^{-\frac{1}{4}K[1]^2}K[2]\right)^2}\right)dK[1]+1\right)}{F\left(e^{-\frac{x^2}{4}}K[2]\right)}dK\right.$$

✓ **Maple** : cpu = 0.089 (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))
```

$$y(x)=\text{RootOf}\left(-x+\int^{\_Z}\frac{1}{F(\_a)}d\_a+c_1\right)\mathrm{e}^{\frac{x^2}{4}}$$

2.613 ODE No. 613

$$y'(x) = \frac{x^2 F\left(\frac{y(x)-x\log(x)}{x}\right) + y(x) + x}{x}$$

✓ **Mathematica** : cpu = 0.230095 (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]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{xF\left(\frac{K[2]-x\log(x)}{x}\right)\int_1^x\left(-\frac{K[2]F'\left(\frac{K[2]-K[1]\log(K[1])}{K[1]}\right)}{F\left(\frac{K[2]-K[1]\log(K[1])}{K[1]}\right)^2 K[1]^3} - \frac{F'\left(\frac{K[2]-K[1]\log(K[1])}{K[1]}\right)}{F\left(\frac{K[2]-K[1]\log(K[1])}{K[1]}\right)^2 K[1]^2} + \frac{1}{F\left(\frac{K[2]-K[1]\log(K[1])}{K[1]}\right) F\right.}{xF\left(\frac{K[2]-x\log(x)}{x}\right)}\right.$$

✓ **Maple** : cpu = 0.076 (sec), leaf count = 23

```
dsolve(diff(y(x),x) = (x+y(x)+F(-(-y(x)+x*ln(x))/x)*x^2)/x,y(x))
```

$$y(x) = \left(\ln(x) + \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{F(\_a)} d\_a + c_1\right)\right) x$$

2.614 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 = 0.304814 (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*F[x^2/2
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{K[2]}{(a-1)(a+1)F\left(-\frac{1}{2}a^2x^2+\frac{x^2}{2}+\frac{K[2]^2}{2}\right)} - \int_1^x \frac{K[1]K[2]F'\left(-\frac{1}{2}a^2K[1]^2+\frac{K[1]^2}{2}+\frac{K[2]^2}{2}\right)}{F\left(-\frac{1}{2}a^2K[1]^2+\frac{K[1]^2}{2}+\frac{K[2]^2}{2}\right)^2}dK[1] +\right.\right.$$

✓ **Maple** : cpu = 0.306 (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
```

$$\frac{y(x)}{(a-1)(a+1)} + \frac{\int^{-a^2x^2+x^2+y(x)^2}\frac{1}{F\left(\frac{\_a}{2}\right)}d\_a}{2a^4-4a^2+2} - c_1 = 0$$

2.615 ODE No. 615

$$y'(x) = \frac{y(x)}{x(y(x)F(xy(x)) - 1)}$$

✓ **Mathematica** : cpu = 0.251056 (sec), leaf count = 77

```
DSolve[Derivative[1][y][x] == y[x]/(x*(-1 + F[x*y[x]]*y[x])),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\int_1^x \frac{F'(K[1]K[2])}{F(K[1]K[2])^2} dK[1] - \frac{1}{F(xK[2])K[2]} + 1\right) dK[2] + \int_1^x -\frac{1}{F(K[1]y(x))K[1]} dK[1] = c_1, y(x$$

✓ **Maple** : cpu = 0.092 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = y(x)/x/(-1+F(x*y(x))*y(x)),y(x))
```

$$-y(x) + \int^{xy(x)} \frac{1}{F(\_a)\_a} d\_a - c_1 = 0$$

2.616 ODE No. 616

$$y'(x) = \frac{F(x(xy(x)-1)) - 2x^3y(x) + x^2}{x^4}$$

✓ **Mathematica** : cpu = 0.377817 (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]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{x^2 + F(x(xK[2]-1)) \int_1^x \left(\frac{2K[2]F'(K[1](K[1]K[2]-1))K[1]^3}{F(K[1](K[1]K[2]-1))^2} - \frac{F'(K[1](K[1]K[2]-1))K[1]^2}{F(K[1](K[1]K[2]-1))^2} - \frac{2K[1]}{F(K[1](K[1]K[2]-\right.}{F(x(xK[2]-1))}\right.$$

✓ **Maple** : cpu = 0.065 (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))
```

$$y(x) = \frac{\text{RootOf}\left(\left(\int^{-Z} \frac{1}{F(\_a)} d\_a\right) x + xc_1 + 1\right) + x}{x^2}$$

2.617 ODE No. 617

$$y'(x)=\frac{1}{9}e^{-\frac{3x^2}{2}}xy(x)^2F\left(\frac{e^{\frac{3x^2}{2}}(y(x)+3)}{3y(x)}\right)$$

✓ **Mathematica** : cpu = 0.8628 (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)/2)),y[x
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{9e^{\frac{3x^2}{2}}-F\left(\frac{e^{\frac{3x^2}{2}}(K[2]+3)}{3K[2]}\right)}{3\left(\left(9e^{\frac{3x^2}{2}}-F\left(\frac{e^{\frac{3x^2}{2}}(K[2]+3)}{3K[2]}\right)\right)K[2]+27e^{\frac{3x^2}{2}}\right)}-\int_1^x\left(-\frac{K[2]\left(\frac{e^{\frac{3K[1]^2}{2}}}{3K[2]}-\frac{e^{\frac{3K[1]^2}{2}}(K[2]+3)}{3K[2]^2}\right)F'\left(\right.}{-9e^{\frac{3K[1]^2}{2}}K[2]+F\left(\frac{e^{\frac{3K[1]^2}{2}}(K[2]+3)}{3K[2]}\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.203 (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)
```

$$y(x)=-\frac{3\,\mathrm{e}^{\frac{3x^2}{2}}}{\mathrm{e}^{\frac{3x^2}{2}}-3\,\mathrm{RootOf}\left(-x^2-18\left(\int^{\_Z}\frac{1}{F(\_a)-27\_a}d\_a\right)+2c_1\right)}$$

2.618 ODE No. 618

$$y'(x) = \frac{(y(x)+1)(x(y(x) - \log(y(x)+1) - \log(x)) + 1)}{xy(x)}$$

✓ **Mathematica** : cpu = 0.154036 (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]),y[x],x]
```

$$\left\{\left\{y(x)\to -1 - W\left(-\frac{e^{-1+c_1 e^x}}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.537 (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))
```

$$y(x) = \frac{e^{-\mathrm{LambertW}\left(-\frac{e^{e^x c_1 - 1}}{x}\right) + e^x c_1 - 1} - x}{x}$$

2.619 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 = 0.541829 (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] + 12*y[x
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\frac{8K[2]^3}{F\left(-\frac{1}{3}K[2]^4 - \frac{K[2]^3}{2} - K[2]^2 - K[2] + x\right)} - \frac{9K[2]^2}{F\left(-\frac{1}{3}K[2]^4 - \frac{K[2]^3}{2} - K[2]^2 - K[2] + x\right)} - \frac{}{F\left(-\right.}\right.\right.$$

✓ **Maple** : cpu = 0.302 (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(
```

$$\int_{\_b}^{y(x)} \frac{-8\_a^4 - 9\_a^3 - 12\_a^2 + F\left(-\frac{1}{3}\_a^4 - \frac{1}{2}\_a^3 - \_a^2 - \_a + x\right) - 6\_a}{F\left(-\frac{1}{3}\_a^4 - \frac{1}{2}\_a^3 - \_a^2 - \_a + x\right)\_a} d\_a - c_1 = 0$$

2.620 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 = 0.820828 (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^(2*F[(-
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{2K[2]}{-x^2 + e^{2F((K[2]-x)(x+K[2]))} + K[2]^2} - \int_1^x \left(\frac{2K[1]\left(-4e^{2F((K[2]-K[1])(K[1]+K[2]))}F'((K[2]-K[1]\right.}{\left(K[1]^2 - e^{2F((K[2]-K[1])(K[1]+K[2])}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.235 (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^
```

$$y(x) = e^{\mathrm{RootOf}\left(-\_Z + \int^{e^{2\_Z} - 2x\,e^{\_Z}} \frac{1}{e^{2F(\_a)} + \_a} d\_a + c_1\right)} - x$$

2.621 ODE No. 621

$$y'(x) = \frac{1}{y(x) + \sqrt{x}}$$

✓ **Mathematica** : cpu = 0.0468571 (sec), leaf count = 445

```
DSolve[Derivative[1][y][x] == (Sqrt[x] + y[x])^(-1),y[x],x]
```

$$\left\{\left\{y(x) \to -\sqrt{x} + \frac{1}{\text{Root}\left[\#1^6\left(16x^3 + 16e^{12c_1}\right) - 24\#1^4x^2 + 8\#1^3x^{3/2} + 9\#1^2x - 6\#1\sqrt{x} + 1\&, 1\right]}\right\}, \left\{y(x) \to\right.\right.$$

✓ **Maple** : cpu = 0.321 (sec), leaf count = 59

```
dsolve(diff(y(x),x) = 1/(y(x)+x^(1/2)),y(x))
```

$$y(x) = \frac{\sqrt{x}\,\text{RootOf}\left(\_Z^{18}c_1 - 9x\_Z^6 - 6\sqrt{x}\_Z^3 - 1\right)^3 + 1}{\text{RootOf}\left(\_Z^{18}c_1 - 9x\_Z^6 - 6\sqrt{x}\_Z^3 - 1\right)^3}$$

2.622 ODE No. 622

$$y'(x) = \frac{1}{y(x) + \sqrt{3x+1} + 2}$$

✓ **Mathematica** : cpu = 0.223991 (sec), leaf count = 140

```
DSolve[Derivative[1][y][x] == (2 + Sqrt[1 + 3*x] + y[x])^(-1),y[x],x]
```

$$\text{Solve}\left[6\sqrt{33}\text{arctanh}\left(\frac{3y(x)+7\sqrt{3x+1}+6}{\sqrt{33}\left(y(x)+\sqrt{3x+1}+2\right)}\right)+44c_1=33\left(\log\left(\frac{-3\sqrt{3x+1}y(x)^2-3\left(3x+4\sqrt{3x+1}+1\right)}{2(3x}\right.\right.\right.$$

✓ **Maple** : cpu = 0.351 (sec), leaf count = 68

```
dsolve(diff(y(x),x) = 1/(y(x)+2+(3*x+1)^(1/2)),y(x))
```

$$-2\sqrt{33}\,\text{arctanh}\left(\frac{3\sqrt{3x+1}+6y(x)+12}{\sqrt{99x+33}}\right)+11\ln\left(\left(3y(x)+6\right)\sqrt{3x+1}+3y(x)^2-6x+12y(x)+10\right)-c_1=0$$

2.623 ODE No. 623

$$y'(x) = \frac{x^2}{x^{3/2} + y(x)}$$

✓ **Mathematica** : cpu = 0.148958 (sec), leaf count = 77

```
DSolve[Derivative[1][y][x] == x^2/(x^(3/2) + y[x]),y[x],x]
```

$$\text{Solve}\left[6\sqrt{33}\text{arctanh}\left(\frac{7x^{3/2}+3y(x)}{\sqrt{33}\left(x^{3/2}+y(x)\right)}\right)+44c_1=33\left(\log\left(-\frac{3y(x)}{2x^{3/2}}-\frac{3y(x)^2}{2x^3}+1\right)+3\log(x)\right),y(x)\right]$$

✓ **Maple** : cpu = 0.304 (sec), leaf count = 51

```
dsolve(diff(y(x),x) = x^2/(y(x)+x^(3/2)),y(x))
```

$$-2\sqrt{33}\ \text{arctanh}\left(\frac{\left(x^{\frac{3}{2}}+2y(x)\right)\sqrt{33}}{11x^{\frac{3}{2}}}\right)+11\ln\left(3x^{\frac{3}{2}}y(x)-2x^3+3y(x)^2\right)-c_1=0$$

2.624 ODE No. 624

$$y'(x) = \frac{x^{5/3}}{x^{4/3} + y(x)}$$

✓ **Mathematica** : cpu = 18.6349 (sec), leaf count = 9837

```
DSolve[Derivative[1][y][x] == x^(5/3)/(x^(4/3) + y[x]),y[x],x]
```

✓ **Maple** : cpu = 0.442 (sec), leaf count = 46

```
dsolve(diff(y(x),x) = x^(5/3)/(y(x)+x^(4/3)),y(x))
```

$$y(x) = \frac{\mathrm{RootOf}\left(\_Z^{192} + 12x^{\frac{4}{3}}\_Z^{176} + 48x^{\frac{8}{3}}\_Z^{160} + 64x^4\_Z^{144} - c_1\right)^{16}}{2} + \frac{x^{\frac{4}{3}}}{2}$$

2.625 ODE No. 625

$$y'(x) = \frac{1}{2} i x^2 \left(-2\sqrt{6y(x) - x^3} + i\right)$$

✓ **Mathematica** : cpu = 0.193271 (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 = 0.276 (sec), leaf count = 55

```
dsolve(diff(y(x),x) = 1/2*I*x^2*(I-2*(-x^3+6*y(x))^(1/2)),y(x))
```

$$i \ln\left(x^3 - 6y(x) - 1\right) + 2\sqrt{-x^3 + 6y(x)} - 2\arctan\left(\sqrt{-x^3 + 6y(x)}\right) + 2ix^3 - c_1 = 0$$

2.626 ODE No. 626

$$y'(x) = \frac{x}{\sqrt{x^2+1}+y(x)}$$

✓ **Mathematica** : cpu = 0.154754 (sec), leaf count = 88

```
DSolve[Derivative[1][y][x] == x/(Sqrt[1 + x^2] + y[x]),y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}\left(\log\left(-\frac{y(x)^2}{x^2+1}-\frac{y(x)}{\sqrt{x^2+1}}+1\right)+\log\left(x^2+1\right)\right)=\frac{\operatorname{arctanh}\left(\frac{3\sqrt{x^2+1}+y(x)}{\sqrt{5}\left(\sqrt{x^2+1}+y(x)\right)}\right)}{\sqrt{5}}+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.441 (sec), leaf count = 115

```
dsolve(diff(y(x),x) = x/(y(x)+(x^2+1)^(1/2)),y(x))
```

$$-\frac{4\ln\left(\frac{36\sqrt{x^2+1}}{y(x)+\sqrt{x^2+1}}\right)}{3}+\frac{2\ln\left(-\frac{1296\left(\sqrt{x^2+1}\,y(x)-x^2+y(x)^2-1\right)}{11\left(y(x)+\sqrt{x^2+1}\right)^2}\right)}{3}-\frac{4\sqrt{5}\operatorname{arctanh}\left(\frac{\left(3\sqrt{x^2+1}+y(x)\right)\sqrt{5}}{5y(x)+5\sqrt{x^2+1}}\right)}{15}+\frac{2\ln\left(x^2+1\right)}{3}-c$$

2.627 ODE No. 627

$$y'(x) = \frac{(y(x)\log(x) - 1)^2}{x}$$

✓ **Mathematica** : cpu = 0.577758 (sec), leaf count = 43

```
DSolve[Derivative[1][y][x] == (-1 + Log[x]*y[x])^2/x,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sin(\log(x)) + c_1\cos(\log(x))}{\log(x)\sin(\log(x)) + \cos(\log(x)) + c_1\log(x)\cos(\log(x)) - c_1\sin(\log(x))}\right\}\right\}$$

✓ **Maple** : cpu = 0.154 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = (-1+y(x)*ln(x))^2/x,y(x))
```

$$y(x) = \frac{\sin(\ln(x))\, c_1 + \cos(\ln(x))}{(\ln(x) + c_1)\cos(\ln(x)) + \sin(\ln(x))\,(c_1\ln(x) - 1)}$$

2.628 ODE No. 628

$$y'(x) = \frac{1}{3}x\left(3\sqrt{x^2+3y(x)}-2\right)$$

✓ **Mathematica** : cpu = 0.126877 (sec), leaf count = 33

```
DSolve[Derivative[1][y][x] == (x*(-2 + 3*Sqrt[x^2 + 3*y[x]]))/3,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{48}\left(9x^4-16x^2-54c_1x^2+81c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.241 (sec), leaf count = 23

```
dsolve(diff(y(x),x) = 1/3*x*(-2+3*(x^2+3*y(x))^(1/2)),y(x))
```

$$c_1+\frac{x^2}{3}+\frac{4}{27}-\frac{4\sqrt{x^2+3y\left(x\right)}}{9}=0$$

2.629 ODE No. 629

$$y'(x) = \frac{(2y(x)\log(x) - 1)^2}{x}$$

✓ **Mathematica** : cpu = 0.56641 (sec), leaf count = 92

```
DSolve[Derivative[1][y][x] == (-1 + 2*Log[x]*y[x])^2/x,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{\sin\left(\sqrt{2}\log(x)\right) + c_1\cos\left(\sqrt{2}\log(x)\right)}{2\log(x)\sin\left(\sqrt{2}\log(x)\right) + \sqrt{2}\cos\left(\sqrt{2}\log(x)\right) + 2c_1\log(x)\cos\left(\sqrt{2}\log(x)\right) - \sqrt{2}c_1\sin\left(\sqrt{2}\log(x)\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.168 (sec), leaf count = 62

```
dsolve(diff(y(x),x) = (2*y(x)*ln(x)-1)^2/x,y(x))
```

$$y(x) = \frac{\sin\left(\sqrt{2}\,\ln(x)\right)c_1 + \cos\left(\sqrt{2}\,\ln(x)\right)}{\sin\left(\sqrt{2}\,\ln(x)\right)\left(2c_1\ln(x) - \sqrt{2}\right) + \left(\sqrt{2}\,c_1 + 2\ln(x)\right)\cos\left(\sqrt{2}\,\ln(x)\right)}$$

2.630 ODE No. 630

$$y'(x) = \frac{e^{bx}}{e^{-bx}y(x) + 1}$$

✓ **Mathematica** : cpu = 0.329594 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == E^(b*x)/(1 + y[x]/E^(b*x)),y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}b\left(\log\left(-be^{-2bx}y(x)^2 - be^{-bx}y(x) + 1\right) + 2bx\right) = \frac{b\arctan\left(\frac{(b+2)\left(-e^{bx}\right) - by(x)}{b\sqrt{-\frac{b+4}{b}}\left(e^{bx}+y(x)\right)}\right)}{\sqrt{-\frac{b+4}{b}}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.346 (sec), leaf count = 98

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(-b*x)+1)*exp(b*x),y(x))
```

$$y(x) = \text{RootOf}\left(-\mathrm{e}^{\text{RootOf}\left(\tanh\left(\frac{\sqrt{b^2+4b}\,(-2bx+2c_1b-\_Z)}{2b}\right)^2 b + 4\tanh\left(\frac{\sqrt{b^2+4b}\,(-2bx+2c_1b-\_Z)}{2b}\right)^2 - 4\,\mathrm{e}^{\_Z} - b - 4\right)} - 1 + \_Zb + b\_Z$$

2.631 ODE No. 631

$$y'(x) = \frac{1}{2}x^2\left(2\sqrt{x^3 - 6y(x)} + 1\right)$$

✓ **Mathematica** : cpu = 0.143825 (sec), leaf count = 31

```
DSolve[Derivative[1][y][x] == (x^2*(1 + 2*Sqrt[x^3 - 6*y[x]]))/2,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{6}\left(-x^6 + x^3 - 12c_1x^3 - 36c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.237 (sec), leaf count = 23

```
dsolve(diff(y(x),x) = 1/2*x^2*(1+2*(x^3-6*y(x))^(1/2)),y(x))
```

$$c_1 - x^3 - \frac{1}{4} - \sqrt{x^3 - 6y(x)} = 0$$

2.632 ODE No. 632

$$y'(x) = \frac{e^x}{e^{-x}y(x) + 1}$$

✓ **Mathematica** : cpu = 0.154898 (sec), leaf count = 65

```
DSolve[Derivative[1][y][x] == E^x/(1 + y[x]/E^x),y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}\log\left(-e^{-2x}y(x)^2 - e^{-x}y(x) + 1\right) + x = \frac{\text{arctanh}\left(\frac{y(x)+3e^x}{\sqrt{5}(y(x)+e^x)}\right)}{\sqrt{5}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.359 (sec), leaf count = 54

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(-x)+1)*exp(x),y(x))
```

$$x - \frac{\sqrt{5}\,\text{arctanh}\left(\frac{2y(x)\sqrt{5}\,e^{-x}}{5} + \frac{\sqrt{5}}{5}\right)}{5} + \frac{\ln\left(y(x)^2 e^{-2x} + y(x)e^{-x} - 1\right)}{2} - c_1 = 0$$

2.633 ODE No. 633

$$y'(x) = \frac{e^{2x/3}}{e^{-2x/3}y(x) + 1}$$

✓ **Mathematica** : cpu = 0.169015 (sec), leaf count = 85

```
DSolve[Derivative[1][y][x] == E^((2*x)/3)/(1 + y[x]/E^((2*x)/3)),y[x],x]
```

$$\text{Solve}\left[7\left(3\log\left(-\frac{2}{3}e^{-4x/3}y(x)^2 - \frac{2}{3}e^{-2x/3}y(x) + 1\right) + 4x - 9c_1\right) = 6\sqrt{7}\text{arctanh}\left(\frac{y(x) + 4e^{2x/3}}{\sqrt{7}\left(y(x) + e^{2x/3}\right)}\right), y(x)\right]$$

✓ **Maple** : cpu = 1.135 (sec), leaf count = 52

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(-2/3*x)+1)*exp(2/3*x),y(x))
```

$$y(x) = \text{RootOf}\left(-\mathrm{e}^{\text{RootOf}\left(343-343\tanh\left(\frac{(4c_1-4x-3\_Z)\sqrt{7}}{6}\right)^2+98\,\mathrm{e}^{\_Z}\right)} - 3 + 2\_Z + 2\_Z^2\right)\mathrm{e}^{\frac{2x}{3}}$$

2.634 ODE No. 634

$$y'(x) = \frac{x^5\sqrt{4x^2y(x)+1}+\frac{1}{2}}{x^3}$$

✓ **Mathematica** : cpu = 0.171463 (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]
```

$$\left\{\left\{y(x)\to \frac{x^{10}-8c_1x^6+16{c_1}^2x^2-4}{16x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.337 (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))
```

$$c_1 - \frac{\sqrt{4x^2y\left(x\right)+1}}{x}+\frac{x^4}{2}=0$$

2.635 ODE No. 635

$$y'(x) = \frac{1}{2}x\left(2\sqrt{x^3 - 6y(x)} + x\right)$$

✓ **Mathematica** : cpu = 0.135686 (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 = 0.225 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = 1/2*x*(x+2*(x^3-6*y(x))^(1/2)),y(x))
```

$$c_1 - \frac{3x^2}{2} - \sqrt{x^3 - 6y(x)} = 0$$

2.636 ODE No. 636

$$y'(x) = y(x)\left(x^2 - \log(y(x))\right)$$

✓ **Mathematica** : cpu = 0.0809842 (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 = 0.224 (sec), leaf count = 19

```
dsolve(diff(y(x),x) = (-ln(y(x))+x^2)*y(x),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{e}^{-x}c_1+x^2-2x+2}$$

2.637 ODE No. 637

$$y'(x) = \frac{e^{-x^2}x}{e^{x^2}y(x) + 1}$$

✓ **Mathematica** : cpu = 7.08583 (sec), leaf count = 62

```
DSolve[Derivative[1][y][x] == x/(E^x^2*(1 + E^x^2*y[x])),y[x],x]
```

$$\text{Solve}\left[-\frac{1}{2}\arctan\left(2e^{x^2}y(x)+1\right)-\frac{1}{4}\log\left(2e^{2x^2}y(x)^2+2e^{x^2}y(x)+1\right)+\frac{1}{2}\log\left(e^{x^2}\right)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.169 (sec), leaf count = 84

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(x^2)+1)*exp(-x^2)*x,y(x))
```

$$y(x) = -\frac{\tan\left(\text{RootOf}\left(2x^2+2\ln\left(\frac{9\tan(\_Z)}{2}-\frac{9}{2}\right)-\ln\left(\frac{81\tan(\_Z)^2}{10}+\frac{81}{10}\right)+6c_1-2\_Z\right)\right)e^{-x^2}}{\tan\left(\text{RootOf}\left(2x^2+2\ln\left(\frac{9\tan(\_Z)}{2}-\frac{9}{2}\right)-\ln\left(\frac{81\tan(\_Z)^2}{10}+\frac{81}{10}\right)+6c_1-2\_Z\right)\right)-1}$$

2.638 ODE No. 638

$$y'(x) = y(x)(\log(\log(y(x))) - \log(x))$$

✓ **Mathematica** : cpu = 0.0941335 (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 = 0.372 (sec), leaf count = 34

```
dsolve(diff(y(x),x) = -(-ln(ln(y(x)))+ln(x))*y(x),y(x))
```

$$\int_{\_b}^{y(x)} -\frac{1}{\_a\,(x\ln(x) - \ln(\ln(\_a))\,x + \ln(\_a))} d\_a - c_1 = 0$$

2.639 ODE No. 639

$$y'(x) = y(x)(\log(x) - \log(\log(y(x))))^2$$

✓ **Mathematica** : cpu = 0.128117 (sec), leaf count = 53

```
DSolve[Derivative[1][y][x] == (Log[x] - Log[Log[y[x]]])^2*y[x],y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \frac{1}{K[1]\left(x\log^2(x) - 2x\log(\log(K[1]))\log(x) + x\log^2(\log(K[1])) - \log(K[1])\right)}dK[1] = \log(x) + c_1, y(x$$

✓ **Maple** : cpu = 0.339 (sec), leaf count = 46

```
dsolve(diff(y(x),x) = (-ln(ln(y(x)))+ln(x))^2*y(x),y(x))
```

$$\int_{\_b}^{y(x)} \frac{1}{\_a\left(x\ln(x)^2 - 2\ln(\ln(\_a))\ln(x)x + \ln(\ln(\_a))^2x - \ln(\_a)\right)}d\_a - c_1 = 0$$

2.640 ODE No. 640

$$y'(x) = \frac{y(x)}{\log(\log(y(x))) - \log(x) + 1}$$

✓ **Mathematica** : cpu = 0.206638 (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 = 0.657 (sec), leaf count = 47

```
dsolve(diff(y(x),x) = 1/(ln(ln(y(x)))-ln(x)+1)*y(x),y(x))
```

$$\int_{\_b}^{y(x)} \frac{-\ln(\ln(\_a)) + \ln(x) - 1}{(\ln(\_a)\ln(x) - \ln(\_a)\ln(\ln(\_a)) - \ln(\_a) + x)\_a} d\_a - c_1 = 0$$

2.641 ODE No. 641

$$y'(x) = \frac{x^4\sqrt{4x^2y(x)+1}+\frac{1}{2}}{x^3}$$

✓ **Mathematica** : cpu = 0.153166 (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]
```

$$\left\{\left\{y(x)\to \frac{4x^8-24c_1x^5+36c_1{}^2x^2-9}{36x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.344 (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))
```

$$c_1-\frac{\sqrt{4x^2y(x)+1}}{x}+\frac{2x^3}{3}=0$$

2.642 ODE No. 642

$$y'(x) = \frac{\left(4ax - y(x)^2\right)^2}{y(x)}$$

✓ **Mathematica** : cpu = 0.123759 (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 = 0.283 (sec), leaf count = 281

```
dsolve(diff(y(x),x) = (-y(x)^2+4*a*x)^2/y(x),y(x))
```

$$y(x) = \frac{2\sqrt{\left(c_1 e^{2x\left(\sqrt{2}\sqrt{a}-2ax\right)}+e^{-2x\left(\sqrt{2}\sqrt{a}+2ax\right)}\right)\left(c_1\left(ax-\frac{\sqrt{2}\sqrt{a}}{4}\right)e^{2x\left(\sqrt{2}\sqrt{a}-2ax\right)}+e^{-2x\left(\sqrt{2}\sqrt{a}+2ax\right)}\left(ax+\frac{\sqrt{2}}{}\right.}}{c_1 e^{2x\left(\sqrt{2}\sqrt{a}-2ax\right)}+e^{-2x\left(\sqrt{2}\sqrt{a}+2ax\right)}}$$

2.643 ODE No. 643

$$y'(x) = \frac{1}{3}x\left(3x\sqrt{x^2+3y(x)}-2\right)$$

✓ **Mathematica** : cpu = 0.129153 (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 = 0.207 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = 1/3*x*(-2+3*x*(x^2+3*y(x))^(1/2)),y(x))
```

$$c_1+\frac{x^3}{2}-\sqrt{x^2+3y\left(x\right)}=0$$

2.644 ODE No. 644

$$y'(x) = -\frac{1}{2}x^2\left(ax - 2\sqrt{a\,(ax^4 + 8y(x))}\right)$$

✓ **Mathematica** : cpu = 0.247109 (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 = 0.386 (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))
```

$$c_1 + \frac{4a\,x^3}{3} - \sqrt{a\,(a\,x^4 + 8y\,(x))} = 0$$

2.645 ODE No. 645

$$y'(x) = y(x)(x - \log(y(x)))$$

✓ **Mathematica** : cpu = 0.0653808 (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 = 0.174 (sec), leaf count = 14

```
dsolve(diff(y(x),x) = (-ln(y(x))+x)*y(x),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{e}^{-x}c_1-1+x}$$

2.646 ODE No. 646

$$y'(x) = \frac{\sqrt{x^3 - 6y(x)} + \frac{x^3}{2} + \frac{x^2}{2}}{x + 1}$$

✓ **Mathematica** : cpu = 0.198764 (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]
```

$$\left\{\left\{y(x) \to \frac{1}{6}\left(x^3 - 9\log^2(x+1) + 18c_1\log(x+1) - 9c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.319 (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))
```

$$c_1 - 3\ln(1+x) - \sqrt{x^3 - 6y(x)} = 0$$

2.647 ODE No. 647

$$y'(x) = \frac{x\left(ay(x)^2 + bx^2\right)^2}{a^{5/2}y(x)}$$

✓ **Mathematica** : cpu = 0.255124 (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 = 0.31 (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))
```

$$y(x) = \frac{\sqrt{-a\left(\left(b\,x^2 - a^{\frac{3}{2}}\sqrt{-\frac{b}{a^{\frac{3}{2}}}}\right)\mathrm{e}^{\frac{x^2\left(-2a^{\frac{3}{2}}\sqrt{-\frac{b}{a^{\frac{3}{2}}}}+b\,x^2\right)}{2a^{\frac{3}{2}}}} + c_1\left(a^{\frac{3}{2}}\sqrt{-\frac{b}{a^{\frac{3}{2}}}} + b\,x^2\right)\mathrm{e}^{\frac{x^2\left(2a^{\frac{3}{2}}\sqrt{-\frac{b}{a^{\frac{3}{2}}}}+b\,x^2\right)}{2a^{\frac{3}{2}}}}\right)\left(c_1\mathrm{e}^{\frac{x^2\left(2a^{\frac{3}{2}}\right.}{}}\right.}}{a\left(c_1\mathrm{e}^{\frac{x^2\left(2a^{\frac{3}{2}}\sqrt{-\frac{b}{a^{\frac{3}{2}}}}+b\,x^2\right)}{2a^{\frac{3}{2}}}} + \mathrm{e}^{\frac{x^2\left(-2a^{\frac{3}{2}}\sqrt{-\frac{b}{a^{\frac{3}{2}}}}+b\,x^2\right)}{2a^{\frac{3}{2}}}}\right)}$$

2.648 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 = 0.37063 (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]]))/(1 +
```

$$\left\{\left\{y(x)\to\frac{1}{72}\left(16ax^6-48ax^5+123ax^4-96ax^3\log(x+1)-96ac_1x^3-72ax^2+144ax^2\log(x+1)+144ac_1x^2\right.\right.\right.$$

✓ **Maple** : cpu = 0.887 (sec), leaf count = 49

```
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)
```

$$-\sqrt{a\,x^4+8y\,(x)}-4\sqrt{a}\,\ln\left(1+x\right)+\frac{2\left(2x^3-3x^2+6x\right)\sqrt{a}}{3}-c_1=0$$

2.649 ODE No. 649

$$y'(x) = x\sqrt{x^2 + 8y(x) - 2x + 1} - \frac{x}{4} + \frac{1}{4}$$

✓ **Mathematica** : cpu = 0.268795 (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]
```

$$\left\{\left\{y(x) \to \frac{1}{8}\left(4x^4 - x^2 - 16c_1x^2 + 2x - 1 + 16c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.262 (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))
```

$$c_1 + \frac{x^2}{8} + \frac{17}{128} - \frac{\sqrt{x^2 - 2x + 1 + 8y(x)}}{16} = 0$$

2.650 ODE No. 650

$$y'(x) = x\sqrt{a^2 + 2ax + x^2 + 4y(x)} - \frac{a}{2} - \frac{x}{2}$$

✓ **Mathematica** : cpu = 0.322669 (sec), leaf count = 40

```
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]
```

$$\left\{\left\{y(x) \to \frac{1}{4}\left(-a^2 - 2ax + x^4 - x^2 - 4c_1x^2 + 4c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.296 (sec), leaf count = 35

```
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))
```

$$c_1 + \frac{a^2}{4} + \frac{x^2}{4} + \frac{1}{16} - \frac{\sqrt{x^2 + 2ax + a^2 + 4y(x)}}{4} = 0$$

2.651 ODE No. 651

$$y'(x) = \frac{y(x)\left(x^2 + \log(y(x))\right)}{x}$$

✓ **Mathematica** : cpu = 0.0740157 (sec), leaf count = 16

```
DSolve[Derivative[1][y][x] == ((x^2 + Log[y[x]])*y[x])/x,y[x],x]
```

$$\left\{\left\{y(x) \to e^{x^2+2c_1x}\right\}\right\}$$

✓ **Maple** : cpu = 0.099 (sec), leaf count = 13

```
dsolve(diff(y(x),x) = (ln(y(x))+x^2)*y(x)/x,y(x))
```

$$y(x) = \mathrm{e}^{xc_1}\mathrm{e}^{x^2}$$

2.652 ODE No. 652

$$y'(x) = \frac{x\sqrt{4ax - y(x)^2} + 2a}{y(x)}$$

✓ **Mathematica** : cpu = 0.640373 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (2*a + x*Sqrt[4*a*x - y[x]^2])/y[x],y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{4096a^5x-256a^4x^4+32a^2e^{c_1}x^2-e^{2c_1}}}{32a^2}\right\},\left\{y(x)\to \frac{\sqrt{4096a^5x-256a^4x^4+32a^2e^{c_1}x^2-e^{2c_1}}}{32a^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.132 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = (2*a+x*(-y(x)^2+4*a*x)^(1/2))/y(x),y(x))
```

$$-\sqrt{-y\left(x\right)^2+4ax}-\frac{x^2}{2}-c_1=0$$

2.653 ODE No. 653

$$y'(x) = x\sqrt{x^2 + 4y(x) - 4x} - \frac{x}{2} + 1$$

✓ **Mathematica** : cpu = 0.24235 (sec), leaf count = 34

```
DSolve[Derivative[1][y][x] == 1 - x/2 + x*Sqrt[-4*x + x^2 + 4*y[x]],y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{4}\left(x^4 - x^2 - 4c_1x^2 + 4x + 4c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.25 (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))
```

$$c_1 + x^2 + \frac{1}{4} - \sqrt{x^2 - 4x + 4y(x)} = 0$$

2.654 ODE No. 654

$$y'(x) = \frac{\sqrt{x^2 + 3y(x)} - \frac{2x^2}{3} - \frac{2x}{3}}{x + 1}$$

✓ **Mathematica** : cpu = 0.198924 (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 = 0.283 (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))
```

$$c_1 + \frac{3\ln(1+x)}{2} - \sqrt{x^2 + 3y(x)} = 0$$

2.655 ODE No. 655

$$y'(x) = \frac{e^{-4x/3}y(x)^3}{e^{-2x/3}y(x) + 1}$$

✓ **Mathematica** : cpu = 9.29515 (sec), leaf count = 89

```
DSolve[Derivative[1][y][x] == y[x]^3/(E^((4*x)/3)*(1 + y[x]/E^((2*x)/3))),y[x],x]
```

$$\text{Solve}\left[\frac{3}{2}\log(y(x)) + \frac{3}{28}\left(-\left(7+\sqrt{7}\right)\log\left(-\sqrt{7}y(x) + y(x) + 2e^{2x/3}\right) + \left(\sqrt{7}-7\right)\log\left(\sqrt{7}y(x) + y(x) + 2e^{2x/3}\right)\right.\right.$$

✓ **Maple** : cpu = 0.888 (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))
```

$$x + \frac{3\sqrt{7}\,\mathrm{arctanh}\left(\frac{3y(x)\sqrt{7}\,\mathrm{e}^{-\frac{2x}{3}}}{7} - \frac{\sqrt{7}}{7}\right)}{14} + \frac{3\ln\left(y(x)\,\mathrm{e}^{-\frac{2x}{3}}\right)}{2} - \frac{3\ln\left(3y(x)^2\,\mathrm{e}^{-\frac{4x}{3}} - 2y(x)\,\mathrm{e}^{-\frac{2x}{3}} - 2\right)}{4} - c_1 = 0$$

2.656 ODE No. 656

$$y'(x) = \frac{y(x)\left(x^3 + \log(y(x))\right)}{x}$$

✓ **Mathematica** : cpu = 0.078218 (sec), leaf count = 20

```
DSolve[Derivative[1][y][x] == ((x^3 + Log[y[x]])*y[x])/x,y[x],x]
```

$$\left\{\left\{y(x) \to e^{\frac{x^3}{2}+3c_1x}\right\}\right\}$$

✓ **Maple** : cpu = 0.099 (sec), leaf count = 15

```
dsolve(diff(y(x),x) = (ln(y(x))+x^3)*y(x)/x,y(x))
```

$$y(x) = \mathrm{e}^{\frac{x^3}{2}} \mathrm{e}^{xc_1}$$

2.657 ODE No. 657

$$y'(x) = x^2\sqrt{x^2 + 8y(x) - 2x + 1} - \frac{x}{4} + \frac{1}{4}$$

✓ **Mathematica** : cpu = 0.348825 (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 = 0.224 (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))
```

$$c_1 + \frac{4x^3}{3} - \sqrt{x^2 - 2x + 1 + 8y(x)} = 0$$

2.658 ODE No. 658

$$y'(x) = \frac{\sqrt{x^2 + 8y(x) - 2x + 1} - \frac{x^2}{4} + \frac{1}{4}}{x + 1}$$

✓ **Mathematica** : cpu = 0.55754 (sec), leaf count = 45

```
DSolve[Derivative[1][y][x] == (1/4 - x^2/4 + Sqrt[1 - 2*x + x^2 + 8*y[x]])/(1 + x),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{8}\left(-x^2 + 2x + 16\log^2\left(\frac{1}{x+1}\right) + 32c_1\log\left(\frac{1}{x+1}\right) - 1 + 16{c_1}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.327 (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))
```

$$c_1 + 4\ln(1+x) - \frac{1}{4} - \sqrt{x^2 - 2x + 1 + 8y(x)} = 0$$

2.659 ODE No. 659

$$y'(x) = x\sqrt{a^2x^2 + 2abx + 4ay(x) + b^2 - 4c} - \frac{ax}{2} - \frac{b}{2}$$

✓ **Mathematica** : cpu = 0.761026 (sec), leaf count = 87

```
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[x]],y[x
```

$$\left\{\left\{y(x)\to \frac{b^2\log^2\left(\sinh\left(\frac{ax^2}{b}-\frac{2ac_1}{b}\right)-\cosh\left(\frac{ax^2}{b}-\frac{2ac_1}{b}\right)\right)}{4a}-\frac{b^2}{4a}+\frac{c}{a}-\frac{ax^2}{4}-\frac{bx}{2}\right\}\right\}$$

✓ **Maple** : cpu = 1.118 (sec), leaf count = 177

```
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))
```

$$\frac{a\,x^2}{\left(-a\,x^2+\sqrt{a^2x^2+2abx+b^2+4ay\left(x\right)-4c}\right)\left(-a^2x^4+a^2x^2+2abx+4ay\left(x\right)+b^2-4c\right)}+\frac{}{\left(-a\,x^2+\sqrt{a^2x^2+2\right.}$$

2.660 ODE No. 660

$$y'(x) = x^2\sqrt{a^2 + 2ax + x^2 + 4y(x)} - \frac{a}{2} - \frac{x}{2}$$

✓ **Mathematica** : cpu = 0.197896 (sec), leaf count = 42

```
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]
```

$$\left\{\left\{y(x)\to \frac{1}{36}\left(-9a^2 - 18ax + 4x^6 - 24c_1x^3 - 9x^2 + 36c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.247 (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))
```

$$c_1 + \frac{2x^3}{3} - \sqrt{x^2 + 2ax + a^2 + 4y\left(x\right)} = 0$$

2.661 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 = 0.355408 (sec), leaf count = 93

```
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*y[x]],y
```

$$\left\{\left\{y(x)\to \frac{b^2\log^2\left(\sinh\left(\frac{2ax^3}{3b}-\frac{2ac_1}{b}\right)-\cosh\left(\frac{2ax^3}{3b}-\frac{2ac_1}{b}\right)\right)}{4a}-\frac{b^2}{4a}+\frac{c}{a}-\frac{ax^2}{4}-\frac{bx}{2}\right\}\right\}$$

✓ **Maple** : cpu = 0.296 (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))
```

$$c_1 + \frac{2a\,x^3}{3} - \sqrt{a^2x^2 + 2abx + b^2 + 4ay\left(x\right) - 4c} = 0$$

2.662 ODE No. 662

$$y'(x) = x^2\sqrt{x^2 - 4y(x) + 2x + 1} + \frac{x}{2} + \frac{1}{2}$$

✓ **Mathematica** : cpu = 0.342448 (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]
```

$$\left\{\left\{y(x) \to \frac{1}{36}\left(-4x^6 + 24c_1x^3 + 9x^2 + 18x + 9 - 36c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.253 (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))
```

$$c_1 - \frac{2x^3}{3} - \sqrt{x^2 + 2x + 1 - 4y\left(x\right)} = 0$$

2.663 ODE No. 663

$$y'(x) = \frac{x^2\sqrt{4ax - y(x)^2} + 2a}{y(x)}$$

✓ **Mathematica** : cpu = 0.70757 (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]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{147456a^7x - 4096a^6x^6 + 128a^3e^{c_1}x^3 - e^{2c_1}}}{192a^3}\right\}, \left\{y(x)\to \frac{\sqrt{147456a^7x - 4096a^6x^6 + 128a^3e^{c_1}x^3 -}}{192a^3}\right.\right.$$

✓ **Maple** : cpu = 0.128 (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))
```

$$-\sqrt{-y(x)^2 + 4ax} - \frac{x^3}{3} - c_1 = 0$$

2.664 ODE No. 664

$$y'(x) = x^2\sqrt{x^2 + 4y(x) - 4x} - \frac{x}{2} + 1$$

✓ **Mathematica** : cpu = 0.150238 (sec), leaf count = 36

```
DSolve[Derivative[1][y][x] == 1 - x/2 + x^2*Sqrt[-4*x + x^2 + 4*y[x]],y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{36}\left(4x^6 - 24c_1x^3 - 9x^2 + 36x + 36c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.217 (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))
```

$$c_1 + \frac{2x^3}{3} - \sqrt{x^2 - 4x + 4y\left(x\right)} = 0$$

2.665 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 = 0.314703 (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]]))/(1
```

$$\left\{\left\{y(x)\to \frac{1}{8}\left(-ax^4+16a\log^2(x+1)-32ac_1\log(x+1)+16ac_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.628 (sec), leaf count = 30

```
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(
```

$$4\sqrt{a}\,\ln(1+x)-\sqrt{a\,x^4+8y(x)}-c_1=0$$

2.666 ODE No. 666

$$y'(x) = y(x)\left(x^3 + x^2 - \log(y(x)) + 1\right)$$

✓ **Mathematica** : cpu = 0.103137 (sec), leaf count = 29

```
DSolve[Derivative[1][y][x] == (1 + x^2 + x^3 - Log[y[x]])*y[x],y[x],x]
```

$$\left\{\left\{y(x)\to e^{x^3-2x^2+4x-c_1e^{-x}-3}\right\}\right\}$$

✓ **Maple** : cpu = 0.275 (sec), leaf count = 24

```
dsolve(diff(y(x),x) = (-ln(y(x))+1+x^2+x^3)*y(x),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{e}^{-x}c_1+x^3-2x^2+4x-3}$$

2.667 ODE No. 667

$$y'(x) = \frac{e^{-2bx} y(x)^3}{e^{-bx} y(x) + 1}$$

✓ **Mathematica** : cpu = 2.56177 (sec), leaf count = 95

```
DSolve[Derivative[1][y][x] == y[x]^3/(E^(2*b*x)*(1 + y[x]/E^(b*x))),y[x],x]
```

$$\text{Solve}\left[\frac{2\sqrt{\frac{b}{b+4}}\text{arctanh}\left(\frac{\sqrt{\frac{b}{b+4}}(2e^{bx}+y(x))}{y(x)}\right) - \log\left(be^{bx}\left(e^{bx}+y(x)\right) - y(x)^2\right) + 2\log\left(e^{bx}\right)}{2b} + \frac{\log(y(x))}{b} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.232 (sec), leaf count = 82

```
dsolve(diff(y(x),x) = y(x)^3/(y(x)*exp(-b*x)+1)*exp(-2*b*x),y(x))
```

$$bx - \frac{b \operatorname{arctanh}\left(\frac{-2y(x)\mathrm{e}^{-bx}+b}{\sqrt{b^2+4b}}\right)}{\sqrt{b^2+4b}} + \ln\left(y(x)\,\mathrm{e}^{-bx}\right) - \frac{\ln\left(-by(x)\,\mathrm{e}^{-bx} + y(x)^2\,\mathrm{e}^{-2bx} - b\right)}{2} - c_1 = 0$$

2.668 ODE No. 668

$$y'(x) = \frac{e^{-2x} y(x)^3}{e^{-x} y(x) + 1}$$

✓ **Mathematica** : cpu = 0.510395 (sec), leaf count = 73

```
DSolve[Derivative[1][y][x] == y[x]^3/(E^(2*x)*(1 + y[x]/E^x)),y[x],x]
```

$$\text{Solve}\left[\log(y(x)) + \frac{1}{10}\left(-\left(5+\sqrt{5}\right)\log\left(-\sqrt{5}y(x)+y(x)+2e^x\right) + \left(\sqrt{5}-5\right)\log\left(\sqrt{5}y(x)+y(x)+2e^x\right) + 10\log\right.\right.$$

✓ **Maple** : cpu = 0.977 (sec), leaf count = 58

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(-x)+1)*y(x)^3*exp(-2*x),y(x))
```

$$y(x) = e^{\mathrm{RootOf}\left(2\sqrt{5}\,\mathrm{arctanh}\left(\frac{\left(-2\,e^{-\_Z}+e^{x}\right)\sqrt{5}\,e^{-x}}{5}\right)+5\ln\left(e^{2\_Z}-e^{x+\_Z}-e^{2x}\right)+10c_1-10\_Z-10x\right)}$$

2.669 ODE No. 669

$$y'(x) = \frac{e^x \left(3e^x - 2y(x)^{3/2}\right)^2}{4\sqrt{y(x)}}$$

✓ **Mathematica** : cpu = 0.504971 (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]
```

$$\left\{\left\{y(x) \to \frac{\left(-2e^{3e^x} + 3e^{x+3e^x} + 3e^{x+3c_1} + 2e^{3c_1}\right)^{2/3}}{\sqrt[3]{4e^{6e^x} + 8e^{3e^x+3c_1} + 4e^{6c_1}}}\right\}, \left\{y(x) \to -\frac{\sqrt[3]{-1}\left(-2e^{3e^x} + 3e^{x+3e^x} + 3e^{x+3c_1} + 2e^{3c_1}\right)^{2/}}{\sqrt[3]{4e^{6e^x} + 8e^{3e^x+3c_1} + 4e^{6c_1}}}\right.\right.$$

✓ **Maple** : cpu = 0.163 (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))
```

$$c_1 + \frac{e^{-\frac{3e^x}{2} - \frac{9e^{2x}}{8}} \left(2y(x)^{\frac{3}{2}} e^x - 2e^x - 3e^{2x}\right) e^{-\frac{3e^x}{2} + \frac{9e^{2x}}{8}}}{2y(x)^{\frac{3}{2}} e^x + 2e^x - 3e^{2x}} = 0$$

2.670 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 = 0.380389 (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 = 0.29 (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))
```

$$-\frac{i\ln\left(x^2 - 4\ln(a) - 4\ln(y(x)) - 1\right)}{4} - \frac{\sqrt{-x^2 + 4\ln(a) + 4\ln(y(x))}}{2} + \frac{\arctan\left(\sqrt{-x^2 + 4\ln(a) + 4\ln(y(x))}\right)}{2} -$$

2.671 ODE No. 671

$$y'(x) = \frac{\left(xy(x)^2 + 1\right)^2}{x^4 y(x)}$$

✓ **Mathematica** : cpu = 0.222685 (sec), leaf count = 192

```
DSolve[Derivative[1][y][x] == (1 + x*y[x]^2)^2/(x^4*y[x]),y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{-\frac{2}{x} + \sqrt{2}e^{\frac{2\sqrt{2}(1+c_1x)}{x}} - \frac{2e^{\frac{2\sqrt{2}(1+c_1x)}{x}}}{x} - \sqrt{2}}}{\sqrt{2 + 2e^{\frac{2\sqrt{2}(1+c_1x)}{x}}}}\right\}, \left\{y(x) \to \frac{\sqrt{-\frac{2}{x} + \sqrt{2}e^{\frac{2\sqrt{2}(1+c_1x)}{x}} - \frac{2e^{\frac{2\sqrt{2}(1+c_1x)}{x}}}{x} - \sqrt{2}}}{\sqrt{2 + 2e^{\frac{2\sqrt{2}(1+c_1x)}{x}}}}\right.$$

✓ **Maple** : cpu = 0.247 (sec), leaf count = 237

```
dsolve(diff(y(x),x) = (x*y(x)^2+1)^2/y(x)/x^4,y(x))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{-\left(c_1 e^{\frac{-1-\sqrt{2}\,x}{x^2}} + e^{\frac{-1+\sqrt{2}\,x}{x^2}}\right) x \left(c_1 \left(\sqrt{2}\,x + 2\right) e^{\frac{-1-\sqrt{2}\,x}{x^2}} + \left(2 - \sqrt{2}\,x\right) e^{\frac{-1+\sqrt{2}\,x}{x^2}}\right)}}{2x\left(c_1 e^{\frac{-1-\sqrt{2}\,x}{x^2}} + e^{\frac{-1+\sqrt{2}\,x}{x^2}}\right)}$$

2.672 ODE No. 672

$$y'(x) = \frac{x^2\left(\sqrt{4y(x)^3 - 9x^4} + 3x\right)}{y(x)^2}$$

✓ **Mathematica** : cpu = 12.3487 (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]
```

$$\text{Solve}\left[\int_1^x \left(-\frac{24\sqrt{4y(x)^3 - 9K[1]^4}\,y(x)^9}{(9K[1]^4 - 4y(x)^3)\,(4y(x)^9 - 729)} + \frac{16K[1]^2\sqrt{4y(x)^3 - 9K[1]^4}\,y(x)^9}{(4K[1]^6 + 9K[1]^4 + 16K[1]^3 - 4y(x)^3 + 16)\,(4y(x)^9 - 729)} + \right.\right.$$

✓ **Maple** : cpu = 0.151 (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))
```

$$\int_{\_b}^{y(x)} \frac{\_a^2}{\sqrt{-9x^4 + 4\_a^3}} d\_a - \frac{x^3}{3} - c_1 = 0$$

2.673 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 = 0.214557 (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]
```

$$\left\{\left\{y(x)\to \arctan\left(\frac{2x^3+3c_1}{6x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.362 (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))
```

$$y(x) = \arctan\left(\frac{x^3+6c_1}{3x}\right)$$

2.674 ODE No. 674

$$y'(x) = \frac{\sqrt{x^2 + 4y(x) - 4x} - \frac{x^2}{2} + \frac{x}{2} + 1}{x + 1}$$

✓ **Mathematica** : cpu = 0.225455 (sec), leaf count = 40

```
DSolve[Derivative[1][y][x] == (1 + x/2 - x^2/2 + Sqrt[-4*x + x^2 + 4*y[x]])/(1 + x),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{4}\left(-x^2 + 4x + 4\log^2(x+1) - 8c_1\log(x+1) + 4c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.317 (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))
```

$$c_1 + 2\ln(1 + x) - 1 - \sqrt{x^2 - 4x + 4y(x)} = 0$$

2.675 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 = 0.244678 (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^2*y[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 = 0.065 (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)-y(x)^2*x^2-x*y(x)^2)/x,
```

$$y(x) = \tanh\left(\frac{\left((6x-6)\,\mathrm{e}^x + 2x^3 + 3x^2 + 6c_1\right)\sqrt{a}}{6}\right) x\sqrt{a}$$

2.676 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 = 0.737065 (sec), leaf count = 206

```
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]
```

$$\left\{\left\{y(x)\to -\frac{1}{4x^2}+\frac{1}{4}\log^2\left(x^2\cosh\left(-\frac{x^4}{2}+\frac{2x^3}{3}-x^2+2x+2c_1\right)+2x\cosh\left(-\frac{x^4}{2}+\frac{2x^3}{3}-x^2+2x+2c_1\right)+\right.\right.\right.$$

✓ **Maple** : cpu = 0.638 (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))
```

$$c_1+2\ln(1+x)-\frac{\sqrt{4x^2y(x)+1}}{x}-2x+x^2-\frac{2x^3}{3}+\frac{x^4}{2}=0$$

2.677 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 = 0.13053 (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]^2 - x*Lo
```

$$\left\{\left\{y(x) \to \sqrt{a} x \tanh\left(\frac{1}{12}(4\sqrt{a}x^3 + 3\sqrt{a}x^2 + 6\sqrt{a}x^2 \log(x+1) + 6\sqrt{a}x - 6\sqrt{a}\log(x+1) + 12\sqrt{a}c_1)\right)\right\}\right\}$$

✓ **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)-y(x)^2*x^2-x*y(x)^2)/
```

$$y(x) = \tanh\left(\frac{\sqrt{a}\left(6\ln(1+x)x^2 + 4x^3 + 3x^2 - 6\ln(1+x) + 12c_1 + 6x + 9\right)}{12}\right) x\sqrt{a}$$

2.678 ODE No. 678

$$y'(x) = \frac{x^2\left(2x\sqrt{x^3-6y(x)}+x+1\right)}{2(x+1)}$$

✓ **Mathematica** : cpu = 2.02011 (sec), leaf count = 115

```
DSolve[Derivative[1][y][x] == (x^2*(1 + x + 2*x*Sqrt[x^3 - 6*y[x]]))/(2*(1 + x)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{24}\left(-4x^6+12x^5-33x^4-4x^3+24x^3\log(x+1)+24c_1x^3+30x^2-36x^2\log(x+1)-36c_1x^2-132x\right.\right.\right.$$

✓ **Maple** : cpu = 0.398 (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))
```

$$c_1 - x^3 + \frac{3x^2}{2} - 3x + 3\ln(1+x) - \frac{1}{2} - \sqrt{x^3-6y(x)} = 0$$

2.679 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 = 0.112797 (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*x*Log[x]
```

$$\left\{\left\{y(x)\to \frac{x \tan \left(\frac{1}{12}\left(4\sqrt{7}x^3+3\sqrt{7}x^2+6\sqrt{7}x^2\log(x)+12\sqrt{7}c_1\right)\right)}{\sqrt{7}}\right\}\right\}$$

✓ **Maple** : cpu = 0.053 (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*y(x)^2*x^2+7*x*y(x)^2)/x,y(
```

$$y(x) = \frac{\tan\left(\frac{(6x^2\ln(x)+4x^3+3x^2+12c_1)\sqrt{7}}{12}\right)x\sqrt{7}}{7}$$

2.680 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 = 0.317045 (sec), leaf count = 39

```
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]
```

$$\left\{\left\{y(x) \to \frac{1}{4}\left(x^2 + 2x - 4\log^2(x+1) + 8c_1\log(x+1) + 1 - 4c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.333 (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))
```

$$c_1 - 2\ln(1+x) - \frac{1}{2} - \sqrt{x^2 + 2x + 1 - 4y(x)} = 0$$

2.681 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 = 0.144171 (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*y[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 = 0.082 (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(
```

$$y(x) = \frac{\tan\left(\frac{\sqrt{ab}\left(4x^3+6x^2\ln\left(\frac{1}{x}\right)+9x^2+12c_1\right)}{12}\right)x\sqrt{ab}}{a}$$

2.682 ODE No. 682

$$y'(x) = \frac{2a}{x\left(-8a^2 + 2axy(x)^2 - xy(x)\right)}$$

✓ **Mathematica** : cpu = 0.217808 (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 = 0.177 (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))
```

$$c_1 + \frac{\left(-xy(x)^2 + 4a\right) e^{-4ay(x)}}{x} = 0$$

2.683 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 = 0.717697 (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[x],x]
```

$$\left\{\left\{y(x)\to \frac{e^{\frac{2x^3}{9}+\frac{x}{3}}}{e^{\frac{x^2}{6}+\frac{1}{18}(4x^2-3x+6)x}x + c_1 e^{\frac{x^2}{6}} x\sqrt[3]{x+1}(x(x+1))^{\frac{x^3}{3}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 45

```
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))
```

$$y(x) = \frac{1}{x\left((x(1+x))^{\frac{x^3}{3}} c_1 (1+x)^{\frac{1}{3}} \mathrm{e}^{-\frac{2}{9}x^3+\frac{1}{6}x^2-\frac{1}{3}x}+1\right)}$$

2.684 ODE No. 684

$$y'(x) = \frac{x^2\sqrt{x^2 + y(x)^2} + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.10386 (sec), leaf count = 36

```
DSolve[Derivative[1][y][x] == (y[x] + x^2*Sqrt[x^2 + y[x]^2])/x,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{2}xe^{-\frac{x^2}{2}-c_1}\left(-1+e^{x^2+2c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 5.805 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = (y(x)+(y(x)^2+x^2)^(1/2)*x^2)/x,y(x))
```

$$\ln\left(\sqrt{y\left(x\right)^2 + x^2} + y(x)\right) - \frac{x^2}{2} - \ln\left(x\right) - c_1 = 0$$

2.685 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 = 0.10286 (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[x]^2)/x
```

$$\left\{\left\{y(x) \to \frac{x \tan\left(\frac{1}{2}\left(-\sqrt{7}x^2 + \sqrt{7}x^2 \log(x-1) + \sqrt{7}x^2 \log(x+1) - \sqrt{7}\log(1-x) - \sqrt{7}\log(x+1) + 2\sqrt{7}c_1\right)\right)}{\sqrt{7}}\right\}\right\}$$

✓ **Maple** : cpu = 0.082 (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))
```

$$y(x) = \frac{\tan\left(\frac{(x^2 \ln((x-1)(1+x)) - x^2 - \ln((x-1)(1+x)) + 2c_1 + 1)\sqrt{7}}{2}\right) x\sqrt{7}}{7}$$

2.686 ODE No. 686

$$y'(x) = \frac{e^{2x^2} x y(x)^3}{e^{x^2} y(x) + 1}$$

✓ **Mathematica** : cpu = 7.17033 (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]
```

$$\text{Solve}\left[\log(y(x)) - 2y(x)^2\left(\frac{\log\left(e^{2x^2}y(x)^2 + 2e^{x^2}y(x) + 2\right)}{4y(x)^2} - \frac{\arctan\left(e^{x^2}y(x) + 1\right)}{2y(x)^2}\right) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.167 (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))
```

$$y(x) = \frac{\left(1 - \tan\left(\text{RootOf}\left(-2x^2 + 2\ln\left(\frac{9\tan(\_Z)}{2} - \frac{9}{2}\right) - \ln\left(\frac{81\tan(\_Z)^2}{10} + \frac{81}{10}\right) + 6c_1 - 2\_Z\right)\right)\right) e^{-x^2}}{\tan\left(\text{RootOf}\left(-2x^2 + 2\ln\left(\frac{9\tan(\_Z)}{2} - \frac{9}{2}\right) - \ln\left(\frac{81\tan(\_Z)^2}{10} + \frac{81}{10}\right) + 6c_1 - 2\_Z\right)\right)}$$

2.687 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 = 0.108457 (sec), leaf count = 130

```
DSolve[Derivative[1][y][x] == (-(x^3*Log[(1 + x)/(-1 + x)]) + y[x] + x*Log[(1 + x)/(-1 + x)]*y[x]^2)/
```

$$\left\{\left\{y(x)\to\frac{-x^2(x-1)^{x^2}-x(x-1)^{x^2}-x^2(x+1)^{x^2}e^{2x+2c_1}+x(x+1)^{x^2}e^{2x+2c_1}}{-x(x-1)^{x^2}-(x-1)^{x^2}-(x+1)^{x^2}e^{2x+2c_1}+x(x+1)^{x^2}e^{2x+2c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.132 (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))
```

$$y(x) = -\tanh\left(\frac{x^2\ln\left(\frac{1+x}{x-1}\right)}{2}-\frac{\ln\left(\frac{1+x}{x-1}\right)}{2}+c_1+x-1\right)x$$

2.688 ODE No. 688

$$y'(x) = \frac{e^{\frac{x+1}{x-1}}x^3 + e^{\frac{x+1}{x-1}}xy(x)^2 + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.267192 (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]^2)/x,y[x
```

$$\left\{\left\{y(x) \to x \tan\left(\frac{1}{2}\left(-8e\,\text{ExpIntegralEi}\left(\frac{2}{x-1}\right) + e^{\frac{x}{x-1}+\frac{1}{x-1}}x^2 + 2e^{\frac{x}{x-1}+\frac{1}{x-1}}x - 3e^{\frac{x}{x-1}+\frac{1}{x-1}} + 2c_1\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (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))
```

$$y(x) = \tan\left(\frac{(x^2+2x-3)\,\mathrm{e}^{\frac{1+x}{x-1}}}{2} + 4\,\mathrm{e}\;\mathrm{expIntegral}_1\left(-\frac{2}{x-1}\right) + c_1\right)x$$

2.689 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 = 0.268255 (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 + x)*x),y[
```

$$\left\{\left\{y(x)\to -\frac{x\left(-1+e^{2e^2\,\text{ExpIntegralEi}(x-1)+2e^{x+1}+2c_1}\right)}{1+e^{2e^2\,\text{ExpIntegralEi}(x-1)+2e^{x+1}+2c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.053 (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))
```

$$y(x) = -\tanh\left(\mathrm{e}^{1+x} - \mathrm{e}^2\,\mathrm{expIntegral}_1\left(1-x\right) + c_1\right)x$$

2.690 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 = 0.654684 (sec), leaf count = 115

```
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]
```

$$\left\{\left\{y(x) \to \frac{1}{72}\left(16x^6 - 48x^5 + 132x^4 - 144x^3 + 96x^3 \log\left(\frac{1}{x+1}\right) - 96c_1x^3 + 135x^2 - 144x^2 \log\left(\frac{1}{x+1}\right) + 144\right.\right.$$

✓ **Maple** : cpu = 0.426 (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))
```

$$c_1 + \frac{4x^3}{3} - 2x^2 - 4\ln(1 + x) + 4x - \sqrt{x^2 - 2x + 1 + 8y(x)} = 0$$

2.691 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 = 0.22158 (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]
```

$$\left\{\left\{y(x)\to \arctan\left(\frac{x^4+2c_1}{4x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.498 (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))
```

$$y(x) = \arctan\left(\frac{x^4+8c_1}{4x}\right)$$

2.692 ODE No. 692

$$y'(x) = \frac{x^3\sqrt{x^2 + y(x)^2} + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.103053 (sec), leaf count = 40

```
DSolve[Derivative[1][y][x] == (y[x] + x^3*Sqrt[x^2 + y[x]^2])/x,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{2}xe^{-\frac{x^3}{3}-c_1}\left(-1+e^{\frac{2x^3}{3}+2c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 5.313 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = (y(x)+x^3*(y(x)^2+x^2)^(1/2))/x,y(x))
```

$$\ln\left(\sqrt{y(x)^2 + x^2} + y(x)\right) - \frac{x^3}{3} - \ln(x) - c_1 = 0$$

2.693 ODE No. 693

$$y'(x) = e^{bx}\left(e^{-3bx}y(x)^3 + e^{-2bx}y(x)^2 + 1\right)$$

✓ **Mathematica** : cpu = 2.66801 (sec), leaf count = 1121

```
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]
```

$$\text{Solve}\left[\frac{1}{9}\text{RootSum}\left[-81b^2\#1^9 - 522b\#1^9 - 841\#1^9 - 243b^2\#1^6 - 1566b\#1^6 - 2523\#1^6 + 729b^3\#1^3 + 486b^2\#1\right.\right.$$

✓ **Maple** : cpu = 0.083 (sec), leaf count = 36

```
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))
```

$$y(x) = \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{\_a^3 + \_a^2 - \_ab + 1} d\_a + c_1\right) \mathrm{e}^{bx}$$

2.694 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 = 0.587036 (sec), leaf count = 64

```
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]
```

$$\left\{\left\{y(x)\to x^2-\frac{1}{4x^2}+\frac{1}{4}\log^2\left(x^2+2x+1\right)-x\log\left(x^2+2x+1\right)+c_1\log\left(x^2+2x+1\right)-2c_1x+c_1{}^2\right\}\right\}$$

✓ **Maple** : cpu = 0.5 (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))
```

$$-2\ln(1+x)-\frac{\sqrt{4x^2y(x)+1}}{x}+2x+c_1=0$$

2.695 ODE No. 695

$$y'(x)=\frac{x^4+x^3+x^2y(x)^2+xy(x)^2+y(x)\log(x-1)}{x\log(x-1)}$$

✓ **Mathematica** : cpu = 0.174548 (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[-1 + x]),
```

$$\{\{y(x)\to x\tan(2\,\text{ExpIntegralEi}(\log(x-1))+3\,\text{ExpIntegralEi}(2\log(x-1))+\text{ExpIntegralEi}(3\log(x-1))+c_1)\}\}$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = (y(x)*ln(x-1)+x^4+x^3+y(x)^2*x^2+x*y(x)^2)/ln(x-1)/x,y(x))
```

$$y(x)=\tan\left(-\operatorname{expIntegral}_1\left(-3\ln\left(x-1\right)\right)-3\,\operatorname{expIntegral}_1\left(-2\ln\left(x-1\right)\right)-2\,\operatorname{expIntegral}_1\left(-\ln\left(x-1\right)\right)+c_1\right)x$$

2.696 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 = 0.755848 (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*Log[-1 + x
```

$$\left\{\left\{y(x)\to \frac{x\tan\left(\sqrt{7}\int_1^x \frac{e^{K[1]+1}K[1]}{\log(K[1]-1)}dK[1]+\sqrt{7}c_1\right)}{\sqrt{7}}\right\}\right\}$$

✓ **Maple** : cpu = 0.059 (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))
```

$$y(x) = \frac{\tan\left(\left(\mathrm{e}\left(\int \frac{x\,\mathrm{e}^{x}}{\ln(x-1)}dx\right)+c_1\right)\sqrt{7}\right)x\sqrt{7}}{7}$$

2.697 ODE No. 697

$$y'(x) = e^{2x/3}\left(e^{-2x}y(x)^3 + e^{-4x/3}y(x)^2 + 1\right)$$

✓ **Mathematica** : cpu = 0.226443 (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]
```

$$\text{Solve}\left[-\frac{35}{3}\text{RootSum}\left[-35\#1^3 + 9\sqrt[3]{35}\#1 - 35\&, \frac{\log\left(\frac{3e^{-4x/3}y(x)+e^{-2x/3}}{\sqrt[3]{35}\sqrt[3]{e^{-2x}}} - \#1\right)}{3\sqrt[3]{35} - 35\#1^2}\&\right] = \frac{1}{9}35^{2/3}e^{4x/3}\left(e^{-2x}\right)^{2/3}x +$$

✓ **Maple** : cpu = 0.077 (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))
```

$$y(x) = \text{RootOf}\left(-x + 3\left(\int^{\_Z} \frac{1}{3\_a^3 + 3\_a^2 - 2\_a + 3}d\_a\right) + c_1\right)\mathrm{e}^{\frac{2x}{3}}$$

2.698 ODE No. 698

$$y'(x) = e^x \left(e^{-3x} y(x)^3 + e^{-2x} y(x)^2 + 1\right)$$

✓ **Mathematica** : cpu = 0.220156 (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]
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3+6\sqrt[3]{38}\#1-19\&,\frac{\log\left(\frac{3e^{-2x}y(x)+e^{-x}}{\sqrt[3]{38}\sqrt[3]{e^{-3x}}}-\#1\right)}{2\sqrt[3]{38}-19\#1^2}\&\right]=\frac{1}{9}38^{2/3}e^{2x}\left(e^{-3x}\right)^{2/3}x+c_1,y(x$$

✓ **Maple** : cpu = 0.065 (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))
```

$$y(x) = \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{\_a^3 + \_a^2 - \_a + 1} d\_a + c_1\right) e^x$$

2.699 ODE No. 699

$$y'(x) = \frac{x\left(3x^2\sqrt{x^2+3y(x)}-2x-2\right)}{3(x+1)}$$

✓ **Mathematica** : cpu = 0.436977 (sec), leaf count = 47

```
DSolve[Derivative[1][y][x] == (x*(-2 - 2*x + 3*x^2*Sqrt[x^2 + 3*y[x]]))/(3*(1 + x)),y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{3}\left(-x^2+\frac{1}{16}\left(2x^3-3x^2+6x+6\log\left(\frac{1}{x+1}\right)-6c_1\right)^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.403 (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))
```

$$c_1+\frac{x^3}{2}-\frac{3x^2}{4}-\frac{3\ln(1+x)}{2}+\frac{3x}{2}-\sqrt{x^2+3y(x)}=0$$

2.700 ODE No. 700

$$y'(x) = \frac{1}{xy(x)\left(xy(x)^2 + x + 1\right)}$$

✓ **Mathematica** : cpu = 0.139769 (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 = 0.099 (sec), leaf count = 62

```
dsolve(diff(y(x),x) = 1/x/(x*y(x)^2+1+x)/y(x),y(x))
```

$$y(x) = \frac{\sqrt{x\left(2\,\mathrm{LambertW}\left(\frac{c_1 \mathrm{e}^{-\frac{x-1}{2x}}}{2}\right)x + x - 1\right)}}{x}$$

2.701 ODE No. 701

$$y'(x) = \frac{x^4 + x^4\log(x) - 2x^2y(x) - 2x^2y(x)\log(x) + y(x)^2 + y(x)^2\log(x) + 2e^x x - 2x - \log(x) - 1}{e^x - 1}$$

✓ **Mathematica** : cpu = 1.05605 (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] - 2*x^2*Lo
```

$$\left\{\left\{y(x)\to \frac{\exp\left(\int_1^x \frac{2(\log(K[5])+1)}{-1+e^{K[5]}}\,dK[5]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[6]} \frac{2(\log(K[5])+1)}{-1+e^{K[5]}}\,dK[5]\right)(\log(K[6])+1)}{-1+e^{K[6]}}\,dK[6] + c_1} + x^2 + 1\right\}\right\}$$

✓ **Maple** : cpu = 6.017 (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)
```

$$y(x) = \frac{-x^2 e^{\int \frac{2\ln(x)+2}{e^x-1}dx} + x^2 c_1 + e^{\int \frac{2\ln(x)+2}{e^x-1}dx} + c_1}{-e^{\int \frac{2\ln(x)+2}{e^x-1}dx} + c_1}$$

2.702 ODE No. 702

$$y'(x) = \frac{-x^3 + x^3(-\log(x)) - xy(x)^2 + xy(x) - e^x y(x) - xy(x)^2 \log(x)}{x\,(x - e^x)}$$

✓ **Mathematica** : cpu = 2.81506 (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[x]^2)/(x
```

$$\left\{\left\{y(x)\to x\tan\left(\int_1^x \frac{K[1](\log(K[1])+1)}{e^{K[1]}-K[1]}dK[1]+c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.066 (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
```

$$y(x) = \tan\left(\int \frac{x\ln(x)}{\mathrm{e}^x - x}dx + \int \frac{x}{\mathrm{e}^x - x}dx + c_1\right)x$$

2.703 ODE No. 703

$$y'(x) = \frac{y(x)\left(x^3y(x) + x^2y(x)\log(x) - x^2 - x - x\log(x) + 1\right)}{(x-1)x}$$

✓ **Mathematica** : cpu = 0.408999 (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]))/((-1 + x)*
```

$$\left\{\left\{y(x)\to -\frac{e^{-\text{PolyLog}(2,x)-x}(1-x)^{-\log(x)}}{(x-1)x\left(-\int_1^x \frac{\exp(-K[1]-\log(1-K[1])(\log(K[1])+1)-\text{PolyLog}(2,K[1]))(K[1]^3+\log(K[1])K[1]^2)}{(K[1]-1)K[1]^2}dK[1]+c_1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.184 (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))
```

$$y(x) = \frac{e^{\text{dilog}(x)}e^{-x}}{x\left(\int -\frac{e^{\text{dilog}(x)}(x+\ln(x))e^{-x}}{(x-1)^2}dx + c_1\right)(x-1)}$$

2.704 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 = 26.878 (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*Log[x])),y
```

$$\left\{\left\{y(x)\to \frac{\sqrt{b}x\tan\left(\sqrt{a}\sqrt{b}\int_1^x \frac{2K[1]^3}{K[1]\log(K[1])-1}dK[1]+\sqrt{a}\sqrt{b}c_1\right)}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.11 (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))
```

$$y(x) = \frac{\tan\left(2\sqrt{ab}\left(c_1+\int \frac{x^3}{x\ln(x)-1}dx\right)\right)x\sqrt{ab}}{a}$$

2.705 ODE No. 705

$$y'(x) = \frac{y(x)\left(x^4 + x^3 + \log(y(x)) + x\right)}{x}$$

✓ **Mathematica** : cpu = 0.111664 (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 = 0.207 (sec), leaf count = 24

```
dsolve(diff(y(x),x) = (ln(y(x))+x+x^3+x^4)*y(x)/x,y(x))
```

$$y(x) = \mathrm{e}^{\frac{x^4}{3}} \mathrm{e}^{\frac{x^3}{2}} \mathrm{e}^{x c_1} x^x$$

2.706 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 = 4.53024 (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])^2),y[x],
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{-2\log(x)x^2+\log(K[2]-1)x^2-\log(K[2]+1)x^2-8}{2\left(2\log(x)x^2-\log(K[2]-1)x^2+\log(K[2]+1)x^2+K[2]\left(2\log(x)x^2-\log(K[2]-1)x^2+\log(K[\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.902 (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))
```

$$\int_{\_b}^{y(x)} -\frac{1}{2\left(\_a+1\right)\left(-\frac{x^2(\_a+1)\ln(\_a-1)}{2}+\frac{x^2(\_a+1)\ln(\_a+1)}{2}+x^2\left(\_a+1\right)\ln\left(x\right)+4\_a-4\right)}d\_a-\frac{\ln\left(x\right)}{8}-c_1=0$$

2.707 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 = 4.61129 (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)/16,y[x],
```

$$\text{Solve}\left[\int_1^x -\frac{}{4\log^2(K[1])K[1]^2+\log^2(y(x)-1)K[1]^2+\log^2(y(x)+1)K[1]^2-4\log(K[1])\log(y(x)-1)K[1]^2+4}\right.$$

✓ **Maple** : cpu = 0.605 (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))
```

$$\int_{\_b}^{y(x)} \frac{1}{4\left(\frac{x^2(\_a+1)\ln(\_a+1)^2}{4}+x^2(\_a+1)\left(-\frac{\ln(\_a-1)}{2}+\ln(x)\right)\ln(\_a+1)+\frac{x^2(\_a+1)\ln(\_a-1)^2}{4}-x^2(\_a+1)\ln(x\right.}$$

2.708 ODE No. 708

$$y'(x) = \frac{\left(4ax - y(x)^2\right)^3}{y(x)\left(4ax - y(x)^2 - 1\right)}$$

✓ **Mathematica** : cpu = 0.253915 (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]
```

$$\text{Solve}\left[2a\left(x - \frac{\text{RootSum}\left[-\#1^3 + 2\#1a - 2a\&, \frac{\#1a\log\left(-\#1+4ax-y(x)^2\right) - a\log\left(-\#1+4ax-y(x)^2\right)}{2a-3\#1^2}\&\right]}{2a}\right) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 55.304 (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))
```

$$\int_{\_b}^{x} - \frac{\left(4\_aa - y(x)^2\right)^3}{-y(x)^6 + 12\_aay(x)^4 + \left(-48\_a^2a^2 + 2a\right)y(x)^2 + 64\_a^3a^3 - 8\_a\,a^2 + 2a} d\_a + \int^{y(x)} \left(\frac{}{-\_f^6 + 12\_f^4ax}\right.$$

2.709 ODE No. 709

$$y'(x) = \frac{x^3\sqrt{4ax - y(x)^2} + 2ax + 2a}{(x+1)y(x)}$$

✓ **Mathematica** : cpu = 1.60818 (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]
```

$$\left\{\left\{y(x) \to -\frac{1}{6}\sqrt{144ax - 4x^6 + 12x^5 - 33x^4 + 36x^3 + 24x^3\log(x+1) - 24c_1x^3 - 36x^2 - 36x^2\log(x+1) + 36c_1\right.\right.$$

✓ **Maple** : cpu = 0.191 (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))
```

$$-\sqrt{-y(x)^2 + 4ax} - \frac{x^3}{3} + \frac{x^2}{2} - x + \ln(1+x) - c_1 = 0$$

2.710 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 = 0.793711 (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^x^(-1)
```

$$\left\{\left\{y(x) \to -x + \tan\left(\int_1^x -\frac{2K[5]}{e^{\frac{1}{K[5]}} - \log(K[5])} dK[5] + c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 2.527 (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
```

$$y(x) = -x + \tan\left(2c_1 - 2\left(\int -\frac{x}{\ln(x) - \mathrm{e}^{\frac{1}{x}}} dx\right)\right)$$

2.711 ODE No. 711

$$y'(x) = \frac{y(x)(-x\log(y(x)) - \log(y(x)) + 1)}{x+1}$$

✓ **Mathematica** : cpu = 0.172179 (sec), leaf count = 28

```
DSolve[Derivative[1][y][x] == ((1 - Log[y[x]] - x*Log[y[x]])*y[x])/(1 + x),y[x],x]
```

$$\left\{\left\{y(x)\to e^{e^{-x-1}\,\text{ExpIntegralEi}(x+1)+c_1 e^{-x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.215 (sec), leaf count = 31

```
dsolve(diff(y(x),x) = -(ln(y(x))*x+ln(y(x))-1)*y(x)/(1+x),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{e}^{-x}c_1}\mathrm{e}^{-\,\mathrm{expIntegral}_1(-1-x)\mathrm{e}^{-1-x}}$$

2.712 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 = 0.593976 (sec), leaf count = 49

```
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[x],x]
```

$$\left\{\left\{y(x) \to \frac{1}{4}\left(x^2 - \frac{1}{9}\left(-2x^3 + 3x^2 - 6x - 6\log\left(\frac{1}{x+1}\right) + 6c_1\right)^2 + 2x + 1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.411 (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))
```

$$c_1 - \frac{2x^3}{3} + x^2 - 2x + 2\ln(1 + x) - \sqrt{x^2 + 2x + 1 - 4y(x)} = 0$$

2.713 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 = 0.0748753 (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 - a*Sqrt[
```

$$\left\{\left\{y(x) \to -\frac{a\sqrt{x} - a - bx - b}{a} + \frac{1}{a^2\text{Root}\left[\#1^6\left(16x^3 + 16e^{12c_1}\right) - \frac{24\#1^4x^2}{a^4} + \frac{8\#1^3x^{3/2}}{a^6} + \frac{9\#1^2x}{a^8} - \frac{6\#1\sqrt{x}}{a^{10}} + \frac{1}{a^{12}}\&,\right.}\right.\right.$$

✓ **Maple** : cpu = 0.395 (sec), leaf count = 116

```
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)
```

$$y(x) = \frac{\text{RootOf}\left(-x^{\frac{3}{2}}ab + b^2x^2 - a^2\sqrt{x} - ba\sqrt{x} - 2a^2x + 2abx + 2b^2x + a^2 + 2ab + b^2 + \mathrm{e}^{\text{RootOf}\left(9x\tanh\left(-\frac{3\_Z}{2} + \right.\right.}\right.}{a}$$

2.714 ODE No. 714

$$y'(x) = -\frac{y(x)\left(x^3y(x) + x^2y(x)\log(x) - x^2 + e^x - x\log(x) - \log\left(\frac{1}{x}\right)\right)}{x\left(e^x - \log\left(\frac{1}{x}\right)\right)}$$

✓ **Mathematica** : cpu = 1.05784 (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*Log[x]*y[x
```

$$\left\{\left\{y(x)\to \frac{\exp\left(\int_1^x -\frac{-K[1]^2-\log(K[1])K[1]+e^{K[1]}-\log\left(\frac{1}{K[1]}\right)}{K[1]\left(e^{K[1]}-\log\left(\frac{1}{K[1]}\right)\right)}dK[1]\right)}{-\int_1^x -\frac{\exp\left(\int_1^{K[2]} -\frac{-K[1]^2-\log(K[1])K[1]+e^{K[1]}-\log\left(\frac{1}{K[1]}\right)}{K[1]\left(e^{K[1]}-\log\left(\frac{1}{K[1]}\right)\right)}dK[1]\right)\left(K[2]^3+\log(K[2])K[2]^2\right)}{K[2]\left(e^{K[2]}-\log\left(\frac{1}{K[2]}\right)\right)}dK[2]+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.25 (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)+
```

$$y(x) = \frac{e^{\int \frac{x\ln(x)+x^2+\ln\left(\frac{1}{x}\right)-e^x}{\left(-\ln\left(\frac{1}{x}\right)+e^x\right)x}dx}}{\int \frac{e^{\int \frac{x\ln(x)+x^2+\ln\left(\frac{1}{x}\right)-e^x}{\left(-\ln\left(\frac{1}{x}\right)+e^x\right)x}dx}x(x+\ln(x))}{-\ln\left(\frac{1}{x}\right)+e^x}dx+c_1}$$

2.715 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 = 0.596279 (sec), leaf count = 50

```
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],x]
```

$$\left\{\left\{y(x) \to \frac{1}{4}\left(-x^2 + \frac{1}{9}\left(2x^3 - 3x^2 + 6x + 6\log\left(\frac{1}{x+1}\right) - 6c_1\right)^2 + 4x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.398 (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))
```

$$c_1 + \frac{2x^3}{3} - x^2 - 2\ln(1+x) + 2x - \sqrt{x^2 - 4x + 4y(x)} = 0$$

2.716 ODE No. 716

$$y'(x) = \frac{\sqrt{9x^4 - 4y(x)^3} + 3x^4 + 3x^3}{(x+1)y(x)^2}$$

✓ **Mathematica** : cpu = 1.50606 (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],x]
```

$$\left\{\left\{y(x) \to \left(-\frac{3}{2}\right)^{2/3} \sqrt[3]{x^4 - 4\log^2(x+1) + 8c_1\log(x+1) - 4{c_1}^2}\right\}, \left\{y(x) \to \left(\frac{3}{2}\right)^{2/3} \sqrt[3]{x^4 - 4\log^2(x+1) + 8c\right.\right.$$

✓ **Maple** : cpu = 0.225 (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))
```

$$\int_{\_b}^{y(x)} \frac{\_a^2}{\sqrt{9x^4 - 4\_a^3}} d\_a - \ln(1+x) - c_1 = 0$$

2.717 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 = 0.309522 (sec), leaf count = 46

```
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[x]])/(1
```

$$\left\{\left\{y(x) \to \frac{1}{4}\left(-a^2 - 2ax - x^2 + 4\log^2(x+1) - 8c_1\log(x+1) + 4c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.394 (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))
```

$$c_1 + \frac{a}{2} + 2\ln(1+x) - \sqrt{x^2 + 2ax + a^2 + 4y(x)} = 0$$

2.718 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 = 0.23134 (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]
```

$$\text{Solve}\left[\frac{11}{3}\text{RootSum}\left[11\#1^3 + 15\sqrt[3]{11}\#1 + 11\&, \frac{\log\left(\frac{3e^{2x^2} x y(x) + e^{x^2} x}{\sqrt[3]{11}\sqrt[3]{e^{3x^2} x^3}} - \#1\right)}{11\#1^2 + 5\sqrt[3]{11}}\&\right] = \frac{11^{2/3} e^{x^2} x^3}{18\sqrt[3]{e^{3x^2} x^3}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.062 (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))
```

$$y(x) = \frac{\left(-11\,\text{RootOf}\left(-5x^2 + 20250\left(\int^{\_Z} \frac{1}{121\_a^3 + 3375\_a - 3375} d\_a\right) + 6c_1\right) - 15\right) e^{-x^2}}{45}$$

2.719 ODE No. 719

$$y'(x) = \frac{e^{-x}y(x)\left(x^2y(x)\log(2x) - e^x - x\log(2x)\right)}{x}$$

✓ **Mathematica** : cpu = 0.36989 (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]
```

$$\left\{\left\{y(x) \to \frac{2^{e^{-x}}x^{e^{-x}-1}}{2^{e^{-x}}x^{e^{-x}} + c_1e^{\text{ExpIntegralEi}(-x)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.104 (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))
```

$$y(x) = \frac{1}{2^{-\mathrm{e}^{-x}}c_1x^{-\mathrm{e}^{-x}+1}\mathrm{e}^{-\operatorname{expIntegral}_1(x)} + x}$$

2.720 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 = 1.91134 (sec), leaf count = 372

```
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],x]
```

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{-4x^6 + 12x^5 - 24x^4 - 8x^3 + 24x^3\log(x+1) + 24c_1x^3 + 30x^2 - 36x^2\log(x+1) - 36c_1x^2 - 132x}}{2^2}\right.\right.$$

✓ **Maple** : cpu = 0.164 (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))
```

$$\int_{\_b}^{y(x)} \frac{\_a^2}{\sqrt{9x^4 - 4\_a^3}} d\_a - \frac{x^3}{3} + \frac{x^2}{2} - x + \ln(1+x) - c_1 = 0$$

2.721 ODE No. 721

$$y'(x) = \frac{1}{36}\sqrt{x}\left(18x^{3/2} + x^6 - 12x^3y(x) + 36y(x)^2\right)$$

✓ **Mathematica** : cpu = 0.0863109 (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],x]
```

$$\left\{\left\{y(x) \to \frac{x^3}{6} + \frac{1}{-\frac{2x^{3/2}}{3} + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.059 (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))
```

$$y(x) = \frac{x^3}{6} + \frac{1}{c_1 - \frac{2x^{\frac{3}{2}}}{3}}$$

2.722 ODE No. 722

$$y'(x) = -\frac{y(x)^3}{x(-y(x) + 2y(x)\log(x) - 1)}$$

✓ **Mathematica** : cpu = 17.1385 (sec), leaf count = 490

```
DSolve[Derivative[1][y][x] == -(y[x]^3/(x*(-1 - y[x] + 2*Log[x]*y[x]))),y[x],x]
```

$$\text{Solve}\left[-\frac{\sqrt[3]{-2}\left((-2)^{2/3} - \frac{(1-2\log(x))^2\left(-\frac{1}{(2\log(x)-1)^3}\right)^{2/3}(y(x)(5-4\log(x))+2)}{2\sqrt[3]{2}(y(x)(2\log(x)-1)-1)}\right)\left(\frac{y(x)(4\log(x)-5)-2}{\sqrt[3]{2}\sqrt[3]{-\frac{1}{(2\log(x)-1)^3}}(2\log(x)-1)(y(x)(2\log(x)-\right.}{}\right.$$

✓ **Maple** : cpu = 0.415 (sec), leaf count = 70

```
dsolve(diff(y(x),x) = -y(x)^3/(-1+2*y(x)*ln(x)-y(x))/x,y(x))
```

$$y(x) = \frac{e^{\mathrm{RootOf}\left(-e^{\_Z}\ln\left(\frac{e^{\_Z}+2}{2x^4}\right)+3e^{\_Z}c_1+\_Z e^{\_Z}+2\right)}}{1+(2\ln(x)-1)e^{\mathrm{RootOf}\left(-e^{\_Z}\ln\left(\frac{e^{\_Z}+2}{2x^4}\right)+3e^{\_Z}c_1+\_Z e^{\_Z}+2\right)}}$$

2.723 ODE No. 723

$$y'(x) = \frac{2a}{32a^3x^2 - 16a^2xy(x)^2 + 2ay(x)^4 + y(x)}$$

✓ **Mathematica** : cpu = 0.15338 (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]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt[3]{-1024a^6c_1{}^3 + 9216a^5c_1x - 432a^2 + \sqrt{4\left(-192a^3x - 64a^4c_1{}^2\right)^3 + \left(-1024a^6c_1{}^3 + 9216a^5c_1x - 43\right.}}}{12\sqrt[3]{2}a}\right.\right.$$

✓ **Maple** : cpu = 0.12 (sec), leaf count = 852

```
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))
```

$$y(x) = \frac{\left(\left(64c_1^3a^4 - 576c_1a^3x + 3\sqrt{-12288a^7xc_1^4 + 24576a^6x^2c_1^2 - 12288a^5x^3 + 384c_1^3a^4 - 3456c_1a^3x + 81} + 27\right)\right.}{6a}$$

2.724 ODE No. 724

$$y'(x) = -\frac{y(x)^3}{x(-y(x) + y(x)\log(x) - 1)}$$

✓ **Mathematica** : cpu = 10.9412 (sec), leaf count = 422

```
DSolve[Derivative[1][y][x] == -(y[x]^3/(x*(-1 - y[x] + Log[x]*y[x]))),y[x],x]
```

$$\text{Solve}\left[-\frac{\sqrt[3]{-2}\left(\frac{1-y(x)(\log(x)-4)}{\sqrt[3]{2}\sqrt[3]{-\frac{1}{(\log(x)-1)^3}}(\log(x)-1)(y(x)(\log(x)-1)-1)}+(-2)^{2/3}\right)\left(\frac{2^{2/3}(y(x)(\log(x)-4)-1)}{\sqrt[3]{-\frac{1}{(\log(x)-1)^3}}(\log(x)-1)(y(x)(\log(x)-1)-1)}+(-\right.}{}\right.$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 18

```
dsolve(diff(y(x),x) = -y(x)^3/(-1+y(x)*ln(x)-y(x))/x,y(x))
```

$$y(x) = \frac{1}{-\text{LambertW}\left(c_1 e^{-2} x\right) + \ln(x) - 2}$$

2.725 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 = 0.234412 (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*x]*y[x]^
```

$$\{\{y(x) \to -x + \tan(\log(2)\,\mathrm{LogIntegral}(x) + x + c_1)\}\}$$

✓ **Maple** : cpu = 1.288 (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
```

$$y(x) = -x - \tan\left(c_1 + \ln(2)\,\mathrm{expIntegral}_1\left(-\ln(x)\right) - x\right)$$

2.726 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 = 0.0758293 (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] + b*x +
```

$$\left\{\left\{y(x) \to -\frac{a\sqrt{x} + bx - c}{a} + \frac{1}{a^2 \text{Root}\left[\#1^6\left(16x^3 + 16e^{12c_1}\right) - \frac{24\#1^4x^2}{a^4} + \frac{8\#1^3x^{3/2}}{a^6} + \frac{9\#1^2x}{a^8} - \frac{6\#1\sqrt{x}}{a^{10}} + \frac{1}{a^{12}}\&, 1\right]}\right.\right.$$

✓ **Maple** : cpu = 0.372 (sec), leaf count = 93

```
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))
```

$$y(x) = \frac{\text{RootOf}\left(x^{\frac{3}{2}}ab + b^2x^2 - \sqrt{x}\,ac - 2a^2x - 2bcx + c^2 - \mathrm{e}^{\text{RootOf}\left(9x\tanh\left(-\frac{3\_Z}{2} + \frac{c_1}{2}\right)^2 a^2 - 9a^2x - 4\,\mathrm{e}^{\_Z}\right)} + \left(a\sqrt{x} + \right.\right.}{a}$$

2.727 ODE No. 727

$$y'(x)=\frac{y(x)(y(x)+2x+2)}{(x+1)(\log(y(x))+2x-1)}$$

✓ **Mathematica** : cpu = 0.28015 (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]
```

$$\left\{\left\{y(x)\to\frac{W\left(e^{-2x}(\log(x+1)+c_1)\right)}{\log(x+1)+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.191 (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))
```

$$y(x)=\mathrm{e}^{-\operatorname{LambertW}\left((\ln(1+x)-c_1)\mathrm{e}^{-2x}\right)-2x}$$

2.728 ODE No. 728

$$y'(x) = \frac{y(x)\left(x^3 + 3y(x)^2\right)}{x\left(6y(x)^2 + x\right)}$$

✓ **Mathematica** : cpu = 0.19918 (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 = 0.396 (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))
```

$$\frac{1}{\frac{1}{y(x)^2}+\frac{6}{x}} = \frac{\left(e^{\mathrm{RootOf}\left(e^{-Z}x^2 - e^{-Z}\ln\left(\frac{\left(e^{-Z}+9\right)x}{2}\right)+3\,e^{-Z}c_1 + \_Z e^{-Z}+9\right)}+9\right)x}{54}$$

2.729 ODE No. 729

$$y'(x) = \frac{(x - y(x))y(x)}{x\,(x - y(x)^3)}$$

✓ **Mathematica** : cpu = 0.183407 (sec), leaf count = 327

```
DSolve[Derivative[1][y][x] == ((x - y[x])*y[x])/(x*(x - y[x]^3)),y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{2}(-6\log(x)+6c_1)}{3\sqrt[3]{54x+\sqrt{2916x^2+4(-6\log(x)+6c_1)^3}}} - \frac{\sqrt[3]{54x+\sqrt{2916x^2+4(-6\log(x)+6c_1)^3}}}{3\sqrt[3]{2}}\right\},\left\{y(x)\to\right.\right.$$

✓ **Maple** : cpu = 0.105 (sec), leaf count = 400

```
dsolve(diff(y(x),x) = y(x)*(x-y(x))/x/(x-y(x)^3),y(x))
```

$$y(x) = \frac{\left(-27x+3\sqrt{-24\ln(x)^3+72\ln(x)^2c_1-72\ln(x)c_1^2+24c_1^3+81x^2}\right)^{\frac{2}{3}}+6\ln(x)-6c_1}{3\left(-27x+3\sqrt{-24\ln(x)^3+72\ln(x)^2c_1-72\ln(x)c_1^2+24c_1^3+81x^2}\right)^{\frac{1}{3}}}$$

2.730 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 = 0.228637 (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[x]^(3/2)
```

$$\text{Solve}\left[-\frac{2}{3}\text{RootSum}\left[\#1^3 - \#1 - 1\&, \frac{\#1\log\left(-\#1 + y(x)^{3/2} - \frac{3e^x}{2}\right) + \log\left(-\#1 + y(x)^{3/2} - \frac{3e^x}{2}\right)}{3\#1^2 - 1}\&\right] + e^x - c_1 =$$

✓ **Maple** : cpu = 1.084 (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
```

$$\mathrm{e}^x - \left(\int^{y(x)^{\frac{3}{2}} - \frac{3\,\mathrm{e}^x}{2}} \frac{2\_a + 2}{3\_a^3 - 3\_a - 3} d\_a\right) - c_1 = 0$$

2.731 ODE No. 731

$$y'(x) = \frac{2y(x)+1}{x\left(2xy(x)^3+xy(x)^2-2\right)}$$

✓ **Mathematica** : cpu = 0.300089 (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 = 0.129 (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))
```

$$y(x) = \frac{e^{\mathrm{RootOf}\left(x\,e^{3\_Z}-4x\,e^{2\_Z}+8xc_1e^{\_Z}+2\_Zx\,e^{\_Z}+3x\,e^{\_Z}+16\right)}}{2}-\frac{1}{2}$$

2.732 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 = 0.755298 (sec), leaf count = 56

```
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 + 4*y[x]])
```

$$\left\{\left\{y(x)\to \frac{1}{4}\left(-a^2-2ax-x^2+\frac{1}{9}\left(2x^3-3x^2+6x-6\log(-x-1)-6c_1\right)^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.418 (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))
```

$$c_1 + \frac{2x^3}{3} - x^2 - 2\ln(1+x) + 2x - \sqrt{x^2+2ax+a^2+4y(x)} = 0$$

2.733 ODE No. 733

$$y'(x) = \csc(x)\left(x^4\log(2x) - 2x^2 y(x)\log(2x) + y(x)^2\log(2x) - \log(2x) + 2x\sin(x)\right)$$

✓ **Mathematica** : cpu = 8.76475 (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]*y[x] + I
```

$$\left\{\left\{y(x)\to \frac{\exp\left(\int_1^x 2\csc(K[5])\log(2K[5])dK[5]\right)}{-\int_1^x \exp\left(\int_1^{K[6]} 2\csc(K[5])\log(2K[5])dK[5]\right)\csc(K[6])\log(2K[6])dK[6]+c_1}+x^2+1\right\}\right\}$$

✗ **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
```

, exception

`time expired`

2.734 ODE No. 734

$$y'(x) = \frac{y(x)\left(x^3 - x\log(y(x)) - \log(y(x))\right)}{x+1}$$

✓ **Mathematica** : cpu = 0.194114 (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]
```

$$\left\{\left\{y(x) \to \exp\left(-e^{-x-1}\,\text{ExpIntegralEi}(x+1) + x^2 - 3x - c_1 e^{-x} + 4\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.299 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = (-ln(y(x))*x-ln(y(x))+x^3)*y(x)/(1+x),y(x))
```

$$y(x) = e^{x^2} e^{-3x} e^4 e^{e^{-x} c_1} e^{e^{-1}\,\text{expIntegral}_1(-1-x) e^{-x}}$$

2.735 ODE No. 735

$$y'(x) = \frac{(2y(x)\log(x) - 1)^3}{x(-y(x) + 2y(x)\log(x) - 1)}$$

✓ **Mathematica** : cpu = 1.13369 (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]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{2(2\log(x)K[1]-K[1]-1)}{8\log^3(x)K[1]^3+4\log(x)K[1]^3-2K[1]^3-12\log^2(x)K[1]^2-2K[1]^2+6\log(x)K[1]-1}+2\text{RootS}\right.\right.$$

✓ **Maple** : cpu = 0.069 (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))
```

$$y(x) = \frac{71\,\text{RootOf}\left(-82944\left(\int^{\_Z}\frac{1}{5041\_a^3-27648\_a+27648}d\_a\right)-16\ln(x)+3c_1\right)-120}{(142\ln(x)-71)\,\text{RootOf}\left(-82944\left(\int^{\_Z}\frac{1}{5041\_a^3-27648\_a+27648}d\_a\right)-16\ln(x)+3c_1\right)-240\ln(x)+48}$$

2.736 ODE No. 736

$$y'(x) = \frac{x^4 - 2x^2y(x) + 2x^2 + y(x)^2 + 2x - 1}{x + 1}$$

✓ **Mathematica** : cpu = 0.146138 (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 = 0.125 (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))
```

$$y(x) = \frac{c_1\left(x^4 + 2x^3 - x^2 - 2x - 2\right) + x^2 + 1}{1 + \left(x^2 + 2x\right)c_1}$$

2.737 ODE No. 737

$$y'(x) = \frac{x(2x^3 - 2xy(x) + x - 1)}{x^2 - y(x)}$$

✓ **Mathematica** : cpu = 0.0284319 (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 = 0.214 (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))
```

$$y(x) = x^2 + \frac{\operatorname{LambertW}\left(-2\,\mathrm{e}^{\frac{4x^3}{3}}\mathrm{e}^{-2x^2}c_1\mathrm{e}^{-1}\right)}{2} + \frac{1}{2}$$

2.738 ODE No. 738

$$y'(x) = \frac{2a}{32a^3 - 16a^2xy(x)^2 + 2ax^2y(x)^4 - x^2y(x)}$$

✓ **Mathematica** : cpu = 0.274625 (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[x],x]
```

$$\left\{\left\{y(x) \to -\frac{4a+e^{c_1}}{12a} + \frac{\sqrt[3]{4608x^2a^4 - 128x^3a^3 + 1152e^{c_1}x^2a^3 - 96e^{c_1}x^3a^2 - 432x^3a^2 - 24e^{2c_1}x^3a - 2e^{3c_1}x^3 +}}{}\right.\right.$$

✓ **Maple** : cpu = 0.546 (sec), leaf count = 1048

```
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))
```

$$y(x) = \frac{\left(\left(-216c_1^3a^2x + 576a^3c_1^2 + 12\sqrt{-\frac{3(16384a^7c_1^4 - 108a^2x^3c_1^4 + 576a^3x^2c_1^3 - 512a^4xc_1^2 - x^3c_1 + 4a\,x^2)}{x}}\,c_1a - x\right)x^2\right)^{\frac{1}{3}}}{12axc_1} + \frac{}{12a}$$

2.739 ODE No. 739

$$y'(x) = \frac{2y(x) + 1}{x\left(2xy(x)^2 + xy(x) - 2\right)}$$

✓ **Mathematica** : cpu = 0.245653 (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 = 0.142 (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))
```

$$y(x) = \frac{e^{\text{RootOf}\left(x\,e^{2\_Z} + 2xc_1\,e^{\_Z} - \_Zx\,e^{\_Z} - x\,e^{\_Z} + 4\right)}}{2} - \frac{1}{2}$$

2.740 ODE No. 740

$$y'(x) = \frac{x^4 - 2x^2y(x)^2 + y(x)^4 + x}{y(x)}$$

✓ **Mathematica** : cpu = 0.0867891 (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]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{2x^3 + 2c_1x^2 - 1}}{\sqrt{2}\sqrt{x + c_1}}\right\}, \left\{y(x) \to \frac{\sqrt{2x^3 + 2c_1x^2 - 1}}{\sqrt{2}\sqrt{x + c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.083 (sec), leaf count = 72

```
dsolve(diff(y(x),x) = (x+y(x)^4-2*y(x)^2*x^2+x^4)/y(x),y(x))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{(x + c_1)(2x^3 + 2x^2c_1 - 1)}}{2x + 2c_1}$$

2.741 ODE No. 741

$$y'(x) = \frac{x(ay(x)^2 + bx^2)^3}{a^{5/2}y(x)\left(ay(x)^2 + a + bx^2\right)}$$

✓ **Mathematica** : cpu = 0.827607 (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)),y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}\left(x^2 - a^{3/2}\text{RootSum}\left[\#1^3b^3 + 3\#1^2ab^2y(x)^2 + \#1a^{3/2}b^2 + 3\#1a^2by(x)^4 + a^{5/2}by(x)^2 + a^{5/2}b + a^3y(x)^6\right.\right.\right.$$

✓ **Maple** : cpu = 0.881 (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))
```

$$\int_{\_b}^{x} \frac{\left(b\_a^2 + ay(x)^2\right)^3 \_a}{a^3\left(b\left(y(x)^2 + 1\right)a^{\frac{5}{2}} + a^{\frac{3}{2}}b^2\_a^2 + \left(b\_a^2 + ay(x)^2\right)^3\right)} d\_a + \int^{y(x)} \frac{\left(\left(-\_f^2 - 1\right)b\,a^{\frac{5}{2}} - a^{\frac{3}{2}}b^2x^2 - \left(\_f^2a + b\right.\right.}{b\left(\_\right.}$$

2.742 ODE No. 742

$$y'(x) = -\frac{(-\cos(y(x)) + x + 1)\cos(y(x))}{(x+1)(x\sin(y(x)) - 1)}$$

✓ **Mathematica** : cpu = 2.1227 (sec), leaf count = 3913

```
DSolve[Derivative[1][y][x] == -(((1 + x - Cos[y[x]])*Cos[y[x]])/((1 + x)*(-1 + x*Sin[y[x]]))),y[x],x]
```

$$\left\{\left\{y(x) \to -\sec^{-1}\left(\frac{c_1 x^3}{x^2-1} + \frac{\log(x+1)x^3}{x^2-1} - \frac{c_1{}^3 x^3}{(x^2-1)\left(c_1{}^2 + 2\log(x+1)c_1 + \log^2(x+1) + 1\right)} - \frac{}{(x^2-1)\left(c_1{}^2\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 1.473 (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))
```

$$y(x) = \arctan\left(\frac{(\ln(1+x) - c_1)\sqrt{\ln(1+x)^2 - 2c_1\ln(1+x) + c_1^2 - x^2 + 1} + x}{c_1^2 - 2c_1\ln(1+x) + \ln(1+x)^2 + 1}, \frac{\ln(1+x)\,x - xc_1 - \sqrt{\ln(1+x}}{c_1^2 - 2c_1\ln(1+x}\right.$$

2.743 ODE No. 743

$$y'(x) = -\frac{i(x^4 + 8x^2 y(x)^2 + 16y(x)^4 + 8ix)}{32y(x)}$$

✓ **Mathematica** : cpu = 0.0740526 (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],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{2}\sqrt{\left(\text{AiryBi}\left(\frac{1}{2}\left(i-\sqrt{3}\right)x\right) + c_1 \text{AiryAi}\left(\frac{1}{2}\left(i-\sqrt{3}\right)x\right)\right)\left(-\frac{1}{2}x^2\left(\text{AiryBi}\left(\frac{1}{2}\left(i-\sqrt{3}\right)x\right) + c_1 \text{AiryA}\right.\right.}}{2\,\text{AiryBi}\left(\frac{1}{2}\left(i-\sqrt{3}\right)x\right)}\right.\right.$$

✓ **Maple** : cpu = 0.743 (sec), leaf count = 296

```
dsolve(diff(y(x),x) = -1/32*I*(8*I*x+16*y(x)^4+8*y(x)^2*x^2+x^4)/y(x),y(x))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{\left(c_1\left(1+i\sqrt{3}\right)\text{AiryAi}\left(1, \frac{\left(i-\sqrt{3}\right)x}{2}\right) + \left(1+i\sqrt{3}\right)\text{AiryBi}\left(1, \frac{\left(i-\sqrt{3}\right)x}{2}\right) - \frac{x^2\left(\text{AiryAi}\left(\frac{\left(i-\sqrt{3}\right)x}{2}\right)c_1 + \text{A}\right.}{2}\right.}}{2\,\text{AiryAi}\left(\frac{\left(i-\sqrt{3}\right)x}{2}\right)c_1 + 2\,\text{AiryBi}\left(\frac{\left(i-\sqrt{3}\right.}{2}\right.}$$

2.744 ODE No. 744

$$y'(x) = \frac{x}{x^4 + 2x^2 y(x)^2 + y(x)^4 - y(x)}$$

✓ **Mathematica** : cpu = 0.107762 (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]
```

$$\left\{\left\{y(x) \to \frac{\sqrt[3]{144c_1x^2 + \sqrt{4\left(12x^2 - 4c_1{}^2\right)^3 + \left(144c_1x^2 - 108 + 16c_1{}^3\right)^2} - 108 + 16c_1{}^3}}{6\sqrt[3]{2}} - \frac{}{3\ 2^{2/3}\sqrt[3]{144c_1x^2 + \sqrt{}}}\right.\right.$$

✓ **Maple** : cpu = 0.19 (sec), leaf count = 619

```
dsolve(diff(y(x),x) = x/(-y(x)+x^4+2*y(x)^2*x^2+y(x)^4),y(x))
```

$$y(x) = \frac{\left(-36x^2c_1 - 54 - c_1^3 + 6\sqrt{48x^6 + 24x^4c_1^2 + 3x^2c_1^4 + 108x^2c_1 + 3c_1^3 + 81}\right)^{\frac{1}{3}}}{6} + \frac{}{6\left(-36x^2c_1 - 54 - c_1^3 + 6\sqrt{4}\right.}$$

2.745 ODE No. 745

$$y'(x) = \frac{(y(x)\log(x) - 1)^3}{x(-y(x) + y(x)\log(x) - 1)}$$

✓ **Mathematica** : cpu = 1.18019 (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]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{\log(x)K[1] - K[1] - 1}{\log^3(x)K[1]^3 + \log(x)K[1]^3 - K[1]^3 - 3\log^2(x)K[1]^2 - K[1]^2 + 3\log(x)K[1] - 1} + \text{RootSum}\left[K\right.\right.\right.$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 77

```
dsolve(diff(y(x),x) = (-1+y(x)*ln(x))^3/(-1+y(x)*ln(x)-y(x))/x,y(x))
```

$$y(x) = \frac{47\,\text{RootOf}\left(-27783\left(\int^{-Z} \frac{1}{2209\_a^3 - 9261\_a + 9261} d\_a\right) - 7\ln(x) + 3c_1\right) - 84}{21 + 47(\ln(x) - 1)\,\text{RootOf}\left(-27783\left(\int^{-Z} \frac{1}{2209\_a^3 - 9261\_a + 9261} d\_a\right) - 7\ln(x) + 3c_1\right) - 84\ln(x)}$$

2.746 ODE No. 746

$$y'(x) = -\frac{i(x^4 + 2x^2 y(x)^2 + y(x)^4 + ix)}{y(x)}$$

✓ **Mathematica** : cpu = 0.0639041 (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]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{2}\sqrt{\left(\text{AiryBi}\left(2(-1)^{5/6}x\right) + c_1\,\text{AiryAi}\left(2(-1)^{5/6}x\right)\right)\left(-2x^2\left(\text{AiryBi}\left(2(-1)^{5/6}x\right) + c_1\,\text{AiryAi}\left(2(-1\right.\right.\right.}}{2\,\text{AiryBi}\left(2(-1)^{5/6}x\right) + 2c_1\,\text{A}}\right.\right.$$

✓ **Maple** : cpu = 0.607 (sec), leaf count = 232

```
dsolve(diff(y(x),x) = -I*(I*x+x^4+2*y(x)^2*x^2+y(x)^4)/y(x),y(x))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{\left(\text{AiryAi}\left(-(-8i)^{\frac{1}{3}}\,x\right)c_1 + \text{AiryBi}\left(-(-8i)^{\frac{1}{3}}\,x\right)\right)\left(c_1\left(1+i\sqrt{3}\right)\text{AiryAi}\left(1, -(-8i)^{\frac{1}{3}}\,x\right) + (1+i\right.}}{2\,\text{AiryAi}\left(-(-8i)^{\frac{1}{3}}\,x\right)c_1 + 2\,\text{Airy}}$$

2.747 ODE No. 747

$$y'(x) = -\frac{y(x)\cot(x)\left(x^2y(x)(-\log(2x)) + x\log(2x) + \tan(x)\right)}{x}$$

✓ **Mathematica** : cpu = 3.27786 (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[x],x]
```

$$\left\{\left\{y(x)\to \frac{\exp\left(\int_1^x \frac{-\cot(K[1])K[1]\log(2K[1])-1}{K[1]}dK[1]\right)}{-\int_1^x \exp\left(\int_1^{K[2]} \frac{-\cot(K[1])K[1]\log(2K[1])-1}{K[1]}dK[1]\right)\cot(K[2])K[2]\log(2K[2])dK[2] + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.513 (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))
```

$$y(x) = \frac{e^{\int \frac{-x\ln(2)-x\ln(x)-\tan(x)}{x\tan(x)}dx}}{\int -\frac{e^{\int \frac{-x\ln(2)-x\ln(x)-\tan(x)}{x\tan(x)}dx}x(\ln(2)+\ln(x))}{\tan(x)}dx + c_1}$$

2.748 ODE No. 748

$$y'(x) = \frac{y(x)(y(x) + x)}{x\,(y(x)^3 + x)}$$

✓ **Mathematica** : cpu = 0.162413 (sec), leaf count = 285

```
DSolve[Derivative[1][y][x] == (y[x]*(x + y[x]))/(x*(x + y[x]^3)),y[x],x]
```

$$\left\{\left\{y(x)\to \frac{2\sqrt[3]{2}(\log(x)+c_1)}{\sqrt[3]{54x+\sqrt{2916x^2-864(\log(x)+c_1)^3}}}+\frac{\sqrt[3]{54x+\sqrt{2916x^2-864(\log(x)+c_1)^3}}}{3\sqrt[3]{2}}\right\},\left\{y(x)\to -\frac{}{\sqrt[3]{5}}\right.$$

✓ **Maple** : cpu = 0.112 (sec), leaf count = 398

```
dsolve(diff(y(x),x) = y(x)*(y(x)+x)/x/(x+y(x)^3),y(x))
```

$$y(x) = \frac{\left(27x+3\sqrt{-24c_1^3-72\ln(x)\,c_1^2-72\ln(x)^2\,c_1-24\ln(x)^3+81x^2}\right)^{\frac{2}{3}}+6\ln(x)+6c_1}{3\left(27x+3\sqrt{-24c_1^3-72\ln(x)\,c_1^2-72\ln(x)^2\,c_1-24\ln(x)^3+81x^2}\right)^{\frac{1}{3}}}$$

2.749 ODE No. 749

$$y'(x) = \frac{x(x - y(x))^2(y(x) + x)^2}{y(x)}$$

✓ **Mathematica** : cpu = 0.119086 (sec), leaf count = 126

```
DSolve[Derivative[1][y][x] == (x*(x - y[x])^2*(x + y[x])^2)/y[x],y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{x^2 + x^2 e^{2x^2+4c_1} - e^{2x^2+4c_1} + 1}}{\sqrt{1 + e^{2x^2+4c_1}}}\right\}, \left\{y(x) \to \frac{\sqrt{x^2 + x^2 e^{2x^2+4c_1} - e^{2x^2+4c_1} + 1}}{\sqrt{1 + e^{2x^2+4c_1}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.14 (sec), leaf count = 186

```
dsolve(diff(y(x),x) = (x-y(x))^2*(y(x)+x)^2*x/y(x),y(x))
```

$$y(x) = \frac{\sqrt{\left(c_1 \left(x^2 + 1\right) e^{-\frac{\left(x^2+1\right)^2}{2}} + \left(x^2 - 1\right) e^{-\frac{x^2\left(x^2-2\right)}{2}}\right)\left(c_1 e^{-\frac{\left(x^2+1\right)^2}{2}} + e^{-\frac{x^2\left(x^2-2\right)}{2}}\right)}}{c_1 e^{-\frac{\left(x^2+1\right)^2}{2}} + e^{-\frac{x^2\left(x^2-2\right)}{2}}}$$

2.750 ODE No. 750

$$y'(x) = \frac{y(x)\left(x^2 + 3y(x)^2\right)}{x\left(6y(x)^2 + x\right)}$$

✓ **Mathematica** : cpu = 0.183002 (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 = 0.437 (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))
```

$$\frac{1}{\frac{1}{y(x)^2} + \frac{6}{x}} = \frac{\left(\mathrm{e}^{\mathrm{RootOf}\left(-\mathrm{e}^{\_Z}\ln\left(\frac{\left(\mathrm{e}^{\_Z}+9\right)x}{2}\right)+3\,\mathrm{e}^{\_Z}c_1+\_Z\mathrm{e}^{\_Z}+2x\,\mathrm{e}^{\_Z}+9\right)} + 9\right)x}{54}$$

2.751 ODE No. 751

$$y'(x) = \frac{y(x)\left(x^4 + x\log(y(x)) + \log(y(x))\right)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.126611 (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 = 0.149 (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))
```

$$y(x) = \mathrm{e}^{\frac{x^3}{2}} (1+x)^x \, \mathrm{e}^{x c_1} \mathrm{e}^{-x^2}$$

2.752 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 = 0.155532 (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]])),y[x],
```

$$\left\{\left\{y(x)\to\tan^{-1}\left(\frac{6\left(2x^4-3x^3+6x^2+6c_1x-6\log(x+1)x+\sqrt{4x^6-12x^5+33x^4+12(2c_1-3)x^3-36c_1x^2}\right.}{4x^6-12x^5+33x^4+12(2c_1-3)x^3-36(c_1-1)x^2+72c_1x+36\log^2(}\right.\right.\right.$$

✓ **Maple** : cpu = 1.724 (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))
```

$$y(x)=\arctan\left(\frac{\left(-2x^3+3x^2+6\ln(1+x)-6c_1-6x\right)\sqrt{36\ln(1+x)^2+\left(-24x^3+36x^2-72x-72c_1\right)\ln(1+}}{36\ln(1+x)^2+\left(-24x^3+36x^2-72x-72c_1\right)\ln(1+x)+4x^6-12x^5+33x}\right.$$

2.753 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 = 0.121695 (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 = 0.207 (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))
```

$$y(x) = \mathrm{e}^{-\frac{12x}{3x^4 - 4x^3 + 6x^2 + 12\ln(1+x) - 12c_1 - 12x}}$$

2.754 ODE No. 754

$$y'(x) = \frac{x^3 + xy(x)^2 + xy(x) + y(x)^3}{x^2}$$

✓ **Mathematica** : cpu = 0.0876933 (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 = 0.019 (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))
```

$$y(x) = \text{RootOf}\left(-\left(\int^{\_Z} \frac{1}{\_a^3 + \_a^2 + 1} d\_a\right) + x + c_1\right) x$$

2.755 ODE No. 755

$$y'(x) = \frac{y(x)^{3/2}}{x^2 - 2xy(x) + y(x)^2 + y(x)^{3/2}}$$

✓ **Mathematica** : cpu = 0.200627 (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]
```

$$\left\{\left\{y(x) \to \frac{2}{3}\left(x + e^{c_1} + 2e^{2c_1}\right) - \frac{1}{3}\sqrt[3]{x^3 + 3e^{c_1}x^2 - 12e^{2c_1}x^2 + 3e^{2c_1}x + 12e^{3c_1}x + 48e^{4c_1}x + e^{3c_1} - 30e^{4c_1} - 96e^{5}}\right.\right.$$

✓ **Maple** : cpu = 0.089 (sec), leaf count = 71

```
dsolve(diff(y(x),x) = y(x)^(3/2)/(y(x)^(3/2)+x^2-2*x*y(x)+y(x)^2),y(x))
```

$$\frac{4\sqrt{y(x)}\,x^2 - y(x)^{\frac{7}{2}}c_1 + (2xc_1 + 4)\,y(x)^{\frac{5}{2}} + 4y(x)^2 + \left(-x^2c_1 - 8x + 1\right)y(x)^{\frac{3}{2}} - 4xy(x)}{(x - y(x))^2\,y(x)^{\frac{3}{2}}} = 0$$

2.756 ODE No. 756

$$y'(x) = \frac{x^6 + 2x^3 y(x) + x^2 y(x)^2 + y(x)^3}{x^4}$$

✓ **Mathematica** : cpu = 1.12749 (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]
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3y(x)}{x^4}+\frac{1}{x^2}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^6}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}\left(\frac{1}{x^6}\right)^{2/3} x^5 + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.037 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = (2*x^3*y(x)+x^6+y(x)^2*x^2+y(x)^3)/x^4,y(x))
```

$$y(x) = \frac{\left(-3 + 29\,\text{RootOf}\left(-81\left(\int^{\_Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + x + 3c_1\right)\right) x^2}{9}$$

2.757 ODE No. 757

$$y'(x) = \frac{x^3 + 2x^2 - 4xy(x) - 4x - 8}{2x^2 - 8y(x) + 4x - 8}$$

✓ **Mathematica** : cpu = 0.0261713 (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]),y[x],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 = 0.097 (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))
```

$$y(x) = \frac{x^2}{4} + 2\,\mathrm{LambertW}\left(\frac{c_1 e^{-\frac{x}{4}} e^{-\frac{1}{2}}}{2}\right) + \frac{x}{2} + 1$$

2.758 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 = 0.513695 (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[x],x]
```

$$\left\{\left\{y(x) \to \frac{6W\left(-\frac{1}{6}\sqrt[6]{e^{-12x}\left(2x^3 - 3x^2 + 6x - 6\log(x+1) + 6c_1\right)^6}\right)}{2x^3 - 3x^2 + 6x - 6\log(x+1) + 6c_1}\right\}, \left\{y(x) \to \frac{6W\left(\frac{1}{6}\sqrt[6]{e^{-12x}\left(2x^3 - 3x^2 + 6\right.}\right.}{2x^3 - 3x^2 + 6x - 6}\right.\right.$$

✓ **Maple** : cpu = 0.22 (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))
```

$$y(x) = e^{-\mathrm{LambertW}\left(-\frac{\left(-2x^3+3x^2+6\ln(1+x)+6c_1-6x\right)e^{-2x}}{6}\right)-2x}$$

2.759 ODE No. 759

$$y'(x) = -\frac{ix(x^8 + 18x^4y(x)^2 + 54ix^2 + 81y(x)^4)}{243y(x)}$$

✓ **Mathematica** : cpu = 0.0679787 (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[x],y[x
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{\left(\text{BesselY}\left(\frac{1}{3}, \left(\frac{2}{9} - \frac{2i}{9}\right)\sqrt{\frac{2}{3}}x^3\right) + c_1\,\text{BesselJ}\left(\frac{1}{3}, \left(\frac{2}{9} - \frac{2i}{9}\right)\sqrt{\frac{2}{3}}x^3\right)\right)\left((1+i)\sqrt{6}x^3\left(\text{BesselY}\left(\frac{4}{3}, \left(\frac{2}{9}\right.\right.\right.\right.}}{\sqrt{3}x\left(\text{BesselY}\left(\right.\right.}\right.\right.$$

✓ **Maple** : cpu = 0.958 (sec), leaf count = 305

```
dsolve(diff(y(x),x) = -1/243*I*(54*I*x^2+81*y(x)^4+18*y(x)^2*x^4+x^8)*x/y(x),y(x))
```

$$y(x) = -\frac{\sqrt{3}\sqrt{\left(\text{BesselJ}\left(\frac{1}{3}, \left(\frac{2}{27} - \frac{2i}{27}\right)\sqrt{6}\,x^3\right)c_1 + \text{BesselY}\left(\frac{1}{3}, \left(\frac{2}{27} - \frac{2i}{27}\right)\sqrt{6}\,x^3\right)\right)\left(-9c_1\left(\frac{x^6}{27} + i\right)\text{BesselJ}\left(\frac{1}{3}, \left(\frac{2}{27}\right.\right.\right.}}{3\left(\text{BesselJ}\left(\frac{1}{3}, \left(\frac{2}{2}\right.\right.\right.}$$

2.760 ODE No. 760

$$y'(x) = \frac{\left(xy(x)^2+1\right)^3}{x^4y(x)\left(xy(x)^2+x+1\right)}$$

✓ **Mathematica** : cpu = 0.488612 (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]
```

$$\text{Solve}\left[2\left(-\frac{1}{10}\arctan\left(2xy(x)^4+2xy(x)^2+2y(x)^2+x+1\right)+\frac{1}{10}\log\left(2x^2y(x)^4+2x^2y(x)^2+x^2+4xy(x)^2+2x\right.\right.\right.$$

✓ **Maple** : cpu = 1.944 (sec), leaf count = 99

```
dsolve(diff(y(x),x) = (x*y(x)^2+1)^3/x^4/(x*y(x)^2+1+x)/y(x),y(x))
```

$$\frac{2\ln\left(xy(x)^2-x+1\right)x-\ln\left(2y(x)^4x^2+\left(2x^2+4x\right)y(x)^2+x^2+2x+2\right)x+\arctan\left(2xy(x)^4+(2x+2)\,y(x)^2\right.}{10x}$$

2.761 ODE No. 761

$$y'(x) = \frac{-x^3 + 4x^2 - 4xy(x) - 4x + 8}{2x^2 + 8y(x) - 8x + 8}$$

✓ **Mathematica** : cpu = 0.0241601 (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[x],x]
```

$$\left\{\left\{y(x) \to W\left(-e^{-x-1+c_1}\right) + \frac{1}{4}\left(-x^2 + 4x - 4\right) + 1\right\}\right\}$$

✓ **Maple** : cpu = 0.08 (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))
```

$$y(x) = -\frac{x^2}{4} + \mathrm{LambertW}\left(\mathrm{e}^{-x} c_1\right) + x$$

2.762 ODE No. 762

$$y'(x) = \frac{y(x)(x(-\log(y(x))) - \log(y(x)) + x)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.12183 (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 = 0.162 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = -(ln(y(x))*x+ln(y(x))-x)*y(x)/x/(1+x),y(x))
```

$$y(x) = \mathrm{e}(1+x)^{-\frac{1}{x}} \mathrm{e}^{\frac{c_1}{x}}$$

2.763 ODE No. 763

$$y'(x) = \frac{y(x)(x\log(y(x)) + \log(y(x)) + x)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.114062 (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]
```

$$\left\{\left\{y(x)\to x^x(x+1)^{-x}e^{c_1x}\right\}\right\}$$

✓ **Maple** : cpu = 0.095 (sec), leaf count = 14

```
dsolve(diff(y(x),x) = (ln(y(x))*x+ln(y(x))+x)*y(x)/x/(1+x),y(x))
```

$$y(x) = \left(\frac{xc_1}{1+x}\right)^x$$

2.764 ODE No. 764

$$y'(x) = \frac{y(x)\left(x^4 - x\log(y(x)) - \log(y(x))\right)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.125858 (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 = 0.18 (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))
```

$$y(x) = \mathrm{e}^{\frac{x^3}{4}}\,\mathrm{e}^{-\frac{x^2}{3}}\,\mathrm{e}^{\frac{x}{2}}\,(1+x)^{\frac{1}{x}}\,\mathrm{e}^{\frac{c_1}{x}}\,\mathrm{e}^{-1}$$

2.765 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 = 0.221563 (sec), leaf count = 138

```
DSolve[Derivative[1][y][x] == (y[x]*(-1 - Log[((-1 + x)*(1 + x))/x] + x*Log[((-1 + x)*(1 + x))/x]*y[x
```

$$\left\{\left\{y(x) \to \frac{\exp\left(-\operatorname{PolyLog}(2,1-x) + \operatorname{PolyLog}(2,-x) - \frac{1}{2}\log^2(x) + \log(x+1)\log(x) - \log\left(x\right.\right.}{x\left(-\int_1^x \frac{\exp\left(-\frac{1}{2}\log^2(K[1]) + \log(K[1]+1)\log(K[1]) - \log\left(K[1] - \frac{1}{K[1]}\right)\log(K[1]) - \operatorname{PolyLog}(2,1-K[1]) + \operatorname{PolyLog}(2,-K[1])\right)\operatorname{lo}}{K[1]}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.132 (sec), leaf count = 48

```
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))
```

$$y(x) = \frac{1}{c_1 x^{\ln\left(\frac{(x-1)(1+x)}{x}\right) - \ln(1+x) + 1} \mathrm{e}^{\operatorname{dilog}(x)} \mathrm{e}^{\frac{\ln(x)^2}{2}} \mathrm{e}^{-\operatorname{dilog}(1+x)} + x}$$

2.766 ODE No. 766

$$y'(x)=\frac{y(x)\left(x^2y(x)\log\left(\frac{(x-1)(x+1)}{x}\right)-x\log\left(\frac{(x-1)(x+1)}{x}\right)-\log(x)\right)}{x\log(x)}$$

✓ **Mathematica** : cpu = 0.339967 (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)*(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 = 0.558 (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
```

$$y(x)=\frac{e^{\int\frac{-x\ln\left(\frac{(x-1)(1+x)}{x}\right)-\ln(x)}{x\ln(x)}dx}}{\int-\frac{e^{\int\frac{-x\ln\left(\frac{(x-1)(1+x)}{x}\right)-\ln(x)}{x\ln(x)}dx}x\ln\left(\frac{(x-1)(1+x)}{x}\right)}{\ln(x)}dx+c_1}$$

2.767 ODE No. 767

$$y'(x) = \frac{-x^3 + 2x^2 - 8xy(x) - 8x + 32}{4x^2 + 32y(x) - 8x + 32}$$

✓ **Mathematica** : cpu = 0.0267402 (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]),y[x],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 = 0.094 (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))
```

$$y(x) = -\frac{x^2}{8} + 4\,\mathrm{LambertW}\left(\frac{c_1 \mathrm{e}^{-\frac{x}{16}} \mathrm{e}^{-\frac{3}{4}}}{4}\right) + \frac{x}{4} + 3$$

2.768 ODE No. 768

$$y'(x) = \frac{y(x)(y(x)+1)}{x(xy(x)-y(x)-1)}$$

✓ **Mathematica** : cpu = 1.07857 (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 = 0.134 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = y(x)*(1+y(x))/x/(-y(x)-1+x*y(x)),y(x))
```

$$y(x) = -\frac{1}{x\,\text{LambertW}\left(\frac{e^{-\frac{1}{x}}}{xc_1}\right)+1}$$

2.769 ODE No. 769

$$y'(x) = -\frac{ix(x^8 + 8x^4y(x)^2 + 16ix^2 + 16y(x)^4)}{32y(x)}$$

✓ **Mathematica** : cpu = 0.0684708 (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],y[x],x
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{\left(\text{BesselY}\left(\frac{1}{3}, \left(\frac{1}{3} - \frac{i}{3}\right)x^3\right) + c_1 \text{BesselJ}\left(\frac{1}{3}, \left(\frac{1}{3} - \frac{i}{3}\right)x^3\right)\right)\left((1+i)x^3\left(\text{BesselY}\left(\frac{4}{3}, \left(\frac{1}{3} - \frac{i}{3}\right)x^3\right) + c_1 \text{B}\right.\right.}}{x\left(\text{BesselY}\left(\frac{1}{3}, \left(\frac{1}{3} - \frac{i}{3}\right)x^3\right)\right.}\right.\right.$$

✓ **Maple** : cpu = 0.74 (sec), leaf count = 246

```
dsolve(diff(y(x),x) = -1/32*I*(16*I*x^2+16*y(x)^4+8*y(x)^2*x^4+x^8)*x/y(x),y(x))
```

$$y(x) = -\frac{\sqrt{\left(-2c_1\left(\frac{x^6}{8} + i\right)\text{BesselJ}\left(\frac{1}{3}, \left(\frac{1}{3} - \frac{i}{3}\right)x^3\right) - \text{BesselY}\left(\frac{1}{3}, \left(\frac{1}{3} - \frac{i}{3}\right)x^3\right)\left(\frac{x^6}{4} + 2i\right) + (1+i)x^3\left(c_1 \text{BesselJ}\left(\right.\right.\right.}}{\left(\text{BesselJ}\left(\frac{1}{3}, \left(\frac{1}{3} - \frac{i}{3}\right)x^3\right)c_1 + \text{B}\right.}$$

2.770 ODE No. 770

$$y'(x) = \frac{2y(x)^6}{32x^2y(x)^4 + y(x)^3 + 16xy(x)^2 + 2}$$

✓ **Mathematica** : cpu = 0.146115 (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]
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{8192x^3+18432c_1{}^2x^2+\sqrt{4\left(-256x^2+192c_1{}^2x-12c_1\right)^3+\left(8192x^3+18432c_1{}^2x^2-2880c_1x+10\right.}}}{3\sqrt[3]{2}(1-16c_1x)}\right.\right.$$

✓ **Maple** : cpu = 0.15 (sec), leaf count = 1096

```
dsolve(diff(y(x),x) = 2*y(x)^6/(y(x)^3+2+16*x*y(x)^2+32*y(x)^4*x^2),y(x))
```

$$y(x) = \frac{\left(4096x^3c_1^3 + 6\sqrt{3}\,\sqrt{4096x^3c_1^4 + 2048x^2c_1^2 + 576xc_1^3 + 27c_1^4 + 256x + 16c_1}\,c_1 + 96\sqrt{3}\,\sqrt{4096x^3c_1^4 + 2048x^2\right.}{3c_1 + 48x}$$

2.771 ODE No. 771

$$y'(x) = \frac{-a^2x^3 - 2abx^2 - 4axy(x) - 4ax + 8}{2ax^2 + 4bx + 8y(x) + 8}$$

✓ **Mathematica** : cpu = 0.0318081 (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*x^2 + 8
```

$$\left\{\left\{y(x)\to \frac{1}{4}\left(-ax^2-2bx-4\right)-\frac{2\left(1+W\left(-e^{-\frac{b^2x}{4}-1+c_1}\right)\right)}{b}\right\}\right\}$$

✓ **Maple** : cpu = 0.296 (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))
```

$$y(x) = \frac{-a\,x^2b - 2b^2x - 4b + 4\,\mathrm{e}^{\frac{-4\,\mathrm{LambertW}\left(-\frac{\mathrm{e}^{-\frac{b^2x}{4}}\,\mathrm{e}^{-\frac{c_1b^2}{2a}}\,\mathrm{e}^{-\frac{b}{2}}\,\mathrm{e}^{-1}}{2}\right)a+\left(-b^2x-2b-4\right)a-2c_1b^2}{4a}} - 8}{4b}$$

2.772 ODE No. 772

$$y'(x) = \frac{y(x)\log(y(x))(x\log(y(x)) + x + 1)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.111304 (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 = 0.163 (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))
```

$$y(x) = \mathrm{e}^{\frac{x}{\ln(1+x)+c_1-x}}$$

2.773 ODE No. 773

$$y'(x) = \frac{y(x)^2 + xy(x) + x}{(x-1)(y(x)+x)}$$

✓ **Mathematica** : cpu = 0.140322 (sec), leaf count = 61

```
DSolve[Derivative[1][y][x] == (x + x*y[x] + y[x]^2)/((-1 + x)*(x + y[x])),y[x],x]
```

$$\text{Solve}\left[\frac{\arctan\left(\frac{\frac{2y(x)}{x}+1}{\sqrt{3}}\right)}{\sqrt{3}} + \frac{1}{2}\log\left(\frac{y(x)^2}{x^2} + \frac{y(x)}{x} + 1\right) = \log(1-x) - \log(x) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.293 (sec), leaf count = 48

```
dsolve(diff(y(x),x) = 1/(x-1)*(x*y(x)+x+y(x)^2)/(y(x)+x),y(x))
```

$$y(x) = -\frac{x}{2} + \frac{\sqrt{3}\,x\tan\left(\text{RootOf}\left(-\sqrt{3}\,\ln\left(\frac{3x^2\left(\tan(\_Z)^2+1\right)}{4(x-1)^2}\right) + 2\sqrt{3}\,c_1 - 2\_Z\right)\right)}{2}$$

2.774 ODE No. 774

$$y'(x) = \frac{-2ax^2 - x^3 - 4xy(x) - 4x + 8}{4ax + 2x^2 + 8y(x) + 8}$$

✓ **Mathematica** : cpu = 0.0279025 (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]),y[x],
```

$$\left\{\left\{y(x) \to \frac{1}{4}\left(-2ax - x^2 - 4\right) - \frac{2\left(1 + W\left(-e^{-\frac{a^2x}{4} - 1 + c_1}\right)\right)}{a}\right\}\right\}$$

✓ **Maple** : cpu = 0.184 (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))
```

$$y(x) = \frac{-2a^2x - a\,x^2 - 8\,\mathrm{LambertW}\left(-\frac{e^{-\frac{a^2x}{4}}e^{-\frac{a}{2}}e^{-1}e^{\frac{c_1a^2}{4}}}{2}\right) - 4a - 8}{4a}$$

2.775 ODE No. 775

$$y'(x) = \frac{-y(x) + \sqrt{y(x)} + x}{-y(x) + \sqrt{y(x)} + x + 1}$$

✓ **Mathematica** : cpu = 0.117869 (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]
```

$\{\{y(x) \to \text{Root}\left[x^6 - 2e^{3c_1}x^3 + e^{6c_1} + \#1^6 + (-6x-6)\#1^5 + \left(15x^2 + 24x + 9\right)\#1^4 + \left(-20x^3 - 36x^2 - 18x + 2\right.\right.$

✓ **Maple** : cpu = 0.083 (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))
```

$$-2y(x)^{\frac{3}{2}} + y(x)^3 + (-3x-3)\,y(x)^2 + \left(3x^2 + 3x\right)y(x) - x^3 - c_1 = 0$$

2.776 ODE No. 776

$$y'(x) = \frac{y(x)\left(x^2y(x)\log\left(\frac{x^2+1}{x}\right) - x\log\left(\frac{x^2+1}{x}\right) - \log\left(\frac{1}{x}\right)\right)}{x\log\left(\frac{1}{x}\right)}$$

✓ **Mathematica** : cpu = 0.433724 (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]*y[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 = 0.585 (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))
```

$$y(x) = \frac{e^{\int \frac{-\ln\left(\frac{x^2+1}{x}\right)x-\ln\left(\frac{1}{x}\right)}{x\ln\left(\frac{1}{x}\right)}dx}}{\int -\frac{e^{\int \frac{-\ln\left(\frac{x^2+1}{x}\right)x-\ln\left(\frac{1}{x}\right)}{x\ln\left(\frac{1}{x}\right)}dx}x\ln\left(\frac{x^2+1}{x}\right)}{\ln\left(\frac{1}{x}\right)}dx+c_1}$$

2.777 ODE No. 777

$$y'(x) = \frac{y(x)(y(x)+1)}{x\left(xy(x)^4 - y(x) - 1\right)}$$

✓ **Mathematica** : cpu = 0.177561 (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 = 0.142 (sec), leaf count = 51

```
dsolve(diff(y(x),x) = y(x)*(1+y(x))/x/(-y(x)-1+x*y(x)^4),y(x))
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(x\,\mathrm{e}^{3\_Z} - 5x\,\mathrm{e}^{2\_Z} + 2xc_1\mathrm{e}^{\_Z} + 2\_Zx\,\mathrm{e}^{\_Z} + 7x\,\mathrm{e}^{\_Z} - 2xc_1 - 2x\_Z - 3x + 2\right)} - 1$$

2.778 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 = 1.1203 (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]
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3x^6 y(x)+x^3}{\sqrt[3]{29}\sqrt[3]{x^9}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{29^{2/3}\left(x^9\right)^{2/3}}{9x^5} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.036 (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))
```

$$y(x) = \frac{-3 + 29\,\text{RootOf}\left(-81\left(\int^{\_Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + x + 3c_1\right)}{9x^3}$$

2.779 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 = 0.118514 (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]
```

$$\text{Solve}\left[\frac{1}{2}\arctan\left(\frac{y(x)}{x}\right) - \frac{1}{4}\log\left(\frac{y(x)^2}{x^2}+1\right) + \frac{1}{2}\log\left(\frac{y(x)}{x}+1\right) = \log(1-x) - \log(x) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.104 (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))
```

$$\frac{\ln\left(\frac{y(x)+x}{x}\right)}{2} - \frac{\ln\left(\frac{y(x)^2+x^2}{x^2}\right)}{4} + \frac{\arctan\left(\frac{y(x)}{x}\right)}{2} - \ln(x-1) + \ln(x) - c_1 = 0$$

2.780 ODE No. 780

$$y'(x) = \frac{x\sqrt{x^2 + y(x)^2} + xy(x) + y(x)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.135279 (sec), leaf count = 48

```
DSolve[Derivative[1][y][x] == (y[x] + x*y[x] + x*Sqrt[x^2 + y[x]^2])/(x*(1 + x)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{e^{-c_1} x \left(e^{2c_1} x^2 + 2e^{2c_1} x - 1 + e^{2c_1}\right)}{2(x+1)}\right\}\right\}$$

✓ **Maple** : cpu = 0.97 (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))
```

$$c_1 + \frac{\sqrt{y(x)^2 + x^2} + y(x)}{x(1+x)} = 0$$

2.781 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 = 0.272205 (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 = 0.484 (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))
```

$$\frac{1}{\frac{1}{y(x)^2}+\frac{6}{x}}=\frac{\left(\mathrm{e}^{\mathrm{RootOf}\left(2x^3\mathrm{e}^{\_Z}+3\,\mathrm{e}^{\_Z}x^2-3\,\mathrm{e}^{\_Z}\ln\left(\frac{\mathrm{e}^{\_Z}+9}{2x}\right)+9\,\mathrm{e}^{\_Z}c_1+3\_Z\mathrm{e}^{\_Z}+27\right)}+9\right)x}{54}$$

2.782 ODE No. 782

$$y'(x)=\frac{y(x)\coth\left(\frac{1}{x}\right)\left(x^2y(x)\log\left(\frac{x^2+1}{x}\right)-x\log\left(\frac{x^2+1}{x}\right)-\tanh\left(\frac{1}{x}\right)\right)}{x}$$

✓ **Mathematica** : cpu = 3.18882 (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*Log[(1 +
```

$$\left\{\left\{y(x)\to\frac{\exp\left(\int_1^x\frac{-\coth\left(\frac{1}{K[1]}\right)K[1]\log\left(\frac{K[1]^2+1}{K[1]}\right)-1}{K[1]}dK[1]\right)}{-\int_1^x\exp\left(\int_1^{K[2]}\frac{-\coth\left(\frac{1}{K[1]}\right)K[1]\log\left(\frac{K[1]^2+1}{K[1]}\right)-1}{K[1]}dK[1]\right)\coth\left(\frac{1}{K[2]}\right)K[2]\log\left(\frac{K[2]^2+1}{K[2]}\right)dK[2]+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 3.588 (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
```

$$y(x)=\frac{e^{\int\frac{-\ln\left(\frac{x^2+1}{x}\right)x-\tanh\left(\frac{1}{x}\right)}{x\tanh\left(\frac{1}{x}\right)}dx}}{\int-\frac{e^{\int\frac{-\ln\left(\frac{x^2+1}{x}\right)x-\tanh\left(\frac{1}{x}\right)}{x\tanh\left(\frac{1}{x}\right)}dx}x\ln\left(\frac{x^2+1}{x}\right)}{\tanh\left(\frac{1}{x}\right)}dx+c_1}$$

2.783 ODE No. 783

$$y'(x) = -\frac{y(x)\coth(x)\left(x^2y(x)(-\log(2x)) + x\log(2x) + \tanh(x)\right)}{x}$$

✓ **Mathematica** : cpu = 4.93835 (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),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 = 0.511 (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))
```

$$y(x) = \frac{e^{\int \frac{-x\ln(2)-x\ln(x)-\tanh(x)}{x\tanh(x)}dx}}{\int -\frac{e^{\int \frac{-x\ln(2)-x\ln(x)-\tanh(x)}{x\tanh(x)}dx} x(\ln(2)+\ln(x))}{\tanh(x)}dx + c_1}$$

2.784 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 = 7.11748 (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[x]*y[x]
```

$$\left\{\left\{y(x)\to -x+\tan\left(\int_1^x \operatorname{csch}(K[5])\log(K[5])dK[5]+c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 10.424 (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))
```

$$y(x) = -x - \tan\left(c_1 - \left(\int \frac{\ln(x)}{\sinh(x)}dx\right)\right)$$

2.785 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 = 5.55214 (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[x]^2)/L
```

$$\left\{\left\{y(x) \to -x + \tan\left(\int_1^x \frac{\sinh(K[5])}{\log(K[5])} dK[5] + c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 33.448 (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
```

$$y(x) = -x - \tan\left(c_1 - \left(\int \frac{\sinh(x)}{\ln(x)} dx\right)\right)$$

2.786 ODE No. 786

$$y'(x) = \frac{axy(x)^2\cosh(x) + bx^3\cosh(x) + y(x)\log(x)}{x\log(x)}$$

✓ **Mathematica** : cpu = 2.94933 (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[x],x]
```

$$\left\{\left\{y(x)\to\frac{\sqrt{b}x\tan\left(\sqrt{a}\sqrt{b}\int_1^x\frac{\cosh(K[1])K[1]}{\log(K[1])}dK[1]+\sqrt{a}\sqrt{b}c_1\right)}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.085 (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))
```

$$y(x) = \frac{\tan\left(\sqrt{ab}\left(c_1+\int\frac{x\cosh(x)}{\ln(x)}dx\right)\right)x\sqrt{ab}}{a}$$

2.787 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 = 17.6424 (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])),y[x],x]
```

$$\text{Solve}\left[\frac{\left(2-\frac{x(x^2-x-1)(2x^2-2y(x)+3)}{\sqrt[3]{x^3(x^2-x-1)^3}(x^2-y(x))}\right)\left(\frac{x(x^2-x-1)(2x^2-2y(x)+3)}{\sqrt[3]{x^3(x^2-x-1)^3}(x^2-y(x))}+4\right)\left(\left(\left(1-\frac{x(x^2-x-1)(2x^2-2y(x)+3)}{2\sqrt[3]{x^3(x^2-x-1)^3}(x^2-y(x))}\right)\log\left(\frac{2-\frac{x(x^2}{\sqrt[3]{x^3}}}{}\right.\right.\right.}{18\sqrt[3]{2}\left(-\frac{(2x^2-2y(x)+3)^3}{8(x^2-y(x))^3}+\frac{3x(x^2-x-1}{2\sqrt[3]{x^3(x^2-}}\right.}\right.$$

✓ **Maple** : cpu = 0.576 (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))
```

$$y(x) = \frac{4x^2 e^{\text{RootOf}\left(8x^3 e^{-Z}-24\,e^{-Z}x^2-36x^3+6\ln\left(\frac{2\,e^{-Z}-9}{(1+x)^4}\right)e^{-Z}+18\,e^{-Z}c_1-6\_Z e^{-Z}+24x\,e^{-Z}+108x^2-27\ln\left(\frac{2\,e^{-Z}-9}{(1+x)^4}\right)-81c_1+27\_Z-10\right.}}{4\,e^{\text{RootOf}\left(8x^3 e^{-Z}-24\,e^{-Z}x^2-36x^3+6\ln\left(\frac{2\,e^{-Z}-9}{(1+x)^4}\right)e^{-Z}+18\,e^{-Z}c_1-6\_Z e^{-Z}+24x\,e^{-Z}+108x^2-27\ln\left(\frac{2\,e^{-Z}-9}{(1+x)^4}\right)-81c_1+27\_Z-\right.}}$$

2.788 ODE No. 788

$$y'(x) = -\frac{y(x)\left(x^2y(x)(-\coth(x+1)) + \log(x-1) + x\coth(x+1)\right)}{x\log(x-1)}$$

✓ **Mathematica** : cpu = 18.483 (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]))/(x*Log[-1
```

$$\left\{\left\{y(x)\to \frac{\exp\left(\int_1^x \frac{-e^2\cosh(K[1])K[1]-\cosh(K[1])K[1]-e^2\sinh(K[1])K[1]+\sinh(K[1])K[1]-e^2\operatorname{co}}{K[1]\log(K[1]-1)(e^2\cosh(}\right.}{-\int_1^x \frac{\exp\left(\int_1^{K[2]} \frac{-e^2\cosh(K[1])K[1]-\cosh(K[1])K[1]-e^2\sinh(K[1])K[1]+\sinh(K[1])K[1]-e^2\cosh(K[1])\log(K[1]-1)+\cosh(K[1])\log(K[1]-1}{K[1]\log(K[1]-1)\left(e^2\cosh(K[1])-\cosh(K[1])+e^2\sinh(K[1])+\sinh(K[1])\right)}\right.}{K[2]\log(K[2]-1)(e^2\cosh(K[2]}}\right.\right.$$

✓ **Maple** : cpu = 0.589 (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))
```

$$y(x) = \frac{e^{\int -\frac{\ln(x-1)\sinh(1+x)+x\cosh(1+x)}{x\ln(x-1)\sinh(1+x)}dx}}{\int -\frac{x\, e^{\int \frac{-\ln(x-1)\sinh(1+x)-x\cosh(1+x)}{x\ln(x-1)\sinh(1+x)}dx}\cosh(1+x)}{\ln(x-1)\sinh(1+x)}dx + c_1}$$

2.789 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 = 42.4843 (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]*y[x] + C
```

$$\left\{\left\{y(x) \to -\frac{e^2 x \sinh(x) - x \sinh(x) + e^2 x \cosh(x) + x \cosh(x)}{e^2 \sinh(x) - \sinh(x) + e^2 \cosh(x) + \cosh(x)} + \tan\left(\int_1^x \frac{e^2 \cosh(K[5]) + \cosh(K[5]) +}{\log(K[5]-1)\left(e^2 \cosh(K[5]) - \cosh(\right.}\right.\right.\right.$$

✗ **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)
```

, exception

```
time expired
```

2.790 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 = 49.8417 (sec), leaf count = 127

```
DSolve[Derivative[1][y][x] == (-Coth[(1 + x)/(-1 + x)] + x^4*Coth[(1 + x)/(-1 + x)] + 2*x*Log[(-1 + x
```

$$\left\{\left\{y(x)\to \frac{\exp\left(\int_1^x \frac{2\coth\left(\frac{K[5]}{K[5]-1}+\frac{1}{K[5]-1}\right)}{\log\left(\frac{1}{K[5]-1}\right)}dK[5]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[6]} \frac{2\coth\left(\frac{K[5]}{K[5]-1}+\frac{1}{K[5]-1}\right)}{\log\left(\frac{1}{K[5]-1}\right)}dK[5]\right)\coth\left(\frac{K[6]}{K[6]-1}+\frac{1}{K[6]-1}\right)}{\log\left(\frac{1}{K[6]-1}\right)}dK[6]+c_1}+x^2+1\right\}\right\}$$

✗ **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+
```

, exception

```
time expired
```

2.791 ODE No. 791

$$y'(x) = \frac{\operatorname{sech}\left(\frac{1}{x-1}\right)\left(x^5+x^4-2x^3y(x)-2x^2y(x)+2x^2\cosh\left(\frac{1}{x-1}\right)+xy(x)^2+y(x)^2-x-2x\cosh\left(\frac{1}{x-1}\right)-1\right)}{x-1}$$

✓ **Mathematica** : cpu = 5.86047 (sec), leaf count = 110

```
DSolve[Derivative[1][y][x] == (Sech[(-1 + x)^(-1)]*(-1 - x + x^4 + x^5 - 2*x*Cosh[(-1 + x)^(-1)] + 2*
```

$$\left\{\left\{y(x)\to \frac{\exp\left(\int_1^x \frac{2(K[5]+1)\operatorname{sech}\left(\frac{1}{K[5]-1}\right)}{K[5]-1}dK[5]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[6]} \frac{2(K[5]+1)\operatorname{sech}\left(\frac{1}{K[5]-1}\right)}{K[5]-1}dK[5]\right)(K[6]+1)\operatorname{sech}\left(\frac{1}{K[6]-1}\right)}{K[6]-1}dK[6]+c_1}+\frac{x^3+x^2}{x+1}+1\right\}\right\}$$

✓ **Maple** : cpu = 9.707 (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
```

$$y(x) = \frac{\left(-x^2+1\right) e^{\frac{\int \frac{4\,e^{\frac{1}{x-1}}(1+x)}{\left(e^{\frac{2}{x-1}}+1\right)(x-1)}dx}{e^{\frac{2}{x-1}}+1}}\, e^{\frac{\left(\int \frac{4\,e^{\frac{1}{x-1}}(1+x)}{\left(e^{\frac{2}{x-1}}+1\right)(x-1)}dx\right) e^{\frac{2}{x-1}}}{e^{\frac{2}{x-1}}+1}} + e^{\frac{4c_1 e^{\frac{2}{x-1}}}{e^{\frac{2}{x-1}}+1}}\, e^{\frac{4c_1}{e^{\frac{2}{x-1}}+1}}\left(x^2+1\right)}{e^{\frac{4c_1 e^{\frac{2}{x-1}}}{e^{\frac{2}{x-1}}+1}}\, e^{\frac{4c_1}{e^{\frac{2}{x-1}}+1}} - e^{\frac{\left(\int \frac{4\,e^{\frac{1}{x-1}}(1+x)}{\left(e^{\frac{2}{x-1}}+1\right)(x-1)}dx\right) e^{\frac{2}{x-1}}}{e^{\frac{2}{x-1}}+1}}\, e^{\frac{\int \frac{4\,e^{\frac{1}{x-1}}(1+x)}{\left(e^{\frac{2}{x-1}}+1\right)(x-1)}dx}{e^{\frac{2}{x-1}}+1}}}$$

2.792 ODE No. 792

$$y'(x) = \frac{y(x)\operatorname{sech}\left(\frac{1}{x+1}\right)\left(x^3 y(x) + x^2 y(x) - x^2 - x - x\cosh\left(\frac{1}{x+1}\right) + \cosh\left(\frac{1}{x+1}\right)\right)}{(x-1)x}$$

✓ **Mathematica** : cpu = 2.6683 (sec), leaf count = 157

```
DSolve[Derivative[1][y][x] == (Sech[(1 + x)^(-1)]*y[x]*(-x - x^2 + Cosh[(1 + x)^(-1)] - x*Cosh[(1 + x
```

$$\left\{\left\{y(x) \to \frac{\exp\left(\int_1^x \frac{-\operatorname{sech}\left(\frac{1}{K[1]+1}\right)K[1]^2 - \operatorname{sech}\left(\frac{1}{K[1]+1}\right)K[1] - K[1] + 1}{(K[1]-1)K[1]}dK[1]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[2]} \frac{-\operatorname{sech}\left(\frac{1}{K[1]+1}\right)K[1]^2 - \operatorname{sech}\left(\frac{1}{K[1]+1}\right)K[1] - K[1] + 1}{(K[1]-1)K[1]}dK[1]\right)\left(\operatorname{sech}\left(\frac{1}{K[2]+1}\right)K[2]^3 + \operatorname{sech}\left(\frac{1}{K[2]+1}\right)K[2]^2\right)}{(K[2]-1)K[2]}dK[2] -\right.\right.$$

✓ **Maple** : cpu = 0.586 (sec), leaf count = 116

```
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)/
```

$$y(x) = \frac{e^{\int -\frac{\cosh\left(\frac{1}{1+x}\right)x + x^2 - \cosh\left(\frac{1}{1+x}\right) + x}{x(x-1)\cosh\left(\frac{1}{1+x}\right)}dx}}{\int -\frac{e^{\int \frac{\cosh\left(\frac{1}{1+x}\right)(1-x) - x^2 - x}{x(x-1)\cosh\left(\frac{1}{1+x}\right)}dx} x(1+x)}{\cosh\left(\frac{1}{1+x}\right)(x-1)}dx + c_1}$$

2.793 ODE No. 793

$$y'(x) = -\frac{y(x)(xy(x)+1)}{x(xy(x)-y(x)+1)}$$

✓ **Mathematica** : cpu = 9.40634 (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]
```

$$\text{Solve}\left[-\frac{\sqrt[3]{-2}\left(\frac{2^{2/3}((x-1)y(x)-2)}{\sqrt[3]{-\frac{1}{(x-1)^3}}(x-1)((x-1)y(x)+1)}+(-2)^{2/3}\right)\left(\frac{-xy(x)+y(x)+2}{\sqrt[3]{2}\sqrt[3]{-\frac{1}{(x-1)^3}}(x-1)((x-1)y(x)+1)}+(-2)^{2/3}\right)\left(\left(\frac{\sqrt[3]{-1}(-x}{\sqrt[3]{-\frac{1}{(x-1)^3}}(x}\right.\right.}{}\right.$$

✓ **Maple** : cpu = 2.847 (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))
```

$$y(x) = -\frac{2\,\mathrm{e}^{-\mathrm{LambertW}\left(-\frac{2(x-1)\mathrm{e}^{3c_1}\mathrm{e}^{-1}}{x}\right)+3c_1-1}}{x}$$

2.794 ODE No. 794

$$y'(x) = \frac{y(x)}{x\left(x^3y(x)^4 + x^2y(x)^3 + y(x) - 1\right)}$$

✓ **Mathematica** : cpu = 0.146475 (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]
```

$$\text{Solve}\left[\text{RootSum}\left[\#1^3y(x)^3 + \#1^2y(x)^2 + 1\&, \frac{\#1y(x)\log(x - \#1) + \log(x - \#1)}{3\#1y(x) + 2}\&\right] + y(x) - \log(x) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.388 (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))
```

$$-y(x) + \int^{xy(x)} \frac{1}{\_a\left(\_a^3 + \_a^2 + 1\right)} d\_a - c_1 = 0$$

2.795 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 = 0.307981 (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)/(a + x)^
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{\frac{3y(x)}{(a+x)^3} + \frac{1}{(a+x)^2}}{\sqrt[3]{38}\sqrt[3]{\frac{1}{(a+x)^6}}} - \#1\right)}{2\sqrt[3]{38} - 19\#1^2}\&\right] = \frac{1}{9}38^{2/3}\left(\frac{1}{(a+x)^6}\right)^{2/3}(a+x$$

✓ **Maple** : cpu = 0.025 (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))
```

$$y(x) = -\operatorname{RootOf}\left(-\left(\int^{\_Z} \frac{1}{\_a^3 - \_a^2 - \_a - 1} d\_a\right) + \ln(x+a) + c_1\right)(x+a)$$

2.796 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 = 7.48535 (sec), leaf count = 109

```
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^2)/2)*y
```

$$\text{Solve}\left[\frac{1}{62}\left(6\sqrt{93}\text{arctanh}\left(\frac{\sqrt{\frac{3}{31}}\left(2e^{\frac{3x^2}{2}}(y(x)+3)+3y(x)\right)}{y(x)}\right) - 31\log\left(9e^{\frac{3x^2}{2}}(y(x)+3)y(x) + 3e^{3x^2}(y(x)+3)^2\right.\right.\right.$$

✓ **Maple** : cpu = 2.308 (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(
```

$$y(x) = \text{RootOf}\left(\left(\left(7\,\mathrm{e}^{3x^2+\text{RootOf}\left(\mathrm{e}^{3x^2}\left(217\tanh\left(\frac{(c_1-5\_Z)\sqrt{93}}{90}\right)^2\mathrm{e}^{3x^2+\_Z}+42\tanh\left(\frac{(c_1-5\_Z)\sqrt{93}}{90}\right)\sqrt{93}\,\mathrm{e}^{3x^2+\_Z}+189\,\mathrm{e}^{3x^2+\_Z}-93\tanh\right.\right.}\right.\right.\right.$$

2.797 ODE No. 797

$$y'(x)=\frac{y(x)\left(x^3y(x)\cosh\left(\frac{x+1}{x-1}\right)+x^2y(x)\cosh\left(\frac{x+1}{x-1}\right)-x^2\cosh\left(\frac{x+1}{x-1}\right)-x\cosh\left(\frac{x+1}{x-1}\right)-1\right)}{x}$$

✓ **Mathematica** : cpu = 1.24112 (sec), leaf count = 307

```
DSolve[Derivative[1][y][x] == (y[x]*(-1 - x*Cosh[(1 + x)/(-1 + x)] - x^2*Cosh[(1 + x)/(-1 + x)] + x^2
```

$$\left\{\left\{y(x)\to\frac{\exp\left(\frac{1}{4}e^{\frac{x}{x-1}+\frac{3}{x-1}}\left(4\left(3-\frac{1}{e^2}\right)e^{-\frac{4}{x-1}}\operatorname{Chi}\left(\frac{2}{x-1}\right)+e^{-\frac{2x}{x-1}-\frac{4}{x-1}}\left(4\left(e^{\frac{2}{x-1}}+3e^{\frac{2x}{x-1}}\right)\operatorname{Shi}\left(\frac{2}{x-1}\right)-\left((x-1)\left(\right.\right.\right.\right.\right.}{\exp\left(\frac{(3e^2-1)\operatorname{Chi}\left(\frac{2}{x-1}\right)}{e}+\frac{(1+3e^2)\operatorname{Shi}\left(\frac{2}{x-1}\right)}{e}+\frac{1}{4}e^{-\frac{2}{x-1}-1}\right)+}\right.\right.$$

✓ **Maple** : cpu = 1.303 (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-
```

$$y(x)=\frac{e^{-\frac{(x^2-1)e^{\frac{-1-x}{x-1}}}{4}-\frac{(x^2+4x-5)e^{\frac{1+x}{x-1}}}{4}+\mathrm{expIntegral}_1\left(\frac{2}{x-1}\right)e^{-1}-3e\ \mathrm{expIntegral}_1\left(-\frac{2}{x-1}\right)}}{x\left(c_1+\int -e^{\frac{(-x^2+1)e^{\frac{-1-x}{x-1}}}{4}+\frac{(-x^2-4x+5)e^{\frac{1+x}{x-1}}}{4}+\mathrm{expIntegral}_1\left(\frac{2}{x-1}\right)e^{-1}-3e\ \mathrm{expIntegral}_1\left(-\frac{2}{x-1}\right)}(1+x)\cosh\left(\frac{1+x}{x-1}\right)dx\right.}$$

2.798 ODE No. 798

$$y'(x) = \frac{y(x)(y(x) + x + 1)}{(x + 1)(2y(x)^3 + y(x) + x)}$$

✓ **Mathematica** : cpu = 0.312933 (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 = 0.128 (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))
```

$$y(x) = e^{\text{RootOf}\left(-e^{3\_Z} + \ln(1+x)e^{\_Z} + e^{\_Z}c_1 - \_Ze^{\_Z} + x\right)}$$

2.799 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 = 0.831036 (sec), leaf count = 64

```
DSolve[Derivative[1][y][x] == (y[x]*(-1 - E^((1 + x)/(-1 + x))*x - E^((1 + x)/(-1 + x))*x^2 + E^((1 +
```

$$\left\{\left\{y(x)\to \frac{e^{6e\,\mathrm{ExpIntegralEi}\left(\frac{2}{x-1}\right)}}{x\left(e^{6e\,\mathrm{ExpIntegralEi}\left(\frac{2}{x-1}\right)} + c_1e^{\frac{1}{2}e^{\frac{2}{x-1}+1}(x-1)(x+5)}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.321 (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
```

$$y(x) = \frac{\mathrm{e}^{\frac{5\,\mathrm{e}^{\frac{1+x}{x-1}}}{2}}\mathrm{e}^{-\frac{x^2\mathrm{e}^{\frac{1+x}{x-1}}}{2}}\mathrm{e}^{-2x\,\mathrm{e}^{\frac{1+x}{x-1}}}\mathrm{e}^{-6\,\mathrm{e}\ \mathrm{expIntegral}_1\left(-\frac{2}{x-1}\right)}}{x\left(c_1 + \int -(1+x)\,\mathrm{e}^{\frac{1+x}{x-1}}\mathrm{e}^{\frac{5\,\mathrm{e}^{\frac{1+x}{x-1}}}{2}}\mathrm{e}^{-\frac{x^2\mathrm{e}^{\frac{1+x}{x-1}}}{2}}\mathrm{e}^{-2x\,\mathrm{e}^{\frac{1+x}{x-1}}}\mathrm{e}^{-6\,\mathrm{e}\ \mathrm{expIntegral}_1\left(-\frac{2}{x-1}\right)}dx\right)}$$

2.800 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 = 0.31661 (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 + 8*y[x]^3
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{\frac{4}{(b-2x)^2} - \frac{24y(x)}{(b-2x)^3}}{4\sqrt[3]{38}\sqrt[3]{\frac{1}{(b-2x)^6}}} - \#1\right)}{2\sqrt[3]{38} - 19\#1^2}\&\right] = \frac{1}{9}38^{2/3}\left(\frac{1}{(b-2x)^6}\right)^{2/3}(b -$$

✓ **Maple** : cpu = 0.024 (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
```

$$y(x) = \frac{\text{RootOf}\left(-\left(\int^{\_Z}\frac{1}{\_a^3 - \_a^2 - \_a - 1}d\_a\right) + \ln(-2x+b) + c_1\right)(-2x+b)}{2}$$

2.801 ODE No. 801

$$y'(x) = \frac{1}{2}e^{\frac{x^2}{4}}\left(2e^{-\frac{3x^2}{4}}y(x)^3 + 2e^{-\frac{x^2}{2}}y(x)^2 + e^{-\frac{x^2}{4}}xy(x) + 2\right)$$

✓ **Mathematica** : cpu = 0.311637 (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*y[x]^3)/
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3e^{-\frac{x^2}{2}}y(x)+e^{-\frac{x^2}{4}}}{\sqrt[3]{29}\sqrt[3]{e^{-\frac{3x^2}{4}}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}e^{\frac{x^2}{2}}\left(e^{-\frac{3x^2}{4}}\right)^{2/3}x +$$

✓ **Maple** : cpu = 0.071 (sec), leaf count = 45

```
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
```

$$y(x) = \frac{29\,\mathrm{e}^{\frac{x^2}{4}}\,\mathrm{RootOf}\left(-81\left(\int^{-Z}\frac{1}{841\_a^3-27\_a+27}d\_a\right)+x+3c_1\right)}{9} - \frac{\mathrm{e}^{\frac{x^2}{4}}}{3}$$

2.802 ODE No. 802

$$y'(x) = \frac{\_F1\left(y(x) + \frac{1}{x}\right) + \frac{1}{x}}{x}$$

✓ **Mathematica** : cpu = 0.0939544 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (x^(-1) + _F1[x^(-1) + y[x]])/x,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{\_F1\left(K[2]+\frac{1}{x}\right)\int_1^x -\frac{\_F1'\left(K[2]+\frac{1}{K[1]}\right)}{K[1]^2\left(\_F1\left(K[2]+\frac{1}{K[1]}\right)\right)^2}dK[1]+1}{\_F1\left(K[2]+\frac{1}{x}\right)}dK[2] + \int_1^x \left(\frac{1}{K[1]} + \frac{1}{\_F1\left(y(x)+\frac{1}{K[1]}\right) K\right.\right.$$

✓ **Maple** : cpu = 0.135 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = -(-1/x-_F1(y(x)+1/x))/x,y(x))
```

$$y(x) = \frac{\text{RootOf}\left(-\ln(x) + \int^{\_Z} \frac{1}{\_F1(\_a)} d\_a + c_1\right) x - 1}{x}$$

2.803 ODE No. 803

$$y'(x) = \frac{\_\mathrm{F1}\left(y(x)^2 - 2\log(x)\right)}{x\sqrt{y(x)^2}}$$

✓ **Mathematica** : cpu = 0.245365 (sec), leaf count = 637

```
DSolve[Derivative[1][y][x] == _F1[-2*Log[x] + y[x]^2]/(x*Sqrt[y[x]^2]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\frac{K[2]}{(\_\mathrm{F1}\left(K[2]^2 - 2\log(x)\right) - 1)\left(\_\mathrm{F1}\left(K[2]^2 - 2\log(x)\right) + 1\right)} - \int_1^x \left(\frac{2K[2]\_\mathrm{F1}'\left(K[2]^2 - 2\log(\right.}{K[1]\left(\_\mathrm{F1}\left(K[2]^2 - 2\log(K[1]\right)\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.471 (sec), leaf count = 65

```
dsolve(diff(y(x),x) = _F1(y(x)^2-2*ln(x))/(y(x)^2)^(1/2)/x,y(x))
```

$$y(x) = \sqrt{2\ln(x) + 2\,\mathrm{RootOf}\left(\ln(x) - \left(\int^{\_Z} \frac{1}{\_F1(2\_a) - 1} d\_a\right) + c_1\right)}$$

2.804 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 = 0.41863 (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]])/2)/(x*(1
```

$$\left\{\left\{y(x)\to \arctan\left(\frac{3x^4-4x^3+6x^2-12x+12\log(x+1)-25-12c_1}{12x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.856 (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))
```

$$y(x) = \arctan\left(\frac{3x^4-4x^3+6x^2+12\ln(1+x)-12c_1-12x}{12x}\right)$$

2.805 ODE No. 805

$$y'(x) = \frac{x^4\sqrt{x^2 + y(x)^2} + xy(x) + y(x)}{x(x + 1)}$$

✓ **Mathematica** : cpu = 0.190937 (sec), leaf count = 88

```
DSolve[Derivative[1][y][x] == (y[x] + x*y[x] + x^4*Sqrt[x^2 + y[x]^2])/(x*(1 + x)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{xe^{-\frac{x^3}{3}-\frac{x^2}{2}-x-\frac{11}{6}-c_1}\left(e^{\frac{2x^3}{3}+2x+\frac{11}{3}+2c_1} - e^{x^2}x^2 - 2e^{x^2}x - e^{x^2}\right)}{2(x + 1)}\right\}\right\}$$

✓ **Maple** : cpu = 1.707 (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))
```

$$\ln\left(\sqrt{y(x)^2 + x^2} + y(x)\right) - \frac{x^3}{3} + \frac{x^2}{2} - x + \ln(1 + x) - \ln(x) - c_1 = 0$$

2.806 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 = 0.312994 (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)/(x*(1 + x
```

$$\left\{\left\{y(x)\to \arctan\left(\frac{x-\log(x+1)-c_1}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.525 (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))
```

$$y(x) = -\arctan\left(\frac{-x+\ln(1+x)-c_1}{x}\right)$$

2.807 ODE No. 807

$$y'(x) = -\frac{1}{-e^{y(x)}y(x)\_\text{F1}(y(x)-\log(x))-x}$$

✓ **Mathematica** : cpu = 0.195609 (sec), leaf count = 59

```
DSolve[Derivative[1][y][x] == -(-x - E^y[x]*y[x]*_F1[-Log[x] + y[x]])^(-1),y[x],x]
```

$$\text{Solve}\left[-\int_1^{y(x)-\log(x)}\frac{K[1]\_\text{F1}(K[1])+e^{-K[1]}}{\_\text{F1}(K[1])}dK[1]-y(x)\log(x)+\frac{\log^2(x)}{2}=-c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.429 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = -1/(-x-_F1(y(x)-ln(x))*y(x)*exp(y(x))),y(x))
```

$$\frac{\ln(x)^2}{2}-y(x)\ln(x)-\left(\int^{y(x)-\ln(x)}\frac{\_F1(\_a)\_a+e^{-\_a}}{\_F1(\_a)}d\_a\right)+c_1=0$$

2.808 ODE No. 808

$$y'(x) = \frac{(y(x)+1)(2y(x)+1)}{x(2xy(x)-2y(x)+x-2)}$$

✓ **Mathematica** : cpu = 1.44132 (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],x]
```

$$\text{Solve}\left[\frac{2^{2/3}\left(x\log\left(-\frac{6\ 2^{2/3}(y(x)+1)}{2(x-1)y(x)+x-2}\right)-x\log\left(\frac{3\ 2^{2/3}(2xy(x)+x)}{2(x-1)y(x)+x-2}\right)+2xy(x)\left(\log\left(-\frac{6\ 2^{2/3}(y(x)+1)}{2(x-1)y(x)+x-2}\right)-\log\left(\frac{3\ 2^{2/3}(2xy}{2(x-1)y(x}\right.\right.\right.}{9(2xy(x)+x)}\right.$$

✓ **Maple** : cpu = 0.142 (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))
```

$$y(x) = \frac{-x\,\text{LambertW}\left(\frac{e^{-\frac{1}{x}}}{xc_1}\right)-2}{2x\,\text{LambertW}\left(\frac{e^{-\frac{1}{x}}}{xc_1}\right)+2}$$

2.809 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 = 0.235191 (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*y[x]^3),
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{\frac{192y(x)}{(4x-5)^3} + \frac{16}{(4x-5)^2}}{16\sqrt[3]{38}\sqrt[3]{\frac{1}{(4x-5)^6}}} - \#1\right)}{2\sqrt[3]{38} - 19\#1^2}\&\right] = \frac{1}{9}38^{2/3}\left(\frac{1}{(5-4x)^6}\right)^{2/3}(5-$$

✓ **Maple** : cpu = 0.028 (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,
```

$$y(x) = -\frac{\text{RootOf}\left(-\left(\int^{-Z} \frac{1}{\_a^3 - \_a^2 - \_a - 1} d\_a\right) + \ln(4x-5) + c_1\right)(4x-5)}{4}$$

2.810 ODE No. 810

$$y'(x) = \frac{x^2 \log^2(x) + y(x)^2 + y(x) - 2xy(x)\log(x) + x}{x}$$

✓ **Mathematica** : cpu = 0.0839079 (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 = 0.039 (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))
```

$$y(x) = \left(\ln(x) + \frac{1}{-x+c_1}\right)x$$

2.811 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 = 1.19788 (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] + x] + E^
```

$$\left\{\left\{y(x)\to -\log\left(-\frac{1}{x}+\frac{e^{-\frac{x^3}{2}-c_1 x}}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.308 (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(
```

$$y(x) = \frac{x^3}{2} + xc_1 + \ln\left(-\frac{x}{-1+\mathrm{e}^{\frac{x^3}{2}}\mathrm{e}^{xc_1}}\right)$$

2.812 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 = 0.283299 (sec), leaf count = 70

```
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[x^3 - 6*
```

$$\left\{\left\{y(x) \to \frac{1}{96}\left(-9x^8 - 24x^7 - 16x^6 - 72x^5 - 96x^4 + 72c_1x^4 + 16x^3 + 96c_1x^3 - 144x^2 + 288c_1x - 144c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.365 (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/
```

$$c_1 - \frac{3x^4}{4} - x^3 - 3x - \sqrt{x^3 - 6y(x)} = 0$$

2.813 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 = 0.42264 (sec), leaf count = 66

```
DSolve[Derivative[1][y][x] == (Sqrt[a]*(-(Sqrt[a]*x^3) + 2*Sqrt[a*x^4 + 8*y[x]] + 2*x^2*Sqrt[a*x^4 +
```

$$\left\{\left\{y(x) \to \frac{1}{72}a\left(9x^8 + 24x^7 + 16x^6 + 72x^5 + 87x^4 - 72c_1x^4 - 96c_1x^3 + 144x^2 - 288c_1x + 144c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.798 (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*
```

$$\frac{\sqrt{a\,x^4 + 8y\left(x\right)}}{4} + \frac{\left(-3x^4 - 4x^3 - 12x\right)\sqrt{a}}{12} - c_1 = 0$$

2.814 ODE No. 814

$$y'(x) = \frac{y(x)\left(x^7y(x)^2 - 3x^3y(x) - 3\right)}{x\left(x^3y(x) + 1\right)}$$

✓ **Mathematica** : cpu = 0.0984876 (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 = 0.036 (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))
```

$$y(x) = \frac{1}{\left(\sqrt{-2x + c_1} - 1\right)x^3}$$

2.815 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 = 7.81026 (sec), leaf count = 103

```
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^((3*x^2)/2
```

$$\text{Solve}\left[\frac{1}{186}\left(6\sqrt{93}\text{arctanh}\left(\frac{81y(x)-2e^{\frac{3x^2}{2}}(y(x)+3)}{9\sqrt{93}y(x)}\right)+31\log\left(-81e^{\frac{3x^2}{2}}(y(x)+3)y(x)+e^{3x^2}(y(x)+3)^2-24\right.\right.\right.$$

✓ **Maple** : cpu = 1.47 (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^
```

$$5\ln\left(\frac{\frac{100(3+y(x))^2e^{3x^2}}{189}+\frac{300\left(-y(x)^2-3y(x)\right)e^{\frac{3x^2}{2}}}{7}-\frac{900y(x)^2}{7}}{\left(e^{\frac{3x^2}{2}}(3+y(x))+3y(x)\right)^2}\right)-\frac{30\sqrt{93}\ \text{arctanh}\left(\frac{\left(29e^{\frac{3x^2}{2}}y(x)+87e^{\frac{3x^2}{2}}+81y(x)\right)\sqrt{93}}{(279y(x)+837)e^{\frac{3x^2}{2}}+837y(x)}\right)}{31}-10$$

2.816 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 = 0.177001 (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]
```

$$\text{Solve}\left[\frac{1}{2}\left(\text{RootSum}\left[\#1^3-\#1+1\&,\frac{\#1\log\left(-\#1+x^2-y(x)^2\right)-\log\left(-\#1+x^2-y(x)^2\right)}{3\#1^2-1}\&\right]+x^2\right)=c_1,y(x$$

✓ **Maple** : cpu = 0.503 (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))
```

$$\int_{\_b}^{x}-\frac{(-y(x)+\_a)^3\,(y(x)+\_a)^3\,\_a}{\_a^6-3\_a^4y(x)^2+3y(x)^4\_a^2-y(x)^6-\_a^2+y(x)^2+1}d\_a+\int^{y(x)}\left(\frac{\left(-\_f^2+x^2-1\right)\_}{-\_f^6+3\_f^4x^2-3\_f^2x^4+x^6+}\right.$$

2.817 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 = 0.427719 (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[x])/2))/
```

$$\left\{\left\{y(x)\to -\sec^{-1}\left(\frac{-x^3+3x^3\log(x)-9c_1}{9\log(x)}\right)\right\},\left\{y(x)\to \sec^{-1}\left(\frac{-x^3+3x^3\log(x)-9c_1}{9\log(x)}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.848 (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
```

$$y(x) = \mathrm{arcsec}\left(\frac{3x^3\ln(x) - x^3 + 9c_1}{9\ln(x)}\right)$$

2.818 ODE No. 818

$$y'(x) = \frac{y(x)}{x\left(xy(x)^4 + xy(x)^3 + xy(x) - 1\right)}$$

✓ **Mathematica** : cpu = 0.152428 (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 = 0.111 (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))
```

$$y(x) = e^{\text{RootOf}\left(-2x\,e^{4\_Z} - 3x\,e^{3\_Z} + 6xc_1e^{\_Z} - 6\_Zx\,e^{\_Z} - 6\right)}$$

2.819 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 = 0.228336 (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*Sqrt[x^2 +
```

$$\left\{\left\{y(x)\to \frac{1}{192}\left(9x^8+24x^7+16x^6+72x^5+96x^4-72c_1x^4-96c_1x^3+80x^2-288c_1x+144c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.351 (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
```

$$c_1 + \frac{3x^4}{8} + \frac{x^3}{2} + \frac{3x}{2} - \sqrt{x^2+3y\left(x\right)} = 0$$

2.820 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 = 0.355497 (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[x])/2))/
```

$$\left\{\left\{y(x)\to -\sec^{-1}\left(\frac{-x^2+2x^2\log(x)-4c_1}{4\log(x)}\right)\right\},\left\{y(x)\to \sec^{-1}\left(\frac{-x^2+2x^2\log(x)-4c_1}{4\log(x)}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.83 (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
```

$$y(x) = \operatorname{arcsec}\left(\frac{2x^2\ln(x) - x^2 + 4c_1}{4\ln(x)}\right)$$

2.821 ODE No. 821

$$y'(x) = \frac{y(x)(xy(x)+1)}{x\left(x^3 y(x)^4 - xy(x) - 1\right)}$$

✓ **Mathematica** : cpu = 0.146058 (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]
```

$$\left\{\left\{y(x)\to \frac{c_1}{4}-\frac{1}{2}\sqrt{\frac{c_1{}^2}{4}+\frac{\sqrt[3]{1944c_1{}^2x^6+1458x^5+\sqrt{\left(1944c_1{}^2x^6+1458x^5\right)^2-4\left(54c_1x^4+144x^3\right)^3}}}{18\sqrt[3]{2}x^3}+\frac{\ldots}{x^3\sqrt[3]{19\ldots}}}\right.\right.$$

✓ **Maple** : cpu = 0.106 (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))
```

$$-\frac{1}{3y\left(x\right)^3x^3}-\frac{1}{2x^2y\left(x\right)^2}-y(x)+c_1=0$$

2.822 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 = 0.23995 (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^2 + 4*y[
```

$$\left\{\left\{y(x)\to \frac{1}{2}e^{-x^2}x^2 + \frac{1}{-\frac{x^2}{2}+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.098 (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
```

$$y(x) = \frac{x^2e^{-x^2}}{2} + \frac{1}{c_1 - \frac{x^2}{2}}$$

2.823 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 = 0.240987 (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 = 0.285 (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))
```

$$y(x)=\mathrm{e}^{\mathrm{RootOf}\left(-2\,\mathrm{e}^{4\_Z}-3\,\mathrm{e}^{3\_Z}+6\,\mathrm{e}^{\_Z}\ln(x)+6\,\mathrm{e}^{\_Z}c_1-6\_Z\mathrm{e}^{\_Z}+6x\right)}$$

2.824 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 = 0.172629 (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],x]
```

$$\text{Solve}\left[\frac{\arctan\left(\frac{\frac{2y(x)}{x}+1}{\sqrt{3}}\right)}{\sqrt{3}} - \frac{1}{2}\log\left(\frac{y(x)^2}{x^2} + \frac{y(x)}{x} + 1\right) + \log\left(\frac{y(x)}{x}\right) = \log(1-x) - \log(x) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.542 (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))
```

$$\ln\left(\frac{y(x)}{x}\right) - \frac{\ln\left(\frac{y(x)^2 + xy(x) + x^2}{x^2}\right)}{2} + \frac{\sqrt{3}\arctan\left(\frac{(x+2y(x))\sqrt{3}}{3x}\right)}{3} - \ln(x-1) + \ln(x) - c_1 = 0$$

2.825 ODE No. 825

$$y'(x) = \frac{x\left(x^2y(x)^3 + (x^2+1)^{3/2}y(x)^2 + x^2(x^2+1)^{3/2} + (x^2+1)^{3/2} + y(x)^3\right)}{(x^2+1)^3}$$

✓ **Mathematica** : cpu = 1.36294 (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]^2 + y[
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3+6\sqrt[3]{38}\#1-19\&,\frac{\log\left(\frac{\frac{3xy(x)}{(x^2+1)^2}+\frac{x}{(x^2+1)^{3/2}}}{\sqrt[3]{38}\sqrt[3]{\frac{x^3}{(x^2+1)^{9/2}}}}-\#1\right)}{2\sqrt[3]{38}-19\#1^2}\&\right]=\frac{19^{2/3}\left(\frac{x^3}{(x^2+1)^{9/2}}\right)^{2/3}(x^2}{9\sqrt[3]{2}x^2}$$

✓ **Maple** : cpu = 0.113 (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)^
```

$$y(x) = \frac{\sqrt{x^2+1}\left(19\,\mathrm{RootOf}\left(-1296\left(\int^{-Z}\frac{1}{361\_a^3-432\_a+432}d\_a\right)+2\ln\left(x^2+1\right)+3c_1\right)-6\right)}{18}$$

2.826 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 = 0.276149 (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[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{x}\sqrt{W\left(\frac{6e^{2c_1}x}{(x+1)^2}\right)}}{\sqrt{6}}\right\},\left\{y(x)\to \frac{\sqrt{x}\sqrt{W\left(\frac{6e^{2c_1}x}{(x+1)^2}\right)}}{\sqrt{6}}\right\}\right\}$$

✓ **Maple** : cpu = 0.567 (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))
```

$$\frac{1}{\frac{1}{y(x)^2}+\frac{6}{x}} = \frac{\left(\mathrm{e}^{\mathrm{RootOf}\left(-\mathrm{e}^{\_Z}\ln\left(\frac{(1+x)^2\left(\mathrm{e}^{\_Z}+9\right)}{2x}\right)+3\,\mathrm{e}^{\_Z}c_1+\_Z\mathrm{e}^{\_Z}+9\right)}+9\right)x}{54}$$

2.827 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 = 0.174981 (sec), leaf count = 104

```
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,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt{2}x\tanh^2\left(\frac{1}{6}\left(-\sqrt{2}x^3-3\sqrt{2}c_1\right)\right)-2x\tanh\left(\frac{1}{6}\left(-\sqrt{2}x^3-3\sqrt{2}c_1\right)\right)}{\sqrt{2}-2\tanh\left(\frac{1}{6}\left(-\sqrt{2}x^3-3\sqrt{2}c_1\right)\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.239 (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))
```

$$\ln\left(\frac{2x\left(\sqrt{2y(x)^2+2x^2}+y(x)+x\right)}{y(x)-x}\right)+\frac{\sqrt{2}\,x^3}{3}-\ln(x)-c_1=0$$

2.828 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 = 0.359348 (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]^4)),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 = 0.335 (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))
```

$$y(x) = \frac{e^{\mathrm{RootOf}\left(x\,e^{3\_Z} - 8x\,e^{2\_Z} + 16\ln\left(\frac{e^{\_Z}}{2} + \frac{1}{2}\right)x\,e^{\_Z} + 8xc_1\,e^{\_Z} - 2\_Zx\,e^{\_Z} + 7x\,e^{\_Z} + 16\right)}}{2} - \frac{1}{2}$$

2.829 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 = 0.295406 (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^6*Sqrt[1
```

$$\left\{\left\{y(x)\to \frac{16x^{12}+40x^{11}+25x^{10}+80x^9+100x^8-160c_1x^7+100x^6-200c_1x^6-400c_1x^4+400c_1{}^2x^2-100}{400x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.49 (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*
```

$$c_1 - \frac{\sqrt{4x^2y(x)+1}}{x} + x^2 + \frac{x^4}{2} + \frac{2x^5}{5} = 0$$

2.830 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 = 0.268439 (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 = 0.284 (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))
```

$$y(x) = e^{\text{RootOf}\left(2\,e^{4\_Z}+3\,e^{3\_Z}-6\,e^{\_Z}\ln(x)+6\,e^{\_Z}c_1+6\_Z\,e^{\_Z}+6x\right)}$$

2.831 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 = 1.90003 (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*Sqrt[4*a*x
```

$$\left\{\left\{y(x) \to -\frac{1}{12}\sqrt{576ax - 9x^8 - 24x^7 - 16x^6 - 72x^5 - 96x^4 - 72c_1x^4 - 96c_1x^3 - 144x^2 - 288c_1x - 144c_1{}^2}\right\}, \left\{\right.\right.$$

✓ **Maple** : cpu = 0.235 (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*
```

$$-\sqrt{-y(x)^2 + 4ax} - \frac{x^4}{4} - \frac{x^3}{3} - x - c_1 = 0$$

2.832 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 = 1.26496 (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)),y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{1}{2}\sqrt{\frac{3\sqrt[3]{2}(-8x+3c_1+3\log(x}{\sqrt[3]{1944(c_1+\log(x+1))^2+972(c_1+\log(x+1))+3726x+\sqrt{(1944(c_1+\log(x+1))^2+972(c}}}}\right.\right.$$

✓ **Maple** : cpu = 0.135 (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))
```

$$\ln(1+x) + \frac{x}{y(x)} - \frac{y(x)^3}{3} - \frac{y(x)^2}{2} - y(x) + c_1 = 0$$

2.833 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 = 0.170107 (sec), leaf count = 104

```
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,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\sqrt{2}x\tanh^2\left(\frac{1}{8}\left(-\sqrt{2}x^4-4\sqrt{2}c_1\right)\right)-2x\tanh\left(\frac{1}{8}\left(-\sqrt{2}x^4-4\sqrt{2}c_1\right)\right)}{\sqrt{2}-2\tanh\left(\frac{1}{8}\left(-\sqrt{2}x^4-4\sqrt{2}c_1\right)\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.2 (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))
```

$$\ln\left(\frac{2x\left(\sqrt{2y(x)^2+2x^2}+y(x)+x\right)}{y(x)-x}\right)+\frac{\sqrt{2}\,x^4}{4}-\ln(x)-c_1=0$$

2.834 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 = 0.320949 (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)),y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{x}\sqrt{W\left(\frac{6(x+1)^2 e^{x^2-2x-3+2c_1}}{x}\right)}}{\sqrt{6}}\right\}, \left\{y(x) \to \frac{\sqrt{x}\sqrt{W\left(\frac{6(x+1)^2 e^{x^2-2x-3+2c_1}}{x}\right)}}{\sqrt{6}}\right\}\right\}$$

✓ **Maple** : cpu = 0.635 (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))
```

$$\frac{1}{\frac{1}{y(x)^2} + \frac{6}{x}} = \frac{\left(\mathrm{e}^{\mathrm{RootOf}\left(\mathrm{e}^{\_Z}x^2 - \mathrm{e}^{\_Z}\ln\left(\frac{x\left(\mathrm{e}^{\_Z}+9\right)}{2(1+x)^2}\right) + 3\,\mathrm{e}^{\_Z}c_1 + \_Z\,\mathrm{e}^{\_Z} - 2x\,\mathrm{e}^{\_Z} + 9\right)} + 9\right)x}{54}$$

2.835 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 = 1.06991 (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])^(-1),
```

, 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]^
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))
```

2.836 ODE No. 836

$$y'(x) = \frac{(x - y(x))y(x)(y(x) + 1)}{x(xy(x) - y(x) + x)}$$

✓ **Mathematica** : cpu = 9.21601 (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]
```

$$\text{Solve}\left[\frac{1}{9}2^{2/3}\left(\frac{\left(1-\frac{(x-1)^2\left(\frac{x^6}{(x-1)^3}\right)^{2/3}((x+2)y(x)+x)}{x^4((x-1)y(x)+x)}\right)\left(\frac{\left(\frac{x^6}{(x-1)^3}\right)^{2/3}(x-1)^2((x+2)y(x)+x)}{x^4((x-1)y(x)+x)}+2\right)\left(\left(1-\frac{(x-1)^2\left(\frac{x^6}{(x-1)^3}\right)^{2/3}(\cdots}{x^4((x-1)y(x\cdots}\right.\right.}{\cdots}\right.\right.$$

✓ **Maple** : cpu = 0.368 (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))
```

$$y(x) = -\frac{x\,\mathrm{e}^{\mathrm{RootOf}\left(-\ln\left(\frac{\mathrm{e}^{\_Z}}{2}+\frac{9}{2}\right)\mathrm{e}^{\_Z}+3\,\mathrm{e}^{\_Z}c_1+\_Z\,\mathrm{e}^{\_Z}-x\,\mathrm{e}^{\_Z}+9\right)}}{-9+(x-1)\,\mathrm{e}^{\mathrm{RootOf}\left(-\ln\left(\frac{\mathrm{e}^{\_Z}}{2}+\frac{9}{2}\right)\mathrm{e}^{\_Z}+3\,\mathrm{e}^{\_Z}c_1+\_Z\,\mathrm{e}^{\_Z}-x\,\mathrm{e}^{\_Z}+9\right)}}$$

2.837 ODE No. 837

$$y'(x) = -\frac{1}{-\sqrt[3]{y(x)^3}\log(x)\_F1\left(3\,\text{ExpIntegralEi}(-\log(x)) + y(x)^3\right) - \left(y(x)^3\right)^{2/3}\log(x)}$$

✗ **Mathematica** : cpu = 1.26291 (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*ExpIntegralEi[
```

, could not solve

```
DSolve[Derivative[1][y][x] == -(-(Log[x]*(y[x]^3)^(2/3)) - Log[x]*(y[x]^3)^(1/3)*_F1[3*ExpIn
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)^3)^(1
```

2.838 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 = 0.135716 (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*Sqrt[x]*y[x
```

$$\left\{\left\{y(x)\to \frac{2}{5}\sqrt{x}\left(x^{5/2}+5\right)+\frac{1}{-\log(x)+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.131 (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+4
```

$$y(x) = \frac{2\left(x^2+\frac{5}{\sqrt{x}}\right)x}{5} + \frac{1}{-\ln(x)+c_1}$$

2.839 ODE No. 839

$$y'(x) = \frac{e^{\frac{y(x)}{x}}\left(x^2 + xe^{-\frac{y(x)}{x}} + e^{-\frac{y(x)}{x}}y(x)\right)}{x}$$

✓ **Mathematica** : cpu = 0.205492 (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))
```

$$y(x) = \ln\left(\frac{2x}{-x^2 + c_1}\right)x$$

2.840 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 = 0.260352 (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 = 0.065 (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))
```

$$y(x) = \ln\left(\frac{3x}{-x^3 + c_1}\right)x$$

2.841 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 = 0.714006 (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*a^(3/2)*
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{2a^{5/2}bx^2-2a^{5/2}c+4a^3b^2x^3-4a^3bcx+a^2x+4\sqrt{a}b^2c_1x^2-4\sqrt{a}bcc_1+2bc_1x}}{\sqrt{2}\sqrt{2a^{3/2}bc_1+a^{7/2}+2a^4bx}}\right\},\left\{y(x)\to \frac{\sqrt{2a^{5}}}{}\right.\right.$$

✓ **Maple** : cpu = 0.288 (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
```

$$y(x)=-\frac{2\sqrt{\left((xc_1+1)\left(b\,x^2-c\right)\sqrt{a}+\frac{x}{2}\right)(xc_1+1)\,a^{\frac{3}{2}}}}{a^{\frac{3}{2}}\,(2xc_1+2)}$$

2.842 ODE No. 842

$$y'(x) = \frac{2x^2y(x)\log^2(x) + x^2y(x)^2\log(x) + x^2\log^3(x) + y(x)}{x\log(x)}$$

✓ **Mathematica** : cpu = 0.149734 (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)/(x*Log[
```

$$\left\{\left\{y(x) \to -\frac{\frac{1}{4}x^2e^{\frac{1}{4}x^2(2\log(x)-1)}(2\log(x)-1)\left(\frac{x}{2}+\frac{1}{2}x(2\log(x)-1)\right)+\frac{1}{2}xe^{\frac{1}{4}x^2(2\log(x)-1)}+\frac{1}{2}xe^{\frac{1}{4}x^2(2\log(x)-1)}(2\mathrm{lo}}{x\left(\frac{1}{4}x^2e^{\frac{1}{4}x^2(2\log(x)-1)}(2\log(x)-1)+c_1e^{\frac{1}{4}x^2(2\log(x)-}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.03 (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))
```

$$y(x) = -\frac{\ln(x)(2x^2\ln(x) - x^2 + 2c_1 + 4)}{2x^2\ln(x) - x^2 + 2c_1}$$

2.843 ODE No. 843

$$y'(x) = \frac{2x^3y(x)\log^2(x) + x^3y(x)^2\log(x) + x^3\log^3(x) + y(x)}{x\log(x)}$$

✓ **Mathematica** : cpu = 0.14441 (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)/(x*Log
```

$$\left\{\left\{y(x) \to -\frac{\frac{1}{9}x^3e^{\frac{1}{9}x^3(3\log(x)-1)}(3\log(x)-1)\left(\frac{x^2}{3}+\frac{1}{3}x^2(3\log(x)-1)\right)+\frac{1}{3}x^2e^{\frac{1}{9}x^3(3\log(x)-1)}+\frac{1}{3}x^2e^{\frac{1}{9}x^3(3\log(x)-1)}}{x^2\left(\frac{1}{9}x^3e^{\frac{1}{9}x^3(3\log(x)-1)}(3\log(x)-1)+c_1e^{\frac{1}{9}x^3(3\mathrm{lo}}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.033 (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))
```

$$y(x) = -\frac{\ln(x)\left(6x^3\ln(x) - 2x^3 + 9c_1 + 18\right)}{6x^3\ln(x) - 2x^3 + 9c_1}$$

2.844 ODE No. 844

$$y'(x)=\frac{y(x)(y(x)+1)(y(x)+x)}{x(xy(x)+y(x)+x)}$$

✓ **Mathematica** : cpu = 9.65442 (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]
```

$$\text{Solve}\left[\frac{2^{2/3}\left(1-\frac{\left(\frac{x^6}{(x+1)^3}\right)^{2/3}(x+1)^2((x-2)y(x)+x)}{x^4((x+1)y(x)+x)}\right)\left(\frac{\left(\frac{x^6}{(x+1)^3}\right)^{2/3}(x+1)^2((x-2)y(x)+x)}{x^4((x+1)y(x)+x)}+2\right)\left(\left(1-\frac{\left(\frac{x^6}{(x+1)^3}\right)^{2/3}(x+1)^2((x-2\cdots}{x^4((x+1)y(x)+x\cdots}\right.\right.}{9\left(\frac{3(\cdots}{\cdots}\right.}\right.$$

✓ **Maple** : cpu = 0.369 (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))
```

$$y(x)=-\frac{e^{\mathrm{RootOf}\left(-\ln\left(\frac{e^{\_Z}}{2}+\frac{9}{2}\right)e^{\_Z}+3\,e^{\_Z}c_1+\_Z\,e^{\_Z}+x\,e^{\_Z}+9\right)}x}{e^{\mathrm{RootOf}\left(-\ln\left(\frac{e^{\_Z}}{2}+\frac{9}{2}\right)e^{\_Z}+3\,e^{\_Z}c_1+\_Z\,e^{\_Z}+x\,e^{\_Z}+9\right)}x+e^{\mathrm{RootOf}\left(-\ln\left(\frac{e^{\_Z}}{2}+\frac{9}{2}\right)e^{\_Z}+3\,e^{\_Z}c_1+\_Z\,e^{\_Z}+x\,e^{\_Z}+9\right)}+9}$$

2.845 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 = 2.163 (sec), leaf count = 227

```
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] + x^3*Sc
```

$$\left\{\left\{y(x) \to -\frac{1}{2}\sqrt[3]{-\frac{1}{2}}\sqrt[3]{9x^8 + 24x^7 + 16x^6 + 72x^5 + 132x^4 + 72c_1x^4 + 96c_1x^3 + 144x^2 + 288c_1x + 144c_1{}^2}\right\}, \left\{y(\right.\right.$$

✓ **Maple** : cpu = 0.178 (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
```

$$\int_{\_b}^{y(x)} \frac{\_a^2}{\sqrt{-9x^4 + 4\_a^3}} d\_a - \frac{x^4}{4} - \frac{x^3}{3} - x - c_1 = 0$$

2.846 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 = 0.506831 (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 + y[x]^(-
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{x\_F1\left(x\left(1+\frac{1}{K[2]}\right)\right)-1}{x\_F1\left(x\left(1+\frac{1}{K[2]}\right)\right)K[2]-K[2]+x\_F1\left(x\left(1+\frac{1}{K[2]}\right)\right)}-\int_1^x\left(\frac{\_F1\left(K[1]\left(1+\frac{1}{K[2]}\right)\right)-\frac{K[1]}{}}{K[1]\left(K[2]\_F1\left(K[1]\left(1+\right.\right.\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.213 (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)
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-\_Z-\left(\int^{\frac{x\,\mathrm{e}^{\_Z}}{\mathrm{e}^{\_Z}-1}}\frac{1}{\_a(\_F1(\_a)\_a-1)}d\_a\right)+c_1\right)}-1$$

2.847 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 = 0.281587 (sec), leaf count = 69

```
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^2 - 4*y
```

$$\left\{\left\{y(x) \to \frac{1}{144}\left(-9x^8 - 24x^7 - 16x^6 - 72x^5 - 96x^4 + 72c_1x^4 + 96c_1x^3 - 108x^2 + 72x + 288c_1x + 36 - 144c_1{}^2\right)\right.\right.$$

✓ **Maple** : cpu = 0.398 (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
```

$$c_1 - \frac{x^4}{2} - \frac{2x^3}{3} - 2x - \sqrt{x^2 + 2x + 1 - 4y\left(x\right)} = 0$$

2.848 ODE No. 848

$$y'(x) = \_\mathrm{F1}(y(x) - \log(\sinh(x))) + \coth(x)$$

✓ **Mathematica** : cpu = 0.142638 (sec), leaf count = 157

```
DSolve[Derivative[1][y][x] == Coth[x] + _F1[-Log[Sinh[x]] + y[x]],y[x],x]
```

$$\mathrm{Solve}\left[\int_1^{y(x)} -\frac{\_\mathrm{F1}(K[2]-\log(\sinh(x)))\int_1^x \left(\frac{(\coth(K[1])+\_\mathrm{F1}(K[2]-\log(\sinh(K[1]))))\_\mathrm{F1}'(K[2]-\log(\sinh(K[1])))}{(\_\mathrm{F1}(K[2]-\log(\sinh(K[1]))))^2} - \frac{\_\mathrm{F1}'(K[2}{\_\mathrm{F1}(K[2}\right.}{\_\mathrm{F1}(K[2]-\log(\sinh(x)))}\right.$$

✓ **Maple** : cpu = 0.608 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = 1/sinh(x)*cosh(x)+_F1(y(x)-ln(sinh(x))),y(x))
```

$$y(x) = \ln(\sinh(x)) + \mathrm{RootOf}\left(x - \left(\int^{\_Z} \frac{1}{\_F1(\_a)} d\_a\right) + c_1\right)$$

2.849 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 = 0.264398 (sec), leaf count = 68

```
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[x]] + x
```

$$\left\{\left\{y(x)\to \frac{1}{144}\left(9x^8+24x^7+16x^6+72x^5+96x^4-72c_1x^4-96c_1x^3+108x^2+144x-288c_1x+144c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.372 (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*
```

$$c_1 + \frac{x^4}{2} + \frac{2x^3}{3} + 2x - \sqrt{x^2-4x+4y\left(x\right)} = 0$$

2.850 ODE No. 850

$$y'(x) = \_\mathrm{F1}(y(x) - \log(\sin(x)) + \log(\cos(x) + 1)) + \csc(x)$$

✓ **Mathematica** : cpu = 0.203701 (sec), leaf count = 1485

```
DSolve[Derivative[1][y][x] == Csc[x] + _F1[Log[1 + Cos[x]] - Log[Sin[x]] + y[x]],y[x],x]
```

$$\text{Solve}\left[\int_1^x -\frac{(\cot^2(K[1]) + \csc(K[1])\cot(K[1]) + 1)\sin(K[1])(\csc(K[1]) + \_\mathrm{F1}(\log(\cos(K[1}{-\cot^2(K[1]) + \_\mathrm{F1}(\log(\cos(K[1]) + 1) - \log(\sin(K[1])) + y(x))\cot(K[1]) + \csc^2(K[1]) + \csc(K[1])}\right.$$

✓ **Maple** : cpu = 0.982 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = 1/sin(x)+_F1(y(x)-ln(sin(x))+ln(cos(x)+1)),y(x))
```

$$y(x) = -\ln(\csc(x) + \cot(x)) + \mathrm{RootOf}\left(-x + \int^{\_Z} \frac{1}{\_F1(\_a)} d\_a + c_1\right)$$

2.851 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 = 2.59531 (sec), leaf count = 902

```
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] + b^3*y[
```

$$\text{Solve}\left[\frac{1}{9}\text{RootSum}\left[729a^2\#1^9 + 841b^2\#1^9 + 1566ab\#1^9 + 2187a^2\#1^6 + 2523b^2\#1^6 + 4698ab\#1^6 + 2187a^2\#1^3 -\right.\right.$$

✓ **Maple** : cpu = 0.058 (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
```

$$y(x) = \frac{\text{RootOf}\left(\left(\int^{\_Z} \frac{1}{b\_a^3 + b\_a^2 + a + b} d\_a\right) b - x + c_1\right) b - ax}{b}$$

2.852 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 = 2.47953 (sec), leaf count = 902

```
DSolve[Derivative[1][y][x] == (alpha^3 + alpha*beta^2*x^2 + beta^3*x^3 + 2*alpha^2*beta*x*y[x] + 3*al
```

$$\text{Solve}\left[\frac{1}{9}\text{RootSum}\left[841\alpha^2\#1^9 + 729\beta^2\#1^9 + 1566\alpha\beta\#1^9 + 2523\alpha^2\#1^6 + 2187\beta^2\#1^6 + 4698\alpha\beta\#1^6 + 2496\alpha^2\#\right.\right.$$

✓ **Maple** : cpu = 0.063 (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*
```

$$y(x) = \frac{\text{RootOf}\left(\left(\int^{\_Z}\frac{1}{\_a^3\alpha+\_a^2\alpha+\alpha+\beta}d\_a\right)\alpha - x + c_1\right)\alpha - \beta x}{\alpha}$$

2.853 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 = 0.120297 (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 + x*y[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 = 0.035 (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*y(x)^2*x^2)/(x*y(x)+2+x),y(x))
```

$$y(x) = \frac{-2\sqrt{-2x+c_1} + x + 2}{\left(\sqrt{-2x+c_1} - 1\right)x}$$

2.854 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 = 0.101763 (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]] + x^2
```

$$\left\{\left\{y(x)\to \frac{e^{-\frac{3x}{x^3+3c_1}}}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.329 (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
```

$$y(x) = x^{-\frac{x^3}{x^3+3c_1}} x^{-\frac{3c_1}{x^3+3c_1}} \mathrm{e}^{-\frac{3x}{x^3+3c_1}}$$

2.855 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 = 0.101912 (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]] + x^3
```

$$\left\{\left\{y(x) \to \frac{e^{-\frac{4x}{x^4+4c_1}}}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.34 (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
```

$$y(x) = x^{-\frac{x^4}{x^4+4c_1}} x^{-\frac{4c_1}{x^4+4c_1}} \mathrm{e}^{-\frac{4x}{x^4+4c_1}}$$

2.856 ODE No. 856

$$y'(x) = \frac{x\left(\_F1\left(y(x)^2 - 2x\right) + \frac{1}{x}\right)}{\sqrt{y(x)^2}}$$

✓ **Mathematica** : cpu = 0.407674 (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]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{\sqrt{K[2]^2}}{\_F1\left(K[2]^2-2x\right)}-\int_1^x \frac{2K[2]\_F1'\left(K[2]^2-2K[1]\right)}{\left(\_F1\left(K[2]^2-2K[1]\right)\right)^2}dK[1]\right)dK[2]+\int_1^x\left(-K[1]-\frac{1}{\_F1\left(y(x)^2-\right.}\right.\right.$$

✓ **Maple** : cpu = 0.316 (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))
```

$$y(x) = \sqrt{2\,\text{RootOf}\left(x^2 - 2\left(\int^{\_Z}\frac{1}{\_F1\,(2\_a)}d\_a\right) + 4c_1\right) + 2x}$$

2.857 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 = 0.393899 (sec), leaf count = 69

```
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^2 + 8*y
```

$$\left\{\left\{y(x)\to \frac{1}{72}\left(9x^8+24x^7+16x^6+72x^5+96x^4-72c_1x^4-96c_1x^3+135x^2+18x-288c_1x-9+144c_1{}^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.388 (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*(
```

$$c_1 + x^4 + \frac{4x^3}{3} + 4x - \sqrt{x^2-2x+1+8y\left(x\right)} = 0$$

2.858 ODE No. 858

$$y'(x) = \frac{a^3y(x)^3 + a^3y(x)^2 + a^3 + 3a^2bxy(x)^2 + 2a^2bxy(x) + 3ab^2x^2y(x) + ab^2x^2 + b^3x^3}{a^3}$$

✓ **Mathematica** : cpu = 2.55608 (sec), leaf count = 902

```
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] + a^3*y[
```

$$\text{Solve}\left[\frac{1}{9}\text{RootSum}\left[841a^2\#1^9 + 729b^2\#1^9 + 1566ab\#1^9 + 2523a^2\#1^6 + 2187b^2\#1^6 + 4698ab\#1^6 + 2496a^2\#1^3 -\right.\right.$$

✓ **Maple** : cpu = 0.059 (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
```

$$y(x) = \frac{\text{RootOf}\left(\left(\int^{\_Z} \frac{1}{\_a^3a + a\_a^2 + a + b} d\_a\right) a - x + c_1\right) a - bx}{a}$$

2.859 ODE No. 859

$$y'(x) = \frac{\_\text{F1}\left(y(x)^2 - 2x\right) + x}{x\sqrt{y(x)^2}}$$

✓ **Mathematica** : cpu = 0.550211 (sec), leaf count = 105

```
DSolve[Derivative[1][y][x] == (x + _F1[-2*x + y[x]^2])/(x*Sqrt[y[x]^2]),y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{\sqrt{K[2]^2}}{\_\text{F1}\left(K[2]^2-2x\right)}-\int_1^x \frac{2K[2]\_\text{F1}'\left(K[2]^2-2K[1]\right)}{\left(\_\text{F1}\left(K[2]^2-2K[1]\right)\right)^2}dK[1]\right)dK[2]+\int_1^x\left(-\frac{1}{\_\text{F1}\left(y(x)^2-2K[1]\right)}\right.\right.$$

✓ **Maple** : cpu = 0.275 (sec), leaf count = 63

```
dsolve(diff(y(x),x) = -(-x-_F1(y(x)^2-2*x))/(y(x)^2)^(1/2)/x,y(x))
```

$$y(x) = \sqrt{2\,\text{RootOf}\left(\ln(x) - \left(\int^{\_Z}\frac{1}{\_F1(2\_a)}d\_a\right) + 2c_1\right) + 2x}$$

2.860 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 = 0.25175 (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 + (x^4*C
```

$$\left\{\left\{y(x)\to \arctan\left(\frac{4x^5+5x^4+10x^2+10c_1}{20x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.612 (sec), leaf count = 27

```
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+
```

$$y(x) = \arctan\left(\frac{4x^5+5x^4+10x^2+c_1}{20x}\right)$$

2.861 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 = 0.91401 (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]
```

$$\mathrm{Solve}\left[\int_1^{y(x)} -\frac{\_\mathrm{F1}\left(e^{\frac{1}{x}}K[2]\right)\int_1^x\left(\frac{e^{\frac{1}{K[1]}}}{K[1]^2\_\mathrm{F1}\left(e^{\frac{1}{K[1]}}K[2]\right)} - \frac{e^{\frac{2}{K[1]}}K[2]\_\mathrm{F1}'\left(e^{\frac{1}{K[1]}}K[2]\right)}{K[1]^2\left(\_\mathrm{F1}\left(e^{\frac{1}{K[1]}}K[2]\right)\right)^2}\right)dK[1] + e^{\frac{1}{x}}}{\_\mathrm{F1}\left(e^{\frac{1}{x}}K[2]\right)}dK[2] + \int_1^x \left(\frac{}{K[}\right.\right.$$

✓ **Maple** : cpu = 0.15 (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))
```

$$y(x) = \mathrm{RootOf}\left(-\ln(x) + \int^{\_Z}\frac{1}{\_F1(\_a)}d\_a + c_1\right)\mathrm{e}^{-\frac{1}{x}}$$

2.862 ODE No. 862

$$y'(x) = \log(y(x)-1)\left(\_\mathrm{F1}(x) - \frac{\mathrm{ExpIntegralEi}(-\log(y(x)-1))}{x}\right)$$

✗ **Mathematica** : cpu = 0.465821 (sec), leaf count = 0

```
DSolve[Derivative[1][y][x] == Log[-1 + y[x]]*(-(ExpIntegralEi[-Log[-1 + y[x]]]/x) + _F1[x]),y[x],x]
```

, could not solve

DSolve[Derivative[1][y][x] == Log[-1 + y[x]]*(-(ExpIntegralEi[-Log[-1 + y[x]]]/x) + _F1[x]),

✓ **Maple** : cpu = 0.157 (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))
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(\left(\int \frac{\_F1(x)}{x}dx\right)x + xc_1 + \mathrm{expIntegral}_1(-\_Z)\right)} + 1$$

2.863 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 = 0.173431 (sec), leaf count = 60

```
DSolve[Derivative[1][y][x] == (y[x] + x*Sqrt[x^2 + y[x]^2] + x^3*Sqrt[x^2 + y[x]^2] + x^4*Sqrt[x^2 +
```

$$\left\{\left\{y(x)\to \frac{1}{2}xe^{-\frac{x^4}{4}-\frac{x^3}{3}-x-c_1}\left(-1+e^{\frac{x^4}{2}+\frac{2x^3}{3}+2x+2c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 10.867 (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/
```

$$\ln\left(\sqrt{y(x)^2 + x^2} + y(x)\right) - \frac{x^4}{4} - \frac{x^3}{3} - x - \ln(x) - c_1 = 0$$

2.864 ODE No. 864

$$y'(x)=\frac{e^{\frac{x^2}{4}}y(x)\left(2e^{-\frac{3x^2}{4}}y(x)^2+e^{-\frac{x^2}{2}}xy(x)+e^{-\frac{x^2}{4}}x\right)}{2e^{-\frac{x^2}{4}}y(x)+2}$$

✓ **Mathematica** : cpu = 0.224679 (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)/E^((3*x^
```

$$\left\{\left\{y(x)\to\frac{2e^{\frac{x^2}{2}}}{-2e^{\frac{x^2}{4}}+\sqrt{2}\sqrt{2e^{\frac{x^2}{2}}+2e^{\frac{x^2}{2}}(-2x+c_1)}}\right\},\left\{y(x)\to-\frac{2e^{\frac{x^2}{2}}}{2e^{\frac{x^2}{4}}+\sqrt{2}\sqrt{2e^{\frac{x^2}{2}}+2e^{\frac{x^2}{2}}(-2x+c_1)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.073 (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))*e
```

$$y(x)=\frac{\left(\mathrm{e}^{\frac{x^2}{2}}\left(\sqrt{-2x+c_1}+1\right)\mathrm{e}^{-\frac{x^2}{4}}-\mathrm{e}^{\frac{x^2}{4}}\sqrt{-2x+c_1}\right)\mathrm{e}^{\frac{x^2}{4}}}{\mathrm{e}^{\frac{x^2}{4}}\sqrt{-2x+c_1}-\mathrm{e}^{-\frac{x^2}{4}}\mathrm{e}^{\frac{x^2}{2}}}$$

2.865 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 = 0.324561 (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[-1 + y[
```

$$\text{Solve}\left[\int_1^x \left(-\frac{f(K[1])}{\log(K[1])} - \frac{\log(y(x) - 1)}{K[1]\log^2(K[1])}\right) dK[1] + \int_1^{y(x)} \left(\frac{1}{(K[2] - 1)\log(x)} - \int_1^x -\frac{1}{K[1](K[2] - 1)\log^2(K[1]\right.\right.$$

✓ **Maple** : cpu = 0.292 (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(
```

$$y(x) = \mathrm{e}^{\left(\int \frac{f(x)}{\ln(x)} dx\right) \ln(x)} x^{c_1} + 1$$

2.866 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 = 0.380729 (sec), leaf count = 74

```
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 + 2*a*x
```

$$\left\{\left\{y(x)\to \frac{1}{144}\left(-36a^2-72ax+9x^8+24x^7+16x^6+72x^5+96x^4-72c_1x^4-96c_1x^3+108x^2-288c_1x+144c\right.\right.\right.$$

✓ **Maple** : cpu = 0.408 (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))^(
```

$$c_1+\frac{x^4}{2}+\frac{2x^3}{3}+2x-\sqrt{x^2+2ax+a^2+4y\left(x\right)}=0$$

2.867 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 = 0.147345 (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 + y[x]^2 +
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{x^2+3y(x)+1}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.057 (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+y(x)^2*x^2+1/3*y(x)*x^4+1/
```

$$y(x) = -\frac{x^2}{3} + \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{\_a^3 + \_a^2 + 1} d\_a + c_1\right)$$

2.868 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 = 0.123886 (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*y[x]^2 +
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{-3x^2+3y(x)+1}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.052 (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*y(x)^2*x^2+3*y(x)*x^4-x^6,y(x))
```

$$y(x) = x^2 + \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{\_a^3 + \_a^2 + 1} d\_a + c_1\right)$$

2.869 ODE No. 869

$$y'(x) = \frac{2x^5 + 2x^4 - 2x^3y(x) + x^3 - 2x^2y(x) + 3x^2 - 2y(x) - x + 1}{x^2 - y(x)}$$

✓ **Mathematica** : cpu = 0.0336895 (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*x^3*y[x]
```

$$\left\{\left\{y(x) \to x^2 + \frac{1}{2}\left(1 + W\left(-e^{x^4 + \frac{4x^3}{3} - 2x^2 + 4x - 1 + c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.237 (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)
```

$$y(x) = x^2 + \frac{\mathrm{LambertW}\left(-2\,\mathrm{e}^{x^4}\mathrm{e}^{\frac{4x^3}{3}}\mathrm{e}^{-2x^2}c_1\mathrm{e}^{4x}\mathrm{e}^{-1}\right)}{2} + \frac{1}{2}$$

2.870 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 = 0.983933 (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,y[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 = 0.462 (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))
```

$$y(x) = -\ln\left(-\frac{3x^4+4x^3+12x+12c_1}{12x}\right)x$$

2.871 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 = 0.157729 (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] + 4*x*L
```

$$\left\{\left\{y(x) \to -\log(2x+1) + \frac{1}{-x + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.064 (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
```

$$y(x) = \frac{-1 + (-x + c_1)\ln(2x+1)}{x - c_1}$$

2.872 ODE No. 872

$$y'(x)=\frac{14x^{7/2}+\frac{12x^6}{5}-6x^3y(x)-6x^3-5\sqrt{x}y(x)+10x-5\sqrt{x}-5}{x\left(2x^3-5y(x)+10\sqrt{x}-5\right)}$$

✓ **Mathematica** : cpu = 0.043209 (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*Sqrt[x]*y[
```

$$\left\{\left\{y(x)\to \frac{1}{5}\left(2x^3+10\sqrt{x}-5\right)-\frac{\sqrt{-x\left(2x^3+10\sqrt{x}-5\right)^2-50x\left(-\frac{4x^{7/2}}{5}-\frac{2x^6}{25}+\frac{2x^3}{5}-2x+2\sqrt{x}+\log(x)\right)-}}{5\sqrt{-\frac{1}{x}}x}\right.\right.$$

✓ **Maple** : cpu = 0.05 (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^(
```

$$y(x)=\frac{2x^3}{5}-\sqrt{c_1+2\ln(x)}+2\sqrt{x}-1$$

2.873 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 = 0.470313 (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*x*y[x]^4
```

$$\text{Solve}\left[\frac{1}{192}\left(-16y(x)^3-12y(x)^2+12y(x)-54\log(4y(x)+2)+7\right)-\frac{1}{2x(2y(x)+1)}=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.193 (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))
```

$$y(x) = \frac{e^{\mathrm{RootOf}\left(2x\,e^{4\_Z}-3x\,e^{3\_Z}-6x\,e^{2\_Z}+48xc_1 e^{\_Z}+54\_Zx\,e^{\_Z}+7x\,e^{\_Z}+96\right)}}{2}-\frac{1}{2}$$

2.874 ODE No. 874

$$y'(x) = \frac{1}{512}x(a^3x^{12} + 24a^2x^8y(x) + 8a^2x^8 + 192ax^4y(x)^2 + 128ax^4y(x) - 256ax^2 + 512y(x)^3 + 512y(x)^2 + 512$$

✓ **Mathematica** : cpu = 0.172325 (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] + 24*a^2*x^
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{1}{8}(3ax^5+8x)+3xy(x)}{\sqrt[3]{29}\sqrt[3]{x^3}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{18}29^{2/3}\left(x^3\right)^{2/3} + c_1, y(x)$$

✓ **Maple** : cpu = 0.058 (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+1
```

$$y(x) = -\frac{a\,x^4}{8} - \frac{1}{3} + \frac{29\,\text{RootOf}\left(x^2 - 162\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + 6c_1\right)}{9}$$

2.875 ODE No. 875

$$y'(x) = \frac{x^5\left(-\sqrt{x^2+y(x)^2}\right)+x^4y(x)\sqrt{x^2+y(x)^2}+xy(x)+y(x)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.18831 (sec), leaf count = 242

```
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[x]^2])/
```

$$\left\{\left\{y(x)\to \frac{\sqrt{2}x\tanh^2\left(\frac{1}{24}\left(-3\sqrt{2}x^4+4\sqrt{2}x^3-6\sqrt{2}x^2+12\sqrt{2}x-12\sqrt{2}\log(x+1)+25\sqrt{2}-12\sqrt{2}c_1\right)\right)-2x\tan}{\sqrt{2}-2\tanh\left(\frac{1}{24}\left(-3\sqrt{2}x^4+4\sqrt{2}x^3-6\sqrt{2}x^2+12\sqrt{2}x\right.\right.}\right.\right.$$

✓ **Maple** : cpu = 0.263 (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/(
```

$$\ln\left(\frac{2x\left(\sqrt{2y(x)^2+2x^2}+y(x)+x\right)}{y(x)-x}\right)+\sqrt{2}\ln(1+x)+\frac{(3x^4-4x^3+6x^2-12x)\sqrt{2}}{12}-c_1-\ln(x)=0$$

2.876 ODE No. 876

$$y'(x) = -\frac{y(x)^2 \left(x^2 y(x) - 2xy(x) + y(x) - 2x\right)}{2x(xy(x) - 2y(x) - 2)}$$

✓ **Mathematica** : cpu = 0.125368 (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[x] + x*y
```

$$\left\{\left\{y(x) \to -\frac{4x}{-2(x-2)x + \frac{2\sqrt{-x(x-2)^2 - 4x\left(-2\left(\frac{x^2}{8} - \frac{x}{2} + \frac{\log(x)}{4}\right) + c_1\right)}}{\sqrt{-\frac{1}{x}}}}\right\}, \left\{y(x) \to \frac{4x}{2(x-2)x + \frac{2\sqrt{-x(x-2)^2 - 4x\left(-2\left(\frac{x^2}{8}\right.\right.}}{\sqrt{-\frac{1}{x}}}}\right.\right.$$

✓ **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))
```

$$y(x) = \frac{4}{\sqrt{c_1 - 8\ln(x) + 2x - 4}}$$

2.877 ODE No. 877

$$y'(x) = \frac{x^6 - 3x^4y(x) + 2x^3 + 3x^2y(x)^2 - 2xy(x) - y(x)^3 - 2x}{x^2 - y(x) - 1}$$

✓ **Mathematica** : cpu = 0.112199 (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[x]^3)/(-
```

$$\left\{\left\{y(x)\to x^2+\frac{1}{1-\frac{1}{\sqrt{-2x+c_1}}}-1\right\},\left\{y(x)\to x^2+\frac{1}{1+\frac{1}{\sqrt{-2x+c_1}}}-1\right\}\right\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 73

```
dsolve(diff(y(x),x) = (-2*x*y(x)+2*x^3-2*x-y(x)^3+3*y(x)^2*x^2-3*y(x)*x^4+x^6)/(-y(x)+x^2-1)
```

$$y(x) = \frac{-2x^2c_1 + 2x^3 + \sqrt{2c_1 - 2x + 1} - 1}{2x - 2c_1}$$

2.878 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 = 0.248244 (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 + y[x]^
```

$$\text{Solve}\left[2a\left(x - \frac{1}{2}\text{RootSum}\left[64\#1^3a^3 - 48\#1^2a^2y(x)^2 - 16\#1^2a^2 + 12\#1ay(x)^4 + 8\#1ay(x)^2 + 2a - y(x)^6 - y(x\right.\right.\right.$$

✓ **Maple** : cpu = 61.309 (sec), leaf count = 73

```
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
```

$$-\left(\int_{\_b}^{y(x)} \frac{\_a}{\_a^6 - 12\_a^4ax + 48\_a^2a^2x^2 - 64a^3x^3 + \_a^4 - 8\_a^2ax + 16a^2x^2 - 2a + 1}d\_a\right) + x - c_1 = 0$$

2.879 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 = 0.223222 (sec), leaf count = 128

```
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]^2])/(x
```

$$\left\{\left\{y(x)\to \frac{\sqrt{2}x\tanh^2\left(\frac{1}{2}\left(-\sqrt{2}x+\sqrt{2}\log(x+1)-\sqrt{2}c_1\right)\right)-2x\tanh\left(\frac{1}{2}\left(-\sqrt{2}x+\sqrt{2}\log(x+1)-\sqrt{2}c_1\right)\right)}{\sqrt{2}-2\tanh\left(\frac{1}{2}\left(-\sqrt{2}x+\sqrt{2}\log(x+1)-\sqrt{2}c_1\right)\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.23 (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+
```

$$\ln\left(\frac{2x\left(\sqrt{2y(x)^2+2x^2}+y(x)+x\right)}{y(x)-x}\right)+\sqrt{2}\,x-\sqrt{2}\,\ln(1+x)-\ln(x)-c_1=0$$

2.880 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 = 0.32637 (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]^2 - 96*a
```

$$\text{Solve}\left[\frac{\text{RootSum}\left[-64\#1^3a^3 + 48\#1^2a^2y(x)^2 + 16\#1^2a^2 - 12\#1ay(x)^4 - 8\#1ay(x)^2 + y(x)^6 + y(x)^4 + 1\&, \frac{}{48\#}\right.}{8a^2}\right.$$

✓ **Maple** : cpu = 0.082 (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(
```

$$\frac{y(x)}{2a} + \frac{\int^{y(x)^2-4ax} \frac{1}{\_a^3+\_a^2+1} d\_a}{8a^2} - c_1 = 0$$

2.881 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 = 0.12309 (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 + 27*y[x]
```

$$\left\{\left\{y(x) \to \frac{1}{3}\left(-x^2 - 3\right) + \frac{1}{27\left(\frac{1}{27} - \frac{1}{\sqrt{-1458x + c_1}}\right)}\right\}, \left\{y(x) \to \frac{1}{3}\left(-x^2 - 3\right) + \frac{1}{27\left(\frac{1}{27} + \frac{1}{\sqrt{-1458x + c_1}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 77

```
dsolve(diff(y(x),x) = (-18*x*y(x)-6*x^3-18*x+27*y(x)^3+27*y(x)^2*x^2+9*y(x)*x^4+x^6)/(27*y(x
```

$$y(x) = \frac{-2x^2c_1 + 2x^3 + 3\sqrt{2c_1 - 2x + 1} + 3}{-6x + 6c_1}$$

2.882 ODE No. 882

$$y'(x) = -\frac{1}{216}\sqrt{x}\left(-108x^{3/2} + x^9 - 18x^6y(x) - 6x^6 + 108x^3y(x)^2 + 72x^3y(x) - 216y(x)^3 - 216y(x)^2 - 216\right)$$

✓ **Mathematica** : cpu = 0.185526 (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] - 18*x^
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{1}{2}(2\sqrt{x}-x^{7/2})+3\sqrt{x}y(x)}{\sqrt[3]{29}\sqrt[3]{x^{3/2}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{2}{27}29^{2/3}\sqrt{x}\left(x^{3/2}\right)^{2/3}\right.$$

✓ **Maple** : cpu = 0.069 (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
```

$$y(x) = \frac{x^3}{6} - \frac{1}{3} + \frac{29\,\text{RootOf}\left(2x^{\frac{3}{2}} - 243\left(\int^{\_Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + 9c_1\right)}{9}$$

2.883 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 = 0.78293 (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^4*y[x]^2
```

$$\text{Solve}\left[\frac{x^2}{2} - \frac{1}{2}a^{5/2}\text{RootSum}\left[\#1^3b^3 + 3\#1^2ab^2y(x)^2 + \#1^2ab^2 + 3\#1a^2by(x)^4 + 2\#1a^2by(x)^2 + a^{5/2}b + a^3y(x)^6\right.\right.$$

✓ **Maple** : cpu = 0.721 (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
```

$$\int_{\_b}^{x} \frac{\left(b^3\_a^6 + 3a\,b^2\_a^4y(x)^2 + 3a^2b\_a^2y(x)^4 + y(x)^6\,a^3 + a\_a^4b^2 + 2y(x)^2\,a^2b\_a^2 + y(x)^4\,a^3 + a^3\right)\_a}{\left(y\,(x)^6\,a^3 + 3a^2b\_a^2y\,(x)^4 + 3a\,b^2\_a^4y\,(x)^2 + b^3\_a^6 + y\,(x)^4\,a^3 + 2y\,(x)^2\,a^2b\_a^2 + a\_a^4b^2 + a^3 + a^{\frac{5}{2}}b\right)a^{\frac{7}{2}}}$$

2.884 ODE No. 884

$$y'(x) = \frac{x\left(-x^6 + 3x^4y(x)^2 + x^4 - 3x^2y(x)^4 - 2x^2y(x)^2 + y(x)^6 + y(x)^4 + 1\right)}{y(x)}$$

✓ **Mathematica** : cpu = 0.460999 (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^2*y[x]^4
```

$$\text{Solve}\left[\frac{1}{4}\left(2\log\left(-x^2 + y(x)^2 + 1\right) - 2x^2 - \frac{1}{y(x)(y(x)+x)} + \frac{1}{xy(x) - y(x)^2} - 2\log(x - y(x)) - 2\log(y(x)+x)\right)\right.$$

✓ **Maple** : cpu = 0.5 (sec), leaf count = 105

```
dsolve(diff(y(x),x) = -(-1-y(x)^4+2*y(x)^2*x^2-x^4-y(x)^6+3*y(x)^4*x^2-3*y(x)^2*x^4+x^6)*x/y
```

$$y(x) = -\mathrm{e}^{\mathrm{RootOf}\left(\mathrm{e}^{2\_Z}x^2 - 2x^3\mathrm{e}^{\_Z} - \mathrm{e}^{2\_Z}\ln\left(\frac{\mathrm{e}^{2\_Z} - 2x\,\mathrm{e}^{\_Z} + 1}{\mathrm{e}^{\_Z} - 2x}\right) + 2\,\mathrm{e}^{2\_Z}c_1 + \_Z\mathrm{e}^{2\_Z} + 2\,\mathrm{e}^{\_Z}\ln\left(\frac{\mathrm{e}^{2\_Z} - 2x\,\mathrm{e}^{\_Z} + 1}{\mathrm{e}^{\_Z} - 2x}\right)x - 4xc_1\mathrm{e}^{\_Z} - 2\_Zx\,\mathrm{e}^{\_Z} + 1\right)}$$

2.885 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 = 40.5023 (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^4*y[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 + 12*
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x) = -1/128*I*(32*I*x+64+64*y(x)^4+32*y(x)^2*x^2+4*x^4+64*y(x)^6+48*y(x)^4*
```

, could not solve

```
dsolve(diff(y(x),x) = -1/128*I*(32*I*x+64+64*y(x)^4+32*y(x)^2*x^2+4*x^4+64*y(x)^6+48*y(x)^4*
```

2.886 ODE No. 886

$$y'(x) = \frac{x^6y(x)^3 - 3x^5y(x)^2 + x^4y(x)^2 + 3x^4y(x) - 4x^3y(x) - x^3 + 2x^2 + 1}{x^4}$$

✓ **Mathematica** : cpu = 0.139139 (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*y[x]^2
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3x^2y(x)-3x+1}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = -\frac{29^{2/3}}{9x} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = 1/x^4*(2*x^2-4*x^3*y(x)+1+y(x)^2*x^4+x^6*y(x)^3-3*y(x)^2*x^5+3*y(x)*x^
```

$$y(x) = \frac{9x - 3 + 29\,\text{RootOf}\left(-81\left(\int^{-Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right)x + 3xc_1 - 1\right)}{9x^2}$$

2.887 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 = 0.161106 (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^3*x^3*y
```

$$\left\{\left\{y(x)\to -\frac{ax+1}{ax}+\frac{1}{a^3x^3\left(\frac{1}{a^3x^3}-\frac{1}{x^3\sqrt{-2a^6x+c_1}}\right)}\right\},\left\{y(x)\to -\frac{ax+1}{ax}+\frac{1}{a^3x^3\left(\frac{1}{a^3x^3}+\frac{1}{x^3\sqrt{-2a^6x+c_1}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.041 (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(
```

$$y(x) = \frac{ax - \sqrt{-2x + c_1} + 1}{\left(\sqrt{-2x + c_1} - 1\right)xa}$$

2.888 ODE No. 888

$$y'(x) = \frac{x^4 y(x)^3 - 5x^3 y(x)^2 + 6x^2 y(x) - 2xy(x) - 2x + 1}{x^2 (x^2 y(x) - x + 1)}$$

✓ **Mathematica** : cpu = 0.119042 (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)/(x^2*(1 -
```

$$\left\{\left\{y(x) \to \frac{x-1}{x^2} + \frac{1}{x^4\left(\frac{1}{x^2} - \frac{1}{x^2\sqrt{\frac{2}{x}+c_1}}\right)}\right\}, \left\{y(x) \to \frac{x-1}{x^2} + \frac{1}{x^4\left(\frac{1}{x^2} + \frac{1}{x^2\sqrt{\frac{2}{x}+c_1}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.053 (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+
```

$$y(x) = \frac{\sqrt{\frac{xc_1+2}{x}}\,x - x + 1}{\left(\sqrt{\frac{xc_1+2}{x}} - 1\right)x^2}$$

2.889 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 = 1.1101 (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) - 54*E^(2*x
```

$$\text{Solve}\left[\frac{2}{3}\log\left(y(x)^{3/2} - \frac{3e^x}{2}\right) + e^x = \frac{4}{9e^x - 6y(x)^{3/2}} + \frac{2}{3}\log\left(y(x)^{3/2} - \frac{3e^x}{2} + 1\right) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.675 (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
```

$$e^x - \frac{2\ln\left(y(x)^{\frac{3}{2}} - \frac{3\,e^x}{2} + 1\right)}{3} + \frac{2\ln\left(y(x)^{\frac{3}{2}} - \frac{3\,e^x}{2}\right)}{3} + \frac{4}{6y(x)^{\frac{3}{2}} - 9\,e^x} - c_1 = 0$$

2.890 ODE No. 890

$$y'(x) = \frac{x}{x^6 + 3x^4y(x)^2 + x^4 + 3x^2y(x)^4 + 2x^2y(x)^2 + y(x)^6 + y(x)^4 - y(x) + 1}$$

✓ **Mathematica** : cpu = 0.135023 (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 + 3*x^2*
```

$$\text{Solve}\left[y(x) - \frac{1}{2}\text{RootSum}\left[\#1^3 + 3\#1^2y(x)^2 + \#1^2 + 3\#1y(x)^4 + 2\#1y(x)^2 + y(x)^6 + y(x)^4 + 1\&, \frac{}{3\#1^2 + 6\#1}\right.\right.$$

✓ **Maple** : cpu = 0.543 (sec), leaf count = 34

```
dsolve(diff(y(x),x) = x/(-y(x)+1+y(x)^4+2*y(x)^2*x^2+x^4+y(x)^6+3*y(x)^4*x^2+3*y(x)^2*x^4+x^
```

$$-y(x) + \frac{\left(\int^{y(x)^2+x^2} \frac{1}{\_a^3 + \_a^2 + 1} d\_a\right)}{2} - c_1 = 0$$

2.891 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 = 0.13463 (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[x] + x^
```

$$\left\{\left\{y(x) \to \frac{x^5}{-x^3\left(x^2-1\right) + \frac{\sqrt{\left(x^2-1\right)^2 x + x^5\left(-2\left(\frac{1}{2x^4} - \frac{1}{x^2} + \log(x)\right) + c_1\right)}}{\sqrt{\frac{1}{x^5}}}}\right\}, \left\{y(x) \to -\frac{x^5}{\left(x^2-1\right)x^3 + \frac{\sqrt{\left(x^2-1\right)^2 x + x^5\left(-2\left(\frac{1}{2x\right.}\right.}}{\sqrt{\frac{1}{x}}}}\right.\right.$$

✓ **Maple** : cpu = 0.052 (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
```

$$y(x) = \frac{x^2}{\sqrt{c_1 - 2\ln(x)}\, x^2 - x^2 + 1}$$

2.892 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 = 3.24802 (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/(-1 + x^
```

$$\text{Solve}\left[\int_1^x \left(-e^{\int_1^{(K[2]-y(x))(K[2]+y(x))} \frac{2((K[1]-3)K[1]+1)}{\left(e^{-\frac{2}{K[1]-1}}-K[1]\right)(K[1]-1)^2} dK[1] + \frac{2}{K[2]^2-y(x)^2-1}} K[2]^2 - 2e^{\int_1^{(K[2]-y(x))(K[2]+y(x))} \frac{2((K[1]}{\left(e^{-\frac{2}{K[1]-1}}\right.}}\right.\right.$$

✓ **Maple** : cpu = 0.757 (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
```

$$y(x) = \mathrm{e}^{\operatorname{RootOf}\left(-\_Z+\int^{\mathrm{e}^{2\_Z}-2x\,\mathrm{e}^{\_Z}} \frac{1}{\mathrm{e}^{\frac{2}{\_a+1}}+\_a} d\_a+c_1\right)} - x$$

2.893 ODE No. 893

$$y'(x) = \frac{x^3y(x)^3 + x^3y(x)^2 + x^3 + 6x^2y(x)^2 + 4x^2y(x) + 12xy(x) + 6x + 8}{x^3}$$

✓ **Mathematica** : cpu = 0.134369 (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[x]^2 + x
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3y(x)+\frac{x+6}{x}}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.035 (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*y(x)^2*x^2+12*x*y(x)+8)/x^
```

$$y(x) = \frac{29\,\text{RootOf}\left(-81\left(\int^{\_Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + x + 3c_1\right)x - 3x - 18}{9x}$$

2.894 ODE No. 894

$$y'(x) = -\frac{i(x^6 + 3x^4y(x)^2 + x^4 + 3x^2y(x)^4 + 2x^2y(x)^2 + y(x)^6 + y(x)^4 + ix + 1)}{y(x)}$$

✗ **Mathematica** : cpu = 40.4637 (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]^4 + 3*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 + y[x
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x) = -I*(I*x+1+x^4+2*y(x)^2*x^2+y(x)^4+x^6+3*y(x)^2*x^4+3*y(x)^4*x^2+y(x)^6
```

, could not solve

```
dsolve(diff(y(x),x) = -I*(I*x+1+x^4+2*y(x)^2*x^2+y(x)^4+x^6+3*y(x)^2*x^4+3*y(x)^4*x^2+y(x)^6
```

2.895 ODE No. 895

$$y'(x) = \frac{x\left(a^3x^{12} + 24a^2x^8y(x) - 32a^2x^6 + 192ax^4y(x)^2 - 256ax^2y(x) - 256ax^2 + 512y(x)^3\right)}{64ax^4 + 512y(x) + 512}$$

✓ **Mathematica** : cpu = 0.163565 (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^2*x^8*y[
```

$$\left\{\left\{y(x)\to \frac{1}{8}\left(-ax^4-8\right)+\frac{1}{512\left(\frac{1}{512}-\frac{1}{\sqrt{-262144x^2+c_1}}\right)}\right\},\left\{y(x)\to \frac{1}{8}\left(-ax^4-8\right)+\frac{1}{512\left(\frac{1}{512}+\frac{1}{\sqrt{-262144x^2+c_1}}\right)}\right.\right.$$

✓ **Maple** : cpu = 0.05 (sec), leaf count = 79

```
dsolve(diff(y(x),x) = (-256*y(x)*a*x^2-32*a^2*x^6-256*a*x^2+512*y(x)^3+192*y(x)^2*a*x^4+24*y
```

$$y(x) = \frac{8 + \left(-\sqrt{-x^2+c_1}+1\right)a\,x^4}{-8+8\sqrt{-x^2+c_1}}$$

2.896 ODE No. 896

$$y'(x) = \frac{-x^6 + 3x^4y(x)^2 + x^4 - 3x^2y(x)^4 - 2x^2y(x)^2 + y(x)^6 + y(x)^4 + x + 1}{y(x)}$$

✓ **Mathematica** : cpu = 0.200318 (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^2*y[x]
```

$$\text{Solve}\left[\frac{1}{2}\text{RootSum}\left[-\#1^3 + 3\#1^2y(x)^2 + \#1^2 - 3\#1y(x)^4 - 2\#1y(x)^2 + y(x)^6 + y(x)^4 + 1\&, \frac{\log}{3\#1^2 - 6\#1y(x)^2}\right.\right.$$

✓ **Maple** : cpu = 0.43 (sec), leaf count = 63

```
dsolve(diff(y(x),x) = (x+1+y(x)^4-2*y(x)^2*x^2+x^4+y(x)^6-3*y(x)^4*x^2+3*y(x)^2*x^4-x^6)/y(x
```

$$\int_{\_b}^{y(x)} \frac{\_a}{-\_a^6 + 3\_a^4x^2 - 3x^4\_a^2 + x^6 - \_a^4 + 2\_a^2x^2 - x^4 - 1} d\_a + x - c_1 = 0$$

2.897 ODE No. 897

$$y'(x) = \frac{\sqrt{x}\left(-108x^{3/2}y(x) + 18x^{9/2} - 108x^{3/2} + x^9 - 18x^6y(x) + 108x^3y(x)^2 - 216y(x)^3\right)}{36x^3 - 216y(x) - 216}$$

✓ **Mathematica** : cpu = 0.152684 (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] - 18*x^6*y
```

$$\left\{\left\{y(x)\to \frac{1}{6}\left(x^3-6\right)-\frac{1}{216\left(-\frac{1}{216}-\frac{1}{\sqrt{-62208x^{3/2}+c_1}}\right)}\right\},\left\{y(x)\to \frac{1}{6}\left(x^3-6\right)-\frac{1}{216\left(-\frac{1}{216}+\frac{1}{\sqrt{-62208x^{3/2}+c_1}}\right)}\right.$$

✓ **Maple** : cpu = 0.067 (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
```

$$y(x) = \frac{\sqrt{9c_1 - 12x^{\frac{3}{2}}}\, x^3 - 3x^3 + 18}{6\sqrt{9c_1 - 12x^{\frac{3}{2}}} - 18}$$

2.898 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 = 0.137598 (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]^2 + 4*
```

$$\left\{\left\{y(x)\to -\frac{4x^2+1}{4x^2}+\frac{1}{64x^8\left(\frac{1}{64x^8}-\frac{1}{x^8\sqrt{\frac{8192}{x}+c_1}}\right)}\right\},\left\{y(x)\to -\frac{4x^2+1}{4x^2}+\frac{1}{64x^8\left(\frac{1}{64x^8}+\frac{1}{x^8\sqrt{\frac{8192}{x}+c_1}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.043 (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*y(x)^2*x^4+12*x^2*
```

$$y(x) = \frac{4x^2 - \sqrt{\frac{xc_1+2}{x}} + 1}{4\left(\sqrt{\frac{xc_1+2}{x}} - 1\right)x^2}$$

2.899 ODE No. 899

$$y'(x) = \frac{x^6y(x)^3 + x^6y(x)^2 + x^6 + \frac{x^5}{2} + \frac{3}{4}x^4y(x)^2 + \frac{1}{2}x^4y(x) + \frac{3}{16}x^2y(x) + \frac{x^2}{16} + \frac{1}{64}}{x^8}$$

✓ **Mathematica** : cpu = 0.156591 (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 + (3*x^4*
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3y(x)}{x^2}+\frac{4x^2+3}{4x^4}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^6}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = -\frac{1}{9}29^{2/3}\left(\frac{1}{x^6}\right)^{2/3}x^3 + c_1, y(x)$$

✓ **Maple** : cpu = 0.045 (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*y
```

$$y(x) = \frac{116\,\text{RootOf}\left(-81\left(\int^{\_Z}\frac{1}{841\_a^3-27\_a+27}d\_a\right)x + 3xc_1 - 1\right)x^2 - 12x^2 - 9}{36x^2}$$

2.900 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 = 0.122394 (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] - 96*a^3*x
```

$$\{\{y(x) \to \text{Root}[8\#1^5a - 16\#1^4a^2c_1 - 64\#1^3a^2x + \#1^2(-2 + 128a^3c_1x) + 128\#1a^3x^2 - 256a^4c_1x^2 + 8ax - 1\&$$

✓ **Maple** : cpu = 0.056 (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^
```

$$\frac{y(x)}{2a} - \frac{1}{16a^2\left(y\left(x\right)^2 - 4ax\right)^2} + \frac{1}{32a^3x - 8a^2y\left(x\right)^2} - c_1 = 0$$

2.901 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 = 0.403023 (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] - Log[
```

$$\text{Solve}\left[ax\log(y(x)) - \frac{x^2}{2} - y(x)\log(x) - y(x)\log(y(x)) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.496 (sec), leaf count = 31

```
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(
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(2a\_Zx - 2\,\mathrm{e}^{\_Z}\ln(x) - 2\_Z\,\mathrm{e}^{\_Z} - x^2 + 2c_1\right)}$$

2.902 ODE No. 902

$$y'(x) = \frac{x^6 - 3x^4y(x)^2 + x^3 + 3x^2y(x)^4 - xy(x)^2 - y(x)^6 - x}{y(x)\,(x^2 - y(x)^2 - 1)}$$

✓ **Mathematica** : cpu = 0.156145 (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]^6)/(y[x
```

$$\left\{\left\{y(x) \to -\frac{1}{2}\sqrt{\frac{4x^3}{x-c_1} - \frac{4c_1x^2}{x-c_1} - \frac{\sqrt{-4x+1+4c_1}}{x-c_1} - \frac{1}{x-c_1}}\right\}, \left\{y(x) \to \frac{1}{2}\sqrt{\frac{4x^3}{x-c_1} - \frac{4c_1x^2}{x-c_1} - \frac{\sqrt{-4x+1+}}{x-c_1}}\right.\right.$$

✓ **Maple** : cpu = 0.201 (sec), leaf count = 177

```
dsolve(diff(y(x),x) = (-x*y(x)^2+x^3-x-y(x)^6+3*y(x)^4*x^2-3*y(x)^2*x^4+x^6)/(-y(x)^2+x^2-1)
```

$$y(x) = \frac{\sqrt{(-x+c_1)\left(4x^2c_1 - 4x^3 + \sqrt{4c_1 - 4x + 1} + 1\right)}}{2x - 2c_1}$$

2.903 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 = 0.0736799 (sec), leaf count = 30

```
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*x)]*Sin
```

$$\{\{y(x)\to -x\arccos(-\tanh(x+c_1))\},\{y(x)\to x\arccos(-\tanh(x+c_1))\}\}$$

✓ **Maple** : cpu = 0.166 (sec), leaf count = 51

```
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
```

$$y(x) = \arctan\left(\frac{2\,\mathrm{e}^{-x}}{c_1\left(\frac{\mathrm{e}^{-2x}}{c_1^2}+1\right)},\frac{\frac{\mathrm{e}^{-2x}}{c_1^2}-1}{\frac{\mathrm{e}^{-2x}}{c_1^2}+1}\right)x$$

2.904 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 = 0.065068 (sec), leaf count = 46

```
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*x)]*Sin
```

$$\left\{\left\{y(x)\to -x\arccos\left(\tanh\left(\frac{1}{2}(-x^2-2c_1)\right)\right)\right\},\left\{y(x)\to x\arccos\left(\tanh\left(\frac{1}{2}(-x^2-2c_1)\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.13 (sec), leaf count = 61

```
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
```

$$y(x) = \arctan\left(\frac{2\,\mathrm{e}^{-\frac{x^2}{2}}c_1}{\mathrm{e}^{-x^2}+c_1^2},\frac{\frac{\mathrm{e}^{-x^2}}{c_1^2}-1}{\frac{\mathrm{e}^{-x^2}}{c_1^2}+1}\right)x$$

2.905 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 = 0.171244 (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^2*x^2*y[
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{ax+3}{ax}+3y(x)}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.046 (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)
```

$$y(x) = \frac{29\,\text{RootOf}\left(-81\left(\int^{\_Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + x + 3c_1\right) ax - 3ax - 9}{9ax}$$

2.906 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 = 0.0970673 (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 - y[x]^3 +
```

$$\{\{y(x) \to \text{Root}[4\#1^5 - 4\#1^4 c_1 + 8\#1^3 x^2 + \#1^2(2 - 8c_1 x^2) + 4\#1 x^4 - 4c_1 x^4 + 2x^2 + 1\&, 1]\}, \{y(x) \to \text{Root}[$$

✓ **Maple** : cpu = 0.197 (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*y(x)^4*x^2+3*y(x)^2*x
```

$$-\frac{1}{4\left(y(x)^2 + x^2\right)^2} - \frac{1}{2y(x)^2 + 2x^2} - y(x) + c_1 = 0$$

2.907 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 = 0.19017 (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^2*Sin[x
```

$$\left\{\left\{y(x) \to -x(\cos(x)-1) + \frac{1}{-\log(x)+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.178 (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^
```

$$y(x) = -(-1+\cos(x))\,x + \frac{1}{-\ln(x)+c_1}$$

2.908 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 = 0.453228 (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 + 4*y[x]
```

$$\left\{\left\{y(x)\to \frac{c_1}{3\left(a^2-1\right)} + \frac{\sqrt[3]{-18x^2c_1a^6 + 54x^2c_1a^4 + 54a^4 - 54x^2c_1a^2 - 108a^2 + 2c_1{}^3 + 18x^2c_1 + \sqrt{4\left(-3x^2a^6 + \right.}}}{}\right.\right.$$

✓ **Maple** : cpu = 0.362 (sec), leaf count = 1726

```
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
```

$$y(x) = \frac{9^{\frac{2}{3}}\left(\left(-a^2c_1+c_1\right)9^{\frac{1}{3}}\left(\left(\left(3+\frac{\sqrt{-3(a-1)^5(a+1)^5x^6+6c_1^2(a-1)^4(a+1)^4x^4-3c_1(a-1)^2(a+1)^2\left(c_1^3a^2-c_1^3-18\right)x^2-6c_1^3a^2+6c_1^3+81}}{3}\right.\right.\right.\right.}{}$$

2.909 ODE No. 909

$$y'(x) = \frac{x^3y(x)^6 + x^3y(x)^4 + x^3 + 3x^2y(x)^4 + 2x^2y(x)^2 + 3xy(x)^2 + x + 1}{x^5y(x)}$$

✓ **Mathematica** : cpu = 0.105506 (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[x]^4 +
```

$$\text{Solve}\left[\frac{1}{2}\text{RootSum}\left[2\#1^3 + 2\#1^2 + 1\&, \frac{\log\left(\frac{xy(x)^2+1}{x} - \#1\right)}{3\#1^2 + 2\#1}\&\right] + \frac{1}{x} + c_1 = 0, y(x)\right]$$

✓ **Maple** : cpu = 0.463 (sec), leaf count = 84

```
dsolve(diff(y(x),x) = (x^3+y(x)^4*x^3+2*y(x)^2*x^2+x+x^3*y(x)^6+3*y(x)^4*x^2+3*x*y(x)^2+1)/x
```

$$y(x) = \frac{\sqrt{x\left(\text{RootOf}\left(\left(\int^{-Z}\frac{1}{2\_a^3+2\_a^2+1}d\_a\right)x + xc_1 + 1\right)x - 1\right)}}{x}$$

2.910 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 = 1.1508 (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]^2 + 3*
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3x^3+3x^2y(x)+x}{\sqrt[3]{29}\sqrt[3]{x^3}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{29^{2/3}\left(x^3\right)^{2/3}}{9x} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.037 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = (-2*x-y(x)+1+y(x)^2*x^2+2*x^3*y(x)+x^4+x^3*y(x)^3+3*y(x)^2*x^4+3*x^5*y
```

$$y(x) = \frac{-9x^2 + 29\,\text{RootOf}\left(-81\left(\int^{\_Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + x + 3c_1\right) - 3}{9x}$$

2.911 ODE No. 911

$$y'(x) = y(x)\left(\_\mathrm{F1}(x) + \frac{\log(y(x))}{x} - \cot(x)\log(y(x))\right)$$

✓ **Mathematica** : cpu = 0.636154 (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]
```

$$\text{Solve}\left[\int_1^x \left(\frac{2\log(y(x))\sin(K[1])}{K[1]^2} - \frac{2(\cos(K[1])\log(y(x)) - \sin(K[1])\_\mathrm{F1}(K[1]))}{K[1]}\right) dK[1] + \int_1^{y(x)} \left(-\frac{2\sin(x)}{xK[2]} - \right.\right.$$

✓ **Maple** : cpu = 0.909 (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))
```

$$y(x) = \mathrm{e}^{\frac{xc_1}{\sin(x)}}\mathrm{e}^{\frac{x\left(\int \frac{\_F1(x)\sin(x)}{x}\,dx\right)}{\sin(x)}}$$

2.912 ODE No. 912

$$y'(x) = \frac{2ax}{-128a^4 + 96a^3xy(x)^2 + 32a^3x - 24a^2x^2y(x)^4 - 16a^2x^2y(x)^2 + 2ax^3y(x)^6 + 2ax^3y(x)^4 + 2ax^3 - x^3y(x)}$$

✓ **Mathematica** : cpu = 0.638953 (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[x]^2 - 1
```

$$\text{Solve}\left[-\text{RootSum}\left[-\#1^3y(x)^6 - \#1^3y(x)^4 - \#1^3 + 12\#1^2ay(x)^4 + 8\#1^2ay(x)^2 - 48\#1a^2y(x)^2 - 16\#1a^2 + 64\right.\right.$$

✗ **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
```

, exception

`time expired`

2.913 ODE No. 913

$$y'(x) = \frac{y(x)^3 + y(x) + y(x)^3(-\log^3(x)) + y(x)^3\log^2(x) + 3y(x)^2\log^2(x) - 2y(x)^2\log(x) - 3y(x)\log(x) + 1}{xy(x)}$$

✓ **Mathematica** : cpu = 0.516779 (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 + y[x]^
```

$$\text{Solve}\left[\int_1^{y(x)}\left(2\text{RootSum}\left[\#1^3K[1]^3 - \#1^2K[1]^3 - 2K[1]^3 - 3\#1^2K[1]^2 + 2\#1K[1]^2 + 3\#1K[1] - K[1] - 1\&,\right.\right.\right.$$

✓ **Maple** : cpu = 0.072 (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*
```

$$y(x) = \frac{9}{9\ln(x) + 56\,\text{RootOf}\left(-81\left(\int^{\_Z}\frac{1}{3136\_a^3 - 27\_a + 27}d\_a\right) - \ln(x) + 3c_1\right) - 3}$$

2.914 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 = 0.518855 (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] + 96*a^
```

$$\{\{y(x) \to \text{Root}\left[8\#1^5ax^2 - 8\#1^4ac_1x^2 - 64\#1^3a^2x + \#1^2\left(2x^2 + 64a^2c_1x\right) + 128\#1a^3 - 128a^3c_1 - 8ax + x^2\&,\right.$$

✓ **Maple** : cpu = 1.562 (sec), leaf count = 71

```
dsolve(diff(y(x),x) = 2*a*(x*y(x)^2-4*a+x)/(-x^3*y(x)^3+4*y(x)*a*x^2-x^3*y(x)+2*a*y(x)^6*x^3
```

$$\frac{xy(x)^4 + (-4a + x)\,y(x)^2 - 2a}{2ay\,(x)^4\left(-xy\,(x)^2 + 4a\right)^2} + \frac{8ay(x)^5 + 2y(x)^2 + 1}{16a^2y\,(x)^4} + c_1 = 0$$

2.915 ODE No. 915

$$y'(x) = \frac{y(x)^3 + y(x) - 8y(x)^3 \log^3(x) + 4y(x)^3 \log^2(x) + 12y(x)^2 \log^2(x) - 4y(x)^2 \log(x) - 6y(x) \log(x) + 1}{xy(x)}$$

✓ **Mathematica** : cpu = 0.561858 (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]^2 + y[x]
```

$$\text{Solve}\left[\int_1^{y(x)} \left(4\text{RootSum}\left[8\#1^3 K[1]^3 - 4\#1^2 K[1]^3 - 3K[1]^3 - 12\#1^2 K[1]^2 + 4\#1 K[1]^2 + 6\#1 K[1] - K[1] - 1\right.\right.\right.$$

✓ **Maple** : cpu = 0.072 (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)
```

$$y(x) = \frac{9}{18\ln(x) + 83\,\text{RootOf}\left(-81\left(\int^{\_Z} \frac{1}{6889\_a^3 - 27\_a + 27} d\_a\right) - \ln(x) + 3c_1\right) - 3}$$

2.916 ODE No. 916

$$y'(x) = \frac{y(x)\left(x^4\log^2(y(x)) + 2x^4\log(x)\log(y(x)) + x^4\log^2(x) + x\log(y(x)) + \log(y(x)) - x + x\log(x) + \log(x)\right.}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.151226 (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[y[x]] +
```

$$\left\{\left\{y(x)\to \frac{\exp\left(\frac{12x}{-3x^4+4x^3-6x^2+12x-12\log(x+1)+c_1}\right)}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.369 (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))
```

$$y(x) = \mathrm{e}^{\frac{-12\ln(1+x)\ln(x)+\left(-3x^4+4x^3-6x^2+12x+12c_1\right)\ln(x)-12x}{3x^4-4x^3+6x^2+12\ln(1+x)-12c_1-12x}}$$

2.917 ODE No. 917

$$y'(x) = \frac{y(x)\left(x\log^2(y(x)) + 2x\log(x)\log(y(x)) + x\log(y(x)) + \log(y(x)) - x + x\log^2(x) + x\log(x) + \log(x) - 1\right.}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.13337 (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[x]] + 2
```

$$\left\{\left\{y(x) \to \frac{e^{-\frac{x}{x-\log(x+1)-c_1}}}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.308 (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(
```

$$y(x) = \mathrm{e}^{\frac{\ln(1+x)\ln(x)+(-x+c_1)\ln(x)-x}{-\ln(1+x)-c_1+x}}$$

2.918 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 = 0.354836 (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[x]^4 +
```

$$\text{Solve}\left[\int_1^{y(x)} \left(\text{RootSum}\left[64\#1^3K[1]^6 + 16\#1^2K[1]^6 + K[1]^6 + 48\#1^2K[1]^4 + 8\#1K[1]^4 + 12\#1K[1]^2 + K[1]^2 +\right.\right.\right.$$

✓ **Maple** : cpu = 0.648 (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(
```

$$x - \text{RootOf}\left(\left(\int^{\_Z} \frac{1}{64\_a^3 + 16\_a^2 + 1} d\_a\right) y(x) + y(x)\, c_1 + 1\right) + \frac{1}{4y\,(x)^2} = 0$$

2.919 ODE No. 919

$$y'(x) = \frac{\left(-y(x) + \sqrt{y(x)} + x\right) y(x)^{3/2}}{x^3 - 3x^2 y(x) + 3xy(x)^2 + xy(x)^{3/2} - y(x)^3 - y(x)^{5/2} + y(x)^2}$$

✓ **Mathematica** : cpu = 0.220941 (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]^(3/2) +
```

$$\left\{\left\{y(x)\to \text{Root}\left[\#1^9 c_1{}^4 - 6\#1^8 c_1{}^4 x + \#1^7\left(15c_1{}^4 x^2 - 6c_1{}^2\right) + \#1^6\left(-20c_1{}^4 x^3 + 30c_1{}^2 x - 4 + 2c_1{}^2\right) + \#1^5\left(15c_1{}^4\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.122 (sec), leaf count = 193

```
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
```

$$-\frac{\left(x^6 c_1 + 80x^3 - 54x^2 - 12x - 1\right) y(x)^{\frac{11}{2}} + \left(-6x^5 c_1 - 60x^2 + 36x + 6\right) y(x)^{\frac{13}{2}} + \left(15c_1 x^4 + 24x - 9\right) y(x)^{\frac{15}{2}} + \left(-\right.}{}$$

2.920 ODE No. 920

$$y'(x) = \frac{2y(x)^6(4xy(x)^2 + y(x)^2 + 1)}{128x^3y(x)^6 + 96x^2y(x)^4 + 4xy(x)^5 + y(x)^5 + y(x)^3 + 24xy(x)^2 + 2}$$

✓ **Mathematica** : cpu = 0.28147 (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 + 96*x^2
```

$$\left\{\left\{y(x) \to \text{Root}\left[\#1^5\left(128c_1x^2 - 8x - 1\right) + 128\#1^4x^2 + \#1^3(-2 + 64c_1x) + 64\#1^2x + 8\#1c_1 + 8\&, 1\right]\right\}, \left\{y(x) \right.\right.$$

✗ **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(x)^2
```

2.921 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 = 0.227059 (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]
```

$$\mathrm{Solve}\left[\int_1^x \left(\frac{\log(y(x)) - \log(K[1])\log(y(x))}{K[1]^2} - \frac{\log(K[1])\_\mathrm{F1}(K[1])}{K[1]}\right) dK[1] + \int_1^{y(x)} \left(\frac{\log(x)}{xK[2]} - \int_1^x \frac{\frac{1}{K[2]} - \frac{\log(K}{K[2}}{K[1]^2}\right.\right.$$

✓ **Maple** : cpu = 0.304 (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))
```

$$y(x) = \mathrm{e}^{\frac{x c_1}{\ln(x)}}\mathrm{e}^{\frac{x\left(\int \frac{\_F1(x)\ln(x)}{x}dx\right)}{\ln(x)}}$$

2.922 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 = 0.592382 (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[x]^(3/2
```

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{-x-K[1]}{2\left(-2x^3+6K[1]x^2-2\sqrt{K[1]}x^2-6K[1]^2x+4K[1]^{3/2}x+K[1]x+2K[1]^3-2K[1]^{5/2}-K[1]^2-\right.}\right.\right.$$

✓ **Maple** : cpu = 0.145 (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
```

$$\frac{\ln(y(x))}{2} - \left(\int^{\frac{x}{\sqrt{y(x)}}-\sqrt{y(x)}} \frac{1}{2\_a^3 + 2\_a^2 - \_a + 2} d\_a\right) - c_1 = 0$$

2.923 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 = 2.61238 (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^(-2*(x - y
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{2e^{2(x-K[2])(x+K[2])}K[2]}{-e^{2(x-K[2])(x+K[2])}x^2 + e^{2(x-K[2])(x+K[2])}K[2]^2 + 1} - \int_1^x \left(-\frac{2e^{2(K[1]-K[2])(K[1]+K[2])}K[1](2(K[1}{e^{2(K[1]-K[2])(K[1]+K[2])}K[1]^2 - e^{2(K}\right.\right.\right.$$

✓ **Maple** : cpu = 0.367 (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-e
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-\_Z + \int^{\mathrm{e}^{2\_Z} - 2x\,\mathrm{e}^{\_Z}} \frac{1}{\mathrm{e}^{2\_a} + \_a} d\_a + c_1\right)} - x$$

2.924 ODE No. 924

$$y'(x) = \frac{y(x)\left(\_F1(x) + \frac{\log^2(y(x))}{2x}\right)}{\log(y(x))}$$

✓ **Mathematica** : cpu = 0.245012 (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]
```

$$\text{Solve}\left[\int_1^x \left(-\frac{\log^2(y(x))}{2K[1]^2} - \frac{\_F1(K[1])}{K[1]}\right) dK[1] + \int_1^{y(x)} \left(\frac{\log(K[2])}{xK[2]} - \int_1^x -\frac{\log(K[2])}{K[1]^2 K[2]} dK[1]\right) dK[2] = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.114 (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))
```

$$y(x) = e^{\sqrt{2}\sqrt{x\left(\int \frac{\_F1(x)}{x} dx + c_1\right)}}$$

2.925 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 = 12.2825 (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^(2*(x -
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\frac{2K[2]}{-x^2+e^{2(x-K[2])^2(x+K[2])^2}+K[2]^2}-\int_1^x\left(\frac{2K[1]\left(-2K[2]-e^{2(K[1]-K[2])^2(K[1]+K[2])^2}\left(4(K[1]-\right.\right.}{\left(K[1]^2-e^{2(K[1]-K[\right.}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.319 (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^
```

$$y(x) = e^{\mathrm{RootOf}\left(-\_Z+\int^{e^{2\_Z}-2x\,e^{\_Z}}\frac{1}{e^{2\_a^2}+\_a}d\_a+c_1\right)} - x$$

2.926 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 = 0.139329 (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 - (x^2*y[
```

$$\left\{\left\{y(x)\to \frac{2}{x-2}+\frac{1}{16x(x-2)\left(-\frac{1}{64}-\frac{e^{2\left(\frac{1}{2}\log(2-x)-\frac{\log(x)}{2}\right)}}{\sqrt{2048\log(x)+c_1}}\right)}\right\},\left\{y(x)\to \frac{2}{x-2}+\frac{1}{16x(x-2)\left(-\frac{1}{64}+\frac{e^{2\left(\frac{1}{2}\log(2-\right.}}{\sqrt{2048\log}}\right.}\right.$$

✓ **Maple** : cpu = 0.048 (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*y(x)^2*x^2+x
```

$$y(x) = \frac{2\sqrt{c_1 + 8\ln(x)} + 8}{x\sqrt{c_1 + 8\ln(x)} + 4x - 8}$$

2.927 ODE No. 927

$$y'(x) = -\frac{1}{8}x\Big(12e^{-x^2}x^2y(x)^2 + 8e^{-x^2}x^2y(x) + 8e^{-x^2}x^2 - 8e^{-x^2} + e^{-3x^2}x^6 - 6e^{-2x^2}x^4y(x) - 2e^{-2x^2}x^4 - 8y(x)^3$$

✓ **Mathematica** : cpu = 0.408699 (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/E^(3*x
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{1}{2}e^{-x^2}x\left(2e^{x^2}-3x^2\right)+3xy(x)}{\sqrt[3]{29}\sqrt[3]{x^3}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{18}29^{2/3}\left(x^3\right)^{2/3} +$$

✓ **Maple** : cpu = 0.102 (sec), leaf count = 45

```
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
```

$$y(x) = \frac{x^2\mathrm{e}^{-x^2}}{2} - \frac{1}{3} + \frac{29\,\mathrm{RootOf}\left(x^2 - 162\left(\int^{\_Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + 6c_1\right)}{9}$$

2.928 ODE No. 928

$$y'(x) = \frac{e^{\frac{y(x)}{x}}\left(x^2e^{-\frac{y(x)}{x}} + xe^{-\frac{y(x)}{x}} + xe^{-\frac{y(x)}{x}}y(x) + e^{-\frac{y(x)}{x}}y(x) + x\right)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.66428 (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) + (x*y
```

$$\left\{\left\{y(x)\to -x\log\left(-\frac{\log(x+1)-c_1}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.213 (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
```

$$y(x) = -\ln\left(\frac{c_1 - \ln(1+x)}{x}\right)x$$

2.929 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 = 0.512776 (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 + y[x]^
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-32\text{RootSum}\left[\#1^3K[1]^3 - 2\#1^2K[1]^3 - 8K[1]^3 - 6\#1^2K[1]^2 + 8\#1K[1]^2 + 12\#1K[1] - 8K[1] \right.\right.\right.$$

✓ **Maple** : cpu = 0.042 (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
```

$$y(x) = \frac{18}{58\,\text{RootOf}\left(-324\left(\int^{\_Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) - \ln(x) + 12c_1\right) + 9x - 6}$$

2.930 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 = 0.913665 (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]/x) + (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 = 0.292 (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
```

$$y(x) = -\ln\left(\frac{-2x^3+3x^2+6\ln(1+x)-6c_1-6x}{6x}\right)x$$

2.931 ODE No. 931

$$y'(x) = \frac{x^6 + 3x^5y(x) + 3x^4y(x)^2 + x^3y(x)^3 - 2x^3 - 3x^2y(x) - xy(x)^2 - y(x) - 2x}{x(x^2 + xy(x) + 1)}$$

✓ **Mathematica** : cpu = 0.127065 (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 + 3*x^4
```

$$\left\{\left\{y(x) \to -\frac{x^2+1}{x} + \frac{1}{x^2\left(\frac{1}{x} - \frac{1}{x\sqrt{-2x+c_1}}\right)}\right\}, \left\{y(x) \to -\frac{x^2+1}{x} + \frac{1}{x^2\left(\frac{1}{x} + \frac{1}{x\sqrt{-2x+c_1}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (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*y(x)^2*x^4+3*x^5*y(x
```

$$y(x) = \frac{-\sqrt{-2x+c_1}\,x^2 + x^2 + 1}{\left(\sqrt{-2x+c_1} - 1\right)x}$$

2.932 ODE No. 932

$$y'(x) = \frac{e^{-\frac{3x^2}{2}}x\left(3e^{3x^2}y(x)^3 + e^{\frac{9x^2}{2}}y(x)^3 + 18e^{3x^2}y(x)^2 + 9e^{\frac{9x^2}{2}}y(x)^2 + 27e^{3x^2}y(x) + 27e^{\frac{9x^2}{2}}y(x) + 27e^{\frac{9x^2}{2}} + 27y(\right.}{243y(x)}$$

✓ **Mathematica** : cpu = 2.81179 (sec), leaf count = 3303

```
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] + 18*E
```

$$\text{Solve}\left[27\text{RootSum}\left[y(x)^3\#1^3 + 9y(x)^2\#1^3 + 27y(x)\#1^3 + 27\#1^3 + 3y(x)^3\#1^2 + 18y(x)^2\#1^2 + 27y(x)\#1^2 - 2\right.\right.$$

✓ **Maple** : cpu = 0.104 (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(
```

$$y(x) = -\frac{369\,\mathrm{e}^{\frac{3x^2}{2}}}{123 + 123\,\mathrm{e}^{\frac{3x^2}{2}} - 136\,\mathrm{RootOf}\left(-41x^2 - 50243409\left(\int^{\_Z}\frac{1}{9248\_a^3 - 1860867\_a + 1860867}d\_a\right) + 27c_1\right)}$$

2.933 ODE No. 933

$$y'(x) = \frac{x^3 + x^3\left(-\log^3(x)\right) + x^3\log^2(x) + 3x^2y(x)\log^2(x) - 2x^2y(x)\log(x) + x^2 + xy(x)^2 + xy(x) + y(x)^3 - 3x}{x^2}$$

✓ **Mathematica** : cpu = 1.1918 (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]*y[x] +
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3y(x)}{x^2} + \frac{1-3\log(x)}{x}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^3}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{29^{2/3}}{9\sqrt[3]{\frac{1}{x^3}}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.059 (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
```

$$y(x) = \frac{x\left(9\ln(x) - 3 + 29\,\text{RootOf}\left(-81\left(\int^{\_Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + x + 3c_1\right)\right)}{9}$$

2.934 ODE No. 934

$$y'(x) = -\frac{x^6}{64} - \frac{3x^5}{32} + \frac{3}{16}x^4y(x) - \frac{x^4}{8} + \frac{3}{4}x^3y(x) + \frac{x^3}{8} - \frac{3}{4}x^2y(x)^2 + \frac{1}{4}x^2y(x) + \frac{x^2}{4} - \frac{3}{2}xy(x)^2 - xy(x) + y(x)^3 + y(x)^2 + \frac{x}{2} +$$

✓ **Mathematica** : cpu = 0.22229 (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] + (x^2*y
```

$$\text{Solve}\left[-\frac{31}{3}\text{RootSum}\left[-31\#1^3 + 3\ 2^{2/3}\sqrt[3]{31}\#1 - 31\&, \frac{\log\left(\sqrt[3]{\frac{2}{31}}\left(\frac{1}{4}\left(-3x^2 - 6x + 4\right) + 3y(x)\right) - \#1\right)}{2^{2/3}\sqrt[3]{31} - 31\#1^2}\&\right] = \frac{1}{9}\left(\right.$$

✓ **Maple** : cpu = 0.059 (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*
```

$$y(x) = \frac{x^2}{4} + \frac{x}{2} + \text{RootOf}\left(-x + 2\left(\int^{\_Z} \frac{1}{2\_a^3 + 2\_a^2 + 1} d\_a\right) + c_1\right)$$

2.935 ODE No. 935

$$y'(x) = \frac{x^6}{64} - \frac{3x^5}{16} + \frac{3}{16}x^4y(x) + \frac{13x^4}{16} - \frac{3}{2}x^3y(x) - \frac{3x^3}{2} + \frac{3}{4}x^2y(x)^2 + \frac{7}{2}x^2y(x) + x^2 - 3xy(x)^2 - 2xy(x) + y(x)^3 + y(x)^2 -$$

✓ **Mathematica** : cpu = 37.0542 (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 - 2*x*y[x
```

$$\text{Solve}\left[\frac{\sqrt[3]{2}\left(\frac{\frac{1}{4}(3x^2-12x+4)+3y(x)}{\sqrt[3]{2}} + 2^{2/3}\right)\left(2^{2/3} - 2^{2/3}\left(\frac{1}{4}(3x^2-12x+4)+3y(x)\right)\right)\left(\left(\frac{1}{4}(-3x^2+12x-4) - 3y(x) +\right.\right.}{9\left(-\left(\frac{1}{4}(3x^2-12x+4) +\right.\right.}\right.$$

✓ **Maple** : cpu = 0.303 (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
```

$$y(x) = \frac{e^{\mathrm{RootOf}\left(\ln(e^{\_Z}-4)e^{\_Z}+e^{\_Z}c_1-\_Z e^{\_Z}+x e^{\_Z}-4\ln(e^{\_Z}-4)-4c_1+4\_Z-4x+4\right)}}{4} - 1 - \frac{x^2}{4} + x$$

2.936 ODE No. 936

$$y'(x) = \frac{x^6}{512} - \frac{3x^5}{256} + \frac{3}{64}x^4y(x) + \frac{5x^4}{128} - \frac{3}{16}x^3y(x) - \frac{5x^3}{64} + \frac{3}{8}x^2y(x)^2 + \frac{7}{16}x^2y(x) + \frac{x^2}{16} - \frac{3}{4}xy(x)^2 - \frac{1}{2}xy(x) + y(x)^3 + y(x)$$

✓ **Mathematica** : cpu = 0.194779 (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^6/512 - (
```

$$\text{Solve}\left[-\frac{89}{3}\text{RootSum}\left[-89\#1^3 + 6\sqrt[3]{178}\#1 - 89\&, \frac{\log\left(\frac{2^{2/3}\left(\frac{1}{8}(3x^2-6x+8)+3y(x)\right)}{\sqrt[3]{89}} - \#1\right)}{2\sqrt[3]{178} - 89\#1^2}\&\right] = \frac{89^{2/3}x}{18\sqrt[3]{2}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.063 (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
```

$$y(x) = -\frac{x^2}{8} + \frac{x}{4} + \text{RootOf}\left(-x + 4\left(\int^{\_Z} \frac{1}{4\_a^3 + 4\_a^2 + 3}d\_a\right) + c_1\right)$$

2.937 ODE No. 937

$$y'(x) = \frac{2xy(x)^3 + y(x)^3 - 2y(x) + 6xy(x)\log^2(2x+1) + 3y(x)\log^2(2x+1) + 6xy(x)^2\log(2x+1) + 3y(x)^2\log(}{(2x+1)(y(x)+\log(2x+1)+1)}$$

✓ **Mathematica** : cpu = 0.195325 (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*y[x] + 3
```

$$\left\{\left\{y(x)\to \frac{1}{(2x+1)\left(\frac{2x+1}{4x^2+4x+1} - \frac{1}{(2x+1)\sqrt{-2x+c_1}}\right)} - \log(2x+1) - 1\right\}, \left\{y(x)\to \frac{1}{(2x+1)\left(\frac{2x+1}{4x^2+4x+1} + \frac{1}{(2x+1)\sqrt{-}}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.069 (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)*
```

$$y(x) = \frac{-\sqrt{-2x+c_1}\,\ln(2x+1) + \ln(2x+1) + 1}{\sqrt{-2x+c_1} - 1}$$

2.938 ODE No. 938

$$y'(x) = \frac{x^6 - 3x^5 + 3x^4 y(x) + 4x^4 - 6x^3 y(x) - 3x^3 + 3x^2 y(x)^2 + 5x^2 y(x) - x^2 - 3xy(x)^2 - 2xy(x) + y(x)^3 + y(}{x}$$

✓ **Mathematica** : cpu = 0.173324 (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[x] - 6*
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3x^2-3x+1}{x}+\frac{3y(x)}{x}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^3}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}\left(\frac{1}{x^3}\right)^{2/3} x^2 \log(x) +$$

✓ **Maple** : cpu = 0.043 (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*y(x)^2*x^2-3
```

$$y(x) = -x^2 + x - \frac{1}{3} + \frac{29\,\text{RootOf}\left(-81\left(\int^{-Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + \ln(x) + 3c_1\right)}{9}$$

2.939 ODE No. 939

$$y'(x) = \frac{x^6 + 6x^5 - 12x^4y(x) + 12x^4 - 48x^3y(x) + 16x^3 + 48x^2y(x)^2 - 48x^2y(x) + 16x^2 + 96xy(x)^2 - 32xy(x) -}{16x^2 - 64y(x) + 32x - 64}$$

✓ **Mathematica** : cpu = 0.370972 (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] - 48*x^2*y[
```

$$\text{Solve}\left[\frac{2}{5}\text{RootSum}\left[\#1^4 + 4\#1^3 - 8\#1^2y(x) - 16\#1y(x) - 8\#1 + 16y(x)^2 + 16y(x) + 8\&, \frac{\#1^2(-\log(x - \#1)) -}{}\right.\right.$$

✓ **Maple** : cpu = 0.082 (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*y(x)^2*x^2+96*x*y(x)^2-12*
```

$$x - \frac{4\ln\left(y(x) - \frac{x^2}{4} - \frac{x}{2} - 1\right)}{5} + \frac{2\ln\left(2\left(y(x) - \frac{x^2}{4} - \frac{x}{2}\right)^2 + 2y(x) - \frac{x^2}{2} - x + 1\right)}{5} - \frac{2\arctan\left(-2y(x) + \frac{x^2}{2} + x - 1\right)}{5}$$

2.940 ODE No. 940

$$y'(x) = \frac{x^3 \log^3(x) - 3x^2 y(x) \log^2(x) - x^2 + x^2 \log(x) - y(x)^3 - y(x)^2 - 2xy(x) + 3xy(x)^2 \log(x) + xy(x) \log(x)}{x(-y(x) - x + x \log(x))}$$

✓ **Mathematica** : cpu = 0.151057 (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] - 3*x^2*Lo
```

$$\left\{\left\{y(x)\to -\frac{1}{x\left(-\frac{1}{x^2}-\frac{1}{x^2\sqrt{-2x+c_1}}\right)}-x+x\log(x)\right\},\left\{y(x)\to -\frac{1}{x\left(-\frac{1}{x^2}+\frac{1}{x^2\sqrt{-2x+c_1}}\right)}-x+x\log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (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
```

$$y(x) = \frac{x\left(\ln(x)\sqrt{-2x+c_1} - \ln(x) + 1\right)}{\sqrt{-2x+c_1} - 1}$$

2.941 ODE No. 941

$$y'(x) = \frac{x^6 - 12x^5 + 12x^4y(x) + 48x^4 - 96x^3y(x) - 72x^3 + 48x^2y(x)^2 + 192x^2y(x) + 32x^2 - 192xy(x)^2 - 32xy(}{16x^2 + 64y(x) - 64x + 64}$$

✓ **Mathematica** : cpu = 0.27052 (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] + 192*x^2*
```

$$\text{Solve}\left[x - 8\text{RootSum}\left[11776\#1^3 - 40\#1 - 1\&, \#1 \log\left(17664\#1^2 - 1472\#1 + 11x^2 + 44y(x) - 44x - 40\right)\&\right] = c\right.$$

✓ **Maple** : cpu = 0.043 (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*y(x)^2*x^2-192*x*y(x)^2+12
```

$$y(x) = -\frac{x^2}{4} + x + \text{RootOf}\left(-x + \int^{\_Z} \frac{\_a + 1}{\_a^3 - \_a - 1} d\_a + c_1\right)$$

2.942 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 = 3.01156 (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 - 2*x*y[x
```

$$\text{Solve}\left[\int_1^{y(x)} \left(-\frac{2K[2]}{-x^2 + \exp\left(\frac{2(x-K[2])^3(x+K[2])^3}{x^2-K[2]^2-1}\right) + K[2]^2} - \int_1^x \left(\frac{2K[1]\left(-2K[2] - \exp\left(\frac{2(K[1]-K[2])^3(K[1]+K[2])^3}{K[1]^2-K[2]^2-1}\right.\right.}{\left(K[1\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 0.707 (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)))/(-
```

$$y(x) = e^{\text{RootOf}\left(-\_Z + \int^{e^{2\_Z} - 2x e^{\_Z}} \frac{1}{e^{\frac{2\_a^3}{\_a+1}} + \_a} d\_a + c_1\right)} - x$$

2.943 ODE No. 943

$$y'(x) = \frac{x^6 - 6x^5 + 24x^4y(x) + 12x^4 - 96x^3y(x) - 24x^3 + 192x^2y(x)^2 + 96x^2y(x) + 32x^2 - 384xy(x)^2 - 128xy(}{64x^2 + 512y(x) - 128x + 512}$$

✓ **Mathematica** : cpu = 0.308811 (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] + 96*x^2*
```

$$\text{Solve}\left[x - 16\text{RootSum}\left[6656\#1^3 - 23\#1 - 1\&, \#1 \log\left(79872\#1^2 - 18304\#1 + 181x^2 + 1448y(x) - 362x - 184\right)\right.\right.$$

✓ **Maple** : cpu = 0.046 (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*y(x)^2*x^2-384*x*y(x)^
```

$$y(x) = -\frac{x^2}{8} + \frac{x}{4} + \text{RootOf}\left(-x + \int^{\_Z} \frac{4\_a + 4}{4\_a^3 - \_a - 1} d\_a + c_1\right)$$

2.944 ODE No. 944

$$y'(x) = \frac{a^3x^6 + 6a^2bx^5 + 12a^2x^4y(x) - 8a^2x^3 + 12ab^2x^4 + 48abx^3y(x) - 16abx^2 + 48ax^2y(x)^2 - 32axy(x) - 32a}{16ax^2 + 32bx + 64y(x) + 64}$$

✓ **Mathematica** : cpu = 17.9677 (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 + 6*a^2*b*
```

$$\text{Solve}\Big[x - 4\text{RootSum}\Big[\#1^6a^3 + 6\#1^5a^2b + 12\#1^4a^2y(x) + 12\#1^4ab^2 + 48\#1^3aby(x) + 8\#1^3b^3 + 8\#1^2ab + 48\#$$

✓ **Maple** : cpu = 0.062 (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
```

$$y(x) = -\frac{a\,x^2}{4} - \frac{bx}{2} + \text{RootOf}\left(bx + 2\left(\int^{\_Z} -\frac{b(\_a+1)}{2\_a^3 + \_ab + b}d\_a\right) + 2c_1\right)$$

2.945 ODE No. 945

$$y'(x) = \frac{8a^3x^3 + 12a^2x^4 + 48a^2x^2y(x) + 6ax^5 + 48ax^3y(x) - 16ax^2 + 96axy(x)^2 + x^6 + 12x^4y(x) - 8x^3 + 48x^2y}{32ax + 16x^2 + 64y(x) + 64}$$

✓ **Mathematica** : cpu = 17.6674 (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 + x^6 - 32
```

$$\text{Solve}\left[x - 4\text{RootSum}\left[\#1^6 + 6\#1^5a + 12\#1^4a^2 + 12\#1^4y(x) + 8\#1^3a^3 + 48\#1^3ay(x) + 48\#1^2a^2y(x) + 8\#1^2a\right.\right.$$

✓ **Maple** : cpu = 0.051 (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*y(x)^2*x^2+96*a*x*y(x)^2+
```

$$y(x) = -\frac{x^2}{4} - \frac{ax}{2} + \text{RootOf}\left(-x + \int^{\_Z} \frac{2\_a + 2}{2\_a^3 + \_aa + a} d\_a + c_1\right)$$

2.946 ODE No. 946

$$y'(x) = \frac{x\left(12e^{-x^2}x^2y(x)^2 + 8e^{-x^2}x^2y(x) - 8e^{-x^2}y(x) + 4e^{-2x^2}x^2 + 8e^{-x^2}x^2 - 8e^{-x^2} + e^{-3x^2}x^6 - 6e^{-2x^2}x^4y(x)\right.}{4e^{-x^2}x^2 - 8y(x) - 8}$$

✓ **Mathematica** : cpu = 0.436859 (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*x^2) +
```

$$\left\{\left\{y(x) \to -\frac{1}{2}e^{-x^2}\left(2e^{x^2} - x^2\right) + \frac{e^{-3x^2}}{8\left(\frac{1}{8}e^{-3x^2} - \frac{e^{-3x^2}}{\sqrt{-64x^2+c_1}}\right)}\right\}, \left\{y(x) \to -\frac{1}{2}e^{-x^2}\left(2e^{x^2} - x^2\right) + \frac{e^{-3x^2}}{8\left(\frac{1}{8}e^{-3x^2} + \right.}\right.\right.$$

✓ **Maple** : cpu = 0.098 (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)-
```

$$y(x) = \frac{2 + x^2\left(\sqrt{-x^2 + c_1} - 1\right)\mathrm{e}^{-x^2}}{2\sqrt{-x^2 + c_1} - 2}$$

2.947 ODE No. 947

$$y'(x) = \frac{x^3\sin(x) + x^2y(x)^2 + 2x^2y(x)\cos(x) + \frac{x^2}{2} + x^2\cos(x) + \frac{1}{2}x^2\cos(2x) + 2xy(x) - 2xy(x)\sin(x) + x - x\,\mathrm{si}}{x^3}$$

✓ **Mathematica** : cpu = 0.288619 (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*Cos[2*x]
```

$$\left\{\left\{y(x)\to -\frac{-\sin(x)+x\cos(x)+1}{x}+\frac{1}{-\log(x)+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.414 (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*y(x)^2*x^2-4*y(x)*sin(
```

$$y(x) = \frac{(\cos(x)\,x - \sin(x) + 1)\ln(x) - \cos(x)\,c_1x + \sin(x)\,c_1 + x - c_1}{x\,(-\ln(x) + c_1)}$$

2.948 ODE No. 948

$$y'(x) = -\frac{216y(x)}{36x^2 + 4y(x)^8 + 12y(x)^7 + 33y(x)^6 + 60y(x)^5 - 24xy(x)^4 - 216y(x)^4 - 36xy(x)^3 - 252y(x)^3 - 72xy(x}$$

✓ **Mathematica** : cpu = 0.42485 (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*y[x]^2 -
```

$$\text{Solve}\left[\frac{36}{y(x)\left(2y(x)^3 + 3y(x)^2 + 6y(x) + 6\right) - 6x} + \log(y(x)) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.167 (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)
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(12c_1\mathrm{e}^{4\_Z}+2\,\mathrm{e}^{4\_Z}\_Z+18c_1\mathrm{e}^{3\_Z}+3\,\mathrm{e}^{3\_Z}\_Z+36\,\mathrm{e}^{2\_Z}c_1+6\_Z\mathrm{e}^{2\_Z}+36\,\mathrm{e}^{\_Z}c_1+6\_Z\mathrm{e}^{\_Z}-36xc_1-6x\_Z+36\right)}$$

2.949 ODE No. 949

$$y'(x) = \frac{x^6 - 3x^5 + 3x^4y(x) + x^4 - 6x^3y(x) + 2x^3 + 3x^2y(x)^2 + x^2y(x) - 3x^2 - 3xy(x)^2 + xy(x) + y(x)^3 + x}{x\,(x^2 + y(x) - x + 1)}$$

✓ **Mathematica** : cpu = 0.1496 (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*x^3*y[x]
```

$$\left\{\left\{y(x)\to -x^2+x+\frac{1}{x\left(\frac{1}{x}-\frac{1}{x\sqrt{-2\log(x)+c_1}}\right)}-1\right\},\left\{y(x)\to -x^2+x+\frac{1}{x\left(\frac{1}{x}+\frac{1}{x\sqrt{-2\log(x)+c_1}}\right)}-1\right\}\right\}$$

✓ **Maple** : cpu = 0.039 (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*y(x)^2*x^2-3*x*y(x)^2+3*y(
```

$$y(x) = \frac{\left(-x^2+x\right)\sqrt{c_1-2\ln(x)}+x^2-x+1}{-1+\sqrt{c_1-2\ln(x)}}$$

2.950 ODE No. 950

$$y'(x) = \frac{a^3x^6}{64}+\frac{3}{32}a^2bx^5+\frac{3}{16}a^2x^4y(x)+\frac{a^2x^4}{16}+\frac{3}{16}ab^2x^4+\frac{3}{4}abx^3y(x)+\frac{1}{4}abx^3+\frac{3}{4}ax^2y(x)^2+\frac{1}{2}ax^2y(x)-\frac{ax}{2}+\frac{b^3x^3}{8}+$$

✓ **Mathematica** : cpu = 6.31842 (sec), leaf count = 920

```
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^4)/16 +
```

$$\text{Solve}\left[\frac{1}{9}\text{RootSum}\left[729b^2\#1^9+3132b\#1^9+3364\#1^9+2187b^2\#1^6+9396b\#1^6+10092\#1^6+2187b^2\#1^3+939\right.\right.$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = -1/2*a*x+1+y(x)^2+1/2*y(x)*a*x^2+b*x*y(x)+1/16*a^2*x^4+1/4*a*x^3*b+1/4
```

$$y(x) = -\frac{a\,x^2}{4}-\frac{bx}{2}+\text{RootOf}\left(-x+2\left(\int^{\_Z}\frac{1}{2\_a^3+2\_a^2+b+2}d\_a\right)+c_1\right)$$

2.951 ODE No. 951

$$y'(x) = \frac{a^3x^3}{8} + \frac{3a^2x^4}{16} + \frac{3}{4}a^2x^2y(x) + \frac{a^2x^2}{4} + \frac{3ax^5}{32} + \frac{3}{4}ax^3y(x) + \frac{ax^3}{4} + \frac{3}{2}axy(x)^2 + axy(x) + \frac{x^6}{64} + \frac{3}{16}x^4y(x) + \frac{x^4}{16} + \frac{3}{4}x^2y$$

✓ **Mathematica** : cpu = 6.2811 (sec), leaf count = 906

```
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^2*x^4)/
```

$$\text{Solve}\left[\frac{1}{9}\text{RootSum}\left[729a^2\#1^9 + 3132a\#1^9 + 3364\#1^9 + 2187a^2\#1^6 + 9396a\#1^6 + 10092\#1^6 + 2187a^2\#1^3 + 93\right.\right.$$

✓ **Maple** : cpu = 0.063 (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
```

$$y(x) = -\frac{x^2}{4} - \frac{ax}{2} + \text{RootOf}\left(-x + 2\left(\int^{\_Z} \frac{1}{2\_a^3 + 2\_a^2 + \_a + 2}d\_a\right) + c_1\right)$$

2.952 ODE No. 952

$$y'(x) = \frac{-x^2\sqrt{x^2+y(x)^2} + xy(x)\sqrt{x^2+y(x)^2} + x^5\left(-\sqrt{x^2+y(x)^2}\right) + x^4y(x)\sqrt{x^2+y(x)^2} - x^4\sqrt{x^2+y(x)^2} +}{x}$$

✓ **Mathematica** : cpu = 0.270609 (sec), leaf count = 164

```
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*Sqrt[x^2
```

$$\left\{\left\{y(x)\to \frac{\sqrt{2}x\tanh^2\left(\frac{1}{40}\left(-4\sqrt{2}x^5-5\sqrt{2}x^4-10\sqrt{2}x^2-20\sqrt{2}c_1\right)\right)-2x\tanh\left(\frac{1}{40}\left(-4\sqrt{2}x^5-5\sqrt{2}x^4-10\sqrt{2}x^2\right.\right.}{\sqrt{2}-2\tanh\left(\frac{1}{40}\left(-4\sqrt{2}x^5-5\sqrt{2}x^4-10\sqrt{2}x^2-20\sqrt{2}c_1\right)\right)}\right.\right.$$

✓ **Maple** : cpu = 0.283 (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
```

$$\ln\left(\frac{2x\left(\sqrt{2y(x)^2+2x^2}+y(x)+x\right)}{y(x)-x}\right)+\frac{(4x^5+5x^4+10x^2)\sqrt{2}}{20}-c_1-\ln(x)=0$$

2.953 ODE No. 953

$$y'(x) = \frac{y(x)\left(x^4\log^2(y(x)) + 2x^4\log(x)\log(y(x)) + x^4\log^2(x) + x^3\log^2(y(x)) + 2x^3\log(x)\log(y(x)) + x^3\log^2(x\right.}{x}$$

✓ **Mathematica** : cpu = 0.160454 (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[y[x]] +
```

$$\left\{\left\{y(x)\to\frac{e^{-\frac{20x}{4x^5+5x^4+10x^2+20c_1}}}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.451 (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*l
```

$$y(x) = x^{-\frac{4x^5}{4x^5+5x^4+10x^2+20c_1}}x^{-\frac{5x^4}{4x^5+5x^4+10x^2+20c_1}}x^{-\frac{10x^2}{4x^5+5x^4+10x^2+20c_1}}x^{-\frac{20c_1}{4x^5+5x^4+10x^2+20c_1}}e^{-\frac{20x}{4x^5+5x^4+10x^2+20c_1}}$$

2.954 ODE No. 954

$$y'(x) = \frac{\frac{24}{5}x^{7/2}y(x) - \frac{24x^{13/2}}{25} + \frac{8x^{7/2}}{5} - 8x^{3/2} - \frac{8x^9}{125} + \frac{12}{25}x^6y(x) + \frac{4x^6}{25} - \frac{24x^4}{5} - \frac{6}{5}x^3y(x)^2 - \frac{4}{5}x^3y(x) + \frac{6x^3}{5} + 12xy}{x}$$

✓ **Mathematica** : cpu = 0.254031 (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 - (24*x^4)/5
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{-6x^3-30\sqrt{x}+5}{5x}+\frac{3y(x)}{x}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^3}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}\left(\frac{1}{x^3}\right)^{2/3}x^2\log(x$$

✓ **Maple** : cpu = 0.09 (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
```

$$y(x) = \frac{18x^{\frac{7}{2}} + 145\,\text{RootOf}\left(-81\left(\int^{\_Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + \ln(x) + 3c_1\right)\sqrt{x} - 15\sqrt{x} + 90x}{45\sqrt{x}}$$

2.955 ODE No. 955

$$y'(x) = \frac{-24x^{7/2}y(x) + \frac{24x^{13/2}}{5} + 14x^{7/2} + 40x^{3/2} + \frac{8x^9}{25} - \frac{12}{5}x^6y(x) + \frac{12x^6}{5} + 24x^4 + 6x^3y(x)^2 - 6x^3y(x) - 6x^3 -}{x\left(2x^3 - 5y(x) + 10\sqrt{x} - 5\right)}$$

✓ **Mathematica** : cpu = 0.246339 (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 + (12*x^6
```

$$\left\{\left\{y(x)\to \frac{1}{5}\left(2x^3+10\sqrt{x}-5\right)-\frac{1}{125x\left(-\frac{1}{125x}-\frac{1}{x\sqrt{-31250\log(x)+c_1}}\right)}\right\},\left\{y(x)\to \frac{1}{5}\left(2x^3+10\sqrt{x}-5\right)-\frac{}{125x\left(\right.}\right.$$

✓ **Maple** : cpu = 0.082 (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-
```

$$y(x) = \frac{\left(2x^3+10\sqrt{x}\right)\sqrt{c_1-2\ln(x)}-2x^3-10\sqrt{x}+5}{5\sqrt{c_1-2\ln(x)}-5}$$

2.956 ODE No. 956

$$y'(x) = \frac{y(x)\left(y(x)e^{\frac{2\log^2(x)}{\log(x)+1}}x^{\frac{2}{\log(x)+1}+2} + y(x)e^{\frac{2\log^2(x)}{\log(x)+1}}\log^2(x)x^{\frac{2}{\log(x)+1}+2} + 2y(x)e^{\frac{2\log^2(x)}{\log(x)+1}}\log(x)x^{\frac{2}{\log(x)+1}+2} - e^{\frac{2\log^2(x)}{\log(x)+1}}\right.}{x(\log(x)+1)}$$

✓ **Mathematica** : cpu = 0.915531 (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])) - E^((
```

$$\left\{\left\{y(x)\to \frac{1}{\left(1+c_1e^{\frac{x^4}{4}}\right)(\log(x)+1)}\right\}\right\}$$

✓ **Maple** : cpu = 0.082 (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
```

$$y(x) = \frac{e^{-\frac{x^4}{4}}}{(\ln(x)+1)\left(x^{-\frac{2\ln(x)}{\ln(x)+1}}(\ln(x)+1)\,e^{\frac{(-4\ln(x)-4)\ln(\ln(x)+1)-x^4\ln(x)-x^4+8\ln(x)^2}{4\ln(x)+4}} + c_1\right)}$$

2.957 ODE No. 957

$$y'(x) = \frac{y(x)\left(y(x)e^{\frac{2\log^2(x)}{\log(x)+1}}x^{\frac{2}{\log(x)+1}+3} + y(x)e^{\frac{2\log^2(x)}{\log(x)+1}}\log^2(x)x^{\frac{2}{\log(x)+1}+3} + 2y(x)e^{\frac{2\log^2(x)}{\log(x)+1}}\log(x)x^{\frac{2}{\log(x)+1}+3} - e^{\frac{2\log^2(}{\log(x)+}}\right.}{x(\log(x)+1)}$$

✓ **Mathematica** : cpu = 0.907546 (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])) - E^((
```

$$\left\{\left\{y(x)\to \frac{1}{\left(1+c_1e^{\frac{x^5}{5}}\right)(\log(x)+1)}\right\}\right\}$$

✓ **Maple** : cpu = 0.065 (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*
```

$$y(x) = \frac{e^{-\frac{x^5}{5}}}{(\ln(x)+1)\left(x^{-\frac{2\ln(x)}{\ln(x)+1}}(\ln(x)+1)\,e^{\frac{(-5\ln(x)-5)\ln(\ln(x)+1)-x^5\ln(x)-x^5+10\ln(x)^2}{5\ln(x)+5}}+c_1\right)}$$

2.958 ODE No. 958

$$y'(x) = \frac{2xy(x)^3 + y(x)^3 + 2xy(x)^2 + y(x)^2 + 6xy(x)\log^2(2x+1) + 3y(x)\log^2(2x+1) + 6xy(x)^2\log(2x+1) +}{}$$

✓ **Mathematica** : cpu = 0.257738 (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]^3 + 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 = 0.069 (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
```

$$y(x) = -\ln(2x+1) - \frac{1}{3} + \frac{29\,\text{RootOf}\left(-81\left(\int^{-Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + x + 3c_1\right)}{9}$$

2.959 ODE No. 959

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(x^3\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2x}\right) - \frac{1}{2}y(x)\sin\left(\frac{y(x)}{x}\right) + \frac{1}{2}y(x)\sin\left(\frac{y(x)}{2x}\right)\right.}{x}$$

✓ **Mathematica** : cpu = 0.167783 (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)]*Sin[y
```

$$\left\{\left\{y(x)\to x\arcsin\left(e^{\frac{x^2}{2}+c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.149 (sec), leaf count = 16

```
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
```

$$y(x) = \frac{\arccos\left(c_1 e^{x^2}+1\right)x}{2}$$

2.960 ODE No. 960

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(x^2\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2x}\right) - \frac{1}{2}y(x)\sin\left(\frac{y(x)}{x}\right) + \frac{1}{2}y(x)\sin\left(\frac{y(x)}{2x}\right)\right.}{x}$$

✓ **Mathematica** : cpu = 0.125225 (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)]*Sin[y
```

$$\left\{\left\{y(x)\to x\arcsin\left(e^{x+c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.122 (sec), leaf count = 16

```
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
```

$$y(x) = \frac{\arccos\left(e^{2x}c_1+1\right)x}{2}$$

2.961 ODE No. 961

$$y'(x) = \frac{\exp\left(-2x^6+6x^4y(x)^2+2x^4-6x^2y(x)^4-4x^2y(x)^2+2y(x)^6+2y(x)^4+2\right)+x^2+2xy(x)+y(x)^2}{-\exp\left(-2x^6+6x^4y(x)^2+2x^4-6x^2y(x)^4-4x^2y(x)^2+2y(x)^6+2y(x)^4+2\right)+x^2+2xy(x)+y(x)^2}$$

✓ **Mathematica** : cpu = 29.0388 (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 - 6*x^2*
```

$$\text{Solve}\left[\int_1^x \left(\frac{1}{K[1]+y(x)} - \frac{2e^{2K[1]^6+6y(x)^4K[1]^2+4y(x)^2K[1]^2}K[1]}{e^{2K[1]^6+6y(x)^4K[1]^2+4y(x)^2K[1]^2}K[1]^2 - e^{2y(x)^6+2y(x)^4+6K[1]^4y(x)^2+2K[1]^4+2} - e^{2K[1]^6+6y(x}\right.\right.$$

✓ **Maple** : cpu = 0.445 (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*y(x)^2*x^2+2*x^4+2*y(x)^6-6*y(x)
```

$$y(x) = \mathrm{e}^{\mathrm{RootOf}\left(-\_Z+\int^{\mathrm{e}^{2\_Z}-2x\,\mathrm{e}^{\_Z}} \frac{1}{\mathrm{e}^{2\_a^3+2\_a^2+2}+\_a}d\_a+c_1\right)} - x$$

2.962 ODE No. 962

$$y'(x) = \frac{4(a-1)(a+1)x\left(a^2x^2 - x^2 -\right.}{a^8x^6 - 4a^6x^6 - 3a^6x^4y(x)^2 + 6a^4x^6 + 9a^4x^4y(x)^2 + 3a^4x^2y(x)^4 - 4a^2x^6 - 9a^2x^4y(x)^2 - 6a^2x^2y(x)^4 + 4}$$

✓ **Mathematica** : cpu = 2.03384 (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^2*x^6 +
```

$$\left\{\left\{y(x) \to \text{Root}\left[2x^4a^8 - 8x^4a^6 + e^{c_1}x^4a^4 + 11x^4a^4 - 2e^{c_1}x^4a^2 - 6x^4a^2 + 4x^2a^2 + \left(2a^2-2\right)\#1^5 + e^{c_1}x^4 + x^4 +\right.\right.\right.$$

✓ **Maple** : cpu = 0.933 (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^
```

$$-\frac{y(x)}{(a-1)(a+1)} + \frac{2}{\left(a^2-1\right)^2 \left(a^2x^2 - x^2 - y(x)^2\right)^2} - \frac{2}{\left(a^2-1\right)^2 \left(a^2x^2 - x^2 - y(x)^2\right)} + c_1 = 0$$

2.963 ODE No. 963

$$y'(x) = \frac{-\frac{5x^3}{2} + \frac{15}{4}x^3\cos(x) - \frac{3}{2}x^3\cos(2x) + \frac{1}{4}x^3\cos(3x) + \frac{9}{2}x^2y(x) - 6x^2y(x)\cos(x) + \frac{3}{2}x^2y(x)\cos(2x) + \frac{3x^2}{2} +}{}$$

✓ **Mathematica** : cpu = 0.34561 (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*x^3*Cos
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3y(x)}{x} + \frac{-3x+3x\cos(x)+1}{x}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^3}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}\left(\frac{1}{x^3}\right)^{2/3}x^2\log(\right.$$

✓ **Maple** : cpu = 0.196 (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)+
```

$$y(x) = -\cos(x)\,x + x - \frac{1}{3} + \frac{29\,\text{RootOf}\left(-81\left(\int^{\_Z}\frac{1}{841\_a^3 - 27\_a + 27}d\_a\right) + \ln(x) + 3c_1\right)}{9}$$

2.964 ODE No. 964

$$y'(x) = -\frac{}{a^8x^6 - 4a^6x^6 - 3a^6x^4y(x)^2 - 2a^6x^4 + 6a^4x^6 + 9a^4x^4y(x)^2 + 6a^4x^4 + 3a^4x^2y(x)^4 + 4a^4x^2y(x)^2 - 4a^2x}$$

✓ **Mathematica** : cpu = 1.90244 (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*x^4 - 2*
```

$$\text{Solve}\left[\frac{y(x)}{(a-1)(a+1)} - \frac{8\text{RootSum}\left[-\#1^3a^6 + 3\#1^3a^4 - 3\#1^3a^2 + \#1^3 + 3\#1^2a^4y(x)^2 + 2\#1^2a^4 - 6\#1^2a^2y(x\right.}{}\right.$$

✓ **Maple** : cpu = 1.74 (sec), leaf count = 80

```
dsolve(diff(y(x),x) = -8*x*(a-1)*(a+1)/(8+3*a^4*y(x)^4*x^2-3*a^6*y(x)^2*x^4+9*y(x)^2*a^4*x^4
```

$$\frac{y(x)}{(a-1)(a+1)} + \frac{4\left(\sum_{\_R=\text{RootOf}(\_Z^3+2\_Z^2+8)} \frac{\ln\left(-a^2x^2+x^2+y(x)^2-\_R\right)}{3\_R^2+4\_R}\right)}{a^4-2a^2+1} - c_1 = 0$$

2.965 ODE No. 965

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(x^4\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2x}\right)+x^3\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2x}\right)\right.}{}$$

✓ **Mathematica** : cpu = 0.198174 (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)]*Sin[y[x
```

$$\left\{\left\{y(x)\to x\arcsin\left(xe^{\frac{x^3}{3}+\frac{x^2}{2}+c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.273 (sec), leaf count = 25

```
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
```

$$y(x) = \frac{\arccos\left(e^{\frac{2x^3}{3}}e^{x^2}c_1x^2+1\right)x}{2}$$

2.966 ODE No. 966

$$y'(x) = -\frac{}{216x^3 - 216x^2y(x)^4 - 324x^2y(x)^3 - 648x^2y(x)^2 - 648x^2y(x) + 216x^2 - 8y(x)^{12} - 36y(x)^{11} - 126y(x)}$$

✓ **Mathematica** : cpu = 0.486026 (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] - 648*x
```

$$\text{Solve}\left[72\text{RootSum}\left[-216\#1^3 + 216\#1^2y(x)^4 + 324\#1^2y(x)^3 + 648\#1^2y(x)^2 + 648\#1^2y(x) - 216\#1^2 - 72\#1y(\right.\right.$$

✓ **Maple** : cpu = 0.443 (sec), leaf count = 50

```
dsolve(diff(y(x),x) = -1296*y(x)/(216+594*x*y(x)^6-126*y(x)^10-315*y(x)^9-8*y(x)^12-36*y(x)^
```

$$y(x) = e^{\mathrm{RootOf}\left(-\_Z - 6\left(\int^{x - \frac{e^{4\_Z}}{3} - \frac{e^{3\_Z}}{2} - e^{2\_Z} - e^{\_Z}} \frac{1}{\_a^3 + \_a^2 + 1} d\_a\right) + c_1\right)}$$

2.967 ODE No. 967

$$y'(x) = -\frac{x(64x^9 - 288x^8y(x) - 96x^8 + 432x^7y(x)^2 + 288x^7y(x) - 144x^7 - 216x^6y(x)^3 - 216x^6y(x)^2 - 288x^6y(}{}$$

✓ **Mathematica** : cpu = 1.3782 (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^5 - 456*
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3+3\sqrt[3]{29}\#1-29\&,\frac{\log\left(\frac{\frac{3xy(x)}{x^2+1}+\frac{-4x^4+2x^3+5x}{2(x^2+1)^2}}{\sqrt[3]{29}\sqrt[3]{\frac{x^3}{(x^2+1)^3}}}-\#1\right)}{\sqrt[3]{29}-29\#1^2}\&\right]=\frac{29^{2/3}\left(\frac{x^3}{(x^2+1)^3}\right)^{2/3}(x^2+}{18x^2}$$

✓ **Maple** : cpu = 0.086 (sec), leaf count = 91

```
dsolve(diff(y(x),x) = -1/216*x/(x^2+1)^4*(-513-432*x+1008*x^5*y(x)-216*x^6*y(x)^3-288*y(x)*x
```

$$y(x) = \frac{58\,\text{RootOf}\left(-162\left(\int^{-Z}\frac{1}{841\_a^3-27\_a+27}d\_a\right)+\ln\left(x^2+1\right)+6c_1\right)x^2+12x^3-6x^2+58\,\text{RootOf}\left(-162\left(\int\right.\right.}{18x^2+18}$$

2.968 ODE No. 968

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(x^4\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2x}\right) - \frac{1}{2}xy(x)\sin\left(\frac{y(x)}{x}\right) - \frac{1}{2}y(x)\sin\left(\frac{y(x)}{x}\right.}{}$$

✓ **Mathematica** : cpu = 0.266431 (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)]*Sin[y
```

$$\left\{\left\{y(x) \to x \arcsin\left((x+1)e^{\frac{x^2}{2}-x-\frac{3}{2}+c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.328 (sec), leaf count = 29

```
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
```

$$y(x) = \frac{\arccos\left(\left(c_1(1+x)^2 e^{x^2} + e^{2x}\right)e^{-2x}\right)x}{2}$$

2.969 ODE No. 969

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(-\frac{1}{2}xy(x)\sin\left(\frac{y(x)}{x}\right) - \frac{1}{2}y(x)\sin\left(\frac{y(x)}{x}\right) + x\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x}{2x}\right.}{}$$

✓ **Mathematica** : cpu = 0.177204 (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)]*Sin[y[x
```

$$\left\{\left\{y(x)\to x\arcsin\left(\frac{e^{c_1}x}{x+1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.306 (sec), leaf count = 26

```
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
```

$$y(x) = \frac{\arccos\left(\frac{1+(1+c_1)x^2+2x}{(1+x)^2}\right)x}{2}$$

2.970 ODE No. 970

$$y'(x) = -\frac{}{216x^3 - 216x^2y(x)^4 - 324x^2y(x)^3 - 648x^2y(x)^2 - 648x^2y(x) - 8y(x)^{12} - 36y(x)^{11} - 126y(x)^{10} - 315}$$

✓ **Mathematica** : cpu = 0.426343 (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))/(216*x
```

$$\text{Solve}\left[\frac{36\left(2y(x)^4+3y(x)^3+6y(x)^2+6y(x)-6x-3\right)}{\left(y(x)\left(2y(x)^3+3y(x)^2+6y(x)+6\right)-6x\right)^2}+\log(y(x))=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.463 (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)/(594*x*y(x)^6-126
```

$$\frac{-6\sqrt{3\ln(y(x))-108c_1+9}+\left(2y(x)^4+3y(x)^3+6y(x)^2-6x+6y(x)\right)\ln(y(x))-72c_1y(x)^4-108c_1y(x)^3-2}{216c_1-6\ln(y(x))}$$

2.971 ODE No. 971

$$y'(x) = \frac{(xy(x) + 1)^3}{x^5}$$

✓ **Mathematica** : cpu = 0.212859 (sec), leaf count = 157

```
DSolve[Derivative[1][y][x] == (1 + x*y[x])^3/x^5,y[x],x]
```

$$\text{Solve}\left[\frac{\arctan\left(\frac{\frac{2\left(\frac{3}{x^3}+\frac{3y(x)}{x^2}\right)}{3\sqrt[3]{-\frac{1}{x^6}}}-1}{\sqrt{3}}\right)}{\sqrt{3}} + \frac{1}{3}\log\left(\frac{\frac{3}{x^3}+\frac{3y(x)}{x^2}}{3\sqrt[3]{-\frac{1}{x^6}}}+1\right) - \frac{1}{6}\log\left(\frac{\left(\frac{3}{x^3}+\frac{3y(x)}{x^2}\right)^2}{9\left(-\frac{1}{x^6}\right)^{2/3}} - \frac{\frac{3}{x^3}+\frac{3y(x)}{x^2}}{3\sqrt[3]{-\frac{1}{x^6}}}+1\right) = -\left(-\right.\right.$$

✓ **Maple** : cpu = 0.436 (sec), leaf count = 84

```
dsolve(diff(y(x),x) = (x*y(x)+1)^3/x^5,y(x))
```

$$y(x) = \frac{\left(3\tan\left(\text{RootOf}\left(18x^3\left(-\frac{1}{x^6}\right)^{\frac{2}{3}} + 6\sqrt{3}\_Z + \ln\left(\frac{\left(\sqrt{3}+\tan(\_Z)\right)^6}{\left(\tan(\_Z)^2+1\right)^3}\right) - 18c_1\right)\right)x^3\left(-\frac{1}{x^6}\right)^{\frac{1}{3}} + \sqrt{3}\left(x^3\left(-\frac{1}{x^6}\right)^{\frac{1}{3}}\right.\right.}{6x}$$

2.972 ODE No. 972

$$y'(x) = \frac{x(-2x^4 + 2x^2 y(x) - x^2 + 1)}{y(x) - x^2}$$

✓ **Mathematica** : cpu = 0.0277348 (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 = 0.228 (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))
```

$$y(x) = x^2 + \frac{\mathrm{LambertW}\left(-2\,\mathrm{e}^{x^4}\mathrm{e}^{-2x^2}c_1\mathrm{e}^{-1}\right)}{2} + \frac{1}{2}$$

2.973 ODE No. 973

$$y'(x) = e^{-2bx} y(x) \left(e^{bx} y(x) + e^{2bx} + y(x)^2\right)$$

✓ **Mathematica** : cpu = 0.989851 (sec), leaf count = 1225

```
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]
```

$$\text{Solve}\left[\frac{-2\sqrt{3}\sqrt[3]{7-9b}\left(\sqrt[3]{7-9b}+\sqrt[3]{9b-7}\right)\arctan\left(\frac{\frac{2\sqrt[3]{7-9b}\left(3e^{-2bx}y(x)+e^{-bx}\right)}{\sqrt[3]{(9b-7)e^{-3bx}}}-1}{\sqrt{3}}\right)-2\sqrt[3]{7-9b}\left(\sqrt[3]{7-9b}-\sqrt[3]{9b-7}\right)}{}\right.$$

✓ **Maple** : cpu = 0.573 (sec), leaf count = 132

```
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))
```

$$y(x) = -\frac{\tan\left(\text{RootOf}\left(-2\_Z\mathrm{e}^{bx}+\ln\left(\frac{4\tan(\_Z)^2b-3\tan(\_Z)^2+4b-3}{\left(\tan(\_Z)\sqrt{-\mathrm{e}^{2bx}(-3+4b)}+\mathrm{e}^{bx}\right)^2}\right)\sqrt{-\mathrm{e}^{2bx}(-3+4b)}+\sqrt{-\mathrm{e}^{2bx}(-3+4b)}\,c_1\right.\right.}{2}$$

2.974 ODE No. 974

$$y'(x) = -x^6 + 3x^4y(x) - 3x^2y(x)^2 + y(x)^3 + 2x$$

✓ **Mathematica** : cpu = 0.0673781 (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 = 0.033 (sec), leaf count = 57

```
dsolve(diff(y(x),x) = y(x)^3-3*y(x)^2*x^2+3*y(x)*x^4-x^6+2*x,y(x))
```

$$y(x) = \frac{x^2\sqrt{-2x + 2c_1} - 1}{\sqrt{-2x + 2c_1}}$$

2.975 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 = 0.0616924 (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 = 0.033 (sec), leaf count = 59

```
dsolve(diff(y(x),x) = y(x)^3+y(x)^2*x^2+1/3*y(x)*x^4+1/27*x^6-2/3*x,y(x))
```

$$y(x) = -\frac{x^2\sqrt{-54c_1-2x}-3}{3\sqrt{-54c_1-2x}}$$

2.976 ODE No. 976

$$y'(x) = \frac{y(x)\left(x^7y(x)^2 + x^4y(x) + x - 3\right)}{x}$$

✓ **Mathematica** : cpu = 1.12526 (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]
```

$$\text{Solve}\left[-\frac{7}{3}\text{RootSum}\left[-7\#1^3 + 6\sqrt[3]{-7}\#1 - 7\&, \frac{\log\left(\frac{3x^6y(x)+x^3}{\sqrt[3]{7}\sqrt[3]{-x^9}} - \#1\right)}{2\sqrt[3]{-7} - 7\#1^2}\&\right] = \frac{7^{2/3}\left(-x^9\right)^{2/3}}{9x^5} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.392 (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))
```

$$y(x) = \frac{\sqrt{3}\tan\left(\text{RootOf}\left(-\sqrt{3}\ln\left(\frac{\frac{9\tan(\_Z)^2}{7} + \frac{9}{7}}{\left(\sqrt{3} - 3\tan(\_Z)\right)^2}\right) + 3\sqrt{3}\,c_1 - 2\sqrt{3}\,x - 2\_Z\right)\right) - 1}{2x^3}$$

2.977 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 = 0.269861 (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]
```

$$\text{Solve}\left[-\frac{25}{3}\text{RootSum}\left[-25\#1^3 + 24\sqrt[3]{-1}5^{2/3}\#1 - 25\&, \frac{\log\left(\frac{3e^{2x^2}xy(x)+e^{x^2}x}{5^{2/3}\sqrt[3]{-e^{3x^2}x^3}} - \#1\right)}{8\sqrt[3]{-1}5^{2/3} - 25\#1^2}\&\right] = -\frac{5\sqrt[3]{5}e^{x^2}x^3}{18\sqrt[3]{-e^{3x^2}x^3}} + c_1, y$$

✓ **Maple** : cpu = 0.333 (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))
```

$$y(x) = \frac{\left(\sqrt{11}\,\tan\left(\text{RootOf}\left(-4\sqrt{11}\,x^2 + 8\ln\left(-\frac{36\sqrt{11}}{11} + 36\tan\left(\_Z\right)\right)\sqrt{11} - 4\ln\left(\frac{14256\,e^{2x^2}\tan(\_Z)^2}{25} + \frac{14256\,e^{2x^2}}{25}\right.\right.\right.\right.}{2}$$

2.978 ODE No. 978

$$y'(x) = \frac{y(x)\left(x^2 + xy(x) + y(x)^2 + x\right)}{x^2}$$

✓ **Mathematica** : cpu = 0.128953 (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]
```

$$\text{Solve}\left[-\frac{\arctan\left(\frac{\frac{2y(x)}{x}+1}{\sqrt{3}}\right)}{\sqrt{3}} - \frac{1}{2}\log\left(\frac{y(x)^2}{x^2} + \frac{y(x)}{x} + 1\right) + \log\left(\frac{y(x)}{x}\right) = x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.318 (sec), leaf count = 71

```
dsolve(diff(y(x),x) = y(x)/x^2*(y(x)^2+x*y(x)+x^2+x),y(x))
```

$$y(x) = -\frac{x}{2} + \frac{\sqrt{3}\,x \tan\left(\text{RootOf}\left(-\sqrt{3}\,\ln\left(\frac{4}{3\left(\tan(\_Z)^2+1\right)}\right) - 2\sqrt{3}\,\ln\left(-\frac{\sqrt{3}}{6} + \frac{\tan(\_Z)}{2}\right) - \sqrt{3}\,\ln(3) + 2\sqrt{3}\,c_1 + 2\right.\right.}{2}$$

2.979 ODE No. 979

$$y'(x) = \frac{-x^3 + 3x^2y(x) - 3xy(x)^2 + y(x)^3 + x}{x}$$

✓ **Mathematica** : cpu = 0.0722032 (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 = 0.046 (sec), leaf count = 49

```
dsolve(diff(y(x),x) = (y(x)^3-3*x*y(x)^2+3*x^2*y(x)-x^3+x)/x,y(x))
```

$$y(x) = \frac{x\sqrt{c_1 - 2\ln(x)} - 1}{\sqrt{c_1 - 2\ln(x)}}$$

2.980 ODE No. 980

$$y'(x) = \frac{x^3y(x)^3 + 6x^2y(x)^2 + 12xy(x) + 2x + 8}{x^3}$$

✓ **Mathematica** : cpu = 0.0816522 (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 = 0.013 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = (x^3*y(x)^3+6*y(x)^2*x^2+12*x*y(x)+8+2*x)/x^3,y(x))
```

$$y(x) = -\frac{1}{\sqrt{-2x+c_1}} - \frac{2}{x}$$

2.981 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 = 0.105519 (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^3*x^3),
```

$$\left\{\left\{y(x) \to -\frac{1}{ax} - \frac{1}{\sqrt{-2x + c_1}}\right\}, \left\{y(x) \to -\frac{1}{ax} + \frac{1}{\sqrt{-2x + c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.017 (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))
```

$$y(x) = -\frac{1}{\sqrt{-2x + c_1}} - \frac{1}{xa}$$

2.982 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 = 0.292265 (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))/(2*E^(
```

$$\text{Solve}\left[-\frac{7}{3}\text{RootSum}\left[-7\#1^3 + 6\sqrt[3]{-7}\#1 - 7\&, \frac{\log\left(\frac{3e^{-\frac{x^2}{2}}y(x)+e^{-\frac{x^2}{4}}}{\sqrt[3]{7}\sqrt[3]{-e^{-\frac{3x^2}{4}}}} - \#1\right)}{2\sqrt[3]{-7} - 7\#1^2}\&\right] = \frac{1}{9}7^{2/3}e^{\frac{x^2}{2}}\left(-e^{-\frac{3x^2}{4}}\right)^{2/3}x + c_1$$

✓ **Maple** : cpu = 0.569 (sec), leaf count = 142

```
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
```

$$\frac{\ln\left(36 + \frac{324\left(y(x)e^{-\frac{x^2}{2}} + \frac{e^{-\frac{x^2}{4}}}{3}\right)^2 e^{\frac{x^2}{2}}}{7} + \frac{36\left(3y(x)e^{-\frac{x^2}{2}} + e^{-\frac{x^2}{4}}\right)e^{\frac{x^2}{4}}}{7}\right)}{3} + \frac{2\sqrt{3}\,\arctan\left(\frac{\left(6y(x)e^{-\frac{x^2}{2}} + 2\,e^{-\frac{x^2}{4}}\right)\sqrt{3}\,e^{\frac{x^2}{4}}}{9} + \frac{\sqrt{3}}{9}\right)}{9} -$$

2.983 ODE No. 983

$$y'(x) = \frac{-x^3 + 3x^2y(x) + x^2 - 3xy(x)^2 + y(x)^3}{(x-1)(x+1)}$$

✓ **Mathematica** : cpu = 1.5195 (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)),y[x],
```

$$\text{Solve}\left[\frac{\arctan\left(\frac{\frac{2\left(\frac{3y(x)}{x^2-1}-\frac{3x}{x^2-1}\right)}{3\sqrt[3]{\frac{1}{(x-1)^3(x+1)^3}}}-1}{\sqrt{3}}\right)}{\sqrt{3}} + \frac{1}{3}\log\left(\frac{\frac{3y(x)}{x^2-1}-\frac{3x}{x^2-1}}{3\sqrt[3]{\frac{1}{(x-1)^3(x+1)^3}}}+1\right) - \frac{1}{6}\log\left(\frac{\left(\frac{3y(x)}{x^2-1}-\frac{3x}{x^2-1}\right)^2}{9\left(\frac{1}{(x-1)^3(x+1)^3}\right)^{2/3}} - \frac{\frac{3y(x)}{x^2-1}-\frac{3x}{x^2-}}{3\sqrt[3]{\frac{1}{(x-1)^3(x+}}}\right.\right.$$

✓ **Maple** : cpu = 0.727 (sec), leaf count = 187

```
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))
```

$$y(x) = \frac{\left(\left(x^2-1\right)\left(3\tan\left(\text{RootOf}\left(9\ln\left(\frac{1+x}{x-1}\right)\left(\frac{1}{(1+x)^3(x-1)^3}\right)^{\frac{2}{3}}x^4 - 18\ln\left(\frac{1+x}{x-1}\right)\left(\frac{1}{(1+x)^3(x-1)^3}\right)^{\frac{2}{3}}x^2 + 9\ln\left(\frac{1+x}{x-1}\right.\right.\right.\right.\right.\right.}{}$$

2.984 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 = 7.63093 (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),y[x],x]
```

$$\text{Solve}\left[\frac{\sqrt[3]{2}\left(\frac{3e^{-2x}x(x-1)y(x)+e^{-x}(x-1)}{\sqrt[3]{2}\sqrt[3]{e^{-3x}(x-1)^3}}+2^{2/3}\right)\left(2^{2/3}-\frac{2^{2/3}\left(3e^{-2x}x(x-1)y(x)+e^{-x}(x-1)\right)}{\sqrt[3]{e^{-3x}(x-1)^3}}\right)\left(\left(1-\frac{3e^{-2x}x(x-1)y(x)+e^{-x}(x-1}{\sqrt[3]{e^{-3x}(x-1)^3}}\right.\right.}{9\left(-\frac{e^{3x}(3e^{-2x}x(x-1)y(x)+e}{(x-1)^3}\right.}\right.$$

✓ **Maple** : cpu = 0.442 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = y(x)/x*(y(x)^2*x^2+y(x)*x*exp(x)+exp(x)^2)/exp(x)^2*(x-1),y(x))
```

$$y(x) = \frac{e^{\mathrm{RootOf}\left(-e^{\_Z}\ln\left(\frac{(e^{\_Z}+9)x}{2}\right)+3e^{\_Z}c_1+\_Ze^{\_Z}+xe^{\_Z}+9\right)+x}}{9x}$$

2.985 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 = 0.242042 (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))/x^5,y[x
```

$$\text{Solve}\left[-\frac{17}{3}\text{RootSum}\left[-17\#1^3 + 3\sqrt[3]{-34}\#1 - 17\&, \frac{\log\left(\frac{\frac{x+3}{x^3}+\frac{3y(x)}{x^2}}{\sqrt[3]{34}\sqrt[3]{-\frac{1}{x^6}}} - \#1\right)}{\sqrt[3]{-34} - 17\#1^2}\&\right] = -\frac{1}{9}34^{2/3}\left(-\frac{1}{x^6}\right)^{2/3}x^3 + c_1, y(x\right.$$

✓ **Maple** : cpu = 0.047 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = (x*y(x)+1)*(y(x)^2*x^2+x^2*y(x)+2*x*y(x)+1+x+x^2)/x^5,y(x))
```

$$y(x) = \frac{17\,\text{RootOf}\left(162\left(\int^{\_Z}\frac{1}{289\_a^3+54\_a-54}d\_a\right)x + 3xc_1 + 2\right)x - 3x - 9}{9x}$$

2.986 ODE No. 986

$$y'(x) = \frac{-x^3\log^3(x) + 3x^2y(x)\log^2(x) + x^2 + y(x)^3 + xy(x) - 3xy(x)^2\log(x)}{x^2}$$

✓ **Mathematica** : cpu = 0.0841656 (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]*y[x]^2
```

$$\left\{\left\{y(x)\to x\log(x) - \frac{x}{\sqrt{-2x+c_1}}\right\},\left\{y(x)\to x\log(x) + \frac{x}{\sqrt{-2x+c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.031 (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^
```

$$y(x) = -\frac{x}{\sqrt{-2x+c_1}} + x\ln(x)$$

2.987 ODE No. 987

$$y'(x) = \frac{y(x)}{x} - F(x)\left(y(x)^2 - ax^2\right)$$

✓ **Mathematica** : cpu = 0.107244 (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 = 0.045 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = -F(x)*(-a*x^2+y(x)^2)+y(x)/x,y(x))
```

$$y(x) = \tanh\left(\sqrt{a}\left(c_1 + \int F(x)\,xdx\right)\right)x\sqrt{a}$$

2.988 ODE No. 988

$$y'(x) = \frac{y(x)}{x} - F(x)\left(-x^2 - 2xy(x) + y(x)^2\right)$$

✓ **Mathematica** : cpu = 0.143187 (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]
```

$$\left\{\left\{y(x) \to -\frac{x\left(-\exp\left(2\sqrt{2}\left(\int_1^x -F(K[1])K[1]dK[1] + c_1\right)\right) + \sqrt{2}\exp\left(2\sqrt{2}\left(\int_1^x -F(K[1])K[1]dK[1] + c_1\right)\right) - 1 -\right.}{1 + \exp\left(2\sqrt{2}\left(\int_1^x -F(K[1])K[1]dK[1] + c_1\right)\right)}\right.\right.$$

✓ **Maple** : cpu = 0.036 (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))
```

$$y(x) = \frac{x\left(\sqrt{2} + 2\tanh\left(\left(c_1 + \int F(x)\,x dx\right)\sqrt{2}\right)\right)\sqrt{2}}{2}$$

2.989 ODE No. 989

$$y'(x) = \frac{y(x)}{x} - F(x)\left(-ay(x)^2 - bx^2\right)$$

✓ **Mathematica** : cpu = 0.111139 (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 = 0.05 (sec), leaf count = 29

```
dsolve(diff(y(x),x) = -F(x)*(-a*y(x)^2-b*x^2)+y(x)/x,y(x))
```

$$y(x) = \frac{\tan\left(\sqrt{ab}\left(c_1 + \int F(x)\,x dx\right)\right) x\sqrt{ab}}{a}$$

2.990 ODE No. 990

$$y'(x) = 2x - F(x)\left(-x^4 + 2x^2y(x) - y(x)^2 + 1\right)$$

✓ **Mathematica** : cpu = 0.125011 (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 = 0.671 (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))
```

$$y(x) = \frac{-x^2 e^{\int 2F(x)dx} + x^2c_1 + e^{\int 2F(x)dx} + c_1}{-e^{\int 2F(x)dx} + c_1}$$

2.991 ODE No. 991

$$y'(x) = \frac{y(x)}{x} - F(x)\left(x^2 + 2xy(x) - y(x)^2\right)$$

✓ **Mathematica** : cpu = 0.117709 (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]
```

$$\left\{\left\{y(x) \to -\frac{x\left(-\exp\left(2\sqrt{2}\left(\int_1^x F(K[1])K[1]dK[1] + c_1\right)\right) + \sqrt{2}\exp\left(2\sqrt{2}\left(\int_1^x F(K[1])K[1]dK[1] + c_1\right)\right) - 1 - \sqrt{2}\right.}{1 + \exp\left(2\sqrt{2}\left(\int_1^x F(K[1])K[1]dK[1] + c_1\right)\right)}\right.\right.$$

✓ **Maple** : cpu = 0.036 (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))
```

$$y(x) = \frac{x\left(\sqrt{2} - 2\tanh\left(\left(c_1 + \int F(x)\, x dx\right)\sqrt{2}\right)\right)\sqrt{2}}{2}$$

2.992 ODE No. 992

$$y'(x) = \frac{y(x)}{x} - F(x)\left(-x^3 - 7xy(x)^2\right)$$

✓ **Mathematica** : cpu = 0.0840813 (sec), leaf count = 43

```
DSolve[Derivative[1][y][x] == y[x]/x - F[x]*(-x^3 - 7*x*y[x]^2),y[x],x]
```

$$\left\{\left\{y(x)\to \frac{x\tan\left(\sqrt{7}\int_1^x F(K[1])K[1]^2dK[1]+\sqrt{7}c_1\right)}{\sqrt{7}}\right\}\right\}$$

✓ **Maple** : cpu = 0.045 (sec), leaf count = 25

```
dsolve(diff(y(x),x) = -F(x)*(-7*x*y(x)^2-x^3)+y(x)/x,y(x))
```

$$y(x) = \frac{\tan\left(\left(\int F(x)\,x^2dx + c_1\right)\sqrt{7}\right)x\sqrt{7}}{7}$$

2.993 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 = 1.05936 (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],x]
```

$$\left\{\left\{y(x) \to \frac{\int_1^x \frac{F(K[1])}{\sqrt{\frac{1}{\log^2(K[1])}}}dK[1] - 1 + c_1}{\sqrt{\frac{1}{\log^2(x)}}\int_1^x \frac{F(K[1])}{\sqrt{\frac{1}{\log^2(K[1])}}}dK[1] + c_1\sqrt{\frac{1}{\log^2(x)}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (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))
```

$$y(x) = -\frac{\ln(x)\left(\int -2F(x)\ln(x)\,dx - c_1 - 2\right)}{\int -2F(x)\ln(x)\,dx - c_1}$$

2.994 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 = 0.143063 (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],x]
```

$$\left\{\left\{y(x)\to -\frac{\frac{1}{16}x^4e^{\frac{1}{16}x^4(4\log(x)-1)}(4\log(x)-1)\left(\frac{x^3}{4}+\frac{1}{4}x^3(4\log(x)-1)\right)+\frac{1}{4}x^3e^{\frac{1}{16}x^4(4\log(x)-1)}+\frac{1}{4}x^3e^{\frac{1}{16}x^4(4\log(x)}}{x^3\left(\frac{1}{16}x^4e^{\frac{1}{16}x^4(4\log(x)-1)}(4\log(x)-1)+c_1e^{\frac{1}{16}x^4}}\right.\right.$$

✓ **Maple** : cpu = 0.033 (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))
```

$$y(x) = -\frac{\ln(x)\left(4x^4\ln(x) - x^4 + 8c_1 + 16\right)}{4x^4\ln(x) - x^4 + 8c_1}$$

2.995 ODE No. 995

$$y'(x) = (y(x) - e^x)^2 + e^x$$

✓ **Mathematica** : cpu = 0.126919 (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 = 0.079 (sec), leaf count = 14

```
dsolve(diff(y(x),x) = (y(x)-exp(x))^2+exp(x),y(x))
```

$$y(x) = e^x + \frac{1}{-x + c_1}$$

2.996 ODE No. 996

$$y'(x) = \frac{(y(x) - \text{Si}(x))^2 + \sin(x)}{x}$$

✓ **Mathematica** : cpu = 0.0807745 (sec), leaf count = 17

```
DSolve[Derivative[1][y][x] == (Sin[x] + (-SinIntegral[x] + y[x])^2)/x,y[x],x]
```

$$\left\{\left\{y(x) \to \text{Si}(x) + \frac{1}{-\log(x) + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.069 (sec), leaf count = 15

```
dsolve(diff(y(x),x) = ((y(x)-Si(x))^2+sin(x))/x,y(x))
```

$$y(x) = \text{Si}\,(x) + \frac{1}{-\ln{(x)} + c_1}$$

2.997 ODE No. 997

$$y'(x) = (y(x) + \cos(x))^2 + \sin(x)$$

✓ **Mathematica** : cpu = 0.0832713 (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 = 0.061 (sec), leaf count = 16

```
dsolve(diff(y(x),x) = (y(x)+cos(x))^2+sin(x),y(x))
```

$$y(x) = -\cos(x) + \frac{1}{-x+c_1}$$

2.998 ODE No. 998

$$y'(x) = \frac{(-\operatorname{CosIntegral}(x) + y(x) - \log(x))^2 + \cos(x)}{x}$$

✓ **Mathematica** : cpu = 0.337364 (sec), leaf count = 27

```
DSolve[Derivative[1][y][x] == (Cos[x] + (-CosIntegral[x] - Log[x] + y[x])^2)/x,y[x],x]
```

$$\left\{\left\{y(x) \to \operatorname{CosIntegral}(x) + \frac{x^2}{-\frac{x^2}{2} + c_1} + \log(x) + 1\right\}\right\}$$

✓ **Maple** : cpu = 0.377 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = ((y(x)-ln(x)-Ci(x))^2+cos(x))/x,y(x))
```

$$y(x) = \ln(x) + \operatorname{Ci}(x) + \frac{-x^2 c_1 + 1}{x^2 c_1 + 1}$$

2.999 ODE No. 999

$$y'(x) = \frac{(y(x) - x + \log(x+1))^2 + x}{x+1}$$

✓ **Mathematica** : cpu = 0.134882 (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 = 0.052 (sec), leaf count = 36

```
dsolve(diff(y(x),x) = ((y(x)-x+ln(1+x))^2+x)/(1+x),y(x))
```

$$y(x) = \frac{-\ln(1+x)^2 + (x - c_1)\ln(1+x) + xc_1 - 1}{\ln(1+x) + c_1}$$

2.1000 ODE No. 1000

$$y'(x) = \frac{x^3 + 2x^2y(x) - xy(x) - y(x)^2 + xy(x)\log(x)}{x^2(x + \log(x))}$$

✓ **Mathematica** : cpu = 0.656237 (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 + Log[x]))
```

$$\left\{\left\{y(x) \to \frac{x^2(x+\log(x))\left(-\frac{\sqrt{x}(x+\log(x)+2)\log(x)\exp\left(-\frac{1}{2}\int_1^x \frac{K[1]+\log(K[1])+2}{K[1]^2+\log(K[1])K[1]}dK[1]\right)}{2(x^2+x\log(x))} + c_1\left(\frac{\exp\left(-\frac{1}{2}\int_1^x \frac{K[1]+\log(K[1])+2}{K[1]^2+\log(K[1])K[1]}d\right.}{2\sqrt{x}}\right.\right.}{\sqrt{x}\log(x)\exp\left(-\frac{1}{2}\int_1^x \frac{K[1]+\log(}{K[1]^2+\log(}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.22 (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))
```

$$y(x) = \frac{x(xc_1 - 1)}{c_1 \ln(x) + 1}$$

2.1001 ODE No. 1001

$$y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0029369 (sec), leaf count = 12

```
DSolve[Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_2 x + c_1\}\}$$

✓ **Maple** : cpu = 0.001 (sec), leaf count = 9

```
dsolve(diff(diff(y(x),x),x)=0,y(x))
```

$$y(x) = x c_1 + c_2$$

Hand solution

$$y'' = 0$$

Integration twice gives

$$y(x) = c_1 x + c_2$$

2.1002 ODE No. 1002

$$y''(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0034712 (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 = 0.003 (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

$$y = c_1 \cos x + c_2 \sin x$$

2.1003 ODE No. 1003

$$-\sin(nx) + y''(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0838895 (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 = 0.191 (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

$$
\begin{aligned}
y_p'' + y_p &= \sin nx\\
u_2'\cos x - u_2\sin x - u_1'\sin x - u_1\cos x + u_1\cos x + u_2\sin x &= \sin nx\\
u_2'\cos x - u_1'\sin x &= \sin nx \qquad (3)
\end{aligned}
$$

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
```

2.1004 ODE No. 1004

$$-a\cos(bx) + y''(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0093554 (sec), leaf count = 30

```
DSolve[-(a*Cos[b*x]) + y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{a\cos(bx)}{b^2-1}+c_1\cos(x)+c_2\sin(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.189 (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

$$\begin{aligned}
y_p'' + y_p &= a\cos bx\\
u_2'\cos x - u_2\sin x - u_1'\sin x - u_1\cos x + u_1\cos x + u_2\sin x &= a\cos bx\\
u_2'\cos x - u_1'\sin x &= a\cos bx \qquad (3)
\end{aligned}$$

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
```

2.1005 ODE No. 1005

$$-\sin(ax)\sin(bx) + y''(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.297546 (sec), leaf count = 1163

```
DSolve[-(Sin[a*x]*Sin[b*x]) + y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1\cos(x) + c_2\sin(x) + \frac{-\cos(x)\cos((a-b-1)x)a^3 + \cos(x)\cos((a-b+1)x)a^3 + \cos(x)\cos((a+b}{}\right.\right.$$

✓ **Maple** : cpu = 0.385 (sec), leaf count = 82

```
dsolve(diff(diff(y(x),x),x)+y(x)-sin(a*x)*sin(b*x)=0,y(x))
```

$$y(x) = \sin(x)\,c_2 + \cos(x)\,c_1 + \frac{-(a+b+1)(a+b-1)\cos(x(a-b)) + \cos((a+b)x)(-b+a+1)(-b+a-1)}{2a^4 + (-4b^2-4)a^2 + 2b^4 - 4b^2 + 2}$$

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

$$\begin{aligned} y_h &= c_1\cos x + c_2\sin x \\ &= y_h = c_1 y_1 + c_2 y_2 \end{aligned}$$

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

$$\begin{aligned} y_p &= -\frac{1}{4}\left(\frac{\cos ((a-b-1)\, x)}{a-b-1} - \frac{\cos ((a-b+1)\, x)}{a-b+1} - \frac{\cos ((a+b-1)\, x)}{a+b-1} + \frac{\cos ((a+b+1)\, x)}{a+b+1}\right) \cos x \\ &+ \frac{1}{4}\left(\frac{\sin ((a-b-1)\, x)}{a-b-1} + \frac{\sin ((a-b+1)\, x)}{a-b+1} - \frac{\sin ((a+b-1)\, x)}{a+b-1} - \frac{\sin ((a+b+1)\, x)}{a+b+1}\right) \sin x \end{aligned}$$

$$\begin{aligned} &= \frac{1}{4}\left(-\frac{\cos^2 ((a-b-1)\, x)}{a-b-1} + \frac{\sin^2 ((a-b-1)\, x)}{a-b-1}\right) + \frac{1}{4}\left(\frac{\cos^2 ((a-b+1)\, x)}{a-b+1} + \frac{\sin^2 ((a-b+1)\, x)}{a-b+1}\right) \\ &+ \frac{1}{4}\left(\frac{\cos^2 ((a+b-1)\, x)}{a+b-1} - \frac{\sin^2 ((a+b-1)\, x)}{a+b-1}\right) + \frac{1}{4}\left(-\frac{\cos^2 ((a+b+1)\, x)}{a+b+1} - \frac{\sin^2 ((a+b+1)\, x)}{a+b+1}\right) \end{aligned}$$

$$\begin{aligned} &= \frac{1}{4}\left(-\frac{\cos^2 ((a-b-1)\, x)}{a-b-1} + \frac{\sin^2 ((a-b-1)\, x)}{a-b-1}\right) + \frac{1}{4}\left(\frac{1}{a-b+1}\right) \\ &+ \frac{1}{4}\left(\frac{\cos^2 ((a+b-1)\, x)}{a+b-1} - \frac{\sin^2 ((a+b-1)\, x)}{a+b-1}\right) - \frac{1}{4}\left(\frac{1}{a+b+1}\right) \end{aligned}$$

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)*(1/(al
y0:=yp+_C1*sin(x)+_C2*cos(x);
not zero
```

2.1006 ODE No. 1006

$$y''(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.00349 (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 = 0.004 (sec), leaf count = 15

```
dsolve(diff(diff(y(x),x),x)-y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{-x} c_1 + c_2 \mathrm{e}^x$$

Hand solution

$$y'' - y = 0 \tag{1}$$

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 $\lambda = \pm 1$, therefore the solution is

$$y_h = Ae^x + Be^{-x}$$

2.1007 ODE No. 1007

$$-4e^{x^2}x^2 + y''(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0941875 (sec), leaf count = 135

```
DSolve[-4*E^x^2*x^2 - 2*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{e^{-\sqrt{2}x}\left(-2e^{x\left(x+\sqrt{2}\right)}x + 2e^{\left(x-\sqrt{2}\right)x+2\sqrt{2}x}x + \sqrt{2}e^{x\left(x+\sqrt{2}\right)} + \sqrt{2}e^{\left(x-\sqrt{2}\right)x+2\sqrt{2}x}\right)}{2\sqrt{2}} + c_1e^{\sqrt{2}x} + c_2e^{-\sqrt{2}x}\right.\right.$$

✓ **Maple** : cpu = 0.01 (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

$$\begin{aligned} \lambda^2e^{\lambda x} - 2e^{\lambda x} &= 0 \\ \lambda^2 - 2 &= 0 \end{aligned}$$

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 $f = 4x^2 e^{x^2}$, which is the RHS of the ODE, and noting that a_0 is the coefficient of y'' which is one here, then

$$
\begin{aligned}
u_1 &= \int \frac{-y_2}{W}\frac{f}{a_0}dx = -\int \frac{e^{-\sqrt{2}x}}{-2\sqrt{2}} 4x^2 e^{x^2}\,dx \\
&= \frac{2}{\sqrt{2}} \int x^2 e^{x^2-\sqrt{2}x}\,dx \\
&= \frac{2}{\sqrt{2}} \left(\frac{1}{4} e^{x\left(x-\sqrt{2}\right)} \left(\sqrt{2}+2x\right) \right)
\end{aligned}
$$

And

$$
\begin{aligned}
u_2 &= \int \frac{y_1}{W}\frac{f}{a_0}dx = \int \frac{e^{\sqrt{2}x}}{-2\sqrt{2}} 4x^2 e^{x^2}\,dx \\
&= \frac{-2}{\sqrt{2}} \int x^2 e^{x^2+\sqrt{2}x}\,dx \\
&= \frac{-2}{\sqrt{2}} \left(-\frac{1}{4} e^{x\left(x+\sqrt{2}\right)} \left(\sqrt{2}-2x\right) \right)
\end{aligned}
$$

Since $y_p = u_1 e^{\sqrt{2}x} + u_2 e^{-\sqrt{2}x}$ 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
```

2.1008 ODE No. 1008

$$a^2y(x) - \cot(ax) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.046072 (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 = 0.138 (sec), leaf count = 37

```
dsolve(diff(diff(y(x),x),x)+a^2*y(x)-cot(a*x)=0,y(x))
```

$$y(x) = \sin(ax)\,c_2 + \cos(ax)\,c_1 + \frac{\sin(ax)\ln(\csc(ax) - \cot(ax))}{a^2}$$

2.1009 ODE No. 1009

$$ly(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0035488 (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 = 0.014 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x)+l*y(x)=0,y(x))
```

$$y(x) = c_1 \sin\left(\sqrt{l}\, x\right) + c_2 \cos\left(\sqrt{l}\, x\right)$$

2.1010 ODE No. 1010

$$y(x)(ax+b)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0046156 (sec), leaf count = 46

```
DSolve[(b + a*x)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{AiryAi}\left(\frac{-b-ax}{(-a)^{2/3}}\right)+c_2\,\text{AiryBi}\left(\frac{-b-ax}{(-a)^{2/3}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.029 (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

$$
\begin{aligned}
a^2\frac{d^2\eta}{d\xi^2}+\xi\eta(\xi)&=0\\
a^2\eta''+\xi\eta&=0 \qquad (2)
\end{aligned}
$$

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

$$
\begin{aligned}
2a^2c_2&=0 \qquad (3)\\
a^2(n+1)\,(n+2)\,c_{n+2}+c_{n-1}&=0 \qquad n\geq 1 \qquad (4)
\end{aligned}
$$

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

$$\eta = c_0 \left(\sum_{n=0}^{\infty} 3^n \left(\frac{1}{3}\right)_n \frac{1}{(3n)!} \left(\frac{-\xi}{a^{\frac{2}{3}}}\right)^{3n} \right) + a c_1 \left(\sum_{n=0}^{\infty} 3^n \left(\frac{2}{3}\right)_n \frac{1}{(3n+1)!} \left(\frac{-\xi}{a^{\frac{2}{3}}}\right)^{3n+1} \right)$$

Let $\left(\frac{-\xi}{a^{\frac{2}{3}}}\right) = z$ then the above is

$$\eta = c_0 \left(\sum_{n=0}^{\infty} 3^n \left(\frac{1}{3}\right)_n \frac{z^{3n}}{(3n)!} \right) + a c_1 \left(\sum_{n=0}^{\infty} 3^n \left(\frac{2}{3}\right)_n \frac{z^{3n+1}}{(3n+1)!} \right)$$

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 $\mathrm{AiryAI}(z)$ we see

$$\mathrm{AiryAI}(z) = r_1 f(z) - r_2 g(z)$$
$$\mathrm{AiryBI}(z) = \sqrt{3}(r_1 f(z) + r_2 g(z))$$

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.

2.1011 ODE No. 1011

$$(-x^2-1)\,y(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0045996 (sec), leaf count = 33

```
DSolve[(-1 - x^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{ParabolicCylinderD}\left(-1,\sqrt{2}x\right)+c_2\,\text{ParabolicCylinderD}\left(0,i\sqrt{2}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (sec), leaf count = 17

```
dsolve(diff(diff(y(x),x),x)-(x^2+1)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{\frac{x^2}{2}}\left(\operatorname{erf}(x)\,c_2+c_1\right)$$

Hand solution

$$y''-\left(x^2+1\right)y=0 \tag{1}$$

Second order with varying coefficient. Using power series, let $y=\sum_{n=0}^{\infty}c_nx^n$, 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

$$\sum_{n=0}^{\infty}(n+1)\,(n+2)\,c_{n+2}x^n-\left(x^2+1\right)\sum_{n=0}^{\infty}c_nx^n=0$$

$$\sum_{n=0}^{\infty}(n+1)\,(n+2)\,c_{n+2}x^n-x^2\sum_{n=0}^{\infty}c_nx^n-\sum_{n=0}^{\infty}c_nx^n=0$$

$$\sum_{n=0}^{\infty}(n+1)\,(n+2)\,c_{n+2}x^n-\sum_{n=0}^{\infty}c_nx^{n+2}-\sum_{n=0}^{\infty}c_nx^n=0$$

$$\sum_{n=0}^{\infty}(n+1)\,(n+2)\,c_{n+2}x^n-\sum_{n=2}^{\infty}c_{n-2}x^n-\sum_{n=0}^{\infty}c_nx^n=0$$

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
```

2.1012 ODE No. 1012

$$(-a-x^2)\,y(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.005248 (sec), leaf count = 47

```
DSolve[(-a - x^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{ParabolicCylinderD}\left(\frac{1}{2}(-a-1),\sqrt{2}x\right)+c_2\,\text{ParabolicCylinderD}\left(\frac{a-1}{2},i\sqrt{2}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.112 (sec), leaf count = 29

```
dsolve(diff(diff(y(x),x),x)-(x^2+a)*y(x)=0,y(x))
```

$$y(x)=\frac{c_1\,\text{WhittakerM}\left(-\frac{a}{4},\frac{1}{4},x^2\right)+c_2\,\text{WhittakerW}\left(-\frac{a}{4},\frac{1}{4},x^2\right)}{\sqrt{x}}$$

2.1013 ODE No. 1013

$$\left(-a^2x^2-a\right)y(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0090826 (sec), leaf count = 43

```
DSolve[(-a - a^2*x^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{ParabolicCylinderD}\left(-1,\sqrt{2}\sqrt{a}x\right)+c_2\,\text{ParabolicCylinderD}\left(0,i\sqrt{2}\sqrt{a}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 22

```
dsolve(diff(diff(y(x),x),x)-(a^2*x^2+a)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{\frac{a\,x^2}{2}}\left(\operatorname{erf}\left(\sqrt{a}\,x\right)c_2+c_1\right)$$

2.1014 ODE No. 1014

$$y''(x) - cx^a y(x) = 0$$

✓ **Mathematica** : cpu = 0.0152268 (sec), leaf count = 170

```
DSolve[-(c*x^a*y[x]) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to (a+2)^{-\frac{1}{a+2}} c_1 c^{\frac{1}{2(a+2)}} x^{\frac{\frac{a}{2}+1}{a+2}} \text{Gamma}\left(1 - \frac{1}{a+2}\right) \text{BesselI}\left(-\frac{1}{a+2}, \frac{2\sqrt{c}x^{\frac{a+2}{2}}}{a+2}\right) + (-1)^{\frac{1}{a+2}} (a+2)^{-\frac{1}{a+2}}\right.\right.$$

✓ **Maple** : cpu = 0.223 (sec), leaf count = 63

```
dsolve(diff(diff(y(x),x),x)-c*x^a*y(x)=0,y(x))
```

$$y(x) = \sqrt{x}\left(\text{BesselJ}\left(\frac{1}{a+2}, \frac{2\sqrt{-c}\,x^{\frac{a}{2}+1}}{a+2}\right) c_1 + \text{BesselY}\left(\frac{1}{a+2}, \frac{2\sqrt{-c}\,x^{\frac{a}{2}+1}}{a+2}\right) c_2\right)$$

2.1015 ODE No. 1015

$$y(x)\left(1-a^2x^{2n}\right)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.215045 (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

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x)+\left(-a^2x^{2n}+1\right)\_Y(x)\right\},\{\_Y(x)\}\right)$$

2.1016 ODE No. 1016

$$y(x)\left(ax^{2c}+bx^{c-1}\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0750641 (sec), leaf count = 312

```
DSolve[(b*x^(-1 + c) + a*x^(2*c))*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to 2^{\frac{c}{2(c+1)}}c_1\left(x^{c+1}\right)^{\frac{c}{2(c+1)}}x^{-c/2}e^{-\frac{\sqrt{a}x^{c+1}}{\sqrt{-c^2-2c-1}}}\text{HypergeometricU}\left(\frac{\frac{\sqrt{a}cb}{\sqrt{-(c+1)^2}}+\frac{\sqrt{a}b}{\sqrt{-(c+1)^2}}+ac}{2(ca+a)},\frac{c}{c+1},\frac{2\sqrt{a}}{\sqrt{-c^2}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.362 (sec), leaf count = 91

```
dsolve(diff(diff(y(x),x),x)+(a*x^(2*c)+b*x^(c-1))*y(x)=0,y(x))
```

$$y(x)=x^{-\frac{c}{2}}\left(\text{WhittakerM}\left(-\frac{ib}{\sqrt{a}\,(2c+2)},\frac{1}{2c+2},\frac{2i\sqrt{a}\,x^{c+1}}{c+1}\right)c_1+\text{WhittakerW}\left(-\frac{ib}{\sqrt{a}\,(2c+2)},\frac{1}{2c+2},\frac{2i\sqrt{a}}{c+}\right.\right.$$

2.1017 ODE No. 1017

$$\left(e^{2x} - v^2\right) y(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0150592 (sec), leaf count = 46

```
DSolve[(E^(2*x) - v^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \operatorname{Gamma}(1-v) \operatorname{BesselJ}\left(-v, \sqrt{e^{2x}}\right) + c_2 \operatorname{Gamma}(v+1) \operatorname{BesselJ}\left(v, \sqrt{e^{2x}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.032 (sec), leaf count = 17

```
dsolve(diff(diff(y(x),x),x)+(exp(2*x)-v^2)*y(x)=0,y(x))
```

$$y(x) = c_1 \operatorname{BesselJ}\left(v, e^x\right) + c_2 \operatorname{BesselY}\left(v, e^x\right)$$

2.1018 ODE No. 1018

$$ae^{bx}y(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0129624 (sec), leaf count = 55

```
DSolve[a*E^(b*x)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,\mathrm{BesselJ}\left(0,\frac{2\sqrt{a}\sqrt{e^{bx}}}{b}\right)+2c_2\,\mathrm{BesselY}\left(0,\frac{2\sqrt{a}\sqrt{e^{bx}}}{b}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.105 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x)+a*exp(b*x)*y(x)=0,y(x))
```

$$y(x)=c_1\,\mathrm{BesselJ}\left(0,\frac{2\sqrt{a}\,\mathrm{e}^{\frac{bx}{2}}}{b}\right)+c_2\,\mathrm{BesselY}\left(0,\frac{2\sqrt{a}\,\mathrm{e}^{\frac{bx}{2}}}{b}\right)$$

2.1019 ODE No. 1019

$$y(x)\left(1-4a^2b^2x^2e^{2bx^2}\right)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.426355 (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

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x)+\left(-4a^2b^2x^2\mathrm{e}^{2b\,x^2}+1\right)\_Y(x)\right\},\{\_Y(x)\}\right)$$

2.1020 ODE No. 1020

$$y(x)\left(ae^{2x}+be^{x}+c\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.352637 (sec), leaf count = 180

```
DSolve[(c + b*E^x + a*E^(2*x))*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{i\left(\sqrt{c}\log(e^x)-\sqrt{a}e^x\right)}\text{HypergeometricU}\left(\frac{i\left(b-i\sqrt{a}+2\sqrt{a}\sqrt{c}\right)}{2\sqrt{a}},2i\sqrt{c}+1,2i\sqrt{a}e^x\right)+c_2e^{i\left(\sqrt{c}\log(e^x)-\sqrt{a}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.298 (sec), leaf count = 58

```
dsolve(diff(diff(y(x),x),x)+(a*exp(2*x)+b*exp(x)+c)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{x}{2}}\left(\text{WhittakerW}\left(-\frac{ib}{2\sqrt{a}},i\sqrt{c},2i\sqrt{a}\,\mathrm{e}^{x}\right)c_2+\text{WhittakerM}\left(-\frac{ib}{2\sqrt{a}},i\sqrt{c},2i\sqrt{a}\,\mathrm{e}^{x}\right)c_1\right)$$

2.1021 ODE No. 1021

$$y(x)\left(a\cos^2(x)+b\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.016727 (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 = 0.355 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x)+(a*cosh(x)^2+b)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{MathieuC}\left(-\frac{a}{2}-b,\frac{a}{4},ix\right)+c_2\,\text{MathieuS}\left(-\frac{a}{2}-b,\frac{a}{4},ix\right)$$

2.1022 ODE No. 1022

$$y(x)(a\cos(2x)+b)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0159341 (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 = 0.355 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x)+(a*cos(2*x)+b)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{MathieuC}\left(b,-\frac{a}{2},x\right)+c_2\,\text{MathieuS}\left(b,-\frac{a}{2},x\right)$$

2.1023 ODE No. 1023

$$y(x)\left(a\cos^2(x)+b\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.007609 (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 = 0.346 (sec), leaf count = 29

```
dsolve(diff(diff(y(x),x),x)+(a*cos(x)^2+b)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{MathieuC}\left(\frac{a}{2}+b,-\frac{a}{4},x\right)+c_2\,\text{MathieuS}\left(\frac{a}{2}+b,-\frac{a}{4},x\right)$$

2.1024 ODE No. 1024

$$y''(x) + y(x)\left(-2\tan^2(x) - 1\right) = 0$$

✓ **Mathematica** : cpu = 0.196571 (sec), leaf count = 58

```
DSolve[(-1 - 2*Tan[x]^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{2}c_2\sec(x)\left(2\arctan\left(\frac{\cos(x)}{\sqrt{1-\cos^2(x)}-1}\right)-\cos(x)\sqrt{1-\cos^2(x)}\right)+c_1\sec(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.172 (sec), leaf count = 28

```
dsolve(diff(diff(y(x),x),x)-(1+2*tan(x)^2)*y(x)=0,y(x))
```

$$y(x) = \sec(x)\left(i\sin(x)\cos(x)\,c_2 + \ln(\cos(x) + i\sin(x))\,c_2 + c_1\right)$$

2.1025 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 = 0.627299 (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],x]
```

$$\left\{\left\{y(x)\to \frac{c_2(-1)^{\frac{1}{2}(-2m-1)+1}\cos^2(x)^{\frac{1}{4}(-2m-1)+1}\left(\cos^2(x)-1\right)^{\frac{1}{2}\left(\frac{4am+4\sqrt{-a}n^2+4an-4\sqrt{-a}n+4(-a)^{3/2}+8\sqrt{-a}a+\sqrt{-a}+4mn^2-4}{8a+8n^2-8n+2}\right.}}{}\right.\right.$$

✓ **Maple** : cpu = 0.286 (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))
```

$$y(x)=\sin(x)^n\left(\cos(x)^{-m+1}\,\mathrm{hypergeom}\left(\left[\frac{n}{2}-\frac{m}{2}-\frac{i\sqrt{a}}{2}+\frac{1}{2},\frac{n}{2}-\frac{m}{2}+\frac{i\sqrt{a}}{2}+\frac{1}{2}\right],\left[\frac{3}{2}-m\right],\cos(x)^2\right)c_2+c\right.$$

2.1026 ODE No. 1026

$$y''(x) - y(x)(B + n(n+1)\wp(x; \mathrm{g2}, \mathrm{g3})) = 0$$

✗ **Mathematica** : cpu = 0.129407 (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[x], x

✗ **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

$$y(x) = \mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x) + (-n(n+1)\,\mathrm{WeierstrassP}\,(x, \mathrm{g2}, \mathrm{g3}) - B)\_Y(x)\right\}, \{\_Y(x)\}\right)$$

2.1027 ODE No. 1027

$$y(x)\left(a\,\mathrm{sn}(x|k)^2+b\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.584203 (sec), leaf count = 235

```
DSolve[(b + a*JacobiSN[x, k]^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\sqrt{k\,\mathrm{sn}(x|k)^2-1}\mathrm{HeunG}\left[\frac{1}{k},-\frac{b-k}{4k},\frac{\sqrt{k-4a}+3\sqrt{k}}{4\sqrt{k}},\frac{\sqrt{k}\sqrt{k-4a}+2a+k}{2\sqrt{k}\left(\sqrt{k-4a}+\sqrt{k}\right)},\frac{1}{2},\frac{1}{2},\mathrm{sn}(x|k)^2\right]+c_2\mathrm{s}\right.\right.$$

✓ **Maple** : cpu = 0.704 (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))
```

$$y(x)=c_1\,\mathrm{HeunG}\left(\frac{1}{k^2},\frac{b}{4k^2},-\frac{n}{2},\frac{n}{2}+\frac{1}{2},\frac{1}{2},\frac{1}{2},\mathrm{JacobiSN}\left(x,k\right)^2\right)+c_2\,\mathrm{HeunG}\left(\frac{1}{k^2},\frac{k^2+b+1}{4k^2},\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2},\frac{3}{2},\right.$$

2.1028 ODE No. 1028

$$y''(x) - y(x)\left(ap(x) + b + \frac{p^4(x)}{30} + \frac{7p''(x)}{3}\right) = 0$$

✗ **Mathematica** : cpu = 0.155991 (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] == 0,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][x]
```

✗ **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

$$y(x) = \mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x) + \left(-\frac{\frac{d^4}{dx^4}p(x)}{30} - \frac{7\frac{d^2}{dx^2}p(x)}{3} - ap(x) - b\right)\_Y(x)\right\}, \{\_Y(x)\}\right)$$

2.1029 ODE No. 1029

$$y''(x) - y(x)\left(f'(x) + f(x)^2\right) = 0$$

✓ **Mathematica** : cpu = 0.0173868 (sec), leaf count = 58

```
DSolve[-(y[x]*(f[x]^2 + Derivative[1][f][x])) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\exp\left(\int_1^x f(K[1])dK[1]\right)+c_2\exp\left(\int_1^x f(K[2])dK[2]\right)\int_1^x\exp\left(\int_1^{K[4]}-2f(K[3])dK[3]\right)dK[4]\right\}\right\}$$

✓ **Maple** : cpu = 0.127 (sec), leaf count = 22

```
dsolve(diff(diff(y(x),x),x)-(f(x)^2+diff(f(x),x))*y(x)=0,y(x))
```

$$y(x) = \left(\int \mathrm{e}^{\int -2f(x)dx}dx + c_1\right)\mathrm{e}^{\int f(x)dx}c_2$$

2.1030 ODE No. 1030

$$y(x)(l + P(x)) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.129996 (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

$$y(x) = \mathrm{DESol}\left(\left\{(P(x) + l)\_Y(x) + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

2.1031 ODE No. 1031

$$y''(x) - f(x)y(x) = 0$$

✗ **Mathematica** : cpu = 0.0909034 (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

$$y(x) = \text{DESol}\left(\left\{-f(x)\_Y(x) + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

2.1032 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 = 0.266744 (sec), leaf count = 0

```
DSolve[y[x]*((g^3)[x]/(2*Derivative[1][g][x]) + Derivative[1][g][x]^2 + ((1/4 - v^2)*Derivative[1][g]
```

, could not solve

```
DSolve[y[x]*((g^3)[x]/(2*Derivative[1][g][x]) + Derivative[1][g][x]^2 + ((1/4 - v^2)*Derivat
```

✓ **Maple** : cpu = 0.11 (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
```

$$y(x)=\frac{c_2\,\mathrm{WhittakerW}\left(\frac{1}{2}iv^2-\frac{1}{8}i,\frac{1}{2},2ig(x)\right)+c_1\,\mathrm{WhittakerM}\left(\frac{1}{2}iv^2-\frac{1}{8}i,\frac{1}{2},2ig(x)\right)}{\sqrt{\frac{d}{dx}g\left(x\right)}}$$

2.1033 ODE No. 1033

$$ae^{-2x}y(x) + y''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.014048 (sec), leaf count = 37

```
DSolve[(a*y[x])/E^(2*x) + Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cos\left(\sqrt{a}e^{-x}\right)-c_2\sin\left(\sqrt{a}e^{-x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (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
```

2.1034 ODE No. 1034

$$y''(x) - y'(x) + e^{2x}y(x) = 0$$

✓ **Mathematica** : cpu = 0.0091487 (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 = 0.014 (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

$$
\begin{aligned}
\frac{d^2\eta}{d\xi^2}(e^{2x}) + \frac{d\eta}{d\xi}(e^x) - \frac{d\eta}{d\xi}(e^x) + e^{2x}\eta = 0 \\
\eta'' + \eta = 0
\end{aligned}
$$

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
```

2.1035 ODE No. 1035

$$ay'(x) + by(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0040337 (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))
```

$$y(x) = c_1 \mathrm{e}^{-\frac{\left(a-\sqrt{a^2-4b}\right)x}{2}} + c_2 \mathrm{e}^{-\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}}$$

2.1036 ODE No. 1036

$$ay'(x) + by(x) - f(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0847113 (sec), leaf count = 209

```
DSolve[-f[x] + b*y[x] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to e^{\frac{1}{2}x\left(-\sqrt{a^2-4b}-a\right)} \int_1^x -\frac{e^{aK[1]+\frac{1}{2}\left(\sqrt{a^2-4b}-a\right)K[1]} f(K[1])}{\sqrt{a^2-4b}} dK[1] + e^{\frac{1}{2}x\left(\sqrt{a^2-4b}-a\right)} \int_1^x \frac{e^{aK[2]+\frac{1}{2}\left(-a-\sqrt{a^2-4b}\right.}}{\sqrt{a^2-4}}\right.\right.$$

✓ **Maple** : cpu = 0.108 (sec), leaf count = 134

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*y(x)-f(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{-\frac{\left(a-\sqrt{a^2-4b}\right)x}{2}} c_2 + \mathrm{e}^{-\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}} c_1 + \frac{\mathrm{e}^{-ax}\left(\left(\left(\int f(x)\,\mathrm{e}^{-\frac{\left(-a+\sqrt{a^2-4b}\right)x}{2}} dx\right)\mathrm{e}^{\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}} - \left(\int f(x)\,\mathrm{e}^{\frac{\left(a+\sqrt{a^2-4b}\right)}{2}}\right.\right.\right.}{\sqrt{a^2-4b}}$$

2.1037 ODE No. 1037

$$a y'(x) + y(x)\left(-b^2x^2 - c\right) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0153361 (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]
```

$$\left\{\left\{y(x)\to c_1 e^{-\frac{ax}{2}-\frac{bx^2}{2}}\,\text{HermiteH}\left(\frac{-a^2-4b-4c}{8b},\sqrt{b}x\right)+c_2 e^{-\frac{ax}{2}-\frac{bx^2}{2}}\,\text{Hypergeometric1F1}\left(-\frac{-a^2-4b-4c}{16b},\frac{1}{2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.126 (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))
```

$$y(x) = \mathrm{e}^{-\frac{x(bx+a)}{2}}\,x\left(\text{KummerU}\left(\frac{a^2+12b+4c}{16b},\frac{3}{2},b\,x^2\right)c_2+\text{KummerM}\left(\frac{a^2+12b+4c}{16b},\frac{3}{2},b\,x^2\right)c_1\right)$$

2.1038 ODE No. 1038

$$2ay'(x) + f(x)y(x) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.257472 (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

$$y(x) = \mathrm{DESol}\left(\left\{f(x)\_Y(x) + 2a\left(\frac{d}{dx}\_Y(x)\right) + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

2.1039 ODE No. 1039

$$y''(x) + xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0198731 (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 = 0.01 (sec), leaf count = 25

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = \left(\operatorname{erf}\left(\frac{i\sqrt{2}\,x}{2}\right) c_1 + c_2\right) \mathrm{e}^{-\frac{x^2}{2}}$$

2.1040 ODE No. 1040

$$y''(x) + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0572016 (sec), leaf count = 53

```
DSolve[-y[x] + x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x - \frac{1}{2} c_2 e^{-\frac{x^2}{2}} \left(\sqrt{2\pi} e^{\frac{x^2}{2}} x \operatorname{erf}\left(\frac{x}{\sqrt{2}}\right) + 2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 33

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = \sqrt{\pi}\,\sqrt{2}\,\mathrm{e}^{-\frac{x^2}{2}} c_2 + x\left(\pi c_2 \operatorname{erf}\left(\frac{\sqrt{2}\,x}{2}\right) + c_1\right)$$

2.1041 ODE No. 1041

$$(n+1)y(x) + y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0058459 (sec), leaf count = 55

```
DSolve[(1 + n)*y[x] + x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{-\frac{x^2}{2}} \text{HermiteH}\left(n, \frac{x}{\sqrt{2}}\right) + c_2 e^{-\frac{x^2}{2}} \text{Hypergeometric1F1}\left(-\frac{n}{2}, \frac{1}{2}, \frac{x^2}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.094 (sec), leaf count = 41

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)+(n+1)*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{-\frac{x^2}{2}} x \left(\text{KummerU}\left(-\frac{n}{2} + \frac{1}{2}, \frac{3}{2}, \frac{x^2}{2}\right) c_2 + \text{KummerM}\left(-\frac{n}{2} + \frac{1}{2}, \frac{3}{2}, \frac{x^2}{2}\right) c_1\right)$$

2.1042 ODE No. 1042

$$-ny(x) + y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0055813 (sec), leaf count = 61

```
DSolve[-(n*y[x]) + x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{-\frac{x^2}{2}} \text{HermiteH}\left(-n-1, \frac{x}{\sqrt{2}}\right) + c_2 e^{-\frac{x^2}{2}} \text{Hypergeometric1F1}\left(\frac{n+1}{2}, \frac{1}{2}, \frac{x^2}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 41

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)-n*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{-\frac{x^2}{2}} x \left(\text{KummerU}\left(\frac{n}{2}+1, \frac{3}{2}, \frac{x^2}{2}\right) c_2 + \text{KummerM}\left(\frac{n}{2}+1, \frac{3}{2}, \frac{x^2}{2}\right) c_1\right)$$

2.1043 ODE No. 1043

$$y''(x) - xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.16661 (sec), leaf count = 69

```
DSolve[2*y[x] - x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{4}c_2\left(\sqrt{2\pi}x^2\text{erfi}\left(\frac{x}{\sqrt{2}}\right)-\sqrt{2\pi}\text{erfi}\left(\frac{x}{\sqrt{2}}\right)-2e^{\frac{x^2}{2}}x\right)+c_1\left(x^2-1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.255 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x)-x*diff(y(x),x)+2*y(x)=0,y(x))
```

$$y(x) = -2\,e^{\frac{x^2}{2}}c_1x + (x-1)\,(1+x)\left(\sqrt{\pi}\,\sqrt{2}\,\text{erf}\left(\frac{\sqrt{2}\,x}{2}\right)c_1 + c_2\right)$$

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

$$\begin{aligned}
y' &= \sum_{n=0}^{\infty} nc_n x^{n-1} = \sum_{n=1}^{\infty} nc_n x^{n-1} = \sum_{n=0}^{\infty} (n+1)\,c_{n+1}x^n \\
y'' &= \sum_{n=0}^{\infty} n(n+1)\,c_{n+1}x^{n-1} = \sum_{n=1}^{\infty} n(n+1)\,c_{n+1}x^{n-1} = \sum_{n=0}^{\infty} (n+1)\,(n+2)\,c_{n+2}x^n
\end{aligned}$$

Substituting back in the original ODE gives

$$\begin{aligned}
\sum_{n=0}^{\infty} (n+1)\,(n+2)\,c_{n+2}x^n - x\sum_{n=0}^{\infty} (n+1)\,c_{n+1}x^n + 2\sum_{n=0}^{\infty} c_n x^n &= 0 \\
\sum_{n=0}^{\infty} (n+1)\,(n+2)\,c_{n+2}x^n - \sum_{n=0}^{\infty} (n+1)\,c_{n+1}x^{n+1} + \sum_{n=0}^{\infty} 2c_n x^n &= 0 \\
\sum_{n=0}^{\infty} (n+1)\,(n+2)\,c_{n+2}x^n - \sum_{n=1}^{\infty} nc_n x^n + \sum_{n=0}^{\infty} 2c_n x^n &= 0
\end{aligned}$$

For $n = 0$

$$\begin{aligned}
(n+1)\,(n+2)\,c_{n+2} + 2c_n &= 0 \\
(1)\,(2)\,c_2 + 2c_0 &= 0 \\
c_2 &= -c_0
\end{aligned}$$

For $n \geq 1$

$$
\begin{aligned}
(n+1)(n+2) c_{n+2} - n c_n + 2c_n &= 0 \\
c_{n+2} &= \frac{c_n(n-2)}{(n+1)(n+2)}
\end{aligned}
$$

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

$$
\begin{aligned}
y &= \sum_{n=0}^{\infty} c_n x^n \\
&= c_0 + c_1 x + c_2 x^2 + c_3 x^3 + \cdots \\
&= c_0 + c_1 x - c_0 x^2 - \frac{c_1}{(2)(3)} x^3 - \frac{c_1}{(2)(3)(4)(5)} x^5 - \frac{3c_1}{(2)(3)(4)(5)(6)(7)} x^7 - \frac{(3)(5)c_1}{(2)(3)(4)(5)(6)(7)(8)(9)} x^9 - \cdots \\
&= c_0(1 - x^2) + c_1 \left(x - \frac{1}{(2)(3)} x^3 - \frac{1}{(2)(3)(4)(5)} x^5 - \frac{3}{(2)(3)(4)(5)(6)(7)} x^7 - \frac{(3)(5)}{(2)(3)(4)(5)(6)(7)(8)(9)} x^9 \right) \\
&= c_0(1 - x^2) + c_1 \left(x - \frac{1}{3!} x^3 - \frac{1}{5!} x^5 - \frac{3}{7!} x^7 - \frac{15}{9!} x^9 - \cdots \right)
\end{aligned}
$$

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
```

2.1044 ODE No. 1044

$$-ay(x) + y''(x) - xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0058248 (sec), leaf count = 39

```
DSolve[-(a*y[x]) - x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \operatorname{HermiteH}\left(-a, \frac{x}{\sqrt{2}}\right) + c_2 \operatorname{Hypergeometric1F1}\left(\frac{a}{2}, \frac{1}{2}, \frac{x^2}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.092 (sec), leaf count = 35

```
dsolve(diff(diff(y(x),x),x)-x*diff(y(x),x)-a*y(x)=0,y(x))
```

$$y(x) = x\left(\operatorname{KummerM}\left(\frac{1}{2} + \frac{a}{2}, \frac{3}{2}, \frac{x^2}{2}\right) c_1 + \operatorname{KummerU}\left(\frac{1}{2} + \frac{a}{2}, \frac{3}{2}, \frac{x^2}{2}\right) c_2\right)$$

2.1045 ODE No. 1045

$$y''(x) - xy'(x) + (x - 1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0243881 (sec), leaf count = 39

```
DSolve[(-1 + x)*y[x] - x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \sqrt{\frac{\pi}{2}}c_2e^{x-2}\text{erfi}\left(\frac{x-2}{\sqrt{2}}\right)+c_1e^x\right\}\right\}$$

✓ **Maple** : cpu = 0.013 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x)-x*diff(y(x),x)+(x-1)*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{x}\left(\mathrm{erf}\left(\frac{i\sqrt{2}\,(x-2)}{2}\right)c_1 + c_2\right)$$

2.1046 ODE No. 1046

$$ay(x) + y''(x) - 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0049645 (sec), leaf count = 31

```
DSolve[a*y[x] - 2*x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \operatorname{HermiteH}\left(\frac{a}{2}, x\right) + c_2 \operatorname{Hypergeometric1F1}\left(-\frac{a}{4}, \frac{1}{2}, x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.1 (sec), leaf count = 31

```
dsolve(diff(diff(y(x),x),x)-2*x*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = x\left(\operatorname{KummerM}\left(\frac{1}{2} - \frac{a}{4}, \frac{3}{2}, x^2\right) c_1 + \operatorname{KummerU}\left(\frac{1}{2} - \frac{a}{4}, \frac{3}{2}, x^2\right) c_2\right)$$

2.1047 ODE No. 1047

$$(4x^2+2)\,y(x)+y''(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0082967 (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 = 0.022 (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

$$y''+4xy'+(4x^2+2)\,y=0 \tag{1}$$

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

$$\sum_{n=0}^{\infty}(n+1)\,(n+2)\,c_{n+2}x^n+4x\sum_{n=0}^{\infty}(n+1)\,c_{n+1}x^n+(4x^2+2)\sum_{n=0}^{\infty}c_nx^n=0$$
$$\sum_{n=0}^{\infty}(n+1)\,(n+2)\,c_{n+2}x^n+\sum_{n=0}^{\infty}4(n+1)\,c_{n+1}x^{n+1}+\sum_{n=0}^{\infty}4c_nx^{n+2}+\sum_{n=0}^{\infty}2c_nx^n=0$$
$$\sum_{n=0}^{\infty}(n+1)\,(n+2)\,c_{n+2}x^n+\sum_{n=1}^{\infty}4nc_nx^n+\sum_{n=2}^{\infty}4c_{n-2}x^n+\sum_{n=0}^{\infty}2c_nx^n=0$$

For $n=0$

$$\begin{aligned}(n+1)\,(n+2)\,c_{n+2}+2c_n&=0\\(1)\,(2)\,c_2+2c_0&=0\\c_2&=-c_0\end{aligned}$$

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 $n \geq 2$

$$
\begin{aligned}
(n+1)(n+2)c_{n+2} + 4nc_n + 4c_{n-2} + 2c_n &= 0 \\
c_{n+2} &= \frac{(-4n-2)c_n - 4c_{n-2}}{(n+1)(n+2)}
\end{aligned}
$$

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

$$
\begin{aligned}
y &= \sum_{n=0}^{\infty} c_n x^n \\
&= c_0 + c_1 x + c_2 x^2 + \cdots \\
&= c_0 + c_1 x - c_0 x^2 - c_1 x^3 + c_0 \frac{6}{(3)(4)} x^4 + c_1 \frac{10}{(4)(5)} x^5 - c_0 \frac{5}{(5)(7)} x^6 - c_1 \frac{7}{(6)(7)} x^7 + c_0 \frac{12}{7} \frac{1}{(7)(8)} x^8 + \cdots \\
&= c_0 \left(1 - x^2 + \frac{6}{(3)(4)} x^4 - \frac{5}{(5)(6)} x^6 + \frac{7}{3} \frac{1}{(7)(8)} x^8 + \cdots \right) + c_1 \left(x - x^3 + \frac{10}{(4)(5)} x^5 - \frac{7}{(6)(7)} x^7 + \cdots \right) \\
&= c_0 \left(1 - x^2 + \frac{1}{2} x^4 - \frac{1}{6} x^6 + \frac{1}{24} x^8 + \cdots \right) + c_1 \left(x - x^3 + \frac{1}{2} x^5 - \frac{1}{6} x^7 + \cdots \right)
\end{aligned}
$$

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
```

2.1048 ODE No. 1048

$$\left(2n+3x^2-1\right)y(x)+y''(x)-4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0070398 (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]
```

$$\left\{\left\{y(x)\to c_1e^{\frac{x^2}{2}}\,\text{HermiteH}(n,x)+c_2e^{\frac{x^2}{2}}\,\text{Hypergeometric1F1}\left(-\frac{n}{2},\frac{1}{2},x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.082 (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))
```

$$y(x)=\mathrm{e}^{\frac{x^2}{2}}x\left(\text{KummerM}\left(-\frac{n}{2}+\frac{1}{2},\frac{3}{2},x^2\right)c_1+\text{KummerU}\left(-\frac{n}{2}+\frac{1}{2},\frac{3}{2},x^2\right)c_2\right)$$

2.1049 ODE No. 1049

$$(4x^2-1)\,y(x)+y''(x)-4xy'(x)-e^x=0$$

✓ **Mathematica** : cpu = 0.0612415 (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]
```

$$\left\{\left\{y(x)\to\frac{1}{4}\sqrt{\pi}e^{x(x-i)-\frac{i}{2}}\left(e^{2ix}\mathrm{erfi}\left(\left(\frac{1}{2}+\frac{i}{2}\right)-ix\right)-ie^{i}\mathrm{erf}\left(-x+\left(\frac{1}{2}+\frac{i}{2}\right)\right)\right)+c_1e^{x(x-i)}-\frac{1}{2}ic_2e^{(x-i)x+2ix}\right\}\right.$$

✓ **Maple** : cpu = 0.194 (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))
```

$$y(x)=\frac{\mathrm{e}^{x^2}\left(\left(i\cos(x)+\sin(x)\right)\mathrm{e}^{\frac{i}{2}}\sqrt{\pi}\ \mathrm{erf}\left(x-\frac{1}{2}-\frac{i}{2}\right)-\left(i\cos(x)-\sin(x)\right)\mathrm{e}^{-\frac{i}{2}}\sqrt{\pi}\ \mathrm{erf}\left(x-\frac{1}{2}+\frac{i}{2}\right)+4\sin(x)\,c_1}{4}$$

2.1050 ODE No. 1050

$$
(4x^2 - 2)\, y(x) + y''(x) - 4xy'(x) = 0
$$

✓ **Mathematica** : cpu = 0.0075803 (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]
```

$$
\left\{\left\{y(x)\to c_1 e^{x^2} + c_2 e^{x^2} x\right\}\right\}
$$

✓ **Maple** : cpu = 0.017 (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))
```

$$
y(x) = \mathrm{e}^{x^2}(xc_2 + c_1)
$$

2.1051 ODE No. 1051

$$(4x^2-3)\,y(x)-e^{x^2}+y''(x)-4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0212033 (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 = 0.028 (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))
```

$$y(x)=\mathrm{e}^{x(1+x)}c_2+\mathrm{e}^{x(x-1)}c_1-\mathrm{e}^{x^2}$$

2.1052 ODE No. 1052

$$axy'(x) + by(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.010781 (sec), leaf count = 78

```
DSolve[b*y[x] + a*x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{-\frac{ax^2}{2}}\,\text{HermiteH}\left(\frac{b-a}{a},\frac{\sqrt{a}x}{\sqrt{2}}\right)+c_2e^{-\frac{ax^2}{2}}\,\text{Hypergeometric1F1}\left(-\frac{b-a}{2a},\frac{1}{2},\frac{ax^2}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.109 (sec), leaf count = 58

```
dsolve(diff(diff(y(x),x),x)+a*x*diff(y(x),x)+b*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{-\frac{a\,x^2}{2}}x\left(\text{KummerU}\left(\frac{2a-b}{2a},\frac{3}{2},\frac{a\,x^2}{2}\right)c_2+\text{KummerM}\left(\frac{2a-b}{2a},\frac{3}{2},\frac{a\,x^2}{2}\right)c_1\right)$$

2.1053 ODE No. 1053

$$a^2x^2y(x) + 2axy'(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0214645 (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 = 0.04 (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))
```

$$y(x) = c_1\mathrm{e}^{-\frac{x(ax-2\sqrt{a})}{2}} + c_2\mathrm{e}^{-\frac{x(ax+2\sqrt{a})}{2}}$$

2.1054 ODE No. 1054

$$(ax+b)y'(x)+y(x)(cx+d)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0244781 (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]
```

$$\left\{\left\{y(x)\to c_1e^{\frac{cx}{a}-\frac{ax^2}{2}-bx}\,\text{HermiteH}\left(\frac{-a^3+da^2-bca+c^2}{a^3},\frac{ab-2c}{\sqrt{2}a^{3/2}}+\frac{\sqrt{a}x}{\sqrt{2}}\right)+c_2e^{\frac{cx}{a}-\frac{ax^2}{2}-bx}\,\text{Hypergeometric1F}\right.\right.$$

✓ **Maple** : cpu = 0.046 (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))
```

$$y(x)=\mathrm{e}^{-\frac{cx}{a}}\left(\text{KummerU}\left(\frac{a^2d-abc+c^2}{2a^3},\frac{1}{2},-\frac{\left(a^2x+ab-2c\right)^2}{2a^3}\right)c_2+\text{KummerM}\left(\frac{a^2d-abc+c^2}{2a^3},\frac{1}{2},-\frac{\left(a^2x+\right.}{}\right.\right.$$

2.1055 ODE No. 1055

$$(ax+b)y'(x)+y(x)\left(\mathrm{a1}x^2+\mathrm{b1}x+\mathrm{c1}\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0984708 (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[x],x]
```

$$\left\{\left\{y(x)\to c_1\exp\left(\frac{-bx\sqrt{a^2-4\mathrm{a1}}-\frac{1}{2}ax^2\sqrt{a^2-4\mathrm{a1}}-\frac{1}{2}a^2x^2-abx+2\mathrm{a1}x^2+2\mathrm{b1}x}{2\sqrt{a^2-4\mathrm{a1}}}\right)\text{HermiteH}\left(\frac{-a^3+2\mathrm{c1}a^2}{\right.\right.\right.$$

✓ **Maple** : cpu = 0.239 (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))
```

$$y(x)=\left(c_2\left(a^2x+ab-4\,\mathrm{a1}\,x-2\,\mathrm{b1}\right)\text{hypergeom}\left(\left[\frac{3\left(a^2-4\,\mathrm{a1}\right)^{\frac{3}{2}}+a^3-2a^2\,\mathrm{c1}+\left(2\,\mathrm{b1}\,b-4\,\mathrm{a1}\right)a+\left(-2b^2+8\right.}{4\left(a^2-4\,\mathrm{a1}\right)^{\frac{3}{2}}}\right.\right.\right.$$

2.1056 ODE No. 1056

$$x^2(-y'(x)) + y''(x) + xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0500058 (sec), leaf count = 41

```
DSolve[x*y[x] - x^2*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1x-\frac{c_2\sqrt[3]{-x^3}\Gamma\left(-\frac{1}{3},-\frac{x^3}{3}\right)}{3\sqrt[3]{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.082 (sec), leaf count = 45

```
dsolve(diff(diff(y(x),x),x)-x^2*diff(y(x),x)+x*y(x)=0,y(x))
```

$$y(x)=xc_1+\left(-\frac{x^3\left(\Gamma\left(\frac{2}{3}\right)-\Gamma\left(\frac{2}{3},-\frac{x^3}{3}\right)\right)}{\left(-x^3\right)^{\frac{2}{3}}}+3^{\frac{1}{3}}\mathrm{e}^{\frac{x^3}{3}}\right)c_2$$

2.1057 ODE No. 1057

$$x^2(-y'(x)) + y''(x) - (x+1)^2 y(x) = 0$$

✓ **Mathematica** : cpu = 0.0471245 (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 = 0.223 (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))
```

$$y(x) = c_1 \operatorname{HeunT}\left(0,-3,2\,3^{\frac{1}{3}},\frac{3^{\frac{2}{3}}x}{3}\right)\mathrm{e}^{-x} + c_2 \operatorname{HeunT}\left(0,3,2\,3^{\frac{1}{3}},-\frac{3^{\frac{2}{3}}x}{3}\right)\mathrm{e}^{\frac{x\left(x^2+3\right)}{3}}$$

2.1058 ODE No. 1058

$$(x^4-2)\,xy(x)-\left((x+1)x^2y'(x)\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0572229 (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 = 0.357 (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))
```

$$y(x)=\mathrm{e}^{\frac{x^3}{3}}\left(\left(\int \mathrm{e}^{\frac{1}{4}x^4-\frac{1}{3}x^3}dx\right)c_2+c_1\right)$$

2.1059 ODE No. 1059

$$x^4y'(x) - x^3y(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0719775 (sec), leaf count = 39

```
DSolve[-(x^3*y[x]) + x^4*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1x-\frac{c_2\sqrt[5]{x^5}\Gamma\left(-\frac{1}{5},\frac{x^5}{5}\right)}{5\sqrt[5]{5}}\right\}\right\}$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 55

```
dsolve(diff(diff(y(x),x),x)+x^4*diff(y(x),x)-x^3*y(x)=0,y(x))
```

$$y(x)=xc_1+\frac{c_2\mathrm{e}^{-\frac{x^5}{10}}\left(x^{10}\,\mathrm{WhittakerM}\left(\frac{2}{5},\frac{9}{10},\frac{x^5}{5}\right)+9\,\mathrm{WhittakerM}\left(\frac{7}{5},\frac{9}{10},\frac{x^5}{5}\right)x^5+36\,\mathrm{WhittakerM}\left(\frac{7}{5},\frac{9}{10},\frac{x^5}{5}\right)\right)}{x^7}$$

2.1060 ODE No. 1060

$$ax^{q-1}y'(x) + bx^{q-2}y(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0199486 (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]
```

$$\left\{\left\{y(x)\to c_2 q^{-1/q} a^{\frac{1}{q}} (x^q)^{\frac{1}{q}}\,\text{Hypergeometric1F1}\left(\frac{b}{aq}+\frac{1}{q},1+\frac{1}{q},-\frac{ax^q}{q}\right)+c_1\,\text{Hypergeometric1F1}\left(\frac{b}{aq},1-\frac{1}{q},-\right.\right.\right.$$

✓ **Maple** : cpu = 0.314 (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))
```

$$y(x) = \mathrm{e}^{-\frac{a\,x^q}{q}}\,x\left(\text{KummerU}\left(\frac{aq-b}{aq},\frac{q+1}{q},\frac{a\,x^q}{q}\right)c_2+\text{KummerM}\left(\frac{aq-b}{aq},\frac{q+1}{q},\frac{a\,x^q}{q}\right)c_1\right)$$

2.1061 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 = 0.0587962 (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] + Derivativ
```

$$\left\{\left\{y(x) \to -\frac{1}{9}e^{3x-\frac{1}{3}(\sqrt{x}+9)x}x + c_1e^{-\frac{1}{3}(\sqrt{x}+9)x} + \frac{1}{6}c_2e^{6x-\frac{1}{3}(\sqrt{x}+9)x}\right\}\right\}$$

✓ **Maple** : cpu = 0.123 (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/
```

$$y(x) = -\frac{\mathrm{e}^{-\frac{x^{\frac{3}{2}}}{3}}\left(-9\cosh\left(3x\right)c_1 - 9\sinh\left(3x\right)c_2 + x\right)}{9}$$

2.1062 ODE No. 1062

$$\frac{\left(x+\sqrt{x}-8\right)y(x)}{4x^2}+y''(x)-\frac{y'(x)}{\sqrt{x}}=0$$

✓ **Mathematica** : cpu = 0.0139979 (sec), leaf count = 35

```
DSolve[((-8 + Sqrt[x] + x)*y[x])/(4*x^2) - Derivative[1][y][x]/Sqrt[x] + Derivative[2][y][x] == 0,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 = 0.023 (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))
```

$$y(x)=\frac{\mathrm{e}^{\sqrt{x}}\left(x^3c_2+c_1\right)}{x}$$

2.1063 ODE No. 1063

$$y''(x) - (2e^x + 1)\, y'(x) + e^{2x} y(x) - e^{3x} = 0$$

✓ **Mathematica** : cpu = 0.0314038 (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[x],x]
```

$$\left\{\left\{y(x) \to e^x + c_1 e^{e^x} + c_2 e^{x+e^x} + 2\right\}\right\}$$

✓ **Maple** : cpu = 1.181 (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))
```

$$y(x) = \mathrm{e}^{\mathrm{e}^x + \frac{x}{2}} \sinh\left(\frac{x}{2}\right) c_2 + \mathrm{e}^{\mathrm{e}^x + \frac{x}{2}} \cosh\left(\frac{x}{2}\right) c_1 + \mathrm{e}^x + 2$$

2.1064 ODE No. 1064

$$a y'(x) + b y(x) + y''(x) + \tan(x) = 0$$

✓ **Mathematica** : cpu = 0.3049 (sec), leaf count = 1400

```
DSolve[Tan[x] + b*y[x] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to e^{\frac{1}{2}\left(-a-\sqrt{a^2-4b}\right)x} c_1 + e^{\frac{1}{2}\left(\sqrt{a^2-4b}-a\right)x} c_2 + \frac{8\left(2\,\text{Hypergeometric2F1}\left(1, \frac{1}{4}i\left(\sqrt{a^2-4b}-a\right), \frac{1}{4}i\left(\sqrt{a^2-4\right.\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.45 (sec), leaf count = 134

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+tan(x)+b*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{-\frac{\left(a-\sqrt{a^2-4b}\right)x}{2}} c_2 + \mathrm{e}^{-\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}} c_1 + \frac{\mathrm{e}^{-ax}\left(-\left(\int \tan(x)\,\mathrm{e}^{-\frac{\left(-a+\sqrt{a^2-4b}\right)x}{2}} dx\right) \mathrm{e}^{\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}} + \left(\int \tan(x)\,\mathrm{e}^{\frac{(a+}{}}\right.\right.}{\sqrt{a^2-4b}}$$

2.1065 ODE No. 1065

$$\left(n^2-a^2\right)y(x)+2n\cot(x)y'(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0974961 (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]
```

$$\left\{\left\{y(x)\to c_1\left(\cos^2(x)-1\right)^{\frac{1}{4}(1-2n)}P_{\frac{1}{2}\left(2\sqrt{2n^2-a^2}-1\right)}^{\frac{1}{2}(2n-1)}(\cos(x))+c_2\left(\cos^2(x)-1\right)^{\frac{1}{4}(1-2n)}Q_{\frac{1}{2}\left(2\sqrt{2n^2-a^2}-1\right)}^{\frac{1}{2}(2n-1)}(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.292 (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))
```

$$y(x)=\sin(x)^{-n+\frac{1}{2}}\left(\mathrm{LegendreQ}\left(-\frac{1}{2}+\sqrt{-a^2+2n^2},n-\frac{1}{2},\cos(x)\right)c_2+\mathrm{LegendreP}\left(-\frac{1}{2}+\sqrt{-a^2+2n^2},n-\right.\right.$$

2.1066 ODE No. 1066

$$y''(x) + \tan(x)y'(x) + y(x)\cos^2(x) = 0$$

✓ **Mathematica** : cpu = 0.0300418 (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 = 0.096 (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))
```

$$y(x) = c_1 \sin(\sin(x)) + c_2 \cos(\sin(x))$$

2.1067 ODE No. 1067

$$y''(x) + \tan(x)y'(x) - y(x)\cos^2(x) = 0$$

✓ **Mathematica** : cpu = 0.0288953 (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 = 0.04 (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))
```

$$y(x) = c_1 e^{\sin(x)} + c_2 e^{-\sin(x)}$$

2.1068 ODE No. 1068

$$v(v+1)y(x)+y''(x)+\cot(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.079406 (sec), leaf count = 20

```
DSolve[v*(1 + v)*y[x] + Cot[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x)\to c_1\,\text{LegendreP}(v,\cos(x))+c_2\,\text{LegendreQ}(v,\cos(x))\}\}$$

✓ **Maple** : cpu = 0.309 (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))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{v}{2},\frac{1}{2}+\frac{v}{2}\right],\left[\frac{1}{2}\right],\cos(x)^2\right)+c_2\cos(x)\,\text{hypergeom}\left(\left[1+\frac{v}{2},\frac{1}{2}-\frac{v}{2}\right],\left[\frac{3}{2}\right],\cos(x)^2\right)$$

2.1069 ODE No. 1069

$$y''(x) - \cot(x)y'(x) + y(x)\sin^2(x) = 0$$

✓ **Mathematica** : cpu = 0.030991 (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 = 0.125 (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))
```

$$y(x) = c_1 \sin(\cos(x)) + c_2 \cos(\cos(x))$$

2.1070 ODE No. 1070

$$a\tan(x)y'(x) + by(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.180971 (sec), leaf count = 143

```
DSolve[b*y[x] + a*Tan[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{Hypergeometric2F1}\left(-\frac{a}{4}-\frac{1}{4}\sqrt{a^2+4b},\frac{1}{4}\sqrt{a^2+4b}-\frac{a}{4},\frac{1}{2}-\frac{a}{2},\cos^2(x)\right)+i^{a+1}c_2\cos^{a+1}(x)\,\text{Hype}\right.\right.$$

✓ **Maple** : cpu = 0.227 (sec), leaf count = 60

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)*tan(x)+b*y(x)=0,y(x))
```

$$y(x)=\cos(x)^{\frac{1}{2}+\frac{a}{2}}\left(\text{LegendreQ}\left(\frac{\sqrt{a^2+4b}}{2}-\frac{1}{2},\frac{1}{2}+\frac{a}{2},\sin(x)\right)c_2+\text{LegendreP}\left(\frac{\sqrt{a^2+4b}}{2}-\frac{1}{2},\frac{1}{2}+\frac{a}{2},\sin(x)\right.\right.$$

2.1071 ODE No. 1071

$$\left(b^2-a^2\right)y(x)+2a\cot(ax)y'(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0504646 (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]
```

$$\left\{\left\{y(x)\to c_1e^{-ibx}\csc(ax)-\frac{ic_2e^{ibx}\csc(ax)}{2b}\right\}\right\}$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 22

```
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))
```

$$y(x)=\csc(ax)\left(\cos(bx)\,c_2+\sin(bx)\,c_1\right)$$

2.1072 ODE No. 1072

$$y(x)\left(-4anp(x)^2+a+bp(x)\right)+ap''(x)y'(x)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.215897 (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] + Derivative[2][y
```

, 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] + Deriva
```

✗ **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

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x)+a\left(\frac{d^2}{dx^2}p(x)\right)\left(\frac{d}{dx}\_Y(x)\right)+\left(a+bp(x)-4nap(x)^2\right)\_Y(x)\right\},\{\_Y(x)\}\right)$$

2.1073 ODE No. 1073

$$\frac{y'(x)\left(-\wp(x;a,b)\wp'(x;a,b)+\wp(x;a,b)^3-6\wp(x;a,b)^2+\frac{a}{2}\right)}{\wp'(x;a,b)-\wp(x;a,b)^2}+\frac{y(x)\left(\wp(x;a,b)^2(-\wp'(x;a,b))-\left(6\wp(x;a,b)^2-\frac{a}{2}\right)\wp\right.}{\wp(x;a,b)^2+\wp'(x;a,b)}$$

✗ **Mathematica** : cpu = 0.778788 (sec), leaf count = 0

```
DSolve[((-(WeierstrassP[x, {a, b}]*(-1/2*a + 6*WeierstrassP[x, {a, b}]^2)) - WeierstrassP[x, {a, b}]^
```

, could not solve

```
DSolve[((-(WeierstrassP[x, {a, b}]*(-1/2*a + 6*WeierstrassP[x, {a, b}]^2)) - WeierstrassP[x,
WeierstrassP[x, {a, b}]^2 + WeierstrassPPrime[x, {a, b}]) + Derivative[2][y][x] == 0, y[x],
```

✗ **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(
```

, result contains DESol or ODESolStruc

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x)+\frac{\left(11\,\mathrm{WeierstrassP}\,(x,a,b)\,\mathrm{WeierstrassPPrime}\,(x,a,b)-6\,\mathrm{WeierstrassP}\,(x,a,b)^2\right.}{\mathrm{WeierstrassPPrime}\,(x,a,b)+\mathrm{WeierstrassP}\,(x,a,b)^2}\right.\right.$$

2.1074 ODE No. 1074

$$\frac{k^2 \operatorname{cn}(x|k) \operatorname{sn}(x|k) y'(x)}{\operatorname{dn}(x|k)} + n^2 y(x) \operatorname{dn}(x|k)^2 + y''(x) = 0$$

✗ **Mathematica** : cpu = 2.97331 (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])/JacobiDN[x
```

, could not solve

```
DSolve[n^2*JacobiDN[x, k]^2*y[x] + (k^2*JacobiCN[x, k]*JacobiSN[x, k]*Derivative[1][y][x])/J
```

✓ **Maple** : cpu = 0.03 (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
```

$$y(x) = c_1 \sin(n \text{ JacobiAM}(x, k)) + c_2 \cos(n \text{ JacobiAM}(x, k))$$

2.1075 ODE No. 1075

$$f(x)y'(x) + g(x)y(x) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.164479 (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

$$y(x) = \mathrm{DESol}\left(\left\{g(x)\_Y(x) + f(x)\left(\frac{d}{dx}\_Y(x)\right) + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

2.1076 ODE No. 1076

$$y(x)\left(a+f'(x)\right)+f(x)y'(x)-g(x)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.150975 (sec), leaf count = 0

```
DSolve[-g[x] + y[x]*(a + Derivative[1][f][x]) + f[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y
```

, could not solve

```
DSolve[-g[x] + y[x]*(a + Derivative[1][f][x]) + f[x]*Derivative[1][y][x] + Derivative[2][y][
```

✗ **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

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x)+f(x)\left(\frac{d}{dx}\_Y(x)\right)+\left(\frac{d}{dx}f(x)+a\right)\_Y(x)-g(x)\right\},\{\_Y(x)\}\right)$$

2.1077 ODE No. 1077

$$y'(x)(af(x)+b)+y(x)(cf(x)+d)+y''(x)=0$$

✗ **Mathematica** : cpu = 0.249101 (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, y[x]

✗ **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

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x)+(af(x)+b)\left(\frac{d}{dx}\_Y(x)\right)+(cf(x)+d)\_Y(x)\right\},\{\_Y(x)\}\right)$$

2.1078 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 = 0.0261128 (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][y][x] =
```

$$\left\{\left\{y(x)\to c_1\exp\left(-\frac{1}{2}\int_1^x f(K[1])dK[1]-i\sqrt{a}x\right)-\frac{ic_2\exp\left(-\frac{1}{2}\int_1^x f(K[1])dK[1]+i\sqrt{a}x\right)}{2\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (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))
```

$$y(x)=e^{-\frac{\left(\int f(x)dx\right)}{2}}\left(\sinh\left(\sqrt{-a}\,x\right)c_1+\cosh\left(\sqrt{-a}\,x\right)c_2\right)$$

2.1079 ODE No. 1079

$$by(x)f(x)^{2a} - \frac{af'(x)y'(x)}{f(x)} + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.179037 (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][x] ==
```

$$\left\{\left\{y(x) \to -\frac{\sqrt{c_1}\exp\left(-\int_1^x -i\sqrt{b}f(K[1])^a dK[1] - c_2\right)\left(-1+\exp\left(2\int_1^x -i\sqrt{b}f(K[1])^a dK[1] + 2c_2\right)\right)}{\sqrt{2}}\right\}, \left\{y(x)\right.\right.$$

✓ **Maple** : cpu = 0.022 (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))
```

$$y(x) = c_1 e^{\int i f(x)^a \sqrt{b} dx} + c_2 e^{-\left(\int i f(x)^a \sqrt{b} dx\right)}$$

2.1080 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 = 0.0423039 (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[x])*Deri
```

$$\left\{\left\{y(x)\to c_1\exp\left(b\int_1^x f(K[1])dK[1]+ax\right)+c_2\exp\left(ax-b\int_1^x f(K[2])dK[2]\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.624 (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^
```

$$y(x)=\mathrm{e}^{\int-\frac{f(x)\mathrm{e}^{\int-2bf(x)dx}\mathrm{e}^{2c_1b}b+bf(x)-\mathrm{e}^{\int-2bf(x)dx}\mathrm{e}^{2c_1b}a+a}{\mathrm{e}^{\int-2bf(x)dx}\mathrm{e}^{2c_1b}-1}dx}c_2$$

2.1081 ODE No. 1081

$$-\frac{a^2y(x)f'(x)^2}{b^2+f(x)^2}+\frac{f(x)f^3(x)y'(x)}{b^2+f(x)^2}+y''(x)=0$$

✗ **Mathematica** : cpu = 0.488364 (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])/(b^2
```

, 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][y][

✗ **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*
```

, result contains DESol or ODESolStruc

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x)+\frac{f(x)\left(\frac{d^3}{dx^3}f(x)\right)\left(\frac{d}{dx}\_Y(x)\right)}{f(x)^2+b^2}-\frac{a^2\left(\frac{d}{dx}f(x)\right)^2\_Y(x)}{f(x)^2+b^2}\right\},\{\_Y(x)\}\right)$$

2.1082 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 = 0.400025 (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][y][x]*
```

, could not solve

DSolve[y[x]*(Derivative[1][g][x]^2 + ((m^2 - v^2)*Derivative[1][g][x]^2)/g[x]) - Derivative[
1 + 2*m)*Derivative[1][g][x])/g[x] + Derivative[2][g][x]/Derivative[1][g][x]) + Derivative[2

✓ **Maple** : cpu = 0.184 (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))*di
```

$$y(x)=g(x)^{2m}\,\mathrm{e}^{-ig(x)}\left(\mathrm{KummerU}\left(\frac{1}{2}im^2-\frac{1}{2}iv^2+m+\frac{1}{2},1+2m,2ig(x)\right)c_2+\mathrm{KummerM}\left(\frac{1}{2}im^2-\frac{1}{2}iv^2+m\right.\right.$$

2.1083 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 = 0.457142 (sec), leaf count = 0

```
DSolve[-((Derivative[1][f][x]*Derivative[1][y][x])/f[x]) + y[x]*((3*Derivative[1][f][x]^2)/(4*f[x]^2)
```

, could not solve

DSolve[-((Derivative[1][f][x]*Derivative[1][y][x])/f[x]) + y[x]*((3*Derivative[1][f][x]^2)/(

✓ **Maple** : cpu = 0.117 (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*di
```

$$y(x)=\sqrt{\frac{g(x)\,f(x)}{\frac{d}{dx}g(x)}}\,(\mathrm{BesselY}\,(v,g(x))\,c_2+\mathrm{BesselJ}\,(v,g(x))\,c_1)$$

2.1084 ODE No. 1084

$$-y'(x)\left(\frac{2f'(x)}{f(x)}-\frac{g'(x)}{g(x)}+\frac{g''(x)}{g'(x)}\right)+y(x)\left(-\frac{f''(x)}{f(x)}+\frac{f'(x)\left(\frac{2f'(x)}{f(x)}-\frac{g'(x)}{g(x)}+\frac{g''(x)}{g'(x)}\right)}{f(x)}-\frac{v^2g'(x)^2}{g(x)^2}+g'(x)^2\right)+y''(x)$$

✓ **Mathematica** : cpu = 0.106755 (sec), leaf count = 36

```
DSolve[-(Derivative[1][y][x]*((2*Derivative[1][f][x])/f[x] - Derivative[1][g][x]/g[x] + Derivative[2]
```

$$\left\{\left\{y(x)\to c_1f(x)\,\text{BesselJ}\left(\sqrt{v^2},g(x)\right)+c_2f(x)\,\text{BesselY}\left(\sqrt{v^2},g(x)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (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)
```

$$y(x)=f(x)\left(\text{BesselY}\left(v,g(x)\right)c_2+\text{BesselJ}\left(v,g(x)\right)c_1\right)$$

2.1085 ODE No. 1085

$$-y'(x)\left(\frac{(2v-1)g'(x)}{g(x)}+\frac{g''(x)}{g'(x)}+\frac{2h'(x)}{h(x)}\right)+y(x)\left(g'(x)^2+\frac{h'(x)\left(\frac{(2v-1)g'(x)}{g(x)}+\frac{g''(x)}{g'(x)}+\frac{2h'(x)}{h(x)}\right)}{h(x)}-\frac{h''(x)}{h(x)}\right)+y''(x$$

✓ **Mathematica** : cpu = 0.100362 (sec), leaf count = 32

```
DSolve[-(Derivative[1][y][x]*(((-1 + 2*v)*Derivative[1][g][x])/g[x] + (2*Derivative[1][h][x])/h[x] +
```

$$\{\{y(x)\to c_1h(x)g(x)^v\operatorname{BesselJ}(v,g(x))+c_2h(x)g(x)^v\operatorname{BesselY}(v,g(x))\}\}$$

✓ **Maple** : cpu = 0.09 (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*d
```

$$y(x)=h(x)\,g(x)^v\left(\operatorname{BesselY}\left(v,g(x)\right)c_2+\operatorname{BesselJ}\left(v,g(x)\right)c_1\right)$$

2.1086 ODE No. 1086

$$4y''(x) + 9xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0043594 (sec), leaf count = 42

```
DSolve[9*x*y[x] + 4*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \operatorname{AiryAi}\left(\sqrt[3]{-1}\left(\frac{3}{2}\right)^{2/3} x\right) + c_2 \operatorname{AiryBi}\left(\sqrt[3]{-1}\left(\frac{3}{2}\right)^{2/3} x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 29

```
dsolve(4*diff(diff(y(x),x),x)+9*x*y(x)=0,y(x))
```

$$y(x) = c_1 \operatorname{AiryAi}\left(-\frac{3^{\frac{2}{3}} 2^{\frac{1}{3}} x}{2}\right) + c_2 \operatorname{AiryBi}\left(-\frac{3^{\frac{2}{3}} 2^{\frac{1}{3}} x}{2}\right)$$

2.1087 ODE No. 1087

$$\left(-a-x^2\right)y(x)+4y''(x)=0$$

✓ **Mathematica** : cpu = 0.005426 (sec), leaf count = 36

```
DSolve[(-a - x^2)*y[x] + 4*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{ParabolicCylinderD}\left(\frac{1}{4}(-a-2),x\right)+c_2\,\text{ParabolicCylinderD}\left(\frac{a-2}{4},ix\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.115 (sec), leaf count = 33

```
dsolve(4*diff(diff(y(x),x),x)-(x^2+a)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\,\text{WhittakerW}\left(-\frac{a}{8},\frac{1}{4},\frac{x^2}{2}\right)+c_1\,\text{WhittakerM}\left(-\frac{a}{8},\frac{1}{4},\frac{x^2}{2}\right)}{\sqrt{x}}$$

2.1088 ODE No. 1088

$$4y''(x) + 4\tan(x)y'(x) + y(x)\left(-5\tan^2(x) - 2\right) = 0$$

✓ **Mathematica** : cpu = 0.0518029 (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],x]
```

$$\left\{\left\{y(x)\to \frac{3(-1)^{5/8}c_2\left(4\sqrt[4]{-1}2^{3/4}\operatorname{arcsinh}\left(\frac{1}{2}\sqrt[4]{-\frac{1}{2}}\sqrt[4]{-8\cos^2(2x)-16\cos(2x)-8}\right)-i\sqrt[4]{-8\cos^2(2x)-16\cos(2}\right.}{8\sqrt[8]{2}\sqrt[8]{-8\cos^2(2x)-16\cos(2x)-8}}\right.\right.$$

✓ **Maple** : cpu = 0.185 (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))
```

$$y(x) = \frac{i\sin(x)\cos(x)\,c_2 - \ln(\sin(x) + i\cos(x))\,c_2 + c_1}{\sqrt{\cos(x)}}$$

2.1089 ODE No. 1089

$$-y'(x)(ab+c+x)+ay''(x)+y(x)(b(c+x)+d)=0$$

✓ **Mathematica** : cpu = 0.024194 (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,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{bx}\,\text{HermiteH}\left(d,\frac{x}{\sqrt{2}\sqrt{a}}-\frac{ab-c}{\sqrt{2}\sqrt{a}}\right)+c_2e^{bx}\,\text{Hypergeometric1F1}\left(-\frac{d}{2},\frac{1}{2},\left(\frac{x}{\sqrt{2}\sqrt{a}}-\frac{ab-c}{\sqrt{2}\sqrt{a}}\right)^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.049 (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))
```

$$y(x)=\mathrm{e}^{bx}\left(\text{KummerU}\left(-\frac{d}{2},\frac{1}{2},\frac{(ab-c-x)^2}{2a}\right)c_2+\text{KummerM}\left(-\frac{d}{2},\frac{1}{2},\frac{(ab-c-x)^2}{2a}\right)c_1\right)$$

2.1090 ODE No. 1090

$$a(a^2 - 2be^{-ax})\,y'(x) + a^2y''(x) + b^2e^{-2ax}y(x) = 0$$

✓ **Mathematica** : cpu = 0.0215865 (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][y][x] =
```

$$\left\{\left\{y(x)\to c_1e^{-\frac{be^{-ax}}{a^2}} - \frac{bc_2e^{-\frac{be^{-ax}}{a^2}-ax}}{a^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.037 (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(
```

$$y(x) = \mathrm{e}^{-\frac{a^3x+2b\,\mathrm{e}^{-ax}}{2a^2}}\left(\sinh\left(\frac{ax}{2}\right)c_1 + \cosh\left(\frac{ax}{2}\right)c_2\right)$$

2.1091 ODE No. 1091

$$x(y''(x) + y(x)) - \cos(x) = 0$$

✓ **Mathematica** : cpu = 0.0161219 (sec), leaf count = 41

```
DSolve[-Cos[x] + x*(y[x] + Derivative[2][y][x]) == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{2}(\text{CosIntegral}(2x)\sin(x) - \text{Si}(2x)\cos(x) + \log(x)\sin(x)) + c_1\cos(x) + c_2\sin(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.12 (sec), leaf count = 35

```
dsolve(x*(diff(diff(y(x),x),x)+y(x))-cos(x)=0,y(x))
```

$$y(x) = \frac{\sin(x)\,\mathrm{Ci}(2x)}{2} - \frac{\mathrm{Si}(2x)\cos(x)}{2} + \frac{(2c_2 + \ln(x))\sin(x)}{2} + \cos(x)\,c_1$$

2.1092 ODE No. 1092

$$(a+x)y(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0494706 (sec), leaf count = 72

```
DSolve[(a + x)*y[x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2e^{-ix}x\,\text{Hypergeometric1F1}\left(1-\frac{1}{4}i(-2(a-2)-4),2,2ix\right)+c_1e^{-ix}x\,\text{HypergeometricU}\left(1-\frac{1}{4}i(-\right.\right.\right.$$

✓ **Maple** : cpu = 0.047 (sec), leaf count = 29

```
dsolve(x*diff(diff(y(x),x),x)+(x+a)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{WhittakerM}\left(-\frac{ia}{2},\frac{1}{2},2ix\right)+c_2\,\text{WhittakerW}\left(-\frac{ia}{2},\frac{1}{2},2ix\right)$$

2.1093 ODE No. 1093

$$xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0107821 (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 = 0.006 (sec), leaf count = 10

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)=0,y(x))
```

$$y(x) = c_2 \ln(x) + c_1$$

2.1094 ODE No. 1094

$$ay(x) + xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0130877 (sec), leaf count = 41

```
DSolve[a*y[x] + Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \operatorname{BesselJ}\left(0, 2\sqrt{a}\sqrt{x}\right) + 2c_2 \operatorname{BesselY}\left(0, 2\sqrt{a}\sqrt{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 29

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = \operatorname{BesselJ}\left(0, 2\sqrt{a}\,\sqrt{x}\right) c_1 + c_2 \operatorname{BesselY}\left(0, 2\sqrt{a}\,\sqrt{x}\right)$$

2.1095 ODE No. 1095

$$lxy(x) + xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0054901 (sec), leaf count = 30

```
DSolve[l*x*y[x] + Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{BesselJ}\left(0,\sqrt{l}x\right)+c_2\,\text{BesselY}\left(0,\sqrt{l}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (sec), leaf count = 23

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)+l*x*y(x)=0,y(x))
```

$$y(x) = c_1\,\text{BesselJ}\left(0,\sqrt{l}\,x\right)+c_2\,\text{BesselY}\left(0,\sqrt{l}\,x\right)$$

2.1096 ODE No. 1096

$$(a+x)y(x)+xy''(x)+y'(x)=0$$

✓ **Mathematica** : cpu = 0.0075766 (sec), leaf count = 61

```
DSolve[(a + x)*y[x] + Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{-ix}\,\text{HypergeometricU}\left(\frac{1}{2}i(a-i),1,2ix\right)+c_2e^{-ix}\,\text{LaguerreL}\left(-\frac{1}{2}i(a-i),2ix\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.089 (sec), leaf count = 39

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)+(x+a)*y(x)=0,y(x))
```

$$y(x)=\mathrm{e}^{-ix}\left(\text{KummerM}\left(\frac{1}{2}+\frac{ia}{2},1,2ix\right)c_1+\text{KummerU}\left(\frac{1}{2}+\frac{ia}{2},1,2ix\right)c_2\right)$$

2.1097 ODE No. 1097

$$ay(x) + xy''(x) - y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0157298 (sec), leaf count = 46

```
DSolve[a*y[x] - Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to 2ac_1x\,\text{BesselJ}\left(2,2\sqrt{a}\sqrt{x}\right)-2ac_2x\,\text{BesselY}\left(2,2\sqrt{a}\sqrt{x}\right)\right\}\right\}$$

✓ **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))
```

$$y(x) = x\left(\text{BesselY}\left(2,2\sqrt{a}\,\sqrt{x}\right)c_2+\text{BesselJ}\left(2,2\sqrt{a}\,\sqrt{x}\right)c_1\right)$$

2.1098 ODE No. 1098

$$-ax^3y(x) + xy''(x) - y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0058543 (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 = 0.012 (sec), leaf count = 27

```
dsolve(x*diff(diff(y(x),x),x)-diff(y(x),x)-y(x)*a*x^3=0,y(x))
```

$$y(x) = c_1\sinh\left(\frac{x^2\sqrt{a}}{2}\right)+c_2\cosh\left(\frac{x^2\sqrt{a}}{2}\right)$$

2.1099 ODE No. 1099

$$x^3\left(e^{x^3}-v^2\right)y(x)+xy''(x)-y'(x)=0$$

✗ **Mathematica** : cpu = 0.64929 (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], x]

✓ **Maple** : cpu = 0.083 (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))
```

$$y(x)=c_1\,\mathrm{BesselJ}\left(v,\mathrm{e}^{\frac{x^2}{2}}\right)+c_2\,\mathrm{BesselY}\left(v,\mathrm{e}^{\frac{x^2}{2}}\right)$$

2.1100 ODE No. 1100

$$xy''(x) + 2y'(x) - xy(x) - e^x = 0$$

✓ **Mathematica** : cpu = 0.0115769 (sec), leaf count = 44

```
DSolve[-E^x - x*y[x] + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{e^x(2x-1)}{4x}+\frac{c_1e^{-x}}{x}+\frac{c_2e^x}{2x}\right\}\right\}$$

✓ **Maple** : cpu = 0.024 (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))
```

$$y(x) = \frac{\sinh(x)\, c_2}{x} + \frac{\cosh(x)\, c_1}{x} + \frac{e^x}{2}$$

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).

$$\begin{aligned} y' &= \frac{u'}{x} - \frac{u}{x^2} \\ y'' &= \frac{u''}{x} - \frac{u'}{x^2} - \frac{u'}{x^2} + 2\frac{u}{x^3} \end{aligned}$$

And (1) becomes

$$\begin{aligned} x\left(\frac{u''}{x} - \frac{u'}{x^2} - \frac{u'}{x^2} + 2\frac{u}{x^3}\right) + 2\left(\frac{u'}{x} - \frac{u}{x^2}\right) - x\left(\frac{u}{x}\right) &= 0 \\ u'' - 2\frac{u'}{x} + 2\frac{u}{x^2} + \frac{2u'}{x} - \frac{2u}{x^2} - u &= 0 \\ u'' - u &= 0 \end{aligned}$$

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

$$
\begin{aligned}
y_{r=0} &= \sum_{n=0}^{\infty} c_n x^n = c_0 + c_1 x^1 + c_2 x^2 + c_3 x^3 + \cdots \\
&= c_0 + \frac{c_0}{6} x^2 + \frac{c_0}{120} x^4 + \cdots \\
&= A\left(1 + \frac{1}{6} x^2 + \frac{1}{120} x^4 + \cdots\right) \qquad (3)
\end{aligned}
$$

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
```

2.1101 ODE No. 1101

$$axy(x) + xy''(x) + 2y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0108857 (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 = 0.033 (sec), leaf count = 29

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+a*x*y(x)=0,y(x))
```

$$y(x) = \frac{c_2 \cosh\left(\sqrt{-a}\,x\right) + c_1 \sinh\left(\sqrt{-a}\,x\right)}{x}$$

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 $\lim_{x\to 0}x^2q(x)=\lim_{x\to 0}-ax^2=0$ which is analytic. Hence the singularity is regular (removable). Using Frobenius series, assume that

$$y=\sum_{n=-\infty}^{\infty}c_nx^{n+r}$$

Where $c_n=0$ for $n<0$. Hence

$$\begin{aligned}y'&=\sum(n+r)\,c_nx^{n+r-1}\\y''&=\sum(n+r)\,(n+r-1)\,c_nx^{n+r-2}\end{aligned}$$

Substituting back in the original ODE gives

$$\sum(n+r)\,(n+r-1)\,c_nx^{n+r-1}+\sum 2(n+r)\,c_nx^{n+r-1}+\sum ac_nx^{n+r+1}=0$$

Adjusting so that all have same power x^{n+r} gives

$$\sum(n+r+1)\,(n+r)\,c_{n+1}x^{n+r}+\sum 2(n+r+1)\,c_{n+1}x^{n+r}+\sum ac_{n-1}x^{n+r}=0$$

Hence

$$\begin{aligned}(n+r+1)\,(n+r)\,c_{n+1}+2(n+r+1)\,c_{n+1}+ac_{n-1}&=0\\(n+r+1)\,(2+(n+r))\,c_{n+1}+ac_{n-1}&=0\end{aligned}\tag{2}$$

We want equation with c_0 in it. Hence let $n=-1$

$$(-1+r+1)\,(2+(-1+r))\,c_0+ac_{-2}=0$$

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)

$$
\begin{aligned}
(n+1)(2+n)\, c_{n+1} + a c_{n-1} &= 0 \\
c_{n+1} &= \frac{-a c_{n-1}}{(n+1)(2+n)}
\end{aligned}
$$

For $n=0$

$$
c_1 = \frac{-a c_{-1}}{(n+1)(2+n)} = 0
$$

For $n=1$

$$
c_2 = \frac{-a c_0}{(2)(3)}
$$

For $n=2$

$$
c_3 = \frac{-a c_1}{(n+1)(2+n)} = 0
$$

For $n=3$

$$
c_4 = \frac{-a c_2}{(4)(5)} = \frac{-a(-a c_0)}{(2)(3)(4)(5)} = \frac{a^2 c_0}{(2)(3)(4)(5)}
$$

And so on. Hence, for $r=0$ we have

$$
\begin{aligned}
y_{r=0} &= \sum_{n=0}^{\infty} c_n x^n = c_0 + c_1 x^1 + c_2 x^2 + c_3 x^3 + \cdots \\
&= c_0 - a\frac{c_0}{6} x^2 + a^2 \frac{c_0}{120} x^4 + \cdots \\
&= A\left(1 - a\frac{1}{6}x^2 + a^2\frac{1}{120}x^4 + \cdots\right) \qquad (3)
\end{aligned}
$$

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)

$$
\begin{aligned}
(n-1+1)\left(2+(n-1)\right) c_{n+1} + a c_{n-1} &= 0 \\
n(1+n)\, c_{n+1} + a c_{n-1} &= 0 \\
c_{n+1} &= \frac{-a c_{n-1}}{n(1+n)}
\end{aligned}
$$

For $n=0$

$$
c_1 = \frac{-a c_{-1}}{n(1+n)} = 0
$$

For $n=1$

$$
c_2 = \frac{-a c_0}{2}
$$

For $n=2$

$$
c_3 = \frac{-a c_1}{n(1+n)} = 0
$$

For $n=3$

$$
c_4 = \frac{-a c_2}{(3)(4)} = \frac{-a(-a c_0)}{(2)(3)(4)} = \frac{a^2 c_0}{(2)(3)(4)}
$$

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.

<u>Third method</u> Using Laplace transform. Using property $\mathcal{L}xf(x) = -\frac{d}{ds}F(s)$ then the Laplace transform of the ODE becomes

$$
\begin{aligned}
\mathcal{L}(xy'' + 2y' + axy) &= 0 \\
-\frac{d}{ds}(\mathcal{L}y'') + 2\left(-\frac{d}{ds}(\mathcal{L}y')\right) + a\left(-\frac{d}{ds}Y\right) &= 0 \\
-\frac{d}{ds}(s^2Y - sA - B) + 2\left(-\frac{d}{ds}(sY - A)\right) + a(-Y') &= 0
\end{aligned}
$$

Where $A = y(0)\,, B = y'(0)$. Simplifying gives

$$
\begin{aligned}
-(2sY + s^2Y' - A) - 2(Y + sY') - aY' &= 0 \\
Y'(-s^2 - 2s - a) + Y(-2s - 2) + A &= 0 \\
Y' + Y\frac{2s+2}{s^2+2s+a} &= \frac{A}{s^2+2s+a}
\end{aligned}
$$

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
```

2.1102 ODE No. 1102

$$ax^2y(x) + xy''(x) + 2y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0045538 (sec), leaf count = 42

```
DSolve[a*x^2*y[x] + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1 \operatorname{AiryAi}\left(-\frac{ax}{(-a)^{2/3}}\right)}{x} + \frac{c_2 \operatorname{AiryBi}\left(-\frac{ax}{(-a)^{2/3}}\right)}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 33

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+y(x)*a*x^2=0,y(x))
```

$$y(x) = \frac{c_2 \operatorname{BesselY}\left(\frac{1}{3}, \frac{2\sqrt{a}\,x^{\frac{3}{2}}}{3}\right) + c_1 \operatorname{BesselJ}\left(\frac{1}{3}, \frac{2\sqrt{a}\,x^{\frac{3}{2}}}{3}\right)}{\sqrt{x}}$$

Hand solution

$$xy'' + 2y' + ax^2y = 0 \tag{1}$$

Since there is a term $2y$, we can use $y = \frac{u(x)}{x}$, hence

$$\begin{aligned} y' &= \frac{u'}{x} - \frac{u}{x^2} \\ y'' &= \frac{u''}{x} - \frac{u'}{x^2} - \frac{u'}{x^2} + 2\frac{u}{x^3} \end{aligned}$$

And (1) becomes

$$\begin{aligned} x\left(\frac{u''}{x} - \frac{u'}{x^2} - \frac{u'}{x^2} + 2\frac{u}{x^3}\right) + 2\left(\frac{u'}{x} - \frac{u}{x^2}\right) + ax^2\left(\frac{u}{x}\right) &= 0 \\ u'' - 2\frac{u'}{x} + 2\frac{u}{x^2} + \frac{2u'}{x} - \frac{2u}{x^2} + axu &= 0 \\ u'' + axu &= 0 \end{aligned} \tag{2}$$

This is Emdon-Fowler. (form is $u'' + x^n u = 0$) with $n = 1$. Assume that

$$u = \sum_{n=0}^{\infty} c_n x^n$$

Hence

$$
\begin{aligned}
u' &= \sum_{n=0} n c_n x^{n-1} = \sum_{n=1} n c_n x^{n-1} = \sum_{n=0} (n+1)\, c_{n+1} x^n \\
u'' &= \sum_{n=0} n(n+1)\, c_{n+1} x^{n-1} = \sum_{n=1} n(n+1)\, c_{n+1} x^{n-1} = \sum_{n=0} (n+1)\,(n+2)\, c_{n+2} x^n
\end{aligned}
$$

Substituting back in (2) gives

$$
\begin{aligned}
\sum_{n=0} (n+1)\,(n+2)\, c_{n+2} x^n + \sum_{n=0} a c_n x^{n+1} &= 0 \\
\sum_{n=0} (n+1)\,(n+2)\, c_{n+2} x^n + \sum_{n=1} a c_{n-1} x^n &= 0
\end{aligned}
$$

For $n = 0$

$$
(1)\,(2)\, c_2 = 0
$$

Hence $c_2 = 0$. For $n \geq 1$

$$
\begin{aligned}
(n+1)\,(n+2)\, c_{n+2} + a c_{n-1} &= 0 \\
c_{n+2} &= \frac{-a c_{n-1}}{(n+1)\,(n+2)} \qquad (3)
\end{aligned}
$$

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,

$$\begin{aligned}
u&=\sum_{n=0}^{\infty}c_nx^n=c_0+c_1x^1+c_2x^2+c_3x^3+\cdots\\
&=c_0+c_1x+0+c_3x^3+c_4x^4+0+c_6x^6+c_7x^7+0+c_9x^9+\cdots\\
&=c_0+c_1x-\frac{ac_0}{(2)(3)}x^3-\frac{ac_1}{(3)(4)}x^4+\frac{a^2c_0}{(2)(3)(5)(6)}x^6+\frac{a^2c_1}{(3)(4)(6)(7)}x^7-\frac{a^3c_0}{(2)(3)(5)(6)(8)(9)}x^9-\frac{a}{(3)(4)(6)}\\
&=c_0\left(1-\frac{a}{6}x^3+\frac{a^2}{180}x^6-\frac{a^3}{12\,960}x^9+\cdots\right)+xc_1\left(1-\frac{a}{12}x^3+\frac{a^2}{504}x^6-\frac{a^3}{45\,360}x^9+\cdots\right)\\
&=c_0\left(1-\frac{1}{6}\left(a^{\frac{1}{3}}x\right)^3+\frac{1}{180}\left(a^{\frac{1}{3}}x\right)^6-\frac{1}{12\,960}\left(a^{\frac{1}{3}}x\right)^9+\cdots\right)+xc_1\left(1-\frac{1}{12}\left(a^{\frac{1}{3}}x\right)^3+\frac{1}{504}\left(a^{\frac{1}{3}}x\right)^6-\frac{1}{45\,360}\left(a^{\frac{1}{3}}\right.\right.
\end{aligned}$$

Comparing the above to the series expansion of Airy functions, we see that

$$u=c_0\operatorname{AiryAI}\left(-a^{\frac{1}{3}}x\right)+c_1\operatorname{AiryBI}\left(-a^{\frac{1}{3}}x\right)$$

And since $y=\frac{u(x)}{x}$ then

$$y=\frac{1}{x}\left(c_0\operatorname{AiryAI}\left(-a^{\frac{1}{3}}x\right)+c_1\operatorname{AiryBI}\left(-a^{\frac{1}{3}}x\right)\right)$$

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
```

2.1103 ODE No. 1103

$$ay(x) + xy''(x) - 2y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0155803 (sec), leaf count = 64

```
DSolve[a*y[x] - 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to 6a^{3/2}c_1x^{3/2}\,\text{BesselJ}\left(3,2\sqrt{a}\sqrt{x}\right)-2ia^{3/2}c_2x^{3/2}\,\text{BesselY}\left(3,2\sqrt{a}\sqrt{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 33

```
dsolve(x*diff(diff(y(x),x),x)-2*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = x^{\frac{3}{2}}\left(\text{BesselY}\left(3,2\sqrt{a}\,\sqrt{x}\right)c_2+\text{BesselJ}\left(3,2\sqrt{a}\,\sqrt{x}\right)c_1\right)$$

2.1104 ODE No. 1104

$$ay(x) + vy'(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0205811 (sec), leaf count = 104

```
DSolve[a*y[x] + v*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 a^{\frac{v-1}{2}-v+1} x^{\frac{v-1}{2}-v+1} \text{Gamma}(2-v) \text{BesselJ}\left(1-v, 2\sqrt{a}\sqrt{x}\right) + c_1 a^{\frac{1-v}{2}} x^{\frac{1-v}{2}} \text{Gamma}(v) \text{BesselJ}\left(v-1,\right.\right.\right.$$

✓ **Maple** : cpu = 0.017 (sec), leaf count = 41

```
dsolve(x*diff(diff(y(x),x),x)+v*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = x^{\frac{1}{2}-\frac{v}{2}} \left(\text{BesselY}\left(v-1, 2\sqrt{a}\,\sqrt{x}\right) c_2 + \text{BesselJ}\left(v-1, 2\sqrt{a}\,\sqrt{x}\right) c_1\right)$$

2.1105 ODE No. 1105

$$ay'(x) + bxy(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0107106 (sec), leaf count = 64

```
DSolve[b*x*y[x] + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 x^{\frac{1-a}{2}} \operatorname{BesselJ}\left(\frac{a-1}{2}, \sqrt{b}x\right) + c_2 x^{\frac{1-a}{2}} \operatorname{BesselY}\left(\frac{a-1}{2}, \sqrt{b}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.038 (sec), leaf count = 39

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x)+b*x*y(x)=0,y(x))
```

$$y(x) = x^{-\frac{a}{2}+\frac{1}{2}}\left(\operatorname{BesselY}\left(\frac{a}{2}-\frac{1}{2}, \sqrt{b}\,x\right) c_2 + \operatorname{BesselJ}\left(\frac{a}{2}-\frac{1}{2}, \sqrt{b}\,x\right) c_1\right)$$

2.1106 ODE No. 1106

$$a y'(x) + b x^{\mathrm{a1}} y(x) + x y''(x) = 0$$

✓ **Mathematica** : cpu = 0.028027 (sec), leaf count = 441

```
DSolve[b*x^a1*y[x] + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\left(\frac{1}{\mathrm{a1}}+1\right)^{\frac{a}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}-\frac{1}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}}\mathrm{a1}^{\frac{a}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}-\frac{1}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}}b^{\frac{1}{2}\left(\frac{1}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}-\frac{a}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}\right)}\left(x^{\mathrm{a1}}\right)^{\frac{1}{2}\left(\frac{1}{\mathrm{a1}}+1\right)\left(\frac{1}{\left(\frac{1}{\mathrm{a1}}+1\right)\mathrm{a1}}-\frac{a}{\left(\frac{1}{\mathrm{a1}}+\right.}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.181 (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))
```

$$y(x) = x^{-\frac{a}{2}+\frac{1}{2}}\left(\mathrm{BesselJ}\left(\frac{a-1}{\mathrm{a1}+1}, \frac{2\sqrt{b}\,x^{\frac{\mathrm{a1}}{2}+\frac{1}{2}}}{\mathrm{a1}+1}\right)c_1 + \mathrm{BesselY}\left(\frac{a-1}{\mathrm{a1}+1}, \frac{2\sqrt{b}\,x^{\frac{\mathrm{a1}}{2}+\frac{1}{2}}}{\mathrm{a1}+1}\right)c_2\right)$$

2.1107 ODE No. 1107

$$ay(x) + (b + x)y'(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0145809 (sec), leaf count = 40

```
DSolve[a*y[x] + (b + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{-x}\,\text{HypergeometricU}(b-a,b,x)+c_2e^{-x}L_{a-b}^{b-1}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.096 (sec), leaf count = 30

```
dsolve(x*diff(diff(y(x),x),x)+(x+b)*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^{-x}(\text{KummerU}\left(-a+b,b,x\right)c_2+\text{KummerM}\left(-a+b,b,x\right)c_1)$$

2.1108 ODE No. 1108

$$(a+b+x)y'(x)+ay(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0166929 (sec), leaf count = 37

```
DSolve[a*y[x] + (a + b + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{-x}\,\text{HypergeometricU}(b,a+b,x)+c_2e^{-x}L_{-b}^{a+b-1}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.095 (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))
```

$$y(x)=\mathrm{e}^{-x}(\text{KummerM}\left(b,a+b,x\right)c_1+\text{KummerU}\left(b,a+b,x\right)c_2)$$

2.1109 ODE No. 1109

$$xy''(x) - xy'(x) - y(x) - e^x x(x+1) = 0$$

✓ **Mathematica** : cpu = 0.151399 (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]
```

$$\{\{y(x) \to c_2(-e^x x\,\text{ExpIntegralEi}(-x) - 1) + e^x\left(x^2 + x - x\log(-x) - 1\right) + c_1 e^x x\}\}$$

✓ **Maple** : cpu = 0.038 (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))
```

$$y(x) = \mathrm{e}^x\left(-c_1\,\mathrm{expIntegral}_1\,(x)\,x + x^2 + c_2 x - x\ln{(x)} + \mathrm{e}^{-x}c_1 - 1\right)$$

2.1110 ODE No. 1110

$$-ay(x) + xy''(x) - xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0248216 (sec), leaf count = 36

```
DSolve[-(a*y[x]) - x*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 G_{1,2}^{2,0}\left(-x\middle|\begin{array}{c}1-a\\0,1\end{array}\right) + c_1 x \,\text{Hypergeometric1F1}(a+1,2,x)\right\}\right\}$$

✓ **Maple** : cpu = 0.038 (sec), leaf count = 23

```
dsolve(x*diff(diff(y(x),x),x)-x*diff(y(x),x)-a*y(x)=0,y(x))
```

$$y(x) = x(\text{KummerU}\,(a+1,2,x)\,c_2 + \text{KummerM}\,(a+1,2,x)\,c_1)$$

2.1111 ODE No. 1111

$$xy''(x) - (x+1)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0202992 (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 = 0.017 (sec), leaf count = 13

```
dsolve(x*diff(diff(y(x),x),x)-(1+x)*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = c_2 e^x + xc_1 + c_1$$

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

$$\begin{aligned}\mathcal{L}(xy'') &= -\frac{d}{ds}(s^2Y - As - B)\\ &= -(2sY + s^2Y' - A)\end{aligned}$$

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

$$
\begin{aligned}
d\left((s-1)\,s^2Y\right)&=(s-1)\,s^2\frac{2A}{s\,(s-1)}\\
(s-1)\,s^2Y&=2A\int sds+c_1\\
(s-1)\,s^2Y&=2A\frac{s^2}{2}+c_1\\
Y&=\frac{As^2+c_1}{(s-1)\,s^2}
\end{aligned}
$$

Inverse Laplace transform gives

$$
\begin{aligned}
y(x)&=-c_1+(A+c_1)\,e^x-c_1x\\
&=-c_1(1+x)+(A+c_1)\,e^x
\end{aligned}
$$

Let $-c_1=A_0, A+c_1+B_0$, hence

$$
y(x)=A_0(1+x)+B_0e^x
$$

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
```

2.1112 ODE No. 1112

$$xy''(x) - (x+1)y'(x) - 2(x-1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.013387 (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 = 0.022 (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))
```

$$y(x) = c_1 \mathrm{e}^{2x} + c_2 \mathrm{e}^{-x} (3x+1)$$

2.1113 ODE No. 1113

$$-ay(x) + (b - x)y'(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0085912 (sec), leaf count = 24

```
DSolve[-(a*y[x]) + (b - x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 \operatorname{HypergeometricU}(a, b, x) + c_2 L_{-a}^{b-1}(x)\}\}$$

✓ **Maple** : cpu = 0.078 (sec), leaf count = 17

```
dsolve(x*diff(diff(y(x),x),x)+(b-x)*diff(y(x),x)-a*y(x)=0,y(x))
```

$$y(x) = c_1 \operatorname{KummerM}(a, b, x) + c_2 \operatorname{KummerU}(a, b, x)$$

2.1114 ODE No. 1114

$$xy''(x) - 2(x-1)y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0314473 (sec), leaf count = 39

```
DSolve[-y[x] - 2*(-1 + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2G_{1,2}^{2,0}\left(-2x\middle|\begin{array}{c}\frac{1}{2}\\-1,0\end{array}\right)+c_1e^x(\text{BesselI}(0,x)-\text{BesselI}(1,x))\right\}\right\}$$

✓ **Maple** : cpu = 0.046 (sec), leaf count = 34

```
dsolve(x*diff(diff(y(x),x),x)-2*(x-1)*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = (-c_2 \operatorname{BesselK}(1,-x) + c_2 \operatorname{BesselK}(0,-x) + c_1(\operatorname{BesselI}(0,x) - \operatorname{BesselI}(1,x)))\,\mathrm{e}^x$$

2.1115 ODE No. 1115

$$xy''(x) - (3x-2)y'(x) + (3-2x)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0344987 (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]
```

$$\left\{\left\{y(x)\to c_2e^{-\frac{1}{2}\left(\sqrt{17}-3\right)x}\,\text{Hypergeometric1F1}\left(1-\frac{6}{\sqrt{17}},2,\sqrt{17}x\right)+c_1e^{-\frac{1}{2}\left(\sqrt{17}-3\right)x}\,\text{HypergeometricU}\left(1-\frac{6}{\sqrt{}}\right.\right.\right.$$

✓ **Maple** : cpu = 1.642 (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))
```

$$y(x) = \mathrm{e}^{-\frac{x\left(-3+\sqrt{17}\right)}{2}}\left(\text{KummerM}\left(1-\frac{6\sqrt{17}}{17},2,\sqrt{17}\,x\right)c_1+\text{KummerU}\left(1-\frac{6\sqrt{17}}{17},2,\sqrt{17}\,x\right)c_2\right)$$

2.1116 ODE No. 1116

$$y'(x)(ax+b+n)+any(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0263927 (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]
```

$$\left\{\left\{y(x)\to c_1e^{-ax}\,\text{HypergeometricU}(b,b+n,ax)+c_2e^{-ax}L_{-b}^{b+n-1}(ax)\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (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))
```

$$y(x)=\mathrm{e}^{-ax}(\text{KummerU}\,(b,b+n,ax)\,c_2+\text{KummerM}\,(b,b+n,ax)\,c_1)$$

2.1117 ODE No. 1117

$$-(x+1)(a+b)y'(x)+abxy(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0396362 (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]
```

$$\left\{\left\{y(x)\to c_1\,\text{HypergeometricU}\left(-\frac{-a^2-ba-a+b}{a-b},a+b+2,(a-b)x\right)e^{(a+b+1)\log(x)+bx}+c_2L_{\frac{-a^2-ba-a+b}{a-b}}^{a+b+1}((a-\right.\right.$$

✓ **Maple** : cpu = 0.141 (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))
```

$$y(x)=\mathrm{e}^{bx}x^{a+b+1}\left(\text{KummerU}\left(\frac{a^2+ab+a-b}{a-b},2+a+b,x(a-b)\right)c_2+\text{KummerM}\left(\frac{a^2+ab+a-b}{a-b},2+a+\right.\right.$$

2.1118 ODE No. 1118

$$y'(x)(x(a+b)+m+n)+y(x)(abx+an+bm)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0375763 (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][x] ==
```

$$\left\{\left\{y(x)\to c_1e^{-ax}\text{HypergeometricU}(m,m+n,(a-b)x)+c_2e^{-ax}L_{-m}^{m+n-1}((a-b)x)\right\}\right\}$$

✓ **Maple** : cpu = 0.117 (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))
```

$$y(x)=\mathrm{e}^{-ax}(\text{KummerU}\left(m,m+n,x(a-b)\right)c_2+\text{KummerM}\left(m,m+n,x(a-b)\right)c_1)$$

2.1119 ODE No. 1119

$$y(x)\left(a^2x+2ab\right)-2(ax+b)y'(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0684808 (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[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{ax}x^{b-\frac{1}{2}\sqrt{(2b+1)^2}+\frac{1}{2}}+\frac{c_2e^{ax}x^{b+\frac{1}{2}\sqrt{(2b+1)^2}+\frac{1}{2}}}{\sqrt{(2b+1)^2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.036 (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))
```

$$y(x)=\mathrm{e}^{ax}\left(x^{2b+1}c_2+c_1\right)$$

2.1120 ODE No. 1120

$$(ax+b)y'(x)+y(x)(cx+d)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0253482 (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]
```

$$\left\{\left\{y(x)\to c_1e^{-\frac{1}{2}x\sqrt{a^2-4c}-\frac{ax}{2}}\,\text{HypergeometricU}\left(-\frac{-ab-\sqrt{a^2-4c}b+2d}{2\sqrt{a^2-4c}},b,\sqrt{a^2-4c}x\right)+c_2e^{-\frac{1}{2}x\sqrt{a^2-4c}-\frac{ax}{2}}L^{b}\right.\right.$$

✓ **Maple** : cpu = 0.247 (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))
```

$$y(x)=\mathrm{e}^{-\frac{x\left(\sqrt{a^2-4c}+a\right)}{2}}\left(\text{KummerU}\left(\frac{b\sqrt{a^2-4c}+ab-2d}{2\sqrt{a^2-4c}},b,\sqrt{a^2-4c}\,x\right)c_2+\text{KummerM}\left(\frac{b\sqrt{a^2-4c}+ab-2d}{2\sqrt{a^2-4c}}\right.\right.$$

2.1121 ODE No. 1121

$$-\left(x^2-x\right)y'(x)+xy''(x)+(x-1)y(x)=0$$

✓ **Mathematica** : cpu = 0.197196 (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]
```

$$\left\{\left\{y(x)\to c_2x\int_1^x\frac{e^{\frac{K[1]^2}{2}-K[1]}}{K[1]^2}dK[1]+c_1x\right\}\right\}$$

✓ **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))
```

$$y(x)=\left(\left(\int\frac{e^{\frac{x(x-2)}{2}}}{x^2}dx\right)c_1+c_2\right)x$$

2.1122 ODE No. 1122

$$-\left(x^2-x-2\right)y'(x)+xy''(x)-x(x+3)y(x)=0$$

✓ **Mathematica** : cpu = 0.327244 (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[x],x]
```

$$\left\{\left\{y(x)\to c_2e^{\frac{x^2}{2}}\int_1^x \frac{e^{-\frac{1}{2}K[1]^2-K[1]}}{K[1]^2}dK[1]+c_1e^{\frac{x^2}{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.263 (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))
```

$$y(x)=\mathrm{e}^{\frac{x^2}{2}}\left(\left(\int\frac{\mathrm{e}^{-\frac{x(x+2)}{2}}}{x^2}dx\right)c_2+c_1\right)$$

2.1123 ODE No. 1123

$$-\left(2ax^2+1\right)y'(x)+bx^3y(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0077571 (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 = 0.053 (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))
```

$$y(x)=c_1\mathrm{e}^{\frac{x^2\left(\sqrt{a^2-b}+a\right)}{2}}+c_2\mathrm{e}^{\frac{x^2\left(-\sqrt{a^2-b}+a\right)}{2}}$$

2.1124 ODE No. 1124

$$-2\left(x^2-a\right)y'(x)+2nxy(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0460383 (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]
```

$$\left\{\left\{y(x)\to c_1\,\text{Hypergeometric1F1}\left(-\frac{n}{2},a+\frac{1}{2},x^2\right)+i^{1-2a}c_2x^{1-2a}\,\text{Hypergeometric1F1}\left(-a-\frac{n}{2}+\frac{1}{2},\frac{3}{2}-a,x^2\right.\right.\right.$$

✓ **Maple** : cpu = 0.115 (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))
```

$$y(x)=c_1\,\text{KummerM}\left(-\frac{n}{2},\frac{1}{2}+a,x^2\right)+c_2\,\text{KummerU}\left(-\frac{n}{2},\frac{1}{2}+a,x^2\right)$$

2.1125 ODE No. 1125

$$-4x^5 - 4x^3y(x) + (4x^2 - 1)\,y'(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.115203 (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[x],x]
```

$$\left\{\left\{y(x) \to -\frac{3\sqrt{2}x^2 + 4x^2 + 6\sqrt{2} + 8}{\sqrt{2}\,(3 + 2\sqrt{2})} + c_1 e^{-\left(\left(1-\sqrt{2}\right)x^2\right)} + c_2 e^{-\left(\left(1+\sqrt{2}\right)x^2\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.039 (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))
```

$$y(x) = \mathrm{e}^{x^2\left(\sqrt{2}-1\right)} c_2 + \mathrm{e}^{-x^2\left(1+\sqrt{2}\right)} c_1 - x^2 - 2$$

2.1126 ODE No. 1126

$$\left(a^2x^3+a\right)y(x)+\left(2ax^3-1\right)y'(x)+xy''(x)=0$$

✗ **Mathematica** : cpu = 0.64878 (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[x],x]
```

, DifferentialRoot result

$$\{\{y(x)\to(x)\}\}$$

✓ **Maple** : cpu = 0.028 (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))
```

$$y(x)=\mathrm{e}^{-\frac{a\,x^3}{3}}\left(x^2c_2+c_1\right)$$

2.1127 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 = 0.0198266 (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*Derivative[2
```

$$\left\{\left\{y(x)\to c_1e^{ax}x^{-ax}+c_2e^{ax}x^{-ax}\log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (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,
```

$$y(x)=x^{-ax}\mathrm{e}^{ax}(\ln(x)\,c_2+c_1)$$

2.1128 ODE No. 1128

$$(xf(x)+2)y'(x)+f(x)y(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0157312 (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 = 0.276 (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))
```

$$y(x)=\frac{c_2\left(\int e^{\int \frac{-xf(x)-2}{x}dx}x^2dx\right)+c_1}{x}$$

2.1129 ODE No. 1129

$$(x-3)y''(x)-(4x-9)y'(x)+(3x-6)y(x)=0$$

✓ **Mathematica** : cpu = 0.0819264 (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[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{8}c_2e^{3x-9}\left(4x^3-42x^2+150x-183\right)+c_1e^{x-3}\right\}\right\}$$

✓ **Maple** : cpu = 0.023 (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))
```

$$y(x)=e^{x}c_1+c_2e^{3x}\left(4x^3-42x^2+150x-183\right)$$

2.1130 ODE No. 1130

$$ay(x) + 2xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0072636 (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 = 0.016 (sec), leaf count = 31

```
dsolve(2*x*diff(diff(y(x),x),x)+diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = c_1 \sin\left(\sqrt{x}\,\sqrt{2}\,\sqrt{a}\right) + c_2 \cos\left(\sqrt{x}\,\sqrt{2}\,\sqrt{a}\right)$$

2.1131 ODE No. 1131

$$ay(x) + 2xy''(x) - (x-1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0069403 (sec), leaf count = 58

```
DSolve[a*y[x] - (-1 + x)*Derivative[1][y][x] + 2*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\sqrt{x}\,\text{HypergeometricU}\left(\frac{1}{2}(1-2a),\frac{3}{2},\frac{x}{2}\right)+c_2\sqrt{x}L_{\frac{1}{2}(2a-1)}^{\frac{1}{2}}\left(\frac{x}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (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))
```

$$y(x)=\sqrt{x}\left(\text{KummerM}\left(-a+\frac{1}{2},\frac{3}{2},\frac{x}{2}\right)c_1+\text{KummerU}\left(-a+\frac{1}{2},\frac{3}{2},\frac{x}{2}\right)c_2\right)$$

2.1132 ODE No. 1132

$$ay(x) + 2xy''(x) - (2x - 1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0071402 (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]
```

$$\left\{\left\{y(x) \to c_1\sqrt{x}\,\text{HypergeometricU}\left(\frac{1-a}{2}, \frac{3}{2}, x\right) + c_2\sqrt{x}L_{\frac{a-1}{2}}^{\frac{1}{2}}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (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))
```

$$y(x) = \sqrt{x}\left(\text{KummerM}\left(-\frac{a}{2} + \frac{1}{2}, \frac{3}{2}, x\right)c_1 + \text{KummerU}\left(-\frac{a}{2} + \frac{1}{2}, \frac{3}{2}, x\right)c_2\right)$$

2.1133 ODE No. 1133

$$(2x-1)y''(x)-(3x-4)y'(x)+(x-3)y(x)=0$$

✓ **Mathematica** : cpu = 0.115801 (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[x],x]
```

$$\left\{\left\{y(x)\to 2^{5/8}c_1e^{x-\frac{1}{2}}-\frac{c_2e^{x-\frac{1}{2}}\Gamma\left(-\frac{1}{4},\frac{1}{4}(2x-1)\right)}{4\sqrt[8]{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.129 (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))
```

$$y(x)=\frac{\mathrm{e}^{\frac{x}{2}}\left(\mathrm{KummerU}\left(1,\frac{3}{4},\frac{x}{2}-\frac{1}{4}\right)c_2+\mathrm{KummerM}\left(1,\frac{3}{4},\frac{x}{2}-\frac{1}{4}\right)c_1\right)}{(2x-1)^{\frac{1}{4}}}$$

2.1134 ODE No. 1134

$$(-a-x)y(x)+4xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0546354 (sec), leaf count = 78

```
DSolve[(-a - x)*y[x] + 4*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{4}c_2e^{-x/2}x\,\text{Hypergeometric1F1}\left(\frac{1}{128}(-32(-a-4i)-128i)+1,2,x\right)+\frac{1}{4}c_1e^{-x/2}x\,\text{HypergeometricU}\right.\right.$$

✓ **Maple** : cpu = 0.035 (sec), leaf count = 21

```
dsolve(4*x*diff(diff(y(x),x),x)-(x+a)*y(x)=0,y(x))
```

$$y(x)=c_1\,\text{WhittakerM}\left(-\frac{a}{4},\frac{1}{2},x\right)+c_2\,\text{WhittakerW}\left(-\frac{a}{4},\frac{1}{2},x\right)$$

2.1135 ODE No. 1135

$$4xy''(x) + 2y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0059387 (sec), leaf count = 27

```
DSolve[-y[x] + 2*Derivative[1][y][x] + 4*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \cosh\left(\sqrt{x}\right) + ic_2 \sinh\left(\sqrt{x}\right)\right\}\right\}$$

✓ **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))
```

$$y(x) = c_1 \sinh\left(\sqrt{x}\right) + c_2 \cosh\left(\sqrt{x}\right)$$

2.1136 ODE No. 1136

$$4xy''(x) + 4y'(x) + (-x-2)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0201954 (sec), leaf count = 30

```
DSolve[(-2 - x)*y[x] + 4*Derivative[1][y][x] + 4*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2e^{x/2}\,\text{ExpIntegralEi}(-x)+c_1e^{x/2}\right\}\right\}$$

✓ **Maple** : cpu = 0.023 (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))
```

$$y(x) = \mathrm{e}^{\frac{x}{2}}\left(\mathrm{expIntegral}_1\left(x\right)c_2+c_1\right)$$

2.1137 ODE No. 1137

$$ly(x) + 4xy''(x) - (x+2)y(x) + 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.0518291 (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]
```

$$\left\{\left\{y(x) \to \frac{1}{4}c_2 e^{-x/2} x \,\text{Hypergeometric1F1}\left(\frac{1}{128}(-32(l+(2-4i)) - 128i) + 1, 2, x\right) + \frac{1}{4}c_1 e^{-x/2} x \,\text{Hypergeomet}\right.\right.$$

✓ **Maple** : cpu = 0.047 (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))
```

$$y(x) = c_1 \,\text{WhittakerM}\left(\frac{l}{4} + \frac{1}{2}, \frac{1}{2}, x\right) + c_2 \,\text{WhittakerW}\left(\frac{l}{4} + \frac{1}{2}, \frac{1}{2}, x\right)$$

2.1138 ODE No. 1138

$$y(x)(2m + 4n - x) + 4my'(x) + 4xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0143145 (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]
```

$$\left\{\left\{y(x)\to c_1e^{-x/2}\,\text{HypergeometricU}(-n,m,x) + c_2e^{-x/2}L_n^{m-1}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.087 (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))
```

$$y(x) = \mathrm{e}^{-\frac{x}{2}}\left(\mathrm{KummerM}\left(-n,m,x\right)c_1 + \mathrm{KummerU}\left(-n,m,x\right)c_2\right)$$

2.1139 ODE No. 1139

$$(-a-x)y(x)+16xy''(x)+8y'(x)=0$$

✓ **Mathematica** : cpu = 0.0083281 (sec), leaf count = 74

```
DSolve[(-a - x)*y[x] + 8*Derivative[1][y][x] + 16*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{\frac{1}{4}(2\log(x)-x)}\,\text{HypergeometricU}\left(\frac{a+6}{8},\frac{3}{2},\frac{x}{2}\right)+c_2e^{\frac{1}{4}(2\log(x)-x)}L_{\frac{1}{8}(-a-6)}^{\frac{1}{2}}\left(\frac{x}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.101 (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))
```

$$y(x)=\sqrt{x}\,\mathrm{e}^{-\frac{x}{4}}\left(\text{KummerM}\left(\frac{a}{8}+\frac{3}{4},\frac{3}{2},\frac{x}{2}\right)c_1+\text{KummerU}\left(\frac{a}{8}+\frac{3}{4},\frac{3}{2},\frac{x}{2}\right)c_2\right)$$

2.1140 ODE No. 1140

$$a x y''(x) + b y'(x) + c y(x) = 0$$

✓ **Mathematica** : cpu = 0.0254114 (sec), leaf count = 190

```
DSolve[c*y[x] + b*Derivative[1][y][x] + a*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1 a^{\frac{1}{2}\left(\frac{b}{a}-1\right)} c^{\frac{1}{2}\left(1-\frac{b}{a}\right)} x^{\frac{1}{2}\left(1-\frac{b}{a}\right)} \text{Gamma}\left(\frac{b}{a}\right) \text{BesselJ}\left(\frac{b}{a}-1,\frac{2\sqrt{c}\sqrt{x}}{\sqrt{a}}\right)+c_2 a^{\frac{1}{2}\left(1-\frac{b}{a}\right)-\frac{a-b}{a}} c^{\frac{a-b}{a}+\frac{1}{2}\left(\frac{b}{a}-1\right)} x$$

✓ **Maple** : cpu = 0.023 (sec), leaf count = 66

```
dsolve(a*x*diff(diff(y(x),x),x)+b*diff(y(x),x)+y(x)*c=0,y(x))
```

$$y(x) = x^{\frac{a-b}{2a}}\left(\text{BesselY}\left(\frac{-a+b}{a}, 2\sqrt{\frac{c}{a}}\sqrt{x}\right)c_2 + \text{BesselJ}\left(\frac{-a+b}{a}, 2\sqrt{\frac{c}{a}}\sqrt{x}\right)c_1\right)$$

2.1141 ODE No. 1141

$$(3a + bx)y'(x) + axy''(x) + 3by(x) = 0$$

✓ **Mathematica** : cpu = 0.129425 (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]
```

$$\left\{\left\{y(x)\to c_1e^{-\frac{bx}{a}}-\frac{c_2e^{-\frac{bx}{a}}\left(a^2e^{\frac{bx}{a}}-b^2x^2\operatorname{ExpIntegralEi}\left(\frac{bx}{a}\right)+abxe^{\frac{bx}{a}}\right)}{2a^2x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.038 (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))
```

$$y(x) = \frac{\mathrm{expIntegral}_1\left(-\frac{bx}{a}\right)\mathrm{e}^{-\frac{bx}{a}}c_2b^2x^2 + c_1\mathrm{e}^{-\frac{bx}{a}}x^2 + ac_2(bx + a)}{x^2}$$

2.1142 ODE No. 1142

$$
cy(x)\sqrt[5]{ax+b}+5(ax+b)y''(x)+8ay'(x)=0
$$

✓ **Mathematica** : cpu = 0.0268252 (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] == 0,y[x],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 = 0.181 (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))
```

$$
y(x)=\frac{c_2\cosh\left(\frac{(ax+b)^{\frac{3}{5}}\sqrt{-5c}}{3a}\right)+c_1\sinh\left(\frac{(ax+b)^{\frac{3}{5}}\sqrt{-5c}}{3a}\right)}{(ax+b)^{\frac{3}{5}}}
$$

2.1143 ODE No. 1143

$$(a+bx)y'(x)+2axy''(x)+cy(x)=0$$

✓ **Mathematica** : cpu = 0.019803 (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]
```

$$\left\{\left\{y(x)\to c_1e^{\frac{a\log(x)-bx}{2a}}\text{HypergeometricU}\left(-\frac{c-b}{b},\frac{3}{2},\frac{bx}{2a}\right)+c_2e^{\frac{a\log(x)-bx}{2a}}L_{\frac{c-b}{b}}^{\frac{1}{2}}\left(\frac{bx}{2a}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.132 (sec), leaf count = 57

```
dsolve(2*a*x*diff(diff(y(x),x),x)+(b*x+a)*diff(y(x),x)+y(x)*c=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{bx}{2a}}\sqrt{x}\left(\text{KummerM}\left(\frac{b-c}{b},\frac{3}{2},\frac{bx}{2a}\right)c_1+\text{KummerU}\left(\frac{b-c}{b},\frac{3}{2},\frac{bx}{2a}\right)c_2\right)$$

2.1144 ODE No. 1144

$$(3a+bx)y'(x)+2axy''(x)+cy(x)=0$$

✓ **Mathematica** : cpu = 0.0174076 (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]
```

$$\left\{\left\{y(x)\to c_1e^{-\frac{bx}{2a}}\,\text{HypergeometricU}\left(-\frac{2c-3b}{2b},\frac{3}{2},\frac{bx}{2a}\right)+c_2e^{-\frac{bx}{2a}}L_{\frac{2c-3b}{2b}}^{\frac{1}{2}}\left(\frac{bx}{2a}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.12 (sec), leaf count = 60

```
dsolve(2*a*x*diff(diff(y(x),x),x)+(b*x+3*a)*diff(y(x),x)+y(x)*c=0,y(x))
```

$$y(x)=\mathrm{e}^{-\frac{bx}{2a}}\left(\text{KummerM}\left(\frac{3b-2c}{2b},\frac{3}{2},\frac{bx}{2a}\right)c_1+\text{KummerU}\left(\frac{3b-2c}{2b},\frac{3}{2},\frac{bx}{2a}\right)c_2\right)$$

2.1145 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 = 0.184797 (sec), leaf count = 386

```
DSolve[(b0 + a0*x)*y[x] + (b1 + a1*x)*Derivative[1][y][x] + (b2 + a2*x)*Derivative[2][y][x] == 0,y[x
```

$$\left\{\left\{y(x)\to c_1\,\mathrm{HypergeometricU}\left(-\frac{\mathrm{b2a1}^2-\mathrm{a2b1a1}-\sqrt{\mathrm{a1}^2-4\mathrm{a0a2}}\mathrm{b2a1}+2\mathrm{a2}^2\mathrm{b0}+\mathrm{a2}\sqrt{\mathrm{a1}^2-4\mathrm{a0a2}}\mathrm{b1}-2\mathrm{a0a}}{2\mathrm{a2}^2\sqrt{\mathrm{a1}^2-4\mathrm{a0a2}}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.194 (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))
```

$$y(x)=\mathrm{e}^{-\frac{\left(\sqrt{-4\,\mathrm{a0}\,\mathrm{a2}+\mathrm{a1}^2}+\mathrm{a1}\right)x}{2\,\mathrm{a2}}}(\mathrm{a2}\,x+\mathrm{b2})^{\frac{\mathrm{a1}\,\mathrm{b2}+\mathrm{a2}^2-\mathrm{a2}\,\mathrm{b1}}{\mathrm{a2}^2}}\left(\mathrm{KummerM}\left(\frac{\left(\mathrm{a1}\,\mathrm{b2}+2\,\mathrm{a2}^2-\mathrm{a2}\,\mathrm{b1}\right)\sqrt{-4\,\mathrm{a0}\,\mathrm{a2}+\mathrm{a1}^2}-2\,\mathrm{a}}{2\sqrt{-4\,\mathrm{a0}\,\mathrm{a2}+\mathrm{a}}}\right.\right.$$

2.1146 ODE No. 1146

$$x^2y''(x) - 6y(x) = 0$$

✓ **Mathematica** : cpu = 0.0033712 (sec), leaf count = 18

```
DSolve[-6*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2x^3 + \frac{c_1}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.004 (sec), leaf count = 15

```
dsolve(x^2*diff(diff(y(x),x),x)-6*y(x)=0,y(x))
```

$$y(x) = \frac{x^5c_2 + c_1}{x^2}$$

2.1147 ODE No. 1147

$$x^2y''(x) - 12y(x) = 0$$

✓ **Mathematica** : cpu = 0.0033364 (sec), leaf count = 18

```
DSolve[-12*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2x^4 + \frac{c_1}{x^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.006 (sec), leaf count = 15

```
dsolve(x^2*diff(diff(y(x),x),x)-12*y(x)=0,y(x))
```

$$y(x) = \frac{x^7c_1 + c_2}{x^3}$$

2.1148 ODE No. 1148

$$ay(x) + x^2y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0062622 (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 = 0.019 (sec), leaf count = 35

```
dsolve(x^2*diff(diff(y(x),x),x)+a*y(x)=0,y(x))
```

$$y(x) = c_1 x^{\frac{1}{2}+\frac{\sqrt{1-4a}}{2}} + c_2 x^{\frac{1}{2}-\frac{\sqrt{1-4a}}{2}}$$

2.1149 ODE No. 1149

$$y(x)(ax+b)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0332421 (sec), leaf count = 212

```
DSolve[(b + a*x)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2a^{\frac{1}{2}\left(\sqrt{1-4b}+1\right)-\frac{1}{2}\sqrt{1-4b}}x^{\frac{1}{2}\left(\sqrt{1-4b}+1\right)-\frac{1}{2}\sqrt{1-4b}}\,\text{Gamma}\left(\sqrt{1-4b}+1\right)\text{BesselJ}\left(\sqrt{1-4b},2\sqrt{a}\sqrt{x}\right)+c_1a^{\frac{1}{2}}\right.\right.$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 45

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x+b)*y(x)=0,y(x))
```

$$y(x)=\sqrt{x}\left(\text{BesselY}\left(\sqrt{1-4b},2\sqrt{a}\,\sqrt{x}\right)c_2+\text{BesselJ}\left(\sqrt{1-4b},2\sqrt{a}\,\sqrt{x}\right)c_1\right)$$

2.1150 ODE No. 1150

$$x^2y''(x) + \left(x^2 - 2\right) y(x) = 0$$

✓ **Mathematica** : cpu = 0.0082062 (sec), leaf count = 21

```
DSolve[(-2 + x^2)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_1 x j_1(x) - c_2 x y_1(x)\}\}$$

✓ **Maple** : cpu = 0.061 (sec), leaf count = 27

```
dsolve(x^2*diff(diff(y(x),x),x)+(x^2-2)*y(x)=0,y(x))
```

$$y(x) = \frac{(xc_1 + c_2)\cos(x) + \sin(x)(xc_2 - c_1)}{x}$$

2.1151 ODE No. 1151

$$\left(-ax^2-2\right)y(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0099831 (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 = 0.075 (sec), leaf count = 42

```
dsolve(x^2*diff(diff(y(x),x),x)-(a*x^2+2)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\left(ax+\sqrt{a}\right)\mathrm{e}^{-\sqrt{a}\,x}+\mathrm{e}^{\sqrt{a}\,x}c_1\left(ax-\sqrt{a}\right)}{x}$$

2.1152 ODE No. 1152

$$(a^2x^2-6)\,y(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0115011 (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 = 0.171 (sec), leaf count = 53

```
dsolve(x^2*diff(diff(y(x),x),x)+(a^2*x^2-6)*y(x)=0,y(x))
```

$$y(x)=\frac{(a^2x^2c_1+3axc_2-3c_1)\cos(ax)+\sin(ax)\,(a^2x^2c_2-3axc_1-3c_2)}{x^2}$$

2.1153 ODE No. 1153

$$y(x)\left(ax^2+(1-v)v\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0149311 (sec), leaf count = 56

```
DSolve[((1 - v)*v + a*x^2)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\sqrt{x}\,\text{BesselJ}\left(\frac{1}{2}(2v-1),\sqrt{a}x\right)+c_2\sqrt{x}\,\text{BesselY}\left(\frac{1}{2}(2v-1),\sqrt{a}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.032 (sec), leaf count = 31

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x^2-v*(v-1))*y(x)=0,y(x))
```

$$y(x)=\sqrt{x}\left(\text{BesselY}\left(v-\frac{1}{2},\sqrt{a}\,x\right)c_2+\text{BesselJ}\left(v-\frac{1}{2},\sqrt{a}\,x\right)c_1\right)$$

2.1154 ODE No. 1154

$$y(x)\left(ax^2+bx+c\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0106023 (sec), leaf count = 88

```
DSolve[(c + b*x + a*x^2)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1M_{-\frac{ib}{2\sqrt{a}},-\frac{1}{2}i\sqrt{4c-1}}\left(2i\sqrt{a}x\right)+c_2W_{-\frac{ib}{2\sqrt{a}},-\frac{1}{2}i\sqrt{4c-1}}\left(2i\sqrt{a}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.173 (sec), leaf count = 57

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x^2+b*x+c)*y(x)=0,y(x))
```

$$y(x)=c_1\,\mathrm{WhittakerM}\left(-\frac{ib}{2\sqrt{a}},\frac{\sqrt{1-4c}}{2},2i\sqrt{a}\,x\right)+c_2\,\mathrm{WhittakerW}\left(-\frac{ib}{2\sqrt{a}},\frac{\sqrt{1-4c}}{2},2i\sqrt{a}\,x\right)$$

2.1155 ODE No. 1155

$$y(x)\left(ax^k+(1-b)b\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0248555 (sec), leaf count = 225

```
DSolve[((1 - b)*b + a*x^k)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1k^{-\frac{2(1-b)}{k}-\frac{2b}{k}+\frac{1}{k}}a^{\frac{1-b}{k}+\frac{1}{2}\left(\frac{2b}{k}-\frac{1}{k}\right)}\left(x^k\right)^{\frac{1-b}{k}+\frac{1}{2}\left(\frac{2b}{k}-\frac{1}{k}\right)}\text{Gamma}\left(-\frac{2b}{k}+\frac{1}{k}+1\right)\text{BesselJ}\left(\frac{1-2b}{k},\frac{2\sqrt{a}\sqrt{x^k}}{k}\right.\right.\right.$$

✓ **Maple** : cpu = 0.05 (sec), leaf count = 67

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x^k-b*(b-1))*y(x)=0,y(x))
```

$$y(x)=\sqrt{x}\left(\text{BesselY}\left(\frac{\sqrt{(-1+2b)^2}}{k},\frac{2\sqrt{a}\,x^{\frac{k}{2}}}{k}\right)c_2+\text{BesselJ}\left(\frac{\sqrt{(-1+2b)^2}}{k},\frac{2\sqrt{a}\,x^{\frac{k}{2}}}{k}\right)c_1\right)$$

2.1156 ODE No. 1156

$$x^2y''(x)+\frac{y(x)}{\log(x)}-e^x x(x\log(x)+2)=0$$

✓ **Mathematica** : cpu = 0.0545486 (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]
```

$$\left\{\left\{y(x)\to c_2\log(x)\left(\text{LogIntegral}(x)-\frac{x}{\log(x)}\right)+e^x\log(x)+c_1\log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.151 (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))
```

$$y(x)=\ln(x)\,c_2-(\text{expIntegral}_1(-\ln(x))\ln(x)+x)\,c_1-\ln(x)\left(-\left(\int\frac{(\text{expIntegral}_1(-\ln(x))\ln(x)+x)\,e^x(2+x$$

2.1157 ODE No. 1157

$$ay'(x) + x^2y''(x) - xy(x) = 0$$

✗ **Mathematica** : cpu = 0.367289 (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

$$y(x) = \mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x) + \frac{a\left(\frac{d}{dx}\_Y(x)\right)}{x^2} - \frac{\_Y(x)}{x}\right\}, \{\_Y(x)\}\right)$$

2.1158 ODE No. 1158

$$y(x)\left(-ab-b^2x^2\right)+ay'(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.133374 (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 = 0.359 (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))
```

$$y(x)=\sqrt{x}\left(\mathrm{e}^{bx}\,\mathrm{HeunD}\left(-4\sqrt{2}\,\sqrt{ab},-1-4\sqrt{2}\,\sqrt{ab},8\sqrt{2}\,\sqrt{ab},-4\sqrt{2}\,\sqrt{ab}+1,\frac{\sqrt{2}\,\sqrt{ab}\,x-a}{\sqrt{2}\,\sqrt{ab}\,x+a}\right)c_2+\mathrm{HeunD}\left(4\sqrt{\right.\right.$$

2.1159 ODE No. 1159

$$-ax^2 + x^2y''(x) + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0062171 (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]
```

$$\left\{\left\{y(x) \to \frac{ax^2}{3} + c_2x + \frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (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))
```

$$y(x) = c_2x + \frac{a\,x^2}{3} + \frac{c_1}{x}$$

2.1160 ODE No. 1160

$$ay(x) + x^2y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0052816 (sec), leaf count = 30

```
DSolve[a*y[x] + x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cos\left(\sqrt{a}\log(x)\right)+c_2\sin\left(\sqrt{a}\log(x)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.007 (sec), leaf count = 23

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = c_1\sin\left(\sqrt{a}\,\ln(x)\right)+c_2\cos\left(\sqrt{a}\,\ln(x)\right)$$

2.1161 ODE No. 1161

$$(-a-x)y(x)+x^2y''(x)+xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0252928 (sec), leaf count = 78

```
DSolve[(-a - x)*y[x] + x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to(-1)^{-\sqrt{a}}c_1\,\text{Gamma}\left(1-2\sqrt{a}\right)\text{BesselI}\left(-2\sqrt{a},2\sqrt{x}\right)+(-1)^{\sqrt{a}}c_2\,\text{Gamma}\left(2\sqrt{a}+1\right)\text{BesselI}\left(2\sqrt{a},2\sqrt{\right.\right.\right.$$

✓ **Maple** : cpu = 0.013 (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))
```

$$y(x)=c_1\,\text{BesselI}\left(2\sqrt{a},2\sqrt{x}\right)+c_2\,\text{BesselK}\left(2\sqrt{a},2\sqrt{x}\right)$$

2.1162 ODE No. 1162

$$(x^2 - v^2)\, y(x) + x^2 y''(x) + x y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0287022 (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]
```

$$\{\{y(x) \to c_1 \operatorname{BesselJ}(v, x) + c_2 \operatorname{BesselY}(v, x)\}\}$$

✓ **Maple** : cpu = 0.008 (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))
```

$$y(x) = c_1 \operatorname{BesselJ}(v, x) + c_2 \operatorname{BesselY}(v, x)$$

2.1163 ODE No. 1163

$$-f(x) + (x^2 - v^2)\, y(x) + x^2 y''(x) + x y'(x) = 0$$

✓ **Mathematica** : cpu = 0.067904 (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],x]
```

$$\left\{\left\{y(x)\to \text{BesselJ}(v,x)\int_1^x -\frac{\pi\,\text{BesselY}(v,K[1])f(K[1])}{2K[1]}dK[1] + \text{BesselY}(v,x)\int_1^x \frac{\pi\,\text{BesselJ}(v,K[2])f(K[2])}{2K[2]}dK\right.\right.$$

✓ **Maple** : cpu = 0.036 (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))
```

$$y(x) = \frac{\pi\left(\int \frac{\text{BesselJ}(v,x)f(x)}{x}dx\right)\text{BesselY}\left(v,x\right)}{2} - \frac{\pi\left(\int \frac{\text{BesselY}(v,x)f(x)}{x}dx\right)\text{BesselJ}\left(v,x\right)}{2} + \text{BesselY}\left(v,x\right)c_1 + \text{BesselJ}\left(v\right.$$

2.1164 ODE No. 1164

$$y(x)\left(lx^2-v^2\right)+x^2y''(x)+xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0113232 (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]
```

$$\left\{\left\{y(x)\to c_1\,\text{BesselJ}\left(v,\sqrt{l}x\right)+c_2\,\text{BesselY}\left(v,\sqrt{l}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.023 (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))
```

$$y(x)=c_1\,\text{BesselJ}\left(v,\sqrt{l}\,x\right)+c_2\,\text{BesselY}\left(v,\sqrt{l}\,x\right)$$

2.1165 ODE No. 1165

$$(a+x)y'(x)+x^2y''(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0713198 (sec), leaf count = 26

```
DSolve[-y[x] + (a + x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2(a+x)}{a^2}+c_1xe^{a/x}\right\}\right\}$$

✓ **Maple** : cpu = 0.015 (sec), leaf count = 19

```
dsolve(x^2*diff(diff(y(x),x),x)+(x+a)*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x)=(x+a)\,c_1+c_2\mathrm{e}^{\frac{a}{x}}x$$

2.1166 ODE No. 1166

$$-3x^3 + x^2y''(x) - xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.007592 (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]
```

$$\left\{\left\{y(x)\to \frac{3x^3}{4} + c_1x + c_2x\log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.01 (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))
```

$$y(x) = \frac{x\left(4c_1\ln\left(x\right) + 3x^2 + 4c_2\right)}{4}$$

2.1167 ODE No. 1167

$$y(x)\left(ax^m+b\right)+x^2y''(x)-xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0402638 (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]
```

$$\left\{\left\{y(x)\to c_1m^{-\frac{2\left(m-i\sqrt{b-1}m\right)}{m^2}-\frac{2i\sqrt{b-1}}{m}}a^{\frac{m-i\sqrt{b-1}m}{m^2}+\frac{i\sqrt{b-1}}{m}}\left(x^m\right)^{\frac{m-i\sqrt{b-1}m}{m^2}+\frac{i\sqrt{b-1}}{m}}\text{Gamma}\left(1-\frac{2i\sqrt{b-1}}{m}\right)\text{BesselJ}\left(-\frac{2i\right.\right.\right.$$

✓ **Maple** : cpu = 0.048 (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))
```

$$y(x)=x\left(\text{BesselY}\left(\frac{2\sqrt{1-b}}{m},\frac{2\sqrt{a}\,x^{\frac{m}{2}}}{m}\right)c_2+\text{BesselJ}\left(\frac{2\sqrt{1-b}}{m},\frac{2\sqrt{a}\,x^{\frac{m}{2}}}{m}\right)c_1\right)$$

2.1168 ODE No. 1168

$$x^2y''(x) + 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0114249 (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 = 0.004 (sec), leaf count = 11

```
dsolve(x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)=0,y(x))
```

$$y(x) = c_1 + \frac{c_2}{x}$$

2.1169 ODE No. 1169

$$y(x)\left(ax-b^2\right)+x^2y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0367968 (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]
```

$$\left\{\left\{y(x)\to c_1a^{\frac{1}{2}\left(-\sqrt{4b^2+1}-1\right)+\frac{1}{2}\sqrt{4b^2+1}}x^{\frac{1}{2}\left(-\sqrt{4b^2+1}-1\right)+\frac{1}{2}\sqrt{4b^2+1}}\,\text{Gamma}\left(1-\sqrt{4b^2+1}\right)\text{BesselJ}\left(-\sqrt{4b^2+1},2\sqrt{a}\right.\right.\right.$$

✓ **Maple** : cpu = 0.036 (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))
```

$$y(x)=\frac{c_2\,\text{BesselY}\left(\sqrt{4b^2+1},2\sqrt{a}\,\sqrt{x}\right)+c_1\,\text{BesselJ}\left(\sqrt{4b^2+1},2\sqrt{a}\,\sqrt{x}\right)}{\sqrt{x}}$$

2.1170 ODE No. 1170

$$y(x)\left(ax^2+b\right)+x^2y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0109084 (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))
```

$$y(x)=\frac{c_2\,\mathrm{BesselY}\left(\frac{\sqrt{1-4b}}{2},\sqrt{a}\,x\right)+c_1\,\mathrm{BesselJ}\left(\frac{\sqrt{1-4b}}{2},\sqrt{a}\,x\right)}{\sqrt{x}}$$

2.1171 ODE No. 1171

$$y(x)\left(ax+lx^2-n(n+1)\right)+x^2y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.023968 (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] == 0,y[x
```

$$\left\{\left\{y(x)\to c_1e^{n\log(x)-i\sqrt{l}x}\,\text{HypergeometricU}\left(\frac{i\left(a-2i\sqrt{l}n-2i\sqrt{l}\right)}{2\sqrt{l}},2n+2,2i\sqrt{l}x\right)+c_2e^{n\log(x)-i\sqrt{l}x}L^{2n+1}_{-\frac{i\left(a-2i\sqrt{\right.}}{2}}\right.\right.$$

✓ **Maple** : cpu = 0.184 (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))
```

$$y(x)=\frac{c_2\,\text{WhittakerW}\left(-\frac{ia}{2\sqrt{l}},n+\frac{1}{2},2i\sqrt{l}\,x\right)+c_1\,\text{WhittakerM}\left(-\frac{ia}{2\sqrt{l}},n+\frac{1}{2},2i\sqrt{l}\,x\right)}{x}$$

2.1172 ODE No. 1172

$$ay(x) + x^2y''(x) + 2(x-1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0434489 (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]
```

$$\left\{\left\{y(x) \to 2^{\frac{1}{2}(1-\sqrt{1-4a})} c_1 \left(\frac{1}{x}\right)^{\frac{1}{2}(1-\sqrt{1-4a})} \text{Hypergeometric1F1}\left(\frac{1}{2} - \frac{1}{2}\sqrt{1-4a}, 1 - \sqrt{1-4a}, -\frac{2}{x}\right) + 2^{\frac{1}{2}(\sqrt{1-4a}+\right.\right.$$

✓ **Maple** : cpu = 0.046 (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))
```

$$y(x) = \mathrm{e}^{-\frac{1}{x}}\sqrt{\frac{1}{x}}\left(\text{BesselK}\left(\frac{\sqrt{1-4a}}{2}, \frac{1}{x}\right) c_2 + \text{BesselI}\left(\frac{\sqrt{1-4a}}{2}, \frac{1}{x}\right) c_1\right)$$

2.1173 ODE No. 1173

$$2(a+x)y'(x)+(1-b)by(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.083368 (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]
```

$$\left\{\left\{y(x)\to(-2)^{1-b}c_1a^{1-b}\left(\frac{1}{x}\right)^{1-b}\text{Hypergeometric1F1}\left(1-b,2-2b,\frac{2a}{x}\right)+(-2)^bc_2a^b\left(\frac{1}{x}\right)^b\text{Hypergeometric1F}\right.\right.$$

✓ **Maple** : cpu = 0.111 (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))
```

$$y(x)=\frac{e^{\frac{a}{x}}\left(\text{BesselK}\left(b-\frac{1}{2},\frac{a}{x}\right)c_2+\text{BesselI}\left(b-\frac{1}{2},\frac{a}{x}\right)c_1\right)}{\sqrt{x}}$$

2.1174 ODE No. 1174

$$x^5(-\log(x)) + x^2y''(x) - 2xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0074433 (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]
```

$$\left\{\left\{y(x)\to \frac{1}{144}\left(12x^5\log(x) - 7x^5\right) + c_2x^2 + c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (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))
```

$$y(x) = \frac{x^5\ln(x)}{12} - \frac{7x^5}{144} + c_2x^2 + xc_1$$

2.1175 ODE No. 1175

$$\left(-ax^2-12a-4\right)\cos(x)+x^2y''(x)-2xy'(x)-4y(x)-x\sin(x)=0$$

✓ **Mathematica** : cpu = 0.232259 (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*Derivative[2][y
```

$$\left\{\left\{y(x)\to\frac{-2a\sin(x)-ax\cos(x)-\sin(x)}{x}+c_2x^4+\frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.13 (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
```

$$y(x)=\frac{(-2a-1)\sin(x)+c_2x^5-ax\cos(x)+c_1}{x}$$

2.1176 ODE No. 1176

$$x^2 y''(x) + (x^2 + 2) y(x) - 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0115516 (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 = 0.021 (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))
```

$$y(x) = x(\cos(x) c_2 + \sin(x) c_1)$$

2.1177 ODE No. 1177

$$x^2y''(x)+\left(x^2+2\right)y'(x)+x^2(-\sec(x))-2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.46791 (sec), leaf count = 141

```
DSolve[-(x^2*Sec[x]) - 2*x*Derivative[1][y][x] + (2 + x^2)*Derivative[1][y][x] + x^2*Derivative[2][y]
```

$$\left\{\left\{y(x)\to\int_1^x e^{\frac{2}{K[1]}-K[1]}K[1]^2dK[1]\int_1^x \frac{e^{K[3]-\frac{2}{K[3]}}\sec(K[3])}{K[3]^2}dK[3]+\int_1^x -\frac{e^{K[2]-\frac{2}{K[2]}}\sec(K[2])\int_1^{K[2]} e^{\frac{2}{K[1]}-K[1]}K}{K[2]^2}\right.\right.$$

✓ **Maple** : cpu = 0.358 (sec), leaf count = 30

```
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))
```

$$y(x)=\left(-\left(\int\frac{\tan(x)}{x}dx\right)\cos(x)+\cos(x)c_1+\sin(x)(c_2+\ln(x))\right)x$$

2.1178 ODE No. 1178

$$x^3(-\sec(x)) + x^2y''(x) + (x^2+2)\,y(x) - 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0305424 (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] == 0,y[x],x
```

$$\left\{\left\{y(x)\to \frac{1}{2}e^{-ix}x\left(e^{2ix}\log\left(1+e^{-2ix}\right)+\log\left(1+e^{2ix}\right)\right)+c_1e^{-ix}x-\frac{1}{2}ic_2e^{ix}x\right\}\right\}$$

✓ **Maple** : cpu = 0.047 (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))
```

$$y(x) = (\cos(x)\ln(\cos(x)) + \cos(x)\,c_1 + \sin(x)\,(x+c_2))\,x$$

2.1179 ODE No. 1179

$$\left(a^2x^2+2\right)y(x)+x^2y''(x)-2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0163816 (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 = 0.03 (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))
```

$$y(x)=x(\cos(ax)\,c_2+\sin(ax)\,c_1)$$

2.1180 ODE No. 1180

$$-f(x) + (-v^2 + x^2 + 1)\, y(x) + x^2 y''(x) + 3xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0387538 (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,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\text{BesselJ}(v,x)\int_1^x -\frac{1}{2}\pi\,\text{BesselY}(v,K[1])f(K[1])dK[1]+\text{BesselY}(v,x)\int_1^x \frac{1}{2}\pi\,\text{BesselJ}(v,K[2])f(K[2])dK}{x}\right.\right.$$

✓ **Maple** : cpu = 0.044 (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))
```

$$y(x) = \frac{\pi\left(\int \text{BesselJ}\,(v,x)\,f(x)\,dx\right)\text{BesselY}\,(v,x) - \pi\left(\int \text{BesselY}\,(v,x)\,f(x)\,dx\right)\text{BesselJ}\,(v,x) + 2\,\text{BesselY}\,(v,x)\,c_1}{2x}$$

2.1181 ODE No. 1181

$$x^2y''(x) + (3x - 1)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0344571 (sec), leaf count = 37

```
DSolve[y[x] + (-1 + 3*x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1e^{-1/x}}{x}-\frac{c_2e^{-1/x}\,\text{ExpIntegralEi}\left(\frac{1}{x}\right)}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.035 (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))
```

$$y(x)=\frac{\left(c_1\,\text{expIntegral}_1\left(-\frac{1}{x}\right)+c_2\right)\mathrm{e}^{-\frac{1}{x}}}{x}$$

2.1182 ODE No. 1182

$$x^2y''(x) - 3xy'(x) + 4y(x) - 5x = 0$$

✓ **Mathematica** : cpu = 0.00817 (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 = 0.009 (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))
```

$$y(x) = c_2x^2 + c_1x^2\ln(x) + 5x$$

2.1183 ODE No. 1183

$$x^2y''(x) + x^2(-\log(x)) - 3xy'(x) - 5y(x) = 0$$

✓ **Mathematica** : cpu = 0.0077569 (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]
```

$$\left\{\left\{y(x)\to c_2x^5-\frac{1}{9}x^2\log(x)+\frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (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))
```

$$y(x) = c_2x^5 + \frac{c_1}{x} - \frac{x^2\ln(x)}{9}$$

2.1184 ODE No. 1184

$$-x^4 + x^2 y''(x) + x^2 - 4xy'(x) + 6y(x) = 0$$

✓ **Mathematica** : cpu = 0.0064652 (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 = 0.026 (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))
```

$$y(x) = \frac{x^2\left(2c_2 x + x^2 + 2\ln\left(x\right) + 2c_1 + 2\right)}{2}$$

2.1185 ODE No. 1185

$$(4-2x^3)\, y(x)+x^2y''(x)+5xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0276782 (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]
```

$$\left\{\left\{y(x)\to \frac{3\sqrt[3]{6}c_2K_0\left(\frac{2}{3}\sqrt{2}x^{3/2}\right)}{x^2}-\frac{3\sqrt[3]{-3}c_1\,\text{BesselI}\left(0,\frac{2}{3}\sqrt{2}x^{3/2}\right)}{2^{2/3}x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (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))
```

$$y(x)=\frac{c_2\,\text{BesselK}\left(0,\frac{2\sqrt{2}\,x^{\frac{3}{2}}}{3}\right)+c_1\,\text{BesselI}\left(0,\frac{2\sqrt{2}\,x^{\frac{3}{2}}}{3}\right)}{x^2}$$

2.1186 ODE No. 1186

$$x^3(-\sin(x)) + x^2y''(x) - 5xy'(x) + 8y(x) = 0$$

✓ **Mathematica** : cpu = 0.0127426 (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]
```

$$\left\{\left\{y(x)\to \frac{1}{2}\left(x^4\,\text{CosIntegral}(x)-x^3\sin(x)+x^2\cos(x)\right)+c_2x^4+c_1x^2\right\}\right\}$$

✓ **Maple** : cpu = 0.05 (sec), leaf count = 32

```
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))
```

$$y(x) = \frac{x^2\left(2x^2c_1 + \mathrm{Ci}\left(x\right)x^2 - x\sin\left(x\right) + 2c_2 + \cos\left(x\right)\right)}{2}$$

2.1187 ODE No. 1187

$$axy'(x) + by(x) + x^2y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0072039 (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 = 0.016 (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))
```

$$y(x) = c_1 x^{-\frac{a}{2}+\frac{1}{2}+\frac{\sqrt{a^2-2a-4b+1}}{2}} + c_2 x^{-\frac{a}{2}+\frac{1}{2}-\frac{\sqrt{a^2-2a-4b+1}}{2}}$$

2.1188 ODE No. 1188

$$(ax+b)y'(x)+cy(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.111989 (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]
```

$$\left\{\left\{y(x)\to c_1 i^{-\sqrt{a^2-2a-4c+1}+a-1}b^{\frac{1}{2}\left(-\sqrt{a^2-2a-4c+1}+a-1\right)}\left(\frac{1}{x}\right)^{\frac{1}{2}\left(-\sqrt{a^2-2a-4c+1}+a-1\right)}\text{Hypergeometric1F1}\left(\frac{a}{2}-\frac{1}{2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.203 (sec), leaf count = 114

```
dsolve(x^2*diff(diff(y(x),x),x)+(a*x+b)*diff(y(x),x)+y(x)*c=0,y(x))
```

$$y(x)=x^{-\frac{\sqrt{a^2-2a-4c+1}}{2}-\frac{a}{2}+\frac{1}{2}}\left(\text{KummerU}\left(-\frac{1}{2}+\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2},1+\sqrt{a^2-2a-4c+1},\frac{b}{x}\right)c_2+\text{Kumm}\right.$$

2.1189 ODE No. 1189

$$axy'(x) + y(x)\left(bx^m + c\right) + x^2y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0343728 (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]
```

$$\left\{\left\{y(x) \to c_1 m^{-\frac{-\sqrt{a^2-2a-4c+1}-a+1}{m}-\frac{\sqrt{a^2-2a-4c+1}}{m}} b^{\frac{-\sqrt{a^2-2a-4c+1}-a+1}{2m}+\frac{\sqrt{a^2-2a-4c+1}}{2m}} \left(x^m\right)^{\frac{-\sqrt{a^2-2a-4c+1}-a+1}{2m}+\frac{\sqrt{a^2-2a-4c+1}}{2m}} \right.\right.$$

✓ **Maple** : cpu = 0.051 (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))
```

$$y(x) = x^{-\frac{a}{2}+\frac{1}{2}}\left(\text{BesselY}\left(\frac{\sqrt{a^2-2a-4c+1}}{m}, \frac{2\sqrt{b}\,x^{\frac{m}{2}}}{m}\right)c_2 + \text{BesselJ}\left(\frac{\sqrt{a^2-2a-4c+1}}{m}, \frac{2\sqrt{b}\,x^{\frac{m}{2}}}{m}\right)c_1\right)$$

2.1190 ODE No. 1190

$$y(x)(ax+b)+x^2y''(x)+x^2y'(x)=0$$

✓ **Mathematica** : cpu = 0.0155914 (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]
```

$$\left\{\left\{y(x)\to c_1e^{\frac{1}{2}\left(\left(\sqrt{1-4b}+1\right)\log(x)-2x\right)}\text{HypergeometricU}\left(\frac{1}{2}\left(-2a+\sqrt{1-4b}+1\right),\sqrt{1-4b}+1,x\right)+c_2e^{\frac{1}{2}\left(\left(\sqrt{1-4b}+\right.\right.}\right.\right.$$

✓ **Maple** : cpu = 0.118 (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))
```

$$y(x)=\mathrm{e}^{-\frac{x}{2}}\left(\text{WhittakerW}\left(a,\frac{\sqrt{1-4b}}{2},x\right)c_2+\text{WhittakerM}\left(a,\frac{\sqrt{1-4b}}{2},x\right)c_1\right)$$

2.1191 ODE No. 1191

$$x^2y''(x) + x^2y'(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0064434 (sec), leaf count = 110

```
DSolve[-2*y[x] + x^2*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{2c_2e^{\frac{1}{2}(\log(x)-x)}\left(i\sinh\left(\frac{x}{2}\right)-\frac{2i\cosh\left(\frac{x}{2}\right)}{x}\right)}{\sqrt{\pi}\sqrt{-ix}}+\frac{2c_1e^{\frac{1}{2}(\log(x)-x)}\left(\frac{2\sinh\left(\frac{x}{2}\right)}{x}-\cosh\left(\frac{x}{2}\right)\right)}{\sqrt{\pi}\sqrt{-ix}}\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (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))
```

$$y(x) = \frac{c_2(x+2)\,\mathrm{e}^{-x} + c_1(x-2)}{x}$$

2.1192 ODE No. 1192

$$x^2y''(x) + (x^2 - 1)\,y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.052562 (sec), leaf count = 40

```
DSolve[-y[x] + (-1 + x^2)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2e^{-x}\int_1^x e^{K[1]-\frac{1}{K[1]}}\,dK[1]+c_1e^{-x}\right\}\right\}$$

✓ **Maple** : cpu = 0.244 (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))
```

$$y(x)=\sqrt{x}\left(\mathrm{e}^{-x}\,\mathrm{HeunD}\left(4,3,-8,5,\frac{x-1}{1+x}\right)c_1+\mathrm{e}^{-\frac{1}{x}}\,\mathrm{HeunD}\left(-4,3,-8,5,\frac{x-1}{1+x}\right)c_2\right)$$

2.1193 ODE No. 1193

$$x^2y''(x) + (x+1)xy'(x) + (x-9)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0975618 (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]
```

$$\left\{\left\{y(x)\to \frac{c_1((x-8)x+20)}{x^3} - \frac{c_2e^{-x}\left(x^3+9x^2+36x+60\right)}{x^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (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))
```

$$y(x) = \frac{c_2\left(x^3+9x^2+36x+60\right)\mathrm{e}^{-x} + c_1\left(x^2-8x+20\right)}{x^3}$$

2.1194 ODE No. 1194

$$x^2y''(x) + (x + 1)xy'(x) + (3x - 1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.066899 (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]
```

$$\left\{\left\{y(x)\to c_1e^{-x}(x-3)x-\frac{c_2e^{-x}\left(x^3(-\operatorname{ExpIntegralEi}(x))+3x^2\operatorname{ExpIntegralEi}(x)+e^xx^2-2e^xx-e^x\right)}{6x}\right\}\right\}$$

✓ **Maple** : cpu = 0.038 (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))
```

$$y(x)=\frac{x^2c_2\mathrm{e}^{-x}(x-3)\operatorname{expIntegral}_1(-x)+x^2c_1(x-3)\,\mathrm{e}^{-x}+c_2\left(x^2-2x-1\right)}{x}$$

2.1195 ODE No. 1195

$$x^2y''(x) + (x+3)xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0146054 (sec), leaf count = 80

```
DSolve[-y[x] + x*(3 + x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{HypergeometricU}\left(2+\sqrt{2},1+2\sqrt{2},x\right)e^{\left(\sqrt{2}-1\right)\log(x)-x}+c_2L_{-2-\sqrt{2}}^{2\sqrt{2}}(x)e^{\left(\sqrt{2}-1\right)\log(x)-x}\right\}\right\}$$

✓ **Maple** : cpu = 0.111 (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))
```

$$y(x) = -\frac{\mathrm{e}^{-\frac{x}{2}}\left(-c_1\left(\sqrt{2}+x+1\right)\text{BesselI}\left(-\frac{1}{2}+\sqrt{2},\frac{x}{2}\right)-c_1\left(-\sqrt{2}+x+1\right)\text{BesselI}\left(\frac{1}{2}+\sqrt{2},\frac{x}{2}\right)+c_2\left(\left(-\sqrt{2}-x-\right.\right.\right.}{\sqrt{x}}$$

2.1196 ODE No. 1196

$$x^2y''(x) - (x-1)xy'(x) + (x-1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0263266 (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]
```

$$\left\{\left\{y(x)\to \frac{c_2\left(x^2\,\text{ExpIntegralEi}(x)-e^x x-e^x\right)}{2x}+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.029 (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))
```

$$y(x)=\frac{\text{expIntegral}_1\left(-x\right)c_2x^2+c_2(1+x)\,\mathrm{e}^x+x^2c_1}{x}$$

2.1197 ODE No. 1197

$$(-a-x)y(x)+x^2y''(x)-\left(x^2-2x\right)y'(x)=0$$

✓ **Mathematica** : cpu = 0.0105599 (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]
```

$$\left\{\left\{y(x)\to c_1e^{\frac{1}{2}(x-\log(x))}\text{BesselJ}\left(\frac{1}{2}\sqrt{4a+1},-\frac{ix}{2}\right)+c_2e^{\frac{1}{2}(x-\log(x))}\text{BesselY}\left(\frac{1}{2}\sqrt{4a+1},-\frac{ix}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.048 (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))
```

$$y(x)=\frac{\mathrm{e}^{\frac{x}{2}}\left(\text{BesselK}\left(\frac{\sqrt{4a+1}}{2},\frac{x}{2}\right)c_2+\text{BesselI}\left(\frac{\sqrt{4a+1}}{2},\frac{x}{2}\right)c_1\right)}{\sqrt{x}}$$

2.1198 ODE No. 1198

$$x^2y''(x) - (x^2 - 2x)\,y'(x) + (-3x - 2)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0323577 (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],x]
```

$$\left\{\left\{y(x)\to c_1e^x x - \frac{c_2\left(e^x x^3\,\text{ExpIntegralEi}(-x) + x^2 - x + 2\right)}{6x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (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))
```

$$y(x) = \frac{\text{expIntegral}_1\,(x)\,\mathrm{e}^x c_2 x^3 + \mathrm{e}^x c_1 x^3 - c_2\left(x^2 - x + 2\right)}{x^2}$$

2.1199 ODE No. 1199

$$x^2y''(x) - (x+4)xy'(x) + 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.0082884 (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]
```

$$\left\{\left\{y(x)\to c_2e^xx^4-\frac{1}{6}c_1x\left(e^xx^3\,\text{ExpIntegralEi}(-x)+x^2-x+2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.025 (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))
```

$$y(x)=x\left(\text{expIntegral}_1\left(x\right)\mathrm{e}^xc_2x^3+\mathrm{e}^xc_1x^3-c_2\left(x^2-x+2\right)\right)$$

2.1200 ODE No. 1200

$$(1-v)vy(x)+x^2y''(x)+2x^2y'(x)=0$$

✓ **Mathematica** : cpu = 0.0106311 (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]
```

$$\left\{\left\{y(x)\to c_1e^{-x}\sqrt{x}\,\text{BesselJ}\left(\frac{1}{2}(2v-1),-ix\right)+c_2e^{-x}\sqrt{x}\,\text{BesselY}\left(\frac{1}{2}(2v-1),-ix\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.017 (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))
```

$$y(x)=\sqrt{x}\,\mathrm{e}^{-x}\left(\text{BesselK}\left(v-\frac{1}{2},x\right)c_2+\text{BesselI}\left(v-\frac{1}{2},x\right)c_1\right)$$

2.1201 ODE No. 1201

$$x^2y''(x) + (2x+1)xy'(x) - 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.1703 (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]
```

$$\left\{\left\{y(x)\to \frac{c_1e^{-2x}(2x+3)}{2x^2}+\frac{c_2\left(2x^2-4x+3\right)}{4x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 31

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(2*x+1)*diff(y(x),x)-4*y(x)=0,y(x))
```

$$y(x) = \frac{c_2(2x+3)\,\mathrm{e}^{-2x} + 2c_1\left(x^2-2x+\frac{3}{2}\right)}{x^2}$$

2.1202 ODE No. 1202

$$x^2y''(x) - 2(x+1)xy'(x) + 2(x+1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0086769 (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]
```

$$\left\{\left\{y(x)\to c_1x+\frac{1}{2}c_2e^{2x}x\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (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))
```

$$y(x) = x\left(e^{2x}c_2 + c_1\right)$$

2.1203 ODE No. 1203

$$ax^2y'(x) + x^2y''(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0108727 (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))
```

$$y(x) = \frac{c_2(ax+2)\,\mathrm{e}^{-ax} + c_1(ax-2)}{x}$$

2.1204 ODE No. 1204

$$x^2(a+2b)y'(x)+y(x)\left(bx^2(a+b)-2\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0109774 (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] == 0,y
```

$$\left\{\left\{y(x)\to \frac{2c_2e^{\frac{1}{2}(-ax-2bx+\log(x))}\left(i\sinh\left(\frac{ax}{2}\right)-\frac{2i\cosh\left(\frac{ax}{2}\right)}{ax}\right)}{\sqrt{\pi}\sqrt{-iax}}+\frac{2c_1e^{\frac{1}{2}(-ax-2bx+\log(x))}\left(\frac{2\sinh\left(\frac{ax}{2}\right)}{ax}-\cosh\left(\frac{ax}{2}\right)\right)}{\sqrt{\pi}\sqrt{-iax}}\right\}\right\}$$

✓ **Maple** : cpu = 0.036 (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))
```

$$y(x)=\frac{c_2(ax+2)\,\mathrm{e}^{-(a+b)x}+c_1\mathrm{e}^{-bx}(ax-2)}{x}$$

2.1205 ODE No. 1205

$$ax^2y'(x) + f(x)y(x) + x^2y''(x) = 0$$

✗ **Mathematica** : cpu = 0.182004 (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

$$y(x) = \mathrm{DESol}\left(\left\{\frac{f(x)\_Y(x)}{x^2} + a\left(\frac{d}{dx}\_Y(x)\right) + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

2.1206 ODE No. 1206

$$y(x)\left(abx+cx^2+d\right)+x(2ax+b)y'(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0413196 (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] == 0,y[
```

$$\left\{\left\{y(x)\to c_1e^{\frac{1}{2}(-2ax-(b-1)\log(x))}\text{BesselJ}\left(\frac{1}{2}\sqrt{b^2-2b-4d+1},-i\sqrt{a^2-c}x\right)+c_2e^{\frac{1}{2}(-2ax-(b-1)\log(x))}\text{BesselY}\left(\right.\right.\right.$$

✓ **Maple** : cpu = 0.06 (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))
```

$$y(x)=x^{-\frac{b}{2}+\frac{1}{2}}e^{-ax}\left(\text{BesselY}\left(\frac{\sqrt{b^2-2b-4d+1}}{2},\sqrt{-a^2+c}\,x\right)c_2+\text{BesselJ}\left(\frac{\sqrt{b^2-2b-4d+1}}{2},\sqrt{-a^2+c}\,x\right)\right.$$

2.1207 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 = 0.0549854 (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] == 0,y[x
```

$$\left\{\left\{y(x)\to c_1\,\mathrm{HypergeometricU}\left(-\frac{-ab+2\mathrm{b1}-\sqrt{a^2-4\mathrm{a1}}-\sqrt{a^2-4\mathrm{a1}}\sqrt{b^2-2b-4\mathrm{c1}+1}}{2\sqrt{a^2-4\mathrm{a1}}},\sqrt{b^2-2b-4\mathrm{c1}+\right.\right.\right.$$

✓ **Maple** : cpu = 0.273 (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))
```

$$y(x)=\mathrm{e}^{-\frac{ax}{2}}x^{-\frac{b}{2}}\left(\mathrm{WhittakerW}\left(-\frac{ab-2\,\mathrm{b1}}{2\sqrt{a^2-4\,\mathrm{a1}}},\frac{\sqrt{b^2-2b-4\,\mathrm{c1}+1}}{2},\sqrt{a^2-4\,\mathrm{a1}}\,x\right)c_2+\mathrm{WhittakerM}\left(-\frac{ab-}{2\sqrt{a^2}}\right.\right.$$

2.1208 ODE No. 1208

$$x^3y'(x) + x^2y''(x) + (x^2-2)\,y(x) = 0$$

✓ **Mathematica** : cpu = 0.0474101 (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]
```

$$\left\{\left\{y(x)\to\frac{c_2e^{-\frac{x^2}{2}}\left(\sqrt{2\pi}e^{\frac{x^2}{2}}\operatorname{erf}\left(\frac{x}{\sqrt{2}}\right)-2x\right)}{2x}+\frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.046 (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))
```

$$y(x)=\frac{\sqrt{\pi}\,\sqrt{2}\,\operatorname{erf}\left(\frac{\sqrt{2}\,x}{2}\right)c_2-2\,\mathrm{e}^{-\frac{x^2}{2}}c_2x+c_1}{x}$$

2.1209 ODE No. 1209

$$x^2y''(x) + (x^2 + 2)\, xy'(x) + (x^2 - 2)\, y(x) = 0$$

✓ **Mathematica** : cpu = 0.0255377 (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],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 = 0.059 (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))
```

$$y(x) = \frac{\left(-\pi \ \mathrm{erf}\left(\frac{i\sqrt{2}\,x}{2}\right) c_2 + c_1\right) \mathrm{e}^{-\frac{x^2}{2}} + i\sqrt{\pi}\,\sqrt{2}\,c_2 x}{x^2}$$

2.1210 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 = 0.132781 (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[2][y][x
```

$$\left\{\left\{y(x)\to c_1(-1)^{\frac{1}{4}\left(-\sqrt{4a^2-4a(-1)^n+1}-2a+1\right)}x^{\frac{1}{2}\left(-\sqrt{4a^2-4a(-1)^n+1}-2a+1\right)}\text{Hypergeometric1F1}\left(-\frac{a}{2}-\frac{n}{2}-\frac{1}{4}\sqrt{4a^2\right.\right.\right.$$

✓ **Maple** : cpu = 0.21 (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))
```

$$y(x)=x^{-\frac{1}{2}-a}\mathrm{e}^{\frac{x^2}{2}}\left(\text{WhittakerM}\left(\frac{n}{2}+\frac{a}{2}+\frac{1}{4},\frac{\sqrt{1-4\left(-1\right)^n a+4a^2}}{4},x^2\right)c_1+\text{WhittakerW}\left(\frac{n}{2}+\frac{a}{2}+\frac{1}{4},\frac{\sqrt{1-\right.\right.$$

2.1211 ODE No. 1211

$$4x^3y'(x) + x^2y''(x) + \left(4x^4 + 2x^2 + 1\right)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0288339 (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[x],x]
```

$$\left\{\left\{y(x) \to c_1 e^{-x^2} x^{\frac{1}{2}-\frac{i\sqrt{3}}{2}} - \frac{i c_2 e^{-x^2} x^{\frac{1}{2}+\frac{i\sqrt{3}}{2}}}{\sqrt{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.044 (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))
```

$$y(x) = \mathrm{e}^{-x^2}\left(x^{\frac{1}{2}-\frac{i\sqrt{3}}{2}} c_2 + x^{\frac{1}{2}+\frac{i\sqrt{3}}{2}} c_1\right)$$

2.1212 ODE No. 1212

$$x\left(ax^2+b\right)y'(x)+f(x)y(x)+x^2y''(x)=0$$

✗ **Mathematica** : cpu = 0.319082 (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[x], x

✗ **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

$$y(x)=\mathrm{DESol}\left(\left\{\frac{f(x)\_Y(x)}{x^2}+\frac{(a\,x^2+b)\left(\frac{d}{dx}\_Y(x)\right)}{x}+\frac{d^2}{dx^2}\_Y(x)\right\},\{\_Y(x)\}\right)$$

2.1213 ODE No. 1213

$$\left(x^3+1\right)xy'(x)+x^2y''(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0542464 (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]
```

$$\left\{\left\{y(x)\to \frac{\sqrt[3]{3}c_1 \text{Hypergeometric1F1}\left(-\frac{1}{3},\frac{1}{3},-\frac{x^3}{3}\right)}{x}+\frac{c_2x \text{Hypergeometric1F1}\left(\frac{1}{3},\frac{5}{3},-\frac{x^3}{3}\right)}{\sqrt[3]{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.062 (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))
```

$$y(x)=\left(c_1 \text{BesselI}\left(-\frac{1}{6},\frac{x^3}{6}\right)+c_1 \text{BesselI}\left(\frac{5}{6},\frac{x^3}{6}\right)-c_2\left(-\text{BesselK}\left(\frac{5}{6},\frac{x^3}{6}\right)+\text{BesselK}\left(\frac{1}{6},\frac{x^3}{6}\right)\right)\right)e^{-\frac{x^3}{6}}x^{\frac{3}{2}}$$

2.1214 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 = 0.132329 (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],x]
```

$$\left\{\left\{y(x)\to\frac{c_1e^{-\frac{x^2}{2}}2^{\frac{1}{4}\left(\sqrt{4a^2-4a(-1)^n+1}+2\right)}\left(x^2\right)^{\frac{1}{4}\left(\sqrt{4a^2-4a(-1)^n+1}+2\right)}\text{HypergeometricU}\left(\frac{1}{4}\left(-2a-2n+\sqrt{4a^2-4(\right.\right.}{\sqrt{x}}\right.\right.$$

✓ **Maple** : cpu = 0.177 (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))
```

$$y(x)=\frac{\text{WhittakerM}\left(\frac{n}{2}+\frac{a}{2}+\frac{1}{4},\frac{\sqrt{1-4(-1)^na+4a^2}}{4},x^2\right)c_1+\text{WhittakerW}\left(\frac{n}{2}+\frac{a}{2}+\frac{1}{4},\frac{\sqrt{1-4(-1)^na+4a^2}}{4},x^2\right)c_2}{\sqrt{x}}$$

2.1215 ODE No. 1215

$$xy'(x)\left(ax^n+b\right)+y(x)\left(\mathrm{a1}x^{2n}+\mathrm{b1}x^n+\mathrm{c1}\right)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0773588 (sec), leaf count = 674

```
DSolve[(c1 + b1*x^n + a1*x^(2*n))*y[x] + x*(b + a*x^n)*Derivative[1][y][x] + x^2*Derivative[2][y][x]
```

$$\left\{\left\{y(x)\to c_1x^{\frac{1-n}{2}}2^{\frac{\sqrt{b^2n^2-2bn^2-4\mathrm{c1}n^2+n^2}+n^2}{2n^2}}\left(x^n\right)^{\frac{\sqrt{b^2n^2-2bn^2-4\mathrm{c1}n^2+n^2}+n^2}{2n^2}}\exp\left(\frac{1}{2}\left(-\frac{ax^n}{n}-\frac{b\log\left(x^n\right)}{n}\right)-\frac{\sqrt{a^2-4\mathrm{a1}}x}{2n}\right.\right.\right.$$

✓ **Maple** : cpu = 0.23 (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))
```

$$y(x)=\mathrm{e}^{-\frac{a\,x^n}{2n}}x^{-\frac{b}{2}-\frac{n}{2}+\frac{1}{2}}\left(\mathrm{WhittakerM}\left(-\frac{(b+n-1)\,a-2\,\mathrm{b1}}{2\sqrt{a^2-4\,\mathrm{a1}}\,n},\frac{\sqrt{b^2-2b-4\,\mathrm{c1}+1}}{2n},\frac{\sqrt{a^2-4\,\mathrm{a1}}\,x^n}{n}\right)c_1+\mathrm{Whitta}\right.$$

2.1216 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 = 0.76443 (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*Derivative
```

, 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] + x^2*D
```

✗ **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

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x)+\frac{\left(a\,x^{\mathrm{a1}}+b\right)\left(\frac{d}{dx}\_Y(x)\right)}{x}+\frac{\left(A\,x^{2\,\mathrm{a1}}+B\,x^{\mathrm{a1}}+C\,x^{\mathrm{b1}}+\mathrm{DD}\right)\_Y(x)}{x^2}\right\},\{\_Y(x)\}\right)$$

2.1217 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 = 0.0867719 (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][x] == 0,
```

$$\left\{\left\{y(x) \to c_1 \sec(x) \,\text{BesselJ}\left(\sqrt{a}, x\right) + c_2 \sec(x) \,\text{BesselY}\left(\sqrt{a}, x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.052 (sec), leaf count = 22

```
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))
```

$$y(x) = \sec(x)\left(\text{BesselY}\left(\sqrt{a}, x\right)c_2 + \text{BesselJ}\left(\sqrt{a}, x\right)c_1\right)$$

2.1218 ODE No. 1218

$$y(x)(a + x\cot(x)) + x^2 y''(x) + \left(2x^2\cot(x) + x\right) y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0819408 (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] == 0,y
```

$$\left\{\left\{y(x)\to c_1\csc(x)\,\text{BesselJ}\left(i\sqrt{a},x\right)+c_2\csc(x)\,\text{BesselY}\left(i\sqrt{a},x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 28

```
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))
```

$$y(x) = \csc(x)\left(\text{BesselY}\left(i\sqrt{a},x\right)c_2 + \text{BesselJ}\left(i\sqrt{a},x\right)c_1\right)$$

2.1219 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 = 0.0602775 (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][y][x]
```

$$\left\{\left\{y(x)\to c_1\,\text{HypergeometricU}\left(-\frac{-ib-\sqrt{a}-\sqrt{a}\sqrt{1-4c}}{2\sqrt{a}},\sqrt{1-4c}+1,2i\sqrt{a}x\right)\exp\left(\int_1^x\frac{-2f(K[1])-2i\sqrt{a}K}{2K}\right.\right.\right.$$

✓ **Maple** : cpu = 0.128 (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+
```

$$y(x)=\mathrm{e}^{-\left(\int\frac{f(x)}{x}dx\right)}\left(\text{WhittakerW}\left(-\frac{ib}{2\sqrt{a}},\frac{\sqrt{1-4c}}{2},2i\sqrt{a}\,x\right)c_2+\text{WhittakerM}\left(-\frac{ib}{2\sqrt{a}},\frac{\sqrt{1-4c}}{2},2i\sqrt{a}\,x\right)c_1\right)$$

2.1220 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 = 0.0669005 (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][x] + x
```

$$\left\{\left\{y(x)\to c_1\,\text{BesselJ}\left(\frac{1}{2}(2v-1),\sqrt{a}x\right)\exp\left(\int_1^x\frac{1-2f(K[1])K[1]}{2K[1]}dK[1]\right)+c_2\,\text{BesselY}\left(\frac{1}{2}(2v-1),\sqrt{a}x\right)\exp\right.\right.$$

✓ **Maple** : cpu = 0.023 (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)
```

$$y(x)=\sqrt{x}\,\mathrm{e}^{-\frac{\left(\int 2f(x)dx\right)}{2}}\left(\text{BesselY}\left(v-\frac{1}{2},\sqrt{a}\,x\right)c_2+\text{BesselJ}\left(v-\frac{1}{2},\sqrt{a}\,x\right)c_1\right)$$

2.1221 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 = 0.0171914 (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])*Derivative[1]
```

$$\left\{\left\{y(x)\to c_1\,\text{BesselJ}(v,x)\exp\left(\int_1^x f(K[1])dK[1]\right)+c_2\,\text{BesselY}(v,x)\exp\left(\int_1^x f(K[1])dK[1]\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.029 (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
```

$$y(x)=\mathrm{e}^{-\frac{\left(\int\frac{-2xf(x)+1}{x}dx\right)}{2}}\sqrt{x}\left(\text{BesselY}\left(v,x\right)c_2+\text{BesselJ}\left(v,x\right)c_1\right)$$

2.1222 ODE No. 1222

$$\left(x^2+1\right)y''(x)+xy'(x)+2y(x)=0$$

✓ **Mathematica** : cpu = 0.0152194 (sec), leaf count = 55

```
DSolve[2*y[x] + x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cos\left(\sqrt{2}\log\left(\sqrt{x^2+1}-x\right)\right)-c_2\sin\left(\sqrt{2}\log\left(\sqrt{x^2+1}-x\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.017 (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))
```

$$y(x)=c_1\sin\left(\sqrt{2}\,\mathrm{arcsinh}\left(x\right)\right)+c_2\cos\left(\sqrt{2}\,\mathrm{arcsinh}\left(x\right)\right)$$

2.1223 ODE No. 1223

$$\left(x^2+1\right)y''(x)+xy'(x)-9y(x)=0$$

✓ **Mathematica** : cpu = 0.0130778 (sec), leaf count = 49

```
DSolve[-9*y[x] + x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cosh\left(3\log\left(\sqrt{x^2+1}-x\right)\right)-ic_2\sinh\left(3\log\left(\sqrt{x^2+1}-x\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 31

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+x*diff(y(x),x)-9*y(x)=0,y(x))
```

$$y(x)=\sqrt{x^2+1}\left(4x^2+1\right)c_2+4x^3c_1+3xc_1$$

2.1224 ODE No. 1224

$$ay(x) + (x^2 + 1)\, y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0145161 (sec), leaf count = 55

```
DSolve[a*y[x] + x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cos\left(\sqrt{a}\log\left(\sqrt{x^2+1}-x\right)\right)-c_2\sin\left(\sqrt{a}\log\left(\sqrt{x^2+1}-x\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.022 (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))
```

$$y(x) = c_1 \sin\left(\sqrt{a}\ \operatorname{arcsinh}(x)\right) + c_2 \cos\left(\sqrt{a}\ \operatorname{arcsinh}(x)\right)$$

2.1225 ODE No. 1225

$$(x^2+1)\,y''(x) - xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0356262 (sec), leaf count = 42

```
DSolve[y[x] - x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2\left(-\sqrt{x^2+1}-x\log\left(\sqrt{x^2+1}-x\right)\right)+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 23

```
dsolve((x^2+1)*diff(diff(y(x),x),x)-x*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = -\sqrt{x^2+1}\,c_2 + x(\operatorname{arcsinh}(x)\,c_2 + c_1)$$

2.1226 ODE No. 1226

$$(1-v)vy(x)+\left(x^2+1\right)y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0081497 (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]
```

$$\{\{y(x)\to c_1\,\text{LegendreP}(v-1,ix)+c_2\,\text{LegendreQ}(v-1,ix)\}\}$$

✓ **Maple** : cpu = 0.061 (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))
```

$$y(x)=c_1\,\text{LegendreP}\left(v-1,ix\right)+c_2\,\text{LegendreQ}\left(v-1,ix\right)$$

2.1227 ODE No. 1227

$$\left(x^2+1\right)y''(x)-2xy'(x)+2y(x)=0$$

✓ **Mathematica** : cpu = 0.0191547 (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]
```

$$\left\{\left\{y(x)\to c_2x-c_1(x-i)^2\right\}\right\}$$

✓ **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))
```

$$y(x)=x^2c_2+xc_1-c_2$$

2.1228 ODE No. 1228

$$ay(x) + (x^2 + 1) y''(x) + 3xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0088427 (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]
```

$$\left\{\left\{y(x)\to \frac{c_1 P_{\frac{1}{2}\left(2\sqrt{1-a}-1\right)}^{\frac{1}{2}}(ix)}{\sqrt[4]{x^2+1}}+\frac{c_2 Q_{\frac{1}{2}\left(2\sqrt{1-a}-1\right)}^{\frac{1}{2}}(ix)}{\sqrt[4]{x^2+1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.089 (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))
```

$$y(x) = \frac{c_2 \left(x+\sqrt{x^2+1}\right)^{-\sqrt{1-a}} + c_1 \left(x+\sqrt{x^2+1}\right)^{\sqrt{1-a}}}{\sqrt{x^2+1}}$$

2.1229 ODE No. 1229

$$\left(x^2+1\right)y''(x)+4xy'(x)+2y(x)+2x-2\cos(x)=0$$

✓ **Mathematica** : cpu = 0.0346591 (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,y[x],x]
```

$$\left\{\left\{y(x)\to\frac{c_1}{x^2+1}+\frac{c_2x}{x^2+1}+\frac{-x^3-6\cos(x)}{3\left(x^2+1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.025 (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))
```

$$y(x)=\frac{-x^3+3xc_1-6\cos\left(x\right)+3c_2}{3x^2+3}$$

2.1230 ODE No. 1230

$$axy'(x) + (a-2)y(x) + \left(x^2+1\right)y''(x) = 0$$

✓ **Mathematica** : cpu = 0.013373 (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]
```

$$\left\{\left\{y(x)\to c_1\left(x^2+1\right)^{\frac{2-a}{4}}P_{\frac{a-4}{2}}^{\frac{a-2}{2}}(ix)+c_2\left(x^2+1\right)^{\frac{2-a}{4}}Q_{\frac{a-4}{2}}^{\frac{a-2}{2}}(ix)\right\}\right\}$$

✓ **Maple** : cpu = 0.247 (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))
```

$$y(x) = c_1\left(x^2+1\right)^{1-\frac{a}{2}} + c_2 x\,\mathrm{hypergeom}\left(\left[1,\frac{a}{2}-\frac{1}{2}\right],\left[\frac{3}{2}\right],-x^2\right)$$

2.1231 ODE No. 1231

$$\left(x^2-1\right)y''(x)-v(v+1)y(x)=0$$

✓ **Mathematica** : cpu = 0.039433 (sec), leaf count = 58

```
DSolve[-(v*(1 + v)*y[x]) + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{Hypergeometric2F1}\left(-\frac{v}{2}-\frac{1}{2},\frac{v}{2},\frac{1}{2},x^2\right)+ic_2x\,\text{Hypergeometric2F1}\left(\frac{v}{2}+\frac{1}{2},-\frac{v}{2},\frac{3}{2},x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.083 (sec), leaf count = 52

```
dsolve((x^2-1)*diff(diff(y(x),x),x)-v*(v+1)*y(x)=0,y(x))
```

$$y(x)=-(x-1)(1+x)\left(\text{hypergeom}\left(\left[1-\frac{v}{2},\frac{3}{2}+\frac{v}{2}\right],\left[\frac{3}{2}\right],x^2\right)c_2x+c_1\,\text{hypergeom}\left(\left[1+\frac{v}{2},\frac{1}{2}-\frac{v}{2}\right],\left[\frac{1}{2}\right],x^2\right.\right.$$

2.1232 ODE No. 1232

$$\frac{nx\,\mathrm{LegendreP}(n,x)-n\,\mathrm{LegendreP}(n-1,x)}{x^2-1}-n(n+1)y(x)+\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 4.3242 (sec), leaf count = 6628

```
DSolve[(-(n*LegendreP[-1 + n, x]) + n*x*LegendreP[n, x])/(-1 + x^2) - n*(1 + n)*y[x] + (-1 + x^2)*Der
```

✓ **Maple** : cpu = 0.214 (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))
```

$$y(x)=3\left(-\mathrm{hypergeom}\left(\left[\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2}\right],\left[\frac{1}{2}\right],x^2\right)(n+1)\left(\int\frac{}{3\,(x-1)^3\,(1+x)^3\,\left(\left(\mathrm{hypergeom}\left(\left[\frac{n}{2}+1,-\frac{n}{2}\right.\right.\right.\right.}\right.\right.\right.$$

2.1233 ODE No. 1233

$$\frac{nx\,\text{LegendreQ}(n,x)-n\,\text{LegendreQ}(n-1,x)}{x^2-1}-n(n+1)y(x)+\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.693818 (sec), leaf count = 6628

```
DSolve[(-(n*LegendreQ[-1 + n, x]) + n*x*LegendreQ[n, x])/(-1 + x^2) - n*(1 + n)*y[x] + (-1 + x^2)*Der
```

✓ **Maple** : cpu = 0.173 (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))
```

$$y(x)=3\left(-\text{hypergeom}\left(\left[\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2}\right],\left[\frac{1}{2}\right],x^2\right)(n+1)\left(\int\frac{}{3\,(x-1)^3\,(1+x)^3\left(\left(\text{hypergeom}\left(\left[\frac{n}{2}+1,-\frac{n}{2}\right.\right.\right.\right.}\right.\right.\right.$$

2.1234 ODE No. 1234

$$\left(x^2-1\right) y''(x)+xy'(x)+2=0$$

✓ **Mathematica** : cpu = 0.0438372 (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))
```

2.1235 ODE No. 1235

$$ay(x) + (x^2 - 1)\, y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0244437 (sec), leaf count = 97

```
DSolve[a*y[x] + x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \cos\left(\frac{1}{2}\sqrt{a}\left(\log\left(1 - \frac{x}{\sqrt{x^2-1}}\right) - \log\left(\frac{x}{\sqrt{x^2-1}} + 1\right)\right)\right) - c_2 \sin\left(\frac{1}{2}\sqrt{a}\left(\log\left(1 - \frac{x}{\sqrt{x^2-1}}\right) - \mathrm{lo}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.032 (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))
```

$$y(x) = \left(c_1 \left(x + \sqrt{x^2-1}\right)^{2i\sqrt{a}} + c_2\right) \left(x + \sqrt{x^2-1}\right)^{-i\sqrt{a}}$$

2.1236 ODE No. 1236

$$f(x)y(x) + (x^2 - 1)\, y''(x) + xy'(x) = 0$$

✗ **Mathematica** : cpu = 0.3269 (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

$$y(x) = \mathrm{DESol}\left(\left\{\frac{f(x)\_Y(x)}{x^2-1} + \frac{x\left(\frac{d}{dx}\_Y(x)\right)}{x^2-1} + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

2.1237 ODE No. 1237

$$\left(x^2-1\right)y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0158004 (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 = 0.015 (sec), leaf count = 20

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)=0,y(x))
```

$$y(x)=c_1-\frac{\left(-\ln\left(x-1\right)+\ln\left(1+x\right)\right)c_2}{2}$$

2.1238 ODE No. 1238

$$-a + (x^2 - 1)\, y''(x) + 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0200903 (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 = 0.028 (sec), leaf count = 26

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-a=0,y(x))
```

$$y(x) = \frac{(a - c_1)\ln(1 + x)}{2} + \frac{(c_1 + a)\ln(x - 1)}{2} + c_2$$

2.1239 ODE No. 1239

$$-ly(x) + (x^2 - 1)\, y''(x) + 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0079267 (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]
```

$$\left\{\left\{y(x)\to c_1 \,\text{LegendreP}\left(\frac{1}{2}\left(\sqrt{4l+1}-1\right),x\right)+c_2 \,\text{LegendreQ}\left(\frac{1}{2}\left(\sqrt{4l+1}-1\right),x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.067 (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))
```

$$y(x) = c_1 \,\text{LegendreP}\left(\frac{\sqrt{1+4l}}{2}-\frac{1}{2},x\right)+c_2 \,\text{LegendreQ}\left(\frac{\sqrt{1+4l}}{2}-\frac{1}{2},x\right)$$

2.1240 ODE No. 1240

$$-v(v+1)y(x)+\left(x^2-1\right)y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0096478 (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],x]
```

$$\{\{y(x)\to c_1\,\text{LegendreP}(v,x)+c_2\,\text{LegendreQ}(v,x)\}\}$$

✓ **Maple** : cpu = 0.06 (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))
```

$$y(x)=c_1\,\text{LegendreP}\left(v,x\right)+c_2\,\text{LegendreQ}\left(v,x\right)$$

2.1241 ODE No. 1241

$$(1-v)(v+2)y(x)+\left(x^2-1\right)y''(x)-2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0090628 (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[x],x]
```

$$\left\{\left\{y(x)\to c_1\left(x^2-1\right)P_v^2(x)+c_2\left(x^2-1\right)Q_v^2(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.065 (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))
```

$$y(x)=(x-1)(1+x)(c_2\,\text{LegendreQ}(v,2,x)+c_1\,\text{LegendreP}(v,2,x))$$

2.1242 ODE No. 1242

$$\left(x^2-1\right)y''(x)+\left(x-x^2\right)y(x)-(3x+1)y'(x)=0$$

✓ **Mathematica** : cpu = 0.267039 (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[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{-x}(x+1)^2-c_2e^{-x-2}\left(x^2(-\text{ExpIntegralEi}(2(x+1)))-2x\,\text{ExpIntegralEi}(2(x+1))-\text{ExpIntegral}\right.\right.\right.$$

✓ **Maple** : cpu = 0.049 (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))
```

$$y(x)=\mathrm{e}^{-2-x}c_2(1+x)^2\,\mathrm{expIntegral}_1\left(-2x-2\right)+c_1\mathrm{e}^{-x}(1+x)^2+2\,\mathrm{e}^{x}c_2$$

2.1243 ODE No. 1243

$$\left(x^2-1\right) y''(x)+\left(x^2+1\right) y(x)+4 x y'(x)=0$$

✓ **Mathematica** : cpu = 0.0162999 (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]
```

$$\left\{\left\{y(x)\to \frac{c_1 e^{-i x}}{x^2-1}-\frac{i c_2 e^{i x}}{2 \left(x^2-1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (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))
```

$$y(x)=\frac{c_2 \cos(x)+\sin(x) c_1}{x^2-1}$$

2.1244 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 = 0.01313 (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][y][x] ==
```

$$\left\{\left\{y(x)\to c_1\left(x^2-1\right)^{-n/2}P_v^n(x)+c_2\left(x^2-1\right)^{-n/2}Q_v^n(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.085 (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))
```

$$y(x)=\left(x^2-1\right)^{-\frac{n}{2}}\left(\mathrm{LegendreQ}\left(v,n,x\right)c_2+\mathrm{LegendreP}\left(v,n,x\right)c_1\right)$$

2.1245 ODE No. 1245

$$(n-v-1)(n+v)y(x)-2(n-1)xy'(x)+(x^2-1)\,y''(x)=0$$

✓ **Mathematica** : cpu = 0.0145944 (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][y][x]
```

$$\left\{\left\{y(x)\to c_1\left(x^2-1\right)^{n/2}P_v^n(x)+c_2\left(x^2-1\right)^{n/2}Q_v^n(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.076 (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))
```

$$y(x)=\left(x^2-1\right)^{\frac{n}{2}}\left(\mathrm{LegendreQ}\left(v,n,x\right)c_2+\mathrm{LegendreP}\left(v,n,x\right)c_1\right)$$

2.1246 ODE No. 1246

$$-2(v-1)xy'(x)-2vy(x)+\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.0109086 (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],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 = 0.172 (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))
```

$$y(x)=\left(x^2-1\right)^v\left(\mathrm{hypergeom}\left(\left[\frac{1}{2},v+1\right],\left[\frac{3}{2}\right],x^2\right)c_2x+c_1\right)$$

2.1247 ODE No. 1247

$$2axy'(x)+(a-1)ay(x)+\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.200208 (sec), leaf count = 132

```
DSolve[(-1 + a)*a*y[x] + 2*a*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2(x+1)^{\frac{1}{2}\sqrt{(a-1)^2}+\frac{1}{2}}\left(x^2-1\right)^{-a/2}(1-x)^{\frac{1}{2}-\frac{1}{2}\sqrt{(a-1)^2}}}{2\sqrt{(a-1)^2}}+c_1(x+1)^{\frac{1}{2}-\frac{1}{2}\sqrt{(a-1)^2}}\left(x^2-1\right)^{-a/2}(1-x)^{\frac{1}{2}}\left(\right.$$

✓ **Maple** : cpu = 0.031 (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))
```

$$y(x)=c_1(1+x)^{1-a}+c_2(x-1)^{1-a}$$

2.1248 ODE No. 1248

$$axy'(x) + y(x)\left(bx^2 + cx + d\right) + \left(x^2 - 1\right)y''(x) = 0$$

✓ **Mathematica** : cpu = 0.177707 (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,y[x],x
```

$$\left\{\left\{y(x)\to c_2\left(\frac{x}{2}-\frac{1}{2}\right)^{a/4}\left(x^2-1\right)^{-a/4}\left(\frac{x}{2}+\frac{1}{2}\right)^{1-\frac{a}{4}}e^{\sqrt{-b}x}\text{HeunC}\left[\frac{1}{4}a\left(a-4\sqrt{-b}-2\right)-b+4\sqrt{-b}+c-d,2\left(\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.365 (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))
```

$$y(x)=\mathrm{e}^{\sqrt{-b}\,x}\left(x^2-1\right)^{-\frac{a}{4}}\left(\left(\frac{1}{2}+\frac{x}{2}\right)^{-\frac{a}{4}+1}\left(-\frac{1}{2}+\frac{x}{2}\right)^{\frac{a}{4}}\text{HeunC}\left(4\sqrt{-b},1-\frac{a}{2},\frac{a}{2}-1,2c,d-c-\frac{a^2}{8}+b+\frac{1}{2},\frac{1}{2}+\right.\right.$$

2.1249 ODE No. 1249

$$(ax+b)y'(x)+cy(x)+\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.0875058 (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]
```

$$\left\{\left\{y(x)\to c_2 2^{\frac{1}{2}(a+b-2)}(x-1)^{\frac{1}{2}(-a-b+2)}\,\text{Hypergeometric2F1}\left(-\frac{b}{2}-\frac{1}{2}\sqrt{a^2-2a-4c+1}+\frac{1}{2},-\frac{b}{2}+\frac{1}{2}\sqrt{a^2-2a\right.\right.\right.$$

✓ **Maple** : cpu = 0.104 (sec), leaf count = 134

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+(a*x+b)*diff(y(x),x)+y(x)*c=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{1}{2}+\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2},-\frac{1}{2}-\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2}\right],\left[\frac{a}{2}-\frac{b}{2}\right],\frac{1}{2}+\frac{x}{2}\right)+c_2\Big($$

2.1250 ODE No. 1250

$$\left(x^2-a^2\right)y''(x)+8xy'(x)+12y(x)=0$$

✓ **Mathematica** : cpu = 0.0283154 (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]
```

$$\left\{\left\{y(x)\to \frac{c_2\left(a^2+3x^2\right)}{3(a-x)^3(a+x)^3}+\frac{c_1}{(a+x)^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.022 (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))
```

$$y(x)=\frac{3a^2xc_2+x^3c_2+a^2c_1+3x^2c_1}{\left(a-x\right)^3\left(x+a\right)^3}$$

2.1251 ODE No. 1251

$$x(x+1)y''(x) - (x-1)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0222649 (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 = 0.022 (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))
```

$$y(x) = (x-1)\,c_2\ln(x) - 4c_2 + c_1(x-1)$$

2.1252 ODE No. 1252

$$(ax+b)y'(x)+cy(x)+x(x+1)y''(x)=0$$

✓ **Mathematica** : cpu = 0.0909117 (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]
```

$$\left\{\left\{y(x)\to c_2x^{1-b}\,\text{Hypergeometric2F1}\left(\frac{a}{2}-b-\frac{1}{2}\sqrt{a^2-2a-4c+1}+\frac{1}{2},\frac{a}{2}-b+\frac{1}{2}\sqrt{a^2-2a-4c+1}+\frac{1}{2},2-\right.\right.\right.$$

✓ **Maple** : cpu = 0.099 (sec), leaf count = 124

```
dsolve(x*(1+x)*diff(diff(y(x),x),x)+(a*x+b)*diff(y(x),x)+y(x)*c=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{1}{2}+\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2},-\frac{1}{2}-\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2}\right],[a-b],1+x\right)+c_2(1+$$

2.1253 ODE No. 1253

$$x(x+1)y''(x) + (3x+2)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0157525 (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))
```

$$y(x) = \frac{c_1 \ln(1+x) + c_2}{x}$$

2.1254 ODE No. 1254

$$(x^2+x-2)\,y''(x)+(x^2-x)\,y'(x)+(-6x^2-7x)\,y(x)=0$$

✓ **Mathematica** : cpu = 0.242394 (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][x] == 0
```

$$\left\{\left\{y(x)\to \frac{1}{5}c_2e^{-3x-5}\left(195e^{5x}x\,\text{ExpIntegralEi}(5-5x)-195e^{5x}\,\text{ExpIntegralEi}(5-5x)+e^5x+44e^5\right)-c_1e^{2x}(x-\right.\right.$$

✓ **Maple** : cpu = 0.052 (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))
```

$$y(x)=195\,\mathrm{e}^{-5+2x}c_2(x-1)\,\mathrm{expIntegral}_1\,(5x-5)-c_2(x+44)\,\mathrm{e}^{-3x}+c_1\mathrm{e}^{2x}(x-1)$$

2.1255 ODE No. 1255

$$ay'(x) + (x-1)xy''(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.273209 (sec), leaf count = 118

```
DSolve[-2*y[x] + a*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1\left(a^2+2ax-a+2x^2-2x\right)}{a^2+3a+4}+\frac{c_2x^{a+1}\left(a^2+2ax-a+2x^2-2x\right)(1-x)^{1-a}}{(a-1)a(a+1)\left(a^2+3a+4\right)\left(a^2+a(2x-1)+2(x-1)x\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (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))
```

$$y(x) = c_1\left(a^2 + a(2x-1) + 2x^2 - 2x\right) + c_2(x-1)^{-a}x^a(x-1)x$$

2.1256 ODE No. 1256

$$-v(v+1)y(x)+(x-1)xy''(x)+(2x-1)y'(x)=0$$

✓ **Mathematica** : cpu = 0.0118387 (sec), leaf count = 26

```
DSolve[-(v*(1 + v)*y[x]) + (-1 + 2*x)*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] == 0,y[x],
```

$$\{\{y(x)\to c_1\,\text{LegendreP}(v,2x-1)+c_2\,\text{LegendreQ}(v,2x-1)\}\}$$

✓ **Maple** : cpu = 0.165 (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))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-v,-v\right],\left[-2v\right],\frac{1}{x}\right)x^{v}+c_2\,\text{hypergeom}\left(\left[v+1,v+1\right],\left[2v+2\right],\frac{1}{x}\right)x^{-v-1}$$

2.1257 ODE No. 1257

$$((a+1)x+b)y'(x)+(x-1)xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0630696 (sec), leaf count = 33

```
DSolve[(b + (1 + a)*x)*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1x^{b+1}\,\text{Hypergeometric2F1}(b+1,a+b+1,b+2,x)}{b+1}+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.183 (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))
```

$$y(x)=c_1+x^{b+1}\,\text{hypergeom}\left([b+1,a+b+1],[b+2],x\right)c_2$$

2.1258 ODE No. 1258

$$(ax+b)y'(x)+cy(x)+(x-1)xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0828506 (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]
```

$$\left\{\left\{y(x)\to(-1)^{b+1}c_2x^{b+1}\,\text{Hypergeometric2F1}\left(\frac{a}{2}+b-\frac{1}{2}\sqrt{a^2-2a-4c+1}+\frac{1}{2},\frac{a}{2}+b+\frac{1}{2}\sqrt{a^2-2a-4c+1}\right.\right.\right.$$

✓ **Maple** : cpu = 0.093 (sec), leaf count = 110

```
dsolve(x*(x-1)*diff(diff(y(x),x),x)+(a*x+b)*diff(y(x),x)+y(x)*c=0,y(x))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{1}{2}+\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2},-\frac{1}{2}-\frac{\sqrt{a^2-2a-4c+1}}{2}+\frac{a}{2}\right],[-b],x\right)+c_2x^{b+1}\,\text{hyperg}$$

2.1259 ODE No. 1259

$$((a+1)x+b)y'(x) - ly(x) + (x-1)xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0718263 (sec), leaf count = 120

```
DSolve[-(l*y[x]) + (b + (1 + a)*x)*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to (-1)^{b+1}c_2x^{b+1}\,\text{Hypergeometric2F1}\left(\frac{a}{2}+b-\frac{1}{2}\sqrt{a^2+4l}+1,\frac{a}{2}+b+\frac{1}{2}\sqrt{a^2+4l}+1,b+2,x\right)+c_1\,\text{I}\right.\right.$$

✓ **Maple** : cpu = 0.099 (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))
```

$$y(x) = c_1\,\text{hypergeom}\left(\left[\frac{a}{2}-\frac{\sqrt{a^2+4l}}{2},\frac{a}{2}+\frac{\sqrt{a^2+4l}}{2}\right],[-b],x\right)+c_2x^{b+1}\,\text{hypergeom}\left(\left[\frac{a}{2}-\frac{\sqrt{a^2+4l}}{2}+b+1,\frac{a}{2}\right.\right.$$

2.1260 ODE No. 1260

$$y'(x)(x(\mathrm{a1}+\mathrm{b1}+1)-\mathrm{d1})+\mathrm{a1b1d1}+(x-1)xy''(x)=0$$

✓ **Mathematica** : cpu = 0.279526 (sec), leaf count = 65

```
DSolve[a1*b1*d1 + (-d1 + (1 + a1 + b1)*x)*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] == 0,y
```

$$\left\{\left\{y(x)\to \mathrm{a1b1}x\,\mathrm{Gamma}(\mathrm{d1}+1)\,{}_3\tilde{F}_2(1,\mathrm{a1}+\mathrm{b1}+1,1;\mathrm{d1}+1,2;x)-\frac{c_1x^{1-\mathrm{d1}}\,\mathrm{Hypergeometric2F1}(1-\mathrm{d1},\mathrm{a1}+}{\mathrm{d1}-1}\right.\right.$$

✓ **Maple** : cpu = 0.5 (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))
```

$$y(x)=\int(x-1)^{-\mathrm{a1}-\mathrm{b1}-1+\mathrm{d1}}\left(-\mathrm{a1}\,\mathrm{b1}\,\mathrm{signum}\,(x-1)^{\mathrm{a1}+\mathrm{b1}-\mathrm{d1}}\,(-\mathrm{signum}\,(x-1))^{-\mathrm{a1}-\mathrm{b1}+\mathrm{d1}}\,\mathrm{hypergeom}\,([\mathrm{d1},\right.$$

2.1261 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 = 0.297407 (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[1][y][x
```

$$\left\{\left\{y(x)\to c_2\left(-\frac{x}{2}-1\right)^{\frac{n}{2}+\frac{1}{2}}x^{-n}(x+2)^{-\frac{n}{2}-\frac{1}{2}}\text{HeunC}\left[-4ln-2lp-m+n^2+n,-4l(p-1),1-n,n+1,4l,-\frac{x}{2}\right]\right.$$

✓ **Maple** : cpu = 0.319 (sec), leaf count = 97

```
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*
```

$$y(x)=(x+2)^{-\frac{n}{2}-\frac{1}{2}}\left(-\frac{x}{2}-1\right)^{\frac{n}{2}+\frac{1}{2}}\left(x^{-n}\,\text{HeunC}\left(4l,-n,n,-4pl,2(n+1+p)\,l-\frac{n^2}{2}+m-n,-\frac{x}{2}\right)c_2+\text{Heun}\right.$$

2.1262 ODE No. 1262

$$\left(x^2+x-1\right)y'(x)+(x+1)^2y''(x)+(-x-2)y(x)=0$$

✓ **Mathematica** : cpu = 0.241553 (sec), leaf count = 88

```
DSolve[(-2 - x)*y[x] + (-1 + x + x^2)*Derivative[1][y][x] + (1 + x)^2*Derivative[2][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x)\to c_2e^{-x}\int_1^x\exp\left(-\frac{K[1]^2}{K[1]+1}-\frac{K[1]}{K[1]+1}+2K[1]-\frac{1}{K[1]+1}\right)(K[1]+1)^{\frac{K[1]}{K[1]+1}+\frac{1}{K[1]+1}}dK[1]+c_1e^{-x}\right\}$$

✓ **Maple** : cpu = 0.365 (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))
```

$$y(x)=(1+x)\left(c_2\operatorname{HeunD}\left(-4,4,-8,12,\frac{x}{x+2}\right)e^{\frac{x-1}{2x+2}}+c_1e^{-x}\operatorname{HeunD}\left(4,4,-8,12,\frac{x}{x+2}\right)\right)$$

2.1263 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 = 10.437 (sec), leaf count = 179

```
DSolve[(-30 - 20*x)*(3*x + x^2)^(7/3) + y[x] + (-1 + 3*x)*Derivative[1][y][x] + x*(3 + x)*Derivative[
```

$$\left\{\left\{y(x)\to \frac{c_2\left(-4\sqrt{3}x^{4/3}\arctan\left(\frac{\sqrt{3}\sqrt[3]{x}}{\sqrt[3]{x}+2\sqrt[3]{x+3}}\right)-4x^{4/3}\log\left(\sqrt[3]{x+3}-\sqrt[3]{x}\right)+2x^{4/3}\log\left(x^{2/3}+\sqrt[3]{x+3}\sqrt[3]{x}+(x+\right.\right.}{4(x+3)^{7/3}}\right.\right.$$

✓ **Maple** : cpu = 0.092 (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(
```

$$y(x)=\frac{\left(c_2+\int\frac{\left(c_1+3\left(x^2+3x\right)^{\frac{7}{3}}x(x+3)\right)(x+3)^{\frac{7}{3}}}{x^{\frac{4}{3}}\left(x^2+3x\right)}dx\right)x^{\frac{4}{3}}}{(x+3)^{\frac{7}{3}}}$$

2.1264 ODE No. 1264

$$(x^2 + 3x + 4)\, y''(x) + (x^2 + x + 1)\, y'(x) + (-2x - 3)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0499452 (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][x] == (
```

$$\{\{y(x) \to c_2(x^2 + x + 3) + c_1 e^{-x}\}\}$$

✓ **Maple** : cpu = 0.03 (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))
```

$$y(x) = \mathrm{e}^{-x} c_1 + c_2(x^2 + x + 3)$$

2.1265 ODE No. 1265

$$(x-2)(x-1)y''(x)-(2x-3)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.022706 (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],x]
```

$$\left\{\left\{y(x)\to c_1\left(x^2-3x+2\right)P_{\frac{1}{2}\left(-1+\sqrt{5}\right)}^2(2x-3)+c_2\left(x^2-3x+2\right)Q_{\frac{1}{2}\left(-1+\sqrt{5}\right)}^2(2x-3)\right\}\right\}$$

✓ **Maple** : cpu = 2.064 (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))
```

$$y(x)=(x-2)^2\left(c_2\,\mathrm{hypergeom}\left(\left[\frac{1}{2}+\frac{\sqrt{5}}{2},\frac{5}{2}+\frac{\sqrt{5}}{2}\right],\left[\sqrt{5}+1\right],\frac{1}{x-1}\right)(x-1)^{-\frac{1}{2}-\frac{\sqrt{5}}{2}}+c_1\,\mathrm{hypergeom}\left(\left[-\frac{\sqrt{5}}{2}\right.\right.\right.$$

2.1266 ODE No. 1266

$$(x-2)^2y''(x)-(x-2)y'(x)-3y(x)=0$$

✓ **Mathematica** : cpu = 0.0147062 (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 = 0.006 (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))
```

$$y(x)=\frac{c_1(x-2)^4+c_2}{x-2}$$

2.1267 ODE No. 1267

$$-\left(l+2x^2-5x\right)y'(x)+2x^2y''(x)+(1-4x)y(x)=0$$

✓ **Mathematica** : cpu = 0.126828 (sec), leaf count = 76

```
DSolve[(1 - 4*x)*y[x] - (1 - 5*x + 2*x^2)*Derivative[1][y][x] + 2*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2e^{x-\frac{l}{2x}}\int_1^x \frac{e^{\frac{l}{2K[1]}-K[1]}}{K[1]^{3/2}}\,dK[1]}{\sqrt{x}}+\frac{c_1e^{x-\frac{l}{2x}}}{\sqrt{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.264 (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))
```

$$y(x)=\frac{\left(c_1\left(\int \frac{\mathrm{e}^{-x}\mathrm{e}^{\frac{l}{2x}}}{2x^{\frac{3}{2}}}\,dx\right)+c_2\right)\mathrm{e}^{x}\mathrm{e}^{-\frac{l}{2x}}}{\sqrt{x}}$$

2.1268 ODE No. 1268

$$y(x)(ax+b)+2(x-1)xy''(x)+(2x-1)y'(x)=0$$

✓ **Mathematica** : cpu = 0.0817325 (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] == 0,y[x],x
```

$$\left\{\left\{y(x)\to c_1\text{MathieuC}\left[-a-2b,\frac{a}{2},\arccos\left(\sqrt{x}\right)\right]+c_2\text{MathieuS}\left[-a-2b,\frac{a}{2},\arccos\left(\sqrt{x}\right)\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.237 (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))
```

$$y(x)=c_1\,\text{MathieuC}\left(-a-2b,\frac{a}{2},\arccos\left(\sqrt{x}\right)\right)+c_2\,\text{MathieuS}\left(-a-2b,\frac{a}{2},\arccos\left(\sqrt{x}\right)\right)$$

2.1269 ODE No. 1269

$$((2v+5)x-2v-3)y'(x)+(v+1)y(x)+2(x-1)xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0491746 (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[2][y][x]
```

$$\left\{\left\{y(x)\to c_2 i^{-2v-1}x^{\frac{1}{2}(-2v-1)}\,\text{Hypergeometric2F1}\left(\frac{1}{2},-v,\frac{1}{2}-v,x\right)+c_1\,\text{Hypergeometric2F1}\left(\frac{1}{2},v+1,v+\frac{3}{2},\right.\right.\right.$$

✓ **Maple** : cpu = 0.145 (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))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[\frac{1}{2},v+1\right],\left[\frac{3}{2}+v\right],x\right)+c_2x^{-\frac{1}{2}-v}\,\text{hypergeom}\left(\left[\frac{1}{2},-v\right],\left[\frac{1}{2}-v\right],x\right)$$

2.1270 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 = 2.61732 (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)*Derivat
```

$$\left\{\left\{y(x)\to c_2e^{-3x}(x+2)^4\int_1^x\frac{e^{K[1]}(K[1]+1)^{3/2}}{(K[1]+2)^5}dK[1]+c_1e^{-3x}(x+2)^4\right\}\right\}$$

✓ **Maple** : cpu = 0.316 (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)=
```

$$y(x)=\mathrm{e}^{-2x}(x+2)^4\left(c_2\,\mathrm{HeunC}\left(-1,\frac{5}{2},4,-\frac{7}{4},\frac{7}{2},-1-x\right)(1+x)^{\frac{5}{2}}+c_1\,\mathrm{HeunC}\left(-1,-\frac{5}{2},4,-\frac{7}{4},\frac{7}{2},-1-x\right)\right)$$

2.1271 ODE No. 1271

$$4x^2y''(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0065506 (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 = 0.005 (sec), leaf count = 14

```
dsolve(4*x^2*diff(diff(y(x),x),x)+y(x)=0,y(x))
```

$$y(x) = \sqrt{x}\left(\ln(x)\,c_2 + c_1\right)$$

2.1272 ODE No. 1272

$$\left(4a^2x^2+1\right)y(x)+4x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0070155 (sec), leaf count = 32

```
DSolve[(1 + 4*a^2*x^2)*y[x] + 4*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\sqrt{x}\,\text{BesselJ}(0,ax)+c_2\sqrt{x}\,\text{BesselY}(0,ax)\right\}\right\}$$

✓ **Maple** : cpu = 0.027 (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))
```

$$y(x)=\sqrt{x}\left(\text{BesselY}\left(0,ax\right)c_2+\text{BesselJ}\left(0,ax\right)c_1\right)$$

2.1273 ODE No. 1273

$$y(x)\left(4kx-4m^2-x^2+1\right)+4x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0098457 (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 = 0.073 (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))
```

$$y(x)=c_1\,\mathrm{WhittakerM}\left(k,m,x\right)+c_2\,\mathrm{WhittakerW}\left(k,m,x\right)$$

2.1274 ODE No. 1274

$$\left(x-v^2\right)y(x)+4x^2y''(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0226265 (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]
```

$$\left\{\left\{y(x)\to c_1\,\text{Gamma}(1-v)\,\text{BesselJ}\left(-v,\sqrt{x}\right)+c_2\,\text{Gamma}(v+1)\,\text{BesselJ}\left(v,\sqrt{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.006 (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))
```

$$y(x)=c_1\,\text{BesselJ}\left(v,\sqrt{x}\right)+c_2\,\text{BesselY}\left(v,\sqrt{x}\right)$$

2.1275 ODE No. 1275

$$y(x)\left(2x(2l-m+1)-m^2-x^2+1\right)+4x^2y''(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0183907 (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[2][y][x]
```

$$\left\{\left\{y(x)\to c_1e^{\frac{1}{2}\left(\sqrt{m^2-1}\log(x)-x\right)}\,\text{HypergeometricU}\left(\frac{1}{2}\left(-2l+m+\sqrt{m^2-1}\right),\sqrt{m^2-1}+1,x\right)+c_2e^{\frac{1}{2}\left(\sqrt{m^2-1}\,\mathrm{l}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.179 (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))
```

$$y(x)=\frac{c_2\,\text{WhittakerW}\left(l-\frac{m}{2}+\frac{1}{2},\frac{\sqrt{m+1}\sqrt{m-1}}{2},x\right)+c_1\,\text{WhittakerM}\left(l-\frac{m}{2}+\frac{1}{2},\frac{\sqrt{m+1}\sqrt{m-1}}{2},x\right)}{\sqrt{x}}$$

2.1276 ODE No. 1276

$$-4e^x\sqrt{x^3}+4x^2y''(x)-\left(4x^2+1\right)y(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.135553 (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][x] == 0
```

$$\left\{\left\{y(x)\to \frac{e^x\sqrt{x^3}(2x-1)}{4x^2}+\frac{c_1e^{-x}}{\sqrt{x}}+\frac{c_2e^x}{2\sqrt{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.062 (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
```

$$y(x)=\frac{\sinh(x)\,c_2}{\sqrt{x}}+\frac{\cosh(x)\,c_1}{\sqrt{x}}+\frac{\sqrt{x^3}\,\mathrm{e}^x}{2x}$$

2.1277 ODE No. 1277

$$(-ax^2-1)\,y(x)+4x^2y''(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0198421 (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]
```

$$\left\{\left\{y(x)\to \frac{c_1e^{-\frac{\sqrt{a}x}{2}}}{\sqrt{x}}+\frac{c_2e^{\frac{\sqrt{a}x}{2}}}{\sqrt{a}\sqrt{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.062 (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))
```

$$y(x)=\frac{c_2\cosh\left(\frac{\sqrt{a}\,x}{2}\right)+c_1\sinh\left(\frac{\sqrt{a}\,x}{2}\right)}{\sqrt{x}}$$

2.1278 ODE No. 1278

$$f(x)y(x) + 4x^2y''(x) + 4xy'(x) = 0$$

✗ **Mathematica** : cpu = 0.265579 (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

$$y(x) = \text{DESol}\left(\left\{\frac{f(x)\_Y(x)}{4x^2} + \frac{\frac{d}{dx}\_Y(x)}{x} + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

2.1279 ODE No. 1279

$$4x^2y''(x) + 5xy'(x) - y(x) - \log(x) = 0$$

✓ **Mathematica** : cpu = 0.0705881 (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]
```

$$\left\{\left\{y(x)\to c_2x^{\frac{1}{2}\left(\frac{\sqrt{17}}{4}-\frac{1}{4}\right)}+c_1x^{\frac{1}{2}\left(-\frac{1}{4}-\frac{\sqrt{17}}{4}\right)}-\frac{256(\log(x)+1)}{\left(\sqrt{17}-1\right)^2\left(1+\sqrt{17}\right)^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.127 (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))
```

$$y(x) = x^{-\frac{1}{8}+\frac{\sqrt{17}}{8}}c_2 + x^{-\frac{1}{8}-\frac{\sqrt{17}}{8}}c_1 - \ln(x) - 1$$

2.1280 ODE No. 1280

$$4x^2y''(x) + (-4x^2 - 12x - 3)\,y(x) + 8xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0340027 (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[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2e^{-x}\left(4e^{2x}x^2\,\text{ExpIntegralEi}(-2x)+2x-1\right)}{2x^{3/2}}+c_1e^x\sqrt{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.037 (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))
```

$$y(x) = \frac{4x^2\,\text{expIntegral}_1\,(2x)\,\mathrm{e}^{x}c_2 + (1-2x)\,c_2\mathrm{e}^{-x} + c_1x^2\mathrm{e}^{x}}{x^{\frac{3}{2}}}$$

2.1281 ODE No. 1281

$$4x^2y''(x) + (4x^2 - 4x - 1)\,y(x) - 4(2x-1)xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0106495 (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][x] == 0,
```

$$\left\{\left\{y(x) \to \frac{c_1 e^x}{\sqrt{x}} + c_2 e^x \sqrt{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.037 (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))
```

$$y(x) = \frac{e^x (xc_2 + c_1)}{\sqrt{x}}$$

2.1282 ODE No. 1282

$$4x^3y'(x)+4x^2y''(x)+(x^2-4)(x^2+6)y(x)=0$$

✓ **Mathematica** : cpu = 0.0116539 (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,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1e^{-\frac{x^2}{4}}}{x^2}+\frac{1}{5}c_2e^{-\frac{x^2}{4}}x^3\right\}\right\}$$

✓ **Maple** : cpu = 0.029 (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))
```

$$y(x)=\frac{\mathrm{e}^{-\frac{x^2}{4}}\left(x^5c_2+c_1\right)}{x^2}$$

2.1283 ODE No. 1283

$$4x^2y''(x)+4x^2\log(x)y'(x)+y(x)\left(x^2\log^2(x)+2x-8\right)-4\sqrt{e^xx^{-x}}x^2=0$$

✓ **Mathematica** : cpu = 0.0418949 (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][x] + 4*x
```

$$\left\{\left\{y(x)\to c_1e^{x/2}x^{-\frac{x}{2}-1}+\frac{1}{3}c_2e^{x/2}x^{2-\frac{x}{2}}+\frac{1}{9}\left(3x^2\sqrt{e^xx^{-x}}\log(x)-x^2\sqrt{e^xx^{-x}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.128 (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*(e
```

$$y(x)=\frac{x^2\left(\ln(x)-\frac{1}{3}\right)\sqrt{x^{-x}\mathrm{e}^x}}{3}+\mathrm{e}^{\frac{x}{2}}\left(c_1x^{-\frac{x}{2}+2}+c_2x^{-\frac{x}{2}-1}\right)$$

2.1284 ODE No. 1284

$$(2x+1)^2y''(x) - 2(2x+1)y'(x) - 12y(x) - 3x - 1 = 0$$

✓ **Mathematica** : cpu = 0.0211235 (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] == 0,y[
```

$$\left\{\left\{y(x) \to \frac{-72x^2-56x-7}{192(2x+1)} + c_1(2x+1)^3 + \frac{c_2}{2x+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.022 (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))
```

$$y(x) = \frac{c_1}{2x+1} + (2x+1)^3 c_2 + \frac{-72x^2-56x-7}{384x+192}$$

2.1285 ODE No. 1285

$$((4a+2)x-a)y'(x)+(a-1)ay(x)+x(4x-1)y''(x)=0$$

✓ **Mathematica** : cpu = 0.208498 (sec), leaf count = 195

```
DSolve[(-1 + a)*a*y[x] + (-a + (2 + 4*a)*x)*Derivative[1][y][x] + x*(-1 + 4*x)*Derivative[2][y][x] ==
```

$$\left\{\left\{y(x)\to \frac{2c_1\sqrt[4]{4x-1}x^{\frac{1}{2}-\frac{a}{2}}e^{\sqrt{-(a-1)^2}\arctan\left(\sqrt{4x-1}\right)}}{\sqrt[4]{1-4x}}-\frac{c_2\sqrt[4]{4x-1}x^{\frac{1}{2}-\frac{a}{2}}\left(1-i\sqrt{4x-1}\right)^{-i\sqrt{-(a-1)^2}}\left(1+i\sqrt{4x-1}\right.}{2\sqrt{-(a-1)^2}\sqrt[4]{1-4x}}\right.\right.$$

✓ **Maple** : cpu = 0.099 (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))
```

$$y(x)=c_1\,\mathrm{hypergeom}\left(\left[\frac{a}{2},\frac{a}{2}-\frac{1}{2}\right],[a],4x\right)+c_2x^{1-a}\,\mathrm{hypergeom}\left(\left[1-\frac{a}{2},-\frac{a}{2}+\frac{1}{2}\right],[-a+2],4x\right)$$

2.1286 ODE No. 1286

$$(3x-1)^2y''(x)+3(3x-1)y'(x)-9y(x)-\log^2(3x-1)=0$$

✓ **Mathematica** : cpu = 0.0669616 (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[2][y][x
```

$$\left\{\left\{y(x)\to\frac{-6x-3x\log^2(3x-1)+\log^2(3x-1)+\log(3x-1)-\log(1-3x)+1}{9(3x-1)}+\frac{c_1\left((1-3x)^2+1\right)}{2(1-3x)}+\frac{ic_2\left((1\right.}{2(}\right.\right.$$

✓ **Maple** : cpu = 0.022 (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))
```

$$y(x)=\frac{c_1}{3x-1}+(3x-1)\,c_2-\frac{\ln\left(3x-1\right)^2}{9}-\frac{2}{9}$$

2.1287 ODE No. 1287

$$9(x-1)xy''(x)+3(2x-1)y'(x)-20y(x)=0$$

✓ **Mathematica** : cpu = 0.0113398 (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[x],x]
```

$$\left\{\left\{y(x)\to c_2\sqrt[3]{1-x}\sqrt[3]{x}Q_1^{\frac{2}{3}}(2x-1)-\frac{c_1(2-2x)^{2/3}\sqrt[3]{1-x}x^{2/3}(6x-5)}{3\,2^{2/3}(x-1)\,\mathrm{Gamma}\left(\frac{4}{3}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.022 (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))
```

$$y(x)=c_1(6x-5)\,x^{\frac{2}{3}}+c_2(6x-1)\,(x-1)^{\frac{2}{3}}$$

2.1288 ODE No. 1288

$$16x^2y''(x) + (4x + 3)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0245801 (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 = 0.02 (sec), leaf count = 21

```
dsolve(16*x^2*diff(diff(y(x),x),x)+(4*x+3)*y(x)=0,y(x))
```

$$y(x) = x^{\frac{1}{4}}\left(\cos\left(\sqrt{x}\right)c_2 + \sin\left(\sqrt{x}\right)c_1\right)$$

2.1289 ODE No. 1289

$$16x^2y''(x) + 32xy'(x) + (-4x - 5)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0789788 (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]
```

$$\left\{\left\{y(x)\to \frac{c_1e^{\sqrt{x}}\left(\sqrt{x}-1\right)}{x^{5/4}}-\frac{c_2e^{-\sqrt{x}}\left(\sqrt{x}+1\right)}{x^{5/4}}\right\}\right\}$$

✓ **Maple** : cpu = 0.093 (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))
```

$$y(x) = \frac{c_2\left(\sqrt{x}+1\right)\mathrm{e}^{-\sqrt{x}}+\mathrm{e}^{\sqrt{x}}c_1\left(\sqrt{x}-1\right)}{x^{\frac{5}{4}}}$$

2.1290 ODE No. 1290

$$\left(27x^2+4\right)y''(x)+27xy'(x)-3y(x)=0$$

✓ **Mathematica** : cpu = 0.0683196 (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]
```

$$\left\{\left\{y(x)\to c_1\cosh\left(\frac{\sqrt{-27x^2-4}\arctan\left(\frac{3x}{\sqrt{-9x^2-\frac{4}{3}}}\right)}{3\sqrt{27x^2+4}}\right)+ic_2\sinh\left(\frac{\sqrt{-27x^2-4}\arctan\left(\frac{3x}{\sqrt{-9x^2-\frac{4}{3}}}\right)}{3\sqrt{27x^2+4}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.028 (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))
```

$$y(x)=c_1\sinh\left(\frac{\operatorname{arcsinh}\left(\frac{3\sqrt{3}\,x}{2}\right)}{3}\right)+c_2\cosh\left(\frac{\operatorname{arcsinh}\left(\frac{3\sqrt{3}\,x}{2}\right)}{3}\right)$$

2.1291 ODE No. 1291

$$48(x-1)xy''(x) + (152x-40)y'(x) + 53y(x) = 0$$

✓ **Mathematica** : cpu = 0.0418644 (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[x],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{Hypergeometric2F1}\left(\frac{13}{12}-\frac{\sqrt{\frac{5}{2}}}{6},\frac{13}{12}+\frac{\sqrt{\frac{5}{2}}}{6},\frac{5}{6},x\right)+\sqrt[6]{-1}c_2\sqrt[6]{x}\,\text{Hypergeometric2F1}\left(\frac{5}{4}-\frac{\sqrt{\frac{5}{2}}}{6},\frac{5}{4}\right.\right.\right.$$

✓ **Maple** : cpu = 1.002 (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))
```

$$y(x) = c_1\,\mathrm{hypergeom}\left(\left[\frac{13}{12}-\frac{\sqrt{10}}{12},\frac{13}{12}+\frac{\sqrt{10}}{12}\right],\left[\frac{5}{6}\right],x\right)+c_2x^{\frac{1}{6}}\,\mathrm{hypergeom}\left(\left[\frac{5}{4}-\frac{\sqrt{10}}{12},\frac{5}{4}+\frac{\sqrt{10}}{12}\right],\left[\frac{7}{6}\right],x\right)$$

2.1292 ODE No. 1292

$$50(x-1)xy''(x)+25(2x-1)y'(x)-2y(x)=0$$

✓ **Mathematica** : cpu = 0.038763 (sec), leaf count = 57

```
DSolve[-2*y[x] + 25*(-1 + 2*x)*Derivative[1][y][x] + 50*(-1 + x)*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cosh\left(\frac{2}{5}\log\left(\sqrt{x-1}-\sqrt{x}\right)\right)-ic_2\sinh\left(\frac{2}{5}\log\left(\sqrt{x-1}-\sqrt{x}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.051 (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))
```

$$y(x)=\frac{c_1\left(\sqrt{x}+\sqrt{x-1}\right)^{\frac{4}{5}}+c_2}{\left(\sqrt{x}+\sqrt{x-1}\right)^{\frac{2}{5}}}$$

2.1293 ODE No. 1293

$$144(x-1)xy''(x)+(120x-48)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.153747 (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],x]
```

$$\left\{\left\{y(x)\to(-1)^{2/3}c_2x^{2/3}\,\text{Hypergeometric2F1}\left(\frac{7}{12},\frac{7}{12},\frac{5}{3},x\right)+c_1\,\text{Hypergeometric2F1}\left(-\frac{1}{12},-\frac{1}{12},\frac{1}{3},x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.1 (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))
```

$$y(x)=x^{\frac{1}{3}}\left(\text{LegendreQ}\left(-\frac{1}{2},\frac{2}{3},\sqrt{1-x}\right)c_2+\text{LegendreP}\left(-\frac{1}{2},\frac{2}{3},\sqrt{1-x}\right)c_1\right)$$

2.1294 ODE No. 1294

$$144(x-1)xy''(x) + (168x-96)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0370013 (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],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{Hypergeometric2F1}\left(\frac{1}{12},\frac{1}{12},\frac{2}{3},x\right)+\sqrt[3]{-1}c_2\sqrt[3]{x}\,\text{Hypergeometric2F1}\left(\frac{5}{12},\frac{5}{12},\frac{4}{3},x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.101 (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))
```

$$y(x) = x^{\frac{1}{6}}\left(\text{LegendreQ}\left(-\frac{1}{2},\frac{1}{3},\sqrt{1-x}\right)c_2+\text{LegendreP}\left(-\frac{1}{2},\frac{1}{3},\sqrt{1-x}\right)c_1\right)$$

2.1295 ODE No. 1295

$$a x^2 y''(x) + b x y'(x) + y(x)\left(c x^2 + d x + f\right) = 0$$

✓ **Mathematica** : cpu = 0.103436 (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],x]
```

$$\left\{\left\{y(x)\to c_1 \text{HypergeometricU}\left(-\frac{-\sqrt{c}a - id\sqrt{a} - \sqrt{c}\sqrt{a^2-2ba-4fa+b^2}}{2a\sqrt{c}}, \frac{\sqrt{a^2-2ba-4fa+b^2}}{a}+1, \frac{2i\sqrt{}}{\sqrt{}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.372 (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))
```

$$y(x) = x^{-\frac{b}{2a}}\left(\text{WhittakerM}\left(-\frac{id}{2\sqrt{a}\sqrt{c}}, \frac{\sqrt{a^2+(-2b-4f)a+b^2}}{2a}, \frac{2i\sqrt{c}\,x}{\sqrt{a}}\right)c_1 + \text{WhittakerW}\left(-\frac{id}{2\sqrt{a}\sqrt{c}}, \frac{\sqrt{a^2}}{}\right.\right.$$

2.1296 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 = 0.212188 (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][y][x] =
```

$$\left\{\left\{y(x)\to c_1\,\text{HypergeometricU}\left(-\frac{2\text{b0a2}-\sqrt{\text{a1}^2-4\text{a0a2}}\text{a2}-\text{a1b1}-\sqrt{\text{a1}^2-4\text{a0a2}}\sqrt{\text{a2}^2-2\text{b1a2}-4\text{c0a2}+}}{2\text{a2}\sqrt{\text{a1}^2-4\text{a0a2}}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.354 (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))
```

$$y(x)=\mathrm{e}^{-\frac{\mathrm{a1}\,x}{2\,\mathrm{a2}}}x^{-\frac{\mathrm{b1}}{2\,\mathrm{a2}}}\left(\text{WhittakerM}\left(-\frac{\mathrm{a1}\,\mathrm{b1}-2\,\mathrm{a2}\,\mathrm{b0}}{2\,\mathrm{a2}\sqrt{-4\,\mathrm{a0}\,\mathrm{a2}+\mathrm{a1}^2}},\frac{\sqrt{\mathrm{a2}^2+(-2\,\mathrm{b1}-4\,\mathrm{c0})\,\mathrm{a2}+\mathrm{b1}^2}}{2\,\mathrm{a2}},\frac{\sqrt{-4\,\mathrm{a0}\,\mathrm{a2}+\mathrm{a1}^2}\,x}{\mathrm{a2}}\right)\right.$$

2.1297 ODE No. 1297

$$\left(ax^2+1\right)y''(x)+axy'(x)+by(x)=0$$

✓ **Mathematica** : cpu = 0.0629098 (sec), leaf count = 84

```
DSolve[b*y[x] + a*x*Derivative[1][y][x] + (1 + a*x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cos\left(\frac{2\sqrt{b}\operatorname{arctanh}\left(\frac{\sqrt{a}x}{\sqrt{ax^2+1}-1}\right)}{\sqrt{a}}\right)+c_2\sin\left(\frac{2\sqrt{b}\operatorname{arctanh}\left(\frac{\sqrt{a}x}{\sqrt{ax^2+1}-1}\right)}{\sqrt{a}}\right)\right\}\right\}$$

✓ **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))
```

$$y(x)=\left(c_1\left(\sqrt{a}\,x+\sqrt{a\,x^2+1}\right)^{\frac{2i\sqrt{b}}{\sqrt{a}}}+c_2\right)\left(\sqrt{a}\,x+\sqrt{a\,x^2+1}\right)^{-\frac{i\sqrt{b}}{\sqrt{a}}}$$

2.1298 ODE No. 1298

$$\left(ax^2+1\right)y''(x)+bxy'(x)+cy(x)=0$$

✓ **Mathematica** : cpu = 0.0323614 (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]
```

$$\left\{\left\{y(x)\to c_1\left(ax^2+1\right)^{\frac{2a-b}{4a}}P_{\frac{\sqrt{a^2-2ba-4ca+b^2}-a}{2a}}^{\frac{b-2a}{2a}}\left(i\sqrt{a}x\right)+c_2\left(ax^2+1\right)^{\frac{2a-b}{4a}}Q_{\frac{\sqrt{a^2-2ba-4ca+b^2}-a}{2a}}^{\frac{b-2a}{2a}}\left(i\sqrt{a}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.148 (sec), leaf count = 124

```
dsolve((a*x^2+1)*diff(diff(y(x),x),x)+b*x*diff(y(x),x)+y(x)*c=0,y(x))
```

$$y(x)=\left(a\,x^2+1\right)^{\frac{2a-b}{4a}}\left(\mathrm{LegendreP}\left(\frac{\sqrt{a^2+(-2b-4c)\,a+b^2}-a}{2a},\frac{2a-b}{2a},\sqrt{-a}\,x\right)c_1+\mathrm{LegendreQ}\left(\frac{\sqrt{a^2+(-\right.\right.$$

2.1299 ODE No. 1299

$$\left(a^2x^2-1\right)y''(x)+2a^2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0186401 (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]
```

$$\left\{\left\{y(x)\to c_2-\frac{c_1\operatorname{arctanh}(ax)}{a}\right\}\right\}$$

✓ **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))
```

$$y(x)=c_1-\frac{\left(\ln\left(ax+1\right)-\ln\left(ax-1\right)\right)c_2}{2a}$$

2.1300 ODE No. 1300

$$\left(a^2x^2-1\right)y''(x)+2a^2xy'(x)-2a^2y(x)=0$$

✓ **Mathematica** : cpu = 0.0084015 (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[x],x]
```

$$\left\{\left\{y(x)\to ac_1x+c_2\left(ax\left(\frac{1}{2}\log(ax+1)-\frac{1}{2}\log(1-ax)\right)-1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (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))
```

$$y(x)=-\frac{c_2a\ln(ax+1)\,x}{2}+\frac{c_2a\ln(ax-1)\,x}{2}+xc_1+c_2$$

2.1301 ODE No. 1301

$$\left(ax^2+bx\right)y''(x)-2ay(x)+2by'(x)=0$$

✓ **Mathematica** : cpu = 0.0174577 (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 = 0.015 (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))
```

$$y(x)=\frac{c_1+c_2(ax+b)^3}{x}$$

2.1302 ODE No. 1302

$$\mathrm{A0}y(x)(ax+b)+\mathrm{A1}(ax+b)y'(x)+\mathrm{A2}(ax+b)^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0417323 (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][x] == 0
```

$$\left\{\left\{y(x)\to c_1\left(\frac{2b}{a}+2x\right)^{\frac{\mathrm{A1}}{2a\mathrm{A2}}}(2a\mathrm{A2}x+2\mathrm{A2}b)^{-\frac{\mathrm{A1}}{2a\mathrm{A2}}}\left(-\frac{\mathrm{A0}\left(\frac{b}{a}+x\right)}{a\mathrm{A2}}\right)^{\frac{1}{2}-\frac{\mathrm{A1}}{2a\mathrm{A2}}}\mathrm{BesselI}\left(\frac{\mathrm{A1}}{a\mathrm{A2}}-1,2\sqrt{-\frac{\mathrm{A0}\left(\frac{b}{a}+x\right)}{a\mathrm{A2}}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.088 (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))
```

$$y(x)=(ax+b)^{-\frac{-a\,\mathrm{A2}+\mathrm{A1}}{2a\,\mathrm{A2}}}\left(\mathrm{BesselY}\left(\frac{a\,\mathrm{A2}-\mathrm{A1}}{a\,\mathrm{A2}},2\sqrt{\mathrm{A0}}\sqrt{\frac{ax+b}{a^2\,\mathrm{A2}}}\right)c_2+\mathrm{BesselJ}\left(\frac{a\,\mathrm{A2}-\mathrm{A1}}{a\,\mathrm{A2}},2\sqrt{\mathrm{A0}}\sqrt{\frac{ax+b}{a^2\,\mathrm{A2}}}\right)c\right.$$

2.1303 ODE No. 1303

$$y''(x)\left(ax^2+bx+c\right)+(dx+f)y'(x)+gy(x)=0$$

✓ **Mathematica** : cpu = 2.43966 (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[x],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{Hypergeometric2F1}\left(-\frac{a-d+\sqrt{(a-d)^2-4ag}}{2a},\frac{-a+d+\sqrt{(a-d)^2-4ag}}{2a},\frac{\left(b+\sqrt{b^2-4ac}\right)d}{2a\sqrt{b^2-4ac}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.257 (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))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[\frac{-a+d+\sqrt{a^2+(-2d-4g)\,a+d^2}}{2a},-\frac{a-d+\sqrt{a^2+(-2d-4g)\,a+d^2}}{2a}\right],\left[\frac{d\sqrt{\frac{-4ac+b^2}{a^2}}}{2a^2\sqrt{}}\right.\right.$$

2.1304 ODE No. 1304

$$x^3y''(x) + xy'(x) + (-2x - 3)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0379733 (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]
```

$$\left\{\left\{y(x)\to \frac{c_2\left(e^{\frac{1}{x}}\,\text{ExpIntegralEi}\left(-\frac{1}{x}\right)+2x^3-x^2+x\right)}{6x}+\frac{c_1e^{\frac{1}{x}}}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.028 (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))
```

$$y(x)=\frac{\text{expIntegral}_1\left(\frac{1}{x}\right)\mathrm{e}^{\frac{1}{x}}c_2+\mathrm{e}^{\frac{1}{x}}c_1-2\left(x^2-\frac{1}{2}x+\frac{1}{2}\right)xc_2}{x}$$

2.1305 ODE No. 1305

$$x^3y''(x) + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.050481 (sec), leaf count = 47

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + x^3*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2 G_{1,2}^{2,0}\left(-\frac{2}{x}\middle|\begin{array}{c}\frac{1}{2}\\ -1,0\end{array}\right)+c_1 e^{\frac{1}{x}}\left(\mathrm{BesselI}\left(0,\frac{1}{x}\right)-\mathrm{BesselI}\left(1,\frac{1}{x}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 44

```
dsolve(x^3*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = \left(-c_2\,\mathrm{BesselK}\left(1,-\frac{1}{x}\right)+c_2\,\mathrm{BesselK}\left(0,-\frac{1}{x}\right)+c_1\left(\mathrm{BesselI}\left(0,\frac{1}{x}\right)-\mathrm{BesselI}\left(1,\frac{1}{x}\right)\right)\right)\mathrm{e}^{\frac{1}{x}}$$

2.1306 ODE No. 1306

$$y(x)\left(ax^2+a+bx\right)+x^3y''(x)+x^2y'(x)=0$$

✗ **Mathematica** : cpu = 0.620304 (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 = 0.277 (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))
```

$$y(x)=\mathrm{HeunD}\left(0,8a+4b,0,8a-4b,\frac{1+x}{x-1}\right)\left(\left(\int\frac{1}{x\,\mathrm{HeunD}\left(0,8a+4b,0,8a-4b,\frac{1+x}{x-1}\right)^2}dx\right)c_2+c_1\right)$$

2.1307 ODE No. 1307

$$x^3y''(x) + (x+1)xy'(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.113623 (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]
```

$$\left\{\left\{y(x)\to \frac{c_1e^{\frac{1}{x}}(x+1)}{x} - \frac{c_2\left(e^{\frac{1}{x}}x\,\text{ExpIntegralEi}\left(-\frac{1}{x}\right) + e^{\frac{1}{x}}\,\text{ExpIntegralEi}\left(-\frac{1}{x}\right) + x\right)}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (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))
```

$$y(x) = \frac{c_2\mathrm{e}^{\frac{1}{x}}(1+x)\,\text{expIntegral}_1\left(\frac{1}{x}\right) + c_1(1+x)\,\mathrm{e}^{\frac{1}{x}} - c_2x}{x}$$

2.1308 ODE No. 1308

$$x^3y''(x) - x^2y'(x) + xy(x) - \log^3(x) = 0$$

✓ **Mathematica** : cpu = 0.0135552 (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]
```

$$\left\{\left\{y(x)\to \frac{2\log^3(x)+6\log^2(x)+9\log(x)+6}{8x}+c_1x+c_2x\log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.018 (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))
```

$$y(x) = \frac{2\ln(x)^3+6\ln(x)^2+(8x^2c_1+9)\ln(x)+8c_2x^2+6}{8x}$$

2.1309 ODE No. 1309

$$x^3y''(x) - (x^2 - 1)\, y'(x) + xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0609706 (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]
```

$$\left\{\left\{y(x) \to c_2 G_{1,2}^{2,0}\left(-\frac{1}{2x^2}\middle|\begin{array}{c} 1 \\ -\frac{1}{2}, -\frac{1}{2} \end{array}\right) + \sqrt{2}c_1 e^{\frac{1}{4x^2}} x\left(\left(1 - \frac{1}{2x^2}\right)\text{BesselI}\left(0, \frac{1}{4x^2}\right) + \frac{\text{BesselI}\left(1, \frac{1}{4x^2}\right)}{2x^2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.109 (sec), leaf count = 65

```
dsolve(x^3*diff(diff(y(x),x),x)-(x^2-1)*diff(y(x),x)+x*y(x)=0,y(x))
```

$$y(x) = \frac{e^{\frac{1}{4x^2}}\left(c_1\left(2x^2 - 1\right)\text{BesselI}\left(0, \frac{1}{4x^2}\right) + \left(2x^2 - 1\right)c_2\,\text{BesselK}\left(0, -\frac{1}{4x^2}\right) + \text{BesselI}\left(1, \frac{1}{4x^2}\right)c_1 + \text{BesselK}\left(1, -\frac{1}{4x}\right.\right.}{x}$$

2.1310 ODE No. 1310

$$x^3y''(x) + 3x^2y'(x) + xy(x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.0068398 (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 = 0.016 (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))
```

$$y(x) = \frac{\frac{\ln(x)^2}{2} + c_1\ln(x) + c_2}{x}$$

2.1311 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 = 0.0669762 (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] == 0,y
```

$$\left\{\left\{y(x)\to c_2G_{2,2}^{2,0}\left(-x^2\middle|\begin{array}{c}\frac{1-v}{2},\frac{v+2}{2}\\0,0\end{array}\right)+c_1\,\text{Hypergeometric2F1}\left(\frac{v}{2}+\frac{1}{2},-\frac{v}{2},1,-x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.219 (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))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{v}{2},\frac{1}{2}+\frac{v}{2}\right],\left[\frac{1}{2}\right],x^2+1\right)+c_2\sqrt{x^2+1}\,\text{hypergeom}\left(\left[1+\frac{v}{2},\frac{1}{2}-\frac{v}{2}\right],\left[\frac{3}{2}\right],x^2+1\right)$$

2.1312 ODE No. 1312

$$x(x^2+1)\,y''(x)+2(x^2-1)\,y'(x)-2xy(x)=0$$

✓ **Mathematica** : cpu = 0.0135896 (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[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1}{x^2+1}+\frac{c_2x^3}{3\,(x^2+1)}\right\}\right\}$$

✓ **Maple** : cpu = 0.017 (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))
```

$$y(x)=\frac{x^3c_2+c_1}{x^2+1}$$

2.1313 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 = 0.107257 (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^2)*Deriv
```

$$\left\{\left\{y(x)\to c_1\,\text{Hypergeometric2F1}\left(\frac{n}{2}-\frac{v}{2},\frac{n}{2}+\frac{v}{2}+\frac{1}{2},n+1,-x^2\right)+c_2x^{-2n}\,\text{Hypergeometric2F1}\left(-\frac{n}{2}-\frac{v}{2},-\frac{n}{2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.128 (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)=
```

$$y(x)=x^{-n}\left(\text{LegendreP}\left(v,n,\sqrt{x^2+1}\right)c_1+\text{LegendreQ}\left(v,n,\sqrt{x^2+1}\right)c_2\right)$$

2.1314 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 = 0.0965108 (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 + x^2)*De
```

$$\left\{\left\{y(x)\to c_1\,\text{Hypergeometric2F1}\left(-\frac{n}{2}-\frac{v}{2},-\frac{n}{2}+\frac{v}{2}+\frac{1}{2},1-n,-x^2\right)+c_2x^{2n}\,\text{Hypergeometric2F1}\left(\frac{n}{2}-\frac{v}{2},\frac{n}{2}\right.\right.$$

✓ **Maple** : cpu = 0.125 (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)
```

$$y(x)=x^n\left(\text{LegendreP}\left(v,n,\sqrt{x^2+1}\right)c_1+\text{LegendreQ}\left(v,n,\sqrt{x^2+1}\right)c_2\right)$$

2.1315 ODE No. 1315

$$ax^3y(x) + (x^2-1)\,xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0157131 (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 = 0.027 (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))
```

$$y(x)=c_1\sin\left(\frac{(x-1)(1+x)\sqrt{a}}{\sqrt{x^2-1}}\right)+c_2\cos\left(\frac{(x-1)(1+x)\sqrt{a}}{\sqrt{x^2-1}}\right)$$

2.1316 ODE No. 1316

$$x(x^2-1)\,y''(x)+(x^2-1)\,y'(x)-xy(x)=0$$

✓ **Mathematica** : cpu = 0.0503936 (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],x]
```

$$\left\{\left\{y(x)\to c_2G_{2,2}^{2,0}\left(x^2\middle|\begin{array}{c}\frac{1}{2},\frac{3}{2}\\0,0\end{array}\right)+\frac{2c_1\,\text{EllipticE}\left(x^2\right)}{\pi}\right\}\right\}$$

✓ **Maple** : cpu = 0.045 (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))
```

$$y(x)=c_1\,\text{EllipticE}\,(x)+c_2(\text{EllipticCE}\,(x)-\text{EllipticCK}\,(x))$$

2.1317 ODE No. 1317

$$x(x^2-1)\,y''(x)+(3x^2-1)\,y'(x)+xy(x)=0$$

✓ **Mathematica** : cpu = 0.0503798 (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],x]
```

$$\left\{\left\{y(x)\to c_2 G_{2,2}^{2,0}\left(x^2\middle|\begin{array}{c}\frac{1}{2},\frac{1}{2}\\0,0\end{array}\right)+\frac{2c_1\,\text{EllipticK}\left(x^2\right)}{\pi}\right\}\right\}$$

✓ **Maple** : cpu = 0.066 (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))
```

$$y(x)=c_1\,\text{EllipticK}\left(x\right)+c_2\,\text{EllipticCK}\left(x\right)$$

2.1318 ODE No. 1318

$$\left(ax^2+b\right)y'(x)+cxy(x)+x\left(x^2-1\right)y''(x)=0$$

✓ **Mathematica** : cpu = 0.146419 (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],x]
```

$$\left\{\left\{y(x)\to c_1\,\text{Hypergeometric2F1}\left(\frac{a}{4}-\frac{1}{4}\sqrt{a^2-2a-4c+1}-\frac{1}{4},\frac{a}{4}+\frac{1}{4}\sqrt{a^2-2a-4c+1}-\frac{1}{4},\frac{1}{2}-\frac{b}{2},x^2\right)+i$$

✓ **Maple** : cpu = 0.168 (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))
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{1}{4}+\frac{a}{4}+\frac{\sqrt{a^2-2a-4c+1}}{4},-\frac{1}{4}+\frac{a}{4}-\frac{\sqrt{a^2-2a-4c+1}}{4}\right],\left[-\frac{b}{2}+\frac{1}{2}\right],x^2\right)+c_2x^{b+1}$$

2.1319 ODE No. 1319

$$x(x^2+2)\,y''(x) - y'(x) - 6xy(x) = 0$$

✓ **Mathematica** : cpu = 10.0411 (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]
```

$$\left\{\left\{y(x)\to c_1x^{3/2}\left(x^2+2\right)^{3/4}-\frac{c_2\left(x^2+2\right)^{3/4}\text{Hypergeometric2F1}\left(-\frac{3}{4},\frac{7}{4},\frac{1}{4},-\frac{x^2}{2}\right)}{3\ 2^{3/4}}\right\}\right\}$$

✓ **Maple** : cpu = 0.126 (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))
```

$$y(x)=\left(x^2+2\right)^{\frac{3}{4}}\left(x^{\frac{3}{2}}c_1+\mathrm{hypergeom}\left(\left[-\frac{3}{4},\frac{7}{4}\right],\left[\frac{1}{4}\right],-\frac{x^2}{2}\right)c_2\right)$$

2.1320 ODE No. 1320

$$x(x^2-2)\,y''(x)+(x^2+4x+2)\,y(x)-(x^3+3x^2-2x-2)\,y'(x)=0$$

✓ **Mathematica** : cpu = 0.071846 (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)*Derivative[
```

$$\{\{y(x)\to c_1e^xx^2+c_2(x-1)\}\}$$

✓ **Maple** : cpu = 0.028 (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)
```

$$y(x)=c_1(x-1)+c_2x^2\mathrm{e}^x$$

2.1321 ODE No. 1321

$$(x+1)x^2y''(x) - (2x+1)xy'(x) + (2x+1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0189651 (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] == 0,y[x],x
```

$$\{\{y(x) \to c_1x + c_2x(x + \log(x))\}\}$$

✓ **Maple** : cpu = 0.019 (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))
```

$$y(x) = x(\ln(x) c_2 + c_2x + c_1)$$

2.1322 ODE No. 1322

$$(x+1)x^2y''(x)+2(3x+2)xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0268964 (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))
```

$$y(x)=c_1+\left(-4\ln(x)+4\ln(1+x)-\frac{12x^3+6x^2-2x+1}{3x^3(1+x)}\right)c_2$$

2.1323 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 = 0.532476 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == (2*(1 + x)*y[x])/((-1 + x)*x) - (2*(-2 + x)*Derivative[1][y][x])/((-1 +
```

, DifferentialRoot result

$$\{\{y(x) \to (x)\}\}$$

✓ **Maple** : cpu = 0.014 (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))
```

$$y(x) = \frac{c_1 + c_2(x-1)^3}{x^2}$$

2.1324 ODE No. 1324

$$y''(x) = \frac{(5x-4)y'(x)}{(x-1)x} - \frac{(9x-6)y(x)}{(x-1)x^2}$$

✓ **Mathematica** : cpu = 0.0167742 (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])/
```

$$\left\{\left\{y(x)\to c_1x^3 - c_2x^2(x\log(x)+1)\right\}\right\}$$

✓ **Maple** : cpu = 0.021 (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))
```

$$y(x) = x^2(\ln(x)\,c_2x + xc_1 + c_2)$$

2.1325 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 = 0.121462 (sec), leaf count = 52

```
DSolve[Derivative[2][y][x] == -(((-(alpha*beta) + a*b*x)*y[x])/((-1 + x)*x^2)) - ((-1 + alpha + beta
```

$$\left\{\left\{y(x) \to (-1)^{\alpha} c_1 x^{\alpha} \text{Hypergeometric2F1}(a+\alpha, \alpha+b, \alpha-\beta+1, x) + (-1)^{\beta} c_2 x^{\beta} \text{Hypergeometric2F1}(a+\beta, b\right.\right.$$

✓ **Maple** : cpu = 0.161 (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*be
```

$$y(x) = (x-1)^{1-a-\alpha-b-\beta} \left(\text{hypergeom}\left([1-b-\beta, 1-a-\beta], [1-\beta+\alpha], x\right) x^{\alpha} c_1 + \text{hypergeom}\left([1-\alpha-b, 1-\right.\right.$$

2.1326 ODE No. 1326

$$y''(x) = -\frac{y'(x)}{x+1} - \frac{y(x)}{x(x+1)^2}$$

✓ **Mathematica** : cpu = 0.0157477 (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 = 0.022 (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))
```

$$y(x) = \frac{\ln(x)\, c_2 x + x c_1 - c_2}{1+x}$$

2.1327 ODE No. 1327

$$y''(x) = \frac{2y'(x)}{(x-2)x} - \frac{y(x)}{(x-2)x^2}$$

✓ **Mathematica** : cpu = 0.0935206 (sec), leaf count = 104

```
DSolve[Derivative[2][y][x] == -(y[x]/((-2 + x)*x^2)) + (2*Derivative[1][y][x])/((-2 + x)*x),y[x],x]
```

$$\left\{\left\{y(x)\to \left(-\frac{1}{2}\right)^{-\frac{1}{\sqrt{2}}} c_1 x^{-\frac{1}{\sqrt{2}}}\,\text{Hypergeometric2F1}\left(-\frac{1}{\sqrt{2}},-1-\frac{1}{\sqrt{2}},1-\sqrt{2},\frac{x}{2}\right)+\left(-\frac{1}{2}\right)^{\frac{1}{\sqrt{2}}} c_2 x^{\frac{1}{\sqrt{2}}}\,\text{Hypergeom}\right.\right.$$

✓ **Maple** : cpu = 1.943 (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))
```

$$y(x) = (x-2)^2\left(c_1 x^{-\frac{\sqrt{2}}{2}}\,\text{hypergeom}\left(\left[2-\frac{\sqrt{2}}{2},1-\frac{\sqrt{2}}{2}\right],\left[1-\sqrt{2}\right],\frac{x}{2}\right)+c_2 x^{\frac{\sqrt{2}}{2}}\,\text{hypergeom}\left(\left[2+\frac{\sqrt{2}}{2},1+\frac{\sqrt{}}{2}\right.\right.\right.$$

2.1328 ODE No. 1328

$$y''(x) = \frac{2y(x)}{(x-1)^2 x}$$

✓ **Mathematica** : cpu = 0.01249 (sec), leaf count = 36

```
DSolve[Derivative[2][y][x] == (2*y[x])/((-1 + x)^2*x),y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2\left(-x^2+2x\log(x)+1\right)}{x-1}-\frac{c_1 x}{x-1}\right\}\right\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x) = 2/x/(x-1)^2*y(x),y(x))
```

$$y(x) = \frac{2\ln(x)\, c_2 x - c_2 x^2 + x c_1 + c_2}{x-1}$$

2.1329 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 = 0.408741 (sec), leaf count = 67

```
DSolve[Derivative[2][y][x] == -(((-q + alpha*beta*x)*y[x])/((-1 + x)*x*(-a + x))) - ((a*gamma1 - (1 +
```

$\{\{y(x) \to c_2 x^{1-\text{gamma1}}\text{HeunG}[a, q - (\text{gamma1} - 1)((a-1)\delta + \alpha + \beta - \text{gamma1} + 1), \alpha - \text{gamma1} + 1, \beta - \text{gam}$

✓ **Maple** : cpu = 0.473 (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
```

$y(x) = c_1 \operatorname{HeunG}(a, q, \alpha, \beta, \gamma 1, \delta, x) + c_2 x^{1-\gamma 1} \operatorname{HeunG}(a, q - (-1+\gamma 1)(\delta(a-1) + \alpha + \beta - \gamma 1 + 1), \beta + 1 - \gamma 1$

2.1330 ODE No. 1330

$$y''(x) = -\frac{y'(x)\left(Ax^2 + Bx + C\right)}{(x-a)(x-b)(x-c)} - \frac{(\mathrm{DD}x + e)y(x)}{(x-a)(x-b)(x-c)}$$

✓ **Mathematica** : cpu = 2.23045 (sec), leaf count = 1176

```
DSolve[Derivative[2][y][x] == -(((E + DD*x)*y[x])/((-a + x)*(-b + x)*(-c + x))) - ((C + B*x + A*x^2)*
```

$$\left\{\left\{y(x) \to c_2\mathrm{HeunG}\left[\frac{a-c}{a-b}, \frac{A^2ba^4 + B^2a^3 + A\left(b^2 - ab + (a+b)B + 2C\right)a^3 + (a-b)^2(a\mathrm{DD} + e)a^2 - 2(a-b)\right.}{}\right.\right.\right.$$

✓ **Maple** : cpu = 0.911 (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)/(
```

Expression too large to display

2.1331 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 = 0.0228299 (sec), leaf count = 55

```
DSolve[Derivative[2][y][x] == -1/2*((-3 + x)*y[x])/((-2 + x)*x^2) + ((-4 + x)*Derivative[1][y][x])/(2
```

$$\left\{\left\{y(x)\to \frac{c_1\sqrt[4]{x-2}\sqrt{x}}{\sqrt[4]{2-x}} + \frac{2c_2(x-2)^{3/4}\sqrt{x}}{\sqrt[4]{2-x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.023 (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))
```

$$y(x) = \sqrt{x}\,c_1 + c_2\sqrt{x\,(x-2)}$$

2.1332 ODE No. 1332

$$y''(x) = \frac{y'(x)}{x+1} - \frac{(3x+1)y(x)}{4x^2(x+1)}$$

✓ **Mathematica** : cpu = 0.0136427 (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 + x),y[x],
```

$$\left\{\left\{y(x)\to c_1\sqrt{x}+c_2\sqrt{x}(x+\log(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (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))
```

$$y(x) = \sqrt{x}\left(\ln(x)\, c_2 + c_2 x + c_1\right)$$

2.1333 ODE No. 1333

$$y''(x) = \frac{v(v+1)y(x)}{4x^2} - \frac{(3x-1)y'(x)}{2(x-1)x}$$

✓ **Mathematica** : cpu = 0.0501683 (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*(-1 + x)
```

$$\left\{\left\{y(x) \to c_1 i^{-v} x^{-v/2} \text{Hypergeometric2F1}\left(\frac{1}{2}, -v, \frac{1}{2} - v, x\right) + c_2 i^{v+1} x^{\frac{v+1}{2}} \text{Hypergeometric2F1}\left(\frac{1}{2}, v+1, v + \frac{3}{2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.142 (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))
```

$$y(x) = c_1 x^{-\frac{v}{2}} \text{hypergeom}\left(\left[\frac{1}{2}, -v\right], \left[\frac{1}{2} - v\right], x\right) + c_2 x^{\frac{1}{2}+\frac{v}{2}} \text{hypergeom}\left(\left[\frac{1}{2}, v+1\right], \left[\frac{3}{2} + v\right], x\right)$$

2.1334 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 = 0.107393 (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 + a)*x)*De
```

$$\left\{\left\{y(x)\to i^{-c}c_1x^{-c/2}\,\text{Hypergeometric2F1}\left(\frac{a}{2}-\frac{b}{2}-\frac{c}{2},\frac{a}{2}+\frac{b}{2}-\frac{c}{2},1-c,x\right)+i^cc_2x^{c/2}\,\text{Hypergeometric2F1}\left(\frac{a}{2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.122 (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
```

$$y(x) = (x-1)^{1-a}\left(\text{hypergeom}\left(\left[-\frac{a}{2}-\frac{b}{2}+\frac{c}{2}+1,-\frac{a}{2}+\frac{b}{2}+\frac{c}{2}+1\right],[c+1],x\right)x^{\frac{c}{2}}c_1+x^{-\frac{c}{2}}\,\text{hypergeom}\left(\left[-\frac{a}{2}\right.\right.\right.$$

2.1335 ODE No. 1335

$$y''(x) = -\frac{y(x)(ax+b)}{4(x-1)^2x} - \frac{(3x-1)y'(x)}{2(x-1)x}$$

✓ **Mathematica** : cpu = 0.260251 (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][y][x])
```

$$\left\{\left\{y(x)\to e^{\frac{1}{4}(-2\log(1-x)-\log(x))}\sqrt[4]{x}c_1\,\text{Hypergeometric2F1}\left(\frac{1}{4}\left(\sqrt{-8a-4b-4\sqrt{4a^2+4ba-a-b}+1}+1\right),\right.\right.\right.$$

✓ **Maple** : cpu = 0.078 (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
```

$$y(x) = c_1\,\text{LegendreP}\left(\frac{\sqrt{1-4a}}{2}-\frac{1}{2},\sqrt{-a-b},\sqrt{x}\right)+c_2\,\text{LegendreQ}\left(\frac{\sqrt{1-4a}}{2}-\frac{1}{2},\sqrt{-a-b},\sqrt{x}\right)$$

2.1336 ODE No. 1336

$$y''(x) = -\frac{(1-3x)y(x)}{(x-1)(2x-1)^2}$$

✓ **Mathematica** : cpu = 0.0294136 (sec), leaf count = 70

```
DSolve[Derivative[2][y][x] == -(((1 - 3*x)*y[x])/((-1 + x)*(-1 + 2*x)^2)),y[x],x]
```

$$\{\{y(x) \to c_2\sqrt{1-2x}(2x\log(2(x-1)+1) - 2\log(2(x-1)+1) - 2x\log(x-1) + 2\log(x-1) - 1) - c_1\sqrt{1-2x}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 42

```
dsolve(diff(diff(y(x),x),x) = -(-3*x+1)/(x-1)/(2*x-1)^2*y(x),y(x))
```

$$y(x) = \sqrt{2x-1}\left(-2(x-1)\,c_2\ln(2x-1) + 2(x-1)\,c_2\ln(x-1) + xc_1 - c_1 + c_2\right)$$

2.1337 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 = 0.0692293 (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)*Derivative[1
```

$$\left\{\left\{y(x)\to \frac{c_1}{\sqrt{\frac{b+x}{a-b}+1}} + \frac{c_2\sqrt{b+x}}{\sqrt{a-b}\sqrt{\frac{b+x}{a-b}+1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.035 (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
```

$$y(x) = \frac{\sqrt{x+b}\,c_1 + c_2}{\sqrt{\frac{x+a}{a-b}}}$$

2.1338 ODE No. 1338

$$y''(x) = \frac{y(x)}{3(x-2)x^2} + \frac{(6x-1)y'(x)}{3(x-2)x}$$

✓ **Mathematica** : cpu = 1.18462 (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 + x)*x)
```

$$\left\{\left\{y(x)\to \frac{3}{935}c_2x\left(18x^2-102x+187\right)+c_1\sqrt[6]{x}(2-x)^{17/6}\right\}\right\}$$

✓ **Maple** : cpu = 0.023 (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))
```

$$y(x) = c_2x^{\frac{1}{6}}(x-2)^{\frac{17}{6}} + 18c_1x\left(x^2-\frac{17}{3}x+\frac{187}{18}\right)$$

2.1339 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 = 0.124228 (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 + a*(2 + b
```

$$\left\{\left\{y(x) \to c_1 a^{-c} x^{-c}\,\text{Hypergeometric2F1}(1-c, b-c, -c-d+1, -ax) + c_2 a^d x^d\,\text{Hypergeometric2F1}(d+1, b+d$$

✓ **Maple** : cpu = 0.158 (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)/
```

$$y(x) = (ax+1)^{-b+c-d}\left(\text{hypergeom}\left([-d, 1-b-d], [1-d-c], -ax\right)x^{-c}c_2 + \text{hypergeom}\left([c, 1-b+c], [1+d+\right.\right.$$

2.1340 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 = 0.0187352 (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)*Derivative[1][
```

$$\left\{\left\{y(x) \to \frac{c_2 x^3}{ax+b} + \frac{c_1 x^2}{ax+b}\right\}\right\}$$

✓ **Maple** : cpu = 0.021 (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
```

$$y(x) = \frac{x^2(xc_2 + c_1)}{ax+b}$$

2.1341 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 = 11.2559 (sec), leaf count = 2921

```
DSolve[Derivative[2][y][x] == A*x - ((-b + a*v*x)*y[x])/(x^2*(b + a*x)) - ((b + 2*a*x)*Derivative[1][
```

$$\left\{\left\{y(x)\to \frac{axc_1\,\text{Hypergeometric2F1}\left(\frac{3}{2}-\frac{1}{2}\sqrt{1-4v},\frac{1}{2}\sqrt{1-4v}+\frac{3}{2},3,-\frac{ax}{b}\right)}{b} + \frac{ax\int_1^x\left(-\frac{}{a^2\left(v\,\text{Hypergeometric2F1}\left(\frac{1}{2}\right.\right.}\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.256 (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)
```

$$y(x) = \frac{x^{-\frac{1}{2}+\frac{\sqrt{1-4v}}{2}}a^2c_2(v+6)(v+2)(v+12)\,\text{hypergeom}\left(\left[\frac{3}{2}-\frac{\sqrt{1-4v}}{2},-\frac{1}{2}-\frac{\sqrt{1-4v}}{2}\right],\left[1-\sqrt{1-4v}\right],-\frac{b}{ax}\right)+a}{}$$

2.1342 ODE No. 1342

$$y''(x) = -\frac{ay(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.058334 (sec), leaf count = 52

```
DSolve[Derivative[2][y][x] == -((a*y[x])/x^4),y[x],x]
```

$$\left\{\left\{y(x)\to c_1xe^{\frac{i\sqrt{a}}{x}}-\frac{ic_2xe^{-\frac{i\sqrt{a}}{x}}}{2\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 31

```
dsolve(diff(diff(y(x),x),x) = -a/x^4*y(x),y(x))
```

$$y(x) = x\left(\cosh\left(\frac{\sqrt{-a}}{x}\right)c_2+\sinh\left(\frac{\sqrt{-a}}{x}\right)c_1\right)$$

2.1343 ODE No. 1343

$$y''(x) = -\frac{y(x)\left((1-a)ax^2 - b(b+x)\right)}{x^4}$$

✓ **Mathematica** : cpu = 0.127757 (sec), leaf count = 73

```
DSolve[Derivative[2][y][x] == -((((1 - a)*a*x^2 - b*(b + x))*y[x])/x^4),y[x],x]
```

$$\left\{\left\{y(x) \to c_1\left(2\left(ax+\frac{b}{2}\right)\text{BesselI}\left(a,\frac{b}{x}\right)+b\,\text{BesselI}\left(a+1,\frac{b}{x}\right)\right)+c_2\left(2\left(ax+\frac{b}{2}\right)K_a\left(\frac{b}{x}\right)-bK_{a+1}\left(\frac{b}{x}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.105 (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))
```

$$y(x) = \text{BesselI}\left(a+1,\frac{b}{x}\right)c_1b - \text{BesselK}\left(a+1,\frac{b}{x}\right)c_2b + 2\left(c_1\,\text{BesselI}\left(a,\frac{b}{x}\right)+c_2\,\text{BesselK}\left(a,\frac{b}{x}\right)\right)\left(ax+\frac{b}{2}\right)$$

2.1344 ODE No. 1344

$$y''(x) = -\frac{(e^{2/x} - v^2)\, y(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.337739 (sec), leaf count = 173

```
DSolve[Derivative[2][y][x] == -(((E^(2/x) - v^2)*y[x])/x^4),y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1 2^{v+\frac{v+1}{2}} \left(e^{2/x}\right)^{\frac{v+1}{2}-\frac{1}{2}} \left(-e^{2/x}\right)^{\frac{1}{2}(-v-1)+\frac{1}{2}} \text{BesselI}\left(v,\sqrt{-e^{2/x}}\right)}{\log\left(e^{2/x}\right)} + \frac{c_2(-1)^{-v} 2^{v+\frac{v+1}{2}} \left(e^{2/x}\right)^{\frac{v+1}{2}-\frac{1}{2}} \left(-e^{2/x}\right.}{\log\left(e^{2/x}\right)}\right.\right.$$

✓ **Maple** : cpu = 0.099 (sec), leaf count = 23

```
dsolve(diff(diff(y(x),x),x) = -(exp(2/x)-v^2)/x^4*y(x),y(x))
```

$$y(x) = x\left(\text{BesselY}\left(v, e^{\frac{1}{x}}\right) c_2 + \text{BesselJ}\left(v, e^{\frac{1}{x}}\right) c_1\right)$$

2.1345 ODE No. 1345

$$y''(x) = \frac{2y(x)}{x^4} - \frac{y'(x)}{x^3}$$

✓ **Mathematica** : cpu = 0.0377073 (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 = 0.039 (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))
```

$$y(x) = x\,\mathrm{e}^{\frac{1}{2x^2}}\left(\mathrm{erf}\left(\frac{\sqrt{2}}{2x}\right)c_2 + c_1\right)$$

2.1346 ODE No. 1346

$$y''(x) = \frac{(a+b)y'(x)}{x^2} - \frac{y(x)(x(a+b)+ab)}{x^4}$$

✓ **Mathematica** : cpu = 0.0637895 (sec), leaf count = 37

```
DSolve[Derivative[2][y][x] == -(((a*b + (a + b)*x)*y[x])/x^4) + ((a + b)*Derivative[1][y][x])/x^2,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 = 0.033 (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))
```

$$y(x) = x\left(\mathrm{e}^{-\frac{b}{x}} c_2 + \mathrm{e}^{-\frac{a}{x}} c_1\right)$$

2.1347 ODE No. 1347

$$y''(x) = -\frac{y(x)}{x^4} - \frac{y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0557146 (sec), leaf count = 31

```
DSolve[Derivative[2][y][x] == -(y[x]/x^4) - Derivative[1][y][x]/x,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 \operatorname{BesselJ}\left(0, \frac{1}{x}\right) + \frac{c_1 K_0\left(\frac{i}{x}\right)}{\sqrt{\pi}}\right\}\right\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 19

```
dsolve(diff(diff(y(x),x),x) = -1/x*diff(y(x),x)-1/x^4*y(x),y(x))
```

$$y(x) = c_1 \operatorname{BesselJ}\left(0, \frac{1}{x}\right) + c_2 \operatorname{BesselY}\left(0, \frac{1}{x}\right)$$

2.1348 ODE No. 1348

$$y''(x) = -\frac{y(x)\left(a(x^4+1)+bx^2\right)}{x^4} - \frac{y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.24349 (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],x]
```

$$\{\{y(x) \to c_1\text{MathieuC}[-b, a, i\log(x)] + c_2\text{MathieuS}[-b, a, i\log(x)]\}\}$$

✓ **Maple** : cpu = 0.442 (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))
```

$$y(x) = \text{HeunD}\left(0, 2a+b, 0, 2a-b, \frac{x^2+1}{x^2-1}\right)\left(\left(\int \frac{1}{x\,\text{HeunD}\left(0, 2a+b, 0, 2a-b, \frac{x^2+1}{x^2-1}\right)^2}dx\right)c_2 + c_1\right)$$

2.1349 ODE No. 1349

$$y''(x) = -\frac{y(x)}{x^4} - \frac{(x^2+1)\,y'(x)}{x^3}$$

✓ **Mathematica** : cpu = 0.0674857 (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]
```

$$\left\{\left\{y(x)\to c_2 G_{1,2}^{2,0}\left(-\frac{1}{2x^2}\middle|\begin{array}{c}\frac{3}{2}\\ 0,0\end{array}\right)+c_1 e^{\frac{1}{4x^2}}\left(\left(1-\frac{1}{2x^2}\right)\text{BesselI}\left(0,\frac{1}{4x^2}\right)+\frac{\text{BesselI}\left(1,\frac{1}{4x^2}\right)}{2x^2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.095 (sec), leaf count = 65

```
dsolve(diff(diff(y(x),x),x) = -(x^2+1)/x^3*diff(y(x),x)-1/x^4*y(x),y(x))
```

$$y(x) = \frac{e^{\frac{1}{4x^2}}\left(c_1\left(2x^2-1\right)\text{BesselI}\left(0,\frac{1}{4x^2}\right)+\left(2x^2-1\right)c_2\,\text{BesselK}\left(0,-\frac{1}{4x^2}\right)+\text{BesselI}\left(1,\frac{1}{4x^2}\right)c_1+\text{BesselK}\left(1,-\frac{1}{4x}\right.\right.}{x^2}$$

2.1350 ODE No. 1350

$$y''(x) = -\frac{a^2 y(x)}{x^4} - \frac{2y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0062022 (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 = 0.013 (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))
```

$$y(x) = c_1 \sin\left(\frac{a}{x}\right) + c_2 \cos\left(\frac{a}{x}\right)$$

2.1351 ODE No. 1351

$$y''(x) = \frac{y(x)}{x^4} - \frac{(2x^2+1)\,y'(x)}{x^3}$$

✓ **Mathematica** : cpu = 0.0115956 (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 = 0.032 (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))
```

$$y(x) = \mathrm{e}^{\frac{1}{2x^2}} \left(\operatorname{erf}\left(\frac{\sqrt{2}}{2x}\right) c_2 + c_1\right)$$

2.1352 ODE No. 1352

$$y''(x) = -\frac{2(a+x)y'(x)}{x^2} - \frac{by(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.0083146 (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 = 0.039 (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))
```

$$y(x) = c_1 \mathrm{e}^{\frac{a-\sqrt{a^2-b}}{x}} + c_2 \mathrm{e}^{\frac{a+\sqrt{a^2-b}}{x}}$$

2.1353 ODE No. 1353

$$y''(x) = \frac{(2x^2-1)\,y'(x)}{x^3} - \frac{y(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.554192 (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]
```

$$\left\{\left\{y(x)\to c_1\left(x^3+2x-\frac{1}{x}\right)-\frac{c_2\left(\sqrt{2\pi}x^4\text{erfi}\left(\frac{1}{\sqrt{2}x}\right)+2\sqrt{2\pi}x^2\text{erfi}\left(\frac{1}{\sqrt{2}x}\right)-\sqrt{2\pi}\text{erfi}\left(\frac{1}{\sqrt{2}x}\right)+2e^{\frac{1}{2x^2}}x-2e^{\frac{1}{2x^2}}x^3\right)}{16x}\right.\right.$$

✓ **Maple** : cpu = 0.291 (sec), leaf count = 65

```
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))
```

$$y(x) = \frac{-c_1\sqrt{2}\sqrt{\pi}\left(x^4+2x^2-1\right)\text{erfi}\left(\frac{\sqrt{2}}{2x}\right)+2c_1\left(x^3-x\right)e^{\frac{1}{2x^2}}+c_2\left(x^4+2x^2-1\right)}{x}$$

2.1354 ODE No. 1354

$$y''(x) = \frac{(2x^2 - 1)\, y'(x)}{x^3} - \frac{2y(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.0857116 (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 = 0.306 (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))
```

$$y(x) = \frac{c_2 x^5 \operatorname{hypergeom}\left(\left[-\frac{5}{2}\right], \left[-\frac{1}{2}\right], \frac{1}{2x^2}\right) + 5x^2 c_1 - c_1}{x^2}$$

2.1355 ODE No. 1355

$$y''(x) = \frac{xy(x)}{x^3+1} - \frac{(x^3-1)\,y'(x)}{x\,(x^3+1)}$$

✓ **Mathematica** : cpu = 3.93717 (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^3)),y[x
```

$$\left\{\left\{y(x)\to \frac{1}{2}c_2\sqrt[3]{x^3+1}x^2\,\text{Hypergeometric2F1}\left(\frac{2}{3},\frac{4}{3},\frac{5}{3},-x^3\right)+c_1\sqrt[3]{x^3+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.153 (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))
```

$$y(x) = (x^3+1)^{\frac{1}{3}}\left(\text{hypergeom}\left(\left[\frac{2}{3},\frac{4}{3}\right],\left[\frac{5}{3}\right],-x^3\right)c_1x^2+c_2\right)$$

2.1356 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 = 0.162732 (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)*Derivat
```

$$\left\{\left\{y(x) \to c_1 x^{-n}\,\text{Hypergeometric2F1}\left(-\frac{n}{2} - \frac{v}{2}, -\frac{n}{2} + \frac{v}{2} + \frac{1}{2}, 1-n, -x^2\right) + c_2 x^n\,\text{Hypergeometric2F1}\left(\frac{n}{2} - \frac{v}{2},\right.\right.\right.$$

✓ **Maple** : cpu = 0.128 (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+
```

$$y(x) = c_1\,\text{LegendreP}\left(v, n, \sqrt{x^2+1}\right) + c_2\,\text{LegendreQ}\left(v, n, \sqrt{x^2+1}\right)$$

2.1357 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 = 0.370543 (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)*Derivative[1]
```

$$\left\{\left\{y(x)\to c_1 x^{\frac{1}{2}\left(-\sqrt{a^2-4a-4c+4}-a+2\right)}\ \text{Hypergeometric2F1}\left(-\frac{1}{4}\sqrt{a^2-2a-4b+1}-\frac{1}{4}\sqrt{a^2-4a-4c+4}+\frac{1}{4},\frac{1}{4}\right.\right.\right.$$

✓ **Maple** : cpu = 0.168 (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(
```

$$y(x) = x^{1-\frac{a}{2}}\left(\text{LegendreQ}\left(-\frac{1}{2}+\frac{\sqrt{a^2-2a-4b+1}}{2},\frac{\sqrt{a^2-4a-4c+4}}{2},\sqrt{x^2+1}\right)c_2+\text{LegendreP}\left(-\frac{1}{2}+\frac{\sqrt{a}}{}\right.\right.$$

2.1358 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 = 0.0294663 (sec), leaf count = 89

```
DSolve[Derivative[2][y][x] == -(((-2 + x^2)*y[x])/(x^2*(-1 + x^2))) + ((-2 + x^2)*Derivative[1][y][x]
```

$$\left\{\left\{y(x)\to \frac{c_1 x\sqrt[4]{x^2-1}}{\sqrt[4]{1-x^2}} - \frac{c_2 x\sqrt[4]{x^2-1}\left(\log\left(1-\frac{x}{\sqrt{x^2-1}}\right)-\log\left(\frac{x}{\sqrt{x^2-1}}+1\right)\right)}{2\sqrt[4]{1-x^2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (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)
```

$$y(x) = x\left(\ln\left(x+\sqrt{x^2-1}\right)c_2 + c_1\right)$$

2.1359 ODE No. 1359

$$y''(x) = -\frac{v(v+1)y(x)}{x^2(x^2-1)} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.0502707 (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])/(-1 +
```

$$\left\{\left\{y(x)\to c_1 i^{-v}x^{-v}\,\text{Hypergeometric2F1}\left(\frac{1}{2}-\frac{v}{2},-\frac{v}{2},\frac{1}{2}-v,x^2\right)+c_2 i^{v+1}x^{v+1}\,\text{Hypergeometric2F1}\left(\frac{v}{2}+\frac{1}{2},\frac{v}{2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.17 (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))
```

$$y(x) = c_1 x^{-v}\,\text{hypergeom}\left(\left[-\frac{v}{2},\frac{1}{2}-\frac{v}{2}\right],\left[\frac{1}{2}-v\right],x^2\right)+c_2 x^{v+1}\,\text{hypergeom}\left(\left[1+\frac{v}{2},\frac{1}{2}+\frac{v}{2}\right],\left[\frac{3}{2}+v\right],x^2\right)$$

2.1360 ODE No. 1360

$$y''(x) = \frac{v(v+1)y(x)}{x^2} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.0471288 (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],x]
```

$$\left\{\left\{y(x) \to c_1 i^{-v} x^{-v} \text{Hypergeometric2F1}\left(\frac{1}{2}, -v, \frac{1}{2} - v, x^2\right) + c_2 i^{v+1} x^{v+1} \text{Hypergeometric2F1}\left(\frac{1}{2}, v+1, v+\frac{3}{2},\right.\right.\right.$$

✓ **Maple** : cpu = 0.163 (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))
```

$$y(x) = c_1 x^{-v} \text{hypergeom}\left(\left[\frac{1}{2}, -v\right], \left[\frac{1}{2} - v\right], x^2\right) + c_2 x^{v+1} \text{hypergeom}\left(\left[\frac{1}{2}, v+1\right], \left[\frac{3}{2} + v\right], x^2\right)$$

2.1361 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 = 0.239855 (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*Derivativ
```

$$\left\{\left\{y(x)\to c_1x^{-a}+c_2\left(-2ax^2+2a-x^2+3\right)x^{a+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.027 (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
```

$$y(x) = x^{-a}c_1 + c_2\left(2a\,x^2+x^2-2a-3\right)x^{a+1}$$

2.1362 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 = 5.8527 (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*(-1 + x^2)
```

, DifferentialRoot result

$$\{\{y(x)\to(x)\}\}$$

✓ **Maple** : cpu = 0.421 (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^
```

$$y(x)=c_1x^{-n}\operatorname{HeunC}\left(0,-n-\frac{1}{2},-2,-\frac{1}{4}a^2+\frac{1}{4}n^2-\frac{1}{4}a+\frac{1}{4}n,-\frac{1}{4}n^2-\frac{1}{4}n+\frac{3}{4}+\frac{1}{4}a^2-\frac{1}{4}a,x^2\right)+c_2x^{n+1}\operatorname{Heun}$$

2.1363 ODE No. 1363

$$y''(x) = -\frac{(ax^2 + a - 2)\, y'(x)}{x\,(x^2 - 1)} - \frac{by(x)}{x^2}$$

✓ **Mathematica** : cpu = 0.355161 (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 + x^2))
```

$$\left\{\left\{y(x) \to c_1(-1)^{\frac{1}{4}\left(-\sqrt{a^2-2a-4b+1}+a-1\right)} x^{\frac{1}{2}\left(-\sqrt{a^2-2a-4b+1}+a-1\right)} \text{Hypergeometric2F1}\left(\frac{a}{2} - \frac{1}{2}, \frac{a}{2} - \frac{1}{2}\sqrt{a^2 - 2a - 4\right.\right.\right.$$

✓ **Maple** : cpu = 0.185 (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))
```

$$y(x) = \left(x^2 - 1\right)^{-a+2} \left(x^{\frac{a}{2} - \frac{1}{2} + \frac{\sqrt{a^2-2a-4b+1}}{2}} \text{hypergeom}\left(\left[-\frac{a}{2} + \frac{3}{2}, -\frac{a}{2} + \frac{3}{2} + \frac{\sqrt{a^2 - 2a - 4b + 1}}{2}\right], \left[1 + \frac{\sqrt{a^2 - 2a\right.\right.\right.$$

2.1364 ODE No. 1364

$$y''(x) = \frac{y'(x)\left(2(a-1)x^2 - 2a + 2bc\left(x^2-1\right)x^c\right)}{x\left(x^2-1\right)} - \frac{y(x)\left(bc(2a-c-1)x^{c+2} - bc(2a-c+1)x^c + x^2((a-1)a -\right.}{x^2\left(x^2-1\right)}$$

✓ **Mathematica** : cpu = 0.0865505 (sec), leaf count = 52

```
DSolve[Derivative[2][y][x] == -(((-(a*(1 + a)) + ((-1 + a)*a - v*(1 + v))*x^2 - b*(1 + 2*a - c)*c*x^c
```

$$\left\{\left\{y(x)\to c_1 \text{LegendreP}(v,x)e^{\frac{a\log\left(x^c\right)}{c}+bx^c} + c_2 \text{LegendreQ}(v,x)e^{\frac{a\log\left(x^c\right)}{c}+bx^c}\right\}\right\}$$

✓ **Maple** : cpu = 0.115 (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)-(
```

$$y(x) = x^a \mathrm{e}^{b\,x^c}\left(\text{LegendreQ}\left(v,x\right)c_2 + \text{LegendreP}\left(v,x\right)c_1\right)$$

2.1365 ODE No. 1365

$$y''(x) = -\frac{ay(x)}{(x^2+1)^2}$$

✓ **Mathematica** : cpu = 0.0508133 (sec), leaf count = 104

```
DSolve[Derivative[2][y][x] == -((a*y[x])/(1 + x^2)^2),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{ic_2\sqrt{x^2+1}(1-ix)^{\sqrt{a+1}}(1+ix)^{-\sqrt{a+1}}e^{i\sqrt{a+1}\arctan(x)}}{2\sqrt{a+1}} + c_1\sqrt{x^2+1}e^{i\sqrt{a+1}\arctan(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 59

```
dsolve(diff(diff(y(x),x),x) = -a/(x^2+1)^2*y(x),y(x))
```

$$y(x) = \sqrt{x^2+1}\left(\left(\frac{x+i}{-x+i}\right)^{-\frac{\sqrt{a+1}}{2}}c_2 + \left(\frac{x+i}{-x+i}\right)^{\frac{\sqrt{a+1}}{2}}c_1\right)$$

2.1366 ODE No. 1366

$$y''(x) = -\frac{2xy'(x)}{x^2+1} - \frac{y(x)}{(x^2+1)^2}$$

✓ **Mathematica** : cpu = 1.01579 (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],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))
```

$$y(x) = \frac{xc_1 + c_2}{\sqrt{x^2+1}}$$

2.1367 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 = 0.163009 (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)^2) - (
```

$$\left\{\left\{y(x) \to c_1 (x^2+1)^{\frac{\sqrt{m^2}}{2}} \text{HeunC}\left[\frac{1}{4}\left(-a^2 - \sqrt{m^2}\left(\sqrt{m^2}+1\right) + \frac{1}{4}\left(\sqrt{(2n+1)^2}-1\right)^2 + \frac{1}{2}\left(\sqrt{(2n+1)^2}-1\right)\right),\right.\right.\right.$$

✓ **Maple** : cpu = 0.379 (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)/
```

$$y(x) = (x^2+1)^{\frac{m}{2}}\left(\text{HeunC}\left(0, \frac{1}{2}, m, -\frac{a^2}{4}, \frac{1}{4} + \frac{1}{4}a^2 + \frac{1}{4}m^2 - \frac{1}{4}n^2 - \frac{1}{4}n, -x^2\right)c_2 x + \text{HeunC}\left(0, -\frac{1}{2}, m, -\frac{a^2}{4}, \frac{1}{4}\right.\right.$$

2.1368 ODE No. 1368

$$y''(x) = -\frac{axy'(x)}{x^2+1} - \frac{by(x)}{(x^2+1)^2}$$

✓ **Mathematica** : cpu = 0.0129194 (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[x],x]
```

$$\left\{\left\{y(x)\to c_1\left(x^2+1\right)^{\frac{2-a}{4}} P_{\frac{a-2}{2}}^{\frac{1}{2}\sqrt{a^2-4a+4b+4}}(ix)+c_2\left(x^2+1\right)^{\frac{2-a}{4}} Q_{\frac{a-2}{2}}^{\frac{1}{2}\sqrt{a^2-4a+4b+4}}(ix)\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (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))
```

$$y(x) = \left(x^2+1\right)^{\frac{1}{2}-\frac{a}{4}}\left(\mathrm{LegendreQ}\left(\frac{a}{2}-1,\frac{\sqrt{a^2-4a+4b+4}}{2},ix\right)c_2+\mathrm{LegendreP}\left(\frac{a}{2}-1,\frac{\sqrt{a^2-4a+4b+4}}{2},i\right.\right.$$

2.1369 ODE No. 1369

$$y''(x) = -\frac{ay(x)}{(x^2-1)^2}$$

✓ **Mathematica** : cpu = 0.11485 (sec), leaf count = 110

```
DSolve[Derivative[2][y][x] == -((a*y[x])/(-1 + x^2)^2),y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2(x+1)^{\frac{\sqrt{1-a}}{2}+\frac{1}{2}}(1-x)^{\frac{1}{2}-\frac{\sqrt{1-a}}{2}}}{2\sqrt{1-a}}+c_1(x+1)^{\frac{1}{2}-\frac{\sqrt{1-a}}{2}}(1-x)^{\frac{1}{2}\left(\sqrt{1-a}+1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 55

```
dsolve(diff(diff(y(x),x),x) = -a/(x^2-1)^2*y(x),y(x))
```

$$y(x) = \sqrt{x^2-1}\left(\left(\frac{x-1}{1+x}\right)^{-\frac{\sqrt{1-a}}{2}}c_2+\left(\frac{x-1}{1+x}\right)^{\frac{\sqrt{1-a}}{2}}c_1\right)$$

2.1370 ODE No. 1370

$$y''(x) = \frac{a^2 y(x)}{(x^2-1)^2} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 1.01634 (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),y[x],x]
```

$$\left\{\left\{y(x)\to c_1\cosh\left(\frac{1}{2}a(\log(1-x)-\log(x+1))\right)+ic_2\sinh\left(\frac{1}{2}a(\log(1-x)-\log(x+1))\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.013 (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))
```

$$y(x) = c_1 \sinh(a \operatorname{arctanh}(x)) + c_2 \cosh(a \operatorname{arctanh}(x))$$

2.1371 ODE No. 1371

$$y''(x) = -\frac{y(x)\left(-a^2 - \lambda(x^2-1)\right)}{(x^2-1)^2} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.0116149 (sec), leaf count = 48

```
DSolve[Derivative[2][y][x] == -(((-a^2 - lambda*(-1 + x^2))*y[x])/(-1 + x^2)^2) - (2*x*Derivative[1][
```

$$\left\{\left\{y(x)\to c_1 P_{\frac{1}{2}\left(\sqrt{4\lambda+1}-1\right)}^a(x) + c_2 Q_{\frac{1}{2}\left(\sqrt{4\lambda+1}-1\right)}^a(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.073 (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)
```

$$y(x) = c_1 \operatorname{LegendreP}\left(\frac{\sqrt{1+4\lambda}}{2} - \frac{1}{2}, a, x\right) + c_2 \operatorname{LegendreQ}\left(\frac{\sqrt{1+4\lambda}}{2} - \frac{1}{2}, a, x\right)$$

2.1372 ODE No. 1372

$$y''(x) = -\frac{y(x)\left((x^2-1)\left(ax^2+bx+c\right)-k^2\right)}{\left(x^2-1\right)^2} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.19524 (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) - (2*x*Der
```

$$\left\{\left\{y(x)\to c_1 e^{\sqrt{-a}x}\left(x^2-1\right)^{k/2}\text{HeunC}\left[(k+1)\left(2\sqrt{-a}-k\right)-a+b-c,2\left(2\sqrt{-a}(k+1)+b\right),k+1,k+1,4\sqrt{-a}\right.\right.\right.$$

✓ **Maple** : cpu = 0.447 (sec), leaf count = 101

```
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)^
```

$$y(x) = \mathrm{e}^{\sqrt{-a}\,x}\left(\text{HeunC}\left(4\sqrt{-a},-k,k,2b,\frac{k^2}{2}+a-b+c,\frac{1}{2}+\frac{x}{2}\right)(1+x)^{-\frac{k}{2}}(x-1)^{\frac{k}{2}}c_2+\left(x^2-1\right)^{\frac{k}{2}}\text{HeunC}\left(4\sqrt{\right.\right.$$

2.1373 ODE No. 1373

$$y''(x) = -\frac{y(x)\left(-a^2\left(x^2-1\right)^2 - m^2 - n(n+1)\left(x^2-1\right)\right)}{\left(x^2-1\right)^2} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.153601 (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 + x^2)^2)
```

$$\left\{\left\{y(x)\to c_1\left(x^2-1\right)^{m/2}\text{HeunC}\left[\frac{1}{4}\left(-a^2-m(m+1)+n^2+n\right),-\frac{a^2}{4},\frac{1}{2},m+1,0,x^2\right]+c_2x\left(x^2-1\right)^{m/2}\text{HeunC}\right.\right.$$

✓ **Maple** : cpu = 0.358 (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)
```

$$y(x) = \left(x^2-1\right)^{\frac{m}{2}}\left(\text{HeunC}\left(0,\frac{1}{2},m,-\frac{a^2}{4},\frac{1}{4}+\frac{1}{4}a^2+\frac{1}{4}m^2-\frac{1}{4}n^2-\frac{1}{4}n,x^2\right)c_2x+\text{HeunC}\left(0,-\frac{1}{2},m,-\frac{a^2}{4},\frac{1}{4}+\right.\right.$$

2.1374 ODE No. 1374

$$y''(x) = \frac{2(2a-1)xy'(x)}{x^2-1} - \frac{y(x)\left(x^2(2a(2a-1)-v(v+1))+2a+v(v+1)\right)}{(x^2-1)^2}$$

✓ **Mathematica** : cpu = 0.0155335 (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])/(-1 + x^2
```

$$\left\{\left\{y(x)\to c_1\left(x^2-1\right)^a \text{LegendreP}(v,x)+c_2\left(x^2-1\right)^a \text{LegendreQ}(v,x)\right\}\right\}$$

✓ **Maple** : cpu = 0.078 (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*
```

$$y(x) = \left(x^2-1\right)^a \left(\text{LegendreQ}\left(v,x\right)c_2+\text{LegendreP}\left(v,x\right)c_1\right)$$

2.1375 ODE No. 1375

$$y''(x) = -\frac{y(x)\left(4ax^2(a-n) - (x^2-1)\left(2a + (v-n)(n+v+1)\right)\right)}{(x^2-1)^2} - \frac{2x(-2a+n+1)y'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.0202948 (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))*y[x])/(-
```

$$\left\{\left\{y(x) \to c_1 \left(x^2-1\right)^{\frac{1}{2}(2a-n)} P_v^n(x) + c_2 \left(x^2-1\right)^{\frac{1}{2}(2a-n)} Q_v^n(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.088 (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*
```

$$y(x) = \left(x^2-1\right)^{a-\frac{n}{2}} \left(\mathrm{LegendreP}\left(v,n,x\right) c_1 + \mathrm{LegendreQ}\left(v,n,x\right) c_2\right)$$

2.1376 ODE No. 1376

$$y''(x) = -\frac{by(x)}{x^2(a+x^2)} - \frac{(a+2x^2)\,y'(x)}{x(a+x^2)}$$

✓ **Mathematica** : cpu = 0.0357852 (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])/(x*(a +
```

$$\left\{\left\{y(x)\to c_1\cos\left(\frac{\sqrt{b}\operatorname{arctanh}\left(\frac{\sqrt{a+x^2}}{\sqrt{a}}\right)}{\sqrt{a}}\right)-c_2\sin\left(\frac{\sqrt{b}\operatorname{arctanh}\left(\frac{\sqrt{a+x^2}}{\sqrt{a}}\right)}{\sqrt{a}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.063 (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))
```

$$y(x) = \left(c_2\left(\frac{2a+2\sqrt{a}\sqrt{x^2+a}}{x}\right)^{\frac{2i\sqrt{b}}{\sqrt{a}}}+c_1\right)\left(\frac{2a+2\sqrt{a}\sqrt{x^2+a}}{x}\right)^{-\frac{i\sqrt{b}}{\sqrt{a}}}$$

2.1377 ODE No. 1377

$$y''(x) = -\frac{b^2 y(x)}{(a^2 + x^2)^2}$$

✓ **Mathematica** : cpu = 0.414605 (sec), leaf count = 109

```
DSolve[Derivative[2][y][x] == -((b^2*y[x])/(a^2 + x^2)^2),y[x],x]
```

$$\left\{\left\{y(x)\to c_1\sqrt{a^2+x^2}e^{-i\sqrt{\frac{b^2}{a^2}+1}\arctan\left(\frac{a}{x}\right)}+\frac{ic_2\sqrt{a^2+x^2}e^{i\sqrt{\frac{a^2+b^2}{a^2}}\arctan\left(\frac{a}{x}\right)}}{2a\sqrt{\frac{a^2+b^2}{a^2}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.112 (sec), leaf count = 83

```
dsolve(diff(diff(y(x),x),x) = -b^2/(a^2+x^2)^2*y(x),y(x))
```

$$y(x) = \sqrt{a^2+x^2}\left(\left(\frac{ix-a}{ix+a}\right)^{\frac{\sqrt{a^2+b^2}}{2a}}c_1+\left(\frac{ix-a}{ix+a}\right)^{-\frac{\sqrt{a^2+b^2}}{2a}}c_2\right)$$

2.1378 ODE No. 1378

$$y''(x) = -\frac{2(x^2-1)\,y'(x)}{(x-1)^2x} - \frac{(-2x^2+2x+2)\,y(x)}{(x-1)^2x^2}$$

✓ **Mathematica** : cpu = 0.029036 (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)*Derivative
```

$$\left\{\left\{y(x)\to \frac{c_1x^2}{1-x} + \frac{c_2x(2x^2\log(1-x)-2x^2\log(x)+2x-2x\log(1-x)+2x\log(x)-1)}{(x-1)^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.032 (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
```

$$y(x) = \frac{x\left(-xc_2(x-1)\ln(x-1)+xc_2(x-1)\ln(x)+x^2c_1+(-c_1-c_2)\,x+\frac{c_2}{2}\right)}{(x-1)^2}$$

2.1379 ODE No. 1379

$$y''(x) = \frac{12y(x)}{(x+1)^2(x^2+2x+3)}$$

✓ **Mathematica** : cpu = 0.0379686 (sec), leaf count = 99

```
DSolve[Derivative[2][y][x] == (12*y[x])/((1 + x)^2*(3 + 2*x + x^2)),y[x],x]
```

$$\left\{\left\{y(x) \to \frac{c_2\left(-3\sqrt{2}x^2\arctan\left(\frac{x+1}{\sqrt{2}}\right) - 6\sqrt{2}x\arctan\left(\frac{x+1}{\sqrt{2}}\right) - 9\sqrt{2}\arctan\left(\frac{x+1}{\sqrt{2}}\right) + 2x^3 + 4x^2 + 8x + 2\right)}{2(x+1)^2} + c_1\left(\right.\right.\right.$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 60

```
dsolve(diff(diff(y(x),x),x) = 12/(1+x)^2/(x^2+2*x+3)*y(x),y(x))
```

$$y(x) = \frac{3\left(x^2+2x+3\right)c_2\arctan\left(\frac{(1+x)\sqrt{2}}{2}\right) - c_2\left(x^3+2x^2+4x+1\right)\sqrt{2} + c_1\left(x^2+2x+3\right)}{(1+x)^2}$$

2.1380 ODE No. 1380

$$y''(x) = -\frac{by(x)}{x^2(x-a)^2}$$

✓ **Mathematica** : cpu = 0.24453 (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 = 0.086 (sec), leaf count = 67

```
dsolve(diff(diff(y(x),x),x) = -b/x^2/(x-a)^2*y(x),y(x))
```

$$y(x) = \sqrt{x\left(a-x\right)}\left(\left(\frac{x}{a-x}\right)^{\frac{\sqrt{a^2-4b}}{2a}}c_2+\left(\frac{a-x}{x}\right)^{\frac{\sqrt{a^2-4b}}{2a}}c_1\right)$$

2.1381 ODE No. 1381

$$y''(x) = c - \frac{by(x)}{x^2(x-a)^2}$$

✓ **Mathematica** : cpu = 0.41656 (sec), leaf count = 589

```
DSolve[Derivative[2][y][x] == c - (b*y[x])/(x^2*(-a + x)^2),y[x],x]
```

$$\left\{\left\{y(x) \to -\frac{2cx^2(a-x)\left(1-\frac{x}{a}\right)^{-\frac{1}{2}\sqrt{\frac{a^2-4b}{a^2}}}\left(\sqrt{\frac{a^2-4b}{a^2}}\left(1-\frac{x}{a}\right)^{\sqrt{\frac{a^2-4b}{a^2}}}\text{Hypergeometric2F1}\left(\frac{1}{2}\sqrt{1-\frac{4b}{a^2}}-\frac{1}{2},\frac{1}{2}\sqrt{1-\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.228 (sec), leaf count = 175

```
dsolve(diff(diff(y(x),x),x) = -b/x^2/(x-a)^2*y(x)+c,y(x))
```

$$y(x) = \frac{\left(\left(c_2\sqrt{a^2-4b} - \left(\int \sqrt{x\left(a-x\right)}\left(\frac{a-x}{x}\right)^{-\frac{\sqrt{a^2-4b}}{2a}}dx\right)c\right)\left(\frac{a-x}{x}\right)^{\frac{\sqrt{a^2-4b}}{2a}} + \left(\left(\int \sqrt{x\left(a-x\right)}\left(\frac{x}{a-x}\right)^{-\frac{\sqrt{a^2-4b}}{2a}}dx\right.\right.\right.}{\sqrt{a^2-4b}}$$

2.1382 ODE No. 1382

$$y''(x) = \frac{cy(x)}{(x-a)^2(x-b)^2}$$

✓ **Mathematica** : cpu = 0.636937 (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 = 0.14 (sec), leaf count = 104

```
dsolve(diff(diff(y(x),x),x) = c/(x-a)^2/(x-b)^2*y(x),y(x))
```

$$y(x) = \sqrt{(a-x)(b-x)}\left(\left(\frac{a-x}{b-x}\right)^{\frac{\sqrt{a^2-2ab+b^2+4c}}{2a-2b}}c_1+\left(\frac{a-x}{b-x}\right)^{-\frac{\sqrt{a^2-2ab+b^2+4c}}{2a-2b}}c_2\right)$$

2.1383 ODE No. 1383

$$y''(x) = -\frac{y'(x)\left((x-a)^2(\alpha+\beta+1)(x-b)+(x-a)(-\alpha-\beta+1)(x-b)^2\right)}{(x-a)^2(x-b)^2} - \frac{\alpha\beta(a-b)^2y(x)}{(x-a)^2(x-b)^2}$$

✓ **Mathematica** : cpu = 1.06664 (sec), leaf count = 50

```
DSolve[Derivative[2][y][x] == -((alpha*(a - b)^2*beta*y[x])/((-a + x)^2*(-b + x)^2)) - (((1 + alpha +
```

$$\left\{\left\{y(x)\to c_1e^{\alpha(\log(x-a)-\log(x-b))}+c_2e^{\beta(\log(x-a)-\log(x-b))}\right\}\right\}$$

✓ **Maple** : cpu = 0.049 (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))/(
```

$$y(x) = c_1\left(\frac{a-x}{b-x}\right)^{\beta} + c_2\left(\frac{a-x}{b-x}\right)^{\alpha}$$

2.1384 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 = 0.0158295 (sec), leaf count = 96

```
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]
```

$$\left\{\left\{y(x)\to c_1 M_{\frac{(a+3)b}{2\sqrt{a^2-1}},\frac{\sqrt{b^2+1}}{2}}\left(\sqrt{a^2-1}x\right)+c_2 W_{\frac{(a+3)b}{2\sqrt{a^2-1}},\frac{\sqrt{b^2+1}}{2}}\left(\sqrt{a^2-1}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.261 (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))
```

$$y(x) = c_1 \operatorname{WhittakerM}\left(\frac{b(a+3)}{2\sqrt{a^2-1}}, \frac{\sqrt{b^2+1}}{2}, \sqrt{a^2-1}\,x\right) + c_2 \operatorname{WhittakerW}\left(\frac{b(a+3)}{2\sqrt{a^2-1}}, \frac{\sqrt{b^2+1}}{2}, \sqrt{a^2-1}\,x\right)$$

2.1385 ODE No. 1385

$$y''(x) = -\frac{(ax^2 + a - 3)\, y(x)}{4\,(x^2+1)^2}$$

✓ **Mathematica** : cpu = 0.0112344 (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]
```

$$\left\{\left\{y(x)\to c_1\sqrt{x^2+1}P_{\frac{1}{2}\left(\sqrt{1-a}-1\right)}^{\frac{1}{2}}(ix)+c_2\sqrt{x^2+1}Q_{\frac{1}{2}\left(\sqrt{1-a}-1\right)}^{\frac{1}{2}}(ix)\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (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))
```

$$y(x) = (x^2+1)^{\frac{1}{4}}\left(\left(x+\sqrt{x^2+1}\right)^{-\frac{\sqrt{1-a}}{2}}c_2+\left(x+\sqrt{x^2+1}\right)^{\frac{\sqrt{1-a}}{2}}c_1\right)$$

2.1386 ODE No. 1386

$$y''(x) = \frac{18y(x)}{(2x+1)^2(x^2+x+1)}$$

✓ **Mathematica** : cpu = 0.0496081 (sec), leaf count = 108

```
DSolve[Derivative[2][y][x] == (18*y[x])/((1 + 2*x)^2*(1 + x + x^2)),y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2\left(-12\sqrt{3}x^2\arctan\left(\frac{2x+1}{\sqrt{3}}\right)-12\sqrt{3}x\arctan\left(\frac{2x+1}{\sqrt{3}}\right)-12\sqrt{3}\arctan\left(\frac{2x+1}{\sqrt{3}}\right)+16x^3+24x^2+30x+\right.}{(2x+1)^2}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 58

```
dsolve(diff(diff(y(x),x),x) = 18/(2*x+1)^2/(x^2+x+1)*y(x),y(x))
```

$$y(x) = \frac{-36c_2\left(x^2+x+1\right)\arctan\left(\frac{(2x+1)\sqrt{3}}{3}\right)+16c_2\left(x^3+x^2+\frac{11}{8}x+\frac{3}{16}\right)\sqrt{3}+c_1\left(x^2+x+1\right)}{(2x+1)^2}$$

2.1387 ODE No. 1387

$$y''(x) = \frac{3y(x)}{4(x^2+x+1)^2}$$

✓ **Mathematica** : cpu = 0.0194254 (sec), leaf count = 50

```
DSolve[Derivative[2][y][x] == (3*y[x])/(4*(1 + x + x^2)^2),y[x],x]
```

$$\left\{\left\{y(x)\to \frac{2c_2\sqrt{x^2+x+1}\arctan\left(\frac{2x+1}{\sqrt{3}}\right)}{\sqrt{3}}+c_1\sqrt{x^2+x+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.023 (sec), leaf count = 28

```
dsolve(diff(diff(y(x),x),x) = 3/4/(x^2+x+1)^2*y(x),y(x))
```

$$y(x) = \sqrt{x^2+x+1}\left(\arctan\left(\frac{(2x+1)\sqrt{3}}{3}\right)c_2+c_1\right)$$

2.1388 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 = 0.157562 (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) - ((-1 + 3*x)
```

$$\left\{\left\{y(x) \to c_2(-1)^{\frac{1}{2}(-2v-3)+1}x^{\frac{1}{4}(-2v-3)+1}e^{\frac{1}{4}(-2\log(1-x)-\log(x))}(x-1)^{\frac{1}{2}\left(\frac{1}{2}(a+v+1)+\frac{1}{2}(a+v+2)+\frac{1}{2}(-2v-3)+1\right)} \text{Hypergeom}\right.\right.$$

✓ **Maple** : cpu = 0.116 (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^
```

$$y(x) = (x-1)^{-\frac{a}{2}}\left(\text{hypergeom}\left(\left[1+\frac{v}{2}-\frac{a}{2}, \frac{1}{2}+\frac{v}{2}-\frac{a}{2}\right], \left[\frac{3}{2}+v\right], x\right)x^{\frac{1}{2}+\frac{v}{2}}c_2 + \text{hypergeom}\left(\left[-\frac{v}{2}-\frac{a}{2}, \frac{1}{2}-\frac{v}{2}\right.\right.\right.$$

2.1389 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 = 0.176492 (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) - ((-1
```

$$\left\{\left\{y(x) \to c_2(-1)^{\frac{1}{2}(-2v-3)+1}x^{\frac{1}{4}(-2v-3)+1}e^{\frac{1}{4}(-2\log(1-x)-\log(x))}(x-1)^{\frac{1}{2}\left(n+\frac{1}{2}(2n+1)+\frac{1}{2}(-2v-3)+v+2\right)}\text{ Hypergeometric2}\right.\right.$$

✓ **Maple** : cpu = 0.114 (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*
```

$$y(x) = (x-1)^{-n}\left(\text{hypergeom}\left(\left[-v-n, -n+\frac{1}{2}\right], \left[\frac{1}{2}-v\right], x\right)x^{-\frac{v}{2}}c_1 + \text{hypergeom}\left(\left[v-n+1, -n+\frac{1}{2}\right], \left[\frac{3}{2}\right.\right.\right.$$

2.1390 ODE No. 1390

$$y''(x) = -\frac{3y(x)}{16(x-1)^2x^2}$$

✓ **Mathematica** : cpu = 0.0327685 (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))
```

$$y(x) = c_1(x-1)^{\frac{1}{4}}x^{\frac{3}{4}} + c_2(x-1)^{\frac{3}{4}}x^{\frac{1}{4}}$$

2.1391 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 = 0.0306169 (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)*Derivative[
```

$$\left\{\left\{y(x) \to c_1 x^5 - \frac{1}{4} c_2 x\left(2ax^2 + 1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.023 (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
```

$$y(x) = x^5 c_1 + 2a\, x^3 c_2 + x c_2$$

2.1392 ODE No. 1392

$$y''(x) = -\frac{bxy'(x)}{a(x^2-1)} - \frac{y(x)(cx^2+dx+e)}{a(x^2-1)^2}$$

✓ **Mathematica** : cpu = 186.749 (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[1][y][x
```

Too large to display

✓ **Maple** : cpu = 0.247 (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
```

$$y(x) = \left(-\frac{1}{2}+\frac{x}{2}\right)^{\frac{2a+\sqrt{4a^2+(-4b-4c-4d-4e)a+b^2}}{4a}} (x^2-1)^{-\frac{b}{4a}} \left(\text{hypergeom}\left(\left[\frac{\sqrt{4a^2+(-4b-4c-4d-4e)a+b^2}+\right.\right.\right.$$

2.1393 ODE No. 1393

$$y''(x) = -\frac{y(x)\left(bx^2+cx+d\right)}{a(x-1)^2x^2}$$

✓ **Mathematica** : cpu = 112.325 (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 = 0.213 (sec), leaf count = 299

```
dsolve(diff(diff(y(x),x),x) = -(b*x^2+c*x+d)/a/x^2/(x-1)^2*y(x),y(x))
```

$$y(x) = c_1 x^{\frac{\sqrt{a-4d}+\sqrt{a}}{2\sqrt{a}}} \operatorname{hypergeom}\left(\left[\frac{-\sqrt{a-4b-4c-4d}+\sqrt{a}+\sqrt{a-4d}+\sqrt{a-4b}}{2\sqrt{a}}, \frac{-\sqrt{a-4b-4c-4d}+\sqrt{a}}{2\sqrt{a}}\right.\right.$$

2.1394 ODE No. 1394

$$y''(x) = -\frac{cy(x)}{x^2(ax+b)^2} - \frac{2y'(x)}{x}$$

✓ **Mathematica** : cpu = 1.02639 (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],x]
```

$$\left\{\left\{y(x) \to c_1 \exp\left(\frac{\sqrt{c}\left(-\frac{\sqrt{b^2-4c}}{\sqrt{c}} - \frac{b}{\sqrt{c}}\right)(\log(x) - \log(ax+b))}{2b}\right) + c_2 \exp\left(\frac{\sqrt{c}\left(\frac{\sqrt{b^2-4c}}{\sqrt{c}} - \frac{b}{\sqrt{c}}\right)(\log(x) - \log(ax\right.}{2b}\right.$$

✓ **Maple** : cpu = 0.112 (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))
```

$$y(x) = \sqrt{\frac{ax+b}{x}}\left(\left(\frac{x}{ax+b}\right)^{-\frac{\sqrt{\frac{b^2-4c}{a^2}}\,a}{2b}} c_2 + \left(\frac{x}{ax+b}\right)^{\frac{\sqrt{\frac{b^2-4c}{a^2}}\,a}{2b}} c_1\right)$$

2.1395 ODE No. 1395

$$y''(x) = -\frac{y(x)}{(ax+b)^4}$$

✓ **Mathematica** : cpu = 0.0543154 (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 = 0.048 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x) = -1/(a*x+b)^4*y(x),y(x))
```

$$y(x) = (ax+b)\left(c_2\cos\left(\frac{1}{a(ax+b)}\right)+c_1\sin\left(\frac{1}{a(ax+b)}\right)\right)$$

2.1396 ODE No. 1396

$$y''(x) = -\frac{Ay(x)}{(ax^2+bx+c)^2}$$

✓ **Mathematica** : cpu = 0.560307 (sec), leaf count = 211

```
DSolve[Derivative[2][y][x] == -((A*y[x])/(c + b*x + a*x^2)^2),y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2\sqrt{ax^2+bx+c}\exp\left(-\frac{\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\arctan\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)}{\sqrt{b^2-4ac}\sqrt{1-\frac{4A}{b^2-4ac}}}+c_1\sqrt{x(ax+b)+c}\exp\left(\frac{\sqrt{4ac-b^2}\sqrt{1}\right.\right.\right.$$

✓ **Maple** : cpu = 0.152 (sec), leaf count = 178

```
dsolve(diff(diff(y(x),x),x) = -A/(a*x^2+b*x+c)^2*y(x),y(x))
```

$$y(x) = \sqrt{a\,x^2+bx+c}\left(\left(\frac{i\sqrt{4ac-b^2}-2ax-b}{2ax+b+i\sqrt{4ac-b^2}}\right)^{\frac{a\sqrt{\frac{-4ac+b^2-4A}{a^2}}}{2\sqrt{-4ac+b^2}}}c_1+\left(\frac{i\sqrt{4ac-b^2}-2ax-b}{2ax+b+i\sqrt{4ac-b^2}}\right)^{-\frac{a\sqrt{\frac{-4ac+b^2-4A}{a^2}}}{2\sqrt{-4ac+b^2}}}c_2\right)$$

2.1397 ODE No. 1397

$$y''(x) = \frac{y(x)}{x^5} - \frac{y'(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.0368253 (sec), leaf count = 38

```
DSolve[Derivative[2][y][x] == y[x]/x^5 - Derivative[1][y][x]/x^4,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_2\Gamma\left(\frac{1}{3},-\frac{1}{3x^3}\right)}{3^{2/3}\sqrt[3]{-\frac{1}{x^3}}}+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.111 (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))
```

$$y(x) = x\left(-\sqrt{3}\,\Gamma\left(\frac{2}{3}\right)\Gamma\left(\frac{1}{3},-\frac{1}{3x^3}\right)c_2+2\pi c_2+c_1\right)$$

2.1398 ODE No. 1398

$$y''(x) = -\frac{\left(-(2v+1)^2 + x^2 - 1\right) y(x)}{\left(x^2-1\right)^2} - \frac{\left(3x^2-1\right) y'(x)}{x\left(x^2-1\right)}$$

✓ **Mathematica** : cpu = 0.0976121 (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)*Derivat
```

$$\left\{\left\{y(x) \to c_1\left(x^2-1\right)^{-v-\frac{1}{2}} \text{Hypergeometric2F1}\left(-v,-v,-2v,1-x^2\right) + c_2\left(x^2-1\right)^{v+\frac{1}{2}} \text{Hypergeometric2F1}\left(v+\right.\right.\right.$$

✓ **Maple** : cpu = 0.263 (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)^
```

$$y(x) = c_1\left(x^2-1\right)^{-v-\frac{1}{2}} \text{hypergeom}\left([-v,-v],[-2v],-x^2+1\right)+c_2\left(x^2-1\right)^{v+\frac{1}{2}} \text{hypergeom}\left([v+1,v+1],[2v+2\right.$$

2.1399 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 = 1.02776 (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)*Derivative[1
```

$$\left\{\left\{y(x) \to c_1 e^{\frac{1}{2}(3\log(1-x)+\log(3x+5))} + \frac{1}{2} c_2 e^{\frac{1}{2}(3\log(1-x)+\log(3x+5))}(3\log(1-x)+\log(3x+5))\right\}\right\}$$

✓ **Maple** : cpu = 0.036 (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)^
```

$$y(x) = (x-1)^{\frac{3}{2}} \sqrt{3x+5}\,(3c_2 \ln(x-1) + c_2 \ln(3x+5) + c_1)$$

2.1400 ODE No. 1400

$$y''(x) = \frac{y'(x)}{x} - \frac{ay(x)}{x^6}$$

✓ **Mathematica** : cpu = 0.0678145 (sec), leaf count = 60

```
DSolve[Derivative[2][y][x] == -((a*y[x])/x^6) + Derivative[1][y][x]/x,y[x],x]
```

$$\left\{\left\{y(x)\to c_1x^2e^{\frac{i\sqrt{a}}{2x^2}}-\frac{ic_2x^2e^{-\frac{i\sqrt{a}}{2x^2}}}{2\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 35

```
dsolve(diff(diff(y(x),x),x) = 1/x*diff(y(x),x)-a/x^6*y(x),y(x))
```

$$y(x) = x^2\left(\cosh\left(\frac{\sqrt{-a}}{2x^2}\right)c_2+\sinh\left(\frac{\sqrt{-a}}{2x^2}\right)c_1\right)$$

2.1401 ODE No. 1401

$$y''(x) = -\frac{(a+3x^2)\, y'(x)}{x^3} - \frac{by(x)}{x^6}$$

✓ **Mathematica** : cpu = 0.0076572 (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 = 0.049 (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))
```

$$y(x) = c_1 \mathrm{e}^{\frac{a-\sqrt{a^2-4b}}{4x^2}} + c_2 \mathrm{e}^{\frac{a+\sqrt{a^2-4b}}{4x^2}}$$

2.1402 ODE No. 1402

$$y''(x) = -\frac{y(x)\left(4a(a+1)x^4 - 2a\left(x^2-1\right)x^2 + \left(x^2-1\right)^2\left(x^2-v^2\right)\right)}{x^2\left(x^2-1\right)^2} - \frac{\left((1-4a)x^2-1\right)y'(x)}{x\left(x^2-1\right)}$$

✓ **Mathematica** : cpu = 0.621271 (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 + x^2))*y
```

$$\left\{\left\{y(x) \to c_2\left(x^2-1\right)^{a+1}x^{-v}\text{HeunC}\left[-\frac{a}{2}+v-\frac{3}{4},\frac{1}{4},1-v,2,0,x^2\right] + c_1\left(x^2-1\right)^{a+1}x^{v}\text{HeunC}\left[\frac{1}{4}(-2a-4v-3)\right.\right.\right.$$

✓ **Maple** : cpu = 0.531 (sec), leaf count = 59

```
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)^
```

$$y(x) = -\left(x^2-1\right)\left(x^2-1\right)^a\left(c_1x^v\,\text{HeunC}\left(0,v,1,\frac{1}{4},\frac{1}{4}+\frac{a}{2},x^2\right) + c_2x^{-v}\,\text{HeunC}\left(0,-v,1,\frac{1}{4},\frac{1}{4}+\frac{a}{2},x^2\right)\right)$$

2.1403 ODE No. 1403

$$y''(x) = -y'(x)\left(\frac{-\mathrm{a1}-\mathrm{b1}+1}{x-\mathrm{c1}}+\frac{-\mathrm{a2}-\mathrm{b2}+1}{x-\mathrm{c2}}+\frac{-\mathrm{a3}-\mathrm{b3}+1}{x-\mathrm{c3}}\right)-\frac{y(x)\left(\frac{\mathrm{a1b1(c1-c2)(c1-c3)}}{x-\mathrm{c1}}+\frac{\mathrm{a2b2(c2-c1)(c2-c3)}}{x-\mathrm{c2}}\right.}{(x-\mathrm{c1})(x-\mathrm{c2})(x-\mathrm{c3})}$$

✓ **Mathematica** : cpu = 8.65497 (sec), leaf count = 316

```
DSolve[Derivative[2][y][x] == -((((a1*b1*(c1 - c2)*(c1 - c3))/(-c1 + x) + (a2*b2*(-c1 + c2)*(c2 - c3)
```

$$\left\{\left\{y(x)\to c_1(x-\mathrm{c1})^{\mathrm{a1}}(x-\mathrm{c2})^{\mathrm{a2}}(x-\mathrm{c3})^{\mathrm{b3}}\mathrm{HeunG}\left[\frac{\mathrm{c1}-\mathrm{c3}}{\mathrm{c1}-\mathrm{c2}},\frac{\mathrm{a1}(\mathrm{c1}(-\mathrm{a3}-2\mathrm{b1}-\mathrm{b2}+2)+\mathrm{c2}(\mathrm{a3}+\mathrm{b1}-1)+\mathrm{c3}}{}\right.\right.\right.$$

✓ **Maple** : cpu = 0.777 (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
```

$$y(x) = (x-\mathrm{c2})^{\mathrm{a2}}(x-\mathrm{c3})^{\mathrm{b3}}\left((x-\mathrm{c1})^{\mathrm{a1}}\,\mathrm{HeunG}\left(\frac{\mathrm{c1}-\mathrm{c3}}{\mathrm{c1}-\mathrm{c2}},\frac{((-\mathrm{a3}-2\,\mathrm{b1}-\mathrm{b2}+2)\,\mathrm{c1}+(\mathrm{a3}+\mathrm{b1}-1)\,\mathrm{c2}+\mathrm{c3}\,(\mathrm{b1}+\mathrm{b}}{}\right.\right.$$

2.1404 ODE No. 1404

$$y''(x) = -\frac{(1-2x^2)\,y(x)}{4x^6} - \frac{(2x^2+1)\,y'(x)}{x^3}$$

✓ **Mathematica** : cpu = 0.01232 (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])/x^3,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 = 0.032 (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))
```

$$y(x) = \frac{e^{\frac{1}{4x^2}}(xc_1 + c_2)}{x}$$

2.1405 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 = 0.0345789 (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[1][y][x]
```

$$\left\{\left\{y(x) \to c_1 e^{-\frac{1}{4x^2}} x^{\frac{3}{2}-\frac{\sqrt{9-a}}{2}} + \frac{c_2 e^{-\frac{1}{4x^2}} x^{\frac{\sqrt{9-a}}{2}+\frac{3}{2}}}{\sqrt{9-a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.06 (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))
```

$$y(x) = \mathrm{e}^{-\frac{1}{4x^2}} \left(x^{\frac{3}{2}+\frac{\sqrt{-a+9}}{2}} c_1 + x^{\frac{3}{2}-\frac{\sqrt{-a+9}}{2}} c_2\right)$$

2.1406 ODE No. 1406

$$y''(x) = -\frac{27xy(x)}{16\left(x^3-1\right)^2}$$

✓ **Mathematica** : cpu = 31.941 (sec), leaf count = 2622

```
DSolve[Derivative[2][y][x] == (-27*x*y[x])/(16*(-1 + x^3)^2),y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{e^{-\frac{1}{2}\operatorname{arctanh}\left(\frac{-2x+\sqrt{2x-i\sqrt{3}+1}\sqrt{2x+i\sqrt{3}+1}+2}{2\sqrt{3}}\right)}(x-1)\left(-2\left(-i+\sqrt{3}\right)x-i\sqrt{2x-i\sqrt{3}+1}\sqrt{2x+i\sqrt{3}+1}+\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.095 (sec), leaf count = 44

```
dsolve(diff(diff(y(x),x),x) = -27/16*x/(x^3-1)^2*y(x),y(x))
```

$$y(x) = \sqrt{x}\left(x^3-1\right)^{\frac{1}{4}}\left(\text{LegendreP}\left(-\frac{1}{6},\frac{1}{3},\sqrt{-x^3+1}\right)c_1+\text{LegendreQ}\left(-\frac{1}{6},\frac{1}{3},\sqrt{-x^3+1}\right)c_2\right)$$

2.1407 ODE No. 1407

$$y''(x) = -y'(x)\left(\frac{\mathrm{b1}(-\mathrm{al1}-\mathrm{bl1}+1)}{\mathrm{b1}x-\mathrm{a1}}+\frac{\mathrm{b2}(-\mathrm{al2}-\mathrm{bl2}+1)}{\mathrm{b2}x-\mathrm{a2}}+\frac{\mathrm{b3}(-\mathrm{al3}-\mathrm{bl3}+1)}{\mathrm{b3}x-\mathrm{a3}}\right)-\frac{y(x)\left(\frac{\mathrm{al1bl1}(\mathrm{a1b2}-\mathrm{a2b1})(\mathrm{a3b1}-}{\mathrm{b1}x-\mathrm{a1}}\right.}{}$$

✓ **Mathematica** : cpu = 80.2671 (sec), leaf count = 2002

```
DSolve[Derivative[2][y][x] == -((((al1*(-(a2*b1) + a1*b2)*(a3*b1 - a1*b3)*bl1)/(-a1 + b1*x) + (al2*(-
```

$$\left\{\left\{y(x)\to\left(x-\frac{\mathrm{a2}}{\mathrm{b2}}\right)^{\frac{1}{2}\left(\mathrm{al2}+\mathrm{bl2}-\sqrt{\mathrm{al2}^2+6\mathrm{bl2}\mathrm{al2}+\mathrm{bl2}^2}\right)}\left(x-\frac{\mathrm{a3}}{\mathrm{b3}}\right)^{\frac{1}{2}\left(\mathrm{al3}+\mathrm{bl3}+\sqrt{\mathrm{al3}^2+6\mathrm{bl3}\mathrm{al3}+\mathrm{bl3}^2}\right)}c_1\mathrm{HeunG}\left[\frac{\frac{\mathrm{a1}}{\mathrm{b1}}-\frac{\mathrm{a3}}{\mathrm{b3}}}{\frac{\mathrm{a1}}{\mathrm{b1}}-\frac{\mathrm{a2}}{\mathrm{b2}}},\right.\right.\right.$$

✓ **Maple** : cpu = 1.629 (sec), leaf count = 2829

```
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

2.1408 ODE No. 1408

$$y''(x) = -\frac{y(x)\left(Ax^2+B\right)}{x\left(x^2-\mathrm{a1}\right)\left(x^2-\mathrm{a2}\right)\left(x^2-\mathrm{a3}\right)} - \frac{y'(x)\left(x^2\left(\left(x^2-\mathrm{a1}\right)\left(x^2-\mathrm{a2}\right)+\left(x^2-\mathrm{a1}\right)\left(x^2-\mathrm{a3}\right)+\left(x^2-\mathrm{a2}\right)\left(x^2\right.\right.\right.}{x\left(x^2-\mathrm{a1}\right)\left(x^2-\mathrm{a2}\right)\left(x^2-\mathrm{a3}\right.}$$

✗ **Mathematica** : cpu = 28.9764 (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))) - (((a1 -
```

, 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

$$y(x) = \mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x) + \frac{\left(x^2\left(\left(x^2-\mathrm{a1}\right)\left(x^2-\mathrm{a2}\right)+\left(x^2-\mathrm{a2}\right)\left(x^2-\mathrm{a3}\right)+\left(x^2-\mathrm{a3}\right)\left(x^2-\mathrm{a1}\right)\right)-\left(x^2-\mathrm{a}\right.\right.}{x\left(x^2-\mathrm{a1}\right)\left(x^2-\mathrm{a2}\right)\left(x^2-\mathrm{a3}\right)}\right.\right.$$

2.1409 ODE No. 1409

$$y''(x) = -b^2 x^{-2a} y(x) - \frac{a y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0128945 (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]
```

$$\left\{\left\{y(x)\to c_1 \cos\left(\frac{bx^{1-a}}{a-1}\right) - c_2 \sin\left(\frac{bx^{1-a}}{a-1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (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))
```

$$y(x) = c_1 \sin\left(\frac{b\, x^{1-a}}{a-1}\right) + c_2 \cos\left(\frac{b\, x^{1-a}}{a-1}\right)$$

2.1410 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 = 0.0704752 (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)*Derivative[
```

$$\left\{\left\{y(x)\to c_1 i^{\frac{-\sqrt{q^2+2q+4s+1}+q+1}{b}} a^{\frac{-\sqrt{q^2+2q+4s+1}+q+1}{2b}} \left(x^b\right)^{\frac{-\sqrt{q^2+2q+4s+1}+q+1}{2b}} \text{Hypergeometric2F1}\left(\frac{p}{2b}+\frac{q}{2b}-\frac{\sqrt{p^2-2}}{}\right.\right.\right.$$

✓ **Maple** : cpu = 0.349 (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
```

$$y(x) = c_1 x^{\frac{1}{2}+\frac{q}{2}+\frac{\sqrt{q^2+2q+4s+1}}{2}} \text{hypergeom}\left(\left[\frac{p+q+\sqrt{q^2+2q+4s+1}+\sqrt{p^2-2p-4r+1}}{2b}, \frac{p+q+\sqrt{q^2+2q+}}{}\right.\right.$$

2.1411 ODE No. 1411

$$y''(x) = \frac{y(x)}{e^x + 1}$$

✓ **Mathematica** : cpu = 0.211392 (sec), leaf count = 42

```
DSolve[Derivative[2][y][x] == y[x]/(1 + E^x),y[x],x]
```

$$\left\{\left\{y(x) \to c_1\left(e^{-x}+1\right) + c_2 e^{-x}\left(e^x \log\left(e^x+1\right) + \log\left(e^x+1\right) + 1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x) = 1/(exp(x)+1)*y(x),y(x))
```

$$y(x) = \left(c_1\left(e^x+1\right)\ln\left(e^x+1\right) + c_2 e^x + c_1 + c_2\right)e^{-x}$$

2.1412 ODE No. 1412

$$y''(x) = \frac{y'(x)}{x\log(x)} + y(x)\log^2(x)$$

✓ **Mathematica** : cpu = 0.0098827 (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 = 0.016 (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))
```

$$y(x) = \sinh\left(x(\ln\left(x\right)-1)\right)c_1 + \cosh\left(x(\ln\left(x\right)-1)\right)c_2$$

2.1413 ODE No. 1413

$$y''(x) = \frac{y'(x)}{x(\log(x) - 1)} - \frac{y(x)}{x^2(\log(x) - 1)}$$

✓ **Mathematica** : cpu = 0.0467762 (sec), leaf count = 16

```
DSolve[Derivative[2][y][x] == -(y[x]/(x^2*(-1 + Log[x]))) + Derivative[1][y][x]/(x*(-1 + Log[x])),y[x
```

$$\{\{y(x) \to c_1 x - c_2 \log(x)\}\}$$

✓ **Maple** : cpu = 0.076 (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))
```

$$y(x) = x c_1 + c_2 \ln(x)$$

2.1414 ODE No. 1414

$$y''(x) = y(x)\left(-\text{csch}^2(x)\right)\left((1-n)n - a^2\sinh^2(x)\right)$$

✓ **Mathematica** : cpu = 0.531367 (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]
```

$$\left\{\left\{y(x)\to \frac{c_2(-1)^{\frac{1}{2}(-2n-1)+1}\tanh^2(x)^{\frac{1}{4}(-2n-1)+1}\left(\tanh^2(x)-1\right)^{\frac{1}{2}\left(\frac{a+n}{2}+\frac{1}{2}(a+n+1)+\frac{1}{2}(-2n-1)+1\right)-\frac{1}{2}}\text{Hypergeometri}}{\sqrt{\tanh(x)}}\right.\right.$$

✓ **Maple** : cpu = 0.399 (sec), leaf count = 82

```
dsolve(diff(diff(y(x),x),x) = -(-a^2*sinh(x)^2-n*(n-1))/sinh(x)^2*y(x),y(x))
```

$$y(x) = \frac{\sinh(x)^{n+\frac{1}{2}}\sqrt{\cosh(x)}\left(\text{hypergeom}\left(\left[\frac{1}{2}-\frac{a}{2}+\frac{n}{2},\frac{1}{2}+\frac{a}{2}+\frac{n}{2}\right],\left[\frac{3}{2}\right],\frac{\cosh(2x)}{2}+\frac{1}{2}\right)\cosh(x)\,c_2+\text{hypergeom}\right.}{\sqrt{\sinh(2x)}}$$

2.1415 ODE No. 1415

$$y''(x) = (a^2 - n^2)\, y(x) - 2n \coth(x) y'(x)$$

✓ **Mathematica** : cpu = 0.467984 (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]
```

$$\left\{\left\{y(x) \to \frac{c_2(-1)^{\frac{1}{2}(-2n-1)+1} \tanh^2(x)^{\frac{1}{4}(-2n-1)+1} \left(\tanh^2(x) - 1\right)^{\frac{1}{2}\left(\frac{a+n}{2}+\frac{1}{2}(a+n+1)+\frac{1}{2}(-2n-1)+1\right)} \text{Hypergeometric2I}}{}\right.\right.$$

✓ **Maple** : cpu = 0.188 (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))
```

$$y(x) = \sinh(x)^{-n+\frac{1}{2}} \left(\text{LegendreP}\left(a - \frac{1}{2}, n - \frac{1}{2}, \cosh(x)\right) c_1 + \text{LegendreQ}\left(a - \frac{1}{2}, n - \frac{1}{2}, \cosh(x)\right) c_2\right)$$

2.1416 ODE No. 1416

$$y''(x) = (n - v)(n + v + 1)y(x) - (2n + 1)\cot(x)y'(x)$$

✓ **Mathematica** : cpu = 0.112591 (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],y[x],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 = 0.224 (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))
```

$$y(x) = \sin(x)^{-n}\left(\mathrm{LegendreP}\left(v, n, \cos(x)\right)c_1 + \mathrm{LegendreQ}\left(v, n, \cos(x)\right)c_2\right)$$

2.1417 ODE No. 1417

$$y''(x) = -\csc(x)y'(x)\left(\sin^2(x) - \cos(x)\right) - y(x)\sin^2(x)$$

✓ **Mathematica** : cpu = 0.0955429 (sec), leaf count = 52

```
DSolve[Derivative[2][y][x] == -(Sin[x]^2*y[x]) - Csc[x]*(-Cos[x] + Sin[x]^2)*Derivative[1][y][x],y[x]
```

$$\left\{\left\{y(x)\to c_1e^{\frac{\cos(x)}{2}}\cos\left(\frac{1}{2}\sqrt{3}\cos(x)\right)+c_2e^{\frac{\cos(x)}{2}}\sin\left(\frac{1}{2}\sqrt{3}\cos(x)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.165 (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))
```

$$y(x) = \mathrm{e}^{\frac{\cos(x)}{2}}\left(\sin\left(\frac{\sqrt{3}\,\cos(x)}{2}\right)c_1+\cos\left(\frac{\sqrt{3}\,\cos(x)}{2}\right)c_2\right)$$

2.1418 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 = 0.0840098 (sec), leaf count = 15

```
DSolve[Derivative[2][y][x] == (Sin[x]*y[x])/(x*Cos[x] - Sin[x]) - (x*Sin[x]*Derivative[1][y][x])/(x*C
```

$$\{\{y(x) \to c_1 x + c_2 \sin(x)\}\}$$

✓ **Maple** : cpu = 3.937 (sec), leaf count = 47

```
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(
```

$$y(x) = \sin(x)\left(\left(\int e^{\int \frac{-2\cos(x)\cot(x)x+3\cos(x)-\sec(x)}{\cos(x)x-\sin(x)}dx}\cos(x)\,dx\right)c_2 + c_1\right)$$

2.1419 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 = 0.784987 (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*Cos[x] + x
```

, 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 = 0.253 (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*s
```

$$y(x) = x(\sin(x)\, c_2 + c_1)$$

2.1420 ODE No. 1420

$$y(x)\left(-a\cos^2(x)-(n-1)n\right)+\cos^2(x)y''(x)=0$$

✓ **Mathematica** : cpu = 0.273112 (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]
```

$$\left\{\left\{y(x)\to c_1 i^{1-n}\cos^{1-n}(x)\,\text{Hypergeometric2F1}\left(-\frac{n}{2}-\frac{i\sqrt{a}}{2}+\frac{1}{2},-\frac{n}{2}+\frac{i\sqrt{a}}{2}+\frac{1}{2},\frac{3}{2}-n,\cos^2(x)\right)+c_2 i^n\cos^n(\right.\right.$$

✓ **Maple** : cpu = 0.454 (sec), leaf count = 114

```
dsolve(cos(x)^2*diff(diff(y(x),x),x)-(a*cos(x)^2+n*(n-1))*y(x),y(x))
```

$$y(x)=\frac{\sin(x)^{\frac{3}{2}}\left(\left(\frac{\cos(2x)}{2}+\frac{1}{2}\right)^{\frac{3}{4}-\frac{n}{2}}\text{hypergeom}\left(\left[1+\frac{i\sqrt{a}}{2}-\frac{n}{2},1-\frac{i\sqrt{a}}{2}-\frac{n}{2}\right],\left[\frac{3}{2}-n\right],\frac{\cos(2x)}{2}+\frac{1}{2}\right)c_2+\cos(x)^{n+}}{\sqrt{\sin(2x)}}$$

2.1421 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 = 0.106734 (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*(-1 + r
```

$$\left\{\left\{y(x) \to c_1 e^{-iax}\cos^{n-1}(ax) - \frac{ic_2 e^{2iax}\left(\frac{1}{2}e^{-iax} + \frac{1}{2}e^{iax}\right)^n}{a\left(1+e^{2iax}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.091 (sec), leaf count = 28

```
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
```

$$y(x) = \sec(ax)^{1-n}\left(\sin(ax) c_1 + \cos(ax) c_2\right)$$

2.1422 ODE No. 1422

$$y''(x) = 2y(x)\csc^2(x)$$

✓ **Mathematica** : cpu = 0.0708253 (sec), leaf count = 67

```
DSolve[Derivative[2][y][x] == 2*Csc[x]^2*y[x],y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1\cos(x)}{\sqrt{\cos^2(x)-1}}+\frac{c_2\left(-\sqrt{\cos^2(x)-1}-\cos(x)\log\left(\sqrt{\cos^2(x)-1}-\cos(x)\right)\right)}{\sqrt{\cos^2(x)-1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.283 (sec), leaf count = 50

```
dsolve(diff(diff(y(x),x),x) = 2/sin(x)^2*y(x),y(x))
```

$$y(x) = \frac{i\sin(2x)\ln(\cos(2x)+i\sin(2x))\,c_2+(-1+\cos(2x))\,(c_1\cot(x)-2c_2)}{-1+\cos(2x)}$$

2.1423 ODE No. 1423

$$y''(x) = -ay(x)\csc^2(x)$$

✓ **Mathematica** : cpu = 0.0436939 (sec), leaf count = 70

```
DSolve[Derivative[2][y][x] == -(a*Csc[x]^2*y[x]),y[x],x]
```

$$\left\{\left\{y(x)\to c_1\sqrt[4]{\cos^2(x)-1}P_{-\frac{1}{2}}^{\frac{1}{2}\sqrt{1-4a}}(\cos(x))+c_2\sqrt[4]{\cos^2(x)-1}Q_{-\frac{1}{2}}^{\frac{1}{2}\sqrt{1-4a}}(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.386 (sec), leaf count = 110

```
dsolve(diff(diff(y(x),x),x) = -a/sin(x)^2*y(x),y(x))
```

$$y(x) = \frac{\left(\frac{\cos(2x)}{2}-\frac{1}{2}\right)^{\frac{1}{2}+\frac{\sqrt{1-4a}}{4}}\sqrt{\cos(x)}\left(\mathrm{hypergeom}\left(\left[\frac{\sqrt{1-4a}}{4}+\frac{3}{4},\frac{\sqrt{1-4a}}{4}+\frac{3}{4}\right],\left[\frac{3}{2}\right],\frac{\cos(2x)}{2}+\frac{1}{2}\right)\cos(x)\,c_2+\mathrm{hype}\right.}{\sqrt{\sin(2x)}}$$

2.1424 ODE No. 1424

$$y(x)\left(-a\sin^2(x)-(n-1)n\right)+\sin^2(x)y''(x)=0$$

✓ **Mathematica** : cpu = 0.138049 (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]
```

$$\left\{\left\{y(x)\to c_1\sqrt[4]{\cos^2(x)-1}P_{\frac{1}{2}i\left(2\sqrt{a}+i\right)}^{\frac{1}{2}(2n-1)}(\cos(x))+c_2\sqrt[4]{\cos^2(x)-1}Q_{\frac{1}{2}i\left(2\sqrt{a}+i\right)}^{\frac{1}{2}(2n-1)}(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.39 (sec), leaf count = 102

```
dsolve(sin(x)^2*diff(diff(y(x),x),x)-(a*sin(x)^2+n*(n-1))*y(x),y(x))
```

$$y(x)=\frac{\left(\frac{\cos(2x)}{2}-\frac{1}{2}\right)^{\frac{n}{2}+\frac{1}{4}}\sqrt{\cos(x)}\left(\mathrm{hypergeom}\left(\left[\frac{1}{2}+\frac{i\sqrt{a}}{2}+\frac{n}{2},\frac{1}{2}-\frac{i\sqrt{a}}{2}+\frac{n}{2}\right],\left[\frac{3}{2}\right],\frac{\cos(2x)}{2}+\frac{1}{2}\right)\cos(x)\,c_2+\mathrm{hype}\right.}{\sqrt{\sin(2x)}}$$

2.1425 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 = 21.5447 (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],x]
```

$$\left\{\left\{y(x)\to \frac{c_2\sqrt{1-\cos(x)}\left(-\frac{(2a-1)(\cos(x)+1)}{-2a\cos(x)+\cos(x)+2}\right)^{a+\frac{1}{2}}(-2a\cos(x)+\cos(x)+2)\left(1-\cos^2(x)\right)^{-a}\left(\frac{(2a-1)(\cos(x)-1)}{(2a-1)\cos(x)-2}\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.61 (sec), leaf count = 87

```
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))
```

$$y(x) = \frac{c_1(-2+(2a-1)\cos(x))\sqrt{\cos\left(\frac{x}{2}\right)}\sin(x)^{a-\frac{1}{2}}}{\sin\left(\frac{x}{2}\right)^{\frac{3}{2}}} + \frac{c_2\left(\frac{\cos(x)}{2}-\frac{1}{2}\right)^{\frac{a}{2}-\frac{3}{4}}\left(\frac{\cos(x)}{2}+\frac{1}{2}\right)^{\frac{3}{4}-\frac{a}{2}}\mathrm{hypergeom}\left(\left[a-\frac{1}{2},\right.\right.}{\sqrt{\sin(x)}}$$

2.1426 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 = 3.07327 (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][y][x] ==
```

$$\left\{\left\{y(x)\to\frac{c_1(\cos(x)+1)^{\frac{1}{2}\left(-\frac{8a^2}{-16a^2+48a-36}+\frac{24a}{-16a^2+48a-36}+a-\frac{-32a^2+96a+\sqrt{\left(32a^2-96a+72\right)^2-4\left(-16a^2+48a-36\right)\left(16a^4+16ba^2-88a^2-\right.}}{2\left(-16a^2+48a-36\right)}\right.}}{}\right.\right.$$

✓ **Maple** : cpu = 0.743 (sec), leaf count = 558

```
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))
```

$$y(x)=\frac{\left(\frac{\cos(x)}{2}-\frac{1}{2}\right)^{\frac{4a-6+\sqrt{16a^4+(16b-72)a^2-48ab+4\left(\frac{9}{2}+b\right)^2}}{8a-12}}\left(\text{hypergeom}\left(\left[\frac{8a^2+\sqrt{16a^4+(16b-72)a^2-48ab+4\left(\frac{9}{2}+b\right)^2}+\sqrt{16a^4+(-\right.}{8a-12}\right.\right.\right.}{}$$

2.1427 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 = 0.59845 (sec), leaf count = 166

```
DSolve[Derivative[2][y][x] == -(Csc[x]^2*((1 - a)*a - (-(1 + a)^2 + a^2*b^2)*Sin[x]^2 - a*(1 + a)*b*S
```

$$\left\{\left\{y(x) \to c_2\left(e^{-abx}\sin^{-a-1}(x) + \frac{2^{2a+1}(2a+1)\left(1-e^{2ix}\right)^{2a}\left(-ie^{-ix}\left(-1+e^{2ix}\right)\right)^{-2a} e^{-abx+2ix}\sin^a(x)\,\text{Hypergeo}}{a(b-i) -}\right.\right.\right.$$

✓ **Maple** : cpu = 0.839 (sec), leaf count = 98

```
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(
```

$$y(x) = \left(c_2(\cot(x)+i)^{\frac{1}{2}+\frac{1}{2}a+\frac{1}{2}iab}\,\text{hypergeom}\left([iab-a+1, a(ib+1)], [iab+a+2], \frac{1}{2} - \frac{i\cot(x)}{2}\right) + c_1(\cot(x)\right.$$

2.1428 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 = 0.248571 (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]
```

$$\left\{\left\{y(x) \to c_1 \sqrt[4]{\cos^2(x) - 1} P_{\frac{1}{2}\left(2\sqrt{b-a}-1\right)}^{\frac{1}{2}\sqrt{-4a-4c+1}}(\cos(x)) + c_2 \sqrt[4]{\cos^2(x) - 1} Q_{\frac{1}{2}\left(2\sqrt{b-a}-1\right)}^{\frac{1}{2}\sqrt{-4a-4c+1}}(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.424 (sec), leaf count = 161

```
dsolve(diff(diff(y(x),x),x) = -(a*cos(x)^2+b*sin(x)^2+c)/sin(x)^2*y(x),y(x))
```

$$y(x) = \frac{\sqrt{\cos(x)}\left(\frac{\cos(2x)}{2} - \frac{1}{2}\right)^{\frac{1}{2}+\frac{\sqrt{-4a+1-4c}}{4}}\left(\cos(x)\,\mathrm{hypergeom}\left(\left[\frac{\sqrt{-4a+1-4c}}{4} + \frac{\sqrt{-a+b}}{2} + \frac{3}{4}, \frac{\sqrt{-4a+1-4c}}{4} - \frac{\sqrt{-a+b}}{2} +\right.\right.\right.}{}$$

2.1429 ODE No. 1429

$$y''(x) = y(x)\csc^2(x) - \cot(x)y'(x)$$

✓ **Mathematica** : cpu = 0.0223321 (sec), leaf count = 41

```
DSolve[Derivative[2][y][x] == Csc[x]^2*y[x] - Cot[x]*Derivative[1][y][x],y[x],x]
```

$$\left\{\left\{y(x)\to \frac{c_1}{\sqrt{1-\cos^2(x)}}-\frac{ic_2\cos(x)}{\sqrt{1-\cos^2(x)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x) = -1/sin(x)*cos(x)*diff(y(x),x)+1/sin(x)^2*y(x),y(x))
```

$$y(x) = c_1(\csc(x)+\cot(x))+\frac{c_2}{\csc(x)+\cot(x)}$$

2.1430 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 = 0.266085 (sec), leaf count = 22

```
DSolve[Derivative[2][y][x] == -(Csc[x]^2*(-n^2 + v*(1 + v)*Sin[x]^2)*y[x]) - Cot[x]*Derivative[1][y][
```

$$\left\{\left\{y(x) \to c_1 P_v^n(\cos(x)) + c_2 Q_v^n(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.387 (sec), leaf count = 79

```
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*
```

$$y(x) = \left(\frac{\cos(2x)}{2} - \frac{1}{2}\right)^{\frac{n}{2}} \left(\cos(x) \operatorname{hypergeom}\left(\left[1 + \frac{v}{2} + \frac{n}{2}, \frac{1}{2} - \frac{v}{2} + \frac{n}{2}\right], \left[\frac{3}{2}\right], \frac{\cos(2x)}{2} + \frac{1}{2}\right) c_2 + \operatorname{hypergeom}\left(\right.\right.$$

2.1431 ODE No. 1431

$$y''(x) = \cot(2x)y'(x) - 2y(x)$$

✓ **Mathematica** : cpu = 10.114 (sec), leaf count = 80

```
DSolve[Derivative[2][y][x] == -2*y[x] + Cot[2*x]*Derivative[1][y][x],y[x],x]
```

$$\left\{\left\{y(x) \to c_1\left(\cos^2(x) - \frac{1}{2}\right) - \frac{2}{3}c_2\cos^{\frac{3}{2}}(x)\left(2\cos^2(x)\,\text{Hypergeometric2F1}\left(\frac{1}{4}, \frac{3}{4}, \frac{7}{4}, \cos^2(x)\right) - \text{Hypergeometric}\right.\right.\right.$$

✓ **Maple** : cpu = 0.253 (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))
```

$$y(x) = \sin(2x)^{\frac{3}{4}}\left(\text{LegendreQ}\left(\frac{1}{4}, \frac{3}{4}, \cos(2x)\right)c_2 + \text{LegendreP}\left(\frac{1}{4}, \frac{3}{4}, \cos(2x)\right)c_1\right)$$

2.1432 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 = 0.058393 (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][y][x],y[
```

$$\left\{\left\{y(x)\to \frac{c_1e^{-2x}}{\sqrt{\sin(x)}} + \frac{c_2e^{2x}}{4\sqrt{\sin(x)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.054 (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(
```

$$y(x) = \frac{c_1\sinh(2x) + c_2\cosh(2x)}{\sqrt{\sin(x)}}$$

2.1433 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 = 0.123124 (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[x])/(4*
```

$$\left\{\left\{y(x) \to \frac{1}{5}c_2x^3\sqrt{\cos(x)} - \frac{1}{4}x^2\sqrt{\cos(x)} + \frac{c_1\sqrt{\cos(x)}}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.122 (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)^
```

$$y(x) = \frac{\sqrt{\cos(x)}\left(4x^5c_1 - x^4 + 4c_2\right)}{4x^2}$$

2.1434 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 = 203.05 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -(((e + d*Cos[x] + c*Cos[x]^2)*Csc[x]^2*y[x])/a) - (b*Cot[x]*Derivative
```

, could not solve

```
DSolve[Derivative[2][y][x] == -(((e + d*Cos[x] + c*Cos[x]^2)*Csc[x]^2*y[x])/a) - (b*Cot[x]*D
```

✓ **Maple** : cpu = 0.827 (sec), leaf count = 513

```
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(
```

$$y(x) = \sin(x)^{-\frac{a+b}{2a}} \left(\frac{\cos(x)}{2} - \frac{1}{2}\right)^{\frac{2a+\sqrt{a^2+(-2b-4c-4d-4e)a+b^2}}{4a}} \left(\cos\left(\frac{x}{2}\right)^{-\frac{-2a+\sqrt{a^2+(-2b-4c+4d-4e)a+b^2}}{2a}} \text{hypergeom}\left(\left[\frac{\sqrt{}}{} \right.\right.\right.$$

2.1435 ODE No. 1435

$$y''(x) = -4y(x)\sin(3x)\csc^3(x)$$

✓ **Mathematica** : cpu = 0.0910257 (sec), leaf count = 70

```
DSolve[Derivative[2][y][x] == -4*Csc[x]^3*Sin[3*x]*y[x],y[x],x]
```

$$\left\{\left\{y(x)\to c_1\sqrt[4]{\cos^2(x)-1}P_{-\frac{1}{2}+4i}^{\frac{i\sqrt{47}}{2}}(\cos(x))+c_2\sqrt[4]{\cos^2(x)-1}Q_{-\frac{1}{2}+4i}^{\frac{i\sqrt{47}}{2}}(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.199 (sec), leaf count = 38

```
dsolve(diff(diff(y(x),x),x) = -4*sin(3*x)/sin(x)^3*y(x),y(x))
```

$$y(x) = \sqrt{\sin(x)}\left(\mathrm{LegendreQ}\left(-\frac{1}{2}+4i, \frac{i\sqrt{47}}{2}, \cos(x)\right)c_2 + \mathrm{LegendreP}\left(-\frac{1}{2}+4i, \frac{i\sqrt{47}}{2}, \cos(x)\right)c_1\right)$$

2.1436 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 = 0.322721 (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[x]),y[x]
```

$$\left\{\left\{y(x)\to c_1\sqrt[4]{\cos^2(x)-1}P_v^n(\cos(x))+c_2\sqrt[4]{\cos^2(x)-1}Q_v^n(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.391 (sec), leaf count = 91

```
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))
```

$$y(x) = \frac{\left(\frac{\cos(2x)}{2}-\frac{1}{2}\right)^{\frac{n}{2}+\frac{1}{2}}\sqrt{\cos(x)}\left(\text{hypergeom}\left(\left[1+\frac{v}{2}+\frac{n}{2},\frac{1}{2}-\frac{v}{2}+\frac{n}{2}\right],\left[\frac{3}{2}\right],\frac{\cos(2x)}{2}+\frac{1}{2}\right)\cos(x)\,c_2+\text{hypergeo}\right.}{\sqrt{\sin(2x)}}$$

2.1437 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 = 0.180943 (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][x],y[x]
```

$$\left\{\left\{y(x)\to c_2\cos^{\frac{1}{2}\left(\sqrt{13}-3\right)}(x) + c_1\cos^{\frac{1}{2}\left(-3-\sqrt{13}\right)}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.221 (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(
```

$$y(x) = c_1\cos(x)^{-\frac{3}{2}+\frac{\sqrt{13}}{2}} + c_2\cos(x)^{-\frac{3}{2}-\frac{\sqrt{13}}{2}}$$

2.1438 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 = 0.612537 (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 - a*Cos[x
```

$$\left\{\left\{y(x)\to \frac{c_2(-1)^{\frac{1}{2}(-2m-1)+1}\cos^2(x)^{\frac{1}{4}(-2m-1)+1}\left(\cos^2(x)-1\right)^{\frac{1}{2}\left(\frac{4am+4\sqrt{-a}n^2+4an-4\sqrt{-a}n+4(-a)^{3/2}+8\sqrt{-a}a+\sqrt{-a}+4mn^2-4}{8a+8n^2-8n+2}\right.}}{}\right.\right.$$

✓ **Maple** : cpu = 0.279 (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(
```

$$y(x) = \sin(x)^n\left(\cos(x)^m \operatorname{hypergeom}\left(\left[\frac{n}{2}+\frac{m}{2}-\frac{i\sqrt{a}}{2}, \frac{n}{2}+\frac{m}{2}+\frac{i\sqrt{a}}{2}\right], \left[\frac{1}{2}+m\right], \cos(x)^2\right)c_1 + \cos(x)^{-m+1} \mathrm{h}\right.$$

2.1439 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 = 0.45634 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == (Derivative[1][phi][x]*Derivative[1][y][x])/(-phi[a] + phi[x]) - (y[x]*
```

, could not solve

```
DSolve[Derivative[2][y][x] == (Derivative[1][phi][x]*Derivative[1][y][x])/(-phi[a] + phi[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)-
```

, result contains DESol or ODESolStruc

$$y(x) = \mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x) - \frac{\left(\frac{d}{dx}\phi(x)\right)\left(\frac{d}{dx}\_Y(x)\right)}{\phi(x) - \phi(a)} + \frac{\left(-n(n+1)\left(\phi(x) - \phi(a)\right)^2 + \frac{d^2}{da^2}\phi(a)\right)\_Y(x)}{\phi(x) - \phi(a)}\right\}, \{\_Y(x$$

2.1440 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 = 0.46508 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -((Derivative[1][y][x]*(phi[x^3] - phi[x]*Derivative[1][phi][x] - Deriv
```

, could not solve

```
DSolve[Derivative[2][y][x] == -((Derivative[1][y][x]*(phi[x^3] - phi[x]*Derivative[1][phi][x
(phi[x]^2*Derivative[1][phi][x]) + Derivative[1][phi][x]^2 - phi[x]*Derivative[2][phi][x]))/
```

✗ **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

$$y(x) = \mathrm{DESol}\left(\left\{\frac{\left(\left(\frac{d}{dx}\phi(x)\right)^2 - \phi(x)^2\left(\frac{d}{dx}\phi(x)\right) - \phi(x)\left(\frac{d^2}{dx^2}\phi(x)\right)\right)\_Y(x)}{\frac{d}{dx}\phi(x) + \phi(x)^2} + \frac{\left(\phi(x^3) - \phi(x)\left(\frac{d}{dx}\phi(x)\right) - \frac{d^2}{dx^2}\phi(x\right.}{\frac{d}{dx}\phi(x) + \phi(x)^2}\right.\right.$$

2.1441 ODE No. 1441

$$y''(x) = -\frac{y'(x)(-\mathrm{cn}(x|k)\mathrm{dn}(x|k) - 2\mathrm{sn}(x|k))}{\mathrm{sn}(x|k)^2 - \mathrm{sn}(a|k)^2} - \frac{y(x)\left(6k^2\mathrm{sn}(a|k)^4 - 4\left(k^2+1\right)\mathrm{sn}(a|k)^2 + 2\right)}{\mathrm{sn}(x|k)^2 - \mathrm{sn}(a|k)^2} - \frac{1}{\mathrm{sn}(x|k)^2 - \mathrm{sn}(a|k)}$$

✗ **Mathematica** : cpu = 0.770475 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -(-JacobiSN[a, k]^2 + JacobiSN[x, k]^2)^(-1) - ((2 - 4*(1 + k^2)*Jacobi
```

, could not solve

```
DSolve[Derivative[2][y][x] == -(-JacobiSN[a, k]^2 + JacobiSN[x, k]^2)^(-1) - ((2 - 4*(1 + k^
JacobiSN[a, k]^2 + JacobiSN[x, k]^2) - ((-(JacobiCN[x, k]*JacobiDN[x, k]) - 2*JacobiSN[x, k]
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

$$y(x) = \mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x) - \frac{2\ \mathrm{JacobiSN}\,(x,k)\,\mathrm{JacobiCN}\,(x,k)\,\mathrm{JacobiDN}\,(x,k)\left(\frac{d}{dx}\_Y(x)\right)}{\mathrm{JacobiSN}\,(x,k)^2 - \mathrm{JacobiSN}\,(a,k)} - \frac{\left(-2 + 4\left(k^2 + 1\right.\right.}{}\right.\right.$$

2.1442 ODE No. 1442

$$y''(x) = \frac{y(x)}{f(x)} - \frac{xy'(x)}{f(x)}$$

✓ **Mathematica** : cpu = 0.0398916 (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 = 0.055 (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))
```

$$y(x) = x\left(c_1\left(\int e^{\int \frac{-2-\frac{x^2}{f(x)}}{x}dx}dx\right)+c_2\right)$$

2.1443 ODE No. 1443

$$y''(x) = -\frac{f'(x)y'(x)}{2f(x)} - \frac{g(x)y(x)}{f(x)}$$

✗ **Mathematica** : cpu = 0.232684 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -((g[x]*y[x])/f[x]) - (Derivative[1][f][x]*Derivative[1][y][x])/(2*f[x]
```

, could not solve

```
DSolve[Derivative[2][y][x] == -((g[x]*y[x])/f[x]) - (Derivative[1][f][x]*Derivative[1][y][x]
```

✗ **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

$$y(x) = \mathrm{DESol}\left(\left\{\frac{g(x)\_Y(x)}{f(x)} + \frac{\left(\frac{d}{dx}f(x)\right)\left(\frac{d}{dx}\_Y(x)\right)}{2f(x)} + \frac{d^2}{dx^2}\_Y(x)\right\}, \{\_Y(x)\}\right)$$

2.1444 ODE No. 1444

$$y''(x) = -by(x)f(x)^{2a} - \frac{af'(x)y'(x)}{f(x)}$$

✗ **Mathematica** : cpu = 0.82263 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -(b*f[x]^(2*a)*y[x]) - (a*Derivative[1][f][x]*Derivative[1][y][x])/f[x]
```

, could not solve

DSolve[Derivative[2][y][x] == -(b*f[x]^(2*a)*y[x]) - (a*Derivative[1][f][x]*Derivative[1][y]

✓ **Maple** : cpu = 0.015 (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)
```

$$y(x) = c_1 e^{\int i f(x)^a \sqrt{b} dx} + c_2 e^{-\left(\int i f(x)^a \sqrt{b} dx\right)}$$

2.1445 ODE No. 1445

$$y''(x) = -\frac{y'(x)\left(2f(x)g(x)g'(x)^2 - \left(g(x)^2-1\right)\left(2f'(x)g'(x) + f(x)g''(x)\right)\right)}{f(x)\left(g(x)^2-1\right)g'(x)} - \frac{y(x)\left(\left(g(x)^2-1\right)\left(f'(x)\left(2f'(x)g'(x\right.\right.\right.}{}$$

✓ **Mathematica** : cpu = 0.10141 (sec), leaf count = 24

```
DSolve[Derivative[2][y][x] == -((Derivative[1][y][x]*(2*f[x]*g[x]*Derivative[1][g][x]^2 - (-1 + g[x]^
```

$$\{\{y(x) \to c_1 f(x)\,\text{LegendreP}(v, g(x)) + c_2 f(x)\,\text{LegendreQ}(v, g(x))\}\}$$

✓ **Maple** : cpu = 0.289 (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
```

$$y(x) = f(x)\left(\text{LegendreP}\left(v, g(x)\right)c_1 + \text{LegendreQ}\left(v, g(x)\right)c_2\right)$$

2.1446 ODE No. 1446

$$y''(x) = -\frac{(x-1)y(x)}{x^4} - \frac{y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0352228 (sec), leaf count = 33

```
DSolve[Derivative[2][y][x] == -(((-1 + x)*y[x])/x^4) - Derivative[1][y][x]/x,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{-1/x} - c_2e^{-1/x}\,\text{ExpIntegralEi}\left(\frac{2}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (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))
```

$$y(x) = \mathrm{e}^{-\frac{1}{x}}\left(\text{expIntegral}_1\left(-\frac{2}{x}\right)c_2 + c_1\right)$$

2.1447 ODE No. 1447

$$y''(x) = -\frac{(-x-1)y(x)}{x^4} - \frac{y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0304436 (sec), leaf count = 29

```
DSolve[Derivative[2][y][x] == -(((-1 - x)*y[x])/x^4) - Derivative[1][y][x]/x,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{\frac{1}{x}} - c_2e^{\frac{1}{x}}\,\text{ExpIntegralEi}\left(-\frac{2}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (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))
```

$$y(x) = e^{\frac{1}{x}}\left(\text{expIntegral}_1\left(\frac{2}{x}\right)c_2 + c_1\right)$$

2.1448 ODE No. 1448

$$y''(x) = -\frac{b^2 y(x)}{(x^2 - a^2)^2}$$

✓ **Mathematica** : cpu = 0.301237 (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 = 0.095 (sec), leaf count = 77

```
dsolve(diff(diff(y(x),x),x) = -b^2/(-a^2+x^2)^2*y(x),y(x))
```

$$y(x) = \sqrt{(a-x)(x+a)}\left(\left(\frac{a-x}{x+a}\right)^{\frac{\sqrt{a^2-b^2}}{2a}}c_1 + \left(\frac{a-x}{x+a}\right)^{-\frac{\sqrt{a^2-b^2}}{2a}}c_2\right)$$

2.1449 ODE No. 1449

$$y^{(3)}(x) - \lambda y(x) = 0$$

✓ **Mathematica** : cpu = 0.0102864 (sec), leaf count = 53

```
DSolve[-(lambda*y[x]) + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{(-1)^{2/3}\sqrt[3]{\lambda}x}+c_2e^{-\sqrt[3]{-1}\sqrt[3]{\lambda}x}+c_3e^{\sqrt[3]{\lambda}x}\right\}\right\}$$

✓ **Maple** : cpu = 0.015 (sec), leaf count = 47

```
dsolve(diff(diff(diff(y(x),x),x),x)-lambda*y(x)=0,y(x))
```

$$y(x) = c_1\mathrm{e}^{-\frac{\lambda^{\frac{1}{3}}\left(1+i\sqrt{3}\right)x}{2}}+c_2\mathrm{e}^{\frac{\lambda^{\frac{1}{3}}\left(i\sqrt{3}-1\right)x}{2}}+c_3\mathrm{e}^{\lambda^{\frac{1}{3}}x}$$

2.1450 ODE No. 1450

$$ax^3y(x) - bx + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 12.5765 (sec), leaf count = 3592

```
DSolve[-(b*x) + a*x^3*y[x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{6}\sqrt[3]{a}c_3\,{}_0F_2\left(;\frac{7}{6},\frac{4}{3};-\frac{ax^6}{216}\right)x^2+\frac{1}{6}\sqrt[3]{a}\,{}_0F_2\left(;\frac{7}{6},\frac{4}{3};-\frac{ax^6}{216}\right)\int_1^x \frac{}{\sqrt[3]{a}\left(-5096a^3\,{}_0F_2\left(;\frac{7}{6},\frac{4}{3};-\frac{1}{216}aK[3]^6\right)\right.}\right.\right.$$

✓ **Maple** : cpu = 0.339 (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

2.1451 ODE No. 1451

$$y^{(3)}(x) - ax^b y(x) = 0$$

✓ **Mathematica** : cpu = 0.0134837 (sec), leaf count = 168

```
DSolve[-(a*x^b*y[x]) + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to (-1)^{\frac{1}{b+3}}(b+3)^{-\frac{3}{b+3}} c_2 x a^{\frac{1}{b+3}} {}_0F_2\left(;1-\frac{1}{b+3},1+\frac{1}{b+3};\frac{ax^{b+3}}{(b+3)^3}\right) + (-1)^{\frac{2}{b+3}}(b+3)^{-\frac{6}{b+3}} c_3 x^2 a^{\frac{2}{b+3}} {}_0F_2\right.\right.$$

✓ **Maple** : cpu = 0.133 (sec), leaf count = 114

```
dsolve(diff(diff(diff(y(x),x),x),x)-a*x^b*y(x)=0,y(x))
```

$$y(x) = c_1 \operatorname{hypergeom}\left([], \left[\frac{b+2}{b+3}, \frac{b+1}{b+3}\right], \frac{a\,x^{b+3}}{(b+3)^3}\right) + c_2 x \operatorname{hypergeom}\left([], \left[\frac{4+b}{b+3}, \frac{b+2}{b+3}\right], \frac{a\,x^{b+3}}{(b+3)^3}\right) + c_3 x^2 \operatorname{hyperg}$$

2.1452 ODE No. 1452

$$y^{(3)}(x) + 3y'(x) - 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.004557 (sec), leaf count = 54

```
DSolve[-4*y[x] + 3*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_3e^x + c_2e^{-x/2}\cos\left(\frac{\sqrt{15}x}{2}\right) + c_1e^{-x/2}\sin\left(\frac{\sqrt{15}x}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.004 (sec), leaf count = 35

```
dsolve(diff(diff(diff(y(x),x),x),x)+3*diff(y(x),x)-4*y(x)=0,y(x))
```

$$y(x) = \mathrm{e}^x c_1 + c_2\mathrm{e}^{-\frac{x}{2}}\sin\left(\frac{\sqrt{15}\,x}{2}\right) + c_3\mathrm{e}^{-\frac{x}{2}}\cos\left(\frac{\sqrt{15}\,x}{2}\right)$$

2.1453 ODE No. 1453

$$a^2(-y'(x)) - e^{2ax}\sin^2(x) + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 3.10421 (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]
```

$$\left\{\left\{y(x)\to \frac{e^{-ax}\left(-9\left(a^2-4\right)a^4e^{3ax}\cos(2x)-3\left(11a^2-4\right)a^3e^{3ax}\sin(2x)+\left(9a^6+49a^4+56a^2+16\right)\left(12a^2c_1e^{2a}\right.\right.}{12a^3\left(9a^6+49a^4+56a^2+16\right)}\right.\right.$$

✓ **Maple** : cpu = 0.286 (sec), leaf count = 124

```
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))
```

$$y(x) = \frac{\left(\left(-9a^6+36a^4\right)\cos(2x)+\left(-33a^5+12a^3\right)\sin(2x)+9a^6+49a^4+56a^2+16\right)e^{2ax}+108(ac_3+e^{ax}c_1-e}{108a^3\left(a^2+4\right)\left(a^2+1\right)\left(a^2+\frac{4}{9}\right)}$$

2.1454 ODE No. 1454

$$2axy'(x) + ay(x) + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0056465 (sec), leaf count = 79

```
DSolve[a*y[x] + 2*a*x*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1 \operatorname{AiryAi}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}x\right)^2 + c_3 \operatorname{AiryBi}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}x\right)^2 + c_2 \operatorname{AiryAi}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}x\right) \operatorname{AiryBi}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{a}x\right.\right.\right.$$

✓ **Maple** : cpu = 0.039 (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))
```

$$y(x) = c_1 \operatorname{AiryAi}\left(-\frac{2^{\frac{2}{3}}a^{\frac{1}{3}}x}{2}\right)^2 + c_2 \operatorname{AiryBi}\left(-\frac{2^{\frac{2}{3}}a^{\frac{1}{3}}x}{2}\right)^2 + c_3 \operatorname{AiryAi}\left(-\frac{2^{\frac{2}{3}}a^{\frac{1}{3}}x}{2}\right) \operatorname{AiryBi}\left(-\frac{2^{\frac{2}{3}}a^{\frac{1}{3}}x}{2}\right)$$

2.1455 ODE No. 1455

$$x(a+b-1)y'(x) - aby(x) + x^2(-y''(x)) + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0157132 (sec), leaf count = 127

```
DSolve[-(a*b*y[x]) + (-1 + a + b)*x*Derivative[1][y][x] - x^2*Derivative[2][y][x] + Derivative[3][y]
```

$$\left\{\left\{y(x) \to \sqrt[3]{-\frac{1}{3}} c_2 x \, {}_2F_2\left(\frac{1}{3}-\frac{a}{3}, \frac{1}{3}-\frac{b}{3}; \frac{2}{3}, \frac{4}{3}; \frac{x^3}{3}\right) + c_1 \, {}_2F_2\left(-\frac{a}{3}, -\frac{b}{3}; \frac{1}{3}, \frac{2}{3}; \frac{x^3}{3}\right) + \left(-\frac{1}{3}\right)^{2/3} c_3 x^2 \, {}_2F_2\left(\frac{2}{3}-\frac{a}{3}, \frac{2}{3}\right.\right.\right.$$

✓ **Maple** : cpu = 0.118 (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
```

$$y(x) = c_1 \operatorname{hypergeom}\left(\left[-\frac{a}{3}, -\frac{b}{3}\right], \left[\frac{1}{3}, \frac{2}{3}\right], \frac{x^3}{3}\right) + c_2 \operatorname{hypergeom}\left(\left[\frac{1}{3}-\frac{b}{3}, \frac{1}{3}-\frac{a}{3}\right], \left[\frac{2}{3}, \frac{4}{3}\right], \frac{x^3}{3}\right) x + c_3 \operatorname{hypergeom}$$

2.1456 ODE No. 1456

$$x^{2c-2}y'(x) + (c-1)x^{2c-3}y(x) + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0189729 (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] == 0,y[x],
```

$$\left\{\left\{y(x) \to c_1\, {}_1F_2\left(\frac{1}{2} - \frac{1}{2c}; 1 - \frac{1}{c}, 1 - \frac{1}{2c}; -\frac{x^{2c}}{4c^2}\right) + 4^{-1/c}c^{-2/c}c_3\left(x^{2c}\right)^{\frac{1}{c}}\, {}_1F_2\left(\frac{1}{2} + \frac{1}{2c}; 1 + \frac{1}{2c}, 1 + \frac{1}{c}; -\frac{x^{2c}}{4c^2}\right) + 2^{-}\right.\right.$$

✓ **Maple** : cpu = 0.086 (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))
```

$$y(x) = x\left(\mathrm{BesselY}\left(\frac{1}{2c}, \frac{x^c}{2c}\right)^2 c_2 + \mathrm{BesselY}\left(\frac{1}{2c}, \frac{x^c}{2c}\right)\mathrm{BesselJ}\left(\frac{1}{2c}, \frac{x^c}{2c}\right)c_3 + \mathrm{BesselJ}\left(\frac{1}{2c}, \frac{x^c}{2c}\right)^2 c_1\right)$$

2.1457 ODE No. 1457

$$-3y'(x)(a+2\wp(x;\mathrm{g2},\mathrm{g3}))+by(x)+y^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 0.0175083 (sec), leaf count = 0

```
DSolve[b*y[x] - 3*(a + 2*WeierstrassP[x, {g2, g3}])*Derivative[1][y][x] + Derivative[3][y][x] == 0,y
```

, could not solve

DSolve[b*y[x] - 3*(a + 2*WeierstrassP[x, {g2, g3}])*Derivative[1][y][x] + Derivative[3][y][x

✗ **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

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^3}{dx^3}\_Y(x)+(-6\,\mathrm{WeierstrassP}\,(x,\mathrm{g2},\mathrm{g3})-3a)\left(\frac{d}{dx}\_Y(x)\right)+b\_Y(x)\right\},\{\_Y(x)\}\right)$$

2.1458 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 = 0.0116597 (sec), leaf count = 0

```
DSolve[((-a + (1 - n^2)*WeierstrassPPrime[x, {g2, g3}])*y[x])/2 + (1 - n^2)*WeierstrassP[x, {g2, g3}]
```

, could not solve

DSolve[((-a + (1 - n^2)*WeierstrassPPrime[x, {g2, g3}])*y[x])/2 + (1 - n^2)*WeierstrassP[x,

✗ **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

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^3}{dx^3}\_Y(x)+\left(-n^2\,\mathrm{WeierstrassP}\,(x,\mathrm{g2},\mathrm{g3})+\mathrm{WeierstrassP}\,(x,\mathrm{g2},\mathrm{g3})\right)\left(\frac{d}{dx}\_Y(x)\right)+\left(-\frac{\mathrm{Wei}}{}\right.\right.\right.$$

2.1459 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 = 0.0119658 (sec), leaf count = 0

```
DSolve[-2*n*(1 + n)*WeierstrassPPrime[x, {g2, g3}]*y[x] - (a + 4*n*(1 + n)*WeierstrassP[x, {g2, g3}])
```

, could not solve

```
DSolve[-2*n*(1 + n)*WeierstrassPPrime[x, {g2, g3}]*y[x] - (a + 4*n*(1 + n)*WeierstrassP[x, {
```

✗ **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+
```

, result contains DESol or ODESolStruc

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x)+\left(-n^2\,\mathrm{WeierstrassP}\left(x,\mathrm{g2},\mathrm{g3}\right)-n\,\mathrm{WeierstrassP}\left(x,\mathrm{g2},\mathrm{g3}\right)-\frac{a}{4}\right)\_Y(x)\right\},\{\_Y(x)$$

2.1460 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 = 0.0087203 (sec), leaf count = 0

```
DSolve[B*WeierstrassPPrime[x, {g2, g3}]*y[x] + (a + A*WeierstrassP[x, {g2, g3}])*Derivative[1][y][x]
```

, could not solve

DSolve[B*WeierstrassPPrime[x, {g2, g3}]*y[x] + (a + A*WeierstrassP[x, {g2, g3}])*Derivative[

✗ **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*WeierstrassPP
```

, result contains DESol or ODESolStruc

$$y(x) = \mathrm{DESol}\left(\left\{\frac{d^3}{dx^3}\_Y(x) + (A\,\mathrm{WeierstrassP}\,(x, \mathrm{g2}, \mathrm{g3}) + a)\left(\frac{d}{dx}\_Y(x)\right) + B\,\mathrm{WeierstrassPPrime}\,(x, \mathrm{g2}, \mathrm{g3})\_\right.\right.$$

2.1461 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 = 0.0174844 (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] - (a + 3*k^
```

, could not solve

```
DSolve[(b - 3*k^2*JacobiCN[z, x]*JacobiDN[z, x]*JacobiSN[z, x] + c*JacobiSN[z, x]^2)*y[x] -
```

✗ **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

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^3}{dx^3}\_Y(x)+\left(-3k^2\,\mathrm{JacobiSN}\,(z,x)^2-a\right)\left(\frac{d}{dx}\_Y(x)\right)+\left(b+c\,\mathrm{JacobiSN}\,(z,x)^2-3k^2\,\mathrm{Jacobi}\right.\right.\right.$$

2.1462 ODE No. 1462

$$-y'(x)\left(a+6k^2\sin^2(x)\right)+by(x)+y^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 0.0304991 (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[x], x

✗ **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

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^3}{dx^3}\_Y(x)+\left(-6k^2\sin(x)^2-a\right)\left(\frac{d}{dx}\_Y(x)\right)+b\_Y(x)\right\},\{\_Y(x)\}\right)$$

2.1463 ODE No. 1463

$$y(x)f'(x) + 2f(x)y'(x) + y^{(3)}(x) = 0$$

✗ **Mathematica** : cpu = 0.0339952 (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],x]
```

, could not solve

```
DSolve[y[x]*Derivative[1][f][x] + 2*f[x]*Derivative[1][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)+2*f(x)*diff(y(x),x)+diff(f(x),x)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x) + \frac{f(x)\_Y(x)}{2}\right\}, \{\_Y(x)\}\right)^2$$

2.1464 ODE No. 1464

$$y^{(3)}(x) - 2y''(x) - 3y'(x) + 10y(x) = 0$$

✓ **Mathematica** : cpu = 0.003627 (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],x]
```

$$\{\{y(x) \to c_3e^{-2x} + c_2e^{2x}\cos(x) + c_1e^{2x}\sin(x)\}\}$$

✓ **Maple** : cpu = 0.005 (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))
```

$$y(x) = \mathrm{e}^{-2x}c_1 + c_2\mathrm{e}^{2x}\sin(x) + c_3\mathrm{e}^{2x}\cos(x)$$

2.1465 ODE No. 1465

$$-a^2y'(x) + 2a^2y(x) + y^{(3)}(x) - 2y''(x) - \sinh(x) = 0$$

✓ **Mathematica** : cpu = 0.0659331 (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][y][x]
```

$$\left\{\left\{y(x) \to \frac{e^{-x}\left(3a^2e^{2x} - a^2 - 3e^{2x} - 12e^x\sinh(x) - 6e^x\cosh(x) + 1\right)}{6(a-2)(a+2)\left(a^2-1\right)} + c_1e^{-ax} + c_3e^{ax} + c_2e^{2x}\right\}\right\}$$

✓ **Maple** : cpu = 0.214 (sec), leaf count = 101

```
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(
```

$$y(x) = \frac{2c_3\left(a^4 - 5a^2 + 4\right)e^{-ax} + 2\left(c_1a^2 + \frac{\sinh(3x)}{6} - 4c_1 - \frac{\cosh(3x)}{6}\right)(a-1)(a+1)e^{2x} + 2c_2\left(a^4 - 5a^2 + 4\right)e^{ax} +}{2a^4 - 10a^2 + 8}$$

2.1466 ODE No. 1466

$$a^3(-y(x)) + 3a^2y'(x) - 3ay''(x) - e^{ax} + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0108607 (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[3][y][x
```

$$\left\{\left\{y(x)\to \frac{1}{6}x^3e^{ax} + c_3x^2e^{ax} + c_2xe^{ax} + c_1e^{ax}\right\}\right\}$$

✓ **Maple** : cpu = 0.013 (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
```

$$y(x) = \frac{e^{ax}\left(x^3 + 6x^2c_3 + 6xc_2 + 6c_1\right)}{6}$$

2.1467 ODE No. 1467

$$\mathrm{a0}y(x) + \mathrm{a1}y'(x) + \mathrm{a2}y''(x) + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0039265 (sec), leaf count = 84

```
DSolve[a0*y[x] + a1*Derivative[1][y][x] + a2*Derivative[2][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1e^{x\mathrm{Root}\left[\#1^3+\#1^2\mathrm{a2}+\#1\mathrm{a1}+\mathrm{a0}\&,1\right]}+c_2e^{x\mathrm{Root}\left[\#1^3+\#1^2\mathrm{a2}+\#1\mathrm{a1}+\mathrm{a0}\&,2\right]}+c_3e^{x\mathrm{Root}\left[\#1^3+\#1^2\mathrm{a2}+\#1\mathrm{a1}+\mathrm{a0}\&,3\right]}\right\}\right.$$

✓ **Maple** : cpu = 0.048 (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))
```

$$y(x) = c_1\mathrm{e}^{-\frac{\left(\left(\frac{i\sqrt{3}}{12}+\frac{1}{12}\right)\left(36\,\mathrm{a1}\,\mathrm{a2}-108\,\mathrm{a0}-8\,\mathrm{a2}^3+12\sqrt{12\,\mathrm{a0}\,\mathrm{a2}^3-3\,\mathrm{a1}^2\,\mathrm{a2}^2-54\,\mathrm{a1}\,\mathrm{a2}\,\mathrm{a0}+12\,\mathrm{a1}^3+81\,\mathrm{a0}^2}\right)^{\frac{2}{3}}+\frac{\mathrm{a2}\left(36\,\mathrm{a1}\,\mathrm{a2}-108\,\mathrm{a0}-8\,\mathrm{a2}^3+12\sqrt{12\,\mathrm{a0}\,\mathrm{a2}^3-\cdots}\right.}{3}}{\left(36\,\mathrm{a1}\,\mathrm{a2}-108\,\mathrm{a0}-8\,\mathrm{a2}^3+12\sqrt{12\,\mathrm{a0}\,\mathrm{a2}^3-3\,\mathrm{a1}^2\,\mathrm{a2}^2-54\,\mathrm{a1}\,\mathrm{a2}\,\mathrm{a0}+12\,\mathrm{a1}^3+81\,\mathrm{a0}^2}\right)}}$$

2.1468 ODE No. 1468

$$2(2a+4x^2-1)\,y'(x)-8axy(x)+y^{(3)}(x)-6xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0391942 (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] + Derivative[
```

$$\left\{\left\{y(x)\to c_2\,\text{HermiteH}\left(\frac{a}{2},x\right)\text{Hypergeometric1F1}\left(-\frac{a}{4},\frac{1}{2},x^2\right)+c_1\,\text{HermiteH}\left(\frac{a}{2},x\right)^2+c_3\,\text{Hypergeometric1F}\right.\right.$$

✓ **Maple** : cpu = 0.112 (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*
```

$$y(x)=x^2\left(\text{KummerM}\left(\frac{1}{2}-\frac{a}{4},\frac{3}{2},x^2\right)^2c_1+\text{KummerM}\left(\frac{1}{2}-\frac{a}{4},\frac{3}{2},x^2\right)\text{KummerU}\left(\frac{1}{2}-\frac{a}{4},\frac{3}{2},x^2\right)c_3+\text{Kumme}\right.$$

2.1469 ODE No. 1469

$$a^3x^3y(x) + 3a^2x^2y'(x) + 3axy''(x) + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0110937 (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[3][y][x
```

$$\left\{\left\{y(x)\to c_1e^{-\frac{ax^2}{2}} + c_2e^{-\frac{ax^2}{2}-\sqrt{3}\sqrt{a}x} + c_3e^{\sqrt{3}\sqrt{a}x-\frac{ax^2}{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (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^
```

$$y(x) = \mathrm{e}^{-\frac{a\,x^2}{2}}\left(c_1 + c_2\mathrm{e}^{\sqrt{3}\,\sqrt{a}\,x} + c_3\mathrm{e}^{-\sqrt{3}\,\sqrt{a}\,x}\right)$$

2.1470 ODE No. 1470

$$y^{(3)}(x) - \sin(x)y''(x) - 2\cos(x)y'(x) + y(x)\sin(x) - \log(x) = 0$$

✓ **Mathematica** : cpu = 2.27645 (sec), leaf count = 64

```
DSolve[-Log[x] + Sin[x]*y[x] - 2*Cos[x]*Derivative[1][y][x] - Sin[x]*Derivative[2][y][x] + Derivative
```

$$\left\{\left\{y(x)\to e^{-\cos(x)}\int_1^x \frac{1}{4}e^{\cos(K[1])}\left(2\log(K[1])K[1]^2-3K[1]^2+4c_1K[1]+4c_2\right)dK[1]+c_3e^{-\cos(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.125 (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)*s
```

$$y(x) = \left(c_3 + \int \left(2xc_1 + c_2 - \frac{3x^2}{4} + \frac{x^2\ln(x)}{2}\right)e^{\cos(x)}dx\right)e^{-\cos(x)}$$

2.1471 ODE No. 1471

$$f(x)y''(x) + f(x)y(x) + y^{(3)}(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0633963 (sec), leaf count = 84

```
DSolve[f[x]*y[x] + Derivative[1][y][x] + f[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_3e^{ix}\int_1^x e^{-2iK[3]}\int_1^{K[3]}\exp\left(\int_1^{K[2]}(i-f(K[1]))dK[1]\right)dK[2]dK[3]+c_1e^{ix}+\frac{1}{2}ic_2e^{-ix}\right\}\right\}$$

✓ **Maple** : cpu = 0.109 (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))
```

$$y(x) = \mathrm{e}^{ix}\left(\int \mathrm{e}^{-2ix}\left(\int c_3\mathrm{e}^{\int(-f(x)+i)dx}dx + c_2\right)dx + c_1\right)$$

2.1472 ODE No. 1472

$$f(x)\left(x^2y''(x)-2xy'(x)+2y(x)\right)+y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.0709245 (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] == 0,y
```

$$\left\{\left\{y(x)\to c_3x\left(\int_1^x\frac{\exp\left(-\int_1^{K[2]}f(K[1])K[1]^2dK[1]\right)}{K[2]^2}dK[2]-x\int_1^x\frac{\exp\left(-\int_1^{K[3]}f(K[1])K[1]^2dK[1]\right)}{K[3]^3}dK[3]\right)\right.\right.$$

✓ **Maple** : cpu = 0.141 (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))=
```

$$y(x)=\left(\int\left(c_1+c_2\left(\int\mathrm{e}^{-\left(\int\left(x^2f(x)+\frac{3}{x}\right)dx\right)}dx\right)\right)dx+c_3\right)x$$

2.1473 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 = 0.0089102 (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][y][x] +
```

, could not solve

```
DSolve[y[x]*(f[x]*g[x] + Derivative[1][g][x]) + g[x]*Derivative[1][y][x] + f[x]*Derivative[2
```

✗ **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)+d
```

, result contains DESol or ODESolStruc

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^3}{dx^3}\_Y(x)+f(x)\left(\frac{d^2}{dx^2}\_Y(x)\right)+g(x)\left(\frac{d}{dx}\_Y(x)\right)+\left(f(x)\,g(x)+\frac{d}{dx}g(x)\right)\_Y(x)\right\},\{\_Y($$

2.1474 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 = 0.0140824 (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])*Derivat
```

, 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][f][x]

✗ **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

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^2}{dx^2}\_Y(x)+f(x)\left(\frac{d}{dx}\_Y(x)\right)+g(x)\_Y(x)\right\},\{\_Y(x)\}\right)^2$$

2.1475 ODE No. 1475

$$4y^{(3)}(x) - 8y''(x) - 11y'(x) - 3y(x) + 18e^x = 0$$

✓ **Mathematica** : cpu = 0.0055869 (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][x] == 0,
```

$$\left\{\left\{y(x)\to e^x + c_1e^{-x/2} + c_2e^{-x/2}x + c_3e^{3x}\right\}\right\}$$

✓ **Maple** : cpu = 0.012 (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
```

$$y(x) = (xc_3 + c_2)\,\mathrm{e}^{-\frac{x}{2}} + c_1\mathrm{e}^{3x} + \mathrm{e}^{x}$$

2.1476 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 = 0.0603536 (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}]*Derivati
```

, could not solve

```
DSolve[-2*n*(3 + n)*(-3 + 4*n)*y[x]*Derivative[1][phi][x] - 36*n^2*WeierstrassP[x, {g2, g3}]
```

✗ **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)*(
```

, result contains DESol or ODESolStruc

$$y(x)=\mathrm{DESol}\left(\left\{27\frac{d^3}{dx^3}\_Y(x)-36n^2\,\mathrm{WeierstrassP}\left(x,\mathrm{g2},\mathrm{g3}\right)\left(\frac{d}{dx}\_Y(x)\right)+\left(-8\,\mathrm{WeierstrassPPrime}\left(x,\mathrm{g2},\mathrm{g3}\right)\right.\right.\right.$$

2.1477 ODE No. 1477

$$xy^{(3)}(x) + 3y''(x) + xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0913171 (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 = 0.017 (sec), leaf count = 39

```
dsolve(x*diff(diff(diff(y(x),x),x),x)+3*diff(diff(y(x),x),x)+x*y(x)=0,y(x))
```

$$y(x) = \frac{e^{-x} c_1 + e^{\frac{x}{2}} \left(\sin\left(\frac{\sqrt{3}\,x}{2}\right) c_2 + c_3 \cos\left(\frac{\sqrt{3}\,x}{2}\right)\right)}{x}$$

2.1478 ODE No. 1478

$$-ax^2y(x)+xy^{(3)}(x)+3y''(x)=0$$

✓ **Mathematica** : cpu = 0.0181032 (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 = 0.062 (sec), leaf count = 48

```
dsolve(x*diff(diff(diff(y(x),x),x),x)+3*diff(diff(y(x),x),x)-y(x)*a*x^2=0,y(x))
```

$$y(x)=c_1\,\mathrm{hypergeom}\left([\,],\left[\frac{3}{4},\frac{5}{4}\right],\frac{a\,x^4}{64}\right)+\frac{c_2\,\mathrm{hypergeom}\left([\,],\left[\frac{1}{2},\frac{3}{4}\right],\frac{a\,x^4}{64}\right)}{x}+c_3x\,\mathrm{hypergeom}\left([\,],\left[\frac{5}{4},\frac{3}{2}\right],\frac{a\,x^4}{64}\right)$$

2.1479 ODE No. 1479

$$(a+b)y''(x) - ay(x) + xy^{(3)}(x) - xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0757729 (sec), leaf count = 153

```
DSolve[-(a*y[x]) - x*Derivative[1][y][x] + (a + b)*Derivative[2][y][x] + x*Derivative[3][y][x] == 0,y
```

$$\left\{\left\{y(x) \to \frac{1}{2}ic_2x\,{}_1F_2\left(\frac{a}{2}+\frac{1}{2};\frac{3}{2},\frac{a}{2}+\frac{b}{2}+\frac{1}{2};\frac{x^2}{4}\right)+c_1\,{}_1F_2\left(\frac{a}{2};\frac{1}{2},\frac{a}{2}+\frac{b}{2};\frac{x^2}{4}\right)+c_3\left(\frac{i}{2}\right)^{-a-b+2}x^{-a-b+2}\,{}_1F_2\left(1-\right.\right.\right.$$

✓ **Maple** : cpu = 0.126 (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
```

$$y(x) = c_1 \operatorname{hypergeom}\left(\left[\frac{a}{2}\right],\left[\frac{1}{2},\frac{a}{2}+\frac{b}{2}\right],\frac{x^2}{4}\right)+c_2x \operatorname{hypergeom}\left(\left[\frac{1}{2}+\frac{a}{2}\right],\left[\frac{3}{2},\frac{a}{2}+\frac{b}{2}+\frac{1}{2}\right],\frac{x^2}{4}\right)+c_3x^{-a-b+2}\operatorname{hyp}$$

2.1480 ODE No. 1480

$$-(2v+x)y''(x)-(-2v+x-1)y'(x)+xy^{(3)}(x)+(x-1)y(x)=0$$

✓ **Mathematica** : cpu = 0.125634 (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*Derivat
```

$$\left\{\left\{y(x)\to \frac{c_3e^xx^{2v+2}\,\text{Gamma}\left(v+\frac{3}{2}\right)\,{}_1\tilde{F}_1\left(v+\frac{3}{2};2v+3;-2x\right)}{\text{Gamma}\left(\frac{1}{2}-v\right)}+c_22^{-2v-2}e^xG_{2,3}^{2,1}\left(2x\middle|\begin{array}{c}1,v+\frac{3}{2}\\1,2(v+1),0\end{array}\right)+c_1e^x\right\}\right.$$

✓ **Maple** : cpu = 0.13 (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
```

$$y(x)=\mathrm{e}^xc_1+c_2x^{v+1}\,\text{BesselI}\left(-v-1,x\right)+c_3x^{v+1}\,\text{BesselK}\left(v+1,x\right)$$

2.1481 ODE No. 1481

$$-f(x) + (x^2 - 3)\, y''(x) + xy^{(3)}(x) + 4xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.318741 (sec), leaf count = 432

```
DSolve[-f[x] + 2*y[x] + 4*x*Derivative[1][y][x] + (-3 + x^2)*Derivative[2][y][x] + x*Derivative[3][y]
```

$$\left\{\left\{y(x) \to -\frac{1}{240} e^{-\frac{x^2}{2}} \left(-240x^5 \int_1^x \left(-\frac{1}{240}\left(15\,\text{ExpIntegralEi}\left(\frac{K[1]^2}{2}\right) + 16e^{\frac{K[1]^2}{2}}\right) f(K[1]) + \frac{1}{15}\sqrt{\frac{\pi}{2}}\text{erfi}\left(\frac{K[\right.\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.099 (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
```

$$y(x) = \left(c_3 + \int \frac{\left(2xc_1 + c_2 - \left(\int \int -f(x)\, dx dx\right)\right) \mathrm{e}^{\frac{x^2}{2}}}{x^6} dx\right) \mathrm{e}^{-\frac{x^2}{2}} x^5$$

2.1482 ODE No. 1482

$$a x y(x) - b + 2 x y^{(3)}(x) + 3 y''(x) = 0$$

✓ **Mathematica** : cpu = 14.0656 (sec), leaf count = 3626

```
DSolve[-b + a*x*y[x] + 3*Derivative[2][y][x] + 2*x*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_1\, {}_0F_2\left(;\frac{2}{3},\frac{5}{6};-\frac{a x^3}{54}\right) + \int_1^x \frac{}{-10192 a^3\, {}_0F_2\left(;\frac{7}{6},\frac{4}{3};-\frac{1}{54} a K[1]^3\right) {}_0F_2\left(;\frac{11}{6},\frac{13}{6};-\frac{1}{54} a K[1]^3\right) {}_0F_2\left(;\frac{8}{3},\frac{17}{6};\right.}\right.\right.$$

✓ **Maple** : cpu = 0.452 (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

2.1483 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 = 0.0821858 (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][y][x]
```

$$\left\{\left\{y(x)\to \frac{c_3e^x x\,\text{Gamma}\left(\frac{5}{2}-3\nu\right)\left(\frac{2\,{}_1\tilde{F}_1\left(\frac{3}{2}-3\nu;1-2\nu;-x\right)}{3(2\nu-1)x}+\frac{2}{3x\,\text{Gamma}(2-2\nu)}\right)}{\text{Gamma}\left(\frac{3}{2}-\nu\right)}+c_2e^xG_{2,3}^{2,1}\left(x\left|\begin{array}{c}1,3\nu-\frac{1}{2}\\1,2\nu,0\end{array}\right.\right)+c_1e^x\right\}\right\}$$

✓ **Maple** : cpu = 0.146 (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(
```

$$y(x)=\mathrm{e}^x c_1+c_2\mathrm{e}^{\frac{x}{2}}x^\nu\,\text{BesselI}\left(\nu,\frac{x}{2}\right)+c_3\mathrm{e}^{\frac{x}{2}}x^\nu\,\text{BesselK}\left(\nu,\frac{x}{2}\right)$$

2.1484 ODE No. 1484

$$6y'(x)(ak+bx)+3(2ax+k)y''(x)+y(x)(3bk+2cx)+2xy^{(3)}(x)=0$$

✗ **Mathematica** : cpu = 61.2105 (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][y][x] +
```

, 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(
```

, result contains DESol or ODESolStruc

$$y(x)=\mathrm{DESol}\left(\left\{(3bk+2cx)\_Y(x)+(6ak+6bx)\left(\frac{d}{dx}\_Y(x)\right)+(6ax+3k)\left(\frac{d^2}{dx^2}\_Y(x)\right)+2x\left(\frac{d^3}{dx^3}\_Y(x)\right)\right.\right.$$

2.1485 ODE No. 1485

$$(x-2)xy^{(3)}(x)-(x-2)xy''(x)-2y'(x)+2y(x)=0$$

✓ **Mathematica** : cpu = 0.191073 (sec), leaf count = 64

```
DSolve[2*y[x] - 2*Derivative[1][y][x] - (-2 + x)*x*Derivative[2][y][x] + (-2 + x)*x*Derivative[3][y][
```

$$\left\{\left\{y(x)\to \frac{1}{4}c_3x^2\left(-\frac{4e^{x-2}\,\text{ExpIntegralEi}(2-x)}{x^2}+\frac{2}{x^2}+\frac{2}{x}+\log(2-x)-\log(x)\right)+c_1x^2+c_2e^x\right\}\right\}$$

✓ **Maple** : cpu = 0.18 (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(
```

$$y(x)=c_3\,\text{expIntegral}_1\,(x-2)\,e^{x-2}+\frac{c_3x^2\ln(x-2)}{4}+c_2e^x-\frac{c_3x^2\ln(x)}{4}+\frac{(2x+2)\,c_3}{4}+x^2c_1$$

2.1486 ODE No. 1486

$$(2x-1)y^{(3)}(x)-8xy'(x)+8y(x)=0$$

✓ **Mathematica** : cpu = 0.365815 (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]
```

$$\left\{\left\{y(x)\to \frac{1}{4}c_3x\left(\frac{e^{2x-2}\,\text{ExpIntegralEi}(2-4x)}{x}-\frac{2\,\text{ExpIntegralEi}(1-2x)}{e}-\frac{e^{-2x}}{x}\right)+c_1x-c_2e^{2x}\right\}\right\}$$

✓ **Maple** : cpu = 0.139 (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))
```

$$y(x)=xc_1+c_2\mathrm{e}^{2x}-\frac{c_3\left(2x\,\mathrm{e}^{-1}\,\mathrm{expIntegral}_1\left(2x-1\right)-\mathrm{expIntegral}_1\left(4x-2\right)\mathrm{e}^{2x-2}-\mathrm{e}^{-2x}\right)}{4}$$

2.1487 ODE No. 1487

$$(2x-1)y^{(3)}(x)+(x+4)y''(x)+2y'(x)=0$$

✓ **Mathematica** : cpu = 0.683556 (sec), leaf count = 87

```
DSolve[2*Derivative[1][y][x] + (4 + x)*Derivative[2][y][x] + (-1 + 2*x)*Derivative[3][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\to \int_1^x \left(\frac{e^{-\frac{K[1]}{2}}c_1\left(1+\frac{1}{4\left(\frac{K[1]}{2}-\frac{1}{4}\right)}\right)}{\sqrt[4]{\frac{K[1]}{2}-\frac{1}{4}}}+e^{-\frac{K[1]}{2}}c_2L_{-\frac{1}{4}}^{\frac{5}{4}}\left(\frac{K[1]}{2}-\frac{1}{4}\right)\right)dK[1]+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.234 (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)
```

$$y(x)=\frac{\left(c_3+\int \frac{(2xc_1+c_2)\mathrm{e}^{\frac{x}{2}}}{(2x-1)^{\frac{3}{4}}}dx\right)\mathrm{e}^{-\frac{x}{2}}}{(2x-1)^{\frac{1}{4}}}$$

2.1488 ODE No. 1488

$$a x^2 y(x) + x^2 y^{(3)}(x) - 6 y'(x) = 0$$

✓ **Mathematica** : cpu = 0.279642 (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]
```

$$\left\{\left\{y(x)\to \frac{c_1 e^{-\sqrt[3]{a} x}\left(\sqrt[3]{a} x+2\right)}{x}+\frac{c_2 e^{\sqrt[3]{-1}\sqrt[3]{a} x}\left(\sqrt[3]{a} x+2(-1)^{2/3}\right)}{x}+\frac{c_3 e^{-(-1)^{2/3}\sqrt[3]{a} x}\left(\sqrt[3]{a} x-2\sqrt[3]{-1}\right)}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.526 (sec), leaf count = 135

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-6*diff(y(x),x)+y(x)*a*x^2=0,y(x))
```

$$y(x) = \frac{-c_3\left(\left(-i-\sqrt{3}\right)\left(-a^4\right)^{\frac{2}{3}}+i a^3 x\right) \mathrm{e}^{\frac{i\left(i-\sqrt{3}\right)\left(-a^4\right)^{\frac{1}{3}} x}{2a}} - c_2\left(\left(-i+\sqrt{3}\right)\left(-a^4\right)^{\frac{2}{3}}+i a^3 x\right) \mathrm{e}^{\frac{i\left(-a^4\right)^{\frac{1}{3}} x\left(\sqrt{3}+i\right)}{2a}} + \mathrm{e}^{\frac{\left(-a^4\right.}{a}}}{x}$$

2.1489 ODE No. 1489

$$x^2 y^{(3)}(x) + (x+1)y''(x) - y(x) = 0$$

✗ **Mathematica** : cpu = 0.387353 (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

$$y(x) = \mathrm{DESol}\left(\left\{-\_Y(x) + (1+x)\left(\frac{d^2}{dx^2}\_Y(x)\right) + x^2\left(\frac{d^3}{dx^3}\_Y(x)\right)\right\}, \{\_Y(x)\}\right)$$

2.1490 ODE No. 1490

$$x^2y^{(3)}(x) + \left(x^2+1\right)y'(x) - xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0188929 (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[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{2}c_1x^2\,\text{Hypergeometric0F1Regularized}\left(2,-\frac{x^2}{4}\right)+c_2x\,\text{BesselY}(1,x)+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.037 (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))
```

$$y(x) = c_1 + c_2x\,\text{BesselJ}\left(1,x\right) + c_3x\,\text{BesselY}\left(1,x\right)$$

2.1491 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 = 0.0215911 (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*Derivativ
```

$$\left\{\left\{y(x)\to c_2\left(x^{2a}\right)^{-\nu}\ {}_1F_2\left(-\nu-\frac{1}{2};1-2\nu,1-\nu;-x^{2a}\right)+c_3\left(x^{2a}\right)^{\nu}\ {}_1F_2\left(\nu-\frac{1}{2};\nu+1,2\nu+1;-x^{2a}\right)+c_1\,{}_1F_2\right(\right.\right.$$

✓ **Maple** : cpu = 0.079 (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
```

$$y(x)=c_1\,\mathrm{hypergeom}\left(\left[-\frac{1}{2}\right],[\nu+1,-\nu+1],-x^{2a}\right)+c_2x^{-2a\nu}\,\mathrm{hypergeom}\left(\left[-\frac{1}{2}-\nu\right],[1-2\nu,-\nu+1],-x^{2a}\right)$$

2.1492 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 = 0.184582 (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] - 3*x*(-
```

$$\left\{\left\{y(x)\to c_2\,\text{HypergeometricU}(-n,m,x)L_n^{m-1}(x)+c_1\,\text{HypergeometricU}(-n,m,x)^2+c_3L_n^{m-1}(x)^2\right\}\right\}$$

✓ **Maple** : cpu = 0.106 (sec), leaf count = 39

```
dsolve(x^2*diff(diff(diff(y(x),x),x),x)-3*(x-m)*x*diff(diff(y(x),x),x)+(2*x^2+4*(n-m)*x+m*(2
```

$$y(x)=c_1\,\text{KummerM}\left(-n,m,x\right)^2+c_2\,\text{KummerU}\left(-n,m,x\right)^2+c_3\,\text{KummerM}\left(-n,m,x\right)\text{KummerU}\left(-n,m,x\right)$$

2.1493 ODE No. 1493

$$-f(x)+x^2y^{(3)}(x)+\left(x^2+2\right)y'(x)+4xy''(x)+3xy(x)=0$$

✓ **Mathematica** : cpu = 1.07985 (sec), leaf count = 479

```
DSolve[-f[x] + 3*x*y[x] + (2 + x^2)*Derivative[1][y][x] + 4*x*Derivative[2][y][x] + x^2*Derivative[3]
```

$$\left\{\left\{y(x)\to \frac{2\,{}_1F_2\left(1;\frac{1}{2},\frac{1}{2};-\frac{x^2}{4}\right)\int_1^x \frac{9\pi(\text{BesselJ}(1,K[3])\,\text{BesselY}(0,K[3])-\text{BesselJ}(0,K[3])\,\text{BesselY}(1,K[3]))f(K[3])K[3]^2}{2\left(16\,{}_1F_2\left(3;\frac{5}{2},\frac{5}{2};-\frac{1}{4}K[3]^2\right)K[3]^4-9\pi\boldsymbol{H}_0(K[3])K[3]^3+18K[3]^2-9\pi\boldsymbol{H}_0(K[3])K[3]+18\right)}dK[3]+x\right.\right.$$

✓ **Maple** : cpu = 0.371 (sec), leaf count = 1032

```
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(
```

Expression too large to display

2.1494 ODE No. 1494

$$x^2 y^{(3)}(x) + 5xy''(x) + 4y'(x) - \log(x) = 0$$

✓ **Mathematica** : cpu = 0.0179256 (sec), leaf count = 43

```
DSolve[-Log[x] + 4*Derivative[1][y][x] + 5*x*Derivative[2][y][x] + x^2*Derivative[3][y][x] == 0,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 = 0.024 (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)
```

$$y(x) = \frac{(x^2 + 4c_2)\ln(x) - 2x^2 + 4xc_1 + 4c_3}{4x}$$

2.1495 ODE No. 1495

$$x^2y^{(3)}(x) + 6xy''(x) + 6y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0055193 (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 = 0.007 (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))
```

$$y(x) = c_1 + \frac{c_2}{x^2} + \frac{c_3}{x}$$

2.1496 ODE No. 1496

$$ax^2y(x) + x^2y^{(3)}(x) + 6xy''(x) + 6y'(x) = 0$$

✓ **Mathematica** : cpu = 0.138353 (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] == 0,y
```

$$\left\{\left\{y(x)\to \frac{c_1e^{-\sqrt[3]{a}x}}{x^2}+\frac{c_2e^{\sqrt[3]{-1}\sqrt[3]{a}x}}{x^2}+\frac{c_3e^{-(-1)^{2/3}\sqrt[3]{a}x}}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.017 (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)+y(x)*a*x^2=0
```

$$y(x)=\frac{c_1\mathrm{e}^{\frac{(-a)^{\frac{1}{3}}\left(i\sqrt{3}-1\right)x}{2}}+c_2\mathrm{e}^{-\frac{(-a)^{\frac{1}{3}}\left(1+i\sqrt{3}\right)x}{2}}+c_3\mathrm{e}^{(-a)^{\frac{1}{3}}x}}{x^2}$$

2.1497 ODE No. 1497

$$-3x(p+q)y''(x)+3p(3q+1)y'(x)+x^2y^{(3)}(x)+x^2(-y(x))=0$$

✓ **Mathematica** : cpu = 0.254748 (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^2*Deriva
```

$$\left\{\left\{y(x)\to c_1\,{}_0F_2\left(;\frac{2}{3}-p,\frac{1}{3}-q;\frac{x^3}{27}\right)+c_2(-1)^{\frac{1}{3}(3p+1)}3^{-3p-1}x^{3p+1}\,{}_0F_2\left(;p+\frac{4}{3},p-q+\frac{2}{3};\frac{x^3}{27}\right)+c_3(-1)^{\frac{1}{3}(3q+2)}\right.\right.$$

✓ **Maple** : cpu = 0.145 (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)
```

$$y(x)=c_1\,\mathrm{hypergeom}\left([\,],\left[-q+\frac{1}{3},-p+\frac{2}{3}\right],\frac{x^3}{27}\right)+c_2x^{3p+1}\,\mathrm{hypergeom}\left([\,],\left[p+\frac{4}{3},\frac{2}{3}-q+p\right],\frac{x^3}{27}\right)+c_3x^{3q+2}\,\mathrm{hy}$$

2.1498 ODE No. 1498

$$\left(ax^2+6n\right)y'(x)-2axy(x)-2(n+1)xy''(x)+x^2y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 6.02767 (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^2*Deriva
```

$$\left\{\left\{y(x)\to -\frac{\pi c_3 2^{-n-\frac{3}{2}}x\left(\sqrt{a}x\right)^{-n-\frac{1}{2}}\left(-a^{3/2}2^{2n}x^3\sec(\pi n)\,\text{Gamma}\left(\frac{3}{2}-n\right)\text{Gamma}\left(n+\frac{3}{2}\right)\text{BesselJ}\left(\frac{1}{2}(2n+1),\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.138 (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)
```

$$y(x)=c_1x^{n+\frac{1}{2}}\,\text{BesselJ}\left(-n-\frac{1}{2},\sqrt{a}\,x\right)+c_2x^{n+\frac{1}{2}}\,\text{BesselY}\left(-n-\frac{1}{2},\sqrt{a}\,x\right)+c_3\left(a\,x^2+4n-2\right)$$

2.1499 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 = 0.139418 (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)*Deriva
```

$$\left\{\left\{y(x)\to\frac{c_3e^xx^{\nu+\frac{1}{2}}\,\text{Gamma}\left(\nu+\frac{1}{2}\right)\,{}_1\tilde{F}_1\left(\nu+\frac{1}{2};2\nu+1;-2x\right)}{\text{Gamma}\left(\frac{3}{2}-\nu\right)}+c_22^{-\nu-\frac{1}{2}}e^xG_{2,3}^{2,1}\left(2x\middle|\begin{array}{c}1,0\\ \frac{1}{2}-\nu,\nu+\frac{1}{2},0\end{array}\right)+c_1e^x\right.\right.$$

✓ **Maple** : cpu = 0.13 (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
```

$$y(x)=e^xc_1+c_2\sqrt{x}\,\text{BesselI}\left(\nu,x\right)+c_3\sqrt{x}\,\text{BesselK}\left(\nu,x\right)$$

2.1500 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 = 20.5347 (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] + x^2*De
```

, DifferentialRoot result

$$\{\{y(x) \to (x)\}\}$$

✓ **Maple** : cpu = 0.124 (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
```

$$y(x) = e^x c_1 + c_2 x^{\frac{\nu}{2}+\frac{1}{2}} \operatorname{BesselJ}\left(-\nu-1, 2\sqrt{\nu}\,\sqrt{x}\right) + c_3 x^{\frac{\nu}{2}+\frac{1}{2}} \operatorname{BesselY}\left(-\nu-1, 2\sqrt{\nu}\,\sqrt{x}\right)$$

2.1501 ODE No. 1501

$$\left(-\nu^2+x^2-2x+\frac{1}{4}\right)y'(x)+\left(\nu^2-\frac{1}{4}\right)y(x)+x^2y^{(3)}(x)-2(x^2-x)\,y''(x)=0$$

✓ **Mathematica** : cpu = 0.116629 (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)*Derivative[2]
```

$$\left\{\left\{y(x)\to\frac{c_3e^xx^{\nu+\frac{1}{2}}\,\mathrm{Gamma}\left(\nu+\frac{1}{2}\right)\,{}_1\tilde{F}_1\left(\nu+\frac{1}{2};2\nu+1;-x\right)}{\mathrm{Gamma}\left(\frac{3}{2}-\nu\right)}+c_2e^xG_{2,3}^{2,1}\left(x\middle|\begin{array}{c}1,0\\\frac{1}{2}-\nu,\nu+\frac{1}{2},0\end{array}\right)+c_1e^x\right\}\right\}$$

✓ **Maple** : cpu = 0.118 (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)*di
```

$$y(x)=\mathrm{e}^xc_1+c_2\mathrm{e}^{\frac{x}{2}}\sqrt{x}\,\mathrm{BesselI}\left(\nu,\frac{x}{2}\right)+c_3\mathrm{e}^{\frac{x}{2}}\sqrt{x}\,\mathrm{BesselK}\left(\nu,\frac{x}{2}\right)$$

2.1502 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 = 0.0727419 (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*Derivat
```

$$\left\{\left\{y(x)\to\frac{c_2\,\text{Gamma}\left(\frac{1}{3}\right)\,{}_2F_2\left(-\frac{2}{3},\frac{1}{3};\frac{2}{3},\frac{4}{3};\frac{x^3}{3}\right)}{3x\,\text{Gamma}\left(\frac{4}{3}\right)}+\frac{\sqrt[3]{-\frac{1}{3}}c_3\,\text{Gamma}\left(\frac{2}{3}\right)\,{}_2F_2\left(-\frac{1}{3},\frac{2}{3};\frac{4}{3},\frac{5}{3};\frac{x^3}{3}\right)}{3\,\text{Gamma}\left(\frac{5}{3}\right)}+\frac{c_1}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.365 (sec), leaf count = 103

```
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
```

$$y(x)=\frac{c_2\left(\int e^{\frac{x^3}{6}}\sqrt{x}\left(\text{BesselI}\left(\frac{1}{6},-\frac{x^3}{6}\right)x^3+\text{BesselI}\left(-\frac{5}{6},-\frac{x^3}{6}\right)x^3-2\,\text{BesselI}\left(\frac{1}{6},-\frac{x^3}{6}\right)\right)dx\right)+c_3\left(\int e^{\frac{x^3}{6}}\sqrt{x}\left(\text{Be}\right.\right.}{x^2}$$

2.1503 ODE No. 1503

$$\left(x^2+1\right)y^{(3)}(x)+\frac{1}{x^2}+8xy''(x)+10y'(x)-2\log(x)-3=0$$

✓ **Mathematica** : cpu = 0.324347 (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)*Derivati
```

$$\left\{\left\{y(x)\to\frac{1}{225}\left(-3(17+75c_2)\arctan(x)-\frac{51x}{x^2+1}-\frac{34x}{\left(x^2+1\right)^2}-\frac{225c_2x}{x^2+1}-\frac{150c_2x}{\left(x^2+1\right)^2}-\frac{225c_1}{4\left(x^2+1\right)^2}-9x+\frac{47}{x-}\right.\right.\right.$$

✓ **Maple** : cpu = 0.028 (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
```

$$y(x)=\frac{\left(45x^5+150x^3+225x\right)\ln(x)-9x^5+225c_1x^4+\left(225c_2-50\right)x^3+450x^2c_1+\left(675c_2-225\right)x+225c_3}{225\left(x^2+1\right)^2}$$

2.1504 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 = 0.181247 (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)*Derivative[3][
```

$$\left\{\left\{y(x)\to \frac{c_1x^2}{2}+\frac{1}{2}ic_2e^{-ix}-\frac{1}{4}c_3e^{ix}\right\}\right\}$$

✓ **Maple** : cpu = 0.101 (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*
```

$$y(x)=x^2c_1+c_2\cos(x)+c_3\sin(x)$$

2.1505 ODE No. 1505

$$(2ax+b)y'(x)+ay(x)+2(x-1)xy^{(3)}(x)+3(2x-1)y''(x)=0$$

✓ **Mathematica** : cpu = 60.2363 (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 + x)*x*Der
```

$$\left\{\left\{y(x)\to c_3\text{MathieuC}\left[-\frac{a}{2}-\frac{b}{2}+1,\frac{a}{4},\arccos\left(\sqrt{x}\right)\right]\text{MathieuS}\left[-\frac{a}{2}-\frac{b}{2}+1,\frac{a}{4},\arccos\left(\sqrt{x}\right)\right]+c_1\text{MathieuC}\left[-\right.\right.\right.$$

✓ **Maple** : cpu = 0.264 (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(
```

$$y(x)=c_1\,\text{MathieuC}\left(-\frac{a}{2}-\frac{b}{2}+1,\frac{a}{4},\arccos\left(\sqrt{x}\right)\right)^2+c_2\,\text{MathieuS}\left(-\frac{a}{2}-\frac{b}{2}+1,\frac{a}{4},\arccos\left(\sqrt{x}\right)\right)^2+c_3\,\text{Mathieu}$$

2.1506 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 = 0.235747 (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*Derivat
```

$$\left\{\left\{y(x) \to c_2 e^{\frac{1}{4}\left(-x-\frac{1}{x}+2\log(x)\right)} \int_1^x e^{\frac{K[1]^2-10\log(K[1])K[1]+1}{4K[1]}} dK[1] - \sqrt{\pi}c_3\left(e\text{erfi}\left(\frac{1-x}{2\sqrt{x}}\right) + \text{erfi}\left(\frac{x+1}{2\sqrt{x}}\right) - i(e-1)\right)\right.\right.$$

✓ **Maple** : cpu = 0.303 (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
```

$$y(x) = \left(c_3 + \int \frac{(2xc_1 + c_2)\,\mathrm{e}^{\frac{x}{4}}\,\mathrm{e}^{\frac{1}{4x}}}{4x^{\frac{5}{2}}}dx\right)\mathrm{e}^{-\frac{x}{4}}\,\mathrm{e}^{-\frac{1}{4x}}\sqrt{x}$$

2.1507 ODE No. 1507

$$xy^{(3)}(x)(ax+b)+(\alpha x+\beta)y''(x)-f(x)+xy'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 2.67415 (sec), leaf count = 56731

```
DSolve[-f[x] + y[x] + x*Derivative[1][y][x] + (beta + alpha*x)*Derivative[2][y][x] + x*(b + a*x)*Deri
```

Too large to display

✓ **Maple** : cpu = 0.783 (sec), leaf count = 1213

```
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
```

Expression too large to display

2.1508 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 = 0.421202 (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] == 0,y[x
```

$$\left\{\left\{y(x)\to c_2 3^{\nu-1}a^{\frac{1-\nu}{3}}x^{1-\nu}\,{}_0F_2\left(;1-\frac{2\nu}{3},1-\frac{\nu}{3};-\frac{ax^3}{27}\right)+c_3 3^{-\nu-1}a^{\frac{\nu+1}{3}}x^{\nu+1}\,{}_0F_2\left(;\frac{\nu}{3}+1,\frac{2\nu}{3}+1;-\frac{ax^3}{27}\right)+\frac{1}{3}\sqrt[3]{\right.$$

✓ **Maple** : cpu = 0.087 (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))
```

$$y(x)=c_1x\,\mathrm{hypergeom}\left([\,],\left[1+\frac{\nu}{3},-\frac{\nu}{3}+1\right],-\frac{a\,x^3}{27}\right)+c_2x^{-\nu+1}\,\mathrm{hypergeom}\left([\,],\left[1-\frac{2\nu}{3},-\frac{\nu}{3}+1\right],-\frac{a\,x^3}{27}\right)+c_3x$$

2.1509 ODE No. 1509

$$((1-4\nu^2)\,x+4x^3)\,y'(x)+(4\nu^2-1)\,y(x)+x^3y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.005751 (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][y][x] ==
```

$$\{\{y(x)\to c_1x\,\text{BesselJ}(\nu,x)^2+c_3x\,\text{BesselY}(\nu,x)^2+c_2x\,\text{BesselJ}(\nu,x)\,\text{BesselY}(\nu,x)\}\}$$

✓ **Maple** : cpu = 0.039 (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
```

$$y(x)=x\Big(\text{BesselY}\,(\nu,x)^2\,c_2+\text{BesselY}\,(\nu,x)\,\text{BesselJ}\,(\nu,x)\,c_3+\text{BesselJ}\,(\nu,x)^2\,c_1\Big)$$

2.1510 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 = 0.0222593 (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))*Derivative[1]
```

$$\left\{\left\{y(x)\to c_1x^{1-\nu}e^{\frac{x^\nu\text{Root}\left[\#1^3+\#1a+b\&,1\right]}{\nu}}+c_2x^{1-\nu}e^{\frac{x^\nu\text{Root}\left[\#1^3+\#1a+b\&,2\right]}{\nu}}+c_3x^{1-\nu}e^{\frac{x^\nu\text{Root}\left[\#1^3+\#1a+b\&,3\right]}{\nu}}\right\}\right\}$$

✗ **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

$$y(x)=\text{DESol}\left(\left\{x^3\left(\frac{d^3}{dx^3}\_Y(x)\right)+\left(x^{2\nu}ax-\nu^2x+x\right)\left(\frac{d}{dx}\_Y(x)\right)+\left(x^{2\nu}a\nu-a\,x^{2\nu}+b\,x^{3\nu}+\nu^2-1\right)\_Y(x)\right.\right.$$

2.1511 ODE No. 1511

$$x^3y^{(3)}(x) + (x + 8)x^3 - 6(x - 1)x^3 \log(x) + 3x^2y''(x) - 2xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0343359 (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*Derivative[2][y
```

$$\left\{\left\{y(x) \to \frac{c_1}{x^2} + \frac{1}{450}\left(-50x^4 + 50x^4 \log(x) - 18x^3 - 135x^3 \log(x)\right) + c_2x + c_3x \log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.023 (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
```

$$y(x) = \frac{\left(50x^6 - 135x^5 + 450x^3c_3\right)\ln(x) - 50x^6 - 18x^5 + 450x^3c_1 + 450c_2}{450x^2}$$

2.1512 ODE No. 1512

$$\left(1-a^2\right)xy'(x)+x^3y^{(3)}(x)+3x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0254617 (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] == 0,y[x
```

$$\left\{\left\{y(x)\to -\frac{c_1x^{-a}}{a}+\frac{c_2x^a}{a}+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.008 (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
```

$$y(x)=c_1+c_2x^a+c_3x^{-a}$$

2.1513 ODE No. 1513

$$x^3y^{(3)}(x) - 4x^2y''(x) + \left(x^2+8\right)xy'(x) - 2\left(x^2+4\right)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0774254 (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*Derivati
```

$$\left\{\left\{y(x)\to c_1x^2 + c_3x\cos(x) - c_2x\sin(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.099 (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*
```

$$y(x) = x(\cos(x)\,c_3 + \sin(x)\,c_2 + xc_1)$$

2.1514 ODE No. 1514

$$(ax^3 - 12)\,y(x) + x^3 y^{(3)}(x) + 6x^2 y''(x) = 0$$

✓ **Mathematica** : cpu = 0.376542 (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]
```

$$\left\{\left\{y(x)\to \frac{c_1 e^{-\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2\right)}{x^3}+\frac{c_2 e^{\sqrt[3]{-1}\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2(-1)^{2/3}\right)}{x^3}+\frac{c_3 e^{-(-1)^{2/3}\sqrt[3]{a}x}\left(\sqrt[3]{a}x-2\sqrt[3]{-1}\right)}{x^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.405 (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))
```

$$y(x) = \frac{-c_3\left(\left(-i-\sqrt{3}\right)\left(-a^4\right)^{\frac{2}{3}}+ia^3x\right)\mathrm{e}^{\frac{i\left(i-\sqrt{3}\right)\left(-a^4\right)^{\frac{1}{3}}x}{2a}}-c_2\left(\left(-i+\sqrt{3}\right)\left(-a^4\right)^{\frac{2}{3}}+ia^3x\right)\mathrm{e}^{\frac{i\left(-a^4\right)^{\frac{1}{3}}x\left(\sqrt{3}+i\right)}{2a}}+\mathrm{e}^{\frac{\left(-a^4\right.}{a}}}{x^3}$$

2.1515 ODE No. 1515

$y(x)\left(a\left(4c^2\nu^2-a^2\right)+4b^2c^2(c-a)x^{2c}\right)+y'(x)\left(3(a-1)ax+4b^2c^2x^{2c+1}-4c^2\nu^2+1\right)+3(1-a)x^2y''(x)+x^3y^{(3)}(x)$

✗ **Mathematica** : cpu = 0.0992496 (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 + a)*a*x +
```

, 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][x]

✗ **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

2.1516 ODE No. 1516

$$x^3y^{(3)}(x) + (x+3)x^2y''(x) + 5(x-6)xy'(x) + (4x+30)y(x) = 0$$

✓ **Mathematica** : cpu = 261.518 (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] + x^3*Der
```

Too large to display

✓ **Maple** : cpu = 0.24 (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
```

$$y(x) = \frac{c_3 \mathrm{e}^{-x}\left(x^8 + 28x^7 + 450x^6 + 5100x^5 + 42900x^4 + 267120x^3 + 1179360x^2 + 3326400x + 4536000\right) \text{expInteg}}{}$$

2.1517 ODE No. 1517

$$x^3y^{(3)}(x) - 2x^3 + x^2y''(x) + 2xy'(x) - y(x) + \log(x) = 0$$

✓ **Mathematica** : cpu = 0.378475 (sec), leaf count = 601

```
DSolve[-2*x^3 + Log[x] - y[x] + 2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] + x^3*Derivative[3]
```

$$\left\{\left\{y(x) \to \frac{i(\text{Root}[\#1^3 - 2\#1^2 + 3\#1 - 1\&, 1] - \text{Root}[\#1^3 - 2\#1^2 + 3\#1 - 1\&, 2])\left(\frac{2x^3}{3-\text{Root}[\#1^3-2\#1^2+3\#1-1}\right.}{\sqrt{23}}\right.\right.$$

✓ **Maple** : cpu = 0.419 (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)
```

Expression too large to display

2.1518 ODE No. 1518

$$x(x^2+1)\,y^{(3)}(x)+3(2x^2+1)\,y''(x)-12y(x)=0$$

✓ **Mathematica** : cpu = 0.288125 (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[x],x]
```

$$\left\{\left\{y(x)\to -\frac{c_3(2x^2+1)\left(3(x^4+x^2)\operatorname{arctanh}\left(\sqrt{x^2+1}\right)-\sqrt{x^2+1}(3x^2+1)\right)}{6\sqrt{x^2+1}\,(2x^3+x)}+\frac{1}{3}c_1(2x^2+1)+\frac{1}{3}c_2x\sqrt{x^2+1}\right.\right.$$

✓ **Maple** : cpu = 0.217 (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)
```

$$y(x)=\frac{3\sqrt{x^2+1}\,\operatorname{arctanh}\left(\frac{1}{\sqrt{x^2+1}}\right)c_2x^2+\sqrt{x^2+1}\,c_1x^2+2c_3x^3-3c_2x^2+c_3x-c_2}{x}$$

2.1519 ODE No. 1519

$$(x+3)x^2y^{(3)}(x) - 3(x+2)xy''(x) + 6(x+1)y'(x) - 6y(x) = 0$$

✓ **Mathematica** : cpu = 0.0159425 (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)*Deriva
```

$$\left\{\left\{y(x)\to \frac{1}{4}c_1\left(x^3-3x^2+3x+3\right)+\frac{1}{2}c_2\left(-x^3+3x^2-x-1\right)+\frac{1}{8}c_3\left(3x^3-5x^2+x+1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.076 (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(
```

$$y(x) = x^3c_2 + x^2c_1 + c_3x + c_3$$

2.1520 ODE No. 1520

$$y''(x)\left(-6x(\mathrm{a1}+\mathrm{a2}+\mathrm{a3})+3\mathrm{a1a2}+3\mathrm{a1a3}+3\mathrm{a2a3}+9x^2\right)+2(x-\mathrm{a1})(x-\mathrm{a2})(x-\mathrm{a3})y^{(3)}(x)-2\left(b+\left(n^2+n-3\right)\right.$$

✓ **Mathematica** : cpu = 2.78063 (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 + 3*a2*a
```

$$\left\{\left\{y(x)\to c_1\mathrm{HeunG}\left[\frac{\mathrm{a3}-\mathrm{a1}}{\mathrm{a2}-\mathrm{a1}},\frac{\frac{1}{4}(\mathrm{a1}+\mathrm{a2}+\mathrm{a3}-b)+\frac{1}{4}\mathrm{a1}\left(-n^2-n\right)}{\mathrm{a1}-\mathrm{a2}},\frac{1}{2}\left(\frac{1}{2}-\sqrt{n^2+n+\frac{1}{4}}\right),\frac{1}{2}\left(\sqrt{n^2+n+\frac{1}{4}}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.561 (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*a
```

$$y(x)=-c_2(x-\mathrm{a1})\,\mathrm{HeunG}\left(\frac{-\mathrm{a3}+\mathrm{a1}}{-\mathrm{a2}+\mathrm{a1}},\frac{\left(-n^2-n+3\right)\mathrm{a1}-b}{-4\,\mathrm{a2}+4\,\mathrm{a1}},\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2},\frac{3}{2},\frac{1}{2},\frac{-x+\mathrm{a1}}{-\mathrm{a2}+\mathrm{a1}}\right)^2+c_3\,\mathrm{HeunG}\left(\frac{-}{-}\right.$$

2.1521 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 = 0.0345461 (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][x] + x^3
```

$$\left\{\left\{y(x)\to c_1x^2+c_3x^2\left(x+\frac{1}{x}+\log^2(x)\right)+c_2x^2\log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.198 (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*di
```

$$y(x)=x\left(\ln(x)^2c_3x+c_2x\ln(x)+c_3x^2+xc_1+c_3\right)$$

2.1522 ODE No. 1522

$$4x^4y^{(3)}(x) - 4x^3y''(x) + 4x^2y'(x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.0113441 (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] == 0,y[
```

$$\left\{\left\{y(x)\to \frac{c_1x^2}{2} - \frac{c_2x^2}{4} + \frac{1}{2}c_2x^2\log(x) - \frac{1}{36x} + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (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,
```

$$y(x) = \frac{18x^3c_1\ln(x) - 1 + (-9c_1 + 18c_2)x^3 + 36c_3x}{36x}$$

2.1523 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 = 0.313321 (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[2][y][x]
```

$$\left\{\left\{y(x)\to c_1\left(-x^3+3x^2-x\right)+\frac{1}{2}c_2\left(x^3-2x^2+x\right)-\frac{c_3x\left(-x^3+3x^2-x\right)\left(\log(x)+1\right)}{2\left(x^2-3x+1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.202 (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
```

$$y(x)=x\left(c_2x\ln(x)+c_3x^2+(c_1+c_2)x+c_3\right)$$

2.1524 ODE No. 1524

$$x^6y^{(3)}(x) + x^2y''(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.113958 (sec), leaf count = 96

```
DSolve[-2*y[x] + x^2*Derivative[2][y][x] + x^6*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\left(-\frac{1}{3}\right)^{2/3}c_2x\,\text{Gamma}\left(\frac{1}{3}\right)\,{}_2F_2\left(-\frac{2}{3},\frac{1}{3};\frac{2}{3},\frac{4}{3};\frac{1}{3x^3}\right)}{3\,\text{Gamma}\left(\frac{4}{3}\right)}+\frac{c_3\,\text{Gamma}\left(\frac{2}{3}\right)\,{}_2F_2\left(-\frac{1}{3},\frac{2}{3};\frac{4}{3},\frac{5}{3};\frac{1}{3x^3}\right)}{9\,\text{Gamma}\left(\frac{5}{3}\right)}+c_1x^2\right\}\right\}$$

✓ **Maple** : cpu = 0.366 (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))
```

$$y(x) = x^2\left(\left(\left(\int \frac{e^{\frac{1}{6x^3}}\left(2x^3\,\text{BesselI}\left(\frac{1}{6},-\frac{1}{6x^3}\right)-\text{BesselI}\left(\frac{1}{6},-\frac{1}{6x^3}\right)-\text{BesselI}\left(-\frac{5}{6},-\frac{1}{6x^3}\right)\right)}{x^{\frac{11}{2}}}dx\right)c_2+\left(\int \frac{e^{\frac{1}{6x^3}}\left(2x^3\,\text{Be}\right.}{}\right.\right.\right.$$

2.1525 ODE No. 1525

$$ay(x) + x^6 y^{(3)}(x) + 6x^5 y''(x) = 0$$

✓ **Mathematica** : cpu = 0.216986 (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 = 0.497 (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))
```

$$y(x)=\frac{c_1\left(-8x^3+a\right)^4 \mathrm{e}^{-\frac{\left(-a^4\right)^{\frac{1}{3}}}{ax}}}{\left(2ax+\left(-a^4\right)^{\frac{1}{3}}\right)^3\left(4a^2x^2-2x\left(-a^4\right)^{\frac{1}{3}}a+\left(-a^4\right)^{\frac{2}{3}}\right)^4}+\frac{c_2\left(-8x^3+a\right)^4 \mathrm{e}^{-\frac{i\left(-a^4\right.}{}}}{\left(\left(-a^4\right)^{\frac{1}{3}}\sqrt{3}-4iax+i\left(-a^4\right)^{\frac{1}{3}}\right)^3\left(-\left(-a^4\right)^{\frac{1}{3}}\sqrt{3}-\right.}$$

2.1526 ODE No. 1526

$$\left(x^4+2x^2+2x+1\right)x^2y^{(3)}(x)-\left(2x^6+3x^4-6x^2-6x-1\right)y''(x)+\left(x^6-6x^3-15x^2-12x-2\right)y'(x)+\left(x^4+4x^3\right.$$

✓ **Mathematica** : cpu = 130.18 (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][y][x]
```

$$\left\{\left\{y(x)\to c_1e^x+c_2e^xx+c_3e^{\frac{1}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.121 (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(dif
```

$$y(x)=c_2\mathrm{e}^{\frac{1}{x}}+\mathrm{e}^x(xc_3+c_1)$$

2.1527 ODE No. 1527

$$(x-a)^3(x-b)^3y^{(3)}(x)-cy(x)=0$$

✓ **Mathematica** : cpu = 130.096 (sec), leaf count = 165

```
DSolve[-(c*y[x]) + (-a + x)^3*(-b + x)^3*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1(x-b)^2\left(\frac{x-a}{x-b}\right)^{\text{Root}\left[-\#1^3+3\#1^2-2\#1+\frac{c}{(a-b)^3}\&,1\right]}+c_2(x-b)^2\left(\frac{x-a}{x-b}\right)^{\text{Root}\left[-\#1^3+3\#1^2-2\#1+\frac{c}{(a-b)^3}\&\right.}\right.\right.$$

✓ **Maple** : cpu = 0.5 (sec), leaf count = 437

```
dsolve((x-a)^3*(x-b)^3*diff(diff(diff(y(x),x),x),x)-y(x)*c=0,y(x))
```

$$y(x)=(x-a)^{-\frac{2b}{a-b}}(x-b)^{\frac{2a}{a-b}}\left((b-x)^{-\frac{\text{RootOf}\left(\_Z^3+(-3a-3b)\_Z^2+\left(2a^2+8ab+2b^2\right)\_Z-4a^2b-4a\,b^2-c,\text{index}=3\right)}{a-b}}(a-x)^{\frac{\text{RootOf}\left(\_Z^3+\right.}{}}\right.$$

2.1528 ODE No. 1528

$$y^{(3)}(x)\sin(x) + (2\cos(x) + 1)y''(x) - \sin(x)y'(x) - \cos(x) = 0$$

✓ **Mathematica** : cpu = 1.31627 (sec), leaf count = 72

```
DSolve[-Cos[x] - Sin[x]*Derivative[1][y][x] + (1 + 2*Cos[x])*Derivative[2][y][x] + Sin[x]*Derivative[
```

$$\left\{\left\{y(x) \to \frac{\sin\left(\frac{x}{2}\right)\left(-2\cos\left(\frac{x}{2}\right)\arcsin(\cos(x)) + \sqrt{2}\left(c_2 x \sin\left(\frac{x}{2}\right) + \cos\left(\frac{x}{2}\right)(c_2 \log(2(\cos(x)+1)) + 2c_1)\right)\right)}{\cos(x) - 1} + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.341 (sec), leaf count = 68

```
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
```

$$y(x) = \frac{\ln(\csc(x) - \cot(x))\, c_1 - \ln(\sin(x))\, c_1 - x\cot(x)^2 + (xc_1 + c_2 + 1)\cot(x) + \csc(x)^2 x + (-xc_1 - c_2 - 1}{-\csc(x) + \cot(x)}$$

2.1529 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 = 0.0699774 (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][x] + (x
```

$$\left\{\left\{y(x)\to \frac{c_3x^2}{x+\sin(x)}-\frac{\cos(x)}{x+\sin(x)}+\frac{c_2x}{x+\sin(x)}+\frac{c_1}{x+\sin(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.1 (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)*di
```

$$y(x)=\frac{c_3+x^2c_1+c_2x-\cos(x)}{\sin(x)+x}$$

2.1530 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 = 0.0536695 (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] + 3*Cos[
```

$$\left\{\left\{y(x)\to c_3\,\text{LegendreP}(\nu,\cos(x))\,\text{LegendreQ}(\nu,\cos(x))+c_1\,\text{LegendreP}(\nu,\cos(x))^2+c_2\,\text{LegendreQ}(\nu,\cos(x))^2\right\}\right.$$

✓ **Maple** : cpu = 0.285 (sec), leaf count = 105

```
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)+
```

$$y(x)=c_1\,\text{hypergeom}\left(\left[-\frac{\nu}{2},\frac{\nu}{2}+\frac{1}{2}\right],\left[\frac{1}{2}\right],\frac{\cos(2x)}{2}+\frac{1}{2}\right)^2+c_2\cos(x)^2\,\text{hypergeom}\left(\left[\frac{\nu}{2}+1,\frac{1}{2}-\frac{\nu}{2}\right],\left[\frac{3}{2}\right],\frac{\cos(2\right.\right.$$

2.1531 ODE No. 1531

$A(x)\left(f(x)y''(x)+g(x)y'(x)+h(x)y(x)\right)+f'(x)y''(x)+f(x)y^{(3)}(x)+g'(x)y'(x)+g(x)y''(x)+y(x)h'(x)+h(x)y'(x)$

✗ **Mathematica** : cpu = 0.0178197 (sec), leaf count = 0

```
DSolve[y[x]*Derivative[1][h][x] + h[x]*Derivative[1][y][x] + Derivative[1][g][x]*Derivative[1][y][x]
```

, could not solve

DSolve[y[x]*Derivative[1][h][x] + h[x]*Derivative[1][y][x] + Derivative[1][g][x]*Derivative[

✗ **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

$$y(x)=\mathrm{DESol}\left(\left\{f(x)\left(\frac{d^3}{dx^3}\_Y(x)\right)+\left(\frac{d}{dx}f(x)+g(x)+A(x)\,f(x)\right)\left(\frac{d^2}{dx^2}\_Y(x)\right)+\left(\frac{d}{dx}g(x)+h(x)+A(x)\right.\right.\right.$$

2.1532 ODE No. 1532

$$ny(x) + y^{(3)}(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0096538 (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 = 0.055 (sec), leaf count = 58

```
dsolve(diff(diff(diff(y(x),x),x),x)+x*diff(y(x),x)+n*y(x)=0,y(x))
```

$$y(x) = c_1 \operatorname{hypergeom}\left(\left[\frac{n}{3}\right],\left[\frac{1}{3},\frac{2}{3}\right],-\frac{x^3}{9}\right)+c_2 x \operatorname{hypergeom}\left(\left[\frac{1}{3}+\frac{n}{3}\right],\left[\frac{2}{3},\frac{4}{3}\right],-\frac{x^3}{9}\right)+c_3 x^2 \operatorname{hypergeom}\left(\left[\frac{2}{3}+\right.\right.$$

2.1533 ODE No. 1533

$$-ny(x) + y^{(3)}(x) - xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.009509 (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 = 0.05 (sec), leaf count = 58

```
dsolve(diff(diff(diff(y(x),x),x),x)-x*diff(y(x),x)-n*y(x)=0,y(x))
```

$$y(x) = c_1 \,\mathrm{hypergeom}\left(\left[\frac{n}{3}\right], \left[\frac{1}{3}, \frac{2}{3}\right], \frac{x^3}{9}\right) + c_2 x \,\mathrm{hypergeom}\left(\left[\frac{1}{3}+\frac{n}{3}\right], \left[\frac{2}{3}, \frac{4}{3}\right], \frac{x^3}{9}\right) + c_3 x^2 \,\mathrm{hypergeom}\left(\left[\frac{2}{3}+\frac{n}{3}\right]\right.$$

2.1534 ODE No. 1534

$$y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0028897 (sec), leaf count = 24

```
DSolve[Derivative[4][y][x] == 0,y[x],x]
```

$$\{\{y(x) \to c_4x^3 + c_3x^2 + c_2x + c_1\}\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 21

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)=0,y(x))
```

$$y(x) = \frac{1}{6}x^3c_1 + \frac{1}{2}c_2x^2 + c_3x + c_4$$

2.1535 ODE No. 1535

$$-f(x) + y^{(4)}(x) + 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.183678 (sec), leaf count = 223

```
DSolve[-f[x] + 4*y[x] + Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to e^{-x}\left(\cos(x) \int_1^x \frac{1}{8} e^{K[1]} f(K[1])(\cos(K[1]) - \sin(K[1])) \left(\cos^2(K[1]) + \sin^2(K[1])\right) dK[1] + \sin(x) \int_1^x \frac{1}{8}\right.\right.\right.$$

✓ **Maple** : cpu = 0.013 (sec), leaf count = 36

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+4*y(x)-f=0,y(x))
```

$$y(x) = \frac{f}{4} + \cos(x) c_1 e^x + c_2 e^x \sin(x) + c_3 e^{-x} \cos(x) + c_4 e^{-x} \sin(x)$$

2.1536 ODE No. 1536

$$\lambda y(x) + y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0035898 (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 = 0.01 (sec), leaf count = 50

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+lambda*y(x)=0,y(x))
```

$$y(x) = c_1 \mathrm{e}^{-i(-\lambda)^{\frac{1}{4}}x} + c_2 \mathrm{e}^{i(-\lambda)^{\frac{1}{4}}x} + c_3 \mathrm{e}^{-(-\lambda)^{\frac{1}{4}}x} + c_4 \mathrm{e}^{(-\lambda)^{\frac{1}{4}}x}$$

2.1537 ODE No. 1537

$$-16e^{x^2}x^4 + y^{(4)}(x) - 12y''(x) + 12y(x) = 0$$

✓ **Mathematica** : cpu = 0.846103 (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 = 0.113 (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)=
```

$$y(x) = e^{x^2} + c_1 e^{\sqrt{6-2\sqrt{6}}\,x} + c_2 e^{\sqrt{6+2\sqrt{6}}\,x} + c_3 e^{-\sqrt{6-2\sqrt{6}}\,x} + c_4 e^{-\sqrt{6+2\sqrt{6}}\,x}$$

2.1538 ODE No. 1538

$$a^4y(x) + 2a^2y''(x) - \cosh(ax) + y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.117394 (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]
```

$$\left\{\left\{y(x) \to \frac{\cos^2(ax)\cosh(ax) + \sin^2(ax)\cosh(ax)}{4a^4} + c_1\cos(ax) + c_2x\cos(ax) + c_3\sin(ax) + c_4x\sin(ax)\right\}\right\}$$

✓ **Maple** : cpu = 1.026 (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,
```

$$y(x) = \frac{\left(1 + e^{2ax}\right)e^{-ax} + 8((xc_3 + c_1)\cos(ax) + \sin(ax)(xc_4 + c_2))a^4}{8a^4}$$

2.1539 ODE No. 1539

$$a^4\lambda y(x) + a^2(\lambda+1)y''(x) + y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0042043 (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],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 = 0.023 (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
```

$$y(x)=\sin(ax)\,c_1+c_2\cos(ax)+c_3\sin\left(a\sqrt{\lambda}\,x\right)+c_4\cos\left(a\sqrt{\lambda}\,x\right)$$

2.1540 ODE No. 1540

$$a(bx-1)y''(x)+aby'(x)+\lambda y(x)+y^{(4)}(x)=0$$

✗ **Mathematica** : cpu = 0.184179 (sec), leaf count = 0

```
DSolve[lambda*y[x] + a*b*Derivative[1][y][x] + a*(-1 + b*x)*Derivative[2][y][x] + Derivative[4][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*(b*x-1)*diff(diff(y(x),x),x)+a*b*diff(y(x),x)+
```

, result contains DESol or ODESolStruc

$$y(x)=\mathrm{DESol}\left(\left\{\lambda\_Y(x)+ab\left(\frac{d}{dx}\_Y(x)\right)+a(bx-1)\left(\frac{d^2}{dx^2}\_Y(x)\right)+\frac{d^4}{dx^4}\_Y(x)\right\},\{\_Y(x)\}\right)$$

2.1541 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 = 80.1184 (sec), leaf count = 0

```
DSolve[(EulerGamma + beta*lambda + a*x^2)*y[x] + (c + b*lambda + a*x^2)*Derivative[2][y][x] + Derivat
```

, 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+b
```

, result contains DESol or ODESolStruc

$$y(x)=\mathrm{DESol}\left(\left\{\left(a\,x^2+\beta\lambda+\gamma\right)\_Y(x)+\left(a\,x^2+b\lambda+c\right)\left(\frac{d^2}{dx^2}\_Y(x)\right)+\frac{d^4}{dx^4}\_Y(x)\right\},\{\_Y(x)\}\right)$$

2.1542 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 = 0.0171217 (sec), leaf count = 0

```
DSolve[(d + c*(-1/2*g2 + 6*WeierstrassP[x, {g2, g3}]^2))*y[x] + b*WeierstrassPPrime[x, {g2, g3}]*Deri
```

, could not solve

```
DSolve[(d + c*(-1/2*g2 + 6*WeierstrassP[x, {g2, g3}]^2))*y[x] + b*WeierstrassPPrime[x, {g2,
```

✗ **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*W
```

, result contains DESol or ODESolStruc

$$y(x) = \mathrm{DESol}\left(\left\{\frac{d^4}{dx^4}\_Y(x) + a\,\mathrm{WeierstrassP}\,(x,\mathrm{g2},\mathrm{g3})\left(\frac{d^2}{dx^2}\_Y(x)\right) + b\,\mathrm{WeierstrassPPrime}\,(x,\mathrm{g2},\mathrm{g3})\left(\frac{d}{dx}\_\right.\right.\right.$$

2.1543 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 = 0.0433851 (sec), leaf count = 0

```
DSolve[(beta + alpha*JacobiSN[z, x]^2)*y[x] + b*Derivative[1][y][x] - (a + 12*k^2*JacobiSN[z, x]^2)*D
```

, could not solve

```
DSolve[(beta + alpha*JacobiSN[z, x]^2)*y[x] + b*Derivative[1][y][x] - (a + 12*k^2*JacobiSN[z
```

✗ **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)+
```

, result contains DESol or ODESolStruc

$$y(x)=\mathrm{DESol}\left(\left\{\frac{d^4}{dx^4}\_Y(x)+\left(-12k^2\,\mathrm{JacobiSN}\left(z,x\right)^2-a\right)\left(\frac{d^2}{dx^2}\_Y(x)\right)+b\left(\frac{d}{dx}\_Y(x)\right)+\left(\alpha\,\mathrm{JacobiSN}\left(z,\right.\right.\right.\right.$$

2.1544 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 = 0.0102845 (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]) + 10*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][x])
```

✓ **Maple** : cpu = 0.01 (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*
```

$$y(x)=\sum_{\_a=1}^{4}\mathrm{e}^{\mathrm{RootOf}\left(\_Z^4+10f\_Z^2+10\,\mathrm{df}\_Z+3f^2+3\,\mathrm{ddf},\mathrm{index}=\_a\right)x}\_C\_a$$

2.1545 ODE No. 1545

$$y^{(4)}(x) + 2y^{(3)}(x) - 3y''(x) - 4y'(x) + 4y(x) - 32\sin(2x) + 24\cos(2x) = 0$$

✓ **Mathematica** : cpu = 0.009333 (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*Derivat
```

$$\{\{y(x) \to \sin(2x) + c_1 e^{-2x} + c_2 e^{-2x} x + c_3 e^x + c_4 e^x x\}\}$$

✓ **Maple** : cpu = 0.27 (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),
```

$$y(x) = (xc_4 + c_2)\,\mathrm{e}^{-2x} + \sin(2x) + (xc_3 + c_1)\,\mathrm{e}^{x}$$

2.1546 ODE No. 1546

$$a^4x^4y(x) + 4a^3x^3y'(x) + 6a^2x^2y''(x) + 4axy^{(3)}(x) + y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.438567 (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*Derivati
```

$$\left\{\left\{y(x) \to \frac{2\left(\sqrt{6}-3\right)\sqrt{-\left(\left(\sqrt{6}-3\right)a\right)}c_3\exp\left(-\frac{ax^2}{2}-\sqrt{-\left(\left(\sqrt{6}-3\right)a\right)}x-\frac{\left(-3+\sqrt{3}+\sqrt{6}\right)ax}{\sqrt{-\left(\left(\sqrt{6}-3\right)a\right)}}\right)}{\left(-3-\sqrt{3}+\sqrt{6}\right)\left(-3+\sqrt{3}+\sqrt{6}\right)a} - \frac{2\left(\sqrt{6}-3\right)\sqrt{\cdots}}{\cdots}\right.\right.$$

✓ **Maple** : cpu = 0.039 (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*dif
```

$$y(x) = e^{-\frac{a\,x^2}{2}}\left(c_2 e^{\sqrt{-a\left(\sqrt{6}-3\right)}\,x} + c_4 e^{\sqrt{\left(3+\sqrt{6}\right)a}\,x} + c_1 e^{-\sqrt{-a\left(\sqrt{6}-3\right)}\,x} + c_3 e^{-\sqrt{\left(3+\sqrt{6}\right)a}\,x}\right)$$

2.1547 ODE No. 1547

$3y(x)\left(2g(x)f'(x)+5f(x)g'(x)+6f(x)^2g(x)+g''(x)+3g(x)^2\right)+y''(x)\left(4f'(x)+11f(x)^2+10g(x)\right)+y'(x)\left(f''(x\right.$

✗ **Mathematica** : cpu = 0.18651 (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*Derivative[1][g
```

, 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*Deriva
```

✓ **Maple** : cpu = 0.01 (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
```

$$y(x)=\sum_{\_a=1}^{4}\mathrm{e}^{\mathrm{RootOf}\left(\_Z^4+6f\_Z^3+\left(11f^2+4\,\mathrm{df}+10g\right)\_Z^2+\left(6f^3+7\,\mathrm{df}\,f+30fg+\mathrm{ddf}+10\,\mathrm{dg}\right)\_Z+18f^2g+6\,\mathrm{df}\,g+15\,\mathrm{dg}\,f+9g^2+3\,\mathrm{ddg},\mathrm{index}=\right.}$$

2.1548 ODE No. 1548

$$4y^{(4)}(x) - 12y^{(3)}(x) + 11y''(x) - 3y'(x) - 4\cos(x) = 0$$

✓ **Mathematica** : cpu = 0.0708757 (sec), leaf count = 50

```
DSolve[-4*Cos[x] - 3*Derivative[1][y][x] + 11*Derivative[2][y][x] - 12*Derivative[3][y][x] + 4*Deriva
```

$$\left\{\left\{y(x)\to \frac{18\sin(x)}{65} - \frac{14\cos(x)}{65} + 2c_1e^{x/2} + \frac{2}{3}c_2e^{3x/2} + c_3e^x + c_4\right\}\right\}$$

✓ **Maple** : cpu = 0.092 (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
```

$$y(x) = 2c_2\mathrm{e}^{\frac{x}{2}} + \frac{2c_3\mathrm{e}^{\frac{3x}{2}}}{3} + \mathrm{e}^x c_1 + \frac{18\sin(x)}{65} - \frac{14\cos(x)}{65} + c_4$$

2.1549 ODE No. 1549

$$xy^{(4)}(x) + 5y^{(3)}(x) - 24 = 0$$

✓ **Mathematica** : cpu = 0.0138833 (sec), leaf count = 34

```
DSolve[-24 + 5*Derivative[3][y][x] + x*Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{4x^3}{5} + c_4x^2 - \frac{c_1}{24x^2} + c_3x + c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.03 (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))
```

$$y(x) = \frac{4x^3}{5} - \frac{c_1}{24x^2} + \frac{c_2x^2}{2} + c_3x + c_4$$

2.1550 ODE No. 1550

$$12x^3y''(x) - (6x^2+1)\,y^{(3)}(x) - (9x^2-7)\,x^2y'(x) + 2(x^2-3)\,x^3y(x) + xy^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 1.17157 (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][x] - (1
```

$$\left\{\left\{y(x)\to c_3e^{\frac{x^2}{2}}\int_1^x \frac{e^{\frac{K[1]^2}{2}}\left(\int \frac{\exp\left(\frac{1}{4}\sqrt{5}K[1]^2+\frac{1}{2}\left(-\frac{1}{2}K[1]^2-2\log(K[1])\right)\right)\text{HypergeometricU}\left(-\frac{-9+\sqrt{5}}{4\sqrt{5}},-\frac{1}{2},-\frac{1}{2}\sqrt{5}K[1]^2\right)}{\sqrt{K[1]}\sqrt[4]{K[1]^2}}\,dK[1]\right)}{\sqrt[4]{2}}\right.\right.$$

✓ **Maple** : cpu = 3.32 (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*
```

$$y(x) = -\mathrm{e}^{x^2}\left(\int \frac{\text{WhittakerM}\left(\frac{9\sqrt{5}}{20},\frac{3}{4},\frac{\sqrt{5}\,x^2}{2}\right)\mathrm{e}^{-\frac{x^2}{4}}}{x^{\frac{3}{2}}}dx\right)c_3 - \mathrm{e}^{x^2}\left(\int \frac{\text{WhittakerW}\left(\frac{9\sqrt{5}}{20},\frac{3}{4},\frac{\sqrt{5}\,x^2}{2}\right)\mathrm{e}^{-\frac{x^2}{4}}}{x^{\frac{3}{2}}}dx\right)c_4 + \Bigg($$

2.1551 ODE No. 1551

$$-2(\nu^2x^2+6)\,y''(x)+\nu^2(\nu^2x^2+4)\,y(x)+x^2y^{(4)}(x)=0$$

✓ **Mathematica** : cpu = 0.197286 (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][x] == (
```

$$\left\{\left\{y(x)\to\frac{c_3(1-x)e^{-\nu x}\left(\nu^2x^2+\nu^2x+\nu^2+6\nu x+6\nu+15\right)}{x}+\frac{c_4(1-x)e^{\nu x}\left(\nu^2x^2+\nu^2x+\nu^2-6\nu x-6\nu+15\right)}{x}\right.\right.$$

✓ **Maple** : cpu = 0.137 (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
```

$$y(x)=\frac{\left(\nu^2x^3c_4+6\nu\,x^2c_4+15xc_4+c_2\right)\mathrm{e}^{-x\nu}+\mathrm{e}^{x\nu}\left(\nu^2x^3c_3-6\nu\,x^2c_3+15xc_3+c_1\right)}{x}$$

2.1552 ODE No. 1552

$$ay(x) - bx^2 + x^2y^{(4)}(x) + 2xy^{(3)}(x) = 0$$

✗ **Mathematica** : cpu = 300.005 (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 = 0.062 (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^
```

$$y(x) = \frac{b\,x^2}{a} + c_1\sqrt{x}\ \mathrm{BesselJ}\left(1, 2(-a)^{\frac{1}{4}}\sqrt{x}\right) + c_2\sqrt{x}\ \mathrm{BesselY}\left(1, 2(-a)^{\frac{1}{4}}\sqrt{x}\right) + c_3\sqrt{x}\ \mathrm{BesselJ}\left(1, 2\sqrt{-\sqrt{-a}}\,\sqrt{x}\right) +$$

2.1553 ODE No. 1553

$$x^2 y^{(4)}(x) + 4xy^{(3)}(x) + 2y''(x) = 0$$

✓ **Mathematica** : cpu = 0.008167 (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 = 0.006 (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
```

$$y(x) = (xc_4 + c_2) \ln(x) + c_3 x + c_1$$

2.1554 ODE No. 1554

$$x^2 y^{(4)}(x) + 6xy^{(3)}(x) + 6y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0071715 (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 = 0.007 (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
```

$$y(x) = c_1 + c_2 \ln(x) + \frac{c_3}{x} + c_4 x$$

2.1555 ODE No. 1555

$$\lambda^2(-y(x)) + x^2 y^{(4)}(x) + 6xy^{(3)}(x) + 6y''(x) = 0$$

✓ **Mathematica** : cpu = 0.032307 (sec), leaf count = 156

```
DSolve[-(lambda^2*y[x]) + 6*Derivative[2][y][x] + 6*x*Derivative[3][y][x] + x^2*Derivative[4][y][x] =
```

$$\left\{\left\{y(x) \to c_4 G_{0,4}^{2,0}\left(\frac{\lambda^2 x^2}{16}\middle|\ -\tfrac{1}{2}, \tfrac{1}{2}, 0, 0\right) + c_2 G_{0,4}^{2,0}\left(\frac{\lambda^2 x^2}{16}\middle|\ 0, 0, -\tfrac{1}{2}, \tfrac{1}{2}\right) + \frac{c_1\left(\text{BesselJ}\left(1, 2\sqrt{\lambda}\sqrt{x}\right) + \text{BesselI}\left(1, 2\right.\right.}{2\sqrt{\lambda}\sqrt{x}}\right.\right.$$

✓ **Maple** : cpu = 0.118 (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
```

$$y(x) = \frac{c_2 \,\text{BesselY}\left(1, 2\sqrt{\lambda}\,\sqrt{x}\right) + c_1 \,\text{BesselJ}\left(1, 2\sqrt{\lambda}\,\sqrt{x}\right) + c_4 \,\text{BesselY}\left(1, 2\sqrt{-\lambda}\,\sqrt{x}\right) + c_3 \,\text{BesselJ}\left(1, 2\sqrt{-\lambda}\,\sqrt{x}\right)}{\sqrt{x}}$$

2.1556 ODE No. 1556

$$x^2y^{(4)}(x) + 8xy^{(3)}(x) + 12y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0077578 (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]
```

$$\left\{\left\{y(x)\to \frac{1}{6}\left(\frac{c_1}{x^2}+\frac{3c_2}{x}\right)+c_4x+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.007 (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(dif
```

$$y(x) = c_1 + \frac{c_2}{x^2} + \frac{c_3}{x} + c_4x$$

2.1557 ODE No. 1557

$$\lambda^2(-y(x)) + x^2 y^{(4)}(x) + 8xy^{(3)}(x) + 12y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0322692 (sec), leaf count = 146

```
DSolve[-(lambda^2*y[x]) + 12*Derivative[2][y][x] + 8*x*Derivative[3][y][x] + x^2*Derivative[4][y][x]
```

$$\left\{\left\{y(x) \to c_4 G_{0,4}^{2,0}\left(\frac{\lambda^2 x^2}{16} \middle| \begin{array}{c} \\ -1, 0, -\frac{1}{2}, \frac{1}{2} \end{array}\right) + c_2 G_{0,4}^{2,0}\left(\frac{\lambda^2 x^2}{16} \middle| \begin{array}{c} \\ -\frac{1}{2}, \frac{1}{2}, -1, 0 \end{array}\right) - \frac{3ic_1\left(\text{BesselI}\left(2, 2\sqrt{\lambda}\sqrt{x}\right) - \text{BesselJ}\right.}{4\lambda x}\right.\right.$$

✓ **Maple** : cpu = 0.071 (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(dif
```

$$y(x) = \frac{c_2 \text{BesselY}\left(2, 2\sqrt{\lambda}\sqrt{x}\right) + c_4 \text{BesselY}\left(2, 2\sqrt{-\lambda}\sqrt{x}\right) + c_3 \text{BesselJ}\left(2, 2\sqrt{-\lambda}\sqrt{x}\right) + c_1 \text{BesselJ}\left(2, 2\sqrt{\lambda}\sqrt{x}\right)}{x}$$

2.1558 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 = 0.0790926 (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*Derivati
```

$$\left\{\left\{y(x)\to c_4 i^{-n+\nu+1}2^{3n-3\nu-3}b^{2(-n+\nu+1)+n-\nu-2}x^{\frac{1}{2}(n-\nu-2)-n+\nu+1}\operatorname{Gamma}(-n+\nu+2)\left(\operatorname{BesselI}\left(\nu-n,b\sqrt{x}\right)-\text{I}\right.\right.\right.$$

✓ **Maple** : cpu = 0.095 (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)+
```

$$y(x) = x^{-\frac{n}{2}+\frac{\nu}{2}}\left(\operatorname{BesselJ}\left(n-\nu,b\sqrt{x}\right)c_2 + \operatorname{BesselK}\left(n-\nu,b\sqrt{x}\right)c_3 + \operatorname{BesselI}\left(n-\nu,b\sqrt{x}\right)c_1 + \operatorname{BesselY}\left(n-\nu,b\sqrt{\right.\right.$$

2.1559 ODE No. 1559

$$a^4\left(-x^3\right)y(x) + x^3y^{(4)}(x) + 2x^2y^{(3)}(x) - xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.13483 (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][x] + x^
```

$$\left\{\left\{y(x)\to c_4G_{0,4}^{2,0}\left(\frac{a^4x^4}{256}|\ 0,0,\tfrac{1}{2},\tfrac{1}{2}\right)+c_2G_{0,4}^{2,0}\left(\frac{a^4x^4}{256}|\ \tfrac{1}{2},\tfrac{1}{2},0,0\right)+\frac{1}{8}ic_1(\text{BesselI}(0,ax)-\text{BesselJ}(0,ax))+\frac{1}{2}c_3\right.\right.$$

✓ **Maple** : cpu = 0.084 (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(di
```

$$y(x) = c_1\,\text{BesselI}\,(0,ax) + c_2\,\text{BesselJ}\,(0,ax) + c_3\,\text{BesselK}\,(0,ax) + c_4\,\text{BesselY}\,(0,ax)$$

2.1560 ODE No. 1560

$$x^3y^{(4)}(x) + 6x^2y^{(3)}(x) + 6xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.005583 (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],x]
```

$$\left\{\left\{y(x)\to c_4x+\frac{1}{2}\left(\frac{c_1}{x}-2c_2\log(x)\right)+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.007 (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(
```

$$y(x) = c_1 + c_2 \ln(x) + \frac{c_3}{x} + c_4x$$

2.1561 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 = 2.04031 (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 + n)*x^
```

$$\left\{\left\{y(x)\to c_1\left(-2^{n-\frac{5}{2}}\right)\sqrt{x}a^{\frac{2-n}{4}+\frac{1}{4}\left(n-\frac{3}{2}\right)}\,\text{Gamma}\left(\frac{3}{2}-n\right)\left(\cos\left(\frac{3}{4}\pi\left(\frac{3}{2}-n\right)\right)\text{ber}_{-n-\frac{1}{2}}\left(\sqrt[4]{a}x\right)+\sin\left(\frac{3}{4}\pi\left(\frac{3}{2}-\right.\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.262 (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)
```

$$y(x)=\sqrt{x}\left(\text{BesselJ}\left(n+\frac{1}{2},\sqrt{-\sqrt{-a}}\,x\right)c_3+\text{BesselY}\left(n+\frac{1}{2},\sqrt{-\sqrt{-a}}\,x\right)c_4+\text{BesselJ}\left(n+\frac{1}{2},(-a)^{\frac{1}{4}}\,x\right)c_1+\right.$$

2.1562 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 = 0.558394 (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] + 4*x^
```

$$\left\{\left\{y(x)\to c_1\,{}_0F_3\left(;\frac{1}{2},1-\frac{n}{2},\frac{n}{2}+1;\frac{x^4}{64}\right)+\frac{1}{8}ic_2x^2\,{}_0F_3\left(;\frac{3}{2},\frac{3}{2}-\frac{n}{2},\frac{n}{2}+\frac{3}{2};\frac{x^4}{64}\right)+c_3\left(\frac{i}{2}\right)^{-n}\text{Gamma}(1-n)^2\,(\text{b}\right.\right.$$

✓ **Maple** : cpu = 0.248 (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)
```

$$y(x)=\left(\text{BesselY}\left(n,\left(\frac{1}{2}-\frac{i}{2}\right)\sqrt{2}\,x\right)c_3+\text{BesselJ}\left(n,\left(\frac{1}{2}-\frac{i}{2}\right)\sqrt{2}\,x\right)c_1\right)\text{BesselJ}\left(n,\left(\frac{1}{2}+\frac{i}{2}\right)\sqrt{2}\,x\right)+\text{Besse}$$

2.1563 ODE No. 1563

$$(4n^2 - 4x^4 - 1)\, y(x) - (4n^2 - 1)\, x^2 y''(x) - (4n^2 - 1)\, x y'(x) + x^4 y^{(4)}(x) + 4x^3 y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 1.05163 (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*Derivative[2
```

$$\left\{\left\{y(x) \to \frac{\sqrt[4]{-1} c_2 x\, {}_0F_3\left(;\frac{3}{2},1-\frac{n}{2},\frac{n}{2}+1;\frac{x^4}{64}\right)}{2\sqrt{2}} - \frac{2(-1)^{3/4}\sqrt{2} c_1\, {}_0F_3\left(;\frac{1}{2},\frac{1}{2}-\frac{n}{2},\frac{n}{2}+\frac{1}{2};\frac{x^4}{64}\right)}{x} + c_3(-1)^{\frac{1}{4}(1-2n)} 2^{2n+\cdots}\right.\right.$$

✓ **Maple** : cpu = 0.158 (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)
```

$$y(x) = \frac{c_4 \operatorname{hypergeom}\left(\left[\,\right],\left[\frac{1}{2},-\frac{n}{2}+\frac{1}{2},\frac{n}{2}+\frac{1}{2}\right],\frac{x^4}{64}\right) + x^2\left(\operatorname{hypergeom}\left(\left[\,\right],\left[\frac{3}{2},-\frac{n}{2}+1,\frac{n}{2}+1\right],\frac{x^4}{64}\right) c_3 + c_2 \operatorname{KelvinBe}\cdots\right.}{x}$$

2.1564 ODE No. 1564

$$(-12n^2 - 4x^4 + 3)\, y(x) - (4n^2 + 3)\, x^2 y''(x) + (12n^2 - 3)\, x y'(x) + x^4 y^{(4)}(x) + 4x^3 y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 0.697338 (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*Derivative[2
```

$$\left\{\left\{y(x) \to \frac{\sqrt[4]{-1} c_1 x\, {}_0F_3\left(;\frac{1}{2},\frac{3}{2}-\frac{n}{2},\frac{n}{2}+\frac{3}{2};\frac{x^4}{64}\right)}{2\sqrt{2}} + c_3(-1)^{\frac{1}{4}(-2n-1)} 2^{2n+\frac{1}{2}(2n+1)+1} x^{-2n-1}\, {}_0F_3\left(;1-n,\frac{1}{2}-\frac{n}{2},-\frac{n}{2};\right.\right.\right.$$

✓ **Maple** : cpu = 0.152 (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)
```

$$y(x) = \frac{c_4 x^2 \operatorname{hypergeom}\left([\,],\left[\frac{1}{2},\frac{n}{2}+\frac{3}{2},\frac{3}{2}-\frac{n}{2}\right],\frac{x^4}{64}\right) + c_3 x^4 \operatorname{hypergeom}\left([\,],\left[\frac{3}{2},-\frac{n}{2}+2,\frac{n}{2}+2\right],\frac{x^4}{64}\right) + c_2 \operatorname{KelvinBei}}{x}$$

2.1565 ODE No. 1565

$$(x(-\rho^2-\sigma^2+1)+16x^3)\,y'(x)+y(x)\,(\rho^2\sigma^2+8x^2)+(x^2(-\rho^2-\sigma^2+7)+4x^4)\,y''(x)+x^4y^{(4)}(x)+6x^3y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.257066 (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] + ((7 -
```

$$\left\{\left\{y(x)\to c_1x^{-\rho}\,{}_2F_3\left(\frac{1}{2}-\frac{\rho}{2},1-\frac{\rho}{2};1-\rho,-\frac{\rho}{2}-\frac{\sigma}{2}+1,-\frac{\rho}{2}+\frac{\sigma}{2}+1;-x^2\right)+c_3x^{-\sigma}\,{}_2F_3\left(\frac{1}{2}-\frac{\sigma}{2},1-\frac{\sigma}{2};1-\sigma,-\right.\right.\right.$$

✓ **Maple** : cpu = 0.229 (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+(-
```

$$y(x)=\left(\mathrm{BesselY}\left(-\frac{\sigma}{2}+\frac{\rho}{2},x\right)c_2+c_1\,\mathrm{BesselJ}\left(-\frac{\sigma}{2}+\frac{\rho}{2},x\right)\right)\mathrm{BesselJ}\left(\frac{\sigma}{2}+\frac{\rho}{2},x\right)+\mathrm{BesselY}\left(\frac{\sigma}{2}+\frac{\rho}{2},x\right)\left(\mathrm{BesselY}\right.$$

2.1566 ODE No. 1566

$$\left(x\left(-2\mu^2-2\nu^2+1\right)+16x^3\right)y'(x)+y(x)\left(\left(\mu^2-\nu^2\right)^2+8x^2\right)+\left(x^2\left(-2\mu^2-2\nu^2+7\right)+4x^4\right)y''(x)+x^4y^{(4)}(x)+6x$$

✓ **Mathematica** : cpu = 0.303874 (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] + ((7
```

$$\left\{\left\{y(x)\to c_1x^{-\mu-\nu}\,{}_2F_3\left(-\frac{\mu}{2}-\frac{\nu}{2}+\frac{1}{2},-\frac{\mu}{2}-\frac{\nu}{2}+1;1-\mu,1-\nu,-\mu-\nu+1;-x^2\right)+c_2x^{\mu-\nu}\,{}_2F_3\left(\frac{\mu}{2}-\frac{\nu}{2}+\frac{1}{2},\right.\right.\right.$$

✓ **Maple** : cpu = 0.197 (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+(-
```

$$y(x)=\left(\mathrm{BesselY}\left(\mu,x\right)c_2+c_1\,\mathrm{BesselJ}\left(\mu,x\right)\right)\mathrm{BesselJ}\left(\nu,x\right)+\mathrm{BesselY}\left(\nu,x\right)\left(\mathrm{BesselY}\left(\mu,x\right)c_4+c_3\,\mathrm{BesselJ}\left(\mu,x\right)\right)$$

2.1567 ODE No. 1567

$$x^4y^{(4)}(x) + 8x^3y^{(3)}(x) + 12x^2y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0055249 (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,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{6}\left(\frac{c_1}{x^2}+\frac{3c_2}{x}\right)+c_4x+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.009 (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*di
```

$$y(x) = c_1 + \frac{c_2}{x^2} + \frac{c_3}{x} + c_4x$$

2.1568 ODE No. 1568

$$ay(x) + x^4y^{(4)}(x) + 8x^3y^{(3)}(x) + 12x^2y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0093502 (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][x] == (
```

$$\left\{\left\{y(x)\to c_1x^{\frac{1}{2}\left(-\sqrt{5-4\sqrt{1-a}}-1\right)}+c_2x^{\frac{1}{2}\left(\sqrt{5-4\sqrt{1-a}}-1\right)}+c_3x^{\frac{1}{2}\left(-\sqrt{4\sqrt{1-a}+5}-1\right)}+c_4x^{\frac{1}{2}\left(\sqrt{4\sqrt{1-a}+5}-1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (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*di
```

$$y(x)=c_1x^{-\frac{1}{2}-\frac{\sqrt{5-4\sqrt{1-a}}}{2}}+c_2x^{-\frac{1}{2}+\frac{\sqrt{5-4\sqrt{1-a}}}{2}}+c_3x^{-\frac{1}{2}-\frac{\sqrt{5+4\sqrt{1-a}}}{2}}+c_4x^{-\frac{1}{2}+\frac{\sqrt{5+4\sqrt{1-a}}}{2}}$$

2.1569 ODE No. 1569

$xy'(x)\left((2a-1)\mathrm{C0}+4b^2\mathrm{B0}c^2x^{2c}\right)+(6-4a)x^3y^{(3)}(x)+x^2y''(x)\left(\mathrm{A0}+4b^2c^2x^{2c}\right)+y(x)\left(4b^2c^2\mathrm{D0}x^{2c}+\mathrm{E0}\right)+x^4y^{(4)}($

✗ **Mathematica** : cpu = 300.502 (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[1][y][x
```

, timed out

`$Aborted`

✓ **Maple** : cpu = 0.283 (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*
```

$y(x) = \left(\left(\mathrm{BesselJ}\left(\mu, x^c b\right) c_1 + \mathrm{BesselY}\left(\mu, x^c b\right) c_3\right) \mathrm{BesselJ}\left(\nu, x^c b\right) + \mathrm{BesselY}\left(\nu, x^c b\right) \left(c_4 \mathrm{BesselY}\left(\mu, x^c b\right) + \mathrm{BesselJ}\right.\right.$

2.1570 ODE No. 1570

$$y(x)\left(\left(a^2-c^2\nu^2\right)\left(a^2+4ac-c^2\nu^2+4c^2\right)-b^4c^4x^{4c}\right)+x^2\left(2a^2+4(a+c-1)^2+4(a-1)(c-1)-2c^2\nu^2-1\right)y''($$

✓ **Mathematica** : cpu = 0.0658429 (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 + 2*c)*
```

$$\left\{\left\{y(x)\to c_1\,\text{Gamma}(1-\nu)(-1)^{\frac{a-c\nu}{4c}}2^{-\frac{2(a-c\nu)}{c}-\nu-1}b^{\frac{a-c\nu}{c}+\nu}\left(x^{4c}\right)^{\frac{a-c\nu}{4c}+\frac{\nu}{4}}\left(\text{BesselJ}\left(-\nu,b\sqrt[4]{x^{4c}}\right)+\text{BesselI}\left(-\nu,b\sqrt[4]{\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.057 (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)
```

$$y(x)=x^a\left(\text{BesselJ}\left(\nu,ib\,x^c\right)c_3+\text{BesselJ}\left(\nu,x^cb\right)c_1+\text{BesselY}\left(\nu,x^cb\right)c_2+\text{BesselY}\left(\nu,ib\,x^c\right)c_4\right)$$

2.1571 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 = 0.0416038 (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*(-2 + 4*n
```

$$\left\{\left\{y(x)\to c_1\,{}_0F_3\left(;1-\frac{v}{2},1-\frac{v}{2\nu},-\frac{v}{2\nu}-\frac{v}{2}+1;\frac{b^4v^4x^{2/v}}{256\nu^4}\right)+c_2\left(\frac{i}{16}\right)^v v^{2v}b^{2v}\nu^{-2v}\left(x^{2/v}\right)^{v/2}\,{}_0F_3\left(;\frac{v}{2}+1,1-\right.\right.\right.$$

✓ **Maple** : cpu = 0.352 (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
```

$$y(x)=\sqrt{x}\left(\mathrm{BesselY}\left(\frac{1}{\lfloor\frac{1}{\nu}\rfloor},\frac{\sqrt{-\frac{b^2}{\nu^2}}\,x^{\frac{\lfloor\frac{1}{\nu}\rfloor}{2}}}{\lfloor\frac{1}{\nu}\rfloor}\right)c_4+\mathrm{BesselJ}\left(\frac{1}{\lfloor\frac{1}{\nu}\rfloor},\frac{\sqrt{-\frac{b^2}{\nu^2}}\,x^{\frac{\lfloor\frac{1}{\nu}\rfloor}{2}}}{\lfloor\frac{1}{\nu}\rfloor}\right)c_3+\mathrm{BesselJ}\left(\frac{1}{\lfloor\frac{1}{\nu}\rfloor},\frac{\sqrt{\frac{b^2}{\nu^2}}\,x^{\frac{\lfloor\frac{1}{\nu}\rfloor}{2}}}{\lfloor\frac{1}{\nu}\rfloor}\right)c_1\right.$$

2.1572 ODE No. 1572

$\left(-2\left(x^2-1\right)\left(\mu(\mu+1)+\nu(\nu+1)\right)+24x^3-8\right)y''(x)-6x(\mu(\mu+1)+\nu(\nu+1)-2)y'(x)+\left((\mu(\mu+1)-\nu(\nu+1))^2-\right.$

✗ **Mathematica** : cpu = 84.4008 (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 + mu) +
```

, DifferentialRoot result

$$\{\{y(x)\to(x)\}\}$$

✓ **Maple** : cpu = 0.309 (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)
```

$y(x)=(\mathrm{LegendreQ}\left(\mu,x\right)c_2+c_1\,\mathrm{LegendreP}\left(\mu,x\right))\,\mathrm{LegendreP}\left(\nu,x\right)+\mathrm{LegendreQ}\left(\nu,x\right)\left(\mathrm{LegendreQ}\left(\mu,x\right)c_4+c_3\right.$

2.1573 ODE No. 1573

$$-\frac{1}{x^5}+(2x+e^x)\,y^{(4)}(x)+4(e^x+2)\,y^{(3)}(x)+6e^xy''(x)+4e^xy'(x)+e^xy(x)=0$$

✓ **Mathematica** : cpu = 0.0907511 (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^x)*Deri
```

$$\left\{\left\{y(x)\to\frac{c_4x^3}{2x+e^x}+\frac{c_3x^2}{2x+e^x}+\frac{1}{24\,(2x+e^x)\,x}+\frac{c_2x}{2x+e^x}+\frac{c_1}{2x+e^x}\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (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)
```

$$y(x)=\frac{24c_1x^4+24x^3c_2+24x^2c_3+24xc_4+1}{24\,(\mathrm{e}^x+2x)\,x}$$

2.1574 ODE No. 1574

$$y(x)\left(a^4\sin^4(x)-3\right)+y^{(4)}(x)\sin^4(x)+2y^{(3)}(x)\sin^3(x)\cos(x)+\left(\sin^2(x)-3\right)\sin^2(x)y''(x)+\left(2\sin^2(x)+3\right)\sin(x)\,\mathrm{c}$$

✓ **Mathematica** : cpu = 0.143419 (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]^2*(-3 +
```

$$\left\{\left\{y(x)\to c_1\sin(x)\,\text{Hypergeometric2F1}\left(\frac{1}{4}\left(3-\sqrt{5-4\sqrt{1-a^4}}\right),\frac{1}{4}\left(\sqrt{5-4\sqrt{1-a^4}}+3\right),\frac{1}{2},\cos^2(x)\right)+c_3\right.\right.$$

✓ **Maple** : cpu = 0.805 (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
```

$$y(x)=\left(\text{hypergeom}\left(\left[\frac{3}{4}-\frac{\sqrt{-4\sqrt{-(a-1)(a+1)(a^2+1)}+5}}{4},\frac{3}{4}+\frac{\sqrt{-4\sqrt{-(a-1)(a+1)(a^2+1)}+5}}{4}\right],\right.\right.$$

2.1575 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 = 4.95916 (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[2][y][x]
```

$$\left\{\left\{y(x)\to x^3\csc(x)\int_1^x\frac{1}{6}\csc^5(K[4])f(K[4])dK[4]+x^2\csc(x)\int_1^x-\frac{1}{2}\csc^5(K[3])f(K[3])K[3]dK[3]+x\csc(x)\int_1\right.\right.$$

✓ **Maple** : cpu = 0.517 (sec), leaf count = 647

```
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
```

Expression too large to display

2.1576 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 = 0.11465 (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[x] - 2*
```

, could not solve

```
DSolve[2*Derivative[1][f][x]*(-(a^2*Derivative[1][y][x]) + Derivative[3][y][x]) + f[x]*(a^4*
```

✓ **Maple** : cpu = 0.013 (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*(di
```

$$y(x)=c_1\mathrm{e}^{-ax}+c_2\mathrm{e}^{ax}+c_3\mathrm{e}^{\frac{\left(-\mathrm{df}+\sqrt{a^2f^2+\mathrm{df}^2}\right)x}{f}}+c_4\mathrm{e}^{-\frac{\left(\mathrm{df}+\sqrt{a^2f^2+\mathrm{df}^2}\right)x}{f}}$$

2.1577 ODE No. 1577

$$f''(x)y''(x) + 2y^{(3)}(x)f'(x) + f(x)y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.03752 (sec), leaf count = 46

```
DSolve[Derivative[2][f][x]*Derivative[2][y][x] + 2*Derivative[1][f][x]*Derivative[3][y][x] + f[x]*De
```

$$\left\{\left\{y(x) \to \int_1^x \int_1^{K[2]} \left(\frac{c_1}{f(K[1])} + \frac{c_2 K[1]}{f(K[1])}\right) dK[1]dK[2] + c_4 x + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 21

```
dsolve(f*diff(diff(diff(diff(y(x),x),x),x),x)=0,y(x))
```

$$y(x) = \frac{1}{6}x^3 c_1 + \frac{1}{2}c_2 x^2 + c_3 x + c_4$$

2.1578 ODE No. 1578

$$a^4y(x)-\lambda(ax-b)\left(y''(x)-a^2y(x)\right)-2a^2y''(x)+y^{(4)}(x)=0$$

✓ **Mathematica** : cpu = 25.221 (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][y][x]) +
```

$$\left\{\left\{y(x)\to c_3e^{-ax}\int_1^x 2ae^{2aK[1]}\int e^{-aK[1]}\operatorname{AiryAi}\left(\frac{a^2+\lambda K[1]a-b\lambda}{(a\lambda)^{2/3}}\right)dK[1]dK[1]+c_4e^{-ax}\int_1^x 2ae^{2aK[2]}\int e^{-a}\right.\right.$$

✓ **Maple** : cpu = 0.425 (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-
```

$$y(x)=\mathrm{e}^{ax}\left(\int \mathrm{e}^{-2ax}\left(\int \mathrm{e}^{ax}\left(c_4\operatorname{AiryBi}\left(-\frac{(-a\lambda)^{\frac{1}{3}}\left(\lambda(ax-b)+a^2\right)}{\lambda a}\right)+c_3\operatorname{AiryAi}\left(-\frac{(-a\lambda)^{\frac{1}{3}}\left(\lambda(ax-b)+a^2\right)}{\lambda a}\right.\right.\right.\right.$$

2.1579 ODE No. 1579

$$-ax - b\sin(x) - c\cos(x) + y^{(n)}(x) + 2y^{(3)}(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.745774 (sec), leaf count = 80

```
DSolve[-(a*x) - c*Cos[x] - b*Sin[x] + Derivative[1][y][x] + 2*Derivative[3][y][x] + Derivative[5][y][
```

$$\left\{\left\{y(x)\to \frac{1}{16}\left(8ax^2+\cos(x)\left(b\left(2x^2-9\right)-2(5cx+8(c_4x-c_2+c_3))\right)+\sin(x)\left(-6bx+c\left(13-2x^2\right)+16(c_2x+\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.952 (sec), leaf count = 69

```
dsolve(diff(diff(diff(diff(diff(y(x),x),x),x),x),x)+2*diff(diff(diff(y(x),x),x),x)+diff(y(x)
```

$$y(x) = \frac{\left(b\,x^2+(-4c-8c_4)\,x-6b-8c_2+8c_3\right)\cos(x)}{8}+\frac{\left(-c\,x^2+(-4b+8c_3)\,x+6c+8c_1+8c_4\right)\sin(x)}{8}+\frac{a\,x^2}{2}+$$

2.1580 ODE No. 1580

$$y^{(6)}(x)+y(x)-\sin\left(\frac{x}{2}\right)\sin\left(\frac{3x}{2}\right)=0$$

✓ **Mathematica** : cpu = 3.92771 (sec), leaf count = 234

```
DSolve[-(Sin[x/2]*Sin[(3*x)/2]) + y[x] + Derivative[6][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to\frac{1}{504}\left(-42\sin^2\left(\frac{x}{2}\right)-42\sin^2(x)+42x\sin(x)+42\sin\left(\frac{x}{2}\right)\sin\left(\frac{3x}{2}\right)+21\sin(x)\sin(2x)-24\sin\left(\frac{x}{2}\right)\right.\right.\right.$$

✓ **Maple** : cpu = 2.691 (sec), leaf count = 71

```
dsolve(diff(diff(diff(diff(diff(diff(y(x),x),x),x),x),x),x)+y(x)-sin(3/2*x)*sin(1/2*x)=0,y(x
```

$$y(x)=\left(\cos\left(\frac{x}{2}\right)c_3+\sin\left(\frac{x}{2}\right)c_4\right)e^{-\frac{\sqrt{3}\,x}{2}}+\left(\cos\left(\frac{x}{2}\right)c_5+\sin\left(\frac{x}{2}\right)c_6\right)e^{\frac{\sqrt{3}\,x}{2}}+\frac{\cos(2x)}{126}+\frac{(5+24c_1)\cos(x)}{24}+\frac{(x+1}{}$$

2.1581 ODE No. 1581

$$-axy(x) - b + y^{(5)}(x) = 0$$

✗ **Mathematica** : cpu = 10.1351 (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 = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(diff(diff(y(x),x),x),x),x),x)-a*x*y(x)-b=0,y(x))
```

, could not solve

dsolve(diff(diff(diff(diff(diff(y(x),x),x),x),x),x)-a*x*y(x)-b=0,y(x))

2.1582 ODE No. 1582

$$a\nu x^{\nu-1}y(x) + ax^{\nu}y'(x) + y^{(5)}(x) = 0$$

✓ **Mathematica** : cpu = 10.1102 (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]
```

$$\left\{\left\{y(x)\to c_5\left(\frac{4}{\nu}+1\right)^{-\frac{16}{\nu+4}}\nu^{-\frac{16}{\nu+4}}a^{\frac{4}{\nu+4}}(x^{\nu})^{\frac{4\left(\frac{4}{\nu}+1\right)}{\nu+4}}\ {}_1F_4\left(\frac{4}{\nu\left(1+\frac{4}{\nu}\right)}+\frac{1}{1+\frac{4}{\nu}};1+\frac{1}{\left(1+\frac{4}{\nu}\right)\nu},1+\frac{2}{\left(1+\frac{4}{\nu}\right)\nu},1+\frac{}{(1}\right.\right.\right.$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(diff(diff(y(x),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

$$y(x) = \mathrm{DESol}\left(\left\{\frac{d^5}{dx^5}\_Y(x) + a\,x^{\nu}\left(\frac{d}{dx}\_Y(x)\right) + a\nu\,x^{\nu-1}\_Y(x)\right\},\{\_Y(x)\}\right)$$

2.1583 ODE No. 1583

$$ay^{(4)}(x) - f(x) + y^{(5)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0691324 (sec), leaf count = 92

```
DSolve[-f[x] + a*Derivative[4][y][x] + Derivative[5][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \int_1^x \int_1^{K[5]} \int_1^{K[4]} \int_1^{K[3]} \left(e^{-aK[2]}c_1 + e^{-aK[2]} \int_1^{K[2]} e^{aK[1]} f(K[1])dK[1]\right) dK[2]dK[3]dK[4]dK[5] + c_5\right.\right.$$

✓ **Maple** : cpu = 0.052 (sec), leaf count = 40

```
dsolve(diff(diff(diff(diff(diff(y(x),x),x),x),x),x)+a*diff(diff(diff(diff(y(x),x),x),x),x)-f
```

$$y(x) = \frac{f\,x^4}{24a} + \frac{c_3x^2}{2} + \frac{c_2x^3}{6} + \frac{c_1\mathrm{e}^{-ax}}{a^4} + c_4x + c_5$$

2.1584 ODE No. 1584

$$a x y(x)-5 m y^{(4)}(x)+x y^{(5)}(x)=0$$

✓ **Mathematica** : cpu = 1.32139 (sec), leaf count = 216

```
DSolve[a*x*y[x] - 5*m*Derivative[4][y][x] + x*Derivative[5][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_5 5^{-5m-4} a^{\frac{1}{5}(5m+4)} x^{5m+4}\,{}_0F_4\left(;m+\frac{6}{5},m+\frac{7}{5},m+\frac{8}{5},m+\frac{9}{5};-\frac{a x^5}{3125}\right)+\frac{1}{125} a^{3/5} c_4 x^3\,{}_0F_4\left(;\frac{6}{5},\frac{7}{5},\frac{8}{5},\right.\right.\right.$$

✓ **Maple** : cpu = 0.151 (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),
```

$$y(x)=c_1\operatorname{hypergeom}\left([\,],\left[\frac{2}{5},\frac{3}{5},\frac{4}{5},\frac{1}{5}-m\right],-\frac{x^5 a}{3125}\right)+c_2 x\operatorname{hypergeom}\left([\,],\left[\frac{3}{5},\frac{4}{5},\frac{6}{5},\frac{2}{5}-m\right],-\frac{x^5 a}{3125}\right)+c_3 x^2\operatorname{hyp}$$

2.1585 ODE No. 1585

$$xy(x)\left(ay'(x)+by''(x)+cy^{(3)}(x)+ey^{(4)}(x)\right)=0$$

✓ **Mathematica** : cpu = 30.1104 (sec), leaf count = 214

```
DSolve[x*y[x]*(a*Derivative[1][y][x] + b*Derivative[2][y][x] + c*Derivative[3][y][x] + e*Derivative[4
```

$$\left\{\{y(x)\to 0\},\left\{y(x)\to \frac{c_1 e^{x\text{Root}\left[\#1^3+\frac{\#1^2 c}{e}+\frac{\#1 b}{e}+\frac{a}{e}\&,1\right]}}{\text{Root}\left[\#1^3+\frac{\#1^2 c}{e}+\frac{\#1 b}{e}+\frac{a}{e}\&,1\right]}+\frac{c_2 e^{x\text{Root}\left[\#1^3+\frac{\#1^2 c}{e}+\frac{\#1 b}{e}+\frac{a}{e}\&,2\right]}}{\text{Root}\left[\#1^3+\frac{\#1^2 c}{e}+\frac{\#1 b}{e}+\frac{a}{e}\&,2\right]}+\frac{c_3 e^{x\text{Root}\left[\#\right.}}{\text{Root}\left[\#1^3+\right.}\right.\right.$$

✓ **Maple** : cpu = 0.057 (sec), leaf count = 675

```
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(d
```

$$y(x)=0$$

2.1586 ODE No. 1586

$-y^{(4)}(x)(x(aA(5)-A(4))+A(5))-y^{(3)}(x)(x(aA(4)-A(3))+A(4))-(x(aA(3)-A(2))+A(3))y''(x)-(x(aA(2)-A($

✗ **Mathematica** : cpu = 82.0206 (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] + x*(-A[2
```

, 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+
```

, result contains DESol or ODESolStruc

$$y(x) = \int \mathrm{DESol}\left(\left\{-\frac{(axA_2 - xA_1 + A_2)\_Y(x)}{x} - \frac{(axA_3 - xA_2 + A_3)\left(\frac{d}{dx}\_Y(x)\right)}{x} - \frac{(axA_4 - xA_3 + A_4)\left(\frac{d^2}{dx^2}\right.}{x}\right.\right.$$

2.1587 ODE No. 1587

$$x^5y^{(10)}(x) - ay(x) = 0$$

✓ **Mathematica** : cpu = 0.163447 (sec), leaf count = 492

```
DSolve[-(a*y[x]) + x^5*Derivative[10][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{(-1)^{4/5}a^{9/5}c_1x^9\,{}_0F_9\left(;\frac{6}{5},\frac{7}{5},\frac{8}{5},\frac{9}{5},2,\frac{11}{5},\frac{12}{5},\frac{13}{5},\frac{14}{5};\frac{ax^5}{9765625}\right)}{3814697265625} + \frac{(-1)^{3/5}a^{8/5}c_3x^8\,{}_0F_9\left(;\frac{4}{5},\frac{6}{5},\frac{7}{5},\frac{8}{5},\frac{9}{5},2,\frac{11}{5},\right.}{152587890625}\right.\right.$$

✓ **Maple** : cpu = 0.434 (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)
```

$$y(x) = x^{\frac{5}{2}}\left(c_2\operatorname{BesselY}\left(5, 2ia^{\frac{1}{10}}\sqrt{x}\right) + c_7\operatorname{BesselY}\left(5, 2(-1)^{\frac{1}{10}}a^{\frac{1}{10}}\sqrt{x}\right) + c_9\operatorname{BesselY}\left(5, 2(-1)^{\frac{7}{10}}a^{\frac{1}{10}}\sqrt{x}\right) + c_3\operatorname{Bes}\right.$$

2.1588 ODE No. 1588

$$x^{10}y^{(5)}(x) - ay(x) = 0$$

✓ **Mathematica** : cpu = 6.41874 (sec), leaf count = 114

```
DSolve[-(a*y[x]) + x^10*Derivative[5][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1x^4e^{-\frac{\sqrt[5]{a}}{x}}+c_2x^4e^{\frac{\sqrt[5]{-1}\sqrt[5]{a}}{x}}+c_3x^4e^{-\frac{(-1)^{2/5}\sqrt[5]{a}}{x}}+c_4x^4e^{\frac{(-1)^{3/5}\sqrt[5]{a}}{x}}+c_5x^4e^{-\frac{(-1)^{4/5}\sqrt[5]{a}}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.087 (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))
```

$$y(x) = c_1 \operatorname{hypergeom}\left([], \left[\frac{6}{5}, \frac{7}{5}, \frac{8}{5}, \frac{9}{5}\right], -\frac{a}{3125x^5}\right) + c_2 x \operatorname{hypergeom}\left([], \left[\frac{4}{5}, \frac{6}{5}, \frac{7}{5}, \frac{8}{5}\right], -\frac{a}{3125x^5}\right) + c_3 x^2 \operatorname{hypergeo}$$

2.1589 ODE No. 1589

$$x^{11/2}y^{(11)}(x) - ay(x) = 0$$

✓ **Mathematica** : cpu = 0.0240881 (sec), leaf count = 670

```
DSolve[-(a*y[x]) + x^(11/2)*Derivative[11][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{4}{121}(-1)^{2/11}a^{2/11}c_2 x\, {}_0F_{10}\left(;-\frac{7}{11},-\frac{5}{11},-\frac{3}{11},-\frac{1}{11},\frac{1}{11},\frac{3}{11},\frac{5}{11},\frac{7}{11},\frac{9}{11},\frac{13}{11};\frac{2048ax^{11/2}}{285311670611}\right) - \frac{10485'}{}\right.\right.$$

✓ **Maple** : cpu = 25.329 (sec), leaf count = 4039

```
dsolve(x^(11/2)*diff(diff(diff(diff(diff(diff(diff(diff(diff(diff(diff(y(x),x),x),x),x),x),x
```

Expression too large to display

2.1590 ODE No. 1590

$$(x-a)^5(x-b)^5y^{(5)}(x)-cy(x)=0$$

✓ **Mathematica** : cpu = 270.626 (sec), leaf count = 331

```
DSolve[-(c*y[x]) + (-a + x)^5*(-b + x)^5*Derivative[5][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_1(x-b)^4\left(\frac{x-a}{x-b}\right)^{\text{Root}\left[-\#1^5+10\#1^4-35\#1^3+50\#1^2-24\#1+\frac{c}{(a-b)^5}\&,1\right]}+c_2(x-b)^4\left(\frac{x-a}{x-b}\right)^{\text{Root}\left[-\#1^5+10\right.}\right.\right.$$

✗ **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)-y(x)*c=0,y(x))
```

, result contains DESol or ODESolStruc

Expression too large to display

2.1591 ODE No. 1591

$$y''(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0265573 (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 = 0.02 (sec), leaf count = 12

```
dsolve(diff(diff(y(x),x),x)-y(x)^2=0,y(x))
```

$$y(x) = 6\,\mathrm{WeierstrassP}\left(x+c_1,0,c_2\right)$$

2.1592 ODE No. 1592

$$y''(x) - 6y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0304762 (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 = 0.021 (sec), leaf count = 10

```
dsolve(diff(diff(y(x),x),x)-6*y(x)^2=0,y(x))
```

$$y(x) = \text{WeierstrassP}\left(x + c_1, 0, c_2\right)$$

2.1593 ODE No. 1593

$$y''(x) - 6y(x)^2 - x = 0$$

✗ **Mathematica** : cpu = 16.8813 (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))

2.1594 ODE No. 1594

$$y''(x) - 6y(x)^2 + 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.288786 (sec), leaf count = 373

```
DSolve[4*y[x] - 6*y[x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{4\left(\text{Root}\left[4\#1^3-4\#1^2+c_1\&,2\right]-\text{Root}\left[4\#1^3-4\#1^2+c_1\&,3\right]\right)\left(y(x)-\text{Root}\left[4\#1^3-4\#1^2+c_1\&,1\right]\right)\left(\right.}{\left(4y(x)^3-4y(x)^2+c_1\right)\left(\text{Root}\left[4\right.\right.}\right.$$

✓ **Maple** : cpu = 0.077 (sec), leaf count = 59

```
dsolve(diff(diff(y(x),x),x)-6*y(x)^2+4*y(x)=0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{4\_a^3 - 4\_a^2 + c_1}} d\_a - x - c_2 = 0$$

2.1595 ODE No. 1595

$$ay(x)^2 + bx + c + y''(x) = 0$$

✗ **Mathematica** : cpu = 20.0942 (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))

2.1596 ODE No. 1596

$$a+y''(x)-2y(x)^3-xy(x)=0$$

✗ **Mathematica** : cpu = 20.3906 (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))

2.1597 ODE No. 1597

$$y''(x) - ay(x)^3 = 0$$

✓ **Mathematica** : cpu = 1.18671 (sec), leaf count = 242

```
DSolve[-(a*y[x]^3) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt[4]{2}\sqrt{c_1}\sqrt{\frac{i\sqrt{a}}{\sqrt{c_1}}}\operatorname{sn}\left(\frac{(-1)^{3/4}\sqrt{\sqrt{2}\sqrt{a}\sqrt{c_1}x^2+2\sqrt{2}\sqrt{a}\sqrt{c_1}c_2x+\sqrt{2}\sqrt{a}\sqrt{c_1}c_2{}^2}}{\sqrt{2}}\middle| -1\right)}{\sqrt{a}}\right\},\left\{y(x)\to \frac{\sqrt[4]{2}\sqrt{c_1}\sqrt{\frac{i\sqrt{a}}{\sqrt{c_1}}}\operatorname{sn}\left(\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x)-a*y(x)^3=0,y(x))
```

$$y(x) = c_2 \operatorname{JacobiSN}\left(\left(\frac{\sqrt{-2a}\,x}{2} + c_1\right)c_2, i\right)$$

2.1598 ODE No. 1598

$$-2a^2y(x)^3 + 2abxy(x) - b + y''(x) = 0$$

✗ **Mathematica** : cpu = 21.239 (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))
```

2.1599 ODE No. 1599

$$ay(x)^3 + bxy(x) + cy(x) + d + y''(x) = 0$$

✗ **Mathematica** : cpu = 20.4552 (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)+y(x)*c+a*y(x)^3=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+d+b*x*y(x)+y(x)*c+a*y(x)^3=0,y(x))
```

2.1600 ODE No. 1600

$$ay(x)^3 + by(x)^2 + cy(x) + d + y''(x) = 0$$

✓ **Mathematica** : cpu = 1.32024 (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]
```

$$\text{Solve}\left[\frac{4\,\text{EllipticF}\left(\arcsin\left(\sqrt{\frac{(\text{Root}[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,2]-\text{Root}[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,4])(y(x)-}{(\text{Root}[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,1]-\text{Root}[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,4])(y(x)-}}\right.\right.}{}\right.$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 89

```
dsolve(diff(diff(y(x),x),x)+d+b*y(x)^2+y(x)*c+a*y(x)^3=0,y(x))
```

$$\int^{y(x)} -\frac{6}{\sqrt{-18a\_a^4 - 24b\_a^3 - 36\_a^2c - 72\_ad + 36c_1}} d\_a - x - c_2 = 0$$

2.1601 ODE No. 1601

$$a x^r y(x)^n + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.023567 (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

$$y(x) = \left(\_a\, e^{\int \_b(\_a) d\_a + c_1}\right) \&\text{where} \left[\left\{ \frac{d}{d\_a}\_b(\_a) = \frac{(\_a^n a\, n^2 - 2\_a^n a n + \_a r n + \_a\, r^2 + \_a^n a + 2\_a n + 3}{(r+2)^2}\right.\right.$$

2.1602 ODE No. 1602

$$(n+1)a^{2n}y(x)^{2n+1}+y''(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0885925 (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 = 0.185 (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))
```

$$\int^{y(x)}\frac{1}{\sqrt{-\_a^{2n+2}a^{2n}+\_a^2+c_1}}d\_a-x-c_2=0$$

2.1603 ODE No. 1603

$$y''(x) - \frac{1}{(ay(x)^2 + bxy(x) + cx^2 + dy(x) + ex + k)^{3/2}} = 0$$

✗ **Mathematica** : cpu = 0.615535 (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[x],x]
```

, 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] == 0,

✓ **Maple** : cpu = 28.97 (sec), leaf count = 7206

```
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

2.1604 ODE No. 1604

$$y''(x) - e^{y(x)} = 0$$

✓ **Mathematica** : cpu = 0.0337313 (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 = 0.341 (sec), leaf count = 23

```
dsolve(diff(diff(y(x),x),x)-exp(y(x))=0,y(x))
```

$$y(x) = \ln\left(\frac{\tan\left(\frac{c_2+x}{2c_1}\right)^2+1}{2c_1^2}\right)$$

2.1605 ODE No. 1605

$$a e^x \sqrt{y(x)} + y''(x) = 0$$

✗ **Mathematica** : cpu = 20.0963 (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

$$y(x) = \left(\_a\, e^{\int 2\_b(\_a) d\_a + 2c_1}\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = (\sqrt{\_a}\, a + 4\_a)\_b(\_a)^3 + 4\_b(\_a)^2\right\}, \left\{\_a = y(x)\, e^{-2}\right.\right.$$

2.1606 ODE No. 1606

$$y''(x) + e^x \sin(y(x)) = 0$$

✗ **Mathematica** : cpu = 20.5791 (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))

2.1607 ODE No. 1607

$$a\sin(y(x)) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0592654 (sec), leaf count = 79

```
DSolve[a*Sin[y[x]] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -2\,\text{JacobiAmplitude}\left(\frac{1}{2}\sqrt{(2a+c_1)(x+c_2)^2},\frac{4a}{2a+c_1}\right)\right\},\left\{y(x)\to 2\,\text{JacobiAmplitude}\left(\frac{1}{2}\sqrt{(2a+c\right.\right.\right.$$

✓ **Maple** : cpu = 0.102 (sec), leaf count = 49

```
dsolve(diff(diff(y(x),x),x)+a*sin(y(x))=0,y(x))
```

$$\int^{y(x)}\frac{1}{\sqrt{2a\cos(\_a)+c_1}}d\_a - x - c_2 = 0$$

2.1608 ODE No. 1608

$$a^2 \sin(y(x)) - b \sin(x) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.0270302 (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))

2.1609 ODE No. 1609

$$a^2 \sin(y(x)) - bf(x) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.0197765 (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))

2.1610 ODE No. 1610

$$y''(x) - \frac{h\left(\frac{y(x)}{\sqrt{x}}\right)}{x^{3/2}} = 0$$

✓ **Mathematica** : cpu = 3.43937 (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 = 0.228 (sec), leaf count = 92

```
dsolve(diff(diff(y(x),x),x)-1/x^(3/2)*h(y(x)/x^(1/2))=0,y(x))
```

$$y(x) = \text{RootOf}\left(\_Zx^{\frac{3}{2}} + 4h\left(\frac{\_Z}{\sqrt{x}}\right)x^2\right)$$

2.1611 ODE No. 1611

$$y''(x) - 3y'(x) - y(x)^2 - 2y(x) = 0$$

✗ **Mathematica** : cpu = 1.97174 (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

$$y(x) = \_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a) - 3\_b(\_a) - \_a^2 - 2\_a = 0\right\}, \left\{\_a = y(x), \_b(\_a) = \frac{d}{dx}y(x)\right\},\right.$$

2.1612 ODE No. 1612

$$y''(x) - 7y'(x) - y(x)^{3/2} + 12y(x) = 0$$

✗ **Mathematica** : cpu = 20.8269 (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

$$y(x) = \_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a) - 7\_b(\_a) - \_a^{\frac{3}{2}} + 12\_a = 0\right\}, \left\{\_a = y(x), \_b(\_a) = \frac{d}{dx}y(x)\right\}\right.$$

2.1613 ODE No. 1613

$$6a^2y(x) + 5ay'(x) + y''(x) - 6y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.870913 (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]
```

$$\left\{\left\{y(x)\to a^2{c_1}^2e^{-2ax}\wp\left(e^{-ax}c_1+c_2;0,-1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.032 (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))
```

$$y(x) = \mathrm{WeierstrassP}\left(-\frac{\mathrm{e}^{-ax}}{a}+c_1,0,c_2\right)\mathrm{e}^{-2ax}$$

2.1614 ODE No. 1614

$$2a^2y(x) + 3ay'(x) + y''(x) - 2y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.632086 (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]
```

$$\left\{\left\{y(x)\to -iac_1e^{-ax}\text{sn}\left(e^{-ax}c_1+c_2\middle|-1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.094 (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))
```

$$y(x) = c_2 \,\mathrm{JacobiSN}\left(\left(-\frac{\sqrt{-\mathrm{e}^{-2ax}}}{a}+c_1\right)c_2, i\right)\mathrm{e}^{-ax}$$

2.1615 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 = 46.7991 (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])/n + De
```

, could not solve

```
DSolve[(-2*(1 + n)*(2 + n)*y[x]*(-1 + y[x]^(n/(1 + n))))/n^2 - ((4 + 3*n)*Derivative[1][y][x
```

✗ **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

$$y(x)=\_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a)-\frac{2\_a^{\frac{n}{n+1}}\_a n^2+6\_a^{\frac{n}{n+1}}\_a n+3\_b(\_a)\,n^2-2\_a n^2+4\_a^{\frac{n}{n+1}}\_}{n^2}\right.\right.$$

2.1616 ODE No. 1616

$$\frac{1}{4}\left(a^2-1\right)y(x)+ay'(x)+by(x)^n+y''(x)=0$$

✗ **Mathematica** : cpu = 9.98885 (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],x]
```

, could not solve

DSolve[((-1 + a^2)*y[x])/4 + b*y[x]^n + a*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[

✗ **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

$$y(x)=\_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a)+a\_b(\_a)+b\_a^n+\frac{\_a\,a^2}{4}-\frac{\_a}{4}=0\right\},\left\{\_a=y(x),\_b(\_a)=\right.\right.$$

2.1617 ODE No. 1617

$$ay'(x) + bx^r y(x)^n + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.0254065 (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))
```

2.1618 ODE No. 1618

$$a y'(x) - 2a + b e^{y(x)} + y''(x) = 0$$

✗ **Mathematica** : cpu = 19.9828 (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

$$y(x) = \_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a) + a\_b(\_a) + b\,\mathrm{e}^{-a} - 2a = 0\right\}, \left\{\_a = y(x), \_b(\_a) = \frac{d}{dx}y(x)\right\}, \left\{\right.\right.$$

2.1619 ODE No. 1619

$$ay'(x) + f(x)\sin(y(x)) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.0327722 (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))
```

2.1620 ODE No. 1620

$$y''(x) + y(x)y'(x) - y(x)^3 = 0$$

✓ **Mathematica** : cpu = 20.301 (sec), leaf count = 492

```
DSolve[-y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[\int_1^{\#1} \frac{2}{\frac{e^{6c_1}K[1]^4}{\sqrt[3]{e^{18c_1}K[1]^6 - 2e^{12c_1} + 2\sqrt{e^{24c_1} - e^{30c_1}K[1]^6}}} - K[1]^2 + e^{-6c_1}\sqrt[3]{e^{18c_1}K[1]^6 - 2e^{12c_1} + 2}\right.\right.\right.$$

✓ **Maple** : cpu = 0.105 (sec), leaf count = 291

```
dsolve(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3=0,y(x))
```

$$\int^{y(x)} \frac{2}{\frac{\_a^4}{\left(\_a^6 + 2c_1 + 2\sqrt{\_a^6 c_1 + c_1^2}\right)^{\frac{1}{3}}} - \_a^2 + \left(\_a^6 + 2c_1 + 2\sqrt{\_a^6 c_1 + c_1^2}\right)^{\frac{1}{3}}} d\_a - x - c_2 = 0$$

2.1621 ODE No. 1621

$$ay(x) + y''(x) + y(x)y'(x) - y(x)^3 = 0$$

✓ **Mathematica** : cpu = 35.1245 (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]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}\frac{}{\frac{e^{6c_1}\left(a-K[1]^2\right)^2}{2\sqrt[3]{e^{18c_1}K[1]^6-3ae^{18c_1}K[1]^4+3a^2e^{18c_1}K[1]^2-2e^{12c_1}-a^3e^{18c_1}+2\sqrt{-e^{30c_1}K[1]^6+3ae^{30c_1}K[1]^4-}}}}\right.\right.\right.$$

✓ **Maple** : cpu = 2.214 (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))
```

$$\int^{y(x)}\frac{4\mathrm{RootOf}\left(\left(-4\_a^6+12a\_a^4-12\_a^2a^2+4a^3+320c_1\right)\_Z^9+\left(-189\_a^6+567a\_a^4-567\_a^2a^2+189a\right.\right.}{-63\_a^2+63a}$$

2.1622 ODE No. 1622

$$2a^2y(x) + (3a + y(x))y'(x) + ay(x)^2 + y''(x) - y(x)^3 = 0$$

✓ **Mathematica** : cpu = 22.3214 (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] == 0,y
```

$$\left\{\left\{y(x)\to \begin{cases} \frac{c_1\wp'(xc_1+c_2;0,1)}{\wp(xc_1+c_2;0,1)} & a=0 \\ -\frac{e^{-ax}c_1\wp'\left(\frac{e^{-ax}c_1}{a}+c_2;0,1\right)}{\wp\left(\frac{e^{-ax}c_1}{a}+c_2;0,1\right)} & \text{True} \end{cases}\right\}\right\}$$

✓ **Maple** : cpu = 0.473 (sec), leaf count = 416

```
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))
```

$$y(x) = \operatorname{RootOf}\left(\left(\left(\int^{\_Z} -\frac{-\_f^3 + c_1\_f^2 - \left(\left(-\_f^6+c_1\right)^2\left(\sqrt{\frac{c_1}{-\_f^6+c_1}}-1\right)\right)^{\frac{2}{3}}}{\left(-\_f^6+c_1\right)\left(\left(-\_f^6+c_1\right)^2\left(\sqrt{\frac{c_1}{-\_f^6+c_1}}-1\right)\right)^{\frac{1}{3}}}d\_f\right)a + c_2a + e^{-ax}\right)e^{-ax}$$

2.1623 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 = 0.127142 (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])*Derivative[1][y
```

, 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])*Deriva
```

✗ **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(x),x)
```

2.1624 ODE No. 1624

$$y(x)\left(af(x)^2-\frac{f''(x)}{f(x)}+3f'(x)+\frac{3f'(x)^2}{f(x)^2}\right)+bf(x)^3-\left(\frac{f'(x)}{f(x)}+f(x)\right)(3y'(x)+y(x)^2)+y''(x)+y(x)y'(x)-y(x)^3$$

✗ **Mathematica** : cpu = 0.422056 (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]^2 + 3*D
```

, 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])*(y[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

$$y(x)=\left(f\left(\mathrm{RootOf}\left(\int \_b(\_a)\,d\_a+c_1-\left(\int^{\_Z} f(\_f)\,d\_f\right)\right)\right)\_a\right)\&\mathrm{where}\left[\left\{\frac{d}{d\_a}\_b(\_a)=(-\_a^3-\_a^2\right.\right.$$

2.1625 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 = 0.50221 (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[x]))*De
```

, could not solve

```
DSolve[-y[x]^3 - (y[x]^2*Derivative[1][f][x])/(2*f[x]) + (y[x] - (3*Derivative[1][f][x])/(2*
```

✗ **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
diff(diff(f(x),x),x))/f(x)*y(x)=0,y(x))
```

2.1626 ODE No. 1626

$$y(x)f'(x) + f(x)y'(x) + y''(x) + 2y(x)y'(x) = 0$$

✗ **Mathematica** : cpu = 23.5279 (sec), leaf count = 0

```
DSolve[y[x]*Derivative[1][f][x] + f[x]*Derivative[1][y][x] + 2*y[x]*Derivative[1][y][x] + Derivative[
```

, could not solve

```
DSolve[y[x]*Derivative[1][f][x] + f[x]*Derivative[1][y][x] + 2*y[x]*Derivative[1][y][x] + De
```

✗ **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

$$y(x) = \_b(\_a)\ \&\text{where} \left[\left\{ \frac{d}{d\_a}\_b(\_a) = -f(\_a)\_b(\_a) - \_b(\_a)^2 - c_1 \right\}, \{\_a = x, \_b(\_a) = y(x)\}, \{x = \_a$$

2.1627 ODE No. 1627

$$f(x)\left(y'(x)+y(x)^2\right)-g(x)+y''(x)+2y(x)y'(x)=0$$

✗ **Mathematica** : cpu = 0.108805 (sec), leaf count = 0

```
DSolve[-g[x] + 2*y[x]*Derivative[1][y][x] + f[x]*(y[x]^2 + Derivative[1][y][x]) + Derivative[2][y][x]
```

, could not solve

DSolve[-g[x] + 2*y[x]*Derivative[1][y][x] + f[x]*(y[x]^2 + Derivative[1][y][x]) + Derivative

✗ **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

$$y(x)=\_b(\_a)\ \&\text{where}\left[\left\{\_b(\_a)^2\,\mathrm{e}^{\int f(\_a)d\_a}+\mathrm{e}^{\int f(\_a)d\_a}\left(\frac{d}{d\_a}\_b(\_a)\right)-\left(\int g(\_a)\,\mathrm{e}^{\int f(\_a)d\_a}d\_a\right)+c_1=\right.\right.$$

2.1628 ODE No. 1628

$$f(x)y(x) - g(x) + y''(x) + 3y(x)y'(x) + y(x)^3 = 0$$

✗ **Mathematica** : cpu = 1.38654 (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],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] == 0, y

✗ **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

$$y(x) = \frac{\frac{d}{dx}\,\mathrm{DESol}\left(\left\{-g(x)\_Y(x) + f(x)\left(\frac{d}{dx}\_Y(x)\right) + \frac{d^3}{dx^3}\_Y(x)\right\}, \{\_Y(x)\}\right)}{\mathrm{DESol}\left(\left\{-g(x)\_Y(x) + f(x)\left(\frac{d}{dx}\_Y(x)\right) + \frac{d^3}{dx^3}\_Y(x)\right\}, \{\_Y(x)\}\right)}$$

2.1629 ODE No. 1629

$$(f(x)+3y(x))y'(x)+f(x)y(x)^2+y''(x)+y(x)^3=0$$

✓ **Mathematica** : cpu = 0.0372981 (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,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{\int_1^x \exp\left(-\int_1^{K[2]} f(K[1])dK[1]\right) c_1 dK[2]+c_2}{\int_1^x \int_1^{K[5]} \exp\left(-\int_1^{K[4]} f(K[3])dK[3]\right) c_1 dK[4]dK[5]+c_2 x+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (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))
```

$$y(x)=\frac{\int c_1 \mathrm{e}^{-\left(\int f(x)dx\right)}dx+c_2}{\int\int c_1 \mathrm{e}^{-\left(\int f(x)dx\right)}dxdx+c_2 x+1}$$

2.1630 ODE No. 1630

$$-4a^2y(x) - 3ay(x)^2 - b + y''(x) - 3y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 4.43161 (sec), leaf count = 3223

```
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[x],x]
```

$$\left\{\left\{y(x)\to -\frac{2\left(-(-1)^{\frac{a^{3/2}\sqrt{4a^3-3b}-2a^3}{4a^3}}2^{-\frac{3\left(a^{3/2}\sqrt{4a^3-3b}-2a^3\right)}{4a^3}+\frac{3\sqrt{4a^6-3a^3b}}{4a^3}+1}3^{\frac{a^{3/2}\sqrt{4a^3-3b}-2a^3}{4a^3}-\frac{\sqrt{4a^6-3a^3b}}{4a^3}}a^{-\frac{a^{3/2}\sqrt{4a^3-3b}-2a^3}{2a^3}}\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.553 (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))
```

$$\int^{y(x)} -\frac{}{-12\_a a^3 - 9\_a^2 a^2 + \mathrm{RootOf}\left(2\,\mathrm{BesselK}\left(\frac{4a^3-3b}{2a\sqrt{4a^4-3ab}}, -\frac{\_Z}{2a^2}\right)c_1 a^2 + 3\,\mathrm{BesselK}\left(\frac{4a^3-3b}{2a\sqrt{4a^4-3ab}}, -\frac{\_Z}{2a^2}\right)c_1 a\_\right.}$$

2.1631 ODE No. 1631

$$-(f(x)+3y(x))y'(x)+f(x)y(x)^2+y''(x)+y(x)^3=0$$

✓ **Mathematica** : cpu = 0.0401602 (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,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{-\int_1^x \exp\left(\int_1^{K[2]} f(K[1])dK[1]\right) c_1 dK[2]-c_2}{\int_1^x \int_1^{K[5]} \exp\left(\int_1^{K[4]} f(K[3])dK[3]\right) c_1 dK[4]dK[5]+c_2 x+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.069 (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))
```

$$y(x)=\frac{-\left(\int c_1 e^{\int f(x)dx}dx\right)-c_2}{\int\int c_1 e^{\int f(x)dx}dxdx+c_2 x+1}$$

2.1632 ODE No. 1632

$$y''(x) - 2ay(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0411041 (sec), leaf count = 46

```
DSolve[-2*a*y[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{\sqrt{c_1}\tan\left(\sqrt{a}\sqrt{c_1}x + \sqrt{a}\sqrt{c_1}c_2\right)}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.1 (sec), leaf count = 23

```
dsolve(diff(diff(y(x),x),x)-2*a*y(x)*diff(y(x),x)=0,y(x))
```

$$y(x) = \frac{\tan\left(\sqrt{c_1 a}\,(c_2 + x)\right)\sqrt{c_1 a}}{a}$$

2.1633 ODE No. 1633

$$ay(x)y'(x) + by(x)^3 + y''(x) = 0$$

✓ **Mathematica** : cpu = 28.4848 (sec), leaf count = 92

```
DSolve[b*y[x]^3 + a*y[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)} \frac{1}{K[2]^2\text{InverseFunction}\left[\frac{1}{4}\left(\log(b+\#1(a+2\#1)) - \frac{2a\arctan\left(\frac{a+4\#1}{\sqrt{8b-a^2}}\right)}{\sqrt{8b-a^2}}\right)\&\right][c_1 - \log(K[2])]} dK[2] =\right.$$

✓ **Maple** : cpu = 0.353 (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))
```

$$\int^{y(x)} \frac{1}{\text{RootOf}\left(-2a\_a^2\operatorname{arctanh}\left(\frac{a\_a^2+4\_Z}{\sqrt{\_a^4(a^2-8b)}}\right) - \ln\left(\_a^4b + \_Z\_a^2a + 2\_Z^2\right)\sqrt{\_a^4\left(a^2-8b\right)} + c_1\sqrt{\_a^4\left(a^2 -\right.}}$$

2.1634 ODE No. 1634

$$y'(x)h(x,y(x)) + j(x,y(x)) + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.110285 (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))

2.1635 ODE No. 1635

$$ay'(x)^2 + by(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.468007 (sec), leaf count = 104

```
DSolve[b*y[x] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}-\frac{\sqrt{2}a}{\sqrt{2e^{-2aK[1]}c_1a^2-2bK[1]a+b}}dK[1]\&\right][x+c_2]\right\},\left\{y(x)\to \text{InverseFunctio}\right.\right.$$

✓ **Maple** : cpu = 0.2 (sec), leaf count = 79

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)^2+b*y(x)=0,y(x))
```

$$\int^{y(x)}-\frac{2a}{\sqrt{4\,\mathrm{e}^{-2\_aa}c_1a^2-4\_aab+2b}}d\_a-x-c_2=0$$

2.1636 ODE No. 1636

$$ay'(x)\left|y'(x)\right| + by'(x) + cy(x) + y''(x) = 0$$

✗ **Mathematica** : cpu = 3.67347 (sec), leaf count = 0

```
DSolve[c*y[x] + b*Derivative[1][y][x] + a*Abs[Derivative[1][y][x]]*Derivative[1][y][x] + Derivative[2
```

, could not solve

```
DSolve[c*y[x] + b*Derivative[1][y][x] + a*Abs[Derivative[1][y][x]]*Derivative[1][y][x] + Der
```

✗ **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)+y(x)*c=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a) + a\_b(\_a)\left|\_b(\_a)\right| + \_b(\_a)\,b + c\_a = 0\right\}, \left\{\_a = y(x)\,, \_b(\_a)\right.\right.$$

2.1637 ODE No. 1637

$$a y'(x)^2 + b y'(x) + c y(x) + y''(x) = 0$$

✗ **Mathematica** : cpu = 9.93054 (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[x],x]
```

, could not solve

DSolve[c*y[x] + b*Derivative[1][y][x] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0,

✗ **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)+y(x)*c=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a) + a\_b(\_a)^2 + \_b(\_a)\, b + c\_a = 0\right\}, \left\{\_a = y(x), \_b(\_a) = \frac{d}{dx}y(\right.\right.$$

2.1638 ODE No. 1638

$$a y'(x)^2 + b \sin(y(x)) + y''(x) = 0$$

✓ **Mathematica** : cpu = 3.54773 (sec), leaf count = 146

```
DSolve[b*Sin[y[x]] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1} -\frac{\sqrt{4a^2+1}}{\sqrt{4e^{-2aK[1]}c_1a^2-4b\sin(K[1])a+e^{-2aK[1]}c_1+2b\cos(K[1])}}dK[1]\&\right]\left[x+c_2\right.\right.\right.$$

✓ **Maple** : cpu = 0.257 (sec), leaf count = 115

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)^2+b*sin(y(x))=0,y(x))
```

$$\int^{y(x)} \frac{4a^2+1}{\sqrt{16\left(a^2+\frac{1}{4}\right)^2 c_1 \mathrm{e}^{-2\_aa} - 16b\left(a\sin\left(\_a\right)-\frac{\cos(\_a)}{2}\right)\left(a^2+\frac{1}{4}\right)}} d\_a - x - c_2 = 0$$

2.1639 ODE No. 1639

$$ay'(x)\left|y'(x)\right| + b\sin(y(x)) + y''(x) = 0$$

✗ **Mathematica** : cpu = 33.7882 (sec), leaf count = 0

```
DSolve[b*Sin[y[x]] + a*Abs[Derivative[1][y][x]]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x
```

, could not solve

```
DSolve[b*Sin[y[x]] + a*Abs[Derivative[1][y][x]]*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)*abs(diff(y(x),x))+b*sin(y(x))=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a) + a\_b(\_a)\left|\_b(\_a)\right| + b\sin\left(\_a\right) = 0\right\}, \left\{\_a = y(x), \_b(\_a) = \frac{d}{dx}\right.\right.$$

2.1640 ODE No. 1640

$$ay(x)y'(x)^2 + by(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.53509 (sec), leaf count = 96

```
DSolve[b*y[x] + a*y[x]*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1} -\frac{\sqrt{a}}{\sqrt{e^{2ac_1-aK[1]^2}-b}}dK[1]\&\right][x+c_2]\right\},\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1} \frac{}{\sqrt{e^{2a}}}\right.\right.$$

✓ **Maple** : cpu = 0.252 (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))
```

$$\int^{y(x)} \frac{a}{\sqrt{a\left(\mathrm{e}^{-a\_a^2}c_1a - b\right)}}d\_a - x - c_2 = 0$$

2.1641 ODE No. 1641

$$g(x)y'(x) + h(y(x))y'(x)^2 + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0312333 (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[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}\exp\left(-\int_1^{K[4]}-h(K[1])dK[1]\right)dK[4]\&\right]\left[\int_1^{x}-\exp\left(-\int_1^{K[5]}g(K[2])dK[2]\right)\right.\right.\right.$$

✓ **Maple** : cpu = 0.036 (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))
```

$$\int^{y(x)} \mathrm{e}^{\int h(\_b)d\_b}d\_b - c_1\left(\int \mathrm{e}^{-\left(\int g(x)dx\right)}dx\right) - c_2 = 0$$

2.1642 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 = 0.309884 (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]] + Derivative
```

, 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]] + D
```

✗ **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,
```

, 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))=0,
```

2.1643 ODE No. 1643

$$f(x)y'(x) + g(x)j(y(x)) + h(y(x))y'(x)^2 + y''(x) = 0$$

✗ **Mathematica** : cpu = 0.203707 (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][y][x]
```

, could not solve

```
DSolve[g[x]*j[y[x]] + f[x]*Derivative[1][y][x] + h[y[x]]*Derivative[1][y][x]^2 + Derivative[
```

✗ **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)*j(y
```

2.1644 ODE No. 1644

$$h(y(x))y'(x)^2 + j(y(x))y'(x) + k(y(x)) + y''(x) = 0$$

✗ **Mathematica** : cpu = 32.5507 (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][y][x] ==
```

, could not solve

DSolve[k[y[x]] + j[y[x]]*Derivative[1][y][x] + h[y[x]]*Derivative[1][y][x]^2 + Derivative[2]

✗ **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

$$y(x) = \_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a) + h(\_a)\_b(\_a)^2 + j(\_a)\_b(\_a) + k(\_a) = 0\right\}, \left\{\_a = y(x), \_b(\right.\right.$$

2.1645 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 = 0.040967 (sec), leaf count = 0

```
DSolve[(j[x, y[x]] + h[x, y[x]]*Derivative[1][y][x])*(1 + Derivative[1][y][x]^2) + Derivative[2][y][x
```

, could not solve

```
DSolve[(j[x, y[x]] + h[x, y[x]]*Derivative[1][y][x])*(1 + Derivative[1][y][x]^2) + Derivativ
```

✗ **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))
```

2.1646 ODE No. 1646

$$a y(x) \left(y'(x)^2+1\right)^2+y''(x)=0$$

✓ **Mathematica** : cpu = 7.56216 (sec), leaf count = 262

```
DSolve[a*y[x]*(1 + Derivative[1][y][x]^2)^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt{\frac{\#1^2(-a)+1+2c_1}{1+2c_1}}\sqrt{2\#1^2a-4c_1}E\left(\arcsin\left(\sqrt{\frac{a}{2c_1+1}}\#1\right)|1+\frac{1}{2c_1}\right)}{\sqrt{\frac{a}{1+2c_1}}\sqrt{\#1^2(-a)+1+2c_1}\sqrt{2-\frac{\#1^2a}{c_1}}}\&\right][x+c_2]\right\},\left\{\right.\right.$$

✓ **Maple** : cpu = 0.171 (sec), leaf count = 94

```
dsolve(diff(diff(y(x),x),x)+a*y(x)*(diff(y(x),x)^2+1)^2=0,y(x))
```

$$\int^{y(x)}\frac{a\left(\_a^2+2c_1\right)}{\sqrt{-a\left(\_a^2+2c_1\right)\left(-1+a\left(\_a^2+2c_1\right)\right)}}d\_a-x-c_2=0$$

2.1647 ODE No. 1647

$$y''(x) - a(xy'(x) - y(x))^r = 0$$

✓ **Mathematica** : cpu = 0.380774 (sec), leaf count = 60

```
DSolve[-(a*(-y[x] + x*Derivative[1][y][x])^r) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to x\left(\int_1^x\left(\frac{1}{2}aK[2]^{2r}-\frac{1}{2}arK[2]^{2r}+c_1K[2]^{2r-2}\right)^{\frac{1}{1-r}}dK[2]+c_2\right)\right\}\right\}$$

✓ **Maple** : cpu = 4.752 (sec), leaf count = 60

```
dsolve(diff(diff(y(x),x),x)-a*(x*diff(y(x),x)-y(x))^r=0,y(x))
```

$$y(x)=\left(\int-\frac{2^{\frac{r}{r-1}}\left((r-1)\,a\,x^2-c_1\right)\left(-\frac{1}{(r-1)a\,x^2-c_1}\right)^{\frac{r}{r-1}}}{2x^2}dx+c_2\right)x$$

2.1648 ODE No. 1648

$$y''(x) - kx^a y(x)^b y'(x)^c = 0$$

✗ **Mathematica** : cpu = 0.0404588 (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

$$y(x) = \left(\_a\, e^{\int \_b(\_a)d\_a + c_1}\right) \&\text{where} \left[\left\{ \frac{d}{d\_a}\_b(\_a) = -\frac{\left(\_a^b \left(-\frac{(\_b(\_a)\_a+1)(a-c+2)}{\_b(\_a)(b+c-1)}\right)^c b^2 k + 2\_a^b \left(-\frac{(\_b(\_a)\_a+}{\_b(\_a)(b}\right.\right.}{}\right.\right.$$

2.1649 ODE No. 1649

$$h(x, y(x))\left(y'(x) - \frac{y(x)}{x}\right)^a + y''(x) = 0$$

✗ **Mathematica** : cpu = 3.64648 (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], 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))

2.1650 ODE No. 1650

$$y''(x) - a\sqrt{y'(x)^2 + 1} = 0$$

✓ **Mathematica** : cpu = 0.118697 (sec), leaf count = 36

```
DSolve[-(a*Sqrt[1 + Derivative[1][y][x]^2]) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{e^{ax+c_1}\left(1+e^{-2ax-2c_1}\right)}{2a}+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.758 (sec), leaf count = 16

```
dsolve(diff(diff(y(x),x),x)-a*(diff(y(x),x)^2+1)^(1/2)=0,y(x))
```

$$y(x) = c_2 + \frac{\cosh\left(a(x+c_1)\right)}{a}$$

2.1651 ODE No. 1651

$$a\left(-\sqrt{y'(x)^2+1}\right)-b+y''(x)=0$$

✓ **Mathematica** : cpu = 0.381115 (sec), leaf count = 972

```
DSolve[-b - a*Sqrt[1 + Derivative[1][y][x]^2] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2-\frac{-\frac{2a\text{InverseFunction}\left[\frac{\frac{2b\arctan\left(\frac{b+a\left(\sqrt{\#1^2+1}-\#1\right)}{\sqrt{a^2-b^2}}\right)}{\sqrt{a^2-b^2}}-\log\left(\sqrt{\#1^2+1}-\#1\right)}{a}\&\right][x+c_1]^2}{\sqrt{\text{InverseFunction}\left[\frac{\frac{2b\arctan\left(\frac{b+a\left(\sqrt{\#1^2+1}-\#1\right)}{\sqrt{a^2-b^2}}\right)}{\sqrt{a^2-b^2}}-\log\left(\sqrt{\#1^2+1}-\#1\right)}{a}\&\right][x+c_1]^2+1}}+b\log\left(\text{InverseFunction}\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.154 (sec), leaf count = 31

```
dsolve(diff(diff(y(x),x),x)-a*(diff(y(x),x)^2+1)^(1/2)-b=0,y(x))
```

$$y(x)=\int \operatorname{RootOf}\left(x-\left(\int^{\_Z}\frac{1}{a\sqrt{\_f^2+1}+b}d\_f\right)+c_1\right)dx+c_2$$

2.1652 ODE No. 1652

$$y''(x) - a\sqrt{by(x)^2 + y'(x)^2} = 0$$

✓ **Mathematica** : cpu = 0.334309 (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 = 0.992 (sec), leaf count = 33

```
dsolve(diff(diff(y(x),x),x)-a*(b*y(x)^2+diff(y(x),x)^2)^(1/2)=0,y(x))
```

$$y(x) = e^{\int \text{RootOf}\left(x + \int^{\_Z} \frac{1}{\_f^2 - a\sqrt{\_f^2+b}} d\_f + c_1\right) dx + c_2}$$

2.1653 ODE No. 1653

$$y''(x) - a\left(y'(x)^2 + 1\right)^{3/2} = 0$$

✓ **Mathematica** : cpu = 0.127343 (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 = 0.191 (sec), leaf count = 41

```
dsolve(diff(diff(y(x),x),x)-a*(diff(y(x),x)^2+1)^(3/2)=0,y(x))
```

$$y(x) = \frac{\left(-1 + (x + c_1)^2 a^2\right)\sqrt{-\frac{1}{-1+(x+c_1)^2 a^2}} + c_2 a}{a}$$

2.1654 ODE No. 1654

$$y''(x) - 2ax\left(y'(x)^2 + 1\right)^{3/2} = 0$$

✓ **Mathematica** : cpu = 0.273445 (sec), leaf count = 308

```
DSolve[-2*a*x*(1 + Derivative[1][y][x]^2)^(3/2) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2 - \frac{\sqrt{\frac{ax^2-1+c_1}{-1+c_1}}\sqrt{\frac{ax^2+1+c_1}{1+c_1}}\left(\text{EllipticF}\left(i\text{arcsinh}\left(x\sqrt{\frac{a}{c_1+1}}\right), \frac{c_1+1}{c_1-1}\right) + (-1+c_1)E\left(i\text{arcsinh}\left(x\sqrt{\frac{a}{c_1+1}}\right)\right.\right.}{\sqrt{\frac{a}{1+c_1}}\sqrt{a^2x^4 + 2ac_1x^2 - 1 + c_1{}^2}}\right.\right.$$

✓ **Maple** : cpu = 0.207 (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))
```

$$y(x) = \int \sqrt{-\frac{1}{-1 + (x^2 + 2c_1)^2 a^2}}\, a\left(x^2 + 2c_1\right) dx + c_2$$

2.1655 ODE No. 1655

$$y''(x) - ay(x)\left(y'(x)^2 + 1\right)^{3/2} = 0$$

✓ **Mathematica** : cpu = 0.522256 (sec), leaf count = 350

```
DSolve[-(a*y[x]*(1 + Derivative[1][y][x]^2)^(3/2)) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-\frac{\sqrt{\frac{\#1^2 a-2+2c_1}{-1+c_1}}\sqrt{\frac{\#1^2 a+2+2c_1}{1+c_1}}\left(\text{EllipticF}\left(i\text{arcsinh}\left(\sqrt{\frac{a}{2c_1+2}}\#1\right), \frac{c_1+1}{c_1-1}\right) + (-1+c_1)\right.}{\sqrt{\frac{a}{2+2c_1}}\sqrt{\#1^4 a^2 + 4\#1^2 ac_1 - 4 + 4c_1{}^2}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.346 (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))
```

$$\int^{y(x)} \frac{\left(\_a^2 + 2c_1\right)a}{\sqrt{4 - \left(\_a^2 + 2c_1\right)^2 a^2}} d\_a - x - c_2 = 0$$

2.1656 ODE No. 1656

$$y''(x) - a\left(y'(x)^2 + 1\right)^{3/2} (bx + c + y(x)) = 0$$

✓ **Mathematica** : cpu = 31.1609 (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],x]
```

$$\left\{\text{Solve}\left[\int_1^x \left(\frac{1}{b^2+1} - \frac{b\sqrt{-a^2\left(c^2+2bK[1]c+2y(x)c+b^2K[1]^2+y(x)^2-2c_1+2bK[1]y(x)\right)^2\left(a^2c^4+4a^2bK[1\right.}}{(b^2+1)\left(a^2c^4+4a^2bK[1]c^3+4a^2y(x)c^3+6a^2b^2K[1]^2c^2\right.}\right.\right.\right.$$

✓ **Maple** : cpu = 1.059 (sec), leaf count = 768

```
dsolve(diff(diff(y(x),x),x)-a*(c+b*x+y(x))*(diff(y(x),x)^2+1)^(3/2)=0,y(x))
```

$$y(x) = -bx + \text{RootOf}\left(-x + \int^{\_Z} \frac{4b^2a^2\_f^2c^2 + 4a^2b^2c\_f^3 + a^2b^2\_f^4 - 8b^2c_1a^2c\_f - 4c_1a^2b^2\_f^2 + 4c_1^2a^2b^2 - 2\sqrt{}}{}\right.$$

2.1657 ODE No. 1657

$$y''(x) + y(x)^3 y'(x) - y(x)y'(x)\sqrt{4y'(x) + y(x)^4} = 0$$

✓ **Mathematica** : cpu = 0.30164 (sec), leaf count = 33

```
DSolve[y[x]^3*Derivative[1][y][x] - y[x]*Derivative[1][y][x]*Sqrt[y[x]^4 + 4*Derivative[1][y][x]] + D
```

$$\left\{\left\{y(x)\to \sqrt{2}e^{c_1}\tan\left(2\sqrt{2}e^{3c_1}(x+c_2)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.316 (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
```

$$y(x) = \frac{\tan\left(\left(\frac{1}{c_1^2}\right)^{\frac{3}{2}}(c_2+x)\right)}{c_1}$$

2.1658 ODE No. 1658

$$y''(x) - h\big(y'(x), ax + by(x)\big) = 0$$

✗ **Mathematica** : cpu = 0.243767 (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

$$y(x) = \left(-\frac{a\left(\int \_b(\_a)\, d\_a + c_1\right) - \_ab}{b}\right) \&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a) = -h\left(-\frac{a\_b(\_a) - b}{b\_b\,(\_a)}, \_ab\right)\_b(\_a)^3\right\}, \left\{\_a\right.\right.$$

2.1659 ODE No. 1659

$$y''(x) - y(x)h\left(x, \frac{y'(x)}{y(x)}\right) = 0$$

✗ **Mathematica** : cpu = 3.45068 (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

$$y(x) = \left(e^{\int \_b(\_a)d\_a + c_1}\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = -\_b(\_a)^2 + h(\_a, \_b(\_a))\right\}, \left\{\_a = x, \_b(\_a) = \frac{\frac{d}{dx}y(x)}{y(x)}\right\}\right]$$

2.1660 ODE No. 1660

$$y''(x) - x^{n-2}h\left(x^{-n}y(x), x^{1-n}y'(x)\right) = 0$$

✗ **Mathematica** : cpu = 1.71074 (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[x],x]
```

, could not solve

```
DSolve[-(x^(-2 + n)*h[y[x]/x^n, x^(1 - n)*Derivative[1][y][x]]) + Derivative[2][y][x] == 0,
```

✗ **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

$$y(x) = \left(\_a\,\mathrm{e}^{\left(\int \_b(\_a)d\_a+c_1\right)n}\right) \&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a) = \left(\_a\,n^2 - \_an - h\left(\_a, \frac{\_b(\_a)\_an+1}{\_b\left(\_a\right)}\right)\right)\_b(\_a)^3 -\right.\right.$$

2.1661 ODE No. 1661

$$8y''(x) + 9y'(x)^4 = 0$$

✓ **Mathematica** : cpu = 0.0490874 (sec), leaf count = 92

```
DSolve[9*Derivative[1][y][x]^4 + 8*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2-\frac{1}{3}\sqrt[3]{-\frac{1}{3}}(9x-8c_1)^{2/3}\right\},\left\{y(x)\to \frac{(9x-8c_1)^{2/3}}{3\sqrt[3]{3}}+c_2\right\},\left\{y(x)\to \frac{(-1)^{2/3}(9x-8c_1)^{2/3}}{3\sqrt[3]{3}}+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.083 (sec), leaf count = 51

```
dsolve(8*diff(diff(y(x),x),x)+9*diff(y(x),x)^4=0,y(x))
```

$$y(x) = (x + c_1)^{\frac{2}{3}} + c_2$$

2.1662 ODE No. 1662

$$ay''(x) + cy(x) + h(y'(x)) = 0$$

✗ **Mathematica** : cpu = 0.604214 (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))+y(x)*c=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a) + \frac{h(\_b(\_a)) + c\_a}{a} = 0\right\}, \left\{\_a = y(x), \_b(\_a) = \frac{d}{dx}y(x)\right\}, \left\{x =\right.\right.$$

2.1663 ODE No. 1663

$$-xy(x)^n + xy''(x) + 2y'(x) = 0$$

✗ **Mathematica** : cpu = 0.0224333 (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

$$y(x) = \left(\_a\, e^{\int \_b(\_a) d\_a + c_1}\right) \&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a) = \left(-\frac{\_a^n n^2}{4} + \frac{\_a^n n}{2} - \frac{\_an}{2} - \frac{\_a^n}{4} + \frac{3\_a}{2}\right)\_b(\_a)^3 + \left(\right.\right.\right.$$

2.1664 ODE No. 1664

$$ax^m y(x)^n + xy''(x) + 2y'(x) = 0$$

✗ **Mathematica** : cpu = 0.129712 (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

$$y(x) = \left(\_a\, e^{\int \_b(\_a)d\_a + c_1}\right) \&\text{where} \left[\left\{ \frac{d}{d\_a}\_b(\_a) = \frac{(\_a^n a\, n^2 - 2\_a^n a n + \_a\, m^2 - \_a m n + \_a^n a + 3\_a m -}{(m+1)^2}\right.\right.$$

2.1665 ODE No. 1665

$$xy''(x) + 2y'(x) + xe^{y(x)} = 0$$

✗ **Mathematica** : cpu = 0.0631206 (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

$$y(x) = \left(\_a - 2\left(\int \_b(\_a)\, d\_a\right) - 2c_1\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = (\mathrm{e}^{-\_a} - 2)\,\_b(\_a)^3 + \_b(\_a)^2\right\}, \left\{\_a = y(x$$

2.1666 ODE No. 1666

$$ay'(x) + bxe^{y(x)} + xy''(x) = 0$$

✗ **Mathematica** : cpu = 0.227838 (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

$$y(x) = \left(\_a - 2\left(\int \_b(\_a)\, d\_a\right) - 2c_1\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = (b\,\mathrm{e}^{-\_a} - 2a + 2)\_b(\_a)^3 + (a-1)\_b(\_a)^2\right.\right.$$

2.1667 ODE No. 1667

$$bx^{5-2a}e^{y(x)} + ay'(x) + xy''(x) = 0$$

✗ **Mathematica** : cpu = 0.389223 (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], 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

$$y(x) = \left(\_a + 2a\left(\int \_b(\_a)\, d\_a + c_1\right) - 6\left(\int \_b(\_a)\, d\_a\right) - 6c_1\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = \left(b\,\mathrm{e}^{-a} + 2a^2 - \right.\right.\right.$$

2.1668 ODE No. 1668

$$xy''(x) + (y(x) - 1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0447254 (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 = 0.15 (sec), leaf count = 24

```
dsolve(x*diff(diff(y(x),x),x)-(1-y(x))*diff(y(x),x)=0,y(x))
```

$$y(x)=\frac{2c_1+\tanh\left(\frac{\ln(x)-c_2}{2c_1}\right)}{c_1}$$

2.1669 ODE No. 1669

$$-x^2y'(x)^2 + xy''(x) + 2y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.487534 (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] == 0,y[x],x
```

$$\text{Solve}\left[\int_1^{y(x)} -\frac{x}{e^{xK[1]}c_1 + 2xK[1] + 1} dK[1] - \int_1^x \left(\int_1^{y(x)} \left(\frac{\left(e^{K[1]K[2]}c_1K[1] + 2K[1]\right)K[2]}{\left(e^{K[1]K[2]}c_1 + 2K[1]K[2] + 1\right)^2} - \frac{1}{e^{K[1]K[2]}c_1 + 2K[1\right.\right.\right.$$

✓ **Maple** : cpu = 0.134 (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))
```

$$y(x) = \frac{\text{RootOf}\left(-\ln(x) + c_2 - \left(\int^{\_Z} \frac{1}{-2\_f - 1 + e^{\_f}c_1} d\_f\right)\right)}{x}$$

2.1670 ODE No. 1670

$$a(xy'(x)-y(x))^2-b+xy''(x)=0$$

✓ **Mathematica** : cpu = 5.13401 (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 = 0.84 (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))
```

$$y(x)=\left(\int \frac{i\tan\left(-i\sqrt{a}\sqrt{b}\,x+c_1\right)\sqrt{b}}{x^2\sqrt{a}}dx+c_2\right)x$$

2.1671 ODE No. 1671

$$2xy''(x) + y'(x)^3 + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0727745 (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 = 0.086 (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))
```

$$y(x) = \frac{2\sqrt{xc_1 - 1}}{c_1} + c_2$$

2.1672 ODE No. 1672

$$x^2y''(x) - a(y(x)^n - y(x)) = 0$$

✗ **Mathematica** : cpu = 7.24998 (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

$$y(x) = \_a\&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a) = (-\_a^n a + \_aa)\_b(\_a)^3 - \_b(\_a)^2\right\}, \left\{\_a = y(x), \_b(\_a) = \frac{1}{x\left(\frac{d}{dx}y(x)\right)}\right.\right.$$

2.1673 ODE No. 1673

$$a\left(e^{y(x)}-1\right)+x^2y''(x)=0$$

✗ **Mathematica** : cpu = 20.4404 (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

$$y(x) = \_a\&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a) = \left(a\,\mathrm{e}^{-\_a}-a\right)\_b(\_a)^3-\_b(\_a)^2\right\},\left\{\_a = y(x)\,,\_b(\_a) = \frac{1}{x\left(\frac{d}{dx}y\left(x\right)\right)}\right\},\left\{x\right.\right.$$

2.1674 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 = 0.0330901 (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*Derivative[2][
```

$$\left\{\left\{y(x)\to c_1 2^{-\frac{a}{b}}c^{a/b}\left(x^{2b}\right)^{\frac{a}{2b}}\cos\left(c\sqrt{x^{2b}}\right)+c_2 2^{-\frac{a+b}{b}}c^{\frac{a+b}{b}-1}\left(x^{2b}\right)^{\frac{a+b}{2b}-\frac{1}{2}}\sin\left(c\sqrt{x^{2b}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.089 (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(
```

$$y(x)=x^a\left(\sin\left(x^bc\right)c_1+\cos\left(x^bc\right)c_2\right)$$

2.1675 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 = 1.97246 (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^2*Deri
```

, 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][x] +
```

✗ **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(x))=0
```

2.1676 ODE No. 1676

$$a(xy'(x) - y(x))^2 - bx^2 + x^2y''(x) = 0$$

✓ **Mathematica** : cpu = 0.238512 (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]
```

$$\left\{\left\{y(x)\to x\left(\int_1^x \frac{i\sqrt{a}\sqrt{b}\,\text{BesselY}\left(1,-i\sqrt{a}\sqrt{b}K[1]\right)-i\sqrt{a}\sqrt{b}\,\text{BesselJ}\left(1,i\sqrt{a}\sqrt{b}K[1]\right)c_1}{a\left(\text{BesselY}\left(0,-i\sqrt{a}\sqrt{b}K[1]\right)+\text{BesselJ}\left(0,i\sqrt{a}\sqrt{b}K[1]\right)c_1\right)K[1]}dK[1]+c_2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.237 (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))
```

$$y(x) = \left(\int -\frac{\sqrt{-ab}\,(c_1\,\text{BesselY}\,(1,\sqrt{-ab}\,x)+\text{BesselJ}\,(1,\sqrt{-ab}\,x))}{xa\,(c_1\,\text{BesselY}\,(0,\sqrt{-ab}\,x)+\text{BesselJ}\,(0,\sqrt{-ab}\,x))}dx+c_2\right)x$$

2.1677 ODE No. 1677

$$a y(x) y'(x)^2 + b x + x^2 y''(x) = 0$$

✗ **Mathematica** : cpu = 21.7161 (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

$$y(x) = \left(\_a\, e^{\int \_b(\_a) d\_a + c_1}\right) \&\text{where} \left[\left\{ \frac{d}{d\_a}\_b(\_a) = \left(\_a^3 a + b\right) \_b(\_a)^3 + \left(2a\,\_a^2 + 1\right) \_b(\_a)^2 + \_a\_b(\_a)\right.\right.$$

2.1678 ODE No. 1678

$$x^2y''(x) - \sqrt{ax^2y'(x)^2 + by(x)^2} = 0$$

✗ **Mathematica** : cpu = 0.613509 (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[x], x
```

✓ **Maple** : cpu = 0.312 (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))
```

$$y(x) - e^{\int^{\ln(x)} \mathrm{RootOf}\left(\int^{\_Z} -\frac{y(x)}{y(x)\_a^2 - \_ay(x) - \sqrt{y(x)^2\left(a\_a^2+b\right)}} d\_a - \_b + c_1\right) d\_b + c_2} = 0$$

2.1679 ODE No. 1679

$$\left(x^2+1\right)y''(x)+y'(x)^2+1=0$$

✓ **Mathematica** : cpu = 0.118345 (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 = 0.122 (sec), leaf count = 26

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+diff(y(x),x)^2+1=0,y(x))
```

$$y(x)=\frac{x}{c_1}+\frac{\left(c_1^2+1\right)\ln\left(xc_1-1\right)}{c_1^2}+c_2$$

2.1680 ODE No. 1680

$$x^4(-y'(x)^2) + 4x^2y''(x) + 4y(x) = 0$$

✗ **Mathematica** : cpu = 4.30933 (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

$$y(x) = \left(\_a\, e^{\int -2\_b(\_a)d\_a - 2c_1}\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = \left(-\_a^2 + 7\_a\right)\_b(\_a)^3 + (\_a - 5)\_b(\_a)^2 - \frac{\_b(\_a)}{4}\right.\right.$$

2.1681 ODE No. 1681

$$a y(x)^3 + 9x^2 y''(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 1.59292 (sec), leaf count = 41

```
DSolve[2*y[x] + a*y[x]^3 + 9*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2\sqrt[3]{x}\,\text{sn}\left(\left(c_1+\frac{\sqrt{a x^{20/3}}}{\sqrt{2}x^3}\right)c_2\middle|-1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 31

```
dsolve(9*x^2*diff(diff(y(x),x),x)+a*y(x)^3+2*y(x)=0,y(x))
```

$$y(x) = c_2 \operatorname{JacobiSN}\left(\left(\frac{\sqrt{2}\sqrt{x^{\frac{20}{3}}a}}{2x^3}+c_1\right)c_2, i\right)x^{\frac{1}{3}}$$

2.1682 ODE No. 1682

$$x^3 \left(y''(x) + y(x)y'(x) - y(x)^3\right) + 12xy(x) + 24 = 0$$

✓ **Mathematica** : cpu = 21.1152 (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[x],x]
```

$$\left\{\left\{y(x) \to \frac{2 + x^3 \wp'(x + c_1; 0, c_2)}{x \left(-1 + x^2 \wp(x + c_1; 0, c_2)\right)}\right\}\right\}$$

✗ **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

$$y(x) = \left(\_a \, e^{\int \_b(\_a) d\_a + c_1}\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = \left(-\_a^3 - \_a^2 + 14\_a + 24\right)\_b(\_a)^3 + \left(-\_a + 3\right)\_b(\_a\right.\right.$$

2.1683 ODE No. 1683

$$x^3y''(x) - a(xy'(x) - y(x))^2 = 0$$

✓ **Mathematica** : cpu = 0.0523232 (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 = 0.07 (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))
```

$$y(x) = -\frac{\ln\left(\frac{a(xc_1-c_2)}{x}\right)x}{a}$$

2.1684 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 = 40.1381 (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*x^3*Deri
```

, 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] + 2

✗ **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*y(x)^
```

, result contains DESol or ODESolStruc

$$y(x)=\left(\_a\,e^{\int \_b(\_a)d\_a+c_1}\right)\ \&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a)=\left(-\_a^3+\frac{1}{2}\_a^2+\frac{1}{2}\_aa-\frac{5}{2}\_a+\frac{1}{2}b\right)\_b(\_a)^3+\left(-\_a\right.\right.\right.$$

2.1685 ODE No. 1685

$$ax y(x)+b-\left(k x^{k-1}-12 x^{2}\right)\left(3 y'(x)+y(x)^{2}\right)+2\left(4 x^{3}-x^{k}\right)\left(y''(x)+y(x) y'(x)-y(x)^{3}\right)=0$$

✗ **Mathematica** : cpu = 2.63571 (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 - x^k)*(-y
```

, could not solve

```
DSolve[b + a*x*y[x] - (-12*x^2 + k*x^(-1 + k))*(y[x]^2 + 3*Derivative[1][y][x]) + 2*(4*x^3 -
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*
```

, 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))
```

2.1686 ODE No. 1686

$$a^2y(x)^n + x^4y''(x) = 0$$

✗ **Mathematica** : cpu = 0.0196856 (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

$$y(x) = \left(\_a\, \mathrm{e}^{\int \_b(\_a) d\_a + c_1}\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = \left(\frac{n^2a^2\_a^n}{4} - \frac{n\,a^2\_a^n}{2} + \frac{a^2\_a^n}{4} - \frac{\_an}{2} + \frac{3\_a}{2}\right)\_b(\_a)^3\right.\right.$$

2.1687 ODE No. 1687

$$x^4 y''(x) - x\left(x^2 + 2y(x)\right) y'(x) + 4y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0854211 (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]
```

$$\left\{\left\{y(x) \to -\frac{x^3\left(i\left(\frac{i}{\sqrt{c_1}} - \frac{\sqrt{-1-c_1}}{\sqrt{c_1}}\right)\sqrt{c_1}c_2 x^{-1+i\left(\frac{i}{\sqrt{c_1}} - \frac{\sqrt{-1-c_1}}{\sqrt{c_1}}\right)\sqrt{c_1}} + i\left(\frac{\sqrt{-1-c_1}}{\sqrt{c_1}} + \frac{i}{\sqrt{c_1}}\right)\sqrt{c_1}x^{-1+i\left(\frac{\sqrt{-1-c_1}}{\sqrt{c_1}} + \frac{i}{\sqrt{c_1}}\right)\sqrt{c}}}{c_2 x^{i\left(\frac{i}{\sqrt{c_1}} - \frac{\sqrt{-1-c_1}}{\sqrt{c_1}}\right)\sqrt{c_1}} + x^{i\left(\frac{\sqrt{-1-c_1}}{\sqrt{c_1}} + \frac{i}{\sqrt{c_1}}\right)\sqrt{c_1}}}\right.\right.$$

✓ **Maple** : cpu = 0.111 (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))
```

$$y(x) = x^2(1 + \tanh(c_1(-\ln(x) + c_2))\, c_1)$$

2.1688 ODE No. 1688

$$x^4y''(x) - x^2y'(x)\left(y'(x) + x\right) + 4y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.735626 (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] == 0,y[
```

$$\text{Solve}\left[\int_1^{y(x)} \frac{1}{-e^{\frac{K[1]}{x^2}}c_1x^2 + 2x^2 + 4K[1]}dK[1] - \int_1^x \left(\frac{K[2]\left(e^{\frac{y(x)}{K[2]^2}}c_1 + 2\left(-\frac{y(x)}{K[2]^2} - 1\right)\right)}{-e^{\frac{y(x)}{K[2]^2}}c_1K[2]^2 + 2K[2]^2 + 4y(x)} + \int_1^{y(x)} -\frac{\frac{2e^{\frac{K[1]}{K[2]^2}}c_1K[1]}{K[2]}}{\left(-e^{\frac{K[1]}{K[2]^2}}c_1K\right.}\right.\right.$$

✓ **Maple** : cpu = 0.119 (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))
```

$$y(x) = \text{RootOf}\left(-\ln(x) + c_2 - \left(\int^{\_Z} \frac{1}{e^{\_f}c_1 + 4\_f + 2}d\_f\right)\right)x^2$$

2.1689 ODE No. 1689

$$x^4y''(x) + (xy'(x) - y(x))^3 = 0$$

✓ **Mathematica** : cpu = 0.192998 (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 = 0.137 (sec), leaf count = 37

```
dsolve(x^4*diff(diff(y(x),x),x)+(x*diff(y(x),x)-y(x))^3=0,y(x))
```

$$y(x) = \left(-\arctan\left(\frac{1}{\sqrt{x^2c_1-1}}\right)+c_2\right)x$$

2.1690 ODE No. 1690

$$\sqrt{x}y''(x) - y(x)^{3/2} = 0$$

✗ **Mathematica** : cpu = 20.9839 (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

$$y(x) = \left(\_a\,\mathrm{e}^{\int -3\_b(\_a)d\_a - 3c_1}\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = \left(-\_a^{\frac{3}{2}} + 12\_a\right)\_b(\_a)^3 - 7\_b(\_a)^2\right\}, \left\{\_a = x^3 y(\right.\right.$$

2.1691 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 = 16.2389 (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],x]
```

$$\left\{\text{Solve}\left[2a\arctan\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)+2\sqrt{4ac-b^2}\int_1^{\frac{y(x)}{\sqrt{c+x(b+ax)}}}\frac{a}{\sqrt{4c_1a^2+(b^2-4ac)K[3]^2+8\int_1^{K[3]}f(K[2])dK[2]}}d\right.\right.$$

✓ **Maple** : cpu = 0.929 (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))
```

$$y(x)=\text{RootOf}\left(4\_Zac-\_Zb^2-4F\left(\frac{\_Z}{\sqrt{a\,x^2+bx+c}}\right)\sqrt{a\,x^2+bx+c}\right)$$

2.1692 ODE No. 1692

$$x^{\frac{n}{n+1}} y''(x) - y(x)^{\frac{2n+1}{n+1}} = 0$$

✗ **Mathematica** : cpu = 0.0440429 (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

$$y(x) = \left(\_a\,\mathrm{e}^{-\frac{\left(\int \_b(\_a)d\_a+c_1\right)(n+2)}{n}}\right) \&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a) = -\frac{\left(\_a^{\frac{2n+1}{n+1}}n^2 - 2\_a n^2 - 6\_an - 4\_a\right)\_b(\_a)^3}{n^2} - \right.\right.$$

2.1693 ODE No. 1693

$$-h(y(x), f(x)y'(x)) + f(x)f'(x)y'(x) + f(x)^2y''(x) = 0$$

✗ **Mathematica** : cpu = 0.590913 (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[x]^2*Der
```

, could not solve

```
DSolve[-h[y[x], f[x]*Derivative[1][y][x]] + f[x]*Derivative[1][f][x]*Derivative[1][y][x] + f
```

✗ **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))=
```

, result contains DESol or ODESolStruc

$$y(x) = \_a\&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a) = -h\left(\_a, \frac{1}{\_b(\_a)}\right)\_b(\_a)^3\right\}, \left\{\_a = y(x), \_b(\_a) = \frac{1}{f(x)\left(\frac{d}{dx}y(x)\right)}\right\}, \left\{\right.\right.$$

2.1694 ODE No. 1694

$$y(x)y''(x) - a = 0$$

✓ **Mathematica** : cpu = 0.0861021 (sec), leaf count = 115

```
DSolve[-a + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \exp\left(\frac{-2a\text{erf}^{-1}\left(-i\sqrt{\frac{2}{\pi}}\sqrt{ae^{\frac{c_1}{a}}(x+c_2)^2}\right)^2 - c_1}{2a}\right)\right\}, \left\{y(x)\to \exp\left(\frac{-2a\text{erf}^{-1}\left(i\sqrt{\frac{2}{\pi}}\sqrt{ae^{\frac{c_1}{a}}(x+c_2)\right.}\right.}{2a}\right.\right.\right.$$

✓ **Maple** : cpu = 0.096 (sec), leaf count = 53

```
dsolve(diff(diff(y(x),x),x)*y(x)-a=0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{2a\ln(\_a) - c_1}} d\_a - x - c_2 = 0$$

2.1695 ODE No. 1695

$$y(x)y''(x) - ax = 0$$

✗ **Mathematica** : cpu = 9.64394 (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

$$y(x) = \left(\_a\left(e^{\int \_b(\_a)d\_a+c_1}\right)^{\frac{3}{2}}\right) \&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a) = \frac{(3\_a^2 - 4a)\_b(\_a)^3}{4\_a} + 2\_b(\_a)^2\right\}, \left\{\_a = \frac{y(x)}{x^{\frac{3}{2}}}, \_\right.\right.$$

2.1696 ODE No. 1696

$$y(x)y''(x) - ax^2 = 0$$

✗ **Mathematica** : cpu = 8.52467 (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

$$y(x) = \left(\_a\,\mathrm{e}^{\int 2\_b(\_a)d\_a+2c_1}\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = \frac{(2\_a^2 - a)\,\_b(\_a)^3}{\_a} + 3\_b(\_a)^2\right\}, \left\{\_a = \frac{y(x)}{x^2}, \_b(\_\right.\right.$$

2.1697 ODE No. 1697

$$-a + y(x)y''(x) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.130791 (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 = 0.049 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x)*y(x)+diff(y(x),x)^2-a=0,y(x))
```

$$y(x) = \sqrt{a\,x^2 - 2xc_1 + 2c_2}$$

2.1698 ODE No. 1698

$$-ax - b + y(x)y''(x) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0209615 (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))
```

2.1699 ODE No. 1699

$$y(x)y''(x) + y'(x)^2 - y'(x) = 0$$

✓ **Mathematica** : cpu = 0.086983 (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 = 0.201 (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))
```

$$y(x) = -c_1\left(\mathrm{LambertW}\left(-\frac{\mathrm{e}^{-1}\mathrm{e}^{-\frac{c_2}{c_1}}\mathrm{e}^{-\frac{x}{c_1}}}{c_1}\right)+1\right)$$

2.1700 ODE No. 1700

$$y(x)y''(x) - y'(x)^2 + 1 = 0$$

✓ **Mathematica** : cpu = 0.203484 (sec), leaf count = 85

```
DSolve[1 - Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{ie^{-c_1}\tanh\left(e^{c_1}(x+c_2)\right)}{\sqrt{-1+\tanh^2\left(e^{c_1}(x+c_2)\right)}}\right\},\left\{y(x)\to \frac{ie^{-c_1}\tanh\left(e^{c_1}(x+c_2)\right)}{\sqrt{-1+\tanh^2\left(e^{c_1}(x+c_2)\right)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.556 (sec), leaf count = 86

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+1=0,y(x))
```

$$y(x) = \frac{\left(-c_1 \mathrm{e}^{\frac{2x}{c_1}} \mathrm{e}^{\frac{2c_2}{c_1}} + c_1\right) \mathrm{e}^{-\frac{x}{c_1}} \mathrm{e}^{-\frac{c_2}{c_1}}}{2}$$

2.1701 ODE No. 1701

$$y(x)y''(x) - y'(x)^2 - 1 = 0$$

✓ **Mathematica** : cpu = 0.129574 (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 = 0.504 (sec), leaf count = 42

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-1=0,y(x))
```

$$y(x) = \frac{c_1\left(e^{\frac{2c_2}{c_1}} e^{\frac{2x}{c_1}} + 1\right) e^{-\frac{c_2}{c_1}} e^{-\frac{x}{c_1}}}{2}$$

2.1702 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 = 0.959466 (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]*Derivative[2][
```

, 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]*Deriv
```

✗ **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)^
```

, 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*y(x)^
```

2.1703 ODE No. 1703

$$y(x)y''(x) - y'(x)^2 + y(x)^2(-\log(y(x))) = 0$$

✓ **Mathematica** : cpu = 0.248896 (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 = 0.178 (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))
```

$$y(x) = \mathrm{e}^{\frac{\mathrm{e}^{-2x}c_1\mathrm{e}^{x}}{2}}\mathrm{e}^{-\frac{c_2\mathrm{e}^{x}}{2}}$$

2.1704 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 = 4.81693 (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][x]^2/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
```

✗ **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(diff(f
diff(f(x),x)^2/f(x)^2)=0,y(x))
```

2.1705 ODE No. 1705

$$-y(x)f'(x) + f(x)y'(x) + y(x)y''(x) - y'(x)^2 - y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.2642 (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 + y[x]*D
```

$$\left\{\left\{y(x)\to -\frac{\exp\left(c_2-\int_1^x \frac{y(K[3])^3+c_1{}^2y(K[3])^2+\int_1^{K[3]}\frac{-y(K[1])^3-f'(K[1])y(K[1])+f(K[1])y'(K[1])}{y(K[1])^2}dK[1]^2y(K[3])^2+2c_1\int_1^{K[3]}\frac{-y(K[1])^3}{}}{y(K[3])^2\left(c_1+\int_1^{K[3]}\frac{-y(K[1])^3-f'(K[1])y(K[1])+}{y(K[1])^2}\right.}\right.}{\int_1^x\frac{-y(K[1])^3-f'(K[1])y(K[1])+f(K[1])y'(K[1}{y(K[1])^2}}\right.\right.$$

✗ **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))
```

2.1706 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 = 0.402764 (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 - y[x]*
```

$$\left\{\left\{y(x)\to -\frac{\exp\left(c_2-\int_1^x \frac{y(K[3])^4-f(K[3])y(K[3])^3+c_1{}^2y(K[3])^2+\int_1^{K[3]}\frac{-y(K[1])^4+f(K[1])y(K[1])^3-f''(K[1])y(K[1])+f'(K[1])y'(K[1])}{y(K[1])^2}d}{y(K[3])^2\left(c_1+\int_1^{K[3]}\frac{-y(K[1])}{}\right.}\right.}{\int_1^x \frac{-y(K[1])^4+f(K[1])y(K[1])}{}}\right.\right.$$

✗ **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),
```

, 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),x),
y(x)^4=0,y(x))
```

2.1707 ODE No. 1707

$$ay(x)y'(x) + by(x)^2 + y(x)y''(x) - y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0495929 (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][x] == 0,
```

$$\left\{\left\{y(x) \to c_2 e^{-\frac{bx}{a} - \frac{c_1 e^{-ax}}{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.273 (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))
```

$$y(x) = \mathrm{e}^{\frac{c_1 \mathrm{e}^{-ax}}{a}} \mathrm{e}^{-\frac{bx}{a}} \mathrm{e}^{-\frac{c_2}{a}} \mathrm{e}^{\frac{b}{a^2}}$$

2.1708 ODE No. 1708

$$ay(x)y'(x) - 2ay(x)^2 + by(x)^3 + y(x)y''(x) - y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 31.1056 (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]*Derivative[
```

, 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[x]*De
```

✗ **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(
```

, result contains DESol or ODESolStruc

$$y(x) = \_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a) - \frac{-b\_a^3 - \_a\_b(\_a)\,a + 2a\_a^2 + \_b(\_a)^2}{\_a} = 0\right\}, \left\{\_a = y(x), \ldots\right.\right.$$

2.1709 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 = 48.8881 (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[1][y][x]
```

$$\left\{\left\{y(x) \to -\frac{1}{2a} + e^{2ax}\left(\frac{e^{-2ax}\left(c_1\left(\sqrt{a^3+2b^2} - a^{3/2}\right)\text{Gamma}\left(1 - \frac{\sqrt{a^3+2b^2}}{2a^{3/2}}\right)\text{BesselJ}\left(-\frac{\sqrt{a^3+2b^2}}{2a^{3/2}}, \frac{\sqrt{ab^2e^{2ax}c_2}}{a^{3/2}}\right) + \right.}{4a}\right.\right.\right.$$

✗ **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*
```

, result contains DESol or ODESolStruc

$$y(x) = \_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a) - \frac{2\_a^3b^2 - 2\_a^2a^2 + \_a\_b(\_a)\,a + \_b(\_a)^2 - \_aa - \_b(\_a)}{\_a} = \right.\right.$$

2.1710 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 = 61.7225 (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] - Derivative[1][y][
```

, could not solve

```
DSolve[-(y[x]*(1 + y[x])*(-a^2 + b^2*y[x]^2)) + (-1 + a*y[x])*Derivative[1][y][x] - Derivati
```

✗ **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*
```

, result contains DESol or ODESolStruc

$$y(x)=\_a\&\text{where}\left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a)-\frac{\_a^4b^2+\_a^3b^2-\_a^2a^2-\_a\_b(\_a)\,a-\_a\,a^2+\_b(\_a)^2+\_b(\right.\right.}{\_a}$$

2.1711 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 = 14.431 (sec), leaf count = 10168

```
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] - Deri
```

$$\left\{\left\{y(x)\to -\frac{(-1)^{-n}2^{n+\frac{1}{2}}e}{c_1+\int_1^x \frac{(-1)^{-n}(\cos^2(K[1])-1)^{-\frac{n}{2}-\frac{1}{2}}\sec(K[1])\left(2^{n+\frac{3}{2}}K_n\left(\sqrt{\cos^2(K[1])-1}\right)\cos^3(K[1])\log(y(K[1]))y(K[1])(2\cos^2(K[1])-}{}}\right.\right.$$

✓ **Maple** : cpu = 0.622 (sec), leaf count = 23

```
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-
```

$$y(x)=\mathrm{e}^{-\frac{c_2\,\mathrm{BesselY}(n,\sin(x))\pi}{2}}\,\mathrm{e}^{\frac{\mathrm{BesselJ}(n,\sin(x))c_1\pi}{2}}$$

2.1712 ODE No. 1712

$$-f(x)y(x)y'(x) - g(x)y(x)^2 + y(x)y''(x) - y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0413659 (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]*Derivative[2][y]
```

$$\left\{\left\{y(x)\to c_2\exp\left(\int_1^x\left(\exp\left(\int_1^{K[3]}f(K[1])dK[1]\right)c_1+\exp\left(\int_1^{K[3]}f(K[1])dK[1]\right)\int_1^{K[3]}\exp\left(-\int_1^{K[2]}f(K[\right.\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.302 (sec), leaf count = 37

```
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))
```

$$y(x) = e^{c_1\left(\int e^{\int f(x)dx}dx\right)}e^{\int e^{\int f(x)dx}\left(\int e^{\int -f(x)dx}g(x)dx\right)dx}c_2$$

2.1713 ODE No. 1713

$$-y(x)\left(g'(x)-y(x)^2f'(x)\right)+y'(x)\left(f(x)y(x)^2+g(x)\right)+y(x)y''(x)-y'(x)^2=0$$

✗ **Mathematica** : cpu = 20.6128 (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)*Derivativ
```

, could not solve

```
DSolve[-(y[x]*(-(y[x]^2*Derivative[1][f][x]) + Derivative[1][g][x])) + (g[x] + f[x]*y[x]^2)*
```

✗ **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

$$y(x)=\_b(\_a)\ \&\text{where}\left[\left\{\frac{\frac{d}{d\_a}\_b(\_a)}{\_b\left(\_a\right)}+\frac{f(\_a)\_b(\_a)^2+\_b(\_a)\,c_1-g(\_a)}{\_b\left(\_a\right)}=0\right\},\{\_a=x,\_b(\_a)=y(x)\},$$

2.1714 ODE No. 1714

$$y(x)y''(x) + 3y(x)y'(x) - 3y'(x)^2 - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0992866 (sec), leaf count = 28

```
DSolve[-y[x]^2 + 3*y[x]*Derivative[1][y][x] - 3*Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == (
```

$$\left\{\left\{y(x) \to \frac{c_2 e^{x+c_1}}{\sqrt{-1 + 2e^{x+c_1}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.086 (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))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{(e^x c_1 - c_2) e^{2x}}}{2 e^x c_1 - 2c_2}$$

2.1715 ODE No. 1715

$$y(x)y''(x) - ay'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0792405 (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 = 0.064 (sec), leaf count = 25

```
dsolve(diff(diff(y(x),x),x)*y(x)-a*diff(y(x),x)^2=0,y(x))
```

$$y(x) = \left(\frac{1}{(1-a)(xc_1+c_2)}\right)^{\frac{1}{a-1}}$$

2.1716 ODE No. 1716

$$a(y'(x)^2+1)+y(x)y''(x)=0$$

✓ **Mathematica** : cpu = 0.431991 (sec), leaf count = 172

```
DSolve[a*(1 + Derivative[1][y][x]^2) + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\#1\sqrt{1-e^{2c_1}\#1^{-2a}}\,\text{Hypergeometric2F1}\left(\frac{1}{2},-\frac{1}{2a},1-\frac{1}{2a},e^{2c_1}\#1^{-2a}\right)}{\sqrt{-1+e^{2c_1}\#1^{-2a}}}\&\right][x+c_2]\right\}\right\}$$

✓ **Maple** : cpu = 0.302 (sec), leaf count = 68

```
dsolve(diff(diff(y(x),x),x)*y(x)+a*(diff(y(x),x)^2+1)=0,y(x))
```

$$\int^{y(x)}\frac{\_a^{a}}{\sqrt{-\_a^{2a}+c_1}}d\_a-x-c_2=0$$

2.1717 ODE No. 1717

$$ay'(x)^2 + by(x)^3 + y(x)y''(x) = 0$$

✓ **Mathematica** : cpu = 47.7272 (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]
```

$$\left\{\text{Solve}\left[\frac{y(x)\sqrt{(2a+3)y(x)^{2a}}\sqrt{1-\frac{2by(x)^{2a+3}}{2ac_1+3c_1}}\,\text{Hypergeometric2F1}\left(\frac{1}{2},\frac{a+1}{2a+3},\frac{a+1}{2a+3}+1,\frac{2by(x)^{2a+3}}{2ac_1+3c_1}\right)}{(a+1)\sqrt{-2by(x)^{2a+3}+2ac_1+3c_1}} = -x+c_2, y(x$$

✓ **Maple** : cpu = 0.408 (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))
```

$$\int^{y(x)} \frac{\_a^{2a}(2a+3)}{\sqrt{-\_a^{2a}\,(2a+3)\,(2\_a^{2a+3}b-c_1)}} d\_a - x - c_2 = 0$$

2.1718 ODE No. 1718

$$dy(x)^{1-a} + ay'(x)^2 + by(x)y'(x) + cy(x)^2 + y(x)y''(x) = 0$$

✓ **Mathematica** : cpu = 0.831133 (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]*Deriva
```

$$\left\{\left\{y(x)\to\left(-\frac{ad\exp\left(\frac{1}{2}x\left(\sqrt{-4ac+b^2-4c}+b\right)-\frac{x\left(b\sqrt{-4ac+b^2-4c}-4(a+1)c+b^2\right)}{\sqrt{-4ac+b^2-4c}+b}-\frac{2(a+1)cx}{\sqrt{-4ac+b^2-4c}+b}\right)}{(a+1)c}-\frac{d\exp\left(\frac{1}{2}\right.}{}\right.\right.\right.$$

✓ **Maple** : cpu = 0.399 (sec), leaf count = 136

```
dsolve(diff(diff(y(x),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)=
```

$$y(x)=\mathrm{e}^{\frac{x\sqrt{(-4a-4)c+b^2}}{2+2a}}\mathrm{e}^{-\frac{bx}{2+2a}}\left(\frac{(-4a-4)\,c^3+b^2c^2}{\left(-d\,\mathrm{e}^{-\frac{\left(-b+\sqrt{(-4a-4)c+b^2}\right)x}{2}}\sqrt{(-4a-4)\,c+b^2}+c\,(a+1)\left(c_2\mathrm{e}^{-x\sqrt{(-4a-4)c+b^2}}-c_1\right)\right.}\right.$$

2.1719 ODE No. 1719

$$a y'(x)^2 + f(x) y(x) y'(x) + g(x) y(x)^2 + y(x) y''(x) = 0$$

✗ **Mathematica** : cpu = 42.1894 (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]*Derivative[2][y][
```

, 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]*Derivati
```

✗ **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

$$y(x) = \left(e^{\int \_b(\_a)d\_a + c_1}\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = (-a-1)\_b(\_a)^2 - f(\_a)\_b(\_a) - g(\_a)\right\}, \left\{\_a = x, \_b(\right.\right.$$

2.1720 ODE No. 1720

$$ay'(x)^2 + by(x)^2y'(x) + cy(x)^4 + y(x)y''(x) = 0$$

✓ **Mathematica** : cpu = 74.0185 (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][y][x] =
```

$$\text{Solve}\left[\int_1^{y(x)} \frac{1}{K[2]^2\text{InverseFunction}\left[\frac{\log(c+\#1(b+(a+2)\#1))-\frac{2b\arctan\left(\frac{b+2(a+2)\#1}{\sqrt{4(a+2)c-b^2}}\right)}{\sqrt{4(a+2)c-b^2}}}{2(a+2)}\&\right][c_1-\log(K[2])]}dK[2] = x - c_2\right.$$

✓ **Maple** : cpu = 0.572 (sec), leaf count = 155

```
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))
```

$$\int^{y(x)} \frac{2a+4}{\tan\left(\text{RootOf}\left(2\_Z\_a^2b - 2a\ln(\_a)\sqrt{\_a^4(4ac-b^2+8c)} - \ln\left(\frac{\_a^4\left(\tan(\_Z)^2+1\right)(4ac-b^2+8c)}{4a+8}\right)\sqrt{\_a^4(4ac\right.\right.}$$

2.1721 ODE No. 1721

$$-\frac{ay(x)^3f'(x)}{a+2}+\frac{af(x)^2y(x)^4}{(a+2)^2}-\frac{(a-1)y'(x)^2}{a}-f(x)y(x)^2y'(x)+y(x)y''(x)=0$$

✓ **Mathematica** : cpu = 20.9906 (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*Derivative[
```

$$\left\{\left\{y(x)\to -\frac{(a+2)(x+c_1)^a}{a\int_1^x f(K[5])(c_1+K[5])^a dK[5]+c_2}\right\}\right\}$$

✗ **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)^2*f
a/(a+2)*diff(f(x),x)*y(x)^3=0,y(x))
```

2.1722 ODE No. 1722

$$-2ay(x)\left(y'(x)^2+1\right)^{3/2}+y(x)y''(x)-y'(x)^2-1=0$$

✓ **Mathematica** : cpu = 0.949235 (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]*Derivative[2][y
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt{1-\frac{2\#1^2a^2}{-2ac_1+\sqrt{1-4ac_1}+1}}\sqrt{1+\frac{2\#1^2a^2}{2ac_1+\sqrt{1-4ac_1}-1}}\left(\left(-2ac_1+\sqrt{1-4ac_1}+1\right)E\left(i\text{arcsi}\right.\right.}{}\right.\right.\right.$$

✓ **Maple** : cpu = 0.483 (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))
```

$$\int^{y(x)}\frac{a\_a^2+c_1}{\sqrt{-a^2\_a^4-2\_a^2ac_1+\_a^2-c_1^2}}d\_a-x-c_2=0$$

2.1723 ODE No. 1723

$$(y(x)+x)y''(x)+y'(x)^2-y'(x)=0$$

✓ **Mathematica** : cpu = 0.487787 (sec), leaf count = 130

```
DSolve[-Derivative[1][y][x] + Derivative[1][y][x]^2 + (x + y[x])*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{1}{2}\left(2x-\sqrt{2}e^{-2c_1}\sqrt{4e^{3c_1}x+e^{2c_1}+4e^{3c_1}c_2}+e^{-c_1}+4c_2\right)\right\},\left\{y(x)\to \frac{1}{2}\left(2x+\sqrt{2}e^{-2c_1}\sqrt{4e^{3c_1}x+e^{2c_1}\right.\right.$$

✓ **Maple** : cpu = 0.128 (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))
```

$$y(x)=\sqrt{2x+c_1}\,c_2+c_1+x$$

2.1724 ODE No. 1724

$$(x - y(x))y''(x) + 2y'(x)\left(y'(x) + 1\right) = 0$$

✓ **Mathematica** : cpu = 0.319427 (sec), leaf count = 38

```
DSolve[2*Derivative[1][y][x]*(1 + Derivative[1][y][x]) + (x - y[x])*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{e^{-c_1}\left(e^{c_1}c_2x + 1 + e^{c_1}c_2{}^2\right)}{x + c_2}\right\}\right\}$$

✓ **Maple** : cpu = 2.553 (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))
```

$$y(x) = \frac{-xc_2 + c_2^2 + c_1}{c_2 - x}$$

2.1725 ODE No. 1725

$$(x - y(x))y''(x) + (-y'(x) - 1)(y'(x)^2 + 1) = 0$$

✓ **Mathematica** : cpu = 27.8965 (sec), leaf count = 18840

```
DSolve[(-1 - Derivative[1][y][x])*(1 + Derivative[1][y][x]^2) + (x - y[x])*Derivative[2][y][x] == 0,y
```

Too large to display

✓ **Maple** : cpu = 0.693 (sec), leaf count = 106

```
dsolve(diff(diff(y(x),x),x)*(x-y(x))-(diff(y(x),x)+1)*(diff(y(x),x)^2+1)=0,y(x))
```

$$y(x) = x + \mathrm{RootOf}\left(-x + \int^{\_Z} - \frac{c_1^2\_f^2 - 1}{c_1^2\_f^2 + \sqrt{-c_1^2\_f^2 + 2\,c_1\_f - 2}}\,d\_f + c_2\right)$$

2.1726 ODE No. 1726

$$(x - y(x))y''(x) - h(y'(x)) = 0$$

✓ **Mathematica** : cpu = 0.198522 (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 = 0.178 (sec), leaf count = 39

```
dsolve(diff(diff(y(x),x),x)*(x-y(x))-h(diff(y(x),x))=0,y(x))
```

$$y(x) = x + \text{RootOf}\left(-x + \int^{\_Z} \frac{1}{-1 + \text{RootOf}\left(\int^{-\_Z} \frac{\_a-1}{h(\_a)} d\_a + \ln(-\_g) + c_1\right)} d\_g + c_2\right)$$

2.1727 ODE No. 1727

$$2y(x)y''(x) + y'(x)^2 + 1 = 0$$

✓ **Mathematica** : cpu = 0.335844 (sec), leaf count = 129

```
DSolve[1 + Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-e^{2c_1}\arctan\left(\frac{\sqrt{-\#1+e^{2c_1}}}{\sqrt{\#1}}\right) - \sqrt{\#1}\sqrt{-\#1+e^{2c_1}}\&\right][x+c_2]\right\}, \left\{y(x) \to \text{Invers}\right.\right.$$

✓ **Maple** : cpu = 0.547 (sec), leaf count = 823

```
dsolve(2*diff(diff(y(x),x),x)*y(x)+diff(y(x),x)^2+1=0,y(x))
```

$$y(x) = \frac{\left(-\operatorname{RootOf}\left(\tan\left(\_Z\right)^2 c_1^2\_Z^2 - 4\tan\left(\_Z\right)^2 c_1 c_2\_Z - 4\tan\left(\_Z\right)^2 c_1 x\_Z + 4\tan\left(\_Z\right)^2 c_2^2 + 8\tan\left(\_Z\right)^2 x\right.\right.}{}$$

2.1728 ODE No. 1728

$$a + 2y(x)y''(x) - y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0039531 (sec), leaf count = 31

```
DSolve[a - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{x^2\left(-a+c_1{}^2\right)}{4c_2}+c_1x+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.041 (sec), leaf count = 24

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+a=0,y(x))
```

$$y(x) = \frac{\left(c_1^2-a\right)x^2}{4c_2}+xc_1+c_2$$

2.1729 ODE No. 1729

$$a + f(x)y(x)^2 + 2y(x)y''(x) - y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 0.0148937 (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], 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))
```

2.1730 ODE No. 1730

$$2y(x)y''(x) - y'(x)^2 - 8y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.527751 (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]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{2\sqrt{\#1}\sqrt{1+\frac{4\#1^2}{c_1}}\,\text{Hypergeometric2F1}\left(\frac{1}{4},\frac{1}{2},\frac{5}{4},-\frac{4\#1^2}{c_1}\right)}{\sqrt{4\#1^2+c_1}}\&\right][x+c_2]\right\},\left\{y(x)\to \text{I}\right.\right.$$

✓ **Maple** : cpu = 0.09 (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))
```

$$\int^{y(x)} \frac{1}{\sqrt{4\_a^3 + \_ac_1}} d\_a - x - c_2 = 0$$

2.1731 ODE No. 1731

$$2y(x)y''(x) - y'(x)^2 - 8y(x)^3 - 4y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.672792 (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]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{i\#1\sqrt{4+\frac{2c_1}{\#1-\#1\sqrt{1-c_1}}}\sqrt{2+\frac{c_1}{\#1+\#1\sqrt{1-c_1}}}\,\text{EllipticF}\left(i\text{arcsinh}\left(\frac{\sqrt{\frac{c_1}{2\sqrt{1-c_1}+2}}}{\sqrt{\#1}}\right),\frac{\sqrt{1-}}{1-\sqrt{}}\right.}{\sqrt{\frac{c_1}{1+\sqrt{1-c_1}}}\sqrt{4\#1^2+4\#1+c_1}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.083 (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))
```

$$\int^{y(x)}\frac{1}{\sqrt{4\_a^3+4\_a^2+\_ac_1}}d\_a - x - c_2 = 0$$

2.1732 ODE No. 1732

$$2y(x)y''(x) - y'(x)^2 - 4(2y(x) + x)y(x)^2 = 0$$

✗ **Mathematica** : cpu = 0.606776 (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],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, y[x
```

✗ **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))
```

2.1733 ODE No. 1733

$$y(x)^2(ay(x)+b)+2y(x)y''(x)-y'(x)^2=0$$

✓ **Mathematica** : cpu = 1.22484 (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]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{i\sqrt{2}\#1^{3/2}\sqrt{2+\frac{4c_1}{\#1\left(-b+\sqrt{b^2+2ac_1}\right)}}\sqrt{1-\frac{2c_1}{\#1\left(b+\sqrt{b^2+2ac_1}\right)}}\text{EllipticF}\left(i\text{arcsinh}\left(\frac{\sqrt{2}}{\ldots}\right.\right.}{\sqrt{\frac{c_1}{-b+\sqrt{b^2+2ac_1}}}\sqrt{-\#1\left(\#1^2a+2\#1b-2c_1\right)}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.089 (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))
```

$$\int^{y(x)}-\frac{2}{\sqrt{-2\_a^3a-4b\_a^2+4\_ac_1}}d\_a-x-c_2=0$$

2.1734 ODE No. 1734

$$ay(x)^3 + 2y(x)y''(x) - y'(x)^2 + 2xy(x)^2 + 1 = 0$$

✗ **Mathematica** : cpu = 0.81872 (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[x],x]
```

, 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] == 0,
```

✗ **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))
```

2.1735 ODE No. 1735

$$y(x)^2(ay(x) + bx) + 2y(x)y''(x) - y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 0.501555 (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, y[x]
```

✗ **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))
```

2.1736 ODE No. 1736

$$2y(x)y''(x) - y'(x)^2 - 3y(x)^4 = 0$$

✓ **Mathematica** : cpu = 4.27182 (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]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{2\sqrt{\#1}\sqrt{1+\frac{\#1^3}{c_1}}\,\text{Hypergeometric2F1}\left(\frac{1}{6},\frac{1}{2},\frac{7}{6},-\frac{\#1^3}{c_1}\right)}{\sqrt{\#1^3+c_1}}\&\right][x+c_2]\right\},\left\{y(x)\to \text{Inv}\right.\right.$$

✓ **Maple** : cpu = 0.1 (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))
```

$$\int^{y(x)}\frac{1}{\sqrt{\_a^4+\_ac_1}}d\_a - x - c_2 = 0$$

2.1737 ODE No. 1737

$$-4(a+x^2)\,y(x)^2+b+2y(x)y''(x)-y'(x)^2-3y(x)^4-8xy(x)^3=0$$

✗ **Mathematica** : cpu = 20.7537 (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]*Derivative[2][
```

, 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]*Deriv
```

✗ **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))
```

2.1738 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 = 0.319795 (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] - Deriva
```

, 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][y][x]
```

✗ **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(
```

, 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+diff(f(
8*y(x)^3=0,y(x))
```

2.1739 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 = 0.0298287 (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[x]*Deriv
```

, 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 + 2*y
```

✗ **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(x)^4
```

2.1740 ODE No. 1740

$$2y(x)y''(x) - 3y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0734353 (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 = 0.138 (sec), leaf count = 13

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-3*diff(y(x),x)^2=0,y(x))
```

$$y(x) = \frac{4}{(xc_1 + c_2)^2}$$

2.1741 ODE No. 1741

$$2y(x)y''(x) - 3y'(x)^2 - 4y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0839109 (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 = 0.5 (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))
```

$$y(x) = \frac{4}{(c_1^2 - c_2^2)\sin(x)^2 - 2c_1c_2\sin(x)\cos(x) + c_2^2}$$

2.1742 ODE No. 1742

$$f(x)y(x)^2 + 2y(x)y''(x) - 3y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 4.52148 (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

$$y(x) = \left(e^{\int \_b(\_a)d\_a+c_1}\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = \frac{\_b(\_a)^2}{2} - \frac{f(\_a)}{2}\right\}, \left\{\_a = x, \_b(\_a) = \frac{\frac{d}{dx}y(x)}{y(x)}\right\}, \left\{x = \_\right.\right.$$

2.1743 ODE No. 1743

$$y(x)^2\left(ay(x)^3+1\right)+2y(x)y''(x)-6y'(x)^2=0$$

✓ **Mathematica** : cpu = 17.5864 (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],x]
```

$$\left\{\text{Solve}\left[-\frac{4\left(\text{EllipticF}\left(\arcsin\left(\sqrt{\frac{(\text{Root}[4c_1\#1^4+4a\#1^3+1\&,2]-\text{Root}[4c_1\#1^4+4a\#1^3+1\&,4])(y(x)-\text{Root}[4c_1\#1^4+4a\#1^3+1\&,1}{(\text{Root}[4c_1\#1^4+4a\#1^3+1\&,1]-\text{Root}[4c_1\#1^4+4a\#1^3+1\&,4])(y(x)-\text{Root}[4c_1\#1^4+4a\#1^3+1\&,2}}\right.\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.094 (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))
```

$$\int^{y(x)}-\frac{2}{\sqrt{4\_a^4c_1+4\_a^3a+1}\_a}d\_a-x-c_2=0$$

2.1744 ODE No. 1744

$$2y(x)y''(x) - y'(x)^2 \left(y'(x)^2 + 1\right) = 0$$

✓ **Mathematica** : cpu = 0.560053 (sec), leaf count = 161

```
DSolve[-(Derivative[1][y][x]^2*(1 + Derivative[1][y][x]^2)) + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \text{InverseFunction}\left[-ie^{-c_1}\left(\sqrt{\#1}\sqrt{-1+\#1e^{2c_1}} - e^{-c_1}\operatorname{arctanh}\left(\frac{e^{-c_1}\sqrt{-1+\#1e^{2c_1}}}{\sqrt{\#1}}\right)\right)\&\right][x+c_2]\right\}$$

✓ **Maple** : cpu = 0.477 (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))
```

$$y(x) = \frac{\left(\text{RootOf}\left(\tan(\_Z)^2 c_1^2\_Z^2 - 4\tan(\_Z)^2 c_1c_2\_Z - 4\tan(\_Z)^2 c_1x\_Z + 4\tan(\_Z)^2 c_2^2 + 8\tan(\_Z)^2 xc_2\right.\right.}{}$$

2.1745 ODE No. 1745

$$2(y(x)-a)y''(x)+y'(x)^2+1=0$$

✓ **Mathematica** : cpu = 0.34188 (sec), leaf count = 195

```
DSolve[1 + Derivative[1][y][x]^2 + 2*(-a + y[x])*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{\sqrt{2}e^{2c_1}\arctan\left(\frac{\sqrt{2\#1-2a+e^{2c_1}}}{\sqrt{2}\sqrt{a-\#1}}\right)+2\sqrt{a-\#1}\sqrt{2\#1-2a+e^{2c_1}}}{2\sqrt{2}}\&\right][x+c_2]\right\},\left\{y\right.\right.$$

✓ **Maple** : cpu = 0.671 (sec), leaf count = 117

```
dsolve(2*(y(x)-a)*diff(diff(y(x),x),x)+diff(y(x),x)^2+1=0,y(x))
```

$$\frac{\arctan\left(\frac{y(x)-a-\frac{c_1}{2}}{\sqrt{-(-y(x)+a)(a+c_1-y(x))}}\right)c_1}{2}-x-c_2-\sqrt{-\left(-y\left(x\right)+a\right)\left(a+c_1-y\left(x\right)\right)}=0$$

2.1746 ODE No. 1746

$$-ax^2 - bx - c + 3y(x)y''(x) - 2y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0798371 (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]
```

$$\text{Solve}\left[\int \frac{y(x)^{2/3}}{\left(ax^2+bx+c\right)\sqrt{-\frac{2\left(ax^2+bx+c\right)^3}{y(x)^2}+\frac{c_1\left(ax^2+bx+c\right)}{y(x)^{2/3}}+9\left(b^2-4ac\right)}}d\frac{ax^2+bx+c}{y(x)^{2/3}} = -\int \frac{1}{3\left(ax^2+bx+c\right)}dx$$

✓ **Maple** : cpu = 0.415 (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))
```

$$y(x) = \text{RootOf}\left(-2b\arctan\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right) - 2\left(\int^{\_Z} \frac{b}{\sqrt{4\_f^{\frac{4}{3}}c_1b^2 - 36c\_f^2a + 9\_f^2b^2 - 2}}d\_f\right)\sqrt{4ac-b^2} + c_2$$

2.1747 ODE No. 1747

$$3y(x)y''(x) - 5y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0718027 (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 = 0.023 (sec), leaf count = 17

```
dsolve(3*diff(diff(y(x),x),x)*y(x)-5*diff(y(x),x)^2=0,y(x))
```

$$-\frac{3}{2y\left(x\right)^{\frac{2}{3}}} - xc_1 - c_2 = 0$$

2.1748 ODE No. 1748

$$4y(x)y''(x) - 3y'(x)^2 + 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.177221 (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 = 0.117 (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))
```

$$y(x) = 0$$

2.1749 ODE No. 1749

$$4y(x)y''(x) - 3y'(x)^2 - 12y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.329397 (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]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{4\#1\sqrt{1+\frac{4\#1^{3/2}}{c_1}}\,\text{Hypergeometric2F1}\left(\frac{1}{6},\frac{1}{2},\frac{7}{6},-\frac{4\#1^{3/2}}{c_1}\right)}{\sqrt{\#1^{3/2}\left(4\#1^{3/2}+c_1\right)}}\&\right][x+c_2]\right\},\left\{y(x)\to\right.\right.$$

✓ **Maple** : cpu = 2.046 (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))
```

$$\int^{y(x)}\frac{1}{\sqrt{c_1\_a^{\frac{3}{2}}+4\_a^3}}d\_a - x - c_2 = 0$$

2.1750 ODE No. 1750

$$ay(x)^3 + by(x)^2 + cy(x) + 4y(x)y''(x) - 3y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.593348 (sec), leaf count = 107

```
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] == 0,y[x],
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1} -\frac{1}{\sqrt{-\frac{1}{3}aK[1]^3 - bK[1]^2 + c_1K[1]^{3/2} + cK[1]}}dK[1]\&\right][x+c_2]\right\},\left\{y(x)\to \text{In}\right.\right.$$

✓ **Maple** : cpu = 1.032 (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+y(x)*c=0,y(x))
```

$$y(x) = 0$$

2.1751 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 = 6.78908 (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]*Derivati
```

, 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*y[x]

✗ **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))*diff
2*y(x)^2*diff(y(x),x)+g(x)*y(x)^2+f(x)*y(x)=0,y(x))

2.1752 ODE No. 1752

$$ay(x)^2 + 4y(x)y''(x) - 5y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.117774 (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]
```

$$\left\{\left\{y(x) \to c_2 \operatorname{sech}^4\left(\frac{1}{4}\sqrt{a}(x - 4c_1)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.309 (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))
```

$$y(x) = \frac{16\,\mathrm{e}^{\sqrt{a}\,x} a^2}{\left(\mathrm{e}^{\frac{\sqrt{a}\,x}{2}} c_1 - c_2\right)^4}$$

2.1753 ODE No. 1753

$$12y(x)y''(x) - 15y'(x)^2 + 8y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.377463 (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]
```

$$\left\{\left\{y(x)\to \frac{2304{c_1}^2}{(3{c_1}^2x^2+6c_2{c_1}^2x+128+3{c_2}^2{c_1}^2)^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.123 (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))
```

$$-\frac{12y(x)\left(8\sqrt{y\left(x\right)}-c_1\right)\sqrt{8y\left(x\right)-c_1\sqrt{y\left(x\right)}}}{\sqrt{-24y\left(x\right)^3+3c_1y\left(x\right)^{\frac{5}{2}}}\,c_1\sqrt{\sqrt{y\left(x\right)}\,\left(8\sqrt{y\left(x\right)}-c_1\right)}}-x-c_2=0$$

2.1754 ODE No. 1754

$$ny(x)y''(x) + (1-n)y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0866508 (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 = 0.051 (sec), leaf count = 15

```
dsolve(n*y(x)*diff(diff(y(x),x),x)-(n-1)*diff(y(x),x)^2=0,y(x))
```

$$y(x) = \left(\frac{xc_1 + c_2}{n}\right)^n$$

2.1755 ODE No. 1755

$$ay(x)y''(x) + by'(x)^2 + c0 + c1y(x) + c2y(x)^2 + c3y(x)^3 + c4y(x)^4 = 0$$

✓ **Mathematica** : cpu = 4.32467 (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]*Derivative
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1} -\frac{}{\sqrt{4b^5c_1K[1]^{-\frac{2b}{a}} + 20ab^4c_1K[1]^{-\frac{2b}{a}} + 35a^2b^3c_1K[1]^{-\frac{2b}{a}} + 25a^3b^2c_1K[1]^{-\frac{2b}{a}} +}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.503 (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
```

$$\int^{y(x)} \frac{\_a^{\frac{2b}{a}}b(3a+2b)(2a+b)}{\sqrt{-36b(a+b)\left(a+\frac{2b}{3}\right)\left(a+\frac{b}{2}\right)\left(\frac{2b(a+b)\left(a+\frac{b}{2}\right)(a+2b)\,\mathrm{c3}\,\_a^{\frac{3a+2b}{a}}}{3} + \left(b\,\mathrm{c2}\left(a+\frac{b}{2}\right)(a+2b)\_a^{\frac{2a+2b}{a}} + \left(\frac{b\,\mathrm{c4}(a+2}{}\right.\right.\right.}}$$

2.1756 ODE No. 1756

$$ay(x)y''(x)+by'(x)^2-\frac{y(x)y'(x)}{\sqrt{c^2+x^2}}=0$$

✓ **Mathematica** : cpu = 4.67574 (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]*Derivative[2]
```

$$\left\{\left\{y(x)\to c_2\exp\left(\int_1^x-\frac{\left(\frac{K[2]}{\sqrt{c^2+K[2]^2}}+1\right)^{\frac{1}{2}/a}}{\left(1-\frac{K[2]}{\sqrt{c^2+K[2]^2}}\right)^{\frac{1}{2}/a}\int_1^{K[2]}\frac{\exp\left(\frac{\frac{1}{2}\log\left(\frac{K[1]}{\sqrt{c^2+K[1]^2}}+1\right)-\frac{1}{2}\log\left(1-\frac{K[1]}{\sqrt{c^2+K[1]^2}}\right)}{a}\right)\left(-\sqrt{c^2+K[1]^2}a-b\sqrt{c^2\cdots}\right.}{a\sqrt{c^2+K[1]^2}}}\cdots\right.\right.\right.$$

✓ **Maple** : cpu = 0.267 (sec), leaf count = 78

```
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)
```

$$y(x)=\left(\frac{a(a+1)}{(a+b)\left(c_1 2^{\frac{1}{a}}a\,x^{\frac{a+1}{a}}\,\mathrm{hypergeom}\left(\left[-\frac{1}{2a},-\frac{a+1}{2a}\right],\left[\frac{a-1}{a}\right],-\frac{c^2}{x^2}\right)+c_2a+c_2\right)}\right)^{-\frac{a}{a+b}}$$

2.1757 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 = 6.96851 (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] - (-1 +
```

, 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][y][x
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)^
```

, 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)+f(x)^
```

2.1758 ODE No. 1758

$$y''(x)(ay(x)+b)+cy'(x)^2=0$$

✓ **Mathematica** : cpu = 0.241734 (sec), leaf count = 36

```
DSolve[c*Derivative[1][y][x]^2 + (b + a*y[x])*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to \frac{-b+\left(-(c_1(a+c)(-x-c_2))\right)^{\frac{a}{a+c}}}{a}\right\}\right\}$$

✓ **Maple** : cpu = 0.076 (sec), leaf count = 42

```
dsolve((a*y(x)+b)*diff(diff(y(x),x),x)+c*diff(y(x),x)^2=0,y(x))
```

$$y(x)=\frac{(xc_1+c_2)\,(a+c)\left(\frac{1}{(a+c)(xc_1+c_2)}\right)^{\frac{c}{a+c}}-b}{a}$$

2.1759 ODE No. 1759

$$xy(x)y''(x) + xy'(x)^2 - y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0997282 (sec), leaf count = 18

```
DSolve[-(y[x]*Derivative[1][y][x]) + x*Derivative[1][y][x]^2 + x*y[x]*Derivative[2][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x) \to c_2\sqrt{x^2 + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.031 (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))
```

$$y(x) = \sqrt{x^2c_1 + 2c_2}$$

2.1760 ODE No. 1760

$$ay(x)y'(x) + f(x) + xy(x)y''(x) + xy'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0483739 (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][x] == 0,
```

$$\left\{\left\{y(x)\to -\sqrt{2}\sqrt{\int_1^x -K[2]^{-a}\left(c_1+\int_1^{K[2]} f(K[1])K[1]^{a-1}dK[1]\right)dK[2]+c_2}\right\},\left\{y(x)\to \sqrt{2}\sqrt{\int_1^x -K[2]^{-a}\right.\right.$$

✓ **Maple** : cpu = 0.104 (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))
```

$$y(x) = \frac{\sqrt{2}\sqrt{(a-1)\left(x^{1-a}\left(\int \frac{x^a f(x)}{x}dx\right)+x^{1-a}c_1-\left(\int f(x)\,dx\right)-c_2\right)}}{a-1}$$

2.1761 ODE No. 1761

$$x(ay(x)^4+d)+y(x)\left(by(x)^2+c\right)+xy(x)y''(x)-xy'(x)^2+y(x)y'(x)=0$$

✗ **Mathematica** : cpu = 0.751153 (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][x]^2 +
```

, 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[1][y
```

✗ **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(x)*(c
```

2.1762 ODE No. 1762

$$ay(x)y'(x) + bxy(x)^3 + xy(x)y''(x) - xy'(x)^2 = 0$$

✗ **Mathematica** : cpu = 41.5958 (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[2][y][x
```

, 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]*Derivative

✗ **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

$$y(x) = \left(\_a\, e^{\int -2\_b(\_a) d\_a - 2c_1}\right) \&\text{where} \left[\left\{ \frac{d}{d\_a}\_b(\_a) = \_a(\_ab - 2a + 2)\_b(\_a)^3 + (a-1)\_b(\_a)^2 - \frac{\_b(\_}{\_a}\right.\right.$$

2.1763 ODE No. 1763

$$ay(x)y'(x) + xy(x)y''(x) + 2xy'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.164091 (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] == 0,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 = 0.117 (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))
```

$$y(x) = \frac{x^{-a}3^{\frac{1}{3}}\left(\left(c_2(a-1)\,x^a - xc_1\right)x^{2a}(a-1)^2\right)^{\frac{1}{3}}}{a-1}$$

2.1764 ODE No. 1764

$$xy(x)y''(x) - 2xy'(x)^2 + (y(x)+1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0459052 (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] == 0,y
```

$$\left\{\left\{y(x)\to \frac{\tan\left(\frac{1}{2}\left(\sqrt{2}\sqrt{c_1}\log(x)-\sqrt{2}\sqrt{c_1}c_2\right)\right)}{\sqrt{2}\sqrt{c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.155 (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))
```

$$y(x) = c_1 \tanh\left(\frac{\ln(x) - c_2}{2c_1}\right)$$

2.1765 ODE No. 1765

$$a y(x) y'(x) + x y(x) y''(x) - 2 x y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.173294 (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] == 0,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 = 0.049 (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))
```

$$y(x) = -\frac{(a-1)\, x^a}{c_2\,(a-1)\, x^a - x c_1}$$

2.1766 ODE No. 1766

$$xy(x)y''(x) - 4xy'(x)^2 + 4y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.110001 (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] == 0,y[x],
```

$$\left\{\left\{y(x)\to \frac{c_2x}{\sqrt[3]{1+c_1x^3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.041 (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))
```

$$y(x) = \frac{x}{\left(-3x^3c_2 + c_1\right)^{\frac{1}{3}}}$$

2.1767 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 = 0.214836 (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[x]*Deri
```

$$\left\{\left\{y(x)\to c_2\exp\left(\frac{\sqrt{b^2-x^2}}{a}+\frac{c_1\log\left(a\sqrt{b^2-x^2}-c_1\right)}{a^2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.347 (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)=
```

$$y(x)=c_2\mathrm{e}^{\int-\frac{x\sqrt{b^2-x^2}}{c_1\sqrt{b^2-x^2}+a\left(b^2-x^2\right)}dx}$$

2.1768 ODE No. 1768

$$x(y(x)+x)y''(x)+xy'(x)^2+(x-y(x))y'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0307555 (sec), leaf count = 53

```
DSolve[-y[x] + (x - y[x])*Derivative[1][y][x] + x*Derivative[1][y][x]^2 + x*(x + y[x])*Derivative[2][
```

$$\left\{\left\{y(x)\to -x-\sqrt{x^2+2c_2x^2+c_1}\right\},\left\{y(x)\to -x+\sqrt{x^2+2c_2x^2+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.058 (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))
```

$$y(x)=-x-\sqrt{(-c_2+1)\,x^2+c_1}$$

2.1769 ODE No. 1769

$$2xy(x)y''(x) - xy'(x)^2 + y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.103884 (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],x]
```

$$\left\{\left\{y(x)\to c_2\left(\sqrt{x}+c_1\right)^2\right\}\right\}$$

✓ **Maple** : cpu = 0.135 (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))
```

$$y(x) = c_1\sqrt{x}\,c_2 + xc_1^2 + \frac{c_2^2}{4}$$

2.1770 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 = 0.432272 (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]^2 + 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 = 0.074 (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*
```

$$y(x)=\frac{x(xc_1-c_2)}{x^2c_1-xc_2-1}$$

2.1771 ODE No. 1771

$$x^2(y(x)+x)y''(x)-(xy'(x)-y(x))^2=0$$

✓ **Mathematica** : cpu = 0.0539596 (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]
```

$$\left\{\left\{y(x)\to -x+c_2xe^{\frac{c_1}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.188 (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))
```

$$y(x)=-\frac{x\left(-\mathrm{e}^{\frac{c_2}{x}}\mathrm{e}^{-1}+c_1\right)}{c_1}$$

2.1772 ODE No. 1772

$$a\left(xy'(x)-y(x)\right)^2+x^2(x-y(x))y''(x)=0$$

✓ **Mathematica** : cpu = 0.39998 (sec), leaf count = 36

```
DSolve[a*(-y[x] + x*Derivative[1][y][x])^2 + x^2*(x - y[x])*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to x\left(1+\left((a-1)\left(-\frac{(-1)^a c_1}{x}-c_2\right)\right)^{\frac{1}{1-a}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.164 (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))
```

$$y(x)=-\operatorname{RootOf}\left(-c_2ax\_Z^a+c_1a\_Z^a+c_2x\_Z^a-c_1\_Z^a-\_Zx^a\right)+x$$

2.1773 ODE No. 1773

$$2x^2y(x)y''(x) - \left(x^2\left(y'(x)^2 + 1\right)\right) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.271482 (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]
```

$$\left\{\left\{y(x) \to \frac{x\left(c_1{}^2 \log^2(x) - 2c_2c_1{}^2 \log(x) + 4 + c_2{}^2c_1{}^2\right)}{4c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.042 (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))
```

$$y(x) = \frac{x\left(4c_2^2 \ln(x)^2 + 4c_1 \ln(x)\, c_2 + c_1^2 + 1\right)}{4c_2}$$

2.1774 ODE No. 1774

$$ax^2y(x)y''(x) + bx^2y'(x)^2 + cxy(x)y'(x) + dy(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.782643 (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]*Derivative[
```

$$\left\{\left\{y(x)\to c_2\exp\left(-\frac{\log(x)\left(a\left(\sqrt{\frac{a^2-2a(c+2d)-4bd+c^2}{a^2}}-1\right)+c\right)-2a\log\left(x^{\sqrt{\frac{a^2-2a(c+2d)-4bd+c^2}{a^2}}}+c_1\right)}{2(a+b)}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.396 (sec), leaf count = 106

```
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
```

$$y(x) = \left(\frac{x^{\frac{\sqrt{(-4a-4b)d+(a-c)^2}-a+c}{a}}\left(a^2+(-2c-4d)\,a-4bd+c^2\right)}{(a+b)^2\left(c_1x^{\frac{\sqrt{(-4a-4b)d+(a-c)^2}}{a}}-c_2\right)^2}\right)^{-\frac{a}{2a+2b}}$$

2.1775 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 = 0.106545 (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][y][x]^2
```

$$\left\{\left\{y(x)\to c_2e^{a\log(x+1)+\frac{-a-c_1}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.265 (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)
```

$$y(x) = \frac{(1+x)^a\,\mathrm{e}^{-a}\mathrm{e}^{\frac{c_2}{x}}\,\mathrm{e}^{-\frac{a}{x}}}{c_1}$$

2.1776 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 = 300.004 (sec), leaf count = 0

```
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*(1 - x^3)
```

, timed out

`$Aborted`

✓ **Maple** : cpu = 0.276 (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),
```

$$y(x)=\frac{x\left(\mathrm{LegendreQ}\left(-\frac{1}{6},\frac{1}{3},\sqrt{-(x-1)\,(x^2+x+1)}\right)c_1+\frac{c_2\,\mathrm{LegendreP}\left(-\frac{1}{6},\frac{1}{3},\sqrt{-(x-1)(x^2+x+1)}\right)}{2}\right)^2}{c_1}$$

2.1777 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 = 45.0461 (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[x]*Deriv
```

, could not solve

```
DSolve[f3[x]*y[x]^2 + f2[x]*y[x]*Derivative[1][y][x] + f1[x]*Derivative[1][y][x]^2 + f0[x]*y
```

✗ **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(
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\mathrm{e}^{\int \_b(\_a)d\_a+c_1}\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = -\frac{(\mathrm{f1}(\_a)+\mathrm{f0}(\_a))\_b(\_a)^2}{\mathrm{f0}(\_a)} - \frac{\mathrm{f2}(\_a)\_b(\_a)}{\mathrm{f0}(\_a)} - \frac{\mathrm{f3}(\_a)}{\mathrm{f0}(\_a)}\right\}\right.$$

2.1778 ODE No. 1778

$$y(x)^2y''(x) - a = 0$$

✓ **Mathematica** : cpu = 0.165445 (sec), leaf count = 65

```
DSolve[-a + y[x]^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\left(\frac{2a\operatorname{arctanh}\left(\frac{\sqrt{-\frac{2a}{y(x)}+c_1}}{\sqrt{c_1}}\right)}{c_1{}^{3/2}}+\frac{y(x)\sqrt{-\frac{2a}{y(x)}+c_1}}{c_1}\right)^2=(x+c_2)^2, y(x)\right]$$

✓ **Maple** : cpu = 0.779 (sec), leaf count = 245

```
dsolve(y(x)^2*diff(diff(y(x),x),x)-a=0,y(x))
```

$$y(x) = \frac{c_1\left(c_1 a + e^{\text{RootOf}\left(\operatorname{csgn}\left(\frac{1}{c_1}\right)c_1^4a^2 - 2\_Z c_1^3 a\,e^{\_Z} - e^{2\_Z}\operatorname{csgn}\left(\frac{1}{c_1}\right)c_1^2 - 2\,e^{\_Z}\operatorname{csgn}\left(\frac{1}{c_1}\right)c_2 - 2\,e^{\_Z}\operatorname{csgn}\left(\frac{1}{c_1}\right)x\right)}\right)^2 e^{-\text{RootOf}\left(\operatorname{csgn}\left(\frac{1}{c_1}\right.\right.}}{2}$$

2.1779 ODE No. 1779

$$ax + y(x)^2 y''(x) + y(x) y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 21.2159 (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 = 0.92 (sec), leaf count = 113

```
dsolve(y(x)^2*diff(diff(y(x),x),x)+y(x)*diff(y(x),x)^2+a*x=0,y(x))
```

$$\ln(x) - \frac{\sqrt{3}\left(\int^{\frac{y(x)}{x}} \frac{\_g^2\left(3\left(\frac{a}{\_g^3}\right)^{\frac{1}{3}}\tan\left(\mathrm{RootOf}\left(2\sqrt{3}\,\_Z - \ln\left(\frac{1}{2\sqrt{3}\,\sin(\_Z)\cos(\_Z)+2\cos(\_Z)^2+1}\right) - 6c_1 - 6\left(\int \frac{\left(\frac{a}{\_g^3}\right)^{\frac{2}{3}}\_g^2}{\_g^3+a}\,d\_g\right)\right)\right)\right) + \sqrt{3}\,(}{\_g^3+a}}{6}$$

2.1780 ODE No. 1780

$$-ax - b + y(x)^2 y''(x) + y(x)y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 20.2804 (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 = 1.245 (sec), leaf count = 171

```
dsolve(y(x)^2*diff(diff(y(x),x),x)+y(x)*diff(y(x),x)^2-a*x-b=0,y(x))
```

$$y(x) = \mathrm{RootOf}\left(\sqrt{3}\,b\left(\int^{\_Z} - \frac{\left(-\left(-\frac{a}{\_g^3 b^3}\right)^{\frac{1}{3}}\sqrt{3}\,b + 2\sqrt{3}\,a - 3b\left(-\frac{a}{\_g^3 b^3}\right)^{\frac{1}{3}}\tan\left(\mathrm{RootOf}\left(-2b^2\left(-\frac{a}{\_g^3 b^3}\right)^{\frac{2}{3}}\_g^2\right.\right.\right.}{}\right.\right.$$

2.1781 ODE No. 1781

$$\left(y(x)^2+1\right)y''(x)+(1-2y(x))y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.138203 (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]
```

$$\left\{\left\{y(x)\to \frac{i\left(1-{c_1}^{2i}(x+c_2)^{2i}\right)}{1+{c_1}^{2i}(x+c_2)^{2i}}\right\}\right\}$$

✓ **Maple** : cpu = 0.054 (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))
```

$$y(x)=\tan\left(\ln\left(xc_1+c_2\right)\right)$$

2.1782 ODE No. 1782

$$\left(y(x)^2+1\right)y''(x)-3y(x)y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.121303 (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]
```

$$\left\{\left\{y(x)\to -\frac{ic_1(x+c_2)}{\sqrt{c_1{}^2x^2+2c_2c_1{}^2x-1+c_2{}^2c_1{}^2}}\right\},\left\{y(x)\to \frac{ic_1(x+c_2)}{\sqrt{c_1{}^2x^2+2c_2c_1{}^2x-1+c_2{}^2c_1{}^2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.068 (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))
```

$$y(x)=\sqrt{-\frac{1}{x^2c_1^2+2xc_1c_2+c_2^2-1}}\,(xc_1+c_2)$$

2.1783 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 = 0.802736 (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][y][x]) +
```

$$\text{Solve}\left[x=-y(x)^2+c_2e^{e^{-c_1y(x)}},y(x)\right]$$

✓ **Maple** : cpu = 0.158 (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)*di
```

$$\frac{-y(x)\,c_1+\ln\left(x+y(x)^2\right)+c_2+2}{y\left(x\right)}=0$$

2.1784 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 = 0.199197 (sec), leaf count = 74

```
DSolve[(y[x] - x*Derivative[1][y][x])*(1 + Derivative[1][y][x]^2) + (x^2 + y[x]^2)*Derivative[2][y][x
```

$$\text{Solve}\left[\frac{1}{2}\left(\log\left(1 - \frac{iy(x)}{x}\right) + \log\left(1 + \frac{iy(x)}{x}\right) + i\cot(c_1)\left(\log\left(1 - \frac{iy(x)}{x}\right) - \log\left(1 + \frac{iy(x)}{x}\right)\right)\right) = -\log(x) +$$

✓ **Maple** : cpu = 1.067 (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))
```

$$y(x) = \tan\left(\text{RootOf}\left(-e^{\frac{2ic_1\_Z}{-1+c_1}} e^{\frac{2c_1c_2}{-1+c_1}} x^{\frac{2c_1}{-1+c_1}} e^{\frac{2i\_Z}{-1+c_1}} + \cos\left(\_Z\right)^2 e^{\frac{2c_2}{-1+c_1}} x^{\frac{2}{-1+c_1}}\right)\right) x$$

2.1785 ODE No. 1785

$$\left(x^2+y(x)^2\right)y''(x)-2\left(xy'(x)-y(x)\right)\left(y'(x)^2+1\right)=0$$

✓ **Mathematica** : cpu = 0.225584 (sec), leaf count = 95

```
DSolve[-2*(-y[x] + x*Derivative[1][y][x])*(1 + Derivative[1][y][x]^2) + (x^2 + y[x]^2)*Derivative[2][
```

$$\left\{\left\{y(x)\to\frac{1}{2}\left(-\sqrt{4x\left(-x+e^{c_2}\right)+e^{2c_2}\cot^2(c_1)}-e^{c_2}\cot(c_1)\right)\right\},\left\{y(x)\to\frac{1}{2}\left(\sqrt{4x\left(-x+e^{c_2}\right)+e^{2c_2}\cot^2(c_1)}-\right.\right.\right.$$

✓ **Maple** : cpu = 7.96 (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))
```

$$y(x)=\frac{c_1+1-\sqrt{c_1^2+\left(4ic_2x+2\right)c_1-4c_2^2x^2-4ic_2x+1}}{2c_2}$$

2.1786 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 = 0.0695276 (sec), leaf count = 99

```
DSolve[f[x]*(1 - y[x])*y[x]*Derivative[1][y][x] - (1 - 2*y[x])*Derivative[1][y][x]^2 + 2*(1 - y[x])*y
```

$$\left\{\left\{y(x)\to\frac{1}{4}\exp\left(-i\int_1^x-\exp\left(-\int_1^{K[3]}\frac{1}{2}f(K[1])dK[1]\right)c_1dK[3]-ic_2\right)\left(1+\exp\left(i\int_1^x-\exp\left(-\int_1^{K[3]}\frac{1}{2}f\right.\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.283 (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
```

$$y(x)=\frac{\left(2\,\mathrm{e}^{c_1\left(\int\mathrm{e}^{-\frac{\left(\int f(x)dx\right)}{2}}dx\right)}c_2+1\right)^2\mathrm{e}^{\int-c_1\mathrm{e}^{\int-\frac{f(x)}{2}dx}dx}}{8c_2}$$

2.1787 ODE No. 1787

$$h(y(x)) + 2(1 - y(x))y(x)y''(x) - ((1 - 3y(x))y'(x)^2) = 0$$

✓ **Mathematica** : cpu = 0.595617 (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] == 0,y[x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1} -\frac{1}{(K[2]-1)\sqrt{K[2]}\sqrt{c_1+2\int_1^{K[2]}\frac{e^{-2\left(\log(1-K[1])+\frac{1}{2}\log(K[1])\right)}h(K[1])}{2(K[1]-1)K[1]}dK[1]}}dK[2]\&\right]\right.\right.$$

✓ **Maple** : cpu = 0.244 (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))
```

$$\int^{y(x)}\frac{1}{\sqrt{\_b\left(c_1+\int\frac{h(\_b)}{(\_b-1)^3\_b^2}d\_b\right)}(\_b-1)}d\_b - x - c_2 = 0$$

2.1788 ODE No. 1788

$$-4(1-y(x))y(x)^2\left(-f'(x)-f(x)^2-g'(x)+g(x)^2\right)+4y(x)y'(x)(f(x)y(x)+g(x))-2(1-y(x))y(x)y''(x)+(1-3y(x$$

✗ **Mathematica** : cpu = 0.992261 (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]) + 4*y[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][x]) +
```

✗ **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)*(
```

, result contains DESol or ODESolStruc

$$\sqrt{y(x)}-\frac{2\left(\frac{\partial}{\partial x}\,\mathrm{DESol}\left(\left\{-\frac{\mathrm{e}^{2\left(\int g(x)dx\right)-2\left(\int f(x)dx\right)}c_1^2\_Y(x)}{4}-2g(x)\left(\frac{d}{dx}\_Y(x)\right)+\frac{d^2}{dx^2}\_Y(x)\right\},\{\_Y(x)\}\right)\right)\mathrm{e}^{\int(f(x)-g(x))d}}{\mathrm{DESol}\left(\left\{-\frac{\mathrm{e}^{2\left(\int g(x)dx\right)-2\left(\int f(x)dx\right)}c_1^2\_Y(x)}{4}-2g(x)\left(\frac{d}{dx}\_Y(x)\right)+\frac{d^2}{dx^2}\_Y(x)\right\},\{\_Y(x)\}\right)c_1}$$

2.1789 ODE No. 1789

$4y(x)^2(1-y(x))\left(-f'(x)+f(x)^2-g'(x)-g(x)^2\right)-4y(x)y'(x)(f(x)y(x)+g(x))+(1-y(x))^3\left(\mathrm{f0}(x)^2y(x)^2-\mathrm{f1}(x)^2\right.$

✗ **Mathematica** : cpu = 2.02098 (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 - Derivative[1
```

, 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 - Der
```

✗ **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)*(
```

, 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),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))
```

2.1790 ODE No. 1790

$$-h(y(x))+3(1-y(x))y(x)y''(x)-2(1-2y(x))y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.468384 (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] == 0,y
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}-\frac{1}{(1-K[2])^{2/3}K[2]^{2/3}\sqrt{c_1+2\int_1^{K[2]}-\frac{\exp\left(-2\left(\frac{2}{3}\log(1-K[1])+\frac{2}{3}\log(K[1])\right)\right)h(K[1])}{3(K[1]-1)K[1]}dK\right.}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.267 (sec), leaf count = 111

```
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))
```

$$\int^{y(x)}-\frac{1}{\sqrt{\left(c_1-\frac{2\left(\int\frac{h(\_b)}{\left(\_b^2-\_b\right)^{\frac{4}{3}}\_b(\_b-1)}d\_b\right)}{3}\right)(\_b(\_b-1))^{\frac{1}{3}}\_b(\_b-1)}}d\_b-x-c_2=0$$

2.1791 ODE No. 1791

$$-h(y(x)) + (1 - y(x))y''(x) - 3(1 - 2y(x))y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.462477 (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,y[x],x]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1} -\frac{e^{\frac{1}{2}(12-12K[2])}}{(K[2]-1)^3\sqrt{c_1+2\int_1^{K[2]} -\frac{\exp(-2(6(K[1]-1)+3\log(K[1]-1)))h(K[1])}{K[1]-1}dK[1]}}dK[2]\&\right.\right.\right.$$

✓ **Maple** : cpu = 0.27 (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))
```

$$\int^{y(x)}\frac{\mathrm{e}^{-6\_b}}{\sqrt{-2\left(\int\frac{\mathrm{e}^{-12\_b}h(\_b)}{(\_b-1)^7}d\_b\right)+c_1}\,(\_b-1)^3}d\_b - x - c_2 = 0$$

2.1792 ODE No. 1792

$$a(y(x)-1)y(x)y''(x)+y'(x)^2(by(x)+c)+h(y(x))=0$$

✓ **Mathematica** : cpu = 0.815403 (sec), leaf count = 232

```
DSolve[h[y[x]] + (c + b*y[x])*Derivative[1][y][x]^2 + a*(-1 + y[x])*y[x]*Derivative[2][y][x] == 0,y[x
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}-\frac{(1-K[2])^{\frac{1}{2}\left(\frac{2b}{a}+\frac{2c}{a}\right)}K[2]^{-\frac{c}{a}}}{\sqrt{c_1+2\int_1^{K[2]}-\frac{\exp\left(-2\left(\frac{c\log(K[1])}{a}-\frac{(b+c)\log(1-K[1])}{a}\right)\right)h(K[1])}{a(K[1]-1)K[1]}dK[1]}}dK[2]\&\right][x+c\right.\right.$$

✓ **Maple** : cpu = 0.54 (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))
```

$$\int^{y(x)}\frac{\_b^{-\frac{c}{a}}(\_b-1)^{-\frac{-b-c}{a}}a}{\sqrt{a\left(c_1a-2\left(\int\frac{(\_b-1)^{\frac{2c}{a}}(\_b-1)^{\frac{2b}{a}}\_b^{-\frac{2c}{a}}h(\_b)}{\_b(\_b-1)}d\_b\right)\right)}}d\_b-x-c_2=0$$

2.1793 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 = 0.100907 (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]^2 + a*(
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[a\#1^{-1/a}(-((\#1-1)\#1))^{\frac{1}{a}}\,\text{Hypergeometric2F1}\left(\frac{1}{a},\frac{a-1}{a},1+\frac{1}{a},1-\#1\right)\&\right]\left[\int_1^{x}\right.\right.\right.$$

✓ **Maple** : cpu = 0.132 (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)
```

$$c_1\mathrm{e}^{-\frac{fx}{a}}-c_2+\int^{y(x)}\frac{(\_a(\_a-1))^{\frac{1}{a}}}{\_a\,(\_a-1)}d\_a=0$$

2.1794 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 = 0.12525 (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])*Derivative[1][
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-a\#1^{\frac{1}{a}}\text{Hypergeometric2F1}\left(\frac{1}{a},1-\frac{1}{b},1+\frac{1}{a},\#1\right)\&\right]\left[\int_1^x \exp\left(-\int_1^{K[3]}\frac{f(K[1])}{ab}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.09 (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
```

$$c_1\mathrm{e}^{-\frac{fx}{ba}}-c_2+\int^{y(x)}\frac{\_a^{\frac{1}{a}}(\_a-1)^{\frac{1}{b}}}{\_a(\_a-1)}d\_a=0$$

2.1795 ODE No. 1795

$$xy(x)^2y''(x) - a = 0$$

✓ **Mathematica** : cpu = 0.186534 (sec), leaf count = 116

```
DSolve[-a + x*y[x]^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[-\frac{a\arctan\left(\frac{\sqrt{2}\sqrt{c_1}\left(\frac{y(x)}{x}+\frac{a}{2c_1}\right)}{\sqrt{-\frac{2ay(x)}{x}-\frac{2c_1y(x)^2}{x^2}}}\right)}{2\sqrt{2}c_1{}^{3/2}} - \frac{\sqrt{-\frac{2ay(x)}{x}-\frac{2c_1y(x)^2}{x^2}}}{2c_1} - \frac{1}{x} - c_2 = 0, y(x)\right]$$

✓ **Maple** : cpu = 1.596 (sec), leaf count = 529

```
dsolve(x*y(x)^2*diff(diff(y(x),x),x)-a=0,y(x))
```

$$y(x) = \frac{xc_1\left(9c_1a + \mathrm{e}^{\mathrm{RootOf}\left(243\ \mathrm{csgn}\left(\frac{1}{c_1}\right)c_1^4a^2x - 54\_Z\mathrm{e}^{-\_Z}axc_1^3 - 3\,\mathrm{e}^{2\_Z}\,\mathrm{csgn}\left(\frac{1}{c_1}\right)c_1^2x - 6\,\mathrm{e}^{\_Z}\,\mathrm{csgn}\left(\frac{1}{c_1}\right)c_2x - 2\,\mathrm{e}^{\_Z}\,\mathrm{csgn}\left(\frac{1}{c_1}\right)\right)}\right)^2\mathrm{e}^{-\mathrm{Ro}}}{2}$$

2.1796 ODE No. 1796

$$(a^2 - x^2)\left(a^2 - y(x)^2\right)y''(x) + (a^2 - x^2)\,y(x)y'(x)^2 - x\left(a^2 - y(x)^2\right)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.159277 (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^2 - x^2)
```

$$\left\{\left\{y(x) \to -\frac{1}{2}e^{-c_2}\left(1 - \frac{x}{\sqrt{x^2 - a^2}}\right)^{-\frac{c_1}{2}}\left(\frac{x}{\sqrt{x^2 - a^2}} + 1\right)^{-\frac{c_1}{2}}\sqrt{2a^2e^{2c_2}\left(1 - \frac{x}{\sqrt{x^2 - a^2}}\right)^{c_1}\left(\frac{x}{\sqrt{x^2 - a^2}} + 1\right)^{c_1} -}\right.\right.$$

✓ **Maple** : cpu = 0.371 (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)
```

$$y(x) = \frac{\left(\left(x + \sqrt{-a^2 + x^2}\right)^{2c_1}c_2^2 + a^2\right)\left(x + \sqrt{-a^2 + x^2}\right)^{-c_1}}{2c_2}$$

2.1797 ODE No. 1797

$$(y(x)-1)^3\left(ay(x)^2+b\right)+cxy(x)^2(y(x)-1)+dx^2y(x)^2(y(x)+1)+2x^2y(x)(y(x)-1)y''(x)-x^2(3y(x)-1)y'(x)^2+2xy$$

✗ **Mathematica** : cpu = 10.8562 (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*(-1 + y[
```

, 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) + 2*x
1 + y[x])*y[x]*Derivative[1][y][x] - x^2*(-1 + 3*y[x])*Derivative[1][y][x]^2 + 2*x^2*(-
1 + y[x])*y[x]*Derivative[2][y][x] == 0, y[x], x]
```

✗ **Maple** : 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+
```

, 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))=0,y
```

2.1798 ODE No. 1798

$$x^3y(x)^2y''(x) + (y(x) + x)\left(xy'(x) - y(x)\right)^3 = 0$$

✓ **Mathematica** : cpu = 33.8098 (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],x]
```

$$\text{Solve}\left[-\int_1^{\frac{y(x)}{x}} \frac{i\sqrt{3}\sqrt{K[2]}\,\text{BesselJ}\left(i\sqrt{3},2\sqrt{K[2]}\right)+\sqrt{K[2]}\,\text{BesselJ}\left(i\sqrt{3},2\sqrt{K[2]}\right)-2\,\text{BesselJ}\left(1+i\sqrt{3},2\sqrt{K\right.}{\left(\text{BesselJ}\left(i\sqrt{3},2\right.\right.}\right.$$

✓ **Maple** : cpu = 0.245 (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))
```

$$y(x) = \text{RootOf}\left(-2\ln(x) - \left(\int^{\_Z} \frac{i\sqrt{3}\,\text{BesselY}\left(i\sqrt{3},2\sqrt{\_f}\right)c_1\sqrt{\_f}+i\sqrt{3}\,\text{BesselJ}\left(i\sqrt{3},2\sqrt{\_f}\right)\sqrt{\_f}+\text{BesselY}}{\_f^{\frac{3}{2}}\left(\text{Be}\right.}\right.\right.$$

2.1799 ODE No. 1799

$$y(x)^3y''(x) - a = 0$$

✓ **Mathematica** : cpu = 0.960685 (sec), leaf count = 88

```
DSolve[-a + y[x]^3*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{a+c_1{}^2x^2+2c_2c_1{}^2x+c_2{}^2c_1{}^2}}{\sqrt{c_1}}\right\},\left\{y(x)\to \frac{\sqrt{a+c_1{}^2x^2+2c_2c_1{}^2x+c_2{}^2c_1{}^2}}{\sqrt{c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.375 (sec), leaf count = 46

```
dsolve(y(x)^3*diff(diff(y(x),x),x)-a=0,y(x))
```

$$y(x) = \frac{\sqrt{\left((c_2+x)^2 c_1^2 + a\right) c_1}}{c_1}$$

2.1800 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 = 0.345602 (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],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 = 0.054 (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))
```

$$y(x)=-\frac{\sqrt{-4\left(xc_1+c_2+\frac{1}{2}\right)\left(xc_1+c_2\right)}}{2xc_1+2c_2}$$

2.1801 ODE No. 1801

$$-a^2xy(x)^2+2y(x)^3y''(x)+y(x)^4-1=0$$

✗ **Mathematica** : cpu = 3.81833 (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))

2.1802 ODE No. 1802

$$-ax^2 - bx - c + 2y(x)^3 y''(x) + y(x)^2 y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 0.180914 (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[x],x]
```

, 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] == 0,

✗ **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))

2.1803 ODE No. 1803

$$-\mathrm{a0}(a-y(x))^2(b-y(x))^2(c-y(x))^2-\mathrm{a2}(a-y(x))^2(c-y(x))^2-\mathrm{a3}(a-y(x))^2(b-y(x))^2+2(a-y(x))(b-y(x))(c-y(x)$$

✓ **Mathematica** : cpu = 17.1006 (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 - y[x])^2
```

$$\left\{\mathrm{Solve}\left[-\frac{2\,\mathrm{EllipticF}\left(\arcsin\left(\sqrt{\frac{(\mathrm{Root}\left[\mathrm{a0}\#1^4+(-a\mathrm{a0}-b\mathrm{a0}-c\mathrm{a0}-c_1)\#1^3+(-\mathrm{a1}-\mathrm{a2}-\mathrm{a3}+a\mathrm{a0}b+a\mathrm{a0}c+\mathrm{a0}bc+ac_1+bc_1+cc_1)\#1^2+(aa\right.}{(\mathrm{Root}\left[\mathrm{a0}\#1^4+(-a\mathrm{a0}-b\mathrm{a0}-c\mathrm{a0}-c_1)\#1^3+(-\mathrm{a1}-\mathrm{a2}-\mathrm{a3}+a\mathrm{a0}b+a\mathrm{a0}c+\mathrm{a0}bc+ac_1+bc_1+cc_1)\#1^2+(aa\right.}}\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.917 (sec), leaf count = 304

```
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
```

$$\int^{y(x)}\frac{}{\sqrt{-\mathrm{a0}\,\_a^4+\mathrm{a0}\,\_a^3a+\_a^3\,\mathrm{a0}\,b+\_a^3\,\mathrm{a0}\,c-\_a^2a\,\mathrm{a0}\,b-\_a^2a\,\mathrm{a0}\,c-\_a^2\,\mathrm{a0}\,bc+\_aa\,\mathrm{a0}\,bc+\_a^3c_1-\_}}$$

2.1804 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 = 11.7614 (sec), leaf count = 416

```
DSolve[(a/2 - 6*y[x]^2)*Derivative[1][y][x]^2 + (-b - a*y[x] + 4*y[x]^3)*Derivative[2][y][x] == 0,y[x
```

$$\text{Solve}\left[\frac{\sqrt{2}\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}}\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,2\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]-\text{Root}\left[4\#1^3-\#1a-b\&,2\right]}}\left(y(x)-\text{Root}\left[4\right.\right.}{c_1\sqrt{ay(x)+b-4y(x}}\right.$$

✓ **Maple** : cpu = 0.035 (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))
```

$$\int^{y(x)}\frac{1}{\sqrt{4\_a^3-\_aa-b}}d\_a-xc_1-c_2=0$$

2.1805 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 = 10.2728 (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][y][x] +
```

$$\text{Solve}\left[\frac{2\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}}\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,2\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]-\text{Root}\left[4\#1^3-\#1a-b\&,2\right]}}\left(y(x)-\text{Root}\left[4\#1\right.\right.}{\sqrt{ay(x)+b-4y(x)^3}}\right.$$

✓ **Maple** : cpu = 0.062 (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),
```

$$c_1\mathrm{e}^{-fx}-c_2+\int^{y(x)}\frac{1}{\sqrt{4\_a^3-\_aa-b}}d\_a=0$$

2.1806 ODE No. 1806

$-f(x)((y(x)-1)y(x)(y(x)-x))^{3/2}+2(1-y(x))\left(x^2-2xy(x)+y(x)\right)y(x)y'(x)-2(1-x)x(1-y(x))(x-y(x))y(x)y'$

✗ **Mathematica** : cpu = 8.57217 (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]*(x^2 +
```

, 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])*y[x
```

✓ **Maple** : cpu = 2.646 (sec), leaf count = 726

```
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
```

Expression too large to display

2.1807 ODE No. 1807

$a(1-y(x))^2(x-y(x))^2y(x)^2+bx(1-y(x))^2(x-y(x))^2-c(1-x)(x-y(x))^2y(x)^2-d(1-x)x(1-y(x))^2y(x)^2+2(1-x)^2$

✗ **Mathematica** : cpu = 19.0609 (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])^2*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 - y[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))*diff(y(
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))
```

2.1808 ODE No. 1808

$$b\sqrt{(1-y(x)^2)(1-a^2y(x)^2)}y'(x)^2+(y(x)^2-1)(a^2y(x)^2-1)y''(x)+y(x)(-2a^2y(x)^2+a^2+1)y'(x)^2=0$$

✓ **Mathematica** : cpu = 10.7047 (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]^2)]*De
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}\frac{\exp\left(\frac{b\sqrt{1-K[1]^2}\sqrt{1-a^2K[1]^2}\,\text{EllipticF}(\arcsin(K[1]),a^2)}{\sqrt{(K[1]^2-1)(a^2K[1]^2-1)}}+\frac{1}{2}(-\log(1-K[1])-\log(K[\right.}{c_1}\right.\right.\right.$$

✓ **Maple** : cpu = 0.155 (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)*di
```

$$\int^{y(x)} \mathrm{e}^{\int \frac{-2\_b^3a^2+\_b\,a^2+b\sqrt{(\_b^2-1)(\_b^2a^2-1)}+\_b}{(\_b^2-1)(\_b^2a^2-1)}d\_b}d\_b - xc_1 - c_2 = 0$$

2.1809 ODE No. 1809

$$y''(x)\left(ax^2+2bx+c+y(x)^2\right)^2+dy(x)=0$$

✓ **Mathematica** : cpu = 23.4114 (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]
```

$$\left\{\text{Solve}\left[a\arctan\left(\frac{ax+b}{\sqrt{ac-b^2}}\right)+\sqrt{ac-b^2}\int_1^{\frac{y(x)}{\sqrt{c+x(2b+ax)}}}\frac{a\left(K[2]^2+1\right)}{\sqrt{\left(K[2]^2+1\right)\left(d+\left(K[2]^2+1\right)\left(c_1a^2+\left(b^2-ac\right)K[2]^2\right)\right)}}\right.\right.$$

✓ **Maple** : cpu = 0.454 (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))
```

$$y(x)=\text{RootOf}\left(-\arctan\left(\frac{ax+b}{\sqrt{ac-b^2}}\right)a+\left(\int^{\_Z}\frac{\sqrt{\left(\_f^2+1\right)\left(-\_f^4ac+\_f^4b^2+\_f^2a^2c_1-c\_f^2a+\_f^2b^2+c\right.}}{-\_f^4ac+\_f^4b^2+\_f^2a^2c_1-c\_f^2a+\_f^2b^2+c_1a^2+\right.\right.$$

2.1810 ODE No. 1810

$$\sqrt{y(x)}y''(x) - a = 0$$

✓ **Mathematica** : cpu = 0.0540618 (sec), leaf count = 1677

```
DSolve[-a + Sqrt[y[x]]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to \frac{3c_1{}^2}{16a^2} + \frac{\sqrt[3]{-\frac{221184c_1{}^6}{a^6} + \frac{159252480x^2c_1{}^3}{a^2} + \frac{159252480c_2{}^2c_1{}^3}{a^2} + \frac{318504960xc_2c_1{}^3}{a^2} + 2293235712a^2x^4 + 2293235}}{}\right.\right.$$

✓ **Maple** : cpu = 0.109 (sec), leaf count = 91

```
dsolve(y(x)^(1/2)*diff(diff(y(x),x),x)-a=0,y(x))
```

$$\frac{-3\sqrt{4a\sqrt{y(x)} - c_1}\, c_1 - \left(4a\sqrt{y(x)} - c_1\right)^{\frac{3}{2}}}{12a^2} - x - c_2 = 0$$

2.1811 ODE No. 1811

$$\sqrt{x^2 + y(x)^2}y''(x) - a\left(y'(x)^2 + 1\right)^{3/2} = 0$$

✗ **Mathematica** : cpu = 300.041 (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[x],x]
```

, timed out

```
$Aborted
```

✓ **Maple** : cpu = 2.068 (sec), leaf count = 88

```
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))
```

$$y(x) = -ix$$

2.1812 ODE No. 1812

$$y(x)y''(x)(1-\log(y(x)))+y'(x)^2(\log(y(x))+1)=0$$

✓ **Mathematica** : cpu = 0.19867 (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,y[x],x]
```

$$\left\{\left\{y(x)\to e^{\frac{c_1x-1+c_2c_1}{c_1(x+c_2)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.176 (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))
```

$$y(x)=\mathrm{e}^{\frac{xc_1+c_2-1}{xc_1+c_2}}$$

2.1813 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 = 17.9171 (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[y[x]]^2)
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1}-\frac{\sqrt{2}\sqrt{\cos(2K[1])a-a-2b}}{\sqrt{2aAK[1]^2+4AcK[1]^2-2aA\sin(2K[1])K[1]+2c_1-aA\cos(2K[1])}}dK[1]\right.\right.\right.$$

✓ **Maple** : cpu = 0.534 (sec), leaf count = 138

```
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
```

$$\int^{y(x)}\frac{\sqrt{2}\left(b+a\sin\left(\_a\right)^2\right)}{\sqrt{-\left(b+a\sin\left(\_a\right)^2\right)\left(Aa\sin\left(\_a\right)^2-2Aa\_a\cos\left(\_a\right)\sin\left(\_a\right)+\_a^2\left(a+2c\right)A-2c_1\right)}}d\_a-x-c_2=0$$

2.1814 ODE No. 1814

$$ah(y(x))y'(x)^2 + h(y(x))y''(x) + j(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.244923 (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]
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[\int_1^{\#1} -\frac{e^{aK[2]}}{\sqrt{c_1+2\int_1^{K[2]} -\frac{e^{2aK[1]}j(K[1])}{h(K[1])}dK[1]}}dK[2]\&\right][x+c_2]\right\},\left\{y(x)\to \text{InverseFun}\right.\right.$$

✓ **Maple** : cpu = 0.139 (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))
```

$$\int^{y(x)} \frac{h(\_b)^a}{\sqrt{-2\left(\int \frac{h(\_b)^{2a}}{h(\_b)}d\_b\right)+c_1}}d\_b - x - c_2 = 0$$

2.1815 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 = 1.29788 (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]]*Deriv
```

, 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 + h[y[

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(h(y(x))*diff(diff(y(x),x),x)-D(h)(y(x))*diff(y(x),x)^2-h(y(x))^2*j(x,diff(y(x),x)/h(y
```

, result contains DESol or ODESolStruc

$$y(x)=\mathrm{RootOf}\left(\int \_b(\_a)\,d\_a+c_1-\left(\int^{\_Z}\frac{1}{h\,(\_f)}d\_f\right)\right)\&\mathrm{where}\left[\left\{\frac{d}{d\_a}\_b(\_a)=j(\_a,\_b(\_a))\right\},\left\{\_a=\right.\right.$$

2.1816 ODE No. 1816

$$x^2(-y(x))y'(x) + y'(x)y''(x) - xy(x)^2 = 0$$

✗ **Mathematica** : cpu = 47.8731 (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] == 0,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][x]

✗ **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

$$y(x) = \_b(\_a)\ \&\text{where} \left[\left\{ -\_b(\_a)^2 \_a^2 + \left(\frac{d}{d\_a} \_b(\_a) \right)^2 + c_1 = 0 \right\}, \{\_a = x, \_b(\_a) = y(x)\}, \{x = \_a, y(x$$

2.1817 ODE No. 1817

$$4y'(x)^2 + (xy'(x) - y(x))\, y''(x) = 0$$

✓ **Mathematica** : cpu = 9.13454 (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],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 = 0.365 (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))
```

$$y(x) = \mathrm{e}^{\int^{\ln(x)} \left(\mathrm{e}^{\mathrm{RootOf}\left(\ln\left(\mathrm{e}^{\_Z}-1\right)\mathrm{e}^{\_Z}+\mathrm{e}^{\_Z} c_1-\_Z\,\mathrm{e}^{\_Z}-\_b\,\mathrm{e}^{\_Z}+2\right)}-1\right) d\_b + c_2}$$

2.1818 ODE No. 1818

$$\left(xy'(x)-y(x)\right)y''(x)-\left(y'(x)^2+1\right)^2=0$$

✗ **Mathematica** : cpu = 0.646431 (sec), leaf count = 0

```
DSolve[-(1 + Derivative[1][y][x]^2)^2 + (-y[x] + x*Derivative[1][y][x])*Derivative[2][y][x] == 0,y[x
```

, could not solve

```
DSolve[-(1 + Derivative[1][y][x]^2)^2 + (-y[x] + x*Derivative[1][y][x])*Derivative[2][y][x]
```

✓ **Maple** : cpu = 0.645 (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))
```

$$y(x)=\mathrm{RootOf}\left(-\ln(x)+\int^{\_Z}\frac{-\_f+\mathrm{RootOf}\left(-\tan\left(\frac{1}{\_Z}\right)c_1\_Z+\_fc_1\tan\left(\frac{1}{\_Z}\right)+\tan\left(\frac{1}{\_Z}\right)\_Z\_f+c_1\_Z\_}{\_f^2+1}\right.$$

2.1819 ODE No. 1819

$$ax^3y'(x)y''(x) + by(x)^2 = 0$$

✗ **Mathematica** : cpu = 0.807789 (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 = 0.076 (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))
```

$$y(x) = e^{\int^{\ln(x)} \mathrm{RootOf}\left(-\left(\int^{\_Z} \frac{\_aa}{\_a^3a - a\_a^2 + b} d\_a\right) - \_b + c_1\right) d\_b + c_2}$$

2.1820 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 = 306.626 (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[x] + f1
```

, 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

$$y(x)=\left(\mathrm{e}^{\int \_b(\_a)d\_a+c_1}\right)\ \&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a)=-\frac{\_b(\_a)^3\,\mathrm{f1}+(\mathrm{f2}+\mathrm{f3})\,\_b(\_a)^2+\mathrm{f4}\left(\_a\right)\_b(\_a)+\mathrm{f5}\left(\_a\right)}{\_b\left(\_a\right)\mathrm{f1}+\mathrm{f2}}\right.\right.$$

2.1821 ODE No. 1821

$$(x^2 + 2y(x)^2 y'(x))\, y''(x) + 2y(x)y'(x)^3 + 3xy'(x) + y(x) = 0$$

✗ **Mathematica** : cpu = 41.1678 (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*Derivative[1][
```

, 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*Deriv
```

✗ **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),
```

, result contains DESol or ODESolStruc

$$y(x) = \_b(\_a) \,\&\text{where} \left[\left\{ \_b(\_a)^2 \left(\frac{d}{d\_a}\_b(\_a) \right)^2 + \left(\frac{d}{d\_a}\_b(\_a) \right) \_a^2 + \_b(\_a)\_a + c_1 = 0 \right\}, \{\_a = x, \_b$$

2.1822 ODE No. 1822

$$\left(y'(x)^2+y(x)^2\right)y''(x)+y(x)^3=0$$

✓ **Mathematica** : cpu = 0.548676 (sec), leaf count = 371

```
DSolve[y[x]^3 + (y[x]^2 + Derivative[1][y][x]^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\to c_2\exp\left(\frac{1}{12}\left(-2\sqrt{3}\arctan\left(\frac{1+2\text{InverseFunction}\left[\frac{\left(\sqrt{3}-i\right)\arctan\left(\frac{\#1}{\sqrt{\frac{1}{2}\left(1-i\sqrt{3}\right)}}\right)}{\sqrt{6\left(1-i\sqrt{3}\right)}}+\frac{\left(\sqrt{3}+i\right)\arctan\left(\frac{\#1}{\sqrt{\frac{1}{2}\left(1+i\right.}}\right.}{\sqrt{6\left(1+i\sqrt{3}\right)}}\right.}{\sqrt{3}}\right.\right.\right.\right.\right.\right.$$

✓ **Maple** : cpu = 1.597 (sec), leaf count = 159

```
dsolve((diff(y(x),x)^2+y(x)^2)*diff(diff(y(x),x),x)+y(x)^3=0,y(x))
```

$$y(x)=\frac{\sqrt{c_1+\tan\left(\sqrt{3}\,x\right)}\,\mathrm{e}^{\frac{\sqrt{3}\left(\int\frac{\sqrt{\left(9c_1^2+12\right)\sec\left(\sqrt{3}\,x\right)^2+3c_1^2+6c_1\tan\left(\sqrt{3}\,x\right)-3}}{c_1+\tan\left(\sqrt{3}\,x\right)}dx\right)}{6}+c_2}}{\left(\sec\left(\sqrt{3}\,x\right)^2\right)^{\frac{1}{4}}}$$

2.1823 ODE No. 1823

$$y''(x)\left(a\left(xy'(x)-y(x)\right)+y'(x)^2\right)-b=0$$

✓ **Mathematica** : cpu = 0.181847 (sec), leaf count = 281

```
DSolve[-b + (Derivative[1][y][x]^2 + a*(-y[x] + x*Derivative[1][y][x]))*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\text{Solve}\left[-\int \frac{a\left(\frac{ax^2}{4}+y(x)\right)+\sqrt{4b\left(\frac{ax^2}{4}+y(x)\right)-2c_1}}{\sqrt{\left(a^2\left(\frac{ax^2}{4}+y(x)\right)^2-4b\left(\frac{ax^2}{4}+y(x)\right)+2c_1\right)\left(a\left(\frac{ax^2}{4}+y(x)\right)+\sqrt{4b\left(\frac{ax^2}{4}+y(x)\right)-2c_1}\right)}}d\left(\frac{a\right.\right.\right.$$

✓ **Maple** : cpu = 0.3 (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))
```

$$y(x)=-\frac{a\,x^2}{4}+\text{RootOf}\left(-x+\int^{\_Z}\frac{\sqrt{\left(\_fa+\sqrt{4\_fb-2c_1}\right)\left(a^2\_f^2-4\_fb+2c_1\right)}}{a^2\_f^2-4\_fb+2c_1}d\_f+c_2\right)$$

2.1824 ODE No. 1824

$$y''(x)\left(a\sqrt{y'(x)^2+1}-xy'(x)\right)-y'(x)^2-1=0$$

✓ **Mathematica** : cpu = 0.580773 (sec), leaf count = 331

```
DSolve[-1 - Derivative[1][y][x]^2 + (-(x*Derivative[1][y][x]) + a*Sqrt[1 + Derivative[1][y][x]^2])*De
```

$$\left\{\left\{y(x)\to -\frac{\sqrt{x^2\left(a^2-x^2+c_1{}^2\right)}\left(c_1 \arctan\left(\frac{a^2-ax+c_1{}^2}{c_1\sqrt{-a^2+x^2-c_1{}^2}}\right)+c_1 \arctan\left(\frac{a^2+ax+c_1{}^2}{c_1\sqrt{-a^2+x^2-c_1{}^2}}\right)+2\sqrt{-a^2+x^2-c_1{}^2}\right.}{2x\sqrt{-a^2+x^2-c_1{}^2}}\right.\right.$$

✓ **Maple** : cpu = 0.902 (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
```

$$y(x)=\int\frac{-c_1a^2+x\sqrt{a^2\left(a^2-x^2+c_1^2\right)}}{a^3-a\,x^2}dx+c_2$$

2.1825 ODE No. 1825

$$f(x) + y''(x)h(y'(x)) + j(y(x))y'(x) = 0$$

✗ **Mathematica** : cpu = 0.0231166 (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[x],x]
```

, could not solve

DSolve[f[x] + j[y[x]]*Derivative[1][y][x] + h[Derivative[1][y][x]]*Derivative[2][y][x] == 0,

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(h(diff(y(x),x))*diff(diff(y(x),x),x)+j(y(x))*diff(y(x),x)+f=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_f(\_b) \,\&\text{where} \left[\left\{\int^{\_f(\_b)} j(\_a)\, d\_a + \int^{\frac{d}{d\_b}\_f(\_b)} h(\_a)\, d\_a + \_bf + c_1 = 0\right\}, \{\_b = x, \_f(\_b) = y(x$$

2.1826 ODE No. 1826

$$-ay(x) - b + y''(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.604612 (sec), leaf count = 201

```
DSolve[-b - a*y[x] + Derivative[2][y][x]^2 == 0,y[x],x]
```

$$\left\{\text{Solve}\left[\frac{(ay(x)+b)^2\left(1-\frac{4(ay(x)+b)^{3/2}}{3ac_1}\right)\text{Hypergeometric2F1}\left(\frac{1}{2},\frac{2}{3},\frac{5}{3},\frac{4(b+ay(x))^{3/2}}{3ac_1}\right)^2}{a^2\left(-\frac{4(ay(x)+b)^{3/2}}{3a}+c_1\right)}=(x+c_2)^2,y(x)\right],\text{Solve}\left[\right.\right.$$

✓ **Maple** : cpu = 0.885 (sec), leaf count = 173

```
dsolve(diff(diff(y(x),x),x)^2-a*y(x)-b=0,y(x))
```

$$y(x) = -\frac{b}{a}$$

2.1827 ODE No. 1827

$$a^2y''(x)^2 - 2axy''(x) + y'(x) = 0$$

✗ **Mathematica** : cpu = 0.533236 (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],x]
```

, could not solve

`DSolve[Derivative[1][y][x] - 2*a*x*Derivative[2][y][x] + a^2*Derivative[2][y][x]^2 == 0, y[x`

✓ **Maple** : cpu = 5.834 (sec), leaf count = 1364

```
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))
```

$$y(x) = \int \mathrm{RootOf}\left(8\_Z^{-2a+1}a^3\sqrt{x^2-\_Z}\left(-x+\sqrt{x^2-\_Z}\right)^{-2a}\left(\sqrt{x^2-\_Z}+x\right)^{2a}\left(4a^2\_Z-4a\,x^2+x^2\right)^{-2a}$$

2.1828 ODE No. 1828

$$2(x^2+1)\,y''(x)^2+2y'(x)\left(y'(x)+x\right)-x\left(4y'(x)+x\right)y''(x)-2y(x)=0$$

✓ **Mathematica** : cpu = 0.0074193 (sec), leaf count = 32

```
DSolve[-2*y[x] + 2*Derivative[1][y][x]*(x + Derivative[1][y][x]) - x*(x + 4*Derivative[1][y][x])*Deri
```

$$\left\{\left\{y(x)\to -\frac{1}{2}\sqrt{c_2-c_1{}^2}x^2+c_1x+c_2\right\}\right\}$$

✓ **Maple** : cpu = 1.289 (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(
```

$$y(x)=\frac{\left(c_1+\frac{\operatorname{arcsinh}(x)}{4}\right)x\sqrt{x^2+1}}{2}-\frac{3x^2}{16}+c_1^2+\frac{c_1\operatorname{arcsinh}(x)}{2}+\frac{\operatorname{arcsinh}(x)^2}{16}$$

2.1829 ODE No. 1829

$$3x^2y''(x)^2 + 4y'(x)^2 - 2(3xy'(x) + y(x))\,y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0044357 (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^2*Deri
```

$$\left\{\left\{y(x)\to \frac{c_1{}^2x^2}{c_2}+c_1x+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.762 (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(
```

$$y(x) = x^{\frac{2\sqrt{3}}{3}}c_1x$$

2.1830 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 = 0.0155594 (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][y][x]*D
```

$$\left\{\left\{y(x)\to\frac{c_1{}^2x^3}{c_2}+c_1x+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.918 (sec), leaf count = 302

```
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*di
```

$$y(x)=\frac{27c_1\left((9x-1)\sqrt{9}+9\sqrt{9x^2-2x}\right)^{-\frac{2\sqrt{9}}{9}}\left((9x-1)\sqrt{9}+9\sqrt{9x^2-2x}\right)^{-\frac{5\sqrt{9}}{18}}\sqrt{5}\sqrt{\frac{\frac{4}{5}+\frac{\sqrt{16}\left(x-\frac{1}{5}\right)}{\sqrt{9x^2-2x}}}{\sqrt{-\frac{(4x-1)^2}{9x^2-2x}}}}\,x\sqrt{4x-1}\,\mathrm{e}^{-}}{2}$$

2.1831 ODE No. 1831

$y(x)(xF(0,2)+xF(2,0))y''(x)+xF(2,2)y''(x)^2+xF(1,1)y''(x)+y'(x)\left((xF(1,2)+xF(2,1))y''(x)+y(x)(xF(0,1\right.$

✗ **Mathematica** : cpu = 64.68 (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]*Derivative[2][
```

, 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]*Deriv
```

✗ **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)+
```

, result contains DESol or ODESolStruc

$$y(x) = \left(\mathrm{e}^{\int \_b(\_a)d\_a+c_1}\right) \&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a) = -\_b(\_a)^2 - \frac{(F_{2,1}(\_a)+F_{1,2}(\_a))\_b(\_a)}{2F_{2,2}(\_a)} - \frac{F_{2,0}(\_a)+F_0}{}\right.\right.$$

2.1832 ODE No. 1832

$$y(x)y''(x)^2 - ae^{2x} = 0$$

✗ **Mathematica** : cpu = 20.2496 (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

$$y(x) = \left(\_a\,\mathrm{e}^{\int \frac{2\_b(\_a)}{3} d\_a + \frac{2c_1}{3}}\right) \&\text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a) = -\frac{\left(-4\_a^2 + 9\sqrt{\_aa}\right)\_b(\_a)^3}{9\_a} + \frac{4\_b(\_a)^2}{3}\right\}, \left\{\_a = y\right.\right.$$

2.1833 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 = 1.98671 (sec), leaf count = 1

```
DSolve[Derivative[1][y][x]^2*(-1 + a^2*Derivative[1][y][x]^2) - 2*a^2*y[x]*Derivative[1][y][x]^2*Deri
```

$$\{\}$$

✓ **Maple** : cpu = 2.542 (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
```

$$y(x) = \frac{\tan\left(\frac{\sqrt{a^2}\,(-x+c_1)}{ab}\right) b}{\sqrt{\tan\left(\frac{\sqrt{a^2}\,(-x+c_1)}{ab}\right)^2 + 1}\, a}$$

2.1834 ODE No. 1834

$$\left(x^2y(x)y''(x)+x^2\left(-y'(x)^2\right)+y(x)^2\right)^2-4xy(x)\left(xy'(x)-y(x)\right)^3=0$$

✓ **Mathematica** : cpu = 41.3741 (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^2*y[x]*D
```

$$\left\{\left\{y(x)\to c_1xe^{\frac{1}{-x+c_2}}\right\}\right\}$$

✗ **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)-
```

, result contains DESol or ODESolStruc

$$y(x)=xc_1$$

2.1835 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 = 0.0468287 (sec), leaf count = 143

```
DSolve[32*Derivative[2][y][x]*(-Derivative[1][y][x] + x*Derivative[2][y][x])^3 + (-Derivative[1][y][x
```

$$\left\{\left\{y(x)\to\frac{1}{4}\left(-\frac{8c_1{}^3}{\sqrt[3]{3}\sqrt[3]{\sqrt{3}\sqrt{27c_1{}^{10}c_2{}^{10}-64c_1{}^9c_2{}^9}-9c_1{}^5c_2{}^5}}+\frac{c_1{}^2}{c_2}-\frac{2\sqrt[3]{\sqrt{3}\sqrt{27c_1{}^{10}c_2{}^{10}-64c_1{}^9c_2{}^9}-9c_1{}^5c_2{}^5}}{3^{2/3}c_2{}^3}\right)\right.\right.$$

✗ **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`

2.1836 ODE No. 1836

$$\sqrt{ay''(x)^2+by'(x)^2}+cy(x)y''(x)+dy'(x)^2=0$$

✗ **Mathematica** : cpu = 5.64574 (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 + a*Deriva
```

, could not solve

```
DSolve[d*Derivative[1][y][x]^2 + c*y[x]*Derivative[2][y][x] + Sqrt[b*Derivative[1][y][x]^2 +
```

✗ **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(
```

, result contains DESol or ODESolStruc

$$y(x)=c_1$$

2.1837 ODE No. 1837

$$y^{(3)}(x) - a^2\left(y'(x)^5 + 2y'(x)^3 + y'(x)\right) = 0$$

✓ **Mathematica** : cpu = 10.0612 (sec), leaf count = 145

```
DSolve[-(a^2*(Derivative[1][y][x] + 2*Derivative[1][y][x]^3 + Derivative[1][y][x]^5)) + Derivative[3]
```

$$\left\{\left\{y(x) \to \int_1^x \text{InverseFunction}\left[-3\int \frac{1}{\sqrt{3\left(a^2\right)^2\#1^6 + 9\left(a^2\right)^2\#1^4 + 9\left(a^2\right)^2\#1^2 + 9c_1}}d\#1\&\right][c_2 - K[1]]dK[1]\right.\right.$$

✓ **Maple** : cpu = 0.324 (sec), leaf count = 105

```
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
```

$$y(x) = \int \text{RootOf}\left(3\left(\int^{\_Z} \frac{1}{\sqrt{3\_f^6a^2 + 9\_f^4a^2 + 9a^2\_f^2 + 3a^2 + 9c_1}}d\_f\right) + x + c_2\right)dx + c_3$$

2.1838 ODE No. 1838

$$y^{(3)}(x) + y(x)y''(x) - y'(x)^2 + 1 = 0$$

✗ **Mathematica** : cpu = 0.0237845 (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, 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+1=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a\&\text{where}\left[\left\{\left(\frac{d^2}{d\_a^2}\_b(\_a)\right)\_b(\_a)^2 + \left(\frac{d}{d\_a}\_b(\_a)\right)^2\_b(\_a) + \left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a)\_a - \_b(\_\right.\right.$$

2.1839 ODE No. 1839

$$y^{(3)}(x) - y(x)y''(x) + y'(x)^2 = 0$$

✗ **Mathematica** : cpu = 0.016138 (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], 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

$$y(x) = \left(e^{\int \_g(\_f)d\_f + c_2}\right) \&\text{where} \left[\left\{\frac{d}{d\_f}\_g(\_f) = (6\_f - 1)\_g(\_f)^3 + \frac{(7\_f - 1)\_g(\_f)^2}{\_f} + \frac{\_g(\_f)}{\_f}\right\}, \left\{\_f = \frac{d}{d}\right.\right.$$

2.1840 ODE No. 1840

$$ay(x)y''(x) + y^{(3)}(x) = 0$$

✗ **Mathematica** : cpu = 0.0218004 (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

$$y(x) = \left(e^{\int \_g(\_f) d\_f + c_2}\right) \&\text{where} \left[\left\{ \frac{d}{d\_f}\_g(\_f) = (6\_f + 2a)\_g(\_f)^3 + \frac{(7\_f + a)\_g(\_f)^2}{\_f} + \frac{\_g(\_f)}{\_f} \right\}, \left\{ \_f = \right.\right.$$

2.1841 ODE No. 1841

$$-f(x)+x^2y^{(3)}(x)+xy''(x)+(2xy(x)-1)y'(x)+y(x)^2=0$$

✗ **Mathematica** : cpu = 0.0797531 (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*Derivative[
```

, could not solve

```
DSolve[-f[x] + y[x]^2 + (-1 + 2*x*y[x])*Derivative[1][y][x] + x*Derivative[2][y][x] + x^2*De
```

✗ **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

$$y(x)=\_b(\_a)\ \&\text{where}\left[\left\{\_a^2\left(\frac{d^2}{d\_a^2}\_b(\_a)\right)+\_a\_b(\_a)^2-\left(\frac{d}{d\_a}\_b(\_a)\right)\_a-\left(\int f(\_a)\,d\_a\right)+c_1=0\right\}\right.$$

2.1842 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 = 0.151441 (sec), leaf count = 286

```
DSolve[(1 - y[x])*Derivative[1][y][x] + x*Derivative[1][y][x]^2 + x*(-1 + y[x])*Derivative[2][y][x] +
```

$$\left\{\left\{y(x)\to \frac{2x\left(c_3\left(\text{BesselJ}\left(\frac{\sqrt{c_2+2}}{\sqrt{2}},-\frac{1}{2}ix\sqrt{c_1}\right)-\frac{1}{4}i\sqrt{c_1}x\left(\text{BesselJ}\left(\frac{\sqrt{c_2+2}}{\sqrt{2}}-1,-\frac{1}{2}ix\sqrt{c_1}\right)-\text{BesselJ}\left(\frac{\sqrt{c_2+2}}{\sqrt{2}}+1,\right.\right.\right.\right.}{c_3 x\,\text{BesselJ}\left(\frac{\sqrt{c_2+2}}{\sqrt{2}}\right.}\right.\right.$$

✓ **Maple** : cpu = 0.687 (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
```

$$\ln(x)+2\left(\int^{y(x)}\frac{}{2\,\text{RootOf}\left(-2\,\text{BesselY}\left(\frac{\sqrt{4+c_1}}{2},\frac{\sqrt{2}\_Z}{2}\right)\sqrt{4+c_1}\,c_2+2\,\text{BesselY}\left(\frac{\sqrt{4+c_1}}{2},\frac{\sqrt{2}\_Z}{2}\right)c_2\_h-4\,\text{BesselY}\right.}\right.$$

2.1843 ODE No. 1843

$$y^{(3)}(x)y(x) + y(x)^3y'(x) - y'(x)y''(x) = 0$$

✓ **Mathematica** : cpu = 1.38017 (sec), leaf count = 409

```
DSolve[y[x]^3*Derivative[1][y][x] - Derivative[1][y][x]*Derivative[2][y][x] + y[x]*Derivative[3][y][x
```

$$\left\{\left\{y(x)\to \text{InverseFunction}\left[-\frac{2i\sqrt{1+\frac{\#1^2}{2\left(\sqrt{c_2{}^2-c_1}-c_2\right)}}\sqrt{1-\frac{\#1^2}{2\left(c_2+\sqrt{c_2{}^2-c_1}\right)}}\text{EllipticF}\left(i\text{arcsinh}\left(\frac{\sqrt{\frac{1}{\sqrt{c_2{}^2-c_1}-c_2}}\#1}{\sqrt{2}}\right)\right.}{\sqrt{\frac{1}{\sqrt{c_2{}^2-c_1}-c_2}}\sqrt{-\frac{\#1^4}{2}+2\#1^2c_2-2c_1}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.389 (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),
```

$$\int^{y(x)} -\frac{2}{\sqrt{-\_a^4+4\_a^2c_2-4c_2^2+4c_1}}d\_a - x - c_3 = 0$$

2.1844 ODE No. 1844

$$4y(x)^2y^{(3)}(x) + 15y'(x)^3 - 18y(x)y'(x)y''(x) = 0$$

✓ **Mathematica** : cpu = 0.113965 (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*Derivati
```

$$\left\{\left\{y(x)\to\frac{1}{\left(c_3x^2+c_2x+c_1\right)^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.443 (sec), leaf count = 75

```
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*di
```

$$y(x) = \mathrm{e}^{\int \mathrm{RootOf}\left(-2\left(\int^{\_Z}\frac{1}{\_h^2+\sqrt{\_h^2c_1+c_1^2}+c_1}d\_h\right)+x+c_2\right)dx+c_3}$$

2.1845 ODE No. 1845

$$9y(x)^2y^{(3)}(x)+40y'(x)^3-45y(x)y'(x)y''(x)=0$$

✓ **Mathematica** : cpu = 0.119391 (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*Derivati
```

$$\left\{\left\{y(x)\to \frac{1}{(c_3x^2+c_2x+c_1)^{3/2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.434 (sec), leaf count = 81

```
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*di
```

$$y(x)=\mathrm{e}^{\int \mathrm{RootOf}\left(-6\left(\int^{-Z}\frac{1}{4\_h^2+\sqrt{4\_h^2c_1+c_1^2}+c_1}d\_h\right)+x+c_2\right)dx+c_3}$$

2.1846 ODE No. 1846

$$2y^{(3)}(x)y'(x) - 3y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0253759 (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 = 0.01 (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))
```

$$y(x) = c_1 + c_2 e^{\frac{\sqrt{6}\,x}{2}} + c_3 e^{-\frac{\sqrt{6}\,x}{2}}$$

2.1847 ODE No. 1847

$$y^{(3)}(x)\left(y'(x)^2+1\right)-3y'(x)y''(x)^2=0$$

✓ **Mathematica** : cpu = 0.142818 (sec), leaf count = 95

```
DSolve[-3*Derivative[1][y][x]*Derivative[2][y][x]^2 + (1 + Derivative[1][y][x]^2)*Derivative[3][y][x]
```

$$\left\{\left\{y(x)\to c_3-\frac{i\sqrt{{c_1}^2x^2+2c_2{c_1}^2x-1+{c_2}^2{c_1}^2}}{c_1}\right\},\left\{y(x)\to \frac{i\sqrt{{c_1}^2x^2+2c_2{c_1}^2x-1+{c_2}^2{c_1}^2}}{c_1}+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.167 (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
```

$$y(x)=-\sqrt{-x^2-2xc_2-c_2^2+c_1}+c_3$$

2.1848 ODE No. 1848

$$y''(x)^2\left(-a-3y'(x)\right)+y^{(3)}(x)\left(y'(x)^2+1\right)=0$$

✓ **Mathematica** : cpu = 0.299357 (sec), leaf count = 187

```
DSolve[(-a - 3*Derivative[1][y][x])*Derivative[2][y][x]^2 + (1 + Derivative[1][y][x]^2)*Derivative[3]
```

$$\left\{\left\{y(x)\to c_3-\frac{\left(1-i\text{InverseFunction}\left[\frac{(\#1-a)e^{-a\arctan(\#1)}}{\sqrt{\#1^2+1}(a^2+1)c_1}\&\right][x+c_2]\right)^{-\frac{1}{2}-\frac{ia}{2}}\left(1+i\text{InverseFunction}\left[\frac{(\#1-a)e^{-a\,\mathrm{arc}}}{\sqrt{\#1^2+1}(a^2}\right.\right.}{(a^2+1)\,c_1}\right.\right.$$

✓ **Maple** : cpu = 1.289 (sec), leaf count = 359

```
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),
```

$$y(x)=\int\tan\left(\text{RootOf}\left(-2\,\mathrm{e}^{\_Za}\cos(\_Z)\,c_1c_2a^3-2\,\mathrm{e}^{\_Za}\cos(\_Z)\,c_1a^3x+c_2^2a^4\mathrm{e}^{2\_Za}+2c_2a^4x\,\mathrm{e}^{2\_Za}+a^4x^2\mathrm{e}^{2\_Z}\right.\right.$$

2.1849 ODE No. 1849

$$y^{(3)}(x)y''(x) - a\sqrt{b^2y''(x)^2 + 1} = 0$$

✓ **Mathematica** : cpu = 0.37942 (sec), leaf count = 426

```
DSolve[-(a*Sqrt[1 + b^2*Derivative[2][y][x]^2]) + Derivative[2][y][x]*Derivative[3][y][x] == 0,y[x],x
```

$$\left\{\left\{y(x) \to \frac{\frac{(a^2b^4x^2+2ab^4c_1x+b^4c_1{}^2-1)^{3/2}}{3ab^2} + \frac{\sqrt{a^2b^4x^2+2ab^4c_1x+b^4c_1{}^2-1}}{ab^2} - \frac{c_1\log\left(\sqrt{a^2b^4x^2+2ab^4c_1x+b^4c_1{}^2-1}+ab^2x+b^2c_1\right)}{a} - x\,\mathrm{lo}}{2ab^3}\right.\right.$$

✓ **Maple** : cpu = 0.357 (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
```

$$y(x) = c_2x + \int \frac{-\frac{\ln\left(\sqrt{(1+b^2(x+c_1)a)(-1+b^2(x+c_1)a)}+\frac{(x+c_1)b^4a^2}{\sqrt{a^2b^4}}\right)}{\sqrt{a^2b^4}} + \sqrt{(1+b^2(x+c_1)a)(-1+b^2(x+c_1)a)}\,(x+c_1)}{2b}\,d$$

2.1850 ODE No. 1850

$$y^{(4)}(x)y'(x) - y^{(3)}(x)y''(x) + y^{(3)}(x)y'(x)^3 = 0$$

✗ **Mathematica** : cpu = 0.170331 (sec), leaf count = 0

```
DSolve[Derivative[1][y][x]^3*Derivative[3][y][x] - Derivative[2][y][x]*Derivative[3][y][x] + Derivati
```

, could not solve

```
DSolve[Derivative[1][y][x]^3*Derivative[3][y][x] - Derivative[2][y][x]*Derivative[3][y][x] +
```

✗ **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

$$y(x) = \left(\int \frac{e^{\int -\_j(\_h)d\_h - c_2}\_j(\_h)}{\_h}d\_h + c_3\right) \&where \left[\left\{\frac{d}{d\_h}\_j(\_h) = (12\_h+3)\_j(\_h)^3 + \frac{(10\_h+1)\_j(\_\right.\right.$$

2.1851 ODE No. 1851

$$y'(x)^3\left(f'(x)y'(x)+f(x)y''(x)\right)-y''(x)\left(f''(x)y'(x)+2f'(x)y''(x)+f(x)y^{(3)}(x)\right)+y'(x)\left(f^{(3)}(x)y'(x)+3f''(x)y\right.$$

✗ **Mathematica** : cpu = 0.460471 (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]*Derivative
```

, could not solve

```
DSolve[2*q[x]*Sin[y[x]]*Derivative[1][y][x]^2 + Derivative[1][y][x]^3*(Derivative[1][f][x]*D
(Derivative[1][q][x]*Derivative[1][y][x]) + q[x]*Derivative[2][y][x]) - Derivative[2][y][x]*
```

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)*(diff(diff(diff(f(x),x),x),x)*diff(y(x),x)+3*diff(diff(f(x),x),x)*diff(d
```

, could not solve

```
dsolve(diff(y(x),x)*(diff(diff(diff(f(x),x),x),x)*diff(y(x),x)+3*diff(diff(f(x),x),x)*diff(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(x),x
diff(q(x),x)*diff(y(x),x))*cos(y(x))=0,y(x))
```

2.1852 ODE No. 1852

$$3y^{(4)}(x)y''(x) - 5y^{(3)}(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0800632 (sec), leaf count = 28

```
DSolve[-5*Derivative[3][y][x]^2 + 3*Derivative[2][y][x]*Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \to c_2\left(-\sqrt{2x+3c_1}\right) + c_4x + c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.369 (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),
```

$$y(x) = 3(c_2 + x)\sqrt{6}\,c_1\sqrt{-\frac{c_1}{c_2 + x}} + c_3x + c_4$$

2.1853 ODE No. 1853

$$40y^{(3)}(x)^3 + 9y^{(5)}(x)y''(x)^2 - 45y^{(4)}(x)y^{(3)}(x)y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0607087 (sec), leaf count = 43

```
DSolve[40*Derivative[3][y][x]^3 - 45*Derivative[2][y][x]*Derivative[3][y][x]*Derivative[4][y][x] + 9*
```

$$\left\{\left\{y(x)\to c_5x-\frac{4\sqrt{x(c_3x+c_2)+c_1}}{c_2{}^2-4c_1c_3}+c_4\right\}\right\}$$

✓ **Maple** : cpu = 0.998 (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(
```

$$y(x)=\int\int \operatorname{RootOf}\left(-\left(\int^{\_Z}\frac{}{\operatorname{RootOf}\left(-20\ln\left(\_f\right)+\int^{\_Z}\_k\left(\mathrm{e}^{\operatorname{RootOf}\left(81\_k^2\mathrm{e}^{\_Z}+20\,\mathrm{e}^{\_Z}\ln(\mathrm{e}^{\_Z}+27)-40\,\mathrm{e}^{\_Z}\ln(2)-20\,\mathrm{e}^{\_}\right.}\right.\right.}\right.\right.$$

2.1854 ODE No. 1854

$$y^{(n)}(x) - f\left(\frac{\partial^{n-1}y(x)}{\partial x^{n-1}}\right) = 0$$

✗ **Mathematica** : cpu = 0.0235083 (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
```

2.1855 ODE No. 1855

$$y^{(n)}(x) - f\left(\frac{\partial^{n-2}y(x)}{\partial x^{n-2}}\right) = 0$$

✗ **Mathematica** : cpu = 0.00268 (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
```

2.1856 ODE No. 1856

$$\{x'(t) = ax(t), y'(t) = b\}$$

✓ **Mathematica** : cpu = 0.01024 (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 = 0.033 (sec), leaf count = 19

```
dsolve({diff(x(t),t) = a*x(t), diff(y(t),t) = b})
```

$$\{x(t) = c_1 e^{at}, y(t) = bt + c_2\}$$

2.1857 ODE No. 1857

$$\{x'(t) = ay(t), y'(t) = -ax(t)\}$$

✓ **Mathematica** : cpu = 0.0091996 (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 = 0.039 (sec), leaf count = 35

```
dsolve({diff(x(t),t) = a*y(t), diff(y(t),t) = -a*x(t)})
```

$$\{x(t) = c_1 \sin(at) + c_2 \cos(at), y(t) = \cos(at) c_1 - \sin(at) c_2\}$$

2.1858 ODE No. 1858

$$\{x'(t) = ay(t), y'(t) = bx(t)\}$$

✓ **Mathematica** : cpu = 0.0060736 (sec), leaf count = 182

```
DSolve[{Derivative[1][x][t] == a*y[t], Derivative[1][y][t] == b*x[t]},{x[t], y[t]},t]
```

$$\left\{\left\{x(t) \to \frac{1}{2} c_1 e^{-\sqrt{a}\sqrt{b}t}\left(e^{2\sqrt{a}\sqrt{b}t} + 1\right) + \frac{\sqrt{a} c_2 e^{-\sqrt{a}\sqrt{b}t}\left(e^{2\sqrt{a}\sqrt{b}t} - 1\right)}{2\sqrt{b}}, y(t) \to \frac{\sqrt{b} c_1 e^{-\sqrt{a}\sqrt{b}t}\left(e^{2\sqrt{a}\sqrt{b}t} - 1\right)}{2\sqrt{a}} + \frac{1}{2} c_2 e\right.\right.$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 64

```
dsolve({diff(x(t),t) = a*y(t), diff(y(t),t) = b*x(t)})
```

$$\left\{x(t) = c_1 \mathrm{e}^{\sqrt{a}\,\sqrt{b}\,t} + c_2 \mathrm{e}^{-\sqrt{a}\,\sqrt{b}\,t}, y(t) = \frac{\sqrt{b}\left(c_1 \mathrm{e}^{\sqrt{a}\,\sqrt{b}\,t} - c_2 \mathrm{e}^{-\sqrt{a}\,\sqrt{b}\,t}\right)}{\sqrt{a}}\right\}$$

2.1859 ODE No. 1859

$$\{x'(t) = ax(t) - y(t), y'(t) = ay(t) + x(t)\}$$

✓ **Mathematica** : cpu = 0.0032071 (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[t]},t]
```

$$\{\{x(t) \to c_1 e^{at}\cos(t) - c_2 e^{at}\sin(t), y(t) \to c_2 e^{at}\cos(t) + c_1 e^{at}\sin(t)\}\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 37

```
dsolve({diff(x(t),t) = a*x(t)-y(t), diff(y(t),t) = x(t)+a*y(t)})
```

$$\{x(t) = e^{at}(c_1 \sin(t) + c_2 \cos(t)), y(t) = e^{at}(\sin(t) c_2 - \cos(t) c_1)\}$$

2.1860 ODE No. 1860

$$\left\{x'(t) = ax(t) + by(t), y'(t) = by(t) + cx(t)\right\}$$

✓ **Mathematica** : cpu = 0.0193385 (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], y[t]},
```

$$\left\{\left\{x(t)\to \frac{c_1\left(a\left(-e^{\frac{1}{2}t\left(-\sqrt{a^2-2ab+b^2+4bc}+a+b\right)}\right)+ae^{\frac{1}{2}t\left(\sqrt{a^2-2ab+b^2+4bc}+a+b\right)}+be^{\frac{1}{2}t\left(-\sqrt{a^2-2ab+b^2+4bc}+a+b\right)}+\sqrt{a^2}\right.}{2}\right.\right.$$

✓ **Maple** : cpu = 0.073 (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)})
```

$$\left\{x(t) = c_1 \mathrm{e}^{\frac{\left(a+b+\sqrt{b^2+(-2a+4c)b+a^2}\right)t}{2}} + c_2 \mathrm{e}^{\frac{\left(a+b-\sqrt{b^2+(-2a+4c)b+a^2}\right)t}{2}}, y(t) = \frac{-c_2\left(a-b+\sqrt{b^2+(-2a+4c)\,b+a^2}\right)\mathrm{e}^{\left(\right.}}{}\right.$$

2.1861 ODE No. 1861

$$\left\{ax'(t)+by'(t)=\alpha x(t)+\beta y(t), bx'(t)-ay'(t)=\beta x(t)-\alpha y(t)\right\}$$

✓ **Mathematica** : cpu = 0.0066679 (sec), leaf count = 183

```
DSolve[{a*Derivative[1][x][t] + b*Derivative[1][y][t] == alpha*x[t] + beta*y[t], b*Derivative[1][x][t
```

$$\left\{\left\{x(t)\to c_1e^{\frac{t(a\alpha+b\beta)}{a^2+b^2}}\cos\left(\frac{t(a\beta-\alpha b)}{a^2+b^2}\right)+c_2e^{\frac{t(a\alpha+b\beta)}{a^2+b^2}}\sin\left(\frac{t(a\beta-\alpha b)}{a^2+b^2}\right), y(t)\to c_2e^{\frac{t(a\alpha+b\beta)}{a^2+b^2}}\cos\left(\frac{t(a\beta-\alpha b)}{a^2+b^2}\right)-\right.\right.$$

✓ **Maple** : cpu = 0.094 (sec), leaf count = 118

```
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)
```

$$\left\{x(t)=c_1\mathrm{e}^{\frac{t(i\beta+\alpha)(-ib+a)}{a^2+b^2}}+c_2\mathrm{e}^{\frac{(-ia+b)(i\alpha+\beta)t}{a^2+b^2}}, y(t)=i\left(c_1\mathrm{e}^{\frac{t(i\beta+\alpha)(-ib+a)}{a^2+b^2}}-c_2\mathrm{e}^{\frac{(-ia+b)(i\alpha+\beta)t}{a^2+b^2}}\right)\right\}$$

2.1862 ODE No. 1862

$$\{x'(t) = -y(t), y'(t) = 2x(t) + 2y(t)\}$$

✓ **Mathematica** : cpu = 0.0195524 (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 = 0.031 (sec), leaf count = 39

```
dsolve({diff(x(t),t) = -y(t), diff(y(t),t) = 2*x(t)+2*y(t)})
```

$$\{x(t) = \mathrm{e}^t (c_1 \sin(t) + c_2 \cos(t)), y(t) = -((c_1 + c_2)\cos(t) + \sin(t)(c_1 - c_2))\mathrm{e}^t\}$$

2.1863 ODE No. 1863

$$\{x'(t) + 3x(t) + 4y(t) = 0, 2x(t) + y'(t) + 5y(t) = 0\}$$

✓ **Mathematica** : cpu = 0.0041379 (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] == 0},{x[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 = 0.034 (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})
```

$$\left\{x(t) = c_1\mathrm{e}^{-t} + c_2\mathrm{e}^{-7t}, y(t) = -\frac{c_1\mathrm{e}^{-t}}{2} + c_2\mathrm{e}^{-7t}\right\}$$

2.1864 ODE No. 1864

$$\{x'(t) = -5x(t) - 2y(t), y'(t) = x(t) - 7y(t)\}$$

✓ **Mathematica** : cpu = 0.0062521 (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], y[t]},t
```

$$\left\{\left\{x(t)\to c_1e^{-6t}(\sin(t)+\cos(t))-2c_2e^{-6t}\sin(t), y(t)\to c_1e^{-6t}\sin(t)+c_2e^{-6t}(\cos(t)-\sin(t))\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 44

```
dsolve({diff(x(t),t) = -5*x(t)-2*y(t), diff(y(t),t) = x(t)-7*y(t)})
```

$$\left\{x(t) = \mathrm{e}^{-6t}(c_1\sin(t)+c_2\cos(t)), y(t) = -\frac{\mathrm{e}^{-6t}((c_1-c_2)\cos(t)-\sin(t)(c_1+c_2))}{2}\right\}$$

2.1865 ODE No. 1865

$$\left\{x'(t)=\mathrm{a1}x(t)+\mathrm{b1}y(t)+\mathrm{c1},y'(t)=\mathrm{a2}x(t)+\mathrm{b2}y(t)+\mathrm{c2}\right\}$$

✓ **Mathematica** : cpu = 0.799443 (sec), leaf count = 2062

```
DSolve[{Derivative[1][x][t] == c1 + a1*x[t] + b1*y[t], Derivative[1][y][t] == c2 + a2*x[t] + b2*y[t]}
```

$$\left\{\left\{x(t)\to -\frac{\mathrm{b1}e^{-\frac{1}{2}\left(\mathrm{a1}+\mathrm{b2}+\sqrt{\mathrm{a1}^2-2\mathrm{b2}\mathrm{a1}+\mathrm{b2}^2+4\mathrm{a2}\mathrm{b1}}\right)t}\left(\frac{2\left(\left(\mathrm{a1}-\mathrm{b2}+\sqrt{\mathrm{a1}^2-2\mathrm{b2}\mathrm{a1}+\mathrm{b2}^2+4\mathrm{a2}\mathrm{b1}}\right)\mathrm{c2}-2\mathrm{a2}\mathrm{c1}\right)e^{\sqrt{\mathrm{a1}^2-2\mathrm{b2}\mathrm{a1}+\mathrm{b2}^2+4\mathrm{a2}\mathrm{b1}}t}}{-\mathrm{a1}-\mathrm{b2}+\sqrt{\mathrm{a1}^2-2\mathrm{b2}\mathrm{a1}+\mathrm{b2}^2+4\mathrm{a2}\mathrm{b1}}}\right.}{2\left(\mathrm{a1}^2\right.}\right.\right.$$

✓ **Maple** : cpu = 0.092 (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})
```

$$\left\{x(t)=\mathrm{e}^{\frac{\left(\mathrm{a1}+\mathrm{b2}+\sqrt{\mathrm{a1}^2-2\,\mathrm{a1}\,\mathrm{b2}+4\,\mathrm{a2}\,\mathrm{b1}+\mathrm{b2}^2}\right)t}{2}}c_2+\mathrm{e}^{\frac{\left(\mathrm{a1}+\mathrm{b2}-\sqrt{\mathrm{a1}^2-2\,\mathrm{a1}\,\mathrm{b2}+4\,\mathrm{a2}\,\mathrm{b1}+\mathrm{b2}^2}\right)t}{2}}c_1+\frac{\mathrm{b1}\,\mathrm{c2}-\mathrm{b2}\,\mathrm{c1}}{\mathrm{a1}\,\mathrm{b2}-\mathrm{a2}\,\mathrm{b1}},y(t)=\frac{-c_1(\mathrm{a1}\,\mathrm{b2}}{}\right.$$

2.1866 ODE No. 1866

$$\{x'(t) + 2y(t) = 3t, y'(t) - 2x(t) = 4\}$$

✓ **Mathematica** : cpu = 0.126893 (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]},t]
```

$$\left\{\left\{x(t) \to \cos(2t)\left(\frac{3}{2}t\sin(2t) - \frac{5}{4}\cos(2t)\right) - \sin(2t)\left(\frac{5}{4}\sin(2t) + \frac{3}{2}t\cos(2t)\right) + c_1\cos(2t) - c_2\sin(2t), y(t) \to \mathrm{co}\right.\right.$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 39

```
dsolve({diff(x(t),t)+2*y(t) = 3*t, diff(y(t),t)-2*x(t) = 4})
```

$$\left\{x(t) = \sin(2t)\,c_2 + \cos(2t)\,c_1 - \frac{5}{4}, y(t) = -\cos(2t)\,c_2 + \sin(2t)\,c_1 + \frac{3t}{2}\right\}$$

2.1867 ODE No. 1867

$$\left\{-t^2+x'(t)+y(t)+6t+1=0,y'(t)-x(t)=-3t^2+3t+1\right\}$$

✓ **Mathematica** : cpu = 0.162308 (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*t - 3*t
```

$$\left\{\left\{x(t)\to \cos(t)\left(\left(3t^2-t-13\right)\cos(t)+(t-12)t\sin(t)\right)-\sin(t)\left(\left(-3t^2+t+13\right)\sin(t)+(t-12)t\cos(t)\right)+c_1\right.\right.$$

✓ **Maple** : cpu = 0.036 (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})
```

$$\left\{x(t)=\sin(t)\,c_2+\cos(t)\,c_1+3t^2-t-13,y(t)=t^2-c_2\cos(t)+c_1\sin(t)-12t\right\}$$

2.1868 ODE No. 1868

$$\{x'(t) + 3x(t) - y(t) = e^{2t}, x(t) + y'(t) + 5y(t) = e^t\}$$

✓ **Mathematica** : cpu = 0.106375 (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] == E^t},{
```

$$\left\{\left\{x(t)\to -e^t(t+1)\left(\frac{t}{5}+\frac{1}{36}e^t(6t-7)-\frac{1}{25}\right)+e^tt\left(\frac{t}{5}+\frac{1}{36}e^t(6t-1)+\frac{4}{25}\right)+c_1e^{-4t}(t+1)+c_2e^{-4t}t,y(t)\right.\right.$$

✓ **Maple** : cpu = 0.064 (sec), leaf count = 56

```
dsolve({diff(x(t),t)+3*x(t)-y(t) = exp(2*t), diff(y(t),t)+x(t)+5*y(t) = exp(t)})
```

$$\left\{x(t) = (tc_1 + c_2)\,\mathrm{e}^{-4t} + \frac{\mathrm{e}^t}{25} + \frac{7\,\mathrm{e}^{2t}}{36}, y(t) = ((-t+1)\,c_1 - c_2)\,\mathrm{e}^{-4t} + \frac{4\,\mathrm{e}^t}{25} - \frac{\mathrm{e}^{2t}}{36}\right\}$$

2.1869 ODE No. 1869

$$\left\{x'(t)+2x(t)+y'(t)+y(t)=t+e^{2t},x'(t)-x(t)+y'(t)+3y(t)=e^t-1\right\}$$

✓ **Mathematica** : cpu = 0.122426 (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[t] + De
```

$$\left\{\left\{x(t)\to\frac{1}{5}\left(t-e^t+e^{2t}+1\right)+\frac{5}{72}\left(\frac{12\left(5712t+833e^t+2352e^{2t}-5508\right)}{20825}+c_1e^{-7t/5}\right),y(t)\to\frac{1}{5}\left(-t+e^t-e^{2t}\right.\right.\right.$$

✓ **Maple** : cpu = 0.05 (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
```

$$\left\{x(t)=\frac{3t}{7}-\frac{1}{49}-\frac{e^t}{6}+\frac{5\,e^{2t}}{17}+e^{-\frac{7t}{5}}c_1,y(t)=-\frac{e^{2t}}{17}+\frac{t}{7}-\frac{26}{49}+\frac{e^t}{4}+\frac{3\,e^{-\frac{7t}{5}}c_1}{2}\right\}$$

2.1870 ODE No. 1870

$$\{x'(t)+y'(t)-y(t)=e^t, 2x'(t)+y'(t)+2y(t)=\cos(t)\}$$

✓ **Mathematica** : cpu = 0.117748 (sec), leaf count = 122

```
DSolve[{-y[t] + Derivative[1][x][t] + Derivative[1][y][t] == E^t, 2*y[t] + 2*Derivative[1][x][t] + De
```

$$\left\{\left\{x(t)\to -\frac{3}{4}c_2\left(e^{4t}-1\right)+\frac{1}{68}e^{-4t}\left(e^{4t}-1\right)\left(34e^t+3\sin(t)-12\cos(t)\right)+\frac{1}{4}\left(2e^{-3t}+2e^t+\frac{3}{17}e^{-4t}\sin(t)+\sin(\right.\right.\right.$$

✓ **Maple** : cpu = 0.177 (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)
```

$$\left\{x(t)=\frac{e^{4t}c_1}{4}+\frac{5\sin(t)}{17}+e^t-\frac{3\cos(t)}{17}+c_2, y(t)=-\frac{e^{4t}c_1}{3}+\frac{4\cos(t)}{17}-\frac{2e^t}{3}-\frac{\sin(t)}{17}\right\}$$

2.1871 ODE No. 1871

$$\{4x'(t) + 2x(t) + 9y'(t) + 31y(t) = e^t, 3x'(t) + x(t) + 7y'(t) + 24y(t) = 3\}$$

✓ **Mathematica** : cpu = 0.282393 (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[t] + 3*D
```

$$\left\{\left\{x(t)\to \frac{1}{442}\left(3\left(153e^t-754\right)\sin(t)+31\left(17e^t-78\right)\cos(t)\right)\left(\cos(t)-\sin(t)\right)+\frac{1}{221}\sin(t)\left(\left(493e^t-2340\right)\sin(t)\right.\right.\right.$$

✓ **Maple** : cpu = 0.122 (sec), leaf count = 60

```
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)
```

$$\left\{x(t)=e^{-4t}\sin(t)\,c_2+e^{-4t}\cos(t)\,c_1-\frac{93}{17}+\frac{31\,e^t}{26},y(t)=\frac{6}{17}+\left(\left(-c_1-c_2\right)\cos(t)+\sin(t)\left(c_1-c_2\right)\right)e^{-4t}-\frac{2\,e^t}{13}\right.$$

2.1872 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 = 0.18284 (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*y[t] +
```

$$\left\{\left\{x(t)\to -e^t t\left(-\frac{4t}{5}+\frac{1}{36}e^t(30t+19)-\frac{11}{25}\right)-e^t(t-1)\left(\frac{4t}{5}-\frac{1}{36}e^t(30t+49)+\frac{31}{25}\right)-c_1e^{-4t}(t-1)-c_2e^{-4t}\right.\right.$$

✓ **Maple** : cpu = 0.059 (sec), leaf count = 56

```
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),
```

$$\left\{x(t)=(tc_1+c_2)\,\mathrm{e}^{-4t}+\frac{31\,\mathrm{e}^t}{25}-\frac{49\,\mathrm{e}^{2t}}{36},y(t)=((-1-t)\,c_1-c_2)\,\mathrm{e}^{-4t}-\frac{11\,\mathrm{e}^t}{25}+\frac{19\,\mathrm{e}^{2t}}{36}\right\}$$

2.1873 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 = 0.145575 (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*y[t] + 3
```

$$\left\{\left\{x(t)\to -\frac{1}{5}e^{-6t}\left(e^{5t}-1\right)\left(\frac{16}{5}e^{6t}\left(\frac{t}{6}-\frac{1}{36}\right)+4e^{2t}-\frac{4e^{7t}}{7}-\frac{31}{5}e^t(t-1)\right)+\frac{1}{25}e^{-6t}\left(4e^{5t}+1\right)\left(e^{6t}\left(\frac{2t}{3}-\frac{1}{9}\right)\right.\right.\right.$$

✓ **Maple** : cpu = 0.054 (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
```

$$\left\{x(t)=\mathrm{e}^{-6t}c_2+c_1\mathrm{e}^{-t}-\frac{56}{9}-\frac{29\,\mathrm{e}^t}{7}+\frac{19t}{3},y(t)=4\,\mathrm{e}^{-6t}c_2-c_1\mathrm{e}^{-t}+\frac{24\,\mathrm{e}^t}{7}+\frac{55}{9}-\frac{17t}{3}\right\}$$

2.1874 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 = 0.0099186 (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[t]*y[t]
```

$$\left\{\left\{x(t) \to c_1 \exp\left(\int_1^t f(K[2])dK[2]\right) \cos\left(\int_1^t g(K[1])dK[1]\right) + c_2 \exp\left(\int_1^t f(K[2])dK[2]\right) \sin\left(\int_1^t g(K[1])dK\right.\right.\right.$$

✓ **Maple** : cpu = 0.559 (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)})
```

$$\left\{x(t) = \mathrm{e}^{\int \left(\tan\left(c_1 - \left(\int g(t)dt\right)\right)g(t)+f(t)\right)dt} c_2, y(t) = \mathrm{e}^{\int \left(\tan\left(c_1 - \left(\int g(t)dt\right)\right)g(t)+f(t)\right)dt} c_2 \tan\left(c_1 - \left(\int g(t)\,dt\right)\right)\right\}$$

2.1875 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 = 0.756365 (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]) + Derivative[1][
```

$$\left\{\left\{x(t)\to \frac{\left(-a+d+\sqrt{a^2-2da+d^2+4bc}\right)e^{\int_1^t -\frac{1}{2}\left(a+d-\sqrt{a^2-2da+d^2+4bc}\right)f(K[1])dK[1]}c_1}{2\sqrt{a^2-2da+d^2+4bc}}+\frac{\left(a-d+\sqrt{a^2-2da+\right.}{}\right.\right.$$

✓ **Maple** : cpu = 3.255 (sec), leaf count = 3237

```
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)})
```

Expression too large to display

2.1876 ODE No. 1876

$$\left\{x'(t)=x(t)\cos(t),y'(t)=x(t)e^{-\sin(t)}\right\}$$

✓ **Mathematica** : cpu = 0.0141776 (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]},t]
```

$$\left\{\left\{x(t)\to c_1e^{\sin(t)},y(t)\to c_1\int_1^t e^{\sin(K[1])-\sin(K[1])}dK[1]+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.231 (sec), leaf count = 18

```
dsolve({diff(x(t),t) = x(t)*cos(t), diff(y(t),t) = x(t)*exp(-sin(t))})
```

$$\{x(t)=c_2e^{\sin(t)},y(t)=tc_2+c_1\}$$

2.1877 ODE No. 1877

$$\{tx'(t) + y(t) = 0, x(t) + ty'(t) = 0\}$$

✓ **Mathematica** : cpu = 0.0029276 (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 = 0.03 (sec), leaf count = 31

```
dsolve({t*diff(x(t),t)+y(t) = 0, t*diff(y(t),t)+x(t) = 0})
```

$$\left\{x(t) = \frac{t^2 c_2 + c_1}{t}, y(t) = \frac{-t^2 c_2 + c_1}{t}\right\}$$

2.1878 ODE No. 1878

$$\{tx'(t)+2x(t)=t,-((t+2)x(t))+ty'(t)-ty(t)=-t\}$$

✓ **Mathematica** : cpu = 0.0264486 (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] == -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 = 0.06 (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})
```

$$\left\{x(t)=\frac{t}{3}+\frac{c_2}{t^2},y(t)=\frac{3c_1\mathrm{e}^tt^2-t^3-3c_2}{3t^2}\right\}$$

2.1879 ODE No. 1879

$$\left\{tx'(t)+2(x(t)-y(t))=t, x(t)+ty'(t)+5y(t)=t^2\right\}$$

✓ **Mathematica** : cpu = 0.0192114 (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] == t^2},
```

$$\left\{\left\{x(t)\to \frac{c_1}{t^4}+\frac{c_2}{t^3}+\frac{1}{30}t(2t+9), y(t)\to -\frac{c_1}{t^4}-\frac{c_2}{2t^3}+\frac{1}{60}t(8t-3)\right\}\right\}$$

✓ **Maple** : cpu = 0.044 (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})
```

$$\left\{x(t)=\frac{2t^6+9t^5+30tc_1+30c_2}{30t^4}, y(t)=\frac{8t^6-3t^5-30tc_1-60c_2}{60t^4}\right\}$$

2.1880 ODE No. 1880

$\{t^2(1-\sin(t))x'(t) = t^2y(t) + tx(t)(1-2\sin(t)), t^2(1-\sin(t))y'(t) = x(t)(t\cos(t)-\sin(t)) + ty(t)(1-t\cos(t))$

✓ **Mathematica** : cpu = 0.0105067 (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 - Sin[t])*De
```

$$\{\{x(t) \to c_1t^2 + c_2t, y(t) \to c_1t + c_2\sin(t)\}\}$$

✓ **Maple** : cpu = 0.06 (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)
```

$$\{x(t) = t(tc_1 + c_2), y(t) = \sin(t)\,c_2 + tc_1\}$$

2.1881 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 = 0.010368 (sec), leaf count = 44

```
DSolve[{y[t] + Derivative[1][x][t] + Derivative[1][y][t] == f[t], x[t] + y[t] + Derivative[1][y][t] +
```

$$\{\{x(t) \to -f''(t) - f'(t) - f(t) + g'(t) + g(t), y(t) \to f''(t) + f(t) - g'(t)\}\}$$

✓ **Maple** : cpu = 0.028 (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)+dif
```

$$\left\{x(t) = -\frac{d}{dt}f(t) + g(t) - f(t) - \frac{d^2}{dt^2}f(t) + \frac{d}{dt}g(t), y(t) = f(t) + \frac{d^2}{dt^2}f(t) - \frac{d}{dt}g(t)\right\}$$

2.1882 ODE No. 1882

$$\left\{2x'(t) - 3x(t) + y'(t) = 0, x''(t) + y'(t) - 2y(t) = e^{2t}\right\}$$

✓ **Mathematica** : cpu = 3.28095 (sec), leaf count = 928

```
DSolve[{-3*x[t] + 2*Derivative[1][x][t] + Derivative[1][y][t] == 0, -2*y[t] + Derivative[1][y][t] + D
```

$$\left\{\left\{x(t) \to \frac{1}{46} e^{t/2} c_1 \left(23 \cos\left(\frac{\sqrt{23}t}{2}\right) + 23e^{t/2} - 3\sqrt{23} \sin\left(\frac{\sqrt{23}t}{2}\right)\right) + \frac{e^{3t/2}\left(23e^{t/2} \cos\left(\frac{\sqrt{23}t}{2}\right) - 7\sqrt{23}e^{t/2} \sin\left(\right.\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.068 (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
```

$$\left\{x(t) = \frac{e^{2t}}{4} + c_1 e^t + c_2 e^{\frac{t}{2}} \cos\left(\frac{\sqrt{23}\, t}{2}\right) + c_3 e^{\frac{t}{2}} \sin\left(\frac{\sqrt{23}\, t}{2}\right), y(t) = -\frac{7\, e^{\frac{t}{2}} \left(\frac{c_3\sqrt{23}}{7} + c_2\right) \cos\left(\frac{\sqrt{23}\, t}{2}\right)}{4} + \frac{e^{\frac{t}{2}} \left(c_2\sqrt{23}\right.}{}\right.$$

2.1883 ODE No. 1883

$$\left\{x'(t)+x(t)-y'(t)=2t,x''(t)-9x(t)+y'(t)+3y(t)=\sin(2t)\right\}$$

✓ **Mathematica** : cpu = 1.8168 (sec), leaf count = 602

```
DSolve[{x[t] + Derivative[1][x][t] - Derivative[1][y][t] == 2*t, -9*x[t] + 3*y[t] + Derivative[1][y][
```

$$\left\{\left\{x(t)\to\frac{e^{-4t}\left(20e^{4t}t+7e^{4t}+9\right)\left(10400\left(t^2+2t+2\right)+\left(260t-225e^{4t}-351\right)\sin(2t)+2\left(260t+75e^{4t}-91\right)\text{co}\right.}{83200}\right.\right.$$

✓ **Maple** : cpu = 0.155 (sec), leaf count = 77

```
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
```

$$\left\{x(t)=4-\frac{2\cos(2t)}{325}+c_2\mathrm{e}^{-3t}-\frac{36\sin(2t)}{325}+(tc_3+c_1)\,\mathrm{e}^{t}+2t,y(t)=10+\frac{16\cos(2t)}{325}+\frac{2c_2\mathrm{e}^{-3t}}{3}-\frac{37\sin(2t)}{325}\right.$$

2.1884 ODE No. 1884

$$\{x'(t) - x(t) + 2y(t) = 0, x''(t) - 2y'(t) = 2t - \cos(2t)\}$$

✓ **Mathematica** : cpu = 0.64009 (sec), leaf count = 224

```
DSolve[{-x[t] + 2*y[t] + Derivative[1][x][t] == 0, -2*Derivative[1][y][t] + Derivative[2][x][t] == 2*
```

$$\left\{\left\{x(t) \to 7\left(t^2 - \frac{1}{2}\sin(2t) + c_2\right) + 8\left(\frac{1}{136}e^{-t/2}\left(2e^{t/2}\cos(2t) - 4\left(34e^{t/2}t^2 + 17e^{t/2}(t+2) - 15e^{t/2}\sin(2t)\right)\right) + \right.\right.$$

✓ **Maple** : cpu = 0.174 (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})
```

$$\left\{x(t) = -t^2 + 2c_1e^{\frac{t}{2}} + \frac{2\cos(2t)}{17} + \frac{\sin(2t)}{34} - 4t + c_2, y(t) = -t + \frac{c_1e^{\frac{t}{2}}}{2} + \frac{9\sin(2t)}{68} + \frac{\cos(2t)}{34} + 2 - \frac{t^2}{2} + \frac{c_2}{2}\right\}$$

2.1885 ODE No. 1885

$$\{tx'(t) - ty'(t) - 2y(t) = 0, tx''(t) + 2x'(t) + tx(t) = 0\}$$

✓ **Mathematica** : cpu = 0.0120837 (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][x][t]
```

$$\left\{\left\{x(t) \to \frac{c_2 \cos(t)}{t} + \frac{c_3 \sin(t)}{t}, y(t) \to \frac{c_1}{t^2} + c_2\left(\frac{\cos(t)}{t} - \frac{2\sin(t)}{t^2}\right) + c_3\left(\frac{2\cos(t)}{t^2} + \frac{\sin(t)}{t}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.133 (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(
```

$$\left\{x(t) = \frac{\sin(t)\, c_2 + c_3 \cos(t)}{t}, y(t) = \frac{(tc_3 + 2c_2)\cos(t) + (tc_2 - 2c_3)\sin(t) + c_1}{t^2}\right\}$$

2.1886 ODE No. 1886

$$\left\{ay(t)+x''(t)=0,y''(t)-a^2y(t)=0\right\}$$

✓ **Mathematica** : cpu = 0.0097285 (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]},t]
```

$$\left\{\left\{x(t)\to -\frac{c_4e^{-at}\left(-2ate^{at}+e^{2at}-1\right)}{2a^2}-\frac{c_3e^{-at}\left(e^{at}-1\right)^2}{2a}+c_2t+c_1,y(t)\to \frac{1}{2}c_3e^{-at}\left(e^{2at}+1\right)+\frac{c_4e^{-at}\left(e^{2at}\right.}{2a}\right.\right.$$

✓ **Maple** : cpu = 0.059 (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})
```

$$\left\{x(t)=\frac{-c_4\mathrm{e}^{-at}-c_3\mathrm{e}^{at}+a(tc_1+c_2)}{a},y(t)=c_3\mathrm{e}^{at}+c_4\mathrm{e}^{-at}\right\}$$

2.1887 ODE No. 1887

$$\left\{x''(t) = ax(t) + by(t), y''(t) = cx(t) + dy(t)\right\}$$

✓ **Mathematica** : cpu = 0.198684 (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], y[t]},
```

$$\left\{\left\{x(t) \to \frac{e^{-\frac{\sqrt{a+d-\sqrt{a^2-2da+d^2+4bc}t}}{\sqrt{2}}-\frac{\sqrt{a+d+\sqrt{a^2-2da+d^2+4bc}t}}{\sqrt{2}}}\left(e^{\frac{\sqrt{a+d-\sqrt{a^2-2da+d^2+4bc}t}}{\sqrt{2}}}a - e^{\frac{\sqrt{a+d+\sqrt{a^2-2da+d^2+4bc}t}}{\sqrt{2}}}a - e^{\sqrt{2}\sqrt{}}\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.086 (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)})
```

$$\left\{x(t) = c_1 e^{-\frac{\sqrt{-2\sqrt{a^2-2ad+4bc+d^2}+2a+2d}\,t}{2}} + c_2 e^{\frac{\sqrt{-2\sqrt{a^2-2ad+4bc+d^2}+2a+2d}\,t}{2}} + c_3 e^{-\frac{\sqrt{2\sqrt{a^2-2ad+4bc+d^2}+2a+2d}\,t}{2}} + c_4 e^{\frac{\sqrt{2\sqrt{a^2-2ad}}}{}}\right.$$

2.1888 ODE No. 1888

$$\left\{x''(t) = \mathrm{a1}x(t) + \mathrm{b1}y(t) + \mathrm{c1}, y''(t) = \mathrm{a2}x(t) + \mathrm{b2}y(t) + \mathrm{c2}\right\}$$

✓ **Mathematica** : cpu = 19.8316 (sec), leaf count = 15664

```
DSolve[{Derivative[2][x][t] == c1 + a1*x[t] + b1*y[t], Derivative[2][y][t] == c2 + a2*x[t] + b2*y[t]]
```

Too large to display

✓ **Maple** : cpu = 0.149 (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
```

$$\left\{x(t) = c_4 \mathrm{e}^{\frac{\sqrt{2\sqrt{\mathrm{a1}^2 - 2\,\mathrm{a1}\,\mathrm{b2} + 4\,\mathrm{a2}\,\mathrm{b1} + \mathrm{b2}^2} + 2\,\mathrm{a1} + 2\,\mathrm{b2}}\, t}{2}} + c_3 \mathrm{e}^{-\frac{\sqrt{2\sqrt{\mathrm{a1}^2 - 2\,\mathrm{a1}\,\mathrm{b2} + 4\,\mathrm{a2}\,\mathrm{b1} + \mathrm{b2}^2} + 2\,\mathrm{a1} + 2\,\mathrm{b2}}\, t}{2}} + c_2 \mathrm{e}^{\frac{\sqrt{2\,\mathrm{a1} + 2\,\mathrm{b2} - 2\sqrt{\mathrm{a1}^2 - 2\,\mathrm{a1}\,\mathrm{b2} + 4}}}{2}}\right.$$

2.1889 ODE No. 1889

$$\{x''(t) + x(t) + y(t) = -5, -4x(t) + y''(t) - 3y(t) = -3\}$$

✓ **Mathematica** : cpu = 0.346782 (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},{x[t],
```

$$\left\{\left\{x(t) \to -\frac{1}{8}e^{-t}\left(e^{-t}(-13t-10)+e^{t}(10-13t)\right)\left(e^{2t}t+t-e^{2t}+1\right)-\frac{1}{8}e^{-t}\left(e^{2t}-1\right)t\left(e^{-t}(-13t-23)+e^{t}(13t\right.\right.\right.$$

✓ **Maple** : cpu = 0.038 (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})
```

$$\{x(t) = (tc_4 + c_2)\,\mathrm{e}^{-t}+18+(tc_3 + c_1)\,\mathrm{e}^{t}, y(t) = ((-2t+2)\,c_4 - 2c_2)\,\mathrm{e}^{-t}-23+((-2t-2)\,c_3 - 2c_1)\,\mathrm{e}^{t}\}$$

2.1890 ODE No. 1890

$$\left\{x''(t) = c^2x(t)\left(3\cos^2(at+b)-1\right)+\frac{3}{2}c^2y(t)\sin(2abt), y''(t) = \frac{3}{2}c^2x(t)\sin(2abt)+c^2y(t)\left(3\sin^2(at+b)-1\right)\right\}$$

✗ **Mathematica** : cpu = 0.0287914 (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, Deriva
```

, 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[t])/
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(d
```

, result contains DESol or ODESolStruc

Expression too large to display

2.1891 ODE No. 1891

$$\{x''(t) + 6x(t) + 7y(t) = 0, 3x(t) + y''(t) + 2y(t) = 2t\}$$

✓ **Mathematica** : cpu = 0.770079 (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] == 2*t},{x[
```

$$\left\{\left\{x(t) \to -\frac{7}{200}e^{-t}(e^{2t} - 2e^t\cos(3t) + 1)\left(-7e^{-t}(e^{2t}(t-1) + t + 1) - \frac{2}{9}\sin(3t) + \frac{2}{3}t\cos(3t)\right) + \frac{7}{600}e^{-t}(3e^{2t} -\right.\right.$$

✓ **Maple** : cpu = 0.045 (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})
```

$$\left\{x(t) = \frac{14t}{9} + c_1\mathrm{e}^t + c_2\cos(3t) + c_3\mathrm{e}^{-t} + c_4\sin(3t), y(t) = -c_1\mathrm{e}^t + \frac{3c_2\cos(3t)}{7} - c_3\mathrm{e}^{-t} + \frac{3c_4\sin(3t)}{7} - \frac{4t}{3}\right\}$$

2.1892 ODE No. 1892

$$\left\{-ay'(t)+bx(t)+x''(t)=0, ax'(t)+by(t)+y''(t)=0\right\}$$

✓ **Mathematica** : cpu = 0.15123 (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][t] + D
```

$$\left\{\left\{x(t)\to \frac{e^{-\frac{\sqrt{-a^2-2b-\sqrt{a^2\left(a^2+4b\right)}}\,t}{\sqrt{2}}-\frac{\sqrt{-a^2-2b+\sqrt{a^2\left(a^2+4b\right)}}\,t}{\sqrt{2}}}\left(e^{\frac{\sqrt{-a^2-2b-\sqrt{a^2\left(a^2+4b\right)}}\,t}{\sqrt{2}}}a^2-e^{\frac{\sqrt{-a^2-2b+\sqrt{a^2\left(a^2+4b\right)}}\,t}{\sqrt{2}}}a^2-e^{\sqrt{2}\sqrt{-}}\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.085 (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)+
```

$$\left\{x(t)=c_1\mathrm{e}^{-\frac{\sqrt{-2a^2-2\sqrt{a^2\left(a^2+4b\right)}-4b}\,t}{2}}+c_2\mathrm{e}^{\frac{\sqrt{-2a^2-2\sqrt{a^2\left(a^2+4b\right)}-4b}\,t}{2}}+c_3\mathrm{e}^{-\frac{\sqrt{-2a^2+2\sqrt{a^2\left(a^2+4b\right)}-4b}\,t}{2}}+c_4\mathrm{e}^{\frac{\sqrt{-2a^2+2\sqrt{a^2\left(a^2+4b\right)}-}}{2}}\right.$$

2.1893 ODE No. 1893

$$\left\{-\mathrm{A0}y'(t)+\mathrm{a1}x''(t)+\mathrm{b1}x'(t)+\mathrm{c1}x(t)=\mathrm{B0}e^{i\omega t},\mathrm{A0}x'(t)+\mathrm{a2}y''(t)+\mathrm{b2}y'(t)+\mathrm{c2}y(t)=0\right\}$$

✓ **Mathematica** : cpu = 0.228076 (sec), leaf count = 5546

```
DSolve[{c1*x[t] + b1*Derivative[1][x][t] - A0*Derivative[1][y][t] + a1*Derivative[2][x][t] == B0*E^(I
```

$$\left\{\left\{x(t)\to -\mathrm{A0}\mathrm{a1}^2\mathrm{c2}c_3\mathrm{RootSum}\left[\#1^4+\mathrm{a2}\mathrm{b1}\#1^3+\mathrm{a1}\mathrm{b2}\#1^3+\mathrm{A0}^2\mathrm{a1}\mathrm{a2}\#1^2+\mathrm{a1}\mathrm{a2}\mathrm{b1}\mathrm{b2}\#1^2+\mathrm{a1}\mathrm{a2}^2\mathrm{c1}\#1^2+\right.\right.\right.$$

✓ **Maple** : cpu = 0.675 (sec), leaf count = 1565

```
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), a
```

Expression too large to display

2.1894 ODE No. 1894

$$\left\{a\left(x'(t)-y'(t)\right)+\mathrm{b1}x(t)+x''(t)=\mathrm{c1}e^{i\omega t},a\left(y'(t)-x'(t)\right)+\mathrm{b2}y(t)+y''(t)=\mathrm{c2}e^{i\omega t}\right\}$$

✓ **Mathematica** : cpu = 0.297248 (sec), leaf count = 3386

```
DSolve[{b1*x[t] + a*(Derivative[1][x][t] - Derivative[1][y][t]) + Derivative[2][x][t] == c1*E^(I*omeg
```

$$\left\{\left\{x(t)\to -a\mathrm{b2}c_3\mathrm{RootSum}\left[\#1^4+2a\#1^3+\mathrm{b1}\#1^2+\mathrm{b2}\#1^2+a\mathrm{b1}\#1+a\mathrm{b2}\#1+\mathrm{b1}\mathrm{b2}\&,\frac{}{4\#1^3+6a\#1^2+2\mathrm{b}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.628 (sec), leaf count = 1040

```
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
```

Expression too large to display

2.1895 ODE No. 1895

$\{a11x''(t) + a12y''(t) + b11x'(t) + b12y'(t) + c11x(t) + c12y(t) = 0, a21x''(t) + a22y''(t) + b21x'(t) + b22y'(t) +$

✓ **Mathematica** : cpu = 0.121034 (sec), leaf count = 7517

```
DSolve[{c11*x[t] + c12*y[t] + b11*Derivative[1][x][t] + b12*Derivative[1][y][t] + a11*Derivative[2][x
```

✓ **Maple** : cpu = 0.168 (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
```

Expression too large to display

2.1896 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 = 0.449866 (sec), leaf count = 1132

```
DSolve[{y[t] - 2*Derivative[1][x][t] - Derivative[1][y][t] + Derivative[2][x][t] == 0, -x[t] + 2*Deri
```

$$\left\{\left\{x(t)\to\frac{1}{64}e^{-t}\left(2e^{2t}t^2-6e^{2t}t+7e^{2t}+1\right)\left(e^t(1-t)+e^{-t}\left(-2t^3-8t^2-17t-17\right)\right)+\frac{1}{64}e^{-t}\left(2e^{2t}t^2+6e^{2t}t+e\right.\right.\right.$$

✓ **Maple** : cpu = 0.049 (sec), leaf count = 66

```
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
```

$$\left\{x(t)=-2-\frac{2c_2\mathrm{e}^{-t}}{3}+\left(-3t^2c_5-2tc_4-c_3-6c_5\right)\mathrm{e}^t-t,y(t)=c_2\mathrm{e}^{-t}-2+\left(t^3c_5+t^2c_4+tc_3+c_1\right)\mathrm{e}^t\right\}$$

2.1897 ODE No. 1897

$$\{x''(t) + y''(t) + y'(t) = \sinh(2t), 2x''(t) + y''(t) = 2t\}$$

✓ **Mathematica** : cpu = 0.243215 (sec), leaf count = 280

```
DSolve[{Derivative[1][y][t] + Derivative[2][x][t] + Derivative[2][y][t] == Sinh[2*t], 2*Derivative[2]
```

$$\left\{\left\{x(t) \to t\left(\frac{t^2}{2} + \frac{t}{2} - \frac{e^{4t}}{8} + e^{2t}\left(\frac{t}{2} - \frac{1}{4}\right)\right) + \frac{1}{48}\left(-4\left(4t^2 - 3t + 3\right)t - 12e^{2t}t - 6e^{-2t} + 3e^{4t}\right) + \frac{1}{4}e^{-2t}\left(-2e^{2t}\left(\frac{t}{2}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.85 (sec), leaf count = 88

```
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(
```

$$\left\{x(t) = \frac{(-3 - 2t + 2c_2)\cosh(2t)}{8} + \frac{(1 + t - c_2)\sinh(2t)}{4} + \frac{t^3}{6} + \frac{t^2}{4} + c_3t + c_4, y(t) = \frac{(-2c_2 + 2t + 3)\cosh(2t)}{4}\right.$$

2.1898 ODE No. 1898

$$\left\{x''(t) - x'(t) + y'(t) = 0, x''(t) - x(t) + y''(t) = 0\right\}$$

✓ **Mathematica** : cpu = 0.0197263 (sec), leaf count = 420

```
DSolve[{-Derivative[1][x][t] + Derivative[1][y][t] + Derivative[2][x][t] == 0, -x[t] + Derivative[2][
```

$$\left\{\left\{x(t) \to -\frac{1}{5}c_1 e^{\frac{t}{2}-\frac{\sqrt{5}t}{2}}\left(\sqrt{5}e^{\sqrt{5}t} - 5e^{\frac{\sqrt{5}t}{2}+\frac{t}{2}} - \sqrt{5}\right) + \frac{c_2 e^{\frac{t}{2}-\frac{\sqrt{5}t}{2}}\left(e^{\sqrt{5}t} - 1\right)}{\sqrt{5}} - \frac{1}{10}c_4 e^{\frac{t}{2}-\frac{\sqrt{5}t}{2}}\left(5e^{\sqrt{5}t} + \sqrt{5}e^{\sqrt{5}t} - 10e\right.\right.\right.$$

✓ **Maple** : cpu = 0.066 (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
```

$$\left\{x(t) = \frac{c_4\left(\sqrt{5}-1\right)e^{-\frac{\left(\sqrt{5}-1\right)t}{2}}}{2} - \frac{c_3\left(\sqrt{5}+1\right)e^{\frac{\left(\sqrt{5}+1\right)t}{2}}}{2} + c_1 e^{t}, y(t) = c_2 + c_3 e^{\frac{\left(\sqrt{5}+1\right)t}{2}} + c_4 e^{-\frac{\left(\sqrt{5}-1\right)t}{2}}\right\}$$

2.1899 ODE No. 1899

$$\{x'(t) = 2x(t), y'(t) = 3x(t) - 2y(t), z'(t) = 2y(t) + 3z(t)\}$$

✓ **Mathematica** : cpu = 0.0090202 (sec), leaf count = 112

```
DSolve[{Derivative[1][x][t] == 2*x[t], Derivative[1][y][t] == 3*x[t] - 2*y[t], Derivative[1][z][t] ==
```

$$\left\{\left\{x(t) \to c_1 e^{2t}, y(t) \to \frac{3}{4} c_1 e^{-2t} \left(e^{4t} - 1\right) + c_2 e^{-2t}, z(t) \to \frac{3}{10} c_1 e^{-2t} \left(2e^t + 3e^{2t} + 4e^{3t} + 1\right) \left(e^t - 1\right)^2 + \frac{2}{5} c_2 e^{-2t} (e\right.\right.$$

✓ **Maple** : cpu = 0.086 (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)})
```

$$\left\{x(t) = c_3 e^{2t}, y(t) = \frac{3c_3 e^{2t}}{4} + c_2 e^{-2t}, z(t) = c_1 e^{3t} - \frac{3c_3 e^{2t}}{2} - \frac{2c_2 e^{-2t}}{5}\right\}$$

2.1900 ODE No. 1900

$$\{x'(t) = 4x(t), y'(t) = x(t) - 2y(t), z'(t) = x(t) - 4y(t) + z(t)\}$$

✓ **Mathematica** : cpu = 0.0055409 (sec), leaf count = 94

```
DSolve[{Derivative[1][x][t] == 4*x[t], Derivative[1][y][t] == x[t] - 2*y[t], Derivative[1][z][t] == x
```

$$\left\{\left\{x(t) \to c_1 e^{4t}, y(t) \to \frac{1}{6}c_1 e^{-2t}\left(e^{6t}-1\right) + c_2 e^{-2t}, z(t) \to \frac{1}{9}c_1 e^{-2t}\left(e^{3t}+e^{6t}-2\right) - \frac{4}{3}c_2 e^{-2t}\left(e^{3t}-1\right) + c_3 e^t\right\}\right\}$$

✓ **Maple** : cpu = 0.086 (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)})
```

$$\left\{x(t) = c_3 e^{4t}, y(t) = \frac{c_3 e^{4t}}{6} + c_2 e^{-2t}, z(t) = \frac{c_3 e^{4t}}{9} + c_1 e^t + \frac{4c_2 e^{-2t}}{3}\right\}$$

2.1901 ODE No. 1901

$$\{x'(t) = y(t) - z(t), y'(t) = x(t) + y(t), z'(t) = x(t) + z(t)\}$$

✓ **Mathematica** : cpu = 0.005298 (sec), leaf count = 105

```
DSolve[{Derivative[1][x][t] == y[t] - z[t], Derivative[1][y][t] == x[t] + y[t], Derivative[1][z][t] =
```

$$\{\{x(t) \to c_2(e^t - 1) + c_3(1 - e^t) + c_1, y(t) \to c_1(e^t - 1) + c_2(e^t t + 1) + c_3(-e^t t + e^t - 1), z(t) \to c_1(e^t - 1) +$$

✓ **Maple** : cpu = 0.066 (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)})
```

$$\{x(t) = c_2 + c_3 \mathrm{e}^t, y(t) = (tc_3 + c_1)\,\mathrm{e}^t - c_2, z(t) = ((t-1)\,c_3 + c_1)\,\mathrm{e}^t - c_2\}$$

2.1902 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 = 0.0162036 (sec), leaf count = 226

```
DSolve[{-y[t] + z[t] + Derivative[1][x][t] == 0, -x[t] - y[t] + Derivative[1][y][t] == t, -x[t] - z[t
```

$$\{\{x(t) \to e^{-t}(1-e^t)(-t-1) + e^{-t}(e^t-1)(-t-1) + c_2(e^t-1) + c_3(1-e^t) + c_1, y(t) \to e^{-t}(-t-1)(-e^t t +$$

✓ **Maple** : cpu = 0.062 (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})
```

$$\{x(t) = c_2 + c_3 e^t, y(t) = (tc_3 + c_1)e^t - t - c_2 - 1, z(t) = ((t-1)c_3 + c_1)e^t - t - c_2 - 1\}$$

2.1903 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 = 0.0482737 (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]), c*De
```

$$\left\{\left\{x(t)\to \frac{e^{-i\sqrt{a^2+b^2+c^2}t}\left(2e^{i\sqrt{a^2+b^2+c^2}t}a^2+b^2e^{2i\sqrt{a^2+b^2+c^2}t}+c^2e^{2i\sqrt{a^2+b^2+c^2}t}+b^2+c^2\right)c_1}{2\left(a^2+b^2+c^2\right)}-\frac{be^{-i\sqrt{a^2+b^2+c^2}t}\left(-\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.109 (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) =
```

$$\left\{x(t)=c_1+c_2\sin\left(\sqrt{a^2+b^2+c^2}\,t\right)+c_3\cos\left(\sqrt{a^2+b^2+c^2}\,t\right),y(t)=\frac{b^3c_1+\left(\left(-c_2\sin\left(\sqrt{a^2+b^2+c^2}\,t\right)-c\right.\right.}{}\right.$$

2.1904 ODE No. 1904

$$\left\{x'(t)=cy(t)-bz(t),y'(t)=az(t)-cx(t),z'(t)=bx(t)-ay(t)\right\}$$

✓ **Mathematica** : cpu = 0.0288343 (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], Derivative
```

$$\left\{\left\{x(t)\to\frac{e^{-\sqrt{-a^2-b^2-c^2}t}\left(2e^{\sqrt{-a^2-b^2-c^2}t}a^2+b^2e^{2\sqrt{-a^2-b^2-c^2}t}+c^2e^{2\sqrt{-a^2-b^2-c^2}t}+b^2+c^2\right)c_1}{2\left(a^2+b^2+c^2\right)}-\frac{e^{-\sqrt{-a^2-b^2-c^2}t}}{}\right.\right.$$

✓ **Maple** : cpu = 0.074 (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*
```

$$\left\{x(t)=c_1+c_2\sin\left(\sqrt{a^2+b^2+c^2}\,t\right)+c_3\cos\left(\sqrt{a^2+b^2+c^2}\,t\right),y(t)=\frac{\left(-a^2bc_3+ac_2c\sqrt{a^2+b^2+c^2}\right)\cos\left(\sqrt{}\right.}{}\right.$$

2.1905 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 = 0.0174669 (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[t]*z[t]
```

, 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[t]},

✗ **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

2.1906 ODE No. 1906

$$\left\{x'(t)=x(t)+y(t)-z(t),y'(t)=-x(t)+y(t)+z(t),z'(t)=x(t)-y(t)+z(t)\right\}$$

✓ **Mathematica** : cpu = 0.0299694 (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], Deriva
```

$$\left\{\left\{x(t)\to \frac{1}{3}c_1e^t\left(2\cos\left(\sqrt{3}t\right)+1\right)-\frac{1}{3}c_2e^t\left(-\sqrt{3}\sin\left(\sqrt{3}t\right)+\cos\left(\sqrt{3}t\right)-1\right)-\frac{1}{3}c_3e^t\left(\sqrt{3}\sin\left(\sqrt{3}t\right)+\cos\left(\sqrt{3}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.059 (sec), leaf count = 110

```
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(
```

$$\left\{x(t)=\mathrm{e}^t\left(c_1+\sin\left(\sqrt{3}\,t\right)c_2+\cos\left(\sqrt{3}\,t\right)c_3\right),y(t)=\mathrm{e}^t\left(\left(\frac{\sqrt{3}\,c_2}{2}-\frac{c_3}{2}\right)\cos\left(\sqrt{3}\,t\right)+\left(-\frac{\sqrt{3}\,c_3}{2}-\frac{c_2}{2}\right)\sin\left(\sqrt{3}\right.\right.\right.$$

2.1907 ODE No. 1907

$$\left\{x'(t) = -3x(t) + 48y(t) - 28z(t), y'(t) = -4x(t) + 40y(t) - 22z(t), z'(t) = -6x(t) + 57y(t) - 31z(t)\right\}$$

✓ **Mathematica** : cpu = 0.0112253 (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] + 40*y[t]
```

$$\left\{\left\{x(t) \to c_1\left(-e^t\right)\left(2e^{2t} - 3\right) + 6c_2e^t\left(2e^t + 3e^{2t} - 5\right) - 2c_3e^t\left(4e^t + 5e^{2t} - 9\right), y(t) \to -2c_1e^t\left(e^{2t} - 1\right) + c_2e^t\left(3e^t\right.\right.\right.$$

✓ **Maple** : cpu = 0.05 (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
```

$$\left\{x(t) = c_1 e^{2t} + c_2 e^{3t} + c_3 e^t, y(t) = \frac{c_1 e^{2t}}{4} + c_2 e^{3t} + \frac{2c_3 e^t}{3}, z(t) = \frac{c_1 e^{2t}}{4} + \frac{3c_2 e^{3t}}{2} + c_3 e^t\right\}$$

2.1908 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 = 0.028107 (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*y[t] + 2
```

$$\left\{\left\{x(t) \to -36c_2\text{RootSum}\left[\#1^3 - 40\#1^2 + 1714\#1 + 1404\&, \frac{2\#1e^{\#1t} + e^{\#1t}}{3\#1^2 - 80\#1 + 1714}\&\right] + 4c_3\text{RootSum}\left[\#1^3 - 40\right.\right.\right.$$

✓ **Maple** : cpu = 0.315 (sec), leaf count = 1145

```
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(
```

Expression too large to display

2.1909 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 = 0.0230967 (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*y[t] +
```

$$\Big\{\Big\{x(t) \to -c_2\text{RootSum}\Big[\#1^3 - a\#1^2 - b\#1^2 - c\#1^2 - \alpha^2\#1 - \beta^2\#1 - g^2\#1 + ab\#1 + ac\#1 + bc\#1 + a\alpha^2 +$$

✓ **Maple** : cpu = 12.006 (sec), leaf count = 32449

```
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), dif
```

Too large to display

2.1910 ODE No. 1910

$$\{tx'(t) = 2x(t) - t, t^3y'(t) = t^2y(t) - x(t) + t, t^4z'(t) = t^3z(t) - t^2y(t) - x(t) + t\}$$

✓ **Mathematica** : cpu = 0.005555 (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], t^4*Der
```

$$\left\{\left\{x(t) \to t + c_3t^2, y(t) \to c_2t + c_3, z(t) \to c_1t + \frac{c_3}{t} + c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.085 (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) = -
```

$$\left\{x(t) = t^2c_3 + t, y(t) = tc_2 + c_3, z(t) = \frac{t^2c_1 + tc_2 + c_3}{t}\right\}$$

2.1911 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 = 0.0174589 (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] + z[t]),
```

$$\left\{\left\{x(t) \to \frac{\left(2a^2 t^{i\sqrt{a^2+b^2+c^2}} + b^2\left(t^{2i\sqrt{a^2+b^2+c^2}} + 1\right) + c^2\left(t^{2i\sqrt{a^2+b^2+c^2}} + 1\right)\right) c_1 t^{-i\sqrt{a^2+b^2+c^2}}}{2\left(a^2+b^2+c^2\right)} - \frac{b\left(t^{i\sqrt{a^2+b^2+c^2}} - 1\right.}{}\right.\right.$$

✓ **Maple** : cpu = 0.108 (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
```

$$\left\{x(t) = c_1 + c_2 \sin\left(\sqrt{a^2+b^2+c^2}\,\ln(t)\right) + c_3 \cos\left(\sqrt{a^2+b^2+c^2}\,\ln(t)\right), y(t) = \frac{\cos\left(\sqrt{a^2+b^2+c^2}\,\ln(t)\right)\sqrt{a}}{}\right.$$

2.1912 ODE No. 1912

$$\{\mathrm{x1}'(t) = a\mathrm{x2}(t) + b\mathrm{x3}(t)\cos(ct) + b\mathrm{x4}(t)\sin(ct), \mathrm{x2}'(t) = -a\mathrm{x1}(t) + b\mathrm{x3}(t)\sin(ct) - b\mathrm{x4}(t)\cos(ct), \mathrm{x3}'(t) = a\mathrm{x4}($$

✓ **Mathematica** : cpu = 0.006965 (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][x2][t] =
```

$$\left\{\left\{\mathrm{x1}(t) \to c_3 \cos\left(\left(\frac{c}{2} - \frac{1}{2}\sqrt{4b^2 + (2a+c)^2}\right)t\right) + c_1 \cos\left(\left(\frac{c}{2} + \frac{1}{2}\sqrt{4b^2 + (2a+c)^2}\right)t\right) + c_4 \sin\left(\left(\frac{c}{2} - \frac{1}{2}\sqrt{4\right.\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.885 (sec), leaf count = 2783

```
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)+
```

$$\left\{\mathrm{x1}\,(t) = c_2 + c_3 \sin(ct) + c_4 \cos(ct)\,, \mathrm{x2}\,(t) = -\cos(ct)\,c_3 + \sin(ct)\,c_4 + c_1, \mathrm{x3}\,(t) = \frac{b(\cos(ct)\,c_1 a - \sin(ct)\,c_2 a}{a\,(a+c)}\right.$$

2.1913 ODE No. 1913

$$\{x'(t) = -x(t)(x(t) + y(t)), y'(t) = y(t)(x(t) + y(t))\}$$

✓ **Mathematica** : cpu = 0.025162 (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])},{x[t
```

$$\left\{\left\{y(t) \to -\sqrt{c_1} \cot\left(\sqrt{c_1}t - \sqrt{c_1}c_2\right), x(t) \to -\sqrt{c_1} \tan\left(\sqrt{c_1}t - \sqrt{c_1}c_2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.119 (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))})
```

$$\left[\{x(t) = 0\}, \left\{y(t) = \frac{1}{-t + c_1}\right\}\right]$$

2.1914 ODE No. 1914

$$\left\{x'(t)=x(t)(ay(t)+b),y'(t)=y(t)(cx(t)+d)\right\}$$

✓ **Mathematica** : cpu = 0.22086 (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]},{x[t], y[
```

$$\left\{\left\{y(t)\to \frac{bW\left(\frac{a\text{InverseFunction}\left[\int_1^{\#1}\frac{1}{K[1]\left(W\left(\frac{ae^{\frac{c_1}{b}+\frac{cK[1]}{b}}K[1]^{\frac{d}{b}}}{b}\right)+1\right)}dK[1]\&\right][bt+c_2]^{\frac{d}{b}}\exp\left(\frac{c\text{InverseFunction}\left[\int_1^{\#1}\frac{1}{K[1]\left(W\left(\frac{ae^{\frac{c_1}{b}+\frac{cK}{}}}{}\right.\right.}\right.}{b}\right.}{b}\right)}{a}\right.\right.$$

✓ **Maple** : cpu = 0.528 (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)})
```

$$[\{x(t) = 0\}, \{y(t) = c_1 e^{dt}\}]$$

2.1915 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 = 300.077 (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]*(beta
```

, 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

$$\left[\{x(t) = 0\}, \left\{y(t) = \frac{\beta}{e^{-\beta t}c_1\beta - bq}\right\}\right]$$

2.1916 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 = 0.475529 (sec), leaf count = 557

```
DSolve[{Derivative[1][x][t] == h*(a - x[t])*(c - x[t] - y[t]), Derivative[1][y][t] == k*(b - y[t])*(c
```

$$\left\{\left\{y(t)\to b\left(ah - h\text{InverseFunction}\left[\int_1^{\#1}\frac{(h(a-K[1]))^{\frac{k}{h}}}{(a-K[1])\left(c_1(ah-hK[1])^{\frac{k}{h}}(h(a-K[1]))^{\frac{k}{h}}-c(h(a-K[1]))^{\frac{k}{h}}+K\right.}\right.\right.\right.\right.$$

✓ **Maple** : cpu = 0.75 (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))})
```

$$\left[\{x(t) = a\}, \left\{y(t) = \frac{(c-a)\,\mathrm{e}^{k(t+c_1)(-c+a+b)} - b}{-1 + \mathrm{e}^{k(t+c_1)(-c+a+b)}}\right\}\right]$$

2.1917 ODE No. 1917

$$\{x'(t) = y(t)^2 - \cos(x(t)), y'(t) = y(t)(-\sin(x(t)))\}$$

✓ **Mathematica** : cpu = 104.356 (sec), leaf count = 3406

```
DSolve[{Derivative[1][x][t] == -Cos[x[t]] + y[t]^2, Derivative[1][y][t] == -(Sin[x[t]]*y[t])},{x[t],
```

$$\left\{\left\{y(t) \to \frac{3\sqrt[3]{2}\cos\left(\text{InverseFunction}\left[\int_1^{\#1} \frac{\left(3c_1+\sqrt{9c\right.}}{2\ 2^{2/3}\cos^2(K[1])+2\left(3c_1+\sqrt{9c_1{}^2-4\cos^3(K[1])}\right)^{2/3}\cos(K[1])+3\sqrt[3]{2}c_1}\right.\right.}{\sqrt[3]{81c_1+\sqrt{6561c_1{}^2-2916\cos^3\left(\text{InverseFunction}\left[\int_1^{\#1}\frac{}{2\ 2^{2/3}\cos^2(K[1])+2\left(3c_1+\sqrt{9c_1{}^2-4\cos^3(K[1])}\right)^{2/3}\cos\right.\right.}}}\right.\right.$$

✓ **Maple** : cpu = 1.474 (sec), leaf count = 101

```
dsolve({diff(x(t),t) = y(t)^2-cos(x(t)), diff(y(t),t) = -y(t)*sin(x(t))})
```

$$\left[\left\{x(t) = \text{RootOf}\left(-2\left(\int^{\_Z}\frac{1}{3\tan\left(\text{RootOf}\left(-3\sqrt{-\cos(\_f)^2}\ln\left(\frac{9\cos(\_f)^2\left(\tan(\_Z)^2+1\right)}{4}\right)+c_1\sqrt{-\cos(\_f)^2}-\right.\right.\right.}\right.\right.\right.\right.$$

2.1918 ODE No. 1918

$$\{x'(t) = -x(t)y(t)^2 + x(t) + y(t), y'(t) = x(t)^2y(t) - x(t) - y(t)\}$$

✗ **Mathematica** : cpu = 0.263008 (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] + x[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

$$[\{x(t) = 0\}, \{y(t) = 0\}]$$

2.1919 ODE No. 1919

$$\{x'(t) = -(x(t)(x(t)^2 + y(t)^2)) + x(t) + y(t), y'(t) = -y(t)(x(t)^2 + y(t)^2) - x(t) + y(t)\}$$

✗ **Mathematica** : cpu = 0.296156 (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] == -x[t] + y
```

, 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)^
```

, result contains DESol or ODESolStruc

$$[\{x(t) = 0\}, \{y(t) = 0\}]$$

2.1920 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 = 0.134603 (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[t] + y[t
```

, could not solve

```
DSolve[{Derivative[1][x][t] == -y[t] + x[t]*(-1 + x[t]^2 + y[t]^2), Derivative[1][y][t] == x
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

$$[\{x(t)=0\},\{y(t)=0\}]$$

2.1921 ODE No. 1921

$$\left\{x'(t) = -y(t)\left(x(t)^2 + y(t)^2\right), y'(t) = \left(\begin{cases} x(t)^2 + y(t)^2 & x(t)^2 + y(t)^2 \geq 2x(t) \\ \left(x(t)^2 + y(t)^2\right)\left(\frac{x(t)}{2} - \frac{y(t)^2}{2x(t)}\right) & \text{True} \end{cases}\right)\right\}$$

✗ **Mathematica** : cpu = 1.40103 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == -(y[t]*(x[t]^2 + y[t]^2)), Derivative[1][y][t] == Piecewise[{{x[t]^2 +
```

, could not solve

```
DSolve[{Derivative[1][x][t] == -(y[t]*(x[t]^2 + y[t]^2)), Derivative[1][y][t] == Piecewise[{
```

✗ **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+y(t)
1/2*y(t)^2/x(t))*(x(t)^2+y(t)^2))})
```

2.1922 ODE No. 1922

$$\left\{x'(t) = \left(\begin{cases} \sin\left(\frac{1}{x(t)^2+y(t)^2}\right) x(t) \left(x(t)^2 + y(t)^2 - 1\right) & x(t)^2 + y(t)^2 \neq 1 \\ 0 & \text{True} \end{cases} \right) - y(t), y'(t) = \left(\begin{cases} \sin\left(\frac{1}{x(t)^2-}\right. \end{cases}\right.\right.$$

✗ **Mathematica** : cpu = 5.81981 (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[t]^2), x
```

, 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] == Piecewise[{{
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
```

2.1923 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 = 0.0089822 (sec), leaf count = 53

```
DSolve[{(1 + t^2)*Derivative[1][x][t] == -(t*x[t]) + y[t], (1 + t^2)*Derivative[1][y][t] == -x[t] - t
```

$$\left\{\left\{x(t)\to\frac{c_1}{t^2+1}+\frac{c_2t}{t^2+1},y(t)\to\frac{c_2}{t^2+1}-\frac{c_1t}{t^2+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.043 (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)})
```

$$\left\{x(t)=\frac{tc_1+c_2}{t^2+1},y(t)=\frac{-tc_2+c_1}{t^2+1}\right\}$$

2.1924 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 = 0.046153 (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)*Derivativ
```

$$\left\{\left\{y(t)\to \frac{c_1\left(e^{c_2}-\sqrt{-4t^2-4c_1{}^2t^2+e^{2c_2}}\right)}{2\left(1+c_1{}^2\right)},x(t)\to \frac{e^{c_2}-\sqrt{-4t^2-4c_1{}^2t^2+e^{2c_2}}}{2\left(1+c_1{}^2\right)}\right\},\left\{y(t)\to \frac{c_1\left(\sqrt{-4t^2-4c_1{}^2t^2}\right.}{2\left(1+c\right.}\right.\right.$$

✓ **Maple** : cpu = 0.934 (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*
```

$$\left[\{x(t)=0\},\left\{y(t)=\frac{1+\sqrt{-4t^2c_1^2+1}}{2c_1},y(t)=\frac{1-\sqrt{-4t^2c_1^2+1}}{2c_1}\right\}\right]$$

2.1925 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 = 0.0119345 (sec), leaf count = 31

```
DSolve[{-x[t] + t*Derivative[1][x][t] + a*Derivative[1][y][t] + Derivative[1][y][t]^2 == 0, -y[t] + t
```

$$\left\{\left\{x(t) \to ac_2 + c_1t + c_2{}^2, y(t) \to c_2t + c_1c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.306 (sec), leaf count = 144

```
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*d
```

$$\left[\left\{x(t) = -\frac{t^2}{3}\right\}, \left\{y(t) = -\frac{t^3}{27a}\right\}\right]$$

2.1926 ODE No. 1926

$$\{x(t) = f(x'(t), y'(t)) + tx'(t), y(t) = g(x'(t), y'(t)) + ty'(t)\}$$

✓ **Mathematica** : cpu = 0.0038343 (sec), leaf count = 28

```
DSolve[{x[t] == f[Derivative[1][x][t], Derivative[1][y][t]] + t*Derivative[1][x][t], y[t] == g[Deriva
```

$$\{\{x(t) \to f(c_1, c_2) + c_1 t, y(t) \to g(c_1, c_2) + c_2 t\}\}$$

✓ **Maple** : cpu = 0.253 (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
```

$$[\{\int \mathrm{RootOf}\left(g\left(\_Z, \frac{d}{dt}y(t)\right) - y(t) + t\left(\frac{d}{dt}y(t)\right)\right) dt + c_1 = t\,\mathrm{RootOf}\left(g\left(\_Z, \frac{d}{dt}y(t)\right) - y(t) + t\left(\frac{d}{dt}y(t)\right)\right) + f$$

2.1927 ODE No. 1927

$$\left\{x''(t) = ae^{2x(t)} + e^{-2x(t)}\cos^2(y(t)) - e^{-x(t)}, y''(t) = e^{-2x(t)}\sin(y(t))\cos(y(t)) - \tan(y(t))\sec^2(y(t))\right\}$$

✗ **Mathematica** : cpu = 0.0051226 (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[2][y][t
```

, could not solve

```
DSolve[{Derivative[2][x][t] == -E^(-x[t]) + a*E^(2*x[t]) + Cos[y[t]]^2/E^(2*x[t]), Derivativ
```

✗ **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(
```

, 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(diff(
2*x(t))*sin(y(t))*cos(y(t))-sin(y(t))/cos(y(t))^3})
```

2.1928 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 = 0.0040239 (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[t])/(x[t
```

, could not solve

```
DSolve[{Derivative[2][x][t] == (k*x[t])/(x[t]^2 + y[t]^2)^(3/2), Derivative[2][y][t] == (k*y
```

✗ **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)/(
```

, exception

```
time expired
```

2.1929 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 = 0.0960217 (sec), leaf count = 0

```
DSolve[{Derivative[2][x][t] == -((c*f[Sqrt[Derivative[1][x][t]^2 + Derivative[1][y][t]^2]]*y[t]*Deriv
```

, could not solve

```
DSolve[{Derivative[2][x][t] == -((c*f[Sqrt[Derivative[1][x][t]^2 + Derivative[1][y][t]^2]]*y
g - (c*f[Sqrt[Derivative[1][x][t]^2 + Derivative[1][y][t]^2]]*y[t]*Derivative[1][y][t])/Sqrt
```

✗ **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)*dif
```

, result contains DESol or ODESolStruc

$$\left[\left\{y(t)=\_a\ \&\text{where}\ \left[\left\{\left(\frac{d}{d\_a}\_b(\_a)\right)\_b(\_a)+\frac{C(\_a)\,f\left(\sqrt{\_b\,(\_a)^2}\right)\_b(\_a)+g\sqrt{\_b\,(\_a)^2}}{\sqrt{\_b\,(\_a)^2}}=0\right\},\left\{\_a=\right.\right.\right.\right.$$

2.1930 ODE No. 1930

$$\{x'(t) = y(t) - z(t), y'(t) = x(t)^2 + y(t), z'(t) = x(t)^2 + z(t)\}$$

✓ **Mathematica** : cpu = 0.0215768 (sec), leaf count = 308

```
DSolve[{Derivative[1][x][t] == y[t] - z[t], Derivative[1][y][t] == x[t]^2 + y[t], Derivative[1][z][t]
```

$$\left\{\left\{x(t) \to e^{-c_3}\left(e^t + e^{c_3}c_1\right), y(t) \to c_2\left(e^{-c_3}\left(e^t + e^{c_3}c_1\right) - c_1\right) + \left(e^{-c_3}\left(e^t + e^{c_3}c_1\right) - c_1\right)\left(-\frac{{c_1}^2}{e^{-c_3}\left(e^t + e^{c_3}c_1\right) - c_1}\right.\right.\right.$$

✓ **Maple** : cpu = 0.046 (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)})
```

$$[\{x(t) = c_2 + c_3 e^t\}, \{y(t) = \left(\int x(t)^2 e^{-t} dt + c_1\right) e^t\}, \{z(t) = -\frac{d}{dt}x(t) + y(t)\}]$$

2.1931 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 = 2.52248 (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[t], c*De
```

$$\left\{\left\{x(t) \to \frac{\frac{\sqrt{2}b^2\sqrt{a(a-c)}c_1\operatorname{sn}\left(\frac{\frac{\sqrt{2}\sqrt{a}\sqrt{a-c}c\sqrt{c_2}t}{\sqrt{b}\sqrt{b-c}}-\frac{\sqrt{2}\sqrt{a}\sqrt{b}\sqrt{a-c}\sqrt{c_2}t}{\sqrt{b-c}}-\frac{\sqrt{2}\sqrt{a}\sqrt{a-c}c\sqrt{c_2}c_3}{\sqrt{b}\sqrt{b-c}}+\frac{\sqrt{2}\sqrt{a}\sqrt{b}\sqrt{a-c}\sqrt{c_2}c_3}{\sqrt{b-c}}}{a}\middle|-\frac{(a-b)bc_1}{(a-c)cc_2}\right)}{(a-c)\sqrt{b(b-c)c_1}} - \frac{\sqrt{2}b\sqrt{a(a-}}{}}{a}\right.\right.$$

✓ **Maple** : cpu = 1.615 (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) =
```

$$[\{x(t) = 0\}, \{y(t) = 0\}, \{z(t) = c_1\}]$$

2.1932 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 = 1.72704 (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]), Deriva
```

, 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

$$[\{x(t) = 0\}, \{y(t) = 0\}, \{z(t) = c_1\}]$$

2.1933 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 = 123.099 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] + Derivative[1][y][t] == x[t]*y[t], Derivative[1][y][t] + Derivative[1][z
```

, could not solve

```
DSolve[{Derivative[1][x][t] + Derivative[1][y][t] == x[t]*y[t], Derivative[1][y][t] + Deriva
```

✓ **Maple** : cpu = 1.343 (sec), leaf count = 4310

```
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
```

$$\left[\left\{x(t)=-\frac{2}{-2c_2+t}\right\},\{y(t)=x(t)\},\left\{z(t)=\left(\int-\frac{x(t)^2\,\mathrm{e}^{-\left(\int x(t)dt\right)}}{2}dt+c_1\right)\mathrm{e}^{\int x(t)dt}\right\}\right]$$

2.1934 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 = 54.2515 (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], Deriv
```

, could not solve

```
DSolve[{Derivative[1][x][t] == x[t]^2/2 - y[t]/24, Derivative[1][y][t] == 2*x[t]*y[t] - 3*z[
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

$$\left[\{y(t)=0\},\left\{x(t)=\frac{2}{-t+2c_1}\right\},\{z(t)=0\}\right]$$

2.1935 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 = 0.0257588 (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 + z[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),
```

, result contains DESol or ODESolStruc

$$[\{x(t)=0\},\{y(t)=0\},\{z(t)=c_1\}]$$

2.1936 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 = 0.0250104 (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 + z[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]}
```

✓ **Maple** : cpu = 0.82 (sec), leaf count = 704

```
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)
```

$$[\{x(t)=0\},\{y(t)=0\},\{z(t)=c_1\}]$$

2.1937 ODE No. 1937

$$\{x'(t) = -x(t)y(t)^2 + x(t) + y(t), y'(t) = x(t)^2y(t) - x(t) - y(t), z'(t) = y(t)^2 - x(t)^2\}$$

✗ **Mathematica** : cpu = 0.436596 (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] + x[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]}, 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(
```

, result contains DESol or ODESolStruc

$$[\{x(t) = 0\}, \{y(t) = 0\}, \{z(t) = c_1\}]$$

2.1938 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 = 0.0056237 (sec), leaf count = 137

```
DSolve[{Derivative[2][x][t] == (x[t]*Derivative[1][f][r])/r, Derivative[2][y][t] == (y[t]*Derivative[
```

$$\left\{\left\{x(t) \to c_1 e^{-\frac{t\sqrt{f'(r)}}{\sqrt{r}}} + c_2 e^{\frac{t\sqrt{f'(r)}}{\sqrt{r}}}, y(t) \to c_3 e^{-\frac{t\sqrt{f'(r)}}{\sqrt{r}}} + c_4 e^{\frac{t\sqrt{f'(r)}}{\sqrt{r}}}, z(t) \to c_5 e^{-\frac{t\sqrt{f'(r)}}{\sqrt{r}}} + c_6 e^{\frac{t\sqrt{f'(r)}}{\sqrt{r}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.113 (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(d
```

$$\left\{x(t) = c_5 \mathrm{e}^{\frac{\sqrt{\frac{d}{dr}F(r)}\,t}{\sqrt{r}}} + c_6 \mathrm{e}^{-\frac{\sqrt{\frac{d}{dr}F(r)}\,t}{\sqrt{r}}}, y(t) = c_3 \mathrm{e}^{\frac{\sqrt{\frac{d}{dr}F(r)}\,t}{\sqrt{r}}} + c_4 \mathrm{e}^{-\frac{\sqrt{\frac{d}{dr}F(r)}\,t}{\sqrt{r}}}, z(t) = c_1 \mathrm{e}^{\frac{\sqrt{\frac{d}{dr}F(r)}\,t}{\sqrt{r}}} + c_2 \mathrm{e}^{-\frac{\sqrt{\frac{d}{dr}F(r)}\,t}{\sqrt{r}}}\right\}$$

2.1939 ODE No. 1939

$$\{(x(t)-y(t))(x(t)-z(t))x'(t)=f(t),(y(t)-x(t))(y(t)-z(t))y'(t)=f(t),(z(t)-x(t))(z(t)-y(t))z'(t)=f(t$$

✓ **Mathematica** : cpu = 0.139265 (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])*Derivat
```

$$\left\{\left\{x(t)\to \frac{c_1}{3}+\frac{\sqrt[3]{2c_1{}^3-9c_2c_1+27c_3+27\int_1^t f(K[1])dK[1]+\sqrt{4\left(3c_2-c_1{}^2\right)^3+\left(2c_1{}^3-9c_2c_1+27c_3+27\int_1^t\right.}}}{3\sqrt[3]{2}}\right.\right.$$

✓ **Maple** : cpu = 1.825 (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) =
```

Expression too large to display

2.1940 ODE No. 1940

$\{\mathrm{x1}'(t)\sin(\mathrm{x2}(t)) = \mathrm{x4}(t)\sin(\mathrm{x3}(t)) + \mathrm{x5}(t)\cos(\mathrm{x3}(t)), \mathrm{x2}'(t) = \mathrm{x4}(t)\cos(\mathrm{x3}(t)) - \mathrm{x5}(t)\sin(\mathrm{x3}(t)), \mathrm{x1}'(t)\cos(\mathrm{x2}(t$

✗ **Mathematica** : cpu = 0.0094489 (sec), leaf count = 0

```
DSolve[{Sin[x2[t]]*Derivative[1][x1][t] == Sin[x3[t]]*x4[t] + Cos[x3[t]]*x5[t], Derivative[1][x2][t]
```

, could not solve

```
DSolve[{Sin[x2[t]]*Derivative[1][x1][t] == Sin[x3[t]]*x4[t] + Cos[x3[t]]*x5[t], Derivative[1
(a*(1 - lambda)*x5[t]) + Derivative[1][x4][t] == -(m*Cos[x3[t]]*Sin[x2[t]]), a*(1 - lambda)*
```

✗ **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(
```

, exception

```
time expired
```

3 Design of test program