

Kamke differential equations. Mathematica 14.1 and Maple 2024.2

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2.1671	ODE No. 1671	1827
2.1672	ODE No. 1672	1828
2.1673	ODE No. 1673	1829
2.1674	ODE No. 1674	1830
2.1675	ODE No. 1675	1831
2.1676	ODE No. 1676	1832
2.1677	ODE No. 1677	1833
2.1678	ODE No. 1678	1834
2.1679	ODE No. 1679	1835
2.1680	ODE No. 1680	1836
2.1681	ODE No. 1681	1837
2.1682	ODE No. 1682	1838
2.1683	ODE No. 1683	1839
2.1684	ODE No. 1684	1840
2.1685	ODE No. 1685	1841
2.1686	ODE No. 1686	1842
2.1687	ODE No. 1687	1843

2.1688	ODE No. 1688	1844
2.1689	ODE No. 1689	1845
2.1690	ODE No. 1690	1846
2.1691	ODE No. 1691	1847
2.1692	ODE No. 1692	1848
2.1693	ODE No. 1693	1849
2.1694	ODE No. 1694	1850
2.1695	ODE No. 1695	1851
2.1696	ODE No. 1696	1852
2.1697	ODE No. 1697	1853
2.1698	ODE No. 1698	1854
2.1699	ODE No. 1699	1855
2.1700	ODE No. 1700	1856
2.1701	ODE No. 1701	1857
2.1702	ODE No. 1702	1858
2.1703	ODE No. 1703	1859
2.1704	ODE No. 1704	1860
2.1705	ODE No. 1705	1861
2.1706	ODE No. 1706	1862
2.1707	ODE No. 1707	1863
2.1708	ODE No. 1708	1864
2.1709	ODE No. 1709	1865
2.1710	ODE No. 1710	1866
2.1711	ODE No. 1711	1867
2.1712	ODE No. 1712	1868
2.1713	ODE No. 1713	1869
2.1714	ODE No. 1714	1870
2.1715	ODE No. 1715	1871
2.1716	ODE No. 1716	1872
2.1717	ODE No. 1717	1873
2.1718	ODE No. 1718	1874
2.1719	ODE No. 1719	1875
2.1720	ODE No. 1720	1876
2.1721	ODE No. 1721	1877
2.1722	ODE No. 1722	1878
2.1723	ODE No. 1723	1879
2.1724	ODE No. 1724	1880
2.1725	ODE No. 1725	1881
2.1726	ODE No. 1726	1882
2.1727	ODE No. 1727	1883
2.1728	ODE No. 1728	1884
2.1729	ODE No. 1729	1885
2.1730	ODE No. 1730	1886
2.1731	ODE No. 1731	1887
2.1732	ODE No. 1732	1888
2.1733	ODE No. 1733	1889
2.1734	ODE No. 1734	1890
2.1735	ODE No. 1735	1891
2.1736	ODE No. 1736	1892
2.1737	ODE No. 1737	1893
2.1738	ODE No. 1738	1894
2.1739	ODE No. 1739	1895
2.1740	ODE No. 1740	1896
2.1741	ODE No. 1741	1897
2.1742	ODE No. 1742	1898

2.1743	ODE No. 1743	1899
2.1744	ODE No. 1744	1900
2.1745	ODE No. 1745	1901
2.1746	ODE No. 1746	1902
2.1747	ODE No. 1747	1903
2.1748	ODE No. 1748	1904
2.1749	ODE No. 1749	1905
2.1750	ODE No. 1750	1906
2.1751	ODE No. 1751	1907
2.1752	ODE No. 1752	1908
2.1753	ODE No. 1753	1909
2.1754	ODE No. 1754	1910
2.1755	ODE No. 1755	1911
2.1756	ODE No. 1756	1912
2.1757	ODE No. 1757	1913
2.1758	ODE No. 1758	1914
2.1759	ODE No. 1759	1915
2.1760	ODE No. 1760	1916
2.1761	ODE No. 1761	1917
2.1762	ODE No. 1762	1918
2.1763	ODE No. 1763	1919
2.1764	ODE No. 1764	1920
2.1765	ODE No. 1765	1921
2.1766	ODE No. 1766	1922
2.1767	ODE No. 1767	1923
2.1768	ODE No. 1768	1924
2.1769	ODE No. 1769	1925
2.1770	ODE No. 1770	1926
2.1771	ODE No. 1771	1927
2.1772	ODE No. 1772	1928
2.1773	ODE No. 1773	1929
2.1774	ODE No. 1774	1930
2.1775	ODE No. 1775	1931
2.1776	ODE No. 1776	1932
2.1777	ODE No. 1777	1933
2.1778	ODE No. 1778	1934
2.1779	ODE No. 1779	1935
2.1780	ODE No. 1780	1936
2.1781	ODE No. 1781	1937
2.1782	ODE No. 1782	1938
2.1783	ODE No. 1783	1939
2.1784	ODE No. 1784	1940
2.1785	ODE No. 1785	1941
2.1786	ODE No. 1786	1942
2.1787	ODE No. 1787	1943
2.1788	ODE No. 1788	1944
2.1789	ODE No. 1789	1945
2.1790	ODE No. 1790	1946
2.1791	ODE No. 1791	1947
2.1792	ODE No. 1792	1948
2.1793	ODE No. 1793	1949
2.1794	ODE No. 1794	1950
2.1795	ODE No. 1795	1951
2.1796	ODE No. 1796	1952
2.1797	ODE No. 1797	1953

2.1798	ODE No. 1798	1954
2.1799	ODE No. 1799	1955
2.1800	ODE No. 1800	1956
2.1801	ODE No. 1801	1957
2.1802	ODE No. 1802	1958
2.1803	ODE No. 1803	1959
2.1804	ODE No. 1804	1960
2.1805	ODE No. 1805	1961
2.1806	ODE No. 1806	1962
2.1807	ODE No. 1807	1963
2.1808	ODE No. 1808	1964
2.1809	ODE No. 1809	1965
2.1810	ODE No. 1810	1966
2.1811	ODE No. 1811	1967
2.1812	ODE No. 1812	1968
2.1813	ODE No. 1813	1969
2.1814	ODE No. 1814	1970
2.1815	ODE No. 1815	1971
2.1816	ODE No. 1816	1972
2.1817	ODE No. 1817	1973
2.1818	ODE No. 1818	1974
2.1819	ODE No. 1819	1975
2.1820	ODE No. 1820	1976
2.1821	ODE No. 1821	1977
2.1822	ODE No. 1822	1978
2.1823	ODE No. 1823	1979
2.1824	ODE No. 1824	1980
2.1825	ODE No. 1825	1981
2.1826	ODE No. 1826	1982
2.1827	ODE No. 1827	1983
2.1828	ODE No. 1828	1984
2.1829	ODE No. 1829	1985
2.1830	ODE No. 1830	1986
2.1831	ODE No. 1831	1987
2.1832	ODE No. 1832	1988
2.1833	ODE No. 1833	1989
2.1834	ODE No. 1834	1990
2.1835	ODE No. 1835	1991
2.1836	ODE No. 1836	1992
2.1837	ODE No. 1837	1993
2.1838	ODE No. 1838	1994
2.1839	ODE No. 1839	1995
2.1840	ODE No. 1840	1996
2.1841	ODE No. 1841	1997
2.1842	ODE No. 1842	1998
2.1843	ODE No. 1843	1999
2.1844	ODE No. 1844	2000
2.1845	ODE No. 1845	2001
2.1846	ODE No. 1846	2002
2.1847	ODE No. 1847	2003
2.1848	ODE No. 1848	2004
2.1849	ODE No. 1849	2005
2.1850	ODE No. 1850	2006
2.1851	ODE No. 1851	2007
2.1852	ODE No. 1852	2008

2.1853	ODE No. 1853	2009
2.1854	ODE No. 1854	2010
2.1855	ODE No. 1855	2011
2.1856	ODE No. 1856	2012
2.1857	ODE No. 1857	2013
2.1858	ODE No. 1858	2014
2.1859	ODE No. 1859	2015
2.1860	ODE No. 1860	2016
2.1861	ODE No. 1861	2017
2.1862	ODE No. 1862	2018
2.1863	ODE No. 1863	2019
2.1864	ODE No. 1864	2020
2.1865	ODE No. 1865	2021
2.1866	ODE No. 1866	2022
2.1867	ODE No. 1867	2023
2.1868	ODE No. 1868	2024
2.1869	ODE No. 1869	2025
2.1870	ODE No. 1870	2026
2.1871	ODE No. 1871	2027
2.1872	ODE No. 1872	2028
2.1873	ODE No. 1873	2029
2.1874	ODE No. 1874	2030
2.1875	ODE No. 1875	2031
2.1876	ODE No. 1876	2032
2.1877	ODE No. 1877	2033
2.1878	ODE No. 1878	2034
2.1879	ODE No. 1879	2035
2.1880	ODE No. 1880	2036
2.1881	ODE No. 1881	2037
2.1882	ODE No. 1882	2038
2.1883	ODE No. 1883	2039
2.1884	ODE No. 1884	2040
2.1885	ODE No. 1885	2041
2.1886	ODE No. 1886	2042
2.1887	ODE No. 1887	2043
2.1888	ODE No. 1888	2044
2.1889	ODE No. 1889	2045
2.1890	ODE No. 1890	2046
2.1891	ODE No. 1891	2047
2.1892	ODE No. 1892	2048
2.1893	ODE No. 1893	2049
2.1894	ODE No. 1894	2050
2.1895	ODE No. 1895	2051
2.1896	ODE No. 1896	2052
2.1897	ODE No. 1897	2053
2.1898	ODE No. 1898	2054
2.1899	ODE No. 1899	2055
2.1900	ODE No. 1900	2056
2.1901	ODE No. 1901	2057
2.1902	ODE No. 1902	2058
2.1903	ODE No. 1903	2059
2.1904	ODE No. 1904	2060
2.1905	ODE No. 1905	2061
2.1906	ODE No. 1906	2062
2.1907	ODE No. 1907	2063

2.1908	ODE No. 1908	2064
2.1909	ODE No. 1909	2065
2.1910	ODE No. 1910	2066
2.1911	ODE No. 1911	2067
2.1912	ODE No. 1912	2068
2.1913	ODE No. 1913	2069
2.1914	ODE No. 1914	2070
2.1915	ODE No. 1915	2071
2.1916	ODE No. 1916	2072
2.1917	ODE No. 1917	2073
2.1918	ODE No. 1918	2074
2.1919	ODE No. 1919	2075
2.1920	ODE No. 1920	2076
2.1921	ODE No. 1921	2077
2.1922	ODE No. 1922	2078
2.1923	ODE No. 1923	2079
2.1924	ODE No. 1924	2080
2.1925	ODE No. 1925	2081
2.1926	ODE No. 1926	2082
2.1927	ODE No. 1927	2083
2.1928	ODE No. 1928	2084
2.1929	ODE No. 1929	2085
2.1930	ODE No. 1930	2086
2.1931	ODE No. 1931	2087
2.1932	ODE No. 1932	2088
2.1933	ODE No. 1933	2089
2.1934	ODE No. 1934	2090
2.1935	ODE No. 1935	2091
2.1936	ODE No. 1936	2092
2.1937	ODE No. 1937	2093
2.1938	ODE No. 1938	2094
2.1939	ODE No. 1939	2095
2.1940	ODE No. 1940	2096

3

Design of test program

2097

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 `ODESolStruc`, 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	87.94	2.69	591.28	76.53	1008721
Maple	88.61	0.63	133.38	18.05	229276

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, 121, 188, 202, 203, 205, 206, 219, 234, 237, 250, 253, 265, 269, 331, 340, 367, 370, 395, 416, 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, 1392, 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, 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, 416, 489, 862, 1032, 1074, 1082, 1083, 1099, 1126, 1306, 1323, 1362, 1392, 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, 110, 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, 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,
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657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674,
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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,
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Both systems unable to solve 47, 48, 49, 50, 55, 56, 74, 79, 82, 87, 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			note on solution
Kamke 1	✓	cpu	leaf	✓	cpu	leaf	Linear first order, To Do
Kamke 2	✓	0.511	1117	✓	0.023	1089	Linear first order, integrating factor $y'(x) + ay(x) = f(x)$
Kamke 3	✓	0.082	34	✓	0.009	25	Linear first order, integrating factor $y'(x) + ay(x) = f(x)$
Kamke 4	✓	0.039	40	✓	0.035	37	Linear first order, integrating factor $y'(x) + ay(x) = f(x)$
Kamke 5	✓	0.034	30	✓	0.004	18	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 6	✓	0.35	39	✓	0.059	21	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 7	✓	0.03	18	✓	0.036	15	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 8	✓	0.073	23	✓	0.006	13	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 9	✓	0.025	17	✓	0.013	13	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 10	✓	0.028	19	✓	0.015	14	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 11	✓	0.028	18	✓	0.01	15	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 12	✓	0.028	66	✓	0.022	24	Linear first order, integrating factor $y'(x) + g(x)y(x) = f(x)$
Kamke 13	✓	0.067	34	✓	0.032	8	Non-linear first order, Riccati, separable $y'(x) + y^2(x) = 1$
Kamke 14	✓	0.098	79	✓	0.142	79	Non-linear first order, Riccati, transform to second order Airy ODE using $y = -\frac{u'(x)}{uR(x)}$
Kamke 15	✓	0.154	602	✓	0.07	187	Non-linear first order, Riccati, transform to second order Airy ODE using $y = -\frac{u'(x)}{uR(x)}$
Continued on next page							

Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 15	✓	0.062	25	✓	0.125	35	Non-linear first order, Riccati, transform to separable first order
Kamke 16	✓	0.058	186	✓	0.058	49	Non-linear first order, Riccati, transform to first order separable using $y = y_p + \frac{1}{u}$
Kamke 17	✓	0.05	34	✓	0.076	24	Non-linear first order, Riccati, transform to second order standard ODE using $y = -\frac{u'(x)}{uR(x)}$
Kamke 18	✓	0.083	50	✓	0.042	39	Non-linear first order, Riccati, transform to first order ODE solved using integrating factor using transformation $y = y_p + \frac{1}{u}$
Kamke 19	✓	0.049	14	✓	0.037	16	Non-linear first order, Riccati, transform to first order separable
Kamke 20	✓	0.141	49	✓	0.046	34	Non-linear first order, Riccati, transform to Bernoulli first order non-linear first order then solve Bernoulli
Kamke 21	✓	0.308	71	✓	0.132	25	Non-linear first order, Riccati, transform to first order ODE solved using integrating factor using transformation $y = y_p + \frac{1}{u}$
Kamke 22	✓	0.56	113	✓	0.359	97	Non-linear first order, Riccati, transform to first order ODE solved using integrating factor using transformation $y = y_p + \frac{1}{u}$
Kamke 23	✓	0.063	43	✓	0.032	23	Non-linear first order, Riccati, Separable
Kamke 24	✓	0.123	733	✓	0.049	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	✓	0.331	1835	✓	0.277	348	Non-linear first order, Riccati. To do
Kamke 26	✓	0.15	68	✓	0.27	45	Non-Linear first order, Riccati, transform to second order standard ODE using $y = -\frac{u'(x)}{uR(x)}$
Continued on next page							

Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 27	✓	0.27	120	✓	0.131	72	Non-linear first order, Riccati, transform to Bernoulli first order non-linear first order then solve Bernoulli
Kamke 28	✓	0.114	96	✓	0.065	51	Non-linear first order, Riccati, transform to Bernoulli first order non-linear first order then solve Bernoulli
Kamke 29	✓	0.058	39	✓	0.009	19	Non-linear first order, Bernoulli
Kamke 30	✓	0.128	230	✓	0.055	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	✓	0.121	21	✓	0.047	23	Non-Linear first order, Riccati, separable
Kamke 32	✓	0.294	34	✓	0.206	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	✓	0.312	160	✓	0.354	58	Non-Linear first order, Riccati. Complicated algebra, will do later
Kamke 34	✓	0.07	54	✓	0.02	28	Non-Linear first order, Bernoulli. Standard method.
Kamke 35	✓	0.096	61	✓	0.034	35	Non-Linear first order, Riccati. Transform to second order ODE using $y(x) = -\frac{u'(x)}{u(x)R(x)}$
Kamke 36	✓	0.319	195	✓	0.056	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	✓	0.73	78	✓	0.064	50	To Do
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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 38	✓	0.384	320	✓	0.023	34	Non-Linear first order. smart transformation makes it proper Abel first kind
Kamke 39	✓	0.122	54	✓	0.014	30	To Do
Kamke 40	✓	0.35	185	✓	0.046	48	To Do
Kamke 41	✓	0.193	103	✓	0.221	103	To Do
Kamke 42	✓	0.679	485	✓	0.019	40	To Do
Kamke 43	✓	4.34	490	✓	1.098	373	To Do
Kamke 44	✓	0.096	72	✓	0.013	53	Non-Linear first order Bernoulli. Solved using standard method of solving Bernoulli.
Kamke 45	✓	0.661	133	✓	0.115	108	To Do
Kamke 46	✓	0.317	228	✓	0.083	690	To Do
Kamke 47	✗	0	0	✗	0	0	To Do
Kamke 48	✗	0	0	✗	0	0	To Do
Kamke 49	✗	0	0	✗	0	0	To Do
Kamke 50	✗	0	0	✗	0	0	To Do
Kamke 51	✓	1.559	355	✓	1.419	648	To Do
Kamke 52	✓	1.545	117	✓	0.366	54	To Do
Kamke 53	✓	1.181	96	✓	0.218	214	To Do
Kamke 54	✓	0.55	74	✓	0.142	38	To Do
Kamke 55	✗	0	0	✗	0	0	To Do
Kamke 56	✗	0	0	✗	0	0	To Do
Kamke 57	✓	0.051	26	✓	0.049	31	To Do
Kamke 58	✓	0.29	119	✓	0.092	68	To Do
Kamke 59	✓	0.249	84	✓	0.085	26	To Do
Kamke 60	✓	0.141	92	✓	0.033	29	Non-Linear first order, separable.
Kamke 61	✓	0.147	75	✓	0.017	50	To Do
Kamke 62	✓	1.723	44	✓	0.503	34	Non-Linear first order, special transformation makes it exact differential.
Kamke 63	✓	0.097	48	✓	11.427	35	To Do
Kamke 64	✓	0.342	269	✓	0.184	124	To Do
Kamke 65	✓	51.86	312	✓	0.114	47	To Do
Kamke 66	✓	0.133	67	✓	0.165	40	To Do
Kamke 67	✓	0.144	14	✓	0.042	51	To Do
Kamke 68	✓	20.559	373	✓	0.108	77	To Do
Kamke 69	✓	28.42	1163	✓	0.279	111	To Do
Kamke 70	✓	23.671	81	✓	0.264	113	To Do
Kamke 71	✓	4.655	2237	✓	0.181	113	To Do
Kamke 72	✓	0.361	89	✓	0.021	64	To Do
Kamke 73	✓	21.121	733	✓	0.701	91	To Do
Kamke 74	✗	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 75	✓	0.152	18	✓	0.191	20	Non-Linear first order, Separable
Kamke 76	✓	0.173	116	✓	0.139	41	Non-Linear first order, Separable, integral requires the tangent half-angle substitution (Weierstrass substitution)
Kamke 77	✓	0.351	124	✓	0.161	54	Non-Linear first order, transform to Separable, becomes same as problem 76 above. Transform back after soluion.
Kamke 78	✓	0.918	1317	✓	0.204	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	✓	0.044	72	✓	2.743	41	To Do
Kamke 81	✓	1.062	220	✓	1.921	78	To Do
Kamke 82	✗	0	0	✗	0	0	To Do
Kamke 83	✓	0.271	69	✓	0.477	44	To Do
Kamke 84	✓	0.209	248	✓	0.051	37	To Do
Kamke 85	✓	0.342	238	✓	0.681	153	To Do
Kamke 86	✓	0.476	184	✓	0.363	52	To Do
Kamke 87	✗	0	0	✗	0	0	To Do
Kamke 88	✓	0.345	2831	✓	0.313	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	✓	0.036	56	Linear first order, separable. Integration tricky. requires tangent half-angle substitution
Kamke 90	✓	0.025	24	✓	0.03	17	Linear first order, separable. integrating factor
Kamke 91	✓	0.024	15	✓	0.007	11	To Do
Kamke 92	✓	0.017	15	✓	0.007	12	Linear first order, separable. integrating factor
Kamke 93	✓	0.038	16	✓	0.035	12	To Do
Kamke 94	✓	0.039	25	✓	0.019	23	Linear first order, separable. integrating factor
Continued on next page							

Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 95	✓	0.061	32	✓	0.069	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	✓	0.054	33	✓	0.059	11	Non-Linear first order, Riccati, but it is separable, so easy to solve by direct integration
Kamke 97	✓	0.086	46	✓	0.056	25	Non-Linear first order, Riccati, smart substitution transfer it to separable first order, so easy to solve by direct integration
Kamke 98	✓	0.16	442	✓	0.117	38	To Do
Kamke 99	✓	0.15	244	✓	0.152	171	To Do
Kamke 100	✓	0.083	199	✓	0.085	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	✓	0.061	18	✓	0.013	16	Non-Linear first order, Bernoulli, standard method of solving Bernoulli
Kamke 102	✓	0.072	36	✓	0.056	22	Non-Linear first order, Riccati, but transformed using smart substitution $y = xv$ to separable first order which is easily solved
Kamke 103	✓	0.105	90	✓	0.043	29	Non-Linear first order, Riccati, conversion to second order linear Sturm-Liouville ODE using $y = \frac{u'}{uR}$, then smart substitution $t = \frac{x^2}{2}$ is used to solve Sturm-Liouville by converting it to constant coefficients second order ODE
Kamke 104	✓	0.092	43	✓	0.075	63	Non-Linear first order, Riccati, conversion using smart transformation to separable first order
Kamke 105	✓	0.147	473	✓	0.421	844	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 106	✓	0.177	40	✓	0.104	41	To Do
Kamke 107	✓	0.306	1415	✓	0.355	174	To Do
Kamke 108	✓	0.061	15	✓	0.018	13	Non-Linear first order, Bernoulli, standard method of solving Bernoulli, leads to first order separable
Kamke 109	✓	0.057	17	✓	0.013	15	Non-Linear first order, Bernoulli, standard method of solving Bernoulli, leads to first order separable
Kamke 110	✓	0.097	56	✓	0.037	13	To Do
Kamke 111	✓	0.321	55	✓	0.191	53	To Do
Kamke 112	✓	0.102	58	✓	0.069	27	Non-Linear first order, smart transformation $y(x) = xv(x)$ makes it separable
Kamke 113	✓	0.095	70	✓	0.037	33	Non-Linear first order, very similar to 112. Smart transformation $y(x) = xv(x)$ makes it separable
Kamke 114	✓	0.085	54	✓	10.057	28	Non-Linear first order, very similar to 113. Smart transformation $y(x) = xv(x)$ makes it separable
Kamke 115	✓	0.232	104	✓	0.338	49	Non-Linear first order, Smart transformation $y(x) = xv(x)$ makes it separable
Kamke 116	✓	14.429	121	✓	0.421	86	To Do
Kamke 117	✓	0.15	28	✓	0.142	20	To Do
Kamke 118	✓	0.081	13	✓	0.105	8	To Do
Kamke 119	✓	0.095	17	✓	0.073	14	To Do
Kamke 120	✓	0.091	20	✓	0.224	17	To Do
Kamke 121	✗	0	0	✗	0	0	To Do
Kamke 122	✓	0.225	21	✓	0.616	16	To Do
Kamke 123	✓	0.086	32	✓	0.136	44	To Do
Kamke 124	✓	0.076	16	✓	0.053	12	To Do
Kamke 125	✓	0.138	16	✓	0.075	14	To Do
Kamke 126	✓	0.241	115	✓	0.035	29	To Do
Kamke 127	✓	0.417	186	✓	0.159	39	To Do
Kamke 128	✓	0.579	41	✓	0.376	33	To Do
Kamke 129	✓	0.197	44	✓	0.056	33	To Do
Kamke 130	✓	0.017	21	✓	0.007	15	To Do
Kamke 131	✓	0.177	20	✓	0.253	31	To Do
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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 132	✓	0.092	115	✓	0.1	153	To Do
Kamke 133	✓	0.017	27	✓	0.014	16	To Do
Kamke 134	✓	0.05	27	✓	0.008	17	To Do
Kamke 135	✓	0.017	14	✓	0.006	11	To Do
Kamke 136	✓	0.064	28	✓	0.017	18	To Do
Kamke 137	✓	0.062	16	✓	0.013	14	To Do
Kamke 138	✓	0.057	13	✓	0.043	11	To Do
Kamke 139	✓	0.197	821	✓	0.194	217	To Do
Kamke 140	✓	0.066	17	✓	0.129	20	To Do
Kamke 141	✓	0.105	67	✓	0.105	51	To Do
Kamke 142	✓	0.155	122	✓	0.115	52	To Do
Kamke 143	✓	0.085	51	✓	0.07	41	To Do
Kamke 144	✓	0.262	1787	✓	0.154	219	To Do
Kamke 145	✓	0.545	267	✓	0.125	117	To Do
Kamke 146	✓	0.629	78	✓	0.27	84	To Do
Kamke 147	✓	0.696	343	✓	0.337	182	To Do
Kamke 148	✓	0.034	40	✓	0.011	16	To Do
Kamke 149	✓	0.018	27	✓	0.013	20	To Do
Kamke 150	✓	0.018	30	✓	0.007	23	To Do
Kamke 151	✓	0.407	203	✓	0.063	76	To Do
Kamke 152	✓	0.267	40	✓	1.145	142	To Do
Kamke 153	✓	0.027	21	✓	0.018	20	To Do
Kamke 154	✓	0.017	26	✓	0.011	19	To Do
Kamke 155	✓	0.095	46	✓	0.105	14	To Do
Kamke 156	✓	0.062	21	✓	0.019	20	To Do
Kamke 157	✓	0.127	158	✓	0.281	231	To Do
Kamke 158	✓	0.112	31	✓	0.018	22	To Do
Kamke 159	✓	0.072	22	✓	0.153	13	To Do
Kamke 160	✓	0.09	27	✓	0.034	21	To Do
Kamke 161	✓	0.021	53	✓	0.016	27	To Do
Kamke 162	✓	0.291	133	✓	0.275	54	To Do
Kamke 163	✓	0.086	43	✓	0.092	27	To Do
Kamke 164	✓	0.102	131	✓	0.273	102	To Do
Kamke 165	✓	0.094	22	✓	0.022	17	To Do
Kamke 166	✓	0.14	71	✓	0.188	97	To Do
Kamke 167	✓	0.071	35	✓	0.034	20	To Do
Kamke 168	✓	0.148	234	✓	0.213	140	To Do
Kamke 169	✓	1.424	149	✓	0.232	153	To Do
Kamke 170	✓	0.064	43	✓	0.017	23	To Do
Kamke 171	✓	0.054	17	✓	0.01	15	To Do
Kamke 172	✓	0.067	35	✓	0.45	26	To Do
Kamke 173	✓	0.083	29	✓	0.135	27	To Do
Kamke 174	✓	0.021	17	✓	0.006	13	To Do
Kamke 175	✓	0.025	24	✓	0.02	20	To Do
Kamke 176	✓	0.15	82	✓	0.099	30	To Do
Kamke 177	✓	0.08	22	✓	0.024	17	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 178	✓	0.112	49	✓	0.306	61	To Do
Kamke 179	✓	0.392	2833	✓	0.171	107	To Do
Kamke 180	✓	0.209	132	✓	0.125	58	To Do
Kamke 181	✓	0.128	146	✓	0.081	27	To Do
Kamke 182	✓	0.135	96	✓	0.144	18	To Do
Kamke 183	✓	0.02	22	✓	0.013	18	To Do
Kamke 184	✓	0.796	704	✓	0.651	493	To Do
Kamke 185	✓	0.309	123	✓	0.049	63	To Do
Kamke 186	✓	0.192	19	✓	0.049	17	To Do
Kamke 187	✓	0.217	328	✓	0.131	60	To Do
Kamke 188	✗	0	0	✓	0.046	32	To Do
Kamke 189	✓	1.061	91	✓	1.093	60	To Do
Kamke 190	✓	0.091	92	✓	0.01	29	To Do
Kamke 191	✓	0.123	63	✓	0.021	16	To Do
Kamke 192	✓	0.139	97	✓	0.024	36	To Do
Kamke 193	✓	0.022	16	✓	0.009	14	To Do
Kamke 194	✓	0.127	98	✓	0.027	23	To Do
Kamke 195	✓	0.113	27	✓	0.137	28	To Do
Kamke 196	✓	0.294	53	✓	0.053	29	To Do
Kamke 197	✓	0.076	104	✓	0.251	237	To Do
Kamke 198	✓	0.027	15	✓	0.021	13	To Do
Kamke 199	✓	0.076	45	✓	0.7	105	To Do
Kamke 200	✓	0.19	77	✓	0.185	53	To Do
Kamke 201	✓	0.104	39	✓	0.059	23	To Do
Kamke 202	✗	0	0	✗	0	0	To Do
Kamke 203	✗	0	0	✗	0	0	To Do
Kamke 204	✓	0.092	70	✓	0.43	92	To Do
Kamke 205	✗	0	0	✗	0	0	To Do
Kamke 206	✗	0	0	✗	0	0	To Do
Kamke 207	✓	0.111	47	✓	0.02	37	To Do
Kamke 208	✓	0.181	118	✓	0.22	106	To Do
Kamke 209	✓	0.105	84	✓	0.013	21	To Do
Kamke 210	✓	0.066	47	✓	0.021	33	To Do
Kamke 211	✓	0.214	41	✓	0.053	31	To Do
Kamke 212	✓	0.327	95	✓	0.154	30	To Do
Kamke 213	✓	0.105	71	✓	1.408	66	To Do
Kamke 214	✓	0.113	78	✓	0.221	48	To Do
Kamke 215	✓	0.119	80	✓	0.277	51	To Do
Kamke 216	✓	0.108	82	✓	0.26	51	To Do
Kamke 217	✓	0.021	29	✓	0.038	23	To Do
Kamke 218	✓	0.101	257	✓	0.442	57	To Do
Kamke 219	✗	0	0	✗	0	0	To Do
Kamke 220	✓	0.089	57	✓	0.023	43	To Do
Kamke 221	✓	0.023	35	✓	0.102	21	To Do
Kamke 222	✓	0.061	65	✓	0.093	32	To Do
Kamke 223	✓	0.025	55	✓	0.204	51	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 224	✓	0.024	29	✓	0.125	35	To Do
Kamke 225	✓	0.022	33	✓	0.095	20	To Do
Kamke 226	✓	0.022	35	✓	0.089	21	To Do
Kamke 227	✓	0.018	107	✓	0.238	33	To Do
Kamke 228	✓	0.191	3357	✓	0.432	264	To Do
Kamke 229	✓	0.017	121	✓	0.211	32	To Do
Kamke 230	✓	0.126	98	✓	0.081	100	To Do
Kamke 231	✓	1.594	252	✓	0.319	178	To Do
Kamke 232	✓	0.06	56	✓	0.02	39	To Do
Kamke 233	✓	0.118	38	✓	0.025	30	To Do
Kamke 234	✗	0	0	✗	0	0	To Do
Kamke 235	✓	0.084	40	✓	0.06	30	To Do
Kamke 236	✓	0.091	114	✓	0.085	141	To Do
Kamke 237	✗	0	0	✗	0	0	To Do
Kamke 238	✓	0.23	192	✓	0.089	91	To Do
Kamke 239	✓	0.097	54	✓	0.221	59	To Do
Kamke 240	✓	0.086	41	✓	0.02	34	To Do
Kamke 241	✓	0.1	41	✓	0.014	33	To Do
Kamke 242	✓	0.069	60	✓	0.017	39	To Do
Kamke 243	✓	8.107	487	✓	0.237	391	To Do
Kamke 244	✓	7.948	484	✓	0.21	391	To Do
Kamke 245	✓	0.302	1453	✓	1.092	31	To Do
Kamke 246	✓	0.098	80	✓	0.09	63	To Do
Kamke 247	✓	6.945	693	✓	0.391	517	To Do
Kamke 248	✓	0.121	110	✓	0.019	75	To Do
Kamke 249	✓	3.763	115	✓	0.262	202	To Do
Kamke 250	✗	0	0	✗	0	0	To Do
Kamke 251	✓	0.094	60	✓	0.019	51	To Do
Kamke 252	✓	7.808	819	✓	1.079	1322	To Do
Kamke 253	✗	0	0	✗	0	0	To Do
Kamke 254	✓	0.1	99	✓	0.027	59	To Do
Kamke 255	✓	6.328	30	✓	0.316	74	To Do
Kamke 256	✓	0.024	21	✓	0.208	31	To Do
Kamke 257	✓	0.283	39	✓	0.131	98	To Do
Kamke 258	✓	0.078	43	✓	0.023	33	To Do
Kamke 259	✓	0.217	50	✓	0.027	51	To Do
Kamke 260	✓	0.097	80	✓	0.028	59	To Do
Kamke 261	✓	0.463	32	✓	0.145	18	To Do
Kamke 262	✓	0.12	101	✓	0.384	65	To Do
Kamke 263	✓	0.102	181	✓	0.261	179	To Do
Kamke 264	✓	0.295	680	✓	0.501	37	To Do
Kamke 265	✗	0	0	✗	0	0	To Do
Kamke 266	✓	2.935	69	✓	3.217	103	To Do
Kamke 267	✓	0.201	36	✓	0.056	32	To Do
Kamke 268	✓	0.121	146	✓	0.108	118	To Do
Kamke 269	✗	0	0	✗	0	0	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 270	✓	0.101	327	✓	0.061	314	To Do
Kamke 271	✓	0.193	370	✓	0.315	349	To Do
Kamke 272	✓	0.117	42	✓	0.197	42	To Do
Kamke 273	✓	0.143	297	✓	0.053	397	To Do
Kamke 274	✓	0.126	411	✓	0.086	653	To Do
Kamke 275	✓	0.088	18	✓	0.088	30	To Do
Kamke 276	✓	0.102	61	✓	0.766	47	To Do
Kamke 277	✓	0.084	53	✓	0.523	41	To Do
Kamke 278	✓	0.153	39	✓	0.069	28	To Do
Kamke 279	✓	0.38	107	✓	0.173	110	To Do
Kamke 280	✓	0.109	21	✓	0.065	24	To Do
Kamke 281	✓	0.141	75	✓	1.049	55	To Do
Kamke 282	✓	0.163	2129	✓	0.856	71	To Do
Kamke 283	✓	0.328	477	✓	0.135	407	To Do
Kamke 284	✓	0.084	59	✓	0.141	21	To Do
Kamke 285	✓	0.123	402	✓	0.148	429	To Do
Kamke 286	✓	0.185	3501	✓	1.845	1337	To Do
Kamke 287	✓	1.327	77	✓	0.095	56	To Do
Kamke 288	✓	0.153	534	✓	0.083	575	To Do
Kamke 289	✓	0.141	115	✓	0.055	115	To Do
Kamke 290	✓	0.368	831	✓	0.434	1386	To Do
Kamke 291	✓	0.765	39	✓	0.19	50	To Do
Kamke 292	✓	30.401	1716	✓	0.048	115	To Do
Kamke 293	✓	0.13	661	✓	0.391	35	To Do
Kamke 294	✓	0.187	71	✓	0.096	112	To Do
Kamke 295	✓	0.169	31	✓	0.286	29	To Do
Kamke 296	✓	0.33	102	✓	0.906	61	To Do
Kamke 297	✓	0.128	216	✓	0.4	29	To Do
Kamke 298	✓	0.073	72	✓	0.031	73	To Do
Kamke 299	✓	0.091	371	✓	0.267	276	To Do
Kamke 300	✓	0.069	99	✓	0.033	83	To Do
Kamke 301	✓	0.105	64	✓	0.254	25	To Do
Kamke 302	✓	0.078	70	✓	0.408	133	To Do
Kamke 303	✓	0.107	25	✓	0.247	34	To Do
Kamke 304	✓	0.269	44	✓	0.348	44	To Do
Kamke 305	✓	0.128	1277	✓	0.023	21	To Do
Kamke 306	✓	0.103	201	✓	0.98	225	To Do
Kamke 307	✓	0.165	149	✓	0.056	113	To Do
Kamke 308	✓	0.014	55	✓	0.014	37	To Do
Kamke 309	✓	0.08	151	✓	0.052	113	To Do
Kamke 310	✓	0.128	159	✓	0.145	125	To Do
Kamke 311	✓	0.19	2201	✓	0.151	50	To Do
Kamke 312	✓	0.794	204	✓	2.034	240	To Do
Kamke 313	✓	0.281	537	✓	0.273	748	To Do
Kamke 314	✓	0.117	188	✓	0.113	158	To Do
Kamke 315	✓	0.234	368	✓	0.164	365	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 316	✓	0.148	48	✓	0.062	53	To Do
Kamke 317	✓	0.223	23	✓	0.154	29	To Do
Kamke 318	✓	0.161	4284	✓	0.024	28	To Do
Kamke 319	✓	0.118	302	✓	0.04	35	To Do
Kamke 320	✓	0.116	76	✓	0.142	78	To Do
Kamke 321	✓	0.298	47	✓	0.197	42	To Do
Kamke 322	✓	0.232	2077	✓	0.029	29	To Do
Kamke 323	✓	0.236	463	✓	0.172	630	To Do
Kamke 324	✓	0.103	723	✓	0.177	811	To Do
Kamke 325	✓	0.147	139	✓	0.803	124	To Do
Kamke 326	✓	1.544	13289	✓	1.203	160	To Do
Kamke 327	✓	0.211	669	✓	0.276	579	To Do
Kamke 328	✓	0.24	42	✓	0.305	33	To Do
Kamke 329	✓	1.232	118	✓	0.725	72	To Do
Kamke 330	✓	0.104	52	✓	0.037	22	To Do
Kamke 331	✗	0	0	✓	0.3	78	To Do
Kamke 332	✓	0.272	29	✓	0.019	33	To Do
Kamke 333	✓	0.447	72	✓	0.114	33	To Do
Kamke 334	✓	0.141	39	✓	0.033	19	To Do
Kamke 335	✓	0.137	75	✓	0.009	50	To Do
Kamke 336	✓	0.405	74	✓	0.043	41	To Do
Kamke 337	✓	0.229	52	✓	0.132	28	To Do
Kamke 338	✓	6.259	116	✓	1.727	129	To Do
Kamke 339	✓	0.393	27	✓	0.2	25	To Do
Kamke 340	✗	0	0	✗	0	0	To Do
Kamke 341	✓	0.349	33	✓	0.052	33	To Do
Kamke 342	✓	0.794	163	✓	0.036	17	To Do
Kamke 343	✓	0.206	35	✓	0.062	27	To Do
Kamke 344	✓	0.226	23	✓	0.049	19	To Do
Kamke 345	✓	0.279	35	✓	0.065	36	To Do
Kamke 346	✓	0.555	24	✓	0.2	19	To Do
Kamke 347	✓	0.559	32	✓	0.197	12	To Do
Kamke 348	✓	0.266	17	✓	0.075	15	To Do
Kamke 349	✓	0.289	15	✓	0.045	17	To Do
Kamke 350	✓	0.624	53	✓	1.165	221	To Do
Kamke 351	✓	0.556	61	✓	0.379	55	To Do
Kamke 352	✓	0.686	43	✓	0.418	33	To Do
Kamke 353	✓	0.093	14	✓	0.063	12	To Do
Kamke 354	✓	0.215	145	✓	0.121	108	To Do
Kamke 355	✓	0.241	17	✓	0.08	15	To Do
Kamke 356	✓	0.374	21	✓	0.087	19	To Do
Kamke 357	✓	0.691	35	✓	0.507	13	To Do
Kamke 358	✓	0.209	29	✓	0.072	11	To Do
Kamke 359	✓	0.464	45	✓	0.087	28	To Do
Kamke 360	✓	19.397	369	✓	0.067	46	To Do
Kamke 361	✓	0.88	31	✓	0.195	22	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 362	✓	0.392	23	✓	0.2	23	To Do
Kamke 363	✓	0.392	33	✓	0.076	35	To Do
Kamke 364	✓	0.49	31	✓	0.161	23	To Do
Kamke 365	✓	0.481	156	✓	0.124	42	To Do
Kamke 366	✓	0.333	91	✓	0.099	45	To Do
Kamke 367	✗	0	0	✗	0	0	To Do
Kamke 368	✓	0.816	581	✗	0	0	To Do
Kamke 369	✓	0.116	107	✓	0.132	68	To Do
Kamke 370	✗	0	0	✗	0	0	To Do
Kamke 371	✓	0.073	37	✓	0.111	20	To Do
Kamke 372	✓	0.006	27	✓	0.05	227	To Do
Kamke 373	✓	0.243	169	✓	0.25	49	To Do
Kamke 374	✓	0.41	99	✓	0.028	85	To Do
Kamke 375	✓	0.032	71	✓	0.024	49	To Do
Kamke 376	✓	0.335	114	✓	0.895	279	To Do
Kamke 377	✓	0.006	19	✓	0.026	24	To Do
Kamke 378	✓	0.006	18	✓	0.026	20	To Do
Kamke 379	✓	0.006	18	✓	0.022	22	To Do
Kamke 380	✓	0.259	1193	✓	0.06	589	To Do
Kamke 381	✓	0.271	1169	✓	0.038	553	To Do
Kamke 382	✓	0.704	197	✓	0.03	146	To Do
Kamke 383	✓	1.513	1085	✗	0	0	To Do
Kamke 384	✓	0.007	24	✓	0.028	50	To Do
Kamke 385	✓	1.113	6145	✓	0.397	161	To Do
Kamke 386	✓	0.687	103	✓	0.447	27	To Do
Kamke 387	✓	1.679	136	✓	0.724	118	To Do
Kamke 388	✓	0.563	72	✓	0.067	223	To Do
Kamke 389	✓	0.103	55	✓	0.763	71	To Do
Kamke 390	✓	3.408	161	✓	0.305	281	To Do
Kamke 391	✓	0.024	29	✓	0.012	22	To Do
Kamke 392	✓	0.227	27	✓	0.528	50	To Do
Kamke 393	✓	0.121	31	✓	0.241	77	To Do
Kamke 394	✓	0.46	89	✓	5.095	109	To Do
Kamke 395	✗	0	0	✗	0	0	To Do
Kamke 396	✓	0.078	29	✓	0.011	20	To Do
Kamke 397	✓	1.578	161	✓	0.389	128	To Do
Kamke 398	✓	7.006	413	✓	2.106	138	To Do
Kamke 399	✓	0.009	20	✓	0.024	22	To Do
Kamke 400	✓	0.667	135	✓	0.254	37	To Do
Kamke 401	✓	0.436	1211	✓	0.053	554	To Do
Kamke 402	✓	1.266	105	✓	0.206	51	To Do
Kamke 403	✓	0.406	118	✓	0.886	247	To Do
Kamke 404	✓	3.512	308	✓	0.269	389	To Do
Kamke 405	✓	0.71	74	✓	0.323	378	To Do
Kamke 406	✓	0.603	68	✓	0.119	262	To Do
Kamke 407	✓	0.04	51	✓	0.027	39	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 408	✓	0.339	97	✓	0.068	73	To Do
Kamke 409	✓	2.49	50	✓	0.07	63	To Do
Kamke 410	✓	30.764	90	✓	0.072	64	To Do
Kamke 411	✓	0.329	97	✓	0.055	65	To Do
Kamke 412	✓	1.068	6457	✓	0.069	146	To Do
Kamke 413	✓	0.131	673	✓	0.158	269	To Do
Kamke 414	✓	0.172	107	✓	0.173	269	To Do
Kamke 415	✓	0.234	49	✓	0.261	95	To Do
Kamke 416	✗	0	0	✓	0.08	136	To Do
Kamke 417	✓	0.006	16	✓	0.03	35	To Do
Kamke 418	✓	1.21	168	✓	0.049	42	To Do
Kamke 419	✓	1.543	9073	✓	0.034	109	To Do
Kamke 420	✓	0.236	1559	✓	0.074	689	To Do
Kamke 421	✓	0.073	123	✓	0.034	32	To Do
Kamke 422	✓	0.114	81	✓	0.033	30	To Do
Kamke 423	✓	0.136	59	✓	0.043	44	To Do
Kamke 424	✓	1.143	423	✓	0.428	193	To Do
Kamke 425	✓	0.007	21	✓	0.036	45	To Do
Kamke 426	✓	0.006	28	✓	0.04	51	To Do
Kamke 427	✓	0.006	24	✓	0.035	60	To Do
Kamke 428	✓	0.007	22	✓	0.065	66	To Do
Kamke 429	✓	0.007	30	✓	0.056	72	To Do
Kamke 430	✓	234.421	507	✓	2.215	1602	To Do
Kamke 431	✓	0.058	81	✓	0.185	62	To Do
Kamke 432	✓	1.451	81	✓	9.551	78	To Do
Kamke 433	✓	0.845	22	✓	0.201	34	To Do
Kamke 434	✓	0.068	123	✓	0.007	7	To Do
Kamke 435	✓	0.078	61	✓	0.247	22	To Do
Kamke 436	✓	0.088	115	✓	1.1	61	To Do
Kamke 437	✓	0.524	47	✓	0.046	36	To Do
Kamke 438	✓	0.032	21	✓	0.01	17	To Do
Kamke 439	✓	0.051	49	✓	0.062	33	To Do
Kamke 440	✓	0.031	19	✓	0.01	15	To Do
Kamke 441	✓	0.114	65	✓	1.65	137	To Do
Kamke 442	✓	0.036	28	✓	0.017	21	To Do
Kamke 443	✓	0.556	3049	✓	1.938	192	To Do
Kamke 444	✓	1.6	49	✓	1.223	120	To Do
Kamke 445	✓	0.066	49	✓	0.013	35	To Do
Kamke 446	✓	0.04	45	✓	0.043	57	To Do
Kamke 447	✓	0.007	41	✓	0.049	33	To Do
Kamke 448	✓	0.111	191	✓	7.718	166	To Do
Kamke 449	✓	0.036	27	✓	0.013	23	To Do
Kamke 450	✓	0.291	26	✓	0.737	51	To Do
Kamke 451	✓	0.051	51	✓	0.056	78	To Do
Kamke 452	✓	0.017	23	✗	0	0	To Do
Kamke 453	✓	0.901	223	✓	0.963	229	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 454	✓	0.198	235	✓	0.139	106	To Do
Kamke 455	✓	0.677	57	✓	0.438	66	To Do
Kamke 456	✓	1.302	473	✓	0.534	33	To Do
Kamke 457	✓	0.366	118	✓	0.957	45	To Do
Kamke 458	✓	0.034	120	✓	0.056	90	To Do
Kamke 459	✓	13.703	397	✓	0.624	113	To Do
Kamke 460	✗	0	0	✗	0	0	To Do
Kamke 461	✗	0	0	✗	0	0	To Do
Kamke 462	✓	0.022	43	✓	0.029	27	To Do
Kamke 463	✓	0.044	47	✓	0.098	50	To Do
Kamke 464	✓	0.062	103	✓	0.699	70	To Do
Kamke 465	✓	0.037	107	✓	0.1	210	To Do
Kamke 466	✓	2.176	51	✓	0.573	71	To Do
Kamke 467	✓	0.161	226	✓	0.099	148	To Do
Kamke 468	✓	2.395	753	✓	0.106	181	To Do
Kamke 469	✓	0.217	157	✓	0.311	264	To Do
Kamke 470	✓	0.405	143	✓	0.446	87	To Do
Kamke 471	✓	0.016	47	✓	0.015	33	To Do
Kamke 472	✓	0.272	127	✓	0.627	121	To Do
Kamke 473	✓	0.247	165	✓	1.11	71	To Do
Kamke 474	✓	0.145	135	✓	1.124	115	To Do
Kamke 475	✓	0.069	113	✓	0.735	67	To Do
Kamke 476	✓	0.411	143	✓	0.388	87	To Do
Kamke 477	✓	0.177	142	✓	0.503	622	To Do
Kamke 478	✓	0.134	141	✓	0.5	211	To Do
Kamke 479	✓	8.783	576	✓	0.302	929	To Do
Kamke 480	✗	0	0	✗	0	0	To Do
Kamke 481	✓	0.022	49	✓	0.017	35	To Do
Kamke 482	✗	0	0	✗	0	0	To Do
Kamke 483	✓	0.14	145	✓	0.099	103	To Do
Kamke 484	✓	0.134	157	✓	0.109	115	To Do
Kamke 485	✓	0.043	29	✗	0	0	To Do
Kamke 486	✓	0.041	117	✓	0.164	54	To Do
Kamke 487	✓	0.427	161	✓	0.372	100	To Do
Kamke 488	✓	0.212	85	✓	0.376	72	To Do
Kamke 489	✗	0	0	✓	1.467	549	To Do
Kamke 490	✓	0.248	70	✓	0.356	83	To Do
Kamke 491	✓	0.504	79	✓	0.685	88	To Do
Kamke 492	✓	0.078	97	✓	0.51	122	To Do
Kamke 493	✓	14.289	97	✓	1.013	109	To Do
Kamke 494	✓	0.082	49	✓	0.203	159	To Do
Kamke 495	✓	0.147	83	✓	0.502	61	To Do
Kamke 496	✓	26.403	18407	✓	0.277	130	To Do
Kamke 497	✓	0.101	151	✓	0.562	187	To Do
Kamke 498	✓	0.108	127	✓	0.346	99	To Do
Kamke 499	✓	0.189	423	✓	0.227	191	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 500	✓	0.475	100	✓	0.993	662	To Do
Kamke 501	✓	34.969	975	✓	3.931	44	To Do
Kamke 502	✓	1.185	100	✓	0.359	196	To Do
Kamke 503	✗	0	0	✗	0	0	To Do
Kamke 504	✓	0.051	36	✓	1.142	247	To Do
Kamke 505	✓	0.075	73	✓	0.023	52	To Do
Kamke 506	✗	0	0	✗	0	0	To Do
Kamke 507	✓	44.182	395	✓	2.52	203	To Do
Kamke 508	✓	1.08	62	✓	0.627	60	To Do
Kamke 509	✓	0.183	34	✓	0.566	212	To Do
Kamke 510	✗	0	0	✗	0	0	To Do
Kamke 511	✓	22.243	229	✓	10.197	199	To Do
Kamke 512	✓	23.644	305	✓	6.25	139	To Do
Kamke 513	✓	0.05	81	✗	0	0	To Do
Kamke 514	✓	7.099	605	✓	6.036	87	To Do
Kamke 515	✓	2.169	1922	✓	1.191	117	To Do
Kamke 516	✓	0.414	253	✓	1.375	70	To Do
Kamke 517	✓	0.419	283	✓	1.396	78	To Do
Kamke 518	✓	0.416	236	✓	0.277	126	To Do
Kamke 519	✓	7.648	353	✓	0.695	197	To Do
Kamke 520	✓	0.021	330	✓	0.177	249	To Do
Kamke 521	✓	0.004	14	✓	0.029	33	To Do
Kamke 522	✓	0.004	20	✓	0.038	44	To Do
Kamke 523	✓	177.751	392	✓	0.071	253	To Do
Kamke 524	✓	0.013	422	✓	0.073	257	To Do
Kamke 525	✓	0.095	129	✓	0.083	122	To Do
Kamke 526	✓	0.05	45	✓	0.016	32	To Do
Kamke 527	✓	0.013	20	✓	0.776	43	To Do
Kamke 528	✓	0.551	398	✓	0.091	86	To Do
Kamke 529	✓	22.499	1758	✓	0.068	1236	To Do
Kamke 530	✓	38.657	648	✓	0.125	370	To Do
Kamke 531	✗	0	0	✗	0	0	To Do
Kamke 532	✓	0.022	1057	✓	0.356	944	To Do
Kamke 533	✓	0.004	16	✓	0.036	76	To Do
Kamke 534	✓	0.046	114	✓	0.056	84	To Do
Kamke 535	✓	0.036	49	✓	0.05	51	To Do
Kamke 536	✓	0.026	64	✓	0.034	52	To Do
Kamke 537	✓	0.024	16	✗	0	0	To Do
Kamke 538	✓	2.924	179	✓	4.116	1725	To Do
Kamke 539	✓	0.02	32	✓	0.066	32	To Do
Kamke 540	✓	0.027	69	✓	0.087	109	To Do
Kamke 541	✓	0.022	39	✓	0.501	103	To Do
Kamke 542	✓	0.022	20	✓	0.525	107	To Do
Kamke 543	✓	0.017	55	✗	0	0	To Do
Kamke 544	✓	0.054	22	✓	3.256	4200	To Do
Kamke 545	✓	0.512	323	✓	0.183	144	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 546	✓	0.031	113	✓	0.074	171	To Do
Kamke 547	✓	5.181	763	✓	0.245	118	To Do
Kamke 548	✓	0.733	479	✓	0.439	250	To Do
Kamke 549	✓	0.333	216	✓	1.083	545	To Do
Kamke 550	✓	1.746	488	✓	0.299	64	To Do
Kamke 551	✓	8.988	84	✓	0.756	55	To Do
Kamke 552	✓	0.05	41	✓	0.086	43	To Do
Kamke 553	✓	0.378	56	✓	0.066	36	To Do
Kamke 554	✓	0.128	54	✓	0.292	40	To Do
Kamke 555	✓	0.005	20	✓	0.037	15	To Do
Kamke 556	✓	2.902	78	✓	0.547	581	To Do
Kamke 557	✓	0.035	39	✓	0.076	105	To Do
Kamke 558	✓	0.335	223	✓	0.469	223	To Do
Kamke 559	✓	0.184	423	✓	0.197	215	To Do
Kamke 560	✓	25.677	110	✓	1.163	1058	To Do
Kamke 561	✓	2.078	2138	✓	2.346	50	To Do
Kamke 562	✓	0.085	84	✓	0.261	3288	To Do
Kamke 563	✓	0.136	59	✓	0.25	66	To Do
Kamke 564	✓	0.004	17	✓	0.025	32	To Do
Kamke 565	✓	0.036	25	✓	0.35	17	To Do
Kamke 566	✓	0.033	38	✓	0.033	16	To Do
Kamke 567	✓	0.066	49	✓	0.039	18	To Do
Kamke 568	✓	0.079	34	✓	0.073	32	To Do
Kamke 569	✓	0.071	59	✓	0.326	139	To Do
Kamke 570	✓	1.183	58	✓	0.048	30	To Do
Kamke 571	✓	0.12	124	✓	1.09	169	To Do
Kamke 572	✗	0	0	✗	0	0	To Do
Kamke 573	✓	0.02	42	✓	0.102	24	To Do
Kamke 574	✓	0.028	102	✓	0.135	41	To Do
Kamke 575	✗	0	0	✗	0	0	To Do
Kamke 576	✗	0	0	✗	0	0	To Do
Kamke 577	✓	0.303	243	✓	0.039	28	To Do
Kamke 578	✓	0.17	100	✓	0.036	22	To Do
Kamke 579	✓	0.218	514	✓	0.055	35	To Do
Kamke 580	✓	0.251	203	✓	0.065	31	To Do
Kamke 581	✓	0.24	144	✓	0.099	32	To Do
Kamke 582	✓	0.285	142	✓	0.178	30	To Do
Kamke 583	✓	0.259	126	✓	0.134	31	To Do
Kamke 584	✓	0.236	115	✓	0.082	35	To Do
Kamke 585	✓	0.208	205	✓	0.705	120	To Do
Kamke 586	✓	0.901	975	✓	0.256	39	To Do
Kamke 587	✓	0.27	123	✓	0.115	29	To Do
Kamke 588	✓	0.203	109	✓	0.143	53	To Do
Kamke 589	✓	0.238	245	✓	0.173	38	To Do
Kamke 590	✓	0.254	94	✓	0.141	28	To Do
Kamke 591	✓	0.535	253	✓	0.268	108	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 592	✓	0.549	241	✓	0.167	33	To Do
Kamke 593	✓	0.303	221	✓	0.233	35	To Do
Kamke 594	✓	0.416	236	✓	0.183	67	To Do
Kamke 595	✓	0.242	204	✓	0.173	72	To Do
Kamke 596	✓	0.268	156	✓	0.129	26	To Do
Kamke 597	✓	0.336	130	✓	0.341	37	To Do
Kamke 598	✓	0.127	37	✓	0.019	29	To Do
Kamke 599	✓	0.138	95	✓	0.106	57	To Do
Kamke 600	✓	0.236	246	✓	0.172	38	To Do
Kamke 601	✓	0.25	182	✓	0.167	61	To Do
Kamke 602	✓	0.443	167	✓	0.152	33	To Do
Kamke 603	✓	0.321	117	✓	0.108	27	To Do
Kamke 604	✓	0.388	143	✓	0.146	30	To Do
Kamke 605	✓	0.758	145	✓	0.142	29	To Do
Kamke 606	✓	0.44	361	✓	0.474	34	To Do
Kamke 607	✓	0.223	121	✓	0.075	22	To Do
Kamke 608	✓	0.49	274	✓	0.174	40	To Do
Kamke 609	✓	0.261	117	✓	0.174	22	To Do
Kamke 610	✓	0.073	25	✓	0.014	20	To Do
Kamke 611	✓	0.285	191	✓	0.071	28	To Do
Kamke 612	✓	0.344	199	✓	0.102	27	To Do
Kamke 613	✓	0.237	226	✓	0.085	23	To Do
Kamke 614	✓	0.308	177	✓	0.368	60	To Do
Kamke 615	✓	0.253	77	✓	0.099	26	To Do
Kamke 616	✓	0.419	177	✓	0.075	26	To Do
Kamke 617	✓	0.879	615	✓	0.232	47	To Do
Kamke 618	✓	0.182	25	✓	0.619	34	To Do
Kamke 619	✓	0.55	330	✓	0.319	81	To Do
Kamke 620	✓	0.802	205	✓	0.28	37	To Do
Kamke 621	✓	0.052	445	✓	0.354	59	To Do
Kamke 622	✓	0.224	140	✓	0.409	68	To Do
Kamke 623	✓	0.148	77	✓	0.355	51	To Do
Kamke 624	✓	16.871	9837	✓	0.461	46	To Do
Kamke 625	✓	0.202	56	✓	0.3	55	To Do
Kamke 626	✓	0.154	88	✓	0.56	115	To Do
Kamke 627	✓	0.424	43	✓	0.174	35	To Do
Kamke 628	✓	0.133	33	✓	0.271	23	To Do
Kamke 629	✓	0.408	92	✓	0.218	62	To Do
Kamke 630	✓	0.332	101	✓	0.384	98	To Do
Kamke 631	✓	0.148	31	✓	0.271	23	To Do
Kamke 632	✓	0.162	65	✓	0.427	54	To Do
Kamke 633	✓	0.175	85	✓	1.253	52	To Do
Kamke 634	✓	0.176	33	✓	0.388	26	To Do
Kamke 635	✓	0.136	33	✓	0.25	22	To Do
Kamke 636	✓	0.083	24	✓	0.257	19	To Do
Kamke 637	✓	7.088	62	✓	0.18	84	To Do
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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 638	✓	0.098	41	✓	0.429	34	To Do
Kamke 639	✓	0.131	53	✓	0.395	46	To Do
Kamke 640	✓	0.199	53	✓	0.744	47	To Do
Kamke 641	✓	0.153	35	✓	0.378	26	To Do
Kamke 642	✓	0.132	105	✓	0.307	281	To Do
Kamke 643	✓	0.131	31	✓	0.243	22	To Do
Kamke 644	✓	0.258	34	✓	0.424	27	To Do
Kamke 645	✓	0.068	20	✓	0.19	14	To Do
Kamke 646	✓	0.205	35	✓	0.352	23	To Do
Kamke 647	✓	0.299	115	✓	0.332	460	To Do
Kamke 648	✓	0.392	128	✓	0.951	49	To Do
Kamke 649	✓	0.249	37	✓	0.291	27	To Do
Kamke 650	✓	0.301	40	✓	0.331	35	To Do
Kamke 651	✓	0.078	16	✓	0.112	13	To Do
Kamke 652	✓	0.889	101	✓	0.154	27	To Do
Kamke 653	✓	0.225	34	✓	0.286	24	To Do
Kamke 654	✓	0.196	37	✓	0.339	23	To Do
Kamke 655	✓	9.487	89	✓	1.234	66	To Do
Kamke 656	✓	0.078	20	✓	0.122	15	To Do
Kamke 657	✓	0.318	37	✓	0.262	26	To Do
Kamke 658	✓	0.539	45	✓	0.369	28	To Do
Kamke 659	✓	0.757	87	✓	1.243	177	To Do
Kamke 660	✓	0.203	42	✓	0.276	29	To Do
Kamke 661	✓	0.38	93	✓	0.336	39	To Do
Kamke 662	✓	0.311	37	✓	0.288	26	To Do
Kamke 663	✓	0.953	101	✓	0.161	27	To Do
Kamke 664	✓	0.149	36	✓	0.233	25	To Do
Kamke 665	✓	0.354	41	✓	0.662	30	To Do
Kamke 666	✓	0.11	29	✓	0.305	24	To Do
Kamke 667	✓	2.843	95	✓	0.257	82	To Do
Kamke 668	✓	0.54	73	✓	1.059	58	To Do
Kamke 669	✓	0.503	264	✓	0.177	72	To Do
Kamke 670	✓	0.361	62	✓	0.313	70	To Do
Kamke 671	✓	0.229	192	✓	0.263	237	To Do
Kamke 672	✓	12.369	4512	✓	0.154	36	To Do
Kamke 673	✓	0.213	23	✓	0.388	17	To Do
Kamke 674	✓	0.225	40	✓	0.366	27	To Do
Kamke 675	✓	0.313	48	✓	0.076	37	To Do
Kamke 676	✓	0.769	206	✓	0.703	43	To Do
Kamke 677	✓	0.149	80	✓	0.094	48	To Do
Kamke 678	✓	2.161	115	✓	0.443	37	To Do
Kamke 679	✓	0.119	59	✓	0.095	37	To Do
Kamke 680	✓	0.301	39	✓	0.323	28	To Do
Kamke 681	✓	0.169	84	✓	0.079	45	To Do
Kamke 682	✓	0.249	39	✓	0.15	28	To Do
Kamke 683	✓	0.764	84	✓	0.069	45	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 684	✓	0.096	86	✓	3.719	30	To Do
Kamke 685	✓	0.111	87	✓	0.065	48	To Do
Kamke 686	✓	7.145	68	✓	0.122	85	To Do
Kamke 687	✓	0.12	130	✓	0.089	39	To Do
Kamke 688	✓	0.32	82	✓	0.085	42	To Do
Kamke 689	✓	0.342	60	✓	0.034	25	To Do
Kamke 690	✓	0.654	115	✓	0.34	40	To Do
Kamke 691	✓	0.221	21	✓	0.543	17	To Do
Kamke 692	✓	0.107	86	✓	3.726	30	To Do
Kamke 693	✓	2.629	1121	✓	0.069	36	To Do
Kamke 694	✓	0.592	64	✓	0.431	30	To Do
Kamke 695	✓	0.218	34	✓	0.04	39	To Do
Kamke 696	✓	0.943	51	✓	0.043	32	To Do
Kamke 697	✓	0.253	114	✓	0.078	40	To Do
Kamke 698	✓	0.249	108	✓	0.059	34	To Do
Kamke 699	✓	0.517	47	✓	0.299	36	To Do
Kamke 700	✓	0.16	76	✓	0.075	62	To Do
Kamke 701	✓	0.93	88	✓	5.539	71	To Do
Kamke 702	✓	4.044	37	✓	0.062	35	To Do
Kamke 703	✓	0.391	101	✓	0.157	44	To Do
Kamke 704	✓	32.309	66	✓	0.097	38	To Do
Kamke 705	✓	0.115	30	✓	0.111	24	To Do
Kamke 706	✓	4.551	610	✓	0.858	65	To Do
Kamke 707	✓	4.778	1391	✓	0.432	105	To Do
Kamke 708	✓	0.277	89	✓	60.77	229	To Do
Kamke 709	✓	1.437	217	✓	0.21	39	To Do
Kamke 710	✓	0.667	38	✓	2.575	31	To Do
Kamke 711	✓	0.177	28	✓	0.203	31	To Do
Kamke 712	✓	0.598	49	✓	0.339	38	To Do
Kamke 713	✓	0.08	649	✓	0.3	116	To Do
Kamke 714	✓	1.174	162	✓	0.249	96	To Do
Kamke 715	✓	0.619	50	✓	0.331	39	To Do
Kamke 716	✓	1.515	133	✓	0.231	37	To Do
Kamke 717	✓	0.308	46	✓	0.329	33	To Do
Kamke 718	✓	0.359	127	✓	0.053	44	To Do
Kamke 719	✓	0.411	49	✓	0.088	34	To Do
Kamke 720	✓	1.99	372	✓	0.147	48	To Do
Kamke 721	✓	0.106	27	✓	0.053	19	To Do
Kamke 722	✓	16.465	490	✓	0.247	70	To Do
Kamke 723	✓	0.187	663	✓	0.107	852	To Do
Kamke 724	✓	10.626	422	✓	0.036	18	To Do
Kamke 725	✓	0.186	19	✓	1.039	25	To Do
Kamke 726	✓	0.083	625	✓	0.26	93	To Do
Kamke 727	✓	0.281	29	✓	0.162	25	To Do
Kamke 728	✓	0.2	72	✓	0.229	50	To Do
Kamke 729	✓	0.171	327	✓	0.088	400	To Do
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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 730	✓	0.3	83	✓	1.102	41	To Do
Kamke 731	✓	0.299	47	✓	0.112	42	To Do
Kamke 732	✓	0.755	56	✓	0.325	43	To Do
Kamke 733	✓	9.019	73	✗	0	0	To Do
Kamke 734	✓	0.188	37	✓	0.286	39	To Do
Kamke 735	✓	1.16	573	✓	0.065	78	To Do
Kamke 736	✓	0.135	31	✓	0.131	43	To Do
Kamke 737	✓	0.029	36	✓	0.201	29	To Do
Kamke 738	✓	0.319	1347	✓	0.562	1048	To Do
Kamke 739	✓	0.25	39	✓	0.125	35	To Do
Kamke 740	✓	0.089	74	✓	0.079	72	To Do
Kamke 741	✓	0.949	175	✓	0.806	246	To Do
Kamke 742	✓	1.903	3913	✓	1.465	239	To Do
Kamke 743	✓	0.072	406	✓	0.565	296	To Do
Kamke 744	✓	0.111	510	✓	0.191	619	To Do
Kamke 745	✓	1.224	546	✓	0.063	77	To Do
Kamke 746	✓	0.061	274	✓	0.457	232	To Do
Kamke 747	✓	3.285	88	✓	1.031	75	To Do
Kamke 748	✓	0.166	285	✓	0.111	398	To Do
Kamke 749	✓	0.121	126	✓	0.145	186	To Do
Kamke 750	✓	0.191	72	✓	0.277	49	To Do
Kamke 751	✓	0.132	30	✓	0.132	26	To Do
Kamke 752	✓	0.151	849	✓	1.733	723	To Do
Kamke 753	✓	0.137	41	✓	0.189	38	To Do
Kamke 754	✓	0.087	47	✓	0.016	26	To Do
Kamke 755	✓	0.195	2633	✓	0.111	71	To Do
Kamke 756	✓	1.128	95	✓	0.036	37	To Do
Kamke 757	✓	0.028	36	✓	0.082	26	To Do
Kamke 758	✓	0.584	459	✓	0.198	41	To Do
Kamke 759	✓	0.067	498	✓	0.632	305	To Do
Kamke 760	✓	0.532	112	✓	1.915	99	To Do
Kamke 761	✓	0.028	33	✓	0.066	18	To Do
Kamke 762	✓	0.125	26	✓	0.137	22	To Do
Kamke 763	✓	0.12	22	✓	0.085	14	To Do
Kamke 764	✓	0.133	50	✓	0.162	36	To Do
Kamke 765	✓	0.236	138	✓	0.137	48	To Do
Kamke 766	✓	0.362	129	✓	0.513	89	To Do
Kamke 767	✓	0.027	38	✓	0.074	26	To Do
Kamke 768	✓	1.077	66	✓	0.123	26	To Do
Kamke 769	✓	0.069	360	✓	0.569	246	To Do
Kamke 770	✓	0.162	705	✓	0.148	1096	To Do
Kamke 771	✓	0.036	46	✓	0.256	84	To Do
Kamke 772	✓	0.118	21	✓	0.147	18	To Do
Kamke 773	✓	0.147	61	✓	0.22	48	To Do
Kamke 774	✓	0.032	45	✓	0.15	51	To Do
Kamke 775	✓	0.121	943	✓	0.088	44	To Do
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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 776	✓	0.459	133	✓	0.539	96	To Do
Kamke 777	✓	0.183	39	✓	0.119	51	To Do
Kamke 778	✓	1.149	95	✓	0.033	37	To Do
Kamke 779	✓	0.116	57	✓	0.092	50	To Do
Kamke 780	✓	0.119	66	✓	0.917	27	To Do
Kamke 781	✓	0.287	82	✓	0.319	61	To Do
Kamke 782	✓	3.123	115	✓	2.964	96	To Do
Kamke 783	✓	5.043	88	✓	0.865	75	To Do
Kamke 784	✓	7.258	27	✓	14.056	24	To Do
Kamke 785	✓	5.561	29	✓	56.27	24	To Do
Kamke 786	✓	3.059	61	✓	0.082	33	To Do
Kamke 787	✓	16.687	488	✓	0.418	191	To Do
Kamke 788	✓	20.631	348	✓	0.517	108	To Do
Kamke 789	✓	44.194	120	✗	0	0	To Do
Kamke 790	✓	50.496	127	✗	0	0	To Do
Kamke 791	✓	5.557	110	✓	9.102	306	To Do
Kamke 792	✓	2.679	157	✓	0.5	116	To Do
Kamke 793	✓	9.087	399	✓	2.543	32	To Do
Kamke 794	✓	0.165	67	✓	0.381	32	To Do
Kamke 795	✓	0.306	111	✓	0.028	37	To Do
Kamke 796	✓	7.621	109	✓	1.664	143	To Do
Kamke 797	✓	1.599	307	✓	1.133	168	To Do
Kamke 798	✓	0.319	27	✓	0.106	30	To Do
Kamke 799	✓	0.844	64	✓	0.347	147	To Do
Kamke 800	✓	0.326	128	✓	0.032	41	To Do
Kamke 801	✓	0.345	126	✓	0.076	45	To Do
Kamke 802	✓	0.095	101	✓	0.132	27	To Do
Kamke 803	✓	0.244	637	✓	0.437	65	To Do
Kamke 804	✓	0.377	43	✓	0.976	38	To Do
Kamke 805	✓	0.14	154	✓	1.229	42	To Do
Kamke 806	✓	0.297	22	✓	0.536	22	To Do
Kamke 807	✓	0.22	59	✓	0.419	43	To Do
Kamke 808	✓	1.411	149	✓	0.141	45	To Do
Kamke 809	✓	0.235	128	✓	0.021	41	To Do
Kamke 810	✓	0.091	40	✓	0.043	16	To Do
Kamke 811	✓	0.788	33	✓	1.196	32	To Do
Kamke 812	✓	0.289	70	✓	0.306	30	To Do
Kamke 813	✓	0.461	66	✓	0.602	40	To Do
Kamke 814	✓	0.111	72	✓	0.038	38	To Do
Kamke 815	✓	8.053	103	✓	1.002	168	To Do
Kamke 816	✓	0.185	74	✓	0.503	190	To Do
Kamke 817	✓	0.431	63	✓	0.854	27	To Do
Kamke 818	✓	0.157	34	✓	0.105	34	To Do
Kamke 819	✓	0.226	65	✓	0.269	30	To Do
Kamke 820	✓	0.359	63	✓	0.837	27	To Do
Kamke 821	✓	0.179	2093	✓	0.129	27	To Do
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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 822	✓	0.278	32	✓	0.109	25	To Do
Kamke 823	✓	0.26	39	✓	0.112	38	To Do
Kamke 824	✓	0.177	68	✓	0.39	61	To Do
Kamke 825	✓	1.383	148	✓	0.126	48	To Do
Kamke 826	✓	0.292	70	✓	0.328	51	To Do
Kamke 827	✓	0.167	104	✓	0.214	49	To Do
Kamke 828	✓	0.374	56	✓	0.215	54	To Do
Kamke 829	✓	0.313	74	✓	0.391	34	To Do
Kamke 830	✓	0.287	37	✓	0.11	38	To Do
Kamke 831	✓	1.503	145	✓	0.27	35	To Do
Kamke 832	✓	1.234	2497	✓	0.135	31	To Do
Kamke 833	✓	0.167	104	✓	0.184	49	To Do
Kamke 834	✓	0.337	90	✓	0.385	60	To Do
Kamke 835	✗	0	0	✗	0	0	To Do
Kamke 836	✓	8.832	379	✓	0.2	73	To Do
Kamke 837	✗	0	0	✗	0	0	To Do
Kamke 838	✓	0.158	31	✓	0.121	25	To Do
Kamke 839	✓	0.218	28	✓	0.066	19	To Do
Kamke 840	✓	0.288	30	✓	0.066	19	To Do
Kamke 841	✓	0.833	236	✓	0.267	97	To Do
Kamke 842	✓	0.142	186	✓	0.029	43	To Do
Kamke 843	✓	0.142	198	✓	0.033	43	To Do
Kamke 844	✓	9.344	386	✓	0.195	97	To Do
Kamke 845	✓	2.062	227	✓	0.211	44	To Do
Kamke 846	✓	0.53	365	✓	0.19	40	To Do
Kamke 847	✓	0.283	69	✓	0.322	34	To Do
Kamke 848	✓	0.147	157	✓	0.6	22	To Do
Kamke 849	✓	0.267	68	✓	0.313	33	To Do
Kamke 850	✓	0.207	1485	✓	1.035	27	To Do
Kamke 851	✓	2.565	902	✓	0.053	42	To Do
Kamke 852	✓	2.514	902	✓	0.058	42	To Do
Kamke 853	✓	0.122	76	✓	0.041	63	To Do
Kamke 854	✓	0.109	24	✓	0.232	51	To Do
Kamke 855	✓	0.118	24	✓	0.231	51	To Do
Kamke 856	✓	0.429	103	✓	0.276	65	To Do
Kamke 857	✓	0.364	69	✓	0.339	32	To Do
Kamke 858	✓	2.55	902	✓	0.053	42	To Do
Kamke 859	✓	0.576	105	✓	0.259	63	To Do
Kamke 860	✓	0.226	33	✓	1.745	27	To Do
Kamke 861	✓	1.022	158	✓	0.142	26	To Do
Kamke 862	✗	0	0	✓	0.164	27	To Do
Kamke 863	✓	0.161	126	✓	13.511	38	To Do
Kamke 864	✓	0.244	137	✓	0.125	162	To Do
Kamke 865	✓	0.338	87	✓	0.307	23	To Do
Kamke 866	✓	0.381	74	✓	0.536	37	To Do
Kamke 867	✓	0.146	77	✓	0.08	30	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 868	✓	0.129	79	✓	0.077	28	To Do
Kamke 869	✓	0.035	42	✓	0.359	37	To Do
Kamke 870	✓	0.789	35	✓	0.851	30	To Do
Kamke 871	✓	0.156	22	✓	0.105	26	To Do
Kamke 872	✓	0.046	215	✓	0.087	49	To Do
Kamke 873	✓	0.445	53	✓	0.307	50	To Do
Kamke 874	✓	0.197	101	✓	0.096	40	To Do
Kamke 875	✓	0.208	242	✓	0.401	73	To Do
Kamke 876	✓	0.133	135	✓	0.061	41	To Do
Kamke 877	✓	0.115	49	✓	0.053	73	To Do
Kamke 878	✓	0.273	130	✓	233.352	73	To Do
Kamke 879	✓	0.189	128	✓	0.388	55	To Do
Kamke 880	✓	0.354	131	✓	0.124	41	To Do
Kamke 881	✓	0.129	75	✓	0.055	77	To Do
Kamke 882	✓	0.212	119	✓	0.115	41	To Do
Kamke 883	✓	0.916	164	✓	1.056	352	To Do
Kamke 884	✓	0.465	71	✓	0.614	105	To Do
Kamke 885	✗	0	0	✗	0	0	To Do
Kamke 886	✓	0.153	82	✓	0.059	42	To Do
Kamke 887	✓	0.19	106	✓	0.068	72	To Do
Kamke 888	✓	0.134	78	✓	0.085	79	To Do
Kamke 889	✓	1.19	68	✓	1.24	49	To Do
Kamke 890	✓	0.146	103	✓	0.875	34	To Do
Kamke 891	✓	0.143	135	✓	0.083	56	To Do
Kamke 892	✓	2.201	1283	✓	0.961	40	To Do
Kamke 893	✓	0.134	80	✓	0.054	41	To Do
Kamke 894	✗	0	0	✗	0	0	To Do
Kamke 895	✓	0.196	81	✓	0.082	79	To Do
Kamke 896	✓	0.205	106	✓	0.686	63	To Do
Kamke 897	✓	0.183	79	✓	0.115	87	To Do
Kamke 898	✓	0.149	106	✓	0.069	87	To Do
Kamke 899	✓	0.166	106	✓	0.071	47	To Do
Kamke 900	✓	0.145	381	✓	0.09	48	To Do
Kamke 901	✓	0.403	33	✓	0.627	31	To Do
Kamke 902	✓	0.16	295	✓	0.307	177	To Do
Kamke 903	✓	0.07	30	✓	0.208	51	To Do
Kamke 904	✓	0.062	46	✓	0.161	61	To Do
Kamke 905	✓	0.201	85	✓	0.073	46	To Do
Kamke 906	✓	0.098	326	✓	0.329	37	To Do
Kamke 907	✓	0.181	22	✓	0.329	20	To Do
Kamke 908	✓	0.553	1269	✓	0.576	1726	To Do
Kamke 909	✓	0.126	64	✓	0.75	84	To Do
Kamke 910	✓	1.16	98	✓	0.057	42	To Do
Kamke 911	✓	0.658	106	✓	1.422	30	To Do
Kamke 912	✓	0.771	201	✗	0	0	To Do
Kamke 913	✓	0.553	716	✓	0.111	43	To Do
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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 914	✓	0.619	401	✓	3.022	71	To Do
Kamke 915	✓	0.593	724	✓	0.11	43	To Do
Kamke 916	✓	0.167	43	✓	0.472	73	To Do
Kamke 917	✓	0.135	28	✓	0.351	38	To Do
Kamke 918	✓	0.392	720	✓	1.175	41	To Do
Kamke 919	✓	0.227	251	✓	0.247	193	To Do
Kamke 920	✓	0.312	301	✗	0	0	To Do
Kamke 921	✓	0.242	92	✓	0.276	30	To Do
Kamke 922	✓	0.589	882	✓	0.219	47	To Do
Kamke 923	✓	4.568	432	✓	0.527	36	To Do
Kamke 924	✓	0.237	80	✓	0.185	46	To Do
Kamke 925	✓	10.264	228	✓	0.455	38	To Do
Kamke 926	✓	0.146	128	✓	0.076	67	To Do
Kamke 927	✓	0.496	112	✓	0.167	45	To Do
Kamke 928	✓	0.519	23	✓	0.371	20	To Do
Kamke 929	✓	0.538	683	✓	0.062	42	To Do
Kamke 930	✓	0.662	39	✓	0.546	36	To Do
Kamke 931	✓	0.133	80	✓	0.051	73	To Do
Kamke 932	✓	2.504	3303	✓	0.174	54	To Do
Kamke 933	✓	1.195	99	✓	0.095	39	To Do
Kamke 934	✓	0.21	102	✓	0.089	39	To Do
Kamke 935	✓	33.86	248	✓	0.283	55	To Do
Kamke 936	✓	0.193	99	✓	0.098	39	To Do
Kamke 937	✓	0.198	124	✓	0.108	79	To Do
Kamke 938	✓	0.179	108	✓	0.063	39	To Do
Kamke 939	✓	0.381	136	✓	0.113	70	To Do
Kamke 940	✓	0.168	80	✓	0.097	63	To Do
Kamke 941	✓	0.281	53	✓	0.067	35	To Do
Kamke 942	✓	2.778	349	✓	1.227	43	To Do
Kamke 943	✓	0.311	53	✓	0.071	40	To Do
Kamke 944	✓	18.225	233	✓	0.103	47	To Do
Kamke 945	✓	18.037	213	✓	0.082	41	To Do
Kamke 946	✓	0.559	150	✓	0.179	85	To Do
Kamke 947	✓	0.288	30	✓	0.606	44	To Do
Kamke 948	✓	0.458	39	✓	0.263	68	To Do
Kamke 949	✓	0.156	76	✓	0.063	81	To Do
Kamke 950	✓	6.359	920	✓	0.107	42	To Do
Kamke 951	✓	6.231	906	✓	0.095	41	To Do
Kamke 952	✓	0.293	164	✓	0.463	62	To Do
Kamke 953	✓	0.189	36	✓	0.584	145	To Do
Kamke 954	✓	0.293	115	✓	0.151	53	To Do
Kamke 955	✓	0.271	112	✓	0.15	101	To Do
Kamke 956	✓	1.1	28	✓	0.115	79	To Do
Kamke 957	✓	1.071	28	✓	0.106	79	To Do
Kamke 958	✓	0.277	82	✓	0.108	40	To Do
Kamke 959	✓	0.163	20	✓	0.146	16	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 960	✓	0.122	14	✓	0.108	16	To Do
Kamke 961	✓	24.41	813	✓	0.741	45	To Do
Kamke 962	✓	2.414	1191	✓	1.745	79	To Do
Kamke 963	✓	0.361	108	✓	0.347	39	To Do
Kamke 964	✓	2.434	264	✓	3.064	80	To Do
Kamke 965	✓	0.18	29	✓	0.258	25	To Do
Kamke 966	✓	0.542	292	✓	0.724	50	To Do
Kamke 967	✓	1.414	151	✓	0.144	91	To Do
Kamke 968	✓	0.263	30	✓	0.287	29	To Do
Kamke 969	✓	0.179	19	✓	0.262	26	To Do
Kamke 970	✓	0.481	66	✓	0.816	181	To Do
Kamke 971	✓	0.218	157	✓	0.464	84	To Do
Kamke 972	✓	0.03	32	✓	0.31	27	To Do
Kamke 973	✓	1.117	1225	✓	0.697	132	To Do
Kamke 974	✓	0.069	39	✓	0.048	57	To Do
Kamke 975	✓	0.07	47	✓	0.05	59	To Do
Kamke 976	✓	1.161	101	✓	0.42	57	To Do
Kamke 977	✓	0.335	139	✓	0.337	122	To Do
Kamke 978	✓	0.127	60	✓	0.361	71	To Do
Kamke 979	✓	0.071	37	✓	0.067	49	To Do
Kamke 980	✓	0.086	43	✓	0.02	35	To Do
Kamke 981	✓	0.132	49	✓	0.026	41	To Do
Kamke 982	✓	0.33	132	✓	0.576	142	To Do
Kamke 983	✓	1.516	238	✓	0.729	187	To Do
Kamke 984	✓	7.252	428	✓	0.446	40	To Do
Kamke 985	✓	0.247	103	✓	0.066	43	To Do
Kamke 986	✓	0.1	44	✓	0.054	36	To Do
Kamke 987	✓	0.128	41	✓	0.073	22	To Do
Kamke 988	✓	0.136	107	✓	0.059	29	To Do
Kamke 989	✓	0.133	56	✓	0.082	29	To Do
Kamke 990	✓	0.126	58	✓	0.849	44	To Do
Kamke 991	✓	0.125	104	✓	0.054	29	To Do
Kamke 992	✓	0.091	43	✓	0.069	25	To Do
Kamke 993	✓	0.777	73	✓	0.046	35	To Do
Kamke 994	✓	0.146	198	✓	0.048	43	To Do
Kamke 995	✓	0.131	17	✓	0.125	14	To Do
Kamke 996	✓	0.081	17	✓	0.12	15	To Do
Kamke 997	✓	0.076	18	✓	0.109	16	To Do
Kamke 998	✓	0.284	27	✓	0.641	27	To Do
Kamke 999	✓	0.135	24	✓	0.076	36	To Do
Kamke 1000	✓	0.626	351	✓	0.305	19	To Do
Kamke 1001	✓	0.003	12	✓	0.006	9	Linear second order, homogeneous, constant coefficient. First problem. Direct integration

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1002	✓	0.004	16	✓	0.005	13	Linear second order, homogeneous, constant coefficient. Direct method
Kamke 1003	✓	0.08	45	✓	0.234	26	Linear second order, Non-homogeneous, constant coefficient. variation of parameters
Kamke 1004	✓	0.008	30	✓	0.227	27	Linear second order, Non-homogeneous, constant coefficient. variation of parameters
Kamke 1005	✓	0.285	1163	✓	0.488	82	Linear second order, Non-homogeneous, constant coefficient. variation of parameters
Kamke 1006	✓	0.004	20	✓	0.008	15	Linear second order, homogeneous, constant coefficient
Kamke 1007	✓	0.131	135	✓	0.019	26	Linear second order, Non-homogeneous, constant coefficient. variation of parameters
Kamke 1008	✓	0.043	48	✓	0.185	37	To Do
Kamke 1009	✓	0.004	28	✓	0.023	21	To Do
Kamke 1010	✓	0.005	46	✓	0.046	31	Linear second order, homogeneous, variable coefficient. Airy ODE with plus sign, series solution
Kamke 1011	✓	0.005	33	✓	0.043	17	Linear second order, homogeneous, variable coefficient. power series solution
Kamke 1012	✓	0.006	47	✓	0.145	29	To Do
Kamke 1013	✓	0.01	43	✓	0.056	22	To Do
Kamke 1014	✓	0.016	170	✓	0.211	63	To Do
Kamke 1015	✗	0	0	✗	0	0	To Do
Kamke 1016	✓	0.101	312	✓	0.371	91	To Do
Kamke 1017	✓	0.016	46	✓	0.063	17	To Do
Kamke 1018	✓	0.014	55	✓	0.106	39	To Do
Kamke 1019	✗	0	0	✗	0	0	To Do
Kamke 1020	✓	0.266	180	✓	0.395	58	To Do
Kamke 1021	✓	0.012	44	✓	0.33	39	To Do
Kamke 1022	✓	0.009	28	✓	0.332	21	To Do
Kamke 1023	✓	0.008	44	✓	0.288	29	To Do
Kamke 1024	✓	0.167	52	✓	0.24	28	To Do
Kamke 1025	✓	0.613	615	✓	0.313	102	To Do
Kamke 1026	✗	0	0	✗	0	0	To Do
Kamke 1027	✓	0.712	235	✓	0.537	69	To Do
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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1028	✗	0	0	✗	0	0	To Do
Kamke 1029	✓	0.018	58	✓	0.184	22	To Do
Kamke 1030	✗	0	0	✗	0	0	To Do
Kamke 1031	✗	0	0	✗	0	0	To Do
Kamke 1032	✗	0	0	✓	0.177	48	To Do
Kamke 1033	✓	0.015	37	✓	0.025	27	Linear second order, homogeneous, variable coefficient. smart substitution turns it to second order with constant coefficient
Kamke 1034	✓	0.009	20	✓	0.023	15	Linear second order, homogeneous, variable coefficient. smart substitution turns it to second order with constant coefficient
Kamke 1035	✓	0.005	58	✓	0.012	41	To Do
Kamke 1036	✓	0.088	209	✓	0.204	134	To Do
Kamke 1037	✓	0.016	101	✓	0.182	64	To Do
Kamke 1038	✗	0	0	✗	0	0	To Do
Kamke 1039	✓	0.023	47	✓	0.016	25	To Do
Kamke 1040	✓	0.056	53	✓	0.065	33	To Do
Kamke 1041	✓	0.006	55	✓	0.13	41	To Do
Kamke 1042	✓	0.006	61	✓	0.127	41	To Do
Kamke 1043	✓	0.141	69	✓	0.39	39	Linear second order, homogeneous, variable coefficient. power series solution
Kamke 1044	✓	0.006	39	✓	0.129	35	To Do
Kamke 1045	✓	0.026	39	✓	0.02	21	To Do
Kamke 1046	✓	0.005	31	✓	0.141	31	To Do
Kamke 1047	✓	0.008	27	✓	0.037	16	Linear second order, homogeneous, variable coefficient. power series solution
Kamke 1048	✓	0.007	45	✓	0.121	37	To Do
Kamke 1049	✓	0.079	109	✓	0.31	66	To Do
Kamke 1050	✓	0.008	23	✓	0.029	14	To Do
Kamke 1051	✓	0.023	44	✓	0.049	27	To Do
Kamke 1052	✓	0.011	78	✓	0.154	58	To Do
Kamke 1053	✓	0.023	57	✓	0.066	35	To Do
Kamke 1054	✓	0.025	172	✓	0.063	98	To Do
Kamke 1055	✓	0.09	421	✓	0.393	262	To Do
Kamke 1056	✓	0.068	41	✓	0.133	51	To Do
Kamke 1057	✓	0.117	56	✓	0.201	50	To Do
Kamke 1058	✓	0.16	56	✓	0.225	29	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1059	✓	0.096	39	✓	0.108	55	To Do
Kamke 1060	✓	0.021	83	✓	0.275	81	To Do
Kamke 1061	✓	0.064	70	✓	0.168	28	To Do
Kamke 1062	✓	0.015	35	✓	0.031	19	To Do
Kamke 1063	✓	0.034	28	✓	1.804	34	To Do
Kamke 1064	✓	0.304	1400	✓	0.631	134	To Do
Kamke 1065	✓	0.08	114	✓	0.319	60	To Do
Kamke 1066	✓	0.027	18	✓	0.126	15	To Do
Kamke 1067	✓	0.026	21	✓	0.063	17	To Do
Kamke 1068	✓	0.065	20	✓	0.333	45	To Do
Kamke 1069	✓	0.028	19	✓	0.162	15	To Do
Kamke 1070	✓	0.167	143	✓	0.267	60	To Do
Kamke 1071	✓	0.041	44	✓	0.107	22	To Do
Kamke 1072	✗	0	0	✗	0	0	To Do
Kamke 1073	✗	0	0	✗	0	0	To Do
Kamke 1074	✗	0	0	✓	0.049	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	✓	0.029	76	✓	0.049	33	To Do
Kamke 1079	✓	0.232	315	✓	0.043	37	To Do
Kamke 1080	✓	0.029	49	✓	0.911	74	To Do
Kamke 1081	✗	0	0	✗	0	0	To Do
Kamke 1082	✗	0	0	✓	0.243	74	To Do
Kamke 1083	✗	0	0	✓	0.175	31	To Do
Kamke 1084	✓	0.083	36	✓	0.158	20	To Do
Kamke 1085	✓	0.083	32	✓	0.138	24	To Do
Kamke 1086	✓	0.005	42	✓	0.032	29	To Do
Kamke 1087	✓	0.006	36	✓	0.136	33	To Do
Kamke 1088	✓	0.041	180	✓	0.214	31	To Do
Kamke 1089	✓	0.024	99	✓	0.058	58	To Do
Kamke 1090	✓	0.028	50	✓	0.059	40	To Do
Kamke 1091	✓	0.015	41	✓	0.137	35	To Do
Kamke 1092	✓	0.054	72	✓	0.072	29	To Do
Kamke 1093	✓	0.013	13	✓	0.008	10	To Do
Kamke 1094	✓	0.014	41	✓	0.016	29	To Do
Kamke 1095	✓	0.006	30	✓	0.046	23	To Do
Kamke 1096	✓	0.008	61	✓	0.108	39	To Do
Kamke 1097	✓	0.017	46	✓	0.016	31	To Do
Kamke 1098	✓	0.006	41	✓	0.019	27	To Do
Kamke 1099	✗	0	0	✓	0.085	25	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1100	✓	0.012	44	✓	0.041	23	Linear second order, non-homogeneous, variable coefficient. Singularity, Frobenius series solution and also using smart transformation. Variation of parameters.
Kamke 1101	✓	0.012	52	✓	0.048	29	Linear second order, homogeneous, variable coefficient. Singularity, Frobenius series solution and also using smart transformation
Kamke 1102	✓	0.005	42	✓	0.042	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	✓	0.016	33	To Do
Kamke 1104	✓	0.021	104	✓	0.025	41	To Do
Kamke 1105	✓	0.012	64	✓	0.062	39	To Do
Kamke 1106	✓	0.029	441	✓	0.171	71	To Do
Kamke 1107	✓	0.015	40	✓	0.127	30	To Do
Kamke 1108	✓	0.017	37	✓	0.125	26	To Do
Kamke 1109	✓	0.172	45	✓	0.059	33	To Do
Kamke 1110	✓	0.025	36	✓	0.062	23	To Do
Kamke 1111	✓	0.023	20	✓	0.024	13	Linear second order, homogeneous, variable coefficient. Solved using Laplace transform instead of series method
Kamke 1112	✓	0.015	30	✓	0.036	22	To Do
Kamke 1113	✓	0.009	24	✓	0.106	17	To Do
Kamke 1114	✓	0.038	39	✓	0.074	34	To Do
Kamke 1115	✓	0.039	76	✓	1.433	47	To Do
Kamke 1116	✓	0.029	43	✓	0.146	31	To Do
Kamke 1117	✓	0.042	107	✓	0.221	82	To Do
Kamke 1118	✓	0.041	51	✓	0.16	39	To Do
Kamke 1119	✓	0.073	77	✓	0.059	20	To Do
Kamke 1120	✓	0.026	168	✓	0.399	109	To Do
Kamke 1121	✓	0.228	41	✓	0.049	23	To Do
Kamke 1122	✓	0.354	57	✓	0.235	28	To Do
Kamke 1123	✓	0.009	91	✓	0.079	45	To Do
Kamke 1124	✓	0.048	65	✓	0.156	29	To Do
Kamke 1125	✓	0.172	84	✓	0.063	36	To Do
Kamke 1126	✗	0	0	✓	0.044	19	To Do
Kamke 1127	✓	0.024	36	✓	0.04	21	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1128	✓	0.016	40	✓	0.388	32	To Do
Kamke 1129	✓	0.112	42	✓	0.038	30	To Do
Kamke 1130	✓	0.007	46	✓	0.029	31	To Do
Kamke 1131	✓	0.007	58	✓	0.128	33	To Do
Kamke 1132	✓	0.007	48	✓	0.131	29	To Do
Kamke 1133	✓	0.141	52	✓	0.174	37	To Do
Kamke 1134	✓	0.056	78	✓	0.056	21	To Do
Kamke 1135	✓	0.006	27	✓	0.014	17	To Do
Kamke 1136	✓	0.023	30	✓	0.04	16	To Do
Kamke 1137	✓	0.056	74	✓	0.069	25	To Do
Kamke 1138	✓	0.015	38	✓	0.124	26	To Do
Kamke 1139	✓	0.009	74	✓	0.134	37	To Do
Kamke 1140	✓	0.027	190	✓	0.04	66	To Do
Kamke 1141	✓	0.147	79	✓	0.063	55	To Do
Kamke 1142	✓	0.023	108	✓	0.166	53	To Do
Kamke 1143	✓	0.019	93	✓	0.181	57	To Do
Kamke 1144	✓	0.018	88	✓	0.15	60	To Do
Kamke 1145	✓	0.196	386	✓	0.286	248	To Do
Kamke 1146	✓	0.004	18	✓	0.008	15	To Do
Kamke 1147	✓	0.004	18	✓	0.012	15	To Do
Kamke 1148	✓	0.007	77	✓	0.013	35	To Do
Kamke 1149	✓	0.034	212	✓	0.029	45	To Do
Kamke 1150	✓	0.007	21	✓	0.098	27	To Do
Kamke 1151	✓	0.011	129	✓	0.119	42	To Do
Kamke 1152	✓	0.012	114	✓	0.284	53	To Do
Kamke 1153	✓	0.016	56	✓	0.052	31	To Do
Kamke 1154	✓	0.011	88	✓	0.256	57	To Do
Kamke 1155	✓	0.025	225	✓	0.072	67	To Do
Kamke 1156	✓	0.059	32	✓	0.226	71	To Do
Kamke 1157	✗	0	0	✗	0	0	To Do
Kamke 1158	✓	0.135	43	✓	0.372	178	To Do
Kamke 1159	✓	0.006	24	✓	0.02	19	To Do
Kamke 1160	✓	0.006	30	✓	0.018	23	To Do
Kamke 1161	✓	0.028	78	✓	0.023	31	To Do
Kamke 1162	✓	0.03	18	✓	0.013	15	To Do
Kamke 1163	✓	0.072	72	✓	0.059	49	To Do
Kamke 1164	✓	0.011	30	✓	0.04	23	To Do
Kamke 1165	✓	0.072	26	✓	0.023	19	To Do
Kamke 1166	✓	0.008	23	✓	0.017	21	To Do
Kamke 1167	✓	0.038	326	✓	0.054	63	To Do
Kamke 1168	✓	0.014	15	✓	0.01	11	To Do
Kamke 1169	✓	0.038	236	✓	0.043	49	To Do
Kamke 1170	✓	0.012	58	✓	0.059	43	To Do
Kamke 1171	✓	0.026	142	✓	0.257	49	To Do
Kamke 1172	✓	0.046	158	✓	0.052	47	To Do
Kamke 1173	✓	0.081	74	✓	0.147	37	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1174	✓	0.008	33	✓	0.047	25	To Do
Kamke 1175	✓	0.23	38	✓	0.174	29	To Do
Kamke 1176	✓	0.01	33	✓	0.039	15	To Do
Kamke 1177	✓	0.461	141	✓	0.413	30	To Do
Kamke 1178	✓	0.027	74	✓	0.069	23	To Do
Kamke 1179	✓	0.02	38	✓	0.043	19	To Do
Kamke 1180	✓	0.044	75	✓	0.069	49	To Do
Kamke 1181	✓	0.035	37	✓	0.059	25	To Do
Kamke 1182	✓	0.009	24	✓	0.014	20	To Do
Kamke 1183	✓	0.008	27	✓	0.021	22	To Do
Kamke 1184	✓	0.007	38	✓	0.04	25	To Do
Kamke 1185	✓	0.022	67	✓	0.032	33	To Do
Kamke 1186	✓	0.011	42	✓	0.068	32	To Do
Kamke 1187	✓	0.008	99	✓	0.013	53	To Do
Kamke 1188	✓	0.111	266	✓	0.282	114	To Do
Kamke 1189	✓	0.032	445	✓	0.056	79	To Do
Kamke 1190	✓	0.016	122	✓	0.153	38	To Do
Kamke 1191	✓	0.007	110	✓	0.024	23	To Do
Kamke 1192	✓	0.057	40	✓	0.224	51	To Do
Kamke 1193	✓	0.111	44	✓	0.044	38	To Do
Kamke 1194	✓	0.081	65	✓	0.063	48	To Do
Kamke 1195	✓	0.015	80	✓	0.171	93	To Do
Kamke 1196	✓	0.04	37	✓	0.046	31	To Do
Kamke 1197	✓	0.011	78	✓	0.06	43	To Do
Kamke 1198	✓	0.044	41	✓	0.051	37	To Do
Kamke 1199	✓	0.009	41	✓	0.037	35	To Do
Kamke 1200	✓	0.011	62	✓	0.026	27	To Do
Kamke 1201	✓	0.26	44	✓	0.027	31	To Do
Kamke 1202	✓	0.009	22	✓	0.034	14	To Do
Kamke 1203	✓	0.011	124	✓	0.029	28	To Do
Kamke 1204	✓	0.014	132	✓	0.059	35	To Do
Kamke 1205	✗	0	0	✗	0	0	To Do
Kamke 1206	✓	0.045	120	✓	0.104	76	To Do
Kamke 1207	✓	0.056	294	✓	0.439	110	To Do
Kamke 1208	✓	0.049	59	✓	0.067	35	To Do
Kamke 1209	✓	0.027	67	✓	0.073	40	To Do
Kamke 1210	✓	0.127	252	✓	0.279	81	To Do
Kamke 1211	✓	0.029	68	✓	0.078	36	To Do
Kamke 1212	✗	0	0	✗	0	0	To Do
Kamke 1213	✓	0.059	54	✓	0.083	53	To Do
Kamke 1214	✓	0.138	260	✓	0.214	71	To Do
Kamke 1215	✓	0.342	674	✓	0.301	148	To Do
Kamke 1216	✗	0	0	✗	0	0	To Do
Kamke 1217	✓	0.05	30	✓	0.077	22	To Do
Kamke 1218	✓	0.05	38	✓	0.083	28	To Do
Kamke 1219	✓	0.065	218	✓	0.186	69	To Do

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Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1220	✓	0.071	98	✓	0.039	40	To Do
Kamke 1221	✓	0.019	42	✓	0.044	35	To Do
Kamke 1222	✓	0.019	50	✓	0.027	23	To Do
Kamke 1223	✓	0.016	45	✓	0.039	31	To Do
Kamke 1224	✓	0.017	50	✓	0.03	23	To Do
Kamke 1225	✓	0.037	39	✓	0.047	23	To Do
Kamke 1226	✓	0.009	30	✓	0.06	25	To Do
Kamke 1227	✓	0.021	21	✓	0.018	16	To Do
Kamke 1228	✓	0.009	82	✓	0.13	53	To Do
Kamke 1229	✓	0.032	48	✓	0.032	31	To Do
Kamke 1230	✓	0.014	82	✓	0.361	36	To Do
Kamke 1231	✓	0.042	58	✓	0.076	52	To Do
Kamke 1232	✓	4.497	6628	✓	0.316	409	To Do
Kamke 1233	✓	0.857	6628	✓	0.237	409	To Do
Kamke 1234	✓	0.031	31	✗	0	0	To Do
Kamke 1235	✓	0.018	50	✓	0.05	45	To Do
Kamke 1236	✗	0	0	✗	0	0	To Do
Kamke 1237	✓	0.018	30	✓	0.024	20	To Do
Kamke 1238	✓	0.022	36	✓	0.033	26	To Do
Kamke 1239	✓	0.008	46	✓	0.07	35	To Do
Kamke 1240	✓	0.01	18	✓	0.059	15	To Do
Kamke 1241	✓	0.009	30	✓	0.066	24	To Do
Kamke 1242	✓	0.421	68	✓	0.085	41	To Do
Kamke 1243	✓	0.016	45	✓	0.048	21	To Do
Kamke 1244	✓	0.013	42	✓	0.096	27	To Do
Kamke 1245	✓	0.011	42	✓	0.082	27	To Do
Kamke 1246	✓	0.011	42	✓	0.218	28	To Do
Kamke 1247	✓	0.384	132	✓	0.05	27	To Do
Kamke 1248	✓	0.177	238	✓	0.318	134	To Do
Kamke 1249	✓	0.083	193	✓	0.112	134	To Do
Kamke 1250	✓	0.03	41	✓	0.033	41	To Do
Kamke 1251	✓	0.023	25	✓	0.036	20	To Do
Kamke 1252	✓	0.078	151	✓	0.087	124	To Do
Kamke 1253	✓	0.016	34	✓	0.009	16	To Do
Kamke 1254	✓	0.401	69	✓	0.088	43	To Do
Kamke 1255	✓	0.321	118	✓	0.033	42	To Do
Kamke 1256	✓	0.012	26	✓	0.155	51	To Do
Kamke 1257	✓	0.105	33	✓	0.275	27	To Do
Kamke 1258	✓	0.081	146	✓	0.084	110	To Do
Kamke 1259	✓	0.073	120	✓	0.092	92	To Do
Kamke 1260	✓	0.364	65	✓	0.713	80	To Do
Kamke 1261	✓	0.355	148	✓	0.302	97	To Do
Kamke 1262	✓	0.245	88	✓	0.378	53	To Do
Kamke 1263	✓	0.683	349	✓	0.116	52	To Do
Kamke 1264	✓	0.063	23	✓	0.047	19	To Do
Kamke 1265	✓	0.023	64	✓	1.908	93	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1266	✓	0.014	22	✓	0.011	19	To Do
Kamke 1267	✓	0.128	76	✓	0.342	41	To Do
Kamke 1268	✓	0.066	50	✓	0.171	39	To Do
Kamke 1269	✓	0.047	60	✓	0.129	40	To Do
Kamke 1270	✓	2.892	58	✓	0.251	46	To Do
Kamke 1271	✓	0.007	27	✓	0.007	14	To Do
Kamke 1272	✓	0.008	32	✓	0.049	23	To Do
Kamke 1273	✓	0.009	20	✓	0.099	17	To Do
Kamke 1274	✓	0.025	38	✓	0.012	19	To Do
Kamke 1275	✓	0.018	120	✓	0.236	53	To Do
Kamke 1276	✓	0.032	55	✓	0.082	31	To Do
Kamke 1277	✓	0.022	51	✓	0.079	27	To Do
Kamke 1278	✗	0	0	✗	0	0	To Do
Kamke 1279	✓	0.072	74	✓	0.197	32	To Do
Kamke 1280	✓	0.045	52	✓	0.059	40	To Do
Kamke 1281	✓	0.011	28	✓	0.049	15	To Do
Kamke 1282	✓	0.012	39	✓	0.046	21	To Do
Kamke 1283	✓	0.044	90	✓	0.213	48	To Do
Kamke 1284	✓	0.022	47	✓	0.026	41	To Do
Kamke 1285	✓	0.515	192	✓	0.14	52	To Do
Kamke 1286	✓	0.067	101	✓	0.03	32	To Do
Kamke 1287	✓	0.012	83	✓	0.029	27	To Do
Kamke 1288	✓	0.023	47	✓	0.033	21	To Do
Kamke 1289	✓	0.08	53	✓	0.14	33	To Do
Kamke 1290	✓	0.097	103	✓	0.041	29	To Do
Kamke 1291	✓	0.042	92	✓	0.881	50	To Do
Kamke 1292	✓	0.047	61	✓	0.083	31	To Do
Kamke 1293	✓	0.185	44	✓	0.096	33	To Do
Kamke 1294	✓	0.042	44	✓	0.096	33	To Do
Kamke 1295	✓	0.108	310	✓	0.586	106	To Do
Kamke 1296	✓	0.214	356	✓	0.552	150	To Do
Kamke 1297	✓	0.048	74	✓	0.061	63	To Do
Kamke 1298	✓	0.033	162	✓	0.191	124	To Do
Kamke 1299	✓	0.021	19	✓	0.017	27	To Do
Kamke 1300	✓	0.009	41	✓	0.049	31	To Do
Kamke 1301	✓	0.018	31	✓	0.026	19	To Do
Kamke 1302	✓	0.047	243	✓	0.1	98	To Do
Kamke 1303	✓	3.451	498	✓	0.314	501	To Do
Kamke 1304	✓	0.062	50	✓	0.046	38	To Do
Kamke 1305	✓	0.063	47	✓	0.099	44	To Do
Kamke 1306	✗	0	0	✓	0.234	69	To Do
Kamke 1307	✓	0.133	54	✓	0.066	36	To Do
Kamke 1308	✓	0.016	41	✓	0.027	40	To Do
Kamke 1309	✓	0.071	84	✓	0.135	65	To Do
Kamke 1310	✓	0.009	31	✓	0.016	20	To Do
Kamke 1311	✓	0.078	63	✓	0.21	52	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1312	✓	0.016	32	✓	0.026	19	To Do
Kamke 1313	✓	0.123	87	✓	0.127	35	To Do
Kamke 1314	✓	0.115	87	✓	0.114	33	To Do
Kamke 1315	✓	0.016	44	✓	0.044	45	To Do
Kamke 1316	✓	0.057	38	✓	0.049	18	To Do
Kamke 1317	✓	0.057	38	✓	0.057	13	To Do
Kamke 1318	✓	0.161	172	✓	0.191	122	To Do
Kamke 1319	✓	0.044	60	✓	0.166	31	To Do
Kamke 1320	✓	0.106	21	✓	0.048	17	To Do
Kamke 1321	✓	0.019	18	✓	0.03	15	To Do
Kamke 1322	✓	0.034	44	✓	0.031	44	To Do
Kamke 1323	✗	0	0	✓	0.026	17	To Do
Kamke 1324	✓	0.02	25	✓	0.036	18	To Do
Kamke 1325	✓	0.143	52	✓	0.191	86	To Do
Kamke 1326	✓	0.016	29	✓	0.036	22	To Do
Kamke 1327	✓	0.103	104	✓	1.716	81	To Do
Kamke 1328	✓	0.014	36	✓	0.036	27	To Do
Kamke 1329	✓	0.446	67	✓	0.431	64	To Do
Kamke 1330	✓	2.463	1176	✓	1.335	1147	To Do
Kamke 1331	✓	0.025	55	✓	0.034	19	To Do
Kamke 1332	✓	0.016	26	✓	0.031	17	To Do
Kamke 1333	✓	0.065	70	✓	0.128	45	To Do
Kamke 1334	✓	0.115	114	✓	0.143	89	To Do
Kamke 1335	✓	0.21	893	✓	0.089	57	To Do
Kamke 1336	✓	0.033	70	✓	0.049	42	To Do
Kamke 1337	✓	0.059	62	✓	0.066	27	To Do
Kamke 1338	✓	0.365	40	✓	0.039	27	To Do
Kamke 1339	✓	0.152	66	✓	0.187	76	To Do
Kamke 1340	✓	0.025	32	✓	0.033	20	To Do
Kamke 1341	✓	11.391	2921	✓	0.268	201	To Do
Kamke 1342	✓	0.018	52	✓	0.04	31	To Do
Kamke 1343	✓	0.123	73	✓	0.154	58	To Do
Kamke 1344	✓	0.248	173	✓	0.101	23	To Do
Kamke 1345	✓	0.041	52	✓	0.064	25	To Do
Kamke 1346	✓	0.064	37	✓	0.054	25	To Do
Kamke 1347	✓	0.063	31	✓	0.036	19	To Do
Kamke 1348	✓	0.257	34	✓	0.337	73	To Do
Kamke 1349	✓	0.048	76	✓	0.114	65	To Do
Kamke 1350	✓	0.006	25	✓	0.019	21	To Do
Kamke 1351	✓	0.011	50	✓	0.052	24	To Do
Kamke 1352	✓	0.009	89	✓	0.059	43	To Do
Kamke 1353	✓	0.528	119	✓	0.438	64	To Do
Kamke 1354	✓	0.099	108	✓	0.449	33	To Do
Kamke 1355	✓	4.796	51	✓	0.182	30	To Do
Kamke 1356	✓	0.175	90	✓	0.122	29	To Do
Kamke 1357	✓	0.356	288	✓	0.182	97	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1358	✓	0.032	66	✓	0.074	20	To Do
Kamke 1359	✓	0.053	86	✓	0.147	57	To Do
Kamke 1360	✓	0.051	68	✓	0.128	47	To Do
Kamke 1361	✓	0.259	38	✓	0.047	33	To Do
Kamke 1362	✗	0	0	✓	0.345	109	To Do
Kamke 1363	✓	0.351	236	✓	0.211	161	To Do
Kamke 1364	✓	0.139	52	✓	0.152	25	To Do
Kamke 1365	✓	0.054	104	✓	0.098	59	To Do
Kamke 1366	✓	1.019	31	✓	0.016	17	To Do
Kamke 1367	✓	0.174	229	✓	0.345	88	To Do
Kamke 1368	✓	0.017	106	✓	0.118	71	To Do
Kamke 1369	✓	0.252	110	✓	0.091	55	To Do
Kamke 1370	✓	1.019	53	✓	0.021	19	To Do
Kamke 1371	✓	0.016	48	✓	0.081	37	To Do
Kamke 1372	✓	0.214	202	✓	0.41	101	To Do
Kamke 1373	✓	0.183	113	✓	0.31	84	To Do
Kamke 1374	✓	0.019	32	✓	0.084	23	To Do
Kamke 1375	✓	0.024	54	✓	0.103	29	To Do
Kamke 1376	✓	0.039	69	✓	0.085	73	To Do
Kamke 1377	✓	0.394	109	✓	0.19	83	To Do
Kamke 1378	✓	0.033	65	✓	0.052	48	To Do
Kamke 1379	✓	0.049	99	✓	0.066	60	To Do
Kamke 1380	✓	9.616	132	✓	0.151	67	To Do
Kamke 1381	✓	20.09	589	✓	0.287	175	To Do
Kamke 1382	✓	10.499	154	✓	0.221	104	To Do
Kamke 1383	✓	1.126	50	✓	0.079	39	To Do
Kamke 1384	✓	0.029	96	✓	0.436	73	To Do
Kamke 1385	✓	0.018	78	✓	0.09	55	To Do
Kamke 1386	✓	0.078	108	✓	0.07	58	To Do
Kamke 1387	✓	0.035	50	✓	0.037	28	To Do
Kamke 1388	✓	0.276	235	✓	0.116	76	To Do
Kamke 1389	✓	0.312	217	✓	0.115	68	To Do
Kamke 1390	✓	0.051	41	✓	0.044	25	To Do
Kamke 1391	✓	0.056	27	✓	0.036	20	To Do
Kamke 1392	✗	0	0	✓	0.318	561	To Do
Kamke 1393	✓	200.2	413606	✓	0.268	272	To Do
Kamke 1394	✓	1.053	115	✓	0.178	79	To Do
Kamke 1395	✓	0.087	59	✓	0.081	39	To Do
Kamke 1396	✓	0.932	211	✓	0.296	178	To Do
Kamke 1397	✓	0.064	38	✓	0.144	27	To Do
Kamke 1398	✓	0.148	72	✓	0.267	69	To Do
Kamke 1399	✓	1.05	72	✓	0.06	34	To Do
Kamke 1400	✓	0.108	60	✓	0.063	35	To Do
Kamke 1401	✓	0.014	93	✓	0.078	45	To Do
Kamke 1402	✓	0.984	86	✓	0.403	59	To Do
Kamke 1403	✓	16.652	316	✓	1.04	298	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1404	✓	0.024	33	✓	0.049	19	To Do
Kamke 1405	✓	0.067	77	✓	0.095	42	To Do
Kamke 1406	✓	31.976	707	✓	0.167	44	To Do
Kamke 1407	✓	88.759	2002	✓	2.428	2829	To Do
Kamke 1408	✗	0	0	✗	0	0	To Do
Kamke 1409	✓	0.023	43	✓	0.036	39	To Do
Kamke 1410	✓	0.1	481	✓	0.415	253	To Do
Kamke 1411	✓	0.248	42	✓	0.039	27	To Do
Kamke 1412	✓	0.018	29	✓	0.023	23	To Do
Kamke 1413	✓	0.057	16	✓	0.097	12	To Do
Kamke 1414	✓	0.775	231	✓	0.407	82	To Do
Kamke 1415	✓	0.603	273	✓	0.203	36	To Do
Kamke 1416	✓	0.143	46	✓	0.257	26	To Do
Kamke 1417	✓	0.114	52	✓	0.229	31	To Do
Kamke 1418	✓	0.113	15	✓	6.048	44	To Do
Kamke 1419	✗	0	0	✓	0.343	12	To Do
Kamke 1420	✓	0.411	134	✓	0.543	114	To Do
Kamke 1421	✓	0.141	81	✓	0.12	28	To Do
Kamke 1422	✓	0.104	64	✓	0.325	50	To Do
Kamke 1423	✓	0.059	70	✓	0.441	110	To Do
Kamke 1424	✓	0.188	90	✓	0.433	102	To Do
Kamke 1425	✓	21.935	236	✓	0.764	87	To Do
Kamke 1426	✓	4.176	4128	✓	1.033	558	To Do
Kamke 1427	✓	0.909	166	✓	1.102	98	To Do
Kamke 1428	✓	0.37	104	✓	0.491	161	To Do
Kamke 1429	✓	0.033	41	✓	0.042	21	To Do
Kamke 1430	✓	0.386	22	✓	0.464	79	To Do
Kamke 1431	✓	10.175	80	✓	0.342	30	To Do
Kamke 1432	✓	0.083	37	✓	0.078	22	To Do
Kamke 1433	✓	0.13	46	✓	0.179	28	To Do
Kamke 1434	✗	0	0	✓	0.995	513	To Do
Kamke 1435	✓	0.133	70	✓	0.247	38	To Do
Kamke 1436	✓	0.492	42	✓	0.437	91	To Do
Kamke 1437	✓	0.258	42	✓	0.299	29	To Do
Kamke 1438	✓	0.96	615	✓	0.299	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	✓	0.055	46	✓	0.083	30	To Do
Kamke 1443	✗	0	0	✗	0	0	To Do
Kamke 1444	✗	0	0	✓	0.025	37	To Do
Kamke 1445	✓	0.156	24	✓	0.412	20	To Do
Kamke 1446	✓	0.054	33	✓	0.052	22	To Do
Kamke 1447	✓	0.052	29	✓	0.053	20	To Do
Kamke 1448	✓	10.234	149	✓	0.17	77	To Do
Kamke 1449	✓	0.017	53	✓	0.029	47	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1450	✓	18.358	3592	✓	0.595	1616	To Do
Kamke 1451	✓	0.018	168	✓	0.166	114	To Do
Kamke 1452	✓	0.008	54	✓	0.01	35	To Do
Kamke 1453	✓	2.725	128	✓	0.405	124	To Do
Kamke 1454	✓	0.01	79	✓	0.064	55	To Do
Kamke 1455	✓	0.024	127	✓	0.145	71	To Do
Kamke 1456	✓	0.03	183	✓	0.103	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	✓	0.007	34	✓	0.008	27	To Do
Kamke 1465	✓	0.104	95	✓	0.273	101	To Do
Kamke 1466	✓	0.015	46	✓	0.024	27	To Do
Kamke 1467	✓	0.007	84	✓	0.029	590	To Do
Kamke 1468	✓	0.068	57	✓	0.161	59	To Do
Kamke 1469	✓	0.018	72	✓	0.038	37	To Do
Kamke 1470	✓	2.572	64	✓	0.174	36	To Do
Kamke 1471	✓	0.106	84	✓	0.161	36	To Do
Kamke 1472	✓	0.113	88	✓	0.212	33	To Do
Kamke 1473	✗	0	0	✗	0	0	To Do
Kamke 1474	✗	0	0	✗	0	0	To Do
Kamke 1475	✓	0.01	38	✓	0.025	23	To Do
Kamke 1476	✗	0	0	✗	0	0	To Do
Kamke 1477	✓	0.138	48	✓	0.027	39	To Do
Kamke 1478	✓	0.032	104	✓	0.115	48	To Do
Kamke 1479	✓	0.131	153	✓	0.229	92	To Do
Kamke 1480	✓	0.209	93	✓	0.231	35	To Do
Kamke 1481	✓	0.724	432	✓	0.165	44	To Do
Kamke 1482	✓	23.612	3626	✓	0.816	1614	To Do
Kamke 1483	✓	0.141	112	✓	0.251	37	To Do
Kamke 1484	✗	0	0	✗	0	0	To Do
Kamke 1485	✓	0.344	64	✓	0.327	51	To Do
Kamke 1486	✓	0.711	65	✓	0.249	51	To Do
Kamke 1487	✓	1.424	87	✓	0.342	38	To Do
Kamke 1488	✓	0.434	102	✓	0.725	132	To Do
Kamke 1489	✗	0	0	✗	0	0	To Do
Kamke 1490	✓	0.028	33	✓	0.062	18	To Do
Kamke 1491	✓	0.043	102	✓	0.11	88	To Do
Kamke 1492	✓	0.302	43	✓	0.148	39	To Do
Kamke 1493	✓	1.767	479	✓	0.475	1032	To Do
Kamke 1494	✓	0.029	43	✓	0.031	32	To Do
Kamke 1495	✓	0.009	24	✓	0.011	16	To Do
Kamke 1496	✓	0.199	63	✓	0.028	57	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1497	✓	0.339	135	✓	0.261	77	To Do
Kamke 1498	✓	204.678	584	✓	0.249	53	To Do
Kamke 1499	✓	0.217	97	✓	0.237	25	To Do
Kamke 1500	✗	0	0	✓	0.201	55	To Do
Kamke 1501	✓	0.18	86	✓	0.205	37	To Do
Kamke 1502	✓	0.089	98	✓	0.562	103	To Do
Kamke 1503	✓	0.461	258	✓	0.039	67	To Do
Kamke 1504	✓	0.406	43	✓	0.184	18	To Do
Kamke 1505	✓	60.333	115	✓	0.213	79	To Do
Kamke 1506	✓	0.372	150	✓	0.501	43	To Do
Kamke 1507	✓	6.787	56731	✓	1.073	1212	To Do
Kamke 1508	✓	0.588	143	✓	0.154	81	To Do
Kamke 1509	✓	0.01	34	✓	0.064	29	To Do
Kamke 1510	✓	0.04	102	✗	0	0	To Do
Kamke 1511	✓	0.058	51	✓	0.039	49	To Do
Kamke 1512	✓	0.038	29	✓	0.012	18	To Do
Kamke 1513	✓	0.122	25	✓	0.177	18	To Do
Kamke 1514	✓	0.545	102	✓	0.654	135	To Do
Kamke 1515	✗	0	0	✗	0	0	To Do
Kamke 1516	✓	260.162	15142	✓	0.438	188	To Do
Kamke 1517	✓	0.6	601	✓	0.657	866	To Do
Kamke 1518	✓	0.454	104	✓	0.415	60	To Do
Kamke 1519	✓	0.027	65	✓	0.127	19	To Do
Kamke 1520	✓	4.545	534	✓	0.6	288	To Do
Kamke 1521	✓	0.057	35	✓	0.368	28	To Do
Kamke 1522	✓	0.019	44	✓	0.056	34	To Do
Kamke 1523	✓	0.488	74	✓	0.394	23	To Do
Kamke 1524	✓	0.181	96	✓	0.604	98	To Do
Kamke 1525	✓	0.316	102	✓	0.866	291	To Do
Kamke 1526	✓	130.245	27	✓	0.215	19	To Do
Kamke 1527	✓	130.14	165	✓	0.801	437	To Do
Kamke 1528	✓	1.892	72	✓	0.449	68	To Do
Kamke 1529	✓	0.089	47	✓	0.139	25	To Do
Kamke 1530	✓	0.067	35	✓	0.341	105	To Do
Kamke 1531	✗	0	0	✗	0	0	To Do
Kamke 1532	✓	0.016	103	✓	0.099	58	To Do
Kamke 1533	✓	0.015	113	✓	0.092	58	To Do
Kamke 1534	✓	0.005	24	✓	0.021	21	To Do
Kamke 1535	✓	0.282	223	✓	0.022	36	To Do
Kamke 1536	✓	0.006	76	✓	0.017	50	To Do
Kamke 1537	✓	1.57	1722	✓	0.175	67	To Do
Kamke 1538	✓	0.171	66	✓	1.504	49	To Do
Kamke 1539	✓	0.008	44	✓	0.04	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

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1543	✗	0	0	✗	0	0	To Do
Kamke 1544	✗	0	0	✓	0.016	41	To Do
Kamke 1545	✓	0.011	40	✓	0.4	27	To Do
Kamke 1546	✓	0.883	300	✓	0.061	73	To Do
Kamke 1547	✗	0	0	✓	0.017	87	To Do
Kamke 1548	✓	0.11	50	✓	0.118	32	To Do
Kamke 1549	✓	0.028	34	✓	0.032	26	To Do
Kamke 1550	✓	1.811	270	✓	3.313	157	To Do
Kamke 1551	✓	0.325	110	✓	0.247	62	To Do
Kamke 1552	✗	0	0	✓	0.102	89	To Do
Kamke 1553	✓	0.013	29	✓	0.011	17	To Do
Kamke 1554	✓	0.011	29	✓	0.012	18	To Do
Kamke 1555	✓	0.054	156	✓	0.177	61	To Do
Kamke 1556	✓	0.013	30	✓	0.014	19	To Do
Kamke 1557	✓	0.055	146	✓	0.118	61	To Do
Kamke 1558	✓	0.131	319	✓	0.175	67	To Do
Kamke 1559	✓	0.23	100	✓	0.162	33	To Do
Kamke 1560	✓	0.01	29	✓	0.012	18	To Do
Kamke 1561	✓	2.706	400	✓	0.424	69	To Do
Kamke 1562	✓	0.84	140	✓	0.411	77	To Do
Kamke 1563	✓	1.519	232	✓	0.287	87	To Do
Kamke 1564	✓	1.033	230	✓	0.279	88	To Do
Kamke 1565	✓	0.424	242	✓	0.399	71	To Do
Kamke 1566	✓	0.483	238	✓	0.341	35	To Do
Kamke 1567	✓	0.009	30	✓	0.014	19	To Do
Kamke 1568	✓	0.012	122	✓	0.033	89	To Do
Kamke 1569	✗	0	0	✓	0.467	63	To Do
Kamke 1570	✓	0.104	470	✓	0.102	49	To Do
Kamke 1571	✓	0.071	390	✓	0.382	143	To Do
Kamke 1572	✗	0	0	✓	0.473	35	To Do
Kamke 1573	✓	0.138	77	✓	0.05	41	To Do
Kamke 1574	✓	0.186	270	✓	1.115	252	To Do
Kamke 1575	✓	7.523	138	✓	0.767	647	To Do
Kamke 1576	✗	0	0	✓	0.02	67	To Do
Kamke 1577	✓	0.063	46	✓	0.019	21	To Do
Kamke 1578	✓	39.056	141	✓	0.603	89	To Do
Kamke 1579	✓	1.15	80	✓	1.274	69	To Do
Kamke 1580	✓	4.565	234	✓	4.115	71	To Do
Kamke 1581	✗	0	0	✗	0	0	To Do
Kamke 1582	✓	10.184	787	✗	0	0	To Do
Kamke 1583	✓	0.11	92	✓	0.057	40	To Do
Kamke 1584	✓	1.873	216	✓	0.274	118	To Do
Kamke 1585	✓	0.264	214	✓	0.11	675	To Do
Kamke 1586	✗	0	0	✗	0	0	To Do
Kamke 1587	✓	0.285	492	✓	0.745	154	To Do
Kamke 1588	✓	9.887	114	✓	0.167	90	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1589	✓	0.037	670	✓	43.879	4046	To Do
Kamke 1590	✓	271.023	331	✗	0	0	To Do
Kamke 1591	✓	0.037	26	✓	0.032	12	To Do
Kamke 1592	✓	0.05	14	✓	0.027	10	To Do
Kamke 1593	✗	0	0	✗	0	0	To Do
Kamke 1594	✓	0.444	373	✓	0.126	59	To Do
Kamke 1595	✗	0	0	✗	0	0	To Do
Kamke 1596	✗	0	0	✗	0	0	To Do
Kamke 1597	✓	1.865	242	✓	0.041	21	To Do
Kamke 1598	✗	0	0	✗	0	0	To Do
Kamke 1599	✗	0	0	✗	0	0	To Do
Kamke 1600	✓	2.132	1017	✓	0.117	89	To Do
Kamke 1601	✗	0	0	✗	0	0	To Do
Kamke 1602	✓	0.138	47	✓	0.306	73	To Do
Kamke 1603	✗	0	0	✓	51.362	7206	To Do
Kamke 1604	✓	0.049	34	✓	0.394	23	To Do
Kamke 1605	✗	0	0	✗	0	0	To Do
Kamke 1606	✗	0	0	✗	0	0	To Do
Kamke 1607	✓	0.084	79	✓	0.154	49	To Do
Kamke 1608	✗	0	0	✗	0	0	To Do
Kamke 1609	✗	0	0	✗	0	0	To Do
Kamke 1610	✓	5.441	754	✓	0.347	92	To Do
Kamke 1611	✗	0	0	✗	0	0	To Do
Kamke 1612	✗	0	0	✗	0	0	To Do
Kamke 1613	✓	1.648	35	✓	0.041	27	To Do
Kamke 1614	✓	0.975	32	✓	0.124	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	✓	33.509	492	✓	0.168	291	To Do
Kamke 1621	✓	38.319	990	✓	3.448	108	To Do
Kamke 1622	✓	23.873	88	✓	0.786	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	✓	0.059	75	✓	0.059	38	To Do
Kamke 1630	✓	7.026	3223	✓	0.959	783	To Do
Kamke 1631	✓	0.06	75	✓	0.099	38	To Do
Kamke 1632	✓	0.068	46	✓	0.167	23	To Do
Kamke 1633	✓	33.97	92	✓	0.497	97	To Do
Kamke 1634	✗	0	0	✗	0	0	To Do
Kamke 1635	✓	0.738	104	✓	0.32	79	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1636	✗	0	0	✗	0	0	To Do
Kamke 1637	✗	0	0	✗	0	0	To Do
Kamke 1638	✓	5.985	146	✓	0.394	115	To Do
Kamke 1639	✗	0	0	✗	0	0	To Do
Kamke 1640	✓	0.698	96	✓	0.405	70	To Do
Kamke 1641	✓	0.049	61	✓	0.058	29	To Do
Kamke 1642	✗	0	0	✗	0	0	To Do
Kamke 1643	✗	0	0	✗	0	0	To Do
Kamke 1644	✗	0	0	✗	0	0	To Do
Kamke 1645	✗	0	0	✗	0	0	To Do
Kamke 1646	✓	10.684	262	✓	0.265	94	To Do
Kamke 1647	✓	0.597	60	✓	8.603	60	To Do
Kamke 1648	✗	0	0	✗	0	0	To Do
Kamke 1649	✗	0	0	✗	0	0	To Do
Kamke 1650	✓	0.195	50	✓	1.203	16	To Do
Kamke 1651	✓	0.574	972	✓	0.181	31	To Do
Kamke 1652	✓	0.53	76	✓	0.919	33	To Do
Kamke 1653	✓	0.189	75	✓	0.208	41	To Do
Kamke 1654	✓	0.427	308	✓	0.21	38	To Do
Kamke 1655	✓	0.832	350	✓	0.328	84	To Do
Kamke 1656	✓	58.774	9706	✓	1.125	768	To Do
Kamke 1657	✓	0.649	365	✓	0.324	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	✓	0.08	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	✓	0.07	60	✓	0.138	24	To Do
Kamke 1669	✓	0.74	160	✓	0.118	32	To Do
Kamke 1670	✓	7.376	51	✓	0.632	35	To Do
Kamke 1671	✓	0.114	59	✓	0.079	35	To Do
Kamke 1672	✗	0	0	✗	0	0	To Do
Kamke 1673	✗	0	0	✗	0	0	To Do
Kamke 1674	✓	0.049	106	✓	0.076	25	To Do
Kamke 1675	✗	0	0	✗	0	0	To Do
Kamke 1676	✓	0.39	134	✓	0.224	72	To Do
Kamke 1677	✗	0	0	✗	0	0	To Do
Kamke 1678	✗	0	0	✓	0.306	57	To Do
Kamke 1679	✓	0.179	33	✓	0.125	26	To Do
Kamke 1680	✗	0	0	✗	0	0	To Do
Kamke 1681	✓	2.639	41	✓	0.056	31	To Do
Kamke 1682	✓	21.688	41	✗	0	0	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1683	✓	0.088	26	✓	0.062	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	✓	0.135	262	✓	0.113	21	To Do
Kamke 1688	✓	1.186	189	✓	0.119	32	To Do
Kamke 1689	✓	0.301	104	✓	0.126	37	To Do
Kamke 1690	✗	0	0	✗	0	0	To Do
Kamke 1691	✓	26.206	251	✓	0.946	254	To Do
Kamke 1692	✗	0	0	✗	0	0	To Do
Kamke 1693	✗	0	0	✗	0	0	To Do
Kamke 1694	✓	0.138	115	✓	0.102	53	To Do
Kamke 1695	✗	0	0	✗	0	0	To Do
Kamke 1696	✗	0	0	✗	0	0	To Do
Kamke 1697	✓	0.199	94	✓	0.045	39	To Do
Kamke 1698	✓	0.034	72	✗	0	0	To Do
Kamke 1699	✓	0.135	40	✓	0.174	33	To Do
Kamke 1700	✓	0.244	85	✓	0.361	86	To Do
Kamke 1701	✓	0.234	80	✓	0.283	42	To Do
Kamke 1702	✗	0	0	✗	0	0	To Do
Kamke 1703	✓	0.382	77	✓	0.223	25	To Do
Kamke 1704	✗	0	0	✗	0	0	To Do
Kamke 1705	✓	0.409	252	✗	0	0	To Do
Kamke 1706	✓	0.646	308	✗	0	0	To Do
Kamke 1707	✓	0.078	31	✓	0.226	39	To Do
Kamke 1708	✗	0	0	✗	0	0	To Do
Kamke 1709	✓	54.631	543	✗	0	0	To Do
Kamke 1710	✗	0	0	✗	0	0	To Do
Kamke 1711	✓	20.371	10168	✓	0.559	23	To Do
Kamke 1712	✓	0.067	75	✓	0.263	37	To Do
Kamke 1713	✗	0	0	✗	0	0	To Do
Kamke 1714	✓	0.17	28	✓	0.075	36	To Do
Kamke 1715	✓	0.128	26	✓	0.067	25	To Do
Kamke 1716	✓	0.641	172	✓	0.285	68	To Do
Kamke 1717	✓	52.256	277	✓	0.423	107	To Do
Kamke 1718	✓	1.778	744	✓	0.382	136	To Do
Kamke 1719	✗	0	0	✗	0	0	To Do
Kamke 1720	✓	94.963	105	✓	0.441	155	To Do
Kamke 1721	✓	22.782	41	✗	0	0	To Do
Kamke 1722	✓	1.511	697	✓	0.446	98	To Do
Kamke 1723	✓	1.09	130	✓	0.11	16	To Do
Kamke 1724	✓	0.536	38	✓	2.273	21	To Do
Kamke 1725	✓	38.197	18840	✓	0.546	106	To Do
Kamke 1726	✓	0.318	82	✓	0.149	39	To Do
Kamke 1727	✓	1.433	482	✓	0.538	823	To Do
Kamke 1728	✓	0.007	31	✓	0.04	24	To Do
Kamke 1729	✗	0	0	✗	0	0	To Do

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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1730	✓	0.844	135	✓	0.085	53	To Do
Kamke 1731	✓	1.058	351	✓	0.081	61	To Do
Kamke 1732	✗	0	0	✗	0	0	To Do
Kamke 1733	✓	1.885	437	✓	0.087	71	To Do
Kamke 1734	✗	0	0	✗	0	0	To Do
Kamke 1735	✗	0	0	✗	0	0	To Do
Kamke 1736	✓	6.824	129	✓	0.102	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	✓	0.121	16	✓	0.098	13	To Do
Kamke 1741	✓	0.135	17	✓	0.481	34	To Do
Kamke 1742	✗	0	0	✗	0	0	To Do
Kamke 1743	✓	21.097	2761	✓	0.097	71	To Do
Kamke 1744	✓	1.816	505	✓	0.453	823	To Do
Kamke 1745	✓	0.546	195	✓	0.638	117	To Do
Kamke 1746	✓	0.217	118	✓	0.395	207	To Do
Kamke 1747	✓	0.119	20	✓	0.025	17	To Do
Kamke 1748	✓	0.323	43	✓	0.123	67	To Do
Kamke 1749	✓	0.505	153	✓	1.89	57	To Do
Kamke 1750	✓	0.957	107	✓	1.161	87	To Do
Kamke 1751	✗	0	0	✗	0	0	To Do
Kamke 1752	✓	0.187	26	✓	0.269	33	To Do
Kamke 1753	✓	0.646	43	✓	0.119	147	To Do
Kamke 1754	✓	0.131	17	✓	0.054	15	To Do
Kamke 1755	✓	7.399	716	✓	0.54	418	To Do
Kamke 1756	✓	0.502	124	✓	0.273	78	To Do
Kamke 1757	✗	0	0	✗	0	0	To Do
Kamke 1758	✓	0.386	36	✓	0.081	42	To Do
Kamke 1759	✓	0.153	18	✓	0.032	31	To Do
Kamke 1760	✓	0.08	108	✓	0.104	114	To Do
Kamke 1761	✗	0	0	✗	0	0	To Do
Kamke 1762	✗	0	0	✗	0	0	To Do
Kamke 1763	✓	0.248	40	✓	0.13	148	To Do
Kamke 1764	✓	0.072	52	✓	0.151	18	To Do
Kamke 1765	✓	0.264	34	✓	0.044	27	To Do
Kamke 1766	✓	0.165	21	✓	0.047	64	To Do
Kamke 1767	✓	0.342	55	✓	0.347	50	To Do
Kamke 1768	✓	0.051	53	✓	0.056	43	To Do
Kamke 1769	✓	0.177	18	✓	0.113	21	To Do
Kamke 1770	✓	0.702	28	✓	0.066	26	To Do
Kamke 1771	✓	0.09	21	✓	0.197	22	To Do
Kamke 1772	✓	0.707	36	✓	0.148	42	To Do
Kamke 1773	✓	0.403	44	✓	0.043	30	To Do
Kamke 1774	✓	1.228	92	✓	0.373	136	To Do
Kamke 1775	✓	0.16	29	✓	0.244	31	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1776	✗	0	0	✓	0.284	49	To Do
Kamke 1777	✗	0	0	✗	0	0	To Do
Kamke 1778	✓	0.282	65	✓	0.549	245	To Do
Kamke 1779	✗	0	0	✓	0.769	113	To Do
Kamke 1780	✗	0	0	✓	1.094	171	To Do
Kamke 1781	✓	0.23	46	✓	0.056	11	To Do
Kamke 1782	✓	0.203	93	✓	0.067	33	To Do
Kamke 1783	✓	1.387	26	✓	0.158	23	To Do
Kamke 1784	✓	0.295	74	✓	0.86	82	To Do
Kamke 1785	✓	0.328	95	✓	6.	83	To Do
Kamke 1786	✓	0.092	98	✓	0.197	42	To Do
Kamke 1787	✓	0.883	170	✓	0.2	80	To Do
Kamke 1788	✗	0	0	✗	0	0	To Do
Kamke 1789	✗	0	0	✗	0	0	To Do
Kamke 1790	✓	0.712	186	✓	0.221	111	To Do
Kamke 1791	✓	0.713	168	✓	0.226	90	To Do
Kamke 1792	✓	1.264	232	✓	0.483	194	To Do
Kamke 1793	✓	0.408	83	✓	0.145	40	To Do
Kamke 1794	✓	0.262	69	✓	0.097	46	To Do
Kamke 1795	✓	0.324	116	✓	1.145	529	To Do
Kamke 1796	✓	0.335	130	✓	0.297	51	To Do
Kamke 1797	✗	0	0	✗	0	0	To Do
Kamke 1798	✓	35.368	248	✓	0.239	166	To Do
Kamke 1799	✓	1.531	88	✓	0.297	46	To Do
Kamke 1800	✓	0.542	84	✓	0.06	60	To Do
Kamke 1801	✗	0	0	✗	0	0	To Do
Kamke 1802	✗	0	0	✗	0	0	To Do
Kamke 1803	✓	22.222	10387	✓	0.985	304	To Do
Kamke 1804	✓	12.836	416	✓	0.038	31	To Do
Kamke 1805	✓	10.424	438	✓	0.057	34	To Do
Kamke 1806	✗	0	0	✓	2.687	726	To Do
Kamke 1807	✗	0	0	✗	0	0	To Do
Kamke 1808	✓	11.193	124	✓	0.158	72	To Do
Kamke 1809	✓	29.486	260	✓	0.456	336	To Do
Kamke 1810	✓	0.126	1677	✓	0.113	91	To Do
Kamke 1811	✗	0	0	✓	2.12	88	To Do
Kamke 1812	✓	0.299	29	✓	0.134	19	To Do
Kamke 1813	✓	38.471	176	✓	0.532	133	To Do
Kamke 1814	✓	0.396	120	✓	0.136	87	To Do
Kamke 1815	✗	0	0	✗	0	0	To Do
Kamke 1816	✗	0	0	✗	0	0	To Do
Kamke 1817	✓	14.557	41	✓	0.246	40	To Do
Kamke 1818	✗	0	0	✓	0.607	66	To Do
Kamke 1819	✗	0	0	✓	0.065	42	To Do
Kamke 1820	✗	0	0	✗	0	0	To Do
Kamke 1821	✗	0	0	✗	0	0	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1822	✓	0.927	371	✓	1.368	159	To Do
Kamke 1823	✓	0.474	281	✓	0.301	289	To Do
Kamke 1824	✓	0.919	331	✓	0.979	96	To Do
Kamke 1825	✗	0	0	✗	0	0	To Do
Kamke 1826	✓	0.893	201	✓	0.725	173	To Do
Kamke 1827	✗	0	0	✓	4.732	1364	To Do
Kamke 1828	✓	0.01	32	✓	1.131	59	To Do
Kamke 1829	✓	0.007	24	✓	0.661	36	To Do
Kamke 1830	✓	0.027	24	✓	0.849	302	To Do
Kamke 1831	✗	0	0	✗	0	0	To Do
Kamke 1832	✗	0	0	✗	0	0	To Do
Kamke 1833	✓	3.179	1	✓	2.641	162	To Do
Kamke 1834	✓	53.5	19	✗	0	0	To Do
Kamke 1835	✓	0.162	143	✗	0	0	To Do
Kamke 1836	✗	0	0	✗	0	0	To Do
Kamke 1837	✓	10.098	145	✓	0.283	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	✓	0.213	286	✓	0.659	190	To Do
Kamke 1843	✓	2.226	409	✓	0.362	77	To Do
Kamke 1844	✓	0.183	20	✓	0.401	75	To Do
Kamke 1845	✓	0.195	22	✓	0.383	81	To Do
Kamke 1846	✓	0.045	51	✓	0.01	28	To Do
Kamke 1847	✓	0.223	95	✓	0.156	49	To Do
Kamke 1848	✓	0.473	187	✓	1.201	359	To Do
Kamke 1849	✓	0.669	426	✓	0.3	197	To Do
Kamke 1850	✗	0	0	✗	0	0	To Do
Kamke 1851	✗	0	0	✗	0	0	To Do
Kamke 1852	✓	0.128	28	✓	0.311	28	To Do
Kamke 1853	✓	0.091	43	✓	0.83	110	To Do
Kamke 1854	✗	0	0	✗	0	0	To Do
Kamke 1855	✗	0	0	✗	0	0	To Do
Kamke 1856	✓	0.021	22	✓	0.034	19	To Do
Kamke 1857	✓	0.014	39	✓	0.043	35	To Do
Kamke 1858	✓	0.01	182	✓	0.04	64	To Do
Kamke 1859	✓	0.005	51	✓	0.037	37	To Do
Kamke 1860	✓	0.031	696	✓	0.081	177	To Do
Kamke 1861	✓	0.012	183	✓	0.096	118	To Do
Kamke 1862	✓	0.018	52	✓	0.033	39	To Do
Kamke 1863	✓	0.007	84	✓	0.033	35	To Do
Kamke 1864	✓	0.01	59	✓	0.034	44	To Do
Kamke 1865	✓	1.772	2062	✓	0.125	224	To Do
Kamke 1866	✓	0.196	132	✓	0.039	39	To Do
Kamke 1867	✓	0.247	124	✓	0.04	42	To Do
Kamke 1868	✓	0.245	162	✓	0.081	56	To Do
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#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1869	✓	0.321	118	✓	0.052	51	To Do
Kamke 1870	✓	0.173	122	✓	0.17	47	To Do
Kamke 1871	✓	0.362	180	✓	0.118	60	To Do
Kamke 1872	✓	0.369	162	✓	0.063	56	To Do
Kamke 1873	✓	0.303	322	✓	0.06	52	To Do
Kamke 1874	✓	0.016	115	✓	0.551	57	To Do
Kamke 1875	✓	1.544	3181	✓	3.392	3237	To Do
Kamke 1876	✓	0.021	39	✓	0.219	18	To Do
Kamke 1877	✓	0.005	31	✓	0.034	31	To Do
Kamke 1878	✓	0.091	39	✓	0.056	39	To Do
Kamke 1879	✓	0.029	58	✓	0.046	54	To Do
Kamke 1880	✓	0.013	29	✓	0.068	23	To Do
Kamke 1881	✓	0.008	44	✓	0.026	48	To Do
Kamke 1882	✓	3.658	928	✓	0.077	99	To Do
Kamke 1883	✓	1.758	602	✓	0.153	77	To Do
Kamke 1884	✓	0.769	224	✓	0.161	69	To Do
Kamke 1885	✓	0.022	66	✓	0.112	47	To Do
Kamke 1886	✓	0.017	115	✓	0.057	49	To Do
Kamke 1887	✓	0.332	5748	✓	0.089	360	To Do
Kamke 1888	✓	26.608	15664	✓	0.166	457	To Do
Kamke 1889	✓	0.816	554	✓	0.04	60	To Do
Kamke 1890	✗	0	0	✗	0	0	To Do
Kamke 1891	✓	0.864	742	✓	0.054	64	To Do
Kamke 1892	✓	0.262	4815	✓	0.091	463	To Do
Kamke 1893	✓	0.67	5546	✓	0.685	1565	To Do
Kamke 1894	✓	0.461	3386	✓	0.62	1040	To Do
Kamke 1895	✓	0.226	7517	✓	0.169	1008	To Do
Kamke 1896	✓	0.892	1132	✓	0.054	66	To Do
Kamke 1897	✓	0.429	280	✓	0.695	88	To Do
Kamke 1898	✓	0.029	420	✓	0.062	71	To Do
Kamke 1899	✓	0.009	112	✓	0.083	52	To Do
Kamke 1900	✓	0.009	94	✓	0.079	50	To Do
Kamke 1901	✓	0.01	105	✓	0.064	43	To Do
Kamke 1902	✓	0.027	226	✓	0.059	51	To Do
Kamke 1903	✓	0.076	1304	✓	0.122	299	To Do
Kamke 1904	✓	0.046	1445	✓	0.076	257	To Do
Kamke 1905	✗	0	0	✗	0	0	To Do
Kamke 1906	✓	0.045	278	✓	0.064	110	To Do
Kamke 1907	✓	0.009	179	✓	0.052	66	To Do
Kamke 1908	✓	0.037	551	✓	0.349	1145	To Do
Kamke 1909	✓	0.036	1630	✓	12.766	32449	To Do
Kamke 1910	✓	0.009	39	✓	0.079	37	To Do
Kamke 1911	✓	0.03	1148	✓	0.113	309	To Do
Kamke 1912	✓	0.01	798	✓	0.951	2783	To Do
Kamke 1913	✓	0.04	64	✓	0.117	57	To Do
Kamke 1914	✓	0.333	204	✓	0.449	92	To Do
Continued on next page							

Table 3 – continued from previous page

#	Mathematica			Maple			note on solution
	solved	cpu	leaf	solved	cpu	leaf	
Kamke 1915	✗	0	0	✗	0	0	To Do
Kamke 1916	✓	0.775	557	✓	0.66	180	To Do
Kamke 1917	✓	120.75	3406	✓	1.447	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
Kamke 1921	✗	0	0	✗	0	0	To Do
Kamke 1922	✗	0	0	✗	0	0	To Do
Kamke 1923	✓	0.013	53	✓	0.043	35	To Do
Kamke 1924	✓	0.077	191	✓	0.905	180	To Do
Kamke 1925	✓	0.021	31	✓	0.314	144	To Do
Kamke 1926	✓	0.007	28	✓	0.186	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	✓	0.035	308	✓	0.051	45	To Do
Kamke 1931	✓	4.151	10101	✓	1.475	1117	To Do
Kamke 1932	✗	0	0	✗	0	0	To Do
Kamke 1933	✗	0	0	✓	1.316	4309	To Do
Kamke 1934	✗	0	0	✗	0	0	To Do
Kamke 1935	✗	0	0	✗	0	0	To Do
Kamke 1936	✗	0	0	✓	0.772	704	To Do
Kamke 1937	✗	0	0	✗	0	0	To Do
Kamke 1938	✓	0.008	137	✓	0.115	101	To Do
Kamke 1939	✓	0.218	2168	✓	1.859	899	To Do
Kamke 1940	✗	0	0	✗	0	0	To Do

2.1 ODE No. 1

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

✓ **Mathematica** : cpu = 10.5105 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 - \frac{2F\left(\sin^{-1}\left(\sqrt{\frac{(x-\text{Root}[a_4\#1^4+a_3\#1^3+a_2\#1^2+a_1\#1+a_0\&,1])}{(x-\text{Root}[a_4\#1^4+a_3\#1^3+a_2\#1^2+a_1\#1+a_0\&,2])}}\right)}{(\text{Root}[a_4\#1^4+a_3\#1^3+a_2\#1^2+a_1\#1+a_0\&,2])-\text{Root}[a_4\#1^4+a_3\#1^3+a_2\#1^2+a_1\#1+a_0\&,1])}\right.\right.$$

✓ **Maple** : cpu = 0.023 (sec), leaf count = 1089

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

Expression too large to display

Hand solution

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

To Do.

2.2 ODE No. 2

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

✓ **Mathematica** : cpu = 0.0820509 (sec), leaf count = 34

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

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

✓ **Maple** : cpu = 0.009 (sec), leaf count = 25

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

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

Hand solution

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

Integrating factor $\mu = e^{\int adx} = e^{ax}$. 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 = 0.0391673 (sec), leaf count = 40

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

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

✓ **Maple** : cpu = 0.035 (sec), leaf count = 37

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

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

Hand solution

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

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}

$$y(x) = b e^{-ax} \int e^{ax} \sin(cx) dx + C e^{-ax} \quad (2)$$

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

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

Therefore (2) becomes

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

2.4 ODE No. 4

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

✓ **Mathematica** : cpu = 0.0335225 (sec), leaf count = 30

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

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{2}e^{-x^2}x^2 + c_1e^{-x^2} \right\} \right\}$$

✓ **Maple** : cpu = 0.004 (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

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

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 = 0.350427 (sec), leaf count = 39

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

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

✓ **Maple** : cpu = 0.059 (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

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

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

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

Integrating both sides

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

2.6 ODE No. 6

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

✓ **Mathematica** : cpu = 0.0295942 (sec), leaf count = 18

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

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

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

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

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

Hand solution

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

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

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

Integrating

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

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

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

2.7 ODE No. 7

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

✓ **Mathematica** : cpu = 0.0728113 (sec), leaf count = 23

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

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

✓ **Maple** : cpu = 0.006 (sec), leaf count = 13

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

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

Hand solution

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

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

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

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

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

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

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

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

2.8 ODE No. 8

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

✓ **Mathematica** : cpu = 0.0246997 (sec), leaf count = 17

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

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

✓ **Maple** : cpu = 0.013 (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

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

Integrating factor $\mu = e^{\int \tan x \, dx} = e^{-\ln(\cos(x))} = \frac{1}{\cos(x)}$. 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 = 0.0280613 (sec), leaf count = 19

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

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

✓ **Maple** : cpu = 0.015 (sec), leaf count = 14

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

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

Hand solution

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

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 $\int \sin(\log(x)) + \cos(\log(x)) dx$, let $r = \log(x)$, $\frac{dr}{dx} = \frac{1}{x}$, then $dx = x dr$, But $x = e^r$, hence the integral becomes

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

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

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

Therefore, substituting back $r = \log(x)$ 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 = 0.0280073 (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]
```

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

✓ **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))
```

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

Hand solution

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

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

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

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

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

2.11 ODE No. 11

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

✓ **Mathematica** : cpu = 0.0275519 (sec), leaf count = 66

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

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

✓ **Maple** : cpu = 0.022 (sec), leaf count = 24

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

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

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 = 0.0671634 (sec), leaf count = 34

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

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

✓ **Maple** : cpu = 0.032 (sec), leaf count = 8

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

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

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 = 0.0977895 (sec), leaf count = 79

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

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

✓ **Maple** : cpu = 0.142 (sec), leaf count = 79

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

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

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

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

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

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

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

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

Reference: Airy function

2.14 ODE No. 14

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

✓ **Mathematica** : cpu = 0.153857 (sec), leaf count = 602

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{\frac{1}{2}(m+2)^{-\frac{1}{m+2}} a^{\frac{1}{2(m+2)} + \frac{1}{2}} x^{\frac{m+2}{2} - \frac{m+1}{m+2}} \Gamma\left(1 + \frac{1}{m+2}\right) \left(J_{\frac{1}{m+2}-1}\left(\frac{2\sqrt{a}x^{\frac{m+2}{2}}}{m+2}\right) - J_{1+\frac{1}{m+2}}\left(\frac{2\sqrt{a}x^{\frac{m+2}{2}}}{m+2}\right) \right) + \dots \right. \right.$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 187

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

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

Hand solution

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

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

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

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

Since $u' = yu$ then

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

So we have new second order ODE

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

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

$$u = c_1 \sqrt{x} \text{Bessel}I\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) + c_2 \sqrt{x} \text{Bessel}K\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right)$$

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

$$u(x) = c_1 \sqrt{x} \text{Bessel}J\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) + c_2 \sqrt{x} \text{Bessel}Y\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) \quad (4)$$

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

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

And

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

Therefore

$$\begin{aligned} u'(x) = & c_1 \frac{\text{Bessel}J\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{ax}^{\frac{m+1}{2}} \text{Bessel}J\left(\frac{m+3}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right)}{\sqrt{x}} \\ & + c_2 \frac{\text{Bessel}Y\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{ax}^{\frac{m+1}{2}} \text{Bessel}Y\left(\frac{m+3}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right)}{\sqrt{x}} \end{aligned}$$

Since $u' = yu$ then

$$\begin{aligned} y = \frac{u'}{u} &= \frac{c_1 \frac{\text{Bessel}J\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{ax}^{\frac{m+1}{2}} \text{Bessel}J\left(\frac{m+3}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right)}{\sqrt{x}} + c_2 \frac{\text{Bessel}Y\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{ax}^{\frac{m+1}{2}} \text{Bessel}Y\left(\frac{m+3}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right)}{\sqrt{x}}}{c_1 \sqrt{x} \text{Bessel}J\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) + c_2 \sqrt{x} \text{Bessel}Y\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right)} \\ &= \frac{c_1 \left[\text{Bessel}J\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{ax}^{\frac{m+1}{2}} \text{Bessel}J\left(\frac{m+3}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) \right] + c_2 \left[\text{Bessel}Y\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{ax}^{\frac{m+1}{2}} \text{Bessel}Y\left(\frac{m+3}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) \right]}{\sqrt{x} \left[c_1 \sqrt{x} \text{Bessel}J\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) + c_2 \sqrt{x} \text{Bessel}Y\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) \right]} \\ &= \frac{c_1 \left[\text{Bessel}J\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{ax}^{\frac{m+1}{2}} \text{Bessel}J\left(\frac{m+3}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) \right] + c_2 \left[\text{Bessel}Y\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{ax}^{\frac{m+1}{2}} \text{Bessel}Y\left(\frac{m+3}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) \right]}{c_1 x \text{Bessel}J\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) + c_2 x \text{Bessel}Y\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right)} \end{aligned}$$

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

$$y = \frac{1}{x} \frac{C_1 \left[\text{Bessel}J\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{ax}^{\frac{m+1}{2}} \text{Bessel}J\left(\frac{m+3}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) \right] + \text{Bessel}Y\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) - \sqrt{ax}^{\frac{m+1}{2}} \text{Bessel}Y\left(\frac{m+3}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right)}{C_1 \text{Bessel}J\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right) + \text{Bessel}Y\left(\frac{1}{m+2}, \frac{2\sqrt{ax}^{\frac{m+1}{2}}}{m+2}\right)}$$

2.15 ODE No. 15

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

✓ **Mathematica** : cpu = 0.062322 (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]
```

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

✓ **Maple** : cpu = 0.125 (sec), leaf count = 35

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

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

Hand solution

$$\begin{aligned} x^4 - 2x^2y(x) + y'(x) + y^2(x) - 2x - 1 &= 0 \\ y'(x) &= -x^4 + 2x + 1 + 2x^2y(x) - y^2(x) \end{aligned} \quad (1)$$

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

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

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

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

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

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

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 = 0.0584435 (sec), leaf count = 186

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

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

✓ **Maple** : cpu = 0.058 (sec), leaf count = 49

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

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

Hand solution

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

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

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

Hence

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

Equating (1) and (2) gives

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

Hence

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

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

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

Integrating both sides

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

Hence

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

Hence

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

2.17 ODE No. 17

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

✓ **Mathematica** : cpu = 0.0504301 (sec), leaf count = 34

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

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

✓ **Maple** : cpu = 0.076 (sec), leaf count = 24

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

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

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

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

Hence

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

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

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

And

$$u'(x) = c_14e^{4x} - c_2e^{-x}$$

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

$$\begin{aligned} y(x) &= \frac{-c_14e^{4x} + c_2e^{-x}}{c_1e^{4x} + c_2e^{-x}} \\ &= \frac{-\frac{c_1}{c_2}4e^{4x} + e^{-x}}{\frac{c_1}{c_2}e^{4x} + e^{-x}} \end{aligned}$$

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

$$y(x) = \frac{-4C_1e^{4x} + e^{-x}}{C_1e^{4x} + e^{-x}}$$

Dividing by e^{-x}

$$y(x) = \frac{-4C_1e^{5x} + 1}{C_1e^{5x} + 1}$$

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

$$\begin{aligned} y(x) &= \frac{4C_2e^{5x} + 1}{-C_2e^{5x} + 1} \\ &= -\frac{4C_2e^{5x} + 1}{C_2e^{5x} - 1} \end{aligned}$$

2.18 ODE No. 18

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

✓ **Mathematica** : cpu = 0.0830439 (sec), leaf count = 50

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

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

✓ **Maple** : cpu = 0.042 (sec), leaf count = 39

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

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

Hand solution

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

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

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

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

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

Hence

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

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

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

Integrating both sides

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

But

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

Hence

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

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

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

Or

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

2.19 ODE No. 19

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

✓ **Mathematica** : cpu = 0.0490408 (sec), leaf count = 14

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

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

✓ **Maple** : cpu = 0.037 (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

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

✓ **Mathematica** : cpu = 0.14071 (sec), leaf count = 49

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

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

✓ **Maple** : cpu = 0.046 (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

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

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 $P(x) = 2x$, $Q(x) = -(x^2 + 1)$, $R(x) = 1$. 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

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

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

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

Integrating

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

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

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

2.21 ODE No. 21

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

✓ **Mathematica** : cpu = 0.307977 (sec), leaf count = 71

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

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

✓ **Maple** : cpu = 0.132 (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

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

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

$$y_p = \sin(x)$$

Therefore

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

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

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

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 = 0.559869 (sec), leaf count = 113

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

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

✓ **Maple** : cpu = 0.359 (sec), leaf count = 97

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

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

Hand solution

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

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

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

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

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

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

Equating this to (1) gives

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\frac{1}{\cos^2 x} e^{-\cos^2 x} u = - \int \frac{e^{-\cos^2 x}}{\cos^2 x} dx + C$$

$$u = \cos^2 x e^{\cos^2 x} \left(C - \int \frac{e^{-\cos^2 x}}{\cos^2 x} dx \right)$$

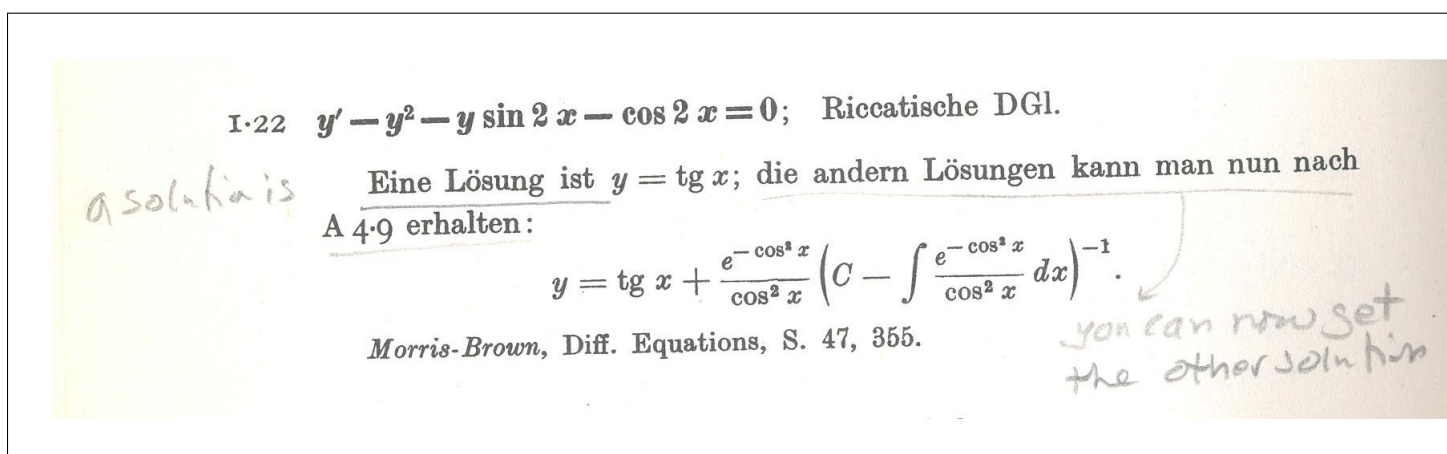
Since $y = \tan x + \frac{1}{u}$ then

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

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

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



2.23 ODE No. 23

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

✓ **Mathematica** : cpu = 0.0630253 (sec), leaf count = 43

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

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

✓ **Maple** : cpu = 0.032 (sec), leaf count = 23

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

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

Hand solution

$$y' + ay^2 - b = 0$$

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

Separable,

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

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

But

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

Hence

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

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

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

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

2.24 ODE No. 24

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

Mathematica : cpu = 0.123047 (sec), leaf count = 733

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

y(x) -> (1/2*(-1)^(1/(nu+2))*(nu+2)^(-1/(nu+2))*a^(1/(2*(nu+2))+1/2)*b^(1/(2*(nu+2))+1/2)*x^(nu/2 - (nu+1)/(2*(nu+2)))*Gamma(1+1/(nu+2)) (I_1/(nu+2)-1(2*sqrt(a)*sqrt(b)*x^(nu/2)/(nu+2)) + I_1+1/(nu+2)(2*sqrt(a)*sqrt(b)*x^(nu/2)/(nu+2))

Maple : cpu = 0.049 (sec), leaf count = 214

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

y(x) = (-sqrt(-a*b)*x^(nu/2+1)*BesselJ((3+nu)/(nu+2), 2*sqrt(-a*b)*x^(nu/2+1)/(nu+2))*c1 - BesselY((3+nu)/(nu+2), 2*sqrt(-a*b)*x^(nu/2+1)/(nu+2))*sqrt(-a*b)*x^(nu/2+1) + c1*BesselJ(1/(nu+2), 2*sqrt(-a*b)*x^(nu/2+1)/(nu+2)))/(x*a*(c1*BesselJ(1/(nu+2), 2*sqrt(-a*b)*x^(nu/2+1)/(nu+2)) + BesselY(1/(nu+2), 2*sqrt(-a*b)*x^(nu/2+1)/(nu+2)))

Hand solution

y' + ay^2 - bx^v = 0
y' = bx^v - ay^2
= P(x) + Q(x)y + R(x)y^2

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

y = -u'/(uR(x)) = u'/au

Hence

y' = u''/au - (u')^2/au^2

Therefore (1) becomes

u''/au - (u')^2/au^2 = bx^v - ay^2
= bx^v - a(u'/au)^2
= bx^v - (u')^2/au^2

Hence

u''/au = bx^v
u'' - abx^v*u = 0

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 $ab < 0$

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

Using derivatives the above becomes

$$\begin{aligned} y &= \frac{C_1 \left[\frac{1}{2x} J_{\frac{1}{2q}} \left(\frac{\sqrt{-ab}}{q} x^q \right) + \frac{1}{2} \left(J_{\frac{1}{2q}-1} \left(\frac{\sqrt{-ab}}{q} x^q \right) - J_{\frac{1}{2q}+1} \left(\frac{\sqrt{-ab}}{q} x^q \right) \right) \right]}{aC_1 J_{\frac{1}{2q}} \left(\frac{\sqrt{-ab}}{q} x^q \right) + aC_2 Y_{\frac{1}{2q}} \left(\frac{\sqrt{-ab}}{q} x^q \right)} \\ &\quad + \frac{C_2 \left[\frac{1}{2x} Y_{\frac{1}{2q}} \left(\frac{\sqrt{-ab}}{q} x^q \right) + \frac{1}{2} \left(Y_{\frac{1}{2q}-1} \left(\frac{\sqrt{-ab}}{q} x^q \right) - Y_{\frac{1}{2q}+1} \left(\frac{\sqrt{-ab}}{q} x^q \right) \right) \right]}{aC_1 J_{\frac{1}{2q}} \left(\frac{\sqrt{-ab}}{q} x^q \right) + aC_2 Y_{\frac{1}{2q}} \left(\frac{\sqrt{-ab}}{q} x^q \right)} \end{aligned}$$

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 = 0.331242 (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]
```

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

✓ Maple : cpu = 0.277 (sec), leaf count = 348

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

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

Hand solution

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

This is Riccati first order non-linear ODE with $P(x) = bx^{\nu} + cx^{\nu-1}, Q(x) = 0, R(x) = -a$.
Need to do this later.

2.26 ODE No. 26

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

✓ **Mathematica** : cpu = 0.150335 (sec), leaf count = 68

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

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

✓ **Maple** : cpu = 0.27 (sec), leaf count = 45

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

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

Hand solution

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

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

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

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

$$u' = -aBc_1e^{-aBx} - c_2Abe^{-Abx}$$

And therefore the solution is

$$\begin{aligned}y &= -\frac{u'}{ABu} = -\frac{1}{AB} \frac{-aBc_1e^{-aBx} - c_2Abe^{-Abx}}{c_1e^{-aBx} + c_2e^{-Abx}} \\&= \frac{aBc_1e^{-aBx} + c_2Abe^{-Abx}}{AB(c_1e^{-aBx} + c_2e^{-Abx})}\end{aligned}$$

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

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

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 = 0.27022 (sec), leaf count = 120

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

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

✓ **Maple** : cpu = 0.131 (sec), leaf count = 72

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

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

Hand solution

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

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 $u = y - x$

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

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 = 0.114253 (sec), leaf count = 96

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

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

✓ **Maple** : cpu = 0.065 (sec), leaf count = 51

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

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

Hand solution

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

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

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

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

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

$\int x e^{-\frac{x^4}{4}} dx = \frac{\sqrt{\pi}}{2} \operatorname{erf}\left(\frac{x^2}{2}\right)$, 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 = 0.0578186 (sec), leaf count = 39

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

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

✓ **Maple** : cpu = 0.009 (sec), leaf count = 19

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

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

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 = 0.12767 (sec), leaf count = 230

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

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

✓ **Maple** : cpu = 0.055 (sec), leaf count = 54

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

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

Hand solution

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

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

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

Hence

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

Comparing to (1) gives

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

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

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

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

Substituting in (2) gives

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

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

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 $n = 0$

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

$$r(r-1) c_0 + r c_0 + a r c_0 = 0$$

Since $c_0 \neq 0$ then

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

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

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

$$(n+r)(n+r-1) c_n + (n+r) c_n + a(n+r) c_n - c_{n-1} = 0$$

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

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

For $r = 0$, we obtain

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

For $r = -a$

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

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

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

For $n = 2$

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

For $n = 3$

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

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

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

Since

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

and

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

Then

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

And (5) can now be written as

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

But modified Bessel function of first kind is

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

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

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

Hence

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

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

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

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 $\text{BesselK}(a, z) = \frac{\pi}{2 \sin(a\pi)} (\text{BesselI}(-a, z) - \text{BesselI}(a, z))$.

The above should result in $\frac{1}{\sqrt{x^a}} \text{BesselK}(a, 2\sqrt{x})$ 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 $u_{r=-a}(x) = \frac{1}{\sqrt{x^a}} \text{BesselK}(a, 2\sqrt{x})$. Therefore, the solution is

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

But

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

Hence

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

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

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

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

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

Or

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

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 = 0.121212 (sec), leaf count = 21

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

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

✓ **Maple** : cpu = 0.047 (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

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

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

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

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 = 0.293864 (sec), leaf count = 34

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

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

✓ **Maple** : cpu = 0.206 (sec), leaf count = 28

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

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

Hand solution

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

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

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

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 $3C = C_1$

$$y = \frac{1}{\cos x} + \frac{3 \cos^2 x}{C_1 - \cos^3(x)}$$

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 = 0.311977 (sec), leaf count = 160

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

Solve

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

✓ **Maple** : cpu = 0.354 (sec), leaf count = 58

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

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

Hand solution

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

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

To do.

2.34 ODE No. 34

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

✓ **Mathematica** : cpu = 0.070472 (sec), leaf count = 54

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

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

✓ **Maple** : cpu = 0.02 (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 $e^{-\int gdx}$ hence

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

Hence

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

Let $\beta = e^{-\int gdx}$ 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

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

✓ **Mathematica** : cpu = 0.095673 (sec), leaf count = 61

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

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

✓ **Maple** : cpu = 0.034 (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

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

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

Let

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

Hence

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

Equating this to RHS of (1) gives

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

Simplifying

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

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

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

Therefore

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

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 = 0.319217 (sec), leaf count = 195

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

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

✓ **Maple** : cpu = 0.056 (sec), leaf count = 62

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

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

Hand solution

$$y'(x) = -axy^2 - y^3 \quad (1)$$

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

$$\frac{dx}{du} = u + \frac{1}{2}ax^2 \quad (2)$$

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

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

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

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

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

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

We now go back to (3) and find x

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

Since

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

Then

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

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

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

✓ **Mathematica** : cpu = 0.730203 (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 = 0.064 (sec), leaf count = 50

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

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

2.38 ODE No. 38

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

✓ **Mathematica** : cpu = 0.383799 (sec), leaf count = 320

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

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

✓ **Maple** : cpu = 0.023 (sec), leaf count = 34

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

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

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 $\eta(\xi) = \sqrt{xy}$ and the above becomes

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

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

2.39

ODE No. 39

$$-a_0 - a_1 y(x) - a_2 y(x)^2 - a_3 y(x)^3 + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.122192 (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]
```

$$\text{Solve}\left[\text{RootSum}\left[\#1^3 a_3 + \#1^2 a_2 + \#1 a_1 + a_0 \&, \frac{\log(y(x) - \#1)}{3 \#1^2 a_3 + 2 \#1 a_2 + a_1} \&\right] = x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 30

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

$$x - \left(\int^{y(x)} \frac{1}{-a^3 a_3 + -a^2 a_2 + -a a_1 + a_0} d_{-}a \right) + c_1 = 0$$

2.40

ODE No. 40

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

✓

Mathematica : cpu = 0.34965 (sec), leaf count = 185

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

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

✓

Maple : cpu = 0.046 (sec), leaf count = 48

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

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

2.41

ODE No. 41

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

✓

Mathematica : cpu = 0.193485 (sec), leaf count = 103

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

Solve

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

✓

Maple : cpu = 0.221 (sec), leaf count = 103

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

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

2.42 ODE No. 42

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

✓ **Mathematica** : cpu = 0.678923 (sec), leaf count = 485

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

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

✓ **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 = 4.34013 (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]
```

Solve $\left[c_1 = -\frac{i\sqrt{-\frac{4a^3-3b}{4a^3}-\frac{3}{2a^2y(x)}+\frac{(-2a-3x)^2}{4a^2}}J_{\frac{1}{2}\sqrt{\frac{4a^3-3b}{a^3}}+1}\left(-i\sqrt{\frac{(-2a-3x)^2}{4a^2}-\frac{4a^3-3b}{4a^3}-\frac{3}{2a^2y(x)}}\right)+\left(\frac{1}{2}\sqrt{\frac{4a^3-3b}{a^3}}\right)}{i\sqrt{-\frac{4a^3-3b}{4a^3}-\frac{3}{2a^2y(x)}+\frac{(-2a-3x)^2}{4a^2}}Y_{\frac{1}{2}\sqrt{\frac{4a^3-3b}{a^3}}+1}\left(-i\sqrt{\frac{(-2a-3x)^2}{4a^2}-\frac{4a^3-3b}{4a^3}-\frac{3}{2a^2y(x)}}\right)+\left(\frac{1}{2}\sqrt{\frac{4a^3-3b}{a^3}}\right)}$

✓ Maple : cpu = 1.098 (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))
```

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

2.44 ODE No. 44

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

✓ **Mathematica** : cpu = 0.0955867 (sec), leaf count = 72

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{2}}{\sqrt{-2ax^2 - a + 2c_1e^{2x^2}}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{2}}{\sqrt{-2ax^2 - a + 2c_1e^{2x^2}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.013 (sec), leaf count = 53

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

$$y(x) = -\frac{2}{\sqrt{-4ax^2 + 4e^{2x^2}c_1 - 2a}}$$

Hand solution

$$y' = -2xy - 2ax^3y^3 \quad (1)$$

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 dividing 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

$$\frac{d}{dx} \left(e^{-2x^2} u \right) = 4ax^3 e^{-2x^2}$$

Integrating

$$\begin{aligned} e^{-2x^2} u &= 4a \int x^3 e^{-2x^2} dx + C \\ &= 4a \left(\frac{-1}{8} (2x^2 + 1) e^{-2x^2} \right) + C \end{aligned}$$

Therefore

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

Hence

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

Or

$$y = \pm \frac{\sqrt{2}}{\sqrt{-a(2x^2 + 1) + Ce^{2x^2}}}$$

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 = 0.660508 (sec), leaf count = 133

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

$$\text{Solve}\left[c_1 = \sqrt[4]{\left(\frac{b}{ax} - \frac{1}{ax^2y(x)}\right)^2 - 1} \left(-\frac{\left(\frac{b}{ax} - \frac{1}{ax^2y(x)}\right) {}_2F_1\left(\frac{1}{2}, \frac{3}{4}, \frac{3}{2}, \left(\frac{b}{ax} - \frac{1}{ax^2y(x)}\right)^2\right)}{2\sqrt[4]{1 - \left(\frac{b}{ax} - \frac{1}{ax^2y(x)}\right)^2}} - \frac{ax}{b}\right), y(x)\right]$$

✓

Maple : cpu = 0.115 (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))

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

2.46

ODE No. 46

$$-x^{-a}y(x) + ax^{-a-1} - x^{-2a} - x^ay(x)^3 + y'(x) + 3y(x)^2 = 0$$

✓

Mathematica : cpu = 0.316526 (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

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

✓

Maple : cpu = 0.083 (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))

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

2.47 ODE No. 47

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

X Mathematica : cpu = 26.1 (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]
```

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

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

X **Mathematica** : cpu = 27.4506 (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]
```

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

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

 **Mathematica** : cpu = 23.4907 (sec), leaf count = 0

```
DSolve[2 + 2*a + 6*a*phi[x]*y[x]^2 + a*y[x]^3*Derivative[1][phi][x] + Derivative[1][y][x] + (
```

, could not solve

```
DSolve[2 + 2*a + 6*a*phi[x]*y[x]^2 + a*y[x]^3*Derivative[1][phi][x] + Derivative[1][y][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
```

, 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
```


2.50 ODE No. 50

$$-f_0(x) - f_1(x)y(x) - f_2(x)y(x)^2 - f_3(x)y(x)^3 + y'(x) = 0$$

✗ Mathematica : cpu = 56.3379 (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

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

✓ **Mathematica** : cpu = 1.55875 (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] +
```

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

✓ **Maple** : cpu = 1.419 (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),
```

$$y(x) = \frac{(f(x)-g(x))(a+2b)}{e^{\text{RootOf}\left(a^3b\left(\int g(x)^2h(x)dx\right)+a^2b^2\left(\int g(x)^2h(x)dx\right)+ab^3\left(\int g(x)^2h(x)dx\right)-Za^3b^3-a^3b\ln\left(\frac{9a^3+18a^2b+18ab^2+9b^3}{(a-b)^3}\right)\right)}}$$

2.52

ODE No. 52

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

✓

Mathematica : cpu = 1.5449 (sec), leaf count = 117

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

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

✓

Maple : cpu = 0.366 (sec), leaf count = 54

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

$$\int_{-b}^{y(x)}\frac{x^{\frac{n}{n-1}}}{(ax\left(n-1\right)-a^n+_ax^{\frac{n}{n-1}}+bx\left(n-1\right)}d_-a-c_1=0$$

2.53 ODE No. 53

$$f(x)^{1-n}g'(x)y(x)^n(-(ag(x)+b)^{-n})-\frac{y(x)f'(x)}{f(x)}-f(x)g'(x)+y'(x)=0$$

✓ **Mathematica** : cpu = 1.18059 (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*Derivative[1][y][x], y[x], x]
```

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

✓ **Maple** : cpu = 0.218 (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),x))
```

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

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 = 0.550091 (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

$$\text{Solve}\left[y(x)\left(a^nf(x)^{-n}\right)^{\frac{1}{n}}{}_2F_1\left(1,\frac{1}{n};1+\frac{1}{n};-\left(\left(a^nf(x)^{-n}\right)^{\frac{1}{n}}y(x)\right)^n\right)=f(x)g(x)\left(a^nf(x)^{-n}\right)^{\frac{1}{n}}+c_1,y(x)\right]$$

✓

Maple : cpu = 0.142 (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(

$$\frac{ay(x)\operatorname{LerchPhi}\left(-\left(\frac{ay(x)}{f(x)}\right)^n,1,\frac{1}{n}\right)}{nf(x)}-ag(x)+c_1=0$$

2.55 ODE No. 55

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

X **Mathematica** : cpu = 0.538744 (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]
```

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 = 0.783869 (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 = 0.0510253 (sec), leaf count = 26

```
DSolve[-Sqrt[Abs[y[x]]] + Derivative[1][y][x] == 0,y[x],x]
```

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

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

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

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

2.58

ODE No. 58

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

✓ **Mathematica** : cpu = 0.289538 (sec), leaf count = 119

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

Solve

$$\frac{a^2\left(-\log\left(a^2\left(\sqrt{\frac{a^2y(x)}{b^2x^2}}+1\right)-\frac{2a^2y(x)}{bx^2}\right)-\frac{2a\tanh^{-1}\left(\frac{a^2-4b\sqrt{\frac{a^2y(x)}{b^2x^2}}}{a\sqrt{a^2+8b}}\right)}{\sqrt{a^2+8b}}\right)}{2b}=\frac{a^2\log(x)}{b}+c_1,y(x)$$

✓ **Maple** : cpu = 0.092 (sec), leaf count = 68

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

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

2.59

ODE No. 59

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

✓ **Mathematica** : cpu = 0.249474 (sec), leaf count = 84

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

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

✓ **Maple** : cpu = 0.085 (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 = 0.140767 (sec), leaf count = 92

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{\tanh\left(\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right) + c_1\right)}{\sqrt{-1 + \tanh^2\left(\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right) + c_1\right)}} \right\}, \left\{ y(x) \rightarrow \frac{\tanh\left(\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right) + c_1\right)}{\sqrt{-1 + \tanh^2\left(\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right) + c_1\right)}} \right\} \right\}$$

✓ **Maple** : cpu = 0.033 (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

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

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 $\int \frac{dy}{(y^2 - 1)^{\frac{1}{2}}} = \tanh^{-1} \frac{y}{(y^2 - 1)^{\frac{1}{2}}} = \ln(y + \sqrt{y^2 - 1})$, hence

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

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 $\int \frac{dy}{(y^2-1)^{\frac{1}{2}}} = \tanh^{-1} \frac{y}{(y^2-1)^{\frac{1}{2}}} = \ln(y + \sqrt{y^2-1})$, hence

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

Therefore

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

2.61

ODE No. 61

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

✓

Mathematica

: cpu = 0.146527 (sec), leaf count = 75

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

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[\frac{1}{2}\#1\sqrt{\#1^2-1}-\frac{1}{2}\tanh^{-1}\left(\frac{\#1}{\sqrt{\#1^2-1}}\right)\&\right]\left[\frac{1}{2}\sqrt{x^2-1}x-\frac{1}{2}\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right)\right]\right.\right.$$

✓

Maple

: cpu = 0.017 (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 = 1.72298 (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], y[x], x]`

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

✓ **Maple** : cpu = 0.503 (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

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

Let $y = ux$ then $y' = u + xu'$ therefore

$$\begin{aligned} u + xu' &= \frac{y - x^2 \sqrt{x^2 - y^2}}{xy \sqrt{x^2 - y^2} + x} \\ &= \frac{ux - x^2 \sqrt{x^2 - (ux)^2}}{x(ux) \sqrt{x^2 - (ux)^2} + x} \\ &= \frac{ux - x^3 \sqrt{1 - u^2}}{x^3 u \sqrt{1 - u^2} + x} \\ &= \frac{u - x^2 \sqrt{1 - u^2}}{x^2 u \sqrt{1 - u^2} + 1} \end{aligned}$$

Hence

$$\begin{aligned} u(x^2 u \sqrt{1 - u^2} + 1) + xu'(x^2 u \sqrt{1 - u^2} + 1) &= u - x^2 \sqrt{1 - u^2} \\ x^2 u^2 \sqrt{1 - u^2} + u + u'(x^3 u \sqrt{1 - u^2} + x) &= u - x^2 \sqrt{1 - u^2} \\ x^2 u^2 \sqrt{1 - u^2} + u'(x^3 u \sqrt{1 - u^2} + x) &= -x^2 \sqrt{1 - u^2} \\ x u^2 \sqrt{1 - u^2} + u'(x^2 u \sqrt{1 - u^2} + 1) &= -x \sqrt{1 - u^2} \\ x u^2 + u' \left(x^2 u + \frac{1}{\sqrt{1 - u^2}} \right) &= -x \\ x(1 + u^2) + u' \left(x^2 u + \frac{1}{\sqrt{1 - u^2}} \right) &= 0 \end{aligned}$$

Hence

$$x(1 + u^2) dx + \left(x^2 u + \frac{1}{\sqrt{1 - u^2}} \right) du = 0 \quad (2)$$

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

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

Therefore (2) is exact. Let

$$x(1+u^2) dx + \left(x^2u + \frac{1}{\sqrt{1-u^2}} \right) du = dU$$

Since $dU = \frac{\partial U}{\partial x} dx + \frac{\partial U}{\partial u} du$. Comparing with the above, we see that

$$\frac{\partial U}{\partial x} = x(1+u^2) \quad (3)$$

$$\frac{\partial U}{\partial u} = x^2u + \frac{1}{\sqrt{1-u^2}} \quad (4)$$

From (3)

$$\begin{aligned} U &= \int x(1+u^2) dx \\ &= \frac{x^2}{2}(1+u^2) + f(u) \end{aligned} \quad (5)$$

From (4)

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

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 = 0.0967389 (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

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

✓

Maple

: cpu = 11.427 (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))

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

2.64 ODE No. 64

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

✓ **Mathematica** : cpu = 0.342154 (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]
```

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

✓ **Maple** : cpu = 0.184 (sec), leaf count = 124

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

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

2.65

ODE No. 65

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

✓ **Mathematica** : cpu = 51.8603 (sec), leaf count = 312

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

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[\frac{i(\#1 + 1) \sqrt{1 + \frac{6i}{(\sqrt{3} - 3i)(\#1 + 1)}} \sqrt{\frac{2}{3} - \frac{4i}{(\sqrt{3} + 3i)(\#1 + 1)}} F \left(i \sinh^{-1} \left(\frac{\sqrt{-\frac{6i}{3i + \sqrt{3}}}}{\sqrt{\#1 + 1}} \right) \middle| \frac{3i + \sqrt{3}}{3i - \sqrt{3}} \right)}{\sqrt{-\frac{i}{\sqrt{3} + 3i}}} \sqrt{\#1^2 - \#1 + 1} \right] \right\} \right\}$$

✓ **Maple** : cpu = 0.114 (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 = 0.133277 (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], y[x], x]

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

✓

Maple

: cpu = 0.165 (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 = 0.143761 (sec), leaf count = 14

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

$$\left\{ \left\{ y(x) \rightarrow \operatorname{sn}\left(c_1 + F\left(\sin^{-1}(x) \middle| -1\right) - 1\right) - 1 \right\} \right\}$$

✓ **Maple** : cpu = 0.042 (sec), leaf count = 51

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

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

2.68 ODE No. 68

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

✓ **Mathematica** : cpu = 20.5589 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{i \sqrt{\frac{2 \#1^2 a + \sqrt{b^2 - 4a} + b}{\sqrt{b^2 - 4a} + b}} \sqrt{\frac{2 \#1^2 a}{b - \sqrt{b^2 - 4a}}} + 1 F \left(i \sinh^{-1} \left(\sqrt{2} \sqrt{\frac{a}{b + \sqrt{b^2 - 4a}}} \#1 \right) \middle| \frac{b + \sqrt{b^2 - 4a}}{b - \sqrt{b^2 - 4a}} \right)}{\sqrt{2} \sqrt{\frac{a}{\sqrt{b^2 - 4a} + b}} \sqrt{\#1^4 a + \#1^2 b + 1}} \right] \right\} \right\}$$

✓ **Maple** : cpu = 0.108 (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))
```

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

2.69 ODE No. 69

$y'(x)-\sqrt{(a_0+a_1x+a_2x^2+a_3x^3+a_4x^4)(b_0+b_1y(x)+b_2y(x)^2+b_3y(x)^3+b_4y(x)^4)}=0$

✓ **Mathematica** : cpu = 28.4203 (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)]==0,x]
```

Solve $\left[-\frac{2F\left(\sin^{-1}\left(\sqrt{\frac{(\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,2]-\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,4])}{(\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,1]-\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,4])}\right)}{(y(x)-\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,4])}\right)}{(\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,1]-\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,4])}\right)}{y(x)-\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,4])}$

✓ **Maple** : cpu = 0.279 (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+b0))/sqrt(a4*b4+a3*b3+a2*b2+a1*b1+b0),x)
```

$\int^{y(x)} \frac{1}{\sqrt{-a^4 b_4+_a^3 b_3+_a^2 b_2+_a b_1+b_0}} d_a+_a + \int^x -\frac{\sqrt{(b_4 y(x)^4+b_3 y(x)^3+b_2 y(x)^2+b_1 y(x)+b_0)}}{\sqrt{b_4 y(x)^4+b_3 y(x)^3+b_2 y(x)^2+b_1 y(x)+b_0}} dx$

2.70

ODE No. 70

$$y'(x) - \sqrt{\frac{a_0 + a_1x + a_2x^2 + a_3x^3 + a_4x^4}{b_0 + b_1y(x) + b_2y(x)^2 + b_3y(x)^3 + b_4y(x)^4}} = 0$$

✓ **Mathematica** : cpu = 23.671 (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)], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[\int_1^{\#1} \sqrt{b_4 K[1]^4 + b_3 K[1]^3 + b_2 K[1]^2 + b_1 K[1] + b_0} dK[1] \& \right] \left[\int_1^x \sqrt{a_4 K[2]^4 + a_3 K[2]^3 + a_2 K[2]^2 + a_1 K[2] + a_0} dK[2] \right] \right\} \right\}$$

✓ **Maple** : cpu = 0.264 (sec), leaf count = 113

```
dsolve(diff(y(x),x)-((a4*x^4+a3*x^3+a2*x^2+a1*x+a0)/(b4*y(x)^4+b3*y(x)^3+b2*y(x)^2+b1*y(x)+b0)),y(x))
```

$$\int^{y(x)} \sqrt{-a^4 b_4 + -a^3 b_3 + -a^2 b_2 + -a b_1 + b_0} da + \int^x -\sqrt{\frac{-a^4 a_4 + -a^3 a_3 + -a^2 a_2 + -a a_1 + a_0}{b_4 y(x)^4 + b_3 y(x)^3 + b_2 y(x)^2 + b_1 y(x) + b_0}} dx$$

2.71

ODE No. 71

$$y'(x) - \sqrt{\frac{b_0 + b_1y(x) + b_2y(x)^2 + b_3y(x)^3 + b_4y(x)^4}{a_0 + a_1x + a_2x^2 + a_3x^3 + a_4x^4}} = 0$$

✓ **Mathematica** : cpu = 4.65477 (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 +
```

Solve

$$\left[-\frac{2F\left(\sin^{-1}\left(\sqrt{\frac{(\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,2]-\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,4])}{(\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,1]-\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,4])}}\right)(y(x)-\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,4])}{(\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,1]-\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,4])}}\right)}{(\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,1]-\text{Root}[b_4\#1^4+b_3\#1^3+b_2\#1^2+b_1\#1+b_0\&,4])}}$$

✓ **Maple** : cpu = 0.181 (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
```

$$\int^{y(x)} \frac{1}{\sqrt{-a^4 b_4 + -a^3 b_3 + -a^2 b_2 + -a b_1 + b_0}} d_- a + \int^x -\frac{\sqrt{\frac{b_4 y(x)^4 + b_3 y(x)^3 + b_2 y(x)^2 + b_1 y(x) + b_0}{-a^4 a_4 + -a^3 a_3 + -a^2 a_2 + -a a_1 + a_0}}}{\sqrt{b_4 y(x)^4 + b_3 y(x)^3 + b_2 y(x)^2 + b_1 y(x) + b_0}}$$

2.72 ODE No. 72

$y'(x)-R1\left(x,\sqrt{a0+a1x+a2x^2+a3x^3+a4x^4}\right)R2\left(y(x),\sqrt{b0+b1y(x)+b2y(x)^2+b3y(x)^3+b4y(x)^4}\right)=0$

✓ **Mathematica** : cpu = 0.361366 (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 + b3*y[x]^3 + b4*y[x]^4]]), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[\int_1^{\#1} \frac{1}{R2\left(K[1], \sqrt{b4K[1]^4 + b3K[1]^3 + b2K[1]^2 + b1K[1] + b0}\right)} dK[1] \right] \right\} \right\}$$

✓ **Maple** : cpu = 0.021 (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+b2*y(x)^2+b1*y(x)+b0)^(1/2)),x)
```

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

2.73 ODE No. 73

$$y'(x) - \left(\frac{a_0 + a_1x + a_2x^2 + a_3x^3}{a_0 + a_1y(x) + a_2y(x)^2 + a_3y(x)^3}\right)^{2/3} = 0$$

✓ **Mathematica** : cpu = 21.1209 (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) + Derivat
```

Solve

$$\left[\frac{3(a_0 + y(x)(a_1 + y(x)(a_2 + a_3y(x))))^{2/3} \left(y(x) - \text{Root}\left[\#1^3a_3 + \#1^2a_2 + \#1a_1 + a_0\&, 1\right]\right) F_1\left(\frac{5}{3}; -\frac{2}{3}\right)}{5 \left(\frac{y(x) - \text{Root}\left[\#1^3a_3 + \#1^2a_2 + \#1a_1 + a_0\&, 2\right]}{\text{Root}\left[\#1^3a_3 + \#1^2a_2 + \#1a_1 + a_0\&, 1\right]} - \text{Root}\left[\#1^3a_3 + \#1^2a_2 + \#1a_1 + a_0\&, 1\right]}\right)} \right]$$

✓ **Maple** : cpu = 0.701 (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
```

$$\int^{y(x)} \left(\_a^3 a_3 + \_a^2 a_2 + \_a a_1 + a_0\right)^{2/3} d\_a + \int^x -\left(\frac{\_a^3 a_3 + \_a^2 a_2 + \_a a_1 + a_0}{a_3 y(x)^3 + a_2 y(x)^2 + a_1 y(x) + a_0}\right)^{2/3} (a_3 y(x)^3 + a_2 y(x)^2 + a_1 y(x) + a_0) dy(x)$$

2.74 ODE No. 74

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

 **Mathematica** : cpu = 1.49156 (sec), leaf count = 0

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

, could not solve

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

 **Maple** : cpu = 0. (sec), leaf count = 0

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

, could not solve

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

2.75 ODE No. 75

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

✓ **Mathematica** : cpu = 0.151781 (sec), leaf count = 18

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

$$\{\{y(x) \rightarrow \log(1 + e^{-e^x + c_1})\}\}$$

✓ **Maple** : cpu = 0.191 (sec), leaf count = 20

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

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

Hand solution

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

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

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

But $\ln x - \ln y = \ln\left(\frac{x}{y}\right)$ and the above becomes

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

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

$$y = \ln(1 - C_2 e^{-e^x})$$

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 = 0.172674 (sec), leaf count = 116

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

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

✓ **Maple** : cpu = 0.139 (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

$$\begin{aligned} \int \frac{dy}{a \cos y + b} &= \int \frac{2}{1+t^2} \frac{1}{\left(a \frac{1-t^2}{1+t^2} + b\right)} dt \\ &= 2 \int \frac{1+t^2}{(1+t^2)(a(1-t^2) + b(1+t^2))} dt \\ &= 2 \int \frac{dt}{a - at^2 + b + bt^2} \\ &= 2 \int \frac{dt}{(a+b) + t^2(b-a)} \\ &= 2 \int \frac{dt}{(a+b) \left(1 + \frac{t^2(b-a)}{(a+b)}\right)} \\ &= \frac{2}{a+b} \int \frac{dt}{\left(1 + \frac{t^2(b-a)}{(a+b)}\right)} \end{aligned}$$

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

$$\begin{aligned}
\frac{2}{a+b} \int \frac{dt}{\left(1 + \frac{t^2(b-a)}{(a+b)}\right)} &= \frac{2}{a+b} \int \frac{\sqrt{a+b}}{\sqrt{b-a}} \frac{dz}{(1+z^2)} \\
&= \frac{2}{a+b} \frac{\sqrt{a+b}}{\sqrt{b-a}} \int \frac{dz}{(1+z^2)} \\
&= \frac{2}{\sqrt{a+b}} \frac{1}{\sqrt{b-a}} \int \frac{dz}{(1+z^2)} \\
&= \frac{2}{\sqrt{(a+b)(b-a)}} \int \frac{dz}{(1+z^2)} \\
&= \frac{2}{\sqrt{b^2-a^2}} \int \frac{dz}{(1+z^2)}
\end{aligned}$$

Now, $\int \frac{dz}{(1+z^2)} = \arctan(z)$, hence

$$\begin{aligned}
\frac{2}{\sqrt{b^2-a^2}} \int \frac{dz}{(1+z^2)} &= \frac{2}{\sqrt{b^2-a^2}} \arctan(z) \\
&= \frac{2}{\sqrt{b^2-a^2}} \arctan\left(\frac{t\sqrt{b-a}}{\sqrt{a+b}}\right)
\end{aligned}$$

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 = 0.351482 (sec), leaf count = 124

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

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

✓ **Maple** : cpu = 0.161 (sec), leaf count = 54

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

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

Hand solution

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

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

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

This is the same as Kamke 76 (the problem before this), which we solved using half angle tan transformation, and the answer is

$$u = 2 \arctan \left(\frac{a+b}{\sqrt{b^2-a^2}} \tan \left(\frac{1}{2} \sqrt{b^2-a^2}(x+C) \right) \right)$$

Since $u = ay + bx$ then $y = \frac{u-bx}{a}$, hence

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

Verification

```
ode:=diff(y(x),x)=cos(a*y(x)+b*x);
my_sol:=(1/a)*(2*arctan((a+b)/sqrt(b^2-a^2)*tan(1/2*sqrt(b^2-a^2)*(x+C1)))-b*x);
odetest(y(x)=my_sol,ode);
0
```


2.78 ODE No. 78

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

✓ **Mathematica** : cpu = 0.918049 (sec), leaf count = 1317

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

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

✓ **Maple** : cpu = 0.204 (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

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

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

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

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

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

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

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

Back to (1), therefore after integrating both sides

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

Let

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

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

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

X **Mathematica** : cpu = 20.8524 (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]
```

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 = 0.0441676 (sec), leaf count = 72

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

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

✓

Maple : cpu = 2.743 (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))

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

2.81

ODE No. 81

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

✓

Mathematica : cpu = 1.06244 (sec), leaf count = 220

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

Solve

$$c_1 = \frac{\frac{1}{2} \left(\frac{1}{\frac{i \tan(x)}{\tan^2(x)+1} - \frac{i \tan^2(x) \tan(y(x))}{\tan^2(x)+1}} + i \cot(x) \right) \sqrt[4]{1 - \left(\frac{1}{\frac{i \tan(x)}{\tan^2(x)+1} - \frac{i \tan^2(x) \tan(y(x))}{\tan^2(x)+1}} + i \cot(x) \right)^2} {}_2F_1 \left(\frac{1}{2}, \frac{5}{4}; \frac{3}{2}; \left(i \frac{1}{\frac{i \tan(x)}{\tan^2(x)+1} - \frac{i \tan^2(x) \tan(y(x))}{\tan^2(x)+1}} + i \cot(x) \right)^2 \right)}{\sqrt[4]{-1 + \left(\frac{1}{\frac{i \tan(x)}{\tan^2(x)+1} - \frac{i \tan^2(x) \tan(y(x))}{\tan^2(x)+1}} + i \cot(x) \right)^2}}$$

✓

Maple : cpu = 1.921 (sec), leaf count = 78

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

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

2.82 ODE No. 82

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

✗ Mathematica : cpu = 43.4182 (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 = 0.270574 (sec), leaf count = 69

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

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

✓ **Maple** : cpu = 0.477 (sec), leaf count = 44

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

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

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 = 0.342009 (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]

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

✓

Maple : cpu = 0.681 (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))

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

2.86

ODE No. 86

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

✓ **Mathematica** : cpu = 0.47636 (sec), leaf count = 184

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

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{-f(x^2+aK[2]^2)K[2]a^2-xa}{x^2+aK[2]^2}-\int_1^x\left(\frac{a-2a^2K[1]K[2]f'(K[1]^2+aK[2]^2)}{K[1]^2+aK[2]^2}-\frac{2aK[2](aK[2]\cdot(K[1]^2+aK[2]^2))}{(K[1]^2+aK[2]^2)^2}\right)dx\right)dy=0\right]$$

✓ **Maple** : cpu = 0.363 (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

$$y'(x) - \frac{cx^ay(x)^b + ay(x)f(x^cy(x))}{bx^f(x^cy(x)) - x^ay(x)^b} = 0$$

 **Mathematica** : cpu = 4.12571 (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]
```

, 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)) + Derivativ
```

 **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
```

, 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
```

2.88 ODE No. 88

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

✓ **Mathematica** : cpu = 0.345099 (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]`

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

✓ **Maple** : cpu = 0.313 (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))`

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

Hand solution

$$y' = \frac{1}{2}b + \frac{1}{2}ce^{-2ax} + 2ay + \frac{3}{2}y^2$$

This is of the form $y' = f_0 + f_1y + f_2y^2$ with $f_0 = \frac{1}{2}b + \frac{1}{2}ce^{-2ax}$, $f_1 = 2a$, $f_2 = \frac{3}{2}$. 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

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

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

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

$$u(x) = C_1 e^{ax} \operatorname{BesselJ}\left(-\frac{1}{2} \frac{\sqrt{4a^2 - 3b}}{a}, \frac{1}{2} \frac{\sqrt{3c} e^{-ax}}{a}\right) + C_2 e^{ax} \operatorname{BesselY}\left(-\frac{1}{2} \frac{\sqrt{4a^2 - 3b}}{a}, \frac{1}{2} \frac{\sqrt{3c} e^{-ax}}{a}\right)$$

But

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

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 = 0.0299719 (sec), leaf count = 42

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

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

✓ **Maple** : cpu = 0.036 (sec), leaf count = 56

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

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

Hand solution

$$xy' = \pm \sqrt{a^2 - x^2}$$

This is separable. $y' = \frac{\pm \sqrt{a^2 - x^2}}{x}$ or $dy = \frac{\pm \sqrt{a^2 - x^2}}{x} dx$. Hence

$$y = \pm \int \frac{\sqrt{a^2 - x^2}}{x} dx + C$$

Let $x = a \sin u$, then $dx = a \cos(u) du$ and the integral becomes

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

For $\int \frac{1}{\sin u} du$, using half tan angle, let $t = \tan \left(\frac{u}{2} \right)$, $du = \frac{2}{1+t^2} dt$, $\sin u = \frac{2t}{1+t^2}$, therefore

$$\begin{aligned} \int \frac{1}{\sin u} du &= \int \frac{1+t^2}{2t} \frac{2}{1+t^2} dt \\ &= \int \frac{1}{t} dt \\ &= \ln(t) \end{aligned}$$

Hence $\int \frac{1}{\sin u} du = \ln \left(\tan \left(\frac{u}{2} \right) \right)$ and from (1)

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

But $x = a \sin u$, hence $u = \arcsin \left(\frac{x}{a} \right)$ and the integral becomes

$$\int \frac{\sqrt{a^2 - x^2}}{x} dx = a \left[\ln \left(\tan \left(\frac{\arcsin \left(\frac{x}{a} \right)}{2} \right) \right) + \cos \left(\arcsin \left(\frac{x}{a} \right) \right) \right]$$

Hence the solution is

$$y = \pm a \left[\ln \left(\tan \left(\frac{\arcsin \left(\frac{x}{a} \right)}{2} \right) \right) + \cos \left(\arcsin \left(\frac{x}{a} \right) \right) \right] + C$$

Maple do not verify the above, but I do not see what is wrong with the solution. Will investigate more later.

2.90 ODE No. 90

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

✓ **Mathematica** : cpu = 0.0249507 (sec), leaf count = 24

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

$$\left\{ \left\{ y(x) \rightarrow \frac{\sin(x) - x \cos(x)}{x} + \frac{c_1}{x} \right\} \right\}$$

✓ **Maple** : cpu = 0.03 (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 = 0.0241953 (sec), leaf count = 15

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

$$\{ \{ y(x) \rightarrow x \log(\log(x)) + c_1 x \} \}$$

✓ **Maple** : cpu = 0.007 (sec), leaf count = 11

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

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

2.92 ODE No. 92

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

✓ **Mathematica** : cpu = 0.0171002 (sec), leaf count = 15

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

$$\{\{y(x) \rightarrow -x \cos(x) + c_1 x\}\}$$

✓ **Maple** : cpu = 0.007 (sec), leaf count = 12

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

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

Hand solution

$$xy' - y = x^2 \sin x$$

Linear first order, exact, separable. $y' - \frac{y}{x} = x \sin x$, integrating factor $\mu = e^{\int -\frac{1}{x} dx} = e^{-\ln x} = \frac{1}{x}$, hence

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

Verification

```
restart;
ode:=x*diff(y(x),x)-y(x)=x^2*sin(x);
my_sol:=x*(C1-cos(x));
odetest(y(x)=my_sol,ode);
0
```

2.93 ODE No. 93

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

✓ **Mathematica** : cpu = 0.0375532 (sec), leaf count = 16

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

$$\{ \{y(x) \rightarrow x \sin(\log(\log(x))) + c_1 x\} \}$$

✓ **Maple** : cpu = 0.035 (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 = 0.0385486 (sec), leaf count = 25

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{bx^n}{a+n} + c_1 x^{-a} \right\} \right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 23

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

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

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

$$\begin{aligned} d(\mu y) &= -\mu bx^{n-1} \\ x^a y &= -\int bx^{a+n-1} + C \end{aligned}$$

If $a = -n$ then

$$\begin{aligned} x^a y &= -\int bx^{-1} + C \\ y &= -x^{-a}b \ln(x) + x^{-a}C \\ &= x^{-a}(C - b \ln x) \end{aligned}$$

If $a \neq -n$ then

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

Verification

```
restart;
ode:=x*diff(y(x),x)+a*y(x)+b*x^n=0;
s1:=x^(-a)*(_C1-b*ln(x));
s2:=-b*(x^n/(a+n))+_C1*x^(-a);
odetest(y(x)=s2,ode);
0
```

2.95 ODE No. 95

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

✓ **Mathematica** : cpu = 0.0612795 (sec), leaf count = 32

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

$$\left\{ \left\{ y(x) \rightarrow \frac{x(-Y_1(x) - c_1 J_1(x))}{Y_0(x) + c_1 J_0(x)} \right\} \right\}$$

✓ **Maple** : cpu = 0.069 (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 $x \neq 0$

$$\begin{aligned} y' &= -x - \frac{1}{x}y^2 \\ &= f_0 + f_1y + f_2y^2 \end{aligned} \tag{1}$$

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

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

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

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

And from (2) the solution is

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

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

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

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 = 0.0536265 (sec), leaf count = 33

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

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

✓ **Maple** : cpu = 0.059 (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 = 0.085697 (sec), leaf count = 46

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{b}x \tan \left(\sqrt{a}\sqrt{b}x - \sqrt{a}\sqrt{b}c_1 \right)}{\sqrt{a}} \right\} \right\}$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 25

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

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

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 = 0.159625 (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]`

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

✓

Maple : cpu = 0.117 (sec), leaf count = 38

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

$$y(x)=-\frac{\tan\left(\frac{\sqrt{c}\sqrt{a}x^b+c_1b}{b}\right)\sqrt{c}x^b}{\sqrt{a}}$$

2.99

ODE No. 99

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

✓

Mathematica : cpu = 0.149694 (sec), leaf count = 244

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

$$\left\{\left\{y(x) \rightarrow -\frac{\sqrt{-a}\sqrt{c}x^{\beta/2}\left(-2J_{\frac{b}{\beta}-1}\left(\frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right)+c_1J_{1-\frac{b}{\beta}}\left(\frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right)-c_1J_{-\frac{b+\beta}{\beta}}\left(\frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right)\right)-bc_1J_{-\frac{b}{\beta}}}{2a\left(J_{\frac{b}{\beta}}\left(\frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right)+c_1J_{-\frac{b}{\beta}}\left(\frac{2\sqrt{-a}\sqrt{c}x^{\beta/2}}{\beta}\right)\right)}\right.\right.$$

✓

Maple : cpu = 0.152 (sec), leaf count = 171

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

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

2.100 ODE No. 100

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

✓ **Mathematica** : cpu = 0.0827244 (sec), leaf count = 199

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{\frac{i\sqrt{a}Y_1(2\sqrt{a}\sqrt{x})}{\sqrt{x}} + ia(Y_0(2\sqrt{a}\sqrt{x}) - Y_2(2\sqrt{a}\sqrt{x})) + c_1\left(\frac{\sqrt{a}J_1(2\sqrt{a}\sqrt{x})}{2\sqrt{x}} + \frac{1}{2}a(J_0(2\sqrt{a}\sqrt{x}) - J_2(2\sqrt{a}\sqrt{x}))\right)}{-2i\sqrt{a}\sqrt{x}Y_1(2\sqrt{a}\sqrt{x}) - \sqrt{a}c_1\sqrt{x}J_1(2\sqrt{a}\sqrt{x})} \right. \right.$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 59

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

$$y(x) = \frac{\sqrt{a} (\text{BesselJ}(0, 2\sqrt{a}\sqrt{x}) c_1 + \text{BesselY}(0, 2\sqrt{a}\sqrt{x}))}{\sqrt{x} (c_1 \text{BesselJ}(1, 2\sqrt{a}\sqrt{x}) + \text{BesselY}(1, 2\sqrt{a}\sqrt{x}))}$$

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

$$u = C_1\sqrt{x} \text{BesselJ}(1, 2\sqrt{ax}) + C_2\sqrt{x} \text{BesselY}(1, 2\sqrt{ax})$$

But

$$\frac{d}{dx} \text{BesselJ}(1, 2\sqrt{ax}) = \frac{\sqrt{a}}{\sqrt{x}} \left(\text{BesselJ}(0, 2\sqrt{ax}) - \frac{1}{2} \frac{1}{\sqrt{ax}} \text{BesselJ}(1, 2\sqrt{ax}) \right)$$

And

$$\frac{d}{dx} \text{BesselY}(1, 2\sqrt{ax}) = \frac{\sqrt{a}}{\sqrt{x}} \left(\text{BesselY}(0, 2\sqrt{ax}) - \frac{1}{2} \frac{1}{\sqrt{ax}} \text{BesselY}(1, 2\sqrt{ax}) \right)$$

Therefore,

$$u' = C_1 \left(\frac{1}{2\sqrt{x}} \text{BesselJ}(1, 2\sqrt{a}\sqrt{x}) + \sqrt{x} \frac{\sqrt{a}}{\sqrt{x}} \left(\text{BesselJ}(0, 2\sqrt{a}\sqrt{x}) - \frac{1}{2} \frac{1}{\sqrt{ax}} \text{BesselJ}(1, 2\sqrt{a}\sqrt{x}) \right) \right) \\ + C_2 \left(\frac{1}{2\sqrt{x}} \text{BesselY}(1, 2\sqrt{a}\sqrt{x}) + \sqrt{x} \frac{\sqrt{a}}{\sqrt{x}} \left(\text{BesselY}(0, 2\sqrt{a}\sqrt{x}) - \frac{1}{2} \frac{1}{\sqrt{ax}} \text{BesselY}(1, 2\sqrt{a}\sqrt{x}) \right) \right)$$

Which is simplified to

$$u' = C_1 \sqrt{a} \text{BesselJ}(0, 2\sqrt{a}\sqrt{x}) + C_2 \sqrt{a} \text{BesselY}(0, 2\sqrt{a}\sqrt{x})$$

Therefore, from $y = \frac{u'}{u}$, the solution is

$$y = \frac{C_1 \sqrt{a} \text{BesselJ}(0, 2\sqrt{a}\sqrt{x}) + C_2 \sqrt{a} \text{BesselY}(0, 2\sqrt{a}\sqrt{x})}{C_1 \sqrt{x} \text{BesselJ}(1, 2\sqrt{a}\sqrt{x}) + C_2 \sqrt{x} \text{BesselY}(1, 2\sqrt{a}\sqrt{x})}$$

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

$$y = \frac{C \sqrt{a} \text{BesselJ}(0, 2\sqrt{a}\sqrt{x}) + \sqrt{a} \text{BesselY}(0, 2\sqrt{a}\sqrt{x})}{C \sqrt{x} \text{BesselJ}(1, 2\sqrt{a}\sqrt{x}) + \sqrt{x} \text{BesselY}(1, 2\sqrt{a}\sqrt{x})}$$

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 = 0.0605519 (sec), leaf count = 18

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

$$\left\{ \left\{ y(x) \rightarrow \frac{2x}{x^2 + 2c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.013 (sec), leaf count = 16

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

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

Hand solution

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

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 = 0.0721555 (sec), leaf count = 36

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

$$\left\{ \left\{ y(x) \rightarrow \sqrt{a}x \tanh \left(\frac{1}{2}(\sqrt{a}x^2 + 2\sqrt{a}c_1) \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 22

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

$$y(x) = \tanh \left(\frac{\sqrt{a}(x^2 + 2c_1)}{2} \right) x\sqrt{a}$$

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

$$\begin{aligned} x(v + xv') + x(xv)^2 - xv - ax^3 &= 0 \\ xv + x^2v' + x^3v^2 - xv - ax^3 &= 0 \\ x^2v' + x^3v^2 - ax^3 &= 0 \\ v' + xv^2 - ax &= 0 \\ \frac{dv}{dx} &= x(a - v^2) \\ \frac{dv}{a - v^2} &= xdx \end{aligned}$$

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 = 0.105428 (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]
```

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

✓ **Maple** : cpu = 0.043 (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

$$\begin{aligned} y' &= x^2 + \frac{(2x^2 + 1)}{x}y + y^2 \\ &= f_0 + f_1y + f_2y^2 \end{aligned} \tag{1}$$

Using standard transformation $y = -\frac{u'}{uf_2} = -\frac{u'}{u}$, therefore

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

Equating the above to RHS of (1) gives

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

This is second order linear ODE (Sturm-Liouville). Using the transformation $t = \frac{x^2}{2}$, then $\frac{dt}{dx} = x$ and

$$\frac{du}{dx} = \frac{du}{dt} \frac{dt}{dx} = x \frac{du}{dt} = \sqrt{2t} \frac{du}{dt}$$

And

$$\begin{aligned}
\frac{d^2u}{dx^2} &= \frac{d}{dx} \left(\frac{du}{dx} \right) \\
&= \frac{d}{dx} \left(x \frac{du}{dt} \right) \\
&= \frac{du}{dt} + x \frac{d^2u}{dt^2} \frac{dt}{dx} \\
&= \frac{du}{dt} + x \frac{d^2u}{dt^2} x \\
&= \frac{du}{dt} + x^2 \frac{d^2u}{dt^2} \\
&= \frac{du}{dt} + 2t \frac{d^2u}{dt^2}
\end{aligned}$$

Hence (2) can be written as

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

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 = 0.0920405 (sec), leaf count = 43

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{ax} - \sqrt{\frac{b}{a}} \tan \left(ax \sqrt{\frac{b}{a}} - c_1 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.075 (sec), leaf count = 63

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

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

Hand solution

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

$$\begin{aligned} y' &= -b - \frac{2}{x}y - ay^2 \\ &= f_0 + f_1y + f_2y^2 \end{aligned} \tag{1}$$

Using transformation suggested by Kamke $y = u(x) - \frac{1}{ax}$ then $y' = u' + \frac{1}{ax^2}$. Equating this to RHS of (1) gives

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

Hence

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

This is separable

$$\frac{du}{b + au^2} = -dx$$

Integrating

$$\begin{aligned} \int \frac{du}{b + au^2} &= -x + C \\ \frac{1}{\sqrt{ba}} \arctan \left(\frac{au}{\sqrt{ba}} \right) &= -x + C \\ \arctan \left(\frac{au}{\sqrt{ba}} \right) &= -\sqrt{ba}x + C \\ u &= \frac{\sqrt{ba}}{a} \tan \left(-\sqrt{ba}x + C \right) \end{aligned}$$

Hence

$$\begin{aligned}y &= u - \frac{1}{ax} \\&= \frac{\sqrt{ba}}{a} \tan\left(-\sqrt{ba}x + C\right) - \frac{1}{ax}\end{aligned}$$

Verification

```
restart;
ode:=x*diff(y(x),x)+a*x*y(x)^2+2*y(x)+b*x = 0;
my_solution:=sqrt(b*a)/a*tan(-sqrt(b*a)*x+_C1)-1/(a*x);
odetest(y(x)=my_solution,ode);
0
```

2.105

ODE No. 105

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

✓

Mathematica : cpu = 0.14705 (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]

$$\left\{\left\{y(x) \rightarrow \frac{c_1 \left(i \sqrt{a} e^{-i \sqrt{a} \sqrt{c} x} \left(b \left(-\sqrt{c}\right)-i \sqrt{a} d\right) U\left(1-\frac{-\sqrt{c} b-i \sqrt{a} d}{2 \sqrt{c}}, b+1, 2 i \sqrt{a} \sqrt{c} x\right)-i \sqrt{a} \sqrt{c} e^{-i \sqrt{a} \sqrt{c} x} U\left(-\frac{-\sqrt{c} b-i \sqrt{a} d}{2 \sqrt{c}}, b+1, 2 i \sqrt{a} \sqrt{c} x\right)\right)}{a \left(c_1 e^{-i \sqrt{a} \sqrt{c} x} U\left(-\frac{-\sqrt{c} b-i \sqrt{a} d}{2 \sqrt{c}}, b, 2 i \sqrt{a} \sqrt{c} x\right)+e^{-i \sqrt{a} \sqrt{c} x} U\left(-\frac{-\sqrt{c} b-i \sqrt{a} d}{2 \sqrt{c}}, b+1, 2 i \sqrt{a} \sqrt{c} x\right)\right)}\right.\right.$$

✓

Maple : cpu = 0.421 (sec), leaf count = 844

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

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

2.106 ODE No. 106

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

✓ **Mathematica** : cpu = 0.177094 (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]
```

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

✓ **Maple** : cpu = 0.104 (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

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

✓ **Mathematica** : cpu = 0.305791 (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]`

$$\left\{ \left\{ \begin{array}{l} x^{1-\alpha} \left((-1)^{\frac{\alpha-b}{\alpha+\beta}} a^{\frac{\alpha-b}{\alpha+\beta} + \frac{1}{2} \left(\frac{b}{\alpha+\beta} - \frac{\alpha}{\alpha+\beta} \right)} (\alpha + \beta)^{\frac{\alpha}{\alpha+\beta} - \frac{b}{\alpha+\beta} + 1} (\alpha^2 + 2\beta\alpha + \beta^2)^{-\frac{\alpha-b}{\alpha+\beta}} \left(\frac{\alpha-b}{\alpha+\beta} + \frac{1}{2} \left(\frac{b}{\alpha+\beta} - \frac{\alpha}{\alpha+\beta} \right) \right) \right. \right. \\ y(x) \rightarrow \frac{\hspace{10cm}}{\hspace{10cm}} \end{array} \right. \right.$$

✓ **Maple** : cpu = 0.355 (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))`

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

2.108 ODE No. 108

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

✓ **Mathematica** : cpu = 0.0611016 (sec), leaf count = 15

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

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{\log(x) + c_1 x + 1} \right\} \right\}$$

✓ **Maple** : cpu = 0.018 (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

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

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

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 = 0.0574562 (sec), leaf count = 17

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

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{2\log(x) + c_1x + 2} \right\} \right\}$$

✓ **Maple** : cpu = 0.013 (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

$$\begin{aligned} xy' - y(2y \ln x - 1) &= 0 \\ xy' &= y(2y \ln x - 1) \\ y' &= -\frac{1}{x}y + y^2 \frac{2}{x} \ln x \\ y' &= f_0 + f_1y + f_2y^2 \end{aligned} \tag{1}$$

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

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

Putting $u = \frac{1}{y}$, hence $u' = -\frac{y'}{y^2}$, and the above becomes

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

Integrating factor is $\mu = e^{\int -\frac{1}{x}dx} = e^{-\ln x} = \frac{1}{x}$, hence

$$\begin{aligned} d(\mu u) &= -2\mu \frac{\ln x}{x} \\ d\left(\frac{1}{x}u\right) &= -2\frac{\ln x}{x^2} \end{aligned}$$

Integrating

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

Therefore

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

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

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

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

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

✓ **Mathematica** : cpu = 0.0967685 (sec), leaf count = 56

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

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

✓ **Maple** : cpu = 0.037 (sec), leaf count = 13

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

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

2.111 ODE No. 111

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

✓ **Mathematica** : cpu = 0.321324 (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 = 0.191 (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 = 0.102146 (sec), leaf count = 58

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{x \tanh(\log(x) + c_1)}{\sqrt{1 - \tanh^2(\log(x) + c_1)}} \right\}, \left\{ y(x) \rightarrow \frac{x \tanh(\log(x) + c_1)}{\sqrt{1 - \tanh^2(\log(x) + c_1)}} \right\} \right\}$$

✓ **Maple** : cpu = 0.069 (sec), leaf count = 27

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

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

Hand solution

$$xy' = \sqrt{x^2 + y^2} + y$$

Let $y = xv$, then $y' = v + xv'$ and the above becomes

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

Separable.

$$\frac{dv}{\sqrt{1 + v^2}} = \frac{1}{x}dx$$

Integrating

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

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 = 0.0951693 (sec), leaf count = 70

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{x \tanh(-a \log(x) + c_1)}{\sqrt{1 - \tanh^2(-a \log(x) + c_1)}} \right\}, \left\{ y(x) \rightarrow \frac{x \tanh(-a \log(x) + c_1)}{\sqrt{1 - \tanh^2(-a \log(x) + c_1)}} \right\} \right\}$$

✓ **Maple** : cpu = 0.037 (sec), leaf count = 33

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

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

Hand solution

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

Let $y = xv$, then $y' = v + xv'$ and the above becomes

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

Separable.

$$\frac{dv}{\sqrt{1 + v^2}} = \frac{-a}{x} dx$$

Integrating

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

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 = 0.0849056 (sec), leaf count = 54

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

$$\left\{\left\{y(x)\rightarrow-\frac{x\tanh(x+c_1)}{\sqrt{1-\tanh^2(x+c_1)}}\right\},\left\{y(x)\rightarrow\frac{x\tanh(x+c_1)}{\sqrt{1-\tanh^2(x+c_1)}}\right\}\right\}$$

✓ **Maple** : cpu = 10.057 (sec), leaf count = 28

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

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

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 = 0.231856 (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]
```

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

✓ **Maple** : cpu = 0.338 (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))
```

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

Hand solution

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

Let $y = xu$, then $y' = u + xu'$ and the above becomes

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

Separable.

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

But $y = xu$, hence

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

Let $\frac{y}{x} = z$

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

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 = 14.4286 (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]

Solve

$$\left[\frac{\sqrt{\frac{\frac{y(x)}{x}+2}{\frac{y(x)}{x}-1}}\sqrt{\frac{\frac{y(x)}{x}+1}{2\frac{y(x)}{x}+4}}F\left(\sin^{-1}\left(\sqrt{\frac{2}{3}}\sqrt{\frac{\frac{y(x)}{x}-2}{\frac{y(x)}{x}-1}}\right)\middle|\frac{9}{8}\right)}{\sqrt{\frac{\frac{y(x)}{x}+1}{\frac{y(x)}{x}-1}}}=\frac{x^2}{2}+c_1,y(x)\right]$$

✓

Maple : cpu = 0.421 (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))

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

2.117 ODE No. 117

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

✓ **Mathematica** : cpu = 0.150283 (sec), leaf count = 28

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

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

✓ **Maple** : cpu = 0.142 (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 = 0.0814052 (sec), leaf count = 13

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

$$\{\{y(x) \rightarrow e^{e^{c_1} x}\}\}$$

✓ **Maple** : cpu = 0.105 (sec), leaf count = 8

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

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

2.119

ODE No. 119

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

✓ **Mathematica** : cpu = 0.0951035 (sec), leaf count = 17

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

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

✓ **Maple** : cpu = 0.073 (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 = 0.0911733 (sec), leaf count = 20

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

$$\left\{ \left\{ y(x) \rightarrow x^2 e^{-2c_1 e^{-x}} \right\} \right\}$$

✓ **Maple** : cpu = 0.224 (sec), leaf count = 17

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

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

2.121 ODE No. 121

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

X **Mathematica** : cpu = 1.09533 (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]
```

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

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

✓ **Mathematica** : cpu = 0.224537 (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]
```

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

✓ **Maple** : cpu = 0.616 (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 = 0.0857616 (sec), leaf count = 32

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

$$\left\{\left\{y(x) \rightarrow -x \cos^{-1}(-\tanh(\log(x) + c_1))\right\}, \left\{y(x) \rightarrow x \cos^{-1}(-\tanh(\log(x) + c_1))\right\}\right\}$$

✓ **Maple** : cpu = 0.136 (sec), leaf count = 44

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

$$y(x) = \arctan\left(\frac{2xc_1}{c_1^2x^2 + 1}, \frac{-c_1^2x^2 + 1}{c_1^2x^2 + 1}\right) x$$

2.124 ODE No. 124

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

✓ **Mathematica** : cpu = 0.0757025 (sec), leaf count = 16

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

$$\{\{y(x) \rightarrow 2x \tan^{-1}(-\log(x) + c_1)\}\}$$

✓ **Maple** : cpu = 0.053 (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

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

✓ **Mathematica** : cpu = 0.138472 (sec), leaf count = 16

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

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

✓ **Maple** : cpu = 0.075 (sec), leaf count = 14

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

$$y(x) = x \arcsin\left(\frac{1}{xc_1}\right)$$

2.126

ODE No. 126

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

✓

Mathematica

: cpu = 0.240773 (sec), leaf count = 115

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

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

✓

Maple

: cpu = 0.035 (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

$$xy'(x) - y(x)f(x^ay(x)^b) = 0$$

✓ **Mathematica** : cpu = 0.417142 (sec), leaf count = 186

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

Solve

$$\left[\int_1^{y(x)} \left(-\frac{b}{(a + bf(x^aK[2]^b))K[2]} - \int_1^x \left(\frac{b^2K[1]^{a-1}K[2]^{b-1}f'(K[1]^aK[2]^b)}{a + bf(K[1]^aK[2]^b)} - \frac{b^3f(K[1]^aK[2]^b)K[1]^a}{(a + bf(K[1]^aK[2]^b))K[2]} \right) dx \right) dy \right]$$

✓ **Maple** : cpu = 0.159 (sec), leaf count = 39

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

$$\int_{-b}^{y(x)} \frac{1}{(f(x^a - a^b)b + a) - a} d - a - \frac{\ln(x)}{b} - c_1 = 0$$

2.128 ODE No. 128

$$-f(x)g(x^ay(x)) + ay(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.578963 (sec), leaf count = 41

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

$$\text{Solve}\left[\int_1^{x^ay(x)} \frac{1}{g(K[1])}dK[1] = \int_1^x f(K[2])K[2]^{a-1}dK[2] + c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.376 (sec), leaf count = 33

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

$$y(x) = \text{RootOf}\left(-\left(\int x^{a-1}f(x)\,dx\right) + \int^{\frac{-Z}{g(-a)}} \frac{1}{g(-a)}d_{-a} + c_1\right)x^{-a}$$

2.129

ODE No. 129

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

✓ **Mathematica** : cpu = 0.197316 (sec), leaf count = 44

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

$$\left\{\left\{y(x)\rightarrow-\frac{e^{x+1}}{-x\operatorname{Ei}(x+1)-\operatorname{Ei}(x+1)+e^{x+1}-ec_1x-ec_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 33

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

$$y(x)=\frac{e^x}{-e^{-1}\left(1+x\right)\operatorname{Ei}_1\left(-1-x\right)-e^x+c_1\left(1+x\right)}$$

2.130 ODE No. 130

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

✓ **Mathematica** : cpu = 0.0165341 (sec), leaf count = 21

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

$$\left\{ \left\{ y(x) \rightarrow \frac{2x^3}{5} + c_1 \sqrt{x} \right\} \right\}$$

✓ **Maple** : cpu = 0.007 (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 = 0.177406 (sec), leaf count = 20

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

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

✓ **Maple** : cpu = 0.253 (sec), leaf count = 31

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

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

2.132 ODE No. 132

$$3xy'(x) - y(x) - 3xy(x)^4 \log(x) = 0$$

✓ **Mathematica** : cpu = 0.0918118 (sec), leaf count = 115

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

$$\left\{ \left\{ y(x) \rightarrow \frac{(-2)^{2/3} \sqrt[3]{x}}{\sqrt[3]{3x^2 - 6x^2 \log(x) + 4c_1}} \right\}, \left\{ y(x) \rightarrow \frac{2^{2/3} \sqrt[3]{x}}{\sqrt[3]{3x^2 - 6x^2 \log(x) + 4c_1}} \right\}, \left\{ y(x) \rightarrow -\frac{\sqrt[3]{-12} 2^{2/3} \sqrt[3]{x}}{\sqrt[3]{3x^2 - 6x^2 \log(x) + 4c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.1 (sec), leaf count = 153

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

$$y(x) = \frac{\left(-4x(6x^2 \ln(x) - 3x^2 - 4c_1)^2\right)^{1/3}}{6x^2 \ln(x) - 3x^2 - 4c_1}$$

2.133 ODE No. 133

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

✓ **Mathematica** : cpu = 0.0170915 (sec), leaf count = 27

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

$$\left\{ \left\{ y(x) \rightarrow -e^{\frac{1}{x}} \operatorname{Ei}\left(-\frac{1}{x}\right) + c_1 e^{\frac{1}{x}} \right\} \right\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 16

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

$$y(x) = \left(\operatorname{Ei}_1\left(\frac{1}{x}\right) + c_1 \right) e^{\frac{1}{x}}$$

2.134 ODE No. 134

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

✓ **Mathematica** : cpu = 0.0502948 (sec), leaf count = 27

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

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

✓ **Maple** : cpu = 0.008 (sec), leaf count = 17

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

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

2.135 ODE No. 135

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

✓ **Mathematica** : cpu = 0.017149 (sec), leaf count = 14

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

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{\frac{1}{x} x} \right\} \right\}$$

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

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

$$y(x) = c_1 x e^{\frac{1}{x}}$$

2.136 ODE No. 136

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

✓ **Mathematica** : cpu = 0.0643728 (sec), leaf count = 28

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

$$\left\{ \left\{ y(x) \rightarrow \frac{-x + x \log(x) - c_1 x}{-\log(x) + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.017 (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

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

✓ **Mathematica** : cpu = 0.0623054 (sec), leaf count = 16

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

$$\left\{ \left\{ y(x) \rightarrow \frac{x}{-\log(x) + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.013 (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

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

✓ **Mathematica** : cpu = 0.0571296 (sec), leaf count = 13

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

$$\{\{y(x) \rightarrow x \tan(\log(x) + c_1)\}\}$$

✓ **Maple** : cpu = 0.043 (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

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

✓ **Mathematica** : cpu = 0.196727 (sec), leaf count = 821

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

$$\left\{ \left\{ y(x) \rightarrow - \frac{a^{\frac{b}{k} + \frac{1}{2} \left(\frac{1}{k} - \frac{2b}{k} \right)} \left(\frac{b}{k} + \frac{1}{2} \left(\frac{1}{k} - \frac{2b}{k} \right) \right) x^{k-1} \left(x^k \right)^{\frac{b}{k} + \frac{1}{2} \left(\frac{1}{k} - \frac{2b}{k} \right) - 1} J_{\frac{2b-1}{k}} \left(\frac{2\sqrt{a}\sqrt{x^k}}{k} \right) \Gamma \left(\frac{2b}{k} - \frac{1}{k} + 1 \right) k^{1-\frac{1}{k}} + \frac{1}{2} a^{\frac{b}{k} + \frac{1}{2} \left(\frac{1}{k} - \frac{2b}{k} \right)}}{1} \right\} \right\}$$

✓ **Maple** : cpu = 0.194 (sec), leaf count = 217

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

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

2.140 ODE No. 140

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

✓ **Mathematica** : cpu = 0.0659334 (sec), leaf count = 17

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

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

✓ **Maple** : cpu = 0.129 (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

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

✓ **Mathematica** : cpu = 0.10522 (sec), leaf count = 67

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{a}{2x} - \frac{-1 + \sqrt{a^2 - 2a - 4b + 1} \left(-1 + \frac{2c_1}{x\sqrt{a^2 - 2a - 4b + 1} + c_1} \right)}{2x} \right\} \right\}$$

✓ **Maple** : cpu = 0.105 (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 = 0.155394 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\frac{e^{ax}(a^2x^2-2ax+2)}{a^2x} - \frac{e^{ax}(a^2x^2-2ax+2)}{a^3x^2} + \frac{e^{ax}(2a^2x-2a)}{a^3x} - \frac{c_1}{x^2}}{\frac{e^{ax}(a^2x^2-2ax+2)}{a^3x} + \frac{c_1}{x}} \right\} \right\}$$

✓ **Maple** : cpu = 0.115 (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

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

✓ **Mathematica** : cpu = 0.0851445 (sec), leaf count = 51

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

$$\left\{\left\{y(x)\rightarrow-\frac{-1+\sqrt{4ab+1}\left(-1+\frac{2c_1}{x\sqrt{4ab+1}+c_1}\right)}{2ax}\right\}\right\}$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 41

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

$$y(x)=\frac{1-\tanh\left(\frac{\sqrt{4ab+1}\left(-\ln(x)+c_1\right)}{2}\right)\sqrt{4ab+1}}{2ax}$$

2.144 ODE No. 144

$$x^2(ay(x)^2 + y'(x)) + bx^\alpha + c = 0$$

✓ **Mathematica** : cpu = 0.262304 (sec), leaf count = 1787

$$\text{DSolve}[c + b x^\alpha + x^2 (a y[x]^2 + \text{Derivative}[1][y][x]) == 0, y[x], x]$$

$$\left\{ \left\{ \begin{array}{l} a^{\frac{i\sqrt{4ac-1}\alpha+\alpha}{2\alpha^2}-\frac{\sqrt{\alpha^2-4a\alpha^2c}}{2\alpha^2}} \alpha^{-\frac{i\sqrt{4ac-1}\alpha+\alpha}{\alpha^2}+\frac{\sqrt{\alpha^2-4a\alpha^2c}}{\alpha^2}+1} b^{\frac{i\sqrt{4ac-1}\alpha+\alpha}{2\alpha^2}-\frac{\sqrt{\alpha^2-4a\alpha^2c}}{2\alpha^2}} \left(\frac{i\sqrt{4ac-1}\alpha+\alpha}{2\alpha^2} - \frac{\sqrt{\alpha^2-4a\alpha^2c}}{2\alpha^2} \right) (x^\alpha \right. \end{array} \right.$$

✓ **Maple** : cpu = 0.154 (sec), leaf count = 219

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

$$y(x) = \frac{-2 \left(\text{BesselY} \left(\frac{\sqrt{-4ac+1}+\alpha}{\alpha}, \frac{2\sqrt{ab}x^{\frac{\alpha}{2}}}{\alpha} \right) c_1 + \text{BesselJ} \left(\frac{\sqrt{-4ac+1}+\alpha}{\alpha}, \frac{2\sqrt{ab}x^{\frac{\alpha}{2}}}{\alpha} \right) \right) \sqrt{ab}x^{\frac{\alpha}{2}} + (\sqrt{-4ac+1}+1) \left(\text{BesselY} \left(\frac{\sqrt{-4ac+1}}{\alpha}, \frac{2\sqrt{ab}x^{\frac{\alpha}{2}}}{\alpha} \right) c_1 + \text{BesselJ} \left(\frac{\sqrt{-4ac+1}}{\alpha}, \frac{2\sqrt{ab}x^{\frac{\alpha}{2}}}{\alpha} \right) \right)}{2xa \left(\text{BesselY} \left(\frac{\sqrt{-4ac+1}}{\alpha}, \frac{2\sqrt{ab}x^{\frac{\alpha}{2}}}{\alpha} \right) c_1 + \text{BesselJ} \left(\frac{\sqrt{-4ac+1}}{\alpha}, \frac{2\sqrt{ab}x^{\frac{\alpha}{2}}}{\alpha} \right) \right)}$$

2.145

ODE No. 145

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

✓ **Mathematica** : cpu = 0.54507 (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]`

Solve

$$\left[\left(-\frac{1}{2^{2/3}a^{2/3}y(x)}-\frac{\sqrt[3]{ax}}{2^{2/3}}\right)\text{Ai}\left(\left(-\frac{\sqrt[3]{ax}}{2^{2/3}}-\frac{1}{2^{2/3}a^{2/3}y(x)}\right)^2+\frac{1}{\sqrt[3]{2}\sqrt[3]{ax}}\right)+\text{Ai}'\left(\left(-\frac{\sqrt[3]{ax}}{2^{2/3}}-\frac{1}{2^{2/3}a^{2/3}y(x)}\right)^2+\frac{1}{\sqrt[3]{2}\sqrt[3]{ax}}\right)\right.\\ \left.\left(-\frac{1}{2^{2/3}a^{2/3}y(x)}-\frac{\sqrt[3]{ax}}{2^{2/3}}\right)\text{Bi}\left(\left(-\frac{\sqrt[3]{ax}}{2^{2/3}}-\frac{1}{2^{2/3}a^{2/3}y(x)}\right)^2+\frac{1}{\sqrt[3]{2}\sqrt[3]{ax}}\right)+\text{Bi}'\left(\left(-\frac{\sqrt[3]{ax}}{2^{2/3}}-\frac{1}{2^{2/3}a^{2/3}y(x)}\right)^2+\frac{1}{\sqrt[3]{2}\sqrt[3]{ax}}\right)\right]$$

✓ **Maple** : cpu = 0.125 (sec), leaf count = 117

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

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

2.146

ODE No. 146

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

✓

Mathematica : cpu = 0.629251 (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 = 0.27 (sec), leaf count = 84

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

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

2.147

ODE No. 147

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

✓

Mathematica : cpu = 0.695751 (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]`

Solve

$$\left[\frac{\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{ax}}+\frac{1}{2^{2/3}\sqrt[3]{a}\sqrt[3]{by(x)}}\right)\text{Ai}\left(\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{ax}}+\frac{1}{2^{2/3}\sqrt[3]{ay(x)}\sqrt[3]{b}}\right)^2-\frac{\sqrt[3]{ax}}{\sqrt[3]{2b^{2/3}}}\right)+\text{Ai}'\left(\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{ax}}+\frac{1}{2^{2/3}\sqrt[3]{ay(x)}\sqrt[3]{b}}\right)^2-\frac{\sqrt[3]{ax}}{\sqrt[3]{2b^{2/3}}}\right)}{\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{ax}}+\frac{1}{2^{2/3}\sqrt[3]{a}\sqrt[3]{by(x)}}\right)\text{Bi}\left(\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{ax}}+\frac{1}{2^{2/3}\sqrt[3]{ay(x)}\sqrt[3]{b}}\right)^2-\frac{\sqrt[3]{ax}}{\sqrt[3]{2b^{2/3}}}\right)+\text{Bi}'\left(\left(\frac{b^{2/3}}{2^{2/3}\sqrt[3]{ax}}+\frac{1}{2^{2/3}\sqrt[3]{ay(x)}\sqrt[3]{b}}\right)^2-\frac{\sqrt[3]{ax}}{\sqrt[3]{2b^{2/3}}}\right)}\right]$$

✓

Maple : cpu = 0.337 (sec), leaf count = 182

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

$$y(x)=-\frac{2^{1/3}abx}{2^{1/3}ab^2-2(a^2b^2)^{2/3}\text{RootOf}\left(\text{AiryBi}\left(\frac{-a2^{2/3}x+2\_Z^2(a^2b^2)^{1/3}}{2(a^2b^2)^{1/3}}\right)c1\_Z+ \_Z\text{AiryAi}\left(\frac{-a2^{2/3}x+2\_Z^2(a^2b^2)^{1/3}}{2(a^2b^2)^{1/3}}\right)\right)}$$

2.148 ODE No. 148

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

✓ **Mathematica** : cpu = 0.0335286 (sec), leaf count = 40

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

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

✓ **Maple** : cpu = 0.011 (sec), leaf count = 16

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

$$y(x) = \frac{\operatorname{arcsinh}(x) + c_1}{\sqrt{x^2 + 1}}$$

2.149 ODE No. 149

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

✓ **Mathematica** : cpu = 0.0183199 (sec), leaf count = 27

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

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{3}(x^2 + 1) + \frac{c_1}{\sqrt{x^2 + 1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.013 (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

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

✓ **Mathematica** : cpu = 0.0178508 (sec), leaf count = 30

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

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

✓ **Maple** : cpu = 0.007 (sec), leaf count = 23

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

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

2.151 ODE No. 151

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

✓ **Mathematica** : cpu = 0.407126 (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]
```

Solve $\left[c_1 = \frac{\frac{1}{2} \left(\frac{1}{\frac{ix}{x^2+1} - \frac{ix^2 y(x)}{x^2+1}} + \frac{i}{x} \right) \sqrt[4]{1 - \left(\frac{1}{\frac{ix}{x^2+1} - \frac{ix^2 y(x)}{x^2+1}} + \frac{i}{x} \right)^2} {}_2F_1 \left(\frac{1}{2}, \frac{5}{4}, \frac{3}{2}; \left(\frac{1}{\frac{ix}{x^2+1} - \frac{ix^2 y(x)}{x^2+1}} + \frac{i}{x} \right)^2 \right) + ix}{\sqrt[4]{-1 + \left(\frac{1}{\frac{ix}{x^2+1} - \frac{ix^2 y(x)}{x^2+1}} + \frac{i}{x} \right)^2}}, y(x) \right]$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 76

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

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

2.152 ODE No. 152

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

✓ **Mathematica** : cpu = 0.266637 (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
```

$$\left\{ \left\{ y(x) \rightarrow \tan^{-1} \left(\frac{x^4 + 2x^2 - 6c_1 \sqrt{x^2 + 1} + 1}{3(x^2 + 1)} \right) \right\} \right\}$$

✓ **Maple** : cpu = 1.145 (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))
```

$$y(x) = \frac{\arctan \left(\frac{6\sqrt{x^2+1} \left(\sqrt{x^2+1} x^2 + \sqrt{x^2+1} + 3c_1 \right)}{10 + 6c_1 (x^2+1)^{3/2} + x^6 + 3x^4 + 12x^2 + 9c_1^2}, \frac{8 + 6(-x^2-1)c_1\sqrt{x^2+1} - x^6 - 3x^4 + 6x^2 - 9c_1^2}{10 + 6c_1 (x^2+1)^{3/2} + x^6 + 3x^4 + 12x^2 + 9c_1^2} \right)}{2}$$

2.153 ODE No. 153

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

✓ **Mathematica** : cpu = 0.0272756 (sec), leaf count = 21

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

$$\left\{ \left\{ y(x) \rightarrow ax + c_1 \sqrt{x^2 - 1} \right\} \right\}$$

✓ **Maple** : cpu = 0.018 (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

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

✓ **Mathematica** : cpu = 0.017264 (sec), leaf count = 26

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

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

✓ **Maple** : cpu = 0.011 (sec), leaf count = 19

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

$$y(x) = \frac{\sin(x) + c_1}{(x - 1)(1 + x)}$$

2.155 ODE No. 155

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

✓ **Mathematica** : cpu = 0.0950251 (sec), leaf count = 46

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

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

✓ **Maple** : cpu = 0.105 (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

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

✓ **Mathematica** : cpu = 0.0616234 (sec), leaf count = 21

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

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

✓ **Maple** : cpu = 0.019 (sec), leaf count = 20

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

$$y(x) = \frac{1}{\sqrt{x-1} \sqrt{1+x} c_1 + x}$$

2.157 ODE No. 157

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

✓ **Mathematica** : cpu = 0.127006 (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]
```

$$\left\{\left\{y(x)\rightarrow\frac{(x^2-1)\left(c_1\left(ax(x^2-1)^{\frac{a}{2}-1}P_{a-1}(x)+(x^2-1)^{\frac{a}{2}-1}(aP_a(x)-axP_{a-1}(x))\right)+ax(x^2-1)^{\frac{a}{2}-1}Q_a(x)}{a\left((x^2-1)^{a/2}Q_{a-1}(x)+c_1(x^2-1)^{a/2}P_{a-1}(x)\right)}\right.\right.$$

✓ **Maple** : cpu = 0.281 (sec), leaf count = 231

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

$$y(x)=\frac{8(1+x)c_1\left(\left(a-\frac{1}{2}\right)x-\frac{a}{2}+\frac{1}{2}\right)\text{HeunC}\left(0,-2a+1,0,0,a^2-a+\frac{1}{2},\frac{2}{1+x}\right)-a(1+x)\left(-\frac{x}{2}-\frac{1}{2}\right)^{-2a+1}\text{HeunC}\left(0,-2a+1,0,0,a^2-a+\frac{1}{2},\frac{2}{1+x}\right)}{4(1+x)a\left(\text{HeunC}\left(0,-2a+1,0,0,a^2-a+\frac{1}{2},\frac{2}{1+x}\right)-\left(-\frac{x}{2}-\frac{1}{2}\right)^{-2a+1}\text{HeunC}\left(0,-2a+1,0,0,a^2-a+\frac{1}{2},\frac{2}{1+x}\right)\right)}$$

2.158 ODE No. 158

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

✓ **Mathematica** : cpu = 0.112473 (sec), leaf count = 31

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

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

✓ **Maple** : cpu = 0.018 (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 = 0.0721096 (sec), leaf count = 22

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

$$\left\{ \left\{ y(x) \rightarrow e^{e^{c_1} x^2 - e^{c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.153 (sec), leaf count = 13

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

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

2.160 ODE No. 160

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

✓ **Mathematica** : cpu = 0.0896283 (sec), leaf count = 27

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

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

✓ **Maple** : cpu = 0.034 (sec), leaf count = 21

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

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

2.161 ODE No. 161

$$(x^2 - 5x + 6) y'(x) + x^2 + 3xy(x) - 8y(x) = 0$$

✓ **Mathematica** : cpu = 0.0211023 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\frac{x^4}{4} - \frac{2x^3}{3}}{(2-x)^2(3-x)} + \frac{c_1}{(2-x)^2(3-x)} \right\} \right\}$$

✓ **Maple** : cpu = 0.016 (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 = 0.291016 (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
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{-ak - bk + 2kx}{2(k + 1)} + \frac{1}{2} \sqrt{\frac{-a^2k^2 + 2abk^2 - b^2k^2}{(k + 1)^2}} \tan \left(\frac{(k + 1) \sqrt{\frac{-a^2k^2 + 2abk^2 - b^2k^2}{(k + 1)^2}} (\log(x - b) - \log(x - a))}{2(a - b)} \right) \right. \right.$$

✓ **Maple** : cpu = 0.275 (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))
```

$$y(x) = \frac{\left((b - x)^{k+1} + c_1(a - x)^k(a - x) \right) k}{(k + 1) \left(c_1(a - x)^k + (b - x)^k \right)}$$

2.163 ODE No. 163

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

✓ **Mathematica** : cpu = 0.0859333 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{-a^2} \sqrt{x} \tan \left(\frac{2\sqrt{-a^2}}{\sqrt{x}} - c_1 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.092 (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 = 0.102457 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x^2 \left(-\frac{e^{\frac{2a}{\sqrt{x}}}}{4a\sqrt{x}} + \frac{e^{\frac{2a}{\sqrt{x}}}}{2x} + c_1 \left(\frac{ae^{-\frac{2a}{\sqrt{x}}}}{x} + \frac{e^{-\frac{2a}{\sqrt{x}}}}{2\sqrt{x}} \right) \right)}{-\frac{\sqrt{x}e^{\frac{2a}{\sqrt{x}}}}{2a} + c_1\sqrt{x}e^{-\frac{2a}{\sqrt{x}}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.273 (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 = 0.0939428 (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]
```

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

✓ **Maple** : cpu = 0.022 (sec), leaf count = 17

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

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

2.166 ODE No. 166

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

✓ **Mathematica** : cpu = 0.140029 (sec), leaf count = 71

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

$$\left\{ \left\{ y(x) \rightarrow \frac{2x \left(-G_{2,2}^{2,0} \left(x \left| \begin{array}{l} -\frac{1}{2}, \frac{1}{2} \\ -1, 0 \end{array} \right. \right) + \frac{c_1(E(x)-K(x))}{\pi x} \right)}{G_{2,2}^{2,0} \left(x \left| \begin{array}{l} \frac{1}{2}, \frac{3}{2} \\ 0, 0 \end{array} \right. \right) + \frac{2c_1 E(x)}{\pi}} \right\} \right\}$$

✓ **Maple** : cpu = 0.188 (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 = 0.0710764 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x \tan \left(\frac{1}{3} (\sqrt{7} \log(x) + 3\sqrt{7}c_1) \right)}{\sqrt{7}} \right\} \right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 20

```
dsolve(3*x^2*diff(y(x),x)-7*y(x)^2-3*x*y(x)-x^2 = 0,y(x))
```

$$y(x) = \frac{\tan \left(\frac{(\ln(x)+c_1)\sqrt{7}}{3} \right) x\sqrt{7}}{7}$$

2.168

ODE No. 168

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

✓

Mathematica : cpu = 0.14756 (sec), leaf count = 234

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

$$\left\{\left\{y(x) \rightarrow \frac{3\left(x^2-4\right)\left(c_1\left(\frac{xP_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)}{6\left(x^2-4\right)^{11/12}}+\frac{{}^{12}\sqrt{x^2-4}\left(\frac{1}{2}P_{\frac{5}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)-\frac{5}{12}xP_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)\right)}{2\left(\frac{x^2}{4}-1\right)}\right)+\frac{xQ_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)}{6\left(x^2-4\right)^{11/12}}+\frac{{}^{12}\sqrt{x^2-4}\left(\frac{1}{2}Q_{\frac{5}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)-\frac{5}{12}xQ_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)\right)}{2\left(\frac{x^2}{4}-1\right)}\right)}{{}^{12}\sqrt{x^2-4}Q_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)+c_1{}^{12}\sqrt{x^2-4}P_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)}\right\}\right\}$$

✓

Maple : cpu = 0.213 (sec), leaf count = 140

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

$$y(x)=-\frac{3\left(x+2\right)\left(\operatorname{HeunC}\left(0,\frac{4}{3},-\frac{1}{3},0,\frac{25}{36},\frac{4}{x+2}\right)c_1+4c_1\left(x-\frac{5}{4}\right)\left(x+2\right)\operatorname{HeunC}\left(0,\frac{4}{3},-\frac{1}{3},0,\frac{25}{36},\frac{4}{x+2}\right)-\left(-\frac{x}{4}-\frac{1}{2}\right)^{4/3}\left(x+2\right)\operatorname{HeunC}\left(0,-\frac{4}{3},-\frac{1}{3},0,\frac{25}{36},\frac{4}{x+2}\right)\right)}{{}^{12}\sqrt{x^2-4}Q_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)+c_1{}^{12}\sqrt{x^2-4}P_{-\frac{1}{6}}^{\frac{1}{3}}\left(\frac{x}{2}\right)}$$

2.169

ODE No. 169

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

✓ **Mathematica** : cpu = 1.42364 (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]
```

Solve

$$-\frac{c}{\sqrt{-a(ax+b)^2}} = \frac{2 \exp\left(\frac{1}{2}\left(-\frac{c}{\sqrt{-a(ax+b)^2}} - \frac{(-a(ax+b)^2)^{3/2}}{ay(x)(ax+b)^3}\right)^2\right)}{\sqrt{2\pi}\operatorname{erfi}\left(\frac{-\frac{c}{\sqrt{-a(ax+b)^2}} - \frac{(-a(ax+b)^2)^{3/2}}{ay(x)(ax+b)^3}}{\sqrt{2}}\right)} + 2c_1}, y(x)$$

✓ **Maple** : cpu = 0.232 (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))
```

$$\left(\operatorname{erf}\left(\frac{\sqrt{2}(y(x)c+a(ax+b))}{2\sqrt{a}y(x)(ax+b)}\right)e^{\frac{(y(x)c+a(ax+b))^2}{2y(x)^2(ax+b)^2a}}\sqrt{2}\sqrt{\pi}ac+2a^{3/2}(ax+b)\right)e^{-\frac{((-ax-b+c)y(x)+a(ax+b))((ax+b+c)y(x)+a(ax+b))}{2y(x)^2(ax+b)^2a}}+2c_1$$

$$2a^{5/2}$$

2.170

ODE No. 170

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

✓ **Mathematica** : cpu = 0.0641557 (sec), leaf count = 43

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

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

✓ **Maple** : cpu = 0.017 (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

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

✓ **Mathematica** : cpu = 0.053787 (sec), leaf count = 17

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

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

✓ **Maple** : cpu = 0.01 (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 = 0.0665638 (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]
```

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

✓ **Maple** : cpu = 0.45 (sec), leaf count = 26

```
dsolve(x^3*diff(y(x),x)-x^4*y(x)^2+x^2*y(x)+20 = 0,y(x))
```

$$y(x)=\frac{5x^9+4c_1}{(-x^9+c_1)x^2}$$

2.173 ODE No. 173

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

✓ **Mathematica** : cpu = 0.0827427 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{3}{x^3} + \frac{1}{x^3 \left(\frac{1}{4} + c_1 e^{4x} \right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.135 (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))
```

$$y(x) = \frac{-3 e^{4x} c_1 - 3}{x^3 (e^{4x} c_1 - 3)}$$

2.174 ODE No. 174

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

✓ **Mathematica** : cpu = 0.0209379 (sec), leaf count = 17

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

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

✓ **Maple** : cpu = 0.006 (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 = 0.0249135 (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]
```

$$\left\{ \left\{ y(x) \rightarrow ax + c_1 \sqrt{1 - x^2} x \right\} \right\}$$

✓ **Maple** : cpu = 0.02 (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

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

✓

Mathematica : cpu = 0.149872 (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]

$$\left\{\left\{y(x)\rightarrow\frac{x\left(-2xG_{2,2}^{2,0}\left(x^2\middle|\begin{smallmatrix}-\frac{1}{2},\frac{1}{2}\\-1,0\end{smallmatrix}\right)+\frac{2c_1(E(x^2)-K(x^2))}{\pi x}\right)}{G_{2,2}^{2,0}\left(x^2\middle|\begin{smallmatrix}\frac{1}{2},\frac{3}{2}\\0,0\end{smallmatrix}\right)+\frac{2c_1E(x^2)}{\pi}}\right\}\right\}$$

✓

Maple : cpu = 0.099 (sec), leaf count = 30

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

$$y(x)=\frac{c_1\operatorname{EllipticCE}(x)+\operatorname{EllipticE}(x)-\operatorname{EllipticK}(x)}{c_1\operatorname{EllipticCE}(x)-c_1\operatorname{EllipticCK}(x)+\operatorname{EllipticE}(x)}$$

2.177 ODE No. 177

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

✓ **Mathematica** : cpu = 0.0796831 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x^2}{c_1x - 1 - c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 17

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

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

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 = 0.11213 (sec), leaf count = 49

```
DSolve[-3 + x^2 - (-5 + 3*x^2)*y[x] + 2*(-1 + x^2)*y[x]^2 + 2*x*(-1 + x^2)*Derivative[1][y][x]
```

$$\left\{\left\{y(x)\rightarrow 1+\frac{\sqrt{x}}{\sqrt{1-x^2}\left(2\sqrt{x}{}_2F_1\left(\frac{1}{4},\frac{1}{2};\frac{5}{4};x^2\right)+c_1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.306 (sec), leaf count = 61

```
dsolve(2*x*(x^2-1)*diff(y(x),x)+2*(x^2-1)*y(x)^2-(3*x^2-5)*y(x)+x^2-3 = 0,y(x))
```

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

2.179

ODE No. 179

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

✓

Mathematica : cpu = 0.391791 (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]

$$\left\{\left\{y(x) \rightarrow \frac{3\left(x^2-1\right)\left(c_1\left(\frac{e^{\int_1^x \text{Root}\left[125 K[1]^8-164 K[1]^6+70 K[1]^4-20 K[1]^2+\left(1296 K[1]^{12}-5184 K[1]^{10}+7776 K[1]^8-5184 K[1]^6+1296 K[1]^4\right) \# 1^4+\left(-\right.\right.\right.\right.}\right.\right.\right.\right.$$

✓

Maple : cpu = 0.171 (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))

$$y(x)=\frac{5 c_1\left(x^2-\frac{2}{5}\right) \operatorname{hypergeom}\left(\left[\frac{5}{6}, \frac{7}{6}\right],\left[\frac{4}{3}\right], x^2\right)+\frac{35\left(x^4-x^2\right) c_1 \operatorname{hypergeom}\left(\left[\frac{11}{6}, \frac{13}{6}\right],\left[\frac{7}{3}\right], x^2\right)}{8}+\frac{15\left(-x^{4 / 3}+x^{10 / 3}\right) \operatorname{hypergeom}\left(\left[\frac{1}{2}, \frac{5}{6}\right],\left[\frac{4}{3}\right], x^2\right) c_1}{4}}{x^{1 / 3}\left(x^{2 / 3} \operatorname{hypergeom}\left(\left[\frac{5}{6}, \frac{7}{6}\right],\left[\frac{4}{3}\right], x^2\right) c_1+\operatorname{hypergeom}\left(\left[\frac{1}{2}, \frac{5}{6}\right],\left[\frac{4}{3}\right], x^2\right) c_1\right)}$$

2.180 ODE No. 180

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

✓ **Mathematica** : cpu = 0.208662 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x \left(-1 + \exp \left(\frac{4 \tan^{-1} \left(\frac{2ax}{\sqrt{4ac-b^2}} + \frac{b}{\sqrt{4ac-b^2}} \right) + 2c_1 \right)}{1 + \exp \left(\frac{4 \tan^{-1} \left(\frac{2ax}{\sqrt{4ac-b^2}} + \frac{b}{\sqrt{4ac-b^2}} \right) + 2c_1 \right)} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.125 (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 = 0.127878 (sec), leaf count = 146

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

$$\left\{ \left\{ y(x) \rightarrow - \frac{-\frac{ie^{-\frac{i\sqrt{a}}{x}}}{2\sqrt{a}} + \frac{e^{-\frac{i\sqrt{a}}{x}}}{2x} + c_1 \left(e^{\frac{i\sqrt{a}}{x}} - \frac{i\sqrt{a}e^{\frac{i\sqrt{a}}{x}}}{x} \right)}{\frac{ixe^{-\frac{i\sqrt{a}}{x}}}{2\sqrt{a}} - c_1xe^{\frac{i\sqrt{a}}{x}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.081 (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

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

✓ **Mathematica** : cpu = 0.134622 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{(x^3 - 1) \left(\frac{x}{(1-x^3)^{2/3}} + \frac{x^4}{(1-x^3)^{5/3}} + \frac{2c_1 x^2}{(1-x^3)^{5/3}} \right)}{2 \left(\frac{x^2}{2(1-x^3)^{2/3}} + \frac{c_1}{(1-x^3)^{2/3}} \right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.144 (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))
```

$$y(x) = \frac{x(x + c_1)}{x^2 c_1 + 1}$$

2.183 ODE No. 183

$$(2x^4 - x) y'(x) - 2(x^3 - 1) y(x) = 0$$

✓ **Mathematica** : cpu = 0.0204922 (sec), leaf count = 22

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

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 x^2}{\sqrt[3]{1 - 2x^3}} \right\} \right\}$$

✓ **Maple** : cpu = 0.013 (sec), leaf count = 18

```
dsolve((2*x^4-x)*diff(y(x),x)-2*(x^3-1)*y(x) = 0,y(x))
```

$$y(x) = \frac{c_1 x^2}{(2x^3 - 1)^{1/3}}$$

2.184

ODE No. 184

$$\left(y'(x)+y(x)^2\right)\left(ax^2+bx+c\right)^2+A=0$$

✓

Mathematica : cpu = 0.796242 (sec), leaf count = 704

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

$$\left\{\left\{y(x) \rightarrow -\frac{2a\sqrt{ax^2+bx+c}\exp\left(-\frac{\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\tan^{-1}\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)}{(b^2-4ac)\left(\frac{(2ax+b)^2}{4ac-b^2}+1\right)}+\frac{(2ax+b)\exp\left(-\frac{\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\tan^{-1}\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)}{2\sqrt{b^2-4ac}\sqrt{1-\frac{4A}{b^2-4ac}}\sqrt{ax^2+bx+c}}\right.\right.\\ \left.\left.-\frac{\sqrt{ax^2+bx+c}\exp\left(-\frac{\sqrt{4ac-b^2}\sqrt{1-\frac{4A}{b^2-4ac}}\tan^{-1}\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac}}\right)}{\sqrt{b^2-4ac}\sqrt{1-\frac{4A}{b^2-4ac}}}+\right.\right.$$

✓

Maple : cpu = 0.651 (sec), leaf count = 493

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

$$y(x) = \frac{2a\left(c_1\left(i\sqrt{\frac{-4ac+b^2-4A}{a^2}}a\sqrt{4ac-b^2}-2\left(ax+\frac{b}{2}\right)\sqrt{-4ac+b^2}\right)\left(\frac{i\sqrt{4ac-b^2}-2ax-b}{2ax+b+i\sqrt{4ac-b^2}}\right)^{-\frac{a\sqrt{\frac{-4ac+b^2-4A}{a^2}}}{2\sqrt{-4ac+b^2}}}-\left(i\sqrt{\frac{-4ac+b^2-4A}{a^2}}\right)\right)}{\sqrt{-4ac+b^2}\left(2ax+b+i\sqrt{4ac-b^2}\right)\left(i\sqrt{4ac-b^2}-2ax-b\right)\left(c_1\left(\frac{i\sqrt{4ac-b^2}}{2ax+b+i\sqrt{4ac-b^2}}\right)^{-\frac{a\sqrt{\frac{-4ac+b^2-4A}{a^2}}}{2\sqrt{-4ac+b^2}}}-\left(i\sqrt{\frac{-4ac+b^2-4A}{a^2}}\right)\right)}$$

2.185 ODE No. 185

$$x^7y'(x) + 5x^3y(x)^2 + 2(x^2 + 1)y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.308862 (sec), leaf count = 123

DSolve[5*x^3*y[x]^2 + 2*(1 + x^2)*y[x]^3 + x^7*Derivative[1][y][x] == 0,y[x],x]

$$\text{Solve}\left[c_1 = \frac{\frac{1}{2}\sqrt[4]{1 - \left(\frac{ix^2}{y(x)} + \frac{i}{x}\right)^2}\left(\frac{ix^2}{y(x)} + \frac{i}{x}\right) {}_2F_1\left(\frac{1}{2}, \frac{5}{4}, \frac{3}{2}, \left(\frac{ix^2}{y(x)} + \frac{i}{x}\right)^2\right) + ix}{\sqrt[4]{-1 + \left(\frac{ix^2}{y(x)} + \frac{i}{x}\right)^2}}, y(x)\right]$$

✓ **Maple** : cpu = 0.049 (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))

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

2.186

ODE No. 186

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

✓ **Mathematica** : cpu = 0.192038 (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]

$$\left\{\left\{y(x)\rightarrow x^{n-1}\tan(-\log(x)+c_1)\right\}\right\}$$

✓ **Maple** : cpu = 0.049 (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 = 0.217377 (sec), leaf count = 328

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

$$\left\{\left\{y(x)\rightarrow-\frac{x^n\left(\frac{1}{2}\sqrt{a}\sqrt{b}\left(\sqrt{\frac{(n-1)^2}{ab}}-4-\frac{n-1}{\sqrt{a}\sqrt{b}}\right)x^{\frac{1}{2}\sqrt{a}\sqrt{b}\left(\sqrt{\frac{(n-1)^2}{ab}}-4-\frac{n-1}{\sqrt{a}\sqrt{b}}\right)-1}+\frac{1}{2}\sqrt{a}\sqrt{b}c_1\left(-\frac{n-1}{\sqrt{a}\sqrt{b}}-\sqrt{\frac{(n-1)^2}{ab}}\right)\right)}{a\left(x^{\frac{1}{2}\sqrt{a}\sqrt{b}\left(\sqrt{\frac{(n-1)^2}{ab}}-4-\frac{n-1}{\sqrt{a}\sqrt{b}}\right)}+c_1x^{\frac{1}{2}\sqrt{a}\sqrt{b}\left(-\frac{n-1}{\sqrt{a}\sqrt{b}}-\sqrt{\frac{(n-1)^2}{ab}}-4\right)}\right.}\right.\right.$$

✓

Maple : cpu = 0.131 (sec), leaf count = 60

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

$$y(x)=\frac{x^{n-1}\left(n-1-\tan\left(\frac{\sqrt{4ab-n^2+2n-1}\left(-\ln(x)+c_1\right)}{2}\right)\sqrt{4ab-n^2+2n-1}\right)}{2a}$$

2.188

ODE No. 188

$$-ay(x)^3 - bnx^3 + x^{2n+1}y'(x) = 0$$

✖

Mathematica : cpu = 12.0681 (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 = 0.046 (sec), leaf count = 32

dsolve(x^(2*n+1)*diff(y(x),x)-a*y(x)^3-b*x^(3*n) = 0,y(x))

$$y(x) = \text{RootOf}\left(-\ln(x) + c_1 + \int^{\frac{-Z}{-a^3a - n_a + b}} \frac{1}{-a^3a - n_a + b} d_{-a}\right) x^n$$

2.189

ODE No. 189

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

✓ **Mathematica** : cpu = 1.0612 (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]

Solve

$$\left[\int_1^{\left(\frac{ax^{-((m+1)n)}}{b}\right)^{\frac{1}{n}}y(x)} \frac{1}{K[1]^n - \left(\frac{b^{1-n}(m+1)^n}{a}\right)^{\frac{1}{n}}K[1] + 1} dK[1] = bx^{m+1} \log(x) \left(\frac{ax^{-((m+1)n)}}{b}\right)^{\frac{1}{n}} + c_1, y(x)$$

✓ **Maple** : cpu = 1.093 (sec), leaf count = 60

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

$$\int_{-b}^{y(x)} -\frac{x^{mn}x^n}{x^n\left(x^mxb-(m+1)\_a\right)x^{mn}+ax^mx\_a^n}d\_a+\ln(x)-c_1=0$$

2.190 ODE No. 190

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

✓ **Mathematica** : cpu = 0.0905812 (sec), leaf count = 92

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

$$\left\{\left\{y(x)\rightarrow-\frac{\tanh\left(\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right)+c_1\right)}{\sqrt{-1+\tanh^2\left(\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right)+c_1\right)}}\right\},\left\{y(x)\rightarrow\frac{\tanh\left(\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right)+c_1\right)}{\sqrt{-1+\tanh^2\left(\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right)+c_1\right)}}\right\}\right\}$$

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

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

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

2.191 ODE No. 191

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

✓ **Mathematica** : cpu = 0.123382 (sec), leaf count = 63

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

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{1+\tan^2\left(\tan^{-1}\left(\frac{x}{\sqrt{1-x^2}}\right)+c_1\right)} \right\}, \left\{ y(x) \rightarrow \sqrt{1+\tan^2\left(\tan^{-1}\left(\frac{x}{\sqrt{1-x^2}}\right)+c_1\right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.021 (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 = 0.138556 (sec), leaf count = 97

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

$$\left\{ \left\{ y(x) \rightarrow a \log \left(ax^2 \sqrt{\frac{a^2}{a^2 + x^2}} + a^2 x + a^3 \sqrt{\frac{a^2}{a^2 + x^2}} \right) e^{-\tanh^{-1}\left(\frac{x}{\sqrt{a^2 + x^2}}\right)} + c_1 e^{-\tanh^{-1}\left(\frac{x}{\sqrt{a^2 + x^2}}\right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.024 (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 = 0.0218968 (sec), leaf count = 16

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

$$\left\{ \left\{ y(x) \rightarrow ax + \frac{c_1}{\log(x)} \right\} \right\}$$

✓ **Maple** : cpu = 0.009 (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 = 0.127044 (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
```

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

✓ **Maple** : cpu = 0.027 (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

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

✓ **Mathematica** : cpu = 0.113089 (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]

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

✓ **Maple** : cpu = 0.137 (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))

$$y(x) = \frac{-4 e^{5x} c_1 - 4}{\sin(x) (e^{5x} c_1 - 4)}$$

2.196 ODE No. 196

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

✓ **Mathematica** : cpu = 0.294041 (sec), leaf count = 53

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

$$\left\{ \left\{ y(x) \rightarrow e^{-2 \tanh^{-1}(\tan(\frac{x}{2}))} \left(\sin(x) + 4 \log \left(\cos \left(\frac{x}{2} \right) - \sin \left(\frac{x}{2} \right) \right) \right) + c_1 e^{-2 \tanh^{-1}(\tan(\frac{x}{2}))} \right\} \right\}$$

✓ **Maple** : cpu = 0.053 (sec), leaf count = 29

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

$$y(x) = \frac{-2 \ln (\sec (x)+\tan (x))+2 \ln (\cos (x))+\sin (x)+c_1}{\sec (x)+\tan (x)}$$

2.197 ODE No. 197

$$\cos(x)y'(x) - y(x)^4 - y(x)\sin(x) = 0$$

✓ **Mathematica** : cpu = 0.0762773 (sec), leaf count = 104

```
DSolve[-(Sin[x]*y[x]) - y[x]^4 + Cos[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{\sqrt[3]{-\sin^3(x) + c_1 \cos^3(x) - 3 \sin(x) \cos^2(x)}} \right\}, \left\{ y(x) \rightarrow -\frac{\sqrt[3]{-1}}{\sqrt[3]{-\sin^3(x) + c_1 \cos^3(x) - 3 \sin(x) \cos^2(x)}} \right\} \right.$$

✓ **Maple** : cpu = 0.251 (sec), leaf count = 237

```
dsolve(cos(x)*diff(y(x),x)-y(x)^4-y(x)*sin(x) = 0,y(x))
```

$$y(x) = \frac{\left(\cos(x)\left(c_1 \sin(x)^4 + 2 \cos(x) \sin(x)^3 - 2 c_1 \sin(x)^2 - 3 \sin(x) \cos(x) + c_1\right)^2\right)^{1/3}}{c_1 \sin(x)^4 + 2 \cos(x) \sin(x)^3 - 2 c_1 \sin(x)^2 - 3 \sin(x) \cos(x) + c_1}$$

2.198 ODE No. 198

$$\sin(x) \cos(x) y'(x) - y(x) - \sin^3(x) = 0$$

✓ **Mathematica** : cpu = 0.0268264 (sec), leaf count = 15

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

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

✓ **Maple** : cpu = 0.021 (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 = 0.075734 (sec), leaf count = 45

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{2} \cos^{-1} \left(-\tanh \left(\tanh^{-1}(\cos(2x)) + 2c_1 \right) \right) \right\}, \left\{ y(x) \rightarrow \frac{1}{2} \cos^{-1} \left(-\tanh \left(\tanh^{-1}(\cos(2x)) + 2c_1 \right) \right) \right\} \right.$$

✓ **Maple** : cpu = 0.7 (sec), leaf count = 105

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

$$y(x) = \frac{\arctan \left(-\frac{2c_1(\sin(4x)+2\sin(2x))}{c_1^2\cos(4x)-c_1^2-\cos(4x)-4\cos(2x)-3}, \frac{c_1^2\cos(4x)-c_1^2+\cos(4x)+4\cos(2x)+3}{c_1^2\cos(4x)-c_1^2-\cos(4x)-4\cos(2x)-3} \right)}{2}$$

2.200 ODE No. 200

$$Ax(a\sin^2(x)+c)+y'(x)(a\sin^2(x)+b)+ay(x)\sin(2x)=0$$

✓ **Mathematica** : cpu = 0.189968 (sec), leaf count = 77

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

$$\left\{\left\{y(x)\rightarrow\frac{\frac{1}{2}aAx^2-\frac{1}{2}aAx\sin(2x)-\frac{1}{4}aA\cos(2x)+Acx^2}{a\cos(2x)-a-2b}+\frac{c_1}{a\cos(2x)-a-2b}\right\}\right\}$$

✓ **Maple** : cpu = 0.185 (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 = 0.104167 (sec), leaf count = 39

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

$$\left\{\left\{y(x)\rightarrow i\sqrt{f(x)}\tan\left(i\int_1^x-\sqrt{f(K[1])}dK[1]+c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.059 (sec), leaf count = 23

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

$$y(x)=i\tan\left(-i\left(\int\sqrt{f\left(x\right)}dx\right)+c_1\right)\sqrt{f\left(x\right)}$$

2.202 ODE No. 202

$$f(x)y'(x) + g(x)\operatorname{tg}(y(x)) + h(x) = 0$$

X **Mathematica** : cpu = 20.1961 (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]
```

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

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

X **Mathematica** : cpu = 1.09542 (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]
```

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 = 0.0922868 (sec), leaf count = 70

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

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

✓ **Maple** : cpu = 0.43 (sec), leaf count = 92

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

$$y(x) = \text{RootOf}\left(-Z^2 - e^{\text{RootOf}\left(x^2\left(\tanh\left(\frac{\sqrt{(a-2)(a+2)}(2c_1+Z+2\ln(x))}{2a}\right)^2 - a^2 - 4\right)\tanh\left(\frac{\sqrt{(a-2)(a+2)}(2c_1+Z+2\ln(x))}{2a}\right)^2 - a^2 - 4}e^{-Z+4}\right)\right)$$

2.205 ODE No. 205

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

✗ Mathematica : cpu = 9.65067 (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

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

X **Mathematica** : cpu = 21.5614 (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]
```

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 = 0.111038 (sec), leaf count = 47

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

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{-4x^2 + c_1 e^{-2x}} \right\}, \left\{ y(x) \rightarrow \sqrt{-4x^2 + c_1 e^{-2x}} \right\} \right\}$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 37

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

$$y(x) = \sqrt{e^{-2x}c_1 - 4x^2}$$

2.208 ODE No. 208

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

✓ **Mathematica** : cpu = 0.180527 (sec), leaf count = 118

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{4a^2c_1e^{-2ax} + 4ab \cos(c + x) + c_1e^{-2ax} + 2b \sin(c + x)}}{\sqrt{4a^2 + 1}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{4a^2c_1e^{-2ax} + 4ab \cos(c + x) + c_1e^{-2ax} + 2b \sin(c + x)}}{\sqrt{4a^2 + 1}} \right\} \right.$$

✓ **Maple** : cpu = 0.22 (sec), leaf count = 106

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

$$y(x) = \frac{\sqrt{16c_1 \left(a^2 + \frac{1}{4}\right)^2 e^{-2ax} + 16b \left(a \cos(x + c) + \frac{\sin(x+c)}{2}\right) \left(a^2 + \frac{1}{4}\right)}}{4a^2 + 1}$$

2.209

ODE No. 209

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

✓ **Mathematica** : cpu = 0.104919 (sec), leaf count = 84

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

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{a^2x^2 + 2a^2c_1x + a^2c_1^2 - b}}{\sqrt{a}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{a^2x^2 + 2a^2c_1x + a^2c_1^2 - b}}{\sqrt{a}} \right\} \right\}$$

✓ **Maple** : cpu = 0.013 (sec), leaf count = 21

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

$$x - \frac{\sqrt{ay(x)^2 + b}}{a} + c_1 = 0$$

2.210 ODE No. 210

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

✓ **Mathematica** : cpu = 0.0655176 (sec), leaf count = 47

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

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{4 + e^{-x^2+2c_1}} \right\}, \left\{ y(x) \rightarrow \sqrt{4 + e^{-x^2+2c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.021 (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 = 0.213568 (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 = 0.053 (sec), leaf count = 31

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

$$y(x) = \text{RootOf}\left(-\left(\int^{-Z} \frac{-a}{-a^2 + e^{\frac{1}{-a}}} d_{-}a\right) + \ln(x) + c_1\right) x$$

2.212

ODE No. 212

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

✓

Mathematica

: cpu = 0.326927 (sec), leaf count = 95

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

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{K[2]}{f\left(x^2+K[2]^2\right)}-\int_1^x-\frac{2K[1]K[2]f'\left(K[1]^2+K[2]^2\right)}{f\left(K[1]^2+K[2]^2\right)^2}dK[1]\right)dK[2]+\int_1^x\left(g\left(K[1]\right)+\frac{K[1]}{f\left(K[1]^2+K[2]^2\right)}\right)dK[1]=0,y[x],x\right]$$

✓

Maple

: cpu = 0.154 (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 = 0.105229 (sec), leaf count = 71

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

$$\text{Solve}\left[\frac{1}{2}\log\left(\frac{x^2-y(x)^2+(x-3)y(x)-x-1}{(x-1)^2}\right)+\log(1-x)=\frac{\tanh^{-1}\left(\frac{y(x)+2x-1}{\sqrt{5}(y(x)+1)}\right)}{\sqrt{5}}+c_1,y(x)\right]$$

✓ **Maple** : cpu = 1.408 (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 = 0.113173 (sec), leaf count = 78

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

$$\text{Solve}\left[2\sqrt{2}\tan^{-1}\left(\frac{-y(x)+2x+3}{\sqrt{2}(y(x)+x-1)}\right)=2\log\left(\frac{6x^2+3y(x)^2-10y(x)+8x+11}{(3x+2)^2}\right)+4\log(3x+2)+3c_1,y(x)\right]$$

✓

Maple : cpu = 0.221 (sec), leaf count = 48

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

$$y(x)=\frac{5}{3}+\frac{(-3x-2)\sqrt{2}\tan\left(\text{RootOf}\left(\sqrt{2}\ln\left(2\left(\tan\left(\_Z\right)^2+1\right)\left(3x+2\right)^2\right)+2\sqrt{2}c_1-2\_Z\right)\right)}{3}$$

2.215

ODE No. 215

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

✓

Mathematica : cpu = 0.118839 (sec), leaf count = 80

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

$$\text{Solve}\left[6\sqrt{3}\tan^{-1}\left(\frac{4-3y(x)}{\sqrt{3}(y(x)+2x-2)}\right)=3\log\left(\frac{3x^2+3y(x)^2+3(x-3)y(x)-6x+7}{(1-3x)^2}\right)+6\log(3x-1)+\right.$$

✓

Maple : cpu = 0.277 (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 = 0.107517 (sec), leaf count = 82

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

$$\text{Solve}\left[6\sqrt{3}\tan^{-1}\left(\frac{3y(x)+1}{\sqrt{3}(-y(x)+2x-1)}\right)=3\log\left(\frac{3x^2+3y(x)^2-3(x-1)y(x)-3x+1}{(1-3x)^2}\right)+6\log(3x-1)\right]$$

✓

Maple : cpu = 0.26 (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

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

✓ **Mathematica** : cpu = 0.0214477 (sec), leaf count = 29

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

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

✓ **Maple** : cpu = 0.038 (sec), leaf count = 23

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

$$y(x)=x^2+\frac{\operatorname{LambertW}\left(-4c_1e^{-2x^2-1}\right)}{2}+\frac{1}{2}$$

2.218

ODE No. 218

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

✓

Mathematica : cpu = 0.100527 (sec), leaf count = 257

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

$$\left\{ \left\{ y(x) \rightarrow x^2 + \frac{1}{-\frac{1}{2x^2} - \frac{\frac{1}{2} - \frac{i}{2}}{\sqrt{2}x^2 \sqrt{x^2 \cosh\left(\frac{2c_1}{9}\right) + x^2 \sinh\left(\frac{2c_1}{9}\right) - i}}} \right\}, \left\{ y(x) \rightarrow x^2 + \frac{1}{-\frac{1}{2x^2} + \frac{\frac{1}{2} - \frac{i}{2}}{\sqrt{2}x^2 \sqrt{x^2 \cosh\left(\frac{2c_1}{9}\right) + x^2 \sinh\left(\frac{2c_1}{9}\right)}}} \right\} \right.$$

✓

Maple : cpu = 0.442 (sec), leaf count = 57

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

$$y(x) = -\frac{c_1 \sqrt{c_1^2 - 4x^2}}{2} + \frac{c_1^2}{2} - x^2$$

2.219 ODE No. 219

$$-f_0(x) - f_1(x)y(x) - f_2(x)y(x)^2 + (g(x) + y(x))y'(x) = 0$$

✗ Mathematica : cpu = 300.791 (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 = 0.0893104 (sec), leaf count = 57

```
DSolve[-x^3 - x*y[x]^2 + 2*y[x]*Derivative[1][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{-x^2 + c_1 e^{\frac{x^2}{2}} - 2} \right\}, \left\{ y(x) \rightarrow \sqrt{-x^2 + c_1 e^{\frac{x^2}{2}} - 2} \right\} \right\}$$

✓ **Maple** : cpu = 0.023 (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 = 0.0233133 (sec), leaf count = 35

```
DSolve[1 - x - 2*y[x] + (1 + x + 2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{2}(-x-1) + \frac{2}{3}\left(1 + W\left(-e^{\frac{9x}{4}-1+c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (sec), leaf count = 21

```
dsolve((2*y(x)+x+1)*diff(y(x),x)-2*y(x)-x+1 = 0,y(x))
```

$$y(x) = -\frac{x}{2} + \frac{2 \operatorname{LambertW}\left(\frac{e^{-\frac{1}{4}}e^{\frac{9x}{4}}c_1}{4}\right)}{3} + \frac{1}{6}$$

2.222

ODE No. 222

$$(2y(x) + x + 7)y'(x) - y(x) + 2x + 4 = 0$$

✓ **Mathematica** : cpu = 0.0607945 (sec), leaf count = 65

```
DSolve[4 + 2*x - y[x] + (7 + x + 2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

Solve

$$\left[2\log\left(\frac{4(x^2 + y(x)^2 + 4y(x) + 6x + 13)}{5(x + 3)^2}\right) + 2\tan^{-1}\left(\frac{y(x) - 2(x + 2)}{2y(x) + x + 7}\right) + 4\log(x + 3) + 5c_1 = 0, y(x)\right]$$

✓ **Maple** : cpu = 0.093 (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 = 0.0250404 (sec), leaf count = 55

```
DSolve[-2*x - y[x] + (-x + 2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{2} \left(x - \sqrt{5x^2 - 4e^{c_1}} \right) \right\}, \left\{ y(x) \rightarrow \frac{1}{2} \left(x + \sqrt{5x^2 - 4e^{c_1}} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.204 (sec), leaf count = 51

```
dsolve((2*y(x)-x)*diff(y(x),x)-y(x)-2*x = 0,y(x))
```

$$y(x) = \frac{xc_1 - \sqrt{5c_1^2x^2 + 4}}{2c_1}$$

2.224

ODE No. 224

$$(2y(x)-6x)y'(x)-y(x)+3x+2=0$$

✓

Mathematica

: cpu = 0.0236248 (sec), leaf count = 29

DSolve[2 + 3*x - y[x] + (-6*x + 2*y[x])*Derivative[1][y][x] == 0,y[x],x]

$$\left\{\left\{y(x)\rightarrow 3x-\frac{2}{5}\left(1+W\left(-e^{\frac{25x}{4}-1+c_1}\right)\right)\right\}\right\}$$

✓

Maple

: cpu = 0.125 (sec), leaf count = 35

dsolve((2*y(x)-6*x)*diff(y(x),x)-y(x)+3*x+2 = 0,y(x))

$$y(x)=\frac{e^{-\operatorname{LambertW}\left(-\frac{e^{\frac{25x}{4}}e^{-1}e^{-\frac{25c_1}{4}}}{2}\right)+\frac{25x}{4}-1-\frac{25c_1}{4}}}{5}+3x-\frac{2}{5}$$

2.225 ODE No. 225

$$(4y(x) + 2x + 3)y'(x) - 2y(x) - x - 1 = 0$$

✓ **Mathematica** : cpu = 0.0220047 (sec), leaf count = 33

```
DSolve[-1 - x - 2*y[x] + (3 + 2*x + 4*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4}(-2x - 3) + \frac{1}{8}(1 + W(-e^{8x-1+c_1})) \right\} \right\}$$

✓ **Maple** : cpu = 0.095 (sec), leaf count = 20

```
dsolve((4*y(x)+2*x+3)*diff(y(x),x)-2*y(x)-x-1 = 0,y(x))
```

$$y(x) = -\frac{x}{2} + \frac{\text{LambertW}(e^5 e^{8x} c_1)}{8} - \frac{5}{8}$$

2.226

ODE No. 226

$$(4y(x) - 2x - 3)y'(x) + 2y(x) - x - 1 = 0$$

✓ **Mathematica** : cpu = 0.0222608 (sec), leaf count = 35

```
DSolve[-1 - x + 2*y[x] + (-3 - 2*x + 4*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4}(2x + 3) + \frac{1}{8}(-1 - W(-e^{8x-1+c_1})) \right\} \right\}$$

✓ **Maple** : cpu = 0.089 (sec), leaf count = 21

```
dsolve((4*y(x)-2*x-3)*diff(y(x),x)+2*y(x)-x-1 = 0,y(x))
```

$$y(x) = \frac{x}{2} - \frac{\operatorname{LambertW}(-e^5e^{8x}c_1)}{8} + \frac{5}{8}$$

2.227 ODE No. 227

$$(4y(x) - 3x - 5)y'(x) - 3y(x) + 7x + 2 = 0$$

✓ **Mathematica** : cpu = 0.0183536 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4}(3x + 5) - \frac{1}{2}i\sqrt{-2\left(-\frac{7x^2}{2} - 2x\right) - \frac{1}{4}(3x + 5)^2 - 4c_1} \right\}, \left\{ y(x) \rightarrow \frac{1}{4}(3x + 5) + \frac{1}{2}i\sqrt{-2\left(-\frac{7x^2}{2} - 2x\right) - \frac{1}{4}(3x + 5)^2 - 4c_1} \right\} \right.$$

✓ **Maple** : cpu = 0.238 (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 = 0.190947 (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]
```

$$\left\{ \left\{ \begin{array}{l} y(x) \rightarrow \frac{4 \left(- \frac{81 (9x-1) \left(81 \cosh\left(\frac{3c_1}{8}\right) x^2 + 81 \sinh\left(\frac{3c_1}{8}\right) x^2 - 18 \cosh\left(\frac{3c_1}{8}\right) x - 18 \sinh\left(\frac{3c_1}{8}\right) x + \cosh\left(\frac{3c_1}{8}\right) + \sinh\left(\frac{3c_1}{8}\right) - 1 \right) \sqrt[3]{-258280326} \right)}{81 (9x-1) \left(81 \cosh\left(\frac{3c_1}{8}\right) x^2 + 81 \sinh\left(\frac{3c_1}{8}\right) x^2 - 18 \cosh\left(\frac{3c_1}{8}\right) x - 18 \sinh\left(\frac{3c_1}{8}\right) x + \cosh\left(\frac{3c_1}{8}\right) + \sinh\left(\frac{3c_1}{8}\right) - 1 \right)} \right. \right. \end{array} \right.$$

✓ **Maple** : cpu = 0.432 (sec), leaf count = 264

```
dsolve((4*y(x)+11*x-11)*diff(y(x),x)-25*y(x)-8*x+62 = 0,y(x))
```

$$y(x) = \frac{-4(-19x + 7) \left(64 - 8748(9x - 1)^2 c_1 + 108\sqrt{43046721} \sqrt{c_1 \left(x - \frac{1}{9}\right)^2 \left(-\frac{32}{177147} + \left(x - \frac{1}{9}\right)^2 c_1\right)} \right)^{1/3} - 16 - 8 \left(64 - 8748(9x - 1)^2 c_1 + 108\sqrt{43046721} \sqrt{c_1 \left(x - \frac{1}{9}\right)^2 \left(-\frac{32}{177147} + \left(x - \frac{1}{9}\right)^2 c_1\right)} \right)}{16 - 8 \left(64 - 8748(9x - 1)^2 c_1 + 108\sqrt{43046721} \sqrt{c_1 \left(x - \frac{1}{9}\right)^2 \left(-\frac{32}{177147} + \left(x - \frac{1}{9}\right)^2 c_1\right)} \right)}$$

2.229

ODE No. 229

$$(12y(x) - 5x - 8)y'(x) - 5y(x) + 2x + 3 = 0$$

✓ **Mathematica** : cpu = 0.0174485 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{12}(5x + 8) - \frac{i\sqrt{-24\left(-\frac{x^2}{12} - \frac{x}{4}\right) - \frac{1}{12}(5x + 8)^2 - 12c_1}}{2\sqrt{3}} \right\}, \left\{ y(x) \rightarrow \frac{1}{12}(5x + 8) + \frac{i\sqrt{-24\left(-\frac{x^2}{12} - \frac{x}{4}\right) - \frac{1}{12}(5x + 8)^2 - 12c_1}}{2\sqrt{3}} \right\} \right.$$

✓ **Maple** : cpu = 0.211 (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 = 0.12563 (sec), leaf count = 98

```
DSolve[f[x] + b*y[x]^2 + a*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow -e^{-\frac{bx}{a}}\sqrt{2\int_1^x-\frac{e^{\frac{2bK[1]}}{a}}f(K[1])dK[1]+c_1}\right\},\left\{y(x)\rightarrow e^{-\frac{bx}{a}}\sqrt{2\int_1^x-\frac{e^{\frac{2bK[1]}}{a}}f(K[1])dK[1]+c_1}\right\}\right.$$

✓ **Maple** : cpu = 0.081 (sec), leaf count = 100

```
dsolve(a*y(x)*diff(y(x),x)+b*y(x)^2+f(x) = 0,y(x))
```

$$y(x)=\frac{e^{-\frac{2bx}{a}}\sqrt{e^{\frac{2bx}{a}}a\left(c_1a-2\left(\int e^{\frac{2bx}{a}}f\left(x\right)dx\right)\right)}}{a}$$

2.231 ODE No. 231

$y'(x)(ay(x) + bx + c) + \alpha y(x) + \beta x + \gamma = 0$

✓ Mathematica : cpu = 1.59365 (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]
```

Solve

$$\frac{(\alpha - b)^2 \left(-\log \left(\frac{(ay(x)+bx+c)^2 \left(-\frac{(\alpha(bx+c)-a(\beta x+\gamma)) \left(a(\alpha-b)y(x)+a(\beta x+\gamma)+b^2(-x)-bc}{(ay(x)+bx+c)^2} + a\beta - \alpha b \right)}{(\alpha(bx+c)-a(\beta x+\gamma))^2} \right) \right) - \frac{2 \tan^{-1} \left(\frac{\frac{2a(\beta x+\gamma)-2\alpha}{ay(x)+bx+c}}{(\alpha-b) \sqrt{\frac{4(a\beta-\alpha b)}{(\alpha-b)^2}}} \right)}{\sqrt{\frac{4(a\beta-\alpha b)}{(\alpha-b)^2}}}}{2(a\beta - \alpha b)}$$

✓ Maple : cpu = 0.319 (sec), leaf count = 178

```
dsolve((a*y(x)+b*x+c)*diff(y(x),x)+alpha*y(x)+beta*x+gamma = 0,y(x))
```

$y(x) = \frac{-b\gamma + \beta c + \frac{(x(a\beta-b\alpha)+a\gamma-\alpha c) \left(\sqrt{4a\beta-\alpha^2-2b\alpha-b^2} \tan \left(\text{RootOf} \left(\sqrt{4a\beta-\alpha^2-2b\alpha-b^2} \ln \left(\frac{(a\beta x-\alpha bx+a\gamma-\alpha c)^2 \left(\tan(\_Z)^2+1 \right) (4a\beta-}{4a} \right) \right) \right)}{2a}}{-a\beta + b\alpha}}$

2.232 ODE No. 232

$$x^2 + xy(x)y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.059813 (sec), leaf count = 56

```
DSolve[x^2 + y[x]^2 + x*y[x]*Derivative[1][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{-x^4 + 2c_1}}{\sqrt{2}x} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{-x^4 + 2c_1}}{\sqrt{2}x} \right\} \right\}$$

✓ **Maple** : cpu = 0.02 (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

$$ax^3 \cos(x) + xy(x)y'(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.117899 (sec), leaf count = 38

```
DSolve[a*x^3*Cos[x] - y[x]^2 + x*y[x]*Derivative[1][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -x\sqrt{-2a\sin(x) + c_1} \right\}, \left\{ y(x) \rightarrow x\sqrt{-2a\sin(x) + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.025 (sec), leaf count = 30

```
dsolve(x*y(x)*diff(y(x),x)-y(x)^2+a*x^3*cos(x) = 0, y(x))
```

$$y(x) = \sqrt{-2\sin(x)a + c_1} x$$

2.234 ODE No. 234

$$x^3 - 2x^2 + xy(x)y'(x) + xy(x) - y(x)^2 = 0$$

X **Mathematica** : cpu = 22.878 (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]
```

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 = 0.0835408 (sec), leaf count = 40

```
DSolve[b*y[x] + (a + x*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[x = -\frac{ae^{-\frac{y(x)}{b}}\text{Ei}\left(\frac{y(x)}{b}\right)}{b} + c_1e^{-\frac{y(x)}{b}}, y(x)\right]$$

✓ **Maple** : cpu = 0.06 (sec), leaf count = 30

```
dsolve((x*y(x)+a)*diff(y(x),x)+b*y(x) = 0,y(x))
```

$$c_1 + \frac{1}{-e^{\frac{y(x)}{b}}bx + a\text{Ei}_1\left(-\frac{y(x)}{b}\right)} = 0$$

2.236

ODE No. 236

$$x(y(x)+4)y'(x)-y(x)^2-2y(x)-2x=0$$

✓ **Mathematica** : cpu = 0.0913848 (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]
```

$$\left\{\left\{y(x) \rightarrow -4 + \frac{1}{x\left(\frac{1}{x^2+4x} - \frac{e^{-2\left(\frac{\log(x)}{4} + \frac{3}{4}\log(x+4)\right)}}{\sqrt{-\frac{4}{x+4}+c_1}}\right)}\right\},\left\{y(x) \rightarrow -4 + \frac{1}{x\left(\frac{1}{x^2+4x} + \frac{e^{-2\left(\frac{\log(x)}{4} + \frac{3}{4}\log(x+4)\right)}}{\sqrt{-\frac{4}{x+4}+c_1}}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 141

```
dsolve(x*(y(x)+4)*diff(y(x),x)-y(x)^2-2*y(x)-2*x = 0,y(x))
```

$$y(x) = \frac{-(x+4)^{3/2}\sqrt{\frac{(x+4)c_1-4}{x+4}}x-16\sqrt{x}-4x^{3/2}}{-(x+4)^{3/2}\sqrt{\frac{(x+4)c_1-4}{x+4}}+4\sqrt{x}+x^{3/2}}$$

2.237 ODE No. 237

$$x(a + y(x))y'(x) + by(x) + cx = 0$$

X **Mathematica** : cpu = 2.48625 (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]
```

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 = 0.229884 (sec), leaf count = 192

`DSolve[-b - y[x]*(x + y[x]) + (a + x*(x + y[x]))*Derivative[1][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x) \rightarrow -\frac{a+x^2}{x} + \frac{1}{x \left(-\frac{a}{-a^2-ax^2-bx^2} - \frac{x}{(a^2+ax^2+bx^2)^{3/2} \sqrt{-\frac{1}{(a+b)(a^2+ax^2+bx^2)} + c_1}} \right)} \right\}, \left\{y(x) \rightarrow -\frac{a+x^2}{x} + \frac{1}{x \left(-\frac{a}{-a^2-ax^2-bx^2} - \frac{x}{(a^2+ax^2+bx^2)^{3/2} \sqrt{-\frac{1}{(a+b)(a^2+ax^2+bx^2)} + c_1}} \right)} \right\}$$

✓ **Maple** : cpu = 0.089 (sec), leaf count = 91

`dsolve((x*(y(x)+x)+a)*diff(y(x),x)-y(x)*(y(x)+x)-b = 0,y(x))`

$$y(x) = \frac{c_1 a b x + x + \sqrt{(a+b) (-1 + (a x^2 + b x^2 + a^2) c_1)}}{a^2 c_1 - 1}$$

2.239 ODE No. 239

$$(xy(x) - x^2) y'(x) - 2x^2 - 3xy(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.097419 (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]
```

$$\left\{ \left\{ y(x) \rightarrow x - \frac{\sqrt{2x^4 + e^{2c_1}}}{x} \right\}, \left\{ y(x) \rightarrow x + \frac{\sqrt{2x^4 + e^{2c_1}}}{x} \right\} \right\}$$

✓ **Maple** : cpu = 0.221 (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))
```

$$y(x) = \frac{x^2 c_1 - \sqrt{2c_1^2 x^4 + 1}}{c_1 x}$$

2.240 ODE No. 240

$$ax + 2xy(x)y'(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0857123 (sec), leaf count = 41

```
DSolve[a*x - y[x]^2 + 2*x*y[x]*Derivative[1][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{-ax \log(x) + c_1 x} \right\}, \left\{ y(x) \rightarrow \sqrt{-ax \log(x) + c_1 x} \right\} \right\}$$

✓ **Maple** : cpu = 0.02 (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 = 0.0998251 (sec), leaf count = 41

```
DSolve[a*x^2 - y[x]^2 + 2*x*y[x]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{-ax^2 + c_1x} \right\}, \left\{ y(x) \rightarrow \sqrt{-ax^2 + c_1x} \right\} \right\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 33

```
dsolve(2*x*y(x)*diff(y(x),x)-y(x)^2+a*x^2 = 0,y(x))
```

$$y(x) = \sqrt{-ax^2 + xc_1}$$

2.242 ODE No. 242

$$2xy(x)y'(x) + 2y(x)^2 + 1 = 0$$

✓ **Mathematica** : cpu = 0.0685911 (sec), leaf count = 60

```
DSolve[1 + 2*y[x]^2 + 2*x*y[x]*Derivative[1][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{-x^2 + e^{4c_1}}}{\sqrt{2}x} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{-x^2 + e^{4c_1}}}{\sqrt{2}x} \right\} \right\}$$

✓ **Maple** : cpu = 0.017 (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 = 8.10688 (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]`

$$\left\{\left\{y(x) \rightarrow -\frac{\sqrt[3]{2}x}{\sqrt[3]{-27c_1^2x^2+\sqrt{108c_1^3x^3+(27c_1^2x-27c_1^2x^2)^2}+27c_1^2x}}+\frac{\sqrt[3]{-27c_1^2x^2+\sqrt{108c_1^3x^3+(27c_1^2x-27c_1^2x^2)^2}+27c_1^2x}}{3\sqrt[3]{2}c_1}\right.\right.$$

✓ **Maple** : cpu = 0.237 (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))`

$$y(x) = \frac{3\,5^{1/3}\left(x\left(\sqrt{5}\sqrt{\frac{80x^2c_1-160xc_1+80c_1-x}{c_1}}+20x-20\right)c_1^2\right)^{1/3}}{40c_1}+\frac{3x5^{2/3}}{40\left(x\left(\sqrt{5}\sqrt{\frac{80x^2c_1-160xc_1+80c_1-x}{c_1}}+20x-20\right)\right)}$$

2.244

ODE No. 244

$$x(2y(x)-x-1)y'(x)+(-y(x)+2x-1)y(x)=0$$

✓ **Mathematica** : cpu = 7.94777 (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]
```

$$\left\{\left\{y(x) \rightarrow -\frac{\sqrt[3]{2} x}{\sqrt[3]{27 c_1^2 x^2+\sqrt{\left(27 c_1^2 x^2+27 c_1^2 x\right)^2-108 c_1^3 x^3}+27 c_1^2 x}}-\frac{\sqrt[3]{27 c_1^2 x^2+\sqrt{\left(27 c_1^2 x^2+27 c_1^2 x\right)^2-108 c_1^3 x^3}+27 c_1^2 x}}{3 \sqrt[3]{2} c_1}\right.\right.$$

✓ **Maple** : cpu = 0.21 (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))
```

$$y(x) = \frac{3 \, 5^{1/3} \left(x \left(\sqrt{5} \sqrt{\frac{80 x^2 c_1 + 160 x c_1 + 80 c_1 - x}{c_1}} - 20 x - 20\right) c_1^2\right)^{1/3}}{40 c_1} + \frac{3 x 5^{2/3}}{40 \left(x \left(\sqrt{5} \sqrt{\frac{80 x^2 c_1 + 160 x c_1 + 80 c_1 - x}{c_1}} - 20 x - 20\right) c_1^2\right)^{1/3}}$$

2.245

ODE No. 245

$$(4x^3 + 2xy(x))\,y'(x) + 112x^2y(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.301536 (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]
```

$$\left\{\left\{y(x) \rightarrow \text{Root}\left[-1521681143169024 \#1 x^{22} - 697437190619136 \#1^2 x^{20} - 145299414712320 \#1^3 x^{18} - 1816\right.\right.\right.$$

✓ **Maple** : cpu = 1.092 (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 = 0.0981638 (sec), leaf count = 80

```
DSolve[3*(x + y[x])^2 + x*(2*x + 3*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{6} \left(-4x - \frac{\sqrt{2}\sqrt{-x^4 + 3e^{4c_1}}}{x} \right) \right\}, \left\{ y(x) \rightarrow \frac{1}{6} \left(-4x + \frac{\sqrt{2}\sqrt{-x^4 + 3e^{4c_1}}}{x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.09 (sec), leaf count = 63

```
dsolve(x*(3*y(x)+2*x)*diff(y(x),x)+3*(y(x)+x)^2 = 0,y(x))
```

$$y(x) = \frac{-4x^2c_1 - \sqrt{-2c_1^2x^4 + 6}}{6xc_1}$$

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 = 6.94526 (sec), leaf count = 693

```
DSolve[-3 - 9*x - 7*x^2 + x*y[x] - y[x]^2 + (2 + 3*x)*(-1 - 2*x + y[x])*Derivative[1][y][x] ==
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[3]{1458x^3 + 2916x^2 + \sqrt{4(-81x^2 - 108x - 36)^3 + (1458x^3 + 2916x^2 + 1944x - 324e^{2c_1}x + 432)}}}{6\sqrt[3]{2}} \right. \right.$$

✓ **Maple** : cpu = 0.391 (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))
```

$$y(x) = -\frac{1}{3} + \frac{(3x + 2) \left(7 \left(-\frac{\left(2(3x+2)c_1 - 27(3x+2)^3c_1^3 + 2\sqrt{-27(3x+2)^4c_1^4 + (3x+2)^2c_1^2} \right)^{1/3}}{4} - \frac{9(3x+2)^2c_1^2}{4 \left(2(3x+2)c_1 - 27(3x+2)^3c_1^3 + 2\sqrt{-27(3x+2)^4c_1^4 + (3x+2)^2c_1^2} \right)} \right)}{6 \left(-\frac{\left(2(3x+2)c_1 - 27(3x+2)^3c_1^3 + 2\sqrt{-27(3x+2)^4c_1^4 + (3x+2)^2c_1^2} \right)^{1/3}}{4} - \frac{9(3x+2)^2c_1^2}{4 \left(2(3x+2)c_1 - 27(3x+2)^3c_1^3 + 2\sqrt{-27(3x+2)^4c_1^4 + (3x+2)^2c_1^2} \right)} \right)}$$

2.248

ODE No. 248

$$(x^2 + 6xy(x) + 3) \, y'(x) + 3y(x)^2 + 2xy(x) + 2x = 0$$

✓

Mathematica : cpu = 0.120798 (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]

$$\left\{ \left\{ y(x) \rightarrow \frac{-x^2 - 3}{6x} - \frac{\sqrt{-2x^3 + \frac{1}{6}(x^2 + 3)^2 + 6c_1x}}{\sqrt{6}x} \right\}, \left\{ y(x) \rightarrow \frac{-x^2 - 3}{6x} + \frac{\sqrt{-2x^3 + \frac{1}{6}(x^2 + 3)^2 + 6c_1x}}{\sqrt{6}x} \right\} \right.$$

✓

Maple : cpu = 0.019 (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))

$$y(x) = \frac{-x^2 - 3 + \sqrt{x^4 - 12x^3 - 12xc_1 + 6x^2 + 9}}{6x}$$

2.249

ODE No. 249

$$y'(x) \left(axy(x) + bx^n\right) + \alpha y(x)^3 + \beta y(x)^2 = 0$$

✓ **Mathematica** : cpu = 3.76303 (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]

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 = 0.262 (sec), leaf count = 202

dsolve((a*x*y(x)+b*x^n)*diff(y(x),x)+alpha*y(x)^3+beta*y(x)^2 = 0,y(x))

$$y(x) = \frac{\text{RootOf}\left(-x^{1-n} \_Z^{\frac{a(n-1)}{\beta}} a^2 \beta n + c_1 a^2 b n^2 + x^{1-n} \_Z^{\frac{a(n-1)}{\beta}} a^2 \beta - x^{1-n} \_Z^{\frac{a(n-1)}{\beta}} a \beta^2 - \_Z^{\frac{an-a+\beta}{\beta}} \beta b a n + \right)}{}$$

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 = 300.576 (sec), leaf count = 0

```
DSolve[EulerGamma + alpha*x + beta*y[x] + A*x*y[x] - B*y[x]^2 + (c + a*x + A*x^2 + b*y[x] + B*
```

, timed out

\$Aborted

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((B*x*y(x)+A*x^2+a*x+b*y(x)+c)*diff(y(x),x)-B*g(x)^2+A*x*y(x)+alpha*x+beta*y(x)+ga
```

, 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)+ga
```

2.251

ODE No. 251

$$(x^2y(x)-1)y'(x)+xy(x)^2-1=0$$

✓ **Mathematica** : cpu = 0.0940395 (sec), leaf count = 60

```
DSolve[-1 + x*y[x]^2 + (-1 + x^2*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{x^2}-\frac{\sqrt{2x^3+c_1x^2+1}}{x^2}\right\},\left\{y(x)\rightarrow \frac{1}{x^2}+\frac{\sqrt{2x^3+c_1x^2+1}}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 51

```
dsolve((x^2*y(x)-1)*diff(y(x),x)+x*y(x)^2-1 = 0,y(x))
```

$$y(x)=\frac{1+\sqrt{-2x^2c_1+2x^3+1}}{x^2}$$

2.252

ODE No. 252

$$(x^2y(x)-1)\,y'(x)-xy(x)^2+1=0$$

✓

Mathematica : cpu = 7.80832 (sec), leaf count = 819

`DSolve[1 - x*y[x]^2 + (-1 + x^2*y[x])*Derivative[1][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow\frac{6xc_1-x}{6c_1-1}+\frac{\sqrt[3]{-1944c_1^2x^3+648c_1x^3-54x^3+1944c_1^2-648c_1}+\sqrt{4\left(54x^2c_1-9x^2\right)^3+(-1944c_1^2+648c_1x^3-54x^3)}}{3\sqrt[3]{2}(6c_1-1)}\right.\right.$$

✓

Maple : cpu = 1.079 (sec), leaf count = 1322

`dsolve((x^2*y(x)-1)*diff(y(x),x)-x*y(x)^2+1 = 0,y(x))`

$$y(x)=\frac{((-c_1+80)x^7-160x^4+80x)4^{1/3}\left(c_1(-80+(c_1-80)x^6+160x^3)\right)^2\left(-\frac{1}{4}+\sqrt{\frac{-5x^6+10x^3-5}{-80+(c_1-80)x^6+160x^3}}\right)}{(80+(-c_1+80)x^6-160x^3)4^{1/3}\left(c_1(-80+(c_1-80)x^6+160x^3)\right)^2\left(-\frac{1}{4}+\sqrt{\frac{-5x^6+10x^3-5}{-80+(c_1-80)x^6+160x^3}}\right)}^{1/3}$$

2.253 ODE No. 253

$$(x^2y(x) - 1)y'(x) + 8xy(x)^2 - 8 = 0$$

X **Mathematica** : cpu = 6.14409 (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]
```

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 = 0.100318 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{2x}{-x^2 + \frac{\sqrt{2}\sqrt{-\frac{x}{2}-2x(-\log(x)+c_1)}}{\sqrt{-\frac{1}{x^3}}}} \right\}, \left\{ y(x) \rightarrow \frac{2x}{x^2 + \frac{\sqrt{2}\sqrt{-\frac{x}{2}-2x(-\log(x)+c_1)}}{\sqrt{-\frac{1}{x^3}}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 59

```
dsolve(x*(x*y(x)-2)*diff(y(x),x)+x^2*y(x)^3+x*y(x)^2-2*y(x) = 0,y(x))
```

$$y(x) = \frac{-1 + \sqrt{1 - 4 \ln(x) + 4c_1}}{2(-\ln(x) + c_1)x}$$

2.255 ODE No. 255

$$x(xy(x) - 3)y'(x) + xy(x)^2 - y(x) = 0$$

✓ **Mathematica** : cpu = 6.32847 (sec), leaf count = 30

```
DSolve[-y[x] + x*y[x]^2 + x*(-3 + x*y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{3W\left(e^{-1+\frac{9c_1}{2^{2/3}}}x^{2/3}\right)}{x} \right\} \right\}$$

✓ **Maple** : cpu = 0.316 (sec), leaf count = 74

```
dsolve(x*(x*y(x)-3)*diff(y(x),x)+x*y(x)^2-y(x) = 0,y(x))
```

$$y(x) = -\frac{3\operatorname{LambertW}\left(\frac{2\left(-\frac{x^2}{8}\right)^{1/3}c_1}{3}\right)}{x}$$

2.256

ODE No. 256

$$x^2(y(x)-1)y'(x)+(x-1)y(x)=0$$

✓ **Mathematica** : cpu = 0.0235343 (sec), leaf count = 21

```
DSolve[(-1 + x)*y[x] + x^2*(-1 + y[x])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow -W\left(x\left(-e^{\frac{1}{x}-c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.208 (sec), leaf count = 31

```
dsolve(x^2*(-1+y(x))*diff(y(x),x)+(x-1)*y(x) = 0,y(x))
```

$$y(x)=e^{\frac{x\ln(x)-\text{LambertW}\left(-xe^{c_1+\frac{1}{x}}\right)x+xc_1+1}{x}}$$

2.257

ODE No. 257

$$x\left(x^4+xy(x)-1\right)y'(x)-y(x)\left(-x^4+xy(x)-1\right)=0$$

✓

Mathematica : cpu = 0.283203 (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 = 0.131 (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))

$$y(x)=\frac{\left(-c_1+e^{\text{RootOf}\left(-2\_Zx^4e^2-\_Z+2x^4e^2-\_Z-2e^{-\_Z}c_1x^4+e^2-\_Z-2e^{-\_Z}c_1+c_1^2\right)}\right)e^{-\text{RootOf}\left(-2\_Zx^4e^2-\_Z+2x^4e^2-\_Z-2e^{-\_Z}c_1x^4+e^2-\_Z-2e^{-\_Z}c_1+c_1^2\right)}}{x}$$

2.258

ODE No. 258

$$-2x^3 + 2x^2y(x)y'(x) - x^2 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0778811 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{x^2 + c_1 e^{\frac{1}{x}}} \right\}, \left\{ y(x) \rightarrow \sqrt{x^2 + c_1 e^{\frac{1}{x}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.023 (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))
```

$$y(x) = \sqrt{e^{\frac{1}{x}}c_1 + x^2}$$

2.259 ODE No. 259

$$2x^2y(x)y'(x) - e^{x-\frac{1}{x}}x^2 - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.217169 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -e^{-\frac{1}{2}/x} \sqrt{e^x + c_1} \right\}, \left\{ y(x) \rightarrow e^{-\frac{1}{2}/x} \sqrt{e^x + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.027 (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))
```

$$y(x) = \sqrt{e^{-\frac{1}{x}}c_1 + e^{\frac{x^2-1}{x}}}$$

2.260 ODE No. 260

$$(2x^2y(x) + x) y'(x) - x^2y(x)^3 + 2xy(x)^2 + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0971911 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x}{-2x^2 + \frac{\sqrt{4x+x(-2\log(x)+c_1)}}{\sqrt{\frac{1}{x^3}}}} \right\}, \left\{ y(x) \rightarrow -\frac{x}{2x^2 + \frac{\sqrt{4x+x(-2\log(x)+c_1)}}{\sqrt{\frac{1}{x^3}}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.028 (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

$$(2x^2y(x) - x) y'(x) - 2xy(x)^2 - y(x) = 0$$

✓ **Mathematica** : cpu = 0.462921 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{2xW\left(\frac{e^{-1+\frac{9c_1}{2^2/3}}}{x^2}\right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.145 (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))
```

$$y(x) = -\frac{1}{2\operatorname{LambertW}\left(-\frac{c_1}{2x^2}\right)x}$$

2.262 ODE No. 262

$$2x^3 + (2x^2y(x) - x^3) y'(x) - 4xy(x)^2 + y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.119535 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{2x^3 - \sqrt{e^{4c_1}x^2 - 3e^{2c_1}x^4}}{x^2 + e^{2c_1}} \right\}, \left\{ y(x) \rightarrow \frac{2x^3 + \sqrt{e^{4c_1}x^2 - 3e^{2c_1}x^4}}{x^2 + e^{2c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.384 (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))
```

$$y(x) = \frac{x(2x^2c_1 - \sqrt{3x^2c_1 + 1})}{x^2c_1 - 1}$$

2.263

ODE No. 263

$$2x^3 + 3x^2y(x)^2 + y(x)y'(x) + 7 = 0$$

✓ **Mathematica** : cpu = 0.102009 (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]

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{\frac{7\,2^{2/3}e^{-2x^3}x\Gamma\left(\frac{1}{3},-2x^3\right)}{3\sqrt[3]{-x^3}} - \frac{2^{2/3}e^{-2x^3}x\Gamma\left(\frac{4}{3},-2x^3\right)}{3\sqrt[3]{-x^3}} + c_1e^{-2x^3}} \right\}, \left\{ y(x) \rightarrow \sqrt{\frac{7\,2^{2/3}e^{-2x^3}x\Gamma\left(\frac{1}{3},-2x^3\right)}{3\sqrt[3]{-x^3}} + \frac{2^{2/3}e^{-2x^3}x\Gamma\left(\frac{4}{3},-2x^3\right)}{3\sqrt[3]{-x^3}} - c_1e^{-2x^3}} \right\} \right.$$

✓ **Maple** : cpu = 0.261 (sec), leaf count = 179

dsolve(2*x^3+y(x)*diff(y(x),x)+3*y(x)^2*x^2+7 = 0,y(x))

$$y(x) = -\frac{2^{2/3}\sqrt{3}\sqrt{-80(-x^3)^{1/3}\Gamma\left(\frac{2}{3}\right)2^{1/3}\left(\frac{9\left(-\frac{3e^{-2x^3}c_1}{2}+x\right)\Gamma\left(\frac{2}{3}\right)2^{1/3}(-x^3)^{1/3}}{40}+xe^{-2x^3}\left(\pi\sqrt{3}-\frac{3\Gamma\left(\frac{1}{3},-2x^3\right)\Gamma\left(\frac{2}{3}\right)}{2}\right)\right)}}{18(-x^3)^{1/3}\Gamma\left(\frac{2}{3}\right)}$$

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 = 0.294531 (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]
```

$$\left\{\left\{y(x)\rightarrow \text{Root}\left[81\#1^7e^{\frac{21c_1}{2}}x^{12}+756\#1^6e^{\frac{21c_1}{2}}x^9+2646\#1^5e^{\frac{21c_1}{2}}x^6+4116\#1^4e^{\frac{21c_1}{2}}x^3+2401\#1^3e^{\frac{21c_1}{2}}-x^3\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.501 (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 = 195.483 (sec), leaf count = 0

```
DSolve[2*(1 + n)^2*x^(-1 + n)*(-1 + x^n^2*y[x]^2) + (-1 + x^(n*(1 + n)))*y[x])*Derivative[1][y]
```

, could not solve

```
DSolve[2*(1 + n)^2*x^(-1 + n)*(-1 + x^n^2*y[x]^2) + (-1 + x^(n*(1 + n)))*y[x])*Derivative
```

 **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 = 2.93459 (sec), leaf count = 69

`DSolve[-(a*Sqrt[(1 + y[x]^2)^3]) + Sqrt[1 + x^2]*(-x + y[x])*Derivative[1][y][x] == 0,y[x],x]`

$$\text{Solve}\left[\left\{\frac{2a \tan^{-1}\left(\frac{1-a \tan\left(\frac{K[1]}{2}\right)}{\sqrt{a^2-1}}\right)}{\sqrt{a^2-1}}+K[1]+\tan^{-1}(x)=c_1,y(x)=\frac{\tan(K[1])+x}{1-x \tan(K[1])}\right\},\{K[1],y(x)\}\right]$$

✓

Maple : cpu = 3.217 (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))`

$$\sqrt{2}\sqrt{\frac{a^2}{1+\cos(2\arctan(x)-2\arctan(y(x)))}}\cos(\arctan(x)-\arctan(y(x)))\arctan\left(\frac{\cos(\arctan(x)-\arctan(y(x)))}{\sqrt{a^2-1}}\right)+a\arctan$$

$$\sqrt{a^2-1}$$

2.267 ODE No. 267

$$y(x) \sin^2(x) y'(x) + y(x)^2 \sin(x) \cos(x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.200845 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{2x + c_1} \csc(x) \right\}, \left\{ y(x) \rightarrow \sqrt{2x + c_1} \csc(x) \right\} \right\}$$

✓ **Maple** : cpu = 0.056 (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 = 0.120888 (sec), leaf count = 146

`DSolve[h[x] + g[x]*y[x]^2 + f[x]*y[x]*Derivative[1][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow -\exp\left(\int_1^x-\frac{g(K[1])}{f(K[1])}dK[1]\right)\sqrt{2\int_1^x-\frac{\exp\left(-2\int_1^{K[2]}-\frac{g(K[1])}{f(K[1])}dK[1]\right)h(K[2])}{f(K[2])}dK[2]+c_1}\right\},\left\{y\right.\right\}$$

✓

Maple : cpu = 0.108 (sec), leaf count = 118

`dsolve(f(x)*y(x)*diff(y(x),x)+g(x)*y(x)^2+h(x) = 0,y(x))`

$$y(x)=e^{\int-\frac{2g(x)}{f(x)}dx}\sqrt{e^{2\left(\int\frac{g(x)}{f(x)}dx\right)}\left(-2\left(\int\frac{e^{\int\frac{2g(x)}{f(x)}dx}h(x)}{f(x)}dx\right)+c_1\right)}$$

2.269

ODE No. 269

$$-f_0(x)-f_1(x)y(x)-f_2(x)y(x)^2-f_3(x)y(x)^3+y'(x)(g_0(x)+g_1(x)y(x))=0$$

✖

Mathematica : cpu = 305.478 (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]], y[x], 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

$$x^2 + (y(x)^2 - x) y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.101205 (sec), leaf count = 327

```
DSolve[x^2 - y[x] + (-x + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{3\sqrt[3]{2}x}{\sqrt[3]{27x^3 + \sqrt{-2916x^3 + (27x^3 + 81c_1)^2} + 81c_1}} - \frac{\sqrt[3]{27x^3 + \sqrt{-2916x^3 + (27x^3 + 81c_1)^2} + 81c_1}}{3\sqrt[3]{2}} \right. \right.$$

✓ **Maple** : cpu = 0.061 (sec), leaf count = 314

```
dsolve((y(x)^2-x)*diff(y(x),x)-y(x)+x^2 = 0,y(x))
```

$$y(x) = \frac{\left(-4x^3 - 12c_1 + 4\sqrt{x^6 + (6c_1 - 4)x^3 + 9c_1^2}\right)^{2/3} + 4x}{2\left(-4x^3 - 12c_1 + 4\sqrt{x^6 + (6c_1 - 4)x^3 + 9c_1^2}\right)^{1/3}}$$

2.271 ODE No. 271

$$(x^2 + y(x)^2) y'(x) + 2x(y(x) + 2x) = 0$$

✓ **Mathematica** : cpu = 0.192736 (sec), leaf count = 370

```
DSolve[2*x*(2*x + y[x]) + (x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[3]{-4x^3 + \sqrt{20x^6 - 8e^{3c_1}x^3 + e^{6c_1}} + e^{3c_1}}}{\sqrt[3]{2}} - \frac{\sqrt[3]{2}x^2}{\sqrt[3]{-4x^3 + \sqrt{20x^6 - 8e^{3c_1}x^3 + e^{6c_1}} + e^{3c_1}}} \right\}, \left\{ y(x) - \right.$$

✓ **Maple** : cpu = 0.315 (sec), leaf count = 349

```
dsolve((y(x)^2+x^2)*diff(y(x),x)+2*x*(y(x)+2*x) = 0,y(x))
```

$$y(x) = \frac{\frac{\left(4-16x^3c_1^{3/2}+4\sqrt{20c_1^3x^6-8x^3c_1^{3/2}+1}\right)^{1/3}}{2} - \frac{2c_1x^2}{\left(4-16x^3c_1^{3/2}+4\sqrt{20c_1^3x^6-8x^3c_1^{3/2}+1}\right)^{1/3}}}{\sqrt{c_1}}$$

2.272

ODE No. 272

$$(x^2 + y(x)^2) \, y'(x) - y(x)^2 = 0$$

✓

Mathematica : cpu = 0.116588 (sec), leaf count = 42

DSolve[-y[x]^2 + (x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]

$$\text{Solve}\left[\log\left(\frac{y(x)}{x}\right) + \frac{2 \tan^{-1}\left(\frac{\frac{2y(x)}{x}-1}{\sqrt{3}}\right)}{\sqrt{3}} = -\log(x) + c_1, y(x)\right]$$

✓

Maple : cpu = 0.197 (sec), leaf count = 42

dsolve((y(x)^2+x^2)*diff(y(x),x)-y(x)^2 = 0,y(x))

$$y(x) = e^{\frac{2\sqrt{3} \operatorname{RootOf}\left(\sqrt{3} x e^{c_1} - 3 \tan(\_Z) x e^{c_1} - 2\sqrt{3} e^{\frac{2\sqrt{3}}{3} - \_Z}\right)}{3}} - c_1$$

2.273 ODE No. 273

$$(a + x^2 + y(x)^2) y'(x) + 2xy(x) = 0$$

✓ **Mathematica** : cpu = 0.143305 (sec), leaf count = 297

```
DSolve[2*x*y[x] + (a + x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[3]{\sqrt{2916(a+x^2)^3 + 6561c_1^2 + 81c_1}}}{3\sqrt[3]{2}} - \frac{3\sqrt[3]{2}(a+x^2)}{\sqrt[3]{\sqrt{2916(a+x^2)^3 + 6561c_1^2 + 81c_1}}} \right\}, \left\{ y(x) \rightarrow \frac{1}{2^{2/3}} \right\} \right.$$

✓ **Maple** : cpu = 0.053 (sec), leaf count = 397

```
dsolve((y(x)^2+x^2+a)*diff(y(x),x)+2*x*y(x) = 0,y(x))
```

$$y(x) = \frac{\left(-12c_1 + 4\sqrt{4x^6 + 12ax^4 + 12a^2x^2 + 4a^3 + 9c_1^2}\right)^{2/3} - 4x^2 - 4a}{2\left(-12c_1 + 4\sqrt{4x^6 + 12ax^4 + 12a^2x^2 + 4a^3 + 9c_1^2}\right)^{1/3}}$$

2.274

ODE No. 274

$$(a + x^2 + y(x)^2) \, y'(x) + b + x^2 + 2xy(x) = 0$$

✓

Mathematica : cpu = 0.126093 (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]`

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[3]{\sqrt{2916 (a + x^2)^3 + (-81bx - 27x^3 + 81c_1)^2} - 81bx - 27x^3 + 81c_1}}{3\sqrt[3]{2}} - \sqrt[3]{\sqrt{2916 (a + x^2)^3 + (-81bx - 27x^3 + 81c_1)^2} - 81bx - 27x^3 + 81c_1} \right. \right.$$

✓

Maple : cpu = 0.086 (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))`

$$y(x) = \frac{\left(-4x^3 - 12bx - 12c_1 + 4\sqrt{5x^6 + 6(2a + b)x^4 + 6x^3c_1 + 3(4a^2 + 3b^2)x^2 + 18bxc_1 + 4a^3 + 9c_1^2}\right)^{2/3}}{2\left(-4x^3 - 12bx - 12c_1 + 4\sqrt{5x^6 + 6(2a + b)x^4 + 6x^3c_1 + 3(4a^2 + 3b^2)x^2 + 18bxc_1 + 4a^3 + 9c_1^2}\right)^{1/3}}$$

2.275

ODE No. 275

$$(x^2 + y(x)^2 + x) \, y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0883541 (sec), leaf count = 18

```
DSolve[-y[x] + (x + x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[y(x) - \tan^{-1}\left(\frac{x}{y(x)}\right) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.088 (sec), leaf count = 30

```
dsolve((y(x)^2+x^2+x)*diff(y(x),x)-y(x) = 0,y(x))
```

$$c_1 + \frac{e^{-2iy(x)}(ix + y(x))}{2iy(x) + 2x} = 0$$

2.276 ODE No. 276

$$(y(x)^2 - x^2) y'(x) + 2xy(x) = 0$$

✓ **Mathematica** : cpu = 0.102072 (sec), leaf count = 61

```
DSolve[2*x*y[x] + (-x^2 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{2} \left(e^{c_1} - \sqrt{-4x^2 + e^{2c_1}} \right) \right\}, \left\{ y(x) \rightarrow \frac{1}{2} \left(\sqrt{-4x^2 + e^{2c_1}} + e^{c_1} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.766 (sec), leaf count = 47

```
dsolve((y(x)^2-x^2)*diff(y(x),x)+2*x*y(x) = 0,y(x))
```

$$y(x) = \frac{1 - \sqrt{-4c_1^2x^2 + 1}}{2c_1}$$

2.277 ODE No. 277

$$(x^4 + y(x)^2) y'(x) - 4x^3 y(x) = 0$$

✓ **Mathematica** : cpu = 0.0838612 (sec), leaf count = 53

```
DSolve[-4*x^3*y[x] + (x^4 + y[x]^2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{2} \left(c_1 - \sqrt{4x^4 + c_1^2} \right) \right\}, \left\{ y(x) \rightarrow \frac{1}{2} \left(\sqrt{4x^4 + c_1^2} + c_1 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.523 (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

$$y'(x) (y(x)^2 + 4 \sin(x)) - \cos(x) = 0$$

✓ **Mathematica** : cpu = 0.153231 (sec), leaf count = 39

```
DSolve[-Cos[x] + (4*Sin[x] + y[x]^2)*Derivative[1][y][x] == 0, y[x], x]
```

$$\text{Solve}\left[-\frac{1}{32}e^{-4y(x)}(8y(x)^2 + 4y(x) + 1) - e^{-4y(x)}\sin(x) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.069 (sec), leaf count = 28

```
dsolve((y(x)^2+4*sin(x))*diff(y(x),x)-cos(x) = 0, y(x))
```

$$\frac{(-8y(x)^2 - 4y(x) - 32 \sin(x) - 1) e^{-4y(x)}}{32} + c_1 = 0$$

2.279 ODE No. 279

$$(y(x)^2 + 2y(x) + x) y'(x) + y(x)^2(y(x) + x)^2 + y(x)(y(x) + 1) = 0$$

✓ **Mathematica** : cpu = 0.379947 (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]]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{-x^2 - \sqrt{(x^2 - c_1 x - 1)^2 + 4(x - c_1) + c_1 x + 1}}{2(x - c_1)} \right\}, \left\{ y(x) \rightarrow \frac{-x^2 + \sqrt{(x^2 - c_1 x - 1)^2 + 4(x - c_1) + c_1 x + 1}}{2(x - c_1)} \right\} \right.$$

✓ **Maple** : cpu = 0.173 (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))
```

$$y(x) = \frac{x^2 - x c_1 + \sqrt{x^4 - 2 x^3 c_1 + (c_1^2 - 2) x^2 + (2 c_1 + 4) x - 4 c_1 + 1} - 1}{-2 x + 2 c_1}$$

2.280

ODE No. 280

$$(y(x)+x)^2y'(x)-a^2=0$$

✓ **Mathematica** : cpu = 0.108615 (sec), leaf count = 21

```
DSolve[-a^2 + (x + y[x])^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[y(x)-a\tan^{-1}\left(\frac{y(x)+x}{a}\right)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 24

```
dsolve((y(x)+x)^2*diff(y(x),x)-a^2 = 0,y(x))
```

$$y(x)=a\operatorname{RootOf}\left(\tan\left(\_Z\right)a-\_Za+c_1-x\right)-c_1$$

2.281

ODE No. 281

$$(-x^2 + 2xy(x) + y(x)^2) y'(x) + x^2 + 2xy(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.140791 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{2} \left(e^{c_1} - \sqrt{-4x^2 + 4e^{c_1}x + e^{2c_1}} \right) \right\}, \left\{ y(x) \rightarrow \frac{1}{2} \left(\sqrt{-4x^2 + 4e^{c_1}x + e^{2c_1}} + e^{c_1} \right) \right\} \right\}$$

✓ **Maple** : cpu = 1.049 (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))
```

$$y(x) = \frac{1 - \sqrt{-4c_1^2x^2 + 4xc_1 + 1}}{2c_1}$$

2.282 ODE No. 282

$$(y(x)+3x-1)^2y'(x)-(2y(x)-1)(4y(x)+6x-3)=0$$

✓ **Mathematica** : cpu = 0.163146 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{6}(12x+4e^{c_1}+1)-\frac{1}{6}\sqrt{36x^2+96e^{c_1}x-12x-16e^{c_1}+16e^{2c_1}+3\,2^{2/3}\sqrt[3]{-7776e^{c_1}x^5+6480e^{c_1}x}}\right.\right.$$

✓ **Maple** : cpu = 0.856 (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))
```

$$-3\ln\left(\frac{-6y(x)+18x}{6x-1}\right)-\ln\left(\frac{-6y(x)+4-6x}{6x-1}\right)+3\ln\left(\frac{-6y(x)+3}{6x-1}\right)-\ln(6x-1)-c_1=0$$

2.283 ODE No. 283

$$3(y(x)^2 - x^2) y'(x) + 2y(x)^3 - 6x(x + 1)y(x) - 3e^x = 0$$

✓ **Mathematica** : cpu = 0.328043 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{e^{-2x} \sqrt[3]{\sqrt{-2916e^{12x}x^6 + (-27e^{7x} + 27c_1e^{4x})^2} - 27e^{7x} + 27c_1e^{4x}}}{3\sqrt[3]{2}} - \frac{3\sqrt[3]{\sqrt{-2916e^{12x}x^6 + (-27e^{7x} + 27c_1e^{4x})^2} - 27e^{7x} + 27c_1e^{4x}}}{\sqrt[3]{\sqrt{-2916e^{12x}x^6 + (-27e^{7x} + 27c_1e^{4x})^2} - 27e^{7x} + 27c_1e^{4x}}}} \right\} \right.$$

✓ **Maple** : cpu = 0.135 (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))
```

$$y(x) = \frac{\left(4x^2e^{4x} + \left(\left(4e^{3x} - 4c_1 + 4\sqrt{-4x^6e^{4x} + e^{6x} - 2e^{3x}c_1 + c_1^2}\right)e^{4x}\right)^{2/3}\right)e^{-2x}}{2\left(-4\left(-e^{3x} + c_1 - \sqrt{-4x^6e^{4x} + e^{6x} - 2e^{3x}c_1 + c_1^2}\right)e^{4x}\right)^{1/3}}$$

2.284

ODE No. 284

$$(x^2 + 4y(x)^2) y'(x) - xy(x) = 0$$

✓

Mathematica : cpu = 0.0837181 (sec), leaf count = 59

DSolve[-(x*y[x]) + (x^2 + 4*y[x]^2)*Derivative[1][y][x] == 0,y[x],x]

$$\left\{ \left\{ y(x) \rightarrow -\frac{x}{2\sqrt{W\left(\frac{1}{4}e^{-\frac{c_1}{2}}x^2\right)}} \right\}, \left\{ y(x) \rightarrow \frac{x}{2\sqrt{W\left(\frac{1}{4}e^{-\frac{c_1}{2}}x^2\right)}} \right\} \right\}$$

✓

Maple : cpu = 0.141 (sec), leaf count = 21

dsolve((4*y(x)^2+x^2)*diff(y(x),x)-x*y(x) = 0,y(x))

$$y(x) = e^{\frac{\operatorname{LambertW}\left(\frac{e^{2c_1}x^2}{4}\right)}{2} - c_1}$$

2.285

ODE No. 285

$$(3x^2 + 2xy(x) + 4y(x)^2) \, y'(x) + 2x^2 + 6xy(x) + y(x)^2 = 0$$

✓

Mathematica : cpu = 0.123418 (sec), leaf count = 402

`DSolve[2*x^2 + 6*x*y[x] + y[x]^2 + (3*x^2 + 2*x*y[x] + 4*y[x]^2)*Derivative[1][y][x] == 0,y[x]`

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[3]{54x^3 + \sqrt{3881196x^6 + (54x^3 + 432e^{3c_1})^2} + 432e^{3c_1}}}{12\sqrt[3]{2}} - \frac{33x^2}{2 \, 2^{2/3} \sqrt[3]{54x^3 + \sqrt{3881196x^6 + (54x^3 + 432e^{3c_1})^2} + 432e^{3c_1}}} \right\} \right.$$

✓

Maple : cpu = 0.148 (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))`

$$y(x) = \frac{\frac{\left(x^3c_1^3+8+2\sqrt{333c_1^6x^6+4x^3c_1^3+16}\right)^{1/3}}{4} - \frac{11c_1^2x^2}{4\left(x^3c_1^3+8+2\sqrt{333c_1^6x^6+4x^3c_1^3+16}\right)^{1/3}} - \frac{xc_1}{4}}{c_1}$$

2.286 ODE No. 286

$$(2y(x) - 3x + 1)^2 y'(x) - (3y(x) - 2x - 4)^2 = 0$$

✓ **Mathematica** : cpu = 0.184712 (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 = 1.845 (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

$$(2y(x) - 4x + 1)^2 y'(x) - (y(x) - 2x)^2 = 0$$

✓ **Mathematica** : cpu = 1.32674 (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]
```

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 = 0.095 (sec), leaf count = 56

```
dsolve((2*y(x)-4*x+1)^2*diff(y(x),x)-(y(x)-2*x)^2 = 0,y(x))
```

$$-\frac{x}{7}-\frac{9\sqrt{2}\operatorname{arctanh}\left(\frac{\left(7y(x)-14x+4\right)\sqrt{2}}{2}\right)}{98}-\frac{2\ln\left(7\left(y(x)-2x\right)^2+8y(x)-16x+2\right)}{49}+\frac{4y(x)}{7}-c_1=0$$

2.288

ODE No. 288

$$\left(-3x^2y(x)+6y(x)^2+1\right)y'(x)-3xy(x)^2+x=0$$

✓

Mathematica : cpu = 0.153048 (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]`

$$\left\{\left\{y(x)\rightarrow \frac{x^2}{4}-\frac{\sqrt[3]{-9x^6+108x^2+4\sqrt{3}\sqrt{-27x^8-54c_1x^6+207x^4+648c_1x^2+32+432c_1^2+144c_1}}{4\,3^{2/3}}+\frac{\sqrt[3]{-324x^2-432c_1+27x^6+12\sqrt{-81x^8-162c_1x^6+621x^4+1944x^2c_1+1296c_1^2+96}}{12}+\frac{-324x^2-432c_1+27x^6+12\sqrt{-81x^8-162c_1x^6+621x^4+1944x^2c_1+1296c_1^2+96}}{4\left(-324x^2-432c_1+27x^6+12\sqrt{-81x^8-162c_1x^6+621x^4+1944x^2c_1+1296c_1^2+96}\right)}\right\}\right.$$

✓

Maple : cpu = 0.083 (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))`

$$y(x)=\frac{\left(-324x^2-432c_1+27x^6+12\sqrt{-81x^8-162c_1x^6+621x^4+1944x^2c_1+1296c_1^2+96}\right)^{1/3}}{12}+\frac{-324x^2-432c_1+27x^6+12\sqrt{-81x^8-162c_1x^6+621x^4+1944x^2c_1+1296c_1^2+96}}{4\left(-324x^2-432c_1+27x^6+12\sqrt{-81x^8-162c_1x^6+621x^4+1944x^2c_1+1296c_1^2+96}\right)}$$

2.289

ODE No. 289

$$a + (6y(x) - x)^2 y'(x) - 6y(x)^2 + 2xy(x) = 0$$

✓ **Mathematica** : cpu = 0.140756 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{6} \left(x + \sqrt[3]{-18ax - x^3 + 18c_1} \right) \right\}, \left\{ y(x) \rightarrow \frac{x}{6} - \frac{1}{12} \left(1 - i\sqrt{3} \right) \sqrt[3]{-18ax - x^3 + 18c_1} \right\}, \left\{ y(x) \rightarrow \frac{x}{6} - \frac{1}{12} \left(1 + i\sqrt{3} \right) \sqrt[3]{-18ax - x^3 + 18c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.055 (sec), leaf count = 115

```
dsolve((6*y(x)-x)^2*diff(y(x),x)-6*y(x)^2+2*x*y(x)+a = 0,y(x))
```

$$y(x) = \frac{(-x^3 - 18ax - 18c_1)^{1/3}}{6} + \frac{x}{6}$$

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 = 0.368374 (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,x]`

$$\left\{ \left\{ y(x) \rightarrow -\frac{bx}{a} + \frac{\sqrt[3]{-54b^3x^3 + 81abcx^3 - 27a^2dx^3 + 27a^2e^{3c_1}} + \sqrt{4(9acx^2 - 9b^2x^2)^3 + (-54b^3x^3 + 81abcx^3 - 27a^2dx^3 + 27a^2e^{3c_1})}}{3\sqrt[3]{2}a} \right\} \right\}$$

✓

Maple : cpu = 0.434 (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))`

$$y(x) = \frac{\left(-4c_1^3a^2dx^3+12cx^3c_1^3ba-8b^3x^3c_1^3+4\sqrt{a^2c_1^6d^2x^6-6abc\,c_1^6dx^6+4a\,c^3c_1^6x^6+4b^3c_1^6dx^6-3b^2c^2c_1^6x^6-2c_1^3a^2dx^3+6cx^3c_1^3ba-4b^3x^3c_1^3+a^2a+4b^2c^2c_1^6x^6-4b^2c^2c_1^6x^6-4b^2c^2c_1^6x^6-4b^2c^2c_1^6x^6} \right)}{2a}$$

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 = 0.765374 (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

$$\text{Solve}\left[\frac{a\beta\left(\log(ax+by(x))+\frac{1}{\alpha x+\beta y(x)}\right)}{a\beta-\alpha b}=c_1,y(x)\right]$$

✓

Maple : cpu = 0.19 (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-

$$y(x)=\frac{-ax+e^{\text{RootOf}(c_1a\beta x-c_1\alpha bx-\_\_Za\beta x+\_\_Z\alpha bx-c_1\beta e^{-Z}+e^{-Z}\_\_Z\beta+b)}}{b}$$

2.292

ODE No. 292

$$y'(x)(ay(x)+bx+c)^2+(\alpha y(x)+\beta x+\gamma)^2=0$$

✓

Mathematica : cpu = 30.4006 (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]]

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\#1^2y(x)\alpha-2\beta c\gamma\right],y(x)\right]

✓

Maple : cpu = 0.048 (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))

$$y(x) = \frac{((bx+c)\alpha-a(\beta x+\gamma))\text{RootOf}\left(\int^{-Z}\frac{(\_aa-b)^2}{\_a^3a^2-2\_a^2ab-\_a^2\alpha^2+2\_a\alpha\beta+\_ab^2-\beta^2}d\_a+\ln(ax\beta-\alpha bx+a\gamma-\alpha^2x)\right)}{a\beta-b\alpha}$$

2.293

ODE No. 293

$$x\big(y(x)^2-3x\big)\,y'(x)+2y(x)^3-5xy(x)=0$$

✓ **Mathematica** : cpu = 0.129966 (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]
```

$$\left\{\left\{y(x)\rightarrow \text{Root}\left[-\#1^{15}-\frac{25\#1^2e^{\frac{65c_1}{2}}}{x^{26}}+\frac{65e^{\frac{65c_1}{2}}}{x^{25}}\&,1\right]\right\},\left\{y(x)\rightarrow \text{Root}\left[-\#1^{15}-\frac{25\#1^2e^{\frac{65c_1}{2}}}{x^{26}}+\frac{65e^{\frac{65c_1}{2}}}{x^{25}}\&\right.\right\}$$

✓ **Maple** : cpu = 0.391 (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

$$x\left(-a+x^2+y(x)^2\right)y'(x)-y(x)\left(a+x^2+y(x)^2\right)=0$$

✓ **Mathematica** : cpu = 0.186808 (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]

$$\left\{\left\{y(x)\rightarrow\frac{1}{2}\left(c_1x-\sqrt{-4a+4x^2+c_1^2x^2}\right)\right\},\left\{y(x)\rightarrow\frac{1}{2}\left(\sqrt{-4a+4x^2+c_1^2x^2}+c_1x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.096 (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

$$x\big(-x^2+xy(x)+y(x)^2\big)y'(x)+x^2y(x)-y(x)^3+xy(x)^2=0$$

✓

Mathematica : cpu = 0.169397 (sec), leaf count = 31

DSolve[x^2*y[x] + x*y[x]^2 - y[x]^3 + x*(-x^2 + x*y[x] + y[x]^2)*Derivative[1][y][x] == 0,y[x]

$$\text{Solve}\left[\frac{x}{y(x)}+\frac{y(x)}{x}+\log\left(\frac{y(x)}{x}\right)=-2\log(x)+c_1,y(x)\right]$$

✓

Maple : cpu = 0.286 (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))

$$y(x)=e^{\text{RootOf}\left(e^{2\_Z}+2\,e^{-Z}\ln(x)+2\,e^{-Z}c_1+\_Ze^{-Z}+1\right)}x$$

2.296

ODE No. 296

$$x^4 + x\big(x^2y(x) + x^2 + y(x)^2\big)y'(x) - 2x^2y(x)^2 - 2y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.329991 (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]]`

$$\left\{\left\{y(x) \rightarrow -e^{-c_1}x^2 - e^{-c_1}\sqrt{x^4 - e^{c_1}x^4 + e^{2c_1}x^2}\right\},\left\{y(x) \rightarrow e^{-c_1}\sqrt{x^4 - e^{c_1}x^4 + e^{2c_1}x^2} - e^{-c_1}x^2\right\}\right\}$$

✓ **Maple** : cpu = 0.906 (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))`

$$y(x) = -x^2c_1 - \sqrt{c_1^2x^4 - c_1x^4 + x^2}$$

2.297

ODE No. 297

$$2x\left(5x^2+y(x)^2\right)y'(x)-x^2y(x)+y(x)^3=0$$

✓ **Mathematica** : cpu = 0.127722 (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]
```

$$\left\{\left\{y(x)\rightarrow \text{Root}\left[-\#1^5+\frac{\#1^2e^{3c_1}}{x^{3/2}}+3e^{3c_1}\sqrt{x}\&,1\right]\right\},\left\{y(x)\rightarrow \text{Root}\left[-\#1^5+\frac{\#1^2e^{3c_1}}{x^{3/2}}+3e^{3c_1}\sqrt{x}\&,2\right]\right\},\left\{y(x)\rightarrow \text{Root}\left[-\#1^5+\frac{\#1^2e^{3c_1}}{x^{3/2}}+3e^{3c_1}\sqrt{x}\&,3\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.4 (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))
```

$$y(x)=\text{RootOf}\left(\_Z^{45}c_1x^9-\_Z^{18}-6\_Z^9-9\right)^{9/2}x$$

2.298 ODE No. 298

$$3xy(x)^2y'(x) + y(x)^3 - 2x = 0$$

✓ **Mathematica** : cpu = 0.0725767 (sec), leaf count = 72

```
DSolve[-2*x + y[x]^3 + 3*x*y[x]^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[3]{x^2 + c_1}}{\sqrt[3]{x}} \right\}, \left\{ y(x) \rightarrow -\frac{\sqrt[3]{-1}\sqrt[3]{x^2 + c_1}}{\sqrt[3]{x}} \right\}, \left\{ y(x) \rightarrow \frac{(-1)^{2/3}\sqrt[3]{x^2 + c_1}}{\sqrt[3]{x}} \right\} \right\}$$

✓ **Maple** : cpu = 0.031 (sec), leaf count = 73

```
dsolve(3*x*y(x)^2*diff(y(x),x)+y(x)^3-2*x = 0,y(x))
```

$$y(x) = \frac{((x^2 + c_1)x^2)^{1/3}}{x}$$

2.299

ODE No. 299

$$(3xy(x)^2 - x^2) y'(x) + y(x)^3 - 2xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0912342 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt[3]{\frac{2}{3}}x^2}{\sqrt[3]{9c_1x^2 + \sqrt{3}\sqrt{-4x^9 + 27c_1^2x^4}}} - \frac{\sqrt[3]{9c_1x^2 + \sqrt{3}\sqrt{-4x^9 + 27c_1^2x^4}}}{\sqrt[3]{2}3^{2/3}x} \right\}, \left\{ y(x) \rightarrow \frac{1}{2^{2/3}\sqrt[3]{3}\sqrt[3]{9c_1x^2 + \sqrt{3}\sqrt{-4x^9 + 27c_1^2x^4}}} \right\} \right.$$

✓ **Maple** : cpu = 0.267 (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))
```

$$y(x) = \frac{\left(\left(12\sqrt{-12x^5 + 81c_1^2} + 108c_1\right)x^2\right)^{1/3}}{6x} + \frac{2x^2}{\left(\left(12\sqrt{-12x^5 + 81c_1^2} + 108c_1\right)x^2\right)^{1/3}}$$

2.300

ODE No. 300

$$6xy(x)^2y'(x)+2y(x)^3+x=0$$

✓ **Mathematica** : cpu = 0.0686002 (sec), leaf count = 99

```
DSolve[x + 2*y[x]^3 + 6*x*y[x]^2*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow\frac{\sqrt[3]{-x^2+4c_1}}{2^{2/3}\sqrt[3]{x}}\right\},\left\{y(x)\rightarrow-\frac{\sqrt[3]{-1}\sqrt[3]{-x^2+4c_1}}{2^{2/3}\sqrt[3]{x}}\right\},\left\{y(x)\rightarrow\frac{(-1)^{2/3}\sqrt[3]{-x^2+4c_1}}{2^{2/3}\sqrt[3]{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 83

```
dsolve(6*x*y(x)^2*diff(y(x),x)+2*y(x)^3+x = 0,y(x))
```

$$y(x)=\frac{\left(-2\left(x^2-4c_1\right)x^2\right)^{1/3}}{2x}$$

2.301 ODE No. 301

$$(x^2 + 6xy(x)^2) y'(x) - y(x) (3y(x)^2 - x) = 0$$

✓ **Mathematica** : cpu = 0.105162 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{x}\sqrt{W\left(\frac{6e^{3c_1}}{x^3}\right)}}{\sqrt{6}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{x}\sqrt{W\left(\frac{6e^{3c_1}}{x^3}\right)}}{\sqrt{6}} \right\} \right\}$$

✓ **Maple** : cpu = 0.254 (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))
```

$$y(x) = \frac{e^{-\frac{\text{LambertW}\left(\frac{6e^{3c_1}}{x^3}\right)}{2} + \frac{3c_1}{2}}}{x}$$

2.302 ODE No. 302

$$(x^2 y(x)^2 + x) y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0778744 (sec), leaf count = 70

```
DSolve[y[x] + (x + x^2*y[x]^2)*Derivative[1][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 x - \sqrt{x} \sqrt{4 + c_1^2 x}}{2x} \right\}, \left\{ y(x) \rightarrow \frac{c_1 x + \sqrt{x} \sqrt{4 + c_1^2 x}}{2x} \right\} \right\}$$

✓ **Maple** : cpu = 0.408 (sec), leaf count = 133

```
dsolve((y(x)^2*x^2+x)*diff(y(x),x)+y(x) = 0, y(x))
```

$$y(x) = -\frac{\sqrt{-2xc_1 \left(-2c_1 - x + \sqrt{x(4c_1 + x)} \right)}}{2xc_1}$$

2.303

ODE No. 303

$$y(x)\left(x^2y(x)^2+1\right)+x(xy(x)-1)^2y'(x)=0$$

✓ **Mathematica** : cpu = 0.107468 (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 = 0.247 (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))
```

$$y(x)=\frac{e^{\text{RootOf}\left(-2e^{-Z}\ln(x)-e^{2-Z}+2e^{-Z}c_1+2_Ze^{-Z}+1\right)}}{x}$$

2.304

ODE No. 304

$$5x^2y(x)^3 + (10x^3y(x)^2 + x^2y(x) + 2x) y'(x) + xy(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.268988 (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]
```

$$\text{Solve}\left[y(x)\sqrt{5x^2y(x)^2+2}e^{\frac{\tan^{-1}\left(\sqrt{\frac{5}{2}}xy(x)\right)}{\sqrt{10}}}=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.348 (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 = 0.128448 (sec), leaf count = 1277

```
DSolve[x^2 - 3*y[x] + (-3*x + y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow -\frac{1}{2}\sqrt{\frac{16\sqrt[3]{2}\left(x^3+3c_1\right)}{\sqrt[3]{104976x^2-\sqrt{11019960576x^4-4\left(144x^3+432c_1\right)^3}}}}+\frac{\sqrt[3]{104976x^2-\sqrt{11019960576x^4-4\left(144x^3+432c_1\right)^3}}}{9\sqrt[3]{2}}}\right\}\right.$$

✓ **Maple** : cpu = 0.023 (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

$$(y(x)^3 - x^3) y'(x) - x^2 y(x) = 0$$

✓ **Mathematica** : cpu = 0.10313 (sec), leaf count = 201

```
DSolve[-(x^2*y[x]) + (-x^3 + y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \sqrt[3]{x^3 - \sqrt{x^6 - e^{6c_1}}} \right\}, \left\{ y(x) \rightarrow -\sqrt[3]{-1} \sqrt[3]{x^3 - \sqrt{x^6 - e^{6c_1}}} \right\}, \left\{ y(x) \rightarrow (-1)^{2/3} \sqrt[3]{x^3 - \sqrt{x^6 - e^{6c_1}}} \right\} \right.$$

✓ **Maple** : cpu = 0.98 (sec), leaf count = 225

```
dsolve((y(x)^3-x^3)*diff(y(x),x)-x^2*y(x) = 0,y(x))
```

$$y(x) = \frac{x}{\left(x^3 c_1 \left(-x^3 c_1 + \sqrt{c_1^2 x^6 + 1}\right)\right)^{1/3}}$$

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 = 0.164699 (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]
```

$$\left\{\left\{y(x) \rightarrow -\sqrt{-\sqrt{a^2+4ax^2+4c_1}-a-x^2}\right\},\left\{y(x) \rightarrow \sqrt{-\sqrt{a^2+4ax^2+4c_1}-a-x^2}\right\},\left\{y(x) \rightarrow -\sqrt{\dots}\right\}\right.$$

✓ **Maple** : cpu = 0.056 (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))
```

$$y(x)=\sqrt{-x^2-a-2\sqrt{ax^2-c_1}}$$

2.308 ODE No. 308

$$2y(x)^3y'(x) + xy(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.014046 (sec), leaf count = 55

```
DSolve[x*y[x]^2 + 2*y[x]^3*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow 0 \right\}, \left\{ y(x) \rightarrow -\frac{\sqrt{-x^2 + 4c_1}}{\sqrt{2}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{-x^2 + 4c_1}}{\sqrt{2}} \right\} \right\}$$

✓ **Maple** : cpu = 0.014 (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 = 0.0801192 (sec), leaf count = 151

```
DSolve[-x - 2*x^3 + (y[x] + 2*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{-1 - \sqrt{4x^4 + 4x^2 + 1 + 8c_1}}}{\sqrt{2}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{-1 - \sqrt{4x^4 + 4x^2 + 1 + 8c_1}}}{\sqrt{2}} \right\}, \left\{ y(x) \rightarrow -\frac{\sqrt{-1 + \sqrt{4x^4 + 4x^2 + 1 + 8c_1}}}{\sqrt{2}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{-1 + \sqrt{4x^4 + 4x^2 + 1 + 8c_1}}}{\sqrt{2}} \right\} \right.$$

✓ **Maple** : cpu = 0.052 (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 = 0.128078 (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]

$$\left\{\left\{y(x) \rightarrow -\frac{\sqrt{-5x^2 - \sqrt{23x^4 + 2e^{4c_1}}}}{\sqrt{2}}\right\},\left\{y(x) \rightarrow \frac{\sqrt{-5x^2 - \sqrt{23x^4 + 2e^{4c_1}}}}{\sqrt{2}}\right\},\left\{y(x) \rightarrow -\frac{\sqrt{-5x^2 + \sqrt{23x^4 + 2e^{4c_1}}}}{\sqrt{2}}\right\},\left\{y(x) \rightarrow \frac{\sqrt{-5x^2 + \sqrt{23x^4 + 2e^{4c_1}}}}{\sqrt{2}}\right\}\right.$$

✓ **Maple** : cpu = 0.145 (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))

$$y(x) = -\frac{\sqrt{-10x^2c_1 - 2\sqrt{23c_1^2x^4 + 2}}}{2\sqrt{c_1}}$$

2.311 ODE No. 311

$$4x^3 + 9x^2y(x) + (3x^3 + 6x^2y(x) - 3xy(x)^2 + 20y(x)^3) y'(x) + 6xy(x)^2 - y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.189747 (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) y'[x] + 6*x*y[x]^2 - y[x]^3 == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x}{20} + \frac{1}{2} \sqrt{-\frac{39x^2}{100} + \frac{\sqrt[3]{99x^6 + 351e^{c_1}x^2 + \sqrt{3}\sqrt{-67037x^{12} + 185406e^{c_1}x^8 - 83733e^{2c_1}x^4 + 32000}}}{5\sqrt[3]{23^2/3}}} \right. \right.$$

✓ **Maple** : cpu = 0.151 (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)^3-y(x)^3, y(x))=0, y(x))
```

$$y(x) = \frac{\text{RootOf}(c_1^4x^4 + 3\_Zc_1^3x^3 + 3\_Z^2c_1^2x^2 - \_Z^3c_1x + 5\_Z^4 - 1)}{c_1}$$

2.312

ODE No. 312

$$(y(x)y'(x)+x)\left(\frac{x^2}{a}+\frac{y(x)^2}{b}\right)+\frac{(a-b)(y(x)y'(x)-x)}{a+b}=0$$

✓ **Mathematica** : cpu = 0.79399 (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][y][x])/(a + b) == 0, y[x]]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{b}\sqrt{a^2+2a^2W\left(\frac{c_1(a+b)e^{\frac{bx^2}{2a^2}-\frac{b}{2a}-\frac{x^2}{2b}-\frac{1}{2}}\right)+ab-ax^2-bx^2}}{\sqrt{a}\sqrt{a+b}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{b}\sqrt{a^2+2a^2W\left(\frac{c_1(a+b)e^{\frac{bx^2}{2a^2}-\frac{b}{2a}-\frac{x^2}{2b}-\frac{1}{2}}\right)+ab-ax^2-bx^2}}{\sqrt{a}\sqrt{a+b}} \right\} \right\}$$

✓ **Maple** : cpu = 2.034 (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))
```

$$y(x) = \sqrt{\frac{a\left(e^{\frac{-2\operatorname{LambertW}\left(\frac{(a+b)e^{-\frac{x^2}{2b}}\frac{bx^2}{2a^2}e^{-\frac{1}{2}}e^{-\frac{b}{2a}}e^{-\frac{c_1}{ab}}\right)}{2a^2b}}a^2b+(-x^2-b)a^2+(-b^2-2c_1)a+b^2x^2}{2ba^2}}+b(-x^2+a)\right)}{a}}$$

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 = 0.280999 (sec), leaf count = 537

```
DSolve[2*b*x^3 + 3*b*x^2*y[x] + c*y[x]^2 - a*y[x]^3 + (c*x^2 - b*x^3 + 3*a*x*y[x]^2 + 2*a*y[x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[3]{2}(3acx + 3ac_1)}{3a\sqrt[3]{\sqrt{(27a^2bx^3 + 27a^2c_1x)^2 + 4(3acx + 3ac_1)^3 + 27a^2bx^3 + 27a^2c_1x}}} - \sqrt[3]{\sqrt{(27a^2bx^3 + 27a^2c_1x)^2 + 4(3acx + 3ac_1)^3 + 27a^2bx^3 + 27a^2c_1x}} \right. \right.$$

✓ **Maple** : cpu = 0.273 (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
```

$$y(x) = \frac{(-12cx + 12c_1)a + \left(\left(-108bx^3 + 108xc_1 + 12\sqrt{\frac{81ab^2x^6 - 162abc_1x^4 + 12c^3x^3 + 81ac_1^2x^2 - 36c^2c_1x^2 + 36cc_1^2x - 12c_1^3}{a}} \right) \right)}{6 \left(\left(-108bx^3 + 108xc_1 + 12\sqrt{\frac{81ab^2x^6 - 162abc_1x^4 + 12c^3x^3 + 81ac_1^2x^2 - 36c^2c_1x^2 + 36cc_1^2x - 12c_1^3}{a}} \right) a^2 \right)^{1/3} a}$$

2.314

ODE No. 314

$$xy(x)^3y'(x)+y(x)^4-x\sin(x)=0$$

✓ **Mathematica** : cpu = 0.116592 (sec), leaf count = 188

```
DSolve[-(x*Sin[x]) + y[x]^4 + x*y[x]^3*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow-\frac{\sqrt[4]{-4x^4\cos(x)+16x^3\sin(x)+48x^2\cos(x)-96x\sin(x)-96\cos(x)+c_1}}{x}\right\},\left\{y(x)\rightarrow-\frac{i\sqrt[4]{-4x^4\cos(x)+16x^3\sin(x)+48x^2\cos(x)-96x\sin(x)-96\cos(x)+c_1}}{x}\right\}\right.$$

✓ **Maple** : cpu = 0.113 (sec), leaf count = 158

```
dsolve(x*y(x)^3*diff(y(x),x)+y(x)^4-x*sin(x) = 0,y(x))
```

$$y(x)=\frac{(4(-x^4+12x^2-24)\cos(x)+16(x^3-6x)\sin(x)+c_1)^{1/4}}{x}$$

2.315 ODE No. 315

$$(2xy(x)^3 - x^4) y'(x) + 2x^3y(x) - y(x)^4 = 0$$

✓ **Mathematica** : cpu = 0.23373 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[3]{\frac{2}{3}} e^{c_1} x}{\sqrt[3]{-9x^3 + \sqrt{3} \sqrt{27x^6 - 4e^{3c_1} x^3}}} + \frac{\sqrt[3]{-9x^3 + \sqrt{3} \sqrt{27x^6 - 4e^{3c_1} x^3}}}{\sqrt[3]{23^{2/3}}} \right\}, \left\{ y(x) \rightarrow -\frac{(1 + \dots)}{2^{2/3} \sqrt[3]{3} \sqrt[3]{-9x^3}} \right\} \right\}$$

✓ **Maple** : cpu = 0.164 (sec), leaf count = 365

```
dsolve((2*x*y(x)^3-x^4)*diff(y(x),x)-y(x)^4+2*x^3*y(x) = 0,y(x))
```

$$y(x) = \frac{\left(-12x \left(9x^2c_1 - \sqrt{3} \sqrt{\frac{27c_1^3x^4 - 4x}{c_1}}\right) c_1^2\right)^{2/3} + 12xc_1}{6c_1 \left(-108c_1^2x \left(x^2c_1 - \frac{\sqrt{3} \sqrt{\frac{27c_1^3x^4 - 4x}{c_1}}}{9}\right)\right)^{1/3}}$$

2.316 ODE No. 316

$$(2xy(x)^3 + y(x)) y'(x) + 2y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.148156 (sec), leaf count = 48

```
DSolve[2*y[x]^2 + (y[x] + 2*x*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \{y(x) \rightarrow 0\}, \text{Solve}\left[x = -\frac{1}{4}e^{-\frac{1}{2}y(x)^2} \text{Ei}\left(\frac{y(x)^2}{2}\right) + c_1 e^{-\frac{1}{2}y(x)^2}, y(x)\right] \right\}$$

✓ **Maple** : cpu = 0.062 (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

$$(x^2 + 2xy(x)^3 + xy(x))\,y'(x) + y(x)^2 - xy(x) = 0$$

✓ **Mathematica** : cpu = 0.222714 (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 = 0.154 (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))
```

$$y(x) = e^{\text{RootOf}(-e^{3-Z}-e^{-Z}\ln(x)+e^{-Z}c_1-_-Ze^{-Z}+x)}$$

2.318

ODE No. 318

$$(3xy(x)^3 - 4xy(x) + y(x))\,y'(x) + (y(x)^2 - 2)\,y(x)^2 = 0$$

✓

Mathematica : cpu = 0.160672 (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]

$$\left\{\left\{y(x) \rightarrow 0\right\},\left\{y(x) \rightarrow -\sqrt{\frac{4\sqrt[3]{2}x^2}{3\sqrt[3]{16x^6+24x^5-27c_1^2x^4+12x^4+2x^3+3\sqrt{3}\sqrt{-32c_1^2x^{10}-48c_1^2x^9+27c_1^4}}}}\right\}\right.$$

✓

Maple : cpu = 0.024 (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

$$(7xy(x)^3 + y(x) - 5x) y'(x) + y(x)^4 - 5y(x) = 0$$

✓ **Mathematica** : cpu = 0.118258 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \text{Root}\left[10 \#1^7 x + 2 \#1^5 - 100 \#1^4 x - 25 \#1^2 + 250 \#1 x - 10 c_1 \&, 1\right] \right\}, \left\{ y(x) \rightarrow \text{Root}\left[10 \#1^7 x + 2 \#1^5 - 100 \#1^4 x - 25 \#1^2 + 250 \#1 x - 10 c_1 \&, 2\right] \right\} \right\}$$

✓ **Maple** : cpu = 0.04 (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))
```

$$x + \frac{2y(x)^5 - 25y(x)^2 - 10c_1}{10 \left(y(x)^3 - 5\right)^2 y(x)} = 0$$

2.320

ODE No. 320

$$(x^2y(x)^3 + xy(x))\,y'(x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.115956 (sec), leaf count = 76

```
DSolve[-1 + (x*y[x] + x^2*y[x]^3)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{2xW\left(c_1e^{\frac{1}{2x}-1}\right) + 2x - 1}}{\sqrt{x}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{2xW\left(c_1e^{\frac{1}{2x}-1}\right) + 2x - 1}}{\sqrt{x}} \right\} \right\}$$

✓ **Maple** : cpu = 0.142 (sec), leaf count = 78

```
dsolve((x^2*y(x)^3+x*y(x))*diff(y(x),x)-1 = 0,y(x))
```

$$y(x) = \frac{\sqrt{2x^2 \operatorname{LambertW}\left(\frac{c_1 e^{-\frac{2x-1}{2x}}}{2}\right) + 2x^2 - x}}{x}$$

2.321

ODE No. 321

$$(2x^2y(x)^3 + x^2y(x)^2 - 2x) \, y'(x) - 2y(x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.297501 (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]
```

$$\text{Solve}\left[\frac{1}{64}(-4y(x)^2 + 4y(x) - 2\log(8y(x) + 4) + 3) - \frac{1}{4x(2y(x) + 1)} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.197 (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))
```

$$y(x) = \frac{e^{\text{RootOf}(xe^{3-Z}-4xe^{2-Z}+8xc_1e^{-Z}+2_Zxe^{-Z}+3xe^{-Z}+16)}}{2} - \frac{1}{2}$$

2.322

ODE No. 322

$$(10x^2y(x)^3 - 3y(x)^2 - 2) y'(x) + 5xy(x)^4 + x = 0$$

✓ **Mathematica** : cpu = 0.231726 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{2} \sqrt{\frac{4\sqrt[3]{2} (5x^4 - 10c_1x^2 - 2)}{5x^2 \sqrt[3]{2268x^2 - 216c_1} + \sqrt{(2160x^2 + 108 (x^2 - 2c_1))^2 - 4 (60x^4 - 120c_1x^2 - 24)^3}}} + \frac{\sqrt[3]{2268x^2 - 216c_1}}{2} \right. \right.$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 29

```
dsolve((10*x^2*y(x)^3-3*y(x)^2-2)*diff(y(x),x)+5*x*y(x)^4+x = 0,y(x))
```

$$\frac{5x^2y(x)^4}{2} - y(x)^3 + \frac{x^2}{2} - 2y(x) + c_1 = 0$$

2.323 ODE No. 323

$$xy'(x) \left(axy(x)^3 + c\right) + y(x) \left(bx^3y(x) + c\right) = 0$$

✓ **Mathematica** : cpu = 0.235588 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{\sqrt[3]{54a^2cx^2 + \sqrt{2916a^4c^2x^4 + 108a^3x^3(bx^3 - 2c_1x)}^3}}{3\sqrt[3]{2}ax} - \frac{\sqrt[3]{2}(bx^3 - 2c_1x)}{\sqrt[3]{54a^2cx^2 + \sqrt{2916a^4c^2x^4 + 108a^3x^3(bx^3 - 2c_1x)}^3}}\right.\right.$$

✓ **Maple** : cpu = 0.172 (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))
```

$$y(x) = \frac{\left(-3abx^4 + 6c_1ax^2 + \left(\left(27c + 3\sqrt{\frac{3b^3x^8 - 18b^2c_1x^6 + 36bc_1^2x^4 - 24c_1^3x^2 + 81ac^2}{a}}\right)a^2x^2\right)^{2/3}\right)3^{2/3}}{9ax\left(\left(9c + \sqrt{\frac{3b^3x^8 - 18b^2c_1x^6 + 36bc_1^2x^4 - 24c_1^3x^2 + 81ac^2}{a}}\right)a^2x^2\right)^{1/3}}$$

2.324 ODE No. 324

$$(2x^3y(x)^3 - x) y'(x) + 2x^3y(x)^3 - y(x) = 0$$

✓ **Mathematica** : cpu = 0.102614 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{2x^3 - c_1 x^2}{6x^2} + \frac{\sqrt[3]{-8x^9 + 12c_1 x^8 - 6c_1^2 x^7 + c_1^3 x^6 - 27x^4 + 3\sqrt{3}\sqrt{16x^{13} - 24c_1 x^{12} + 12c_1^2 x^{11} - 3c_1^3 x^{10} - 27x^4 + 3\sqrt{3}\sqrt{16x^{13} - 24c_1 x^{12} + 12c_1^2 x^{11} - 3c_1^3 x^{10}}}}{6x^2} \right. \right.$$

✓ **Maple** : cpu = 0.177 (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))
```

$$y(x) = \frac{\left(\left(c_1^3 x^2 - 6c_1^2 x^3 + 12c_1 x^4 - 8x^5 + 3\sqrt{-6c_1^3 x^2 + 36c_1^2 x^3 - 72c_1 x^4 + 48x^5 + 81} - 27\right)x\right)^{1/3}}{6x} + \frac{1}{6\left(c_1^3 x^2 - 6c_1^2 x^3 + 12c_1 x^4 - 8x^5 + 3\sqrt{-6c_1^3 x^2 + 36c_1^2 x^3 - 72c_1 x^4 + 48x^5 + 81} - 27\right)}$$

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 = 0.146779 (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]
```

Solve $\left[\frac{1}{7}\text{RootSum}\left[\#1^4+\#1^3+3\#1^2+\#1+1\&, \frac{8\#1^3\log\left(\frac{y(x)}{x}-\#1\right)+9\#1^2\log\left(\frac{y(x)}{x}-\#1\right)+12\#1\log\left(\frac{y(x)}{x}-\#1\right)}{4\#1^3+3\#1^2+6\#1+1}\right], y(x)\right]$

✓ **Maple** : cpu = 0.803 (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))
```

$$-\frac{2\ln\left(\frac{4x^4+4x^3y(x)+12y(x)^2x^2+4xy(x)^3+4y(x)^4}{x^4}\right)}{7}-\frac{2\sqrt{3}\arctan\left(\frac{(x+2y(x))\sqrt{3}}{3x}\right)}{7}+\frac{2\sqrt{3}\arctan\left(\frac{\sqrt{3}\left(x^3+4x^2y(x)+2xy(x)^2+2y(x)^3\right)}{3x^3}\right)}{7}$$

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 = 1.544 (sec), leaf count = 13289

DSolve[x*(a*y[x]^3 + (b*x + a*y[x])^3) + y[x]*(b*x^3 + (b*x + a*y[x])^3)*Derivative[1][y][x] ==

Too large to display

✓

Maple : cpu = 1.203 (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))

$$y(x)=\frac{x\left(xc_1-b\operatorname{RootOf}\left(b^2\_Z^4-2bxc_1\_Z^3+\left(a^2c_1^2x^2+b^2c_1^2x^2+c_1^2x^2-a^2\right)\_Z^2-2bx^3c_1^3\_Z+x^4c_1^4\right)\right)}{a\operatorname{RootOf}\left(b^2\_Z^4-2bxc_1\_Z^3+\left(a^2c_1^2x^2+b^2c_1^2x^2+c_1^2x^2-a^2\right)\_Z^2-2bx^3c_1^3\_Z+x^4c_1^4\right)}$$

2.327

ODE No. 327

$$(2x^2y(x)^3+xy(x)^4+2y(x)+x)\,y'(x)+y(x)^5+y(x)=0$$

✓

Mathematica : cpu = 0.210542 (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]`

$$\left\{\left\{y(x)\rightarrow \frac{\sqrt[3]{27x^2+9c_1^2x^2+3\sqrt{3}\sqrt{-4c_1^3x^6+27x^4-c_1^4x^4+18c_1^2x^4+4c_1^3x^2+2c_1^3}}}{3\sqrt[3]{2}x}-\frac{3x\sqrt[3]{27x^2+9c_1^2x^2+3\sqrt{3}\sqrt{-4c_1^3x^6+27x^4-c_1^4x^4+18c_1^2x^4+4c_1^3x^2+2c_1^3}}}{3x\sqrt[3]{27x^2+9c_1^2x^2+3\sqrt{3}\sqrt{-4c_1^3x^6+27x^4-c_1^4x^4+18c_1^2x^4+4c_1^3x^2+2c_1^3}}}\right.\right.$$

✓

Maple : cpu = 0.276 (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))`

$$y(x)=\frac{\left(108c_1^3x^2+12\sqrt{3}\sqrt{27c_1^4x^2+4c_1x^4+18c_1^2x^2-x^2-4c_1xc_1+36x^2c_1-8}\right)^{1/3}}{6xc_1}-\frac{3c_1x\left(108c_1^3x^2+12\sqrt{3}\sqrt{27c_1^4x^2+4c_1x^4+18c_1^2x^2-x^2-4c_1xc_1+36x^2c_1-8}\right)^{1/3}}{3c_1x\left(108c_1^3x^2+12\sqrt{3}\sqrt{27c_1^4x^2+4c_1x^4+18c_1^2x^2-x^2-4c_1xc_1+36x^2c_1-8}\right)^{1/3}}$$

2.328

ODE No. 328

$$ax^2y(x)^ny'(x) - 2xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.240412 (sec), leaf count = 42

```
DSolve[y[x] - 2*x*Derivative[1][y][x] + a*x^2*y[x]^n*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\frac{n(\log(x) - \log(-axy(x)^n + n + 2))}{n + 2} - \frac{2n\log(y(x))}{n + 2} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.305 (sec), leaf count = 33

```
dsolve(a*x^2*y(x)^n*diff(y(x),x)-2*x*diff(y(x),x)+y(x) = 0,y(x))
```

$$(y(x)^n ax - n - 2)^n y(x)^{2n} x^{-n} - c_1 = 0$$

2.329

ODE No. 329

$$x^n y(x)^m (axy'(x) + by(x)) + \alpha xy'(x) + \beta y(x) = 0$$

✓ **Mathematica** : cpu = 1.23233 (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])
```

Solve

$$\left[\frac{m(n(a\beta - \alpha b) \log(x^n y(x)^m (bm - an) - \alpha n + \beta m) + \beta (bm - an) \log(nx^n (\alpha n - \beta m)))}{n(an - bm)(\alpha n - \beta m)} + \frac{\alpha m \log(\beta m)}{\beta m}\right]$$

✓ **Maple** : cpu = 0.725 (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))
```

$$(x^n(an - bm) y(x)^m - \beta m + \alpha n)^{-m(a\beta - b\alpha)} (y(x)^m)^{\alpha(an - bm)} x^{\beta m(an - bm)} - c_1 = 0$$

2.330

ODE No. 330

$$(f(y(x)+x)+1)y'(x)+f(y(x)+x)=0$$

✓ **Mathematica** : cpu = 0.103512 (sec), leaf count = 52

```
DSolve[f[x + y[x]] + (1 + f[x + y[x]])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(f(x+K[2])-\int_1^xf'(K[1]+K[2])dK[1]+1\right)dK[2]+\int_1^xf(K[1]+y(x))dK[1]=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.037 (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

$$y'(x)\left(\sum_{\nu=1}^py(x)^{\nu}f(\nu)(x)\right)-\sum_{\nu=1}^qy(x)^{\nu}g(\nu)(x)=0$$

✗ **Mathematica** : cpu = 47.7843 (sec), leaf count = 0

DSolve[-Sum[y[x]^nu*g[nu][x], {nu, 1, q}] + Sum[y[x]^nu*f[nu][x], {nu, 1, p}]*Derivative[1][y[

, could not solve

DSolve[-Sum[y[x]^nu*g[nu][x], {nu, 1, q}] + Sum[y[x]^nu*f[nu][x], {nu, 1, p}]*Derivative

✓ **Maple** : cpu = 0.3 (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))/(-

$$y(x)^{p+1}\operatorname{LerchPhi}\left(-y(x)^q(-1)^{\operatorname{csgn}(iy(x)^q)},1,\frac{p+1}{q}\right)-y(x)\operatorname{LerchPhi}\left(-y(x)^q(-1)^{\operatorname{csgn}(iy(x)^q)},1,\frac{1}{q}\right)+q\left(\int\frac{g_{\nu}(x)}{f_{\nu}(x)}\right)$$

$$q$$

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 = 0.271744 (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 = 0.019 (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

$$-x^{3/2}y(x)^{5/2} + (2x^{5/2}y(x)^{3/2} + x^2y(x) - x) \, y'(x) + xy(x)^2 - y(x) = 0$$

✓

Mathematica : cpu = 0.446601 (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))*Derivati

Solve

$$\left[\frac{2\sqrt{xy(x)}\log(y(x))}{\sqrt{x}\sqrt{y(x)}} - \frac{\sqrt{xy(x)}(3x^{3/2}y(x)^{3/2}\log(x) + 6xy(x) - 2)}{3x^2y(x)^2} = c_1, y(x)\right]$$

✓

Maple : cpu = 0.114 (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)=

$$3\ln(y(x)) + \frac{1}{x^{3/2}y(x)^{3/2}} - \frac{3}{\sqrt{x}\sqrt{y(x)}} - \frac{3\ln(x)}{2} - c_1 = 0$$

2.334 ODE No. 334

$$\left(\sqrt{y(x)+x+1}\right)y'(x)+1=0$$

✓ **Mathematica** : cpu = 0.141454 (sec), leaf count = 39

```
DSolve[1 + (1 + Sqrt[x + y[x]])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow -2\sqrt{x+1+c_1}+2+c_1\right\},\left\{y(x)\rightarrow 2\sqrt{x+1+c_1}+2+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (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 = 0.136593 (sec), leaf count = 75

```
DSolve[-Sqrt[-1 + x^2] + Sqrt[-1 + y[x]^2]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \text{InverseFunction}\left[\frac{1}{2}\#1\sqrt{\#1^2-1}-\frac{1}{2}\tanh^{-1}\left(\frac{\#1}{\sqrt{\#1^2-1}}\right)\&\right]\left[\frac{1}{2}\sqrt{x^2-1}x-\frac{1}{2}\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right)\right]\right.\right.$$

✓ **Maple** : cpu = 0.009 (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 = 0.404635 (sec), leaf count = 74

```
DSolve[Sqrt[1 + x^2] + a*y[x] + (a*x + Sqrt[1 + y[x]^2])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[axy(x) + \frac{1}{2}\sqrt{x^2 + 1}x + \frac{1}{2}\tanh^{-1}\left(\frac{x}{\sqrt{x^2 + 1}}\right) + \frac{1}{2}\left(y(x)\sqrt{y(x)^2 + 1} + \tanh^{-1}\left(\frac{y(x)}{\sqrt{y(x)^2 + 1}}\right)\right) = c_1\right]$$

✓ **Maple** : cpu = 0.043 (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 = 0.229011 (sec), leaf count = 52

```
DSolve[-y[x] + (x + Sqrt[x^2 + y[x]^2])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow -e^{\frac{c_1}{2}}\sqrt{2x+e^{c_1}}\right\},\left\{y(x)\rightarrow e^{\frac{c_1}{2}}\sqrt{2x+e^{c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.132 (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

$y'(x)\left(\sin(\alpha)\left(y(x)^2-x^2\right)-2x\cos(\alpha)y(x)+\sqrt{x^2+y(x)^2}y(x)\right)+\cos(\alpha)\left(y(x)^2-x^2\right)+2x\sin(\alpha)y(x)+x\sqrt{x^2+y(x)^2}$

✓ **Mathematica** : cpu = 6.2591 (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] + x*Sqrt[x^2 + y[x]^2]) == 0, y[x], x]
```

Solve $\left[\sqrt{\cos^2(\alpha)}\sec(\alpha)\left(\log\left(\cos(\alpha)\left(\frac{\cos(\alpha)y(x)}{x}+\sin(\alpha)\right)\right)-\log\left(\frac{1}{2}\left(-2\sqrt{\cos^2(\alpha)}\sqrt{\frac{y(x)^2}{x^2}+1}-\frac{\sin(2\alpha)}{2}\right)\right)\right)=0\right]$

✓ **Maple** : cpu = 1.727 (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)=0, y(x))
```

$y(x) = \text{RootOf}\left(-\ln(x) + \int^{-Z} \frac{-a^3 \cos(2\alpha) - 3a^2 \sin(2\alpha) - a^3 + 3a \cos(2\alpha) + \sin(2\alpha) + \sqrt{2} \sqrt{a^2 + 1}}{(a^2 + 1)(a^2 \cos(2\alpha) + 2a \sin(2\alpha) + 1)} dx\right)$

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 = 0.393367 (sec), leaf count = 27

```
DSolve[-(x*(x^2 + y[x]^2)) - y[x]*Sqrt[1 + x^2 + y[x]^2] + (-(y[x]*(x^2 + y[x]^2)) + x*Sqrt[1 +
```

$$\text{Solve}\left[\sqrt{x^2+y(x)^2+1}+\tan^{-1}\left(\frac{x}{y(x)}\right)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.2 (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)-
```

$$\arctan\left(\frac{x}{y(x)}\right)+\sqrt{x^2+y(x)^2+1}-c_1=0$$

2.340

ODE No. 340

$$y'(x)\left(\frac{e_1(a+x)}{((a+x)^2+y(x)^2)^{3/2}}+\frac{e_2(x-a)}{((x-a)^2+y(x)^2)^{3/2}}\right)-y(x)\left(\frac{e_1}{((a+x)^2+y(x)^2)^{3/2}}+\frac{e_2}{((x-a)^2+y(x)^2)^{3/2}}\right)$$

✗ Mathematica : cpu = 79.9026 (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) + e1*(a + x))/((-a + x)^2 + y[x]^2)^(3/2) + (e1*(a + x))/(a + x))/((a + x)^2 + y[x]^2)^(3/2))*Derivative[1][y][x], y[x], x]
```

, 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) + e1*(a + x))/((-a + x)^2 + y[x]^2)^(3/2) + (e1*(a + x))/(a + x))/((a + x)^2 + y[x]^2)^(3/2))*Derivative[1][y][x], y[x], x]
```

✗ 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)*((e1*(a+x))/((a+x)^2+y(x)^2)^(3/2)+(e2*(-a+x))/((-a+x)^2+y(x)^2)^(3/2))), y(x))
```

, exception

time expired

2.341 ODE No. 341

$$(xe^{y(x)} + e^x) y'(x) + e^x y(x) + e^{y(x)} = 0$$

✓ **Mathematica** : cpu = 0.349192 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-x} - W\left(x e^{-x + c_1 e^{-x}}\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.052 (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))
```

$$y(x) = \left(-\operatorname{LambertW}\left(x e^{-x} e^{-e^{-x} c_1}\right) e^x - c_1\right) e^{-x}$$

2.342

ODE No. 342

$$x\left(2e^{-xy(x)}+3e^{xy(x)}\right)\left(xy'(x)+y(x)\right)+1=0$$

✓ **Mathematica** : cpu = 0.794262 (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]
```

$$\left\{\left\{y(x)\rightarrow-\frac{\cosh^{-1}\left(\frac{1}{24}\left(-5\sqrt{24+\log^2\left(\frac{c_1}{x}\right)}-\log\left(\frac{c_1}{x}\right)\right)\right)}{x}\right\},\left\{y(x)\rightarrow\frac{\cosh^{-1}\left(\frac{1}{24}\left(-5\sqrt{24+\log^2\left(\frac{c_1}{x}\right)}-\log\left(\frac{c_1}{x}\right)\right)\right)}{x}\right\}\right.$$

✓ **Maple** : cpu = 0.036 (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 = 0.206343 (sec), leaf count = 35

```
DSolve[-1 + (x + Log[y[x]])*Derivative[1][y][x] == 0,y[x],x]
```

$$\text{Solve}\big[x = e^{y(x)}\big(\text{Ei}(-y(x)) - e^{-y(x)}\log(y(x))\big) + c_1e^{y(x)},y(x)\big]$$

✓ **Maple** : cpu = 0.062 (sec), leaf count = 27

```
dsolve((ln(y(x))+x)*diff(y(x),x)-1 = 0,y(x))
```

$$y(x) = e^{\text{RootOf}\big(-x - \_Z - e^{e^{-Z}}\text{Ei}_1(e^{-Z}) + e^{e^{-Z}}c_1\big)}$$

2.344

ODE No. 344

$$y'(x)(\log(y(x)) + 2x - 1) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.225607 (sec), leaf count = 23

```
DSolve[-2*y[x] + (-1 + 2*x + Log[y[x]])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow -\frac{W(-2c_1e^{-2x})}{2c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.049 (sec), leaf count = 19

```
dsolve((ln(y(x))+2*x-1)*diff(y(x),x)-2*y(x) = 0,y(x))
```

$$y(x) = e^{-\operatorname{LambertW}(-2e^{-2x}c_1)-2x}$$

2.345

ODE No. 345

$$xy'(x)\left(2x^2y(x)\log(y(x))+1\right)-2y(x)=0$$

✓ **Mathematica** : cpu = 0.279092 (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 = 0.065 (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))
```

$$y(x)=e^{\text{RootOf}(2\_Zx^2e^{2\_Z}-x^2e^{2\_Z}+2x^2c_1+2e^{-Z})}$$

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 = 0.554743 (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
```

$$\text{Solve}[ax\log(xy(x)) - y(x)\log(xy(x)) = c_1, y(x)]$$

✓ **Maple** : cpu = 0.2 (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 = 0.558928 (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]
```

$$\left\{\left\{y(x)\rightarrow 0\right\},\left\{y(x)\rightarrow 2\sin^{-1}\left(\frac{1}{4}c_1\left(\sin\left(\frac{x}{2}\right)+\cos\left(\frac{x}{2}\right)\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.197 (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 = 0.266146 (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 = 0.075 (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 = 0.288615 (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]
```

$$\left\{\left\{y(x)\rightarrow x\operatorname{csc}^{-1}(2(\log(x)+c_1))\right\}\right\}$$

✓ **Maple** : cpu = 0.045 (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 = 0.623551 (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]
```

$$\left\{\left\{y(x)\rightarrow \csc^{-1}\left(\frac{1}{2}(-\sin(x)-\cos(x)-2c_1e^{-x})\right)\right\},\left\{y(x)\rightarrow -\csc^{-1}\left(\frac{1}{2}(\sin(x)+\cos(x)+2c_1e^{-x})\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.165 (sec), leaf count = 221

```
dsolve(diff(y(x),x)*cos(y(x))-cos(x)*sin(y(x))^2-sin(y(x)) = 0,y(x))
```

$$y(x)=\arctan\left(-\frac{2\,e^x}{\left(\cos\left(x\right)+\sin\left(x\right)\right)e^x+2c_1},\frac{4\sqrt{\left(\frac{\left(\sin\left(x\right)\cos\left(x\right)+\frac{1}{2}\right)e^{2x}}{2}+\left(\cos\left(x\right)+\sin\left(x\right)\right)e^xc_1+c_1^2\right)\left(\frac{\left(\sin\left(x\right)\cos\left(x\right)+\frac{1}{2}\right)e^{2x}}{2}+\left(\cos\left(x\right)+\sin\left(x\right)\right)e^xc_1+c_1^2\right)}}{4c_1^2+4\left(\cos\left(x\right)+\sin\left(x\right)\right)e^xc_1+e^{2x}\left(2\cos\left(x\right)+2\sin\left(x\right)+1\right)}\right)$$

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 = 0.555924 (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]`

$$\left\{ \left\{ y(x) \rightarrow -\cot^{-1} \left(\sqrt{e^{x^2} \left(-\sqrt{\pi} \operatorname{erf}(x) + 4c_1 \right)} \right) \right\}, \left\{ y(x) \rightarrow \cot^{-1} \left(\sqrt{e^{x^2} \left(-\sqrt{\pi} \operatorname{erf}(x) + 4c_1 \right)} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.379 (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))`

$$y(x) = \arcsin \left(\frac{1}{\sqrt{1 - \sqrt{\pi} \operatorname{erf}(x) e^{x^2} - 2c_1 e^{x^2}}} \right)$$

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 = 0.686173 (sec), leaf count = 43

DSolve[Cos[x]*(Cos[x] - Sin[alpha]*Sin[y[x]]) + Cos[y[x]]*(Cos[y[x]] - Sin[alpha]*Sin[x])*Deri

$$\text{Solve}\left[4\sin(\alpha)\sin(x)\sin(y(x))-4\left(\frac{y(x)}{2}+\frac{1}{4}\sin(2y(x))\right)-2x-\sin(2x)=c_1,y(x)\right]$$

✓

Maple

: cpu = 0.418 (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))

$$\frac{(-2\sin(\alpha)\sin(x)+\cos(y(x)))\sin(y(x))}{2}+\frac{\sin(x)\cos(x)}{2}+\frac{x}{2}+c_1+\frac{y(x)}{2}=0$$

2.353

ODE No. 353

$$xy'(x)\cos(y(x))+\sin(y(x))=0$$

✓ **Mathematica** : cpu = 0.0930041 (sec), leaf count = 14

```
DSolve[Sin[y[x]] + x*Cos[y[x]]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow\sin^{-1}\left(\frac{e^{c_1}}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 12

```
dsolve(x*diff(y(x),x)*cos(y(x))+sin(y(x)) = 0,y(x))
```

$$y(x)=\arcsin\left(\frac{1}{xc_1}\right)$$

2.354 ODE No. 354

$$y'(x)(x \sin(y(x)) - 1) + \cos(y(x)) = 0$$

✓ **Mathematica** : cpu = 0.214596 (sec), leaf count = 145

```
DSolve[Cos[y[x]] + (-1 + x*Sin[y[x]])*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\cos^{-1} \left(\frac{c_1 x - \sqrt{-x^2 + 1 + c_1^2}}{1 + c_1^2} \right) \right\}, \left\{ y(x) \rightarrow \cos^{-1} \left(\frac{c_1 x - \sqrt{-x^2 + 1 + c_1^2}}{1 + c_1^2} \right) \right\}, \left\{ y(x) \rightarrow -\cos^{-1} \left(\frac{c_1 x - \sqrt{-x^2 + 1 + c_1^2}}{1 + c_1^2} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.121 (sec), leaf count = 108

```
dsolve((x*sin(y(x))-1)*diff(y(x),x)+cos(y(x)) = 0,y(x))
```

$$y(x) = \arctan \left(\frac{-c_1 \sqrt{c_1^2 - x^2 + 1} + x}{c_1^2 + 1}, \frac{x c_1 + \sqrt{c_1^2 - x^2 + 1}}{c_1^2 + 1} \right)$$

2.355

ODE No. 355

$$y'(x)(x \cos(y(x)) + \cos(x)) + \sin(y(x)) - y(x) \sin(x) = 0$$

✓ **Mathematica** : cpu = 0.241408 (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 = 0.08 (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 = 0.373865 (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], x]
```

$$\text{Solve}\left[x^2 \sin(y(x)) + y(x)^2 \sin(x) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.087 (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 = 0.690582 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\sec^{-1} \left(\frac{x - c_1}{\log(x)} \right) \right\}, \left\{ y(x) \rightarrow \sec^{-1} \left(\frac{x - c_1}{\log(x)} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.507 (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 = 0.208863 (sec), leaf count = 29

```
DSolve[Cos[y[x]]*Sin[x] + Cos[x]*Sin[y[x]]*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow-\cos^{-1}\left(\frac{1}{2}c_1\sec(x)\right)\right\},\left\{y(x)\rightarrow\cos^{-1}\left(\frac{1}{2}c_1\sec(x)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.072 (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 = 0.46446 (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]
```

$$\left\{\left\{y(x)\rightarrow \text{SinIntegral}^{(-1)}\left(-\frac{5}{3}\left(\frac{5\cos(x)}{4}+\frac{1}{12}\cos(3x)+\log\left(\sin\left(\frac{x}{2}\right)\right)-\log\left(\cos\left(\frac{x}{2}\right)\right)\right)+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.087 (sec), leaf count = 28

```
dsolve(3*diff(y(x),x)*sin(x)*sin(y(x))+5*cos(x)^4*y(x) = 0,y(x))
```

$$\frac{3\operatorname{Si}\left(y(x)\right)}{5}+c_1+\ln\left(\csc\left(x\right)-\cot\left(x\right)\right)+\frac{\cos\left(3x\right)}{12}+\frac{5\cos\left(x\right)}{4}=0$$

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 = 19.3971 (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]]*Derivat
```

$$\left\{\left\{y(x)\rightarrow\text{InverseFunction}\left[-\frac{i(\cos(\#1a)+1)\sqrt{\frac{2c\cos(\#1a)+\cos(2\#1a)-1}{(\cos(\#1a)+1)^2}}\sqrt{\frac{c\tan^2\left(\frac{\#1a}{2}\right)+\sqrt{c^2+4}+2}{\sqrt{c^2+4}+2}}\sqrt{1-\frac{c\tan^2\left(\frac{\#1a}{2}\right)}{\sqrt{c^2+4}-2}}}{a\left(c^2-1\right)\sqrt{\frac{c}{4-2\sqrt{c^2+4}}}}\right.\right.$$

✓ **Maple** : cpu = 0.067 (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
```

$$x+c_1-\left(\int^{y(x)}-\frac{2}{b\sqrt{-2+2\cos\left(2\_aa\right)+4c\cos\left(\_aa\right)\left(c-\sec\left(\_aa\right)\right)}d\_a\right)=0$$

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 = 0.879978 (sec), leaf count = 31

```
DSolve[Cos[x] + Cos[x + y[x]] + Sin[x*y[x]]*y[x] + (Cos[x + y[x]] - Sin[y[x]] + x*Sin[x*y[x]])
```

$\text{Solve}[\cos(y(x)) - \cos(xy(x)) + \sin(x) \cos(y(x)) + \cos(x) \sin(y(x)) + \sin(x) = c_1, y(x)]$

✓ **Maple** : cpu = 0.195 (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)+c1=0
```

$-\cos(xy(x))+\sin(x)+\sin(y(x)+x)+\cos(y(x))+c_1=0$

2.362

ODE No. 362

$$y'(x)\left(x^2y(x)\sin(xy(x))-4x\right)-y(x)+xy(x)^2\sin(xy(x))=0$$

✓ **Mathematica** : cpu = 0.392481 (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
```

$$\text{Solve}[-4\log(y(x))-\cos(xy(x))-\log(x)=c_1,y(x)]$$

✓ **Maple** : cpu = 0.2 (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))
```

$$y(x)=\frac{\text{RootOf}\left(-\_Z+e^{-\frac{\cos(\_Z)}{4}}c_1x^{3/4}\right)}{x}$$

2.363

ODE No. 363

$$(xy'(x) - y(x)) \cos^2\left(\frac{y(x)}{x}\right) + x = 0$$

✓ **Mathematica** : cpu = 0.391505 (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 = 0.076 (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 = 0.489657 (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]))*Derivative[1][y][x], y[x], x]

$$\text{Solve}\left[-\log\left(\frac{y(x)}{x}\right)-\log\left(\cos\left(\frac{y(x)}{x}\right)\right)=2\log(x)+c_1,y(x)\right]$$

✓

Maple : cpu = 0.161 (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))*x,y(x))

$$y(x)=\frac{c_1}{\cos(\text{RootOf}(-\_Z\cos(\_Z)x^2+c_1))x}$$

2.365

ODE No. 365

$$(y(x)f(x^2+y(x)^2)-x)\,y'(x)+xf(x^2+y(x)^2)+y(x)=0$$

✓

Mathematica : cpu = 0.481025 (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]`

Solve

$$\left[\int_1^{y(x)}\left(\frac{x-f(x^2+K[2]^2)K[2]}{x^2+K[2]^2}-\int_1^x\left(\frac{-2K[1]K[2]f'(K[1]^2+K[2]^2)-1}{K[1]^2+K[2]^2}-\frac{2(-f(K[1]^2+K[2]^2)K}{(K[1]^2+K[2]^2)}\right)dx\right)dy\right]$$

✓

Maple : cpu = 0.124 (sec), leaf count = 42

`dsolve((y(x)*f(y(x)^2+x^2)-x)*diff(y(x),x)+y(x)+x*f(y(x)^2+x^2) = 0,y(x))`

$$y(x)=\frac{x}{\tan\left(\text{RootOf}\left(-2\_Z-\left(\int\frac{x^2(\tan(\_Z)^2+1)}{\tan(\_Z)^2}\frac{f(\_a)}{\_a}d\_a\right)+2c_1\right)\right)}$$

2.366

ODE No. 366

$$f\left(ay(x)^2+x^2\right)\left(ay(x)y'(x)+x\right)-xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.333406 (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
```

Solve $\left[\int_1^{y(x)} \left(x - af\left(x^2 + aK[2]^2\right) K[2] - \int_1^x \left(1 - 2aK[1]K[2]f'\left(K[1]^2 + aK[2]^2\right)\right) dK[1]\right) dK[2] + \int_1^x (y$

✓ **Maple** : cpu = 0.099 (sec), leaf count = 45

```
dsolve(f(x^2+a*y(x)^2)*(a*y(x)*diff(y(x),x)+x)-y(x)-x*diff(y(x),x) = 0,y(x))
```

$$-\frac{ay(x)^2x}{\sqrt{a^2y(x)^2}}-\left(\int^{-\frac{ay(x)^2}{2}-\frac{x^2}{2}}f(-2\_a)d\_a\right)+c_1=0$$

2.367

ODE No. 367

$$f(x^cy(x))(bxy'(x)-a)-x^ay(x)^b(cy(x)+xy'(x))=0$$

 **Mathematica** : cpu = 5.69708 (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]), 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][y][x]), y[x]]
```

 **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 = 0.815559 (sec), leaf count = 581

`DSolve[b*x^2 + a*y[x] + Derivative[1][y][x]^2 == 0,y[x],x]`

$$\left\{ \text{Solve} \left[\text{RootSum} \left[\#1^4 - \#1^3 a + 2 \#1^2 b + \#1 a b + b^2 \&, \frac{2 \#1^3 \log \left(\#1 x - \sqrt{-a y(x) - b x^2} + \sqrt{-a y(x)} \right) - \dots}{\dots} \right] \right]$$

✗

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 = 0.11645 (sec), leaf count = 107

```
DSolve[-a^2 + y[x]^2 + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{a \tan(x - c_1)}{\sqrt{1 + \tan^2(x - c_1)}} \right\}, \left\{ y(x) \rightarrow \frac{a \tan(x - c_1)}{\sqrt{1 + \tan^2(x - c_1)}} \right\}, \left\{ y(x) \rightarrow -\frac{a \tan(x + c_1)}{\sqrt{1 + \tan^2(x + c_1)}} \right\}, \left\{ y(x) \rightarrow \frac{a \tan(x + c_1)}{\sqrt{1 + \tan^2(x + c_1)}} \right\} \right\}$$

✓ **Maple** : cpu = 0.132 (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 = 8.22073 (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 = 0.07299 (sec), leaf count = 37

```
DSolve[y[x]^2 - y[x]^3 + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow 1 + \tan^2 \left(\frac{-x + c_1}{2} \right) \right\}, \left\{ y(x) \rightarrow 1 + \tan^2 \left(\frac{x + c_1}{2} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.111 (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 = 0.0057619 (sec), leaf count = 27

```
DSolve[b + a*y[x] - 4*y[x]^3 + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\{\{y(x) \rightarrow \wp(x - c_1; a, b)\}, \{y(x) \rightarrow \wp(x + c_1; a, b)\}\}$$

✓ **Maple** : cpu = 0.05 (sec), leaf count = 227

```
dsolve(diff(y(x),x)^2-4*y(x)^3+a*y(x)+b = 0,y(x))
```

$$y(x) = \frac{\left(27b + 3\sqrt{-3a^3 + 81b^2}\right)^{2/3} + 3a}{6\left(27b + 3\sqrt{-3a^3 + 81b^2}\right)^{1/3}}$$

2.373

ODE No. 373

$$a^2y(x)^2\left(\log^2(y(x))-1\right)+y'(x)^2=0$$

✓ **Mathematica** : cpu = 0.243403 (sec), leaf count = 169

```
DSolve[a^2*(-1 + Log[y[x]]^2)*y[x]^2 + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow\exp\left(-\frac{i\tan(ax-ic_1)}{\sqrt{-1-\tan^2(ax-ic_1)}}\right)\right\},\left\{y(x)\rightarrow\exp\left(\frac{i\tan(ax-ic_1)}{\sqrt{-1-\tan^2(ax-ic_1)}}\right)\right\},\left\{y(x)\rightarrow\exp\left(\frac{i\tan(ax-ic_1)}{\sqrt{-1-\tan^2(ax-ic_1)}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.25 (sec), leaf count = 49

```
dsolve(diff(y(x),x)^2+a^2*y(x)^2*(ln(y(x)))^2-1) = 0,y(x))
```

$$y(x)=e^{\operatorname{RootOf}(a^2e^{2\_Z}(\_Z^2-1))}$$

2.374

ODE No. 374

$$y'(x)^2 - 2y'(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.409663 (sec), leaf count = 99

```
DSolve[-y[x]^2 - 2*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{\sqrt{\#1^2 + 1} + \#1 \log \left(\sqrt{\#1^2 + 1} - \#1 \right) + 1}{\#1} \& \right] [-x + c_1] \right\}, \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{\sqrt{\#1^2 + 1} - \#1 \log \left(\sqrt{\#1^2 + 1} - \#1 \right) + 1}{\#1} \& \right] [-x + c_1] \right\} \right.$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 85

```
dsolve(diff(y(x),x)^2-2*diff(y(x),x)-y(x)^2 = 0,y(x))
```

$$x - \frac{1}{y(x)} - \frac{(y(x)^2 + 1)^{3/2}}{y(x)} + y(x) \sqrt{y(x)^2 + 1} + \operatorname{arcsinh}(y(x)) - c_1 = 0$$

2.375 ODE No. 375

$$ay'(x) + bx + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0315169 (sec), leaf count = 71

```
DSolve[b*x + a*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{2} \left(-\frac{(a^2 - 4bx)^{3/2}}{6b} - ax \right) + c_1 \right\}, \left\{ y(x) \rightarrow \frac{1}{2} \left(\frac{(a^2 - 4bx)^{3/2}}{6b} - ax \right) + c_1 \right\} \right\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 49

```
dsolve(diff(y(x),x)^2+a*diff(y(x),x)+b*x = 0,y(x))
```

$$y(x) = -\frac{ax}{2} + \frac{(a^2 - 4bx)^{3/2}}{12b} + c_1$$

2.376

ODE No. 376

$$ay'(x) + by(x) + y'(x)^2 = 0$$

✓

Mathematica

: cpu = 0.334609 (sec), leaf count = 114

DSolve[b*y[x] + a*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{\sqrt{a^2 - 4\#1b} + a \log \left(b(\sqrt{a^2 - 4\#1b} - a) \right)}{2b} \& \right] \left[\frac{x}{2} + c_1 \right] \right\}, \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{\sqrt{a^2 - 4\#1b} - a \log \left(b(\sqrt{a^2 - 4\#1b} - a) \right)}{2b} \& \right] \left[\frac{x}{2} + c_1 \right] \right\} \right.$$

✓

Maple

: cpu = 0.895 (sec), leaf count = 279

dsolve(diff(y(x),x)^2+a*diff(y(x),x)+b*y(x) = 0,y(x))

$$y(x) = -\frac{a^2 \left(\text{LambertW} \left(-\frac{2\sqrt{-b} e^{\frac{c_1 b}{a}} e^{-\frac{bx}{a}} e^{-1}}{a} \right) + 2 \right) \text{LambertW} \left(-\frac{2\sqrt{-b} e^{\frac{c_1 b}{a}} e^{-\frac{bx}{a}} e^{-1}}{a} \right)}{4b}$$

2.377 ODE No. 377

$$y'(x)^2 + (x - 2)y'(x) - y(x) + 1 = 0$$

✓ **Mathematica** : cpu = 0.0064483 (sec), leaf count = 19

```
DSolve[1 - y[x] + (-2 + x)*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0, y[x], x]
```

$$\{\{y(x) \rightarrow c_1 x + 1 + c_1^2 - 2c_1\}\}$$

✓ **Maple** : cpu = 0.026 (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 = 0.0064334 (sec), leaf count = 18

```
DSolve[-y[x] + (a + x)*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0, y[x], x]
```

$$\{ \{ y(x) \rightarrow ac_1 + c_1x + c_1^2 \} \}$$

✓ **Maple** : cpu = 0.026 (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 = 0.0058428 (sec), leaf count = 18

```
DSolve[y[x] - (1 + x)*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0, y[x], x]
```

$$\{\{y(x) \rightarrow c_1 x - c_1^2 + c_1\}\}$$

✓ **Maple** : cpu = 0.022 (sec), leaf count = 22

```
dsolve(diff(y(x),x)^2-(1+x)*diff(y(x),x)+y(x) = 0,y(x))
```

$$y(x) = \frac{(1+x)^2}{4}$$

2.380

ODE No. 380

$$y'(x)^2 + 2xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.258677 (sec), leaf count = 1193

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow -\frac{x^2}{4} + \frac{1}{4}\sqrt[3]{-x^6 + 20e^{3c_1}x^3 + 8e^{6c_1} + 8\sqrt{-e^{3c_1}x^9 + 3e^{6c_1}x^6 - 3e^{9c_1}x^3 + e^{12c_1}}} - \frac{\sqrt[3]{-x^6 + 20e^{3c_1}x^3 + 8e^{6c_1} + 8\sqrt{-e^{3c_1}x^9 + 3e^{6c_1}x^6 - 3e^{9c_1}x^3 + e^{12c_1}}}}{36}\right\}\right.$$

✓ **Maple** : cpu = 0.06 (sec), leaf count = 589

```
dsolve(diff(y(x),x)^2+2*x*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = -\frac{\left(\frac{x^2}{\left(6c_1-x^3+2\sqrt{-3x^3c_1+9c_1^2}\right)^{1/3}}-x+\left(6c_1-x^3+2\sqrt{-3x^3c_1+9c_1^2}\right)^{1/3}\right)^2}{4}+x\left(\frac{x^2}{\left(6c_1-x^3+2\sqrt{-3x^3c_1+9c_1^2}\right)^{1/3}}-x+\left(6c_1-x^3+2\sqrt{-3x^3c_1+9c_1^2}\right)^{1/3}\right)$$

2.381

ODE No. 381

$$y'(x)^2 - 2xy'(x) + y(x) = 0$$

✓

Mathematica : cpu = 0.270505 (sec), leaf count = 1169

`DSolve[y[x] - 2*x*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]`

$$\left\{\left\{y(x) \rightarrow \frac{x^2}{4} + \frac{1}{4} \sqrt[3]{x^6 - 20e^{3c_1}x^3 - 8e^{6c_1} + 8\sqrt{-e^{3c_1}x^9 + 3e^{6c_1}x^6 - 3e^{9c_1}x^3 + e^{12c_1}}} - \frac{\sqrt[3]{x^6 - 20e^{3c_1}x^3 - 8e^{6c_1}}}{36}\right\}\right.$$

✓

Maple : cpu = 0.038 (sec), leaf count = 553

`dsolve(diff(y(x),x)^2-2*x*diff(y(x),x)+y(x) = 0,y(x))`

$$y(x) = -\frac{\left(\frac{x^2}{\left(-6c_1+x^3+2\sqrt{-3x^3c_1+9c_1^2}\right)^{1/3}}+x+\left(-6c_1+x^3+2\sqrt{-3x^3c_1+9c_1^2}\right)^{1/3}\right)^2}{4}+x\left(\frac{x^2}{\left(-6c_1+x^3+2\sqrt{-3x^3c_1+9c_1^2}\right)^{1/3}}+x+\left(-6c_1+x^3+2\sqrt{-3x^3c_1+9c_1^2}\right)^{1/3}\right)$$

2.382

ODE No. 382

$$axy'(x) - bx^2 - c + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.703732 (sec), leaf count = 197

DSolve[-c - b*x^2 + a*x*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{2} \left(\frac{1}{2} x \sqrt{x^2 (a^2 + 4b) + 4c} + \frac{2c \tan^{-1} \left(\frac{x \sqrt{-a^2 - 4b}}{\sqrt{x^2 (a^2 + 4b) + 4c}} \right)}{\sqrt{-a^2 - 4b}} - \frac{ax^2}{2} \right) + c_1 \right\}, \left\{ y(x) \rightarrow \frac{1}{2} \left(-\frac{1}{2} x \left(\sqrt{x^2 (a^2 + 4b) + 4c} \right) + \frac{2c \tan^{-1} \left(\frac{x \sqrt{-a^2 - 4b}}{\sqrt{x^2 (a^2 + 4b) + 4c}} \right)}{\sqrt{-a^2 - 4b}} - \frac{ax^2}{2} \right) + c_1 \right\} \right.$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 146

dsolve(diff(y(x),x)^2+a*x*diff(y(x),x)-b*x^2-c = 0,y(x))

$$y(x) = -\frac{x\sqrt{(a^2+4b)x^2+4c}}{4} - \frac{c\ln\left(\sqrt{a^2+4b}x + \sqrt{(a^2+4b)x^2+4c}\right)}{\sqrt{a^2+4b}} - \frac{ax^2}{4} + c_1$$

2.383

ODE No. 383

$$axy'(x)+by(x)+cx^2+y'(x)^2=0$$

✓ **Mathematica** : cpu = 1.51284 (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]
```

$$\left\{ \text{Solve}\left[2\log(x)+\frac{1}{2}\log(y(x))-\log\left(2by(x)+\sqrt{-by(x)}\sqrt{(a^2-4c)x^2-4by(x)}\right)+\text{RootSum}\left[a^4-2\sqrt{1^2a^2-4c}y(x),\right.\right.\right.$$

✗ **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 = 0.0067863 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{bc_1 + c + c_1^2}{a} + c_1 x \right\} \right\}$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 50

```
dsolve(diff(y(x), x)^2 + (a*x + b)*diff(y(x), x) - a*y(x) + c = 0, y(x))
```

$$y(x) = \frac{-a^2 x^2 - 2abx - b^2 + 4c}{4a}$$

2.385

ODE No. 385

$$-2x^2y'(x) + y'(x)^2 + 2xy(x) = 0$$

✓

Mathematica : cpu = 1.11263 (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]

$$\left\{ \left\{ y(x) \rightarrow -x^3 \left(\frac{1}{2} \sqrt{\frac{2 \left(e^{12 c_1} x^{12} - 8 e^{6 c_1} x^{18} \right)}{9 x^{24} \sqrt[3]{\frac{64 \sqrt{e^{12 c_1} x^{60} + 3 e^{18 c_1} x^{54} + 3 e^{24 c_1} x^{48} + e^{30 c_1} x^{42}}}{x^{36}} - \frac{64 e^{6 c_1}}{x^6} + \frac{160 e^{12 c_1}}{x^{12}} + \frac{8 e^{18 c_1}}{x^{18}}}} + \frac{1}{18} \sqrt[3]{64 \sqrt{e^{12 c_1}}}} \right. \right. \right.$$

✓

Maple : cpu = 0.397 (sec), leaf count = 161

dsolve(diff(y(x),x)^2-2*x^2*diff(y(x),x)+2*x*y(x) = 0,y(x))

$$y(x) = \frac{x^4 - \text{RootOf}\left(x^{16} - 12\_Z^2 x^{12} + 16\_Z^3 x^{10} + 30\_Z^4 x^8 - 96\_Z^5 x^6 + 100\_Z^6 x^4 - 48\_Z^7 x^2 + 9\_Z^8 - \right)}{2x}$$

2.386

ODE No. 386

$$ax^3y'(x) - 2ax^2y(x) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.686707 (sec), leaf count = 103

```
DSolve[-2*a*x^2*y[x] + a*x^3*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{2}(\cosh(2c_1) + \sinh(2c_1)) \left(-i\sqrt{2}\sqrt{ax^2} + 2\cosh(2c_1) + 2\sinh(2c_1) \right) \right\}, \left\{ y(x) \rightarrow -\frac{1}{2}(\cosh(2c_1) \right.$$

✓ **Maple** : cpu = 0.447 (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))
```

$$y(x) = -\frac{ax^4}{8}$$

2.387

ODE No. 387

$$y'(x)^2 + e^x(y'(x) - y(x)) = 0$$

✓ **Mathematica** : cpu = 1.67852 (sec), leaf count = 136

```
DSolve[Derivative[1][y][x]^2 + E^x*(-y[x] + Derivative[1][y][x]) == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\log(y(x)) - \frac{-e^{x/2}\sqrt{4y(x) + e^x} - 4y(x)\tanh^{-1}\left(\frac{e^{x/2}}{\sqrt{4y(x) + e^x}}\right) + e^x}{2y(x)} = c_1, y(x)\right], \text{Solve}\left[\log(y(x)) - \frac{e^{x/2}\sqrt{4y(x) + e^x} - 4y(x)\tanh^{-1}\left(\frac{e^{x/2}}{\sqrt{4y(x) + e^x}}\right) + e^x}{2y(x)} = c_1, y(x)\right] \right\}$$

✓ **Maple** : cpu = 0.724 (sec), leaf count = 118

```
dsolve(diff(y(x),x)^2+(diff(y(x),x)-y(x))*exp(x) = 0,y(x))
```

$$2\ln(y(x)) + \frac{\sqrt{e^{2x} + 4y(x)e^x}}{y(x)} + 4\operatorname{arctanh}\left(\sqrt{e^{2x} + 4y(x)e^x}e^{-x}\right) - \frac{e^x}{y(x)} - c_1 = 0$$

2.388

ODE No. 388

$$y'(x)^2-2y(x)y'(x)-2x=0$$

✓

Mathematica : cpu = 0.563171 (sec), leaf count = 72

`DSolve[-2*x - 2*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]`

$$\text{Solve}\left[\left\{x=\frac{K[1]\tanh^{-1}\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)}{2\sqrt{K[1]^2+1}}+\frac{c_1K[1]}{\sqrt{K[1]^2+1}},y(x)=\frac{K[1]}{2}-\frac{x}{K[1]}\right\},\{y(x),K[1]\}\right]$$

✓

Maple : cpu = 0.067 (sec), leaf count = 223

`dsolve(diff(y(x),x)^2-2*y(x)*diff(y(x),x)-2*x = 0,y(x))`

$$\frac{\left(y(x)-\sqrt{y(x)^2+2x}\right)\operatorname{arcsinh}\left(-y(x)+\sqrt{y(x)^2+2x}\right)}{2}+x\sqrt{2y(x)^2+2x-2y(x)\sqrt{y(x)^2+2x+1}-2c_1y(x)+2c_1\sqrt{y(x)^2+2x+1}}$$
$$\sqrt{2y(x)^2+2x-2y(x)\sqrt{y(x)^2+2x+1}}$$

2.389

ODE No. 389

$$y'(x)^2 - (4y(x) + 1)y'(x) + y(x)(4y(x) + 1) = 0$$

✓ **Mathematica** : cpu = 0.103244 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4}e^{x-4c_1}(e^x + 2e^{2c_1}) \right\}, \left\{ y(x) \rightarrow \frac{1}{4}e^{x+2c_1}(-2 + e^{x+2c_1}) \right\} \right\}$$

✓ **Maple** : cpu = 0.763 (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 = 3.40758 (sec), leaf count = 161

`DSolve[-c - b*x + a*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]`

Solve

$$\left\{x=\left(\frac{a\log\left(\sqrt{b-aK[1]^2}-\sqrt{-a}K[1]\right)}{(-a)^{3/2}}-\frac{c\sqrt{b-aK[1]^2}}{bK[1]}\right)\exp\left(b\left(\frac{\log(K[1])}{b}-\frac{\log(b-aK[1]^2)}{2b}\right)\right)\right\}$$

✓

Maple : cpu = 0.305 (sec), leaf count = 281

`dsolve(diff(y(x),x)^2+a*y(x)*diff(y(x),x)-b*x-c = 0,y(x))`

$$y(x) = \frac{2e^{\text{RootOf}(\sqrt{a}c_1be^{2-Z}-e^{2-Z}abx-e^{2-Z}Zb-e^{2-Z}ac+\sqrt{a}c_1b^2+ab^2x-Zb^2+abc)}}{a^{3/2}\left(e^{2\text{RootOf}(\sqrt{a}c_1be^{2-Z}-e^{2-Z}abx-e^{2-Z}Zb-e^{2-Z}ac+\sqrt{a}c_1b^2+ab^2x-Zb^2+abc)}\right)}$$

2.391

ODE No. 391

$$y'(x)(ay(x) + bx) + abxy(x) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0236881 (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]

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-ax} \right\}, \left\{ y(x) \rightarrow -\frac{bx^2}{2} + c_1 \right\} \right\}$$

✓ **Maple** : cpu = 0.012 (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))

$$y(x) = c_1 e^{-ax}$$

2.392

ODE No. 392

$$y(x)^2 \log(ay(x)) - xy(x)y'(x) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.227455 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{e^{\frac{c_1 x}{2} - \frac{c_1^2}{4}}}{a} \right\} \right\}$$

✓ **Maple** : cpu = 0.528 (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 = 0.121324 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \csc^2\left(\frac{x}{2}\right) \right\}, \left\{ y(x) \rightarrow c_1 \sec^2\left(\frac{x}{2}\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.241 (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))
```

$$y(x) = \frac{c_1 \left(\tan(x)^2 + 1\right) \sqrt{\frac{\tan(x)^2}{\tan(x)^2 + 1}}}{\left(1 + \sqrt{\tan(x)^2 + 1}\right) \tan(x)}$$

2.394

ODE No. 394

$$-\left(g(x)-f(x)^2\right) e^{-2 \int_a^x f(\mathrm{xp}) d \mathrm{xp}}+2 f(x) y(x) y'(x)+g(x) y(x)^2+y'(x)^2=0$$

✓

Mathematica : cpu = 0.459834 (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]*Deri

$$\left\{\left\{y(x) \rightarrow e^{-\int_a^x f(K[1]) d K[1]}\left(\left\{\begin{array}{ll} \sin \left(c_1+\int_a^x \sqrt{g(K[1])-f(K[1])^2} d K[1]\right) & g(x)>f(x)^2 \\ \cosh \left(c_1+\int_a^x \sqrt{f(K[1])^2-g(K[1])} d K[1]\right) & g(x)<f(x)^2 \\ c_1 & \text { True } \end{array}\right.\right)\right\}\right\}$$

✓

Maple : cpu = 5.095 (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,a,x))

$$y(x)=\tan \left(-\left(\int e^{\int_a^x 2 f(\mathrm{xp}) d \mathrm{xp}} \sqrt{\left(g(x)-f(x)^2\right) e^{\int_a^x-4 f(\mathrm{xp}) d \mathrm{xp}} d x}+c_1\right) \sqrt{\frac{e^{-2 \int_a^x f(\mathrm{xp}) d \mathrm{xp}}}{\tan \left(-\left(\int e^{\int_a^x 2 f(\mathrm{xp}) d \mathrm{xp}} \sqrt{g(x)} d x\right)+c_1\right)}}$$

2.395

ODE No. 395

$$2f(x)y(x)y'(x) + g(x)y(x)^2 + h(x) + y'(x)^2 = 0$$

✗ Mathematica : cpu = 26.2948 (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[x],x]
```

✗ 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 = 0.0775955 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{x-c_1}\right\},\left\{y(x)\rightarrow c_1e^{\frac{x^2}{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.011 (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))
```

$$y(x)=e^{\frac{x^2}{2}}c_1$$

2.397

ODE No. 397

$$-2x^3y(x)^2y'(x)-4x^2y(x)^3+y'(x)^2=0$$

✓ **Mathematica** : cpu = 1.57811 (sec), leaf count = 161

`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]`

$$\left\{\text{Solve}\left[-\frac{x\sqrt{x^4y(x)+4}y(x)^{3/2}\tanh^{-1}\left(\frac{\sqrt{x^4y(x)+4}}{x^2\sqrt{y(x)}}\right)-\frac{1}{4}\log(y(x))=c_1,y(x)\right],\text{Solve}\left[\frac{xy(x)^{3/2}\sqrt{x^4y(x)+4}}{2\sqrt{x^2y(x)^3}}\right]\right\}$$

✓ **Maple** : cpu = 0.389 (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 = 7.00597 (sec), leaf count = 413

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]

⎧

Solve

⎡

$$\frac{\sqrt{x^2 - 4\sqrt[3]{y(x)}}\sqrt{x^2y(x)^{4/3} - 4y(x)^{5/3}}}{8y(x) - 2x^2y(x)^{2/3}} + \frac{\sqrt{\left(x^2 - 4\sqrt[3]{y(x)}\right)y(x)^{4/3}\log\left(\sqrt{x^2 - 4\sqrt[3]{y(x)}} - x\right)}}{\sqrt{x^2 - 4\sqrt[3]{y(x)}}y(x)^{2/3}} + 1$$

⎣

⎫

✓ **Maple** : cpu = 2.106 (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 = 0.0090887 (sec), leaf count = 20

```
DSolve[-y[x] + (-1 + x)*Derivative[1][y][x] + 2*Derivative[1][y][x]^2 == 0, y[x], x]
```

$$\{ \{ y(x) \rightarrow c_1 x + 2c_1^2 - c_1 \} \}$$

✓ **Maple** : cpu = 0.024 (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 = 0.667174 (sec), leaf count = 135

```
DSolve[3*x*y[x] - 2*x^2*Derivative[1][y][x] + 2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{1}{3}\log(y(x)) - \frac{2\sqrt{x^4 - 6xy(x)}\tanh^{-1}\left(\frac{x^{3/2}}{\sqrt{x^3 - 6y(x)}}\right)}{3\sqrt{x}\sqrt{x^3 - 6y(x)}} = c_1, y(x)\right], \text{Solve}\left[\frac{2\sqrt{x^4 - 6xy(x)}\tanh^{-1}\left(\frac{x^{3/2}}{\sqrt{x^3 - 6y(x)}}\right)}{3\sqrt{x}\sqrt{x^3 - 6y(x)}} = c_1, y(x)\right] \right\}$$

✓ **Maple** : cpu = 0.254 (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 = 0.435636 (sec), leaf count = 1211

`DSolve[y[x] - 2*x*Derivative[1][y][x] + 3*Derivative[1][y][x]^2 == 0,y[x],x]`

$$\left\{ \left\{ y(x) \rightarrow \frac{x^2}{12} + \frac{1}{12} \sqrt[3]{x^6 - 540e^{3c_1}x^3 - 5832e^{6c_1} + 24\sqrt{3}\sqrt{-e^{3c_1}x^9 + 81e^{6c_1}x^6 - 2187e^{9c_1}x^3 + 19683e^{12c_1}}} \right. \right.$$

✓

Maple : cpu = 0.053 (sec), leaf count = 554

`dsolve(3*diff(y(x),x)^2-2*x*diff(y(x),x)+y(x) = 0,y(x))`

$$y(x) = -\frac{\left(\frac{x^2}{\left(-54c_1+x^3+6\sqrt{-3x^3c_1+81c_1^2}\right)^{1/3}}+x+\left(-54c_1+x^3+6\sqrt{-3x^3c_1+81c_1^2}\right)^{1/3}\right)^2}{12}+\frac{x\left(\frac{x^2}{\left(-54c_1+x^3+6\sqrt{-3x^3c_1+81c_1^2}\right)^{1/3}}+x+\left(-54c_1+x^3+6\sqrt{-3x^3c_1+81c_1^2}\right)^{1/3}\right)}{12}$$

2.402

ODE No. 402

$$x^2 + 4xy'(x) + 3y'(x)^2 - y(x) = 0$$

✓ **Mathematica** : cpu = 1.26636 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{12} \left(-3x^2 + 2x - 2e^{c_1}x + 1 - 2e^{c_1} + e^{2c_1} \right) \right\}, \left\{ y(x) \rightarrow \frac{-3x^2 - 3x^2 \tanh^2 \left(\frac{c_1}{2} \right) + 6x^2 \tanh \left(\frac{c_1}{2} \right) + 2x \tanh \left(\frac{c_1}{2} \right) - 1 + 2e^{c_1} - e^{2c_1}}{12 \left(1 - \tanh \left(\frac{c_1}{2} \right) \right)^2} \right\} \right.$$

✓ **Maple** : cpu = 0.206 (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

$ay'(x)^2 + by'(x) - y(x) = 0$

✓ **Mathematica** : cpu = 0.405654 (sec), leaf count = 118

```
DSolve[-y[x] + b*Derivative[1][y][x] + a*Derivative[1][y][x]^2 == 0,y[x],x]
```

$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction}\left[\frac{\sqrt{4\#1a + b^2} + b \log\left(a(\sqrt{4\#1a + b^2} - b)\right)}{2a}\right] \left[\frac{x}{2a} + c_1\right] \right\}, \left\{ y(x) \rightarrow \text{InverseFu}$

✓ **Maple** : cpu = 0.886 (sec), leaf count = 247

```
dsolve(a*diff(y(x),x)^2+b*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = \frac{e^{-\frac{b \ln\left(\frac{1}{4a}\right) + 2b \operatorname{LambertW}\left(\frac{2e^{-\frac{c_1}{b}}e^{-1}e^{\frac{x}{b}}}{b\sqrt{\frac{1}{a}}}\right) + 2c_1 + 2b - 2x}}{4a} \left(e^{-\frac{b \ln\left(\frac{1}{4a}\right) + 2b \operatorname{LambertW}\left(\frac{2e^{-\frac{c_1}{b}}e^{-1}e^{\frac{x}{b}}}{b\sqrt{\frac{1}{a}}}\right) + 2c_1 + 2b - 2x}} + 2b \right)$$

2.404

ODE No. 404

$$ay'(x)^2+bx^2y'(x)+cxy(x)=0$$

✓

Mathematica : cpu = 3.51203 (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]

$$\left\{\text{Solve}\left[\frac{-6b\tanh^{-1}\left(\frac{bx\sqrt{b^2x^4-4acxy(x)}}{b^2x^3-4acy(x)}\right)+(6b+4c)\tanh^{-1}\left(\frac{x^2(3b+2c)}{3\sqrt{b^2x^4-4acxy(x)}}\right)+(3b+2c)\log\left(9ay(x)+3bx^3-\right)}{6(3b+c)}\right.\right.$$

✓

Maple : cpu = 0.269 (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))

$$\int_{-b}^x\frac{-b\_a^2+\sqrt{-a^4b^2-4\_aacy\left(x\right)}}{b\_a^3+6ay\left(x\right)-\sqrt{-a^4b^2-4\_aacy\left(x\right)}\_a}d\_a+\int^{y(x)}\left(\frac{2a}{-bx^3+\sqrt{b^2x^4-4\_facx}x-6\_fa}-\left(\int_{-b}^x-\right.\right.$$

2.405

ODE No. 405

$$ay'(x)^2+y(x)y'(x)-x=0$$

✓

Mathematica : cpu = 0.71037 (sec), leaf count = 74

DSolve[-x + y[x]*Derivative[1][y][x] + a*Derivative[1][y][x]^2 == 0,y[x],x]

$$\text{Solve}\left[\left\{x=\frac{aK[1]\tan^{-1}\left(\frac{K[1]}{\sqrt{1-K[1]^2}}\right)+\frac{c_1K[1]}{\sqrt{1-K[1]^2}},y(x)=\frac{x}{K[1]}-aK[1]\right\},\{y(x),K[1]\}\right]$$

✓

Maple : cpu = 0.323 (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

$$ay'(x)^2-y(x)y'(x)-x=0$$

✓

Mathematica : cpu = 0.603063 (sec), leaf count = 68

DSolve[-x - y[x]*Derivative[1][y][x] + a*Derivative[1][y][x]^2 == 0,y[x],x]

$$\text{Solve}\left[\left\{x=\frac{aK[1]\tanh^{-1}\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)+\frac{c_1K[1]}{\sqrt{K[1]^2+1}},y(x)=aK[1]-\frac{x}{K[1]}\right\},\{y(x),K[1]\}\right]$$

✓

Maple : cpu = 0.119 (sec), leaf count = 262

dsolve(a*diff(y(x),x)^2-y(x)*diff(y(x),x)-x = 0,y(x))

$$\frac{-\frac{\sqrt{2}\left(y(x)+\sqrt{4ax+y(x)^2}\right)\operatorname{arcsinh}\left(\frac{y(x)+\sqrt{4ax+y(x)^2}}{2a}\right)}{2}+x\sqrt{\frac{y(x)\sqrt{4ax+y(x)^2}+2a^2+2ax+y(x)^2}{a^2}}+c_1y(x)+c_1\sqrt{4ax+y(x)^2}}{\sqrt{\frac{y(x)\sqrt{4ax+y(x)^2}+y(x)^2+2a(x+a)}{a^2}}} =$$

2.407 ODE No. 407

$$xy'(x)^2 - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0397949 (sec), leaf count = 51

```
DSolve[-y[x] + x*Derivative[1][y][x]^2 == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4}(4x - 4c_1\sqrt{x} + c_1^2) \right\}, \left\{ y(x) \rightarrow \frac{1}{4}(4x + 4c_1\sqrt{x} + c_1^2) \right\} \right\}$$

✓ **Maple** : cpu = 0.027 (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 = 0.338681 (sec), leaf count = 97

```
DSolve[x - 2*y[x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{2}{\sqrt{\frac{2y(x)}{x}-1}-1}-2\log\left(\sqrt{\frac{2y(x)}{x}-1}-1\right)=\log(x)+c_1,y(x)\right], \text{Solve}\left[\frac{2}{\sqrt{\frac{2y(x)}{x}-1}+1}+2\log\left(\sqrt{\frac{2y(x)}{x}-1}+1\right)=\log(x)+c_1,y(x)\right] \right.$$

✓ **Maple** : cpu = 0.068 (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 = 2.48993 (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 = 0.07 (sec), leaf count = 63

```
dsolve(x*diff(y(x),x)^2-2*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x)=xe^{2\operatorname{RootOf}\left(-xe^{2-Z}+2xe^{-Z}+2e^{-Z}+c_1-2\_Z-x\right)}-2e^{\operatorname{RootOf}\left(-xe^{2-Z}+2xe^{-Z}+2e^{-Z}+c_1-2\_Z-x\right)}$$

2.410

ODE No. 410

$$xy'(x)^2 + 4y'(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 30.7636 (sec), leaf count = 90

```
DSolve[-2*y[x] + 4*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

Solve $\left[\left\{ x = -\frac{2(2K[1] - y(K[1]))}{K[1]^2}, y(x) = 4\left(\frac{2}{K[1]} + \log(K[1])\right) \exp\left(-4\left(\frac{1}{2}\log(2 - K[1]) - \frac{1}{2}\log(K[1])\right)\right) \right. \right.$

✓ **Maple** : cpu = 0.072 (sec), leaf count = 64

```
dsolve(x*diff(y(x),x)^2+4*diff(y(x),x)-2*y(x) = 0,y(x))
```

$$y(x) = \frac{x e^{2 \operatorname{RootOf}(-x e^{2-Z} + 4x e^{-Z} - 4 e^{-Z} + c_1 + 8_Z - 4x)}}{2} + 2 e^{\operatorname{RootOf}(-x e^{2-Z} + 4x e^{-Z} - 4 e^{-Z} + c_1 + 8_Z - 4x)}$$

2.411

ODE No. 411

$$xy'(x)^2 + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.328955 (sec), leaf count = 97

```
DSolve[-y[x] + x*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{1}{\sqrt{\frac{4y(x)}{x} + 1} - 1} - \log\left(\sqrt{\frac{4y(x)}{x} + 1} - 1\right) = \frac{\log(x)}{2} + c_1, y(x)\right], \text{Solve}\left[\frac{1}{\sqrt{\frac{4y(x)}{x} + 1} + 1} + \log\left(\sqrt{\frac{4y(x)}{x} + 1} + 1\right) = \frac{\log(x)}{2} + c_2, y(x)\right] \right\}$$

✓ **Maple** : cpu = 0.055 (sec), leaf count = 65

```
dsolve(x*diff(y(x),x)^2+x*diff(y(x),x)-y(x) = 0,y(x))
```

$$y(x) = \frac{\left(1 + 2 \operatorname{LambertW}\left(-\frac{1}{2\sqrt{\frac{c_1}{x}}}\right)\right) x}{4 \operatorname{LambertW}\left(-\frac{1}{2\sqrt{\frac{c_1}{x}}}\right)^2}$$

2.412

ODE No. 412

$$a + xy'(x)^2 + y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 1.06786 (sec), leaf count = 6457

```
DSolve[a + y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{2} \sqrt{-\frac{16ax}{9} + \frac{\sqrt[3]{-131072a^6x^6 + 2560a^3e^{3c_1}x^3 + e^{6c_1}} + \sqrt{-1073741824a^9e^{3c_1}x^9 + 3145728a^6e^{6c_1}}}{18\,2^{2/3}ax}} \right. \right.$$

✓ **Maple** : cpu = 0.069 (sec), leaf count = 146

```
dsolve(x*diff(y(x),x)^2+y(x)*diff(y(x),x)+a = 0,y(x))
```

$$-\frac{c_1\left(\frac{-y(x)+\sqrt{y(x)^2-4ax}}{x}\right)^{3/2}x^2}{\left(-y(x)+\sqrt{y(x)^2-4ax}\right)^2}+x+\frac{4ax^2}{3\left(-y(x)+\sqrt{y(x)^2-4ax}\right)^2}=0$$

2.413

ODE No. 413

$-x^2 + xy'(x)^2 + y(x)y'(x) = 0$

✓ **Mathematica** : cpu = 0.131347 (sec), leaf count = 673

```
DSolve[-x^2 + y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$\left\{ \text{Solve}\left[\int\left(\frac{4\sqrt{4x^3+y(x)^2}x^2}{5y(x)\left(4x^3-15y(x)^2\right)}+\frac{16x^2}{5\left(4x^3-15y(x)^2\right)}-\frac{\sqrt{4x^3+y(x)^2}}{5y(x)x}+\frac{1}{5x}\right)dx+\int\left(\frac{8y(x)}{15y(x)^2-4x^3}-\frac{1}{5x}\right)dx,\right.$

✓ **Maple** : cpu = 0.158 (sec), leaf count = 269

```
dsolve(x*diff(y(x),x)^2+y(x)*diff(y(x),x)-x^2 = 0,y(x))
```

$\int_{-b}^x \frac{-y(x)+\sqrt{4a^3+y(x)^2}}{-a\left(4y(x)-\sqrt{4a^3+y(x)^2}\right)}d_a+\int^{y(x)} \frac{-2+\left(48f-12\sqrt{4x^3+f^2}\right)\left(\int_{-b}^x \frac{-a^2}{\left(-4f+\sqrt{4a^3+f^2}\right)^2\sqrt{4a^3+y(x)^2}}dx\right)}{4f-\sqrt{4x^3+f^2}}d_f$

2.414

ODE No. 414

$$x^3 + xy'(x)^2 + y(x)y'(x) = 0$$

✓

Mathematica : cpu = 0.171851 (sec), leaf count = 107

`DSolve[x^3 + y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]`

$$\left\{ \left\{ y(x) \rightarrow x^2 \text{InverseFunction} \left[\int_1^{\#1} \frac{1}{5K[2] + \sqrt{K[2]^2 - 4}} dK[2] \& \right] \left[\int_1^x -\frac{1}{2K[3]} dK[3] + c_1 \right] \right\}, \left\{ y(x) \rightarrow x^2 \right\} \right.$$

✓

Maple : cpu = 0.173 (sec), leaf count = 269

`dsolve(x*diff(y(x),x)^2+y(x)*diff(y(x),x)+x^3 = 0,y(x))`

$$\int_{-b}^x \frac{-y(x) + \sqrt{-4\_a^4 + y(x)^2}}{-\_a \left(5y(x) - \sqrt{-4\_a^4 + y(x)^2} \right)} d\_a + \int^{y(x)} \frac{-2 + \left(-80\_f + 16\sqrt{-4x^4 + \_f^2} \right) \left(\int_{-b}^x \frac{\_a^3}{(-5\_f + \sqrt{-4\_a^4 + \_f^2}} \right)}{5\_f - \sqrt{-4x^4 + \_f^2}} d\_f$$

2.415 ODE No. 415

$$y(x)y'(x) + xy'(x)^2 - y(x)^4 = 0$$

✓ **Mathematica** : cpu = 0.234241 (sec), leaf count = 49

```
DSolve[-y[x]^4 + y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{2e^{\frac{c_1}{2}}}{-4x + e^{c_1}} \right\}, \left\{ y(x) \rightarrow \frac{2e^{\frac{c_1}{2}}}{-4x + e^{c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.261 (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 = 300.185 (sec), leaf count = 0

```
DSolve[y[x] + (-3*x + y[x])*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0, y[x], x]
```

, timed out

\$Aborted

✓ **Maple** : cpu = 0.08 (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 = 0.0058208 (sec), leaf count = 16

```
DSolve[a - y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{a}{c_1} + c_1 x \right\} \right\}$$

✓ **Maple** : cpu = 0.03 (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 = 1.20987 (sec), leaf count = 168

```
DSolve[a*y[x] - y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{\sqrt{\frac{y(x)}{x} - 4a}}{\sqrt{\frac{y(x)}{x} - 4a} - \sqrt{\frac{y(x)}{x}}} + \tanh^{-1}\left(\frac{\sqrt{\frac{y(x)}{x} - 4a}}{\sqrt{\frac{y(x)}{x}}}\right) = \frac{\log(x)}{2} + c_1, y(x)\right], \text{Solve}\left[\tanh^{-1}\left(\frac{\sqrt{\frac{y(x)}{x} - 4a}}{\sqrt{\frac{y(x)}{x}}}\right) = \frac{\log(x)}{2} + c_1, y(x)\right] \right\}$$

✓ **Maple** : cpu = 0.049 (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 = 1.54272 (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 = 0.034 (sec), leaf count = 109

```
dsolve(x*diff(y(x),x)^2+2*y(x)*diff(y(x),x)-x = 0,y(x))
```

$$x + \frac{\left(y(x) - \sqrt{y(x)^2 + x^2}\right) c_1}{\left(\frac{2x^2 + 6y(x)^2 - 6y(x)\sqrt{y(x)^2 + x^2}}{x^2}\right)^{2/3} x} = 0$$

2.420

ODE No. 420

$$a + xy'(x)^2 - 2y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.236382 (sec), leaf count = 1559

```
DSolve[a - 2*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow -\frac{1}{4}a^2e^{-\frac{3c_1}{2}}x^2 + \frac{1}{4}e^{-\frac{3c_1}{2}}\sqrt[3]{-a^6x^6 + 20a^3e^{3c_1}x^3 + 8e^{6c_1} + 8\sqrt{-a^9e^{3c_1}x^9 + 3a^6e^{6c_1}x^6 - 3a^3e^{9c_1}x^3 + 8e^{12c_1}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.074 (sec), leaf count = 689

```
dsolve(x*diff(y(x),x)^2-2*y(x)*diff(y(x),x)+a = 0,y(x))
```

$$y(x) = \frac{x\left(\frac{4x^2}{\left(-36ac_1^2+8x^3+12\sqrt{a(9ac_1^2-4x^3)}c_1\right)^{1/3}} + 2x + \left(-36ac_1^2 + 8x^3 + 12\sqrt{a(9ac_1^2 - 4x^3)}c_1\right)^{1/3}\right)}{12c_1} + \frac{\sqrt{-36ac_1^2+8x^3+12\sqrt{a(9ac_1^2-4x^3)}c_1}}{12c_1}$$

2.421

ODE No. 421

$$xy'(x)^2-2y(x)y'(x)-x=0$$

✓ **Mathematica** : cpu = 0.0726636 (sec), leaf count = 123

```
DSolve[-x - 2*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow-\frac{x\tanh(-\log(x)+c_1)}{\sqrt{1-\tanh^2(-\log(x)+c_1)}}\right\},\left\{y(x)\rightarrow\frac{x\tanh(-\log(x)+c_1)}{\sqrt{1-\tanh^2(-\log(x)+c_1)}}\right\},\left\{y(x)\rightarrow-\frac{x\tanh(-\log(x)+c_1)}{\sqrt{1-\tanh^2(-\log(x)+c_1)}}\right\},\left\{y(x)\rightarrow\frac{x\tanh(-\log(x)+c_1)}{\sqrt{1-\tanh^2(-\log(x)+c_1)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (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 = 0.114329 (sec), leaf count = 81

```
DSolve[4*x - 2*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{2(x + x \tanh^2(\frac{1}{2}(-\log(x) + c_1)))}{-1 + \tanh^2(\frac{1}{2}(-\log(x) + c_1))} \right\}, \left\{ y(x) \rightarrow \frac{2(x + x \tanh^2(\frac{1}{2}(\log(x) + c_1)))}{-1 + \tanh^2(\frac{1}{2}(\log(x) + c_1))} \right\} \right\}$$

✓ **Maple** : cpu = 0.033 (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 = 0.135995 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{2}(-e^{-c_1}x^2 + 2x - 2e^{c_1}) \right\}, \left\{ y(x) \rightarrow \frac{1}{2}(-2e^{c_1}x^2 + 2x - e^{-c_1}) \right\} \right\}$$

✓ **Maple** : cpu = 0.043 (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 = 1.14277 (sec), leaf count = 423

`DSolve[b*x + a*y[x]*Derivative[1][y][x] + x*Derivative[1][y][x]^2 == 0,y[x],x]`

$$\left\{ \text{Solve} \left[-\frac{i \left(2 \log \left(-i \sqrt{4b - \frac{a^2 y(x)^2}{x^2}} + \frac{ay(x)}{x} + 2i\sqrt{b} \right) + 2(a+1) \log \left(i \sqrt{4b - \frac{a^2 y(x)^2}{x^2}} + \frac{ay(x)}{x} - 2i\sqrt{b} \right) - (a \right)}{4(a+1)} \right. \right.$$

✓

Maple : cpu = 0.428 (sec), leaf count = 193

`dsolve(x*diff(y(x),x)^2+a*y(x)*diff(y(x),x)+b*x = 0,y(x))`

$$\frac{-c_1 \left(ay(x) - \sqrt{a^2 y(x)^2 - 4bx^2} \right) \left(\frac{a \left(-y(x)(a+1) \sqrt{a^2 y(x)^2 - 4bx^2} + (a^2+a)y(x)^2 - 2bx^2 \right)}{2x^2} \right)^{\frac{-a-2}{2a+2}} + x^2}{x} = 0$$

2.425

ODE No. 425

$$(x+1)y'(x)^2-(y(x)+x)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.0067445 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1x+\frac{c_1^2}{-1+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.036 (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 = 0.0057938 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x + \frac{9 + c_1^2 - 6c_1}{3c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.04 (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 = 0.0062074 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1x+\frac{5c_1^2}{-1+3c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.035 (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 = 0.0067075 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{cc_1}{b + ac_1} + c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.065 (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 = 0.0068773 (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
```

$$\left\{\left\{y(x)\rightarrow \frac{ac_1+bc_1}{-b+ac_1}+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (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

$$a_0x + y'(x)(a_1x + b_1y(x) + c_1) + (a_2x + c_2)y'(x)^2 + b_0y(x) + c_0 = 0$$

✓ **Mathematica** : cpu = 234.421 (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][x]^2 + b0*y[x] + c0 == 0, y[x], x]
```

Solve $\left\{ \begin{array}{l} x = (b_1 K[1] + b_0) \exp \left(\frac{(b_1(b_0 - a_1) + 2a_2b_0) \tan^{-1} \left(\frac{2(a_2+b_1)K[1]+a_1+b_0}{\sqrt{4a_0(a_2+b_1)-a_1^2-2a_1b_0-b_0^2}} \right)}{(a_2+b_1)\sqrt{4a_0(a_2+b_1)-a_1^2-2a_1b_0-b_0^2}} - \frac{(2a_2+b_1) \log(b_1 K[1] + b_0)}{2(a_2+b_1)} \right) \end{array} \right.$

✓ **Maple** : cpu = 2.215 (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 = 0.0582197 (sec), leaf count = 81

```
DSolve[y[x]^2 - y[x]^4 + x^2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{1 + \tan^2(-\log(x) + c_1)} \right\}, \left\{ y(x) \rightarrow \sqrt{1 + \tan^2(-\log(x) + c_1)} \right\}, \left\{ y(x) \rightarrow -\sqrt{1 + \tan^2(\log(x) + c_1)} \right\}, \left\{ y(x) \rightarrow \sqrt{1 + \tan^2(\log(x) + c_1)} \right\} \right\}$$

✓ **Maple** : cpu = 0.185 (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

$$(a + xy'(x))^2 - 2ay(x) + x^2 = 0$$

✓ **Mathematica** : cpu = 1.45149 (sec), leaf count = 81

```
DSolve[x^2 - 2*a*y[x] + (a + x*Derivative[1][y][x])^2 == 0,y[x],x]
```

Solve $\left[\left\{ y(x) = \frac{2axK[1] + x^2K[1]^2 + a^2 + x^2}{2a}, x = -\frac{a \tanh^{-1}\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right)}{\sqrt{K[1]^2+1}} + \frac{c_1}{\sqrt{K[1]^2+1}} \right\}, \{y(x), K[1]\} \right]$

✓ **Maple** : cpu = 9.551 (sec), leaf count = 78

```
dsolve((x*diff(y(x),x)+a)^2-2*a*y(x)+x^2 = 0,y(x))
```

$$y(x)-\text{RootOf}\left(-a \operatorname{arcsinh}\left(\frac{\text{RootOf}\left(-2ay(x)+a^2+x^2+2\_Za+\_Z^2\right)}{x}\right)-x\sqrt{a\left(-2\text{RootOf}\left(-2ay\left(x\right)\right.\right.}\right.$$

2.433 ODE No. 433

$$-4a - 4x^2 + (xy'(x) + y(x) + 2x)^2 - 4xy(x) = 0$$

✓ **Mathematica** : cpu = 0.844861 (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]`

$$\left\{ \left\{ y(x) \rightarrow \frac{-a - 2c_1x + c_1^2}{x} \right\} \right\}$$

✓ **Maple** : cpu = 0.201 (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 = 0.0676489 (sec), leaf count = 123

```
DSolve[-x^2 - 2*x*y[x]*Derivative[1][y][x] + x^2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x \tanh(-\log(x) + c_1)}{\sqrt{1 - \tanh^2(-\log(x) + c_1)}} \right\}, \left\{ y(x) \rightarrow \frac{x \tanh(-\log(x) + c_1)}{\sqrt{1 - \tanh^2(-\log(x) + c_1)}} \right\}, \left\{ y(x) \rightarrow -\frac{x \tanh(-\log(x) + c_1)}{\sqrt{1 - \tanh^2(-\log(x) + c_1)}} \right\} \right\}$$

✓ **Maple** : cpu = 0.007 (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 = 0.0776781 (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]]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{4}(4x+c_1^2x-4ic_1\sqrt{x}-4)\right\},\left\{y(x)\rightarrow \frac{1}{4}(4x+c_1^2x+4ic_1\sqrt{x}-4)\right\}\right\}$$

✓ **Maple** : cpu = 0.247 (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 = 0.0876419 (sec), leaf count = 115

```
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
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x \tanh(x - c_1)}{\sqrt{1 - \tanh^2(x - c_1)}} \right\}, \left\{ y(x) \rightarrow \frac{x \tanh(x - c_1)}{\sqrt{1 - \tanh^2(x - c_1)}} \right\}, \left\{ y(x) \rightarrow -\frac{x \tanh(x + c_1)}{\sqrt{1 - \tanh^2(x + c_1)}} \right\} \right\}$$

✓ **Maple** : cpu = 1.1 (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 = 0.524225 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x - 2\sqrt{a}c_1}{4c_1^2} \right\}, \left\{ y(x) \rightarrow \frac{x + 2\sqrt{a}c_1}{4c_1^2} \right\} \right\}$$

✓ **Maple** : cpu = 0.046 (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 = 0.0320164 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1}{x^2} \right\}, \left\{ y(x) \rightarrow \frac{c_1}{x} \right\} \right\}$$

✓ **Maple** : cpu = 0.01 (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

$$x^2y'(x)^2 + 3xy(x)y'(x) + 3y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0513123 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x^{\frac{1}{2}(-3-i\sqrt{3})} \right\}, \left\{ y(x) \rightarrow c_1 x^{\frac{1}{2}i(\sqrt{3}+3i)} \right\} \right\}$$

✓ **Maple** : cpu = 0.062 (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))
```

$$y(x) = \frac{c_1 x^{-\frac{i\sqrt{3}}{2}}}{x^{3/2}}$$

2.440 ODE No. 440

$$x^2 y'(x)^2 + 4xy(x)y'(x) - 5y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0311204 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1}{x^5} \right\}, \left\{ y(x) \rightarrow c_1 x \right\} \right\}$$

✓ **Maple** : cpu = 0.01 (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 = 0.113696 (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
```

$$\left\{\left\{y(x) \rightarrow -e^{-c_1}x\left(-x + 2\sqrt{2}e^{\frac{c_1}{2}}\right)\right\},\left\{y(x) \rightarrow e^{\frac{c_1}{2}}x\left(-2\sqrt{2} + e^{\frac{c_1}{2}}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.65 (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 = 0.0358359 (sec), leaf count = 28

DSolve[(1 - x)*(-(x^2*y[x]) + y[x]^2) + (x^3 - 2*x*y[x] + x^2*y[x])*Derivative[1][y][x] + x^2*

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-x} x \right\}, \left\{ y(x) \rightarrow -x^2 + c_1 x \right\} \right\}$$

✓

Maple : cpu = 0.017 (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) =

$$y(x) = (-x + c_1) x$$

2.443

ODE No. 443

$$x(xy'(x)-y(x))^2-y'(x)=0$$

✓

Mathematica : cpu = 0.556486 (sec), leaf count = 3049

`DSolve[-Derivative[1][y][x] + x*(-y[x] + x*Derivative[1][y][x])^2 == 0,y[x],x]`

$$\left\{\left\{y(x) \rightarrow -\frac{1}{2}\sqrt{\frac{16}{9}e^{-6c_1}x^2 + \frac{2\sqrt[3]{512e^{-18c_1}x^{12} + 160e^{-12c_1}x^6 - e^{-6c_1} + e^{-36c_1}\sqrt{262144e^{42c_1}x^{18} + 12288e^{48c_1}}}}{9x^2}}\right.\right.$$

✓

Maple : cpu = 1.938 (sec), leaf count = 192

`dsolve(x*(x*diff(y(x),x)-y(x))^2-diff(y(x),x) = 0,y(x))`

$$y(x) = \frac{(\text{RootOf}(-729c_1x^{12} + \_Z^8 - 12\_Z^7 + 60\_Z^6 - 160\_Z^5 + 240\_Z^4 - 192\_Z^3 + 64\_Z^2) - 2)(\text{RootOf}(-729c_1x^{12} + \_Z^8 - 12\_Z^7 + 60\_Z^6 - 160\_Z^5 + 240\_Z^4 - 192\_Z^3 + 64\_Z^2) - 2)}{9x^2}$$

2.444

ODE No. 444

$$x^2y'(x)^2 - (y(x) - 2x)y(x)y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 1.60041 (sec), leaf count = 49

```
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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{16e^{-2c_1}}{-4 + e^{2c_1}x} \right\}, \left\{ y(x) \rightarrow -\frac{16e^{-2c_1}}{4 + e^{2c_1}x} \right\} \right\}$$

✓ **Maple** : cpu = 1.223 (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 = 0.0664386 (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]
```

$$\left\{\left\{y(x) \rightarrow -\frac{1}{\sqrt{2ax - 2c_1}}\right\},\left\{y(x) \rightarrow \frac{1}{\sqrt{2ax - 2c_1}}\right\},\left\{y(x) \rightarrow \frac{b}{x} + c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.013 (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

$$(x^2 + 1) y'(x)^2 - 2xy(x)y'(x) + y(x)^2 - 1 = 0$$

✓ **Mathematica** : cpu = 0.0402572 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x - \sqrt{1 - c_1^2} \right\}, \left\{ y(x) \rightarrow c_1 x + \sqrt{1 - c_1^2} \right\} \right\}$$

✓ **Maple** : cpu = 0.043 (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

$$(x^2 - 1) y'(x)^2 - 1 = 0$$

✓ **Mathematica** : cpu = 0.0074335 (sec), leaf count = 41

```
DSolve[-1 + (-1 + x^2)*Derivative[1][y][x]^2 == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right) + c_1 \right\}, \left\{ y(x) \rightarrow \tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right) + c_1 \right\} \right\}$$

✓ **Maple** : cpu = 0.049 (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

$$(x^2 - 1) y'(x)^2 - y(x)^2 + 1 = 0$$

✓ **Mathematica** : cpu = 0.110828 (sec), leaf count = 191

```
DSolve[1 - y[x]^2 + (-1 + x^2)*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\tanh\left(\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right) - c_1\right)}{\sqrt{-1 + \tanh^2\left(\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right) - c_1\right)}} \right\}, \left\{ y(x) \rightarrow \frac{\tanh\left(\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right) - c_1\right)}{\sqrt{-1 + \tanh^2\left(\tanh^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right) - c_1\right)}} \right\} \right\}$$

✓ **Maple** : cpu = 7.718 (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

$$(x^2 - a^2) y'(x)^2 + 2xy(x)y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0360069 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1}{a - x} \right\}, \left\{ y(x) \rightarrow \frac{c_1}{a + x} \right\} \right\}$$

✓ **Maple** : cpu = 0.013 (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

$$(x^2 - a^2) y'(x)^2 - x^2 - 2xy(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.290986 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{a^2 - x^2 + c_1^2}{2c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.737 (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

$$(a + x^2) y'(x)^2 + b - 2xy(x)y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0513715 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x - \sqrt{-b - a c_1^2} \right\}, \left\{ y(x) \rightarrow \sqrt{-b - a c_1^2} + c_1 x \right\} \right\}$$

✓ **Maple** : cpu = 0.056 (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))
```

$$y(x) = \frac{\sqrt{-ab(x^2 + a)}}{a}$$

2.452

ODE No. 452

$$(2x^2 + 1) \, y'(x)^2 + (x^2 + 2xy(x) + y(x)^2 + 2) \, y'(x) + 2y(x)^2 + 1 = 0$$

✓

Mathematica : cpu = 0.0173581 (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)*Derivati

$$\left\{ \left\{ y(x) \rightarrow \frac{-c_1 x + 1 + c_1^2}{x + c_1} \right\} \right\}$$

✗

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

$$(a^2-1)x^2y'(x)^2+a^2x^2+2xy(x)y'(x)-y(x)^2=0$$

✓ **Mathematica** : cpu = 0.900573 (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 -
```

$$\left\{ \text{Solve} \left[\frac{2i \tan^{-1} \left(\frac{y(x)}{x \sqrt{a^2 - \frac{y(x)^2}{x^2} - 1}} \right) - 2ia \tan^{-1} \left(\frac{ay(x)}{x \sqrt{a^2 - \frac{y(x)^2}{x^2} - 1}} \right) + a \log \left(\frac{y(x)^2}{x^2} + 1 \right)}{2a^2 - 2} = \frac{a \log (x - a^2 x)}{1 - a^2} + c_1, y(x) \right] \right.$$

✓ **Maple** : cpu = 0.963 (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))
```

$$\frac{-2c_1a + 2a \ln(x) + \ln \left(\frac{y(x)^2 + x^2}{x^2} \right) a - 2\sqrt{-a^2} \arctan \left(\frac{a^2y(x)}{\sqrt{-a^2} \sqrt{\frac{y(x)^2 + (-a^2 + 1)x^2}{x^2}} x} \right) + 2 \ln \left(\frac{\sqrt{\frac{-a^2x^2 + x^2 + y(x)^2}{x^2}} x + y(x)}{x} \right)}{2a}$$

2.454

ODE No. 454

$$ax^2y'(x)^2 - (a - 1)ax^2 - 2axy(x)y'(x) + y(x)^2 = 0$$

✓

Mathematica : cpu = 0.197509 (sec), leaf count = 235

DSolve[-((-1 + a)*a*x^2) + y[x]^2 - 2*a*x*y[x]*Derivative[1][y][x] + a*x^2*Derivative[1][y][x]

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{a}x \tanh\left(-\sqrt{\frac{a-1}{a}}\log(x) + c_1\right)}{\sqrt{1 - \tanh^2\left(-\sqrt{\frac{a-1}{a}}\log(x) + c_1\right)}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{a}x \tanh\left(-\sqrt{\frac{a-1}{a}}\log(x) + c_1\right)}{\sqrt{1 - \tanh^2\left(-\sqrt{\frac{a-1}{a}}\log(x) + c_1\right)}} \right\}, \left\{ y(x) \right.$$

✓

Maple : cpu = 0.139 (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 = 0.677017 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{e^{-\frac{c_1}{2}}(x + 4ae^{c_1})}{2x} \right\}, \left\{ y(x) \rightarrow \frac{e^{-\frac{c_1}{2}}(x + 4ae^{c_1})}{2x} \right\} \right\}$$

✓ **Maple** : cpu = 0.438 (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

$$2(1-x^2)y(x)y'(x)+x(x^2-1)y'(x)^2+xy(x)^2-x=0$$

✓

Mathematica : cpu = 1.3023 (sec), leaf count = 473

`DSolve[-x + x*y[x]^2 + 2*(1 - x^2)*y[x]*Derivative[1][y][x] + x*(-1 + x^2)*Derivative[1][y][x]`

$$\left\{\left\{y(x) \rightarrow \frac{x\left(1+\tanh ^2\left(\frac{1}{2}\left(c_1-2 \tanh ^{-1}\left(\frac{-i \sqrt{x+1} \sqrt{x-1}+i \sqrt{3} \sqrt{x-1}+i \sqrt{x+1}-i \sqrt{3}}{-2 x+\sqrt{x-1}(\sqrt{3} \sqrt{x+1}-1)+\sqrt{3} \sqrt{x+1}-1}\right)\right)\right)\right\}\right\},\left\{y(x) \rightarrow \frac{x\left(1+\tanh ^2\left(\frac{1}{2}\left(c_1-2 \tanh ^{-1}\left(\frac{-i \sqrt{x+1} \sqrt{x-1}+i \sqrt{3} \sqrt{x-1}+i \sqrt{x+1}-i \sqrt{3}}{-2 x+\sqrt{x-1}(\sqrt{3} \sqrt{x+1}-1)+\sqrt{3} \sqrt{x+1}-1}\right)\right)\right)\right\}\right\},\left\{y(x) \rightarrow \frac{x\left(1+\tanh ^2\left(\frac{1}{2}\left(c_1-2 \tanh ^{-1}\left(\frac{-i \sqrt{x+1} \sqrt{x-1}+i \sqrt{3} \sqrt{x-1}+i \sqrt{x+1}-i \sqrt{3}}{-2 x+\sqrt{x-1}(\sqrt{3} \sqrt{x+1}-1)+\sqrt{3} \sqrt{x+1}-1}\right)\right)\right)\right\}\right\}$$

✓

Maple : cpu = 0.534 (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 = 0.365828 (sec), leaf count = 118

```
DSolve[-y[x] - x*Derivative[1][y][x] + x^4*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[-\frac{x\sqrt{4x^2y(x)+1}\tanh^{-1}\left(\sqrt{4x^2y(x)+1}\right)}{\sqrt{4x^4y(x)+x^2}}-\frac{1}{2}\log(y(x))=c_1,y(x)\right], \text{Solve}\left[\frac{x\sqrt{4x^2y(x)+1}\tanh^{-1}\left(\sqrt{4x^2y(x)+1}\right)}{\sqrt{4x^4y(x)+x^2}}-\frac{1}{2}\log(y(x))=c_2,y(x)\right] \right\}$$

✓ **Maple** : cpu = 0.957 (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 = 0.0335087 (sec), leaf count = 120

```
DSolve[-1 + x^2*(-a^2 + x^2)*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x\sqrt{x^2 - a^2} \tan^{-1}\left(\frac{\sqrt{x^2 - a^2}}{a}\right)}{a\sqrt{x^4 - a^2x^2}} + c_1 \right\}, \left\{ y(x) \rightarrow \frac{x\sqrt{x^2 - a^2} \tan^{-1}\left(\frac{\sqrt{x^2 - a^2}}{a}\right)}{a\sqrt{x^4 - a^2x^2}} + c_1 \right\} \right\}$$

✓ **Maple** : cpu = 0.056 (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

$$-(y'(x)-1)^2+e^{-2x}y'(x)^2+e^{-2y(x)}=0$$

✓ **Mathematica** : cpu = 13.7031 (sec), leaf count = 397

```
DSolve[E^(-2*y[x]) - (-1 + Derivative[1][y][x])^2 + Derivative[1][y][x]^2/E^(2*x) == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \log \left(-\frac{i\left(e^x-1\right) e^{c_1\left(-e^{-x}\right) \sqrt{e^{2 x}}}\left(e^x+e^{2 c_1 e^{-x} \sqrt{e^{2 x}}}+e^{x+2 c_1 e^{-x} \sqrt{e^{2 x}}}-1\right)}{\sqrt{-8 e^x+4 e^{2 x}+4}}\right)\right\},\left\{y(x) \rightarrow \log \left(\frac{i\left(e^x-\right)}{\right)}\right.\right.$$

✓ **Maple** : cpu = 0.624 (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))
```

$$y(x)=c_1-\ln \left(\frac{e^{-2 x} e^{2 c_1}-\sqrt{\left(e^{4 c_1}-e^{2 c_1}\right) e^{-2 x}}}{-e^{-2 x} e^{2 c_1}+e^{2 c_1}-1}\right)$$

2.460 ODE No. 460

$$\cos^4(x) (y'(x)^2 + y(x)^2) - a^2 = 0$$

X **Mathematica** : cpu = 46.0696 (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]
```

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

$$a(x)y'(x)^2 + 2b(x)y(x)y'(x) + c(x)y(x)^2 + 2d(x)y'(x) + 2e(x)y(x) + f(x) = 0$$

X Mathematica : cpu = 300.04 (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

X 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)+
```

, 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)+
```

2.462 ODE No. 462

$$y(x)y'(x)^2 - 1 = 0$$

✓ **Mathematica** : cpu = 0.0224085 (sec), leaf count = 43

```
DSolve[-1 + y[x]*Derivative[1][y][x]^2 == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \left(\frac{3}{2} \right)^{2/3} (-x + c_1)^{2/3} \right\}, \left\{ y(x) \rightarrow \left(\frac{3}{2} \right)^{2/3} (x + c_1)^{2/3} \right\} \right\}$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 27

```
dsolve(y(x)*diff(y(x),x)^2-1 = 0,y(x))
```

$$x - \frac{2y(x)^{3/2}}{3} - c_1 = 0$$

2.463

ODE No. 463

$$y(x)y'(x)^2 - e^{2x} = 0$$

✓ **Mathematica** : cpu = 0.0435761 (sec), leaf count = 47

```
DSolve[-E^(2*x) + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \left(\frac{3}{2}\right)^{2/3} (-e^x + c_1)^{2/3} \right\}, \left\{ y(x) \rightarrow \left(\frac{3}{2}\right)^{2/3} (e^x + c_1)^{2/3} \right\} \right\}$$

✓ **Maple** : cpu = 0.098 (sec), leaf count = 50

```
dsolve(y(x)*diff(y(x),x)^2-exp(2*x) = 0,y(x))
```

$$-\frac{\sqrt{e^{2x}y(x)}}{\sqrt{y(x)}} + \frac{2y(x)^{3/2}}{3} + c_1 = 0$$

2.464

ODE No. 464

$$y(x)y'(x)^2+2xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0621039 (sec), leaf count = 103

```
DSolve[-y[x] + 2*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow -e^{\frac{c_1}{2}}\sqrt{-2x+e^{c_1}}\right\},\left\{y(x)\rightarrow e^{\frac{c_1}{2}}\sqrt{-2x+e^{c_1}}\right\},\left\{y(x)\rightarrow -e^{\frac{c_1}{2}}\sqrt{2x+e^{c_1}}\right\},\left\{y(x)\rightarrow e^{\frac{c_1}{2}}\sqrt{2x+e^{c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.699 (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 = 0.0373762 (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]
```

$$\left\{\text{Solve}\left[\int\frac{y(x)}{x\left(\frac{y(x)^2}{x^2}-\sqrt{\frac{9y(x)^2}{x^2}+1}+1\right)}d\frac{y(x)}{x}=-\log(x)+c_1,y(x)\right],\text{Solve}\left[\int\frac{y(x)}{x\left(\frac{y(x)^2}{x^2}+\sqrt{\frac{9y(x)^2}{x^2}+1}+1\right)}d\frac{y(x)}{x}=-\log(x)+c_1,y(x)\right]\right\}$$

✓ **Maple** : cpu = 0.1 (sec), leaf count = 210

```
dsolve(y(x)*diff(y(x),x)^2+2*x*diff(y(x),x)-9*y(x) = 0,y(x))
```

$$\frac{c_1x\left(x+\sqrt{x^2+9y(x)^2}\right)\left(\frac{-x-\sqrt{x^2+9y(x)^2}}{y(x)}\right)^{2/7}}{\left(x\sqrt{x^2+9y(x)^2}+x^2+y(x)^2\right)\left(\frac{x\sqrt{x^2+9y(x)^2+x^2+y(x)^2}}{y(x)^2}\right)^{1/7}}+x=0$$

2.466

ODE No. 466

$$y(x)y'(x)^2-2xy'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 2.17632 (sec), leaf count = 51

```
DSolve[y[x] - 2*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow-\sqrt{2e^{c_1}x-e^{2c_1}}\right\},\left\{y(x)\rightarrow\sqrt{2e^{c_1}x-e^{2c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.573 (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 = 0.16103 (sec), leaf count = 226

```
DSolve[y[x] - 4*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \sqrt{x^2+\frac{2^{2/3}c_1^3x}{\sqrt[3]{32x^6-40c_1^3x^3+\sqrt{-4096c_1^3x^9+768c_1^6x^6-48c_1^9x^3+c_1^{12}-c_1^6}}}}+\frac{\sqrt[3]{32x^6-40c_1^3x^3}}{\sqrt{-4096c_1^3x^9+768c_1^6x^6-48c_1^9x^3+c_1^{12}-c_1^6}}}\right.\right.$$

✓ **Maple** : cpu = 0.099 (sec), leaf count = 148

```
dsolve(y(x)*diff(y(x),x)^2-4*x*diff(y(x),x)+y(x) = 0,y(x))
```

$$-\frac{c_1x}{y\left(x\right)\left(\frac{x\sqrt{4x^2-y\left(x\right)^2}+2x^2-y\left(x\right)^2}{y\left(x\right)^2}\right)^{1/3}\left(\frac{2x+\sqrt{4x^2-y\left(x\right)^2}}{y\left(x\right)}\right)^{1/3}}+x=0$$

2.468

ODE No. 468

$$-4a^2xy'(x)+a^2y(x)+y(x)y'(x)^2=0$$

✓

Mathematica : cpu = 2.39532 (sec), leaf count = 753

`DSolve[a^2*y[x] - 4*a^2*x*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]`

$$\left\{ \text{Solve} \left[\frac{8 \left(4a^2 - \frac{y(x)^2}{x^2} \right)^{3/2} \sinh^{-1} \left(\frac{\sqrt{\frac{y(x)}{x} - 2a}}{2\sqrt{a}} \right) + \sqrt{a} \sqrt{\frac{y(x)}{ax}} + 2 \left(4\sqrt{\frac{y(x)}{x}} - 2a \left(\frac{y(x)^2}{x^2} - 4a^2 \right) \tanh^{-1} \left(\frac{\sqrt{4a^2 - \frac{y(x)^2}{x^2}}}{2a} \right)}{\right.} \right. \right.$$

✓

Maple : cpu = 0.106 (sec), leaf count = 181

`dsolve(y(x)*diff(y(x),x)^2-4*a^2*x*diff(y(x),x)+a^2*y(x) = 0,y(x))`

$$-\frac{C_1x}{y(x)a\left(\frac{a^2\left(2a^2x^2+\sqrt{4a^2x^2-y(x)^2}ax-y(x)^2\right)}{y(x)^2}\right)^{1/3}\left(\frac{\left(2ax+\sqrt{4a^2x^2-y(x)^2}\right)a}{y(x)}\right)^{1/3}}+x=0$$

2.469

ODE No. 469

$$axy'(x)+by(x)+y(x)y'(x)^2=0$$

✓

Mathematica : cpu = 0.217318 (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]`

$$\left\{\text{Solve}\left[\frac{a\log\left(\sqrt{a^2-\frac{4by(x)^2}{x^2}}+a\right)+(a+2b)\log\left(\sqrt{a^2-\frac{4by(x)^2}{x^2}}-a-2b\right)}{4(a+b)}=-\frac{\log(x)}{2}+c_1,y(x)\right],\text{Solve}\left[\frac{c_1\left(\frac{-ax+\sqrt{a^2x^2-4by(x)^2}}{2y(x)}\right)^{-\frac{a}{a+b}}\left(ax-\sqrt{a^2x^2-4by(x)^2}\right)\left(-\frac{a\left(-ax^2+\sqrt{a^2x^2-4by(x)^2}x-2y(x)^2\right)}{2y(x)^2}\right)^{\frac{-a-2b}{2a+2b}}-y(x)^2}{y(x)^2}\right]\right\}$$

✓

Maple : cpu = 0.311 (sec), leaf count = 264

`dsolve(y(x)*diff(y(x),x)^2+a*x*diff(y(x),x)+b*y(x) = 0,y(x))`

$$\frac{\left(c_1\left(\frac{-ax+\sqrt{a^2x^2-4by(x)^2}}{2y(x)}\right)^{-\frac{a}{a+b}}\left(ax-\sqrt{a^2x^2-4by(x)^2}\right)\left(-\frac{a\left(-ax^2+\sqrt{a^2x^2-4by(x)^2}x-2y(x)^2\right)}{2y(x)^2}\right)^{\frac{-a-2b}{2a+2b}}-y(x)^2}{y(x)^2}$$

2.470

ODE No. 470

$$x^3y'(x) - x^2y(x) + y(x)y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.405058 (sec), leaf count = 143

```
DSolve[-(x^2*y[x]) + x^3*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{1}{2}\log(y(x)) - \frac{\sqrt{x^6 + 4x^2y(x)^2}\tanh^{-1}\left(\frac{\sqrt{x^4+4y(x)^2}}{x^2}\right)}{2x\sqrt{x^4 + 4y(x)^2}} = c_1, y(x)\right], \text{Solve}\left[\frac{\sqrt{x^6 + 4x^2y(x)^2}\tanh^{-1}\left(\frac{\sqrt{x^4+4y(x)^2}}{x^2}\right)}{2x\sqrt{x^4 + 4y(x)^2}} = c_1, y(x)\right] \right\}$$

✓ **Maple** : cpu = 0.446 (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 = 0.0155543 (sec), leaf count = 47

```
DSolve[-x - (-x + y[x])*Derivative[1][y][x] + y[x]*Derivative[1][y][x]^2 == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow x + c_1 \right\}, \left\{ y(x) \rightarrow -\sqrt{-x^2 + 2c_1} \right\}, \left\{ y(x) \rightarrow \sqrt{-x^2 + 2c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.015 (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 = 0.271835 (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]
```

$$\left\{\left\{y(x)\rightarrow\frac{1}{3}\left(-2\sqrt{e^{2c_1}-3e^{c_1}x}-e^{c_1}\right)\right\},\left\{y(x)\rightarrow\frac{1}{3}\left(2\sqrt{e^{2c_1}-3e^{c_1}x}-e^{c_1}\right)\right\},\left\{y(x)\rightarrow e^{c_1}-2\sqrt{e^{c_1}x+e^{2c_1}}$$

✓ **Maple** : cpu = 0.627 (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 = 0.247373 (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
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{2}\left(-\sqrt{-4e^{c_1}x+4e^{c_1}-e^{2c_1}}+4-e^{c_1}\right)\right\},\left\{y(x)\rightarrow \frac{1}{2}\left(\sqrt{-4e^{c_1}x+4e^{c_1}-e^{2c_1}}+4-e^{c_1}\right)\right\},\left\{y(x)\rightarrow \frac{1}{2}\left(-\sqrt{-4e^{c_1}x+4e^{c_1}-e^{2c_1}}+4-e^{c_1}\right)\right\},\left\{y(x)\rightarrow \frac{1}{2}\left(\sqrt{-4e^{c_1}x+4e^{c_1}-e^{2c_1}}+4-e^{c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 1.11 (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 = 0.145095 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -i\sqrt{2}e^{\frac{c_1}{2}}\sqrt{4x - 5 + 8e^{c_1}} \right\}, \left\{ y(x) \rightarrow i\sqrt{2}e^{\frac{c_1}{2}}\sqrt{4x - 5 + 8e^{c_1}} \right\}, \left\{ y(x) \rightarrow -\frac{1}{4}ie^{\frac{c_1}{2}}\sqrt{8x - 10 + e^{c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 1.124 (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 = 0.068638 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{2}e^{2c_1}\sqrt{-2x + e^{4c_1}} \right\}, \left\{ y(x) \rightarrow \frac{1}{2}e^{2c_1}\sqrt{-2x + e^{4c_1}} \right\}, \left\{ y(x) \rightarrow -\frac{1}{2}e^{2c_1}\sqrt{2x + e^{4c_1}} \right\}, \left\{ y(x) \rightarrow \frac{1}{2}e^{2c_1}\sqrt{2x + e^{4c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.735 (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 = 0.411055 (sec), leaf count = 143

```
DSolve[-4*x^2*y[x] + 4*x^3*Derivative[1][y][x] + 9*y[x]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{1}{2}\log(y(x)) - \frac{\sqrt{x^6 + 9x^2y(x)^2}\tanh^{-1}\left(\frac{\sqrt{x^4 + 9y(x)^2}}{x^2}\right)}{2x\sqrt{x^4 + 9y(x)^2}} = c_1, y(x)\right], \text{Solve}\left[\frac{\sqrt{x^6 + 9x^2y(x)^2}\tanh^{-1}\left(\frac{\sqrt{x^4 + 9y(x)^2}}{x^2}\right)}{2x\sqrt{x^4 + 9y(x)^2}} = c_1, y(x)\right] \right\}$$

✓ **Maple** : cpu = 0.388 (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 = 0.177223 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{2}e^{\frac{c_1}{2}}\sqrt{2ae^{c_1} + b - 2x} \right\}, \left\{ y(x) \rightarrow \sqrt{2}e^{\frac{c_1}{2}}\sqrt{2ae^{c_1} + b - 2x} \right\}, \left\{ y(x) \rightarrow -\frac{e^{\frac{c_1}{2}}\sqrt{-2b + 4x + e^{c_1}}}{2\sqrt{a}} \right\} \right\}$$

✓ **Maple** : cpu = 0.503 (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

$$(y'(x)^2 + 1) (ay(x) + b) - c = 0$$

✓ **Mathematica** : cpu = 0.133722 (sec), leaf count = 141

```
DSolve[-c + (b + a*y[x])*(1 + Derivative[1][y][x]^2) == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[\frac{c \tan^{-1} \left(\frac{\sqrt{\#1a+b}}{\sqrt{-\#1a-b+c}} \right) - \sqrt{\#1a+b} \sqrt{-\#1a-b+c}}{a} \& \right] [-x + c_1] \right\}, \left\{ y(x) \rightarrow 1 \right\} \right.$$

✓ **Maple** : cpu = 0.5 (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

$a_0x + y'(x)(a_1x + b_1y(x) + c_1) + y'(x)^2(a_2x + b_2y(x) + c_2) + b_0y(x) + c_0 = 0$

✓ **Mathematica** : cpu = 8.78273 (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])
```

Solve $\left\{ \begin{array}{l} x = - \frac{-(K[2](b_2K[2] + b_1) + b_0) \exp \left(\text{RootSum} \left[\#1^3b_2 + \#1^2a_2 + \#1^2b_1 + \#1a_1 + \#1b_0 + a_0 \right] \right)}{\dots} \end{array} \right.$

✓ **Maple** : cpu = 0.302 (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 =
```

$$x - e^{\int \frac{-a_1x - b_1y(x) - \sqrt{-4a_0a_2x^2 - 4a_0b_2xy(x) + a_1^2x^2 + 2a_1b_1xy(x) - 4a_2b_0xy(x) - 4b_0b_2y(x)^2 + b_1^2y(x)^2 - 4a_0c_2x + 2a_1c_1x - 4a_2c_0x - 4b_0c_2y(x) + 2b_1c_1}}{2b_2y(x) + 2a_2x + 2c_2} dx}$$

2.480

ODE No. 480

$$(ay(x) - x^2) y'(x)^2 + 2xy(x)y'(x)^2 - y(x)^2 = 0$$

 **Mathematica** : cpu = 11.4364 (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
```

, could not solve

```
DSolve[-y[x]^2 + 2*x*y[x]*Derivative[1][y][x]^2 + (-x^2 + a*y[x])*Derivative[1][y][x]^2
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((a*y(x)-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)^2-y(x)^2 = 0,y(x))
```

, could not solve

```
dsolve((a*y(x)-x^2)*diff(y(x),x)^2+2*x*y(x)*diff(y(x),x)^2-y(x)^2 = 0,y(x))
```


2.481

ODE No. 481

$$(x^2 + y(x)^2) y'(x) + xy(x)y'(x)^2 + xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0219243 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_1}{x}\right\},\left\{y(x) \rightarrow -\sqrt{-x^2 + 2c_1}\right\},\left\{y(x) \rightarrow \sqrt{-x^2 + 2c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.017 (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

$$(a + x^{22} - y(x)^2) y'(x) + xy(x)y'(x)^2 - xy(x) = 0$$

 **Mathematica** : cpu = 69.0184 (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
```

, 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 == 0
```

 **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

$$(2xy(x) - x^2) y'(x)^2 + 2xy(x)y'(x) - y(x)^2 + 2xy(x) = 0$$

✓ **Mathematica** : cpu = 0.140172 (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], y[x], x]`

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{-x^2 - 2e^{\frac{c_1}{2}}x - e^{\frac{c_1}{2}}} \right\}, \left\{ y(x) \rightarrow \sqrt{-x^2 - 2e^{\frac{c_1}{2}}x - e^{\frac{c_1}{2}}} \right\}, \left\{ y(x) \rightarrow e^{\frac{c_1}{2}} - \sqrt{-x^2 + 2e^{\frac{c_1}{2}}x} \right\}, \left\{ y(x) \rightarrow e^{\frac{c_1}{2}} + \sqrt{-x^2 + 2e^{\frac{c_1}{2}}x} \right\} \right\}$$

✓ **Maple** : cpu = 0.099 (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

$$(2xy(x) - x^2) y'(x)^2 - 6xy(x)y'(x) - y(x)^2 + 2xy(x) = 0$$

✓ **Mathematica** : cpu = 0.133521 (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], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{3x^2 - 2e^{\frac{c_1}{2}}x + 2x - e^{\frac{c_1}{2}}} \right\}, \left\{ y(x) \rightarrow \sqrt{3x^2 - 2e^{\frac{c_1}{2}}x + 2x - e^{\frac{c_1}{2}}} \right\}, \left\{ y(x) \rightarrow -\sqrt{3x^2 + 2e^{\frac{c_1}{2}}x} \right\} \right.$$

✓ **Maple** : cpu = 0.109 (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

$$-y'(x)\left(ay(x)^2+bx^2+c\right)+axy(x)y'(x)^2+by(x)=0$$

✓

Mathematica : cpu = 0.0428222 (sec), leaf count = 29

DSolve[b*x*y[x] - (c + b*x^2 + a*y[x]^2)*Derivative[1][y][x] + a*x*y[x]*Derivative[1][y][x]^2 -

$$\left\{\left\{y(x)\rightarrow\sqrt{\frac{cc_1}{b-ac_1}+c_1x^2}\right\}\right\}$$

✗

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 = 0.0409376 (sec), leaf count = 117

DSolve[-a^2 + y[x]^2 + y[x]^2*Derivative[1][y][x]^2 == 0,y[x],x]

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{a^2 - x^2 - 2c_1 x - c_1^2} \right\}, \left\{ y(x) \rightarrow \sqrt{a^2 - x^2 - 2c_1 x - c_1^2} \right\}, \left\{ y(x) \rightarrow -\sqrt{a^2 - x^2 + 2c_1 x - c_1^2} \right\}, \left\{ y(x) \rightarrow \sqrt{a^2 - x^2 + 2c_1 x - c_1^2} \right\} \right\}$$

✓

Maple : cpu = 0.164 (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 = 0.427093 (sec), leaf count = 161

```
DSolve[4*x^2*y[x] - 6*x^3*Derivative[1][y][x] + y[x]^2*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \text{Solve}\left[\frac{3}{4}\log(y(x)) - \frac{\sqrt{9x^6 - 4x^2y(x)^3}\tanh^{-1}\left(\frac{\sqrt{9x^4 - 4y(x)^3}}{3x^2}\right)}{2x\sqrt{9x^4 - 4y(x)^3}} = c_1, y(x)\right], \text{Solve}\left[\frac{\sqrt{9x^6 - 4x^2y(x)^3}\tanh^{-1}\left(\frac{\sqrt{9x^4 - 4y(x)^3}}{3x^2}\right)}{2x\sqrt{9x^4 - 4y(x)^3}} = c_1, y(x)\right] \right\}$$

✓ **Maple** : cpu = 0.372 (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))
```

$$y(x) = \frac{18^{1/3}x^{4/3}}{2}$$

2.488

ODE No. 488

$$4a^2 - 4ay(x)y'(x) - 4ax + y(x)^2y'(x)^2 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.212425 (sec), leaf count = 85

```
DSolve[4*a^2 - 4*a*x + y[x]^2 - 4*a*y[x]*Derivative[1][y][x] + y[x]^2*Derivative[1][y][x]^2 ==
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{16a^3x - 4a^2x^2 - 4ac_1x - c_1^2}}{2a} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{16a^3x - 4a^2x^2 - 4ac_1x - c_1^2}}{2a} \right\} \right\}$$

✓ **Maple** : cpu = 0.376 (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

$$ay(x)^2+bx+c+y(x)^2y'(x)^2+2xy(x)y'(x)=0$$

 **Mathematica** : cpu = 300.16 (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
```

, timed out

\$Aborted

 **Maple** : cpu = 1.467 (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))
```

$$y(x) = -\frac{2\sqrt{\left((a+1)^2a\left(ax-\frac{1}{2}b+x\right)^2\operatorname{RootOf}\left(-b\ln\left(2ax-b+2x\right)+2\left(\int^{-Z}-\frac{b\left(4_aa^2+\sqrt{-e^{\frac{4a+4}{b}}}\left(4_aa^3+\right.\right.\right.\right.\right.}{4(4_aa^2+8} \right.$$

2.490

ODE No. 490

$$a - x^2 - 2xy(x)y'(x) + y(x)^2y'(x)^2 + 2y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.247548 (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
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{-a - 2x^2 + 8c_1x - 4c_1^2}}{\sqrt{2}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{-a - 2x^2 + 8c_1x - 4c_1^2}}{\sqrt{2}} \right\} \right\}$$

✓ **Maple** : cpu = 0.356 (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 = 0.504089 (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][x]^2 == 0, y[x], x]

$$\left\{\left\{y(x)\rightarrow -\sqrt{-2ac_1x+ac_1^2+b-x^2+2c_1x-c_1^2}\right\},\left\{y(x)\rightarrow \sqrt{-2ac_1x+ac_1^2+b-x^2+2c_1x-c_1^2}\right\}\right\}$$

✓

Maple : cpu = 0.685 (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),x)

$$y(x)=\sqrt{-ax^2+b}$$

2.492

ODE No. 492

$$(y(x)^2 - a^2) y'(x)^2 + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0777023 (sec), leaf count = 97

```
DSolve[y[x]^2 + (-a^2 + y[x]^2)*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[\sqrt{a^2 - \#1^2} - a \tanh^{-1} \left(\frac{\sqrt{a^2 - \#1^2}}{a} \right) \& \right] [-x + c_1] \right\}, \left\{ y(x) \rightarrow \text{InverseFunction} \left[\sqrt{a^2 - \#1^2} + a \tanh^{-1} \left(\frac{\sqrt{a^2 - \#1^2}}{a} \right) \& \right] [-x + c_1] \right\} \right.$$

✓ **Maple** : cpu = 0.51 (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

$$(a^2 - 2ax + y(x)^2) \, y'(x)^2 + 2ay(x)y'(x) + y(x)^2 = 0$$

✓ **Mathematica** : cpu = 14.289 (sec), leaf count = 97

```
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 ==
```

Solve

$$\left\{ \begin{array}{l} x = \frac{a^2 K[1]^2 + 2aK[1]y(K[1]) + K[1]^2 y(K[1])^2 + y(K[1])^2}{2aK[1]^2}, y(x) = -\frac{aK[1] \tanh^{-1}\left(\sqrt{K[1]^2 + 1}\right)}{\sqrt{K[1]^2 + 1}} \end{array} \right.$$

✓ **Maple** : cpu = 1.013 (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))
```

$$\left[\begin{array}{l} x(\_T) = \frac{\sqrt{\_T^2 + 1} \operatorname{arctanh}\left(\frac{1}{\sqrt{\_T^2 + 1}}\right)^2 a^2 + \left(-2ac_1 \sqrt{\_T^2 + 1} - 2a^2\right) \operatorname{arctanh}\left(\frac{1}{\sqrt{\_T^2 + 1}}\right) + (a^2 + c_1^2) \sqrt{\_T^2 + 1}}{2\sqrt{\_T^2 + 1} a} \end{array} \right.$$

2.494

ODE No. 494

$$(y(x)^2 - a^2 x^2) y'(x)^2 + (1 - a^2) x^2 + 2xy(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0821509 (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]
```

$$\left\{ \left\{ y(x) \rightarrow ac_1 - \sqrt{-x^2 + c_1^2} \right\}, \left\{ y(x) \rightarrow ac_1 + \sqrt{-x^2 + c_1^2} \right\} \right\}$$

✓ **Maple** : cpu = 0.203 (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 = 0.147304 (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)*Derivati

$$\left\{\text{Solve}\left[\sqrt{a-1}\tan^{-1}\left(\frac{y(x)}{x}\right)-\frac{1}{2}\log\left(\frac{y(x)^2}{x^2}+1\right)=\log(x)+c_1,y(x)\right],\text{Solve}\left[\sqrt{a-1}\tan^{-1}\left(\frac{y(x)}{x}\right)+\frac{1}{2}\right.\right.$$

✓

Maple : cpu = 0.502 (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 = 26.4034 (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]
```

Too large to display

✓ **Maple** : cpu = 0.277 (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 = 0.100837 (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]]`

$$\left\{\left\{y(x)\rightarrow-\frac{\sqrt{-3x^2-4ie^{3c_1}x+e^{6c_1}}}{\sqrt{3}}\right\},\left\{y(x)\rightarrow\frac{\sqrt{-3x^2-4ie^{3c_1}x+e^{6c_1}}}{\sqrt{3}}\right\},\left\{y(x)\rightarrow-\frac{\sqrt{-3x^2+4ie^{3c_1}x}}{\sqrt{3}}\right\}\right.$$

✓ **Maple** : cpu = 0.562 (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 = 0.107719 (sec), leaf count = 127

```
DSolve[-4 + 4*y[x] + (-2 + 3*y[x])*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[\frac{\tan^{-1} \left(\frac{\sqrt{3\#1-2}}{\sqrt{3-3\#1}} \right)}{\sqrt{3}} - \sqrt{1-\#1} \sqrt{3\#1-2} \right] [-2x+c_1] \right\}, \left\{ y(x) \rightarrow \text{InverseFu} \right. \right.$$

✓ **Maple** : cpu = 0.346 (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 = 0.18853 (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]^2, y[x], x]`

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{a^6(-x^2) + 3a^4x^2 - 3a^2x^2 - 2a^2xe^{a^2c_1 - c_1} + 2xe^{a^2c_1 - c_1} + e^{2a^2c_1 - 2c_1} + x^2}}{\sqrt{a^6 - 3a^4 + 3a^2 - 1}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{a^6(-x^2) + 3a^4x^2 - 3a^2x^2 - 2a^2xe^{a^2c_1 - c_1} + 2xe^{a^2c_1 - c_1} + e^{2a^2c_1 - 2c_1} + x^2}}{\sqrt{a^6 - 3a^4 + 3a^2 - 1}} \right\} \right\}$$

✓

Maple : cpu = 0.227 (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 = 0.474698 (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]^2, y[x], x]
```

$$\left\{\left\{y(x) \rightarrow -\frac{\sqrt{-ab+ax^2-2ac_1x+ac_1^2+b^2-bx^2}}{\sqrt{b-a}}\right\},\left\{y(x) \rightarrow \frac{\sqrt{-ab+ax^2-2ac_1x+ac_1^2+b^2-bx^2}}{\sqrt{b-a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.993 (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))
```

$$y(x)=\frac{\sqrt{b\left(x^2+a-b\right)\left(a-b\right)}}{a-b}$$

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 = 34.9686 (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
```

$$\left\{ \text{Solve} \left[\left\{ y(x) = \frac{bK[1] - \sqrt{-K[1]^2 \left(-b^2 + 4axK[1]^2b + 4dxb + 4acK[1]^2 + 4cd \right)}}{2 \left(aK[1]^2 + d \right)}, x = \frac{-b^2c_1^2d^4 - ab^2c_1^2K[1]^2d^4 - 2ab^2c_1^2d^3K[1]^2 - 2ab^2c_1^2d^2K[1]^2 - 2ab^2c_1^2dK[1]^2 - 2ab^2c_1^2K[1]^2}{2 \left(aK[1]^2 + d \right)} \right\} \right. \right.$$

✓ **Maple** : cpu = 3.931 (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))
```

$$y(x) = -\frac{\sqrt{-ad} \left(bx + c \right)}{ab}$$

2.502

ODE No. 502

$$(ay(x) - bx)^2 (a^2y'(x)^2 + b^2) - c^2(ay'(x) + b)^2 = 0$$

✓ **Mathematica** : cpu = 1.18463 (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), y[x]]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{bc_1}{a} - \frac{\sqrt{b^2(-x^2) + 2b^2c_1x - b^2c_1^2 + c^2}}{a} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{b^2(-x^2) + 2b^2c_1x - b^2c_1^2 + c^2}}{a} + \frac{bc_1}{a} \right\} \right\}$$

✓ **Maple** : cpu = 0.359 (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

$$a_0 + y'(x)(a_1x + b_1y(x) + c_1) + y'(x)^2(a_2x + b_2y(x) + c_2)^2 + b_0y(x) + c_0 = 0$$

 **Mathematica** : cpu = 300.049 (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
```

, 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
```

, 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
```

2.504

ODE No. 504

$$-(-a + x^3 + y(x)^3) \, y'(x) + x^2 y(x) + x y(x)^2 y'(x)^2 = 0$$

✓

Mathematica : cpu = 0.0508612 (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

$$\left\{y(x) \rightarrow \frac{\sqrt[3]{c_1} \sqrt[3]{a - x^3 + c_1 x^3}}{\sqrt[3]{-1 + c_1}}\right\}$$

✓

Maple : cpu = 1.142 (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))

$$y(x) = \left(x^3 + a - 2x\sqrt{ax}\right)^{1/3}$$

2.505

ODE No. 505

$$-x^3 + xy(x)^2y'(x)^2 - 2y(x)^3y'(x) + 2xy(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0753019 (sec), leaf count = 73

`DSolve[-x^3 + 2*x*y[x]^2 - 2*y[x]^3*Derivative[1][y][x] + x*y[x]^2*Derivative[1][y][x]^2 == 0,`

$$\left\{\left\{y(x) \rightarrow -\sqrt{x^2 + 2c_1}\right\}, \left\{y(x) \rightarrow \sqrt{x^2 + 2c_1}\right\}, \left\{y(x) \rightarrow -\sqrt{x^2 + c_1x^4}\right\}, \left\{y(x) \rightarrow \sqrt{x^2 + c_1x^4}\right\}\right\}$$

✓ **Maple** : cpu = 0.023 (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

$$2x^2(y(x) - x)y(x)^2y'(x) + x^2(xy(x)^2 - 1)y'(x)^2 - ((x^2y(x) - 1)y(x)^2) = 0$$

✗ Mathematica : cpu = 45.0103 (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)*Derivative[1][y][x]^2 == 0, y[x], x]
```

, could not solve

```
DSolve[-(y[x]^2*(-1 + x^2*y[x])) + 2*x^2*y[x]^2*(-x + y[x])*Derivative[1][y][x] + x^2*(-1 + x*y[x]^2)*Derivative[1][y][x]^2 == 0, y[x], x]
```

✗ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve(x^2*(x*y(x)^2-1)*diff(y(x),x)^2+2*x^2*y(x)^2*(y(x)-x)*diff(y(x),x)-y(x)^2*(x^2*y(x)^2-1)=0,y(x))
```

, 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)^2-1)=0,y(x))
```

2.507

ODE No. 507

$$\left(y(x)^4 - a^2 x^2\right) y'(x)^2 + 2 a^2 x y(x) y'(x) + y(x)^2 \left(y(x)^2 - a^2\right) = 0$$

✓

Mathematica : cpu = 44.182 (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*Deriv

$$\left\{\text{Solve}\left[\left\{x = \frac{a^2 K[1] y(K[1]) - \sqrt{a^2 K[1]^2 \left(K[1]^2 + 1\right) y(K[1])^4}}{a^2 K[1]^2}, y(x) = \frac{-4 a {}_2F_1\left(-\frac{1}{4}, \frac{1}{4}; \frac{3}{4}; -K[1]^2\right) - a c_1 \sqrt{4 \sqrt{K[1]^2 + 1}}}{4 \sqrt{K[1]^2 + 1}}\right.\right.\right.$$

✓

Maple : cpu = 2.52 (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

$$y(x)-\text{RootOf}\left(\sqrt{\text{RootOf}\left(\left(-y(x)^4+a^2 x^2\right) \_Z^2+a^2-y(x)^2-2\_Z a^2 x\right) \_Z c_1+a} \text{hypergeom}\left(\left[-\frac{1}{4}, \frac{1}{4}\right]\right.\right.$$

2.508

ODE No. 508

$$(x^2y(x)^2 - x^2 + y(x)^4) y'(x)^2 + 2xy(x)y'(x) - y(x)^2 = 0$$

✓ **Mathematica** : cpu = 1.07967 (sec), leaf count = 62

```
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], y[x], x]
```

$$\text{Solve}\left[\frac{\sqrt{x^2+y(x)^2}y(x)\tanh^{-1}\left(\frac{x}{\sqrt{x^2+y(x)^2}}\right)}{x^2\sqrt{\frac{y(x)^2(x^2+y(x)^2)}{x^4}}}+y(x)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.627 (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

$$9(x^2-1)y(x)^4y'(x)^2-4x^2-6xy(x)^5y'(x)=0$$

✓ **Mathematica** : cpu = 0.182895 (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], x]
```

$$\left\{y(x)\rightarrow-\frac{\sqrt[3]{-\frac{1}{2}}\sqrt[3]{-4x^2+4+c_1^2}}{\sqrt[3]{c_1}}\right\}$$

✓ **Maple** : cpu = 0.566 (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))
```

$$y(x)=\left(-4x^2+4\right)^{1/6}$$

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 = 46.4054 (sec), leaf count = 0

Dsolve[-(y[x]^2*(-1 + x^4*y[x]^2)) + 2*x^3*y[x]^3*(-x^2 + y[x]^2)*Derivative[1][y][x] + x^2*(-

, could not solve

Dsolve[-(y[x]^2*(-1 + x^4*y[x]^2)) + 2*x^3*y[x]^3*(-x^2 + y[x]^2)*Derivative[1][y][x] +
1 + x^2*y[x]^4)*Derivative[1][y][x]^2 == 0, y[x], x]

 **Maple** : cpu = 0. (sec), leaf count = 0

dsolve(x^2*(x^2*y(x)^4-1)*diff(y(x),x)^2+2*x^3*y(x)^3*(y(x)^2-x^2)*diff(y(x),x)-y(x)^2*(

, could not solve

dsolve(x^2*(x^2*y(x)^4-1)*diff(y(x),x)^2+2*x^3*y(x)^3*(y(x)^2-x^2)*diff(y(x),x)-
y(x)^2*(x^4*y(x)^2-1)=0,y(x))

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 = 22.2426 (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]^2])
```

$$\left\{ \text{Solve} \left[\tan^{-1} \left(\frac{x}{y(x)} \right) - \frac{2\sqrt{a^2 (x^2 + y(x)^2) \left(\sqrt{x^2 + y(x)^2} - a^2 \right)} \tan^{-1} \left(\frac{\sqrt{\sqrt{x^2 + y(x)^2} - a^2}}{a} \right)}{a\sqrt{x^2 + y(x)^2} \sqrt{\sqrt{x^2 + y(x)^2} - a^2}} = c_1, y(x) \right], \text{Solve} \right.$$

✓ Maple : cpu = 10.197 (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
```

$$\arctan\left(\frac{x}{y(x)}\right) - \frac{2\sqrt{\left(-a^2 + \sqrt{y(x)^2 + x^2}\right)} (y(x)^2 + x^2) a^2 \arctan\left(\frac{\sqrt{-a^2 + \sqrt{y(x)^2 + x^2}}}{a}\right)}{a\sqrt{y(x)^2 + x^2} \sqrt{-a^2 + \sqrt{y(x)^2 + x^2}}} - c_1 = 0$$

2.512

ODE No. 512

$$\left(a(x^2+y(x)^2)^{3/2}-x^2\right)y'(x)^2+a(x^2+y(x)^2)^{3/2}+2xy(x)y'(x)-y(x)^2=0$$

✓ **Mathematica** : cpu = 23.6438 (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)^(3/2))y'[x], y[x], x]
```

$$\left\{\text{Solve}\left[\tan^{-1}\left(\frac{x}{y(x)}\right)-\frac{2\sqrt{a\left(x^2+y(x)^2\right)^2\left(-ax^2-ay(x)^2+\sqrt{x^2+y(x)^2}\right)}{\sqrt{a}\left(x^2+y(x)^2\right)\sqrt{-ax^2-ay(x)^2+\sqrt{x^2+y(x)^2}}}\tan^{-1}\left(\frac{\sqrt{-ax^2-ay(x)^2+\sqrt{x^2+y(x)^2}}}{\sqrt{a}\sqrt{x^2+y(x)^2}}\right),y(x)\right]\right\}$$

✓ **Maple** : cpu = 6.25 (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))=0,y(x))
```

$$y(x)=\frac{x}{\tan\left(\text{RootOf}\left(-\_Z-\left(\int\frac{x^2\left(\tan(\_Z)^2+1\right)}{\tan(\_Z)^2}\frac{\sqrt{-\_a\_a^{5/2}\left(a\sqrt{\_a}-1\right)\left(a\sqrt{\_a}+1\right)}}{2\_a^2(\_a\_a^2-1)}d\_a\right)+c_1\right)\right)}$$

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 = 0.0497337 (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],y[x]]`

$$\left\{\left\{y(x) \rightarrow \tan^{-1}\left(2\left(-\frac{c_1^{3/2}}{\sqrt{x+c_1}} - \frac{\sqrt{c_1}x}{\sqrt{x+c_1}}\right)\right)\right\},\left\{y(x) \rightarrow \tan^{-1}\left(2\left(\frac{c_1^{3/2}}{\sqrt{x+c_1}} + \frac{\sqrt{c_1}x}{\sqrt{x+c_1}}\right)\right)\right\}\right\}$$

✗

Maple : cpu = 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 = 7.09859 (sec), leaf count = 605

```
DSolve[d - c*Cos[y[x]] + (b + a*Cos[y[x]])*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[\frac{4 \sin^2\left(\frac{\#1}{2}\right) \csc(\#1) \sqrt{a \cos(\#1)+b} \sqrt{\frac{\cot^2\left(\frac{\#1}{2}\right)(c-d)}{c+d}} \sqrt{\frac{\csc^2\left(\frac{\#1}{2}\right)(a+b)(d-c \cos(\#1))}{ad+bc}}\right](c(\right.$$

✓ **Maple** : cpu = 6.036 (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

$$f\big(x^2+y(x)^2\big)\big(y'(x)^2+1\big)-\big(xy'(x)-y(x)\big)^2=0$$

✓

Mathematica : cpu = 2.16897 (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`

$$\left\{\text{Solve}\left[\int_1^x\left(\frac{\sqrt{f\left(K[1]^2+y(x)^2\right)\left(K[1]^2+y(x)^2-f\left(K[1]^2+y(x)^2\right)}\right)K[1]}{f\left(K[1]^2+y(x)^2\right)\left(K[1]^2+y(x)^2\right)}-\frac{\sqrt{f\left(K[1]^2+y(x)^2\right)\left(K[1]^2+y(x)^2-f\left(K[1]^2+y(x)^2\right)}\right)K[1]}{f\left(K[1]^2+y(x)^2\right)\left(K[1]^2+y(x)^2\right)}\right]\right\}$$

✓

Maple : cpu = 1.191 (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))`

$$y(x)=\frac{x}{\tan\left(\text{RootOf}\left(-2\_Z-\left(\int\frac{x^2\left(\tan(\_Z)^2+1\right)}{\tan(\_Z)^2}\frac{\sqrt{-f(\_a)\left(f(\_a)-\_a\right)}}{\_a\left(f(\_a)-\_a\right)}d\_a\right)+2c_1\right)\right)}$$

2.516

ODE No. 516

$$(x^2 + y(x)^2) \, f\left(\frac{x}{\sqrt{x^2 + y(x)^2}}\right) \, (y'(x)^2 + 1) - (xy'(x) - y(x))^2 = 0$$

✓

Mathematica : cpu = 0.414036 (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 + Deriva

$$\left\{\text{Solve}\left[\int_1^{\frac{y(x)}{x}}\frac{f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)K[1]^2+f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)-1}{\sqrt{f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)(K[1]-i)(K[1]+i)\left(\sqrt{f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)K[1]}+i\sqrt{f\left(\frac{1}{\sqrt{K[1]^2+1}}\right)-1}\right)}}dK[1]=\right.$$

✓

Maple : cpu = 1.375 (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

$$y(x)=\text{RootOf}\left(-\ln(x)+\int^{-z}-\frac{af\left(\frac{1}{\sqrt{-a^2+1}}\right)+\sqrt{-f\left(\frac{1}{\sqrt{-a^2+1}}\right)^2+f\left(\frac{1}{\sqrt{-a^2+1}}\right)}}{(-a^2+1)f\left(\frac{1}{\sqrt{-a^2+1}}\right)}d\_a+c_1\right)x$$

2.517

ODE No. 517

$$(x^2 + y(x)^2) f\left(\frac{y(x)}{\sqrt{x^2 + y(x)^2}}\right) (y'(x)^2 + 1) - (xy'(x) - y(x))^2 = 0$$

✓ **Mathematica** : cpu = 0.418833 (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[1][y][x])^2, y[x], x]
```

$$\left\{ \text{Solve} \left[\int_1^{\frac{y(x)}{x}} \frac{f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right) K[1]^2 + f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right) - 1}{\sqrt{f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right) (K[1] - i)(K[1] + i) \left(\sqrt{f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right) K[1] + i \sqrt{f\left(\frac{K[1]}{\sqrt{K[1]^2+1}}\right) - 1}\right)}} dK[1] = 0 \right], K[1] \right\}$$

✓ **Maple** : cpu = 1.396 (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), y(x))
```

$$y(x) = \text{RootOf} \left(-\ln(x) + \int^{-Z} -\frac{af\left(\frac{a}{\sqrt{-a^2+1}}\right) + \sqrt{-f\left(\frac{a}{\sqrt{-a^2+1}}\right)^2 + f\left(\frac{a}{\sqrt{-a^2+1}}\right)}}{(-a^2 + 1) f\left(\frac{a}{\sqrt{-a^2+1}}\right)} d_a + c_1 \right) x$$

2.518

ODE No. 518

$$y'(x)^3 - (y(x) - a)^2(y(x) - b)^2 = 0$$

✓ **Mathematica** : cpu = 0.415563 (sec), leaf count = 236

```
DSolve[-((-a + y[x])^2*(-b + y[x])^2) + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{3\sqrt[3]{a-\#1} \left(\frac{\#1-b}{a-b} \right)^{2/3} {}_2F_1 \left(\frac{1}{3}, \frac{2}{3}; \frac{4}{3}; \frac{a-\#1}{a-b} \right)}{(b-\#1)^{2/3}} \& \right] [x + c_1] \right\}, \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{3\sqrt[3]{a-\#1} \left(\frac{\#1-b}{a-b} \right)^{2/3} {}_2F_1 \left(\frac{1}{3}, \frac{2}{3}; \frac{4}{3}; \frac{a-\#1}{a-b} \right)}{(b-\#1)^{2/3}} \& \right] [x + c_1] \right\} \right.$$

✓ **Maple** : cpu = 0.277 (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 = 7.64828 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[\frac{\sqrt[3]{2}(2\#1a + b) \left(\frac{a(\#1(\#1a + b) + c)}{4ac - b^2} \right)^{2/3} {}_2F_1 \left(\frac{1}{2}, \frac{2}{3}, \frac{3}{2}, \frac{(b + 2a\#1)^2}{b^2 - 4ac} \right)}{a(\#1(\#1a + b) + c)^{2/3}} \right] \& \right\} \left[\int_1^x \sqrt[3]{f(K[1])} d\right.$$

✓ **Maple** : cpu = 0.695 (sec), leaf count = 197

```
dsolve(diff(y(x),x)^3-f(x)*(a*y(x)^2+b*y(x)+c)^2=0,y(x))
```

$$\int^{y(x)} \frac{1}{(a\_a^2 + \_ab + c)^{2/3}} d\_a + \int^x - \frac{\left(f(\_a) \left(ay(x)^2 + by(x) + c \right)^2\right)^{1/3}}{\left(ay(x)^2 + by(x) + c \right)^{2/3}} d\_a + c_1 = 0$$

2.520

ODE No. 520

$$y'(x)^3 + y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.02117 (sec), leaf count = 330

```
DSolve[-y[x] + Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[\int \frac{\sqrt[3]{\sqrt{729 \#1^2 + 108} - 27 \#1}}{2^{2/3} \left(\sqrt{729 \#1^2 + 108} - 27 \#1 \right)^{2/3} - 6 \sqrt[3]{2}} d\#1 \& \right] \left[-\frac{x}{6} + c_1 \right] \right\}, \left\{ y(x) \rightarrow \dots \right. \right.$$

✓ **Maple** : cpu = 0.177 (sec), leaf count = 249

```
dsolve(diff(y(x),x)^3+diff(y(x),x)-y(x)=0,y(x))
```

$$x - \left(\int^{y(x)} \frac{6 \left(108\_a + 12 \sqrt{81\_a^2 + 12} \right)^{1/3}}{\left(108\_a + 12 \sqrt{81\_a^2 + 12} \right)^{2/3} - 12} d\_a \right) - c_1 = 0$$

2.521 ODE No. 521

$$y'(x)^3 + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0036268 (sec), leaf count = 14

```
DSolve[-y[x] + x*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0, y[x], x]
```

$$\{\{y(x) \rightarrow c_1 x + c_1^3\}\}$$

✓ **Maple** : cpu = 0.029 (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 = 0.0036064 (sec), leaf count = 20

```
DSolve[y[x] - (5 + x)*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0, y[x], x]
```

$$\{ \{ y(x) \rightarrow c_1 x - c_1^3 + 5c_1 \} \}$$

✓ **Maple** : cpu = 0.038 (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 = 177.751 (sec), leaf count = 392

`DSolve[x^3 - a*x*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow\int_1^x\left(\frac{\sqrt[3]{\frac{2}{3}}aK[1]}{\sqrt[3]{\sqrt{3}\sqrt{27K[1]^6-4a^3K[1]^3-9K[1]^3}}}+\frac{\sqrt[3]{\sqrt{3}\sqrt{27K[1]^6-4a^3K[1]^3-9K[1]^3}}}{\sqrt[3]{2}3^{2/3}}\right)dK[1]+\right.\right.$$

✓ **Maple** : cpu = 0.071 (sec), leaf count = 253

`dsolve(diff(y(x),x)^3-a*x*diff(y(x),x)+x^3=0,y(x))`

$$y(x)=\int\frac{i\left(\left(-108x^3+12\sqrt{-12a^3x^3+81x^6}\right)^{2/3}-12ax\right)\sqrt{3}-\left(-108x^3+12\sqrt{-12a^3x^3+81x^6}\right)^{2/3}-12ax}{12\left(-108x^3+12\sqrt{-12a^3x^3+81x^6}\right)^{1/3}}$$

2.524

ODE No. 524

$$y'(x)^3-2y(x)y'(x)+y(x)^2=0$$

✓ **Mathematica** : cpu = 0.0127944 (sec), leaf count = 422

DSolve[y[x]^2 - 2*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^3 == 0,y[x],x]

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[\int \frac{\sqrt[3]{\sqrt{3}\sqrt{\#1^3(27\#1-32)}-9\#1^2}}{\sqrt[3]{2}\left(\sqrt{3}\sqrt{\#1^3(27\#1-32)}-9\#1^2\right)^{2/3}+4\sqrt[3]{3}\#1}d\#1\&\right]\left[\frac{x}{6^{2/3}}+c_1\right]\right\},\left\{\right\}\right\}$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 257

dsolve(diff(y(x),x)^3-2*y(x)*diff(y(x),x)+y(x)^2=0,y(x))

$$x-\left(\int^{y(x)}\frac{6\left(-108\_a^2+12\sqrt{3}\sqrt{27\_a^4-32\_a^3}\right)^{1/3}}{\left(-108\_a^2+12\sqrt{3}\sqrt{27\_a^4-32\_a^3}\right)^{2/3}+24\_a}d\_a\right)-c_1=0$$

2.525

ODE No. 525

$$-axy(x)y'(x)+2ay(x)^2+y'(x)^2=0$$

✓

Mathematica : cpu = 0.094588 (sec), leaf count = 129

`DSolve[2*a*y[x]^2 - a*x*y[x]*Derivative[1][y][x] + Derivative[1][y][x]^2 == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow c_1\exp\left(\frac{1}{2}\left(\frac{ax^2}{2}+\frac{1}{2}\sqrt{ax}\sqrt{ax^2-8}-4\tanh^{-1}\left(\frac{\sqrt{ax}}{\sqrt{ax^2-8}}\right)\right)\right)\right\},\left\{y(x)\rightarrow c_1\exp\left(\frac{1}{2}\left(\frac{ax^2}{2}-\frac{1}{2}\right)\right)\right\}\right\}$$

✓

Maple : cpu = 0.083 (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))`

$$y(x)=c_1\left(\frac{x\,a^2}{\sqrt{a^2}}+\sqrt{a^2x^2-8a}\right)^{-\frac{2a}{\sqrt{a^2}}}\,e^{\frac{x\left(ax+\sqrt{a^2x^2-8a}\right)}{4}}$$

2.526

ODE No. 526

$$-x^3y(x)^3 - (x^2 + xy(x) + y(x)^2) \, y'(x)^2 + (x^3y(x) + x^2y(x)^2 + xy(x)^3) \, y'(x) + y'(x)^3 = 0$$

✓

Mathematica : cpu = 0.0504069 (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]^2)*y'[x]^2 + (x^3*y[x] + x^2*y[x]^2 + x*y[x]^3)*y'[x] + y'[x]^3 == 0,x]

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{-x - c_1} \right\}, \left\{ y(x) \rightarrow c_1 e^{\frac{x^2}{2}} \right\}, \left\{ y(x) \rightarrow \frac{x^3}{3} + c_1 \right\} \right\}$$

✓

Maple : cpu = 0.016 (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))*y'(x)-y'(x)^3,x)

$$y(x) = \frac{x^3}{3} + c_1$$

2.527

ODE No. 527

$$-xy(x)^4y'(x)+y'(x)^3-y(x)^5=0$$

✓ **Mathematica** : cpu = 0.0126709 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{c_1\left(x-c_1^2\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.776 (sec), leaf count = 43

```
dsolve(diff(y(x),x)^3-x*y(x)^4*diff(y(x),x)-y(x)^5=0,y(x))
```

$$y(x)=-\frac{3\sqrt{3}}{2x^{3/2}}$$

2.528

ODE No. 528

$$abx + ay'(x)^2 + by(x) + y'(x)^3 = 0$$

✓

Mathematica : cpu = 0.551088 (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]`

Solve

$$\left\{ x = -\frac{-a\left(\frac{\sqrt[3]{-2a^3+\sqrt{(-2a^3-27abx-27by(x))^2-4a^6-27abx-27by(x)}}}{3\sqrt[3]{2}}\right)+\frac{\sqrt[3]{2}a^2}{3\sqrt[3]{-2a^3+\sqrt{(-2a^3-27abx-27by(x))^2-4a^6-27abx-27by(x)}}}}{1}\right.$$

✓

Maple : cpu = 0.091 (sec), leaf count = 86

`dsolve(diff(y(x),x)^3+a*diff(y(x),x)^2+b*y(x)+a*b*x=0,y(x))`

$$y(x) = -ax - \frac{\left(e^{\text{RootOf}\left(-2a^2\_Z - 3e^2\_Z + 8ae^{-Z} + 2c_1b - 5a^2 - 2bx\right)} - a\right)^2 e^{\text{RootOf}\left(-2a^2\_Z - 3e^2\_Z + 8ae^{-Z} + 2c_1b - 5a^2 - 2bx\right)}}{b}$$

2.529

ODE No. 529

$$y'(x)^3 + xy'(x)^2 - y(x) = 0$$

✓ **Mathematica** : cpu = 22.4989 (sec), leaf count = 1758

```
DSolve[-y[x] + x*Derivative[1][y][x]^2 + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{2} \left(\frac{4 \, 2^{2/3} x^4}{3 \left(-16 x^3 - 72 x^2 - 108 x + 216 c_1 + \sqrt{4 \left(-4 x^2 - 12 x - 9\right)^3 + \left(-16 x^3 - 72 x^2 - 108 x + 216 c_1\right)^2}\right)}\right.\right.$$

✓ **Maple** : cpu = 0.068 (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 = 38.6566 (sec), leaf count = 648

```
DSolve[y[x]^2 - y[x]*Derivative[1][y][x]^2 + Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[\int_1^{\#1} \frac{\sqrt[3]{2K[1]^3 - 27K[1]^2 + 3\sqrt{3}\sqrt{-K[1]}}}{2\sqrt[3]{2}K[1]^2 + 2\sqrt[3]{2K[1]^3 - 27K[1]^2 + 3\sqrt{3}\sqrt{-K[1]^4(4K[1] - 27)K[1] + 27}}dx\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.125 (sec), leaf count = 370

```
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

$$-x^3y(x)^6 - (x^2 + y(x)^4 + xy(x)^2) y'(x)^2 + (x^3y(x)^2 + x^2y(x)^4 + xy(x)^6) y'(x) + y'(x)^2 = 0$$

✗ Mathematica : cpu = 49.6258 (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]^2, y[x], 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[1][y][x]^2, y[x], x]
```

✗ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x)^2-(y(x)^4+x*y(x)^2+x^2)*diff(y(x),x)^2+(x*y(x)^6+x^2*y(x)^4+x^3*y(x)^3*y(x)^6=0,y(x))
```

, could not solve

```
dsolve(diff(y(x),x)^2-(y(x)^4+x*y(x)^2+x^2)*diff(y(x),x)^2+(x*y(x)^6+x^2*y(x)^4+x^3*y(x)^3*y(x)^6=0,y(x))
```

2.532 ODE No. 532

$ay'(x)^3 + by'(x)^2 + cy'(x) - d - y(x) = 0$

✓ **Mathematica** : cpu = 0.0222637 (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], x]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[\int \frac{\sqrt[3]{2b^3 - 9acb - 27a^2d - 27a^2\#1 + \sqrt{4(3ac - b^2)^3 + (2b^3 - 9acb - 27a^2d)^2}}}{2\sqrt[3]{2b^2} + 2\sqrt[3]{2b^3 - 9acb - 27a^2d - 27a^2\#1 + \sqrt{4(3ac - b^2)^3 + (2b^3 - 9acb - 27a^2d)^2}}} dx \right] \right\} \right\}$$

✓ **Maple** : cpu = 0.356 (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))
```

$$x - \int^{y(x)} \frac{3 \cdot 6^{1/3} a 27^{1/3} \left(\left(\sqrt{27(d+ \_a)^2 a^2 + 18((d+ \_a)b + \frac{2c^2}{9})ca + (-4d - 4\_a)b^3 - b^2c^2 a} \right)}{3 \cdot 6^{2/3} ac - 6^{2/3} b^2 + 6^{1/3} 27^{1/3} \left(\left(\frac{\sqrt{27(d+ \_a)^2 a^2 + 18((d+ \_a)b + \frac{2c^2}{9})ca + (-4d - 4\_a)b^3 - b^2c^2 a}}{3} + (a^2 (d + \_a) \right)} \right)} dy}{1}$$

2.533

ODE No. 533

$$a + xy'(x)^3 - y(x)y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0039357 (sec), leaf count = 16

```
DSolve[a - y[x]*Derivative[1][y][x]^2 + x*Derivative[1][y][x]^3 == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{a}{c_1^2} + c_1 x \right\} \right\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 76

```
dsolve(x*diff(y(x),x)^3-y(x)*diff(y(x),x)^2+a=0,y(x))
```

$$y(x) = \frac{3 \, 2^{1/3} (a \, x^2)^{1/3}}{2}$$

2.534

ODE No. 534

$$4xy'(x)^3 - 6y(x)y'(x)^2 + 3y(x) - x = 0$$

✓ **Mathematica** : cpu = 0.0464308 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{-\sqrt{2}\sqrt{c_1x^3 + 3c_1^2x^2 + 3c_1^3x + c_1^4} - c_1^2}{3c_1} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{2}\sqrt{c_1x^3 + 3c_1^2x^2 + 3c_1^3x + c_1^4} - c_1^2}{3c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.056 (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 = 0.036493 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{(x+3c_1)^{3/2}}{3\sqrt{c_1}} \right\}, \left\{ y(x) \rightarrow \frac{(x+3c_1)^{3/2}}{3\sqrt{c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.05 (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 = 0.0258429 (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)*Deriv

$$\left\{\left\{y(x)\rightarrow -\frac{bx^2}{2}+c_1\right\},\left\{y(x)\rightarrow -\tan^{-1}\left(\frac{x}{\sqrt{a^2-x^2}}\right)+c_1\right\},\left\{y(x)\rightarrow \tan^{-1}\left(\frac{x}{\sqrt{a^2-x^2}}\right)+c_1\right\}\right\}$$

✓

Maple : cpu = 0.034 (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))

$$y(x)=-\frac{bx^2}{2}+c_1$$

2.537

ODE No. 537

$$(x^6 + 3xy(x)^2) y'(x) - 2x^5y(x) + x^3y'(x)^3 - 3x^2y(x)y'(x)^2 - y(x)^3 = 0$$

✓

Mathematica : cpu = 0.0240933 (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]^2 - y[x]^3 == 0,x]

$$\left\{\left\{y(x) \rightarrow x\left(c_1 x+c_1^3\right)\right\}\right\}$$

✗

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==0,x)

, exception

time expired

2.538

ODE No. 538

$$2(xy'(x)+y(x))^3-y(x)y'(x)=0$$

✓ **Mathematica** : cpu = 2.92399 (sec), leaf count = 179

```
DSolve[-(y[x]*Derivative[1][y][x]) + 2*(y[x] + x*Derivative[1][y][x])^3 == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{\int_1^x \frac{\text{InverseFunction}\left[-\frac{2\sqrt{\#1^2-8\#1^3}\tan^{-1}(\sqrt{8\#1-1})}{\#1\sqrt{8\#1-1}}-14\log(\#1^2(8\#1-1))+\log\left(\#1^{14}(8\#1-1)^{15/2}\left(\#1-\sqrt{\#1^2-8\#1^3}\right)\right)+\log(\#1^2(8\#1-1)^{15/2}\left(\#1-\sqrt{\#1^2-8\#1^3}\right)\right)}{K[1]}\right.\right.}$$

x

✓ **Maple** : cpu = 4.116 (sec), leaf count = 1725

```
dsolve(2*(x*diff(y(x),x)+y(x))^3-y(x)*diff(y(x),x)=0,y(x))
```

$$\int_{-b}^x \frac{-6^{2/3}\left(-9_{-}a^2\left(-\frac{\sqrt{3}\sqrt{\frac{27_{-}ay(x)^2-2y(x)}{-a}}}{9}+y(x)\right)y(x)\right)^{2/3}+6_{-}ay(x)\left(6^{1/3}\left(-9_{-}a^2\left(-\frac{\sqrt{3}\sqrt{\frac{27_{-}ay(x)^2-2y(x)}{-a}}}{9}+y(x)\right)y(x)\right)^{2/3}+6_{-}a^2y(x)+_{-}a6^{2/3}\left(-9_{-}a^2\left(-\frac{\sqrt{3}\sqrt{\frac{27_{-}ay(x)^2-2y(x)}{-a}}}{9}+y(x)\right)y(x)\right)^{2/3}}{6_{-}a^2y(x)+_{-}a6^{2/3}\left(-9_{-}a^2\left(-\frac{\sqrt{3}\sqrt{\frac{27_{-}ay(x)^2-2y(x)}{-a}}}{9}+y(x)\right)y(x)\right)^{2/3}}$$

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 = 0.0203852 (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])*
```

$$\left\{\left\{y(x) \rightarrow c_1 e^x\right\},\left\{y(x) \rightarrow \tanh ^{-1}(\cos (x))+c_1\right\},\left\{y(x) \rightarrow -\cos (x)+c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.066 (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))*
```

$$y(x)=c_1e^x$$

2.540

ODE No. 540

$$2y(x)y'(x)^3 - y(x)y'(x)^2 + 2xy'(x) - x = 0$$

✓ **Mathematica** : cpu = 0.0273933 (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,
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x}{2} + c_1 \right\}, \left\{ y(x) \rightarrow \frac{(3c_1 - 2ix^{3/2})^{2/3}}{2^{2/3}} \right\}, \left\{ y(x) \rightarrow \frac{(2ix^{3/2} + 3c_1)^{2/3}}{2^{2/3}} \right\} \right\}$$

✓ **Maple** : cpu = 0.087 (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))
```

$$x + \frac{xc_1}{\left(\frac{-\sqrt{-xy(x)}+y(x)}{y(x)}\right)^{2/3} \left(\frac{-x+\sqrt{-xy(x)}+y(x)}{y(x)}\right)^{2/3} y(x)} = 0$$

2.541

ODE No. 541

$$y(x)^2y'(x)^3+2xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0216485 (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]
```

$$\left\{\left\{y(x)\rightarrow-\sqrt{2c_1x+c_1^3}\right\},\left\{y(x)\rightarrow\sqrt{2c_1x+c_1^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.501 (sec), leaf count = 103

```
dsolve(y(x)^2*diff(y(x),x)^3+2*x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x)=-\frac{2\,2^{1/4}3^{1/4}(-x^3)^{1/4}}{3}$$

2.542

ODE No. 542

$$16y(x)^2y'(x)^3+2xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0217818 (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]
```

$$\left\{\left\{y(x)\rightarrow \sqrt{c_1x+2c_1^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.525 (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))
```

$$y(x)=-\frac{2^{1/4}3^{1/4}(-x^3)^{1/4}}{3}$$

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 = 0.0167105 (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
```

$$\left\{\left\{y(x)\rightarrow-\sqrt{c_1x^2+\frac{c_1}{1+c_1^2}}\right\},\left\{y(x)\rightarrow\sqrt{c_1x^2+\frac{c_1}{1+c_1^2}}\right\}\right\}$$

✗ **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
```

, 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
```

2.544

ODE No. 544

$$x^7y(x)^2y'(x)^3 - (3x^6y(x)^3 - 1) y'(x)^2 + 3x^5y(x)^4y'(x) - x^4y(x)^5 = 0$$

✓ **Mathematica** : cpu = 0.0539088 (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], y[x], x]
```

$$\left\{\left\{y(x) \rightarrow \sqrt[3]{c_1 x^3 + c_1^{2/3}}\right\}\right\}$$

✓ **Maple** : cpu = 3.256 (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^4*y(x)^5,y(x),x)
```

$$y(x) = \frac{2^{2/3}}{3x^2}$$

2.545

ODE No. 545

$$y'(x)^4 - (y(x) - a)^3(y(x) - b)^2 = 0$$

✓ **Mathematica** : cpu = 0.512129 (sec), leaf count = 323

`DSolve[-((-a + y[x])^3*(-b + y[x])^2) + Derivative[1][y][x]^4 == 0,y[x],x]`

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{4\sqrt[4]{a-\#1}\sqrt{\frac{\#1-b}{a-b}} {}_2F_1\left(\frac{1}{4}, \frac{1}{2}, \frac{5}{4}, \frac{a-\#1}{a-b}\right)}{\sqrt{b-\#1}} \& \right] \left[-\sqrt[4]{-1}x + c_1 \right] \right\}, \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{4\sqrt[4]{a-\#1}\sqrt{\frac{\#1-b}{a-b}} {}_2F_1\left(\frac{1}{4}, \frac{1}{2}, \frac{5}{4}, \frac{a-\#1}{a-b}\right)}{\sqrt{b-\#1}} \& \right] \left[-\sqrt[4]{-1}x + c_1 \right] \right\} \right.$$

✓ **Maple** : cpu = 0.183 (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 = 0.0312256 (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][x]^4 == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{12} \left(-\sqrt{64x^3 + 48c_1^2x^2 + 12c_1^4x + c_1^6} - 6c_1x + 6 - c_1^3 + 6c_1 \right) \right\}, \left\{ y(x) \rightarrow \frac{1}{12} \left(\sqrt{64x^3 + 48c_1^2x^2 + 12c_1^4x + c_1^6} - 6c_1x + 6 - c_1^3 + 6c_1 \right) \right\} \right.$$

✓ **Maple** : cpu = 0.074 (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 = 5.18094 (sec), leaf count = 763

`DSolve[Derivative[1][y][x]^4 - 4*y[x]*(-2*y[x] + x*Derivative[1][y][x])^2 == 0,y[x],x]`

$$\left\{ \text{Solve} \left[\frac{\sqrt{x^2 - 4\sqrt{y(x)}} \sqrt{x^2 y(x) - 4y(x)^{3/2}}}{8y(x) - 2x^2 \sqrt{y(x)}} + \frac{\sqrt{\left(x^2 - 4\sqrt{y(x)}\right) y(x) \log \left(\sqrt{x^2 - 4\sqrt{y(x)}} - x\right)}}{\sqrt{x^2 - 4\sqrt{y(x)}} \sqrt{y(x)}} + \log \left(4\sqrt{y(x)}\right) \right] \right.$$

✓

Maple : cpu = 0.245 (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 = 0.733067 (sec), leaf count = 479

`DSolve[-((-a + y[x])^4*(-b + y[x])^3) + Derivative[1][y][x]^6 == 0,y[x],x]`

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{3\sqrt[3]{a-\#1}\sqrt{\frac{\#1-b}{a-b}} {}_2F_1\left(\frac{1}{3}, \frac{1}{2}; \frac{4}{3}, \frac{a-\#1}{a-b}\right)}{\sqrt{b-\#1}} \& \right] [c_1 - ix] \right\}, \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{3\sqrt[3]{a-\#1}\sqrt{\frac{\#1-b}{a-b}} {}_2F_1\left(\frac{1}{3}, \frac{1}{2}; \frac{4}{3}, \frac{a-\#1}{a-b}\right)}{\sqrt{b-\#1}} \& \right] [c_1 + ix] \right\} \right.$$

✓

Maple : cpu = 0.439 (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

$$x^2\big(y'(x)^2+1\big)^3-a^2=0$$

✓ **Mathematica** : cpu = 0.332825 (sec), leaf count = 216

```
DSolve[-a^2 + x^2*(1 + Derivative[1][y][x]^2)^3 == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow -x\left(\frac{a^{2/3}}{x^{2/3}}-1\right)^{3/2}+c_1\right\},\left\{y(x)\rightarrow x\left(\frac{a^{2/3}}{x^{2/3}}-1\right)^{3/2}+c_1\right\},\left\{y(x)\rightarrow c_1-x\left(-1-\frac{i\left(\sqrt{3}-i\right)a}{2x^{2/3}}\right)\right\}\right.$$

✓ **Maple** : cpu = 1.083 (sec), leaf count = 545

```
dsolve(x^2*(diff(y(x),x)^2+1)^3-a^2=0,y(x))
```

$$y(x)=\frac{\sqrt{-\frac{(a^2x)^{4/3}\left((a^2x)^{2/3}-a^2\right)}{a^4}}\left((a^2x)^{2/3}-a^2\right)}{(a^2x)^{2/3}}+c_1$$

2.550

ODE No. 550

$$-ay(x)^s - bx^{\frac{rs}{r-s}} + y'(x)^r = 0$$

✓

Mathematica : cpu = 1.74617 (sec), leaf count = 488

DSolve[-(b*x^((r*s)/(r - s))) - a*y[x]^s + Derivative[1][y][x]^r == 0,y[x],x]

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{r}{-rx\left(aK[2]^s+bx^{\frac{rs}{r-s}}\right)^{\frac{1}{r}}+sx\left(aK[2]^s+bx^{\frac{rs}{r-s}}\right)^{\frac{1}{r}}+rK[2]}-\int_1^x\left(\frac{asK[2]^{s-}}{rK[1]\left(aK[2]^s+bK[1]^{\frac{rs}{r-s}}\right)}\right.\right.\right.$$

✓

Maple : cpu = 0.299 (sec), leaf count = 64

dsolve(diff(y(x),x)^r-a*y(x)^s-b*x^(r*s/(r-s))=0,y(x))

$$-\left(\int_{-b}^{y(x)}\frac{1}{x\left(r-s\right)\left(a_{-}a^s+bx^{\frac{rs}{r-s}}\right)^{\frac{1}{r}}-r_{-}a}d_{-}a\right)+\frac{\ln\left(x\right)}{r-s}-c_1=0$$

2.551

ODE No. 551

$$y'(x)^n - f(x)^n(y(x) - a)^{n+1}(y(x) - b)^{n-1} = 0$$

✓ **Mathematica** : cpu = 8.98785 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{-bn^n - a(a-b)^n \left(\int_1^x -(-1)^{\frac{1}{n}} f(K[1]) dK[1] + c_1 \right)^n}{-n^n - (a-b)^n \left(\int_1^x -(-1)^{\frac{1}{n}} f(K[1]) dK[1] + c_1 \right)^n} \right\} \right\}$$

✓ **Maple** : cpu = 0.756 (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 = 0.0503749 (sec), leaf count = 41

DSolve[-(f[x]*g[y[x]]) + Derivative[1][y][x]^n == 0,y[x],x]

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[\int_1^{\#1} g(K[1])^{-1/n} dK[1] \&\right] \left[\int_1^x f(K[2])^{\frac{1}{n}} dK[2] + c_1\right]\right\}\right\}$$

✓

Maple

: cpu = 0.086 (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

$$ay'(x)^m + by'(x)^n - y(x) = 0$$

✓

Mathematica : cpu = 0.378077 (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 = 0.066 (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 = 0.128068 (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 = 0.292 (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 = 0.0048813 (sec), leaf count = 20

```
DSolve[-y[x] + x*Derivative[1][y][x] + Sqrt[1 + Derivative[1][y][x]^2] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1 x + \sqrt{1 + c_1^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.037 (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 = 2.90167 (sec), leaf count = 78

```
DSolve[y[x] + x*Derivative[1][y][x]^2 + Sqrt[1 + Derivative[1][y][x]^2] == 0,y[x],x]
```

Solve $\left[\left\{ x = \frac{\log \left(\sqrt{K[1]^2 + 1} - K[1] \right) - \sqrt{K[1]^2 + 1}}{(K[1] + 1)^2} + \frac{c_1}{(K[1] + 1)^2}, y(x) = -xK[1]^2 - \sqrt{K[1]^2 + 1} \right\}, \{y(x) = -xK[1]^2 - \sqrt{K[1]^2 + 1}\} \right]$

✓ **Maple** : cpu = 0.547 (sec), leaf count = 581

```
dsolve((diff(y(x),x)^2+1)^(1/2)+x*diff(y(x),x)^2+y(x)=0,y(x))
```

$$\frac{x^2 c_1}{\left(\sqrt{-4xy(x)+2+2\sqrt{4x^2-4xy(x)+1}}-2x\right)^2+x} + \frac{2x^2\left(\sqrt{2}\sqrt{\frac{2x^2-2xy(x)+\sqrt{4x^2-4xy(x)+1}+1}{x^2}}-2\operatorname{arcsinh}\left(\frac{\sqrt{2}\sqrt{4x^2-4xy(x)+1}}{2x}\right)\right)}{\left(\sqrt{-4xy(x)+2+2\sqrt{4x^2-4xy(x)+1}}-2x\right)^2+x}$$

2.557

ODE No. 557

$$x\left(y'(x)+\sqrt{y'(x)^2+1}\right)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0347759 (sec), leaf count = 39

```
DSolve[-y[x] + x*(Derivative[1][y][x] + Sqrt[1 + Derivative[1][y][x]^2]) == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow-\sqrt{-x^2+c_1x}\right\},\left\{y(x)\rightarrow\sqrt{-x^2+c_1x}\right\}\right\}$$

✓ **Maple** : cpu = 0.076 (sec), leaf count = 105

```
dsolve(x*((diff(y(x),x)^2+1)^(1/2)+diff(y(x),x))-y(x)=0,y(x))
```

$$y(x)=\frac{x\left(\sqrt{-\frac{c_1^2}{x(-2c_1+x)}}\sqrt{2xc_1-x^2}+c_1-x\right)}{\sqrt{2xc_1-x^2}}$$

2.558

ODE No. 558

$$ax\sqrt{y'(x)^2+1}+xy'(x)-y(x)=0$$

✓

Mathematica : cpu = 0.335376 (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]`

$$\left\{ \text{Solve} \left[\frac{2i \tan^{-1} \left(\frac{y(x)}{x \sqrt{a^2 - \frac{y(x)^2}{x^2} - 1}} \right) - 2ia \tan^{-1} \left(\frac{ay(x)}{x \sqrt{a^2 - \frac{y(x)^2}{x^2} - 1}} \right) + a \log \left(\frac{y(x)^2}{x^2} + 1 \right)}{2a^2 - 2} = \frac{a \log (x - a^2 x)}{1 - a^2} + c_1, y \right] \right.$$

✓

Maple : cpu = 0.469 (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 = 0.183543 (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]`

$$\left\{\left\{y(x)\rightarrow-\frac{\sqrt{a^6\left(-x^2\right)+3a^4x^2-3a^2x^2-2a^2xe^{a^2c_1-c_1}+2xe^{a^2c_1-c_1}+e^{2a^2c_1-2c_1}+x^2}}{\sqrt{a^6-3a^4+3a^2-1}}\right\},\left\{y(x)\rightarrow\frac{\sqrt{a^6\left(-x^2\right)+3a^4x^2-3a^2x^2-2a^2xe^{a^2c_1-c_1}+2xe^{a^2c_1-c_1}+e^{2a^2c_1-2c_1}+x^2}}{\sqrt{a^6-3a^4+3a^2-1}}\right\}\right.$$

✓

Maple : cpu = 0.197 (sec), leaf count = 215

`dsolve(y(x)*(diff(y(x),x)^2+1)^(1/2)-a*y(x)*diff(y(x),x)-a*x=0,y(x))`

$$-e^{\int\frac{-a^2x+\sqrt{y(x)^2(a^2-1)+a^2x^2}}{(a^2-1)y(x)}dx}\frac{(a\sqrt{-a^2+1}-a)a}{\sqrt{-a^2+1}\left(-aa-\sqrt{-a^2+1}\right)(a-a^2-\sqrt{-a^2+1}-a+a)^d}-a c_1+x=0$$

2.560

ODE No. 560

$ay(x)\sqrt{y'(x)^2+1}-x^2-2xy(x)y'(x)+y(x)^2=0$

✓ **Mathematica** : cpu = 25.6773 (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], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{a^2 c_1^2 (-x^2) - 4 a^2 c_1 x - 4 a^2 + 4 x^2}}{\sqrt{-4 + a^2 c_1^2}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{a^2 c_1^2 (-x^2) - 4 a^2 c_1 x - 4 a^2 + 4 x^2}}{\sqrt{-4 + a^2 c_1^2}} \right\} \right\}$$

✓ **Maple** : cpu = 1.163 (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))
```

$$\int_{-b}^x \frac{2_-a^3 - 2_-ay(x)^2 + \sqrt{a^2 \left(y(x)^4 - (-2_-a^2 + a^2)y(x)^2 + _-a^4\right)} - 2_-a^5 + 4_-a^3y(x)^2 + 2y(x)^4 _-a + _-a^2\sqrt{a^2 \left(y(x)^4 - (-2_-a^2 + a^2)y(x)^2 + _-a^4\right)} - y(x)^2}{1} dx$$

2.561

ODE No. 561

$$f\big(x^2+y(x)^2\big)\sqrt{y'(x)^2+1}-xy'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 2.07753 (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]
```

$$\left\{\text{Solve}\left[\int_1^x\left(\frac{\sqrt{f\left(K[1]^2+y(x)^2\right)^2\left(-f\left(K[1]^2+y(x)^2\right)^2+K[1]^2+y(x)^2\right)K[1]}}{f\left(K[1]^2+y(x)^2\right)^2\left(K[1]^2+y(x)^2\right)}-\frac{\sqrt{f\left(K[1]^2+y(x)^2\right)^2\left(-f\left(K[1]^2+y(x)^2\right)^2+K[1]^2+y(x)^2\right)}}{f\left(K[1]^2+y(x)^2\right)^2\left(K[1]^2+y(x)^2\right)}\right]dx\right\}$$

✓ **Maple** : cpu = 2.346 (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 = 0.0853865 (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]`

$$\text{Solve}\left[\left\{x=K[1]^{\frac{b}{1-b}}\left(\frac{a\int\frac{K[1]^{\frac{2b-1}{b-1}}dK[1]}{(K[1]^3+1)^{2/3}}+c_1\right),y(x)=a\sqrt[3]{K[1]^3+1}+bxK[1]\right\},\{K[1],y(x)\}\right]$$

✓

Maple : cpu = 0.261 (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

$$ay(x) + b + xy'(x) + \log(y'(x)) = 0$$

✓ **Mathematica** : cpu = 0.13645 (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 = 0.25 (sec), leaf count = 66

```
dsolve(ln(diff(y(x),x))+x*diff(y(x),x)+a*y(x)+b=0,y(x))
```

$$-\left(e^{-ay(x)-\text{LambertW}\left(xe^{-ay(x)-b}\right)-b}\right)^{-\frac{1}{a+1}}c_1+x-\frac{e^{ay(x)+\text{LambertW}\left(xe^{-ay(x)-b}\right)+b}}{a}=0$$

2.564

ODE No. 564

$$a(xy'(x) - y(x)) + \log(y'(x)) = 0$$

✓ **Mathematica** : cpu = 0.003763 (sec), leaf count = 17

```
DSolve[Log[Derivative[1][y][x]] + a*(-y[x] + x*Derivative[1][y][x]) == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\log(c_1)}{a} + c_1 x \right\} \right\}$$

✓ **Maple** : cpu = 0.025 (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

$$y'(x)+y(x)\log(y'(x))-xy(x)-y(x)\log(y(x))=0$$

✓ **Mathematica** : cpu = 0.0358012 (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
```

$$\left\{\left\{y(x)\rightarrow c_1e^{\frac{1}{2}W(e^x)^2+W(e^x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.35 (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))
```

$$y(x)=c_1e^{\frac{\operatorname{LambertW}\left(e^x\right)\left(\operatorname{LambertW}\left(e^x\right)+2\right)}{2}}$$

2.566

ODE No. 566

$$y'(x) + \sin(y'(x)) - x = 0$$

✓ **Mathematica** : cpu = 0.0333336 (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 = 0.033 (sec), leaf count = 16

```
dsolve(sin(diff(y(x),x))+diff(y(x),x)-x=0,y(x))
```

$$y(x) = \int \text{RootOf}(\sin(\_Z) + \_Z - x) dx + c_1$$

2.567

ODE No. 567

$$a \cos (y'(x))+by'(x)+x=0$$

✓ **Mathematica** : cpu = 0.0655936 (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 = 0.039 (sec), leaf count = 18

```
dsolve(a*cos(diff(y(x),x))+b*diff(y(x),x)+x=0,y(x))
```

$$y(x)=\int \text{RootOf}\left(a\cos\left(\_Z\right)+\_Zb+x\right)dx+c_1$$

2.568

ODE No. 568

$$y'(x)^2 \sin(y'(x)) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0787218 (sec), leaf count = 34

```
DSolve[-y[x] + Sin[Derivative[1][y][x]]*Derivative[1][y][x]^2 == 0,y[x],x]
```

$$\text{Solve}\big[\{x = K[1] \sin(K[1]) - \cos(K[1]) + c_1, y(x) = K[1]^2 \sin(K[1])\}, \{y(x), K[1]\}\big]$$

✓ **Maple** : cpu = 0.073 (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

$$(y'(x)^2 + 1) \sin^2(y(x) - xy'(x)) - 1 = 0$$

✓ **Mathematica** : cpu = 0.0712869 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x - \frac{1}{2} \cos^{-1} \left(\frac{-1 + c_1^2}{1 + c_1^2} \right) \right\}, \left\{ y(x) \rightarrow c_1 x + \frac{1}{2} \cos^{-1} \left(\frac{-1 + c_1^2}{1 + c_1^2} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.326 (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

$$(y'(x)^2 + 1) (ax + \tan^{-1}(y'(x))) + y'(x) = 0$$

✓ **Mathematica** : cpu = 1.18265 (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], x]
```

$$\text{Solve}\left[\left\{y(x) = \frac{1}{a(K[1]^2 + 1)} + c_1, x = \frac{-K[1] + K[1]^2(-\tan^{-1}(K[1])) - \tan^{-1}(K[1])}{a(K[1]^2 + 1)}\right\}, \{y(x), K[1]\}\right]$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 30

```
dsolve((diff(y(x), x)^2+1)*(arctan(diff(y(x), x))+a*x)+diff(y(x), x)=0, y(x))
```

$$y(x) = \int \tan \left(\text{RootOf} \left(ax \tan \left(\_Z \right)^2 + \tan \left(\_Z \right)^2 \_Z + ax + \tan \left(\_Z \right) + \_Z \right) \right) dx + c_1$$

2.571

ODE No. 571

$$ax^nf(y'(x))+xy'(x)-y(x)=0$$

✓

Mathematica : cpu = 0.120291 (sec), leaf count = 124

`DSolve[a*x^n*f[Derivative[1][y][x]] - y[x] + x*Derivative[1][y][x] == 0,y[x],x]`

$$\text{Solve}\left[\left\{y(x)=ax^nf(K[1])+xK[1],x=\left(nf(K[1])^{\frac{1}{n}-1}\int_1^{K[1]}-\frac{f(K[2])^{\frac{n-1}{n}-1}}{an}dK[2]-f(K[1])^{\frac{1}{n}-1}\int_1^{K[1]}-\right.\right.\right.$$

✓

Maple : cpu = 1.09 (sec), leaf count = 169

`dsolve(a*x^n*f(diff(y(x),x))+x*diff(y(x),x)-y(x)=0,y(x))`

$$\left[y(\_T)=a\left(\left(\frac{(1-n)\left(\int f(\_T)^{-\frac{1}{n}}d\_T\right)+c_1an}{anf(\_T)}\right)^{\frac{1}{n-1}}f(\_T)^{\frac{1}{n(n-1)}}\right)^nf(\_T)+\_T\left(\frac{(1-n)\left(\int f(\_T)^{-\frac{1}{n}}\right.}{anf(\_T)}\right.\right.$$

2.572

ODE No. 572

$$f(y'(x))(xy'(x)-y(x))^n+y(x)g(y'(x))+xh(y'(x))=0$$

✗ Mathematica : cpu = 0.0563605 (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*Derivative[1][y][x])^n == 0, y[x], x]
```

, could not solve

```
DSolve[x*h[Derivative[1][y][x]] + g[Derivative[1][y][x]]*y[x] + f[Derivative[1][y][x]]*(-y[x] + x*Derivative[1][y][x])^n == 0, y[x], x]
```

✗ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve((x*diff(y(x),x)-y(x))^n*f(diff(y(x),x))+y(x)*g(diff(y(x),x))+x*h(diff(y(x),x))=0, y(x), 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), x)
```

2.573

ODE No. 573

$$f\left(xy'(x)^2\right)+2xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0200109 (sec), leaf count = 42

```
DSolve[f[x*Derivative[1][y][x]^2] - y[x] + 2*x*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow f(c_1)-2\sqrt{c_1}\sqrt{x},y(x)\rightarrow f(c_1)+2\sqrt{c_1}\sqrt{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (sec), leaf count = 24

```
dsolve(f(x*diff(y(x),x)^2)+2*x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x)=c_1+2\sqrt{x}\operatorname{RootOf}\left(-f\left(\_Z^2\right)-2\_Z+c_1+c_2\right)$$

2.574

ODE No. 574

$$f\left(x-\frac{3}{2}y'(x)^2\right)+y'(x)^3-y(x)=0$$

✓ **Mathematica** : cpu = 0.0275355 (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]
```

$$\left\{\left\{y(x)\rightarrow\frac{1}{9}\left(9f(c_1)+2\sqrt{6}x\sqrt{x-c_1}-2\sqrt{6}c_1\sqrt{x-c_1}\right),y(x)\rightarrow\frac{1}{9}\left(9f(c_1)-2\sqrt{6}x\sqrt{x-c_1}+2\sqrt{6}c_1\sqrt{x-c_1}\right)\right\}\right.$$

✓ **Maple** : cpu = 0.135 (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

$$y'(x)f(xy(x)y'(x)-y(x)^2)+x^2(-y'(x))+xy(x)=0$$

 **Mathematica** : cpu = 0.0288085 (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], y[x], 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[1][y][x], y[x], x]
```

 **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

$$\phi(f(x,y(x),y'(x)),g(x,y(x),y'(x)))=0$$

X Mathematica : cpu = 0.0146384 (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 = 0.302632 (sec), leaf count = 243

```
DSolve[Derivative[1][y][x] == F[y[x]/(a + x)], y[x], x]
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{1}{-aF\left(\frac{K[2]}{a+x}\right) - xF\left(\frac{K[2]}{a+x}\right) + K[2]} - \int_1^x \left(\frac{F'\left(\frac{K[2]}{a+K[1]}\right)}{(a+K[1])\left(aF\left(\frac{K[2]}{a+K[1]}\right) + K[1]F\left(\frac{K[2]}{a+K[1]}\right) - K[2]\right)} \right. \right.$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 28

```
dsolve(diff(y(x), x) = F(y(x)/(x+a)), y(x))
```

$$y(x) = -\text{RootOf}\left(\int^{-Z} \frac{1}{F(-_a) + _a} d\_a + \ln(x+a) + c_1\right)(x+a)$$

2.578

ODE No. 578

$$y'(x) = F(y(x) - x^2) + 2x$$

✓ **Mathematica** : cpu = 0.169573 (sec), leaf count = 100

```
DSolve[Derivative[1][y][x] == 2*x + F[-x^2 + y[x]], y[x], x]
```

Solve $\left[\int_1^{y(x)} -\frac{F(K[2] - x^2) \int_1^x -\frac{2K[1]F'(K[2] - K[1]^2)}{F(K[2] - K[1]^2)^2} dK[1] + 1}{F(K[2] - x^2)} dK[2] + \int_1^x \left(\frac{2K[1]}{F(y(x) - K[1]^2)} + 1 \right) dK[1] = \right.$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 22

```
dsolve(diff(y(x), x) = 2*x+F(y(x)-x^2), y(x))
```

$$y(x) = x^2 + \text{RootOf} \left(-x + \int^{\text{-Z}} \frac{1}{F(\text{-a})} d\text{-a} + c_1 \right)$$

2.579

ODE No. 579

$$y'(x) = F\left(\frac{ax^2}{4} + \frac{bx}{2} + y(x)\right) - \frac{ax}{2}$$

✓ **Mathematica** : cpu = 0.217984 (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]
```

Solve

$$\left[\int_1^{y(x)} - \frac{b \int_1^x \left(\frac{2aK[1]F'(\frac{1}{4}aK[1]^2 + \frac{1}{2}bK[1] + K[2])}{(b+2F(\frac{1}{4}aK[1]^2 + \frac{1}{2}bK[1] + K[2]))^2} + \frac{2F'(\frac{1}{4}aK[1]^2 + \frac{1}{2}bK[1] + K[2])}{b+2F(\frac{1}{4}aK[1]^2 + \frac{1}{2}bK[1] + K[2])} - \frac{4F(\frac{1}{4}aK[1]^2 + \frac{1}{2}bK[1] + K[2])F'(\frac{1}{4}aK[1]^2 + \frac{1}{2}bK[1] + K[2])}{(b+2F(\frac{1}{4}aK[1]^2 + \frac{1}{2}bK[1] + K[2]))^2} \right) dx}{1}$$

✓ **Maple** : cpu = 0.055 (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))
```

$$y(x) = -\frac{a\,x^2}{4} - \frac{bx}{2} + \text{RootOf}\left(-x + 2\left(\int^{-x} \frac{1}{2F(\_a) + b} d\_a\right) + c_1\right)$$

2.580 ODE No. 580

$$y'(x) = e^{bx} F(e^{-bx} y(x))$$

- ✓ **Mathematica** : cpu = 0.251414 (sec), leaf count = 203

```
Dsolve[Derivative[1][y][x] == E^(b*x)*F[y[x]/E^(b*x)], y[x], x]
```

$$\text{Solve} \left[\int_1^{y(x)} \left(\frac{1}{bK[2] - e^{bx}F(e^{-bx}K[2])} \right) - \int_1^x \left(\frac{F'(e^{-bK[1]}K[2])}{e^{bK[1]}F(e^{-bK[1]}K[2]) - bK[2]} - \frac{e^{bK[1]}F(e^{-bK[1]}K[2]) (F'(e^{-bK[1]}K[2])}{(e^{bK[1]}F(e^{-bK[1]}K[2]) - bK[2])} \right) \right]$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 31

```
dsolve(diff(y(x),x) = F(y(x)*exp(-b*x))*exp(b*x),y(x))
```

$$y(x) = \text{RootOf} \left(-x + \int^{-Z} \frac{1}{F(\_a) - \_ab} d\_a + c_1 \right) e^{bx}$$

2.581 ODE No. 581

$$y'(x) = \frac{x F\left(\frac{x^2 y(x) + \frac{1}{4}}{x^2}\right) + \frac{1}{2}}{x^3}$$

✓ **Mathematica** : cpu = 0.240012 (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]
```

Solve $\left[\int_1^{y(x)} \frac{F\left(\frac{K[2]x^2 + \frac{1}{4}}{x^2}\right) \int_1^x -\frac{F'\left(\frac{K[2]K[1]^2 + \frac{1}{4}}{K[1]^2}\right)}{2F\left(\frac{K[2]K[1]^2 + \frac{1}{4}}{K[1]^2}\right)^2 K[1]^3} dK[1] + 1}{F\left(\frac{K[2]x^2 + \frac{1}{4}}{x^2}\right)} dK[2] + \int_1^x \left(\frac{1}{K[1]^2} + \frac{1}{2K[1]^3 F\left(\frac{y(x)K[1]^2 + \frac{1}{4}}{K[1]^2}\right)} \right) \right]$

✓ **Maple** : cpu = 0.099 (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))
```

$$y(x) = \frac{4 \operatorname{RootOf}\left(\left(\int^{-Z} \frac{1}{F(\_a)} d\_a\right) x + x c_1 + 1\right) x^2 - 1}{4 x^2}$$

2.582

ODE No. 582

$$y'(x) = \frac{ax^2F\left(\frac{axy(x)+1}{ax}\right) + 1}{ax^2}$$

✓ **Mathematica** : cpu = 0.285467 (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]
```

Solve

$$\left[\int_1^{y(x)} -\frac{F\left(\frac{axK[2]+1}{ax}\right) \int_1^x \frac{F'\left(\frac{aK[1]K[2]+1}{aK[1]}\right)}{aF\left(\frac{aK[1]K[2]+1}{aK[1]}\right)^2 K[1]^2} dK[1] - 1}{F\left(\frac{axK[2]+1}{ax}\right)} dK[2] + \int_1^x \left(-1 - \frac{1}{aK[1]^2 F\left(\frac{aK[1]y(x)+1}{aK[1]}\right)}\right) dK[1] \right]$$

✓ **Maple** : cpu = 0.178 (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))
```

$$y(x) = \frac{\text{RootOf}\left(-x + \int^{-Z} \frac{1}{F(\_a)} d\_a + c_1\right) xa - 1}{xa}$$

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 = 0.259057 (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]
```

Solve $\left[\int_1^{y(x)} -\frac{F\left(\frac{ax^4}{8} + K[2]\right) \int_1^x \frac{aK[1]^3 F'\left(\frac{1}{8}aK[1]^4 + K[2]\right)}{2F\left(\frac{1}{8}aK[1]^4 + K[2]\right)^2} dK[1] + 1}{F\left(\frac{ax^4}{8} + K[2]\right)} dK[2] + \int_1^x \left(K[1] - \frac{aK[1]^3}{2F\left(\frac{1}{8}aK[1]^4 + y(x)\right)} \right) \right]$

✓ **Maple** : cpu = 0.134 (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))
```

$$y(x) = -\frac{ax^4}{8} + \text{RootOf}\left(-x^2 + 2\left(\int^{-Z} \frac{1}{F(\_a)} d\_a\right) + 2c_1\right)$$

2.584

ODE No. 584

$$y'(x) = \frac{2a}{2aF(y(x)^2 - 4ax) + y(x)}$$

✓ **Mathematica** : cpu = 0.236146 (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]
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{K[2]}{4a^2 F(K[2]^2 - 4ax)} - \frac{2a \int_1^x \frac{K[2] F'(K[2]^2 - 4aK[1])}{a F(K[2]^2 - 4aK[1])^2} dK[1] - 1}{2a} \right) dK[2] + \int_1^x -\frac{1}{2a F(y(x)^2 - 4aK[1])} dx \right]$$

✓ **Maple** : cpu = 0.082 (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 = 0.20784 (sec), leaf count = 205

```
DSolve[Derivative[1][y][x] == F[-Log[x] + Log[Log[y[x]]]]*y[x],y[x],x]
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{1}{K[2](xF(\log(\log(K[2])) - \log(x)) - \log(K[2]))} - \int_1^x \left(\frac{F(\log(\log(K[2])) - \log(K[1]))}{(F(\log(\log(K[2])) - \log(K[1])) - \log(K[1]))} \right) \frac{K[1]}{K[2]} \right. \right.$$

✓ **Maple** : cpu = 0.705 (sec), leaf count = 120

```
dsolve(diff(y(x),x) = F(ln(ln(y(x)))-ln(x))*y(x),y(x))
```

$$\int_{-b}^x \frac{F(\ln(\ln(y(x))) - \ln(-a))}{-aF(\ln(\ln(y(x))) - \ln(-a)) + \ln(y(x))} d-a + \int^{y(x)} \left(-\frac{1}{-f(-xF(\ln(\ln(-f)) - \ln(x)) + \ln(-f))} - \right.$$

2.586

ODE No. 586

$$y'(x) = \frac{x F\left(\frac{y(x)}{\sqrt{x^2+1}}\right)}{\sqrt{x^2+1}}$$

✓ **Mathematica** : cpu = 0.901427 (sec), leaf count = 975

```
DSolve[Derivative[1][y][x] == (x*F[y[x]/Sqrt[1 + x^2]])/Sqrt[1 + x^2],y[x],x]
```

Solve

$$\int_1^x \left(-\frac{K[1] \sqrt{K[1]^2 + 1} F\left(\frac{y(x)}{\sqrt{K[1]^2 + 1}}\right)^3}{y(x) \left(K[1]^2 F\left(\frac{y(x)}{\sqrt{K[1]^2 + 1}}\right)^2 + F\left(\frac{y(x)}{\sqrt{K[1]^2 + 1}}\right)^2 - y(x)^2 \right)} - \frac{K[1] F\left(\frac{y(x)}{\sqrt{K[1]^2 + 1}}\right)^2}{K[1]^2 F\left(\frac{y(x)}{\sqrt{K[1]^2 + 1}}\right)^2 + F\left(\frac{y(x)}{\sqrt{K[1]^2 + 1}}\right)^2} \right) dx$$

✓ **Maple** : cpu = 0.256 (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))
```

$$y(x) = \text{RootOf}\left(-\ln\left(x^2+1\right)+2\left(\int^{\frac{-x}{\sqrt{x^2+1}}}\frac{1}{F\left(\frac{-a}{\sqrt{x^2+1}}\right)-a}d_a\right)+2c_1\right)\sqrt{x^2+1}$$

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 = 0.270439 (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]
```

Solve

$$\left[\int_1^{y(x)} - \frac{F\left(K[2] - \frac{x^3}{6}\right) \int_1^x - \frac{K[1]^2 F'\left(K[2] - \frac{K[1]^3}{6}\right)}{2F\left(K[2] - \frac{K[1]^3}{6}\right)^2} dK[1] + 1}{F\left(K[2] - \frac{x^3}{6}\right)} dK[2] + \int_1^x \left(\frac{K[1]^2}{2F\left(y(x) - \frac{K[1]^3}{6}\right)} + \sqrt{K[1]} \right) \right]$$

✓ **Maple** : cpu = 0.115 (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))
```

$$\int_{-b}^{y(x)} \frac{1}{F\left(-a - \frac{x^3}{6}\right)} d_{-a} - \frac{2x^{3/2}}{3} - c_1 = 0$$

2.588

ODE No. 588

$$y'(x) = \frac{F((y(x) - x)(y(x) + x)) + x}{y(x)}$$

✓ **Mathematica** : cpu = 0.203253 (sec), leaf count = 109

```
DSolve[Derivative[1][y][x] == (x + F[(-x + y[x])*(x + y[x])])/y[x], y[x], x]
```

Solve

$$\left[\int_1^{y(x)} \left(-\frac{K[2]}{F((K[2] - x)(x + K[2]))} - \int_1^x -\frac{2K[1]K[2]F'((K[2] - K[1])(K[1] + K[2]))}{F((K[2] - K[1])(K[1] + K[2]))^2} dK[1] \right) dK[2] \right]$$

✓ **Maple** : cpu = 0.143 (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

$$y'(x) = \frac{y(x)^2 F\left(\frac{1-y(x)\log(x)}{y(x)}\right)}{x}$$

✓

Mathematica : cpu = 0.238312 (sec), leaf count = 245

DSolve[Derivative[1][y][x] == (F[(1 - Log[x]*y[x])/y[x]]*y[x]^2)/x,y[x],x]

$$\text{Solve}\left[\int_1^{y(x)}\left(\frac{1}{\left(-F\left(\frac{1-K[2]\log(x)}{K[2]}\right)-1\right)K[2]^2}-\int_1^x\left(\frac{\left(-\frac{\log(K[1])}{K[2]}-\frac{1-K[2]\log(K[1])}{K[2]^2}\right)F'\left(\frac{1-K[2]\log(K[1])}{K[2]}\right)}{\left(F\left(\frac{1-K[2]\log(K[1])}{K[2]}\right)+1\right)K[1]}-\frac{F\left(\frac{1-K[2]\log(K[1])}{K[2]}\right)}{K[1]}\right)dx\right]=0,y[x],x\right]$$

✓

Maple : cpu = 0.173 (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

$$y'(x) = \frac{x}{F(x^2 + y(x)^2) - y(x)}$$

✓ **Mathematica** : cpu = 0.254032 (sec), leaf count = 94

```
DSolve[Derivative[1][y][x] == x/(F[x^2 + y[x]^2] - y[x]), y[x], x]
```

Solve

$$\left[\int_1^{y(x)} \left(-\frac{K[2]}{F(x^2 + K[2]^2)} - \int_1^x \frac{2K[1]K[2]F'(K[1]^2 + K[2]^2)}{F(K[1]^2 + K[2]^2)^2} dK[1] + 1 \right) dK[2] + \int_1^x -\frac{K[1]}{F(K[1]^2 + y(x)^2)} dK[1] \right]$$

✓ **Maple** : cpu = 0.141 (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

$$y'(x) = \frac{x F\left(\frac{ay(x)^2+bx^2}{a}\right)}{\sqrt{a}y(x)}$$

✓ **Mathematica** : cpu = 0.53461 (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]
```

Solve

$$\left[\int_1^{y(x)} \left(-\frac{bK[2]}{b + \sqrt{a}F\left(\frac{bx^2+aK[2]^2}{a}\right)} - \int_1^x \left(\frac{2bK[1]K[2]F'\left(\frac{bK[1]^2+aK[2]^2}{a}\right)}{\sqrt{a}\left(b + \sqrt{a}F\left(\frac{bK[1]^2+aK[2]^2}{a}\right)\right)} - \frac{2bF\left(\frac{bK[1]^2+aK[2]^2}{a}\right)K[1]K[2]}{\left(b + \sqrt{a}F\left(\frac{bK[1]^2+aK[2]^2}{a}\right)\right)} \right) dx \right]$$

✓ **Maple** : cpu = 0.268 (sec), leaf count = 108

```
dsolve(diff(y(x),x) = F((a*y(x)^2+b*x^2)/a)*x/a^(1/2)/y(x),y(x))
```

$$y(x) = \frac{\sqrt{a\left(-bx^2 + \text{RootOf}\left(\left(\int^{-Z} \frac{1}{F(-a)a+b\sqrt{a}}d_-a\right)ba^{3/2} - bx^2 + 2c_1a\right)a\right)}}{a}$$

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 = 0.548509 (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]

Solve

$$\left[\int_1^{y(x)} \frac{F\left(-\frac{2x^3}{5} - 2\sqrt{x} + K[2]\right) \int_1^x \left(-\frac{6F'\left(-\frac{2}{5}K[1]^3 - 2\sqrt{K[1]} + K[2]\right)K[1]^2}{5F\left(-\frac{2}{5}K[1]^3 - 2\sqrt{K[1]} + K[2]\right)^2} - \frac{F'\left(-\frac{2}{5}K[1]^3 - 2\sqrt{K[1]} + K[2]\right)}{F\left(-\frac{2}{5}K[1]^3 - 2\sqrt{K[1]} + K[2]\right)^2\sqrt{K[1]}} \right) dx}{F\left(-\frac{2x^3}{5} - 2\sqrt{x} + K[2]\right)} \right]$$

✓ **Maple** : cpu = 0.167 (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 = 0.303442 (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]
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{\sqrt{K[2]}}{F\left(K[2]^{3/2} - \frac{3e^x}{2}\right) - 1} - \int_1^x \left(\frac{3e^{K[1]} F\left(K[2]^{3/2} - \frac{3e^{K[1]}}{2}\right) \sqrt{K[2]} F'\left(K[2]^{3/2} - \frac{3e^{K[1]}}{2}\right)}{2 \left(F\left(K[2]^{3/2} - \frac{3e^{K[1]}}{2}\right) - 1\right)^2} - \frac{3e^{K[1]}}{2}\right) dx\right]$$

✓ **Maple** : cpu = 0.233 (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))
```

$$\int_{-b}^{y(x)} \frac{\sqrt{-a}}{F\left(-a^{3/2} - \frac{3e^x}{2}\right) - 1} d_{-}a - e^x - c_1 = 0$$

2.594

ODE No. 594

$$y'(x) = \frac{x F\left(\frac{y(x)^2 - b}{x^2}\right)}{y(x)}$$

✓ **Mathematica** : cpu = 0.415584 (sec), leaf count = 236

```
DSolve[Derivative[1][y][x] == (x*F[(-b + y[x]^2)/x^2])/y[x],y[x],x]
```

Solve

$$\left[\int_1^{y(x)} \left(-\frac{K[2]}{-F\left(\frac{K[2]^2 - b}{x^2}\right) x^2 + K[2]^2 - b} - \int_1^x \left(\frac{F\left(\frac{K[2]^2 - b}{K[1]^2}\right) K[1] \left(2K[2]F'\left(\frac{K[2]^2 - b}{K[1]^2}\right) - 2K[2]\right)}{\left(F\left(\frac{K[2]^2 - b}{K[1]^2}\right) K[1]^2 - K[2]^2 + b\right)^2} - \frac{K[1]}{K[1]^2 - K[2]^2 + b} \right) dx \right. \right.$$

✓ **Maple** : cpu = 0.183 (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

$$y'(x) = \frac{F\left(\frac{xy(x)^2+1}{x}\right)}{x^2y(x)}$$

✓ **Mathematica** : cpu = 0.24177 (sec), leaf count = 204

```
DSolve[Derivative[1][y][x] == F[(1 + x*y[x]^2)/x]/(x^2*y[x]),y[x],x]
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{K[2]}{2F\left(\frac{xK[2]^2+1}{x}\right) - 1} - \int_1^x \left(\frac{4F\left(\frac{K[1]K[2]^2+1}{K[1]}\right) K[2]F'\left(\frac{K[1]K[2]^2+1}{K[1]}\right)}{\left(2F\left(\frac{K[1]K[2]^2+1}{K[1]}\right) - 1\right)^2 K[1]^2} - \frac{2K[2]F'\left(\frac{K[1]K[2]^2+1}{K[1]}\right)}{\left(2F\left(\frac{K[1]K[2]^2+1}{K[1]}\right) - 1\right) K[1]^2} \right) dx \right]$$

✓ **Maple** : cpu = 0.173 (sec), leaf count = 72

```
dsolve(diff(y(x),x) = F((x*y(x)^2+1)/x)/y(x)/x^2,y(x))
```

$$y(x) = \frac{\sqrt{x \left(\text{RootOf} \left(\left(\int^{-Z} \frac{1}{-1+2F(\_a)} d\_a \right) x + xc_1 + 1 \right) x - 1 \right)}}{x}$$

2.596

ODE No. 596

$$y'(x) = \frac{F(x^2 + y(x) - x) - 2x^2 + x}{x}$$

✓ **Mathematica** : cpu = 0.268362 (sec), leaf count = 156

```
DSolve[Derivative[1][y][x] == (x - 2*x^2 + F[-x + x^2 + y[x]])/x,y[x],x]
```

Solve

$$\left[\int_1^{y(x)} -\frac{F(x^2 - x + K[2]) \int_1^x \left(\frac{2K[1]F'(K[1]^2 - K[1] + K[2])}{F(K[1]^2 - K[1] + K[2])^2} - \frac{F'(K[1]^2 - K[1] + K[2])}{F(K[1]^2 - K[1] + K[2])^2} \right) dK[1] + 1}{F(x^2 - x + K[2])} dK[2] + \int_1^x \left(-\right.$$

✓ **Maple** : cpu = 0.129 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = (-2*x^2+x+F(y(x)+x^2-x))/x,y(x))
```

$$y(x) = -x^2 + \text{RootOf}\left(-\ln(x) + \int^{\frac{-Z}{F(\frac{-a}{})}} \frac{1}{F(\frac{-a}{})} d_{-a} + c_1\right) + x$$

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 = 0.336169 (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]
```

Solve

$$\left[\int_1^{y(x)}\left(-\frac{K[2]}{2aF\left(\frac{xK[2]^2-4a}{x}\right)}-\int_1^x\frac{2K[2]F'\left(\frac{K[1]K[2]^2-4a}{K[1]}\right)}{F\left(\frac{K[1]K[2]^2-4a}{K[1]}\right)^2K[1]^2}dK[1]+1\right)dK[2]+\int_1^x-\frac{1}{F\left(\frac{K[1]y(x)^2-4a}{K[1]}\right)}dK[1]\right]$$

✓ **Maple** : cpu = 0.341 (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))
```

$$-\frac{y(x)}{2a}+\frac{\int^{y(x)^2-\frac{4a}{x}}\frac{1}{F(\frac{\_a}{a})}d\_a}{8a^2}-c_1=0$$

2.598

ODE No. 598

$$y'(x) = \frac{F\left(\frac{y(x)}{x}\right) + y(x)}{x - 1}$$

✓ **Mathematica** : cpu = 0.127404 (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 = 0.019 (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

$$y'(x) = \frac{F(x^2 + y(x)^2) - x}{y(x)}$$

✓ **Mathematica** : cpu = 0.138449 (sec), leaf count = 95

```
DSolve[Derivative[1][y][x] == (-x + F[x^2 + y[x]^2])/y[x], y[x], x]
```

Solve

$$\left[\int_1^{y(x)} \left(-\frac{K[2]}{F(x^2 + K[2]^2)} - \int_1^x \frac{2K[1]K[2]F'(K[1]^2 + K[2]^2)}{F(K[1]^2 + K[2]^2)^2} dK[1] \right) dK[2] + \int_1^x \left(1 - \frac{K[1]}{F(K[1]^2 + y(x)^2)} \right) dK[1] \right]$$

✓ **Maple** : cpu = 0.106 (sec), leaf count = 57

```
dsolve(diff(y(x), x) = (-x+F(y(x)^2+x^2))/y(x), y(x))
```

$$y(x) = \sqrt{-x^2 + \text{RootOf}\left(-2x + \int^{-Z} \frac{1}{F(\_a)} d\_a + 2c_1\right)}$$

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 = 0.23572 (sec), leaf count = 246

DSolve[Derivative[1][y][x] == (F[(1 - 2*Log[x]*y[x])/y[x]]*y[x]^2)/x,y[x],x]

$$\text{Solve}\left[\int_1^{y(x)}\left(-\int_1^x\left(\frac{2\left(-\frac{2\log(K[1])}{K[2]}-\frac{1-2K[2]\log(K[1])}{K[2]^2}\right)F'\left(\frac{1-2K[2]\log(K[1])}{K[2]}\right)}{\left(F\left(\frac{1-2K[2]\log(K[1])}{K[2]}\right)+2\right)K[1]}-\frac{2F\left(\frac{1-2K[2]\log(K[1])}{K[2]}\right)\left(-\frac{2\log(K[1])}{K[2]}\right)}{\left(F\left(\frac{1-2K[2]\log(K[1])}{K[2]}\right)+2\right)K[1]}\right)dx,y[x]\right]$$

✓

Maple : cpu = 0.172 (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

$$y'(x) = \frac{x F((y(x) - x)(y(x) + x))}{y(x)}$$

✓ **Mathematica** : cpu = 0.24955 (sec), leaf count = 182

```
DSolve[Derivative[1][y][x] == (x*F[(-x + y[x])*(x + y[x])])/y[x],y[x],x]
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{K[2]}{F((K[2] - x)(x + K[2])) - 1} - \int_1^x \left(\frac{2F((K[2] - K[1])(K[1] + K[2]))K[1]K[2]F'((K[2] - K[1])(K[1] + K[2])) - 1)}{F((K[2] - K[1])(K[1] + K[2])) - 1} \right) dx \right. \right.$$

✓ **Maple** : cpu = 0.167 (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 = 0.442951 (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]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\int_1^x-\frac{2\left(-\frac{K[1]^2-K[2]}{K[1]^2K[2]^2}-\frac{1}{K[1]^2K[2]}\right)F'\left(\frac{K[1]^2-K[2]}{K[1]^2K[2]}\right)}{F\left(\frac{K[1]^2-K[2]}{K[1]^2K[2]}\right)^2K[1]^3}dK[1]-\frac{1}{F\left(\frac{x^2-K[2]}{x^2K[2]}\right)K[2]^2}\right)dK[2]+\int_1^x\left(\right.$$

✓ **Maple** : cpu = 0.152 (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 = 0.320821 (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[x], x]

$$\text{Solve}\left[\int_1^{y(x)} -\frac{F(K[2] + \log(2x + 1)) \int_1^x -\frac{2F'(K[2] + \log(2K[1] + 1))}{F(K[2] + \log(2K[1] + 1))^2(2K[1] + 1)} dK[1] - 1}{F(K[2] + \log(2x + 1))} dK[2] + \int_1^x \left(\frac{F(\log(2K[1] + 1))}{F(\log(2K[1] + 1))^2(2K[1] + 1)} dK[1] - 1\right) dK[2], y(x)\right]$$

✓

Maple : cpu = 0.108 (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 = 0.387543 (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]
```

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 = 0.146 (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 = 0.758316 (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]

$$\text{Solve}\left[\int_1^{y(x)}\left(-\int_1^x\frac{2\left(-\frac{K[1]}{2K[2]}-\frac{1-\frac{1}{2}K[1]K[2]}{K[2]^2}\right)F'\left(\frac{1-\frac{1}{2}K[1]K[2]}{K[2]}\right)}{F\left(\frac{1-\frac{1}{2}K[1]K[2]}{K[2]}\right)^2}dK[1]-\frac{4}{F\left(\frac{1-\frac{1}{2}xK[2]}{K[2]}\right)K[2]^2}\right)dK[2]+\int_1^x\left(-\frac{2\left(-\frac{K[1]}{2K[2]}-\frac{1-\frac{1}{2}K[1]K[2]}{K[2]^2}\right)F'\left(\frac{1-\frac{1}{2}K[1]K[2]}{K[2]}\right)}{F\left(\frac{1-\frac{1}{2}K[1]K[2]}{K[2]}\right)^2}\right)dK[1]-\frac{4}{F\left(\frac{1-\frac{1}{2}xK[2]}{K[2]}\right)K[2]^2}\right)dx,\left(y(x),x\right)\right]$$

✓

Maple : cpu = 0.142 (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))

$$y(x) = \frac{2}{2\operatorname{RootOf}\left(-\ln\left(x\right)-4\left(\int^{\frac{-Z}{F\left(\frac{1}{\frac{1}{2}a}\right)}\frac{1}{F\left(\frac{1}{\frac{1}{2}a}\right)}}d\_a\right)+c_1\right)+x}$$

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 = 0.439929 (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]
```

Solve

$$\left[\int_1^{y(x)} \frac{F \left(K[2] - \frac{1}{2} e^{-x^2} x^2 \right) \int_1^x \left(\frac{e^{-K[1]^2} F' \left(K[2] - \frac{1}{2} e^{-K[1]^2} K[1]^2 \right) K[1]^3}{F \left(K[2] - \frac{1}{2} e^{-K[1]^2} K[1]^2 \right)^2} - \frac{e^{-K[1]^2} \left(e^{K[1]^2} F \left(K[2] - \frac{1}{2} e^{-K[1]^2} K[1]^2 \right) + 1 \right) K[1]^2}{F \left(K[2] - \frac{1}{2} e^{-K[1]^2} K[1]^2 \right)} \right) dx}{F \left(K[2] - \frac{1}{2} e^{-x^2} x^2 \right)} \right]$$

✓ **Maple** : cpu = 0.474 (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))
```

$$y(x) = \frac{x^2 e^{-x^2}}{2} + \text{RootOf} \left(x^2 - 2 \left(\int^{-x^2} \frac{1}{F(\_a)} d\_a \right) + 2c_1 \right)$$

2.607

ODE No. 607

$$y'(x) = \frac{x^3 F\left(\frac{y(x)}{x^2}\right) + 2y(x)}{x}$$

✓ **Mathematica** : cpu = 0.222547 (sec), leaf count = 121

```
DSolve[Derivative[1][y][x] == (x^3*F[y[x]/x^2] + 2*y[x])/x,y[x],x]
```

Solve

$$\left[\int_1^{y(x)} \frac{F\left(\frac{K[2]}{x^2}\right) \int_1^x \left(\frac{2}{F\left(\frac{K[2]}{K[1]^2}\right) K[1]^3} - \frac{2K[2]F'\left(\frac{K[2]}{K[1]^2}\right)}{F\left(\frac{K[2]}{K[1]^2}\right)^2 K[1]^5} \right) dK[1] x^2 + 1}{x^2 F\left(\frac{K[2]}{x^2}\right)} dK[2] + \int_1^x \left(\frac{2y(x)}{F\left(\frac{y(x)}{K[1]^2}\right) K[1]^3} + 1 \right) \right]$$

✓ **Maple** : cpu = 0.075 (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 = 0.489941 (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]
```

Solve

$$\left[\int_1^{y(x)} \left(-\frac{F\left(\frac{x-K[2]}{\sqrt{K[2]}}\right)}{x\sqrt{K[2]}} - \int_1^x -\frac{F\left(\frac{K[1]-K[2]}{\sqrt{K[2]}}\right)}{\sqrt{K[2]}} - 2\left(-\frac{K[1]-K[2]}{2K[2]^{3/2}} - \frac{1}{\sqrt{K[2]}}\right)\sqrt{K[2]}F'\left(\frac{K[1]-K[2]}{\sqrt{K[2]}}\right) - 1}{\left(-2\sqrt{K[2]}F\left(\frac{K[1]-K[2]}{\sqrt{K[2]}}\right) + K[1] - K[2]\right)^2} dK[1] \right]$$

✓ **Maple** : cpu = 0.174 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = y(x)^(1/2)/(y(x)^(1/2)+F((x-y(x))/y(x)^(1/2))),y(x))
```

$$\frac{\ln(y(x))}{2} - \left(\int^{\frac{x}{\sqrt{y(x)}} - \sqrt{y(x)}} \frac{1}{2F(\_a) - \_a} d\_a \right) - c_1 = 0$$

2.609

ODE No. 609

$$y'(x) = \frac{F(x^3y(x)) - 3x^2y(x)}{x^3}$$

✓ **Mathematica** : cpu = 0.261041 (sec), leaf count = 117

```
DSolve[Derivative[1][y][x] == (F[x^3*y[x]] - 3*x^2*y[x])/x^3,y[x],x]
```

Solve $\left[\int_1^{y(x)} -\frac{x^3 + F(x^3 K[2]) \int_1^x \left(\frac{3K[1]^5 K[2] F'(K[1]^3 K[2])}{F(K[1]^3 K[2])^2} - \frac{3K[1]^2}{F(K[1]^3 K[2])} \right) dK[1]}{F(x^3 K[2])} dK[2] + \int_1^x \left(1 - \frac{3K[1]^2 y(x)}{F(K[1]^3 y(x))} \right) dx, y(x) \right]$

✓ **Maple** : cpu = 0.174 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = (-3*x^2*y(x)+F(x^3*y(x)))/x^3,y(x))
```

$$y(x) = \frac{\text{RootOf}\left(x - \left(\int^{-Z} \frac{1}{F(\square a)} d\_a\right) + c_1\right)}{x^3}$$

2.610

ODE No. 610

$$y'(x) = \frac{x^2 F\left(\frac{y(x)}{x}\right) + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.072971 (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 = 0.285259 (sec), leaf count = 191

```
DSolve[Derivative[1][y][x] == (-2*x + F[x*(x + y[x])] - y[x])/x,y[x],x]
```

Solve

$$\left[\int_1^{y(x)} - \frac{x + F(x(x + K[2])) \int_1^x \left(\frac{2F'(K[1](K[1]+K[2]))K[1]^2}{F(K[1](K[1]+K[2]))^2} + \frac{(K[2]-F(K[1](K[1]+K[2]))F'(K[1](K[1]+K[2]))K[1]}{F(K[1](K[1]+K[2]))^2} \right) dx}{F(x(x + K[2]))} \right]$$

✓ **Maple** : cpu = 0.071 (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 = 0.34395 (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]

Solve

$$\left[\int_1^{y(x)}\frac{e^{-\frac{x^2}{4}}\left(e^{\frac{x^2}{4}}F\left(e^{-\frac{x^2}{4}}K[2]\right)\int_1^x\left(\frac{e^{-\frac{1}{4}K[1]^2}K[1]}{2F\left(e^{-\frac{1}{4}K[1]^2}K[2]\right)}-\frac{e^{-\frac{1}{2}K[1]^2}K[1]K[2]F'\left(e^{-\frac{1}{4}K[1]^2}K[2]\right)}{2F\left(e^{-\frac{1}{4}K[1]^2}K[2]\right)^2}\right)dK[1]+1)}{F\left(e^{-\frac{x^2}{4}}K[2]\right)}dK[2]\right]$$

✓

Maple : cpu = 0.102 (sec), leaf count = 27

dsolve(diff(y(x),x) = 1/2*(y(x)*exp(-1/4*x^2)*x+2*F(y(x)*exp(-1/4*x^2)))*exp(1/4*x^2),y(x))

$$y(x) = \text{RootOf}\left(-x + \int^{-Z} \frac{1}{F(\_a)} d\_a + c_1\right) e^{\frac{x^2}{4}}$$

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 = 0.23671 (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]
```

Solve

$$\left[\int_1^{y(x)} x F\left(\frac{K[2]-x \log(x)}{x}\right) \int_1^x \left(-\frac{K[2] F'\left(\frac{K[2]-K[1] \log(K[1])}{K[1]}\right)}{F\left(\frac{K[2]-K[1] \log(K[1])}{K[1]}\right)^2 K[1]^3} - \frac{F'\left(\frac{K[2]-K[1] \log(K[1])}{K[1]}\right)}{F\left(\frac{K[2]-K[1] \log(K[1])}{K[1]}\right)^2 K[1]^2} + \frac{1}{F\left(\frac{K[2]-K[1] \log(K[1])}{K[1]}\right) K[1]} \right) dx \right. \\ \left. - \frac{x F\left(\frac{K[2]-x \log(x)}{x}\right)}{x F\left(\frac{K[2]-x \log(x)}{x}\right)} \right]$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 23

```
dsolve(diff(y(x),x) = (x+y(x)+F(-(-y(x)+x*ln(x))/x)*x^2)/x,y(x))
```

$$y(x) = \left(\ln(x) + \text{RootOf}\left(-x + \int^{-Z} \frac{1}{F(\frac{\_a}{\_a})} d\_a + c_1\right)\right) x$$

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 = 0.308443 (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
```

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 = 0.368 (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)^2-1/2*a^2*x^2+1/2*x^2)
```

$$\frac{y(x)}{(a-1)(a+1)} + \frac{\int^{-a^2x^2+x^2+y(x)^2} \frac{1}{F(\frac{a}{2})} d_a}{2a^4 - 4a^2 + 2} - c_1 = 0$$

2.615

ODE No. 615

$$y'(x) = \frac{y(x)}{x(y(x)F(xy(x)) - 1)}$$

✓ **Mathematica** : cpu = 0.252589 (sec), leaf count = 77

```
DSolve[Derivative[1][y][x] == y[x]/(x*(-1 + F[x*y[x]]*y[x])), y[x], x]
```

Solve $\left[\int_1^{y(x)} \left(- \int_1^x \frac{F'(K[1]K[2])}{F(K[1]K[2])^2} dK[1] - \frac{1}{F(xK[2])K[2]} + 1 \right) dK[2] + \int_1^x - \frac{1}{F(K[1]y(x))K[1]} dK[1] = c_1 \right.$

✓ **Maple** : cpu = 0.099 (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 = 0.41893 (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]

Solve
$$\left[\int_1^{y(x)} - \frac{x^2 + F(x(xK[2] - 1)) \int_1^x \left(\frac{2K[2]F'(K[1](K[1]K[2]-1))K[1]^3}{F(K[1](K[1]K[2]-1))^2} - \frac{F'(K[1](K[1]K[2]-1))K[1]^2}{F(K[1](K[1]K[2]-1))^2} - \frac{2K[1]}{F(K[1](K[1]K[2]-1))} \right) dx}{F(x(xK[2] - 1))} \right]$$

✓

Maple : cpu = 0.075 (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 = 0.878596 (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)/
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{9e^{\frac{3x^2}{2}} - F\left(\frac{e^{\frac{3x^2}{2}}(K[2]+3)}{3K[2]}\right)}{3\left(\left(9e^{\frac{3x^2}{2}} - F\left(\frac{e^{\frac{3x^2}{2}}(K[2]+3)}{3K[2]}\right)\right)K[2] + 27e^{\frac{3x^2}{2}}\right)} - \int_1^x \left(-\frac{K[2]\left(\frac{e^{\frac{3K[1]^2}{2}}}{3K[2]} - \frac{e^{\frac{3K[1]^2}{2}}(K[2]+3)}{3K[2]^2}\right)F\left(\frac{e^{\frac{3x^2}{2}}(K[2]+3)}{3K[2]}\right)}{-9e^{\frac{3K[1]^2}{2}}K[2] + F\left(\frac{e^{\frac{3K[1]^2}{2}}(K[2]+3)}{3K[2]}\right)} \right) dx \right]$$

✓ Maple : cpu = 0.232 (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))
```

$$y(x) = -\frac{3e^{\frac{3x^2}{2}}}{e^{\frac{3x^2}{2}} - 3\operatorname{RootOf}\left(-x^2 - 18\left(\int^{-Z}\frac{1}{F(\_a)-27\_a}d\_a\right) + 2c_1\right)}$$

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 = 0.182424 (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
```

$$\left\{ \left\{ y(x) \rightarrow -1 - W\left(-\frac{e^{-1+c_1e^x}}{x}\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.619 (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))
```

$$y(x) = \frac{e^{-\operatorname{LambertW}\left(-\frac{e^{e^xc_1-1}}{x}\right)+e^xc_1-1}}}{x} - x$$

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 = 0.549875 (sec), leaf count = 330

```
DSolve[Derivative[1][y][x] == (6*y[x])/(-F[x - y[x] - y[x]^2 - y[x]^3/2 - y[x]^4/3] + 6*y[x] +
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\frac{8K[2]^3}{F\left(-\frac{1}{3}K[2]^4 - \frac{K[2]^3}{2} - K[2]^2 - K[2] + x\right)} - \frac{9K[2]^2}{F\left(-\frac{1}{3}K[2]^4 - \frac{K[2]^3}{2} - K[2]^2 - K[2] + x\right)} - \frac{K[2]}{F\left(-\frac{1}{3}K[2]^4 - \frac{K[2]^3}{2} - K[2]^2 - K[2] + x\right)}\right]dx = 0\right]$$

✓ **Maple** : cpu = 0.319 (sec), leaf count = 81

```
dsolve(diff(y(x),x) = 6*y(x)/(8*y(x)^4+9*y(x)^3+12*y(x)^2+6*y(x)-F(-1/3*y(x)^4-1/2*y(x)^3-y(x)^2-y(x)+x)),y(x))
```

$$\int_{-b}^{y(x)} \frac{-8\_a^4 - 9\_a^3 - 12\_a^2 + F\left(-\frac{1}{3}\_a^4 - \frac{1}{2}\_a^3 - \_a^2 - \_a + x\right) - 6\_a}{F\left(-\frac{1}{3}\_a^4 - \frac{1}{2}\_a^3 - \_a^2 - \_a + x\right) \_a} d\_a - c_1 = 0$$

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 = 0.80185 (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[(-x + y[x])*(x + y[x])]) + x^2 + 2*x*y[x] + y[x]^2), y[x], x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\frac{2K[2]}{-x^2 + e^{2F((K[2]-x)(x+K[2])})} + K[2]^2} - \int_1^x\left(\frac{2K[1] \left(-4e^{2F((K[2]-K[1])(K[1]+K[2])})F'((K[2]-K[1])(K[1]+K[2])}\right)}{(K[1]^2 - e^{2F((K[2]-K[1])(K[1]+K[2])})})}\right)dx\right]dx, y(x)\right]$$

✓ **Maple** : cpu = 0.28 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = (y(x)^2+2*x*y(x)+x^2+exp(2*F(-(x-y(x))*(y(x)+x))))/(y(x)^2+2*x*y(x)+x^2), y(x))
```

$$y(x) = e^{\text{RootOf}\left(-Z + \int^{e^{2Z} - 2x} \frac{1}{e^{2F(\frac{1}{-a})} + -a} d\_a + c_1\right)} - x$$

2.621

ODE No. 621

$$y'(x) = \frac{1}{y(x) + \sqrt{x}}$$

✓ **Mathematica** : cpu = 0.0515312 (sec), leaf count = 445

```
DSolve[Derivative[1][y][x] == (Sqrt[x] + y[x])^(-1), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{x} + \frac{1}{\text{Root}\left[\#1^6(16x^3 + 16e^{12c_1}) - 24\#1^4x^2 + 8\#1^3x^{3/2} + 9\#1^2x - 6\#1\sqrt{x} + 1\&, 1\right]} \right\}, \left\{ y(x) \rightarrow -\sqrt{x} + \frac{1}{\text{Root}\left[\#1^6(16x^3 + 16e^{12c_1}) - 24\#1^4x^2 + 8\#1^3x^{3/2} + 9\#1^2x - 6\#1\sqrt{x} + 1\&, 1\right]} \right\} \right\}$$

✓ **Maple** : cpu = 0.354 (sec), leaf count = 59

```
dsolve(diff(y(x), x) = 1/(y(x)+x^(1/2)), y(x))
```

$$y(x) = \frac{\sqrt{x} \operatorname{RootOf}\left(\_Z^{18}c_1 - 9x\_Z^6 - 6\sqrt{x}\_Z^3 - 1\right)^3 + 1}{\operatorname{RootOf}\left(\_Z^{18}c_1 - 9x\_Z^6 - 6\sqrt{x}\_Z^3 - 1\right)^3}$$

2.622

ODE No. 622

$$y'(x) = \frac{1}{y(x) + \sqrt{3x+1} + 2}$$

✓ **Mathematica** : cpu = 0.22396 (sec), leaf count = 140

```
DSolve[Derivative[1][y][x] == (2 + Sqrt[1 + 3*x] + y[x])^(-1), y[x], x]
```

Solve $\left[6\sqrt{33}\tanh^{-1}\left(\frac{3y(x)+7\sqrt{3x+1}+6}{\sqrt{33}\left(y(x)+\sqrt{3x+1}+2\right)}\right)+44c_1=33\left(\log\left(\frac{-3\sqrt{3x+1}y(x)^2-3(3x+4\sqrt{3x+1}+2)y(x)+10}{\sqrt{33}\left(y(x)+\sqrt{3x+1}+2\right)}\right)+c_1\right)\right]$

✓ **Maple** : cpu = 0.409 (sec), leaf count = 68

```
dsolve(diff(y(x),x) = 1/(y(x)+2+(3*x+1)^(1/2)),y(x))
```

$$-2\sqrt{33}\operatorname{arctanh}\left(\frac{3\sqrt{3x+1}+6y(x)+12}{\sqrt{99x+33}}\right)+11\ln\left((3y(x)+6)\sqrt{3x+1}+3y(x)^2-6x+12y(x)+10\right)-c_1$$

2.623

ODE No. 623

$$y'(x) = \frac{x^2}{x^{3/2} + y(x)}$$

✓ **Mathematica** : cpu = 0.147537 (sec), leaf count = 77

```
DSolve[Derivative[1][y][x] == x^2/(x^(3/2) + y[x]),y[x],x]
```

$$\text{Solve}\left[6\sqrt{33}\tanh^{-1}\left(\frac{7x^{3/2}+3y(x)}{\sqrt{33}(x^{3/2}+y(x))}\right)+44c_1=33\left(\log\left(-\frac{3y(x)}{2x^{3/2}}-\frac{3y(x)^2}{2x^3}+1\right)+3\log(x)\right),y(x)\right]$$

✓ **Maple** : cpu = 0.355 (sec), leaf count = 51

```
dsolve(diff(y(x),x) = x^2/(y(x)+x^(3/2)),y(x))
```

$$-2\sqrt{33}\operatorname{arctanh}\left(\frac{(x^{3/2}+2y(x))\sqrt{33}}{11x^{3/2}}\right)+11\ln(3x^{3/2}y(x)-2x^3+3y(x)^2)-c_1=0$$

2.624 ODE No. 624

$$y'(x) = \frac{x^{5/3}}{x^{4/3} + y(x)}$$

✓ **Mathematica** : cpu = 16.8708 (sec), leaf count = 9837

```
DSolve[Derivative[1][y][x] == x^(5/3)/(x^(4/3) + y[x]), y[x], x]
```

✓ **Maple** : cpu = 0.461 (sec), leaf count = 46

```
dsolve(diff(y(x), x) = x^(5/3)/(y(x)+x^(4/3)), y(x))
```

$$y(x) = \frac{\text{RootOf}\left(\_Z^{192} + 12x^{4/3}\_Z^{176} + 48x^{8/3}\_Z^{160} + 64x^4\_Z^{144} - c_1\right)^{16}}{2} + \frac{x^{4/3}}{2}$$

2.625

ODE No. 625

$$y'(x) = \frac{1}{2}ix^2\Big(-2\sqrt{6y(x)-x^3}+i\Big)$$

✓ **Mathematica** : cpu = 0.202227 (sec), leaf count = 56

```
DSolve[Derivative[1][y][x] == (I/2)*x^2*(I - 2*Sqrt[-x^3 + 6*y[x]]),y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{6}\Big(-W\Big(-ie^{-x^3-1-6c_1}\Big)^2-2W\Big(-ie^{-x^3-1-6c_1}\Big)+x^3-1\Big)\right\}\right\}$$

✓ **Maple** : cpu = 0.3 (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))
```

$$i\ln\left(x^3-6y(x)-1\right)+2\sqrt{-x^3+6y\left(x\right)}-2\arctan\left(\sqrt{-x^3+6y\left(x\right)}\right)+2ix^3-c_1=0$$

2.626

ODE No. 626

$$y'(x) = \frac{x}{\sqrt{x^2 + 1} + y(x)}$$

✓ **Mathematica** : cpu = 0.154217 (sec), leaf count = 88

```
DSolve[Derivative[1][y][x] == x/(Sqrt[1 + x^2] + y[x]),y[x],x]
```

Solve $\left[\frac{1}{2} \left(\log \left(-\frac{y(x)^2}{x^2 + 1} - \frac{y(x)}{\sqrt{x^2 + 1}} + 1 \right) + \log (x^2 + 1) \right) = \frac{\tanh^{-1} \left(\frac{3\sqrt{x^2 + 1} + y(x)}{\sqrt{5}(\sqrt{x^2 + 1} + y(x))} \right)}{\sqrt{5}} + c_1, y(x) \right]$

✓ **Maple** : cpu = 0.56 (sec), leaf count = 115

```
dsolve(diff(y(x),x) = x/(y(x)+(x^2+1)^(1/2)),y(x))
```

$$\frac{2 \ln \left(-\frac{1296 \left(\sqrt{x^2 + 1} y(x) - x^2 + y(x)^2 - 1 \right)}{11 \left(y(x) + \sqrt{x^2 + 1} \right)^2} \right)}{3} - \frac{4 \sqrt{5} \operatorname{arctanh} \left(\frac{\left(3 \sqrt{x^2 + 1} + y(x) \right) \sqrt{5}}{5 y(x) + 5 \sqrt{x^2 + 1}} \right)}{15} - \frac{4 \ln \left(\frac{36 \sqrt{x^2 + 1}}{y(x) + \sqrt{x^2 + 1}} \right)}{3} + \frac{2 \ln (x^2 + 1)}{3} - c_1$$

2.627

ODE No. 627

$$y'(x) = \frac{(y(x) \log(x) - 1)^2}{x}$$

✓ **Mathematica** : cpu = 0.424194 (sec), leaf count = 43

```
DSolve[Derivative[1][y][x] == (-1 + Log[x]*y[x])^2/x,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sin(\log(x)) + c_1 \cos(\log(x))}{\log(x) \sin(\log(x)) + \cos(\log(x)) + c_1 \log(x) \cos(\log(x)) - c_1 \sin(\log(x))} \right\} \right\}$$

✓ **Maple** : cpu = 0.174 (sec), leaf count = 35

```
dsolve(diff(y(x),x) = (-1+y(x)*ln(x))^2/x,y(x))
```

$$y(x) = \frac{\sin(\ln(x)) c_1 + \cos(\ln(x))}{(\ln(x) + c_1) \cos(\ln(x)) + \sin(\ln(x)) (\ln(x) c_1 - 1)}$$

2.628

ODE No. 628

$$y'(x) = \frac{1}{3}x\left(3\sqrt{x^2 + 3y(x)} - 2\right)$$

✓ **Mathematica** : cpu = 0.133185 (sec), leaf count = 33

```
DSolve[Derivative[1][y][x] == (x*(-2 + 3*Sqrt[x^2 + 3*y[x]]))/3,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{48}\left(9x^4 - 16x^2 - 54c_1x^2 + 81c_1^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.271 (sec), leaf count = 23

```
dsolve(diff(y(x),x) = 1/3*x*(-2+3*(x^2+3*y(x))^(1/2)),y(x))
```

$$c_1 + \frac{x^2}{3} + \frac{4}{27} - \frac{4\sqrt{x^2 + 3y(x)}}{9} = 0$$

2.629 ODE No. 629

$$y'(x) = \frac{(2y(x)\log(x) - 1)^2}{x}$$

✓ **Mathematica** : cpu = 0.408079 (sec), leaf count = 92

```
DSolve[Derivative[1][y][x] == (-1 + 2*Log[x]*y[x])^2/x,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sin(\sqrt{2}\log(x)) + c_1 \cos(\sqrt{2}\log(x))}{2\log(x)\sin(\sqrt{2}\log(x)) + \sqrt{2}\cos(\sqrt{2}\log(x)) + 2c_1\log(x)\cos(\sqrt{2}\log(x)) - \sqrt{2}c_1\sin(\sqrt{2}\log(x))} \right. \right.$$

✓ **Maple** : cpu = 0.218 (sec), leaf count = 62

```
dsolve(diff(y(x),x) = (2*y(x)*ln(x)-1)^2/x,y(x))
```

$$y(x) = \frac{\sin(\sqrt{2}\ln(x))c_1 + \cos(\sqrt{2}\ln(x))}{\sin(\sqrt{2}\ln(x))(2\ln(x)c_1 - \sqrt{2}) + (\sqrt{2}c_1 + 2\ln(x))\cos(\sqrt{2}\ln(x))}$$

2.630

ODE No. 630

$$y'(x) = \frac{e^{bx}}{e^{-bx}y(x) + 1}$$

✓ **Mathematica** : cpu = 0.332091 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == E^(b*x)/(1 + y[x]/E^(b*x)), y[x], x]
```

$$\text{Solve}\left[\frac{1}{2}b(\log(-be^{-2bx}y(x)^2 - be^{-bx}y(x) + 1) + 2bx) = \frac{b \tan^{-1}\left(\frac{(b+2)(-e^{bx}) - by(x)}{b\sqrt{-\frac{b+4}{b}}(e^{bx} + y(x))}\right)}{\sqrt{-\frac{b+4}{b}}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.384 (sec), leaf count = 98

```
dsolve(diff(y(x), x) = 1/(y(x)*exp(-b*x)+1)*exp(b*x), y(x))
```

$$y(x) = \text{RootOf}\left(-e^{\text{RootOf}\left(\tanh\left(\frac{\sqrt{b^2+4b}(2bc_1-2bx-{}_Z)}{2b}\right)^2b+4\tanh\left(\frac{\sqrt{b^2+4b}(2bc_1-2bx-{}_Z)}{2b}\right)^2-4e^{-{}_Z-b-4}\right)-1+{}_Zb+b_{}_Z^2}, \right)$$

2.631 ODE No. 631

$$y'(x) = \frac{1}{2}x^2\left(2\sqrt{x^3 - 6y(x)} + 1\right)$$

✓ **Mathematica** : cpu = 0.147674 (sec), leaf count = 31

```
DSolve[Derivative[1][y][x] == (x^2*(1 + 2*Sqrt[x^3 - 6*y[x]]))/2,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{6}(-x^6 + x^3 - 12c_1x^3 - 36c_1^2)\right\}\right\}$$

✓ **Maple** : cpu = 0.271 (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 = 0.162321 (sec), leaf count = 65

```
DSolve[Derivative[1][y][x] == E^x/(1 + y[x]/E^x),y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}\log\left(-e^{-2x}y(x)^2 - e^{-x}y(x) + 1\right) + x = \frac{\tanh^{-1}\left(\frac{y(x)+3e^x}{\sqrt{5}(y(x)+e^x)}\right)}{\sqrt{5}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.427 (sec), leaf count = 54

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(-x)+1)*exp(x),y(x))
```

$$x - \frac{\sqrt{5} \operatorname{arctanh}\left(\frac{2\sqrt{5}y(x)e^{-x}}{5} + \frac{\sqrt{5}}{5}\right)}{5} + \frac{\ln\left(y(x)^2 e^{-2x} + y(x) e^{-x} - 1\right)}{2} - c_1 = 0$$

2.633

ODE No. 633

$$y'(x) = \frac{e^{2x/3}}{e^{-2x/3}y(x) + 1}$$

✓ **Mathematica** : cpu = 0.175241 (sec), leaf count = 85

```
DSolve[Derivative[1][y][x] == E^((2*x)/3)/(1 + y[x]/E^((2*x)/3)),y[x],x]
```

$$\text{Solve}\left[7\left(3\log\left(-\frac{2}{3}e^{-4x/3}y(x)^2-\frac{2}{3}e^{-2x/3}y(x)+1\right)+4x-9c_1\right)=6\sqrt{7}\tanh^{-1}\left(\frac{y(x)+4e^{2x/3}}{\sqrt{7}(y(x)+e^{2x/3})}\right),y(x)\right]$$

✓ **Maple** : cpu = 1.253 (sec), leaf count = 52

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(-2/3*x)+1)*exp(2/3*x),y(x))
```

$$y(x) = \text{RootOf}\left(-e^{\text{RootOf}\left(343-343\tanh\left(\frac{(4c_1-4x-3\_Z)\sqrt{7}}{6}\right)^2+98e^{-Z}\right)-3+2\_Z+2\_Z^2}\right)e^{\frac{2x}{3}}$$

2.634 ODE No. 634

$$y'(x) = \frac{x^5 \sqrt{4x^2 y(x) + 1} + \frac{1}{2}}{x^3}$$

✓ **Mathematica** : cpu = 0.175713 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x^{10} - 8c_1x^6 + 16c_1^2x^2 - 4}{16x^2} \right\} \right\}$$

✓ **Maple** : cpu = 0.388 (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))
```

$$c_1 - \frac{\sqrt{4x^2y(x) + 1}}{x} + \frac{x^4}{2} = 0$$

2.635

ODE No. 635

$$y'(x) = \frac{1}{2}x\left(2\sqrt{x^3 - 6y(x)} + x\right)$$

✓ **Mathematica** : cpu = 0.135561 (sec), leaf count = 33

```
DSolve[Derivative[1][y][x] == (x*(x + 2*Sqrt[x^3 - 6*y[x]]))/2,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{24}(-9x^4 + 4x^3 + 36c_1x^2 - 36c_1^2)\right\}\right\}$$

✓ **Maple** : cpu = 0.25 (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 = 0.0829399 (sec), leaf count = 24

```
DSolve[Derivative[1][y][x] == (x^2 - Log[y[x]])*y[x], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow e^{x^2 - 2x - 2c_1 e^{-x} + 2} \right\} \right\}$$

✓ **Maple** : cpu = 0.257 (sec), leaf count = 19

```
dsolve(diff(y(x), x) = (-ln(y(x))+x^2)*y(x), y(x))
```

$$y(x) = e^{e^{-x}c_1 + x^2 - 2x + 2}$$

2.637 ODE No. 637

$$y'(x) = \frac{e^{-x^2} x}{e^{x^2} y(x) + 1}$$

✓ **Mathematica** : cpu = 7.08779 (sec), leaf count = 62

```
DSolve[Derivative[1][y][x] == x/(E^x^2*(1 + E^x^2*y[x])), y[x], x]
```

$$\text{Solve}\left[-\frac{1}{4}\log\left(2e^{2x^2}y(x)^2+2e^{x^2}y(x)+1\right)-\frac{1}{2}\tan^{-1}\left(2e^{x^2}y(x)+1\right)+\frac{1}{2}\log\left(e^{x^2}\right)=c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.18 (sec), leaf count = 84

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(x^2)+1)*exp(-x^2)*x,y(x))
```

$$y(x) = -\frac{\tan\left(\text{RootOf}\left(2x^2-\ln\left(\frac{81\tan(\_Z)^2}{10}+\frac{81}{10}\right)+2\ln\left(\frac{9\tan(\_Z)}{2}-\frac{9}{2}\right)+6c_1-2\_Z\right)\right)e^{-x^2}}{\tan\left(\text{RootOf}\left(2x^2-\ln\left(\frac{81\tan(\_Z)^2}{10}+\frac{81}{10}\right)+2\ln\left(\frac{9\tan(\_Z)}{2}-\frac{9}{2}\right)+6c_1-2\_Z\right)\right)-1}$$

2.638

ODE No. 638

$$y'(x) = y(x)(\log(\log(y(x))) - \log(x))$$

✓ **Mathematica** : cpu = 0.0982974 (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 = 0.429 (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 = 0.131032 (sec), leaf count = 53

`DSolve[Derivative[1][y][x] == (Log[x] - Log[Log[y[x]]])^2*y[x],y[x],x]`

Solve $\left[\int_1^{y(x)} \frac{1}{K[1] \left(x \log^2(x) - 2x \log(\log(K[1])) \log(x) + x \log^2(\log(K[1])) - \log(K[1])) \right)} dK[1] = \log(x) + c_1 \right]$

✓ **Maple** : cpu = 0.395 (sec), leaf count = 46

`dsolve(diff(y(x),x) = (-ln(ln(y(x)))+ln(x))^2*y(x),y(x))`

$$\int_{_b}^{y(x)} \frac{1}{\_a \left(x \ln(x)^2 - 2 \ln(\ln(\_a)) \ln(x) x + \ln(\ln(\_a))^2 x - \ln(\_a) \right)} d\_a - c_1 = 0$$

2.640

ODE No. 640

$$y'(x) = \frac{y(x)}{\log(\log(y(x))) - \log(x) + 1}$$

✓ **Mathematica** : cpu = 0.198646 (sec), leaf count = 53

```
DSolve[Derivative[1][y][x] == y[x]/(1 - Log[x] + Log[Log[y[x]]]), y[x], x]
```

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 = 0.744 (sec), leaf count = 47

```
dsolve(diff(y(x), x) = 1/(ln(ln(y(x)))-ln(x)+1)*y(x), y(x))
```

$$\int_{-b}^{y(x)} \frac{-\ln(\ln(\_a)) + \ln(x) - 1}{(-\ln(\_a) \ln(\ln(\_a)) + \ln(\_a) \ln(x) - \ln(\_a) + x) \_a} d\_a - c_1 = 0$$

2.641

ODE No. 641

$$y'(x) = \frac{x^4 \sqrt{4x^2y(x) + 1} + \frac{1}{2}}{x^3}$$

✓

Mathematica

: cpu = 0.15289 (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]

$$\left\{\left\{y(x) \rightarrow \frac{4x^8 - 24c_1x^5 + 36c_1^2x^2 - 9}{36x^2}\right\}\right\}$$

✓

Maple

: cpu = 0.378 (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))

$$c_1 - \frac{\sqrt{4x^2y\left(x\right) + 1}}{x} + \frac{2x^3}{3} = 0$$

2.642

ODE No. 642

$$y'(x) = \frac{(4ax - y(x)^2)^2}{y(x)}$$

✓ **Mathematica** : cpu = 0.131907 (sec), leaf count = 105

```
DSolve[Derivative[1][y][x] == (4*a*x - y[x]^2)^2/y[x], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{4ax - \sqrt{2}\sqrt{a} \tanh\left(\frac{2\sqrt{2}ax - \sqrt{2}c_1}{\sqrt{a}}\right)} \right\}, \left\{ y(x) \rightarrow \sqrt{4ax - \sqrt{2}\sqrt{a} \tanh\left(\frac{2\sqrt{2}ax - \sqrt{2}c_1}{\sqrt{a}}\right)} \right\} \right.$$

✓ **Maple** : cpu = 0.307 (sec), leaf count = 281

```
dsolve(diff(y(x), x) = (-y(x)^2+4*a*x)^2/y(x), y(x))
```

$$y(x) = \frac{2\sqrt{\left(c_1\left(ax - \frac{\sqrt{2}\sqrt{a}}{4}\right)e^{2x(\sqrt{2}\sqrt{a}-2ax)} + e^{-2x(\sqrt{2}\sqrt{a}+2ax)}\left(ax + \frac{\sqrt{2}\sqrt{a}}{4}\right)\right)\left(c_1e^{2x(\sqrt{2}\sqrt{a}-2ax)} + e^{-2x(\sqrt{2}\sqrt{a}+2ax)}\right)}}{c_1e^{2x(\sqrt{2}\sqrt{a}-2ax)} + e^{-2x(\sqrt{2}\sqrt{a}+2ax)}}$$

2.643

ODE No. 643

$$y'(x) = \frac{1}{3}x\left(3x\sqrt{x^2 + 3y(x)} - 2\right)$$

✓ **Mathematica** : cpu = 0.131336 (sec), leaf count = 31

```
DSolve[Derivative[1][y][x] == (x*(-2 + 3*x*Sqrt[x^2 + 3*y[x]]))/3,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{12}\left(x^6 - 6c_1x^3 - 4x^2 + 9c_1^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.243 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = 1/3*x*(-2+3*x*(x^2+3*y(x))^(1/2)),y(x))
```

$$c_1 + \frac{x^3}{2} - \sqrt{x^2 + 3y(x)} = 0$$

2.644

ODE No. 644

$$y'(x) = -\frac{1}{2}x^2\Big(ax - 2\sqrt{a\left(ax^4 + 8y(x)\right)}\Big)$$

✓ **Mathematica** : cpu = 0.257638 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{72}a\big(16x^6 - 9x^4 - 96c_1x^3 + 144c_1^2\big)\right\}\right\}$$

✓ **Maple** : cpu = 0.424 (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))
```

$$c_1 + \frac{4ax^3}{3} - \sqrt{a\left(ax^4 + 8y(x)\right)} = 0$$

2.645

ODE No. 645

$$y'(x) = y(x)(x - \log(y(x)))$$

✓ **Mathematica** : cpu = 0.0677988 (sec), leaf count = 20

```
DSolve[Derivative[1][y][x] == (x - Log[y[x]])*y[x],y[x],x]
```

$$\left\{\left\{y(x) \rightarrow e^{x-e^{-x+c_1}-1}\right\}\right\}$$

✓ **Maple** : cpu = 0.19 (sec), leaf count = 14

```
dsolve(diff(y(x),x) = (-ln(y(x))+x)*y(x),y(x))
```

$$y(x) = e^{e^{-x}c_1-1+x}$$

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 = 0.205296 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{6} (x^3 - 9 \log^2(x + 1) + 18c_1 \log(x + 1) - 9c_1^2) \right\} \right\}$$

✓ **Maple** : cpu = 0.352 (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

$$y'(x) = \frac{x(ay(x)^2 + bx^2)^2}{a^{5/2}y(x)}$$

✓ **Mathematica** : cpu = 0.298669 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\sqrt{-\frac{bx^2}{a} + \frac{\sqrt{b} \tan\left(\frac{a^{3/2}bx^2+2c_1}{a^{9/4}\sqrt{b}}\right)}{\sqrt[4]{a}}}\right\}, \left\{ y(x) \rightarrow \sqrt{-\frac{bx^2}{a} + \frac{\sqrt{b} \tan\left(\frac{a^{3/2}bx^2+2c_1}{a^{9/4}\sqrt{b}}\right)}{\sqrt[4]{a}}}\right\} \right\}$$

✓ **Maple** : cpu = 0.332 (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))
```

$$y(x) = \frac{\sqrt{-\left(c_1 e^{\frac{x^2\left(2a^{3/2}\sqrt{-\frac{b}{a^{3/2}}}+bx^2\right)}{2a^{3/2}}} + e^{\frac{x^2\left(-2a^{3/2}\sqrt{-\frac{b}{a^{3/2}}}+bx^2\right)}{2a^{3/2}}}\right)\left(\left(bx^2-a^{3/2}\sqrt{-\frac{b}{a^{3/2}}}\right)e^{\frac{x^2\left(-2a^{3/2}\sqrt{-\frac{b}{a^{3/2}}}+bx^2\right)}{2a^{3/2}}} + \right)}{a\left(c_1 e^{\frac{x^2\left(2a^{3/2}\sqrt{-\frac{b}{a^{3/2}}}+bx^2\right)}{2a^{3/2}}} + e^{\frac{x^2\left(-2a^{3/2}\sqrt{-\frac{b}{a^{3/2}}}+bx^2\right)}{2a^{3/2}}}\right)}}$$

2.648

ODE No. 648

$$y'(x) = -\frac{\sqrt{a}x^3\left(-2\sqrt{ax^4+8y(x)}+\sqrt{ax}+\sqrt{a}\right)}{2(x+1)}$$

✓ **Mathematica** : cpu = 0.39156 (sec), leaf count = 128

`DSolve[Derivative[1][y][x] == -1/2*(Sqrt[a]*x^3*(Sqrt[a] + Sqrt[a]*x - 2*Sqrt[a*x^4 + 8*y[x]])`

$$\left\{\left\{y(x)\rightarrow \frac{1}{72}(16ax^6-48ax^5+123ax^4-96ax^3\log(x+1)-96ac_1x^3-72ax^2+144ax^2\log(x+1)+144ac_1x^2-144ac_1x\right.\right.$$

✓ **Maple** : cpu = 0.951 (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),`

$$-\sqrt{ax^4+8y(x)}-4\sqrt{a}\ln(1+x)+\frac{2(2x^3-3x^2+6x)\sqrt{a}}{3}-c_1=0$$

2.649

ODE No. 649

$$y'(x) = x\sqrt{x^2 + 8y(x) - 2x + 1} - \frac{x}{4} + \frac{1}{4}$$

✓ **Mathematica** : cpu = 0.248724 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{8}(4x^4 - x^2 - 16c_1x^2 + 2x - 1 + 16c_1^2)\right\}\right\}$$

✓ **Maple** : cpu = 0.291 (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 = 0.301151 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{4}(-a^2 - 2ax + x^4 - x^2 - 4c_1x^2 + 4c_1^2)\right\}\right\}$$

✓ **Maple** : cpu = 0.331 (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 = 0.0775057 (sec), leaf count = 16

```
DSolve[Derivative[1][y][x] == ((x^2 + Log[y[x]])*y[x])/x,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow e^{x^2+2c_1x} \right\} \right\}$$

✓ **Maple** : cpu = 0.112 (sec), leaf count = 13

```
dsolve(diff(y(x),x) = (ln(y(x))+x^2)*y(x)/x,y(x))
```

$$y(x) = e^{xc_1}e^{x^2}$$

2.652

ODE No. 652

$$y'(x) = \frac{x\sqrt{4ax - y(x)^2} + 2a}{y(x)}$$

✓ **Mathematica** : cpu = 0.88878 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (2*a + x*Sqrt[4*a*x - y[x]^2])/y[x],y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{16a^5x - a^4x^4 + 2a^2e^{c_1}x^2 - e^{2c_1}}}{2a^2} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{16a^5x - a^4x^4 + 2a^2e^{c_1}x^2 - e^{2c_1}}}{2a^2} \right\} \right\}$$

✓ **Maple** : cpu = 0.154 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = (2*a+x*(-y(x)^2+4*a*x)^(1/2))/y(x),y(x))
```

$$-\sqrt{-y(x)^2 + 4ax} - \frac{x^2}{2} - c_1 = 0$$

2.653

ODE No. 653

$$y'(x) = x\sqrt{x^2 + 4y(x) - 4x} - \frac{x}{2} + 1$$

✓ **Mathematica** : cpu = 0.224959 (sec), leaf count = 34

```
DSolve[Derivative[1][y][x] == 1 - x/2 + x*Sqrt[-4*x + x^2 + 4*y[x]], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4} (x^4 - x^2 - 4c_1x^2 + 4x + 4c_1^2) \right\} \right\}$$

✓ **Maple** : cpu = 0.286 (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 = 0.19594 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{12}(-4x^2 + 9\log^2(x + 1) - 18c_1 \log(x + 1) + 9c_1^2) \right\} \right\}$$

✓ **Maple** : cpu = 0.339 (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 = 9.48728 (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]
```

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 = 1.234 (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))
```

$$x + \frac{3\sqrt{7} \operatorname{arctanh}\left(\frac{3y(x)\sqrt{7}e^{-\frac{2x}{3}}}{7} - \frac{\sqrt{7}}{7}\right)}{14} - \frac{3\ln\left(3y(x)^2e^{-\frac{4x}{3}} - 2y(x)e^{-\frac{2x}{3}} - 2\right)}{4} + \frac{3\ln\left(y(x)e^{-\frac{2x}{3}}\right)}{2} - c_1 = 0$$

2.656

ODE No. 656

$$y'(x) = \frac{y(x) \left(x^3 + \log(y(x))\right)}{x}$$

✓ **Mathematica** : cpu = 0.0783927 (sec), leaf count = 20

```
DSolve[Derivative[1][y][x] == ((x^3 + Log[y[x]])*y[x])/x,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow e^{\frac{x^3}{2}+3c_1x}\right\}\right\}$$

✓ **Maple** : cpu = 0.122 (sec), leaf count = 15

```
dsolve(diff(y(x),x) = (ln(y(x))+x^3)*y(x)/x,y(x))
```

$$y(x) = e^{\frac{x^3}{2}} e^{xc_1}$$

2.657 ODE No. 657

$$y'(x) = x^2 \sqrt{x^2 + 8y(x) - 2x + 1} - \frac{x}{4} + \frac{1}{4}$$

✓ **Mathematica** : cpu = 0.318022 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{72} (16x^6 - 96c_1x^3 - 9x^2 + 18x - 9 + 144c_1^2) \right\} \right\}$$

✓ **Maple** : cpu = 0.262 (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 = 0.538666 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{8} \left(-x^2 + 2x + 16 \log^2 \left(\frac{1}{x+1} \right) + 32c_1 \log \left(\frac{1}{x+1} \right) - 1 + 16c_1^2 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.369 (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 = 0.757194 (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]]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{b^2 \log^2 \left(\sinh \left(\frac{ax^2}{b} - \frac{2ac_1}{b} \right) - \cosh \left(\frac{ax^2}{b} - \frac{2ac_1}{b} \right) \right)}{4a} - \frac{b^2}{4a} + \frac{c}{a} - \frac{ax^2}{4} - \frac{bx}{2} \right\} \right\}$$

✓ **Maple** : cpu = 1.243 (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))
```

$$\frac{a x^2}{\left(-a x^2 + \sqrt{a^2 x^2 + 2 a b x + b^2 + 4 a y(x)} - 4 c\right) \left(-a^2 x^4 + a^2 x^2 + 2 a b x + 4 a y(x) + b^2 - 4 c\right)} + \frac{1}{\left(-a x^2 + \sqrt{a^2 x^2 + 2 a b x + b^2 + 4 a y(x)} - 4 c\right)}$$

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 = 0.202514 (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]`

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{36}(-9a^2 - 18ax + 4x^6 - 24c_1x^3 - 9x^2 + 36c_1^2) \right\} \right\}$$

✓ **Maple** : cpu = 0.276 (sec), leaf count = 29

`dsolve(diff(y(x),x) = -1/2*x-1/2*a+x^2*(x^2+2*a*x+a^2+4*y(x))^(1/2),y(x))`

$$c_1 + \frac{2x^3}{3} - \sqrt{x^2 + 2ax + a^2 + 4y(x)} = 0$$

2.661

ODE No. 661

$$y'(x) = x^2 \sqrt{a^2 x^2 + 2abx + 4ay(x) + b^2 - 4c} - \frac{ax}{2} - \frac{b}{2}$$

✓ **Mathematica** : cpu = 0.379988 (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(x), x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{b^2 \log^2 \left(\sinh \left(\frac{2ax^3}{3b} - \frac{2ac_1}{b} \right) - \cosh \left(\frac{2ax^3}{3b} - \frac{2ac_1}{b} \right) \right)}{4a} - \frac{b^2}{4a} + \frac{c}{a} - \frac{ax^2}{4} - \frac{bx}{2} \right\} \right\}$$

✓ **Maple** : cpu = 0.336 (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))
```

$$c_1 + \frac{2a}{3} x^3 - \sqrt{a^2 x^2 + 2abx + b^2 + 4ay(x) - 4c} = 0$$

2.662

ODE No. 662

$$y'(x) = x^2 \sqrt{x^2 - 4y(x) + 2x + 1} + \frac{x}{2} + \frac{1}{2}$$

✓ **Mathematica** : cpu = 0.311375 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{36} \left(-4x^6 + 24c_1x^3 + 9x^2 + 18x + 9 - 36c_1^2 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.288 (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))
```

$$c_1 - \frac{2x^3}{3} - \sqrt{x^2 + 2x + 1 - 4y(x)} = 0$$

2.663

ODE No. 663

$$y'(x) = \frac{x^2 \sqrt{4ax - y(x)^2} + 2a}{y(x)}$$

✓ **Mathematica** : cpu = 0.953112 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{36a^7x - a^6x^6 + 2a^3e^{c_1}x^3 - e^{2c_1}}}{3a^3} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{36a^7x - a^6x^6 + 2a^3e^{c_1}x^3 - e^{2c_1}}}{3a^3} \right\} \right\}$$

✓ **Maple** : cpu = 0.161 (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 = 0.148577 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{36} (4x^6 - 24c_1x^3 - 9x^2 + 36x + 36c_1^2) \right\} \right\}$$

✓ **Maple** : cpu = 0.233 (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))
```

$$c_1 + \frac{2x^3}{3} - \sqrt{x^2 - 4x + 4y(x)} = 0$$

2.665

ODE No. 665

$$y'(x) = -\frac{\sqrt{a}\Big(-2\sqrt{ax^4+8y(x)}+\sqrt{ax^4}+\sqrt{ax^3}\Big)}{2(x+1)}$$

✓ **Mathematica** : cpu = 0.353813 (sec), leaf count = 41

```
DSolve[Derivative[1][y][x] == -1/2*(Sqrt[a]*(Sqrt[a]*x^3 + Sqrt[a]*x^4 - 2*Sqrt[a*x^4 + 8*y[x]]
```

$$\left\{\left\{y(x)\rightarrow\frac{1}{8}\Big(-ax^4+16a\log^2(x+1)-32ac_1\log(x+1)+16ac_1^2\Big)\right\}\right\}$$

✓ **Maple** : cpu = 0.662 (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
```

$$4\sqrt{a}\ln(1+x)-\sqrt{ax^4+8y(x)}-c_1=0$$

2.666

ODE No. 666

$$y'(x) = y(x) \left(x^3 + x^2 - \log(y(x)) + 1 \right)$$

✓ **Mathematica** : cpu = 0.109909 (sec), leaf count = 29

```
DSolve[Derivative[1][y][x] == (1 + x^2 + x^3 - Log[y[x]])*y[x], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow e^{x^3 - 2x^2 + 4x - c_1 e^{-x} - 3} \right\} \right\}$$

✓ **Maple** : cpu = 0.305 (sec), leaf count = 24

```
dsolve(diff(y(x), x) = (-ln(y(x)) + 1 + x^2 + x^3)*y(x), y(x))
```

$$y(x) = e^{e^{-x} c_1 + x^3 - 2x^2 + 4x - 3}$$

2.667 ODE No. 667

$$y'(x) = \frac{e^{-2bx}y(x)^3}{e^{-bx}y(x)+1}$$

✓ **Mathematica** : cpu = 2.84321 (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]
```

$$\text{Solve} \left[\frac{\log(y(x))}{b} + \frac{-\log\left(b e^{bx}\left(e^{bx} + y(x)\right) - y(x)^2\right) + 2\sqrt{\frac{b}{b+4}} \tanh^{-1}\left(\frac{\sqrt{\frac{b}{b+4}}(2e^{bx} + y(x))}{y(x)}\right) + 2\log\left(e^{bx}\right)}{2b} = c_1, y \right]$$

✓ **Maple** : cpu = 0.257 (sec), leaf count = 82

```
dsolve(diff(y(x),x) = y(x)^3/(y(x)*exp(-b*x)+1)*exp(-2*b*x),y(x))
```

$$bx - \frac{b \operatorname{arctanh}\left(\frac{-2y(x)e^{-bx}+b}{\sqrt{b^2+4b}}\right)}{\sqrt{b^2+4b}} - \frac{\ln\left(-by(x)e^{-bx} + y(x)^2e^{-2bx} - b\right)}{2} + \ln\left(y(x)e^{-bx}\right) - c_1 = 0$$

2.668

ODE No. 668

$$y'(x) = \frac{e^{-2x}y(x)^3}{e^{-x}y(x) + 1}$$

✓ **Mathematica** : cpu = 0.539511 (sec), leaf count = 73

```
DSolve[Derivative[1][y][x] == y[x]^3/(E^(2*x)*(1 + y[x]/E^x)),y[x],x]
```

Solve $\left[\log(y(x)) + \frac{1}{10} \left(-\left(5 + \sqrt{5}\right) \log\left(-\sqrt{5}y(x) + y(x) + 2e^x\right) + \left(\sqrt{5} - 5\right) \log\left(\sqrt{5}y(x) + y(x) + 2e^x\right) + \right.$

✓ **Maple** : cpu = 1.059 (sec), leaf count = 58

```
dsolve(diff(y(x),x) = 1/(y(x)*exp(-x)+1)*y(x)^3*exp(-2*x),y(x))
```

$$y(x) = e^{\operatorname{RootOf}\left(2\sqrt{5} \operatorname{arctanh}\left(\frac{\left(-2 e^{-Z} + e^x\right)\sqrt{5} e^{-x}}{5}\right) + 5 \ln\left(e^{2-Z} - e^x + -Z - e^{2x}\right) + 10 c_1 - 10_Z - 10 x\right)}$$

2.669

ODE No. 669

$$y'(x) = \frac{e^x(3e^x - 2y(x)^{3/2})^2}{4\sqrt{y(x)}}$$

✓ **Mathematica** : cpu = 0.503051 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{\left(-2 e^{3 e^x}+3 e^{x+3 e^x}+3 e^{x+3 c_1}+2 e^{3 c_1}\right)^{2 / 3}}{\sqrt[3]{4 e^{6 e^x}+8 e^{3 e^x+3 c_1}+4 e^{6 c_1}}}\right\},\left\{y(x) \rightarrow-\frac{\sqrt[3]{-1}\left(-2 e^{3 e^x}+3 e^{x+3 e^x}+3 e^{x+3 c_1}+2 e^{3 c_1}\right)}{\sqrt[3]{4 e^{6 e^x}+8 e^{3 e^x+3 c_1}+4 e^{6 c_1}}}\right\}\right.$$

✓ **Maple** : cpu = 0.177 (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))
```

$$c_1 + \frac{e^{-\frac{3}{2}e^x - \frac{9}{8}e^{2x}} \left(2y(x)^{3/2}e^x - 2e^x - 3e^{2x}\right) e^{-\frac{3}{2}e^x + \frac{9}{8}e^{2x}}}{2y(x)^{3/2}e^x + 2e^x - 3e^{2x}} = 0$$

2.670

ODE No. 670

$$y'(x) = \frac{1}{2}ixy(x)\left(-2\sqrt{4\log(a)-x^2+4\log(y(x))}+i\right)$$

✓ **Mathematica** : cpu = 0.361161 (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]
```

$$\left\{\left\{y(x)\rightarrow \exp\left(\frac{1}{4}\left(-4\log(a)-W\left(ie^{-x^2-1-4c_1}\right)^2-2W\left(ie^{-x^2-1-4c_1}\right)+x^2-1\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.313 (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))
```

$$-\frac{i\ln\left(x^2-4\ln\left(a\right)-4\ln\left(y\left(x\right)\right)-1\right)}{4}-\frac{\sqrt{-x^2+4\ln\left(a\right)+4\ln\left(y\left(x\right)\right)}}{2}+\frac{\arctan\left(\sqrt{-x^2+4\ln\left(a\right)+4\ln\left(y\left(x\right)\right)}\right)}{2}$$

2.671 ODE No. 671

$$y'(x) = \frac{(xy(x)^2 + 1)^2}{x^4y(x)}$$

✓ **Mathematica** : cpu = 0.228674 (sec), leaf count = 192

```
DSolve[Derivative[1][y][x] == (1 + x*y[x]^2)^2/(x^4*y[x]), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{-\frac{2}{x} + \sqrt{2}e^{\frac{2\sqrt{2}(1+c_1x)}{x}} - \frac{2e^{\frac{2\sqrt{2}(1+c_1x)}{x}}}{x} - \sqrt{2}}}{\sqrt{2 + 2e^{\frac{2\sqrt{2}(1+c_1x)}{x}}}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{-\frac{2}{x} + \sqrt{2}e^{\frac{2\sqrt{2}(1+c_1x)}{x}} - \frac{2e^{\frac{2\sqrt{2}(1+c_1x)}{x}}}{x} - \sqrt{2}}}{\sqrt{2 + 2e^{\frac{2\sqrt{2}(1+c_1x)}{x}}}} \right\} \right.$$

✓ **Maple** : cpu = 0.263 (sec), leaf count = 237

```
dsolve(diff(y(x), x) = (x*y(x)^2+1)^2/y(x)/x^4, y(x))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{-\left(c_1e^{\frac{-1-\sqrt{2}x}{x^2}} + e^{\frac{-1+\sqrt{2}x}{x^2}}\right)x\left(c_1\left(\sqrt{2}x+2\right)e^{\frac{-1-\sqrt{2}x}{x^2}} + \left(2-\sqrt{2}x\right)e^{\frac{-1+\sqrt{2}x}{x^2}}\right)}}{2x\left(c_1e^{\frac{-1-\sqrt{2}x}{x^2}} + e^{\frac{-1+\sqrt{2}x}{x^2}}\right)}$$

2.672

ODE No. 672

$$y'(x) = \frac{x^2 \left(\sqrt{4y(x)^3 - 9x^4} + 3x \right)}{y(x)^2}$$

✓ **Mathematica** : cpu = 12.3693 (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]
```

Solve

$$\left[\int_1^x \left(-\frac{24\sqrt{4y(x)^3 - 9K[1]^4}y(x)^9}{(9K[1]^4 - 4y(x)^3)(4y(x)^9 - 729)} + \frac{16K[1]^2\sqrt{4y(x)^3 - 9K[1]^4}y(x)^9}{(4K[1]^6 + 9K[1]^4 + 16K[1]^3 - 4y(x)^3 + 16)(4y(x)^9 - 729)} \right) dx \right]$$

✓ **Maple** : cpu = 0.154 (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))
```

$$\int_{-b}^{y(x)} \frac{-a^2}{\sqrt{-9x^4 + 4a^3}} da - \frac{x^3}{3} - c_1 = 0$$

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 = 0.2129 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \tan^{-1} \left(\frac{2x^3 + 3c_1}{6x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.388 (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 = 0.224741 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4} \left(-x^2 + 4x + 4 \log^2(x + 1) - 8c_1 \log(x + 1) + 4c_1^2 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.366 (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

$$y'(x) = \frac{ax^4 + ae^xx^3 + ax^3 - x^2y(x)^2 - e^xxy(x)^2 - xy(x)^2 + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.312866 (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
```

$$\left\{\left\{y(x) \rightarrow \sqrt{a} x \tanh \left(\frac{1}{6} \sqrt{a}\left(2 x^3+3 x^2+6 e^x x-6 e^x+6 c_1\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.076 (sec), leaf count = 37

```
dsolve(diff(y(x),x) = (y(x)+x^3*a*exp(x)+a*x^4+a*x^3-x*y(x)^2*exp(x)-y(x)^2*x^2-x*y(x)^2
```

$$y(x) = \tanh \left(\frac{\left(\left(6 x-6\right) e^x+2 x^3+3 x^2+6 c_1\right) \sqrt{a}}{6}\right) x \sqrt{a}$$

2.676

ODE No. 676

$$y'(x) = \frac{x^6 \sqrt{4x^2 y(x) + 1} + \frac{x}{2} + \frac{1}{2}}{x^3(x+1)}$$

✓ **Mathematica** : cpu = 0.768687 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{4x^2} + \frac{1}{4} \log^2 \left(x^2 \cosh \left(-\frac{x^4}{2} + \frac{2x^3}{3} - x^2 + 2x + 2c_1 \right) + 2x \cosh \left(-\frac{x^4}{2} + \frac{2x^3}{3} - x^2 + 2x + 2c_1 \right) \right. \right.$$

✓ **Maple** : cpu = 0.703 (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))
```

$$c_1 + 2 \ln(1+x) - \frac{\sqrt{4x^2 y(x) + 1}}{x} - 2x + x^2 - \frac{2x^3}{3} + \frac{x^4}{2} = 0$$

2.677

ODE No. 677

$$y'(x) = \frac{ax^4 + ax^3 + ax^3 \log(x + 1) - x^2y(x)^2 - xy(x)^2 + y(x) - xy(x)^2 \log(x + 1)}{x}$$

✓

Mathematica : cpu = 0.148734 (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`

$$\left\{\left\{y(x) \rightarrow \sqrt{a}x \tanh \left(\frac{1}{12}(4\sqrt{a}x^3 + 3\sqrt{a}x^2 + 6\sqrt{a}x^2 \log(x + 1) + 6\sqrt{a}x - 6\sqrt{a} \log(x + 1) + 12\sqrt{a}c_1)\right)\right\}\right\}$$

✓

Maple : cpu = 0.094 (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)`

$$y(x) = \tanh \left(\frac{\sqrt{a} \left(6 \ln \left(1+x\right) x^2 + 4 x^3 + 3 x^2 - 6 \ln \left(1+x\right) + 12 c_1 + 6 x + 9\right)}{12}\right) x \sqrt{a}$$

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 = 2.16066 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{24} \left(-4x^6 + 12x^5 - 33x^4 - 4x^3 + 24x^3 \log(x + 1) + 24c_1x^3 + 30x^2 - 36x^2 \log(x + 1) - 36c_1x^2 - \right. \right. \right.$$

✓ **Maple** : cpu = 0.443 (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

$$y'(x) = \frac{x^4 + x^3 + x^3 \log(x) + 7x^2y(x)^2 + 7xy(x)^2 + y(x) + 7xy(x)^2 \log(x)}{x}$$

✓ **Mathematica** : cpu = 0.119294 (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
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x \tan \left(\frac{1}{12} (4\sqrt{7}x^3 + 3\sqrt{7}x^2 + 6\sqrt{7}x^2 \log(x) + 12\sqrt{7}c_1) \right)}{\sqrt{7}} \right\} \right\}$$

✓ **Maple** : cpu = 0.095 (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)/
```

$$y(x) = \frac{\tan \left(\frac{(6x^2 \ln(x)+4x^3+3x^2+12c_1)\sqrt{7}}{12} \right) x\sqrt{7}}{7}$$

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 = 0.300549 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4} \left(x^2 + 2x - 4 \log^2(x + 1) + 8c_1 \log(x + 1) + 1 - 4c_1^2 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.323 (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 = 0.169314 (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
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt{b}x \tan\left(\frac{1}{12}\left(4\sqrt{a}\sqrt{b}x^3 + 9\sqrt{a}\sqrt{b}x^2 - 6\sqrt{a}\sqrt{b}x^2 \log(x) + 12\sqrt{a}\sqrt{b}c_1\right)\right)}{\sqrt{a}} \right\} \right\}$$

✓ **Maple** : cpu = 0.079 (sec), leaf count = 45

```
dsolve(diff(y(x),x) = (y(x)+x^3*b*ln(1/x)+b*x^4+b*x^3+x*a*y(x)^2*ln(1/x)+a*x^2*y(x)^2+a*
```

$$y(x) = \frac{\tan\left(\frac{\sqrt{ab}\left(4x^3+6x^2\ln\left(\frac{1}{x}\right)+9x^2+12c_1\right)}{12}\right)}{a}x\sqrt{ab}$$

2.682 ODE No. 682

$$y'(x) = \frac{2a}{x(-8a^2 + 2axy(x)^2 - xy(x))}$$

✓ **Mathematica** : cpu = 0.249234 (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 = 0.15 (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))
```

$$c_1 + \frac{(-xy(x)^2 + 4a) e^{-4ay(x)}}{x} = 0$$

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 = 0.763959 (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]`

$$\left\{ \left\{ y(x) \rightarrow \frac{e^{\frac{2x^3}{9} + \frac{x}{3}}}{e^{\frac{x^2}{6} + \frac{1}{18}(4x^2 - 3x + 6)x} x + c_1 e^{\frac{x^2}{6}} x \sqrt{x+1} (x(x+1))^{\frac{x^3}{3}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.069 (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))`

$$y(x) = \frac{1}{x \left((x(1+x))^{\frac{x^3}{3}} c_1 (1+x)^{1/3} e^{-\frac{2}{9}x^3 + \frac{1}{6}x^2 - \frac{1}{3}x} + 1 \right)}$$

2.684 ODE No. 684

$$y'(x) = \frac{x^2 \sqrt{x^2 + y(x)^2} + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.0961161 (sec), leaf count = 86

```
DSolve[Derivative[1][y][x] == (y[x] + x^2*Sqrt[x^2 + y[x]^2])/x,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x \tanh\left(\frac{1}{2}(x^2 + 2c_1)\right)}{\sqrt{1 - \tanh^2\left(\frac{1}{2}(x^2 + 2c_1)\right)}} \right\}, \left\{ y(x) \rightarrow \frac{x \tanh\left(\frac{1}{2}(x^2 + 2c_1)\right)}{\sqrt{1 - \tanh^2\left(\frac{1}{2}(x^2 + 2c_1)\right)}} \right\} \right\}$$

✓ **Maple** : cpu = 3.719 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = (y(x)+(y(x)^2+x^2)^(1/2)*x^2)/x,y(x))
```

$$\ln\left(\sqrt{y(x)^2 + x^2} + y(x)\right) - \frac{x^2}{2} - \ln(x) - c_1 = 0$$

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 = 0.111494 (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], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x \tan\left(\frac{1}{2}(-\sqrt{7}x^2 + \sqrt{7}x^2 \log(x-1) + \sqrt{7}x^2 \log(x+1) - \sqrt{7} \log(1-x) - \sqrt{7} \log(x+1) + 2\sqrt{7}c_1)\right)}{\sqrt{7}} \right. \right.$$

✓ **Maple** : cpu = 0.065 (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

$$y'(x) = \frac{e^{2x^2}xy(x)^3}{e^{x^2}y(x)+1}$$

✓ **Mathematica** : cpu = 7.14459 (sec), leaf count = 68

```
DSolve[Derivative[1][y][x] == (E^(2*x^2)*x*y[x]^3)/(1 + E^x^2*y[x]),y[x],x]
```

$$\text{Solve}\left[\log(y(x)) - 2y(x)^2\left(\frac{\log\left(e^{2x^2}y(x)^2 + 2e^{x^2}y(x) + 2\right)}{4y(x)^2} - \frac{\tan^{-1}\left(e^{x^2}y(x) + 1\right)}{2y(x)^2}\right) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.122 (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))
```

$$y(x) = \frac{\left(1 - \tan\left(\text{RootOf}\left(-2x^2 - \ln\left(\frac{81 \tan(\frac{Z}{2})^2}{10} + \frac{81}{10}\right) + 2 \ln\left(-\frac{9}{2} + \frac{9 \tan(\frac{Z}{2})}{2}\right) + 6c_1 - 2Z\right)\right)\right) e^{-x^2}}{\tan\left(\text{RootOf}\left(-2x^2 - \ln\left(\frac{81 \tan(\frac{Z}{2})^2}{10} + \frac{81}{10}\right) + 2 \ln\left(-\frac{9}{2} + \frac{9 \tan(\frac{Z}{2})}{2}\right) + 6c_1 - 2Z\right)\right)}$$

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 = 0.119855 (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
```

$$\left\{ \left\{ y(x) \rightarrow \frac{-x^2(x-1)^{x^2} - x(x-1)^{x^2} - x^2(x+1)^{x^2} e^{2x+2c_1} + x(x+1)^{x^2} e^{2x+2c_1}}{-x(x-1)^{x^2} - (x-1)^{x^2} - (x+1)^{x^2} e^{2x+2c_1} + x(x+1)^{x^2} e^{2x+2c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.089 (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 = 0.319798 (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,
```

$$\left\{\left\{y(x) \rightarrow x \tan \left(\frac{1}{2} \left(-8 e \operatorname{Ei}\left(\frac{2}{x-1}\right) + e^{\frac{x}{x-1} + \frac{1}{x-1}} x^2 + 2 e^{\frac{x}{x-1} + \frac{1}{x-1}} x - 3 e^{\frac{x}{x-1} + \frac{1}{x-1}} + 2 c_1\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.085 (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))
```

$$y(x) = \tan \left(\frac{(x^2 + 2x - 3) e^{\frac{1+x}{x-1}}}{2} + 4 e \operatorname{Ei}_1 \left(-\frac{2}{x-1} \right) + c_1 \right) x$$

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 = 0.341703 (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
```

$$\left\{\left\{y(x) \rightarrow -\frac{x\left(-1 + e^{2e^2\operatorname{Ei}(x-1)+2e^{x+1}+2c_1}\right)}{1 + e^{2e^2\operatorname{Ei}(x-1)+2e^{x+1}+2c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (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))
```

$$y(x) = -\tanh\left(e^{1+x} - e^2 \operatorname{Ei}_1(1-x) + c_1\right) x$$

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 = 0.654299 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{72} \left(16x^6 - 48x^5 + 132x^4 - 144x^3 + 96x^3 \log\left(\frac{1}{x+1}\right) - 96c_1x^3 + 135x^2 - 144x^2 \log\left(\frac{1}{x+1}\right) + \right. \right.$$

✓ **Maple** : cpu = 0.34 (sec), leaf count = 40

```
dsolve(diff(y(x),x) = 1/4*(-x^2+1+4*x^3*(x^2-2*x+1+8*y(x))^(1/2))/(1+x),y(x))
```

$$c_1 + \frac{4x^3}{3} - 2x^2 + 4x - 4 \ln(1+x) - \sqrt{x^2 - 2x + 1 + 8y(x)} = 0$$

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 = 0.220558 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \tan^{-1} \left(\frac{x^4 + 2c_1}{4x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.543 (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 = 0.106517 (sec), leaf count = 86

```
DSolve[Derivative[1][y][x] == (y[x] + x^3*Sqrt[x^2 + y[x]^2])/x,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x \tanh\left(\frac{1}{3}(x^3 + 3c_1)\right)}{\sqrt{1 - \tanh^2\left(\frac{1}{3}(x^3 + 3c_1)\right)}} \right\}, \left\{ y(x) \rightarrow \frac{x \tanh\left(\frac{1}{3}(x^3 + 3c_1)\right)}{\sqrt{1 - \tanh^2\left(\frac{1}{3}(x^3 + 3c_1)\right)}} \right\} \right\}$$

✓ **Maple** : cpu = 3.726 (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 = 2.6294 (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]
```

Solve $\left[\frac{1}{9} \text{RootSum} \left[-81 b^2 \#1^9 - 522 b \#1^9 - 841 \#1^9 - 243 b^2 \#1^6 - 1566 b \#1^6 - 2523 \#1^6 + 729 b^3 \#1^3 + 486 \right], y[x], x \right]$

✓ **Maple** : cpu = 0.069 (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))
```

$$y(x) = \text{RootOf} \left(-x + \int^{-x} \frac{1}{-a^3 + -a^2 - ab + 1} d-a + c_1 \right) e^{bx}$$

2.694

ODE No. 694

$$y'(x) = \frac{x^3 \sqrt{4x^2 y(x) + 1} + \frac{x}{2} + \frac{1}{2}}{x^3(x+1)}$$

✓ **Mathematica** : cpu = 0.591884 (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]
```

$$\left\{ \left\{ y(x) \rightarrow x^2 - \frac{1}{4x^2} + \frac{1}{4} \log^2(x^2 + 2x + 1) - x \log(x^2 + 2x + 1) + c_1 \log(x^2 + 2x + 1) - 2c_1 x + c_1^2 \right\} \right\}$$

✓ **Maple** : cpu = 0.431 (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))
```

$$-2 \ln(1+x) - \frac{\sqrt{4x^2 y(x) + 1}}{x} + 2x + c_1 = 0$$

2.695 ODE No. 695

$$y'(x) = \frac{x^4 + x^3 + x^2 y(x)^2 + x y(x)^2 + y(x) \log(x-1)}{x \log(x-1)}$$

✓ **Mathematica** : cpu = 0.218192 (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
```

$$\{\{y(x) \rightarrow x \tan(2\operatorname{Ei}(\log(x-1)) + 3\operatorname{Ei}(2\log(x-1)) + \operatorname{Ei}(3\log(x-1)) + c_1)\}\}$$

✓ **Maple** : cpu = 0.04 (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))
```

$$y(x) = \tan\left(-\operatorname{Ei}_1\left(-3\ln(x-1)\right) - 3\operatorname{Ei}_1\left(-2\ln(x-1)\right) - 2\operatorname{Ei}_1\left(-\ln(x-1)\right) + c_1\right)x$$

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 = 0.943388 (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
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x \tan \left(\sqrt{7} \int_1^x \frac{e^{K[1]+1} K[1]}{\log(K[1]-1)} dK[1] + \sqrt{7} c_1 \right)}{\sqrt{7}} \right\} \right\}$$

✓ **Maple** : cpu = 0.043 (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))
```

$$y(x) = \frac{\tan \left(\left(e \left(\int \frac{x e^x}{\ln(x-1)} dx \right) + c_1 \right) \sqrt{7} \right) x \sqrt{7}}{7}$$

2.697

ODE No. 697

$$y'(x) = e^{2x/3} \big(e^{-2x} y(x)^3 + e^{-4x/3} y(x)^2 + 1 \big)$$

✓ **Mathematica** : cpu = 0.253403 (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]
```

$$\text{Solve}\left[-\frac{35}{3}\text{RootSum}\left[-35\#1^3 + 9\sqrt[3]{35}\#1 - 35\&, \frac{\log\left(\frac{3e^{-4x/3}y(x)+e^{-2x/3}}{\sqrt[3]{35}\sqrt[3]{e^{-2x}}}-\#1\right)}{3\sqrt[3]{35}-35\#1^2}\&\right] = \frac{1}{9}35^{2/3}e^{4x/3}\left(e^{-2x}\right)^{2/3}x\right]$$

✓ **Maple** : cpu = 0.078 (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))
```

$$y(x) = \text{RootOf}\left(-x + 3\left(\int^{-x} \frac{1}{3a^3 + 3a^2 - 2a + 3}d_a\right) + c_1\right) e^{\frac{2x}{3}}$$

2.698

ODE No. 698

$$y'(x) = e^x \big(e^{-3x} y(x)^3 + e^{-2x} y(x)^2 + 1 \big)$$

✓ **Mathematica** : cpu = 0.24876 (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]
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{3e^{-2x}y(x)+e^{-x}}{\sqrt[3]{38}\sqrt[3]{e^{-3x}}} - \#1\right)}{2\sqrt[3]{38} - 19\#1^2}\&\right] = \frac{1}{9}38^{2/3}e^{2x}\left(e^{-3x}\right)^{2/3}x + c_1$$

✓ **Maple** : cpu = 0.059 (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 = 0.517171 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{3}\left(-x^2 + \frac{1}{16}\left(2x^3 - 3x^2 + 6x + 6\log\left(\frac{1}{x+1}\right) - 6c_1\right)^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.299 (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))
```

$$c_1 + \frac{x^3}{2} - \frac{3x^2}{4} + \frac{3x}{2} - \frac{3\ln(1+x)}{2} - \sqrt{x^2+3y(x)} = 0$$

2.700

ODE No. 700

$$y'(x) = \frac{1}{xy(x) \left(xy(x)^2 + x + 1 \right)}$$

✓ **Mathematica** : cpu = 0.159574 (sec), leaf count = 76

```
DSolve[Derivative[1][y][x] == 1/(x*y[x]*(1 + x + x*y[x]^2)), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{2xW\left(c_1e^{\frac{1}{2x}-\frac{1}{2}}\right) + x - 1}}{\sqrt{x}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{2xW\left(c_1e^{\frac{1}{2x}-\frac{1}{2}}\right) + x - 1}}{\sqrt{x}} \right\} \right\}$$

✓ **Maple** : cpu = 0.075 (sec), leaf count = 62

```
dsolve(diff(y(x),x) = 1/x/(x*y(x)^2+1+x)/y(x),y(x))
```

$$y(x) = \frac{\sqrt{x \left(2 \operatorname{LambertW}\left(\frac{c_1 e^{-\frac{x-1}{2x}}}{2}\right) x + x - 1 \right)}}{x}$$

2.701

ODE No. 701

$$y'(x) = \frac{x^4 + x^4 \log(x) - 2x^2y(x) - 2x^2y(x) \log(x) + y(x)^2 + y(x)^2 \log(x) + 2e^xx - 2x - \log(x) - 1}{e^x - 1}$$

✓

Mathematica : cpu = 0.93007 (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*

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp\left(\int_1^x \frac{2(\log(K[5])+1)}{-1+e^{K[5]}} dK[5]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[6]} \frac{2(\log(K[5])+1)}{-1+e^{K[5]}} dK[5]\right)(\log(K[6])+1)}{-1+e^{K[6]}} dK[6] + c_1} + x^2 + 1 \right\} \right\}$$

✓

Maple : cpu = 5.539 (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)+

$$y(x) = \frac{-x^2e^{\int \frac{2\ln(x)+2}{e^x-1}dx} + x^2c_1 + e^{\int \frac{2\ln(x)+2}{e^x-1}dx} + c_1}{-e^{\int \frac{2\ln(x)+2}{e^x-1}dx} + c_1}$$

2.702

ODE No. 702

$$y'(x) = \frac{-x^3 + x^3(-\log(x)) - xy(x)^2 + xy(x) - e^xy(x) - xy(x)^2\log(x)}{x\left(x - e^x\right)}$$

✓ **Mathematica** : cpu = 4.04442 (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], y[x], x]
```

$$\left\{\left\{y(x) \rightarrow x \tan \left(\int_1^x \frac{K[1](\log (K[1])+1)}{e^{K[1]}-K[1]} d K[1]+c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.062 (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^3), y(x))
```

$$y(x) = \tan \left(\int \frac{x \ln (x)}{e^x-x} d x+\int \frac{x}{e^x-x} d x+c_1\right) x$$

2.703

ODE No. 703

$$y'(x) = \frac{y(x) \left(x^3 y(x) + x^2 y(x) \log(x) - x^2 - x - x \log(x) + 1\right)}{(x-1)x}$$

✓ **Mathematica** : cpu = 0.391363 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (y[x]*(1 - x - x^2 - x*Log[x] + x^3*y[x] + x^2*Log[x]*y[x]))/((-
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{e^{-\operatorname{Li}_2(x)-x}(1-x)^{-\log(x)}}{(x-1)x \left(-\int_1^x \frac{\exp(-K[1]-\log(1-K[1])(\log(K[1])+1)-\operatorname{Li}_2(K[1]))(K[1]^3+\log(K[1])K[1]^2)}{(K[1]-1)K[1]^2} dK[1] + c_1\right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.157 (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))
```

$$y(x) = \frac{e^{\operatorname{dilog}(x)}e^{-x}}{x \left(\int -\frac{e^{\operatorname{dilog}(x)}(x+\ln(x))e^{-x}}{(x-1)^2} dx + c_1\right) (x-1)}$$

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 = 32.309 (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
```

$$\left\{\left\{y(x) \rightarrow \frac{\sqrt{b}x \tan \left(\sqrt{a}\sqrt{b} \int_1^x \frac{2K[1]^3}{K[1]\log(K[1]) - 1} dK[1] + \sqrt{a}\sqrt{b}c_1\right)}{\sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.097 (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))
```

$$y(x) = \frac{\tan \left(2\sqrt{ab} \left(c_1 + \int \frac{x^3}{x\ln(x)-1} dx\right)\right)}{a} x\sqrt{ab}$$

2.705

ODE No. 705

$$y'(x) = \frac{y(x) \left(x^4 + x^3 + \log(y(x)) + x\right)}{x}$$

✓ **Mathematica** : cpu = 0.114718 (sec), leaf count = 30

```
DSolve[Derivative[1][y][x] == ((x + x^3 + x^4 + Log[y[x]])*y[x])/x,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow x^xe^{\frac{x^4}{3}+\frac{x^3}{2}+c_1x}\right\}\right\}$$

✓ **Maple** : cpu = 0.111 (sec), leaf count = 24

```
dsolve(diff(y(x),x) = (ln(y(x))+x+x^3+x^4)*y(x)/x,y(x))
```

$$y(x) = e^{\frac{x^4}{3}}e^{\frac{x^3}{2}}e^{c_1x}x^x$$

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 = 4.55096 (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,
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{-2\log(x)x^2 + \log(K[2] - 1)x^2 - \log(K[2] + 1)x^2 - 8}{2(2\log(x)x^2 - \log(K[2] - 1)x^2 + \log(K[2] + 1)x^2 + K[2](2\log(x)x^2 - \log(K[2] - 1)x^2 + \log(K[2] + 1)x^2 - 8))} \right) dy(x) \right]$$

✓ **Maple** : cpu = 0.858 (sec), leaf count = 65

```
dsolve(diff(y(x),x) = -1/8*(-ln(-1+y(x))+ln(1+y(x))+2*ln(x))*x*(1+y(x))^2,y(x))
```

$$\int_{-b}^{y(x)} \frac{1}{2 \left(-\frac{x^2(1+a)\ln(a-1)}{2} + \frac{x^2(1+a)\ln(1+a)}{2} + x^2(1+a)\ln(x) + 4a - 4 \right) (1+a)} d_{-a} + \frac{\ln(x)}{8} - c_1 = 0$$

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 = 4.77844 (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], x]
```

Solve $\left[\int_1^x -\frac{1}{4\log^2(K[1])K[1]^2 + \log^2(y(x) - 1)K[1]^2 + \log^2(y(x) + 1)K[1]^2 - 4\log(K[1])\log(y(x) - 1)K[1] + 4\log(K[1])\log(y(x) + 1)K[1])} dx \right]$

✓ **Maple** : cpu = 0.432 (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))
```

$$\int_{-b}^{y(x)} \frac{1}{4 \left(\frac{x^2(1+a)\ln(1+a)^2}{4} + x^2(1+a) \left(-\frac{\ln(a-1)}{2} + \ln(x) \right) \ln(1+a) + \frac{x^2(1+a)\ln(a-1)^2}{4} - x^2(1+a) \ln(x) \right)} dx$$

2.708

ODE No. 708

$$y'(x) = \frac{(4ax - y(x)^2)^3}{y(x) (4ax - y(x)^2 - 1)}$$

✓ **Mathematica** : cpu = 0.276986 (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]
```

$$\text{Solve}\left[2a\left(x - \frac{\text{RootSum}\left[-\#1^3 + 2\#1a - 2a\&, \frac{\#1a \log(-\#1 + 4ax - y(x)^2) - a \log(-\#1 + 4ax - y(x)^2)}{2a - 3\#1^2}\&]\right)}{2a}\right) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 60.77 (sec), leaf count = 229

```
dsolve(diff(y(x),x) = (-y(x)^2+4*a*x)^3/(-y(x)^2+4*a*x-1)/y(x),y(x))
```

$$\int_{-b}^x -\frac{\left(4\_aa - y(x)^2\right)^3}{-y(x)^6 + 12\_aay(x)^4 + \left(-48\_a^2a^2 + 2a\right)y(x)^2 + 64\_a^3a^3 - 8\_aa^2 + 2a}d\_a + \int^{y(x)}\left(\frac{-\_f^6 + 12\_a}{-y(x)^6 + 12\_aay(x)^4 + \left(-48\_a^2a^2 + 2a\right)y(x)^2 + 64\_a^3a^3 - 8\_aa^2 + 2a}\right)dy(x)$$

2.709

ODE No. 709

$$y'(x) = \frac{x^3 \sqrt{4ax - y(x)^2} + 2ax + 2a}{(x + 1)y(x)}$$

✓ **Mathematica** : cpu = 1.43746 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{6} \sqrt{144ax - 4x^6 + 12x^5 - 33x^4 + 36x^3 + 24x^3 \log(x + 1) - 24c_1x^3 - 36x^2 - 36x^2 \log(x + 1) + \dots} \right. \right.$$

✓ **Maple** : cpu = 0.21 (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

$$y'(x) = \frac{2x^3 + 4x^2y(x) + 2xy(x)^2 + 2x + e^{\frac{1}{x}} - \log(x)}{\log(x) - e^{\frac{1}{x}}}$$

✓ **Mathematica** : cpu = 0.666553 (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) + Log[x] - 2*x - 2*x^3), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -x + \tan \left(\int_1^x -\frac{2K[5]}{e^{\frac{1}{K[5]}} - \log(K[5])} dK[5] + c_1 \right) \right\} \right\}$$

✓ **Maple** : cpu = 2.575 (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))
```

$$y(x) = -x + \tan \left(2c_1 - 2 \left(\int -\frac{x}{\ln(x) - e^{\frac{1}{x}}} dx \right) \right)$$

2.711

ODE No. 711

$$y'(x) = \frac{y(x)(-x \log(y(x)) - \log(y(x)) + 1)}{x + 1}$$

✓ **Mathematica** : cpu = 0.177246 (sec), leaf count = 28

```
DSolve[Derivative[1][y][x] == ((1 - Log[y[x]] - x*Log[y[x]])*y[x])/(1 + x), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow e^{e^{-x-1}\text{Ei}(x+1)+c_1e^{-x}} \right\} \right\}$$

✓ **Maple** : cpu = 0.203 (sec), leaf count = 31

```
dsolve(diff(y(x), x) = -(ln(y(x))*x+ln(y(x))-1)*y(x)/(1+x), y(x))
```

$$y(x) = e^{e^{-x}c_1}e^{-\text{Ei}_1(-1-x)e^{-1-x}}$$

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 = 0.598448 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4} \left(x^2 - \frac{1}{9} \left(-2x^3 + 3x^2 - 6x - 6 \log \left(\frac{1}{x+1} \right) + 6c_1 \right)^2 + 2x + 1 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.339 (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 = 0.080146 (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*y[x])), y[x], x]
```

$$\left\{\left\{y(x) \rightarrow -\frac{a\sqrt{x} - a - bx - b}{a} + \frac{1}{a^2\text{Root}\left[\#1^6(16x^3 + 16e^{12c_1}) - \frac{24\#1^4x^2}{a^4} + \frac{8\#1^3x^{3/2}}{a^6} + \frac{9\#1^2x}{a^8} - \frac{6\#1\sqrt{x}}{a^{10}} + \frac{1}{a^{12}}\right]}\right\}\right\}$$

✓ Maple : cpu = 0.3 (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))
```

$$y(x) = \frac{\text{RootOf}\left(-x^{3/2}ab + b^2x^2 - a^2\sqrt{x} - ba\sqrt{x} - 2a^2x + 2abx + 2b^2x + a^2 + 2ab + b^2 + e^{\text{RootOf}\left(9x\tanh\left(-\frac{1}{3}\right)\right)}\right)}{a}$$

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 = 1.17447 (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

$$\left\{\left\{y(x) \rightarrow \frac{\exp\left(\int_1^x-\frac{-K[1]^2-\log(K[1])K[1]+e^{K[1]}-\log\left(\frac{1}{K[1]}\right)}{K[1]\left(e^{K[1]}-\log\left(\frac{1}{K[1]}\right)\right)}dK[1]\right)}{-\int_1^x-\frac{\exp\left(\int_1^{K[2]}-\frac{-K[1]^2-\log(K[1])K[1]+e^{K[1]}-\log\left(\frac{1}{K[1]}\right)}{K[1]\left(e^{K[1]}-\log\left(\frac{1}{K[1]}\right)\right)}dK[1]\right)\left(K[2]^3+\log(K[2])K[2]^2\right)}{K[2]\left(e^{K[2]}-\log\left(\frac{1}{K[2]}\right)\right)}dK[2]+c_1}\right\}\right\}$$

✓

Maple : cpu = 0.249 (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

$$y(x) = \frac{e^{\int \frac{x\ln(x)+x^2+\ln\left(\frac{1}{x}\right)-e^x}{\left(-\ln\left(\frac{1}{x}\right)+e^x\right)x}dx}}{\int \frac{e^{\int \frac{x\ln(x)+x^2+\ln\left(\frac{1}{x}\right)-e^x}{\left(-\ln\left(\frac{1}{x}\right)+e^x\right)x}dx}}{-\ln\left(\frac{1}{x}\right)+e^x}x(x+\ln(x))dx+c_1}$$

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 = 0.618674 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4} \left(-x^2 + \frac{1}{9} \left(2x^3 - 3x^2 + 6x + 6 \log \left(\frac{1}{x+1} \right) - 6c_1 \right)^2 + 4x \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.331 (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 = 1.51455 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \left(-\frac{3}{2}\right)^{2/3} \sqrt[3]{x^4 - 4 \log^2(x + 1) + 8 c_1 \log(x + 1) - 4 c_1^2} \right\}, \left\{ y(x) \rightarrow \left(\frac{3}{2}\right)^{2/3} \sqrt[3]{x^4 - 4 \log^2(x + 1)}$$

✓ **Maple** : cpu = 0.231 (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))
```

$$\int_{-b}^{y(x)} \frac{-a^2}{\sqrt{9x^4 - 4a^3}} d_a - \ln(1 + x) - c_1 = 0$$

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 = 0.308268 (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]]

$$\left\{\left\{y(x) \rightarrow \frac{1}{4}(-a^2 - 2ax - x^2 + 4\log^2(x + 1) - 8c_1\log(x + 1) + 4c_1^2)\right\}\right\}$$

✓

Maple : cpu = 0.329 (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

$$y'(x) = e^{-x^2} x \Big(e^{3x^2} y(x)^3 + e^{2x^2} y(x)^2 + 1 \Big)$$

✓ **Mathematica** : cpu = 0.35865 (sec), leaf count = 127

```
DSolve[Derivative[1][y][x] == (x*(1 + E^(2*x^2)*y[x]^2 + E^(3*x^2)*y[x]^3))/E^x^2,y[x],x]
```

$$\text{Solve}\left[\frac{11}{3}\text{RootSum}\left[11\#1^3 + 15\sqrt[3]{11}\#1 + 11\&, \frac{\log\left(\frac{3e^{2x^2}xy(x)+e^{x^2}x}{\sqrt[3]{11}\sqrt[3]{e^{3x^2}x^3}} - \#1\right)}{11\#1^2 + 5\sqrt[3]{11}}\&\right] = \frac{11^{2/3}e^{x^2}x^3}{18\sqrt[3]{e^{3x^2}x^3}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.053 (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))
```

$$y(x) = \frac{\left(-11 \operatorname{RootOf}\left(-5x^2 + 20250\left(\int^{-Z} \frac{1}{121\_a^3 + 3375\_a - 3375} d\_a\right) + 6c_1\right) - 15\right) e^{-x^2}}{45}$$

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 = 0.411042 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{2^{e^{-x}}x^{e^{-x}-1}}{2^{e^{-x}}x^{e^{-x}}+c_1e^{\operatorname{Ei}(-x)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.088 (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))
```

$$y(x) = \frac{1}{2^{-e^{-x}}c_1x^{-e^{-x}+1}e^{-\operatorname{Ei}_1(x)}+x}$$

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 = 1.99047 (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]
```

$$\left\{\left\{y(x) \rightarrow \sqrt[3]{-4x^6+12x^5-24x^4-8x^3+24x^3\log(x+1)+24c_1x^3+30x^2-36x^2\log(x+1)-36c_1x^2-1}\right.\right.$$

✓ **Maple** : cpu = 0.147 (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))
```

$$\int_{-b}^{y(x)} \frac{-a^2}{\sqrt{9x^4-4a^3}}d_a-\frac{x^3}{3}+\frac{x^2}{2}-x+\ln(1+x)-c_1=0$$

2.721

ODE No. 721

$$y'(x) = \frac{1}{36}\sqrt{x}(18x^{3/2} + x^6 - 12x^3y(x) + 36y(x)^2)$$

✓ **Mathematica** : cpu = 0.105728 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{x^3}{6} + \frac{1}{-\frac{2x^{3/2}}{3} + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.053 (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))
```

$$y(x) = \frac{x^3}{6} + \frac{1}{c_1 - \frac{2x^{3/2}}{3}}$$

2.722

ODE No. 722

$$y'(x) = -\frac{y(x)^3}{x(-y(x) + 2y(x)\log(x) - 1)}$$

✓ **Mathematica** : cpu = 16.4646 (sec), leaf count = 490

```
DSolve[Derivative[1][y][x] == -(y[x]^3/(x*(-1 - y[x] + 2*Log[x]*y[x]))),y[x],x]
```

Solve

[

$$-\frac{\sqrt[3]{-2}\left((-2)^{2/3}-\frac{(1-2\log(x))^2\left(-\frac{1}{(2\log(x)-1)^3}\right)^{2/3}(y(x)(5-4\log(x))+2)}{2\sqrt[3]{2}(y(x)(2\log(x)-1)-1)}\right)\left(\frac{y(x)(4\log(x)-5)-2}{\sqrt[3]{2}\sqrt[3]{-\frac{1}{(2\log(x)-1)^3}(2\log(x)-1)(y(x)(2\log(x)-1)-1)}}\right)}{\right.$$

]

✓ **Maple** : cpu = 0.247 (sec), leaf count = 70

```
dsolve(diff(y(x),x) = -y(x)^3/(-1+2*y(x)*ln(x)-y(x))/x,y(x))
```

$$y(x) = \frac{e^{\operatorname{RootOf}\left(-e^{-Z}\ln\left(\frac{e^{-Z}+2}{2x^4}\right)+3c_1e^{-Z}+_Ze^{-Z}+2\right)}}{1+(2\ln(x)-1)e^{\operatorname{RootOf}\left(-e^{-Z}\ln\left(\frac{e^{-Z}+2}{2x^4}\right)+3c_1e^{-Z}+_Ze^{-Z}+2\right)}}$$

2.723

ODE No. 723

$$y'(x) = \frac{2a}{32a^3x^2 - 16a^2xy(x)^2 + 2ay(x)^4 + y(x)}$$

✓ **Mathematica** : cpu = 0.187367 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt[3]{-1024a^6c_1^3 + 9216a^5c_1x - 432a^2 + \sqrt{4(-192a^3x - 64a^4c_1^2)^3 + (-1024a^6c_1^3 + 9216a^5c_1x - 432a^2)}}{12\sqrt[3]{2}a} \right\} \right.$$

✓ **Maple** : cpu = 0.107 (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))
```

$$y(x) = \frac{\left(\left(64a^4c_1^3 - 576c_1a^3x + 3\sqrt{-12288a^7c_1^4x + 24576a^6c_1^2x^2 - 12288a^5x^3 + 384a^4c_1^3 - 3456c_1a^3x + 81}\right)\right)}{6a}$$

2.724

ODE No. 724

$$y'(x) = -\frac{y(x)^3}{x(-y(x) + y(x)\log(x) - 1)}$$

✓ **Mathematica** : cpu = 10.626 (sec), leaf count = 422

```
DSolve[Derivative[1][y][x] == -(y[x]^3/(x*(-1 - y[x] + Log[x]*y[x]))),y[x],x]
```

Solve

$$\left[-\frac{\sqrt[3]{-2}\left(\frac{1-y(x)(\log(x)-4)}{\sqrt[3]{2}\sqrt[3]{-\frac{1}{(\log(x)-1)^3}}(\log(x)-1)(y(x)(\log(x)-1)-1)} + (-2)^{2/3}\right)\left(\frac{2^{2/3}(y(x)(\log(x)-4)-1)}{\sqrt[3]{-\frac{1}{(\log(x)-1)^3}}(\log(x)-1)(y(x)(\log(x)-1)-1)} + (-2)^{2/3}\right)}{\dots}\right]$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 18

```
dsolve(diff(y(x),x) = -y(x)^3/(-1+y(x)*ln(x)-y(x))/x,y(x))
```

$$y(x) = \frac{1}{-\operatorname{LambertW}(c_1 e^{-2x}) + \ln(x) - 2}$$

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 = 0.186239 (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]
```

$$\{\{y(x) \rightarrow -x + \tan(\log(2)\operatorname{li}(x) + x + c_1)\}\}$$

✓ **Maple** : cpu = 1.039 (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)
```

$$y(x) = -x - \tan(c_1 + \ln(2) \operatorname{Ei}_1(-\ln(x)) - x)$$

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 = 0.0827177 (sec), leaf count = 625

```
DSolve[Derivative[1][y][x] == (a^2 + b*c - a*b*Sqrt[x] - b^2*x - a*b*y[x])/(a*(-c + a*Sqrt[x]
```

$$\left\{\left\{y(x) \rightarrow -\frac{a\sqrt{x} + bx - c}{a} + \frac{1}{a^2\text{Root}\left[\#1^6\left(16x^3 + 16e^{12c_1}\right) - \frac{24\#1^4x^2}{a^4} + \frac{8\#1^3x^{3/2}}{a^6} + \frac{9\#1^2x}{a^8} - \frac{6\#1\sqrt{x}}{a^{10}} + \frac{1}{a^{12}}\right], 1\right\}\right\}$$

✓ **Maple** : cpu = 0.26 (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
```

$$y(x) = \frac{\text{RootOf}\left(x^{3/2}ab + b^2x^2 - \sqrt{x}ac - 2a^2x - 2bcx + c^2 - e^{\text{RootOf}\left(9x\tanh\left(-\frac{3}{2}\frac{Z}{2} + \frac{c_1}{2}\right)^2a^2 - 9a^2x - 4e^{-Z}\right)} + (a\sqrt{x}\right)}{a}$$

2.727

ODE No. 727

$$y'(x) = \frac{y(x)(y(x) + 2x + 2)}{(x + 1)(\log(y(x)) + 2x - 1)}$$

✓ **Mathematica** : cpu = 0.280667 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{W(e^{-2x}(\log(x + 1) + c_1))}{\log(x + 1) + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.162 (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))
```

$$y(x) = e^{-\operatorname{LambertW}((\ln(1+x)-c_1)e^{-2x})-2x}$$

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 = 0.200188 (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]
```

$$\left\{\left\{y(x) \rightarrow -\frac{\sqrt{x}\sqrt{W\left(\frac{6e^{x^2+2c_1}}{x}\right)}}{\sqrt{6}}\right\},\left\{y(x) \rightarrow \frac{\sqrt{x}\sqrt{W\left(\frac{6e^{x^2+2c_1}}{x}\right)}}{\sqrt{6}}\right\}\right\}$$

✓ **Maple** : cpu = 0.229 (sec), leaf count = 50

```
dsolve(diff(y(x),x) = 1/(6*y(x)^2+x)*(x^3+3*y(x)^2)*y(x)/x,y(x))
```

$$\frac{1}{\frac{1}{y(x)^2} + \frac{6}{x}} = \frac{\left(e^{\operatorname{RootOf}\left(x^2e^{-Z}-e^{-Z}\ln\left(\frac{\left(e^{-Z}+9\right)x}{2}\right)+3c_1e^{-Z}+_Z e^{-Z}+9\right)}+9\right)x}{54}$$

2.729

ODE No. 729

$$y'(x) = \frac{(x - y(x))y(x)}{x(x - y(x)^3)}$$

✓ **Mathematica** : cpu = 0.170794 (sec), leaf count = 327

```
DSolve[Derivative[1][y][x] == ((x - y[x])*y[x])/(x*(x - y[x]^3)),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[3]{2}(-6 \log(x) + 6c_1)}{3\sqrt[3]{54x + \sqrt{2916x^2 + 4(-6 \log(x) + 6c_1)^3}}} - \frac{\sqrt[3]{54x + \sqrt{2916x^2 + 4(-6 \log(x) + 6c_1)^3}}}{3\sqrt[3]{2}} \right\}, \left\{ y(x) \rightarrow \dots \right\} \right\}$$

✓ **Maple** : cpu = 0.088 (sec), leaf count = 400

```
dsolve(diff(y(x),x) = y(x)*(x-y(x))/x/(x-y(x)^3),y(x))
```

$$y(x) = \frac{\left(-27x + 3\sqrt{24c_1^3 - 72c_1^2 \ln(x) + 72c_1 \ln(x)^2 - 24 \ln(x)^3 + 81x^2}\right)^{2/3} + 6 \ln(x) - 6c_1}{3 \left(-27x + 3\sqrt{24c_1^3 - 72c_1^2 \ln(x) + 72c_1 \ln(x)^2 - 24 \ln(x)^3 + 81x^2}\right)^{1/3}}$$

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 = 0.299783 (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], y[x]]], x]
```

$$\text{Solve}\left[-\frac{2}{3}\text{RootSum}\left[\#1^3 - \#1 - 1\&, \frac{\#1 \log\left(-\#1 + y(x)^{3/2} - \frac{3e^x}{2}\right) + \log\left(-\#1 + y(x)^{3/2} - \frac{3e^x}{2}\right)}{3\#1^2 - 1}\&\right] + e^x - \right]$$

✓ **Maple** : cpu = 1.102 (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), x)
```

$$e^x - \left(\int^{y(x)^{3/2} - \frac{3e^x}{2}} \frac{2 + 2\_a}{3\_a^3 - 3\_a - 3} d\_a\right) - c_1 = 0$$

2.731

ODE No. 731

$$y'(x) = \frac{2y(x) + 1}{x(2xy(x)^3 + xy(x)^2 - 2)}$$

✓ **Mathematica** : cpu = 0.298739 (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]
```

$$\text{Solve}\left[\frac{1}{64}(-4y(x)^2 + 4y(x) - 2\log(8y(x) + 4) + 3) - \frac{1}{4x(2y(x) + 1)} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.112 (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))
```

$$y(x) = \frac{e^{\text{RootOf}(xe^{3-Z}-4xe^{2-Z}+8c_1xe^{-Z}+2_Zxe^{-Z}+3xe^{-Z}+16)}}{2} - \frac{1}{2}$$

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 = 0.754571 (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)])/(1+x), y(x), x]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{4}\left(-a^2 - 2ax - x^2 + \frac{1}{9}\left(2x^3 - 3x^2 + 6x - 6\log(-x - 1) - 6c_1\right)^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.325 (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 = 9.01908 (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
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp \left(\int_1^x 2 \csc(K[5]) \log(2K[5]) dK[5] \right)}{- \int_1^x \exp \left(\int_1^{K[6]} 2 \csc(K[5]) \log(2K[5]) dK[5] \right) \csc(K[6]) \log(2K[6]) dK[6] + c_1} + x^2 + 1 \right\} \right\}$$

✗ **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)
```

, 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 = 0.187678 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \exp \left(-e^{-x-1} \operatorname{Ei}(x+1) + x^2 - 3x - c_1 e^{-x} + 4 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.286 (sec), leaf count = 39

```
dsolve(diff(y(x),x) = (-ln(y(x))*x-ln(y(x))+x^3)*y(x)/(1+x),y(x))
```

$$y(x) = e^{x^2} e^{-3x} e^4 e^{e^{-x} c_1} e^{e^{-1} \operatorname{Ei}_1(-1-x) e^{-x}}$$

2.735

ODE No. 735

$$y'(x) = \frac{(2y(x) \log(x) - 1)^3}{x(-y(x) + 2y(x) \log(x) - 1)}$$

✓ **Mathematica** : cpu = 1.16032 (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]
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{2(2 \log(x) K[1] - K[1] - 1)}{8 \log^3(x) K[1]^3 + 4 \log(x) K[1]^3 - 2 K[1]^3 - 12 \log^2(x) K[1]^2 - 2 K[1]^2 + 6 \log(x) K[1] - 1} + 2 \right) dy \right]$$

✓ **Maple** : cpu = 0.065 (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))
```

$$y(x) = \frac{71 \operatorname{RootOf}\left(-82944\left(\int^{-Z} \frac{1}{5041_a^3-27648_a+27648} d_a\right)-16 \ln (x)+3 c_1\right)-120}{(142 \ln (x)-71) \operatorname{RootOf}\left(-82944\left(\int^{-Z} \frac{1}{5041_a^3-27648_a+27648} d_a\right)-16 \ln (x)+3 c_1\right)-240 \ln (x)+\dots}$$

2.736

ODE No. 736

$$y'(x) = \frac{x^4 - 2x^2y(x) + 2x^2 + y(x)^2 + 2x - 1}{x + 1}$$

✓ **Mathematica** : cpu = 0.135282 (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]
```

$$\left\{ \left\{ y(x) \rightarrow x^2 + \frac{(x+1)^2}{-\frac{x^2}{2} - x + c_1} + 1 \right\} \right\}$$

✓ **Maple** : cpu = 0.131 (sec), leaf count = 43

```
dsolve(diff(y(x),x) = (2*x^2+2*x+x^4-2*x^2*y(x)-1+y(x)^2)/(1+x),y(x))
```

$$y(x) = \frac{c_1(x^4 + 2x^3 - x^2 - 2x - 2) + x^2 + 1}{1 + (x^2 + 2x) c_1}$$

2.737 ODE No. 737

$$y'(x) = \frac{x(2x^3 - 2xy(x) + x - 1)}{x^2 - y(x)}$$

✓ **Mathematica** : cpu = 0.02862 (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]
```

$$\left\{ \left\{ y(x) \rightarrow x^2 + \frac{1}{2} \left(1 + W \left(-e^{\frac{4x^3}{3} - 2x^2 - 1 + c_1} \right) \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.201 (sec), leaf count = 29

```
dsolve(diff(y(x), x) = 1/(x^2 - y(x))*x*(-1 + x - 2*x*y(x) + 2*x^3), y(x))
```

$$y(x) = x^2 + \frac{\text{LambertW} \left(-2 e^{\frac{4x^3}{3}} e^{-2x^2} c_1 e^{-1} \right)}{2} + \frac{1}{2}$$

2.738

ODE No. 738

$$y'(x) = \frac{2a}{32a^3 - 16a^2xy(x)^2 + 2ax^2y(x)^4 - x^2y(x)}$$

✓ **Mathematica** : cpu = 0.318911 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{4a + e^{c_1}}{12a} + \frac{\sqrt[3]{4608x^2a^4 - 128x^3a^3 + 1152e^{c_1}x^2a^3 - 96e^{c_1}x^3a^2 - 432x^3a^2 - 24e^{2c_1}x^3a - 2e^{3c_1}x^3}}{12ax} \right\} \right.$$

✓ **Maple** : cpu = 0.562 (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))
```

$$y(x) = \frac{\left(\left(-216c_1^3a^2x + 576a^3c_1^2 + 12\sqrt{-\frac{3(16384a^7c_1^4 - 108a^2c_1^4x^3 + 576a^3c_1^3x^2 - 512a^4c_1^2x - c_1x^3 + 4ax^2)}{x}}c_1a - x\right)x^2\right)^{1/3}}{12axc_1} + \frac{1}{12a}$$

2.739

ODE No. 739

$$y'(x) = \frac{2y(x) + 1}{x \left(2xy(x)^2 + xy(x) - 2 \right)}$$

✓ **Mathematica** : cpu = 0.250198 (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 = 0.125 (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))
```

$$y(x) = \frac{e^{\text{RootOf}(xe^{2-Z}+2c_1xe^{-Z}-Zxe^{-Z}-xe^{-Z}+4)}}{2} - \frac{1}{2}$$

2.740 ODE No. 740

$$y'(x) = \frac{x^4 - 2x^2y(x)^2 + y(x)^4 + x}{y(x)}$$

✓ **Mathematica** : cpu = 0.0888139 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{2x^3 + 2c_1x^2 - 1}}{\sqrt{2}\sqrt{x + c_1}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{2x^3 + 2c_1x^2 - 1}}{\sqrt{2}\sqrt{x + c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.079 (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))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{(c_1+x)(2c_1x^2+2x^3-1)}}{2c_1+2x}$$

2.741

ODE No. 741

$$y'(x) = \frac{x(ay(x)^2 + bx^2)^3}{a^{5/2}y(x) (ay(x)^2 + a + bx^2)}$$

✓ **Mathematica** : cpu = 0.949029 (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
```

Solve $\left[\frac{1}{2}\left(x^2 - a^{3/2}\text{RootSum}\left[\#1^3b^3 + 3\#1^2ab^2y(x)^2 + \#1a^{3/2}b^2 + 3\#1a^2by(x)^4 + a^{5/2}by(x)^2 + a^{5/2}b + a^3y(x)^2\right],x\right) = 0\right]$

✓ **Maple** : cpu = 0.806 (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))
```

$$\int_{-b}^x \frac{(-a^2b + ay(x)^2)^3 - a}{\left(b(y(x)^2 + 1)a^{5/2} + a^{3/2}b^2 - a^2 + (-a^2b + ay(x)^2)^3\right)a^3} d - a + \int^{y(x)} \frac{\left((-f^2 - 1)ba^{5/2} - a^{3/2}b^2x^2 - (-a^2b + ay(x)^2)^3\right)a^3}{\left(b(y(x)^2 + 1)a^{5/2} + a^{3/2}b^2 - a^2 + (-a^2b + ay(x)^2)^3\right)a^3} dy(x)$$

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 = 1.90283 (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]
```

$$\left\{\left\{y(x) \rightarrow -\sec^{-1}\left(\frac{c_1 x^3}{x^2-1} + \frac{\log(x+1)x^3}{x^2-1} - \frac{c_1^3 x^3}{(x^2-1)(c_1^2+2\log(x+1)c_1+\log^2(x+1)+1)} - \frac{c_1^3 x^3}{(x^2-1)(c_1^2+2\log(x+1)c_1+\log^2(x+1)+1)}\right)\right\}\right.$$

✓ **Maple** : cpu = 1.465 (sec), leaf count = 239

```
dsolve(diff(y(x),x) = -cos(y(x))/(x*sin(y(x))-1)*(x-cos(y(x))+1)/(1+x), y(x))
```

$$y(x) = \arctan\left(\frac{(c_1 - \ln(1+x))\sqrt{\ln(1+x)^2 - 2c_1\ln(1+x) + c_1^2 - x^2 + 1} + x}{c_1^2 - 2c_1\ln(1+x) + \ln(1+x)^2 + 1}, \frac{x\ln(1+x) - c_1x + \sqrt{\ln(1+x)^2 - 2c_1\ln(1+x) + c_1^2 - x^2 + 1}}{c_1^2 - 2c_1\ln(1+x) + \ln(1+x)^2 + 1}\right)$$

2.743

ODE No. 743

$$y'(x) = -\frac{i(x^4 + 8x^2y(x)^2 + 16y(x)^4 + 8ix)}{32y(x)}$$

✓ **Mathematica** : cpu = 0.0721964 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{2}\sqrt{\left(\text{Bi}\left(\frac{1}{2}(i-\sqrt{3})x\right)+c_1\text{Ai}\left(\frac{1}{2}(i-\sqrt{3})x\right)\right)\left(-\frac{1}{2}x^2\left(\text{Bi}\left(\frac{1}{2}(i-\sqrt{3})x\right)+c_1\text{Ai}\left(\frac{1}{2}(i-\sqrt{3})x\right)\right)\right)}}{2\text{Bi}\left(\frac{1}{2}(i-\sqrt{3})x\right)+2c_1\text{Ai}\left(\frac{1}{2}(i-\sqrt{3})x\right)} \right. \right.$$

✓ **Maple** : cpu = 0.565 (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))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{\left(\text{AiryAi}\left(\frac{(i-\sqrt{3})x}{2}\right)c_1+\text{AiryBi}\left(\frac{(i-\sqrt{3})x}{2}\right)\right)\left((1+i\sqrt{3})c_1\text{AiryAi}\left(1,\frac{(i-\sqrt{3})x}{2}\right)+(1+i\sqrt{3})\text{AiryBi}\left(1,\frac{(i-\sqrt{3})x}{2}\right)\right)}}{2\text{AiryAi}\left(\frac{(i-\sqrt{3})x}{2}\right)c_1+2\text{AiryBi}\left(\frac{(i-\sqrt{3})x}{2}\right)}$$

2.744

ODE No. 744

$$y'(x) = \frac{x}{x^4 + 2x^2y(x)^2 + y(x)^4 - y(x)}$$

✓ **Mathematica** : cpu = 0.11119 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[3]{144c_1x^2 + \sqrt{4(12x^2 - 4c_1^2)^3 + (144c_1x^2 - 108 + 16c_1^3)^2} - 108 + 16c_1^3}}{6\sqrt[3]{2}} - \frac{3^{2/3}\sqrt[3]{144c_1x^2 - 108 + 16c_1^3}}{6\sqrt[3]{2}} \right\} \right.$$

✓ **Maple** : cpu = 0.191 (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))
```

$$y(x) = \frac{\left(-36x^2c_1 - 54 - c_1^3 + 6\sqrt{3c_1^4x^2 + 24c_1^2x^4 + 48x^6 + 3c_1^3 + 108x^2c_1 + 81}\right)^{1/3}}{6} + \frac{3^{2/3}\sqrt[3]{144c_1x^2 - 108 + 16c_1^3}}{6\sqrt[3]{2}}$$

2.745

ODE No. 745

$$y'(x) = \frac{(y(x) \log(x) - 1)^3}{x(-y(x) + y(x) \log(x) - 1)}$$

✓ **Mathematica** : cpu = 1.22379 (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]
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{\log(x) K[1] - K[1] - 1}{\log^3(x) K[1]^3 + \log(x) K[1]^3 - K[1]^3 - 3 \log^2(x) K[1]^2 - K[1]^2 + 3 \log(x) K[1] - 1} + \text{RootSum} \right) dy(x) \right]$$

✓ **Maple** : cpu = 0.063 (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))
```

$$y(x) = \frac{47 \operatorname{RootOf} \left(-27783 \left(\int^{-Z} \frac{1}{2209\_a^3 - 9261\_a + 9261} d\_a \right) - 7 \ln(x) + 3c_1 \right) - 84}{21 + 47 (\ln(x) - 1) \operatorname{RootOf} \left(-27783 \left(\int^{-Z} \frac{1}{2209\_a^3 - 9261\_a + 9261} d\_a \right) - 7 \ln(x) + 3c_1 \right) - 84 \ln(x)}$$

2.746

ODE No. 746

$$y'(x) = -\frac{i(x^4 + 2x^2y(x)^2 + y(x)^4 + ix)}{y(x)}$$

✓ **Mathematica** : cpu = 0.0610493 (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]
```

$$\left\{\left\{y(x) \rightarrow -\frac{\sqrt{2}\sqrt{\left(\text{Bi}\left(2(-1)^{5/6}x\right)+c_1\text{Ai}\left(2(-1)^{5/6}x\right)\right)\left(-2x^2\left(\text{Bi}\left(2(-1)^{5/6}x\right)+c_1\text{Ai}\left(2(-1)^{5/6}x\right)\right)+\left(1+i\sqrt{3}\right)c_1\right)}}{2\text{Bi}\left(2(-1)^{5/6}x\right)+2c_1\text{Ai}\left(2(-1)^{5/6}x\right)}\right.\right.$$

✓ **Maple** : cpu = 0.457 (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))
```

$$y(x) = -\frac{\sqrt{2}\sqrt{\left(\left(1+i\sqrt{3}\right)c_1\text{AiryAi}\left(1,-\left(-8i\right)^{1/3}x\right)+\left(1+i\sqrt{3}\right)\text{AiryBi}\left(1,-\left(-8i\right)^{1/3}x\right)-2x^2\left(\text{AiryAi}\left(-\left(-8i\right)^{1/3}x\right)+c_1\text{AiryBi}\left(-\left(-8i\right)^{1/3}x\right)\right)\right)}}{2\text{AiryAi}\left(-\left(-8i\right)^{1/3}x\right)+2c_1\text{AiryBi}\left(-\left(-8i\right)^{1/3}x\right)}$$

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 = 3.28509 (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]

$$\left\{\left\{y(x)\rightarrow\frac{\exp\left(\int_1^x\frac{-\cot(K[1])K[1]\log(2K[1])-1}{K[1]}dK[1]\right)}{-\int_1^x\exp\left(\int_1^{K[2]}\frac{-\cot(K[1])K[1]\log(2K[1])-1}{K[1]}dK[1]\right)\cot(K[2])K[2]\log(2K[2])dK[2]+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 1.031 (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))

$$y(x) = \frac{e^{\int \frac{-x\ln(2)-x\ln(x)-\tan(x)}{x\tan(x)}dx}}{\int -\frac{e^{\int \frac{-x\ln(2)-x\ln(x)-\tan(x)}{x\tan(x)}dx}}{\tan(x)}x(\ln(2)+\ln(x))dx+c_1}$$

2.748 ODE No. 748

$$y'(x) = \frac{y(x)(y(x) + x)}{x(y(x)^3 + x)}$$

✓ **Mathematica** : cpu = 0.166079 (sec), leaf count = 285

```
DSolve[Derivative[1][y][x] == (y[x]*(x + y[x]))/(x*(x + y[x]^3)),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{2\sqrt[3]{2}(\log(x) + c_1)}{\sqrt[3]{54x + \sqrt{2916x^2 - 864(\log(x) + c_1)^3}}} + \frac{\sqrt[3]{54x + \sqrt{2916x^2 - 864(\log(x) + c_1)^3}}}{3\sqrt[3]{2}} \right\}, \left\{ y(x) \rightarrow - \right.$$

✓ **Maple** : cpu = 0.111 (sec), leaf count = 398

```
dsolve(diff(y(x),x) = y(x)*(y(x)+x)/x/(x+y(x)^3),y(x))
```

$$y(x) = \frac{\left(27x + 3\sqrt{-24c_1^3 - 72c_1^2 \ln(x) - 72c_1 \ln(x)^2 - 24 \ln(x)^3 + 81x^2}\right)^{2/3} + 6 \ln(x) + 6c_1}{3 \left(27x + 3\sqrt{-24c_1^3 - 72c_1^2 \ln(x) - 72c_1 \ln(x)^2 - 24 \ln(x)^3 + 81x^2}\right)^{1/3}}$$

2.749 ODE No. 749

$$y'(x) = \frac{x(x - y(x))^2(y(x) + x)^2}{y(x)}$$

✓ **Mathematica** : cpu = 0.121277 (sec), leaf count = 126

```
DSolve[Derivative[1][y][x] == (x*(x - y[x])^2*(x + y[x])^2)/y[x],y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{x^2 + x^2 e^{2x^2 + 4c_1} - e^{2x^2 + 4c_1} + 1}}{\sqrt{1 + e^{2x^2 + 4c_1}}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{x^2 + x^2 e^{2x^2 + 4c_1} - e^{2x^2 + 4c_1} + 1}}{\sqrt{1 + e^{2x^2 + 4c_1}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.145 (sec), leaf count = 186

```
dsolve(diff(y(x),x) = (x-y(x))^2*(y(x)+x)^2*x/y(x),y(x))
```

$$y(x) = \frac{\sqrt{\left(c_1(x^2 + 1)e^{-\frac{(x^2 + 1)^2}{2}} + (x^2 - 1)e^{-\frac{x^2(x^2 - 2)}{2}}\right)\left(c_1e^{-\frac{(x^2 + 1)^2}{2}} + e^{-\frac{x^2(x^2 - 2)}{2}}\right)}}{c_1e^{-\frac{(x^2 + 1)^2}{2}} + e^{-\frac{x^2(x^2 - 2)}{2}}}$$

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 = 0.191271 (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]
```

$$\left\{\left\{y(x) \rightarrow -\frac{\sqrt{x}\sqrt{W\left(\frac{6e^{2x+2c_1}}{x}\right)}}{\sqrt{6}}\right\},\left\{y(x) \rightarrow \frac{\sqrt{x}\sqrt{W\left(\frac{6e^{2x+2c_1}}{x}\right)}}{\sqrt{6}}\right\}\right\}$$

✓ **Maple** : cpu = 0.277 (sec), leaf count = 49

```
dsolve(diff(y(x),x) = 1/(6*y(x)^2+x)*(x^2+3*y(x)^2)*y(x)/x,y(x))
```

$$\frac{1}{\frac{1}{y(x)^2} + \frac{6}{x}} = \frac{\left(e^{\operatorname{RootOf}\left(-e^{-Z}\ln\left(\frac{\left(e^{-Z}+9\right)x}{2}\right)+3c_1e^{-Z}+_Ze^{-Z}+2xe^{-Z}+9\right)}+9\right)x}{54}$$

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 = 0.132107 (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]
```

$$\left\{\left\{y(x) \rightarrow (x+1)^xe^{\frac{x^3}{2}-x^2+c_1x}\right\}\right\}$$

✓ **Maple** : cpu = 0.132 (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))
```

$$y(x) = e^{\frac{x^3}{2}}(1+x)^xe^{c_1x}e^{-x^2}$$

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 = 0.150592 (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], x]
```

$$\left\{ \left\{ y(x) \rightarrow \tan^{-1} \left(\frac{6 \left(2x^4 - 3x^3 + 6x^2 + 6c_1x - 6 \log(x + 1)x + \sqrt{4x^6 - 12x^5 + 33x^4 + 12(2c_1 - 3)x^3 - 36(c_1 - 1)x^2 + 72c_1x + 36 \ln(1 + x)} \right)}{4x^6 - 12x^5 + 33x^4 + 12(2c_1 - 3)x^3 - 36(c_1 - 1)x^2 + 72c_1x + 36 \ln(1 + x)} \right) \right. \right.$$

✓ **Maple** : cpu = 1.733 (sec), leaf count = 723

```
dsolve(diff(y(x),x) = cos(y(x))/(x*sin(y(x))-1)*(cos(y(x))*x^3-x-1)/(1+x),y(x))
```

$$y(x) = \arctan \left(\frac{(-2x^3 + 3x^2 - 6x - 6c_1 + 6 \ln(1 + x)) \sqrt{36 \ln(1 + x)^2 + (-24x^3 + 36x^2 - 72c_1 - 72x) \ln(1 + x) + 4x^6 - 12x^5 + 33x^4 + 12(2c_1 - 3)x^3 - 36(c_1 - 1)x^2 + 72c_1x + 36 \ln(1 + x)}}{36 \ln(1 + x)^2 + (-24x^3 + 36x^2 - 72c_1 - 72x) \ln(1 + x) + 4x^6 - 12x^5 + 33x^4 + 12(2c_1 - 3)x^3 - 36(c_1 - 1)x^2 + 72c_1x + 36 \ln(1 + x)} \right)$$

2.753

ODE No. 753

$$y'(x) = \frac{y(x) \log(y(x)) (x^4 \log(y(x)) + x + 1)}{x(x + 1)}$$

✓ **Mathematica** : cpu = 0.137078 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \exp \left(-\frac{12x}{3x^4 - 4x^3 + 6x^2 - 12x + 12 \log(x + 1) - 12c_1} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.189 (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))
```

$$y(x) = e^{-\frac{12x}{3x^4 - 4x^3 + 6x^2 + 12 \ln(1+x) - 12c_1 - 12x}}$$

2.754

ODE No. 754

$$y'(x) = \frac{x^3 + xy(x)^2 + xy(x) + y(x)^3}{x^2}$$

✓ **Mathematica** : cpu = 0.0873083 (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 = 0.016 (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))
```

$$y(x) = \text{RootOf}\left(-\left(\int^{-x}\frac{1}{-a^3 + -a^2 + 1}d\_a\right) + x + c_1\right)x$$

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 = 0.19465 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{2}{3} \left(x + e^{c_1} + 2e^{2c_1} \right) - \frac{1}{3} \sqrt[3]{x^3 + 3e^{c_1}x^2 - 12e^{2c_1}x^2 + 3e^{2c_1}x + 12e^{3c_1}x + 48e^{4c_1}x + e^{3c_1} - 30e^{4c_1} - 9} \right. \right.$$

✓ **Maple** : cpu = 0.111 (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))
```

$$\frac{4\sqrt{y(x)}x^2 - y(x)^{7/2}c_1 + (2c_1x + 4)y(x)^{5/2} + 4y(x)^2 + (-c_1x^2 - 8x + 1)y(x)^{3/2} - 4xy(x)}{(x - y(x))^2y(x)^{3/2}} = 0$$

2.756

ODE No. 756

$$y'(x) = \frac{x^6 + 2x^3y(x) + x^2y(x)^2 + y(x)^3}{x^4}$$

✓ **Mathematica** : cpu = 1.12819 (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 = 0.036 (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 = 0.0275275 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4} (x^2 + 2x - 4) + 2 (1 + W(-e^{-\frac{x}{4} - 1 + c_1})) \right\} \right\}$$

✓ **Maple** : cpu = 0.082 (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))
```

$$y(x) = \frac{x^2}{4} + 2 \operatorname{LambertW}\left(\frac{c_1 e^{-\frac{x}{4}} e^{-\frac{1}{2}}}{2}\right) + \frac{x}{2} + 1$$

2.758 ODE No. 758

$$y'(x) = \frac{y(x) (x^3 y(x) + 2x + 2)}{(x + 1)(\log(y(x)) + 2x - 1)}$$

✓ **Mathematica** : cpu = 0.583564 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{6W\left(-\frac{1}{6}\sqrt[6]{e^{-12x}(2x^3 - 3x^2 + 6x - 6\log(x + 1) + 6c_1)^6}\right)}{2x^3 - 3x^2 + 6x - 6\log(x + 1) + 6c_1} \right\}, \left\{ y(x) \rightarrow \frac{6W\left(\frac{1}{6}\sqrt[6]{e^{-12x}(2x^3 - 3x^2 + 6x - 6\log(x + 1) + 6c_1)^6}\right)}{2x^3 - 3x^2 + 6x - 6\log(x + 1) + 6c_1} \right\} \right.$$

✓ **Maple** : cpu = 0.198 (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))
```

$$y(x) = e^{-\text{LambertW}\left(-\frac{\left(-2x^3+3x^2+6\ln(1+x)+6c_1-6x\right)e^{-2x}}{6}\right)-2x}$$

2.759

ODE No. 759

$$y'(x) = -\frac{ix(x^8 + 18x^4y(x)^2 + 54ix^2 + 81y(x)^4)}{243y(x)}$$

✓ **Mathematica** : cpu = 0.0667447 (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], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{\left(Y_{\frac{1}{3}}\left(\left(\frac{2}{9}-\frac{2i}{9}\right)\sqrt{\frac{2}{3}}x^3\right)+c_1J_{\frac{1}{3}}\left(\left(\frac{2}{9}-\frac{2i}{9}\right)\sqrt{\frac{2}{3}}x^3\right)\right)}\left((1+i)\sqrt{6}x^3\left(Y_{\frac{4}{3}}\left(\left(\frac{2}{9}-\frac{2i}{9}\right)\sqrt{\frac{2}{3}}x^3\right)+c_1J_{\frac{4}{3}}\left(\left(\frac{2}{9}-\frac{2i}{9}\right)\sqrt{\frac{2}{3}}x^3\right)\right)\right)}{\sqrt{3}x\left(Y_{\frac{1}{3}}\left(\left(\frac{2}{9}-\frac{2i}{9}\right)\sqrt{\frac{2}{3}}x^3\right)+c_1J_{\frac{1}{3}}\left(\left(\frac{2}{9}-\frac{2i}{9}\right)\sqrt{\frac{2}{3}}x^3\right)\right)}\right\} \right\}$$

✓ **Maple** : cpu = 0.632 (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))
```

$$y(x) = -\frac{\sqrt{3}\sqrt{\left(-9\left(\frac{x^6}{27}+i\right)c_1\operatorname{BesselJ}\left(\frac{1}{3},\left(\frac{2}{27}-\frac{2i}{27}\right)\sqrt{6}x^3\right)+\left(-\frac{x^6}{3}-9i\right)\operatorname{BesselY}\left(\frac{1}{3},\left(\frac{2}{27}-\frac{2i}{27}\right)\sqrt{6}x^3\right)+\left(1-i\right)\left(\frac{x^6}{3}+9i\right)\right)}{3\left(\operatorname{BesselJ}\left(\frac{1}{3},\left(\frac{2}{27}-\frac{2i}{27}\right)\sqrt{6}x^3\right)+c_1\operatorname{BesselY}\left(\frac{1}{3},\left(\frac{2}{27}-\frac{2i}{27}\right)\sqrt{6}x^3\right)\right)}$$

2.760

ODE No. 760

$$y'(x) = \frac{(xy(x)^2 + 1)^3}{x^4 y(x) (xy(x)^2 + x + 1)}$$

✓ **Mathematica** : cpu = 0.532011 (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]
```

Solve $\left[2 \left(\frac{1}{10} \log \left(2x^2y(x)^4 + 2x^2y(x)^2 + x^2 + 4xy(x)^2 + 2x + 2 \right) - \frac{1}{5} \log \left(xy(x)^2 - x + 1 \right) - \frac{1}{10} \tan^{-1} \left(2xy(x) \right) \right]$

✓ **Maple** : cpu = 1.915 (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))
```

$$\frac{2 \ln \left(xy(x)^2 - x + 1 \right) x - \ln \left(2y(x)^4 x^2 + (2x^2 + 4x) y(x)^2 + x^2 + 2x + 2 \right) x + \arctan \left(2xy(x)^4 + (2 + 2x) y(x) \right)}{10x}$$

2.761

ODE No. 761

$$y'(x) = \frac{-x^3 + 4x^2 - 4xy(x) - 4x + 8}{2x^2 + 8y(x) - 8x + 8}$$

✓ **Mathematica** : cpu = 0.0283448 (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]
```

$$\left\{ \left\{ y(x) \rightarrow W\left(-e^{-x-1+c_1}\right) + \frac{1}{4}(-x^2 + 4x - 4) + 1 \right\} \right\}$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 18

```
dsolve(diff(y(x),x) = (-4*x*y(x)-x^3+4*x^2-4*x+8)/(8*y(x)+2*x^2-8*x+8),y(x))
```

$$y(x) = -\frac{x^2}{4} + \text{LambertW}\left(e^{-x}c_1\right) + x$$

2.762

ODE No. 762

$$y'(x) = \frac{y(x)(x(-\log(y(x))) - \log(y(x)) + x)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.124595 (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]
```

$$\left\{\left\{y(x) \rightarrow (x+1)^{-1/x} e^{1-\frac{c_1}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.137 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = -(ln(y(x))*x+ln(y(x))-x)*y(x)/x/(1+x),y(x))
```

$$y(x) = (1+x)^{-\frac{1}{x}} e e^{\frac{c_1}{x}}$$

2.763

ODE No. 763

$$y'(x) = \frac{y(x)(x \log(y(x)) + \log(y(x)) + x)}{x(x + 1)}$$

✓ **Mathematica** : cpu = 0.120406 (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]
```

$$\left\{ \left\{ y(x) \rightarrow x^x (x + 1)^{-x} e^{c_1 x} \right\} \right\}$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 14

```
dsolve(diff(y(x),x) = (ln(y(x))*x+ln(y(x))+x)*y(x)/x/(1+x),y(x))
```

$$y(x) = \left(\frac{c_1 x}{1 + x} \right)^x$$

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 = 0.13275 (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]
```

$$\left\{\left\{y(x) \rightarrow (x+1)^{\frac{1}{x}} e^{\frac{x^3}{4} - \frac{x^2}{3} + \frac{x}{2} - \frac{25}{12x} - \frac{c_1}{x} - 1}\right\}\right\}$$

✓ **Maple** : cpu = 0.162 (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))
```

$$y(x) = e^{\frac{x^3}{4}} e^{-\frac{x^2}{3}} e^{\frac{x}{2}} (1+x)^{\frac{1}{x}} e^{\frac{c_1}{x}} e^{-1}$$

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 = 0.236046 (sec), leaf count = 138

```
DSolve[Derivative[1][y][x] == (y[x]*(-1 - Log[((-1 + x)*(1 + x))/x] + x*Log[((-1 + x)*(1 + x))
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp \left(-\operatorname{Li}_2(1-x) + \operatorname{Li}_2(-x) - \frac{1}{2} \log^2(x) + \log(x+1) \log(x) - \log \left(x - \frac{1}{x} \right) \log(x) \right)}{x \left(- \int_1^x \frac{\exp \left(-\frac{1}{2} \log^2(K[1]) + \log(K[1]+1) \log(K[1]) - \log \left(K[1] - \frac{1}{K[1]} \right) \log(K[1]) - \operatorname{Li}_2(1-K[1]) + \operatorname{Li}_2(-K[1]) \right) \log \left(\frac{(K[1]-1)(K[1])}{K[1]} \right)}{K[1]} \right. \right.$$

✓ **Maple** : cpu = 0.137 (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))
```

$$y(x) = \frac{1}{c_1 x^{\ln \left(\frac{(x-1)(1+x)}{x} \right) - \ln(1+x)+1} e^{-\operatorname{dilog}(1+x)} e^{\operatorname{dilog}(x)} e^{\frac{\ln(x)^2}{2}} + x}$$

2.766

ODE No. 766

$$y'(x) = \frac{y(x) \left(x^2 y(x) \log \left(\frac{(x-1)(x+1)}{x} \right) - x \log \left(\frac{(x-1)(x+1)}{x} \right) - \log(x) \right)}{x \log(x)}$$

✓

Mathematica : cpu = 0.361916 (sec), leaf count = 129

DSolve[Derivative[1][y][x] == (y[x]*(-Log[x] - x*Log[((-1 + x)*(1 + x))/x] + x^2*Log[((-1 + x)

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp \left(\int_1^x \frac{-\log(K[1]) - K[1] \log \left(\frac{(K[1]-1)(K[1]+1)}{K[1]} \right)}{K[1] \log(K[1])} dK[1] \right)}{-\int_1^x \frac{\exp \left(\int_1^{K[2]} \frac{-\log(K[1]) - K[1] \log \left(\frac{(K[1]-1)(K[1]+1)}{K[1]} \right)}{K[1] \log(K[1])} dK[1] \right) K[2] \log \left(\frac{(K[2]-1)(K[2]+1)}{K[2]} \right)}{\log(K[2])} dK[2] + c_1} \right\} \right\}$$

✓

Maple : cpu = 0.513 (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(

$$y(x) = \frac{e^{\int \frac{-x \ln \left(\frac{(x-1)(1+x)}{x} \right) - \ln(x)}{x \ln(x)} dx}}{\int - \frac{e^{\int \frac{-x \ln \left(\frac{(x-1)(1+x)}{x} \right) - \ln(x)}{x \ln(x)} dx} x \ln \left(\frac{(x-1)(1+x)}{x} \right)}{\ln(x)} dx + c_1}$$

2.767

ODE No. 767

$$y'(x) = \frac{-x^3 + 2x^2 - 8xy(x) - 8x + 32}{4x^2 + 32y(x) - 8x + 32}$$

✓ **Mathematica** : cpu = 0.0270343 (sec), leaf count = 38

```
DSolve[Derivative[1][y][x] == (32 - 8*x + 2*x^2 - x^3 - 8*x*y[x])/(32 - 8*x + 4*x^2 + 32*y[x])
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{8}(-x^2 + 2x - 8) + 4(1 + W(-e^{-\frac{x}{16}-1+c_1}))\right\}\right\}$$

✓ **Maple** : cpu = 0.074 (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))
```

$$y(x) = -\frac{x^2}{8} + 4\operatorname{LambertW}\left(\frac{c_1e^{-\frac{x}{16}}e^{-\frac{3}{4}}}{4}\right) + \frac{x}{4} + 3$$

2.768

ODE No. 768

$$y'(x) = \frac{y(x)(y(x) + 1)}{x(xy(x) - y(x) - 1)}$$

✓ **Mathematica** : cpu = 1.07654 (sec), leaf count = 66

```
DSolve[Derivative[1][y][x] == (y[x]*(1 + y[x]))/(x*(-1 - y[x] + x*y[x])),y[x],x]
```

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 = 0.123 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = y(x)*(1+y(x))/x/(-y(x)-1+x*y(x)),y(x))
```

$$y(x) = -\frac{1}{x \operatorname{LambertW}\left(\frac{e^{-\frac{1}{x}}}{xc_1}\right) + 1}$$

2.769

ODE No. 769

$$y'(x) = -\frac{ix(x^8 + 8x^4y(x)^2 + 16ix^2 + 16y(x)^4)}{32y(x)}$$

✓ **Mathematica** : cpu = 0.0689703 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{\left(Y_{\frac{1}{3}}\left(\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)+c_1J_{\frac{1}{3}}\left(\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)\right)\left((1+i)x^3\left(Y_{\frac{4}{3}}\left(\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)+c_1J_{\frac{4}{3}}\left(\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)\right)\right)}{x\left(Y_{\frac{1}{3}}\left(\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)+c_1J_{\frac{1}{3}}\left(\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)\right)} \right. \right.$$

✓ **Maple** : cpu = 0.569 (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))
```

$$y(x) = -\frac{\sqrt{\left(-2\left(\frac{x^6}{8}+i\right)c_1\operatorname{BesselJ}\left(\frac{1}{3},\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)-\operatorname{BesselY}\left(\frac{1}{3},\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)\left(\frac{x^6}{4}+2i\right)+(1+i)x^3\left(c_1\operatorname{BesselJ}\left(\frac{1}{3},\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)\right)\right)}{\left(\operatorname{BesselJ}\left(\frac{1}{3},\left(\frac{1}{3}-\frac{i}{3}\right)x^3\right)c_1\right)}$$

2.770

ODE No. 770

$$y'(x) = \frac{2y(x)^6}{32x^2y(x)^4 + y(x)^3 + 16xy(x)^2 + 2}$$

✓ **Mathematica** : cpu = 0.161656 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[3]{8192x^3 + 18432c_1^2x^2 + \sqrt{4(-256x^2 + 192c_1^2x - 12c_1)^3 + (8192x^3 + 18432c_1^2x^2 - 2880c_1x - 12c_1^2)}}{3\sqrt[3]{2}(1 - 16c_1x)} \right. \right.$$

✓ **Maple** : cpu = 0.148 (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))
```

$$y(x) = \frac{\left(4096c_1^3x^3 + 6\sqrt{3}\sqrt{4096c_1^4x^3 + 27c_1^4 + 576c_1^3x + 2048x^2c_1^2 + 16c_1 + 256x}c_1 + 96\sqrt{3}\sqrt{4096c_1^4x^3 + 27c_1^4 + 576c_1^3x + 2048x^2c_1^2 + 16c_1 + 256x}\right)}{3c_1 + 48x}$$

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 = 0.035688 (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), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4}(-ax^2 - 2bx - 4) - \frac{2\left(1 + W\left(-e^{-\frac{b^2x}{4} - 1 + c_1}\right)\right)}{b} \right\} \right\}$$

✓ Maple : cpu = 0.256 (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))
```

$$y(x) = \frac{-ax^2b - 2b^2x - 4b + 4e^{-4\operatorname{LambertW}\left(-e^{-\frac{b^2x}{4}}e^{-\frac{c_1b^2}{2a}}e^{-\frac{b}{2}}e^{-1}\right)}a + (-b^2x - 2b - 4)a - 2c_1b^2}{4b} - 8$$

2.772 ODE No. 772

$$y'(x) = \frac{y(x) \log(y(x))(x \log(y(x)) + x + 1)}{x(x + 1)}$$

✓ **Mathematica** : cpu = 0.117958 (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]
```

$$\left\{ \left\{ y(x) \rightarrow e^{\frac{x}{-x + \log(x+1) + c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.147 (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))
```

$$y(x) = e^{\frac{x}{\ln(1+x) + c_1 - x}}$$

2.773 ODE No. 773

$$y'(x) = \frac{y(x)^2 + xy(x) + x}{(x-1)(y(x) + x)}$$

✓ **Mathematica** : cpu = 0.147248 (sec), leaf count = 61

```
DSolve[Derivative[1][y][x] == (x + x*y[x] + y[x]^2)/((-1 + x)*(x + y[x])),y[x],x]
```

$$\text{Solve}\left[\frac{1}{2}\log\left(\frac{y(x)^2}{x^2} + \frac{y(x)}{x} + 1\right) + \frac{\tan^{-1}\left(\frac{\frac{2y(x)}{x} + 1}{\sqrt{3}}\right)}{\sqrt{3}} = \log(1-x) - \log(x) + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.22 (sec), leaf count = 48

```
dsolve(diff(y(x),x) = 1/(x-1)*(x*y(x)+x+y(x)^2)/(y(x)+x),y(x))
```

$$y(x) = -\frac{x}{2} + \frac{\sqrt{3}x \tan\left(\text{RootOf}\left(-\sqrt{3} \ln\left(\frac{3x^2(\tan(_Z)^2+1)}{4(x-1)^2}\right) + 2\sqrt{3}c_1 - 2_Z\right)\right)}{2}$$

2.774 ODE No. 774

$$y'(x) = \frac{-2ax^2 - x^3 - 4xy(x) - 4x + 8}{4ax + 2x^2 + 8y(x) + 8}$$

✓ **Mathematica** : cpu = 0.031951 (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], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4}(-2ax - x^2 - 4) - \frac{2\left(1 + W\left(-e^{-\frac{a^2x}{4}-1+c_1}\right)\right)}{a} \right\} \right\}$$

✓ **Maple** : cpu = 0.15 (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))
```

$$y(x) = \frac{-2a^2x - ax^2 - 8\operatorname{LambertW}\left(-\frac{e^{-\frac{a^2x}{4}}e^{-\frac{a}{2}}e^{-1}e^{\frac{c_1a^2}{4}}}{2}\right) - 4a - 8}{4a}$$

2.775

ODE No. 775

$$y'(x) = \frac{-y(x) + \sqrt{y(x)} + x}{-y(x) + \sqrt{y(x)} + x + 1}$$

✓ **Mathematica** : cpu = 0.121472 (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]
```

$$\{ \{ y(x) \rightarrow \text{Root}\big[x^6 - 2e^{3c_1}x^3 + e^{6c_1} + \#1^6 + (-6x - 6)\#1^5 + (15x^2 + 24x + 9)\#1^4 + (-20x^3 - 36x^2 - 18$$

✓ **Maple** : cpu = 0.088 (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))
```

$$-2y(x)^{3/2} + y(x)^3 + (-3x - 3)y(x)^2 + (3x^2 + 3x)y(x) - x^3 - c_1 = 0$$

2.776

ODE No. 776

$$y'(x) = \frac{y(x) \left(x^2 y(x) \log \left(\frac{x^2+1}{x} \right) - x \log \left(\frac{x^2+1}{x} \right) - \log \left(\frac{1}{x} \right) \right)}{x \log \left(\frac{1}{x} \right)}$$

✓

Mathematica : cpu = 0.459163 (sec), leaf count = 133

DSolve[Derivative[1][y][x] == (y[x]*(-Log[x^(-1)]) - x*Log[(1 + x^2)/x] + x^2*Log[(1 + x^2)/x])*

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp \left(\int_1^x \frac{-\log \left(\frac{1}{K[1]} \right) - K[1] \log \left(\frac{K[1]^2+1}{K[1]} \right)}{K[1] \log \left(\frac{1}{K[1]} \right)} dK[1] \right)}{-\int_1^x \frac{\exp \left(\int_1^{K[2]} \frac{-\log \left(\frac{1}{K[1]} \right) - K[1] \log \left(\frac{K[1]^2+1}{K[1]} \right)}{K[1] \log \left(\frac{1}{K[1]} \right)} dK[1] \right) K[2] \log \left(\frac{K[2]^2+1}{K[2]} \right)}{\log \left(\frac{1}{K[2]} \right)} dK[2] + c_1} \right\} \right\}$$

✓

Maple : cpu = 0.539 (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

$$y(x) = \frac{e^{\int \frac{-\ln \left(\frac{x^2+1}{x} \right) x - \ln \left(\frac{1}{x} \right)}{x \ln \left(\frac{1}{x} \right)} dx}}{\int -\frac{e^{\int \frac{-\ln \left(\frac{x^2+1}{x} \right) x - \ln \left(\frac{1}{x} \right)}{x \ln \left(\frac{1}{x} \right)} dx} \ln \left(\frac{x^2+1}{x} \right) x}{\ln \left(\frac{1}{x} \right)} dx + c_1}$$

2.777

ODE No. 777

$$y'(x) = \frac{y(x)(y(x)+1)}{x(xy(x)^4-y(x)-1)}$$

✓ **Mathematica** : cpu = 0.182612 (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 = 0.119 (sec), leaf count = 51

```
dsolve(diff(y(x),x) = y(x)*(1+y(x))/x/(-y(x)-1+x*y(x)^4),y(x))
```

$$y(x) = e^{\text{RootOf}\left(x\,e^{3-Z}-5x\,e^{2-Z}+2c_1x\,e^{-Z}+2\_Zx\,e^{-Z}+7x\,e^{-Z}-2c_1x-2\_Zx-3x+2\right)} - 1$$

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 = 1.14863 (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]`

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3x^6y(x)+x^3}{\sqrt[3]{29}\sqrt[3]{x^9}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{29^{2/3}(x^9)^{2/3}}{9x^5} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.033 (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))`

$$y(x) = \frac{-3 + 29 \operatorname{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + x + 3c_1\right)}{9x^3}$$

2.779 ODE No. 779

$$y'(x) = \frac{x^3 y(x) + x^3 + xy(x)^2 + y(x)^3}{(x-1)x^3}$$

✓ **Mathematica** : cpu = 0.116017 (sec), leaf count = 57

`DSolve[Derivative[1][y][x] == (x^3 + x^3*y[x] + x*y[x]^2 + y[x]^3)/((-1 + x)*x^3),y[x],x]`

$$\text{Solve}\left[-\frac{1}{4}\log\left(\frac{y(x)^2}{x^2}+1\right)+\frac{1}{2}\log\left(\frac{y(x)}{x}+1\right)+\frac{1}{2}\tan^{-1}\left(\frac{y(x)}{x}\right)=\log(1-x)-\log(x)+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.092 (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))`

$$-\frac{\ln\left(\frac{y(x)^2+x^2}{x^2}\right)}{4}+\frac{\arctan\left(\frac{y(x)}{x}\right)}{2}+\frac{\ln\left(\frac{y(x)+x}{x}\right)}{2}+\ln(x)-\ln(x-1)-c_1=0$$

2.780 ODE No. 780

$$y'(x) = \frac{x\sqrt{x^2 + y(x)^2} + xy(x) + y(x)}{x(x + 1)}$$

✓ **Mathematica** : cpu = 0.119454 (sec), leaf count = 66

`DSolve[Derivative[1][y][x] == (y[x] + x*y[x] + x*Sqrt[x^2 + y[x]^2])/(x*(1 + x)), y[x], x]`

$$\left\{ \left\{ y(x) \rightarrow -\frac{x \tanh(\log(x + 1) + c_1)}{\sqrt{1 - \tanh^2(\log(x + 1) + c_1)}} \right\}, \left\{ y(x) \rightarrow \frac{x \tanh(\log(x + 1) + c_1)}{\sqrt{1 - \tanh^2(\log(x + 1) + c_1)}} \right\} \right\}$$

✓ **Maple** : cpu = 0.917 (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 = 0.287024 (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]
```

$$\left\{\left\{y(x) \rightarrow -\frac{\sqrt{x}\sqrt{W\left(6xe^{\frac{2x^3}{3}+x^2+2c_1}\right)}}{\sqrt{6}}\right\},\left\{y(x) \rightarrow \frac{\sqrt{x}\sqrt{W\left(6xe^{\frac{2x^3}{3}+x^2+2c_1}\right)}}{\sqrt{6}}\right\}\right\}$$

✓ **Maple** : cpu = 0.319 (sec), leaf count = 61

```
dsolve(diff(y(x),x) = 1/(6*y(x)^2+x)*(x^4+x^3+x+3*y(x)^2)*y(x)/x,y(x))
```

$$\frac{1}{\frac{1}{y(x)^2} + \frac{6}{x}} = \frac{\left(e^{\operatorname{RootOf}\left(2x^3e^{-Z}+3x^2e^{-Z}-3e^{-Z}\ln\left(\frac{e^{-Z}+9}{2x}\right)+9c_1e^{-Z}+3Ze^{-Z}+27\right)}+9\right)x}{54}$$

2.782 ODE No. 782

$$y'(x) = \frac{y(x) \coth\left(\frac{1}{x}\right) \left(x^2 y(x) \log\left(\frac{x^2+1}{x}\right) - x \log\left(\frac{x^2+1}{x}\right) - \tanh\left(\frac{1}{x}\right)\right)}{x}$$

✓ **Mathematica** : cpu = 3.1234 (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 + x^2)/x]), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp\left(\int_1^x \frac{-\coth\left(\frac{1}{K[1]}\right) K[1] \log\left(\frac{K[1]^2+1}{K[1]}\right)-1}{K[1]} dK[1]\right)}{-\int_1^x \exp\left(\int_1^{K[2]} \frac{-\coth\left(\frac{1}{K[1]}\right) K[1] \log\left(\frac{K[1]^2+1}{K[1]}\right)-1}{K[1]} dK[1]\right) \coth\left(\frac{1}{K[2]}\right) K[2] \log\left(\frac{K[2]^2+1}{K[2]}\right) dK[2] + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 2.964 (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(x))
```

$$y(x) = \frac{e^{\int \frac{-\ln\left(\frac{x^2+1}{x}\right)x-\tanh\left(\frac{1}{x}\right)}{x \tanh\left(\frac{1}{x}\right)} dx}}{\int -\frac{e^{\int \frac{-\ln\left(\frac{x^2+1}{x}\right)x-\tanh\left(\frac{1}{x}\right)}{x \tanh\left(\frac{1}{x}\right)} dx} \ln\left(\frac{x^2+1}{x}\right)x}{\tanh\left(\frac{1}{x}\right)} dx + c_1}$$

2.783

ODE No. 783

$$y'(x) = -\frac{y(x) \coth(x) \left(x^2 y(x) (-\log(2x)) + x \log(2x) + \tanh(x)\right)}{x}$$

✓ **Mathematica** : cpu = 5.04345 (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
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp\left(\int_1^x \frac{-\coth(K[1])K[1]\log(2K[1])-1}{K[1]}dK[1]\right)}{-\int_1^x \exp\left(\int_1^{K[2]} \frac{-\coth(K[1])K[1]\log(2K[1])-1}{K[1]}dK[1]\right) \coth(K[2])K[2]\log(2K[2])dK[2] + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.865 (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 = 7.25811 (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]
```

$$\left\{\left\{y(x) \rightarrow -x + \tan \left(\int_1^x \operatorname{csch}(K[5]) \log(K[5]) dK[5] + c_1\right)\right\}\right\}$$

✓ **Maple** : cpu = 14.056 (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 = 5.56147 (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]) , x]
```

$$\left\{ \left\{ y(x) \rightarrow -x + \tan \left(\int_1^x \frac{\sinh(K[5])}{\log(K[5])} dK[5] + c_1 \right) \right\} \right\}$$

✓ **Maple** : cpu = 56.27 (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))
```

$$y(x) = -x - \tan \left(c_1 - \left(\int \frac{\sinh(x)}{\ln(x)} dx \right) \right)$$

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 = 3.05911 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt{b}x \tan \left(\sqrt{a}\sqrt{b} \int_1^x \frac{\cosh(K[1])K[1]}{\log(K[1])} dK[1] + \sqrt{a}\sqrt{b}c_1 \right)}{\sqrt{a}} \right\} \right\}$$

✓ **Maple** : cpu = 0.082 (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

$$y'(x) = \frac{x(2x^4 - 2x^2y(x) + x^2 - x - 1)}{(x + 1)(x^2 - y(x))}$$

✓ **Mathematica** : cpu = 16.6869 (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
```

Solve

$$\left[\left(2 - \frac{x(x^2-x-1)(2x^2-2y(x)+3)}{\sqrt[3]{x^3(x^2-x-1)^3(x^2-y(x))}} \right) \left(\frac{x(x^2-x-1)(2x^2-2y(x)+3)}{\sqrt[3]{x^3(x^2-x-1)^3(x^2-y(x))}} + 4 \right) \left(\left(1 - \frac{x(x^2-x-1)(2x^2-2y(x)+3)}{2\sqrt[3]{x^3(x^2-x-1)^3(x^2-y(x))}} \right) \log \left(\frac{2 - \frac{x(x^2-x-1)(2x^2-2y(x)+3)}{\sqrt[3]{x^3(x^2-x-1)^3(x^2-y(x))}}}{\sqrt[3]{x^3(x^2-x-1)^3(x^2-y(x))}} \right) \right. \right. \\ \left. \left. - 18\sqrt[3]{2} \left(-\frac{(2x^2-2y(x)+3)^3}{8(x^2-y(x))^3} + \frac{3x(x^2-x-1)}{2\sqrt[3]{x^3(x^2-x-1)^3(x^2-y(x))}} \right) \right] = 0$$

✓ **Maple** : cpu = 0.418 (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))
```

$$y(x) = \frac{4x^2e^{\text{RootOf}\left(8x^3e^{-Z}-24x^2e^{-Z}-36x^3+6\ln\left(\frac{2e^{-Z}-9}{(1+x)^4}\right)e^{-Z}+18c_1e^{-Z}-6_Ze^{-Z}+24xe^{-Z}+108x^2-27\ln\left(\frac{2e^{-Z}-9}{(1+x)^4}\right)-81c_1+27_Z-108x\right)}}{4e^{\text{RootOf}\left(8x^3e^{-Z}-24x^2e^{-Z}-36x^3+6\ln\left(\frac{2e^{-Z}-9}{(1+x)^4}\right)e^{-Z}+18c_1e^{-Z}-6_Ze^{-Z}+24xe^{-Z}+108x^2-27\ln\left(\frac{2e^{-Z}-9}{(1+x)^4}\right)-81c_1+27_Z-108x\right)}}$$

2.788

ODE No. 788

$$y'(x) = -\frac{y(x)(x^2y(x)(-\coth(x+1)) + \log(x-1) + x\coth(x+1))}{x\log(x-1)}$$

- ✓ **Mathematica** : cpu = 20.631 (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
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp \left(\int_1^x \frac{-e^2 \cosh(K[1])K[1] - \cosh(K[1])K[1] - e^2 \sinh(K[1])K[1] + \sinh(K[1])K[1] - e^2 \cosh(K[1]) \log(K[1] - 1) (e^2 \cosh(K[1]) - \cosh(K[1]))}{K[1] \log(K[1] - 1) (e^2 \cosh(K[1]) - \cosh(K[1]))} dx \right)}{-\int_1^x \frac{\exp \left(\int_1^{K[2]} \frac{-e^2 \cosh(K[1])K[1] - \cosh(K[1])K[1] - e^2 \sinh(K[1])K[1] + \sinh(K[1])K[1] - e^2 \cosh(K[1]) \log(K[1] - 1) + \cosh(K[1]) \log(K[1] - 1) - K[1] \log(K[1] - 1) (e^2 \cosh(K[1]) - \cosh(K[1]) + e^2 \sinh(K[1]) + \sinh(K[1]))}{K[2] \log(K[2] - 1) (e^2 \cosh(K[2]) - \cosh(K[2]))} dK[1]} dx \right. \right.$$

✓ **Maple** : cpu = 0.517 (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 = 44.1944 (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
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{e^2 x \sinh(x) - x \sinh(x) + e^2 x \cosh(x) + x \cosh(x)}{e^2 \sinh(x) - \sinh(x) + e^2 \cosh(x) + \cosh(x)} + \tan \left(\int_1^x \frac{e^2 \cosh(K[5]) + \cosh(K[5])}{\log(K[5] - 1) (e^2 \cosh(K[5]) - \cosh(K[5]))} dx \right) \right. \right.$$

✗ **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)
```

, 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 = 50.4957 (sec), leaf count = 127

```
DSolve[Derivative[1][y][x] == (-Coth[(1 + x)/(-1 + x)] + x^4*Coth[(1 + x)/(-1 + x)] + 2*x*Log[
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp\left(\int_1^x \frac{2 \coth\left(\frac{K[5]}{K[5]-1} + \frac{1}{K[5]-1}\right)}{\log\left(\frac{1}{K[5]-1}\right)} dK[5]\right)}{\exp\left(\int_1^{K[6]} \frac{2 \coth\left(\frac{K[5]}{K[5]-1} + \frac{1}{K[5]-1}\right)}{\log\left(\frac{1}{K[5]-1}\right)} dK[5]\right) \coth\left(\frac{K[6]}{K[6]-1} + \frac{1}{K[6]-1}\right)} - \int_1^x \frac{dK[6]}{\log\left(\frac{1}{K[6]-1}\right)} + x^2 + 1 \right\} \right\}$$

✗ **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
```

, 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 = 5.5567 (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)] - 1))/x + y(x)^2, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp\left(\int_1^x \frac{2(K[5]+1)\operatorname{sech}\left(\frac{1}{K[5]-1}\right)}{K[5]-1} dK[5]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[6]} \frac{2(K[5]+1)\operatorname{sech}\left(\frac{1}{K[5]-1}\right)}{K[5]-1} dK[5]\right)(K[6]+1)\operatorname{sech}\left(\frac{1}{K[6]-1}\right)}{K[6]-1} dK[6] + c_1} + \frac{x^3+x^2}{x+1} + 1 \right\} \right\}$$

✓ **Maple** : cpu = 9.102 (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+1)/(x-1), y(x))
```

$$y(x) = \frac{(-x^2+1)e^{\frac{\int \frac{4e^{\frac{1}{x-1}}(1+x)}{\left(\frac{2}{e^{\frac{2}{x-1}}+1}\right)(x-1)} dx}}{e^{\frac{2}{e^{\frac{2}{x-1}}+1}}} e^{\frac{\int \frac{4e^{\frac{1}{x-1}}(1+x)}{\left(\frac{2}{e^{\frac{2}{x-1}}+1}\right)(x-1)} dx}}{e^{\frac{2}{e^{\frac{2}{x-1}}+1}}} + e^{\frac{4c_1e^{\frac{2}{x-1}}}{e^{\frac{2}{e^{\frac{2}{x-1}}+1}}}} e^{\frac{4c_1}{e^{\frac{2}{e^{\frac{2}{x-1}}+1}}}} (x^2+1)}{e^{\frac{4c_1e^{\frac{2}{x-1}}}{e^{\frac{2}{e^{\frac{2}{x-1}}+1}}}} e^{\frac{4c_1}{e^{\frac{2}{e^{\frac{2}{x-1}}+1}}}} - e^{\frac{\int \frac{4e^{\frac{1}{x-1}}(1+x)}{\left(\frac{2}{e^{\frac{2}{x-1}}+1}\right)(x-1)} dx}}{e^{\frac{2}{e^{\frac{2}{x-1}}+1}}} e^{\frac{\int \frac{4e^{\frac{1}{x-1}}(1+x)}{\left(\frac{2}{e^{\frac{2}{x-1}}+1}\right)(x-1)} dx}}{e^{\frac{2}{e^{\frac{2}{x-1}}+1}}}}$$

2.792 ODE No. 792

$$y'(x) = \frac{y(x)\operatorname{sech}\left(\frac{1}{x+1}\right)\left(x^3y(x)+x^2y(x)-x^2-x-x\cosh\left(\frac{1}{x+1}\right)+\cosh\left(\frac{1}{x+1}\right)\right)}{(x-1)x}$$

✓ Mathematica : cpu = 2.67857 (sec), leaf count = 157

```
DSolve[Derivative[1][y][x] == (Sech[(1 + x)^(-1)]*y[x]*(-x - x^2 + Cosh[(1 + x)^(-1)] - x*Cosh
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp\left(\int_1^x \frac{-\operatorname{sech}\left(\frac{1}{K[1]+1}\right)K[1]^2-\operatorname{sech}\left(\frac{1}{K[1]+1}\right)K[1]-K[1]+1}{(K[1]-1)K[1]}dK[1]\right)}{-\int_1^x \frac{\exp\left(\int_1^{K[2]} \frac{-\operatorname{sech}\left(\frac{1}{K[1]+1}\right)K[1]^2-\operatorname{sech}\left(\frac{1}{K[1]+1}\right)K[1]-K[1]+1}{(K[1]-1)K[1]}dK[1]\right)\left(\operatorname{sech}\left(\frac{1}{K[2]+1}\right)K[2]^3+\operatorname{sech}\left(\frac{1}{K[2]+1}\right)K[2]^2\right)}{(K[2]-1)K[2]}dK[2] + \right.$$

✓ Maple : cpu = 0.5 (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
```

$$y(x) = \frac{e^{\int -\frac{\cosh\left(\frac{1}{1+x}\right)x+x^2-\cosh\left(\frac{1}{1+x}\right)+x}{x(x-1)\cosh\left(\frac{1}{1+x}\right)}dx}}{\int -e^{\frac{\cosh\left(\frac{1}{1+x}\right)(1-x)-x^2-x}{x(x-1)\cosh\left(\frac{1}{1+x}\right)}dx}\frac{x(1+x)}{\cosh\left(\frac{1}{1+x}\right)(x-1)}dx + c_1}$$

2.793

ODE No. 793

$$y'(x) = -\frac{y(x)(xy(x)+1)}{x(xy(x)-y(x)+1)}$$

✓ **Mathematica** : cpu = 9.08674 (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]
```

Solve

$$-\frac{\sqrt[3]{-2}\left(\frac{2^{2/3}((x-1)y(x)-2)}{\sqrt[3]{-\frac{1}{(x-1)^3}(x-1)((x-1)y(x)+1)}}+(-2)^{2/3}\right)\left(\frac{-xy(x)+y(x)+2}{\sqrt[3]{2}\sqrt[3]{-\frac{1}{(x-1)^3}(x-1)((x-1)y(x)+1)}}+(-2)^{2/3}\right)\left(\left(\frac{\sqrt[3]{-1}(-x)}{\sqrt[3]{-\frac{1}{(x-1)^3}(x-1)((x-1)y(x)+1)}}\right)\right)}{\dots}$$

✓ **Maple** : cpu = 2.543 (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))
```

$$y(x) = -\frac{2e^{-\text{LambertW}\left(-\frac{2(x-1)e^{3c_1}e^{-1}}{x}\right)+3c_1-1}}{x}$$

2.794

ODE No. 794

$$y'(x) = \frac{y(x)}{x \left(x^3 y(x)^4 + x^2 y(x)^3 + y(x) - 1\right)}$$

✓ **Mathematica** : cpu = 0.164567 (sec), leaf count = 67

```
DSolve[Derivative[1][y][x] == y[x]/(x*(-1 + y[x] + x^2*y[x]^3 + x^3*y[x]^4)),y[x],x]
```

$$\text{Solve}\left[\text{RootSum}\left[\#1^3 y(x)^3 + \#1^2 y(x)^2 + 1 \&, \frac{\#1 y(x) \log(x - \#1) + \log(x - \#1)}{3 \#1 y(x) + 2} \&\right] + y(x) - \log(x) = c_1, y\right]$$

✓ **Maple** : cpu = 0.381 (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))
```

$$-y(x) + \int^{xy(x)} \frac{1}{_a(_a^3+_a^2+1)} d\_a - c_1 = 0$$

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 = 0.306378 (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)^3, y[x]]
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{\frac{3y(x)}{(a+x)^3} + \frac{1}{(a+x)^2}}{\sqrt[3]{38}\sqrt[3]{\frac{1}{(a+x)^6}}} - \#1\right)}{2\sqrt[3]{38} - 19\#1^2}\&\right] = \frac{1}{9}38^{2/3}\left(\frac{1}{(a+x)^6}\right)^{2/3}(a+x)^3, y[x]\right]$$

✓ **Maple** : cpu = 0.028 (sec), leaf count = 37

```
dsolve(diff(y(x), x) = (x^3+3*a*x^2+3*a^2*x+a^3+x*y(x)^2+a*y(x)^2+y(x)^3)/(x+a)^3, y(x))
```

$$y(x) = -\text{RootOf}\left(-\left(\int^x \frac{1}{_a^3 - _a^2 - _a - 1} d\_a\right) + \ln(x+a) + c_1\right)(x+a)$$

2.796

ODE No. 796

$$y'(x) = \frac{e^{-\frac{3x^2}{2}}xy(x)^3}{3\left(e^{\frac{3x^2}{2}}y(x)+3e^{\frac{3x^2}{2}}+3y(x)\right)}$$

✓ **Mathematica** : cpu = 7.62071 (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[x], x]
```

Solve

$$\left[\frac{1}{62}\left(-31\log\left(9e^{\frac{3x^2}{2}}(y(x)+3)y(x)+3e^{3x^2}(y(x)+3)^2-y(x)^2\right)+6\sqrt{93}\tanh^{-1}\left(\frac{\sqrt{\frac{3}{31}}\left(2e^{\frac{3x^2}{2}}(y(x)+3)+y(x)\right)}{y(x)}\right)\right)\right]$$

✓ **Maple** : cpu = 1.664 (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)), y(x))
```

$$y(x) = \text{RootOf}\left(\left(7e^{3x^2+\text{RootOf}\left(e^{3x^2}\left(42\sqrt{93}\tanh\left(\frac{(c_1-5_Z)\sqrt{93}}{90}\right)e^{3x^2+_{-Z}+217\tanh\left(\frac{(c_1-5_Z)\sqrt{93}}{90}\right)^2e^{3x^2+_{-Z}+189e^{3x^2+_{-Z}-93\tanh\left(\frac{(c_1-5_Z)\sqrt{93}}{90}\right)}\right)}\right)}\right)\right)$$

2.797 ODE No. 797

$$y'(x) = \frac{y(x) \left(x^3 y(x) \cosh\left(\frac{x+1}{x-1}\right) + x^2 y(x) \cosh\left(\frac{x+1}{x-1}\right) - x^2 \cosh\left(\frac{x+1}{x-1}\right) - x \cosh\left(\frac{x+1}{x-1}\right) - 1\right)}{x}$$

✓ **Mathematica** : cpu = 1.59904 (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)]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp\left(\frac{1}{4}e^{\frac{x}{x-1}+\frac{3}{x-1}}\left(4\left(3-\frac{1}{e^2}\right)e^{-\frac{4}{x-1}}\text{Chi}\left(\frac{2}{x-1}\right)+e^{-\frac{2x}{x-1}-\frac{4}{x-1}}\left(4\left(e^{\frac{2}{x-1}}+3e^{\frac{2x}{x-1}}\right)\text{Shi}\left(\frac{2}{x-1}\right)-\left((x-1)\right)\right)\right)}{\exp\left(\frac{(3e^2-1)\text{Chi}\left(\frac{2}{x-1}\right)}{e}+\frac{(1+3e^2)\text{Shi}\left(\frac{2}{x-1}\right)}{e}+\frac{1}{4}e^{-\frac{2}{x-1}-1}\right)}-\right. \right.$$

✓ **Maple** : cpu = 1.133 (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)
```

$$y(x) = \frac{e^{-\frac{(x^2-1)e^{\frac{-1-x}{x-1}}}{4}}- \frac{(x^2+4x-5)e^{\frac{1+x}{x-1}}}{4}+\text{Ei}_1\left(\frac{2}{x-1}\right)e^{-1}-3\text{Ei}_1\left(-\frac{2}{x-1}\right)e}{x\left(c_1+\int -e^{\frac{(-x^2+1)e^{\frac{-1-x}{x-1}}}{4}}+\frac{(-x^2-4x+5)e^{\frac{1+x}{x-1}}}{4}+\text{Ei}_1\left(\frac{2}{x-1}\right)e^{-1}-3\text{Ei}_1\left(-\frac{2}{x-1}\right)e(1+x)\cosh\left(\frac{1+x}{x-1}\right)dx\right)}$$

2.798

ODE No. 798

$$y'(x) = \frac{y(x)(y(x) + x + 1)}{(x + 1)(2y(x)^3 + y(x) + x)}$$

✓ **Mathematica** : cpu = 0.318705 (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 = 0.106 (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))
```

$$y(x) = e^{\text{RootOf}(-e^{3-Z} + \ln(1+x)e^{-Z} + c_1e^{-Z} - Ze^{-Z} + x)}$$

2.799

ODE No. 799

$$y'(x) = \frac{y(x) \left(e^{\frac{x+1}{x-1}} x^3 y(x) + e^{\frac{x+1}{x-1}} x^2 y(x) - e^{\frac{x+1}{x-1}} x^2 - e^{\frac{x+1}{x-1}} x - 1 \right)}{x}$$

✓ **Mathematica** : cpu = 0.843798 (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 + 1
```

$$\left\{ \left\{ y(x) \rightarrow \frac{e^{6e\text{Ei}\left(\frac{2}{x-1}\right)}}{x \left(e^{6e\text{Ei}\left(\frac{2}{x-1}\right)} + c_1 e^{\frac{1}{2} e^{\frac{2}{x-1} + 1} (x-1)(x+5)} \right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.347 (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)
```

$$y(x) = \frac{e^{\frac{5}{2} e^{\frac{1+x}{x-1}}} e^{-\frac{x^2 e^{\frac{1+x}{x-1}}}{2}} e^{-2x e^{\frac{1+x}{x-1}}} e^{-6 \text{Ei}_1\left(-\frac{2}{x-1}\right) e}}{x \left(c_1 + \int - (1+x) e^{\frac{1+x}{x-1}} e^{\frac{5}{2} e^{\frac{1+x}{x-1}}} e^{-\frac{x^2 e^{\frac{1+x}{x-1}}}{2}} e^{-6 \text{Ei}_1\left(-\frac{2}{x-1}\right) e} e^{-2x e^{\frac{1+x}{x-1}}} dx \right)}$$

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 = 0.325521 (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*x*y[x]^2)/(2*x - b)^3, y[x], x]`

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{\frac{4}{(b-2x)^2} - \frac{24y(x)}{(b-2x)^3}}{4\sqrt[3]{38}\sqrt[3]{\frac{1}{(b-2x)^6}}}\right) - \#1}{2\sqrt[3]{38} - 19\#1^2}\&\right] = \frac{1}{9}38^{2/3}\left(\frac{1}{(b-2x)^6}\right)^{2/3}, y[x], x\right]$$

✓

Maple : cpu = 0.032 (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))`

$$y(x) = \frac{\text{RootOf}\left(-\left(\int^{-Z} \frac{1}{-a^3 - a^2 - a - 1} d_a\right) + \ln(-2x + b) + c_1\right)(-2x + b)}{2}$$

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 = 0.344604 (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
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3e^{-\frac{x^2}{2}}y(x)+e^{-\frac{x^2}{4}}}{\sqrt[3]{29}\sqrt[3]{e^{-\frac{3x^2}{4}}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}e^{\frac{x^2}{2}}\left(e^{-\frac{3x^2}{4}}\right)^{2/3}x$$

✓ **Maple** : cpu = 0.076 (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
```

$$y(x) = \frac{29\,e^{\frac{x^2}{4}}\,\text{RootOf}\left(-81\left(\int^{-Z}\frac{1}{841\,a^3-27\,a+27}d\_a\right)+x+3c_1\right)}{9}-\frac{e^{\frac{x^2}{4}}}{3}$$

2.802

ODE No. 802

$$y'(x) = \frac{-\operatorname{F1}\left(y(x) + \frac{1}{x}\right) + \frac{1}{x}}{x}$$

✓ **Mathematica** : cpu = 0.0948338 (sec), leaf count = 101

```
DSolve[Derivative[1][y][x] == (x^(-1) + _F1[x^(-1) + y[x]])/x,y[x],x]
```

$$\text{Solve} \left[\int_1^{y(x)} \frac{-\operatorname{F1}\left(K[2] + \frac{1}{x}\right) \int_1^x -\frac{-\operatorname{F1}'\left(K[2] + \frac{1}{K[1]}\right)}{K[1]^2 \left(-\operatorname{F1}\left(K[2] + \frac{1}{K[1]}\right)\right)^2} dK[1] + 1}{-\operatorname{F1}\left(K[2] + \frac{1}{x}\right)} dK[2] + \int_1^x \left(\frac{1}{K[1]} + \frac{1}{-\operatorname{F1}\left(y(x) + \frac{1}{K[1]}\right)} \right) \right]$$

✓ **Maple** : cpu = 0.132 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = -(-1/x-_F1(y(x)+1/x))/x,y(x))
```

$$y(x) = \frac{\operatorname{RootOf}\left(-\ln(x) + \int^{-Z} \frac{1}{-\operatorname{F1}(\_a)} d\_a + c_1\right) x - 1}{x}$$

2.803

ODE No. 803

$$y'(x) = \frac{-F1(y(x)^2 - 2 \log(x))}{x \sqrt{y(x)^2}}$$

✓

Mathematica : cpu = 0.243598 (sec), leaf count = 637

DSolve[Derivative[1][y][x] == _F1[-2*Log[x] + y[x]^2]/(x*Sqrt[y[x]^2]),y[x],x]

Solve

$$\left[\int_1^{y(x)} \left(\frac{K[2]}{(\_F1(K[2]^2 - 2 \log(x)) - 1) (\_F1(K[2]^2 - 2 \log(x)) + 1)} - \int_1^x \left(\frac{2K[2]\_F1'(K[2]^2 - 2 \log(x))}{K[1] (\_F1(K[2]^2 - 2 \log(x)) - 1) (\_F1(K[2]^2 - 2 \log(x)) + 1)} \right) dx \right) dy(x) \right]$$

✓

Maple : cpu = 0.437 (sec), leaf count = 65

dsolve(diff(y(x),x) = _F1(y(x)^2-2*ln(x))/(y(x)^2)^(1/2)/x,y(x))

$$y(x) = \sqrt{2 \ln(x) + 2 \operatorname{RootOf}\left(\ln(x) - \left(\int \frac{1}{\_F1(2\_a) - 1} d\_a\right) + c_1\right)}$$

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 = 0.377393 (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,
```

$$\left\{ \left\{ y(x) \rightarrow \tan^{-1} \left(\frac{3x^4 - 4x^3 + 6x^2 - 12x + 12 \log(x+1) - 25 - 12c_1}{12x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.976 (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 = 0.139689 (sec), leaf count = 154

```
DSolve[Derivative[1][y][x] == (y[x] + x*y[x] + x^4*Sqrt[x^2 + y[x]^2])/(x*(1 + x)),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x \tanh\left(\frac{1}{6}(2x^3 - 3x^2 + 6x - 6\log(x+1) + 11 + 6c_1)\right)}{\sqrt{1 - \tanh^2\left(\frac{1}{6}(2x^3 - 3x^2 + 6x - 6\log(x+1) + 11 + 6c_1)\right)}} \right\}, \left\{ y(x) \rightarrow \frac{x \tanh\left(\frac{1}{6}(2x^3 - 3x^2 + 6x - 6\log(x+1) + 11 + 6c_1)\right)}{\sqrt{1 - \tanh^2\left(\frac{1}{6}(2x^3 - 3x^2 + 6x - 6\log(x+1) + 11 + 6c_1)\right)}} \right\} \right.$$

✓ **Maple** : cpu = 1.229 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = (x*y(x)+y(x)+x^4*(y(x)^2+x^2)^(1/2))/x/(1+x),y(x))
```

$$\ln\left(y(x) + \sqrt{y(x)^2 + x^2}\right) - \frac{x^3}{3} + \frac{x^2}{2} - x + \ln(1+x) - \ln(x) - c_1 = 0$$

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 = 0.296857 (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*(x+1)), y[x]]
```

$$\left\{ \left\{ y(x) \rightarrow \tan^{-1} \left(\frac{x - \log(x+1) - c_1}{x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.536 (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

$$y'(x) = -\frac{1}{-e^{y(x)}y(x)\_F1(y(x) - \log(x)) - x}$$

✓ **Mathematica** : cpu = 0.220386 (sec), leaf count = 59

```
DSolve[Derivative[1][y][x] == -(-x - E^y[x]*y[x]*_F1[-Log[x] + y[x]])^(-1),y[x],x]
```

$$\text{Solve}\left[-\int_1^{y(x)-\log(x)}\frac{K[1]\_F1(K[1])+e^{-K[1]}}{\_F1(K[1])}dK[1]-y(x)\log(x)+\frac{\log^2(x)}{2}=-c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.419 (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 = 1.41065 (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]
```

Solve

$$\frac{2^{2/3} \left(x \log \left(-\frac{6 \, 2^{2/3} (y(x)+1)}{2(x-1)y(x)+x-2} \right) - x \log \left(\frac{3 \, 2^{2/3} (2xy(x)+x)}{2(x-1)y(x)+x-2} \right) + 2xy(x) \left(\log \left(-\frac{6 \, 2^{2/3} (y(x)+1)}{2(x-1)y(x)+x-2} \right) - \log \left(\frac{3 \, 2^{2/3} (2xy(x)+x)}{2(x-1)y(x)+x-2} \right) \right) \right)}{9(2xy(x) + x)}$$

✓ **Maple** : cpu = 0.141 (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))
```

$$y(x) = \frac{-x \operatorname{LambertW}\left(\frac{e^{-\frac{1}{x}}}{xc_1}\right) - 2}{2x \operatorname{LambertW}\left(\frac{e^{-\frac{1}{x}}}{xc_1}\right) + 2}$$

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 = 0.234719 (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)/(4*x - 5)^3, y[x], x]
```

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{\frac{192y(x)}{(4x-5)^3} + \frac{16}{(4x-5)^2} - \#1\right)}{2\sqrt[3]{38} - 19\#1^2}\&\right] = \frac{1}{9}38^{2/3}\left(\frac{1}{(5-4x)^6}\right)^{2/3}, \#1\right]$$

✓ **Maple** : cpu = 0.021 (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))
```

$$y(x) = -\frac{\text{RootOf}\left(-\left(\int^{-Z}\frac{1}{-a^3--a^2--a-1}d\_a\right) + \ln(4x - 5) + c_1\right)(4x - 5)}{4}$$

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 = 0.0914123 (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]

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{2}x^2 \left(\frac{1 - 2x \log(x)}{x^2} - \frac{1}{x^2} \right) + \frac{1}{-1 + \frac{c_1}{x}} \right\} \right\}$$

✓

Maple

: cpu = 0.043 (sec), leaf count = 16

dsolve(diff(y(x),x) = (x+y(x)+y(x)^2-2*y(x)*ln(x)*x+x^2*ln(x)^2)/x,y(x))

$$y(x) = \left(\ln(x) + \frac{1}{c_1 - x} \right) x$$

2.811

ODE No. 811

$$y'(x) = \frac{x^4 + x^3 e^{y(x)} + xy(x) + e^{y(x)}y(x) - x \log(e^{y(x)} + x) - e^{y(x)} \log(e^{y(x)} + x) + x}{x^2}$$

✓

Mathematica : cpu = 0.787542 (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], y[x], x]

$$\left\{ \left\{ y(x) \rightarrow -\log\left(-\frac{1}{x} + \frac{e^{-\frac{x^3}{2} - c_1 x}}{x}\right) \right\} \right\}$$

✓

Maple : cpu = 1.196 (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), y(x))

$$y(x) = \frac{x^3}{2} + xc_1 + \ln\left(-\frac{x}{-1 + e^{\frac{x^3}{2}} e^{xc_1}}\right)$$

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 = 0.288781 (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*y[x]], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{96} \left(-9x^8 - 24x^7 - 16x^6 - 72x^5 - 96x^4 + 72c_1x^4 + 16x^3 + 96c_1x^3 - 144x^2 + 288c_1x - 144c_1^2 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.306 (sec), leaf count = 30

```
dsolve(diff(y(x),x) = 1/2*x^2+(x^3-6*y(x))^(1/2)+x^2*(x^3-6*y(x))^(1/2)+x^3*(x^3-6*y(x))^(1/2), y(x))
```

$$c_1 - \frac{3x^4}{4} - x^3 - 3x - \sqrt{x^3 - 6y(x)} = 0$$

2.813

ODE No. 813

$$y'(x) = \frac{1}{2}\sqrt{a}\Big(2\sqrt{ax^4+8y(x)}-\sqrt{a}x^3+2x^3\sqrt{ax^4+8y(x)}+2x^2\sqrt{ax^4+8y(x)}\Big)$$

✓

Mathematica

: cpu = 0.461344 (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

$$\left\{\left\{y(x)\rightarrow \frac{1}{72}a(9x^8+24x^7+16x^6+72x^5+87x^4-72c_1x^4-96c_1x^3+144x^2-288c_1x+144c_1^2)\right\}\right\}$$

✓

Maple

: cpu = 0.602 (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

$$\frac{\sqrt{a\,x^4+8y\left(x\right)}}{4}+\frac{\left(-3x^4-4x^3-12x\right)\sqrt{a}}{12}-c_1=0$$

2.814 ODE No. 814

$$y'(x) = \frac{y(x) (x^7 y(x)^2 - 3x^3 y(x) - 3)}{x (x^3 y(x) + 1)}$$

✓ **Mathematica** : cpu = 0.111393 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x}{-x^4 + \frac{\sqrt{x+x(-2x+c_1)}}{\sqrt{\frac{1}{x^7}}}} \right\}, \left\{ y(x) \rightarrow -\frac{x}{x^4 + \frac{\sqrt{x+x(-2x+c_1)}}{\sqrt{\frac{1}{x^7}}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.038 (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))
```

$$y(x) = \frac{1}{(\sqrt{c_1 - 2x - 1}) x^3}$$

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 = 8.05327 (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))), y[x], x]
```

Solve

$$\left[\frac{1}{186}\left(31\log\left(-81e^{\frac{3x^2}{2}}(y(x)+3)y(x)+e^{3x^2}(y(x)+3)^2-243y(x)^2\right)+6\sqrt{93}\tanh^{-1}\left(\frac{81y(x)-2e^{\frac{3x^2}{2}}(y(x)+3)}{9\sqrt{93}y(x)+e^{3x^2}+3}\right)\right)\right]$$

✓ **Maple** : cpu = 1.002 (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*x^2)), y(x))
```

$$-10\ln\left(\frac{10e^{\frac{3x^2}{2}}(3+y(x))}{9\left(3e^{\frac{3x^2}{2}}+e^{\frac{3x^2}{2}}y(x)+3y(x)\right)}\right)+5\ln\left(\frac{\frac{100(3+y(x))^2e^{3x^2}}{189}+\frac{300(-y(x)^2-3y(x))e^{\frac{3x^2}{2}}}{7}-\frac{900y(x)^2}{7}}{\left(e^{\frac{3x^2}{2}}(3+y(x))+3y(x)\right)^2}\right)-\frac{30\sqrt{93}}{9}$$

2.816

ODE No. 816

$$y'(x) = \frac{x(x-y(x))^3(y(x)+x)^3}{y(x)(x^2-y(x)^2-1)}$$

✓ **Mathematica** : cpu = 0.185419 (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]
```

$$\text{Solve}\left[\frac{1}{2}\left(\text{RootSum}\left[\#1^3-\#1+1\&, \frac{\#1\log\left(-\#1+x^2-y(x)^2\right)-\log\left(-\#1+x^2-y(x)^2\right)}{3\#1^2-1}\&\right]+x^2\right)=c_1,\right.$$

✓ **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))
```

$$\int_{-b}^x -\frac{\left(-a-y(x)\right)^3\left(y(x)+a\right)^3 a}{-a^6-3 a^4 y(x)^2+3 a^2 y(x)^4-y(x)^6-a^2+y(x)^2+1} d-a+\int^{y(x)}\left(\frac{\left(-f^2+x^2-1\right)}{-f^6+3 f^4 x^2-3 f^2 x^4+a}\right) d x$$

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 = 0.431361 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\sec^{-1} \left(\frac{-x^3 + 3x^3 \log(x) - 9c_1}{9 \log(x)} \right) \right\}, \left\{ y(x) \rightarrow \sec^{-1} \left(\frac{-x^3 + 3x^3 \log(x) - 9c_1}{9 \log(x)} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.854 (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)
```

$$y(x) = \operatorname{arcsec} \left(\frac{3x^3 \ln(x) - x^3 + 9c_1}{9 \ln(x)} \right)$$

2.818

ODE No. 818

$$y'(x) = \frac{y(x)}{x(xy(x)^4 + xy(x)^3 + xy(x) - 1)}$$

✓ **Mathematica** : cpu = 0.156528 (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 = 0.105 (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))
```

$$y(x) = e^{\text{RootOf}(-2xe^{4-Z}-3xe^{3-Z}+6c_1xe^{-Z}-6_Zxe^{-Z}-6)}$$

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 = 0.226415 (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*Sqr
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{192} \left(9 x^8+24 x^7+16 x^6+72 x^5+96 x^4-72 c_1 x^4-96 c_1 x^3+80 x^2-288 c_1 x+144 c_1^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.269 (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),y(x))
```

$$c_1 + \frac{3x^4}{8} + \frac{x^3}{2} + \frac{3x}{2} - \sqrt{x^2 + 3y(x)} = 0$$

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 = 0.359492 (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]))]
```

$$\left\{ \left\{ y(x) \rightarrow -\sec^{-1} \left(\frac{-x^2 + 2x^2 \log(x) - 4c_1}{4 \log(x)} \right) \right\}, \left\{ y(x) \rightarrow \sec^{-1} \left(\frac{-x^2 + 2x^2 \log(x) - 4c_1}{4 \log(x)} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.837 (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))
```

$$y(x) = \operatorname{arcsec} \left(\frac{2x^2 \ln(x) - x^2 + 4c_1}{4 \ln(x)} \right)$$

2.821 ODE No. 821

$$y'(x) = \frac{y(x)(xy(x) + 1)}{x(x^3y(x)^4 - xy(x) - 1)}$$

✓ **Mathematica** : cpu = 0.179152 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1}{4} - \frac{1}{2} \sqrt{\frac{c_1^2}{4} + \frac{\sqrt[3]{1944c_1^2x^6 + 1458x^5 + \sqrt{(1944c_1^2x^6 + 1458x^5)^2 - 4(54c_1x^4 + 144x^3)^3}}}{18\sqrt[3]{2}x^3} + \frac{1}{x^3} \right. \right.$$

✓ **Maple** : cpu = 0.129 (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))
```

$$-\frac{1}{3y(x)^3x^3} - \frac{1}{2x^2y(x)^2} - y(x) + c_1 = 0$$

2.822

ODE No. 822

$$y'(x) = \frac{1}{4}x\Big(-4e^{-x^2}x^2y(x) - 4e^{-x^2}x^2 + 4e^{-x^2} + e^{-2x^2}x^4 + 4y(x)^2\Big)$$

✓ **Mathematica** : cpu = 0.278402 (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
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{2}e^{-x^2}x^2 + \frac{1}{-\frac{x^2}{2} + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.109 (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
```

$$y(x) = \frac{x^2e^{-x^2}}{2} + \frac{1}{c_1 - \frac{x^2}{2}}$$

2.823

ODE No. 823

$$y'(x) = \frac{y(x)(y(x) + x)}{x(y(x)^4 + y(x)^3 + y(x) + x)}$$

✓ **Mathematica** : cpu = 0.26006 (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 = 0.112 (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))
```

$$y(x) = e^{\text{RootOf}\left(-2e^{4-Z}-3e^{3-Z}+6\ln(x)e^{-Z}+6c_1e^{-Z}-6Ze^{-Z}+6x\right)}$$

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 = 0.176989 (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]
```

$$\text{Solve}\left[-\frac{1}{2}\log\left(\frac{y(x)^2}{x^2}+\frac{y(x)}{x}+1\right)+\log\left(\frac{y(x)}{x}\right)+\frac{\tan^{-1}\left(\frac{\frac{2y(x)}{x}+1}{\sqrt{3}}\right)}{\sqrt{3}}=\log(1-x)-\log(x)+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.39 (sec), leaf count = 61

```
dsolve(diff(y(x),x) = y(x)/x^2/(x-1)*(x^3+x^2*y(x)+y(x)^2)/(y(x)+x),y(x))
```

$$-\frac{\ln\left(\frac{y(x)^2+xy(x)+x^2}{x^2}\right)}{2}+\frac{\sqrt{3}\arctan\left(\frac{(x+2y(x))\sqrt{3}}{3x}\right)}{3}+\ln\left(\frac{y(x)}{x}\right)-\ln(x-1)+\ln(x)-c_1=0$$

2.825

ODE No. 825

$$y'(x) = \frac{x\Big(x^2y(x)^3 + (x^2+1)^{3/2}y(x)^2 + x^2(x^2+1)^{3/2} + (x^2+1)^{3/2} + y(x)^3\Big)}{(x^2+1)^3}$$

✓ **Mathematica** : cpu = 1.383 (sec), leaf count = 148

`DSolve[Derivative[1][y][x] == (x*((1 + x^2)^(3/2) + x^2*(1 + x^2)^(3/2) + (1 + x^2)^(3/2)*y[x]`

$$\text{Solve}\left[-\frac{19}{3}\text{RootSum}\left[-19\#1^3 + 6\sqrt[3]{38}\#1 - 19\&, \frac{\log\left(\frac{\frac{3xy(x)}{(x^2+1)^2} + \frac{x}{(x^2+1)^{3/2}} - \#1\right)}{2\sqrt[3]{38} - 19\#1^2}\&\right] = \frac{19^{2/3}\left(\frac{x^3}{(x^2+1)^{9/2}}\right)^{2/3}}{9\sqrt[3]{38}}$$

✓ **Maple** : cpu = 0.126 (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`

$$y(x) = \frac{\left(19\text{RootOf}\left(-1296\left(\int^{-Z}\frac{1}{361\_a^3-432\_a+432}d\_a\right) + 2\ln(x^2+1) + 3c_1\right) - 6\right)\sqrt{x^2+1}}{18}$$

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 = 0.291502 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{x}\sqrt{W\left(\frac{6e^{2c_1}x}{(x+1)^2}\right)}}{\sqrt{6}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{x}\sqrt{W\left(\frac{6e^{2c_1}x}{(x+1)^2}\right)}}{\sqrt{6}} \right\} \right\}$$

✓ **Maple** : cpu = 0.328 (sec), leaf count = 51

```
dsolve(diff(y(x),x) = 1/(6*y(x)^2+x)*(3*x*y(x)^2+x+3*y(x)^2)*y(x)/x/(1+x),y(x))
```

$$\frac{1}{\frac{1}{y(x)^2} + \frac{6}{x}} = \frac{\left(e^{\operatorname{RootOf}\left(-e^{-Z}\ln\left(\frac{(1+x)^2(e^{-Z}+9)}{2x}\right)+3c_1e^{-Z}+_Ze^{-Z}+9\right)} + 9 \right) x}{54}$$

2.827

ODE No. 827

$$y'(x) = \frac{x^2y(x)\sqrt{x^2+y(x)^2} + x^3\Big(-\sqrt{x^2+y(x)^2}\Big) + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.166901 (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,
```

$$\left\{\left\{y(x) \rightarrow \frac{\sqrt{2}x \tanh^2\left(\frac{1}{6}\left(-\sqrt{2}x^3-3\sqrt{2}c_1\right)\right)-2x \tanh\left(\frac{1}{6}\left(-\sqrt{2}x^3-3\sqrt{2}c_1\right)\right)}{\sqrt{2}-2 \tanh\left(\frac{1}{6}\left(-\sqrt{2}x^3-3\sqrt{2}c_1\right)\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.214 (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))
```

$$\ln\left(\frac{2x\left(\sqrt{2y\left(x\right)^2+2x^2}+y\left(x\right)+x\right)}{y\left(x\right)-x}\right)+\frac{\sqrt{2}x^3}{3}-\ln\left(x\right)-c_1=0$$

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 = 0.373674 (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 = 0.215 (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))
```

$$y(x) = \frac{e^{\text{RootOf}\left(x\,e^{3-Z}-8x\,e^{2-Z}+16\ln\left(\frac{e^{-Z}}{2}+\frac{1}{2}\right)x\,e^{-Z}+8c_1x\,e^{-Z}-2\_Zx\,e^{-Z}+7\,e^{-Z}x+16\right)}}{2}-\frac{1}{2}$$

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 = 0.312827 (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 + 4*x^2*y[x]])/x^3, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{16x^{12} + 40x^{11} + 25x^{10} + 80x^9 + 100x^8 - 160c_1x^7 + 100x^6 - 200c_1x^6 - 400c_1x^4 + 400c_1^2x^2 - 100c_1^2x}{400x^2} \right\} \right.$$

✓ **Maple** : cpu = 0.391 (sec), leaf count = 34

```
dsolve(diff(y(x), x) = 1/2*(1+2*(4*x^2*y(x)+1)^(1/2)*x^3+2*x^5*(4*x^2*y(x)+1)^(1/2)+2*x^6*(4*x^2*y(x)+1)^(1/2))/x^3, y(x))
```

$$c_1 - \frac{\sqrt{4x^2y(x) + 1}}{x} + x^2 + \frac{x^4}{2} + \frac{2x^5}{5} = 0$$

2.830

ODE No. 830

$$y'(x) = \frac{(x - y(x))y(x)}{x(-y(x)^4 - y(x)^3 - y(x) + x)}$$

✓ **Mathematica** : cpu = 0.286732 (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 = 0.11 (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))
```

$$y(x) = e^{\text{RootOf}(2e^{4-Z} + 3e^{3-Z} - 6\ln(x)e^{-Z} + 6c_1e^{-Z} + 6Ze^{-Z} + 6x)}$$

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 = 1.50335 (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*Sqr
```

$$\left\{\left\{y(x) \rightarrow -\frac{1}{12}\sqrt{576ax - 9x^8 - 24x^7 - 16x^6 - 72x^5 - 96x^4 - 72c_1x^4 - 96c_1x^3 - 144x^2 - 288c_1x - 144c_1^2}\right.\right.$$

✓ **Maple** : cpu = 0.27 (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+
```

$$-\sqrt{-y(x)^2 + 4ax} - \frac{x^4}{4} - \frac{x^3}{3} - x - c_1 = 0$$

2.832

ODE No. 832

$$y'(x) = \frac{y(x)(y(x) + x + 1)}{(x + 1)(y(x)^4 + y(x)^3 + y(x)^2 + x)}$$

✓ **Mathematica** : cpu = 1.23402 (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
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{2} \sqrt{\frac{3\sqrt[3]{2}(-8x + 3c_1 + 3)}{\sqrt[3]{1944(c_1 + \log(x + 1))^2 + 972(c_1 + \log(x + 1)) + 3726x} + \sqrt{(1944(c_1 + \log(x + 1))^2 + 972(c_1 + \log(x + 1)) + 3726x)}}} \right. \right.$$

✓ **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

$$y'(x) = \frac{x^4\Big(-\sqrt{x^2+y(x)^2}\Big) + x^3y(x)\sqrt{x^2+y(x)^2} + y(x)}{x}$$

✓ **Mathematica** : cpu = 0.166631 (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,
```

$$\left\{\left\{y(x) \rightarrow \frac{\sqrt{2} x \tanh ^2\left(\frac{1}{8}\left(-\sqrt{2} x^4-4 \sqrt{2} c_1\right)\right)-2 x \tanh \left(\frac{1}{8}\left(-\sqrt{2} x^4-4 \sqrt{2} c_1\right)\right)}{\sqrt{2}-2 \tanh \left(\frac{1}{8}\left(-\sqrt{2} x^4-4 \sqrt{2} c_1\right)\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.184 (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))
```

$$\ln \left(\frac{2 x\left(\sqrt{2 y(x)^2+2 x^2+y(x)+x}\right)}{y(x)-x}\right)+\frac{\sqrt{2} x^4}{4}-\ln (x)-c_1=0$$

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 = 0.337189 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{x}\sqrt{W\left(\frac{6(x+1)^2e^{x^2-2x-3+2c_1}}{x}\right)}}{\sqrt{6}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{x}\sqrt{W\left(\frac{6(x+1)^2e^{x^2-2x-3+2c_1}}{x}\right)}}{\sqrt{6}} \right\} \right\}$$

✓ **Maple** : cpu = 0.385 (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))
```

$$\frac{1}{\frac{1}{y(x)^2} + \frac{6}{x}} = \frac{\left(e^{\operatorname{RootOf}\left(x^2e^{-Z}-e^{-Z}\ln\left(\frac{x(e^{-Z}+9)}{2(1+x)^2}\right)+3c_1e^{-Z}+_Ze^{-Z}-2e^{-Z}x+9\right)+9}} \right) x}{54}$$

2.835

ODE No. 835

$$y'(x) = -\frac{1}{x\left(-\sqrt[3]{y(x)^3}\right)_F1\left(y(x)^3-3\log(x)\right)-x\left(y(x)^3\right)^{2/3}}$$

✗ Mathematica : cpu = 1.19407 (sec), leaf count = 0

`DSolve[Derivative[1][y][x] == -(-(x*(y[x]^3)^(2/3)) - x*(y[x]^3)^(1/3)*_F1[-3*Log[x] + y[x]^3]`

, could not solve

`DSolve[Derivative[1][y][x] == -(-(x*(y[x]^3)^(2/3)) - x*(y[x]^3)^(1/3)*_F1[-3*Log[x] + y`
`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 = 8.83189 (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]
```

Solve

$$\left[\frac{1}{9} 2^{2/3} \left(\frac{\left(1 - \frac{(x-1)^2 \left(\frac{x^6}{(x-1)^3} \right)^{2/3} ((x+2)y(x)+x)}{x^4 ((x-1)y(x)+x)} \right) \left(\frac{\left(\frac{x^6}{(x-1)^3} \right)^{2/3} (x-1)^2 ((x+2)y(x)+x)}{x^4 ((x-1)y(x)+x)} + 2 \right) \left(\left(1 - \frac{(x-1)^2 \left(\frac{x^6}{(x-1)^3} \right)^{2/3} ((x+2)y(x)+x)}{x^4 ((x-1)y(x)+x)} \right) \right)}{ \right. \right.$$

✓ **Maple** : cpu = 0.2 (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))
```

$$y(x) = -\frac{x e^{\operatorname{RootOf}\left(-\ln\left(\frac{e^{-Z}}{2} + \frac{9}{2}\right) e^{-Z} + 3c_1 e^{-Z} + _Z e^{-Z} - e^{-Z} x + 9\right)}}{-9 + (x - 1) e^{\operatorname{RootOf}\left(-\ln\left(\frac{e^{-Z}}{2} + \frac{9}{2}\right) e^{-Z} + 3c_1 e^{-Z} + _Z e^{-Z} - e^{-Z} x + 9\right)}}$$

2.837 ODE No. 837

$$y'(x) = -\frac{1}{-\sqrt[3]{y(x)^3} \log(x) {}_2F_1(3\text{Ei}(-\log(x)) + y(x)^3) - (y(x)^3)^{2/3} \log(x)}$$

X Mathematica : cpu = 1.37922 (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*ExpInte
```

, could not solve

```
DSolve[Derivative[1][y][x] == -(- (Log[x]*(y[x]^3)^(2/3)) - Log[x]*(y[x]^3)^(1/3)*_F1[3*E
Log[x]] + y[x]^3))^( -1), y[x], 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
```

, 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
```

2.838

ODE No. 838

$$y'(x) = \frac{\frac{8x^{7/2}}{5} + \frac{4x^6}{25} - \frac{4}{5}x^3y(x) + \frac{6x^3}{5} - 4\sqrt{x}y(x) + y(x)^2 + 4x + \sqrt{x}}{x}$$

✓ **Mathematica** : cpu = 0.158038 (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
```

$$\left\{ \left\{ y(x) \rightarrow \frac{2}{5}\sqrt{x}\left(x^{5/2} + 5\right) + \frac{1}{-\log(x) + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.121 (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
```

$$y(x) = \frac{2\left(x^2 + \frac{5}{\sqrt{x}}\right)x}{5} + \frac{1}{c_1 - \ln(x)}$$

2.839

ODE No. 839

$$y'(x) = \frac{e^{\frac{y(x)}{x}} \left(x^2 + x e^{-\frac{y(x)}{x}} + e^{-\frac{y(x)}{x}} y(x) \right)}{x}$$

✓ **Mathematica** : cpu = 0.21767 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -x \log \left(-\frac{x}{2} + \frac{e^{2c_1}}{2x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.066 (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

$$y'(x) = \frac{e^{\frac{y(x)}{x}} \left(x^3 + x e^{-\frac{y(x)}{x}} + e^{-\frac{y(x)}{x}} y(x) \right)}{x}$$

✓ **Mathematica** : cpu = 0.287532 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -x \log \left(-\frac{x^2}{3} + \frac{e^{3c_1}}{3x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.066 (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

$$y'(x) = \frac{-2a^{3/2}bx^2y(x)^2 + 2a^{3/2}cy(x)^2 + a^{5/2}y(x)^4 + \sqrt{ab^2x^4 - 2\sqrt{abc}x^2 + \sqrt{ac^2 + bx^3}}}{ax^2y(x)}$$

✓ **Mathematica** : cpu = 0.83339 (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

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{2a^{5/2}bx^2 - 2a^{5/2}c + 4a^3b^2x^3 - 4a^3bcx + a^2x + 4\sqrt{ab^2c_1x^2 - 4\sqrt{abcc_1 + 2bc_1x}}}}{\sqrt{2}\sqrt{2a^{3/2}bc_1 + a^{7/2} + 2a^4bx}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{2a^{5/2}bx^2 - 2a^{5/2}c + 4a^3b^2x^3 - 4a^3bcx + a^2x + 4\sqrt{ab^2c_1x^2 - 4\sqrt{abcc_1 + 2bc_1x}}}}{\sqrt{2}\sqrt{2a^{3/2}bc_1 + a^{7/2} + 2a^4bx}} \right\} \right.$$

✓ **Maple** : cpu = 0.267 (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

$$y(x) = -\frac{2\sqrt{(c_1x + 1) \left((c_1x + 1) (bx^2 - c) \sqrt{a + \frac{x}{2}}\right) a^{3/2}}}{a^{3/2} (2c_1x + 2)}$$

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 = 0.141925 (sec), leaf count = 186

```
DSolve[Derivative[1][y][x] == (x^2*Log[x]^3 + y[x] + 2*x^2*Log[x]^2*y[x] + x^2*Log[x]*y[x]^2)/
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\frac{1}{4}x^2e^{\frac{1}{4}x^2(2\log(x)-1)}(2\log(x)-1)\left(\frac{x}{2} + \frac{1}{2}x(2\log(x)-1)\right) + \frac{1}{2}xe^{\frac{1}{4}x^2(2\log(x)-1)} + \frac{1}{2}xe^{\frac{1}{4}x^2(2\log(x)-1)}(2\log(x)-1)}{x\left(\frac{1}{4}x^2e^{\frac{1}{4}x^2(2\log(x)-1)}(2\log(x)-1) + c_1e^{\frac{1}{4}x^2(2\log(x)-1)}\right)} \right. \right.$$

✓ Maple : cpu = 0.029 (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 = 0.14242 (sec), leaf count = 198

```
DSolve[Derivative[1][y][x] == (x^3*Log[x]^3 + y[x] + 2*x^3*Log[x]^2*y[x] + x^3*Log[x]*y[x]^2)/
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\frac{1}{9}x^3e^{\frac{1}{9}x^3(3\log(x)-1)}(3\log(x)-1)\left(\frac{x^2}{3} + \frac{1}{3}x^2(3\log(x)-1)\right) + \frac{1}{3}x^2e^{\frac{1}{9}x^3(3\log(x)-1)} + \frac{1}{3}x^2e^{\frac{1}{9}x^3(3\log(x)-1)}}{x^2\left(\frac{1}{9}x^3e^{\frac{1}{9}x^3(3\log(x)-1)}(3\log(x)-1) + c_1e^{\frac{1}{9}x^3(3\log(x)-1)}\right)} \right. \right.$$

✓ **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))
```

$$y(x) = -\frac{\ln(x)(6x^3\ln(x) - 2x^3 + 9c_1 + 18)}{6x^3\ln(x) - 2x^3 + 9c_1}$$

2.844

ODE No. 844

$$y'(x) = \frac{y(x)(y(x) + 1)(y(x) + x)}{x(xy(x) + y(x) + x)}$$

✓ **Mathematica** : cpu = 9.34398 (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]
```

Solve

$$\left[2^{2/3} \left(1 - \frac{\left(\frac{x^6}{(x+1)^3} \right)^{2/3} (x+1)^2 ((x-2)y(x)+x)}{x^4 ((x+1)y(x)+x)} \right) \left(\frac{\left(\frac{x^6}{(x+1)^3} \right)^{2/3} (x+1)^2 ((x-2)y(x)+x)}{x^4 ((x+1)y(x)+x)} + 2 \right) \left(\left(1 - \frac{\left(\frac{x^6}{(x+1)^3} \right)^{2/3} (x+1)^2 ((x-2)y(x)+x)}{x^4 ((x+1)y(x)+x)} \right) \right. \right. \\ \left. \left. 9 \left(\frac{3}{\dots} \right) \right] \right.$$

✓ **Maple** : cpu = 0.195 (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))
```

$$y(x) = -\frac{e^{\operatorname{RootOf}\left(-\ln\left(\frac{e^{-Z}}{2}+\frac{9}{2}\right)e^{-Z}+3c_1e^{-Z}+Ze^{-Z}+e^{-Z}x+9\right)}x}{e^{\operatorname{RootOf}\left(-\ln\left(\frac{e^{-Z}}{2}+\frac{9}{2}\right)e^{-Z}+3c_1e^{-Z}+Ze^{-Z}+e^{-Z}x+9\right)}x+e^{\operatorname{RootOf}\left(-\ln\left(\frac{e^{-Z}}{2}+\frac{9}{2}\right)e^{-Z}+3c_1e^{-Z}+Ze^{-Z}+e^{-Z}x+9\right)}+9}$$

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 = 2.06239 (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] +
```

$$\left\{\left\{y(x) \rightarrow -\frac{1}{2}\sqrt[3]{-\frac{1}{2}\sqrt[3]{9x^8 + 24x^7 + 16x^6 + 72x^5 + 132x^4 + 72c_1x^4 + 96c_1x^3 + 144x^2 + 288c_1x + 144c_1^2}}\right\}\right\},$$

✓ **Maple** : cpu = 0.211 (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
```

$$\int_{-b}^{y(x)} \frac{-a^2}{\sqrt{-9x^4 + 4a^3}} d_{-}a - \frac{x^4}{4} - \frac{x^3}{3} - x - c_1 = 0$$

2.846

ODE No. 846

$$y'(x) = \frac{1}{- \left(x^2 \left(\frac{1}{y(x)} + 1\right) {}_2F1\left(x \left(\frac{1}{y(x)} + 1\right)\right)\right) + x^2 {}_2F1\left(x \left(\frac{1}{y(x)} + 1\right)\right) + x \left(\frac{1}{y(x)} + 1\right) - x}$$

✓ **Mathematica** : cpu = 0.52996 (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]^(-1))], y[x], x]
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{x {}_2F1\left(x \left(1 + \frac{1}{K[2]}\right)\right) - 1}{x {}_2F1\left(x \left(1 + \frac{1}{K[2]}\right)\right) K[2] - K[2] + x {}_2F1\left(x \left(1 + \frac{1}{K[2]}\right)\right)} - \int_1^x \left(\frac{{}_2F1\left(K[1] \left(1 + \frac{1}{K[2]}\right)\right) - 1}{K[1] \left(K[2] {}_2F1\left(K[1] \left(1 + \frac{1}{K[2]}\right)\right) - K[2]} \right) dx \right) dx \right]$$

✓ **Maple** : cpu = 0.19 (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)+1)), y(x))
```

$$y(x) = e^{\text{RootOf}\left(-x - \left(\int \frac{x e^{-Z}}{e^{-Z} - 1} \frac{1}{-a({}_2F1(-a) - a - 1)} d_a\right) + c_1\right)} - 1$$

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 = 0.283194 (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[x]], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{144} \left(-9x^8 - 24x^7 - 16x^6 - 72x^5 - 96x^4 + 72c_1x^4 + 96c_1x^3 - 108x^2 + 72x + 288c_1x + 36 - 144c_1 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.322 (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^2+2*x+1-4*y(x))^(1/2), y(x))
```

$$c_1 - \frac{x^4}{2} - \frac{2x^3}{3} - 2x - \sqrt{x^2 + 2x + 1 - 4y(x)} = 0$$

2.848

ODE No. 848

$$y'(x) = {}_2F_1(y(x) - \log(\sinh(x))) + \coth(x)$$

✓ **Mathematica** : cpu = 0.146556 (sec), leaf count = 157

`DSolve[Derivative[1][y][x] == Coth[x] + _F1[-Log[Sinh[x]] + y[x]],y[x],x]`

Solve $\left[\int_1^{y(x)} -\frac{{}_2F_1(K[2] - \log(\sinh(x))) \int_1^x \left(\frac{(\coth(K[1]) + {}_2F_1(K[2] - \log(\sinh(K[1]))) {}_2F_1'(K[2] - \log(\sinh(K[1])))}{({}_2F_1(K[2] - \log(\sinh(K[1])))^2} - \frac{{}_2F_1'(K[2] - \log(\sinh(K[1]))}{{}_2F_1(K[2] - \log(\sinh(K[1]))} \right) d_{a_1}}{({}_2F_1(K[2] - \log(\sinh(x)))} \right]$

✓ **Maple** : cpu = 0.6 (sec), leaf count = 22

`dsolve(diff(y(x),x) = 1/sinh(x)*cosh(x)+_F1(y(x)-ln(sinh(x))),y(x))`

$$y(x) = \ln(\sinh(x)) + \text{RootOf}\left(x - \left(\int^{-Z} \frac{1}{{}_2F_1(a)} d_{a_1}\right) + c_1\right)$$

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 = 0.266952 (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]]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{144}\left(9x^8 + 24x^7 + 16x^6 + 72x^5 + 96x^4 - 72c_1x^4 - 96c_1x^3 + 108x^2 + 144x - 288c_1x + 144c_1^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.313 (sec), leaf count = 33

```
dsolve(diff(y(x),x) = -1/2*x+1+(x^2-4*x+4*y(x))^(1/2)+x^2*(x^2-4*x+4*y(x))^(1/2)+x^3*(x^2-4*x+4*y(x))^(1/2))
```

$$c_1 + \frac{x^4}{2} + \frac{2x^3}{3} + 2x - \sqrt{x^2 - 4x + 4y(x)} = 0$$

2.850

ODE No. 850

$$y'(x) = \_F1(y(x) - \log(\sin(x)) + \log(\cos(x) + 1)) + \csc(x)$$

✓ **Mathematica** : cpu = 0.207257 (sec), leaf count = 1485

`DSolve[Derivative[1][y][x] == Csc[x] + _F1[Log[1 + Cos[x]] - Log[Sin[x]] + y[x]],y[x],x]`

$$\text{Solve}\left[\int_1^x -\frac{(\cot^2(K[1]) + \csc(K[1]) \cot(K[1]) + 1) \sin(K[1]) (\csc(K[1]) + \_F1(\log(\cos(K[1]) + 1) - \log(\sin(K[1])) + y(x)) \cot(K[1]) + \csc^2(K[1]) + \csc(K[1]))}{-\cot^2(K[1]) + \_F1(\log(\cos(K[1]) + 1) - \log(\sin(K[1])) + y(x)) \cot(K[1]) + \csc^2(K[1]) + \csc(K[1])} dx, y(x)\right]$$

✓ **Maple** : cpu = 1.035 (sec), leaf count = 27

`dsolve(diff(y(x),x) = 1/sin(x)+_F1(y(x)-ln(sin(x))+ln(cos(x)+1)),y(x))`

$$y(x) = -\ln(\csc(x) + \cot(x)) + \text{RootOf}\left(-x + \int^{-x} \frac{1}{\_F1(\_a)} d\_a + c_1\right)$$

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 = 2.56476 (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] +
```

$$\text{Solve} \left[\frac{1}{9} \text{RootSum} \left[729a^2 \#1^9 + 841b^2 \#1^9 + 1566ab \#1^9 + 2187a^2 \#1^6 + 2523b^2 \#1^6 + 4698ab \#1^6 + 2187a^2 \#1^3 + 2523b^2 \#1^3 + 4698ab \#1^3 + 729a^2 \#1^0 + 841b^2 \#1^0 + 1566ab \#1^0 \right], \#1 \right]$$

✓ **Maple** : cpu = 0.053 (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
```

$$y(x) = \frac{\text{RootOf}\left(\left(\left(\int^{-Z} \frac{1}{-a^3 b + -a^2 b + a + b} d_- a\right) b - x + c_1\right) b - a x\right)}{b}$$

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 = 2.51438 (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]
```

$$\text{Solve}\left[\frac{1}{9}\text{RootSum}\left[841\alpha^2\#1^9 + 729\beta^2\#1^9 + 1566\alpha\beta\#1^9 + 2523\alpha^2\#1^6 + 2187\beta^2\#1^6 + 4698\alpha\beta\#1^6 + 2496\right],\right]$$

✓ **Maple** : cpu = 0.058 (sec), leaf count = 42

```
dsolve(diff(y(x),x) = (alpha^3+y(x)^2*alpha^3+2*y(x)*alpha^2*beta*x+alpha*beta^2*x^2+y(x)
```

$$y(x) = \frac{\text{RootOf}\left(\left(\int^{-Z} \frac{1}{-a^3\alpha + -a^2\alpha + \alpha + \beta} d\_a\right) \alpha - x + c_1\right) \alpha - \beta x}{\alpha}$$

2.853

ODE No. 853

$$y'(x) = \frac{x^3y(x)^3 + 6x^2y(x)^2 + 14xy(x) + 2x + 12}{x^2(xy(x) + x + 2)}$$

✓ **Mathematica** : cpu = 0.121717 (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])), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x+2}{x} + \frac{1}{x^3 \left(\frac{1}{x^3} - \frac{1}{x^3 \sqrt{-2x+c_1}} \right)} \right\}, \left\{ y(x) \rightarrow -\frac{x+2}{x} + \frac{1}{x^3 \left(\frac{1}{x^3} + \frac{1}{x^3 \sqrt{-2x+c_1}} \right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.041 (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))
```

$$y(x) = \frac{-2\sqrt{c_1 - 2x} + x + 2}{(\sqrt{c_1 - 2x} - 1) x}$$

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 = 0.108963 (sec), leaf count = 24

DSolve[Derivative[1][y][x] == ((-1 + Log[x] + x^2*Log[x]^2 + Log[y[x]] + 2*x^2*Log[x]*Log[y[x]]

$$\left\{\left\{y(x) \rightarrow \frac{e^{-\frac{3x}{x^3+3c_1}}}{x}\right\}\right\}$$

✓

Maple : cpu = 0.232 (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

$$y(x) = x^{-\frac{x^3}{x^3+3c_1}} x^{-\frac{3c_1}{x^3+3c_1}} e^{-\frac{3x}{x^3+3c_1}}$$

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 = 0.118165 (sec), leaf count = 24

DSolve[Derivative[1][y][x] == ((-1 + Log[x] + x^3*Log[x]^2 + Log[y[x]] + 2*x^3*Log[x]*Log[y[x]]

$$\left\{\left\{y(x) \rightarrow \frac{e^{-\frac{4x}{x^4+4c_1}}}{x}\right\}\right\}$$

✓

Maple : cpu = 0.231 (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)

$$y(x) = x^{-\frac{x^4}{x^4+4c_1}} x^{-\frac{4c_1}{x^4+4c_1}} e^{-\frac{4x}{x^4+4c_1}}$$

2.856

ODE No. 856

$$y'(x) = \frac{x(\_F1(y(x)^2 - 2x) + \frac{1}{x})}{\sqrt{y(x)^2}}$$

✓ **Mathematica** : cpu = 0.429133 (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]
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{\sqrt{K[2]^2}}{\_F1(K[2]^2 - 2x)} - \int_1^x \frac{2K[2]\_F1'(K[2]^2 - 2K[1])}{(\_F1(K[2]^2 - 2K[1]))^2} dK[1] \right) dK[2] + \int_1^x \left(-K[1] - \frac{\_F1(y(x) - K[1])}{\_F1(K[2]^2 - 2K[1])} \right) dK[1] \right]$$

✓ **Maple** : cpu = 0.276 (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))
```

$$y(x) = \sqrt{2 \operatorname{RootOf}\left(x^2 - 2 \left(\int^{-z} \frac{1}{\_F1(2\_a)} d\_a\right) + 4c_1\right) + 2x}$$

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 = 0.364445 (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[x]], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{72} (9x^8 + 24x^7 + 16x^6 + 72x^5 + 96x^4 - 72c_1x^4 - 96c_1x^3 + 135x^2 + 18x - 288c_1x - 9 + 144c_1^2) \right\} \right\}$$

✓ **Maple** : cpu = 0.339 (sec), leaf count = 32

```
dsolve(diff(y(x),x) = -1/4*x+1/4+(x^2-2*x+1+8*y(x))^(1/2)+x^2*(x^2-2*x+1+8*y(x))^(1/2)+x^3*(x^2-2*x+1+8*y(x))^(1/2), y(x))
```

$$c_1 + x^4 + \frac{4x^3}{3} + 4x - \sqrt{x^2 - 2x + 1 + 8y(x)} = 0$$

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 = 2.5499 (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] +
```

$$\text{Solve}\left[\frac{1}{9}\text{RootSum}\left[841a^2\#1^9 + 729b^2\#1^9 + 1566ab\#1^9 + 2523a^2\#1^6 + 2187b^2\#1^6 + 4698ab\#1^6 + 2496a^2\#1^3 + 2496b^2\#1^3 + 2496ab\#1^3 + 2496\right], y[x]\right]$$

✓ **Maple** : cpu = 0.053 (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
```

$$y(x) = \frac{\text{RootOf}\left(\left(\int^{-Z} \frac{1}{-a^3a+-a^2a+a+b}d\_a\right)a-x+c_1\right)a-bx}{a}$$

2.859

ODE No. 859

$$y'(x) = \frac{-F1(y(x)^2 - 2x) + x}{x\sqrt{y(x)^2}}$$

✓ **Mathematica** : cpu = 0.575961 (sec), leaf count = 105

```
DSolve[Derivative[1][y][x] == (x + _F1[-2*x + y[x]^2])/(x*Sqrt[y[x]^2]),y[x],x]
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{\sqrt{K[2]^2}}{-F1(K[2]^2 - 2x)} - \int_1^x \frac{2K[2]_F1'(K[2]^2 - 2K[1])}{(-F1(K[2]^2 - 2K[1]))^2} dK[1] \right) dK[2] + \int_1^x \left(-\frac{1}{-F1(y(x)^2 - 2K[2])} \right) dK[2] \right]$$

✓ **Maple** : cpu = 0.259 (sec), leaf count = 63

```
dsolve(diff(y(x),x) = -(-x-_F1(y(x)^2-2*x))/(y(x)^2)^(1/2)/x,y(x))
```

$$y(x) = \sqrt{2 \operatorname{RootOf} \left(\ln(x) - \left(\int^{-Z} \frac{1}{-F1(2-a)} d-a \right) + 2c_1 \right) + 2x}$$

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 = 0.22634 (sec), leaf count = 33

DSolve[Derivative[1][y][x] == (x/2 + x^3/2 + x^4/2 + (x*Cos[2*y[x]])/2 + (x^3*Cos[2*y[x]])/2 +

$$\left\{ \left\{ y(x) \rightarrow \tan^{-1} \left(\frac{4x^5 + 5x^4 + 10x^2 + 10c_1}{20x} \right) \right\} \right\}$$

✓

Maple : cpu = 1.745 (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+

$$y(x) = \arctan \left(\frac{4x^5 + 5x^4 + 10x^2 + c_1}{20x} \right)$$

2.861 ODE No. 861

$$y'(x) = \frac{e^{-1/x} \left(-\text{F1} \left(e^{\frac{1}{x}} y(x) \right) + \frac{e^{\frac{1}{x}} y(x)}{x} \right)}{x}$$

✓ **Mathematica** : cpu = 1.02241 (sec), leaf count = 158

```
DSolve[Derivative[1][y][x] == ((E^x^(-1)*y[x])/x + _F1[E^x^(-1)*y[x]])/(E^x^(-1)*x), y[x], x]
```

$$\text{Solve} \left[\int_1^{y(x)} \frac{-\text{F1}\left(e^{\frac{1}{x}} K[2]\right) \int_1^x \left(\frac{e^{\frac{1}{K[1]}}}{K[1]^2 \text{F1}\left(e^{\frac{1}{K[1]}} K[2]\right)} - \frac{e^{\frac{2}{K[1]} K[2]} \text{F1}'\left(e^{\frac{1}{K[1]}} K[2]\right)}{K[1]^2 \left(-\text{F1}\left(e^{\frac{1}{K[1]}} K[2]\right)\right)^2} \right) dK[1] + e^{\frac{1}{x}}}{-\text{F1}\left(e^{\frac{1}{x}} K[2]\right)} dK[2] + \int_1^x \left(\right.$$

✓ **Maple** : cpu = 0.142 (sec), leaf count = 26

```
dsolve(diff(y(x),x) = -(-1/x*y(x)/exp(-1/x)-_F1(y(x)/exp(-1/x)))*exp(-1/x)/x,y(x))
```

$$y(x) = \text{RootOf} \left(-\ln(x) + \int^{-Z} \frac{1}{-F1(-a)} d_{-}a + c_1 \right) e^{-\frac{1}{x}}$$

2.862

ODE No. 862

$$y'(x) = \log(y(x) - 1) \left(-F1(x) - \frac{\operatorname{Ei}(-\log(y(x) - 1))}{x} \right)$$

 **Mathematica** : cpu = 0.494515 (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]),y[x],x]
```

 **Maple** : cpu = 0.164 (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))
```

$$y(x) = e^{\operatorname{RootOf}\left(\left(\int \frac{F1(x)}{x} dx\right)x + xc_1 + \operatorname{Ei}_1(-\_Z)\right)} + 1$$

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 = 0.161071 (sec), leaf count = 126

```
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 + y[x]^2])/x, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x \tanh\left(\frac{1}{12}(3x^4 + 4x^3 + 12x + 12c_1)\right)}{\sqrt{1 - \tanh^2\left(\frac{1}{12}(3x^4 + 4x^3 + 12x + 12c_1)\right)}} \right\}, \left\{ y(x) \rightarrow \frac{x \tanh\left(\frac{1}{12}(3x^4 + 4x^3 + 12x + 12c_1)\right)}{\sqrt{1 - \tanh^2\left(\frac{1}{12}(3x^4 + 4x^3 + 12x + 12c_1)\right)}} \right\} \right.$$

✓ **Maple** : cpu = 13.511 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = (y(x)+x*(y(x)^2+x^2)^(1/2)+x^3*(y(x)^2+x^2)^(1/2)+x^4*(y(x)^2+x^2)^(1/2))/x, y(x))
```

$$\ln\left(y(x) + \sqrt{y(x)^2 + x^2}\right) - \frac{x^4}{4} - \frac{x^3}{3} - x - \ln(x) - c_1 = 0$$

2.864 ODE No. 864

$$y'(x) = \frac{e^{\frac{x^2}{4}} y(x) \left(2e^{-\frac{3x^2}{4}} y(x)^2 + e^{-\frac{x^2}{2}} x y(x) + e^{-\frac{x^2}{4}} x \right)}{2e^{-\frac{x^2}{4}} y(x) + 2}$$

✓ Mathematica : cpu = 0.24383 (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^(x^2/4)))/E^(x^2/4), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{2e^{\frac{x^2}{2}}}{-2e^{\frac{x^2}{4}} + \sqrt{2}\sqrt{2e^{\frac{x^2}{2}} + 2e^{\frac{x^2}{2}}(-2x + c_1)}} \right\}, \left\{ y(x) \rightarrow -\frac{2e^{\frac{x^2}{2}}}{2e^{\frac{x^2}{4}} + \sqrt{2}\sqrt{2e^{\frac{x^2}{2}} + 2e^{\frac{x^2}{2}}(-2x + c_1)}} \right\} \right\}$$

✓ Maple : cpu = 0.125 (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)), y(x))
```

$$y(x) = \frac{\left(e^{\frac{x^2}{2}} \left(\sqrt{c_1 - 2x} + 1 \right) e^{-\frac{x^2}{4}} - e^{\frac{x^2}{4}} \sqrt{c_1 - 2x} \right) e^{\frac{x^2}{4}}}{e^{\frac{x^2}{4}} \sqrt{c_1 - 2x} - e^{-\frac{x^2}{4}} e^{\frac{x^2}{2}}}$$

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 = 0.337864 (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[
```

Solve

$$\left[\int_1^x \left(-\frac{f(K[1])}{\log(K[1])} - \frac{\log(y(x) - 1)}{K[1] \log^2(K[1])} \right) dK[1] + \int_1^{y(x)} \left(\frac{1}{(K[2] - 1) \log(x)} - \int_1^x -\frac{1}{K[1](K[2] - 1) \log^2} \right) \right]$$

✓ **Maple** : cpu = 0.307 (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))
```

$$y(x) = e^{\left(\int \frac{f(x)}{\ln(x)} dx\right) \ln(x)} x^{c_1} + 1$$

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 = 0.380873 (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 +
```

$$\left\{\left\{y(x)\rightarrow\frac{1}{144}\left(-36a^2-72ax+9x^8+24x^7+16x^6+72x^5+96x^4-72c_1x^4-96c_1x^3+108x^2-288c_1x+\right.\right.\right.$$

✓ **Maple** : cpu = 0.536 (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)
```

$$c_1+\frac{x^4}{2}+\frac{2x^3}{3}+2x-\sqrt{x^2+2ax+a^2+4y(x)}=0$$

2.867

ODE No. 867

$$y'(x) = \frac{x^6}{27} + \frac{1}{3}x^4y(x) + \frac{x^4}{9} + x^2y(x)^2 + \frac{2}{3}x^2y(x) + y(x)^3 + y(x)^2 - \frac{2x}{3} + 1$$

✓ **Mathematica** : cpu = 0.146195 (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]^3 + y[x]^2 - 2*x/3, y[x], x]
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{x^2+3y(x)+1}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.08 (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, y(x))
```

$$y(x) = -\frac{x^2}{3} + \text{RootOf}\left(-x + \int^{-Z} \frac{1}{-a^3 + -a^2 + 1} d_-a + c_1\right)$$

2.868

ODE No. 868

$$y'(x) = -x^6 + 3x^4y(x) + x^4 - 3x^2y(x)^2 - 2x^2y(x) + y(x)^3 + y(x)^2 + 2x + 1$$

✓

Mathematica : cpu = 0.128583 (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`

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{-3x^2+3y(x)+1}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓

Maple : cpu = 0.077 (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 = 0.0351024 (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
```

$$\left\{\left\{y(x) \rightarrow x^2 + \frac{1}{2}\left(1 + W\left(-e^{x^4 + \frac{4x^3}{3} - 2x^2 + 4x - 1 + c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.359 (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*
```

$$y(x) = x^2 + \frac{\text{LambertW}\left(-2\text{e}^{x^4}\text{e}^{\frac{4x^3}{3}}\text{e}^{-2x^2}c_1\text{e}^{4x}\text{e}^{-1}\right)}{2} + \frac{1}{2}$$

2.870

ODE No. 870

$$y'(x) = \frac{e^{\frac{y(x)}{x}} \left(x^4 + x^3 + x e^{-\frac{y(x)}{x}} + e^{-\frac{y(x)}{x}} y(x) + x \right)}{x}$$

✓ **Mathematica** : cpu = 0.788632 (sec), leaf count = 35

```
DSolve[Derivative[1][y][x] == (E^(y[x]/x)*(x + x/E^(y[x]/x) + x^3 + x^4 + y[x]/E^(y[x]/x)))/x,
```

$$\left\{ \left\{ y(x) \rightarrow -x \log \left(\frac{-\frac{x^4}{4} - \frac{x^3}{3} - x - c_1}{x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.851 (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))
```

$$y(x) = -\ln \left(-\frac{3x^4 + 4x^3 + 12c_1 + 12x}{12x} \right) x$$

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 = 0.15591 (sec), leaf count = 22

```
DSolve[Derivative[1][y][x] == (-2 + Log[1 + 2*x]^2 + 2*x*Log[1 + 2*x]^2 + 2*Log[1 + 2*x]*y[x] -
```

$$\left\{\left\{y(x) \rightarrow -\log(2x + 1) + \frac{1}{-x + c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.105 (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+
```

$$y(x) = \frac{-1 + (c_1 - x)\ln(2x + 1)}{-c_1 + x}$$

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 = 0.0462224 (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*Sqr
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{5}\left(2x^3 + 10\sqrt{x} - 5\right) - \frac{\sqrt{-x\left(2x^3 + 10\sqrt{x} - 5\right)^2 - 50x\left(-\frac{4x^{7/2}}{5} - \frac{2x^6}{25} + \frac{2x^3}{5} - 2x + 2\sqrt{x} + \log(x)\right)}}{5\sqrt{-\frac{1}{x}x}}\right.\right.$$

✓ **Maple** : cpu = 0.087 (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
```

$$y(x) = \frac{2x^3}{5} + 2\sqrt{x} - \sqrt{c_1 + 2\ln(x)} - 1$$

2.873

ODE No. 873

$$y'(x) = \frac{2y(x) + 1}{x(2xy(x)^4 + 3xy(x)^3 + xy(x)^2 + 2xy(x) + x - 2)}$$

✓ **Mathematica** : cpu = 0.444665 (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
```

$$\text{Solve}\left[\frac{1}{192}(-16y(x)^3 - 12y(x)^2 + 12y(x) - 54\log(4y(x) + 2) + 7) - \frac{1}{2x(2y(x) + 1)} = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.307 (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)
```

$$y(x) = \frac{e^{\text{RootOf}(2xe^{4-Z}-3xe^{3-Z}-6xe^{2-Z}+48c_1xe^{-Z}+54_Zxe^{-Z}+7e^{-Z}x+96)}}{2} - \frac{1}{2}$$

2.874 ODE No. 874

$y'(x) = \frac{1}{512}x(a^3x^{12} + 24a^2x^8y(x) + 8a^2x^8 + 192ax^4y(x)^2 + 128ax^4y(x) - 256ax^2 + 512y(x)^3 + 512y(x)^2 +$

✓ **Mathematica** : cpu = 0.196576 (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
```

$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{1}{8}(3ax^5+8x)+3xy(x)}{\sqrt[3]{29}\sqrt[3]{x^3}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{18}29^{2/3}\left(x^3\right)^{2/3} + c_1, y$

✓ **Maple** : cpu = 0.096 (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)
```

$$y(x) = -\frac{ax^4}{8} - \frac{1}{3} + \frac{29 \operatorname{RootOf}\left(x^2 - 162\left(\int^{-Z} \frac{1}{841a^3 - 27a + 27} d_a\right) + 6c_1\right)}{9}$$

2.875

ODE No. 875

$$y'(x) = \frac{x^5 \Big(-\sqrt{x^2 + y(x)^2}\Big) + x^4 y(x) \sqrt{x^2 + y(x)^2} + x y(x) + y(x)}{x(x + 1)}$$

✓

Mathematica : cpu = 0.207856 (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]), y[x], x]`

$$\left\{\left\{y(x) \rightarrow \frac{\sqrt{2} x \tanh ^2\left(\frac{1}{24}\left(-3 \sqrt{2} x^4+4 \sqrt{2} x^3-6 \sqrt{2} x^2+12 \sqrt{2} x-12 \sqrt{2} \log (x+1)+25 \sqrt{2}-12 \sqrt{2} c_1\right)\right)-2 \sqrt{2} \tanh \left(\frac{1}{24}\left(-3 \sqrt{2} x^4+4 \sqrt{2} x^3-6 \sqrt{2} x^2+12 \sqrt{2} x-12 \sqrt{2} \log (x+1)+25 \sqrt{2}-12 \sqrt{2} c_1\right)\right)}{\sqrt{2}-2 \tanh \left(\frac{1}{24}\left(-3 \sqrt{2} x^4+4 \sqrt{2} x^3-6 \sqrt{2} x^2+12 \sqrt{2} x-12 \sqrt{2} \log (x+1)+25 \sqrt{2}-12 \sqrt{2} c_1\right)\right)}\right\}\right\}$$

✓

Maple : cpu = 0.401 (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)),y(x))`

$$\ln \left(\frac{2 x \left(\sqrt{2 y(x)^2+2 x^2+y(x)+x}\right)}{y(x)-x}\right)+\sqrt{2} \ln (1+x)+\frac{\left(3 x^4-4 x^3+6 x^2-12 x\right) \sqrt{2}}{12}-c_1-\ln (x)=0$$

2.876

ODE No. 876

$$y'(x) = -\frac{y(x)^2\left(x^2y(x)-2xy(x)+y(x)-2x\right)}{2x(xy(x)-2y(x)-2)}$$

✓ **Mathematica** : cpu = 0.132938 (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]
```

$$\left\{\left\{y(x) \rightarrow -\frac{4x}{-2(x-2)x + \frac{2\sqrt{-x(x-2)^2-4x\left(-2\left(\frac{x^2}{8}-\frac{x}{2}+\frac{\log(x)}{4}\right)+c_1}\right)}}{\sqrt{-\frac{1}{x}}}\right\},\left\{y(x) \rightarrow \frac{4x}{2(x-2)x + \frac{2\sqrt{-x(x-2)^2-4x\left(-2\left(\frac{x^2}{8}-\frac{x}{2}+\frac{\log(x)}{4}\right)+c_1}\right)}}{\sqrt{-\frac{1}{x}}}\right\}\right.$$

✓ **Maple** : cpu = 0.061 (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 = 0.114655 (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 - 2*x)/(x^2 - y[x] - 1), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow x^2 + \frac{1}{1 - \frac{1}{\sqrt{-2x + c_1}}} - 1 \right\}, \left\{ y(x) \rightarrow x^2 + \frac{1}{1 + \frac{1}{\sqrt{-2x + c_1}}} - 1 \right\} \right\}$$

✓ **Maple** : cpu = 0.053 (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))
```

$$y(x) = \frac{-2c_1x^2 + 2x^3 + \sqrt{2c_1 - 2x + 1} - 1}{-2c_1 + 2x}$$

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 = 0.272907 (sec), leaf count = 130

```
DSolve[Derivative[1][y][x] == (1 + 16*a^2*x^2 - 64*a^3*x^3 - 8*a*x*y[x]^2 + 48*a^2*x^2*y[x]^2 -
```

$$\text{Solve}\left[2a\left(x-\frac{1}{2}\text{RootSum}\left[64\#1^3a^3-48\#1^2a^2y(x)^2-16\#1^2a^2+12\#1ay(x)^4+8\#1ay(x)^2+2a-y(x)^6-\right.\right.\right.$$

✓ **Maple** : cpu = 233.352 (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
```

$$-\left(\int_{-b}^{y(x)} \frac{-a}{-a^6-12_a^4ax+48_a^2a^2x^2-64a^3x^3+_a^4-8_a^2ax+16a^2x^2-2a+1}d_a\right)+x-c_1=0$$

2.879

ODE No. 879

$$y'(x) = \frac{x^2\Big(-\sqrt{x^2+y(x)^2}\Big)+xy(x)\sqrt{x^2+y(x)^2}+xy(x)+y(x)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.188899 (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, y[x], x]
```

$$\left\{\left\{y(x) \rightarrow \frac{\sqrt{2} x \tanh ^2\left(\frac{1}{2}\left(-\sqrt{2} x+\sqrt{2} \log (x+1)-\sqrt{2} c_1\right)\right)-2 x \tanh \left(\frac{1}{2}\left(-\sqrt{2} x+\sqrt{2} \log (x+1)-\sqrt{2} c_1\right)\right)}{\sqrt{2}-2 \tanh \left(\frac{1}{2}\left(-\sqrt{2} x+\sqrt{2} \log (x+1)-\sqrt{2} c_1\right)\right)}\right.\right.$$

✓ **Maple** : cpu = 0.388 (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, y(x))
```

$$\ln \left(\frac{2 x\left(\sqrt{2 y(x)^2+2 x^2}+y(x)+x\right)}{y(x)-x}\right)+x \sqrt{2}-\sqrt{2} \ln (1+x)-\ln (x)-c_1=0$$

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 = 0.353741 (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
```

Solve

$$\left[\frac{\text{RootSum}\left[-64\#1^3a^3 + 48\#1^2a^2y(x)^2 + 16\#1^2a^2 - 12\#1ay(x)^4 - 8\#1ay(x)^2 + y(x)^6 + y(x)^4 + 1\&\right]}{8a^2}$$

✓ **Maple** : cpu = 0.124 (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+2
```

$$\frac{y(x)}{2a} + \frac{\int^{y(x)^2-4ax} \frac{1}{-a^3+-a^2+1} d-a}{8a^2} - c_1 = 0$$

2.881

ODE No. 881

$$y'(x) = \frac{x^6 + 9x^4y(x) - 6x^3 + 27x^2y(x)^2 - 18xy(x) + 27y(x)^3 - 18x}{9x^2 + 27y(x) + 27}$$

✓

Mathematica : cpu = 0.128535 (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]^3 - 18*x)/(9*x^2 + 27*y[x] + 27), y[x], x]`

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{3}(-x^2 - 3) + \frac{1}{27\left(\frac{1}{27} - \frac{1}{\sqrt{-1458x + c_1}}\right)} \right\}, \left\{ y(x) \rightarrow \frac{1}{3}(-x^2 - 3) + \frac{1}{27\left(\frac{1}{27} + \frac{1}{\sqrt{-1458x + c_1}}\right)} \right\} \right\}$$

✓

Maple : cpu = 0.055 (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*x^2+27*y(x)+27), y(x))`

$$y(x) = \frac{-2c_1x^2 + 2x^3 + 3\sqrt{2c_1 - 2x + 1} + 3}{-6x + 6c_1}$$

2.882 ODE No. 882

$$y'(x) = -\frac{1}{216}\sqrt{x}(-108x^{3/2} + x^9 - 18x^6y(x) - 6x^6 + 108x^3y(x)^2 + 72x^3y(x) - 216y(x)^3 - 216y(x)^2 - 216)$$

✓ **Mathematica** : cpu = 0.21234 (sec), leaf count = 119

```
DSolve[Derivative[1][y][x] == -1/216*(Sqrt[x]*(-216 - 108*x^(3/2) - 6*x^6 + x^9 + 72*x^3*y[x]
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{1}{2}(2\sqrt{x}-x^{7/2})+3\sqrt{x}y(x)}{\sqrt[3]{29}\sqrt[3]{x^{3/2}}}-\#1\right)}{\sqrt[3]{29}-29\#1^2}\&\right] = \frac{2}{27}29^{2/3}\sqrt{x}\left(x^{3/2}\right)^{2/3}$$

✓ **Maple** : cpu = 0.115 (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+1
```

$$y(x) = \frac{x^3}{6} - \frac{1}{3} + \frac{29 \text{RootOf}\left(2x^{3/2} - 243\left(\int^{-Z} \frac{1}{841a^3 - 27a + 27}d_a\right) + 9c_1\right)}{9}$$

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 = 0.915798 (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 + a^3*y[x]^4 + b^3*x^6))/a^(7/2)*y[x], y[x], x]
```

$$\text{Solve}\left[\frac{x^2}{2} - \frac{1}{2}a^{5/2}\text{RootSum}\left[\#1^3b^3 + 3\#1^2ab^2y(x)^2 + \#1^2ab^2 + 3\#1a^2by(x)^4 + 2\#1a^2by(x)^2 + a^{5/2}b + a^3y(x)^4 + b^3x^6\right], x\right]$$

✓ **Maple** : cpu = 1.056 (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*b^2*x^4+b^3*x^6)/a^(7/2)*y(x), y(x))
```

$$\int_{-b}^x \frac{(b^3_{-}a^6 + 3y(x)^2 a b^2_{-}a^4 + 3y(x)^4 a^2b_{-}a^2 + y(x)^6 a^3 + a_{-}a^4b^2 + 2y(x)^2 a^2b_{-}a^2 + y(x)^4 a^3 + a^3)_{-}}{(y(x)^6 a^3 + 3y(x)^4 a^2b_{-}a^2 + 3y(x)^2 a b^2_{-}a^4 + b^3_{-}a^6 + y(x)^4 a^3 + 2y(x)^2 a^2b_{-}a^2 + a_{-}a^4b^2 + a^3 + a^{5/2})_{-}} dx$$

2.884

ODE No. 884

$$y'(x) = \frac{x(-x^6 + 3x^4y(x)^2 + x^4 - 3x^2y(x)^4 - 2x^2y(x)^2 + y(x)^6 + y(x)^4 + 1)}{y(x)}$$

✓

Mathematica : cpu = 0.464796 (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`

Solve $\left[\frac{1}{4}\left(2\log\left(-x^2+y(x)^2+1\right)-2x^2-\frac{1}{y(x)(y(x)+x)}+\frac{1}{xy(x)-y(x)^2}-2\log(x-y(x))-2\log(y(x)+\right.\right.$

✓

Maple : cpu = 0.614 (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)`

$$y(x) = e^{\operatorname{RootOf}\left(x^2e^{2-Z}-2x^3e^{-Z}-e^{2-Z}\ln\left(\frac{e^{2-Z}-2e^{-Z}x+1}{e^{-Z}-2x}\right)+2c_1e^{2-Z}+_Ze^{2-Z}+2e^{-Z}\ln\left(\frac{e^{2-Z}-2e^{-Z}x+1}{e^{-Z}-2x}\right)x-4c_1xe^{-Z}-2_Zxe^{-Z}+1\right)}-x$$

2.885 ODE No. 885

$$y'(x) = -\frac{i(x^6 + 12x^4y(x)^2 + 4x^4 + 48x^2y(x)^4 + 32x^2y(x)^2 + 64y(x)^6 + 64y(x)^4 + 32ix + 64)}{128y(x)}$$

X Mathematica : cpu = 40.5209 (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^2*y[x]^4 + 64*y[x]^6 + 64*y[x]^4 + 32*I*x + 64))/128*y[x], y[x], 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*x^2*y[x]^4 + 64*y[x]^6 + 64*y[x]^4 + 32*I*x + 64))/128*y[x], y[x], x]
```

X 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+32*I*x+64)/128*y(x), y(x))
```

, 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+32*I*x+64)/128*y(x), y(x))
```

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 = 0.153373 (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]^3), y[x], x]
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3x^2y(x)-3x+1}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = -\frac{29^{2/3}}{9x} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.059 (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)^3*x^6), y(x))
```

$$y(x) = \frac{9x - 3 + 29 \operatorname{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) x + 3xc_1 - 1\right)}{9x^2}$$

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 = 0.189928 (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[x]^3), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{ax+1}{ax} + \frac{1}{a^3x^3\left(\frac{1}{a^3x^3} - \frac{1}{x^3\sqrt{-2a^6x+c_1}}\right)} \right\}, \left\{ y(x) \rightarrow -\frac{ax+1}{ax} + \frac{1}{a^3x^3\left(\frac{1}{a^3x^3} + \frac{1}{x^3\sqrt{-2a^6x+c_1}}\right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.068 (sec), leaf count = 72

```
dsolve(diff(y(x),x) = 1/a^2/x^2*(y(x)*a^2*x+a+a^2*x+y(x)^3*a^3*x^3+3*y(x)^2*a^2*x^2+3*a*x), y(x))
```

$$y(x) = \frac{ax - \sqrt{c_1 - 2x} + 1}{\left(\sqrt{c_1 - 2x} - 1\right)xa}$$

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 = 0.134408 (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*(x^2*y[x] - x + 1)), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x-1}{x^2} + \frac{1}{x^4 \left(\frac{1}{x^2} - \frac{1}{x^2 \sqrt{\frac{2}{x} + c_1}} \right)} \right\}, \left\{ y(x) \rightarrow \frac{x-1}{x^2} + \frac{1}{x^4 \left(\frac{1}{x^2} + \frac{1}{x^2 \sqrt{\frac{2}{x} + c_1}} \right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.085 (sec), leaf count = 79

```
dsolve(diff(y(x),x) = 1/x^2*(6*x^2*y(x)-2*x+1-5*x^3*y(x)^2-2*x*y(x)+y(x)^3*x^4)/(x^2*y(x)-x+1),y(x))
```

$$y(x) = \frac{\sqrt{\frac{c_1 x + 2}{x}} x - x + 1}{\left(\sqrt{\frac{c_1 x + 2}{x}} - 1\right) x^2}$$

2.889 ODE No. 889

$$y'(x) = -\frac{e^x(-8y(x)^{9/2} + 36e^xy(x)^3 - 8y(x)^3 + 24e^xy(x)^{3/2} - 54e^{2x}y(x)^{3/2} - 18e^{2x} + 27e^{3x} - 8)}{8\sqrt{y(x)}}$$

✓ **Mathematica** : cpu = 1.19018 (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)*y[x]^(3/2) - 18*E^(2*x) + 27*E^(3*x) - 8)/8*Sqrt[y[x]], y[x], x]
```

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 = 1.24 (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*exp(x)^2*y(x)^3-8*y(x)^3)/8/sqrt(y(x)), y(x))
```

$$e^x - \frac{2\ln\left(y(x)^{3/2}-\frac{3e^x}{2}+1\right)}{3} + \frac{4}{6y(x)^{3/2}-9e^x} + \frac{2\ln\left(y(x)^{3/2}-\frac{3e^x}{2}\right)}{3} - c_1 = 0$$

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 = 0.145586 (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 +
```

Solve

$$\left[y(x) - \frac{1}{2}\text{RootSum}\left[\#1^3 + 3\#1^2y(x)^2 + \#1^2 + 3\#1y(x)^4 + 2\#1y(x)^2 + y(x)^6 + y(x)^4 + 1\&, \frac{}{3\#1^2 + 6}\right]\right]$$

✓ **Maple** : cpu = 0.875 (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^
```

$$-y(x) + \frac{\left(\int^{y(x)^2+x^2} \frac{1}{-a^3+_a^2+1} d_a\right)}{2} - c_1 = 0$$

2.891

ODE No. 891

$$y'(x) = \frac{y(x)^2 \left(x^4 y(x) + 2 x^2 y(x) + 2 x^2 - 2 y(x)\right)}{x^3 \left(x^2 y(x) + x^2 - y(x)\right)}$$

✓ **Mathematica** : cpu = 0.143206 (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])), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x^5}{-x^3 \left(x^2 - 1\right) + \frac{\sqrt{\left(x^2 - 1\right)^2 x + x^5 \left(-2 \left(\frac{1}{2 x^4} - \frac{1}{x^2} + \log(x)\right) + c_1}\right)}}{\sqrt{\frac{1}{x^5}}} \right\}, \left\{ y(x) \rightarrow -\frac{x^5}{\left(x^2 - 1\right) x^3 + \frac{\sqrt{\left(x^2 - 1\right)^2 x + x^5 \left(-2 \left(\frac{1}{2 x^4} - \frac{1}{x^2} + \log(x)\right) + c_1}\right)}}{\sqrt{\frac{1}{x^5}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.083 (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 = 2.20099 (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^2 - y[x]^2)) + x^2 + 2*x*y[x] + y[x]^2), y[x], x]
```

Solve

$$\left[\int_1^x \left(-e^{\int_1^{(K[2]-y(x))(K[2]+y(x))} \frac{2((K[1]-3)K[1]+1)}{\left(e^{-\frac{2}{K[1]-1}} - K[1]\right)(K[1]-1)^2} dK[1] + \frac{2}{K[2]^2 - y(x)^2 - 1}} \right) \right]$$

✓ **Maple** : cpu = 0.961 (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^2-1), y(x))
```

$$y(x) = e^{\text{RootOf}\left(-_Z + \int e^{2\_Z - 2 e^{-\_Z x}} \frac{2}{e^{-\frac{2}{\_a + 1}} + \_a} d\_a + c_1\right)} - x$$

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 = 0.133841 (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]^3), y[x], x]`

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3y(x) + \frac{x+6}{\sqrt[3]{29}}}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 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^3,y(x))`

$$y(x) = \frac{29 \operatorname{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841 \_a^3 - 27 \_a + 27} d\_a\right) + x + 3c_1\right) x - 3x - 18}{9x}$$

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 = 40.4727 (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]^6 + y[x]^4 + I*x + 1))/y[x], y[x], 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]^6 + y[x]^4 + I*x + 1))/y[x], y[x], 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+y(x)^4+I*x+1)/y(x), y(x))
```

, 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+y(x)^4+I*x+1)/y(x), y(x))
```

2.895 ODE No. 895

$$y'(x) = \frac{x(a^3x^{12} + 24a^2x^8y(x) - 32a^2x^6 + 192ax^4y(x)^2 - 256ax^2y(x) - 256ax^2 + 512y(x)^3)}{64ax^4 + 512y(x) + 512}$$

✓ **Mathematica** : cpu = 0.195923 (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
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{8}(-ax^4 - 8) + \frac{1}{512 \left(\frac{1}{512} - \frac{1}{\sqrt{-262144x^2 + c_1}} \right)} \right\}, \left\{ y(x) \rightarrow \frac{1}{8}(-ax^4 - 8) + \frac{1}{512 \left(\frac{1}{512} + \frac{1}{\sqrt{-262144x^2 + c_1}} \right)} \right\} \right.$$

✓ **Maple** : cpu = 0.082 (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+
```

$$y(x) = \frac{8 + (-\sqrt{-x^2 + c_1} + 1) a x^4}{-8 + 8\sqrt{-x^2 + c_1}}$$

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 = 0.204632 (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]^2 + y[x]^6 + x + 1)/y[x], y[x], x]`

Solve

$$\left[\frac{1}{2}\text{RootSum}\left[-\#1^3 + 3\#1^2y(x)^2 + \#1^2 - 3\#1y(x)^4 - 2\#1y(x)^2 + y(x)^6 + y(x)^4 + 1\&, \frac{-\#1^6 + 3\#1^4y(x)^2 + \#1^4 - 3\#1^2y(x)^4 - 2\#1^2y(x)^2 + y(x)^6 + y(x)^4 + \#1 + 1}{3\#1^2 - 6\#1y(x)^2 + y(x)^4 + 1}\right], y(x)\right]$$

✓

Maple : cpu = 0.686 (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), y(x))`

$$\int_{-b}^{y(x)} \frac{-a}{-a^6 + 3a^4x^2 - 3a^2x^4 + x^6 - a^4 + 2a^2x^2 - x^4 - 1} d_a + x - c_1 = 0$$

2.897 ODE No. 897

$$y'(x) = \frac{\sqrt{x}(-108x^{3/2}y(x) + 18x^{9/2} - 108x^{3/2} + x^9 - 18x^6y(x) + 108x^3y(x)^2 - 216y(x)^3)}{36x^3 - 216y(x) - 216}$$

✓ **Mathematica** : cpu = 0.183103 (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[x] + 108*x^3*y[x]^2 - 216*y[x]^3)/(36*x^3 - 216*y[x] - 216), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{6}(x^3 - 6) - \frac{1}{216 \left(-\frac{1}{216} - \frac{1}{\sqrt{-62208x^{3/2} + c_1}} \right)} \right\}, \left\{ y(x) \rightarrow \frac{1}{6}(x^3 - 6) - \frac{1}{216 \left(-\frac{1}{216} + \frac{1}{\sqrt{-62208x^{3/2} + c_1}} \right)} \right\} \right.$$

✓ **Maple** : cpu = 0.115 (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)^2-216*y(x)^3)/(36*x^3-216*y(x)-216), y(x))
```

$$y(x) = \frac{\sqrt{9c_1 - 12x^{3/2}} x^3 - 3x^3 + 18}{6\sqrt{9c_1 - 12x^{3/2}} - 18}$$

2.898

ODE No. 898

$$y'(x) = \frac{4x^6y(x)^3 + 2x^5y(x) + 2x^5 + 3x^4y(x)^2 + \frac{x^3}{2} + \frac{3}{4}x^2y(x) + \frac{1}{16}}{x^6(4x^2y(x) + 4x^2 + 1)}$$

✓ **Mathematica** : cpu = 0.148888 (sec), leaf count = 106

```
DSolve[Derivative[1][y][x] == (1/16 + x^3/2 + 2*x^5 + (3*x^2*y[x])/4 + 2*x^5*y[x] + 3*x^4*y[x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{4x^2 + 1}{4x^2} + \frac{1}{64x^8 \left(\frac{1}{64x^8} - \frac{1}{x^8 \sqrt{\frac{8192}{x} + c_1}} \right)} \right\}, \left\{ y(x) \rightarrow -\frac{4x^2 + 1}{4x^2} + \frac{1}{64x^8 \left(\frac{1}{64x^8} + \frac{1}{x^8 \sqrt{\frac{8192}{x} + c_1}} \right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.069 (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*
```

$$y(x) = \frac{4x^2 - \sqrt{\frac{c_1x+2}{x}} + 1}{4 \left(\sqrt{\frac{c_1x+2}{x}} - 1 \right) x^2}$$

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 = 0.166048 (sec), leaf count = 106

```
DSolve[Derivative[1][y][x] == (1/64 + x^2/16 + x^5/2 + x^6 + (3*x^2*y[x])/16 + (x^4*y[x])/2 +
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, -\frac{\log\left(\frac{\frac{3y(x) + \frac{4x^2+3}{x^2} + \frac{4x^4}{x^4}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^6}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = -\frac{1}{9}29^{2/3}\left(\frac{1}{x^6}\right)^{2/3}x^3 + c_1, y\right]$$

✓ **Maple** : cpu = 0.071 (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+
```

$$y(x) = \frac{116 \operatorname{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841 \_a^3 - 27 \_a + 27} d\_a\right) x + 3 x c_1 - 1\right) x^2 - 12 x^2 - 9}{36 x^2}$$

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 = 0.14472 (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] - 9
```

$$\{ \{ y(x) \rightarrow \text{Root}[8\#1^5a - 16\#1^4a^2c_1 - 64\#1^3a^2x + \#1^2(-2 + 128a^3c_1x) + 128\#1a^3x^2 - 256a^4c_1x^2 + 8ax$$

✓ **Maple** : $\text{cpu} = 0.09$ (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)^
```

$$\frac{y(x)}{2a} - \frac{1}{16a^2 (y(x)^2 - 4ax)^2} + \frac{1}{32a^3 x - 8a^2 y(x)^2} - c_1 = 0$$

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 = 0.402771 (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])], y[x], x]
```

$$\text{Solve}\left[ax \log(y(x)) - \frac{x^2}{2} - y(x) \log(x) - y(x) \log(y(x)) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.627 (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(x))
```

$$y(x) = e^{\text{RootOf}(2\_Zax-2\ln(x)e^{-Z}-2\_Ze^{-Z}-x^2+2c_1)}$$

2.902

ODE No. 902

$$y'(x) = \frac{x^6 - 3x^4y(x)^2 + x^3 + 3x^2y(x)^4 - xy(x)^2 - y(x)^6 - x}{y(x) \left(x^2 - y(x)^2 - 1\right)}$$

✓ **Mathematica** : cpu = 0.159911 (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 - x)/y[x] (x^2 - y[x]^2 - 1), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{2} \sqrt{\frac{4x^3}{x - c_1} - \frac{4c_1x^2}{x - c_1} - \frac{\sqrt{-4x + 1 + 4c_1}}{x - c_1} - \frac{1}{x - c_1}} \right\}, \left\{ y(x) \rightarrow \frac{1}{2} \sqrt{\frac{4x^3}{x - c_1} - \frac{4c_1x^2}{x - c_1} - \frac{\sqrt{-4x + 1 + 4c_1}}{x - c_1} - \frac{1}{x - c_1}} \right\} \right.$$

✓ **Maple** : cpu = 0.307 (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))
```

$$y(x) = \frac{\sqrt{(-x + c_1) \left(4c_1x^2 - 4x^3 + \sqrt{4c_1 - 4x + 1} + 1\right)}}{-2c_1 + 2x}$$

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 = 0.0703819 (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)]
```

$$\left\{\left\{y(x) \rightarrow -x \cos^{-1}(-\tanh(x+c_1))\right\},\left\{y(x) \rightarrow x \cos^{-1}(-\tanh(x+c_1))\right\}\right\}$$

✓ **Maple** : cpu = 0.208 (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
```

$$y(x) = \arctan\left(\frac{2\,e^{-x}}{c_1\left(\frac{e^{-2x}}{c_1^2}+1\right)},\frac{\frac{e^{-2x}}{c_1^2}-1}{\frac{e^{-2x}}{c_1^2}+1}\right)x$$

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 = 0.062422 (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)]

$$\left\{\left\{y(x)\rightarrow -x\cos^{-1}\left(\tanh\left(\frac{1}{2}(-x^2-2c_1)\right)\right)\right\},\left\{y(x)\rightarrow x\cos^{-1}\left(\tanh\left(\frac{1}{2}(-x^2-2c_1)\right)\right)\right\}\right\}$$

✓

Maple

: cpu = 0.161 (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

$$y(x)=\arctan\left(\frac{2\,\mathrm{e}^{-\frac{x^2}{2}}c_1}{\mathrm{e}^{-x^2}+c_1^2},\frac{\frac{\mathrm{e}^{-x^2}}{c_1^2}-1}{\frac{\mathrm{e}^{-x^2}}{c_1^2}+1}\right)x$$

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 = 0.200924 (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
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{ax+3}{ax}+3y(x)}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.073 (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*
```

$$y(x) = \frac{29 \operatorname{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3-27\_a+27}d\_a\right) + x + 3c_1\right) ax - 3ax - 9}{9ax}$$

2.906

ODE No. 906

$$y'(x)=\frac{x(x^2+y(x)^2+1)}{x^6+3x^4y(x)^2+3x^2y(x)^4-x^2y(x)+y(x)^6-y(x)^3-y(x)}$$

✓ **Mathematica** : cpu = 0.0977283 (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]), y[x], x]
```

$\{\{y(x) \rightarrow \text{Root}[4\#1^5 - 4\#1^4c_1 + 8\#1^3x^2 + \#1^2(2 - 8c_1x^2) + 4\#1x^4 - 4c_1x^4 + 2x^2 + 1\&, 1]\}, \{y(x) \rightarrow \text{Root}[4\#1^5 - 4\#1^4c_1 + 8\#1^3x^2 + \#1^2(2 - 8c_1x^2) + 4\#1x^4 - 4c_1x^4 + 2x^2 + 1\&, 2]\}\}$

✓ **Maple** : cpu = 0.329 (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)^3-x^2-y(x)), y(x))
```

$$-\frac{1}{2y(x)^2+2x^2}-\frac{1}{4(y(x)^2+x^2)^2}-y(x)+c_1=0$$

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 = 0.181286 (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
```

$$\left\{ \left\{ y(x) \rightarrow -x(\cos(x) - 1) + \frac{1}{-\log(x) + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.329 (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)
```

$$y(x) = -(-1 + \cos(x))x + \frac{1}{c_1 - \ln(x)}$$

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 = 0.55309 (sec), leaf count = 1269

DSolve[Derivative[1][y][x] == (4*(-1 + a)*(1 + a)*x)/(-x^4 + 3*a^2*x^4 - 3*a^4*x^4 + a^6*x^4 +

$$\left\{\left\{y(x) \rightarrow \frac{c_1}{3\left(a^2-1\right)} + \frac{\sqrt[3]{-18x^2c_1a^6+54x^2c_1a^4+54a^4-54x^2c_1a^2-108a^2+2c_1^3+18x^2c_1+\sqrt{4\left(-3x^2c_1a^6+54x^2c_1a^4+54a^4-54x^2c_1a^2-108a^2+2c_1^3+18x^2c_1\right)}}}{3}\right\}\right.$$

✓

Maple : cpu = 0.576 (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

$$y(x) = -\frac{\left((-a^2c_1+c_1)9^{1/3}\left(\left(3+\frac{\sqrt{-3(a-1)^5(a+1)^5x^6+6c_1^2(a-1)^4(a+1)^4x^4-3c_1(a-1)^2(a+1)^2(c_1^3a^2-c_1^3-18)x^2-6c_1^3a^2+6c_1^3+81}}{3}\right.\right.\right.}$$

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 = 0.126015 (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 + x^3*y[x]^2 + x^3 + 3*x^2*y[x]^2 + 2*x^2*y[x]^4 + 3*x*y[x]^2 + x + 1)/x^5, y[x], x]
```

$$\text{Solve}\left[\frac{1}{2}\text{RootSum}\left[2\#1^3 + 2\#1^2 + 1\&, \frac{\log\left(\frac{xy(x)^2+1}{x} - \#1\right)}{3\#1^2 + 2\#1}\&\right] + \frac{1}{x} + c_1 = 0, y(x)\right]$$

✓ **Maple** : cpu = 0.75 (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+x^3+y(x)^4+x^3+3*x^2*y(x)^2+2*x^2*y(x)^4+3*x*y(x)^2+x+1)/x^5, y(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

$$y'(x) = \frac{x^6 + 3x^5y(x) + 3x^4y(x)^2 + x^4 + x^3y(x)^3 + 2x^3y(x) + x^2y(x)^2 - y(x) - 2x + 1}{x}$$

✓

Mathematica : cpu = 1.15985 (sec), leaf count = 98

`DSolve[Derivative[1][y][x] == (1 - 2*x + x^4 + x^6 - y[x] + 2*x^3*y[x] + 3*x^5*y[x] + x^2*y[x]`

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3x^3+3x^2y(x)+x}{\sqrt[3]{29}\sqrt[3]{x^3}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{29^{2/3}(x^3)^{2/3}}{9x} + c_1, y(x)\right]$$

✓

Maple : cpu = 0.057 (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`

$$y(x) = \frac{-9x^2 + 29 \operatorname{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + x + 3c_1\right) - 3}{9x}$$

2.911

ODE No. 911

$$y'(x) = y(x) \left(-F1(x) + \frac{\log(y(x))}{x} - \cot(x) \log(y(x)) \right)$$

✓ **Mathematica** : cpu = 0.657714 (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]
```

Solve

$$\left[\int_1^x \left(\frac{2 \log(y(x)) \sin(K[1])}{K[1]^2} - \frac{2(\cos(K[1]) \log(y(x)) - \sin(K[1])_F1(K[1]))}{K[1]} \right) dK[1] + \int_1^{y(x)} \left(-\frac{2 \sin(K[1])}{x K[1]} \right) dy(x) \right]$$

✓ **Maple** : cpu = 1.422 (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))
```

$$y(x) = e^{\frac{x c_1}{\sin(x)}} e^{\frac{x \left(\int \frac{F1(x) \sin(x)}{x} dx \right)}{\sin(x)}}$$

2.912

ODE No. 912

$$y'(x) = \frac{2ax}{-128a^4 + 96a^3xy(x)^2 + 32a^3x - 24a^2x^2y(x)^4 - 16a^2x^2y(x)^2 + 2ax^3y(x)^6 + 2ax^3y(x)^4 + 2ax^3 - x^3y(x)^6}$$

✓

Mathematica : cpu = 0.770563 (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 + 32*a^3*x^2*y[x]^4 - 16*a^2*x^2*y[x]^2 + 2*a*x^3*y[x]^6 + 2*a*x^3*y[x]^4 + 2*a*x^3 - x^3*y[x]^6), y[x], x]`

$$\text{Solve}\left[-\text{RootSum}\left[-\#1^3y(x)^6 - \#1^3y(x)^4 - \#1^3 + 12\#1^2ay(x)^4 + 8\#1^2ay(x)^2 - 48\#1a^2y(x)^2 - 16\#1a^2y(x)^4 + 2a^3x^3y(x)^6 + 2a^3x^3y(x)^4 + 2a^3x^3 - x^3y(x)^6\right], y(x)\right]$$

✗

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*y(x)^4-16*a^2*x^2*y(x)^2+2*a*x^3*y(x)^6+2*a*x^3-y(x)^3*x^3), y(x))`

, exception

time expired

2.913

ODE No. 913

$$y'(x) = \frac{y(x)^3 + y(x) + y(x)^3 \left(-\log^3(x)\right) + y(x)^3 \log^2(x) + 3y(x)^2 \log^2(x) - 2y(x)^2 \log(x) - 3y(x) \log(x) + 1}{xy(x)}$$

✓

Mathematica : cpu = 0.552529 (sec), leaf count = 716

DSolve[Derivative[1][y][x] == (1 + y[x] - 3*Log[x]*y[x] - 2*Log[x]*y[x]^2 + 3*Log[x]^2*y[x]^2

$$\text{Solve}\left[\int_1^{y(x)}\left(2\text{RootSum}\left[\#1^3K[1]^3-\#1^2K[1]^3-2K[1]^3-3\#1^2K[1]^2+2\#1K[1]^2+3\#1K[1]-K[1]-\right.\right.\right.$$

✓

Maple : cpu = 0.111 (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)

$$y(x) = \frac{9}{9 \ln \left(x\right) + 56 \operatorname{RootOf}\left(-81 \left(\int^{-Z} \frac{1}{3136 \_a^3 - 27 \_a + 27} d\_a\right) - \ln \left(x\right) + 3 c_1\right) - 3}$$

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 = 0.619149 (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]^3 - x^3*y[x]), y[x], x]
```

$$\{ \{ y(x) \rightarrow \text{Root}\big[8 \#1^5 a x^2 - 8 \#1^4 a c_1 x^2 - 64 \#1^3 a^2 x + \#1^2 (2 x^2 + 64 a^2 c_1 x) + 128 \#1 a^3 - 128 a^3 c_1 - 8 a x + a^4, 1\big] \}$$

✓ **Maple** : cpu = 3.022 (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, y(x))
```

$$\frac{xy(x)^4 + (-4a + x)y(x)^2 - 2a}{2ay(x)^4(-xy(x)^2 + 4a)^2} + \frac{8ay(x)^5 + 2y(x)^2 + 1}{16a^2y(x)^4} + c_1 = 0$$

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 = 0.593128 (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

$$\text{Solve}\left[\int_1^{y(x)}\left(4\text{RootSum}\left[8\#1^3K[1]^3-4\#1^2K[1]^3-3K[1]^3-12\#1^2K[1]^2+4\#1K[1]^2+6\#1K[1]-K[1]\right]d\#1\right)=0,y(x)\right]$$

✓

Maple : cpu = 0.11 (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*y(x)^2*ln(x)^2),y(x))

$$y(x) = \frac{9}{18 \ln(x) + 83 \operatorname{RootOf}\left(-81 \left(\int^{-Z} \frac{1}{6889\_a^3 - 27\_a + 27} d\_a\right) - \ln(x) + 3c_1\right) - 3}$$

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 = 0.166602 (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]]), y[x], x]`

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp\left(\frac{12x}{-3x^4+4x^3-6x^2+12x-12\log(x+1)+c_1}\right)}{x} \right\} \right\}$$

✓

Maple : cpu = 0.472 (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))`

$$y(x) = e^{\frac{-12\ln(1+x)\ln(x) + \left(-3x^4 + 4x^3 - 6x^2 + 12c_1 + 12x\right)\ln(x) - 12x}{3x^4 - 4x^3 + 6x^2 + 12\ln(1+x) - 12c_1 - 12x}}$$

2.917

ODE No. 917

$$y'(x) = \frac{y(x) \left(x \log^2(y(x)) + 2x \log(x) \log(y(x)) + x \log(y(x)) + \log(y(x)) - x + x \log^2(x) + x \log(x) + \log(x) \right)}{x(x+1)}$$

✓

Mathematica : cpu = 0.134735 (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]]

$$\left\{ \left\{ y(x) \rightarrow \frac{e^{-\frac{x}{x-\log(x+1)-c_1}}}{x} \right\} \right\}$$

✓

Maple : cpu = 0.351 (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))

$$y(x) = e^{\frac{\ln(1+x) \ln(x) + (-x+c_1) \ln(x) - x}{-\ln(1+x) - c_1 + x}}$$

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 = 0.391999 (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]^2 + 32*x^2*y[x]^6 + 128*x^3*y[x]^6), x]

$$\text{Solve}\left[\int_1^{y(x)} \left(\text{RootSum}\left[64\#1^3 K[1]^6 + 16\#1^2 K[1]^6 + K[1]^6 + 48\#1^2 K[1]^4 + 8\#1 K[1]^4 + 12\#1 K[1]^2 + K[1]\right] dy(x)\right) = 0, y(x)\right]$$

✓

Maple : cpu = 1.175 (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^2*y(x)^6),x)

$$x - \text{RootOf}\left(\left(\int^{-Z} \frac{1}{64\_a^3 + 16\_a^2 + 1} d\_a\right) y(x) + c_1 y(x) + 1\right) + \frac{1}{4y(x)^2} = 0$$

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 = 0.227304 (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]^2), y[x], x]
```

$$\{ \{ y(x) \rightarrow \text{Root}[\#1^9 c_1^4 - 6\#1^8 c_1^4 x + \#1^7(15c_1^4 x^2 - 6c_1^2) + \#1^6(-20c_1^4 x^3 + 30c_1^2 x - 4 + 2c_1^2) + \#1^5(1$$

✓ **Maple** : cpu = 0.247 (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
```

$$(c_1x^6 + 80x^3 - 54x^2 - 12x - 1)y(x)^{11/2} + (-6c_1x^5 - 60x^2 + 36x + 6)y(x)^{13/2} + (15c_1x^4 + 24x - 9)y(x)^1$$

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 = 0.312474 (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 + 128*x^3*y[x]^6 + 96*x^2*y[x]^4 + 4*x*y[x]^5 + y[x]^5 + y[x]^3 + 24*x*y[x]^2 + 2), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \text{Root}\left[\#1^5(128c_1x^2 - 8x - 1) + 128\#1^4x^2 + \#1^3(-2 + 64c_1x) + 64\#1^2x + 8\#1c_1 + 8\&, 1\right] \right\}, \left\{ y(x) \rightarrow \text{Root}\left[\#1^5(128c_1x^2 - 8x - 1) + 128\#1^4x^2 + \#1^3(-2 + 64c_1x) + 64\#1^2x + 8\#1c_1 + 8\&, 1\right] \right\} \right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(y(x),x) = 2*y(x)^6*(1+4*x*y(x)^2+y(x)^2)/(y(x)^3+4*y(x)^5*x+y(x)^5+2+24*x*y(x)^6+96*x^2*y(x)^4+4*x*y(x)^5+y(x)^5+y(x)^3+24*x*y(x)^2+2), y(x))
```

, 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)^6+96*x^2*y(x)^4+4*x*y(x)^5+y(x)^5+y(x)^3+24*x*y(x)^2+2), y(x))
```


2.921

ODE No. 921

$$y'(x) = y(x) \left(-F1(x) + \frac{\log(y(x))}{x} - \frac{\log(y(x))}{x \log(x)} \right)$$

✓ **Mathematica** : cpu = 0.241622 (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]
```

Solve

$$\left[\int_1^x \left(\frac{\log(y(x)) - \log(K[1]) \log(y(x))}{K[1]^2} - \frac{\log(K[1])\_F1(K[1])}{K[1]} \right) dK[1] + \int_1^{y(x)} \left(\frac{\log(x)}{xK[2]} - \int_1^x \frac{\frac{1}{K[2]} - \frac{1}{K[1]}}{K[2]} dx \right) dy(x) \right]$$

✓ **Maple** : cpu = 0.276 (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))
```

$$y(x) = e^{\frac{x c_1}{\ln(x)}} e^{\frac{x \left(\int \frac{-F1(x) \ln(x)}{x} dx \right)}{\ln(x)}}$$

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 = 0.588845 (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]
```

Solve

$$\left[\int_1^{y(x)} \left(\frac{-x - K[1]}{2 \left(-2x^3 + 6K[1]x^2 - 2\sqrt{K[1]}x^2 - 6K[1]^2x + 4K[1]^{3/2}x + K[1]x + 2K[1]^3 - 2K[1]^{5/2} - K[1] \right)} \right) \right]$$

✓ **Maple** : cpu = 0.219 (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)
```

$$\frac{\ln(y(x))}{2} - \left(\int^{\frac{x}{\sqrt{y(x)}} - \sqrt{y(x)}} \frac{1}{2_a^3 + 2_a^2 - _a + 2} d_a \right) - c_1 = 0$$

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 = 4.56839 (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[x])*(x + y[x])) + x^2 + 2*x*y[x] + y[x]^2), y[x], x]

$$\text{Solve}\left[\int_1^{y(x)}\left(-\frac{2e^{2(x-K[2])(x+K[2])}K[2]}{-e^{2(x-K[2])(x+K[2])}x^2+e^{2(x-K[2])(x+K[2])}K[2]^2+1}-\int_1^x\left(-\frac{2e^{2(K[1]-K[2])(K[1]+K[2])}K[1](2(K[1]-K[2])(K[1]+K[2])K[1]^2-e^{2(K[1]-K[2])(K[1]+K[2])}K[1]^2)}{e^{2(K[1]-K[2])(K[1]+K[2])}K[1]^2-e^{2(K[1]-K[2])(K[1]+K[2])}K[1]^2}}\right)dx\right)dy(x)=0\right]$$

✓

Maple : cpu = 0.527 (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), y(x))

$$y(x) = e^{\text{RootOf}\left(-\_Z + \int^{e^{2\_Z} - 2e^{-Zx}} \frac{1}{e^{2\_a} + \_a} d\_a + c_1\right)} - x$$

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 = 0.237304 (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]
```

Solve $\left[\int_1^x \left(-\frac{\log^2(y(x))}{2K[1]^2} - \frac{-F1(K[1])}{K[1]} \right) dK[1] + \int_1^{y(x)} \left(\frac{\log(K[2])}{xK[2]} - \int_1^x -\frac{\log(K[2])}{K[1]^2K[2]} dK[1] \right) dK[2] = c_1, y \right]$

✓ **Maple** : cpu = 0.185 (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 = 10.2638 (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 - y[x])^2*(x + y[x])^2) + x^2 + 2*x*y[x] + y[x]^2), y[x], x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\frac{2K[2]}{-x^2 + e^{2(x-K[2])^2(x+K[2])^2} + K[2]^2} - \int_1^x\left(\frac{2K[1]\left(-2K[2] - e^{2(K[1]-K[2])^2(K[1]+K[2])^2}(4(K[1]-K[2])^2(K[1]+K[2])^2 - 2(K[1]-K[2])^2(K[1]+K[2])^2)\right)}{(K[1]^2 - e^{2(K[1]-K[2])^2(K[1]+K[2])^2})}\right)dx\right)dy(x) = 0, y(x), x\right]$$

✓ **Maple** : cpu = 0.455 (sec), leaf count = 38

```
dsolve(diff(y(x),x) = (y(x)^2+2*x*y(x)+x^2+exp(2*(x-y(x))^2*(y(x)+x)^2))/(y(x)^2+2*x*y(x)+x^2), y(x))
```

$$y(x) = e^{\text{RootOf}\left(-\_Z + \int e^{2\_Z - 2e^{-Z}x} \frac{1}{e^{2\_a^2} + \_a} d\_a + c_1\right)} - x$$

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 = 0.145659 (sec), leaf count = 128

```
DSolve[Derivative[1][y][x] == (-1/2 + (3*x*y[x])/4 + x*y[x]^2 - (3*x^2*y[x]^2)/8 + x*y[x]^3 -
```

$$\left\{ \left\{ y(x) \rightarrow \frac{2}{x-2} + \frac{1}{16x(x-2) \left(-\frac{1}{64} - \frac{e^{2\left(\frac{1}{2}\log(2-x) - \frac{\log(x)}{2}\right)}}{\sqrt{2048\log(x)+c_1}} \right)} \right\}, \left\{ y(x) \rightarrow \frac{2}{x-2} + \frac{1}{16x(x-2) \left(-\frac{1}{64} + \frac{e^{2\left(\frac{1}{2}\log(2-x) - \frac{\log(x)}{2}\right)}}{\sqrt{2048\log(x)+c_1}} \right)} \right\} \right.$$

✓ **Maple** : cpu = 0.076 (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
```

$$y(x) = \frac{2\sqrt{c_1 + 8\ln(x)} + 8}{x\sqrt{c_1 + 8\ln(x)} + 4x - 8}$$

2.927 ODE No. 927

$$y'(x) = -\frac{1}{8}x\Big(12e^{-x^2}x^2y(x)^2 + 8e^{-x^2}x^2y(x) + 8e^{-x^2}x^2 - 8e^{-x^2} + e^{-3x^2}x^6 - 6e^{-2x^2}x^4y(x) - 2e^{-2x^2}x^4 - 8y(x)$$

✓ **Mathematica** : cpu = 0.496479 (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^6/1
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{1}{2}e^{-x^2}x\left(2e^{x^2}-3x^2\right)+3xy(x)}{\sqrt[3]{29}\sqrt[3]{x^3}}-\#1\right)}{\sqrt[3]{29}-29\#1^2}\&\right] = \frac{1}{18}29^{2/3}\left(x^3\right)^{2/3}$$

✓ **Maple** : cpu = 0.167 (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)
```

$$y(x) = \frac{x^2e^{-x^2}}{2} - \frac{1}{3} + \frac{29\text{RootOf}\left(x^2 - 162\left(\int^{-Z}\frac{1}{841\_a^3-27\_a+27}d\_a\right) + 6c_1\right)}{9}$$

2.928

ODE No. 928

$$y'(x) = \frac{e^{\frac{y(x)}{x}} \left(x^2 e^{-\frac{y(x)}{x}} + x e^{-\frac{y(x)}{x}} + x e^{-\frac{y(x)}{x}} y(x) + e^{-\frac{y(x)}{x}} y(x) + x \right)}{x(x+1)}$$

✓ **Mathematica** : cpu = 0.519018 (sec), leaf count = 23

```
DSolve[Derivative[1][y][x] == (E^(y[x]/x)*(x + x/E^(y[x]/x) + x^2/E^(y[x]/x) + y[x]/E^(y[x]/x)
```

$$\left\{ \left\{ y(x) \rightarrow -x \log \left(-\frac{\log(x+1) - c_1}{x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.371 (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)/
```

$$y(x) = -\ln \left(\frac{-\ln(1+x) + c_1}{x} \right) x$$

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 = 0.537594 (sec), leaf count = 683

DSolve[Derivative[1][y][x] == (1/4 + y[x]/4 - (3*x*y[x])/8 - (x*y[x]^2)/4 + (3*x^2*y[x]^2)/16 -

$$\text{Solve}\left[\int_1^{y(x)}\left(-32\text{RootSum}\left[\#1^3K[1]^3-2\#1^2K[1]^3-8K[1]^3-6\#1^2K[1]^2+8\#1K[1]^2+12\#1K[1]-8K[1]\right]d\#1\right)=0,y(x)\right]$$

✓

Maple : cpu = 0.062 (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+

$$y(x) = \frac{18}{58\text{RootOf}\left(-324\left(\int^{-Z}\frac{1}{841\_a^3-27\_a+27}d\_a\right)-\ln(x)+12c_1\right)+9x-6}$$

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 = 0.662178 (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))
```

$$\left\{ \left\{ y(x) \rightarrow -x \log \left(\frac{-\frac{x^3}{3} + \frac{x^2}{2} - x + \log(x+1) - c_1}{x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.546 (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)
```

$$y(x) = -\ln \left(\frac{-2x^3 + 3x^2 + 6 \ln(1+x) - 6c_1 - 6x}{6x} \right) x$$

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 = 0.1333 (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 - 2*x^3 - 3*x^2*y[x] - x*y[x]^2 - y[x] - 2*x)/(x*(x^2 + x*y[x] + 1)), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x^2 + 1}{x} + \frac{1}{x^2 \left(\frac{1}{x} - \frac{1}{x\sqrt{-2x + c_1}} \right)} \right\}, \left\{ y(x) \rightarrow -\frac{x^2 + 1}{x} + \frac{1}{x^2 \left(\frac{1}{x} + \frac{1}{x\sqrt{-2x + c_1}} \right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.051 (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)/(x*(x^2+x*y(x)+1)), y(x))
```

$$y(x) = \frac{-\sqrt{c_1 - 2x} x^2 + x^2 + 1}{(\sqrt{c_1 - 2x} - 1) x}$$

2.932

ODE No. 932

$$y'(x) = \frac{e^{-\frac{3x^2}{2}}x\Big(3e^{3x^2}y(x)^3 + e^{\frac{9x^2}{2}}y(x)^3 + 18e^{3x^2}y(x)^2 + 9e^{\frac{9x^2}{2}}y(x)^2 + 27e^{3x^2}y(x) + 27e^{\frac{9x^2}{2}}y(x) + 27e^{\frac{9x^2}{2}} + 27\Big)}{243y(x)}$$

✓

Mathematica : cpu = 2.50393 (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]

$$\text{Solve}\left[27\text{RootSum}\left[y(x)^3\#1^3 + 9y(x)^2\#1^3 + 27y(x)\#1^3 + 27\#1^3 + 3y(x)^3\#1^2 + 18y(x)^2\#1^2 + 27y(x)\#1^2\right.\right.$$

✓

Maple : cpu = 0.174 (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*

$$y(x) = -\frac{369\,e^{\frac{3x^2}{2}}}{123 + 123\,e^{\frac{3x^2}{2}} - 136\,\text{RootOf}\left(-41x^2 - 50243409\left(\int^{-Z}\frac{1}{9248\_a^3-1860867\_a+1860867}d\_a\right) + 27c_1\right)}$$

2.933 ODE No. 933

$$y'(x) = \frac{x^3 + x^3(-\log^3(x)) + x^3 \log^2(x) + 3x^2y(x) \log^2(x) - 2x^2y(x) \log(x) + x^2 + xy(x)^2 + xy(x) + y(x)^3}{x^2}$$

✓ **Mathematica** : cpu = 1.19468 (sec), leaf count = 99

```
DSolve[Derivative[1][y][x] == (x^2 + x^3 + x^3*Log[x]^2 - x^3*Log[x]^3 + x*y[x] - 2*x^2*Log[x]
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3y(x)+1-3\log(x)}{x^2} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{29^{2/3}}{9\sqrt[3]{\frac{1}{x^3}}} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.095 (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
```

$$y(x) = \frac{x\left(9\ln(x) - 3 + 29\text{RootOf}\left(-81\left(\int^{-Z}\frac{1}{841\_a^3-27\_a+27}d\_a\right) + x + 3c_1\right)\right)}{9}$$

2.934

ODE No. 934

$$y'(x)=-\frac{x^6}{64}-\frac{3x^5}{32}+\frac{3}{16}x^4y(x)-\frac{x^4}{8}+\frac{3}{4}x^3y(x)+\frac{x^3}{8}-\frac{3}{4}x^2y(x)^2+\frac{1}{4}x^2y(x)+\frac{x^2}{4}-\frac{3}{2}xy(x)^2-xy(x)+y(x)^3+y(x)^2+$$

✓ **Mathematica** : cpu = 0.209888 (sec), leaf count = 102

```
DSolve[Derivative[1][y][x] == 1 + x/2 + x^2/4 + x^3/8 - x^4/8 - (3*x^5)/32 - x^6/64 - x*y[x] +
```

$$\text{Solve}\left[-\frac{31}{3}\text{RootSum}\left[-31\#1^3+3\,2^{2/3}\sqrt[3]{31}\#1-31\&, \frac{\log\left(\sqrt[3]{\frac{2}{31}}\left(\frac{1}{4}(-3x^2-6x+4)+3y(x)\right)-\#1\right)}{2^{2/3}\sqrt[3]{31}-31\#1^2}\&\right]=\right.$$

✓ **Maple** : cpu = 0.089 (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-
```

$$y(x)=\frac{x^2}{4}+\frac{x}{2}+\text{RootOf}\left(-x+2\left(\int^{-x}\frac{1}{2\_a^3+2\_a^2+1}d\_a\right)+c_1\right)$$

2.935 ODE No. 935

$$y'(x) = \frac{x^6}{64} - \frac{3x^5}{16} + \frac{3}{16}x^4y(x) + \frac{13x^4}{16} - \frac{3}{2}x^3y(x) - \frac{3x^3}{2} + \frac{3}{4}x^2y(x)^2 + \frac{7}{2}x^2y(x) + x^2 - 3xy(x)^2 - 2xy(x) + y(x)^3 + y(x)$$

✓ **Mathematica** : cpu = 33.8596 (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 - 3*x^2*y(x)^2 - 2*x*y(x) + y(x)^3 + y(x), y[x], x]
```

Solve
$$\left[\frac{\sqrt[3]{2} \left(\frac{\frac{1}{4}(3x^2 - 12x + 4) + 3y(x)}{\sqrt[3]{2}} + 2^{2/3} \right) \left(2^{2/3} - 2^{2/3} \left(\frac{1}{4}(3x^2 - 12x + 4) + 3y(x) \right) \right) \left(\left(\frac{1}{4}(-3x^2 + 12x - 4) - 3y(x) \right)^2 - 9 \left(-\left(\frac{1}{4}(3x^2 - 12x + 4) \right)^2 \right) \right)}{9 \left(-\left(\frac{1}{4}(3x^2 - 12x + 4) \right)^2 \right)} \right]$$

✓ **Maple** : cpu = 0.283 (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, y(x))
```

$$y(x) = \frac{e^{\text{RootOf}(\ln(e^{-Z}-4)e^{-Z}+c_1e^{-Z}-Z)e^{-Z}+e^{-Z}x-4\ln(e^{-Z}-4)-4c_1+4_Z-4x+4)}}{4} - 1 - \frac{x^2}{4} + x$$

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 = 0.19254 (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 + x^4*y(x) - 3*x^3*y(x)/16 - 5*x^3/64 + 3*x^2*y(x)^2/8 + 7*x^2*y(x)/16 + x^2/16 - 3*x*y(x)^2/4 - x*y(x)/2 + y(x)^3 + y(x), y(x), x]
```

$$\text{Solve}\left[-\frac{89}{3}\text{RootSum}\left[-89\#1^3 + 6\sqrt[3]{178}\#1 - 89\&, \frac{\log\left(\frac{2^{2/3}\left(\frac{1}{8}(3x^2-6x+8)+3y(x)\right)}{\sqrt[3]{89}} - \#1\right)}{2\sqrt[3]{178} - 89\#1^2}\&\right] = \frac{89^{2/3}x}{18\sqrt[3]{2}} + c_1, y(x), x\right]$$

✓ **Maple** : cpu = 0.098 (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^6, y(x))
```

$$y(x) = -\frac{x^2}{8} + \frac{x}{4} + \text{RootOf}\left(-x + 4\left(\int^{-Z} \frac{1}{4\_a^3 + 4\_a^2 + 3\_a} d\_a\right) + c_1\right)$$

2.937 ODE No. 937

$$y'(x) = \frac{2xy(x)^3 + y(x)^3 - 2y(x) + 6xy(x)\log^2(2x + 1) + 3y(x)\log^2(2x + 1) + 6xy(x)^2\log(2x + 1) + 3y(x)^2\log(2x + 1)}{(2x + 1)(y(x) + \log(2x + 1) + 1)}$$

✓ **Mathematica** : cpu = 0.197527 (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
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{(2x + 1) \left(\frac{2x+1}{4x^2+4x+1} - \frac{1}{(2x+1)\sqrt{-2x+c_1}} \right)} - \log(2x + 1) - 1 \right\}, \left\{ y(x) \rightarrow \frac{1}{(2x + 1) \left(\frac{2x+1}{4x^2+4x+1} + \frac{1}{(2x+1)\sqrt{-2x+c_1}} \right)} - \log(2x + 1) - 1 \right\} \right.$$

✓ **Maple** : cpu = 0.108 (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
```

$$y(x) = \frac{-\sqrt{c_1 - 2x} \ln(2x + 1) + \ln(2x + 1) + 1}{\sqrt{c_1 - 2x} - 1}$$

2.938 ODE No. 938

$$y'(x) = \frac{x^6 - 3x^5 + 3x^4y(x) + 4x^4 - 6x^3y(x) - 3x^3 + 3x^2y(x)^2 + 5x^2y(x) - x^2 - 3xy(x)^2 - 2xy(x) + y(x)^3}{x}$$

✓ **Mathematica** : cpu = 0.179011 (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]^2 - 3*x*y[x]^2 + y[x]^3)/x, y[x], x]
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3x^2-3x+1}{x} + \frac{3y(x)}{x}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^3}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}\left(\frac{1}{x^3}\right)^{2/3}x^2\log(x), x\right]$$

✓ **Maple** : cpu = 0.063 (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)/x, y(x))
```

$$y(x) = -x^2 + x - \frac{1}{3} + \frac{29 \operatorname{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841\_a^3 - 27\_a + 27} d\_a\right) + \ln(x) + 3c_1\right)}{9}$$

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 = 0.167983 (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*y[x]^2 - y[x]^3)/(x*(-y[x] - x + x*Log[x])), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{x \left(-\frac{1}{x^2} - \frac{1}{x^2 \sqrt{-2x+c_1}} \right)} - x + x \log(x) \right\}, \left\{ y(x) \rightarrow -\frac{1}{x \left(-\frac{1}{x^2} + \frac{1}{x^2 \sqrt{-2x+c_1}} \right)} - x + x \log(x) \right\} \right\}$$

✓ **Maple** : cpu = 0.097 (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), y(x))
```

$$y(x) = \frac{x(\ln(x) \sqrt{c_1 - 2x} - \ln(x) + 1)}{\sqrt{c_1 - 2x} - 1}$$

2.941

ODE No. 941

$$y'(x) = \frac{x^6 - 12x^5 + 12x^4y(x) + 48x^4 - 96x^3y(x) - 72x^3 + 48x^2y(x)^2 + 192x^2y(x) + 32x^2 - 192xy(x)^2 - 32x}{16x^2 + 64y(x) - 64x + 64}$$

✓

Mathematica : cpu = 0.281339 (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*y[x]^2 - 192*x*y[x]), y[x], x]`

$$\text{Solve}\big[x - 8\text{RootSum}\big[11776\#1^3 - 40\#1 - 1\&, \#1 \log\big(17664\#1^2 - 1472\#1 + 11x^2 + 44y(x) - 44x - 40\big) \&$$

✓

Maple : cpu = 0.067 (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)^2-192*x*y(x)), y(x))`

$$y(x) = -\frac{x^2}{4} + x + \text{RootOf}\left(-x + \int^{-Z} \frac{-a + 1}{-a^3 - a - 1} d_{-a} + c_1\right)$$

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 = 2.77849 (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] - y[x]^2)/(E^((2*(x - y[x])^3*(x + y[x])^3)/(-1 + x^2 - y[x]^2)) - x^2 - 2*x*y[x] - y[x]^2), y[x], x]
```

$$\text{Solve}\left[\int_1^{y(x)}\left(-\frac{2K[2]}{-x^2+\exp\left(\frac{2(x-K[2])^3(x+K[2])^3}{x^2-K[2]^2-1}\right)+K[2]^2}-\int_1^x\left(\frac{2K[1]\left(-2K[2]-\exp\left(\frac{2(K[1]-K[2])^3(K[1]+K[2])^3}{K[1]^2-K[2]^2-1}\right)\right)}{\left(K[1]-K[2]\right)^3\left(K[1]+K[2]\right)^3}\right)dx\right)dy(x)\right]$$

✓ **Maple** : cpu = 1.227 (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))
```

$$y(x) = e^{\text{RootOf}\left(-_Z+\int^{e^{2-Z}-2e^{-Z}x}\frac{1}{e^{\frac{2}{a^3}}+_a}d\_a+c_1\right)}-x$$

2.943

ODE No. 943

$$y'(x) = \frac{x^6 - 6x^5 + 24x^4y(x) + 12x^4 - 96x^3y(x) - 24x^3 + 192x^2y(x)^2 + 96x^2y(x) + 32x^2 - 384xy(x)^2 - 128xy(x) + 512}{64x^2 + 512y(x) - 128x + 512}$$

✓

Mathematica : cpu = 0.310561 (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*y[x]^2 - 384*x*y[x]^2 + 192*x^2*y[x]^2 + 512*y[x] + 512), y[x], x]

$$\text{Solve}\Big[x - 16\text{RootSum}\Big[6656\#1^3 - 23\#1 - 1\&, \#1 \log\big(79872\#1^2 - 18304\#1 + 181x^2 + 1448y(x) - 362x - 1\big)\Big], x, y(x)\Big]$$

✓

Maple : cpu = 0.071 (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)^2+512*y(x)+512),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**

$$y'(x) = \frac{a^3x^6 + 6a^2bx^5 + 12a^2x^4y(x) - 8a^2x^3 + 12ab^2x^4 + 48abx^3y(x) - 16abx^2 + 48ax^2y(x)^2 - 32axy(x) - 16ax^2 + 32bx + 64y(x) + 64}{16ax^2 + 32bx + 64y(x) + 64}$$

✓ **Mathematica** : cpu = 18.2254 (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
```

$$\text{Solve}\left[x - 4\text{RootSum}\left[\#1^6 a^3 + 6\#1^5 a^2 b + 12\#1^4 a^2 y(x) + 12\#1^4 a b^2 + 48\#1^3 a b y(x) + 8\#1^3 b^3 + 8\#1^2 a b + \right.\right.$$

✓ **Maple** : cpu = 0.103 (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)^
```

$$y(x) = -\frac{ax^2}{4} - \frac{bx}{2} + \text{RootOf}\left(bx + 2\left(\int^{-Z} -\frac{b(-a+1)}{2_a a^3 + _a ab + b} d_{-a}\right) + 2c_1\right)$$

2.946 ODE No. 946

$$y'(x) = \frac{x \left(12e^{-x^2} x^2 y(x)^2 + 8e^{-x^2} x^2 y(x) - 8e^{-x^2} y(x) + 4e^{-2x^2} x^2 + 8e^{-x^2} x^2 - 8e^{-x^2} + e^{-3x^2} x^6 - 6e^{-2x^2} x^4 y(x) \right)}{4e^{-x^2} x^2 - 8y(x) - 8}$$

✓ **Mathematica** : cpu = 0.558999 (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))
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{2}e^{-x^2}(2e^{x^2} - x^2) + \frac{e^{-3x^2}}{8\left(\frac{1}{8}e^{-3x^2} - \frac{e^{-3x^2}}{\sqrt{-64x^2 + c_1}}\right)} \right\}, \left\{ y(x) \rightarrow -\frac{1}{2}e^{-x^2}(2e^{x^2} - x^2) + \frac{e^{-3x^2}}{8\left(\frac{1}{8}e^{-3x^2} + \frac{e^{-3x^2}}{\sqrt{-64x^2 + c_1}}\right)} \right\} \right\}$$

✓ **Maple** : cpu = 0.179 (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
```

$$y(x) = \frac{2 + x^2(\sqrt{-x^2 + c_1} - 1) e^{-x^2}}{2\sqrt{-x^2 + c_1} - 2}$$

2.947

ODE No. 947

$$y'(x) = \frac{x^3 \sin(x) + x^2 y(x)^2 + 2 x^2 y(x) \cos(x) + \frac{x^2}{2} + x^2 \cos(x) + \frac{1}{2} x^2 \cos(2x) + 2 x y(x) - 2 x y(x) \sin(x) + x - \cos(2 x)}{x^3}$$

✓

Mathematica : cpu = 0.288287 (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[x] + x^2*y(x)^2 + 2 x^2 y(x) cos(x) + x^2/2 + x^2 cos(x) + 1/2 x^2 cos(2x) + 2 x y(x) - 2 x y(x) sin(x) + x - cos(2 x))/x^3, y[x], x]`

$$\left\{ \left\{ y(x) \rightarrow -\frac{-\sin(x) + x \cos(x) + 1}{x} + \frac{1}{-\log(x) + c_1} \right\} \right\}$$

✓

Maple : cpu = 0.606 (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(x)), y(x))`

$$y(x) = \frac{(\cos(x) x - \sin(x) + 1) \ln(x) - \cos(x) c_1 x + \sin(x) c_1 + x - c_1}{x (c_1 - \ln(x))}$$

2.948 ODE No. 948

$$y'(x) = -\frac{216y(x)}{36x^2 + 4y(x)^8 + 12y(x)^7 + 33y(x)^6 + 60y(x)^5 - 24xy(x)^4 - 216y(x)^4 - 36xy(x)^3 - 252y(x)^3 - 72}$$

✓ **Mathematica** : cpu = 0.457507 (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
```

$$\text{Solve}\left[\frac{36}{y(x) (2y(x)^3 + 3y(x)^2 + 6y(x) + 6) - 6x} + \log(y(x)) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.263 (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
```

$$y(x) = e^{\text{RootOf}(12c_1e^{4-Z}+2e^{4-Z}-Z+18c_1e^{3-Z}+3e^{3-Z}-Z+36c_1e^{2-Z}+6-Ze^{2-Z}+36c_1e^{-Z}+6-Ze^{-Z}-36xc_1-6x-Z+36)}$$

2.949 ODE No. 949

$$y'(x) = \frac{x^6 - 3x^5 + 3x^4y(x) + x^4 - 6x^3y(x) + 2x^3 + 3x^2y(x)^2 + x^2y(x) - 3x^2 - 3xy(x)^2 + xy(x) + y(x)^3 + 1}{x(x^2 + y(x) - x + 1)}$$

✓ **Mathematica** : cpu = 0.156373 (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^2 - 3*x*y[x]^2 + x*y[x] + y[x]^3 + 1)/(x*(x^2 + y[x] - x + 1)), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -x^2 + x + \frac{1}{x \left(\frac{1}{x} - \frac{1}{x \sqrt{-2 \ln(x) + c_1}} \right)} - 1 \right\}, \left\{ y(x) \rightarrow -x^2 + x + \frac{1}{x \left(\frac{1}{x} + \frac{1}{x \sqrt{-2 \ln(x) + c_1}} \right)} - 1 \right\} \right\}$$

✓ **Maple** : cpu = 0.063 (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+1)/(x*(x^2+y(x)-x+1)), y(x))
```

$$y(x) = \frac{(-x^2 + x) \sqrt{c_1 - 2 \ln(x)} + x^2 - x + 1}{-1 + \sqrt{c_1 - 2 \ln(x)}}$$

2.950

ODE No. 950

$$y'(x)=\frac{a^3x^6}{64}+\frac{3}{32}a^2bx^5+\frac{3}{16}a^2x^4y(x)+\frac{a^2x^4}{16}+\frac{3}{16}ab^2x^4+\frac{3}{4}abx^3y(x)+\frac{1}{4}abx^3+\frac{3}{4}ax^2y(x)^2+\frac{1}{2}ax^2y(x)-\frac{ax}{2}+\frac{b^3x^5}{8}$$

✓ **Mathematica** : cpu = 6.35872 (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, y[x], x]
```

$$\text{Solve}\left[\frac{1}{9}\text{RootSum}\left[729b^2\#1^9+3132b\#1^9+3364\#1^9+2187b^2\#1^6+9396b\#1^6+10092\#1^6+2187b^2\#1^3+9396b\#1^3+10092\#1^3+2187\#1^3\right], y[x]\right]$$

✓ **Maple** : cpu = 0.107 (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, y(x))
```

$$y(x)=-\frac{ax^2}{4}-\frac{bx}{2}+\text{RootOf}\left(-x+2\left(\int^{-Z}\frac{1}{2\_a^3+2\_a^2+b+2}d\_a\right)+c_1\right)$$

2.952

ODE No. 952

$$y'(x) = \frac{-x^2 \sqrt{x^2 + y(x)^2} + xy(x) \sqrt{x^2 + y(x)^2} + x^5 \left(-\sqrt{x^2 + y(x)^2}\right) + x^4 y(x) \sqrt{x^2 + y(x)^2} - x^4 \sqrt{x^2 + y(x)^2}}{x}$$

✓ **Mathematica** : cpu = 0.293356 (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 + y[x]^2])/x, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt{2} x \tanh^2\left(\frac{1}{40}(-4\sqrt{2} x^5 - 5\sqrt{2} x^4 - 10\sqrt{2} x^2 - 20\sqrt{2} c_1)\right) - 2 x \tanh\left(\frac{1}{40}(-4\sqrt{2} x^5 - 5\sqrt{2} x^4 - 10\sqrt{2} x^2 - 20\sqrt{2} c_1)\right)}{\sqrt{2} - 2 \tanh\left(\frac{1}{40}(-4\sqrt{2} x^5 - 5\sqrt{2} x^4 - 10\sqrt{2} x^2 - 20\sqrt{2} c_1)\right)} \right. \right.$$

✓ **Maple** : cpu = 0.463 (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^2)^(1/2)),y(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 = 0.188916 (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
```

$$\left\{\left\{y(x) \rightarrow \frac{e^{-\frac{20x}{4x^5+5x^4+10x^2+20c_1}}}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.584 (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
```

$$y(x) = x^{-\frac{4x^5}{4x^5+5x^4+10x^2+20c_1}} x^{-\frac{5x^4}{4x^5+5x^4+10x^2+20c_1}} x^{-\frac{10x^2}{4x^5+5x^4+10x^2+20c_1}} x^{-\frac{20c_1}{4x^5+5x^4+10x^2+20c_1}} e^{-\frac{20x}{4x^5+5x^4+10x^2+20c_1}}$$

2.954 ODE No. 954

$$y'(x) = \frac{\frac{24}{5}x^{7/2}y(x) - \frac{24x^{13/2}}{25} + \frac{8x^{7/2}}{5} - 8x^{3/2} - \frac{8x^9}{125} + \frac{12}{25}x^6y(x) + \frac{4x^6}{25} - \frac{24x^4}{5} - \frac{6}{5}x^3y(x)^2 - \frac{4}{5}x^3y(x) + \frac{6x^3}{5} + 12}{x}$$

✓ **Mathematica** : cpu = 0.292749 (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
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{-6x^3-30\sqrt{x}+5}{5x} + \frac{3y(x)}{x}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^3}}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}\left(\frac{1}{x^3}\right)^{2/3}x^2\log$$

✓ **Maple** : cpu = 0.151 (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^
```

$$y(x) = \frac{18x^{7/2} + 145 \operatorname{RootOf}\left(-81\left(\int^{-Z} \frac{1}{841a^3-27a+27}d_a\right) + \ln(x) + 3c_1\right)\sqrt{x} - 15\sqrt{x} + 90x}{45\sqrt{x}}$$

2.955

ODE No. 955

$$y'(x) = \frac{-24x^{7/2}y(x) + \frac{24x^{13/2}}{5} + 14x^{7/2} + 40x^{3/2} + \frac{8x^9}{25} - \frac{12}{5}x^6y(x) + \frac{12x^6}{5} + 24x^4 + 6x^3y(x)^2 - 6x^3y(x) - 6x}{x\left(2x^3 - 5y(x) + 10\sqrt{x} - 5\right)}$$

✓

Mathematica : cpu = 0.270892 (sec), leaf count = 112

`DSolve[Derivative[1][y][x] == (-5*Sqrt[x] + 10*x + 40*x^(3/2) - 6*x^3 + 14*x^(7/2)) + 24*x^4 +`

$$\left\{\left\{y(x) \rightarrow \frac{1}{5}\left(2x^3 + 10\sqrt{x} - 5\right) - \frac{1}{125x\left(-\frac{1}{125x} - \frac{1}{x\sqrt{-31250\log(x)+c_1}}\right)}\right\},\left\{y(x) \rightarrow \frac{1}{5}\left(2x^3 + 10\sqrt{x} - 5\right) - \frac{1}{12}\right\}\right.$$

✓

Maple : cpu = 0.15 (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)+25`

$$y(x) = \frac{\left(2x^3 + 10\sqrt{x}\right)\sqrt{c_1 - 2\ln(x)} - 2x^3 - 10\sqrt{x} + 5}{5\sqrt{c_1 - 2\ln(x)} - 5}$$

2.956

ODE No. 956

$$y'(x) = \frac{y(x) \left(y(x) e^{\frac{2 \log^2(x)}{\log(x)+1}} x^{\frac{2}{\log(x)+1}+2} + y(x) e^{\frac{2 \log^2(x)}{\log(x)+1}} \log^2(x) x^{\frac{2}{\log(x)+1}+2} + 2 y(x) e^{\frac{2 \log^2(x)}{\log(x)+1}} \log(x) x^{\frac{2}{\log(x)+1}+2} - e^{\frac{2 \log^2(x)}{\log(x)+1}} \right)}{x(\log(x)+1)}$$

✓

Mathematica : cpu = 1.09993 (sec), leaf count = 28

DSolve[Derivative[1][y][x] == (y[x]*(-1 - E^((2*Log[x]^2)/(1 + Log[x])))*x^(2 + 2/(1 + Log[x]))

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{\left(1+c_1 e^{\frac{x^4}{4}}\right) (\log(x)+1)} \right\} \right\}$$

✓

Maple : cpu = 0.115 (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-

$$y(x) = \frac{e^{-\frac{x^4}{4}}}{(\ln(x)+1) \left(x^{-\frac{2 \ln(x)}{\ln(x)+1}} (\ln(x)+1) e^{\frac{(-4 \ln(x)-4) \ln(\ln(x)+1)-x^4 \ln(x)-x^4+8 \ln(x)^2}{4+4 \ln(x)}} + c_1 \right)}$$

2.957

ODE No. 957

$$y'(x) = \frac{y(x) \left(y(x) e^{\frac{2 \log^2(x)}{\log(x)+1}} x^{\frac{2}{\log(x)+1}+3} + y(x) e^{\frac{2 \log^2(x)}{\log(x)+1}} \log^2(x) x^{\frac{2}{\log(x)+1}+3} + 2 y(x) e^{\frac{2 \log^2(x)}{\log(x)+1}} \log(x) x^{\frac{2}{\log(x)+1}+3} - e^{\frac{2 \log^2(x)}{\log(x)+1}} \right)}{x(\log(x)+1)}$$

✓

Mathematica : cpu = 1.07052 (sec), leaf count = 28

DSolve[Derivative[1][y][x] == (y[x]*(-1 - E^((2*Log[x]^2)/(1 + Log[x])))*x^(3 + 2/(1 + Log[x]))

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{\left(1+c_1 e^{\frac{x^5}{5}}\right) (\log(x)+1)} \right\} \right\}$$

✓

Maple : cpu = 0.106 (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)-

$$y(x) = \frac{e^{-\frac{x^5}{5}}}{(\ln(x)+1) \left(x^{-\frac{2 \ln(x)}{\ln(x)+1}} (\ln(x)+1) e^{\frac{(-5 \ln(x)-5) \ln(\ln(x)+1)-x^5 \ln(x)-x^5+10 \ln(x)^2}{5+5 \ln(x)}} + c_1 \right)}$$

2.958

ODE No. 958

$$y'(x) = \frac{2xy(x)^3 + y(x)^3 + 2xy(x)^2 + y(x)^2 + 6xy(x)\log^2(2x + 1) + 3y(x)\log^2(2x + 1) + 6xy(x)^2\log(2x + 1) + y(x)^2\log(2x + 1)}{2x^2 + 2x + 1}$$

✓ **Mathematica** : cpu = 0.276887 (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^2 + 2*x + 1), y[x], x]
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{3y(x)+3\log(2x+1)+1}{\sqrt[3]{29}} - \#1\right)}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}x + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.108 (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))
```

$$y(x) = -\ln(2x + 1) - \frac{1}{3} + \frac{29\operatorname{RootOf}\left(-81\left(\int^{-x}\frac{1}{841a^3-27a+27}d_a\right) + x + 3c_1\right)}{9}$$

2.959

ODE No. 959

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(x^3\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2x}\right) - \frac{1}{2}y(x)\sin\left(\frac{y(x)}{x}\right) + \frac{1}{2}y(x)\sin\left(\frac{y(x)}{2}\right)\right)}{x}$$

✓

Mathematica : cpu = 0.163254 (sec), leaf count = 20

DSolve[Derivative[1][y][x] == (Csc[y[x]/(2*x)]*Sec[y[x]/(2*x)]*Sec[y[x]/x]*(x^3*Cos[y[x]/(2*x))

$$\left\{\left\{y(x) \rightarrow x \sin^{-1}\left(e^{\frac{x^2}{2}+c_1}\right)\right\}\right\}$$

✓

Maple : cpu = 0.146 (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)*c

$$y(x) = \frac{\arccos\left(e^{x^2}c_1 + 1\right)x}{2}$$

2.960

ODE No. 960

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(x^2\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2x}\right) - \frac{1}{2}y(x)\sin\left(\frac{y(x)}{x}\right) + \frac{1}{2}y(x)\sin\left(\frac{y(x)}{2}\right)\right)}{x}$$

✓

Mathematica : cpu = 0.122193 (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)]`

$$\left\{\left\{y(x) \rightarrow x \sin^{-1}\left(e^{x+c_1}\right)\right\}\right\}$$

✓

Maple : cpu = 0.108 (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)*c`

$$y(x) = \frac{\arccos\left(c_1e^{2x} + 1\right)x}{2}$$

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 = 24.41 (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 -
```

Solve

$$\left[\int_1^x \left(\frac{1}{K[1] + y(x)} - \frac{2e^{2K[1]^6 + 6y(x)^4 K[1]^2 + 4y(x)^2 K[1]^2} K[1]}{e^{2K[1]^6 + 6y(x)^4 K[1]^2 + 4y(x)^2 K[1]^2} K[1]^2 - e^{2y(x)^6 + 2y(x)^4 + 6K[1]^4 y(x)^2 + 2K[1]^4 + 2} - e^{2K[1]^6 + 6y(x)^4 K[1]^2 + 4y(x)^2 K[1]^2} K[1]^2} \right) dx \right]$$

✓ **Maple** : cpu = 0.741 (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*x^2
```

$$y(x) = e^{\operatorname{RootOf}\left(-{}_Z+ \int^{{\mathrm e}^2-{}_Z-2\,{\mathrm e}^{-{}_Z}{}_x} \frac{1}{{\mathrm e}^2-{}_a^3+2\,{}_a^2+2+_a} d\_a+c_1\right)} - x$$

2.962

ODE No. 962

$$y'(x) = \frac{4(a-1)(a+1)x(a^2x^2-x)}{a^8x^6-4a^6x^6-3a^6x^4y(x)^2+6a^4x^6+9a^4x^4y(x)^2+3a^4x^2y(x)^4-4a^2x^6-9a^2x^4y(x)^2-6a^2x^2y(x)^4}$$

✓ **Mathematica** : cpu = 2.414 (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^4 + 3*a^4*x^2 - 4*a^2*x^2*y[x]^2 + 3*a^4*x^2*y[x]^4 - 4*a^2*x^2*y[x]^4), y[x], x]
```

$$\{ \{ y(x) \rightarrow \text{Root}\big[2x^4a^8 - 8x^4a^6 + e^{c_1}x^4a^4 + 11x^4a^4 - 2e^{c_1}x^4a^2 - 6x^4a^2 + 4x^2a^2 + (2a^2 - 2) \#1^5 + e^{c_1}x^4 + x\big], x \}$$

✓ **Maple** : cpu = 1.745 (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*a^2*x^2*y(x)^4+3*a^4*x^2*y(x)^4-4*a^2*x^2*y(x)^4), y(x))
```

$$-\frac{y(x)}{(a-1)(a+1)} + \frac{2}{(a^2-1)^2(a^2x^2-x^2-y(x)^2)^2} - \frac{2}{(a^2-1)^2(a^2x^2-x^2-y(x)^2)} + c_1 = 0$$

2.963 ODE No. 963

$y'(x) = -\frac{5x^3}{2} + \frac{15}{4}x^3 \cos(x) - \frac{3}{2}x^3 \cos(2x) + \frac{1}{4}x^3 \cos(3x) + \frac{9}{2}x^2y(x) - 6x^2y(x) \cos(x) + \frac{3}{2}x^2y(x) \cos(2x) + \frac{3x}{2}$

✓ **Mathematica** : cpu = 0.360876 (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
```

$$\text{Solve}\left[-\frac{29}{3}\text{RootSum}\left[-29\#1^3 + 3\sqrt[3]{29}\#1 - 29\&, \frac{\log\left(\frac{\frac{3y(x)}{x} + \frac{-3x + 3x\cos(x) + 1}{x}}{\sqrt[3]{29}\sqrt[3]{\frac{1}{x^3}}}\right) - \#1}{\sqrt[3]{29} - 29\#1^2}\&\right] = \frac{1}{9}29^{2/3}\left(\frac{1}{x^3}\right)^{2/3}x^2\&$$

✓ **Maple** : cpu = 0.347 (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
```

$$y(x) = -\cos(x)x + x - \frac{1}{3} + \frac{29\text{RootOf}\left(-81\left(\int^{-Z}\frac{1}{841\_a^3-27\_a+27}d\_a\right) + \ln(x) + 3c_1\right)}{9}$$

2.964 ODE No. 964

$$y'(x) = -\frac{a^8 x^6 - 4a^6 x^6 - 3a^6 x^4 y(x)^2 - 2a^6 x^4 + 6a^4 x^6 + 9a^4 x^4 y(x)^2 + 6a^4 x^4 + 3a^4 x^2 y(x)^4 + 4a^4 x^2 y(x)^2 - 4}{}$$

- ✓ **Mathematica** : cpu = 2.4336 (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
```

$$\text{Solve} \left[\frac{y(x)}{(a-1)(a+1)} - \frac{8\text{RootSum} \left[-\#1^3 a^6 + 3\#1^3 a^4 - 3\#1^3 a^2 + \#1^3 + 3\#1^2 a^4 y(x)^2 + 2\#1^2 a^4 - 6\#1^2 a^4 y(x) \right]}{8\text{RootSum} \left[-\#1^3 a^6 + 3\#1^3 a^4 - 3\#1^3 a^2 + \#1^3 + 3\#1^2 a^4 y(x)^2 + 2\#1^2 a^4 - 6\#1^2 a^4 y(x) \right]} \right]$$

✓ **Maple** : cpu = 3.064 (sec), leaf count = 80

```
dsolve(diff(y(x),x) = -8*x*(a-1)*(a+1)/(8-8*y(x)^2*a^2*x^2+4*a^4*y(x)^2*x^2-6*y(x)^4*a^2
```

$$\frac{y(x)}{(a-1)(a+1)} + \frac{4 \left(\sum_{-R=\text{RootOf}(-Z^3+2-Z^2+8)} \frac{\ln(-a^2x^2+x^2+y(x)^2-R)}{3-R^2+4-R} \right)}{a^4-2a^2+1} - c_1 = 0$$

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 = 0.180108 (sec), leaf count = 29

DSolve[Derivative[1][y][x] == (Csc[y[x]/(2*x)]*Sec[y[x]/(2*x)]*Sec[y[x]/x]*(x*Cos[y[x]/(2*x)]*

$$\left\{\left\{y(x)\rightarrow x\sin^{-1}\left(xe^{\frac{x^3}{3}+\frac{x^2}{2}+c_1}\right)\right\}\right\}$$

✓

Maple : cpu = 0.258 (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)*c

$$y(x) = \frac{\arccos\left(e^{\frac{2x^3}{3}}e^{x^2}c_1x^2+1\right)x}{2}$$

2.966

ODE No. 966

$y'(x) = -\frac{216x^3 - 216x^2y(x)^4 - 324x^2y(x)^3 - 648x^2y(x)^2 - 648x^2y(x) + 216x^2 - 8y(x)^{12} - 36y(x)^{11} - 126y(x)^{10} - 126y(x)^9 - 126y(x)^8 - 126y(x)^7 - 126y(x)^6 - 126y(x)^5 - 126y(x)^4 - 126y(x)^3 - 126y(x)^2 - 126y(x) - 126}{216x^3 - 216x^2y(x)^4 - 324x^2y(x)^3 - 648x^2y(x)^2 - 648x^2y(x) + 216x^2 - 8y(x)^{12} - 36y(x)^{11} - 126y(x)^{10} - 126y(x)^9 - 126y(x)^8 - 126y(x)^7 - 126y(x)^6 - 126y(x)^5 - 126y(x)^4 - 126y(x)^3 - 126y(x)^2 - 126y(x) - 126}$

✓ **Mathematica** : cpu = 0.542037 (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] - 432*x^2*y[x] - 432*x^3*y[x] - 432*x^4*y[x] - 432*x^5*y[x] - 432*x^6*y[x] - 432*x^7*y[x] - 432*x^8*y[x] - 432*x^9*y[x] - 432*x^10*y[x] - 432*x^11*y[x] - 432*x^12*y[x]), y[x], x]
```

Solve $\left[72\text{RootSum}\left[-216\#1^3 + 216\#1^2y(x)^4 + 324\#1^2y(x)^3 + 648\#1^2y(x)^2 + 648\#1^2y(x) - 216\#1^2 - 72\#1 - 72\right], y(x)\right]$

✓ **Maple** : cpu = 0.724 (sec), leaf count = 50

```
dsolve(diff(y(x),x) = -1296*y(x)/(216-882*y(x)^6+1080*y(x)^5*x+72*y(x)^8*x+216*y(x)^7*x-1296*y(x)^4-1296*y(x)^3-1296*y(x)^2-1296*y(x)-1296), y(x))
```

$$y(x) = e^{\text{RootOf}\left(-Z-6\left(\int x^{-\frac{e^4 Z}{3}} - \frac{e^3 Z}{2} - e^{2Z} - e^{-Z} \frac{1}{-a^3 + a^2 + 1} d-a\right) + c_1\right)}$$

2.968

ODE No. 968

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(x^4\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{2x}\right) - \frac{1}{2}xy(x)\sin\left(\frac{y(x)}{x}\right) - \frac{1}{2}y(x)\sin\left(\frac{y(x)}{x}\right)\right)}{\dots}$$

✓

Mathematica : cpu = 0.262778 (sec), leaf count = 30

`DSolve[Derivative[1][y][x] == (Csc[y[x]/(2*x)]*Sec[y[x]/(2*x)]*Sec[y[x]/x]*(x^4*Cos[y[x]/(2*x))`

$$\left\{\left\{y(x) \rightarrow x \sin^{-1}\left((x+1) e^{\frac{x^2}{2}-x-\frac{3}{2}+c_1}\right)\right\}\right\}$$

✓

Maple : cpu = 0.287 (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`

$$y(x) = \frac{\arccos\left(\left(c_1(1+x)^2 e^{x^2} + e^{2x}\right) e^{-2x}\right) x}{2}$$

2.969

ODE No. 969

$$y'(x) = \frac{\csc\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{2x}\right)\sec\left(\frac{y(x)}{x}\right)\left(-\frac{1}{2}xy(x)\sin\left(\frac{y(x)}{x}\right) - \frac{1}{2}y(x)\sin\left(\frac{y(x)}{x}\right) + x\sin\left(\frac{y(x)}{2x}\right)\sin\left(\frac{y(x)}{x}\right)\cos\left(\frac{y(x)}{x}\right)\right)}{\dots}$$

✓ **Mathematica** : cpu = 0.17878 (sec), leaf count = 19

```
DSolve[Derivative[1][y][x] == (Csc[y[x]/(2*x)]*Sec[y[x]/(2*x)]*Sec[y[x]/x]*(x*Cos[y[x]/(2*x)]*...
```

$$\left\{\left\{y(x) \rightarrow x \sin^{-1}\left(\frac{e^{c_1} x}{x+1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.262 (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)*c...
```

$$y(x) = \frac{\arccos\left(\frac{1+(c_1+1)x^2+2x}{(1+x)^2}\right)}{2} x$$

2.970

ODE No. 970

$$y'(x) = -\frac{216x^3 - 216x^2y(x)^4 - 324x^2y(x)^3 - 648x^2y(x)^2 - 648x^2y(x) - 8y(x)^{12} - 36y(x)^{11} - 126y(x)^{10} - \dots}{\dots}$$

✓ **Mathematica** : cpu = 0.481345 (sec), leaf count = 66

```
DSolve[Derivative[1][y][x] == (-216*y[x]*(6 + 6*x - 6*y[x] - 6*y[x]^2 - 3*y[x]^3 - 2*y[x]^4))/...
```

$$\text{Solve}\left[\frac{36(2y(x)^4 + 3y(x)^3 + 6y(x)^2 + 6y(x) - 6x - 3)}{(y(x)(2y(x)^3 + 3y(x)^2 + 6y(x) + 6) - 6x)^2} + \log(y(x)) = c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.816 (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)/(2484*y(x)^6+...
```

$$\frac{-6\sqrt{3\ln(y(x)) - 108c_1 + 9} + (2y(x)^4 + 3y(x)^3 + 6y(x)^2 - 6x + 6y(x))\ln(y(x)) - 72c_1y(x)^4 - 108c_1y(x)^3}{216c_1 - 6\ln(y(x))}$$

2.971 ODE No. 971

$$y'(x) = \frac{(xy(x) + 1)^3}{x^5}$$

✓ **Mathematica** : cpu = 0.217982 (sec), leaf count = 157

```
DSolve[Derivative[1][y][x] == (1 + x*y[x])^3/x^5,y[x],x]
```

Solve $\left[\frac{1}{3} \log \left(\frac{\frac{3}{x^3} + \frac{3y(x)}{x^2}}{3 \sqrt[3]{-\frac{1}{x^6}}} + 1 \right) - \frac{1}{6} \log \left(\frac{\left(\frac{3}{x^3} + \frac{3y(x)}{x^2} \right)^2}{9 \left(-\frac{1}{x^6} \right)^{2/3}} - \frac{\frac{3}{x^3} + \frac{3y(x)}{x^2}}{3 \sqrt[3]{-\frac{1}{x^6}}} + 1 \right) + \frac{\tan^{-1} \left(\frac{\frac{2 \left(\frac{3}{x^3} + \frac{3y(x)}{x^2} \right)}{3 \sqrt[3]{-\frac{1}{x^6}}} - 1}{\sqrt{3}} \right)}{\sqrt{3}} = - \right]$

✓ **Maple** : cpu = 0.464 (sec), leaf count = 84

```
dsolve(diff(y(x),x) = (x*y(x)+1)^3/x^5,y(x))
```

$$y(x) = \frac{\left(3 \tan \left(\text{RootOf} \left(18x^3 \left(-\frac{1}{x^6} \right)^{2/3} + 6\_Z \sqrt{3} + \ln \left(\frac{\left(\sqrt{3} + \tan(\_Z) \right)^6}{\left(\tan(\_Z)^2 + 1 \right)^3} \right) - 18c_1 \right) \right) x^3 \left(-\frac{1}{x^6} \right)^{1/3} + \sqrt{3} \left(x^3 \left(-\frac{1}{x^6} \right)^{1/3} + \sqrt{3} \right)}{6x}$$

2.972 ODE No. 972

$$y'(x) = \frac{x(-2x^4 + 2x^2y(x) - x^2 + 1)}{y(x) - x^2}$$

✓ **Mathematica** : cpu = 0.0296206 (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]
```

$$\left\{ \left\{ y(x) \rightarrow x^2 + \frac{1}{2} \left(1 + W \left(-e^{x^4 - 2x^2 - 1 + c_1} \right) \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.31 (sec), leaf count = 27

```
dsolve(diff(y(x),x) = x*(-x^2+2*x^2*y(x)-2*x^4+1)/(y(x)-x^2),y(x))
```

$$y(x) = x^2 + \frac{\text{LambertW}\left(-2e^{x^4}e^{-2x^2}c_1e^{-1}\right)}{2} + \frac{1}{2}$$

2.973

ODE No. 973

$$y'(x) = e^{-2bx}y(x)\left(e^{bx}y(x) + e^{2bx} + y(x)^2\right)$$

✓ **Mathematica** : cpu = 1.11676 (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]
```

Solve

$$\left[-2\sqrt{3}\sqrt[3]{7-9b}\left(\sqrt[3]{7-9b} + \sqrt[3]{9b-7}\right)\tan^{-1}\left(\frac{\frac{2\sqrt[3]{7-9b}\left(3e^{-2bx}y(x)+e^{-bx}\right)}{\sqrt[3]{(9b-7)e^{-3bx}}}-1}{\sqrt{3}}}\right) - 2\sqrt[3]{7-9b}\left(\sqrt[3]{7-9b} - \sqrt[3]{9b-7}\right) \right]$$

✓ **Maple** : cpu = 0.697 (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))
```

$$y(x) = -\frac{\tan\left(\text{RootOf}\left(-2\_Ze^{bx} + \ln\left(\frac{4\tan(\_Z)^2b-3\tan(\_Z)^2+4b-3}{\left(\tan(\_Z)\sqrt{-e^{2bx}(-3+4b)}+e^{bx}\right)^2}\right)\sqrt{-e^{2bx}(-3+4b)} + \sqrt{-e^{2bx}(-3+4b)}\right)}{2}$$

2.974

ODE No. 974

$$y'(x) = -x^6 + 3x^4y(x) - 3x^2y(x)^2 + y(x)^3 + 2x$$

✓ **Mathematica** : cpu = 0.0690316 (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]
```

$$\left\{ \left\{ y(x) \rightarrow x^2 - \frac{1}{\sqrt{-2x + c_1}} \right\}, \left\{ y(x) \rightarrow x^2 + \frac{1}{\sqrt{-2x + c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.048 (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))
```

$$y(x) = \frac{x^2\sqrt{2c_1 - 2x} - 1}{\sqrt{2c_1 - 2x}}$$

2.975

ODE No. 975

$$y'(x) = \frac{x^6}{27} + \frac{1}{3}x^4y(x) + x^2y(x)^2 + y(x)^3 - \frac{2x}{3}$$

✓ **Mathematica** : cpu = 0.0700305 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x^2}{3} - \frac{1}{\sqrt{-2x + c_1}} \right\}, \left\{ y(x) \rightarrow -\frac{x^2}{3} + \frac{1}{\sqrt{-2x + c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.05 (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

$$y'(x) = \frac{y(x) \left(x^7 y(x)^2 + x^4 y(x) + x - 3\right)}{x}$$

✓ **Mathematica** : cpu = 1.16121 (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]
```

$$\text{Solve}\left[-\frac{7}{3}\text{RootSum}\left[-7\#1^3 + 6\sqrt[3]{-7}\#1 - 7\&, \frac{\log\left(\frac{3x^6y(x)+x^3}{\sqrt[3]{7}\sqrt[3]{-x^9}} - \#1\right)}{2\sqrt[3]{-7} - 7\#1^2}\&\right] = \frac{7^{2/3}(-x^9)^{2/3}}{9x^5} + c_1, y(x)\right]$$

✓ **Maple** : cpu = 0.42 (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))
```

$$y(x) = \frac{\sqrt{3} \tan\left(\text{RootOf}\left(-\sqrt{3} \ln\left(\frac{\frac{9 \tan(\_Z)^2}{7} + \frac{9}{7}}{(-3 \tan(\_Z) + \sqrt{3})^2}\right) + 3\sqrt{3} c_1 - 2\sqrt{3} x - 2\_Z\right)\right) - 1}{2x^3}$$

2.977

ODE No. 977

$$y'(x) = e^{2x^2}xy(x)\left(e^{-x^2}y(x) + e^{-2x^2} + y(x)^2\right)$$

✓

Mathematica : cpu = 0.33494 (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]

$$\text{Solve}\left[-\frac{25}{3}\text{RootSum}\left[-25\#1^3 + 24\sqrt[3]{-15}^{2/3}\#1 - 25\&, \frac{\log\left(\frac{3e^{2x^2}xy(x)+e^{x^2}x}{5^{2/3}\sqrt[3]{-e^{3x^2}x^3}} - \#1\right)}{8\sqrt[3]{-15}^{2/3} - 25\#1^2}\&\right] = -\frac{5\sqrt[3]{5}e^{x^2}x^3}{18\sqrt[3]{-e^{3x^2}x^3}} + c\right.$$

✓

Maple : cpu = 0.337 (sec), leaf count = 122

dsolve(diff(y(x),x) = y(x)*(y(x)^2+exp(-x^2)*y(x)+exp(-x^2)^2)/exp(-x^2)^2*x,y(x))

$$y(x) = \frac{\left(\sqrt{11} \tan \left(\text{RootOf} \left(-4 \sqrt{11} x^2 - 4 \ln \left(\frac{14256 e^{2 x^2} \tan (\_Z)^2}{25} + \frac{14256 e^{2 x^2}}{25}\right) \sqrt{11} + 8 \ln \left(-\frac{36 \sqrt{11}}{11} + 36 \tan (\_Z)\right.\right.\right.}{2}$$

2.978

ODE No. 978

$$y'(x) = \frac{y(x) \left(x^2 + x y(x) + y(x)^2 + x\right)}{x^2}$$

✓ **Mathematica** : cpu = 0.126985 (sec), leaf count = 60

```
DSolve[Derivative[1][y][x] == (y[x]*(x + x^2 + x*y[x] + y[x]^2))/x^2,y[x],x]
```

$$\text{Solve}\left[-\frac{1}{2}\log\left(\frac{y(x)^2}{x^2}+\frac{y(x)}{x}+1\right)+\log\left(\frac{y(x)}{x}\right)-\frac{\tan^{-1}\left(\frac{\frac{2y(x)}{x}+1}{\sqrt{3}}\right)}{\sqrt{3}}=x+c_1,y(x)\right]$$

✓ **Maple** : cpu = 0.361 (sec), leaf count = 71

```
dsolve(diff(y(x),x) = y(x)/x^2*(y(x)^2+x*y(x)+x^2+x),y(x))
```

$$y(x) = -\frac{x}{2} + \frac{\sqrt{3} x \tan\left(\text{RootOf}\left(-\sqrt{3} \ln\left(\frac{4}{3\left(\tan\left(\_Z\right)^2+1}\right)}\right)-2\sqrt{3} \ln\left(-\frac{\sqrt{3}}{6}+\frac{\tan\left(\_Z\right)}{2}\right)-\sqrt{3} \ln(3)+2\sqrt{3} c_1\right)}{2}$$

2.979 ODE No. 979

$$y'(x) = \frac{-x^3 + 3x^2y(x) - 3xy(x)^2 + y(x)^3 + x}{x}$$

✓ **Mathematica** : cpu = 0.0710178 (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]
```

$$\left\{ \left\{ y(x) \rightarrow x - \frac{1}{\sqrt{-2\log(x) + c_1}} \right\}, \left\{ y(x) \rightarrow x + \frac{1}{\sqrt{-2\log(x) + c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.067 (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))
```

$$y(x) = \frac{\sqrt{c_1 - 2\ln(x)}x - 1}{\sqrt{c_1 - 2\ln(x)}}$$

2.980 ODE No. 980

$$y'(x) = \frac{x^3y(x)^3 + 6x^2y(x)^2 + 12xy(x) + 2x + 8}{x^3}$$

✓ **Mathematica** : cpu = 0.08577754 (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]`

$$\left\{ \left\{ y(x) \rightarrow -\frac{2}{x} - \frac{1}{\sqrt{-2x + c_1}} \right\}, \left\{ y(x) \rightarrow -\frac{2}{x} + \frac{1}{\sqrt{-2x + c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.02 (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))`

$$y(x) = -\frac{1}{\sqrt{c_1 - 2x}} - \frac{2}{x}$$

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 = 0.132417 (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), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{ax} - \frac{1}{\sqrt{-2x + c_1}} \right\}, \left\{ y(x) \rightarrow -\frac{1}{ax} + \frac{1}{\sqrt{-2x + c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.026 (sec), leaf count = 41

```
dsolve(diff(y(x),x) = (y(x)^3*a^3*x^3+3*y(x)^2*a^2*x^2+3*a*x*y(x)+1+a^2*x)/x^3/a^3,y(x))
```

$$y(x) = -\frac{1}{\sqrt{c_1 - 2x}} - \frac{1}{xa}$$

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 = 0.329821 (sec), leaf count = 132

```
DSolve[Derivative[1][y][x] == (y[x]*(2*E^(x^2/2) + E^(x^2/2)*x + 2*E^(x^2/4)*y[x] + 2*y[x]^2)),
```

$$\text{Solve}\left[-\frac{7}{3}\text{RootSum}\left[-7\#1^3 + 6\sqrt[3]{-7}\#1 - 7\&, \frac{\log\left(\frac{3e^{-\frac{x^2}{2}}y(x)+e^{-\frac{x^2}{4}}}{\sqrt[3]{7}\sqrt[3]{-e^{-\frac{3x^2}{4}}}} - \#1\right)}{2\sqrt[3]{-7} - 7\#1^2}\&\right] = \frac{1}{9}7^{2/3}e^{\frac{x^2}{2}}\left(-e^{-\frac{3x^2}{4}}\right)^{2/3}x +$$

✓ **Maple** : cpu = 0.576 (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),
```

$$-\frac{2\ln\left(-6+6\left(3y(x)e^{-\frac{x^2}{2}}+e^{-\frac{x^2}{4}}\right)e^{\frac{x^2}{4}}\right)}{3}+\frac{\ln\left(36+\frac{324\left(y(x)e^{-\frac{x^2}{2}}+e^{-\frac{x^2}{4}}\right)^2e^{\frac{x^2}{2}}}{7}+\frac{36\left(3y(x)e^{-\frac{x^2}{2}}+e^{-\frac{x^2}{4}}\right)e^{\frac{x^2}{4}}}{7}\right)}{3}+\frac{2\sqrt{3}}{3}$$

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 = 1.51637 (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], x]
```

Solve

$$\left[\frac{1}{3} \log \left(\frac{\frac{3y(x)}{x^2-1} - \frac{3x}{x^2-1}}{3 \sqrt[3]{\frac{1}{(x-1)^3(x+1)^3}}} + 1 \right) - \frac{1}{6} \log \left(\frac{\left(\frac{3y(x)}{x^2-1} - \frac{3x}{x^2-1} \right)^2}{9 \left(\frac{1}{(x-1)^3(x+1)^3} \right)^{2/3}} - \frac{\frac{3y(x)}{x^2-1} - \frac{3x}{x^2-1}}{3 \sqrt[3]{\frac{1}{(x-1)^3(x+1)^3}}} + 1 \right) + \frac{\tan^{-1} \left(\frac{2 \left(\frac{3y(x)}{x^2-1} - \frac{3x}{x^2-1} \right) - \frac{3 \sqrt[3]{\frac{1}{(x-1)^3(x+1)^3}}}{\sqrt{3}}}{\sqrt{3}} \right)}{\sqrt{3}} \right]$$

✓ **Maple** : cpu = 0.729 (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))
```

$$y(x) = \frac{\left((x^2-1) \left(3 \tan \left(\text{RootOf} \left(-9 \left(\frac{1}{(x-1)^3(1+x)^3} \right)^{2/3} \ln \left(\frac{x-1}{1+x} \right) x^4 + 18 \left(\frac{1}{(x-1)^3(1+x)^3} \right)^{2/3} \ln \left(\frac{x-1}{1+x} \right) x^2 - 9 \left(\frac{1}{(x-1)^3(1+x)^3} \right)^{2/3} \right) \right) \right)}{\dots}$$

2.984

ODE No. 984

$$y'(x) = \frac{e^{-2x}(x-1)y(x)\left(x^2y(x)^2 + e^xxy(x) + e^{2x}\right)}{x}$$

✓ **Mathematica** : cpu = 7.25244 (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]
```

Solve

$$\left[\frac{\sqrt[3]{2}\left(\frac{3e^{-2x}x(x-1)y(x)+e^{-x}(x-1)}{\sqrt[3]{2}\sqrt[3]{e^{-3x}(x-1)^3}}+2^{2/3}\right)\left(2^{2/3}-\frac{2^{2/3}(3e^{-2x}x(x-1)y(x)+e^{-x}(x-1))}{\sqrt[3]{e^{-3x}(x-1)^3}}\right)\left(\left(1-\frac{3e^{-2x}x(x-1)y(x)+e^{-x}(x-1)}{\sqrt[3]{e^{-3x}(x-1)^3}}\right)^3-9\left(-\frac{e^{3x}(3e^{-2x}x(x-1)y(x)+e^{-x}(x-1))}{(x-1)^3}\right)\right)}{9\left(-\frac{e^{3x}(3e^{-2x}x(x-1)y(x)+e^{-x}(x-1))}{(x-1)^3}\right)}\right]$$

✓ **Maple** : cpu = 0.446 (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))
```

$$y(x) = \frac{e^{\operatorname{RootOf}\left(-e^{-Z}\ln\left(\frac{x\left(e^{-Z}+9\right)}{2}\right)+3c_1e^{-Z}+_Ze^{-Z}+e^{-Z}x+9\right)+x}}{9x}$$

2.985 ODE No. 985

$$y'(x) = \frac{(xy(x) + 1) (x^2y(x)^2 + x^2y(x) + x^2 + 2xy(x) + x + 1)}{x^5}$$

✓ **Mathematica** : cpu = 0.246915 (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],x]
```

$$\text{Solve}\left[-\frac{17}{3}\text{RootSum}\left[-17\#1^3 + 3\sqrt[3]{-34}\#1 - 17\&, \frac{\log\left(\frac{\frac{x+3}{x^3} + \frac{3y(x)}{x^2}}{\sqrt[3]{34}\sqrt[3]{-\frac{1}{x^6}}} - \#1\right)}{\sqrt[3]{-34} - 17\#1^2}\&\right] = -\frac{1}{9}34^{2/3}\left(-\frac{1}{x^6}\right)^{2/3}x^3 + c_1\right]$$

✓ **Maple** : cpu = 0.066 (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

$$y'(x) = \frac{-x^3 \log^3(x) + 3x^2 y(x) \log^2(x) + x^2 + y(x)^3 + xy(x) - 3xy(x)^2 \log(x)}{x^2}$$

✓ **Mathematica** : cpu = 0.100294 (sec), leaf count = 44

```
DSolve[Derivative[1][y][x] == (x^2 - x^3*Log[x]^3 + x*y[x] + 3*x^2*Log[x]^2*y[x] - 3*x*Log[x]*
```

$$\left\{ \left\{ y(x) \rightarrow x \log(x) - \frac{x}{\sqrt{-2x + c_1}} \right\}, \left\{ y(x) \rightarrow x \log(x) + \frac{x}{\sqrt{-2x + c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.054 (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)
```

$$y(x) = -\frac{x}{\sqrt{c_1 - 2x}} + x \ln(x)$$

2.987 ODE No. 987

$$y'(x) = \frac{y(x)}{x} - F(x) (y(x)^2 - ax^2)$$

✓ **Mathematica** : cpu = 0.12825 (sec), leaf count = 41

```
DSolve[Derivative[1][y][x] == y[x]/x - F[x]*(-a*x^2) + y[x]^2,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \sqrt{a} x \tanh \left(\sqrt{a} \int_1^x F(K[1]) K[1] dK[1] + \sqrt{a} c_1 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 22

```
dsolve(diff(y(x),x) = -F(x)*(-a*x^2+y(x)^2)+y(x)/x,y(x))
```

$$y(x) = \tanh \left(\sqrt{a} \left(c_1 + \int F(x) x dx \right) \right) x \sqrt{a}$$

2.988 ODE No. 988

$$y'(x) = \frac{y(x)}{x} - F(x) (-x^2 - 2xy(x) + y(x)^2)$$

✓ **Mathematica** : cpu = 0.135677 (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]

$$\left\{ \left\{ y(x) \rightarrow -\frac{x \left(-\exp \left(2\sqrt{2} \left(\int_1^x -F(K[1])K[1]dK[1] + c_1 \right) \right) + \sqrt{2} \exp \left(2\sqrt{2} \left(\int_1^x -F(K[1])K[1]dK[1] + c_1 \right) \right) \right)}{1 + \exp \left(2\sqrt{2} \left(\int_1^x -F(K[1])K[1]dK[1] + c_1 \right) \right)} \right. \right.$$

✓ **Maple** : cpu = 0.059 (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

$$y'(x) = \frac{y(x)}{x} - F(x) (-ay(x)^2 - bx^2)$$

✓ **Mathematica** : cpu = 0.132982 (sec), leaf count = 56

```
DSolve[Derivative[1][y][x] == y[x]/x - F[x]*(-(b*x^2) - a*y[x]^2),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt{b}x \tan \left(\sqrt{a}\sqrt{b} \int_1^x F(K[1])K[1]dK[1] + \sqrt{a}\sqrt{b}c_1 \right)}{\sqrt{a}} \right\} \right\}$$

✓ **Maple** : cpu = 0.082 (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 = 0.125916 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\exp \left(\int_1^x 2F(K[5])dK[5] \right)}{-\int_1^x \exp \left(\int_1^{K[6]} 2F(K[5])dK[5] \right) F(K[6])dK[6] + c_1} + x^2 + 1 \right\} \right\}$$

✓ **Maple** : cpu = 0.849 (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))
```

$$y(x) = \frac{-x^2e^{\int 2F(x)dx} + c_1x^2 + e^{\int 2F(x)dx} + c_1}{-e^{\int 2F(x)dx} + c_1}$$

2.991 ODE No. 991

$$y'(x) = \frac{y(x)}{x} - F(x) (x^2 + 2xy(x) - y(x)^2)$$

✓ **Mathematica** : cpu = 0.124574 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{x(-\exp(2\sqrt{2}(\int_1^x F(K[1])K[1]dK[1] + c_1)) + \sqrt{2}\exp(2\sqrt{2}(\int_1^x F(K[1])K[1]dK[1] + c_1)) - 1}{1 + \exp(2\sqrt{2}(\int_1^x F(K[1])K[1]dK[1] + c_1))} \right. \right.$$

✓ **Maple** : cpu = 0.054 (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))
```

$$y(x) = \frac{x(\sqrt{2} - 2 \tanh((c_1 + \int F(x) x dx) \sqrt{2})) \sqrt{2}}{2}$$

2.992 ODE No. 992

$$y'(x) = \frac{y(x)}{x} - F(x) (-x^3 - 7xy(x)^2)$$

✓ **Mathematica** : cpu = 0.0912212 (sec), leaf count = 43

```
DSolve[Derivative[1][y][x] == y[x]/x - F[x]*(-x^3 - 7*x*y[x]^2),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x \tan \left(\sqrt{7} \int_1^x F(K[1]) K[1]^2 dK[1] + \sqrt{7} c_1 \right)}{\sqrt{7}} \right\} \right\}$$

✓ **Maple** : cpu = 0.069 (sec), leaf count = 25

```
dsolve(diff(y(x),x) = -F(x)*(-7*x*y(x)^2-x^3)+y(x)/x,y(x))
```

$$y(x) = \frac{\tan \left(\left(\int F(x) x^2 dx + c_1 \right) \sqrt{7} \right) x \sqrt{7}}{7}$$

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 = 0.777411 (sec), leaf count = 73

```
DSolve[Derivative[1][y][x] == y[x]/(x*Log[x]) - F[x]*(-Log[x]^2 - 2*Log[x]*y[x] - y[x]^2),y[x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\int_1^x \frac{F(K[1])}{\sqrt{\frac{1}{\log^2(K[1])}}} dK[1] - 1 + c_1}{\sqrt{\frac{1}{\log^2(x)} \int_1^x \frac{F(K[1])}{\sqrt{\frac{1}{\log^2(K[1])}}} dK[1] + c_1 \sqrt{\frac{1}{\log^2(x)}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.046 (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))
```

$$y(x) = -\frac{\ln(x) \left(\int -2 \ln(x) F(x) dx - c_1 - 2 \right)}{\int -2 \ln(x) F(x) dx - c_1}$$

2.994 ODE No. 994

$$y'(x) = \frac{y(x)}{x \log(x)} - x^3(-y(x)^2 - 2y(x) \log(x) - \log^2(x))$$

✓ **Mathematica** : cpu = 0.14573 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\frac{1}{16}x^4 e^{\frac{1}{16}x^4(4\log(x)-1)}(4\log(x)-1)\left(\frac{x^3}{4} + \frac{1}{4}x^3(4\log(x)-1)\right) + \frac{1}{4}x^3 e^{\frac{1}{16}x^4(4\log(x)-1)} + \frac{1}{4}x^3 e^{\frac{1}{16}x^4(4\log(x)-1)}}{x^3\left(\frac{1}{16}x^4 e^{\frac{1}{16}x^4(4\log(x)-1)}(4\log(x)-1) + c_1 e^{\frac{1}{16}x^4(4\log(x)-1)}\right)} \right\} \right.$$

✓ **Maple** : cpu = 0.048 (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 = 0.131018 (sec), leaf count = 17

```
DSolve[Derivative[1][y][x] == E^x + (-E^x + y[x])^2,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow e^x + \frac{1}{-x + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.125 (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

$$y'(x) = \frac{(y(x) - \operatorname{Si}(x))^2 + \sin(x)}{x}$$

✓ **Mathematica** : cpu = 0.0809138 (sec), leaf count = 17

```
DSolve[Derivative[1][y][x] == (Sin[x] + (-SinIntegral[x] + y[x])^2)/x,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \operatorname{Si}(x) + \frac{1}{-\log(x) + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.12 (sec), leaf count = 15

```
dsolve(diff(y(x),x) = ((y(x)-Si(x))^2+sin(x))/x,y(x))
```

$$y(x) = \operatorname{Si}(x) + \frac{1}{c_1 - \ln(x)}$$

2.997 ODE No. 997

$$y'(x) = (y(x) + \cos(x))^2 + \sin(x)$$

✓ **Mathematica** : cpu = 0.0759268 (sec), leaf count = 18

```
DSolve[Derivative[1][y][x] == Sin[x] + (Cos[x] + y[x])^2,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\cos(x) + \frac{1}{-x + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.109 (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

$$y'(x) = \frac{(-\operatorname{Ci}(x) + y(x) - \log(x))^2 + \cos(x)}{x}$$

✓ **Mathematica** : cpu = 0.284316 (sec), leaf count = 27

```
DSolve[Derivative[1][y][x] == (Cos[x] + (-CosIntegral[x] - Log[x] + y[x])^2)/x, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \operatorname{Ci}(x) + \frac{x^2}{-\frac{x^2}{2} + c_1} + \log(x) + 1 \right\} \right\}$$

✓ **Maple** : cpu = 0.641 (sec), leaf count = 27

```
dsolve(diff(y(x), x) = ((y(x)-ln(x)-Ci(x))^2+cos(x))/x, y(x))
```

$$y(x) = \ln(x) + \operatorname{Ci}(x) + \frac{-c_1 x^2 + 1}{c_1 x^2 + 1}$$

2.999 ODE No. 999

$$y'(x) = \frac{(y(x) - x + \log(x + 1))^2 + x}{x + 1}$$

✓ **Mathematica** : cpu = 0.134557 (sec), leaf count = 24

```
DSolve[Derivative[1][y][x] == (x + (-x + Log[1 + x] + y[x])^2)/(1 + x), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow x - \log(x + 1) + \frac{1}{-\log(x + 1) + c_1} \right\} \right\}$$

✓ **Maple** : cpu = 0.076 (sec), leaf count = 36

```
dsolve(diff(y(x), x) = ((y(x)-x+ln(1+x))^2+x)/(1+x), y(x))
```

$$y(x) = \frac{-\ln(1+x)^2 + (-c_1 + x)\ln(1+x) + xc_1 - 1}{\ln(1+x) + c_1}$$

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 = 0.626261 (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]),y[x]]

$$\left\{\left\{y(x) \rightarrow \frac{x^2(x + \log(x)) \left(-\frac{\sqrt{x}(x + \log(x) + 2) \log(x) \exp\left(-\frac{1}{2} \int_1^x \frac{K[1] + \log(K[1]) + 2}{K[1]^2 + \log(K[1])K[1]} dK[1]\right)}{2(x^2 + x \log(x))} + c_1 \left(\frac{\exp\left(-\frac{1}{2} \int_1^x \frac{K[1] + \log(K[1]) + 2}{K[1]^2 + \log(K[1])K[1]} dK[1]\right)}{2\sqrt{x}}\right)}{\sqrt{x} \log(x) \exp\left(-\frac{1}{2} \int_1^x \frac{K[1] + \log(K[1]) + 2}{K[1]^2 + \log(K[1])K[1]} dK[1]\right)}\right.\right.$$

✓

Maple : cpu = 0.305 (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 = 0.0032828 (sec), leaf count = 12

```
DSolve[Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \rightarrow c_2x + c_1\}\}$$

✓ **Maple** : cpu = 0.006 (sec), leaf count = 9

```
dsolve(diff(diff(y(x),x),x)=0,y(x))
```

$$y(x) = c_1x + c_2$$

Hand solution

$$y'' = 0$$

Integration twice gives

$$y(x) = c_1x + c_2$$

2.1002 ODE No. 1002

$$y''(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0039151 (sec), leaf count = 16

```
DSolve[y[x] + Derivative[2][y][x] == 0, y[x], x]
```

$$\{\{y(x) \rightarrow c_1 \cos(x) + c_2 \sin(x)\}\}$$

✓ **Maple** : cpu = 0.005 (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

$$\lambda^2 e^{\lambda x} + e^{\lambda x} = 0$$

$$\lambda^2 + 1 = 0$$

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 = 0.0802898 (sec), leaf count = 45

```
DSolve[-Sin[n*x] + y[x] + Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\cos^2(x)(-\sin(nx)) - \sin^2(x)\sin(nx)}{n^2 - 1} + c_1 \cos(x) + c_2 \sin(x) \right\} \right\}$$

✓ **Maple** : cpu = 0.234 (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

$$y'' + y = \sin nx \quad (1)$$

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

$$u'_1 \cos x + u'_2 \sin x = 0 \quad (2)$$

Hence

$$\begin{aligned} y'_p &= u_2 \cos x - u_1 \sin x \\ y''_p &= u'_2 \cos x - u_2 \sin x - u'_1 \sin x - u_1 \cos x \end{aligned}$$

Substituting in (1) gives

$$\begin{aligned}
 y_p'' + y_p &= \sin nx \\
 u_2' \cos x - u_2 \sin x - u_1' \sin x - u_1 \cos x + u_1 \cos x + u_2 \sin x &= \sin nx \\
 u_2' \cos x - u_1' \sin x &= \sin nx
 \end{aligned} \tag{3}$$

So we have two equations (1)(2) to solve for u_1, u_2

$$\begin{aligned}
 u_1' \cos x + u_2' \sin x &= 0 \\
 u_2' \cos x - u_1' \sin x &= \sin nx
 \end{aligned}$$

From the first equation

$$u_1' = -u_2' \frac{\sin x}{\cos x} \tag{4}$$

Substituting in the second equation

$$\begin{aligned}
 u_2' \cos x - \left(-u_2' \frac{\sin x}{\cos x} \right) \sin x &= \sin nx \\
 u_2' \left(\cos x + \frac{\sin x}{\cos x} \sin x \right) &= \sin nx \\
 u_2' \left(\frac{\cos^2 x + \sin^2 x}{\cos x} \right) &= \sin nx \\
 u_2' &= \cos x \sin nx
 \end{aligned}$$

Hence

$$\begin{aligned}
 u_2 &= \int \cos x \sin (nx) dx \\
 &= \frac{-n \cos x \cos (nx) - \sin x \sin (nx)}{n^2 - 1}
 \end{aligned}$$

From (4)

$$\begin{aligned}
 u_1' &= -\cos x \sin nx \frac{\sin x}{\cos x} \\
 u_1 &= -\int \sin (nx) \sin x dx \\
 &= \frac{n \cos (nx) \sin x - \cos x \sin (nx)}{n^2 - 1}
 \end{aligned}$$

Since $y_p = u_1(x) \cos x + u_2(x) \sin x$ then

$$\begin{aligned}
 y_p &= \left(\frac{n \cos (nx) \sin x - \cos x \sin (nx)}{n^2 - 1} \right) \cos x + \left(\frac{-n \cos x \cos (nx) - \sin x \sin (nx)}{n^2 - 1} \right) \sin x \\
 &= \frac{n \cos (nx) \cos x \sin x - \cos^2 x \sin (nx) - n \cos x \sin x \cos (nx) - \sin^2 x \sin (nx)}{n^2 - 1} \\
 &= \frac{-\sin (nx) (\cos^2 x + \sin^2 x)}{n^2 - 1} \\
 &= \frac{\sin (nx)}{1 - n^2}
 \end{aligned}$$

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

$$y_p' = -An \sin(nx) + Bn \cos(nx)$$

$$y_p'' = -An^2 \cos(nx) - Bn^2 \sin(nx)$$

Plug into the ODE gives

$$y_p'' + y_p = \sin nx$$

$$-An^2 \cos(nx) - Bn^2 \sin(nx) + A \cos(nx) + B \sin(nx) = \sin nx$$

$$\cos(nx) (-An^2 + A) + \sin(nx) (-Bn^2 + B) = \sin(nx)$$

Hence $-Bn^2 - B = 1$ and $-An^2 + A = 0$. Therefore $A = 0$ and from the first equation

$$B(n^2 + 1) = -1$$

$$B = \frac{-1}{n^2 + 1}$$

Hence

$$y_p = A \cos(nx) + B \sin(nx)$$

$$= \frac{\sin(nx)}{1 - n^2}$$

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 = 0.0076557 (sec), leaf count = 30

```
DSolve[-(a*Cos[b*x]) + y[x] + Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{a \cos(bx)}{b^2 - 1} + c_1 \cos(x) + c_2 \sin(x) \right\} \right\}$$

✓ **Maple** : cpu = 0.227 (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

$$y'' + y = a \cos bx \quad (1)$$

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

$$u'_1 \cos x + u'_2 \sin x = 0 \quad (2)$$

Hence

$$\begin{aligned} y'_p &= u_2 \cos x - u_1 \sin x \\ y''_p &= u'_2 \cos x - u_2 \sin x - u'_1 \sin x - u_1 \cos x \end{aligned}$$

Substituting in (1) gives

$$\begin{aligned} y_p'' + y_p &= a \cos bx \\ u_2' \cos x - u_2 \sin x - u_1' \sin x - u_1 \cos x + u_1 \cos x + u_2 \sin x &= a \cos bx \\ u_2' \cos x - u_1' \sin x &= a \cos bx \end{aligned} \quad (3)$$

So we have two equations (1)(2) to solve for u_1, u_2

$$\begin{aligned} u_1' \cos x + u_2' \sin x &= 0 \\ u_2' \cos x - u_1' \sin x &= a \cos bx \end{aligned}$$

From the first equation

$$u_1' = -u_2' \frac{\sin x}{\cos x} \quad (4)$$

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

$$\begin{aligned} y_p &= \left(-a \frac{\cos (bx) \cos x + b \sin x \sin (bx)}{b^2 - 1} \right) \cos x + \left(a \frac{-\cos (bx) \sin x + b \cos x \sin (bx)}{b^2 - 1} \right) \sin x \\ &= \frac{-a \cos (bx) \cos^2 x - ab \cos x \sin x \sin (bx) - a \cos (bx) \sin^2 x + ab \sin x \cos x \sin (bx)}{b^2 - 1} \\ &= \frac{-a \cos (bx) \cos^2 x - a \cos (bx) \sin^2 x}{b^2 - 1} \\ &= \frac{-a \cos (bx) (\cos^2 x + \sin^2 x)}{b^2 - 1} \\ &= \frac{-a \cos (bx)}{b^2 - 1} \\ &= \frac{a \cos (bx)}{1 - b^2} \end{aligned}$$

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 = 0.285302 (sec), leaf count = 1163

`DSolve[-(Sin[a*x]*Sin[b*x]) + y[x] + Derivative[2][y][x] == 0,y[x],x]`

$$\left\{ \left\{ y(x) \rightarrow c_1 \cos(x) + c_2 \sin(x) + \frac{-\cos(x) \cos((a-b-1)x)a^3 + \cos(x) \cos((a-b+1)x)a^3 + \cos(x) \cos((a-b-1)x)a^3 + \cos(x) \cos((a-b+1)x)a^3}{2a^4 + (-4b^2 - 4)a^2 + 2b^4 - 4b^2 + 2} \right. \right.$$

✓ **Maple** : cpu = 0.488 (sec), leaf count = 82

`dsolve(diff(diff(y(x),x),x)+y(x)-sin(a*x)*sin(b*x)=0,y(x))`

$$y(x) = \sin(x) c_2 + \cos(x) c_1 + \frac{-(a+b+1)(a+b-1)\cos(x(a-b)) + \cos((a+b)x)(-b+a+1)(-b+a-1) + \cos((a-b)x)(-b+a+1)(-b+a-1)}{2a^4 + (-4b^2 - 4)a^2 + 2b^4 - 4b^2 + 2}$$

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

$$\begin{aligned}
y_p &= -\frac{1}{4} \left(\frac{\cos((a-b-1)x)}{a-b-1} - \frac{\cos((a-b+1)x)}{a-b+1} - \frac{\cos((a+b-1)x)}{a+b-1} + \frac{\cos((a+b+1)x)}{a+b+1} \right) \cos x \\
&\quad + \frac{1}{4} \left(\frac{\sin((a-b-1)x)}{a-b-1} + \frac{\sin((a-b+1)x)}{a-b+1} - \frac{\sin((a+b-1)x)}{a+b-1} - \frac{\sin((a+b+1)x)}{a+b+1} \right) \sin x \\
&= \frac{1}{4} \left(-\frac{\cos^2((a-b-1)x)}{a-b-1} + \frac{\sin^2((a-b-1)x)}{a-b-1} \right) + \frac{1}{4} \left(\frac{\cos^2((a-b+1)x)}{a-b+1} + \frac{\sin^2((a-b+1)x)}{a-b+1} \right) \\
&\quad + \frac{1}{4} \left(\frac{\cos^2((a+b-1)x)}{a+b-1} - \frac{\sin^2((a+b-1)x)}{a+b-1} \right) + \frac{1}{4} \left(-\frac{\cos^2((a+b+1)x)}{a+b+1} - \frac{\sin^2((a+b+1)x)}{a+b+1} \right) \\
&= \frac{1}{4} \left(-\frac{\cos^2((a-b-1)x)}{a-b-1} + \frac{\sin^2((a-b-1)x)}{a-b-1} \right) + \frac{1}{4} \left(\frac{1}{a-b+1} \right) \\
&\quad + \frac{1}{4} \left(\frac{\cos^2((a+b-1)x)}{a+b-1} - \frac{\sin^2((a+b-1)x)}{a+b-1} \right) - \frac{1}{4} \left(\frac{1}{a+b+1} \right)
\end{aligned}$$

Let $a-b-1 = \alpha, a+b-1 = \beta$ then

$$\begin{aligned}
y_p &= \frac{1}{4} \left(\frac{\sin^2(\alpha x) - \cos^2(\alpha x)}{\alpha} \right) + \frac{1}{4} \left(\frac{\cos^2(\beta x) - \sin^2(\beta x)}{\beta} \right) + \frac{1}{4} \left(\frac{1}{\alpha+2} \right) - \frac{1}{4} \left(\frac{1}{\beta+2} \right) \\
&= \frac{1}{4} \left(\frac{\sin^2(\alpha x) - \cos^2(\alpha x)}{\alpha} + \frac{\cos^2(\beta x) - \sin^2(\beta x)}{\beta} + \frac{1}{\alpha+2} - \frac{1}{\beta+2} \right)
\end{aligned}$$

Therefore, the full solution is

$$\begin{aligned}
y &= y_h + y_p \\
&= c_1 \cos x + c_2 \sin x + \frac{1}{4} \left(\frac{\sin^2(\alpha x) - \cos^2(\alpha x)}{\alpha} + \frac{\cos^2(\beta x) - \sin^2(\beta x)}{\beta} + \frac{1}{\alpha+2} - \frac{1}{\beta+2} \right)
\end{aligned}$$

I made mistake. Need to go over it again. I do not see it now. Maple does not verify.

```

restart;
ode:=diff(diff(y(x),x),x)+y(x)-sin(a*x)*sin(b*x)=0;
alpha:=a-b-1;
beta:=a+b-1;
yp:=1/4*(1/alpha*(sin(alpha*x)^2-cos(alpha*x)^2)+1/beta*(cos(beta*x)^2-sin(beta
*x)^2))+(1/4)*(1/(alpha+2)-1/(beta+2));
y0:=yp+_C1*sin(x)+_C2*cos(x);
not zero

```

2.1006 ODE No. 1006

$$y''(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0037038 (sec), leaf count = 20

```
DSolve[-y[x] + Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^x + c_2 e^{-x} \right\} \right\}$$

✓ **Maple** : cpu = 0.008 (sec), leaf count = 15

```
dsolve(diff(diff(y(x), x), x) - y(x) = 0, y(x))
```

$$y(x) = c_1 e^x + c_2 e^{-x}$$

Hand solution

$$y'' - y = 0 \tag{1}$$

Let $y = e^{\lambda x}$, substitution in above gives

$$\lambda^2 e^{\lambda x} - e^{\lambda x} = 0$$

$$\lambda^2 - 1 = 0$$

Hence $\lambda = \pm 1$, therefore the solution is

$$y_h = Ae^x + Be^{-x}$$

2.1007 ODE No. 1007

$$-4e^{x^2}x^2 + y''(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.131288 (sec), leaf count = 135

```
DSolve[-4*E^x^2*x^2 - 2*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{e^{-\sqrt{2}x} \left(-2e^{x(x+\sqrt{2})}x + 2e^{(x-\sqrt{2})x+2\sqrt{2}x}x + \sqrt{2}e^{x(x+\sqrt{2})} + \sqrt{2}e^{(x-\sqrt{2})x+2\sqrt{2}x} \right)}{2\sqrt{2}} + c_1e^{\sqrt{2}x} + c_2e^{-\sqrt{2}x} \right. \right.$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 26

```
dsolve(diff(diff(y(x),x),x)-2*y(x)-4*x^2*exp(x^2)=0,y(x))
```

$$y(x) = e^{x\sqrt{2}}c_2 + e^{-x\sqrt{2}}c_1 + e^{x^2}$$

Hand solution

$$y'' - 2y = 4x^2e^{x^2} \tag{1}$$

We start by solving the homogeneous equation

$$y'' - 2y = 0$$

Let $y = e^{\lambda x}$, substitution in above gives

$$\begin{aligned} \lambda^2 e^{\lambda x} - 2e^{\lambda x} &= 0 \\ \lambda^2 - 2 &= 0 \end{aligned}$$

Hence $\lambda = \pm\sqrt{2}$, therefore the solution is

$$\begin{aligned} y_h &= Ae^{\sqrt{2}x} + Be^{-\sqrt{2}x} \\ &= Ay_1 + By_2 \end{aligned}$$

Now we solve for the particular solution using variation of parameters.

$$y_p = u_1y_1 + u_2y_2$$

wronskian is

$$W = \begin{vmatrix} y_1 & y_2 \\ y_1' & y_2' \end{vmatrix} = \begin{vmatrix} e^{\sqrt{2}x} & e^{-\sqrt{2}x} \\ \sqrt{2}e^{\sqrt{2}x} & -\sqrt{2}e^{-\sqrt{2}x} \end{vmatrix} = -\sqrt{2} - \sqrt{2} = -2\sqrt{2}$$

Hence, using $f = 4x^2e^{x^2}$, which is the RHS of the ODE, and noting that a_0 is the coefficient of y'' which is one here, then

$$\begin{aligned} u_1 &= \int \frac{-y_2}{W} \frac{f}{a_0} dx = - \int \frac{e^{-\sqrt{2}x}}{-2\sqrt{2}} 4x^2e^{x^2} dx \\ &= \frac{2}{\sqrt{2}} \int x^2e^{x^2-\sqrt{2}x} dx \\ &= \frac{2}{\sqrt{2}} \left(\frac{1}{4}e^{x(x-\sqrt{2})} (\sqrt{2} + 2x) \right) \end{aligned}$$

And

$$\begin{aligned}
 u_2 &= \int \frac{y_1}{W} \frac{f}{a_0} dx = \int \frac{e^{\sqrt{2}x}}{-2\sqrt{2}} 4x^2 e^{x^2} dx \\
 &= \frac{-2}{\sqrt{2}} \int x^2 e^{x^2} \sqrt{2} x dx \\
 &= \frac{-2}{\sqrt{2}} \left(-\frac{1}{4} e^{x(x+\sqrt{2})} (\sqrt{2} - 2x) \right)
 \end{aligned}$$

Since $y_p = u_1 e^{\sqrt{2}x} + u_2 e^{-\sqrt{2}x}$ then

$$\begin{aligned}
 y_p &= \frac{2}{\sqrt{2}} \left(\frac{1}{4} e^{x(x-\sqrt{2})} (\sqrt{2} + 2x) \right) e^{\sqrt{2}x} - \frac{2}{\sqrt{2}} \left(-\frac{1}{4} e^{x(x+\sqrt{2})} (\sqrt{2} - 2x) \right) e^{-\sqrt{2}x} \\
 &= \frac{2}{\sqrt{2}} \frac{1}{4} e^{x^2} (\sqrt{2} + 2x) + \frac{2}{\sqrt{2}} \frac{1}{4} e^{x^2} (\sqrt{2} - 2x) \\
 &= \frac{1}{2} e^{x^2} + \frac{1}{2} e^{x^2} \\
 &= e^{x^2}
 \end{aligned}$$

Therefore, the full solution is

$$\begin{aligned}
 y &= y_h + y_p \\
 &= A e^{\sqrt{2}x} + B e^{-\sqrt{2}x} + e^{x^2}
 \end{aligned}$$

```

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 = 0.0427087 (sec), leaf count = 48

```
DSolve[-Cot[a*x] + a^2*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sin(ax) \left(\log \left(\cos \left(\frac{ax}{2} \right) \right) - \log \left(\sin \left(\frac{ax}{2} \right) \right) \right)}{a^2} + c_1 \cos(ax) + c_2 \sin(ax) \right\} \right\}$$

✓ **Maple** : cpu = 0.185 (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 = 0.0040704 (sec), leaf count = 28

```
DSolve[l*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \cos(\sqrt{l}x) + c_2 \sin(\sqrt{l}x) \right\} \right\}$$

✓ **Maple** : cpu = 0.023 (sec), leaf count = 21

```
dsolve(diff(diff(y(x), x), x) + l*y(x) = 0, y(x))
```

$$y(x) = c_1 \sin(\sqrt{l}x) + c_2 \cos(\sqrt{l}x)$$

2.1010 ODE No. 1010

$$y(x)(ax + b) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0050312 (sec), leaf count = 46

```
DSolve[(b + a*x)*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \text{Ai} \left(\frac{-b - ax}{(-a)^{2/3}} \right) + c_2 \text{Bi} \left(\frac{-b - ax}{(-a)^{2/3}} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.046 (sec), leaf count = 31

```
dsolve(diff(diff(y(x), x), x) + (a*x+b)*y(x)=0, y(x))
```

$$y(x) = c_1 \text{AiryAi} \left(-\frac{ax + b}{a^{2/3}} \right) + c_2 \text{AiryBi} \left(-\frac{ax + b}{a^{2/3}} \right)$$

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

$$\begin{aligned} \frac{d^2 y}{dx^2} &= \frac{d}{dx} \left(\frac{d\eta}{d\xi} a \right) \\ &= a \frac{d}{dx} \left(\frac{d\eta}{d\xi} \right) \\ &= a \left(\frac{d^2 \eta}{d\xi^2} \frac{d\xi}{dx} \right) \\ &= a^2 \frac{d^2 \eta}{d\xi^2} \end{aligned}$$

Therefore (1) becomes

$$\begin{aligned} a^2 \frac{d^2 \eta}{d\xi^2} + \xi \eta(\xi) &= 0 \\ a^2 \eta'' + \xi \eta &= 0 \end{aligned} \tag{2}$$

This is Airy ODE but with plus sign instead of the normal Airy $\eta'' - \xi \eta = 0$. Let

$$\begin{aligned}
\eta &= \sum_{n=0}^{\infty} c_n \xi^n \\
\eta' &= \sum_{n=0}^{\infty} n c_n \xi^{n-1} = \sum_{n=1}^{\infty} n c_n \xi^{n-1} = \sum_{n=0}^{\infty} (n+1) c_{n+1} \xi^n \\
\eta'' &= \sum_{n=0}^{\infty} n(n+1) c_{n+1} \xi^{n-1} = \sum_{n=1}^{\infty} n(n+1) c_{n+1} \xi^{n-1} = \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} \xi^n
\end{aligned}$$

Hence (2) becomes

$$\begin{aligned}
&a^2 \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} \xi^n + \xi \sum_{n=0}^{\infty} c_n \xi^n = 0 \\
&\sum_{n=0}^{\infty} a^2 (n+1)(n+2) c_{n+2} \xi^n + \sum_{n=0}^{\infty} c_n \xi^{n+1} = 0 \\
&\sum_{n=0}^{\infty} a^2 (n+1)(n+2) c_{n+2} \xi^n + \sum_{n=1}^{\infty} c_{n-1} \xi^n = 0 \\
&2a^2 c_2 + \sum_{n=1}^{\infty} (a^2 (n+1)(n+2) c_{n+2} + c_{n-1}) \xi^n = 0
\end{aligned}$$

Hence

$$2a^2 c_2 = 0 \quad (3)$$

$$a^2 (n+1)(n+2) c_{n+2} + c_{n-1} = 0 \quad n \geq 1 \quad (4)$$

From (3) and since $a \neq 0$

$$c_2 = 0$$

From (4)

$$c_{n+2} = \frac{-c_{n-1}}{a^2 (n+1)(n+2)}$$

Hence for $n = 3$, we see from the above recurrence equation and because $c_2 = 0$ that

$$c_5 = \frac{-c_2}{a^2 (4)(6)} = 0$$

Similarly, for $n = 6$

$$c_8 = \frac{-c_5}{a^2 (7)(8)} = 0$$

Similarly, for $n = 9$

$$c_{11} = \frac{-c_8}{a^2 (10)(11)} = 0$$

And so on. Hence we found so far that for $n = 3, 6, 9, 12, \dots$ all terms generated which are $c_5, c_8, c_{11}, \dots$ 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 $n = 3, 6, 9, 12, \dots$ all terms are zero. For $n = 1, 4, 7, \dots$ all terms are expressed using c_0 and for $n = 2, 5, 8, \dots$ all terms are expressed using c_1 . So there are two arbitrary constants c_0, c_1 .

In other words, $c_2, c_5, c_8, c_{11}, \dots = 0$ and $c_3, c_6, c_9, c_{12}, \dots = f(c_0)$ and $c_4, c_7, c_{10}, c_{13}, \dots = f(c_1)$.

$$\begin{aligned} \eta &= \sum_{n=0}^{\infty} c_n \xi^n \\ &= c_0 + c_1 \xi^1 + c_2 \xi^2 + c_3 \xi^3 + \dots \\ &= c_0 + (c_1 \xi^1) + 0 - \left(c_0 \frac{\xi^3}{a^2} \frac{1}{2 \cdot 3} \right) - \left(c_1 \frac{\xi^4}{a^2} \frac{1}{3 \cdot 4} \right) + 0 + c_0 \frac{\xi^6}{a^4} \frac{1}{2 \cdot 3 \cdot 5 \cdot 6} + c_1 \frac{\xi^7}{a^4} \frac{1}{3 \cdot 4 \cdot 6 \cdot 7} + 0 \\ &= c_0 \left(1 - \frac{\xi^3}{a^2} \frac{1}{2 \cdot 3} + \frac{\xi^6}{a^4} \frac{1}{2 \cdot 3 \cdot 5 \cdot 6} - \dots \right) + c_1 \left(\xi - \frac{\xi^4}{a^2} \frac{1}{3 \cdot 4} + \frac{\xi^7}{a^4} \frac{1}{3 \cdot 4 \cdot 6 \cdot 7} - \dots \right) \\ &= c_0 \left(1 - \frac{1}{a^2} \frac{\xi^3}{3!} + \frac{1 \cdot 4}{a^4} \frac{\xi^6}{6!} - \frac{1 \cdot 4 \cdot 7}{a^6} \frac{\xi^9}{9!} + \dots \right) + c_1 \left(\xi - \frac{\xi^4}{a^2} \frac{2}{4!} + \frac{\xi^7}{a^4} \frac{2 \cdot 5}{7!} - \frac{\xi^{10}}{a^6} \frac{2 \cdot 5 \cdot 8}{10!} + \dots \right) \end{aligned}$$

Hence

$$\eta = c_0 \left(\sum_{n=0}^{\infty} 3^n \left(\frac{1}{3} \right)_n \frac{(-1)^n}{a^{2n}} \frac{\xi^{3n}}{(3n)!} \right) + c_1 \left(\sum_{n=0}^{\infty} 3^n \left(\frac{2}{3} \right)_n \frac{(-1)^n}{a^{2n}} \frac{\xi^{3n+1}}{(3n+1)!} \right) \quad (5)$$

Where

$$\begin{aligned} 3^n \left(\frac{1}{3} \right)_n &= (1) \cdot (4) \cdot (7) \dots (3n-2) \\ 3^n \left(\frac{2}{3} \right)_n &= (2) \cdot (5) \cdot (8) \dots (3n-1) \end{aligned}$$

And

$$\left(\frac{1}{3}\right)_0 = \left(\frac{2}{3}\right)_0 = 1$$

Equation (5) can be simplified more by moving $\frac{(-1)^n}{a^{2n}}$ into ξ as follows

$$\eta = c_0 \left(\sum_{n=0}^{\infty} 3^n \left(\frac{1}{3}\right)_n \frac{1}{(3n)!} \left(\frac{-\xi}{a^{\frac{2}{3}}}\right)^{3n} \right) + ac_1 \left(\sum_{n=0}^{\infty} 3^n \left(\frac{2}{3}\right)_n \frac{1}{(3n+1)!} \left(\frac{-\xi}{a^{\frac{2}{3}}}\right)^{3n+1} \right)$$

Let $\left(\frac{-\xi}{a^{\frac{2}{3}}}\right) = z$ then the above is

$$\eta = c_0 \left(\sum_{n=0}^{\infty} 3^n \left(\frac{1}{3}\right)_n \frac{z^{3n}}{(3n)!} \right) + ac_1 \left(\sum_{n=0}^{\infty} 3^n \left(\frac{2}{3}\right)_n \frac{z^{3n+1}}{(3n+1)!} \right)$$

Let

$$f(\xi) = \sum_{n=0}^{\infty} 3^n \left(\frac{1}{3}\right)_n \frac{\xi^{3n}}{(3n)!}$$

$$g(\xi) = \sum_{n=0}^{\infty} 3^n \left(\frac{2}{3}\right)_n \frac{\xi^{3n+1}}{(3n+1)!}$$

Now looking at definition of $\text{AiryAI}(z)$ we see

$$\text{AiryAI}(z) = r_1 f(z) - r_2 g(z)$$

$$\text{AiryBI}(z) = \sqrt{3}(r_1 f(z) + r_2 g(z))$$

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 = 0.0049603 (sec), leaf count = 33

```
DSolve[(-1 - x^2)*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 D_{-1}(\sqrt{2}x) + c_2 D_0(i\sqrt{2}x) \right\} \right\}$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 17

```
dsolve(diff(diff(y(x), x), x) - (x^2 + 1)*y(x) = 0, y(x))
```

$$y(x) = e^{\frac{x^2}{2}} (\operatorname{erf}(x) c_2 + c_1)$$

Hand solution

$$y'' - (x^2 + 1) y = 0 \quad (1)$$

Second order with varying coefficient. Using power series, let $y = \sum_{n=0}^{\infty} c_n x^n$, hence

$$\begin{aligned} y' &= \sum_{n=0}^{\infty} n c_n x^{n-1} = \sum_{n=1}^{\infty} n c_n x^{n-1} = \sum_{n=0}^{\infty} (n+1) c_{n+1} x^n \\ y'' &= \sum_{n=0}^{\infty} n(n+1) c_{n+1} x^{n-1} = \sum_{n=1}^{\infty} n(n+1) c_{n+1} x^{n-1} = \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n \end{aligned}$$

Substituting back in the original ODE gives

$$\begin{aligned} \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n - (x^2 + 1) \sum_{n=0}^{\infty} c_n x^n &= 0 \\ \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n - x^2 \sum_{n=0}^{\infty} c_n x^n - \sum_{n=0}^{\infty} c_n x^n &= 0 \\ \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n - \sum_{n=0}^{\infty} c_n x^{n+2} - \sum_{n=0}^{\infty} c_n x^n &= 0 \\ \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n - \sum_{n=2}^{\infty} c_{n-2} x^n - \sum_{n=0}^{\infty} c_n x^n &= 0 \end{aligned}$$

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

$$\begin{aligned} y &= \sum_{n=0}^{\infty} c_n x^n \\ &= c_0 + c_1 x + c_2 x^2 + c_3 x^3 + \dots \\ &= c_0 + c_1 x + \frac{c_0}{2} x^2 + \frac{c_1}{6} x^3 + c_0 \frac{3}{(2)(3)(4)} x^4 + c_1 \frac{7}{(4)(5)(6)} x^5 + c_0 \frac{15}{(2)(3)(4)(5)(6)} x^6 + c_1 \frac{3}{560} x^7 + \dots \\ &= c_0 + c_1 x + \frac{c_0}{2} x^2 + \frac{c_1}{6} x^3 + c_0 \frac{1}{8} x^4 + c_1 \frac{7}{120} x^5 + c_0 \frac{1}{48} x^6 + c_1 \frac{3}{560} x^7 + \dots \\ &= c_0 \left(1 + \frac{x^2}{2} + \frac{1}{8} x^4 + \frac{1}{48} x^6 + \dots \right) + c_1 \left(x + \frac{1}{6} x^3 + \frac{7}{120} x^5 + \frac{3}{560} x^7 + \dots \right) \end{aligned}$$

Now the power series for $e^{\frac{x^2}{2}} = 1 + \frac{x^2}{2} + \frac{x^4}{8} + \frac{x^6}{48} + \dots$, so we can convert the first term above (the expression for c_0 to be $e^{\frac{x^2}{2}}$. Hence

$$c_0 \left(1 + \frac{x^2}{2} + \frac{1}{8} x^4 + \frac{1}{48} x^6 + \dots \right) = c_0 e^{\frac{x^2}{2}}$$

So now we have to work on the second term (the expression for c_1)

$$c_1 \left(x + \frac{1}{6} x^3 + \frac{7}{120} x^5 + \frac{3}{560} x^7 + \dots \right) = ?$$

Recall that series for error function is

$$\operatorname{erf}(x) = \frac{2}{\sqrt{\pi}} \left(x - \frac{x^3}{3} + \frac{x^5}{10} - \frac{x^7}{48} + \dots \right)$$

Multiplying $e^{\frac{x^2}{2}}$ by $\operatorname{erf}(x)$ gives

$$\begin{aligned} e^{\frac{x^2}{2}} \operatorname{erf}(x) &= \frac{2}{\sqrt{\pi}} \left(1 + \frac{x^2}{2} + \frac{x^4}{(2)(4)} + \frac{x^6}{(2)(4)(6)} + \dots \right) \left(x - \frac{x^3}{3} + \frac{x^5}{10} - \frac{x^7}{48} + \dots \right) \\ &= \frac{2}{\sqrt{\pi}} \left(x - \frac{x^3}{3} + \frac{x^5}{10} - \frac{x^7}{48} + \dots + \frac{x^3}{2} - \frac{x^5}{6} + \frac{x^7}{20} - \frac{x^{15}}{96} + \dots \right) \\ &= \frac{2}{\sqrt{\pi}} \left(x + \frac{x^3}{6} + \frac{7x^5}{120} + \frac{3}{560} x^7 + \dots \right) \end{aligned}$$

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

$$\begin{aligned} y &= c_0 \left(1 + \frac{x^2}{2} + \frac{1}{8} x^4 + \frac{1}{48} x^6 + \dots \right) + c_1 \left(x + \frac{1}{6} x^3 + \frac{7}{120} x^5 + \frac{3}{560} x^7 + \dots \right) \\ &= c_0 e^{\frac{x^2}{2}} + c_1 \left(e^{\frac{x^2}{2}} \operatorname{erf}(x) \right) \end{aligned}$$

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

$$\left(-a-x^2\right) y(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0056069 (sec), leaf count = 47

```
DSolve[(-a - x^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1 D_{\frac{1}{2}(-a-1)}\left(\sqrt{2} x\right)+c_2 D_{\frac{a-1}{2}}\left(i \sqrt{2} x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.145 (sec), leaf count = 29

```
dsolve(diff(diff(y(x),x),x)-(x^2+a)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2 \operatorname{WhittakerW}\left(-\frac{a}{4}, \frac{1}{4}, x^2\right)+c_1 \operatorname{WhittakerM}\left(-\frac{a}{4}, \frac{1}{4}, x^2\right)}{\sqrt{x}}$$

2.1013 ODE No. 1013

$$(-a^2x^2 - a)y(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0098912 (sec), leaf count = 43

```
DSolve[(-a - a^2*x^2)*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 D_{-1} \left(\sqrt{2} \sqrt{ax} \right) + c_2 D_0 \left(i \sqrt{2} \sqrt{ax} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 22

```
dsolve(diff(diff(y(x), x), x) - (a^2*x^2+a)*y(x)=0, y(x))
```

$$y(x) = e^{\frac{ax^2}{2}} \left(\operatorname{erf} \left(\sqrt{a} x \right) c_2 + c_1 \right)$$

2.1014 ODE No. 1014

$$y''(x) - cx^a y(x) = 0$$

✓ **Mathematica** : cpu = 0.0157786 (sec), leaf count = 170

```
DSolve[-(c*x^a*y[x]) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow (a+2)^{-\frac{1}{a+2}} c_1 c^{\frac{1}{2(a+2)}} x^{\frac{\frac{a}{2}+1}{a+2}} \Gamma\left(1 - \frac{1}{a+2}\right) I_{-\frac{1}{a+2}}\left(\frac{2\sqrt{c} x^{\frac{a+2}{2}}}{a+2}\right) + (-1)^{\frac{1}{a+2}} (a+2)^{-\frac{1}{a+2}} c_2 c^{\frac{1}{2(a+2)}} x^{1-\frac{\frac{a}{2}+1}{a+2}} \right. \right.$$

✓ **Maple** : cpu = 0.211 (sec), leaf count = 63

```
dsolve(diff(diff(y(x),x),x)-c*x^a*y(x)=0,y(x))
```

$$y(x) = \sqrt{x} \left(\text{BesselY}\left(\frac{1}{a+2}, \frac{2\sqrt{-c} x^{\frac{a}{2}+1}}{a+2}\right) c_2 + \text{BesselJ}\left(\frac{1}{a+2}, \frac{2\sqrt{-c} x^{\frac{a}{2}+1}}{a+2}\right) c_1 \right)$$

2.1015

ODE No. 1015

$$y(x)\left(1-a^2x^{2n}\right)+y''(x)=0$$

 **Mathematica** : cpu = 0.146801 (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

$$y(x)=\text{DESol}\left(\left\{\frac{d^2}{dx^2}-Y(x)+\left(-a^2x^{2n}+1\right)_-Y(x)\right\},\left\{_-Y(x)\right\}\right)$$

2.1016

ODE No. 1016

$$y(x)\left(ax^{2c}+bx^{c-1}\right)+y''(x)=0$$

✓

Mathematica : cpu = 0.101125 (sec), leaf count = 312

`DSolve[(b*x^(-1 + c) + a*x^(2*c))*y[x] + Derivative[2][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow 2^{\frac{c}{2(c+1)}}c_1\left(x^{c+1}\right)^{\frac{c}{2(c+1)}}x^{-c/2}e^{-\frac{\sqrt{a}x^{c+1}}{\sqrt{-c^2-2c-1}}}U\left(\frac{\frac{\sqrt{a}cb}{\sqrt{-(c+1)^2}}+\frac{\sqrt{a}b}{\sqrt{-(c+1)^2}}+ac}{2(ca+a)},\frac{c}{c+1},\frac{2\sqrt{a}x^{c+1}}{\sqrt{-c^2-2c-1}}\right)+2\right.\right.$$

✓

Maple : cpu = 0.371 (sec), leaf count = 91

`dsolve(diff(diff(y(x),x),x)+(a*x^(2*c)+b*x^(c-1))*y(x)=0,y(x))`

$$y(x)=x^{-\frac{c}{2}}\left(\text{WhittakerM}\left(-\frac{ib}{\sqrt{a}\left(2c+2\right)},\frac{1}{2c+2},\frac{2i\sqrt{a}x^{c+1}}{c+1}\right)c_1+\text{WhittakerW}\left(-\frac{ib}{\sqrt{a}\left(2c+2\right)},\frac{1}{2c+2},\frac{2i\sqrt{a}x^{c+1}}{c+1}\right)c_2\right)$$

2.1017 ODE No. 1017

$$(e^{2x} - v^2) y(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0156501 (sec), leaf count = 46

```
DSolve[(E^(2*x) - v^2)*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \Gamma(1-v) J_{-v}(\sqrt{e^{2x}}) + c_2 \Gamma(v+1) J_v(\sqrt{e^{2x}}) \right\} \right\}$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 17

```
dsolve(diff(diff(y(x), x), x) + (exp(2*x) - v^2)*y(x) = 0, y(x))
```

$$y(x) = c_1 \text{BesselJ}(v, e^x) + c_2 \text{BesselY}(v, e^x)$$

2.1018 ODE No. 1018

$$ae^{bx}y(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0135391 (sec), leaf count = 55

```
DSolve[a*E^(b*x)*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 J_0 \left(\frac{2\sqrt{a}\sqrt{e^{bx}}}{b} \right) + 2c_2 Y_0 \left(\frac{2\sqrt{a}\sqrt{e^{bx}}}{b} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.106 (sec), leaf count = 39

```
dsolve(diff(diff(y(x), x), x) + a*exp(b*x)*y(x) = 0, y(x))
```

$$y(x) = c_1 \text{BesselJ} \left(0, \frac{2\sqrt{a} e^{\frac{bx}{2}}}{b} \right) + c_2 \text{BesselY} \left(0, \frac{2\sqrt{a} e^{\frac{bx}{2}}}{b} \right)$$

2.1019 ODE No. 1019

$$y(x) \left(1 - 4a^2b^2x^2e^{2bx^2}\right) + y''(x) = 0$$

✗ Mathematica : cpu = 0.306785 (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

$$y(x) = \text{DESol} \left(\left\{ \frac{d^2}{dx^2} - Y(x) + \left(-4a^2b^2x^2e^{2bx^2} + 1 \right) - Y(x) \right\}, \{ - Y(x) \} \right)$$

2.1020

ODE No. 1020

$$y(x)\left(ae^{2x}+be^x+c\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.265549 (sec), leaf count = 180

```
DSolve[(c + b*E^x + a*E^(2*x))*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{i(\sqrt{c}\log(e^x)-\sqrt{a}e^x)}U\left(\frac{i(b-i\sqrt{a}+2\sqrt{a}\sqrt{c})}{2\sqrt{a}},2i\sqrt{c}+1,2i\sqrt{a}e^x\right)+c_2e^{i(\sqrt{c}\log(e^x)-\sqrt{a}e^x)}L_{-\frac{i(b-i\sqrt{a}+2\sqrt{a}\sqrt{c})}{2\sqrt{a}}}^{2i\sqrt{c}}\right.\right.$$

✓ **Maple** : cpu = 0.395 (sec), leaf count = 58

```
dsolve(diff(diff(y(x),x),x)+(a*exp(2*x)+b*exp(x)+c)*y(x)=0,y(x))
```

$$y(x)=e^{-\frac{x}{2}}\left(\text{WhittakerM}\left(-\frac{ib}{2\sqrt{a}},i\sqrt{c},2i\sqrt{a}e^x\right)c_1+\text{WhittakerW}\left(-\frac{ib}{2\sqrt{a}},i\sqrt{c},2i\sqrt{a}e^x\right)c_2\right)$$

2.1021

ODE No. 1021

$$y(x)\left(a\cos^2(x)+b\right)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0119724 (sec), leaf count = 44

```
DSolve[(b + a*Cos[x]^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1\text{MathieuC}\left[\frac{1}{2}(a+2b),-\frac{a}{4},x\right]+c_2\text{MathieuS}\left[\frac{1}{2}(a+2b),-\frac{a}{4},x\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.33 (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 = 0.0088949 (sec), leaf count = 28

```
DSolve[(b + a*Cos[2*x])*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \text{MathieuC}\left[b, -\frac{a}{2}, x\right] + c_2 \text{MathieuS}\left[b, -\frac{a}{2}, x\right] \right\} \right\}$$

✓ **Maple** : cpu = 0.332 (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 = 0.0081067 (sec), leaf count = 44

```
DSolve[(b + a*Cos[x]^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1\text{MathieuC}\left[\frac{1}{2}(a+2b),-\frac{a}{4},x\right]+c_2\text{MathieuS}\left[\frac{1}{2}(a+2b),-\frac{a}{4},x\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.288 (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

$$y''(x) + y(x) (-2 \tan^2(x) - 1) = 0$$

✓ **Mathematica** : cpu = 0.166874 (sec), leaf count = 52

```
DSolve[(-1 - 2*Tan[x]^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \sec(x) + \frac{1}{2} c_2 \sec(x) \left(\tan^{-1} \left(\frac{\cos(x)}{\sqrt{1 - \cos^2(x)}} \right) - \cos(x) \sqrt{1 - \cos^2(x)} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.24 (sec), leaf count = 28

```
dsolve(diff(diff(y(x),x),x)-(1+2*tan(x)^2)*y(x)=0,y(x))
```

$$y(x) = \sec(x) (i \sin(x) \cos(x) c_2 + \ln(\cos(x) + i \sin(x)) c_2 + c_1)$$

2.1025

ODE No. 1025

$y(x) \left(-a - (m - 1)m \sec^2(x) - ((n - 1)n \csc^2(x))\right) + y''(x) = 0$

✓ **Mathematica** : cpu = 0.613452 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_2(-1)^{\frac{1}{2}(-2m-1)+1} \cos^2(x)^{\frac{1}{4}(-2m-1)+1} (\cos^2(x) - 1)^{\frac{1}{2}\left(\frac{4am+4\sqrt{-a}n^2+4an-4\sqrt{-a}n+4(-a)^{3/2}+8\sqrt{-a}a+\sqrt{-a}+4mn^2-4m^2n}{8a+8n^2-8n+2}\right)}\right.}\right.$$

✓ **Maple** : cpu = 0.313 (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))
```

$$y(x) = \sin(x)^n \left(\cos(x)^{-m+1} \operatorname{hypergeom}\left(\left[\frac{n}{2} - \frac{m}{2} + \frac{i\sqrt{a}}{2} + \frac{1}{2}, \frac{n}{2} - \frac{m}{2} - \frac{i\sqrt{a}}{2} + \frac{1}{2}\right], \left[\frac{3}{2} - m\right], \cos(x)^2\right) c_2\right.$$

2.1026

ODE No. 1026

$$y''(x) - y(x)(B + n(n + 1)\wp(x; g2, g3)) = 0$$

X Mathematica : cpu = 0.112967 (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

$$y(x) = \text{DESol}\left(\left\{\frac{d^2}{dx^2}Y(x) + (-n(n + 1)\text{WeierstrassP}(x, g2, g3) - B)Y(x)\right\}, \{Y(x)\}\right)$$

2.1027

ODE No. 1027

$$y(x)\left(a\operatorname{sn}(x|k)^2+b\right) +y''(x)=0$$

✓ **Mathematica** : cpu = 0.711807 (sec), leaf count = 235

```
DSolve[(b + a*JacobiSN[x, k]^2)*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1\sqrt{k\operatorname{sn}(x|k)^2-1}\operatorname{HeunG}\left[\frac{1}{k},-\frac{b-k}{4k},\frac{\sqrt{k-4a}+3\sqrt{k}}{4\sqrt{k}},\frac{\sqrt{k}\sqrt{k-4a}+2a+k}{2\sqrt{k}\left(\sqrt{k-4a}+\sqrt{k}\right)},\frac{1}{2},\frac{1}{2},\operatorname{sn}(x|k)^2\right]\right\}\right.$$

✓ **Maple** : cpu = 0.537 (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))
```

$$y(x)=c_1\operatorname{HeunG}\left(\frac{1}{k^2},\frac{b}{4k^2},-\frac{n}{2},\frac{n}{2}+\frac{1}{2},\frac{1}{2},\frac{1}{2},\operatorname{JacobiSN}(x,k)^2\right)+c_2\operatorname{HeunG}\left(\frac{1}{k^2},\frac{k^2+b+1}{4k^2},\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2},\frac{1}{2},\frac{1}{2},\operatorname{JacobiSN}(x,k)^2\right)$$

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 = 0.146279 (sec), leaf count = 0

```
DSolve[-(y[x]*(b + a*p[x] + (p^4)[x]/30 + (7*Derivative[2][p][x])/3)) + Derivative[2][y][x] ==
```

, could not solve

```
DSolve[-(y[x]*(b + a*p[x] + (p^4)[x]/30 + (7*Derivative[2][p][x])/3)) + Derivative[2][y][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),x))-
```

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ \frac{d^2}{dx^2} Y(x) + \left(-\frac{\frac{d^4}{dx^4} p(x)}{30} - \frac{7 \frac{d^2}{dx^2} p(x)}{3} - ap(x) - b \right) Y(x) \right\}, \{ \_ Y(x) \} \right)$$

2.1029

ODE No. 1029

$$y''(x) - y(x) \left(f'(x) + f(x)^2\right) = 0$$

✓ **Mathematica** : cpu = 0.0178158 (sec), leaf count = 58

```
DSolve[-(y[x]*(f[x]^2 + Derivative[1][f][x])) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1 \exp \left(\int_1^x f(K[1]) d K[1]\right)+c_2 \exp \left(\int_1^x f(K[2]) d K[2]\right) \int_1^x \exp \left(\int_1^{K[4]}-2 f(K[3]) d K[3]\right) d K[4]\right.\right.$$

✓ **Maple** : cpu = 0.184 (sec), leaf count = 22

```
dsolve(diff(diff(y(x),x),x)-(f(x)^2+diff(f(x),x))*y(x)=0,y(x))
```

$$y(x)=\left(\int e^{\int-2 f(x) d x} d x+c_1\right) e^{\int f(x) d x} c_2$$

2.1030

ODE No. 1030

$$y(x)(l+P(x))+y''(x)=0$$

X Mathematica : cpu = 0.115723 (sec), leaf count = 0

```
DSolve[(1 + P[x])*y[x] + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[(1 + P[x])*y[x] + Derivative[2][y][x] == 0, y[x], x]
```

X Maple : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+(P(x)+1)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=\text{DESol}\left(\left\{(P(x)+l)\_Y(x)+\frac{d^2}{dx^2}\_Y(x)\right\},\{\_Y(x)\}\right)$$

2.1031 ODE No. 1031

$$y''(x) - f(x)y(x) = 0$$

X **Mathematica** : cpu = 0.0752583 (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]
```

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 = 0.308938 (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][x]^2 + Derivative[2][g][x]^2)/4, y[x], x]
```

, could not solve

```
DSolve[y[x]*((g^3)[x]/(2*Derivative[1][g][x])) + Derivative[1][g][x]^2 + ((1/4 - v^2)*Derivative[1][g][x]^2 + Derivative[2][g][x]^2)/4, y[x], x]
```

 **Maple** : cpu = 0.177 (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),x),x))/diff(g(x),x),y(x))=0,x)
```

$$y(x)=\frac{c_2\operatorname{WhittakerW}\left(\frac{1}{2}iv^2-\frac{1}{8}i,\frac{1}{2},2ig(x)\right)+c_1\operatorname{WhittakerM}\left(\frac{1}{2}iv^2-\frac{1}{8}i,\frac{1}{2},2ig(x)\right)}{\sqrt{\frac{d}{dx}g(x)}}$$

2.1033 ODE No. 1033

$$ae^{-2x}y(x) + y''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0154347 (sec), leaf count = 37

```
DSolve[(a*y[x])/E^(2*x) + Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \cos \left(\sqrt{a} e^{-x} \right) - c_2 \sin \left(\sqrt{a} e^{-x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.025 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)+a*exp(-2*x)*y(x)=0,y(x))
```

$$y(x) = c_1 \sin \left(e^{-x} \sqrt{a} \right) + c_2 \cos \left(e^{-x} \sqrt{a} \right)$$

Hand solution

$$y'' + y' + ae^{-2x}y = 0$$

Let $y(x) = \eta(\xi)$ where $\xi = e^{-x}$, hence

$$\begin{aligned} \frac{dy}{dx} &= \frac{d\eta}{d\xi} \frac{d\xi}{dx} \\ &= \frac{d\eta}{d\xi} (-e^{-x}) \end{aligned}$$

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

$$\begin{aligned} \frac{d^2\eta}{d\xi^2} (e^{-2x}) + \frac{d\eta}{d\xi} (e^{-x}) + \frac{d\eta}{d\xi} (-e^{-x}) + ae^{-2x}\eta(\xi) &= 0 \\ \eta'' + a\eta &= 0 \end{aligned}$$

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 = 0.0092987 (sec), leaf count = 20

```
DSolve[E^(2*x)*y[x] - Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \rightarrow c_1 \cos(e^x) + c_2 \sin(e^x)\}\}$$

✓ **Maple** : cpu = 0.023 (sec), leaf count = 15

```
dsolve(diff(diff(y(x),x),x)-diff(y(x),x)+exp(2*x)*y(x)=0,y(x))
```

$$y(x) = c_1 \sin(e^x) + c_2 \cos(e^x)$$

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 = 0.0045289 (sec), leaf count = 58

```
DSolve[b*y[x] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1 e^{\frac{1}{2} x \left(-\sqrt{a^2-4 b}-a\right)}+c_2 e^{\frac{1}{2} x \left(\sqrt{a^2-4 b}-a\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.012 (sec), leaf count = 41

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*y(x)=0,y(x))
```

$$y(x) = c_1 e^{-\frac{\left(a-\sqrt{a^2-4 b}\right) x}{2}}+c_2 e^{-\frac{\left(a+\sqrt{a^2-4 b}\right) x}{2}}$$

2.1036

ODE No. 1036

$ay'(x)+by(x)-f(x)+y''(x)=0$

✓

Mathematica : cpu = 0.0879073 (sec), leaf count = 209

`DSolve[-f[x] + b*y[x] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow e^{\frac{1}{2}x\left(-\sqrt{a^2-4b}-a\right)}\int_1^x-\frac{e^{aK[1]+\frac{1}{2}\left(\sqrt{a^2-4b}-a\right)K[1]}f(K[1])}{\sqrt{a^2-4b}}dK[1]+e^{\frac{1}{2}x\left(\sqrt{a^2-4b}-a\right)}\int_1^xe^{aK[2]+\frac{1}{2}\left(-a-\sqrt{a^2-4b}\right)K[2]}\frac{f(K[2])}{\sqrt{a^2-4b}}dK[2]+c_1\right\}\right.$$

✓

Maple : cpu = 0.204 (sec), leaf count = 134

`dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*y(x)-f(x)=0,y(x))`

$$y(x)=e^{-\frac{(a-\sqrt{a^2-4b})x}{2}}c_2+e^{-\frac{(a+\sqrt{a^2-4b})x}{2}}c_1+\frac{e^{-ax}\left(\left(\int f(x)e^{-\frac{(-a+\sqrt{a^2-4b})x}{2}}dx\right)e^{\frac{(a+\sqrt{a^2-4b})x}{2}}-\left(\int f(x)e^{\frac{(a+\sqrt{a^2-4b})x}{2}}dx\right)e^{-\frac{(a-\sqrt{a^2-4b})x}{2}}\right)}{\sqrt{a^2-4b}}$$

2.1037 ODE No. 1037

$$ay'(x) + y(x) \left(-b^2x^2 - c\right) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0161222 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-\frac{ax}{2} - \frac{bx^2}{2}} H_{-\frac{a^2-4b-4c}{8b}} \left(\sqrt{b}x \right) + c_2 e^{-\frac{ax}{2} - \frac{bx^2}{2}} {}_1F_1 \left(-\frac{-a^2-4b-4c}{16b}; \frac{1}{2}; bx^2 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.182 (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))
```

$$y(x) = e^{-\frac{x(bx+a)}{2}} x \left(\text{KummerU} \left(\frac{a^2+12b+4c}{16b}, \frac{3}{2}, bx^2 \right) c_2 + \text{KummerM} \left(\frac{a^2+12b+4c}{16b}, \frac{3}{2}, bx^2 \right) c_1 \right)$$

2.1038 ODE No. 1038

$$2ay'(x) + f(x)y(x) + y''(x) = 0$$

X **Mathematica** : cpu = 0.185359 (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]
```

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

$$y(x) = \text{DESol} \left(\left\{ f(x) \_ Y(x) + 2a \left(\frac{d}{dx} \_ Y(x) \right) + \frac{d^2}{dx^2} \_ Y(x) \right\}, \{ \_ Y(x) \} \right)$$

2.1039

ODE No. 1039

$$y''(x) + xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0225599 (sec), leaf count = 47

```
DSolve[y[x] + x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \sqrt{\frac{\pi}{2}} c_1 e^{-\frac{x^2}{2}} \operatorname{erfi}\left(\frac{x}{\sqrt{2}}\right) + c_2 e^{-\frac{x^2}{2}} \right\} \right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 25

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = \left(\operatorname{erf}\left(\frac{i\sqrt{2}x}{2}\right) c_1 + c_2 \right) e^{-\frac{x^2}{2}}$$

2.1040

ODE No. 1040

$$y''(x)+xy'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0560492 (sec), leaf count = 53

```
DSolve[-y[x] + x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1x-\frac{1}{2}c_2e^{-\frac{x^2}{2}}\left(\sqrt{2\pi}e^{\frac{x^2}{2}}x\operatorname{erf}\left(\frac{x}{\sqrt{2}}\right)+2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.065 (sec), leaf count = 33

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x)=\sqrt{\pi}\sqrt{2}e^{-\frac{x^2}{2}}c_2+x\left(\pi c_2\operatorname{erf}\left(\frac{x\sqrt{2}}{2}\right)+c_1\right)$$

2.1041

ODE No. 1041

$$(n+1)y(x)+y''(x)+xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0063327 (sec), leaf count = 55

```
DSolve[(1 + n)*y[x] + x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{-\frac{x^2}{2}}H_n\left(\frac{x}{\sqrt{2}}\right)+c_2e^{-\frac{x^2}{2}}{}_1F_1\left(-\frac{n}{2};\frac{1}{2};\frac{x^2}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.13 (sec), leaf count = 41

```
dsolve(diff(diff(y(x),x),x)+x*diff(y(x),x)+(n+1)*y(x)=0,y(x))
```

$$y(x)=e^{-\frac{x^2}{2}}x\left(\text{KummerU}\left(-\frac{n}{2}+\frac{1}{2},\frac{3}{2},\frac{x^2}{2}\right)c_2+\text{KummerM}\left(-\frac{n}{2}+\frac{1}{2},\frac{3}{2},\frac{x^2}{2}\right)c_1\right)$$

2.1042 ODE No. 1042

$$-ny(x) + y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0058436 (sec), leaf count = 61

```
DSolve[-(n*y[x]) + x*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-\frac{x^2}{2}} H_{-n-1} \left(\frac{x}{\sqrt{2}} \right) + c_2 e^{-\frac{x^2}{2}} {}_1F_1 \left(\frac{n+1}{2}; \frac{1}{2}; \frac{x^2}{2} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.127 (sec), leaf count = 41

```
dsolve(diff(diff(y(x), x), x) + x*diff(y(x), x) - n*y(x) = 0, y(x))
```

$$y(x) = e^{-\frac{x^2}{2}} x \left(\text{KummerU} \left(\frac{n}{2} + 1, \frac{3}{2}, \frac{x^2}{2} \right) c_2 + \text{KummerM} \left(\frac{n}{2} + 1, \frac{3}{2}, \frac{x^2}{2} \right) c_1 \right)$$

2.1043 ODE No. 1043

$$y''(x) - xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.140662 (sec), leaf count = 69

```
DSolve[2*y[x] - x*Derivative[1][y][x] + Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4} c_2 \left(\sqrt{2\pi} x^2 \operatorname{erfi} \left(\frac{x}{\sqrt{2}} \right) - \sqrt{2\pi} \operatorname{erfi} \left(\frac{x}{\sqrt{2}} \right) - 2e^{\frac{x^2}{2}} x \right) + c_1 (x^2 - 1) \right\} \right\}$$

✓ **Maple** : cpu = 0.39 (sec), leaf count = 39

```
dsolve(diff(diff(y(x), x), x) - x*diff(y(x), x) + 2*y(x) = 0, y(x))
```

$$y(x) = -2e^{\frac{x^2}{2}} c_1 x + (x - 1)(1 + x) \left(\sqrt{2} \sqrt{\pi} \operatorname{erfi} \left(\frac{x\sqrt{2}}{2} \right) c_1 + c_2 \right)$$

Hand solution

$$y'' - xy' + 2y = 0 \quad (1)$$

Second order with varying coefficient. Using power series, let $y = \sum_{n=0}^{\infty} c_n x^n$, hence

$$\begin{aligned} y' &= \sum_{n=0}^{\infty} n c_n x^{n-1} = \sum_{n=1}^{\infty} n c_n x^{n-1} = \sum_{n=0}^{\infty} (n+1) c_{n+1} x^n \\ y'' &= \sum_{n=0}^{\infty} n(n+1) c_{n+1} x^{n-1} = \sum_{n=1}^{\infty} n(n+1) c_{n+1} x^{n-1} = \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n \end{aligned}$$

Substituting back in the original ODE gives

$$\begin{aligned} \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n - x \sum_{n=0}^{\infty} (n+1) c_{n+1} x^n + 2 \sum_{n=0}^{\infty} c_n x^n &= 0 \\ \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n - \sum_{n=0}^{\infty} (n+1) c_{n+1} x^{n+1} + \sum_{n=0}^{\infty} 2c_n x^n &= 0 \\ \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n - \sum_{n=1}^{\infty} n c_n x^n + \sum_{n=0}^{\infty} 2c_n x^n &= 0 \end{aligned}$$

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

$$\begin{aligned} y &= \sum_{n=0}^{\infty} c_n x^n \\ &= c_0 + c_1 x + c_2 x^2 + c_3 x^3 + \dots \\ &= c_0 + c_1 x - c_0 x^2 - \frac{c_1}{(2)(3)} x^3 - \frac{c_1}{(2)(3)(4)(5)} x^5 - \frac{3c_1}{(2)(3)(4)(5)(6)(7)} x^7 - \frac{(3)(5)c_1}{(2)(3)(4)(5)(6)(7)(8)(9)} x^9 \\ &= c_0(1-x^2) + c_1 \left(x - \frac{1}{(2)(3)} x^3 - \frac{1}{(2)(3)(4)(5)} x^5 - \frac{3}{(2)(3)(4)(5)(6)(7)} x^7 - \frac{(3)(5)}{(2)(3)(4)(5)(6)(7)(8)(9)} x^9 \right) \\ &= c_0(1-x^2) + c_1 \left(x - \frac{1}{3!} x^3 - \frac{1}{5!} x^5 - \frac{3}{7!} x^7 - \frac{15}{9!} x^9 - \dots \right) \end{aligned}$$

Hence

$$y(x) = c_0(1-x^2) + c_1 \left(x - \frac{1}{6} x^3 - \frac{1}{120} x^5 - \frac{1}{1680} x^7 - \frac{1}{24192} x^9 - \dots \right)$$

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 = 0.0061337 (sec), leaf count = 39

```
DSolve[-(a*y[x]) - x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1H_{-a}\left(\frac{x}{\sqrt{2}}\right)+c_2{}_1F_1\left(\frac{a}{2};\frac{1}{2};\frac{x^2}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.129 (sec), leaf count = 35

```
dsolve(diff(diff(y(x),x),x)-x*diff(y(x),x)-a*y(x)=0,y(x))
```

$$y(x)=x\left(\text{KummerU}\left(\frac{1}{2}+\frac{a}{2},\frac{3}{2},\frac{x^2}{2}\right)c_2+\text{KummerM}\left(\frac{1}{2}+\frac{a}{2},\frac{3}{2},\frac{x^2}{2}\right)c_1\right)$$

2.1045

ODE No. 1045

$$y''(x) - xy'(x) + (x - 1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0260477 (sec), leaf count = 39

```
DSolve[(-1 + x)*y[x] - x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \sqrt{\frac{\pi}{2}} c_2 e^{x-2} \operatorname{erfi}\left(\frac{x-2}{\sqrt{2}}\right) + c_1 e^x \right\} \right\}$$

✓ **Maple** : cpu = 0.02 (sec), leaf count = 21

```
dsolve(diff(diff(y(x),x),x)-x*diff(y(x),x)+(x-1)*y(x)=0,y(x))
```

$$y(x) = e^x \left(\operatorname{erf}\left(\frac{i\sqrt{2}(x-2)}{2}\right) c_1 + c_2 \right)$$

2.1046

ODE No. 1046

$$ay(x) + y''(x) - 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0051747 (sec), leaf count = 31

```
DSolve[a*y[x] - 2*x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 H_{\frac{a}{2}}(x) + c_2 {}_1F_1\left(-\frac{a}{4}; \frac{1}{2}; x^2\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.141 (sec), leaf count = 31

```
dsolve(diff(diff(y(x),x),x)-2*x*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = x \left(\text{KummerU}\left(\frac{1}{2} - \frac{a}{4}, \frac{3}{2}, x^2\right) c_2 + \text{KummerM}\left(\frac{1}{2} - \frac{a}{4}, \frac{3}{2}, x^2\right) c_1 \right)$$

2.1047 ODE No. 1047

$$(4x^2 + 2)y(x) + y''(x) + 4xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0083742 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-x^2} + c_2 e^{-x^2} x \right\} \right\}$$

✓ **Maple** : cpu = 0.037 (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))
```

$$y(x) = e^{-x^2}(c_2 x + c_1)$$

Hand solution

$$y'' + 4xy' + (4x^2 + 2)y = 0 \quad (1)$$

Second order with varying coefficient. Using power series, let $y = \sum_{n=0}^{\infty} c_n x^n$, hence

$$\begin{aligned} y' &= \sum_{n=0}^{\infty} n c_n x^{n-1} = \sum_{n=1}^{\infty} n c_n x^{n-1} = \sum_{n=0}^{\infty} (n+1) c_{n+1} x^n \\ y'' &= \sum_{n=0}^{\infty} n(n+1) c_{n+1} x^{n-1} = \sum_{n=1}^{\infty} n(n+1) c_{n+1} x^{n-1} = \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n \end{aligned}$$

Substituting back in the original ODE gives

$$\begin{aligned} \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n + 4x \sum_{n=0}^{\infty} (n+1) c_{n+1} x^n + (4x^2 + 2) \sum_{n=0}^{\infty} c_n x^n &= 0 \\ \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n + \sum_{n=0}^{\infty} 4(n+1) c_{n+1} x^{n+1} + \sum_{n=0}^{\infty} 4c_n x^{n+2} + \sum_{n=0}^{\infty} 2c_n x^n &= 0 \\ \sum_{n=0}^{\infty} (n+1)(n+2) c_{n+2} x^n + \sum_{n=1}^{\infty} 4n c_n x^n + \sum_{n=2}^{\infty} 4c_{n-2} x^n + \sum_{n=0}^{\infty} 2c_n x^n &= 0 \end{aligned}$$

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 $n = 1$

$$\begin{aligned} (n+1)(n+2) c_{n+2} + 4n c_n + 2c_n &= 0 \\ (2)(3) c_3 + 4c_1 + 2c_1 &= 0 \\ c_3 &= -c_1 \end{aligned}$$

For $n \geq 2$

$$\begin{aligned} (n+1)(n+2) c_{n+2} + 4n c_n + 4c_{n-2} + 2c_n &= 0 \\ c_{n+2} &= \frac{(-4n-2) c_n - 4c_{n-2}}{(n+1)(n+2)} \end{aligned}$$

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

$$\begin{aligned} y &= \sum_{n=0}^{\infty} c_n x^n \\ &= c_0 + c_1 x + c_2 x^2 + \dots \\ &= c_0 + c_1 x - c_0 x^2 - c_1 x^3 + c_0 \frac{6}{(3)(4)} x^4 + c_1 \frac{10}{(4)(5)} x^5 - c_0 \frac{5}{(5)(7)} x^6 - c_1 \frac{7}{(6)(7)} x^7 + c_0 \frac{12}{7} \frac{1}{(7)(8)} x^8 + \dots \\ &= c_0 \left(1 - x^2 + \frac{6}{(3)(4)} x^4 - \frac{5}{(5)(6)} x^6 + \frac{7}{3} \frac{1}{(7)(8)} x^8 + \dots \right) + c_1 \left(x - x^3 + \frac{10}{(4)(5)} x^5 - \frac{7}{(6)(7)} x^7 + \dots \right) \\ &= c_0 \left(1 - x^2 + \frac{1}{2} x^4 - \frac{1}{6} x^6 + \frac{1}{24} x^8 + \dots \right) + c_1 \left(x - x^3 + \frac{1}{2} x^5 - \frac{1}{6} x^7 + \dots \right) \end{aligned}$$

But Taylor series for $e^{-x^2} = 1 - x^2 + \frac{1}{2} x^4 - \frac{x^6}{4} + \dots$, 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

$$(2n + 3x^2 - 1) y(x) + y''(x) - 4xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0068826 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{\frac{x^2}{2}} H_n(x) + c_2 e^{\frac{x^2}{2}} {}_1F_1\left(-\frac{n}{2}; \frac{1}{2}; x^2\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.121 (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))
```

$$y(x) = e^{\frac{x^2}{2}} x \left(\text{KummerU}\left(-\frac{n}{2} + \frac{1}{2}, \frac{3}{2}, x^2\right) c_2 + \text{KummerM}\left(-\frac{n}{2} + \frac{1}{2}, \frac{3}{2}, x^2\right) c_1 \right)$$

2.1049

ODE No. 1049

$$(4x^2 - 1) y(x) + y''(x) - 4xy'(x) - e^x = 0$$

✓

Mathematica : cpu = 0.078616 (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]

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{4} \sqrt{\pi} e^{x(x-i)-\frac{i}{2}} \left(e^{2ix} \operatorname{erfi} \left(\left(\frac{1}{2} + \frac{i}{2} \right) - ix \right) - i e^i \operatorname{erf} \left(-x + \left(\frac{1}{2} + \frac{i}{2} \right) \right) \right) + c_1 e^{x(x-i)} - \frac{1}{2} i c_2 e^{(x-i)x+i} \right. \right.$$

✓

Maple : cpu = 0.31 (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))

$$y(x) = \frac{e^{x^2} \left(e^{\frac{i}{2}} (i \cos(x) + \sin(x)) \sqrt{\pi} \operatorname{erf} \left(x - \frac{1}{2} - \frac{i}{2} \right) - (i \cos(x) - \sin(x)) e^{-\frac{i}{2}} \sqrt{\pi} \operatorname{erf} \left(x - \frac{1}{2} + \frac{i}{2} \right) + 4 \sin(x) \right)}{4}$$

2.1050 ODE No. 1050

$$(4x^2 - 2)y(x) + y''(x) - 4xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.007817 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{x^2} + c_2 e^{x^2} x \right\} \right\}$$

✓ **Maple** : cpu = 0.029 (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))
```

$$y(x) = e^{x^2}(c_2 x + c_1)$$

2.1051

ODE No. 1051

$$(4x^2 - 3) y(x) - e^{x^2} + y''(x) - 4xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0232011 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -e^{(x-1)x+x} + c_1 e^{(x-1)x} + \frac{1}{2} c_2 e^{(x-1)x+2x} \right\} \right\}$$

✓ **Maple** : cpu = 0.049 (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))
```

$$y(x) = e^{x(1+x)} c_2 + e^{(x-1)x} c_1 - e^{x^2}$$

2.1052

ODE No. 1052

$$axy'(x)+by(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.0109082 (sec), leaf count = 78

```
DSolve[b*y[x] + a*x*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{-\frac{ax^2}{2}}H_{\frac{b-a}{a}}\left(\frac{\sqrt{a}x}{\sqrt{2}}\right)+c_2e^{-\frac{ax^2}{2}}{}_1F_1\left(-\frac{b-a}{2a};\frac{1}{2};\frac{ax^2}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.154 (sec), leaf count = 58

```
dsolve(diff(diff(y(x),x),x)+a*x*diff(y(x),x)+b*y(x)=0,y(x))
```

$$y(x)=e^{-\frac{ax^2}{2}}x\left(\text{KummerM}\left(\frac{2a-b}{2a},\frac{3}{2},\frac{ax^2}{2}\right)c_1+\text{KummerU}\left(\frac{2a-b}{2a},\frac{3}{2},\frac{ax^2}{2}\right)c_2\right)$$

2.1053 ODE No. 1053

$$a^2 x^2 y(x) + 2a x y'(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0231016 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-\frac{ax^2}{2} - \sqrt{a}x} + \frac{c_2 e^{\sqrt{a}x - \frac{ax^2}{2}}}{2\sqrt{a}} \right\} \right\}$$

✓ **Maple** : cpu = 0.066 (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))
```

$$y(x) = c_1 e^{-\frac{x(ax-2\sqrt{a})}{2}} + c_2 e^{-\frac{x(ax+2\sqrt{a})}{2}}$$

2.1054

ODE No. 1054

$$(ax + b)y'(x) + y(x)(cx + d) + y''(x) = 0$$

✓

Mathematica : cpu = 0.0249726 (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]`

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{\frac{cx}{a} - \frac{ax^2}{2} - bx} H_{-\frac{a^3 + da^2 - bca + c^2}{a^3}} \left(\frac{ab - 2c}{\sqrt{2}a^{3/2}} + \frac{\sqrt{ax}}{\sqrt{2}} \right) + c_2 e^{\frac{cx}{a} - \frac{ax^2}{2} - bx} {}_1F_1 \left(-\frac{-a^3 + da^2 - bca + c^2}{2a^3}; \frac{1}{2}; \left(\frac{ab - 2c}{\sqrt{2}a^{3/2}} + \frac{\sqrt{ax}}{\sqrt{2}} \right)^2 \right) \right. \right.$$

✓

Maple : cpu = 0.063 (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))`

$$y(x) = e^{-\frac{cx}{a}} \left(\text{KummerU} \left(\frac{da^2 - abc + c^2}{2a^3}, \frac{1}{2}, -\frac{(a^2x + ab - 2c)^2}{2a^3} \right) c_2 + \text{KummerM} \left(\frac{da^2 - abc + c^2}{2a^3}, \frac{1}{2}, -\frac{(a^2x + ab - 2c)^2}{2a^3} \right) c_1 \right)$$

2.1055

ODE No. 1055

$$(ax + b)y'(x) + y(x) \left(a1x^2 + b1x + c1 \right) + y''(x) = 0$$

✓

Mathematica : cpu = 0.0896262 (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]

$$\left\{ \left\{ y(x) \rightarrow c_1 \exp \left(\frac{-bx\sqrt{a^2 - 4a1} - \frac{1}{2}ax^2\sqrt{a^2 - 4a1} - \frac{1}{2}a^2x^2 - abx + 2a1x^2 + 2b1x}{2\sqrt{a^2 - 4a1}} \right) H_{\frac{-a^3 + 2c1a^2 - \sqrt{a^2 - 4a1}a^2 + 2abx - 2a1x^2}{2\sqrt{a^2 - 4a1}}} \right. \right.$$

✓

Maple : cpu = 0.393 (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))

$$y(x) = e^{-\frac{\left((ax+2b)(a^2-4a1)^{3/2}+(a^2-4a1)(a^2x+2ab-4a1x-4b1)\right)x}{4(a^2-4a1)^{3/2}}} \left(c_2(a^2x+ab-4a1x-2b1) \operatorname{hypergeom} \left(\left[\frac{3(a^2-4a1)}{2(a^2-4a1)^{3/2}} \right], \left[\frac{3(a^2-4a1)}{2(a^2-4a1)^{3/2}} + 1 \right], -\frac{bx\sqrt{a^2-4a1} - \frac{1}{2}ax^2\sqrt{a^2-4a1} - \frac{1}{2}a^2x^2 - abx + 2a1x^2 + 2b1x}{2\sqrt{a^2-4a1}} \right) \right)$$

2.1056

ODE No. 1056

$$x^2(-y'(x)) + y''(x) + xy(x) = 0$$

✓ **Mathematica** : cpu = 0.0676594 (sec), leaf count = 41

`DSolve[x*y[x] - x^2*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]`

$$\left\{ \left\{ y(x) \rightarrow c_1 x - \frac{c_2 \sqrt[3]{-x^3} \Gamma\left(-\frac{1}{3}, -\frac{x^3}{3}\right)}{3 \sqrt[3]{3}} \right\} \right\}$$

✓ **Maple** : cpu = 0.133 (sec), leaf count = 51

`dsolve(diff(diff(y(x),x),x)-x^2*diff(y(x),x)+x*y(x)=0,y(x))`

$$y(x) = x c_1 + c_2 \left(3^{2/3} (-x^3)^{1/3} \Gamma\left(\frac{2}{3}\right) - 3^{2/3} (-x^3)^{1/3} \Gamma\left(\frac{2}{3}, -\frac{x^3}{3}\right) + 3 e^{\frac{x^3}{3}} \right)$$

2.1057

ODE No. 1057

$$x^2(-y'(x)) + y''(x) - (x + 1)^2y(x) = 0$$

✓

Mathematica : cpu = 0.117418 (sec), leaf count = 56

DSolve[-((1 + x)^2*y[x]) - x^2*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]

$$\left\{ \left\{ y(x) \rightarrow c_2 e^{\frac{x^3}{3} + x} \int_1^x e^{-\frac{1}{3}K[1]^3 - 2K[1]} dK[1] + c_1 e^{\frac{x^3}{3} + x} \right\} \right\}$$

✓

Maple : cpu = 0.201 (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))

$$y(x) = c_1 \operatorname{HeunT}\left(0, -3, 2 \, 3^{1/3}, \frac{3^{2/3} x}{3}\right) e^{-x} + c_2 \operatorname{HeunT}\left(0, 3, 2 \, 3^{1/3}, -\frac{3^{2/3} x}{3}\right) e^{\frac{x(x^2+3)}{3}}$$

2.1058

ODE No. 1058

$$(x^4-2)xy(x)-((x+1)x^2y'(x))+y''(x)=0$$

✓ **Mathematica** : cpu = 0.160129 (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]
```

$$\left\{\left\{y(x)\rightarrow c_2e^{\frac{x^3}{3}}\int_1^xe^{\frac{K[1]^4}{4}-\frac{K[1]^3}{3}}dK[1]+c_1e^{\frac{x^3}{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.225 (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))
```

$$y(x)=e^{\frac{x^3}{3}}\left(\left(\int e^{\frac{1}{4}x^4-\frac{1}{3}x^3}dx\right)c_2+c_1\right)$$

2.1059

ODE No. 1059

$$x^4y'(x) - x^3y(x) + y''(x) = 0$$

✓

Mathematica : cpu = 0.0960131 (sec), leaf count = 39

DSolve[-(x^3*y[x]) + x^4*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]

$$\left\{\left\{y(x) \rightarrow c_1 x - \frac{c_2 \sqrt[5]{x^5} \Gamma\left(-\frac{1}{5}, \frac{x^5}{5}\right)}{5 \sqrt[5]{5}}\right\}\right\}$$

✓

Maple : cpu = 0.108 (sec), leaf count = 55

dsolve(diff(diff(y(x),x),x)+x^4*diff(y(x),x)-x^3*y(x)=0,y(x))

$$y(x) = x c_1 + \frac{c_2 e^{-\frac{x^5}{10}} \left(x^{10} \operatorname{WhittakerM}\left(\frac{2}{5}, \frac{9}{10}, \frac{x^5}{5}\right) + 9 \operatorname{WhittakerM}\left(\frac{7}{5}, \frac{9}{10}, \frac{x^5}{5}\right) x^5 + 36 \operatorname{WhittakerM}\left(\frac{7}{5}, \frac{9}{10}, \frac{x^5}{5}\right)\right)}{x^7}$$

2.1060

ODE No. 1060

$$ax^{q-1}y'(x)+bx^{q-2}y(x)+y''(x)=0$$

✓

Mathematica : cpu = 0.0206432 (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]`

$$\left\{\left\{y(x)\rightarrow c_2q^{-1/q}a^{\frac{1}{q}}(x^q)^{\frac{1}{q}}{}_1F_1\left(\frac{b}{aq}+\frac{1}{q};1+\frac{1}{q};-\frac{ax^q}{q}\right)+c_1{}_1F_1\left(\frac{b}{aq};1-\frac{1}{q};-\frac{ax^q}{q}\right)\right\}\right\}$$

✓

Maple : cpu = 0.275 (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))`

$$y(x)=e^{-\frac{ax^q}{q}}x\left(\text{KummerU}\left(\frac{aq-b}{aq},\frac{q+1}{q},\frac{ax^q}{q}\right)c_2+\text{KummerM}\left(\frac{aq-b}{aq},\frac{q+1}{q},\frac{ax^q}{q}\right)c_1\right)$$

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 = 0.0641201 (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] + Derivative[2][y][x], y[x], x]
```

$$\left\{\left\{y(x)\rightarrow-\frac{1}{9}e^{3x-\frac{1}{3}(\sqrt{x}+9)x}x+c_1e^{-\frac{1}{3}(\sqrt{x}+9)x}+\frac{1}{6}c_2e^{6x-\frac{1}{3}(\sqrt{x}+9)x}\right\}\right\}$$

✓ **Maple** : cpu = 0.168 (sec), leaf count = 28

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)*x^(1/2)+(1/4/x^(1/2)+1/4*x-9)*y(x)-x*exp(-1/3*x^(3/2)),y(x))
```

$$y(x)=-\frac{e^{-\frac{x^{3/2}}{3}}(-9\cosh(3x)c_1-9\sinh(3x)c_2+x)}{9}$$

2.1062

ODE No. 1062

$$\frac{(x + \sqrt{x} - 8) y(x)}{4x^2} + y''(x) - \frac{y'(x)}{\sqrt{x}} = 0$$

✓ **Mathematica** : cpu = 0.0150635 (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], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{3} c_2 e^{\sqrt{x}} x^2 + \frac{c_1 e^{\sqrt{x}}}{x} \right\} \right\}$$

✓ **Maple** : cpu = 0.031 (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))
```

$$y(x) = \frac{e^{\sqrt{x}}(c_2 x^3 + c_1)}{x}$$

2.1063

ODE No. 1063

$$y''(x) - (2e^x + 1) y'(x) + e^{2x} y(x) - e^{3x} = 0$$

✓ **Mathematica** : cpu = 0.0337613 (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]
```

$$\left\{\left\{y(x) \rightarrow e^x + c_1 e^{e^x} + c_2 e^{x+e^x} + 2\right\}\right\}$$

✓ **Maple** : cpu = 1.804 (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))
```

$$y(x) = e^{e^x+\frac{x}{2}} \sinh\left(\frac{x}{2}\right) c_2 + e^{e^x+\frac{x}{2}} \cosh\left(\frac{x}{2}\right) c_1 + e^x + 2$$

2.1064

ODE No. 1064

$$ay'(x)+by(x)+y''(x)+\tan(x)=0$$

✓

Mathematica : cpu = 0.303881 (sec), leaf count = 1400

`DSolve[Tan[x] + b*y[x] + a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow e^{\frac{1}{2}\left(-a-\sqrt{a^2-4b}\right)x}c_1+e^{\frac{1}{2}\left(\sqrt{a^2-4b}-a\right)x}c_2+\frac{8\left({}_2F_1\left(1,\frac{1}{4}i\left(\sqrt{a^2-4b}-a\right);\frac{1}{4}i\left(\sqrt{a^2-4b}-a\right)+1;-e^{2iax}\right)\right)}{\sqrt{a^2-4b}}\right\}\right.$$

✓

Maple : cpu = 0.631 (sec), leaf count = 134

`dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+tan(x)+b*y(x)=0,y(x))`

$$y(x)=e^{-\frac{\left(a-\sqrt{a^2-4b}\right)x}{2}}c_2+e^{-\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}}c_1+\frac{e^{-ax}\left(-\left(\int\tan(x)e^{-\frac{\left(-a+\sqrt{a^2-4b}\right)x}{2}}dx\right)e^{\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}}+\left(\int\tan(x)e^{\frac{\left(a-\sqrt{a^2-4b}\right)x}{2}}dx\right)e^{-\frac{\left(a+\sqrt{a^2-4b}\right)x}{2}}\right)}{\sqrt{a^2-4b}}$$

2.1065

ODE No. 1065

$$(n^2 - a^2) y(x) + 2n \cot(x) y'(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0795839 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 (\cos^2(x) - 1)^{\frac{1}{4}(1-2n)} P_{\frac{1}{2}(2\sqrt{2n^2-a^2}-1)}^{\frac{1}{2}(2n-1)}(\cos(x)) + c_2 (\cos^2(x) - 1)^{\frac{1}{4}(1-2n)} Q_{\frac{1}{2}(2\sqrt{2n^2-a^2}-1)}^{\frac{1}{2}(2n-1)}(\cos(x)) \right\} \right\}$$

✓ **Maple** : cpu = 0.319 (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))
```

$$y(x) = \sin(x)^{-n+\frac{1}{2}} \left(\text{LegendreQ} \left(-\frac{1}{2} + \sqrt{-a^2 + 2n^2}, n - \frac{1}{2}, \cos(x) \right) c_2 + \text{LegendreP} \left(-\frac{1}{2} + \sqrt{-a^2 + 2n^2}, \right.$$

2.1066 ODE No. 1066

$$y''(x) + \tan(x)y'(x) + y(x)\cos^2(x) = 0$$

✓ **Mathematica** : cpu = 0.0266617 (sec), leaf count = 18

```
DSolve[Cos[x]^2*y[x] + Tan[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \rightarrow c_2 \sin(\sin(x)) + c_1 \cos(\sin(x))\}\}$$

✓ **Maple** : cpu = 0.126 (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 = 0.0260078 (sec), leaf count = 21

```
DSolve[-(Cos[x]^2*y[x]) + Tan[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \rightarrow c_1 \cosh(\sin(x)) + ic_2 \sinh(\sin(x))\}\}$$

✓ **Maple** : cpu = 0.063 (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))
```

$$y(x) = c_1e^{\sin(x)} + c_2e^{-\sin(x)}$$

2.1068

ODE No. 1068

$$v(v+1)y(x)+y''(x)+\cot(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.0649705 (sec), leaf count = 20

```
DSolve[v*(1 + v)*y[x] + Cot[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{ \{ y(x) \rightarrow c_1 P_v(\cos(x)) + c_2 Q_v(\cos(x)) \} \}$$

✓ **Maple** : cpu = 0.333 (sec), leaf count = 45

```
dsolve(diff(diff(y(x),x),x)+diff(y(x),x)*cot(x)+v*(v+1)*y(x)=0,y(x))
```

$$y(x)=c_1 \operatorname{hypergeom}\left(\left[-\frac{v}{2},\frac{1}{2}+\frac{v}{2}\right],\left[\frac{1}{2}\right],\cos(x)^2\right)+c_2 \cos(x) \operatorname{hypergeom}\left(\left[1+\frac{v}{2},\frac{1}{2}-\frac{v}{2}\right],\left[\frac{3}{2}\right],\cos(x)^2\right)$$

2.1069

ODE No. 1069

$$y''(x) - \cot(x)y'(x) + y(x) \sin^2(x) = 0$$

✓ **Mathematica** : cpu = 0.0275229 (sec), leaf count = 19

```
DSolve[Sin[x]^2*y[x] - Cot[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \rightarrow c_1 \cos(\cos(x)) - c_2 \sin(\cos(x))\}\}$$

✓ **Maple** : cpu = 0.162 (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 = 0.166771 (sec), leaf count = 143

`DSolve[b*y[x] + a*Tan[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]`

$$\left\{ \left\{ y(x) \rightarrow c_1 {}_2F_1\left(-\frac{a}{4} - \frac{1}{4}\sqrt{a^2 + 4b}, \frac{1}{4}\sqrt{a^2 + 4b} - \frac{a}{4}; \frac{1}{2} - \frac{a}{2}; \cos^2(x)\right) + i^{a+1} c_2 \cos^{a+1}(x) {}_2F_1\left(\frac{a}{4} - \frac{1}{4}\sqrt{a^2 + 4b}, \frac{1}{4}\sqrt{a^2 + 4b} - \frac{a}{4}; \frac{1}{2} - \frac{a}{2}; \cos^2(x)\right) \right\} \right.$$

✓

Maple : cpu = 0.267 (sec), leaf count = 60

`dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)*tan(x)+b*y(x)=0,y(x))`

$$y(x) = \cos(x)^{\frac{1}{2} + \frac{a}{2}} \left(\text{LegendreQ}\left(\frac{\sqrt{a^2 + 4b}}{2} - \frac{1}{2}, \frac{1}{2} + \frac{a}{2}, \sin(x)\right) c_2 + \text{LegendreP}\left(\frac{\sqrt{a^2 + 4b}}{2} - \frac{1}{2}, \frac{1}{2} + \frac{a}{2}, \sin(x)\right) c_1 \right)$$

2.1071

ODE No. 1071

$$(b^2 - a^2) y(x) + 2a \cot(ax) y'(x) + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0405075 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-i b x} \csc(a x) - \frac{i c_2 e^{i b x} \csc(a x)}{2 b} \right\} \right\}$$

✓ **Maple** : cpu = 0.107 (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))
```

$$y(x) = \csc(ax) (\cos(bx) c_2 + \sin(bx) c_1)$$

2.1072

ODE No. 1072

$$y(x) \left(-4 a n p(x)^2 + a + b p(x) \right) + a p''(x) y'(x) + y''(x) = 0$$

✖

Mathematica : cpu = 0.16462 (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] + Derivati`

, 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] + De`

✖

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)*`

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ \frac{d^2}{dx^2} \_ Y(x) + a \left(\frac{d^2}{dx^2} p(x) \right) \left(\frac{d}{dx} \_ Y(x) \right) + \left(a + b p(x) - 4 n a p(x)^2 \right) \_ Y(x) \right\}, \{ \_ Y(x) \} \right)$$

2.1073 ODE No. 1073

$$\frac{y'(x) \left(-\wp(x; a, b) \wp'(x; a, b) + \wp(x; a, b)^3 - 6\wp(x; a, b)^2 + \frac{a}{2} \right)}{\wp'(x; a, b) - \wp(x; a, b)^2} + \frac{y(x) \left(\wp(x; a, b)^2 (-\wp'(x; a, b)) - (6\wp(x; a, b)^2 - \wp'(x; a, b)) \right)}{\wp(x; a, b)^2 + \wp'(x; a, b)}$$

✗ Mathematica : cpu = 0.668766 (sec), leaf count = 0

```
DSolve[(((WeierstrassP[x, {a, b}]*(-1/2*a + 6*WeierstrassP[x, {a, b}]^2)) - WeierstrassP[x, {a, b}]^2 + WeierstrassPPrime[x, {a, b}])) + Derivative[2][y][x] == 0, y[x], x]
```

, could not solve

```
DSolve[(((WeierstrassP[x, {a, b}]*(-1/2*a + 6*WeierstrassP[x, {a, b}]^2)) - WeierstrassP[x, {a, b}]^2 + WeierstrassPPrime[x, {a, b}])) + Derivative[2][y][x] == 0, y[x], 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(x, a, b)^2), y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ \frac{d^2}{dx^2} - Y(x) + \frac{(11 \text{ WeierstrassP}(x, a, b) \text{ WeierstrassPPrime}(x, a, b) - 6 \text{ WeierstrassP}(x, a, b)^2)}{\text{WeierstrassPPrime}(x, a, b) + \text{WeierstrassP}(x, a, b)^2} \right\} \right)$$

2.1074

ODE No. 1074

$$\frac{k^2\operatorname{cn}(x|k)\operatorname{sn}(x|k)y'(x)}{\operatorname{dn}(x|k)}+n^2y(x)\operatorname{dn}(x|k)^2+y''(x)=0$$

 **Mathematica** : cpu = 2.9745 (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])/Jacobi
```

, could not solve

```
DSolve[n^2*JacobiDN[x, k]^2*y[x] + (k^2*JacobiCN[x, k]*JacobiSN[x, k]*Derivative[1][y][x])/Jacobi
```

 **Maple** : cpu = 0.049 (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(x)*JacobiDN(x,k)^2,y(x))=0)
```

$$y(x)=c_1\sin\left(n\operatorname{JacobiAM}\left(x,k\right)\right)+c_2\cos\left(n\operatorname{JacobiAM}\left(x,k\right)\right)$$

2.1075

ODE No. 1075

$$f(x)y'(x) + g(x)y(x) + y''(x) = 0$$

X Mathematica : cpu = 0.109056 (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]
```

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

$$y(x) = \text{DESol} \left(\left\{ g(x) \_ Y(x) + f(x) \left(\frac{d}{dx} \_ Y(x) \right) + \frac{d^2}{dx^2} \_ Y(x) \right\}, \{ \_ Y(x) \} \right)$$

2.1076

ODE No. 1076

$$y(x) \left(a + f'(x)\right) + f(x)y'(x) - g(x) + y''(x) = 0$$

X Mathematica : cpu = 0.115252 (sec), leaf count = 0

```
DSolve[-g[x] + y[x]*(a + Derivative[1][f][x]) + f[x]*Derivative[1][y][x] + Derivative[2][y][x]
```

, could not solve

```
DSolve[-g[x] + y[x]*(a + Derivative[1][f][x]) + f[x]*Derivative[1][y][x] + Derivative[2]
```

X 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

$$y(x) = \text{DESol} \left(\left\{ \frac{d^2}{dx^2} Y(x) + f(x) \left(\frac{d}{dx} Y(x) \right) + \left(\frac{d}{dx} f(x) + a \right) Y(x) - g(x) \right\}, \{ Y(x) \} \right)$$

2.1077

ODE No. 1077

$$y'(x)(af(x)+b)+y(x)(cf(x)+d)+y''(x)=0$$

X Mathematica : cpu = 0.176418 (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,
```

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

$$y(x) = \text{DESol}\left(\left\{\frac{d^2}{dx^2}Y(x) + (af(x)+b)\left(\frac{d}{dx}Y(x)\right) + (cf(x)+d)Y(x)\right\},\{Y(x)\}\right)$$

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 = 0.0285994 (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] == 0, y[x], x]
```

$$\left\{\left\{y(x) \rightarrow c_1 \exp \left(-\frac{1}{2} \int_1^x f(K[1]) d K[1]-i \sqrt{a} x\right)-\frac{i c_2 \exp \left(-\frac{1}{2} \int_1^x f(K[1]) d K[1]+i \sqrt{a} x\right)}{2 \sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.049 (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),x))
```

$$y(x)=e^{-\frac{(\int f(x)dx)}{2}}\left(\sinh \left(x \sqrt{-a}\right) c_1+\cosh \left(x \sqrt{-a}\right) c_2\right)$$

2.1079

ODE No. 1079

$$by(x)f(x)^{2a}-\frac{af'(x)y'(x)}{f(x)}+y''(x)=0$$

✓

Mathematica : cpu = 0.232275 (sec), leaf count = 315

DSolve[b*f[x]^(2*a)*y[x] - (a*Derivative[1][f][x]*Derivative[1][y][x])/f[x] + Derivative[2][y]

$$\left\{\left\{y(x)\rightarrow-\frac{\sqrt{c_1}\exp\left(-\int_1^x-i\sqrt{b}f(K[1])^adK[1]-c_2\right)\left(-1+\exp\left(2\int_1^x-i\sqrt{b}f(K[1])^adK[1]+2c_2\right)\right)}{\sqrt{2}}\right\},\right\}$$

✓

Maple : cpu = 0.043 (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))

$$y(x)=c_1e^{\int if(x)^a\sqrt{b}dx}+c_2e^{-\left(\int if(x)^a\sqrt{b}dx\right)}$$

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 = 0.0291693 (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])
```

$$\left\{\left\{y(x)\rightarrow c_1\exp\left(b\int_1^xf(K[1])dK[1]+ax\right)+c_2\exp\left(ax-b\int_1^xf(K[2])dK[2]\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.911 (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
```

$$y(x)=e^{\int-\frac{f(x)e^{\int-2bf(x)dx}e^{2c_1b}b+bf(x)-e^{\int-2bf(x)dx}e^{2c_1b}a+a}{e^{\int-2bf(x)dx}e^{2c_1b}-1}dx}C_2$$

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 = 0.387082 (sec), leaf count = 0

```
DSolve[-((a^2*y[x]*Derivative[1][f][x]^2)/(b^2 + f[x]^2)) + (f[x]*(f^3)[x]*Derivative[1][y][x])
```

, could not solve

```
DSolve[-((a^2*y[x]*Derivative[1][f][x]^2)/(b^2 + f[x]^2)) + (f[x]*(f^3)[x]*Derivative[1]
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+f(x)*diff(diff(diff(f(x),x),x),x)/(f(x)^2+b^2)*diff(y(x),x)-
```

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ \frac{d^2}{dx^2} Y(x) + \frac{f(x) \left(\frac{d^3}{dx^3} f(x) \right) \left(\frac{d}{dx} Y(x) \right)}{f(x)^2 + b^2} - \frac{a^2 \left(\frac{d}{dx} f(x) \right)^2 Y(x)}{f(x)^2 + b^2} \right\}, \{ Y(x) \} \right)$$

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 = 0.279223 (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][g][x]*(Derivative[2][g][x]/Derivative[1][g][x]) + Derivative[2][g][x]]/g[x] == 0, y[x], 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][g][x]*(Derivative[2][g][x]/Derivative[1][g][x]) + Derivative[2][g][x]]/g[x] == 0, y[x], x]
```

 **Maple** : cpu = 0.243 (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)) * y(x) = 0, y(x))
```

$$y(x) = e^{-ig(x)}g(x)^{2m}\left(\text{KummerM}\left(\frac{1}{2}im^2 - \frac{1}{2}iv^2 + m + \frac{1}{2}, 2m + 1, 2ig(x)\right)c_1 + \text{KummerU}\left(\frac{1}{2}im^2 - \frac{1}{2}iv^2 + m + \frac{1}{2}, 2m + 1, 2ig(x)\right)c_2\right)$$

2.1083

ODE No. 1083

$$-\frac{f'(x)y'(x)}{f(x)}+y(x)\left(-\frac{f''(x)}{2f(x)}+\frac{3f'(x)^2}{4f(x)^2}+\frac{(\frac{1}{4}-v^2)g'(x)^2}{g(x)^2}+g'(x)^2+\frac{g^3(x)}{2g'(x)}-\frac{3g''(x)^2}{4g'(x)^2}\right)+y''(x)=0$$

 **Mathematica** : cpu = 0.431474 (sec), leaf count = 0

```
DSolve[-((Derivative[1][f][x]*Derivative[1][y][x])/f[x]) + y[x]*((3*Derivative[1][f][x]^2)/(4*
```

, could not solve

```
DSolve[-((Derivative[1][f][x]*Derivative[1][y][x])/f[x]) + y[x]*((3*Derivative[1][f][x]^2)/(4*
```

 **Maple** : cpu = 0.175 (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/
```

$$y(x)=\sqrt{\frac{g(x)f(x)}{\frac{d}{dx}g(x)}}\left(\text{BesselJ}\left(v,g(x)\right)c_1+\text{BesselY}\left(v,g(x)\right)c_2\right)$$

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 = 0.0827224 (sec), leaf count = 36

```
DSolve[-(Derivative[1][y][x]*(2*Derivative[1][f][x])/f[x] - Derivative[1][g][x]/g[x] + Derivative[2][y][x]) == 0, y[x], x]
```

$$\left\{\left\{y(x) \rightarrow c_1 f(x) J_{\sqrt{v^2}}(g(x))+c_2 f(x) Y_{\sqrt{v^2}}(g(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.158 (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(y(x),x)^2),x))
```

$$y(x)=f(x)\left(\operatorname{BesselJ}\left(v,g(x)\right)c_1+\operatorname{BesselY}\left(v,g(x)\right)c_2\right)$$

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 = 0.0830997 (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],y[x],x]

$$\{ \{ y(x) \rightarrow c_1 h(x) g(x)^v J_v(g(x)) + c_2 h(x) g(x)^v Y_v(g(x)) \} \}$$

✓

Maple : cpu = 0.138 (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)),x),y(x))

$$y(x) = h(x) g(x)^v \left(\text{BesselJ}\left(v, g(x)\right) c_1 + \text{BesselY}\left(v, g(x)\right) c_2 \right)$$

2.1086

ODE No. 1086

$$4y''(x)+9xy(x)=0$$

✓ **Mathematica** : cpu = 0.0045385 (sec), leaf count = 42

```
DSolve[9*x*y[x] + 4*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1\text{Ai}\left(\sqrt[3]{-1}\left(\frac{3}{2}\right)^{2/3}x\right)+c_2\text{Bi}\left(\sqrt[3]{-1}\left(\frac{3}{2}\right)^{2/3}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.032 (sec), leaf count = 29

```
dsolve(4*diff(diff(y(x),x),x)+9*x*y(x)=0,y(x))
```

$$y(x)=c_1\text{AiryAi}\left(-\frac{3^{2/3}2^{1/3}x}{2}\right)+c_2\text{AiryBi}\left(-\frac{3^{2/3}2^{1/3}x}{2}\right)$$

2.1087

ODE No. 1087

$$(-a-x^2)y(x)+4y''(x)=0$$

✓ **Mathematica** : cpu = 0.0057049 (sec), leaf count = 36

```
DSolve[(-a - x^2)*y[x] + 4*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1D_{\frac{1}{4}(-a-2)}(x)+c_2D_{\frac{a-2}{4}}(ix)\right\}\right\}$$

✓ **Maple** : cpu = 0.136 (sec), leaf count = 33

```
dsolve(4*diff(diff(y(x),x),x)-(x^2+a)*y(x)=0,y(x))
```

$$y(x)=\frac{c_1\operatorname{WhittakerM}\left(-\frac{a}{8},\frac{1}{4},\frac{x^2}{2}\right)+c_2\operatorname{WhittakerW}\left(-\frac{a}{8},\frac{1}{4},\frac{x^2}{2}\right)}{\sqrt{x}}$$

2.1088

ODE No. 1088

$$4y''(x)+4\tan(x)y'(x)+y(x)\left(-5\tan^2(x)-2\right)=0$$

✓ **Mathematica** : cpu = 0.0407475 (sec), leaf count = 180

```
DSolve[(-2 - 5*Tan[x]^2)*y[x] + 4*Tan[x]*Derivative[1][y][x] + 4*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\rightarrow\frac{3(-1)^{5/8}c_2\left(4\sqrt[4]{-12}^{3/4}\sinh^{-1}\left(\frac{1}{2}\sqrt[4]{-\frac{1}{2}}\sqrt[4]{-8\cos^2(2x)-16\cos(2x)-8}\right)-i\sqrt[4]{-8\cos^2(2x)-16\cos(2x)-8}\right)}{8\sqrt[8]{2}\sqrt[8]{-8\cos^2(2x)-16\cos(2x)-8}}\right.\right.$$

✓ **Maple** : cpu = 0.214 (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 = 0.0243196 (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

$$\left\{\left\{y(x)\rightarrow c_1e^{bx}H_d\left(\frac{x}{\sqrt{2}\sqrt{a}}-\frac{ab-c}{\sqrt{2}\sqrt{a}}\right)+c_2e^{bx}{}_1F_1\left(-\frac{d}{2};\frac{1}{2};\left(\frac{x}{\sqrt{2}\sqrt{a}}-\frac{ab-c}{\sqrt{2}\sqrt{a}}\right)^2\right)\right\}\right\}$$

✓

Maple : cpu = 0.058 (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))

$$y(x)=e^{bx}\left(\text{KummerU}\left(-\frac{d}{2},\frac{1}{2},\frac{(ab-c-x)^2}{2a}\right)c_2+\text{KummerM}\left(-\frac{d}{2},\frac{1}{2},\frac{(ab-c-x)^2}{2a}\right)c_1\right)$$

2.1090

ODE No. 1090

$$a\big(a^2-2be^{-ax}\big)y'(x)+a^2y''(x)+b^2e^{-2ax}y(x)=0$$

✓ **Mathematica** : cpu = 0.027799 (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] == 0,x,Assumptions->{a>0,b>0}]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{-\frac{be^{-ax}}{a^2}}-\frac{bc_2e^{-\frac{be^{-ax}}{a^2}-ax}}{a^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.059 (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,x)
```

$$y(x)=e^{-\frac{a^3x+2be^{-ax}}{2a^2}}\left(\cosh\left(\frac{ax}{2}\right)c_2+\sinh\left(\frac{ax}{2}\right)c_1\right)$$

2.1091

ODE No. 1091

$$x(y''(x)+y(x))-\cos(x)=0$$

✓ **Mathematica** : cpu = 0.0145932 (sec), leaf count = 41

```
DSolve[-Cos[x] + x*(y[x] + Derivative[2][y][x]) == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow\frac{1}{2}(\operatorname{Ci}(2x)\sin(x)-\operatorname{Si}(2x)\cos(x)+\log(x)\sin(x))+c_1\cos(x)+c_2\sin(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.137 (sec), leaf count = 35

```
dsolve(x*(diff(diff(y(x),x),x)+y(x))-cos(x)=0,y(x))
```

$$y(x)=\frac{\sin(x)\operatorname{Ci}(2x)}{2}-\frac{\operatorname{Si}(2x)\cos(x)}{2}+\frac{(2c_2+\ln(x))\sin(x)}{2}+\cos(x)c_1$$

2.1092

ODE No. 1092

$$(a+x)y(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0543041 (sec), leaf count = 72

```
DSolve[(a + x)*y[x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_2e^{-ix}{}_1F_1\left(1-\frac{1}{4}i(-2(a-2)-4);2;2ix\right)+c_1e^{-ix}xU\left(1-\frac{1}{4}i(-2(a-2)-4),2,2ix\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.072 (sec), leaf count = 29

```
dsolve(x*diff(diff(y(x),x),x)+(x+a)*y(x)=0,y(x))
```

$$y(x)=c_1\operatorname{WhittakerM}\left(-\frac{ia}{2},\frac{1}{2},2ix\right)+c_2\operatorname{WhittakerW}\left(-\frac{ia}{2},\frac{1}{2},2ix\right)$$

2.1093

ODE No. 1093

$$xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0131384 (sec), leaf count = 13

```
DSolve[Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \rightarrow c_1 \log(x) + c_2\}\}$$

✓ **Maple** : cpu = 0.008 (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 = 0.0138091 (sec), leaf count = 41

```
DSolve[a*y[x] + Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

$$\{ \{ y(x) \rightarrow c_1 J_0(2\sqrt{a}\sqrt{x}) + 2c_2 Y_0(2\sqrt{a}\sqrt{x}) \} \}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 29

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = c_1 \text{BesselJ}(0, 2\sqrt{a}\sqrt{x}) + c_2 \text{BesselY}(0, 2\sqrt{a}\sqrt{x})$$

2.1095 ODE No. 1095

$$lxy(x) + xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0060082 (sec), leaf count = 30

```
DSolve[l*x*y[x] + Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 J_0\left(\sqrt{l}x\right) + c_2 Y_0\left(\sqrt{l}x\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.046 (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 = 0.0078782 (sec), leaf count = 61

```
DSolve[(a + x)*y[x] + Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1 e^{-i x} U\left(\frac{1}{2} i(a-i), 1, 2 i x\right)+c_2 e^{-i x} L_{-\frac{1}{2} i(a-i)}(2 i x)\right\}\right\}$$

✓ **Maple** : cpu = 0.108 (sec), leaf count = 39

```
dsolve(x*diff(diff(y(x),x),x)+diff(y(x),x)+(x+a)*y(x)=0,y(x))
```

$$y(x)=e^{-i x}\left(\text{KummerU}\left(\frac{1}{2}+\frac{i a}{2}, 1, 2 i x\right) c_2+\text{KummerM}\left(\frac{1}{2}+\frac{i a}{2}, 1, 2 i x\right) c_1\right)$$

2.1097

ODE No. 1097

$$ay(x) + xy''(x) - y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0166029 (sec), leaf count = 46

```
DSolve[a*y[x] - Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow 2ac_1xJ_2\left(2\sqrt{a}\sqrt{x}\right) - 2ac_2xY_2\left(2\sqrt{a}\sqrt{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (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 = 0.0062101 (sec), leaf count = 41

```
DSolve[-(a*x^3*y[x]) - Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \cosh \left(\frac{\sqrt{a}x^2}{2} \right) + ic_2 \sinh \left(\frac{\sqrt{a}x^2}{2} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 27

```
dsolve(x*diff(diff(y(x),x),x)-diff(y(x),x)-y(x)*a*x^3=0,y(x))
```

$$y(x) = c_1 \sinh \left(\frac{\sqrt{a}x^2}{2} \right) + c_2 \cosh \left(\frac{\sqrt{a}x^2}{2} \right)$$

2.1099

ODE No. 1099

$$x^3\left(e^{x^3}-v^2\right)y(x)+xy''(x)-y'(x)=0$$

 **Mathematica** : cpu = 0.383283 (sec), leaf count = 0

```
DSolve[(E^x^3 - v^2)*x^3*y[x] - Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[(E^x^3 - v^2)*x^3*y[x] - Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x],
```

 **Maple** : cpu = 0.085 (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))
```

$$y(x)=c_1\operatorname{BesselJ}\left(v,e^{\frac{x^2}{2}}\right)+c_2\operatorname{BesselY}\left(v,e^{\frac{x^2}{2}}\right)$$

2.1100 ODE No. 1100

$$xy''(x) + 2y'(x) - xy(x) - e^x = 0$$

✓ **Mathematica** : cpu = 0.011829 (sec), leaf count = 44

```
DSolve[-E^x - x*y[x] + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{e^x(2x-1)}{4x} + \frac{c_1 e^{-x}}{x} + \frac{c_2 e^x}{2x} \right\} \right\}$$

✓ **Maple** : cpu = 0.041 (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

$$xy'' + 2y' - xy = e^x \quad (1)$$

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

$$y_h = \frac{1}{x}(Ae^x + Be^{-x})$$

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 $\lim_{x \rightarrow 0} xp(x) = \lim_{x \rightarrow 0} x \frac{2}{x} = 2$ which is analytic at $x = 0$. And $\lim_{x \rightarrow 0} x^2 q(x) = \lim_{x \rightarrow 0} -x^2 = 0$ 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

$$\begin{aligned}
 y_{r=0} &= \sum_{n=0}^{\infty} c_n x^n = c_0 + c_1 x^1 + c_2 x^2 + c_3 x^3 + \dots \\
 &= c_0 + \frac{c_0}{6} x^2 + \frac{c_0}{120} x^4 + \dots \\
 &= A \left(1 + \frac{1}{6} x^2 + \frac{1}{120} x^4 + \dots \right)
 \end{aligned} \tag{3}$$

Where A is used as arbitrary constant instead of a_0 . Now we find the solution for $r = -1$. we go back the recurrence equation (2)

$$\begin{aligned}
 (n-1+1)(2+(n-1))c_{n+1} - c_{n-1} &= 0 \\
 n(1+n)c_{n+1} - c_{n-1} &= 0 \\
 c_{n+1} &= \frac{c_{n-1}}{n(1+n)}
 \end{aligned}$$

For $n = 0$

$$c_1 = \frac{c_{-1}}{n(1+n)} = 0$$

For $n = 1$

$$c_2 = \frac{c_0}{2}$$

For $n = 2$

$$c_3 = \frac{c_1}{n(1+n)} = 0$$

For $n = 3$

$$c_4 = \frac{c_2}{(3)(4)} = \frac{c_0}{(2)(3)(4)}$$

For $n = 4$

$$c_5 = \frac{c_3}{n(1+n)} = 0$$

For $n = 5$

$$c_6 = \frac{c_4}{(5)(6)} = \frac{c_0}{(2)(3)(4)(5)(6)}$$

And so on. Hence solution is

$$\begin{aligned}
 y_{r=-1} &= \frac{1}{x} \sum_{n=0}^{\infty} c_n x^n = \frac{1}{x} \left(c_0 + \frac{c_0}{2} x^2 + \frac{c_0}{(2)(3)(4)} x^4 + \frac{c_0}{(2)(3)(4)(5)(6)} x^6 + \dots \right) \\
 &= \frac{B}{x} \left(1 + \frac{1}{2} x^2 + \frac{1}{24} x^4 + \frac{1}{720} x^6 + \dots \right)
 \end{aligned}$$

Where B is used as arbitrary constant instead of a_0 . Therefore, the homogeneous solution found is

$$\begin{aligned}
 y_h &= y_{r=0} + y_{r=-1} \\
 &= A \left(1 + \frac{1}{6} x^2 + \frac{1}{120} x^4 + \dots \right) + \frac{B}{x} \left(1 + \frac{1}{2} x^2 + \frac{1}{24} x^4 + \frac{1}{720} x^6 + \dots \right)
 \end{aligned}$$

But

$$e^x = 1 + x + \frac{1}{2} x^2 + \frac{1}{6} x^3 + \frac{1}{24} x^4 + \frac{1}{120} x^5 + \dots \tag{3}$$

And

$$e^{-x} = 1 - x + \frac{1}{2} x^2 - \frac{1}{6} x^3 + \frac{1}{24} x^4 - \frac{1}{120} x^5 + \dots \tag{4}$$

Hence adding (3)+(4) gives

$$\begin{aligned}
 e^x + e^{-x} &= 2 + 2 \frac{1}{2} x^2 + 2 \frac{1}{24} x^4 + \dots \\
 &= 2 \left(1 + \frac{1}{2} x^2 + \frac{1}{24} x^4 + \frac{1}{720} x^6 + \dots \right)
 \end{aligned}$$

But $y_{r=-1} = \frac{B}{x} \left(1 + \frac{1}{2}x^2 + \frac{1}{24}x^4 + \frac{1}{720}x^6 + \dots \right)$, 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

$$\begin{aligned} \frac{1}{x}e^x &= \frac{1}{x} \left(1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \frac{1}{24}x^4 + \frac{1}{120}x^5 + \dots \right) \\ &= \frac{1}{x} + 1 + \frac{1}{2}x + \frac{1}{6}x^2 + \frac{1}{24}x^3 + \frac{1}{120}x^4 + \dots \end{aligned} \quad (3A)$$

And

$$\begin{aligned} \frac{1}{x}e^{-x} &= \frac{1}{x} \left(1 - x + \frac{1}{2}x^2 - \frac{1}{6}x^3 + \frac{1}{24}x^4 - \frac{1}{120}x^5 + \dots \right) \\ &= \frac{1}{x} - 1 + \frac{1}{2}x - \frac{1}{6}x^2 + \frac{1}{24}x^3 - \frac{1}{120}x^4 + \dots \end{aligned} \quad (4A)$$

Now (3A)-(4A) gives

$$\begin{aligned} \frac{1}{x}e^x - \frac{1}{x}e^{-x} &= \left(\frac{1}{x} + 1 + \frac{1}{2}x + \frac{1}{6}x^2 + \frac{1}{24}x^3 + \frac{1}{120}x^4 + \dots \right) - \left(\frac{1}{x} - 1 + \frac{1}{2}x - \frac{1}{6}x^2 + \frac{1}{24}x^3 - \frac{1}{120}x^4 + \dots \right) \\ &= 2 + 2\frac{1}{6}x^2 + 2\frac{1}{120}x^4 + \dots \\ &= 2 \left(1 + \frac{1}{6}x^2 + \frac{1}{120}x^4 + \dots \right) \end{aligned}$$

Hence

$$\left(1 + \frac{1}{6}x^2 + \frac{1}{120}x^4 + \dots \right) = \frac{1}{2x}(e^x - e^{-x})$$

But $y_{r=0} = A \left(1 + \frac{1}{6}x^2 + \frac{1}{120}x^4 + \dots \right)$, therefore comparing the result we found above, we see that we can write $y_{r=0}$ as

$$\begin{aligned} y_{r=0} &= A \left(\frac{1}{2x}(e^x - e^{-x}) \right) \\ &= \frac{A}{2x}(e^x - e^{-x}) \end{aligned}$$

Therefore

$$\begin{aligned} y_h &= y_{r=0} + y_{r=-1} \\ &= \frac{A}{2x}(e^x - e^{-x}) + \frac{B}{2x}(e^x + e^{-x}) \\ &= \frac{1}{x} \left(\frac{A}{2}e^x - \frac{A}{2}e^{-x} + \frac{B}{2}e^x + \frac{B}{2}e^{-x} \right) \\ &= \frac{1}{x} \left(e^x \left(\frac{A}{2} + \frac{B}{2} \right) + e^{-x} \left(-\frac{A}{2} + \frac{B}{2} \right) \right) \end{aligned}$$

Let $\frac{A+B}{2} = A_0$, $\frac{B-A}{2} = B_0$ hence the above becomes

$$y_h = \frac{1}{x}(A_0e^x + B_0e^{-x})$$

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 $y_p = u_1y_1 + u_2y_2$ 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

$$\begin{aligned} y_p &= u_1y_1 + u_2y_2 \\ &= \frac{x}{2} \frac{e^x}{x} - \frac{1}{4} e^{2x} \frac{e^{-x}}{x} \\ &= \frac{1}{2} e^x - \frac{1}{4x} e^x \end{aligned}$$

Therefore

$$y_p = e^x \left(\frac{1}{2} - \frac{1}{4x} \right)$$

Hence the general solution is

$$\begin{aligned} y &= y_h + y_p \\ &= \frac{1}{x} (A_0 e^x + B_0 e^{-x}) + e^x \left(\frac{1}{2} - \frac{1}{4x} \right) \end{aligned}$$

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 = 0.0120352 (sec), leaf count = 52

```
DSolve[a*x*y[x] + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 e^{-i\sqrt{a}x}}{x} - \frac{ic_2 e^{i\sqrt{a}x}}{2\sqrt{a}x} \right\} \right\}$$

✓ **Maple** : cpu = 0.048 (sec), leaf count = 29

```
dsolve(x*diff(diff(y(x),x),x)+2*diff(y(x),x)+a*x*y(x)=0,y(x))
```

$$y(x) = \frac{\cosh(x\sqrt{-a})c_2 + \sinh(x\sqrt{-a})c_1}{x}$$

Hand solution

$$xy'' + 2y' + axy = 0 \quad (1)$$

First method much shorter, using transformation suggested by Kamke. Let $y = \frac{u(x)}{x}$, hence

$$y' = \frac{u'}{x} - \frac{u}{x^2}$$

$$y'' = \frac{u''}{x} - \frac{u'}{x^2} - \frac{u'}{x^2} + 2\frac{u}{x^3}$$

And (1) becomes

$$x\left(\frac{u''}{x} - \frac{u'}{x^2} - \frac{u'}{x^2} + 2\frac{u}{x^3}\right) + 2\left(\frac{u'}{x} - \frac{u}{x^2}\right) + ax\left(\frac{u}{x}\right) = 0$$

$$u'' - 2\frac{u'}{x} + 2\frac{u}{x^2} + \frac{2u'}{x} - \frac{2u}{x^2} + au = 0$$

$$u'' + au = 0$$

Hence the roots of the characteristic equation are $\pm\sqrt{-a}$ and the solution is

$$u = A \cos(\sqrt{a}x) + B \sin(\sqrt{a}x)$$

Hence

$$y = \frac{1}{x}(A \cos(\sqrt{a}x) + B \sin(\sqrt{a}x))$$

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 $\lim_{x \rightarrow 0} xp(x) = \lim_{x \rightarrow 0} x \frac{2}{x} = 2$ which is analytic at $x = 0$. And $\lim_{x \rightarrow 0} x^2 q(x) = \lim_{x \rightarrow 0} -ax^2 = 0$ which is analytic. Hence the singularity is regular (removable). Using Frobenius series, assume that

$$y = \sum_{n=-\infty}^{\infty} c_n x^{n+r}$$

Where $c_n = 0$ for $n < 0$. Hence

$$\begin{aligned} y' &= \sum (n+r) c_n x^{n+r-1} \\ y'' &= \sum (n+r)(n+r-1) c_n x^{n+r-2} \end{aligned}$$

Substituting back in the original ODE gives

$$\sum (n+r)(n+r-1) c_n x^{n+r-1} + \sum 2(n+r) c_n x^{n+r-1} + \sum a c_n x^{n+r+1} = 0$$

Adjusting so that all have same power x^{n+r} gives

$$\sum (n+r+1)(n+r) c_{n+1} x^{n+r} + \sum 2(n+r+1) c_{n+1} x^{n+r} + \sum a c_{n-1} x^{n+r} = 0$$

Hence

$$\begin{aligned} (n+r+1)(n+r) c_{n+1} + 2(n+r+1) c_{n+1} + a c_{n-1} &= 0 \\ (n+r+1)(2+(n+r)) c_{n+1} + a c_{n-1} &= 0 \end{aligned} \quad (2)$$

We want equation with c_0 in it. Hence let $n = -1$

$$(-1+r+1)(2+(-1+r)) c_0 + a c_{-2} = 0$$

But $c_n = 0$ for all $n < 0$ hence

$$(-1+r+1)(2+(-1+r)) c_0 = 0$$

But $c_0 \neq 0$, as this is the basis for this method. Therefore, we obtain the indicial equation for r

$$\begin{aligned} (-1+r+1)(2+(-1+r)) &= 0 \\ r(r+1) &= 0 \end{aligned}$$

Hence $r = 0$ or $r = -1$ are the roots. Now for each r we find a solution. Using $r = 0$, we go back the recurrence equation (2)

$$\begin{aligned} (n+1)(2+n) c_{n+1} + a c_{n-1} &= 0 \\ c_{n+1} &= \frac{-a c_{n-1}}{(n+1)(2+n)} \end{aligned}$$

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

$$\begin{aligned} y_{r=0} &= \sum_{n=0}^{\infty} c_n x^n = c_0 + c_1 x^1 + c_2 x^2 + c_3 x^3 + \dots \\ &= c_0 - a \frac{c_0}{6} x^2 + a^2 \frac{c_0}{120} x^4 + \dots \\ &= A \left(1 - a \frac{1}{6} x^2 + a^2 \frac{1}{120} x^4 + \dots \right) \end{aligned} \quad (3)$$

Where A is used as arbitrary constant instead of a_0 . Now we find the solution for $r = -1$. we go back the recurrence equation (2)

$$\begin{aligned}(n-1+1)(2+(n-1))c_{n+1} + ac_{n-1} &= 0 \\ n(1+n)c_{n+1} + ac_{n-1} &= 0 \\ c_{n+1} &= \frac{-ac_{n-1}}{n(1+n)}\end{aligned}$$

For $n = 0$

$$c_1 = \frac{-ac_{-1}}{n(1+n)} = 0$$

For $n = 1$

$$c_2 = \frac{-ac_0}{2}$$

For $n = 2$

$$c_3 = \frac{-ac_1}{n(1+n)} = 0$$

For $n = 3$

$$c_4 = \frac{-ac_2}{(3)(4)} = \frac{-a(-ac_0)}{(2)(3)(4)} = \frac{a^2c_0}{(2)(3)(4)}$$

For $n = 4$

$$c_5 = \frac{-ac_3}{n(1+n)} = 0$$

For $n = 5$

$$c_6 = \frac{-ac_4}{(5)(6)} = \frac{-a(a^2c_0)}{(2)(3)(4)(5)(6)} = \frac{-a^3c_0}{(2)(3)(4)(5)(6)}$$

And so on. Hence solution is

$$\begin{aligned}y_{r=-1} &= \frac{1}{x} \sum_{n=0}^{\infty} c_n x^n = \frac{1}{x} \left(c_0 - \frac{ac_0}{2} x^2 + \frac{a^2c_0}{(2)(3)(4)} x^4 - \frac{a^3c_0}{(2)(3)(4)(5)(6)} x^6 + \dots \right) \\ &= \frac{B}{x} \left(1 - \frac{a}{2} x^2 + \frac{a^2}{24} x^4 - \frac{a^3}{720} x^6 + \dots \right)\end{aligned}$$

Where B is used as arbitrary constant instead of a_0 . Therefore, the homogeneous solution found is

$$y_h = y_{r=0} + y_{r=-1}$$

$$\begin{aligned}&= A \left(1 - a \frac{1}{6} x^2 + a^2 \frac{1}{120} x^4 + \dots \right) + \frac{B}{x} \left(1 - \frac{a}{2} x^2 + \frac{a^2}{24} x^4 - \frac{a^3}{720} x^6 + \dots \right) \\ &= A \left(1 - \frac{1}{6} (\sqrt{ax})^2 + \frac{1}{120} (\sqrt{ax})^4 + \dots \right) + \frac{B}{x} \left(1 - \frac{1}{2} (\sqrt{ax})^2 + \frac{1}{24} (\sqrt{ax})^4 - \frac{1}{720} (\sqrt{ax})^6 + \dots \right)\end{aligned}$$

But

$$\sin x = x - \frac{1}{6} x^3 + \frac{1}{120} x^5 - \dots \quad (3)$$

And

$$\cos x = 1 - \frac{1}{2} x^2 + \frac{1}{24} x^4 - \frac{1}{720} x^6 + \dots \quad (4)$$

Therefore

$$\begin{aligned}\sin(\sqrt{ax}) &= \sqrt{ax} - \frac{1}{6} (\sqrt{ax})^3 + \frac{1}{120} (\sqrt{ax})^5 - \dots \\ \cos(\sqrt{ax}) &= 1 - \frac{1}{2} (\sqrt{ax})^2 + \frac{1}{24} (\sqrt{ax})^4 - \frac{1}{720} (\sqrt{ax})^6 + \dots\end{aligned}$$

Therefore, using the above, we can write y_h as

$$\begin{aligned}y_h &= \frac{A}{\sqrt{ax}} \sqrt{ax} \left(1 - \frac{1}{6} (\sqrt{ax})^2 + \frac{1}{120} (\sqrt{ax})^4 + \dots \right) + \frac{B}{x} \cos(\sqrt{ax}) \\ &= \frac{A}{\sqrt{ax}} \left(\sqrt{ax} - \frac{1}{6} (\sqrt{ax})^3 + \frac{1}{120} (\sqrt{ax})^5 + \dots \right) + \frac{B}{x} \cos(\sqrt{ax}) \\ &= \frac{A}{\sqrt{ax}} \sin(\sqrt{ax}) + \frac{B}{x} \cos(\sqrt{ax})\end{aligned}$$

Let $A_0 = \frac{A}{\sqrt{a}}$, hence the above becomes the same solution found using the transformation method

$$y(x) = \frac{1}{x} (A_0 \sin(\sqrt{a}x) + B \cos(\sqrt{a}x))$$

Clearly, the transformation method is much faster and better. But the trick is to see the correct transformation needed and this is not always easy.

Third method Using Laplace transform. Using property $\mathcal{L}xf(x) = -\frac{d}{ds}F(s)$ then the Laplace transform of the ODE becomes

$$\begin{aligned}\mathcal{L}(xy'' + 2y' + axy) &= 0 \\ -\frac{d}{ds}(\mathcal{L}y'') + 2\left(-\frac{d}{ds}(\mathcal{L}y')\right) + a\left(-\frac{d}{ds}Y\right) &= 0 \\ -\frac{d}{ds}(s^2Y - sA - B) + 2\left(-\frac{d}{ds}(sY - A)\right) + a(-Y') &= 0\end{aligned}$$

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

$$y(x) = e^{-x} \left(A \cos(x\sqrt{1-a}) + \frac{(-A + c_1)}{\sqrt{1-a}} \sinh(x\sqrt{1-a}) \right)$$

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 = 0.0049484 (sec), leaf count = 42

```
DSolve[a*x^2*y[x] + 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

{ { y(x) -> (c1 Ai(-ax/(-a)^(2/3)) / x + c2 Bi(-ax/(-a)^(2/3)) / x } }

✓ Maple : cpu = 0.042 (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) = (c2 BesselY(1/3, 2*sqrt(a)*x^(3/2)/3) + c1 BesselJ(1/3, 2*sqrt(a)*x^(3/2)/3)) / sqrt(x)

Hand solution

xy'' + 2y' + ax^2y = 0 (1)

Since there is a term 2y, we can use y = u(x)/x, hence

y' = u'/x - u/x^2
y'' = u''/x - u'/x^2 - u'/x^2 + 2u/x^3

And (1) becomes

x(u''/x - u'/x^2 - u'/x^2 + 2u/x^3) + 2(u'/x - u/x^2) + ax^2(u/x) = 0
u'' - 2u'/x + 2u/x^2 + 2u'/x - 2u/x^2 + axu = 0
u'' + axu = 0 (2)

This is Emdon-Fowler. (form is u'' + x^n u = 0) with n = 1. Assume that

u = sum_{n=0}^inf c_n x^n

Hence

u' = sum_{n=0} n c_n x^{n-1} = sum_{n=1} n c_n x^{n-1} = sum_{n=0} (n+1) c_{n+1} x^n
u'' = sum_{n=0} n(n+1) c_{n+1} x^{n-1} = sum_{n=1} n(n+1) c_{n+1} x^{n-1} = sum_{n=0} (n+1)(n+2) c_{n+2} x^n

Substituting back in (2) gives

sum_{n=0} (n+1)(n+2) c_{n+2} x^n + sum_{n=0} a c_n x^{n+1} = 0
sum_{n=0} (n+1)(n+2) c_{n+2} x^n + sum_{n=1} a c_{n-1} x^n = 0

For n = 0

(1)(2) c2 = 0

Hence $c_2 = 0$. For $n \geq 1$

$$(n+1)(n+2)c_{n+2} + ac_{n-1} = 0$$

$$c_{n+2} = \frac{-ac_{n-1}}{(n+1)(n+2)} \quad (3)$$

For $n = 1$, from (3)

$$c_3 = \frac{-ac_0}{(2)(3)}$$

For $n = 2$, from (3)

$$c_4 = \frac{-ac_1}{(3)(4)}$$

For $n = 3$, from (3)

$$c_5 = \frac{-ac_2}{(4)(5)} = 0$$

For $n = 4$, from (3)

$$c_6 = \frac{-ac_3}{(5)(6)} = \frac{-a}{(5)(6)} \left(\frac{-ac_0}{(2)(3)} \right) = \frac{a^2c_0}{(2)(3)(5)(6)}$$

For $n = 5$, from (3)

$$c_7 = \frac{-ac_4}{(6)(7)} = \frac{-a}{(6)(7)} \left(\frac{-ac_1}{(3)(4)} \right) = \frac{a^2c_1}{(3)(4)(6)(7)}$$

For $n = 6$, from (3)

$$c_8 = \frac{-ac_5}{(7)(8)} = 0$$

For $n = 7$, from (3)

$$c_9 = \frac{-ac_6}{(8)(9)} = \frac{-a}{(8)(9)} \left(\frac{a^2c_0}{(2)(3)(5)(6)} \right) = \frac{-a^3c_0}{(2)(3)(5)(6)(8)(9)}$$

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,

$$\begin{aligned} u &= \sum_{n=0}^{\infty} c_n x^n = c_0 + c_1 x^1 + c_2 x^2 + c_3 x^3 + \dots \\ &= c_0 + c_1 x + 0 + c_3 x^3 + c_4 x^4 + 0 + c_6 x^6 + c_7 x^7 + 0 + c_9 x^9 + \dots \\ &= c_0 + c_1 x - \frac{ac_0}{(2)(3)} x^3 - \frac{ac_1}{(3)(4)} x^4 + \frac{a^2c_0}{(2)(3)(5)(6)} x^6 + \frac{a^2c_1}{(3)(4)(6)(7)} x^7 - \frac{a^3c_0}{(2)(3)(5)(6)(8)(9)} x^9 - \frac{a^3c_1}{(3)(4)(6)(7)(9)(10)} x^{10} + \dots \\ &= c_0 \left(1 - \frac{a}{6} x^3 + \frac{a^2}{180} x^6 - \frac{a^3}{12960} x^9 + \dots \right) + xc_1 \left(1 - \frac{a}{12} x^3 + \frac{a^2}{504} x^6 - \frac{a^3}{45360} x^9 + \dots \right) \\ &= c_0 \left(1 - \frac{1}{6} \left(a^{\frac{1}{3}} x \right)^3 + \frac{1}{180} \left(a^{\frac{1}{3}} x \right)^6 - \frac{1}{12960} \left(a^{\frac{1}{3}} x \right)^9 + \dots \right) + xc_1 \left(1 - \frac{1}{12} \left(a^{\frac{1}{3}} x \right)^3 + \frac{1}{504} \left(a^{\frac{1}{3}} x \right)^6 - \frac{1}{45360} \left(a^{\frac{1}{3}} x \right)^9 + \dots \right) \end{aligned}$$

Comparing the above to the series expansion of Airy functions, we see that

$$u = c_0 \text{AiryAI} \left(-a^{\frac{1}{3}} x \right) + c_1 \text{AiryBI} \left(-a^{\frac{1}{3}} x \right)$$

And since $y = \frac{u(x)}{x}$ then

$$y = \frac{1}{x} \left(c_0 \text{AiryAI} \left(-a^{\frac{1}{3}} x \right) + c_1 \text{AiryBI} \left(-a^{\frac{1}{3}} x \right) \right)$$

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 = 0.0164703 (sec), leaf count = 64

```
DSolve[a*y[x] - 2*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow 6a^{3/2}c_1x^{3/2}J_3\left(2\sqrt{a}\sqrt{x}\right) - 2ia^{3/2}c_2x^{3/2}Y_3\left(2\sqrt{a}\sqrt{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 33

```
dsolve(x*diff(diff(y(x),x),x)-2*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = x^{3/2}\left(\text{BesselY}\left(3,2\sqrt{a}\sqrt{x}\right)c_2 + \text{BesselJ}\left(3,2\sqrt{a}\sqrt{x}\right)c_1\right)$$

2.1104

ODE No. 1104

$$ay(x) + vy'(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0214324 (sec), leaf count = 104

```
DSolve[a*y[x] + v*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 a^{\frac{v-1}{2}-v+1} x^{\frac{v-1}{2}-v+1} \Gamma(2-v) J_{1-v}(2\sqrt{a}\sqrt{x}) + c_1 a^{\frac{1-v}{2}} x^{\frac{1-v}{2}} \Gamma(v) J_{v-1}(2\sqrt{a}\sqrt{x}) \right\} \right\}$$

✓ **Maple** : cpu = 0.025 (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 = 0.0121262 (sec), leaf count = 64

```
DSolve[b*x*y[x] + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1 x^{\frac{1-a}{2}} J_{\frac{a-1}{2}}\left(\sqrt{b} x\right)+c_2 x^{\frac{1-a}{2}} Y_{\frac{a-1}{2}}\left(\sqrt{b} x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.062 (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

$$ay'(x)+bx^{a_1}y(x)+xy''(x)=0$$

✓

Mathematica : cpu = 0.0288576 (sec), leaf count = 441

```
DSolve[b*x^a1*y[x] + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1\left(\frac{1}{a_1}+1\right)^{\frac{a}{\left(\frac{1}{a_1}+1\right)a_1}-\left(\frac{1}{a_1}+1\right)a_1}a_1^{\frac{a}{\left(\frac{1}{a_1}+1\right)a_1}-\left(\frac{1}{a_1}+1\right)a_1}b^{\frac{1}{2}\left(\frac{1}{\left(\frac{1}{a_1}+1\right)a_1}-\frac{a}{\left(\frac{1}{a_1}+1\right)a_1}\right)}\left(x^{a_1}\right)^{\frac{1}{2}\left(\frac{1}{a_1}+1\right)\left(\frac{1}{\left(\frac{1}{a_1}+1\right)a_1}-\frac{a}{\left(\frac{1}{a_1}+1\right)a_1}\right)}\right.\right.$$

✓

Maple : cpu = 0.171 (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))
```

$$y(x)=x^{-\frac{a}{2}+\frac{1}{2}}\left(\text{BesselJ}\left(\frac{a-1}{a_1+1},\frac{2\sqrt{b}x^{\frac{a_1}{2}+\frac{1}{2}}}{a_1+1}\right)c_1+\text{BesselY}\left(\frac{a-1}{a_1+1},\frac{2\sqrt{b}x^{\frac{a_1}{2}+\frac{1}{2}}}{a_1+1}\right)c_2\right)$$

2.1107 ODE No. 1107

$$ay(x) + (b+x)y'(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0146921 (sec), leaf count = 40

```
DSolve[a*y[x] + (b + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-x} U(b-a, b, x) + c_2 e^{-x} L_{a-b}^{b-1}(x) \right\} \right\}$$

✓ **Maple** : cpu = 0.127 (sec), leaf count = 30

```
dsolve(x*diff(diff(y(x), x), x) + (x+b)*diff(y(x), x) + a*y(x) = 0, y(x))
```

$$y(x) = e^{-x} (\text{KummerU}(-a+b, b, x) c_2 + \text{KummerM}(-a+b, b, x) c_1)$$

2.1108

ODE No. 1108

$$(a + b + x)y'(x) + ay(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0172795 (sec), leaf count = 37

```
DSolve[a*y[x] + (a + b + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-x} U(b, a + b, x) + c_2 e^{-x} L_{-b}^{a+b-1}(x) \right\} \right\}$$

✓ **Maple** : cpu = 0.125 (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))
```

$$y(x) = e^{-x}(\text{KummerU}(b, a + b, x) c_2 + \text{KummerM}(b, a + b, x) c_1)$$

2.1109

ODE No. 1109

$$xy''(x) - xy'(x) - y(x) - e^x x(x + 1) = 0$$

✓ **Mathematica** : cpu = 0.172288 (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]
```

$$\{\{y(x) \rightarrow c_2(-e^x x \operatorname{Ei}(-x) - 1) + e^x(x^2 + x - x \log(-x) - 1) + c_1 e^x x\}\}$$

✓ **Maple** : cpu = 0.059 (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))
```

$$y(x) = e^x(-xc_1 \operatorname{Ei}_1(x) + x^2 + c_2 x - x \ln(x) + e^{-x} c_1 - 1)$$

2.1110

ODE No. 1110

$$-ay(x)+xy''(x)-xy'(x)=0$$

✓

Mathematica : cpu = 0.02457 (sec), leaf count = 36

`DSolve[-(a*y[x]) - x*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow c_2G_{1,2}^{2,0}\left(-x\left|\begin{array}{c}1-a\\0,1\end{array}\right.\right)+c_1x{}_1F_1(a+1;2;x)\right\}\right\}$$

✓

Maple : cpu = 0.062 (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 = 0.0233712 (sec), leaf count = 20

```
DSolve[y[x] - (1 + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x], x]
```

$$\{\{y(x) \rightarrow c_1 e^x + c_2(-x-1)\}\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 13

```
dsolve(x*diff(diff(y(x),x),x)-(1+x)*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x) = c_2 e^x + x c_1 + c_1$$

Hand solution

$$xy'' - (x+1)y' + y = 0 \quad (1)$$

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

$$\begin{aligned} -(2sY + s^2Y' - A) - (-Y - sY' + sY - A) + Y &= 0 \\ -2sY - s^2Y' + A + Y + sY' - sY + A + Y &= 0 \\ Y'(s - s^2) + Y(-2s + 1 - s + 1) &= -2A \\ Y'(s^2 - s) + Y(3s - 2) &= 2A \\ Y' + \frac{(3s-2)}{s(s-1)}Y &= \frac{2A}{s(s-1)} \end{aligned}$$

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

$$\begin{aligned} d((s-1)s^2Y) &= (s-1)s^2\frac{2A}{s(s-1)} \\ (s-1)s^2Y &= 2A\int sds + c_1 \\ (s-1)s^2Y &= 2A\frac{s^2}{2} + c_1 \\ Y &= \frac{As^2 + c_1}{(s-1)s^2} \end{aligned}$$

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 = 0.0148125 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{2x} - \frac{1}{9} c_2 e^{-x} (3x + 1) \right\} \right\}$$

✓ **Maple** : cpu = 0.036 (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))
```

$$y(x) = c_1 e^{2x} + c_2 e^{-x} (3x + 1)$$

2.1113

ODE No. 1113

$$-ay(x) + (b - x)y'(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0091343 (sec), leaf count = 24

```
DSolve[-(a*y[x]) + (b - x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\{ \{y(x) \rightarrow c_1 U(a,b,x) + c_2 L_{-a}^{b-1}(x) \} \}$$

✓ **Maple** : cpu = 0.106 (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 = 0.0376194 (sec), leaf count = 39

```
DSolve[-y[x] - 2*(-1 + x)*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 G_{1,2}^{2,0} \left(-2x \left| \begin{matrix} \frac{1}{2} \\ -1, 0 \end{matrix} \right. \right) + c_1 e^x (I_0(x) - I_1(x)) \right\} \right\}$$

✓ **Maple** : cpu = 0.074 (sec), leaf count = 34

```
dsolve(x*diff(diff(y(x),x),x)-2*(x-1)*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = (-c_2 \operatorname{BesselK}(1, -x) + c_2 \operatorname{BesselK}(0, -x) + c_1 (\operatorname{BesselI}(0, x) - \operatorname{BesselI}(1, x))) e^x$$

2.1115 ODE No. 1115

$$xy''(x) - (3x - 2)y'(x) + (3 - 2x)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0386103 (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]`

$$\left\{ \left\{ y(x) \rightarrow c_2 e^{-\frac{1}{2}(\sqrt{17}-3)x} {}_1F_1\left(1 - \frac{6}{\sqrt{17}}; 2; \sqrt{17}x\right) + c_1 e^{-\frac{1}{2}(\sqrt{17}-3)x} U\left(1 - \frac{6}{\sqrt{17}}, 2, \sqrt{17}x\right) \right\} \right\}$$

✓ **Maple** : cpu = 1.433 (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))`

$$y(x) = e^{-\frac{x(-3+\sqrt{17})}{2}} \left(\text{KummerU}\left(1 - \frac{6\sqrt{17}}{17}, 2, \sqrt{17}x\right) c_2 + \text{KummerM}\left(1 - \frac{6\sqrt{17}}{17}, 2, \sqrt{17}x\right) c_1 \right)$$

2.1116

ODE No. 1116

$$y'(x)(ax + b + n) + any(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0290079 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-ax} U(b, b + n, ax) + c_2 e^{-ax} L_{-b}^{b+n-1}(ax) \right\} \right\}$$

✓ **Maple** : cpu = 0.146 (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))
```

$$y(x) = e^{-ax}(\text{KummerU}(b, b + n, ax) c_2 + \text{KummerM}(b, b + n, ax) c_1)$$

2.1117

ODE No. 1117

$$-(x+1)(a+b)y'(x)+abxy(x)+xy''(x)=0$$

✓

Mathematica : cpu = 0.0419112 (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]

$$\left\{\left\{y(x) \rightarrow c_1 U\left(-\frac{-a^2-ba-a+b}{a-b}, a+b+2, (a-b)x\right) e^{(a+b+1) \log (x)+b x}+c_2 L_{\frac{-a^2-ba-a+b}{a-b}}^{a+b+1}((a-b) x) e^{(a+b+1) \log (x)+b x}\right.\right.$$

✓

Maple : cpu = 0.221 (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))

$$y(x)=e^{b x} x^{a+b+1}\left(\text {KummerU}\left(\frac{a^2+a b+a-b}{a-b}, 2+a+b, x(a-b)\right) c_2+\text {KummerM}\left(\frac{a^2+a b+a-b}{a-b}, 2+a+b, x(a-b)\right) c_1\right)$$

2.1118

ODE No. 1118

$$y'(x)(x(a+b)+m+n)+y(x)(abx+an+bm)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0410894 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{-ax}U(m,m+n,(a-b)x)+c_2e^{-ax}L_{-m}^{m+n-1}((a-b)x)\right\}\right\}$$

✓ **Maple** : cpu = 0.16 (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))
```

$$y(x)=e^{-ax}(\text{KummerU}(m,m+n,x(a-b))\,c_2+\text{KummerM}(m,m+n,x(a-b))\,c_1)$$

2.1119

ODE No. 1119

$$y(x)\left(a^2x+2ab\right)-2(ax+b)y'(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0725533 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{ax}x^{b-\frac{1}{2}\sqrt{(2b+1)^2+\frac{1}{2}}}+\frac{c_2e^{ax}x^{b+\frac{1}{2}\sqrt{(2b+1)^2+\frac{1}{2}}}}{\sqrt{(2b+1)^2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.059 (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))
```

$$y(x)=e^{ax}\left(x^{2b+1}c_2+c_1\right)$$

2.1120

ODE No. 1120

$$(ax + b)y'(x) + y(x)(cx + d) + xy''(x) = 0$$

✓

Mathematica : cpu = 0.0264337 (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]`

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-\frac{1}{2}x\sqrt{a^2-4c}-\frac{ax}{2}} U\left(-\frac{-ab-\sqrt{a^2-4c}b+2d}{2\sqrt{a^2-4c}}, b, \sqrt{a^2-4c}x\right) + c_2 e^{-\frac{1}{2}x\sqrt{a^2-4c}-\frac{ax}{2}} L^{b-1}_{\frac{-ab-\sqrt{a^2-4c}b+2d}{2\sqrt{a^2-4c}}} \left(\sqrt{a^2-4c}x\right) \right. \right.$$

✓

Maple : cpu = 0.399 (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))`

$$y(x) = e^{-\frac{x(\sqrt{a^2-4c}+a)}{2}} \left(\text{KummerU}\left(\frac{b\sqrt{a^2-4c}+ab-2d}{2\sqrt{a^2-4c}}, b, \sqrt{a^2-4c}x\right) c_2 + \text{KummerM}\left(\frac{b\sqrt{a^2-4c}+ab-2d}{2\sqrt{a^2-4c}}, b, \sqrt{a^2-4c}x\right) c_1 \right)$$

2.1121

ODE No. 1121

$$-(x^2-x)y'(x)+xy''(x)+(x-1)y(x)=0$$

✓ **Mathematica** : cpu = 0.227812 (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]

$$\left\{\left\{y(x)\rightarrow c_2x\int_1^xe^{\frac{K[1]^2}{2}-K[1]}\frac{dK[1]}{K[1]^2}+c_1x\right\}\right\}$$

✓ **Maple** : cpu = 0.049 (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

$$-(x^2-x-2)y'(x)+xy''(x)-x(x+3)y(x)=0$$

✓

Mathematica : cpu = 0.353543 (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]

$$\left\{\left\{y(x)\rightarrow c_2e^{\frac{x^2}{2}}\int_1^xe^{-\frac{1}{2}K[1]^2-K[1]}\frac{dK[1]}{K[1]^2}+c_1e^{\frac{x^2}{2}}\right\}\right\}$$

✓

Maple : cpu = 0.235 (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))

$$y(x)=e^{\frac{x^2}{2}}\left(\left(\int\frac{e^{-\frac{x(x+2)}{2}}}{x^2}dx\right)c_2+c_1\right)$$

2.1123

ODE No. 1123

$$-(2ax^2+1)y'(x)+bx^3y(x)+xy''(x)=0$$

✓

Mathematica : cpu = 0.0086448 (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]

$$\left\{\left\{y(x)\rightarrow c_1e^{\frac{1}{2}\sqrt{b}x^2\left(\frac{a}{\sqrt{b}}-\frac{\sqrt{a^2-b}}{\sqrt{b}}\right)}+c_2e^{\frac{1}{2}\sqrt{b}x^2\left(\frac{\sqrt{a^2-b}}{\sqrt{b}}+\frac{a}{\sqrt{b}}\right)}\right\}\right\}$$

✓

Maple : cpu = 0.079 (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))

$$y(x)=c_1e^{\frac{x^2\left(\sqrt{a^2-b}+a\right)}{2}}+c_2e^{\frac{x^2\left(-\sqrt{a^2-b}+a\right)}{2}}$$

2.1124

ODE No. 1124

$$-2\left(x^2-a\right)y'(x)+2nxy(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0482205 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1{}_1F_1\left(-\frac{n}{2};a+\frac{1}{2};x^2\right)+i^{1-2a}c_2x^{1-2a}{}_1F_1\left(-a-\frac{n}{2}+\frac{1}{2};\frac{3}{2}-a;x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.156 (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))
```

$$y(x)=c_1\operatorname{KummerM}\left(-\frac{n}{2},\frac{1}{2}+a,x^2\right)+c_2\operatorname{KummerU}\left(-\frac{n}{2},\frac{1}{2}+a,x^2\right)$$

2.1125

ODE No. 1125

$$-4x^5 - 4x^3y(x) + (4x^2 - 1)y'(x) + xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.171783 (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]
```

$$\left\{\left\{y(x) \rightarrow -\frac{3\sqrt{2}x^2 + 4x^2 + 6\sqrt{2} + 8}{\sqrt{2}\left(3 + 2\sqrt{2}\right)} + c_1e^{-\left(\left(1-\sqrt{2}\right)x^2\right)} + c_2e^{-\left(\left(1+\sqrt{2}\right)x^2\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.063 (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))
```

$$y(x) = e^{x^2\left(\sqrt{2}-1\right)}c_2 + e^{-x^2\left(1+\sqrt{2}\right)}c_1 - x^2 - 2$$

2.1126

ODE No. 1126

$$(a^2x^3 + a) y(x) + (2ax^3 - 1) y'(x) + xy''(x) = 0$$

 **Mathematica** : cpu = 0.498887 (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

$$\{\{y(x) \rightarrow (x)\}\}$$

 **Maple** : cpu = 0.044 (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))
```

$$y(x) = e^{-\frac{ax^3}{3}}(c_2x^2 + c_1)$$

2.1127

ODE No. 1127

$$y(x)\left(a^2x\log^2(x)+a\log(x)+a\right)+\left(2ax\log(x)+1\right)y'(x)+xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0237825 (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*Deriv
```

$$\left\{\left\{y(x)\rightarrow c_1e^{ax}x^{-ax}+c_2e^{ax}x^{-ax}\log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (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)
```

$$y(x)=x^{-ax}e^{ax}(\ln(x)c_2+c_1)$$

2.1128

ODE No. 1128

$$(xf(x)+2)y'(x)+f(x)y(x)+xy''(x)=0$$

✓

Mathematica : cpu = 0.0163894 (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]`

$$\left\{\left\{y(x)\rightarrow\frac{c_2\int_1^x\exp\left(-\int_1^{K[2]}f(K[1])dK[1]\right)dK[2]}{x}+\frac{c_1}{x}\right\}\right\}$$

✓

Maple : cpu = 0.388 (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 = 0.112061 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{8}c_2e^{3x-9}\left(4x^3-42x^2+150x-183\right)+c_1e^{x-3}\right\}\right\}$$

✓ **Maple** : cpu = 0.038 (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))
```

$$y(x)=c_1e^x+c_2e^{3x}\left(4x^3-42x^2+150x-183\right)$$

2.1130 ODE No. 1130

$$ay(x) + 2xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.006809 (sec), leaf count = 46

```
DSolve[a*y[x] + Derivative[1][y][x] + 2*x*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \cos \left(\sqrt{2} \sqrt{a} \sqrt{x} \right) + c_2 \sin \left(\sqrt{2} \sqrt{a} \sqrt{x} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.029 (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 = 0.0070923 (sec), leaf count = 58

DSolve[a*y[x] - (-1 + x)*Derivative[1][y][x] + 2*x*Derivative[2][y][x] == 0,y[x],x]

$$\left\{ \left\{ y(x) \rightarrow c_1 \sqrt{x} U\left(\frac{1}{2}(1-2a), \frac{3}{2}, \frac{x}{2}\right) + c_2 \sqrt{x} L^{\frac{1}{2}}_{\frac{1}{2}(2a-1)}\left(\frac{x}{2}\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.128 (sec), leaf count = 33

dsolve(2*x*diff(diff(y(x),x),x)-(x-1)*diff(y(x),x)+a*y(x)=0,y(x))

$$y(x) = \sqrt{x} \left(\text{KummerU}\left(-a + \frac{1}{2}, \frac{3}{2}, \frac{x}{2}\right) c_2 + \text{KummerM}\left(-a + \frac{1}{2}, \frac{3}{2}, \frac{x}{2}\right) c_1 \right)$$

2.1132 ODE No. 1132

$$ay(x) + 2xy''(x) - (2x - 1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0071261 (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]`

$$\left\{ \left\{ y(x) \rightarrow c_1 \sqrt{x} U\left(\frac{1-a}{2}, \frac{3}{2}, x\right) + c_2 \sqrt{x} L^{\frac{1}{2}}_{\frac{a-1}{2}}(x) \right\} \right\}$$

✓ **Maple** : cpu = 0.131 (sec), leaf count = 29

`dsolve(2*x*diff(diff(y(x),x),x)-(2*x-1)*diff(y(x),x)+a*y(x)=0,y(x))`

$$y(x) = \sqrt{x} \left(\text{KummerU}\left(-\frac{a}{2} + \frac{1}{2}, \frac{3}{2}, x\right) c_2 + \text{KummerM}\left(-\frac{a}{2} + \frac{1}{2}, \frac{3}{2}, x\right) c_1 \right)$$

2.1133

ODE No. 1133

$$(2x-1)y''(x)-(3x-4)y'(x)+(x-3)y(x)=0$$

✓ **Mathematica** : cpu = 0.140522 (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]]
```

$$\left\{\left\{y(x)\rightarrow 2^{5/8}c_1e^{x-\frac{1}{2}}-\frac{c_2e^{x-\frac{1}{2}}\Gamma\left(-\frac{1}{4},\frac{1}{4}(2x-1)\right)}{4\sqrt[8]{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.174 (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))
```

$$y(x)=\frac{e^{\frac{x}{2}}\left(\text{KummerU}\left(1,\frac{3}{4},\frac{x}{2}-\frac{1}{4}\right)c_2+\text{KummerM}\left(1,\frac{3}{4},\frac{x}{2}-\frac{1}{4}\right)c_1\right)}{(2x-1)^{1/4}}$$

2.1134

ODE No. 1134

$$(-a-x)y(x)+4xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0562877 (sec), leaf count = 78

```
DSolve[(-a - x)*y[x] + 4*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{4} c_2 e^{-x/2} x {}_1F_1\left(\frac{1}{128} (-32 (-a-4 i)-128 i)+1;2;x\right)+\frac{1}{4} c_1 e^{-x/2} x U\left(\frac{1}{128} (-32 (-a-4 i)-128 i)\right.\right.\right.$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 21

```
dsolve(4*x*diff(diff(y(x),x),x)-(x+a)*y(x)=0,y(x))
```

$$y(x)=c_1 \operatorname{WhittakerM}\left(-\frac{a}{4},\frac{1}{2},x\right)+c_2 \operatorname{WhittakerW}\left(-\frac{a}{4},\frac{1}{2},x\right)$$

2.1135 ODE No. 1135

$$4xy''(x) + 2y'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0062086 (sec), leaf count = 27

```
DSolve[-y[x] + 2*Derivative[1][y][x] + 4*x*Derivative[2][y][x] == 0, y[x], x]
```

$$\{\{y(x) \rightarrow c_1 \cosh(\sqrt{x}) + ic_2 \sinh(\sqrt{x})\}\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 17

```
dsolve(4*x*diff(diff(y(x), x), x) + 2*diff(y(x), x) - y(x) = 0, y(x))
```

$$y(x) = c_1 \sinh(\sqrt{x}) + c_2 \cosh(\sqrt{x})$$

2.1136 ODE No. 1136

$$4xy''(x) + 4y'(x) + (-x - 2)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0229552 (sec), leaf count = 30

```
DSolve[(-2 - x)*y[x] + 4*Derivative[1][y][x] + 4*x*Derivative[2][y][x] == 0, y[x], x]
```

$$\{\{y(x) \rightarrow c_2 e^{x/2} \text{Ei}(-x) + c_1 e^{x/2}\}\}$$

✓ **Maple** : cpu = 0.04 (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))
```

$$y(x) = e^{\frac{x}{2}} (\text{Ei}_1(x) c_2 + c_1)$$

2.1137

ODE No. 1137

$$ly(x)+4xy''(x)-(x+2)y(x)+4y(x)=0$$

✓ **Mathematica** : cpu = 0.0555774 (sec), leaf count = 74

```
DSolve[4*y[x] + 1*y[x] - (2 + x)*y[x] + 4*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{4}c_2e^{-x/2}x{}_1F_1\left(\frac{1}{128}(-32(l+(2-4i))-128i)+1;2;x\right)+\frac{1}{4}c_1e^{-x/2}xU\left(\frac{1}{128}(-32(l+(2-4i))\right.\right.$$

✓ **Maple** : cpu = 0.069 (sec), leaf count = 25

```
dsolve(4*x*diff(diff(y(x),x),x)+4*y(x)-(x+2)*y(x)+1*y(x)=0,y(x))
```

$$y(x)=c_1\operatorname{WhittakerM}\left(\frac{l}{4}+\frac{1}{2},\frac{1}{2},x\right)+c_2\operatorname{WhittakerW}\left(\frac{l}{4}+\frac{1}{2},\frac{1}{2},x\right)$$

2.1138

ODE No. 1138

$$y(x)(2m+4n-x)+4my'(x)+4xy''(x)=0$$

✓ **Mathematica** : cpu = 0.0147862 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{-x/2}U(-n,m,x)+c_2e^{-x/2}L_n^{m-1}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.124 (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))
```

$$y(x)=e^{-\frac{x}{2}}(\text{KummerU}(-n,m,x)c_2+\text{KummerM}(-n,m,x)c_1)$$

2.1139

ODE No. 1139

$$(-a-x)y(x)+16xy''(x)+8y'(x)=0$$

✓ **Mathematica** : cpu = 0.0087725 (sec), leaf count = 74

```
DSolve[(-a - x)*y[x] + 8*Derivative[1][y][x] + 16*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1 e^{\frac{1}{4}(2 \log (x)-x)} U\left(\frac{a+6}{8}, \frac{3}{2}, \frac{x}{2}\right)+c_2 e^{\frac{1}{4}(2 \log (x)-x)} L_{\frac{1}{8}(-a-6)}^{\frac{1}{2}}\left(\frac{x}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.134 (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))
```

$$y(x)=\sqrt{x} e^{-\frac{x}{4}}\left(\text{KummerU}\left(\frac{a}{8}+\frac{3}{4}, \frac{3}{2}, \frac{x}{2}\right) c_2+\text{KummerM}\left(\frac{a}{8}+\frac{3}{4}, \frac{3}{2}, \frac{x}{2}\right) c_1\right)$$

2.1140

ODE No. 1140

$$axy''(x)+by'(x)+cy(x)=0$$

✓ **Mathematica** : cpu = 0.0274913 (sec), leaf count = 190

`DSolve[c*y[x] + b*Derivative[1][y][x] + a*x*Derivative[2][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow c_1a^{\frac{1}{2}\left(\frac{b}{a}-1\right)}c^{\frac{1}{2}\left(1-\frac{b}{a}\right)}x^{\frac{1}{2}\left(1-\frac{b}{a}\right)}\Gamma\left(\frac{b}{a}\right)J_{\frac{b}{a}-1}\left(\frac{2\sqrt{c}\sqrt{x}}{\sqrt{a}}\right)+c_2a^{\frac{1}{2}\left(1-\frac{b}{a}\right)-\frac{a-b}{a}}c^{\frac{a-b}{a}+\frac{1}{2}\left(\frac{b}{a}-1\right)}x^{\frac{a-b}{a}+\frac{1}{2}\left(\frac{b}{a}-1\right)}\Gamma\left(2\right.\right.\right.$$

✓ **Maple** : cpu = 0.04 (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 = 0.14687 (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]

$$\left\{\left\{y(x)\rightarrow c_1e^{-\frac{bx}{a}}-\frac{c_2e^{-\frac{bx}{a}}\left(a^2e^{\frac{bx}{a}}-b^2x^2\text{Ei}\left(\frac{bx}{a}\right)+abxe^{\frac{bx}{a}}\right)}{2a^2x^2}\right\}\right\}$$

✓

Maple : cpu = 0.063 (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))

$$y(x)=\frac{e^{-\frac{bx}{a}}\text{Ei}_1\left(-\frac{bx}{a}\right)c_2b^2x^2+c_1e^{-\frac{bx}{a}}x^2+ac_2(bx+a)}{x^2}$$

2.1142

ODE No. 1142

$$cy(x)\sqrt[5]{ax+b}+5(ax+b)y''(x)+8ay'(x)=0$$

✓ **Mathematica** : cpu = 0.0234016 (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
```

$$\left\{\left\{y(x)\rightarrow\frac{6ac_1\cos\left(\frac{\sqrt{5}\sqrt{c}(ax+b)^{3/5}}{3a}\right)}{\sqrt{5}\sqrt{c}(ax+b)^{3/5}}+\frac{3ac_2\sin\left(\frac{\sqrt{5}\sqrt{c}(ax+b)^{3/5}}{3a}\right)}{\sqrt{5}\sqrt{c}(ax+b)^{3/5}}\right\}\right\}$$

✓ **Maple** : cpu = 0.166 (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))
```

$$y(x)=\frac{c_2\cosh\left(\frac{(ax+b)^{3/5}\sqrt{-5c}}{3a}\right)+c_1\sinh\left(\frac{(ax+b)^{3/5}\sqrt{-5c}}{3a}\right)}{(ax+b)^{3/5}}$$

2.1143

ODE No. 1143

$$(a+bx)y'(x)+2axy''(x)+cy(x)=0$$

✓

Mathematica : cpu = 0.019192 (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]

$$\left\{\left\{y(x)\rightarrow c_1e^{\frac{a\log(x)-bx}{2a}}U\left(-\frac{c-b}{b},\frac{3}{2},\frac{bx}{2a}\right)+c_2e^{\frac{a\log(x)-bx}{2a}}L^{\frac{1}{2}}_{\frac{c-b}{b}}\left(\frac{bx}{2a}\right)\right\}\right\}$$

✓

Maple : cpu = 0.181 (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))

$$y(x)=e^{-\frac{bx}{2a}}\sqrt{x}\left(\text{KummerU}\left(\frac{b-c}{b},\frac{3}{2},\frac{bx}{2a}\right)c_2+\text{KummerM}\left(\frac{b-c}{b},\frac{3}{2},\frac{bx}{2a}\right)c_1\right)$$

2.1144

ODE No. 1144

$$(3a+bx)y'(x)+2axy''(x)+cy(x)=0$$

✓

Mathematica : cpu = 0.0184172 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{-\frac{bx}{2a}}U\left(-\frac{2c-3b}{2b},\frac{3}{2},\frac{bx}{2a}\right)+c_2e^{-\frac{bx}{2a}}L^{\frac{1}{2}}_{\frac{2c-3b}{2b}}\left(\frac{bx}{2a}\right)\right\}\right\}$$

✓

Maple : cpu = 0.15 (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))
```

$$y(x)=e^{-\frac{bx}{2a}}\left(\text{KummerM}\left(\frac{3b-2c}{2b},\frac{3}{2},\frac{bx}{2a}\right)c_1+\text{KummerU}\left(\frac{3b-2c}{2b},\frac{3}{2},\frac{bx}{2a}\right)c_2\right)$$

2.1145

ODE No. 1145

$y(x)(a_0x + b_0) + (a_1x + b_1)y'(x) + (a_2x + b_2)y''(x) = 0$

✓ **Mathematica** : cpu = 0.196091 (sec), leaf count = 386

```
DSolve[(b0 + a0*x)*y[x] + (b1 + a1*x)*Derivative[1][y][x] + (b2 + a2*x)*Derivative[2][y][x] ==
```

$$\left\{ \left\{ y(x) \rightarrow c_1 U \left(- \frac{b_2 a_1^2 - a_2 b_1 a_1 - \sqrt{a_1^2 - 4 a_0 a_2} b_2 a_1 + 2 a_2^2 b_0 + a_2 \sqrt{a_1^2 - 4 a_0 a_2} b_1 - 2 a_0 a_2 b_2 - 2 a_2^2}{2 a_2^2 \sqrt{a_1^2 - 4 a_0 a_2}} \right) \right. \right.$$

✓ **Maple** : cpu = 0.286 (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))
```

$$y(x) = (a_2 x + b_2)^{\frac{a_1 b_2 + a_2^2 - a_2 b_1}{a_2^2}} e^{-\frac{(\sqrt{-4 a_0 a_2 + a_1^2} + a_1) x}{2 a_2}} \left(\text{KummerM} \left(\frac{(a_1 b_2 + 2 a_2^2 - a_2 b_1) \sqrt{-4 a_0 a_2 + a_1^2} -}{2 \sqrt{-4 a_0 a_2 -}} \right) \right)$$

2.1146 ODE No. 1146

$$x^2 y''(x) - 6y(x) = 0$$

✓ **Mathematica** : cpu = 0.0035025 (sec), leaf count = 18

```
DSolve[-6*y[x] + x^2*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 x^3 + \frac{c_1}{x^2} \right\} \right\}$$

✓ **Maple** : cpu = 0.008 (sec), leaf count = 15

```
dsolve(x^2*diff(diff(y(x), x), x)-6*y(x)=0, y(x))
```

$$y(x) = \frac{c_2 x^5 + c_1}{x^2}$$

2.1147

ODE No. 1147

$$x^2y''(x) - 12y(x) = 0$$

✓ **Mathematica** : cpu = 0.0035809 (sec), leaf count = 18

```
DSolve[-12*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_2x^4 + \frac{c_1}{x^3}\right\}\right\}$$

✓ **Maple** : cpu = 0.012 (sec), leaf count = 15

```
dsolve(x^2*diff(diff(y(x),x),x)-12*y(x)=0,y(x))
```

$$y(x) = \frac{c_2x^7 + c_1}{x^3}$$

2.1148

ODE No. 1148

$$ay(x) + x^2y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0069036 (sec), leaf count = 77

```
DSolve[a*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x^{\frac{1}{2} \left(\frac{1}{\sqrt{a}} - \frac{\sqrt{1-4a}}{\sqrt{a}} \right) \sqrt{a}} + c_2 x^{\frac{1}{2} \left(\frac{\sqrt{1-4a}}{\sqrt{a}} + \frac{1}{\sqrt{a}} \right) \sqrt{a}} \right\} \right\}$$

✓ **Maple** : cpu = 0.013 (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 = 0.0339941 (sec), leaf count = 212

```
DSolve[(b + a*x)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 a^{\frac{1}{2}(\sqrt{1-4b}+1)-\frac{1}{2}\sqrt{1-4b}} x^{\frac{1}{2}(\sqrt{1-4b}+1)-\frac{1}{2}\sqrt{1-4b}} \Gamma\left(\sqrt{1-4b}+1\right) J_{\sqrt{1-4b}}\left(2\sqrt{a}\sqrt{x}\right) + c_1 a^{\frac{1}{2}(1-\sqrt{1-4b})+\frac{1}{2}\sqrt{1-4b}} x^{\frac{1}{2}(1-\sqrt{1-4b})+\frac{1}{2}\sqrt{1-4b}} \Gamma\left(\sqrt{1-4b}\right) Y_{\sqrt{1-4b}}\left(2\sqrt{a}\sqrt{x}\right) \right\} \right.$$

✓ **Maple** : cpu = 0.029 (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

$$x^2 y''(x) + (x^2 - 2) y(x) = 0$$

✓ **Mathematica** : cpu = 0.0072508 (sec), leaf count = 21

```
DSolve[(-2 + x^2)*y[x] + x^2*Derivative[2][y][x] == 0, y[x], x]
```

$$\{\{y(x) \rightarrow c_1 x j_1(x) - c_2 x y_1(x)\}\}$$

✓ **Maple** : cpu = 0.098 (sec), leaf count = 27

```
dsolve(x^2*diff(diff(y(x), x), x) + (x^2-2)*y(x)=0, y(x))
```

$$y(x) = \frac{(c_1 x + c_2) \cos(x) + \sin(x) (c_2 x - c_1)}{x}$$

2.1151

ODE No. 1151

$$(-ax^2-2)y(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0106041 (sec), leaf count = 129

```
DSolve[(-2 - a*x^2)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow\frac{\sqrt{\frac{2}{\pi}}c_2\sqrt{x}\left(i\sinh\left(\sqrt{a}x\right)-\frac{i\cosh\left(\sqrt{a}x\right)}{\sqrt{ax}}\right)}{\sqrt{-i\sqrt{a}x}}+\frac{\sqrt{\frac{2}{\pi}}c_1\sqrt{x}\left(\frac{\sinh\left(\sqrt{a}x\right)}{\sqrt{ax}}-\cosh\left(\sqrt{a}x\right)\right)}{\sqrt{-i\sqrt{a}x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.119 (sec), leaf count = 42

```
dsolve(x^2*diff(diff(y(x),x),x)-(a*x^2+2)*y(x)=0,y(x))
```

$$y(x)=\frac{c_2\left(ax+\sqrt{a}\right)e^{-\sqrt{a}x}+e^{\sqrt{a}x}c_1\left(ax-\sqrt{a}\right)}{x}$$

2.1152

ODE No. 1152

$$(a^2x^2-6)y(x)+x^2y''(x)=0$$

✓

Mathematica : cpu = 0.012177 (sec), leaf count = 114

DSolve[(-6 + a^2*x^2)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]

$$\left\{\left\{y(x)\rightarrow\frac{\sqrt{\frac{2}{\pi}}c_1\sqrt{x}\left(\frac{3\sin(ax)}{a^2x^2}-\sin(ax)-\frac{3\cos(ax)}{ax}\right)}{\sqrt{ax}}+\frac{\sqrt{\frac{2}{\pi}}c_2\sqrt{x}\left(-\frac{3\cos(ax)}{a^2x^2}-\frac{3\sin(ax)}{ax}+\cos(ax)\right)}{\sqrt{ax}}\right\}\right\}$$

✓

Maple : cpu = 0.284 (sec), leaf count = 53

dsolve(x^2*diff(diff(y(x),x),x)+(a^2*x^2-6)*y(x)=0,y(x))

$$y(x)=\frac{(a^2c_1x^2+3ac_2x-3c_1)\cos(ax)+\sin(ax)(a^2c_2x^2-3ac_1x-3c_2)}{x^2}$$

2.1153 ODE No. 1153

$$y(x) (ax^2 + (1 - v)v) + x^2 y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0160514 (sec), leaf count = 56

```
DSolve[((1 - v)*v + a*x^2)*y[x] + x^2*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \sqrt{x} J_{\frac{1}{2}(2v-1)}(\sqrt{ax}) + c_2 \sqrt{x} Y_{\frac{1}{2}(2v-1)}(\sqrt{ax}) \right\} \right\}$$

✓ **Maple** : cpu = 0.052 (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

$$y(x) (ax^2 + bx + c) + x^2 y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0109489 (sec), leaf count = 88

```
DSolve[(c + b*x + a*x^2)*y[x] + x^2*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 M_{-\frac{ib}{2\sqrt{a}}, -\frac{1}{2}i\sqrt{4c-1}}(2i\sqrt{a}x) + c_2 W_{-\frac{ib}{2\sqrt{a}}, -\frac{1}{2}i\sqrt{4c-1}}(2i\sqrt{a}x) \right\} \right\}$$

✓ **Maple** : cpu = 0.256 (sec), leaf count = 57

```
dsolve(x^2*diff(diff(y(x), x), x) + (a*x^2 + b*x + c)*y(x) = 0, y(x))
```

$$y(x) = c_1 \text{WhittakerM}\left(-\frac{ib}{2\sqrt{a}}, \frac{\sqrt{1-4c}}{2}, 2i\sqrt{a}x\right) + c_2 \text{WhittakerW}\left(-\frac{ib}{2\sqrt{a}}, \frac{\sqrt{1-4c}}{2}, 2i\sqrt{a}x\right)$$

2.1155

ODE No. 1155

$$y(x)\left(ax^k+(1-b)b\right)+x^2y''(x)=0$$

✓

Mathematica : cpu = 0.0249506 (sec), leaf count = 225

`DSolve[((1 - b)*b + a*x^k)*y[x] + x^2*Derivative[2][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x) \rightarrow c_1 k^{-\frac{2(1-b)}{k}-\frac{2b}{k}+\frac{1}{k}} a^{\frac{1-b}{k}+\frac{1}{2}\left(\frac{2b}{k}-\frac{1}{k}\right)}\left(x^k\right)^{\frac{1-b}{k}+\frac{1}{2}\left(\frac{2b}{k}-\frac{1}{k}\right)} \Gamma\left(-\frac{2b}{k}+\frac{1}{k}+1\right) J_{\frac{1-2b}{k}}\left(\frac{2 \sqrt{a} \sqrt{x^k}}{k}\right)+c_2 k^{-1 / k} a^{\frac{b}{k}+\frac{1}{2}\left(\frac{2b}{k}-\frac{1}{k}\right)}\right.\right.$$

✓

Maple : cpu = 0.072 (sec), leaf count = 67

`dsolve(x^2*diff(diff(y(x),x),x)+(a*x^k-b*(b-1))*y(x)=0,y(x))`

$$y(x)=\sqrt{x}\left(\operatorname{BesselJ}\left(\frac{\sqrt{\left(2 b-1\right)^2}}{k}, \frac{2 \sqrt{a} x^{\frac{k}{2}}}{k}\right) c_1+\operatorname{BesselY}\left(\frac{\sqrt{\left(2 b-1\right)^2}}{k}, \frac{2 \sqrt{a} x^{\frac{k}{2}}}{k}\right) c_2\right)$$

2.1156

ODE No. 1156

$$x^2y''(x) + \frac{y(x)}{\log(x)} - e^x x(x \log(x) + 2) = 0$$

✓ **Mathematica** : cpu = 0.0585862 (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]

$$\left\{ \left\{ y(x) \rightarrow c_2 \log(x) \left(\operatorname{li}(x) - \frac{x}{\log(x)} \right) + e^x \log(x) + c_1 \log(x) \right\} \right\}$$

✓ **Maple** : cpu = 0.226 (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))

$$y(x) = \ln(x) c_2 - (\operatorname{Ei}_1(-\ln(x)) \ln(x) + x) c_1 - \left(- \left(\int \frac{(\operatorname{Ei}_1(-\ln(x)) \ln(x) + x) e^x (2 + x \ln(x))}{x} dx \right) + \ln(x) \right)$$

2.1157

ODE No. 1157

$$ay'(x) + x^2y''(x) - xy(x) = 0$$

 **Mathematica** : cpu = 0.259068 (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

$$\{\{y(x) \rightarrow (x)\}\}$$

 **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

$$y(x) = \text{DESol} \left(\left\{ \frac{d^2}{dx^2} Y(x) + \frac{a \left(\frac{d}{dx} Y(x) \right)}{x^2} - \frac{Y(x)}{x} \right\}, \{ \_ Y(x) \} \right)$$

2.1158

ODE No. 1158

$$y(x)\left(-ab-b^2x^2\right)+ay'(x)+x^2y''(x)=0$$

✓

Mathematica : cpu = 0.135216 (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]`

$$\left\{\left\{y(x)\rightarrow c_2e^{bx}\int_1^xe^{\frac{a}{K[1]}-2bK[1]}dK[1]+c_1e^{bx}\right\}\right\}$$

✓

Maple : cpu = 0.372 (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))`

$$y(x)=\sqrt{x}\left(e^{\frac{-bx^2+a}{x}}\operatorname{HeunD}\left(4\sqrt{2}\sqrt{ab},-1-4\sqrt{2}\sqrt{ab},8\sqrt{2}\sqrt{ab},-4\sqrt{2}\sqrt{ab}+1,\frac{\sqrt{2}\sqrt{ab}x-a}{\sqrt{2}\sqrt{ab}x+a}\right)c_1+e^{bx}\operatorname{HeunD}\left(4\sqrt{2}\sqrt{ab},-1-4\sqrt{2}\sqrt{ab},8\sqrt{2}\sqrt{ab},-4\sqrt{2}\sqrt{ab}+1,\frac{\sqrt{2}\sqrt{ab}x-a}{\sqrt{2}\sqrt{ab}x+a}\right)c_2\right)$$

2.1159

ODE No. 1159

$$-ax^2 + x^2y''(x) + xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0060648 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{ax^2}{3} + c_2x + \frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.02 (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))
```

$$y(x) = c_2x + \frac{ax^2}{3} + \frac{c_1}{x}$$

2.1160 ODE No. 1160

$$ay(x) + x^2y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0060461 (sec), leaf count = 30

```
DSolve[a*y[x] + x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0, y[x], x]
```

$$\{\{y(x) \rightarrow c_1 \cos(\sqrt{a} \log(x)) + c_2 \sin(\sqrt{a} \log(x))\}\}$$

✓ **Maple** : cpu = 0.018 (sec), leaf count = 23

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)+a*y(x)=0,y(x))
```

$$y(x) = c_1 \sin(\sqrt{a} \ln(x)) + c_2 \cos(\sqrt{a} \ln(x))$$

2.1161 ODE No. 1161

$$(-a-x)y(x) + x^2 y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0280826 (sec), leaf count = 78

```
DSolve[(-a - x)*y[x] + x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow (-1)^{-\sqrt{a}} c_1 \Gamma(1 - 2\sqrt{a}) I_{-2\sqrt{a}}(2\sqrt{x}) + (-1)^{\sqrt{a}} c_2 \Gamma(2\sqrt{a} + 1) I_{2\sqrt{a}}(2\sqrt{x}) \right\} \right\}$$

✓ **Maple** : cpu = 0.023 (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))
```

$$y(x) = c_1 \text{BesselI}(2\sqrt{a}, 2\sqrt{x}) + c_2 \text{BesselK}(2\sqrt{a}, 2\sqrt{x})$$

2.1162

ODE No. 1162

$$(x^2 - v^2) y(x) + x^2 y''(x) + x y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0298893 (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]
```

$$\{ \{ y(x) \rightarrow c_1 J_v(x) + c_2 Y_v(x) \} \}$$

✓ **Maple** : cpu = 0.013 (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

$$-f(x) + \left(x^2 - v^2\right) y(x) + x^2 y''(x) + x y'(x) = 0$$

✓

Mathematica : cpu = 0.0723059 (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]

$$\left\{\left\{y(x) \rightarrow J_v(x) \int_1^x -\frac{\pi Y_v(K[1]) f(K[1])}{2 K[1]} d K[1]+Y_v(x) \int_1^x \frac{\pi J_v(K[2]) f(K[2])}{2 K[2]} d K[2]+c_1 J_v(x)+c_2 Y_v(x)\right\}\right\}$$

✓

Maple : cpu = 0.059 (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))

$$y(x)=\frac{\pi\left(\int \frac{\text{BesselJ}(v,x) f(x)}{x} d x\right) \text{BesselY}(v, x)}{2}-\frac{\pi\left(\int \frac{\text{BesselY}(v, x) f(x)}{x} d x\right) \text{BesselJ}(v, x)}{2}+\text{BesselY}(v, x) c_1+\text{BesselJ}(v, x) c_2$$

2.1164 ODE No. 1164

$$y(x) (lx^2 - v^2) + x^2 y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.011072 (sec), leaf count = 30

```
DSolve[(-v^2 + 1*x^2)*y[x] + x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 J_v(\sqrt{l}x) + c_2 Y_v(\sqrt{l}x) \right\} \right\}$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 23

```
dsolve(x^2*diff(diff(y(x),x),x)+x*diff(y(x),x)+(1*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 = 0.0724572 (sec), leaf count = 26

```
DSolve[-y[x] + (a + x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_2(a+x)}{a^2} + c_1 x e^{a/x} \right\} \right\}$$

✓ **Maple** : cpu = 0.023 (sec), leaf count = 19

```
dsolve(x^2*diff(diff(y(x),x),x)+(x+a)*diff(y(x),x)-y(x)=0,y(x))
```

$$y(x) = (x+a)c_1 + c_2 e^{\frac{a}{x}} x$$

2.1166

ODE No. 1166

$$-3x^3 + x^2y''(x) - xy'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0080793 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{3x^3}{4} + c_1x + c_2x \log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.017 (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))
```

$$y(x) = \frac{x(4 \ln(x) c_1 + 3x^2 + 4c_2)}{4}$$

2.1167

ODE No. 1167

$$y(x)\left(ax^m+b\right)+x^2y''(x)-xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0377506 (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]
```

$$\left\{\left\{y(x) \rightarrow c_1 m^{-\frac{2(m-i \sqrt{b-1} m)}{m^2}-\frac{2 i \sqrt{b-1}}{m}} a^{\frac{m-i \sqrt{b-1} m}{m^2}+\frac{i \sqrt{b-1}}{m}}\left(x^m\right)^{\frac{m-i \sqrt{b-1} m}{m^2}+\frac{i \sqrt{b-1}}{m}} \Gamma\left(1-\frac{2 i \sqrt{b-1}}{m}\right) J_{-\frac{2 i \sqrt{b-1}}{m}}\left(\frac{2 \sqrt{a} \sqrt{x^m}}{m}\right)\right.\right.$$

✓ **Maple** : cpu = 0.054 (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))
```

$$y(x)=x\left(\operatorname{BesselY}\left(\frac{2 \sqrt{1-b}}{m}, \frac{2 \sqrt{a} x^{\frac{m}{2}}}{m}\right) c_2+\operatorname{BesselJ}\left(\frac{2 \sqrt{1-b}}{m}, \frac{2 \sqrt{a} x^{\frac{m}{2}}}{m}\right) c_1\right)$$

2.1168 ODE No. 1168

$$x^2 y''(x) + 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0135439 (sec), leaf count = 15

```
DSolve[2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 - \frac{c_1}{x} \right\} \right\}$$

✓ **Maple** : cpu = 0.01 (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 = 0.0377683 (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]
```

$$\left\{\left\{y(x) \rightarrow c_1 a^{\frac{1}{2} \left(-\sqrt{4 b^2+1}-1\right)+\frac{1}{2} \sqrt{4 b^2+1}} x^{\frac{1}{2} \left(-\sqrt{4 b^2+1}-1\right)+\frac{1}{2} \sqrt{4 b^2+1}} \Gamma\left(1-\sqrt{4 b^2+1}\right) J_{-\sqrt{4 b^2+1}}\left(2 \sqrt{a} \sqrt{x}\right)+c_2 a^{\frac{1}{2} \left(\sqrt{4 b^2+1}-1\right)+\frac{1}{2} \sqrt{4 b^2+1}} x^{\frac{1}{2} \left(\sqrt{4 b^2+1}-1\right)+\frac{1}{2} \sqrt{4 b^2+1}} \Gamma\left(1+\sqrt{4 b^2+1}\right) Y_{-\sqrt{4 b^2+1}}\left(2 \sqrt{a} \sqrt{x}\right)\right.\right.$$

✓ **Maple** : cpu = 0.043 (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))
```

$$y(x)=\frac{c_2 \operatorname{BesselY}\left(\sqrt{4 b^2+1}, 2 \sqrt{a} \sqrt{x}\right)+c_1 \operatorname{BesselJ}\left(\sqrt{4 b^2+1}, 2 \sqrt{a} \sqrt{x}\right)}{\sqrt{x}}$$

2.1170 ODE No. 1170

$$y(x) (ax^2 + b) + x^2 y''(x) + 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0123349 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 j_{\frac{1}{2}(\sqrt{1-4b}-1)}(\sqrt{ax}) + c_2 y_{\frac{1}{2}(\sqrt{1-4b}-1)}(\sqrt{ax}) \right\} \right\}$$

✓ **Maple** : cpu = 0.059 (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))
```

$$y(x) = \frac{c_2 \text{BesselY}\left(\frac{\sqrt{1-4b}}{2}, \sqrt{ax}\right) + c_1 \text{BesselJ}\left(\frac{\sqrt{1-4b}}{2}, \sqrt{ax}\right)}{\sqrt{x}}$$

2.1171

ODE No. 1171

$$y(x)\left(ax+lx^2-n(n+1)\right)+x^2y''(x)+2xy'(x)=0$$

✓

Mathematica : cpu = 0.0255396 (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,x,Assumptions->{l>0}]

$$\left\{\left\{y(x)\rightarrow c_1e^{n\log(x)-i\sqrt{l}x}U\left(\frac{i\left(a-2i\sqrt{l}n-2i\sqrt{l}\right)}{2\sqrt{l}},2n+2,2i\sqrt{l}x\right)+c_2e^{n\log(x)-i\sqrt{l}x}L_{-\frac{i\left(a-2i\sqrt{l}n-2i\sqrt{l}\right)}{2\sqrt{l}}}^{2n+1}\left(2i\sqrt{l}x\right)\right.\right.$$

✓

Maple : cpu = 0.257 (sec), leaf count = 49

dsolve(x^2*diff(diff(y(x),x),x)+2*x*diff(y(x),x)+(1*x^2+a*x-n*(n+1))*y(x)=0,y(x))

$$y(x)=\frac{c_2\operatorname{WhittakerW}\left(-\frac{ia}{2\sqrt{l}},\frac{1}{2}+n,2i\sqrt{l}x\right)+c_1\operatorname{WhittakerM}\left(-\frac{ia}{2\sqrt{l}},\frac{1}{2}+n,2i\sqrt{l}x\right)}{x}$$

2.1172

ODE No. 1172

$$ay(x) + x^2y''(x) + 2(x - 1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0456161 (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]
```

$$\left\{\left\{y(x) \rightarrow 2^{\frac{1}{2}(1-\sqrt{1-4a})}c_1\left(\frac{1}{x}\right)^{\frac{1}{2}(1-\sqrt{1-4a})}{}_1F_1\left(\frac{1}{2}-\frac{1}{2}\sqrt{1-4a};1-\sqrt{1-4a};-\frac{2}{x}\right)+2^{\frac{1}{2}(\sqrt{1-4a}+1)}c_2\left(\frac{1}{x}\right)^{\frac{1}{2}(\sqrt{1-4a}+1)}\right.\right.$$

✓ **Maple** : cpu = 0.052 (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))
```

$$y(x) = e^{-\frac{1}{x}}\sqrt{\frac{1}{x}}\left(\text{BesselK}\left(\frac{\sqrt{1-4a}}{2},\frac{1}{x}\right)c_2 + \text{BesselI}\left(\frac{\sqrt{1-4a}}{2},\frac{1}{x}\right)c_1\right)$$

2.1173

ODE No. 1173

$$2(a+x)y'(x)+(1-b)by(x)+x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0814 (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]`

$$\left\{\left\{y(x)\rightarrow (-2)^{1-b}c_1a^{1-b}\left(\frac{1}{x}\right)^{1-b}{}_1F_1\left(1-b;2-2b;\frac{2a}{x}\right)+(-2)^bc_2a^b\left(\frac{1}{x}\right)^b{}_1F_1\left(b;2b;\frac{2a}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.147 (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 = 0.0084376 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{144} (12x^5 \log(x) - 7x^5) + c_2x^2 + c_1x \right\} \right\}$$

✓ **Maple** : cpu = 0.047 (sec), leaf count = 25

```
dsolve(x^2*diff(diff(y(x),x),x)-2*x*diff(y(x),x)+2*y(x)-x^5*ln(x)=0,y(x))
```

$$y(x) = \frac{x^5 \ln(x)}{12} - \frac{7x^5}{144} + x^2c_2 + xc_1$$

2.1175

ODE No. 1175

$$(-ax^2-12a-4)\cos(x)+x^2y''(x)-2xy'(x)-4y(x)-x\sin(x)=0$$

✓

Mathematica : cpu = 0.229723 (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*Derivati

$$\left\{\left\{y(x)\rightarrow \frac{-2a\sin(x)-ax\cos(x)-\sin(x)}{x}+c_2x^4+\frac{c_1}{x}\right\}\right\}$$

✓

Maple : cpu = 0.174 (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

$$y(x)=\frac{(-2a-1)\sin(x)+x^5c_2-ax\cos(x)+c_1}{x}$$

2.1176 ODE No. 1176

$$x^2 y''(x) + (x^2 + 2) y(x) - 2x y'(x) = 0$$

✓ **Mathematica** : cpu = 0.010235 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-ix} x - \frac{1}{2} i c_2 e^{ix} x \right\} \right\}$$

✓ **Maple** : cpu = 0.039 (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

$$x^2y''(x) + (x^2 + 2) y'(x) + x^2(-\sec(x)) - 2xy'(x) = 0$$

✓

Mathematica : cpu = 0.460665 (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[1][y][x], y[x], x]`

$$\left\{ \left\{ y(x) \rightarrow \int_1^x e^{\frac{2}{K[1]} - K[1]} K[1]^2 dK[1] \int_1^x \frac{e^{K[3] - \frac{2}{K[3]}} \sec(K[3])}{K[3]^2} dK[3] + \int_1^x -\frac{e^{K[2] - \frac{2}{K[2]}} \sec(K[2]) \int_1^{K[2]} e^{\frac{2}{K[1]} - K[1]} dK[1]}{K[2]^2} dK[2] \right. \right.$$

✓

Maple : cpu = 0.413 (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 = 0.0271565 (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
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{2}e^{-ix}x\left(e^{2ix}\log\left(1+e^{-2ix}\right)+\log\left(1+e^{2ix}\right)\right)+c_1e^{-ix}x-\frac{1}{2}ic_2e^{ix}x\right\}\right\}$$

✓ **Maple** : cpu = 0.069 (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))
```

$$y(x)=\left(\cos\left(x\right)\ln\left(\cos\left(x\right)\right)+\cos\left(x\right)c_1+\sin\left(x\right)\left(x+c_2\right)\right)x$$

2.1179

ODE No. 1179

$$(a^2x^2 + 2) y(x) + x^2y''(x) - 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0197277 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x e^{-iax} - \frac{ic_2 x e^{iax}}{2a} \right\} \right\}$$

✓ **Maple** : cpu = 0.043 (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

$$-f(x) + \left(-v^2 + x^2 + 1\right) y(x) + x^2 y''(x) + 3xy'(x) = 0$$

✓

Mathematica : cpu = 0.0438333 (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

$$\left\{\left\{y(x) \rightarrow \frac{J_v(x) \int_1^x -\frac{1}{2} \pi Y_v(K[1]) f(K[1]) dK[1] + Y_v(x) \int_1^x \frac{1}{2} \pi J_v(K[2]) f(K[2]) dK[2]}{x} + \frac{c_1 J_v(x)}{x} + \frac{c_2 Y_v(x)}{x}\right\}\right\}$$

✓

Maple : cpu = 0.069 (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))

$$y(x) = \frac{\pi \left(\int \text{BesselJ}\left(v,x\right) f(x) dx\right) \text{BesselY}\left(v,x\right) - \pi \left(\int \text{BesselY}\left(v,x\right) f(x) dx\right) \text{BesselJ}\left(v,x\right) + 2 \text{BesselY}\left(v,x\right)}{2x}$$

2.1181 ODE No. 1181

$$x^2 y''(x) + (3x - 1)y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0353266 (sec), leaf count = 37

```
DSolve[y[x] + (-1 + 3*x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 e^{-1/x}}{x} - \frac{c_2 e^{-1/x} \text{Ei}\left(\frac{1}{x}\right)}{x} \right\} \right\}$$

✓ **Maple** : cpu = 0.059 (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))
```

$$y(x) = \frac{(c_1 \text{Ei}_1\left(-\frac{1}{x}\right) + c_2) e^{-\frac{1}{x}}}{x}$$

2.1182

ODE No. 1182

$$x^2y''(x) - 3xy'(x) + 4y(x) - 5x = 0$$

✓ **Mathematica** : cpu = 0.0085862 (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]
```

$$\left\{\left\{y(x) \rightarrow c_1 x^2 + 2 c_2 x^2 \log (x) + 5 x\right\}\right\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 20

```
dsolve(x^2*diff(diff(y(x),x),x)-3*x*diff(y(x),x)+4*y(x)-5*x=0,y(x))
```

$$y(x) = x^2 c_2 + x^2 \ln (x) c_1 + 5 x$$

2.1183

ODE No. 1183

$$x^2y''(x)+x^2(-\log(x))-3xy'(x)-5y(x)=0$$

✓ **Mathematica** : cpu = 0.0080755 (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]
```

$$\left\{\left\{y(x)\rightarrow c_2x^5-\frac{1}{9}x^2\log(x)+\frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.021 (sec), leaf count = 22

```
dsolve(x^2*diff(diff(y(x),x),x)-3*x*diff(y(x),x)-5*y(x)-x^2*ln(x)=0,y(x))
```

$$y(x)=x^5c_2+\frac{c_1}{x}-\frac{x^2\ln(x)}{9}$$

2.1184

ODE No. 1184

$$-x^4+x^2y''(x)+x^2-4xy'(x)+6y(x)=0$$

✓

Mathematica : cpu = 0.0074339 (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]

$$\left\{\left\{y(x)\rightarrow c_2x^3+c_1x^2+\frac{1}{2}(x^4+2x^2+2x^2\log(x))\right\}\right\}$$

✓

Maple : cpu = 0.04 (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))

$$y(x)=\frac{x^2(2xc_1+x^2+2\ln(x)+2c_2+2)}{2}$$

2.1185

ODE No. 1185

$$(4-2x^3)y(x)+x^2y''(x)+5xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0220499 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{3\sqrt[3]{6}c_2K_0\left(\frac{2}{3}\sqrt{2}x^{3/2}\right)}{x^2}-\frac{3\sqrt[3]{-3}c_1I_0\left(\frac{2}{3}\sqrt{2}x^{3/2}\right)}{2^{2/3}x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.032 (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))
```

$$y(x)=\frac{c_2\operatorname{BesselK}\left(0,\frac{2\sqrt{2}x^{3/2}}{3}\right)+c_1\operatorname{BesselI}\left(0,\frac{2\sqrt{2}x^{3/2}}{3}\right)}{x^2}$$

2.1186

ODE No. 1186

$$x^3(-\sin(x)) + x^2y''(x) - 5xy'(x) + 8y(x) = 0$$

✓ **Mathematica** : cpu = 0.0109348 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{2}(x^4\text{Ci}(x) - x^3\sin(x) + x^2\cos(x)) + c_2x^4 + c_1x^2\right\}\right\}$$

✓ **Maple** : cpu = 0.068 (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))
```

$$y(x) = \frac{x^2(2c_1x^2 + \text{Ci}(x)x^2 - x\sin(x) + 2c_2 + \cos(x))}{2}$$

2.1187

ODE No. 1187

$$axy'(x)+by(x)+x^2y''(x)=0$$

✓

Mathematica : cpu = 0.0077426 (sec), leaf count = 99

DSolve[b*y[x] + a*x*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]

$$\left\{\left\{y(x)\rightarrow c_1x^{\frac{1}{2}\sqrt{b}\left(-\frac{\sqrt{a^2-2a-4b+1}}{\sqrt{b}}-\frac{a-1}{\sqrt{b}}\right)}+c_2x^{\frac{1}{2}\sqrt{b}\left(\frac{\sqrt{a^2-2a-4b+1}}{\sqrt{b}}-\frac{a-1}{\sqrt{b}}\right)}\right\}\right\}$$

✓

Maple : cpu = 0.013 (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))

$$y(x)=c_1x^{-\frac{a}{2}+\frac{1}{2}+\frac{\sqrt{a^2-2a-4b+1}}{2}}+c_2x^{-\frac{a}{2}+\frac{1}{2}-\frac{\sqrt{a^2-2a-4b+1}}{2}}$$

2.1188

ODE No. 1188

$(ax + b)y'(x) + cy(x) + x^2y''(x) = 0$

✓ **Mathematica** : cpu = 0.110596 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 i^{-\sqrt{a^2-2a-4c+1}+a-1} b^{\frac{1}{2} \left(-\sqrt{a^2-2a-4c+1}+a-1 \right)} \left(\frac{1}{x} \right)^{\frac{1}{2} \left(-\sqrt{a^2-2a-4c+1}+a-1 \right)} {}_1F_1 \left(\frac{a}{2} - \frac{1}{2} \sqrt{a^2-2a-4c+1}, \frac{b}{x} \right) \right. \right.$$

✓ **Maple** : cpu = 0.282 (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))
```

$$y(x) = x^{-\frac{\sqrt{a^2-2a-4c+1}}{2}-\frac{a}{2}+\frac{1}{2}} \left(\text{KummerM} \left(-\frac{1}{2} + \frac{\sqrt{a^2-2a-4c+1}}{2} + \frac{a}{2}, 1 + \sqrt{a^2-2a-4c+1}, \frac{b}{x} \right) c_1 + \text{KummerM} \left(-\frac{1}{2} + \frac{\sqrt{a^2-2a-4c+1}}{2} + \frac{a}{2}, 1 + \sqrt{a^2-2a-4c+1}, \frac{b}{x} \right) c_2 \right)$$

2.1189

ODE No. 1189

$$axy'(x)+y(x)\left(bx^m+c\right)+x^2y''(x)=0$$

✓

Mathematica

: cpu = 0.0321461 (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]

$$\left\{\left\{y(x)\rightarrow c_1m^{-\frac{-\sqrt{a^2-2a-4c+1}-a+1}{m}-\frac{\sqrt{a^2-2a-4c+1}}{m}}b^{\frac{-\sqrt{a^2-2a-4c+1}-a+1}{2m}+\frac{\sqrt{a^2-2a-4c+1}}{2m}}\left(x^m\right)^{\frac{-\sqrt{a^2-2a-4c+1}-a+1}{2m}+\frac{\sqrt{a^2-2a-4c+1}}{2m}}\Gamma\left(\frac{-\sqrt{a^2-2a-4c+1}-a+1}{2m}+\frac{\sqrt{a^2-2a-4c+1}}{2m}\right)\right.\right.$$

✓

Maple

: cpu = 0.056 (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 = 0.0164096 (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]
```

$$\left\{\left\{y(x) \rightarrow c_1 e^{\frac{1}{2}((\sqrt{1-4b}+1)\log(x)-2x)} U\left(\frac{1}{2}(-2a + \sqrt{1-4b} + 1), \sqrt{1-4b} + 1, x\right) + c_2 e^{\frac{1}{2}((\sqrt{1-4b}+1)\log(x)-2x)} L_{\frac{1}{2}}^{\sqrt{1-4b}+1}\left(\frac{1}{2}(-2a + \sqrt{1-4b} + 1)x\right)\right\}\right.$$

✓ **Maple** : cpu = 0.153 (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))
```

$$y(x) = e^{-\frac{x}{2}} \left(\text{WhittakerW}\left(a, \frac{\sqrt{1-4b}}{2}, x\right) c_2 + \text{WhittakerM}\left(a, \frac{\sqrt{1-4b}}{2}, x\right) c_1 \right)$$

2.1191

ODE No. 1191

$$x^2y''(x)+x^2y'(x)-2y(x)=0$$

✓ **Mathematica** : cpu = 0.0065904 (sec), leaf count = 110

```
DSolve[-2*y[x] + x^2*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \frac{2c_2e^{\frac{1}{2}(\log(x)-x)}\left(i\sinh\left(\frac{x}{2}\right)-\frac{2i\cosh\left(\frac{x}{2}\right)}{x}\right)}{\sqrt{\pi}\sqrt{-ix}}+\frac{2c_1e^{\frac{1}{2}(\log(x)-x)}\left(\frac{2\sinh\left(\frac{x}{2}\right)}{x}-\cosh\left(\frac{x}{2}\right)\right)}{\sqrt{\pi}\sqrt{-ix}}\right\}\right\}$$

✓ **Maple** : cpu = 0.024 (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 = 0.0571979 (sec), leaf count = 40

```
DSolve[-y[x] + (-1 + x^2)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 e^{-x} \int_1^x e^{K[1] - \frac{1}{K[1]}} dK[1] + c_1 e^{-x} \right\} \right\}$$

✓ **Maple** : cpu = 0.224 (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))
```

$$y(x) = \sqrt{x} \left(e^{-\frac{1}{x}} \operatorname{HeunD} \left(-4, 3, -8, 5, \frac{x-1}{1+x} \right) c_2 + \operatorname{HeunD} \left(4, 3, -8, 5, \frac{x-1}{1+x} \right) e^{-x} c_1 \right)$$

2.1193

ODE No. 1193

$$x^2y''(x) + (x + 1)xy'(x) + (x - 9)y(x) = 0$$

✓ **Mathematica** : cpu = 0.111493 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1((x - 8)x + 20)}{x^3} - \frac{c_2e^{-x}(x^3 + 9x^2 + 36x + 60)}{x^3} \right\} \right\}$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 38

```
dsolve(x^2*diff(diff(y(x),x),x)+x*(1+x)*diff(y(x),x)+(x-9)*y(x)=0,y(x))
```

$$y(x) = \frac{c_2(x^3 + 9x^2 + 36x + 60) e^{-x} + c_1(x^2 - 8x + 20)}{x^3}$$

2.1194

ODE No. 1194

$$x^2y''(x) + (x + 1)xy'(x) + (3x - 1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0814899 (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]

$$\left\{\left\{y(x) \rightarrow c_1 e^{-x}(x-3)x - \frac{c_2 e^{-x}(x^3(-\operatorname{Ei}(x)) + 3x^2 \operatorname{Ei}(x) + e^x x^2 - 2e^x x - e^x)}{6x}\right\}\right\}$$

✓ **Maple** : cpu = 0.063 (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))

$$y(x) = \frac{x^2 c_2 e^{-x}(x-3) \operatorname{Ei}_1(-x) + c_1 x^2(x-3) e^{-x} + c_2(x^2-2x-1)}{x}$$

2.1195

ODE No. 1195

$$x^2y''(x) + (x + 3)xy'(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.0154191 (sec), leaf count = 80

```
DSolve[-y[x] + x*(3 + x)*Derivative[1][y][x] + x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1 U\left(2+\sqrt{2}, 1+2 \sqrt{2}, x\right) e^{(\sqrt{2}-1) \log (x)-x}+c_2 L_{-2-\sqrt{2}}^{2 \sqrt{2}}(x) e^{(\sqrt{2}-1) \log (x)-x}\right\}\right\}$$

✓ **Maple** : cpu = 0.171 (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))
```

$$y(x) = -\frac{e^{-\frac{x}{2}}\left(-c_1\left(\sqrt{2}+x+1\right) \operatorname{BesselI}\left(-\frac{1}{2}+\sqrt{2}, \frac{x}{2}\right)-c_1\left(-\sqrt{2}+x+1\right) \operatorname{BesselI}\left(\frac{1}{2}+\sqrt{2}, \frac{x}{2}\right)+\left(\left(-\sqrt{2}-x\right) \operatorname{BesselK}\left(-\frac{1}{2}+\sqrt{2}, \frac{x}{2}\right)+\left(\sqrt{2}+x\right) \operatorname{BesselK}\left(\frac{1}{2}+\sqrt{2}, \frac{x}{2}\right)\right)\right)}{\sqrt{x}}$$

2.1196

ODE No. 1196

$$x^2y''(x) - (x - 1)xy'(x) + (x - 1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0395362 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_2(x^2\text{Ei}(x) - e^x x - e^x)}{2x} + c_1 x\right\}\right\}$$

✓ **Maple** : cpu = 0.046 (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))
```

$$y(x) = \frac{\text{Ei}_1(-x) c_2 x^2 + (1 + x) c_2 e^x + c_1 x^2}{x}$$

2.1197

ODE No. 1197

$$(-a-x)y(x)+x^2y''(x)-(x^2-2x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.0107481 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{\frac{1}{2}(x-\log(x))}J_{\frac{1}{2}\sqrt{4a+1}}\left(-\frac{ix}{2}\right)+c_2e^{\frac{1}{2}(x-\log(x))}Y_{\frac{1}{2}\sqrt{4a+1}}\left(-\frac{ix}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.06 (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))
```

$$y(x)=\frac{e^{\frac{x}{2}}\left(\text{BesselK}\left(\frac{\sqrt{4a+1}}{2},\frac{x}{2}\right)c_2+\text{BesselI}\left(\frac{\sqrt{4a+1}}{2},\frac{x}{2}\right)c_1\right)}{\sqrt{x}}$$

2.1198

ODE No. 1198

$$x^2y''(x) - (x^2 - 2x) y'(x) + (-3x - 2)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0443572 (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]
```

$$\left\{\left\{y(x) \rightarrow c_1 e^x x - \frac{c_2 (e^x x^3 \text{Ei}(-x) + x^2 - x + 2)}{6 x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.051 (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))
```

$$y(x) = \frac{\text{Ei}_1(x) e^x c_2 x^3 + c_1 x^3 e^x - c_2 (x^2 - x + 2)}{x^2}$$

2.1199

ODE No. 1199

$$x^2y''(x) - (x + 4)xy'(x) + 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.008673 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 e^x x^4 - \frac{1}{6} c_1 x \left(e^x x^3 \operatorname{Ei}(-x) + x^2 - x + 2 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.037 (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))
```

$$y(x) = x \left(\operatorname{Ei}_1(x) e^x c_2 x^3 + c_1 x^3 e^x - c_2 (x^2 - x + 2) \right)$$

2.1200

ODE No. 1200

$$(1-v)vy(x)+x^2y''(x)+2x^2y'(x)=0$$

✓ **Mathematica** : cpu = 0.010915 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{-x}\sqrt{x}J_{\frac{1}{2}(2v-1)}(-ix)+c_2e^{-x}\sqrt{x}Y_{\frac{1}{2}(2v-1)}(-ix)\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (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))
```

$$y(x)=\sqrt{x}\,e^{-x}\left(\operatorname{BesselK}\left(v-\frac{1}{2},x\right)c_2+\operatorname{BesselI}\left(v-\frac{1}{2},x\right)c_1\right)$$

2.1201

ODE No. 1201

$$x^2y''(x) + (2x + 1)xy'(x) - 4y(x) = 0$$

✓

Mathematica : cpu = 0.260271 (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]

$$\left\{\left\{y(x) \rightarrow \frac{c_1 e^{-2x}(2x + 3)}{2x^2} + \frac{c_2(2x^2 - 4x + 3)}{4x^2}\right\}\right\}$$

✓

Maple : cpu = 0.027 (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))

$$y(x) = \frac{c_2(2x + 3) e^{-2x} + 2\left(x^2 - 2x + \frac{3}{2}\right) c_1}{x^2}$$

2.1202

ODE No. 1202

$$x^2y''(x) - 2(x + 1)xy'(x) + 2(x + 1)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0087684 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x + \frac{1}{2} c_2 e^{2x} x \right\} \right\}$$

✓ **Maple** : cpu = 0.034 (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))
```

$$y(x) = x(e^{2x}c_2 + c_1)$$

2.1203

ODE No. 1203

$$ax^2y'(x) + x^2y''(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0112494 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{2c_2 e^{\frac{1}{2}(\log(x)-ax)} \left(i \sinh\left(\frac{ax}{2}\right) - \frac{2i \cosh\left(\frac{ax}{2}\right)}{ax} \right)}{\sqrt{\pi} \sqrt{-iax}} + \frac{2c_1 e^{\frac{1}{2}(\log(x)-ax)} \left(\frac{2 \sinh\left(\frac{ax}{2}\right)}{ax} - \cosh\left(\frac{ax}{2}\right) \right)}{\sqrt{\pi} \sqrt{-iax}} \right\} \right\}$$

✓ **Maple** : cpu = 0.029 (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))
```

$$y(x) = \frac{c_2(ax + 2) e^{-ax} + c_1(ax - 2)}{x}$$

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 = 0.013646 (sec), leaf count = 132

`DSolve[(-2 + b*(a + b)*x^2)*y[x] + (a + 2*b)*x^2*Derivative[1][y][x] + x^2*Derivative[2][y][x]`

$$\left\{\left\{y(x)\rightarrow\frac{2c_2e^{\frac{1}{2}(-ax-2bx+\log(x))}\left(i\sinh\left(\frac{ax}{2}\right)-\frac{2i\cosh\left(\frac{ax}{2}\right)}{ax}\right)}{\sqrt{\pi}\sqrt{-iax}}+\frac{2c_1e^{\frac{1}{2}(-ax-2bx+\log(x))}\left(\frac{2\sinh\left(\frac{ax}{2}\right)}{ax}-\cosh\left(\frac{ax}{2}\right)\right)}{\sqrt{\pi}\sqrt{-iax}}\right\}\right\}$$

✓

Maple : cpu = 0.059 (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))`

$$y(x)=\frac{c_2(ax+2)e^{-(a+b)x}+c_1e^{-bx}(ax-2)}{x}$$

2.1205

ODE No. 1205

$$ax^2y'(x) + f(x)y(x) + x^2y''(x) = 0$$

 **Mathematica** : cpu = 0.11661 (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

$$y(x) = \text{DESol}\left(\left\{\frac{f(x)-Y(x)}{x^2} + a\left(\frac{d}{dx}-Y(x)\right) + \frac{d^2}{dx^2}-Y(x)\right\},\{-Y(x)\}\right)$$

2.1206

ODE No. 1206

$$y(x)\left(abx+cx^2+d\right)+x\left(2ax+b\right)y'(x)+x^2y''(x)=0$$

✓

Mathematica : cpu = 0.0450184 (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[x], x]

$$\left\{\left\{y(x)\rightarrow c_1e^{\frac{1}{2}(-2ax-(b-1)\log(x))}J_{\frac{1}{2}\sqrt{b^2-2b-4d+1}}\left(-i\sqrt{a^2-cx}\right)+c_2e^{\frac{1}{2}(-2ax-(b-1)\log(x))}Y_{\frac{1}{2}\sqrt{b^2-2b-4d+1}}\left(-i\sqrt{a^2-cx}\right)\right\}\right\}$$

✓

Maple : cpu = 0.104 (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))

$$y(x)=x^{-\frac{b}{2}+\frac{1}{2}}e^{-ax}\left(\text{BesselY}\left(\frac{\sqrt{b^2-2b-4d+1}}{2},\sqrt{-a^2+cx}\right)c_2+\text{BesselJ}\left(\frac{\sqrt{b^2-2b-4d+1}}{2},\sqrt{-a^2+cx}\right)c_1\right)$$

2.1207

ODE No. 1207

$$x(ax + b)y'(x) + y(x) \left(a1x^2 + b1x + c1 \right) + x^2y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0561143 (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], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 U \left(-\frac{-ab + 2b1 - \sqrt{a^2 - 4a1} - \sqrt{a^2 - 4a1} \sqrt{b^2 - 2b - 4c1 + 1}}{2\sqrt{a^2 - 4a1}}, \sqrt{b^2 - 2b - 4c1 + 1} + 1, \sqrt{a^2 - 4a1} x \right) \right\} \right.$$

✓ **Maple** : cpu = 0.439 (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))
```

$$y(x) = e^{-\frac{ax}{2}} x^{-\frac{b}{2}} \left(\text{WhittakerW} \left(-\frac{ab - 2b1}{2\sqrt{a^2 - 4a1}}, \frac{\sqrt{b^2 - 2b - 4c1 + 1}}{2}, \sqrt{a^2 - 4a1} x \right) c_2 + \text{WhittakerM} \left(-\frac{ab - 2b1}{2\sqrt{a^2 - 4a1}}, \frac{\sqrt{b^2 - 2b - 4c1 + 1}}{2}, \sqrt{a^2 - 4a1} x \right) c_1 \right)$$

2.1208

ODE No. 1208

$$x^3y'(x)+x^2y''(x)+(x^2-2)y(x)=0$$

✓ **Mathematica** : cpu = 0.0486005 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_2e^{-\frac{x^2}{2}}\left(\sqrt{2\pi}e^{\frac{x^2}{2}}\operatorname{erf}\left(\frac{x}{\sqrt{2}}\right)-2x\right)}{2x}+\frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.067 (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))
```

$$y(x)=\frac{\sqrt{\pi}\sqrt{2}\operatorname{erf}\left(\frac{x\sqrt{2}}{2}\right)c_2-2e^{-\frac{x^2}{2}}c_2x+c_1}{x}$$

2.1209

ODE No. 1209

$$x^2y''(x) + (x^2 + 2)xy'(x) + (x^2 - 2)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0274555 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_1 e^{-\frac{x^2}{2}} \left(e^{\frac{x^2}{2}} x - \sqrt{\frac{\pi}{2}} \operatorname{erfi}\left(\frac{x}{\sqrt{2}}\right)\right)}{x^2} + \frac{c_2 e^{-\frac{x^2}{2}}}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.073 (sec), leaf count = 40

```
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))
```

$$y(x) = \frac{\left(i\sqrt{\pi}\sqrt{2}\operatorname{erf}\left(\frac{i\sqrt{2}x}{2}\right)c_2 + c_1\right)e^{-\frac{x^2}{2}} + 2c_2x}{x^2}$$

2.1210 ODE No. 1210

$y(x) \left(a((-1)^n - 1) + 2nx^2\right) - 2x(x^2 - a) y'(x) + x^2 y''(x) = 0$

✓ **Mathematica** : cpu = 0.127433 (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] == 0, y[x], x]
```

$\left\{ \left\{ y(x) \rightarrow c_1 (-1)^{\frac{1}{4} \left(-\sqrt{4a^2 - 4a(-1)^{n+1} - 2a + 1} \right)} x^{\frac{1}{2} \left(-\sqrt{4a^2 - 4a(-1)^{n+1} - 2a + 1} \right)} {}_1F_1 \left(-\frac{a}{2} - \frac{n}{2} - \frac{1}{4} \sqrt{4a^2 - 4(-1)^n a + 1}, \frac{x^2}{4} \right) \right. \right.$

✓ **Maple** : cpu = 0.279 (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))
```

$y(x) = x^{-\frac{1}{2} - a} e^{\frac{x^2}{2}} \left(\text{WhittakerM} \left(\frac{n}{2} + \frac{a}{2} + \frac{1}{4}, \frac{\sqrt{1 - 4(-1)^n a + 4a^2}}{4}, x^2 \right) c_1 + \text{WhittakerW} \left(\frac{n}{2} + \frac{a}{2} + \frac{1}{4}, \frac{\sqrt{1 - 4(-1)^n a + 4a^2}}{4}, x^2 \right) c_2 \right)$

2.1211

ODE No. 1211

$$4x^3y'(x)+x^2y''(x)+(4x^4+2x^2+1)y(x)=0$$

✓ **Mathematica** : cpu = 0.0293593 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{-x^2}x^{\frac{1}{2}-\frac{i\sqrt{3}}{2}}-\frac{ic_2e^{-x^2}x^{\frac{1}{2}+\frac{i\sqrt{3}}{2}}}{\sqrt{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.078 (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))
```

$$y(x)=e^{-x^2}\left(x^{\frac{1}{2}-\frac{i\sqrt{3}}{2}}c_2+x^{\frac{1}{2}+\frac{i\sqrt{3}}{2}}c_1\right)$$

2.1212

ODE No. 1212

$$x(ax^2 + b) y'(x) + f(x)y(x) + x^2y''(x) = 0$$

 **Mathematica** : cpu = 0.191481 (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]
```

 **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

$$y(x) = \text{DESol} \left(\left\{ \frac{f(x) - Y(x)}{x^2} + \frac{(ax^2 + b) \left(\frac{d}{dx} Y(x) \right)}{x} + \frac{d^2}{dx^2} Y(x) \right\}, \{ - Y(x) \} \right)$$

2.1213

ODE No. 1213

$$(x^3+1)xy'(x)+x^2y''(x)-y(x)=0$$

✓

Mathematica : cpu = 0.0591991 (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]

$$\left\{\left\{y(x)\rightarrow\frac{\sqrt[3]{3}c_1{}_1F_1\left(-\frac{1}{3};\frac{1}{3};-\frac{x^3}{3}\right)}{x}+\frac{c_2x{}_1F_1\left(\frac{1}{3};\frac{5}{3};-\frac{x^3}{3}\right)}{\sqrt[3]{3}}\right\}\right\}$$

✓

Maple : cpu = 0.083 (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))

$$y(x)=\left(c_1\operatorname{BesselI}\left(-\frac{1}{6},\frac{x^3}{6}\right)+c_1\operatorname{BesselI}\left(\frac{5}{6},\frac{x^3}{6}\right)-c_2\left(-\operatorname{BesselK}\left(\frac{5}{6},\frac{x^3}{6}\right)+\operatorname{BesselK}\left(\frac{1}{6},\frac{x^3}{6}\right)\right)\right)e^{-\frac{x^3}{6}}x$$

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 = 0.137556 (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]

$$\left\{\left\{y(x) \rightarrow \frac{c_1 e^{-\frac{x^2}{2}} 2^{\frac{1}{4} \left(\sqrt{4 a^2-4 a(-1)^n+1}+2\right)}\left(x^2\right)^{\frac{1}{4} \left(\sqrt{4 a^2-4 a(-1)^n+1}+2\right)} U\left(\frac{1}{4} \left(-2 a-2 n+\sqrt{4 a^2-4(-1)^n a+1}+1\right), \sqrt{x}\right)}{\sqrt{x}}\right.\right.$$

✓

Maple : cpu = 0.214 (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))

$$y(x)=\frac{\text{WhittakerM}\left(\frac{n}{2}+\frac{a}{2}+\frac{1}{4},\frac{\sqrt{1-4(-1)^n a+4 a^2}}{4},x^2\right) c_1+\text{WhittakerW}\left(\frac{n}{2}+\frac{a}{2}+\frac{1}{4},\frac{\sqrt{1-4(-1)^n a+4 a^2}}{4},x^2\right) c_2}{\sqrt{x}}$$

2.1215

ODE No. 1215

$$xy'(x)\left(ax^n+b\right)+y(x)\left(a1x^{2n}+b1x^n+c1\right)+x^2y''(x)=0$$

✓

Mathematica : cpu = 0.341876 (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] == 0,x,Assumptions->{n>0}]

$$\left\{\left\{y(x) \rightarrow c_1 x^{\frac{1-n}{2}} 2^{\frac{\sqrt{b^2 n^2-2 b n^2-4 c 1 n^2+n^2}+n^2}{2 n^2}}\left(x^n\right)^{\frac{\sqrt{b^2 n^2-2 b n^2-4 c 1 n^2+n^2}+n^2}{2 n^2}} \exp \left(\frac{1}{2}\left(-\frac{a x^n}{n}-\frac{b \log \left(x^n\right)}{n}\right)-\frac{\sqrt{a^2-4 a 1} x^n}{2 n}\right)\right.\right.$$

✓

Maple : cpu = 0.301 (sec), leaf count = 148

dsolve(x^2*diff(diff(y(x),x),x)+(a*x^n+b)*diff(y(x),x)*x+(a1*x^(2*n)+b1*x^n+c1)*y(x)=0,y(x))

$$y(x)=x^{-\frac{b}{2}-\frac{n}{2}+\frac{1}{2}}e^{-\frac{a x^n}{2 n}}\left(\text{WhittakerM}\left(-\frac{\left(b+n-1\right) a-2 b 1}{2 \sqrt{a^2-4 a 1} n}, \frac{\sqrt{b^2-2 b-4 c 1}+1}{2 n}, \frac{\sqrt{a^2-4 a 1} x^n}{n}\right) c_1+\text{WhittakerM}\left(-\frac{\left(b+n-1\right) a-2 b 1}{2 \sqrt{a^2-4 a 1} n}, \frac{\sqrt{b^2-2 b-4 c 1}+1}{2 n}, \frac{\sqrt{a^2-4 a 1} x^n}{n}\right) c_2\right)$$

2.1216

ODE No. 1216

$$xy'(x)\left(ax^{a_1}+b\right)+y(x)\left(Ax^{2a_1}+Bx^{a_1}+Cx^{b_1}+DD\right)+x^2y''(x)=0$$

✖

Mathematica : cpu = 0.654696 (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[2][y][x] == 0, y[x], x]

, 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*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^a1+b)*x*diff(y(x),x)+(A*x^(2*a1)+B*x^a1+C*x^b1+DD)*y(x),y(x))

, result contains DESol or ODESolStruc

$$y(x)=\text{DESol}\left(\left\{\frac{d^2}{dx^2}-Y(x)+\frac{\left(ax^{a_1}+b\right)\left(\frac{d}{dx}-Y(x)\right)}{x}+\frac{\left(Ax^{2a_1}+Bx^{a_1}+Cx^{b_1}+DD\right)-Y(x)}{x^2}\right\},\left\{-Y(x)\right\}\right)$$

2.1217

ODE No. 1217

$$y(x)(-a-x\tan(x))+x^2y''(x)-(2x^2\tan(x)-x)y'(x)=0$$

✓

Mathematica : cpu = 0.0503701 (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]

$$\left\{\left\{y(x)\rightarrow c_1\sec(x)J_{\sqrt{a}}(x)+c_2\sec(x)Y_{\sqrt{a}}(x)\right\}\right\}$$

✓

Maple : cpu = 0.077 (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))

$$y(x)=\sec(x)\left(\operatorname{BesselY}\left(\sqrt{a},x\right)c_2+\operatorname{BesselJ}\left(\sqrt{a},x\right)c_1\right)$$

2.1218

ODE No. 1218

$$y(x)(a+x\cot(x))+x^2y''(x)+(2x^2\cot(x)+x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.0503573 (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[x], x]
```

$$\left\{\left\{y(x)\rightarrow c_1\csc(x)J_{i\sqrt{a}}(x)+c_2\csc(x)Y_{i\sqrt{a}}(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.083 (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))
```

$$y(x)=\csc(x)\left(\operatorname{BesselY}\left(i\sqrt{a},x\right)c_2+\operatorname{BesselJ}\left(i\sqrt{a},x\right)c_1\right)$$

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 = 0.0646313 (sec), leaf count = 218

`DSolve[y[x]*(c + b*x + a*x^2 - f[x] + f[x]^2 + x*Derivative[1][f][x]) + 2*x*f[x]*Derivative[1]`

$$\left\{\left\{y(x)\rightarrow c_1U\left(-\frac{-ib-\sqrt{a}-\sqrt{a}\sqrt{1-4c}}{2\sqrt{a}},\sqrt{1-4c}+1,2i\sqrt{a}x\right)\exp\left(\int_1^x\frac{-2f(K[1])-2i\sqrt{a}K[1]+\sqrt{1-4c}}{2K[1]}dx\right)\right.\right.$$

✓

Maple : cpu = 0.186 (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+)`

$$y(x)=e^{-\left(\int\frac{f(x)}{x}dx\right)}\left(\text{WhittakerW}\left(-\frac{ib}{2\sqrt{a}},\frac{\sqrt{1-4c}}{2},2i\sqrt{a}x\right)c_2+\text{WhittakerM}\left(-\frac{ib}{2\sqrt{a}},\frac{\sqrt{1-4c}}{2},2i\sqrt{a}x\right)c_1\right)$$

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 = 0.0708194 (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] == 0,x,x]
```

$$\left\{\left\{y(x) \rightarrow c_1 J_{\frac{1}{2}(2v-1)}(\sqrt{a} x) \exp \left(\int_1^x \frac{1-2 f(K[1]) K[1]}{2 K[1]} d K[1]\right)+c_2 Y_{\frac{1}{2}(2v-1)}(\sqrt{a} x) \exp \left(\int_1^x \frac{1-2 f(K[1]) K[1]}{2 K[1]} d K[1]\right)\right.\right.$$

✓ **Maple** : cpu = 0.039 (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*(diff(y(x),x)+diff(y(x),x))))=0,x)
```

$$y(x)=\sqrt{x} e^{-\frac{(\int 2 f(x) d x)}{2}}\left(\operatorname{BesselY}\left(v-\frac{1}{2}, \sqrt{a} x\right) c_2+\operatorname{BesselJ}\left(v-\frac{1}{2}, \sqrt{a} x\right) c_1\right)$$

2.1221

ODE No. 1221

$$y(x)\left(x^2\left(-f'(x)+f(x)^2+1\right)-x f(x)-v^2\right)+(x-2 x^2 f(x)) y'(x)+x^2 y''(x)=0$$

✓

Mathematica

: cpu = 0.01879 (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])*Deriva

$$\left\{\left\{y(x) \rightarrow c_1 J_v(x) \exp \left(\int_1^x f(K[1]) d K[1]\right)+c_2 Y_v(x) \exp \left(\int_1^x f(K[1]) d K[1]\right)\right\}\right\}$$

✓

Maple

: cpu = 0.044 (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))

$$y(x)=e^{-\frac{\left(\int \frac{-2 x f(x)+1}{x} d x\right)}{\sqrt{x}}\left(\text {BesselY}\left(v, x\right) c_2+\text {BesselJ}\left(v, x\right) c_1\right)$$

2.1222

ODE No. 1222

$$(x^2 + 1) y''(x) + xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0193397 (sec), leaf count = 50

DSolve[2*y[x] + x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]

$$\left\{ \left\{ y(x) \rightarrow c_1 \cos \left(\sqrt{2} \tanh^{-1} \left(\frac{x}{\sqrt{x^2 + 1}} \right) \right) + c_2 \sin \left(\sqrt{2} \tanh^{-1} \left(\frac{x}{\sqrt{x^2 + 1}} \right) \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.027 (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))

$$y(x) = c_1 \sin \left(\sqrt{2} \operatorname{arcsinh}(x) \right) + c_2 \cos \left(\sqrt{2} \operatorname{arcsinh}(x) \right)$$

2.1223

ODE No. 1223

$$(x^2 + 1) y''(x) + xy'(x) - 9y(x) = 0$$

✓ **Mathematica** : cpu = 0.0163028 (sec), leaf count = 45

```
DSolve[-9*y[x] + x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \cosh \left(3 \tanh^{-1} \left(\frac{x}{\sqrt{x^2 + 1}} \right) \right) + i c_2 \sinh \left(3 \tanh^{-1} \left(\frac{x}{\sqrt{x^2 + 1}} \right) \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.039 (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))
```

$$y(x) = \sqrt{x^2 + 1} \left(4x^2 + 1 \right) c_2 + 4c_1 x^3 + 3xc_1$$

2.1224

ODE No. 1224

$$ay(x) + (x^2 + 1) y''(x) + xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0169105 (sec), leaf count = 50

DSolve[a*y[x] + x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]

$$\left\{ \left\{ y(x) \rightarrow c_1 \cos \left(\sqrt{a} \tanh^{-1} \left(\frac{x}{\sqrt{x^2 + 1}} \right) \right) + c_2 \sin \left(\sqrt{a} \tanh^{-1} \left(\frac{x}{\sqrt{x^2 + 1}} \right) \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.03 (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

$$(x^2 + 1) y''(x) - x y'(x) + y(x) = 0$$

✓ **Mathematica** : cpu = 0.0371588 (sec), leaf count = 39

```
DSolve[y[x] - x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 \left(x \tanh^{-1} \left(\frac{x}{\sqrt{x^2 + 1}} \right) - \sqrt{x^2 + 1} \right) + c_1 x \right\} \right\}$$

✓ **Maple** : cpu = 0.047 (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

$$(1 - v)vy(x) + (x^2 + 1)y''(x) + 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0088395 (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]
```

$$\{\{y(x) \rightarrow c_1 P_{v-1}(ix) + c_2 Q_{v-1}(ix)\}\}$$

✓ **Maple** : cpu = 0.06 (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))
```

$$y(x) = c_1 \text{LegendreP}(v - 1, ix) + c_2 \text{LegendreQ}(v - 1, ix)$$

2.1227 ODE No. 1227

$$(x^2 + 1) y''(x) - 2xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.0210714 (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]
```

$$\{ \{ y(x) \rightarrow c_2 x - c_1 (x - i)^2 \} \}$$

✓ **Maple** : cpu = 0.018 (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))
```

$$y(x) = c_2 x^2 + c_1 x - c_2$$

2.1228

ODE No. 1228

$$ay(x) + (x^2 + 1) y''(x) + 3xy'(x) = 0$$

✓

Mathematica : cpu = 0.0093784 (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]`

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 P^{\frac{1}{2}}_{\frac{1}{2}(2\sqrt{1-a}-1)}(ix)}{\sqrt[4]{x^2+1}} + \frac{c_2 Q^{\frac{1}{2}}_{\frac{1}{2}(2\sqrt{1-a}-1)}(ix)}{\sqrt[4]{x^2+1}} \right\} \right\}$$

✓

Maple : cpu = 0.13 (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

$$(x^2 + 1) y''(x) + 4xy'(x) + 2y(x) + 2x - 2 \cos(x) = 0$$

✓ **Mathematica** : cpu = 0.0320571 (sec), leaf count = 48

```
DSolve[2*x - 2*Cos[x] + 2*y[x] + 4*x*Derivative[1][y][x] + (1 + x^2)*Derivative[2][y][x] == 0,
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1}{x^2 + 1} + \frac{c_2 x}{x^2 + 1} + \frac{-x^3 - 6 \cos(x)}{3(x^2 + 1)} \right\} \right\}$$

✓ **Maple** : cpu = 0.032 (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))
```

$$y(x) = \frac{-x^3 + 3xc_1 - 6 \cos(x) + 3c_2}{3x^2 + 3}$$

2.1230

ODE No. 1230

$$axy'(x) + (a - 2)y(x) + (x^2 + 1) y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0135431 (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]
```

$$\left\{\left\{y(x) \rightarrow c_1 \left(x^2 + 1\right)^{\frac{2-a}{4}} P_{\frac{a-2}{2}}^{\frac{a-2}{2}}(ix) + c_2 \left(x^2 + 1\right)^{\frac{2-a}{4}} Q_{\frac{a-4}{2}}^{\frac{a-2}{2}}(ix)\right\}\right\}$$

✓ **Maple** : cpu = 0.361 (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))
```

$$y(x) = c_1 \left(x^2 + 1\right)^{1-\frac{a}{2}} + c_2 x \operatorname{hypergeom}\left(\left[1, \frac{a}{2} - \frac{1}{2}\right], \left[\frac{3}{2}\right], -x^2\right)$$

2.1231

ODE No. 1231

$$(x^2-1)y''(x)-v(v+1)y(x)=0$$

✓ **Mathematica** : cpu = 0.0415563 (sec), leaf count = 58

```
DSolve[-(v*(1 + v)*y[x]) + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1{}_2F_1\left(-\frac{v}{2}-\frac{1}{2},\frac{v}{2};\frac{1}{2};x^2\right)+ic_2x{}_2F_1\left(\frac{v}{2}+\frac{1}{2},-\frac{v}{2};\frac{3}{2};x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.076 (sec), leaf count = 52

```
dsolve((x^2-1)*diff(diff(y(x),x),x)-v*(v+1)*y(x)=0,y(x))
```

$$y(x)=-\left(x-1\right)\left(1+x\right)\left(\operatorname{hypergeom}\left(\left[1-\frac{v}{2},\frac{3}{2}+\frac{v}{2}\right],\left[\frac{3}{2}\right],x^2\right)c_2x+c_1\operatorname{hypergeom}\left(\left[1+\frac{v}{2},\frac{1}{2}-\frac{v}{2}\right],\left[\frac{1}{2}\right],x^2\right)\right)$$

2.1232

ODE No. 1232

$$\frac{nxP_n(x)-nP_{n-1}(x)}{x^2-1}-n(n+1)y(x)+(x^2-1)y''(x)=0$$

✓ **Mathematica** : cpu = 4.49659 (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
```

$$\left\{\left\{y(x)\rightarrow c_1{}_2F_1\left(-\frac{n}{2}-\frac{1}{2},\frac{n}{2};\frac{1}{2};x^2\right)+\int_1^x\left(\frac{4\left({}_2F_1\left(\frac{1}{2}(-n-1),\frac{n}{2};\frac{1}{2};K[1]^2\right){}_2F_1\left(1-\frac{n}{2},\frac{n+3}{2};\frac{5}{2};K[1]^2\right)n^2\right.}{\right.}\right.$$

✓ **Maple** : cpu = 0.316 (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))
```

$$y(x)=3\left(-\operatorname{hypergeom}\left(\left[\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2}\right],\left[\frac{1}{2}\right],x^2\right)(n+1)\left(\int\frac{1}{3(x-1)^3\left(\operatorname{hypergeom}\left(\left[\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2}\right],\left[\frac{1}{2}\right],x^2\right)\right)}dx\right)\right)$$

2.1233

ODE No. 1233

$$\frac{nxQ_n(x)-nQ_{n-1}(x)}{x^2-1}-n(n+1)y(x)+(x^2-1)y''(x)=0$$

✓

Mathematica : cpu = 0.856819 (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

$$\left\{\left\{y(x)\rightarrow c_1\,{}_2F_1\left(-\frac{n}{2}-\frac{1}{2},\frac{n}{2};\frac{1}{2};x^2\right)+\int_1^x\left(\frac{4\left({}_2F_1\left(\frac{1}{2}(-n-1),\frac{n}{2};\frac{1}{2};K[1]^2\right){}_2F_1\left(1-\frac{n}{2},\frac{n+3}{2};\frac{5}{2};K[1]^2\right)n^2\right.}{\right.}\right.$$

✓

Maple : cpu = 0.237 (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))

$$y(x)=3\left(-\operatorname{hypergeom}\left(\left[\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2}\right],\left[\frac{1}{2}\right],x^2\right)(n+1)\left(\int\frac{3(x-1)^3\left(\operatorname{hypergeom}\left(\left[\frac{n}{2}+1,-\frac{n}{2}+\frac{1}{2}\right],\left[\frac{1}{2}\right],x^2\right)\right)}{3(x-1)^3}\right.\right.$$

2.1234

ODE No. 1234

$$(x^2 - 1) y''(x) + xy'(x) + 2 = 0$$

✓ **Mathematica** : cpu = 0.0314429 (sec), leaf count = 31

```
DSolve[2 + x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 - \frac{1}{4} \left(-2 \tanh^{-1} \left(\frac{x}{\sqrt{x^2 - 1}} \right) + c_1 \right)^2 \right\} \right\}$$

✗ **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 = 0.017783 (sec), leaf count = 50

```
DSolve[a*y[x] + x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \cos \left(\sqrt{a} \tanh^{-1} \left(\frac{x}{\sqrt{x^2 - 1}} \right) \right) + c_2 \sin \left(\sqrt{a} \tanh^{-1} \left(\frac{x}{\sqrt{x^2 - 1}} \right) \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.05 (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 = 0.18824 (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

$$y(x) = \text{DESol} \left(\left\{ \frac{f(x) - Y(x)}{x^2 - 1} + \frac{x \left(\frac{d}{dx} Y(x) \right)}{x^2 - 1} + \frac{d^2}{dx^2} Y(x) \right\}, \{ \_Y(x) \} \right)$$

2.1237

ODE No. 1237

$$(x^2-1)y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0182283 (sec), leaf count = 30

```
DSolve[2*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1\left(\frac{1}{2}\log(1-x)-\frac{1}{2}\log(x+1)\right)+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.024 (sec), leaf count = 20

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)=0,y(x))
```

$$y(x)=c_1-\frac{(\ln(1+x)-\ln(x-1))c_2}{2}$$

2.1238

ODE No. 1238

$$-a + \left(x^2 - 1\right) y''(x) + 2xy'(x) = 0$$

✓

Mathematica : cpu = 0.022242 (sec), leaf count = 36

DSolve[-a + 2*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]

$$\left\{\left\{y(x) \rightarrow \frac{1}{2}(a + c_1) \log(1 - x) + \frac{1}{2}(a - c_1) \log(x + 1) + c_2\right\}\right\}$$

✓

Maple : cpu = 0.033 (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 = 0.0081179 (sec), leaf count = 46

```
DSolve[-(1*y[x]) + 2*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 P_{\frac{1}{2}(\sqrt{4l+1}-1)}(x) + c_2 Q_{\frac{1}{2}(\sqrt{4l+1}-1)}(x) \right\} \right\}$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 35

```
dsolve((x^2-1)*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-1*y(x)=0,y(x))
```

$$y(x) = c_1 \operatorname{LegendreP}\left(\frac{\sqrt{1+4l}}{2} - \frac{1}{2}, x\right) + c_2 \operatorname{LegendreQ}\left(\frac{\sqrt{1+4l}}{2} - \frac{1}{2}, x\right)$$

2.1240

ODE No. 1240

$$-v(v+1)y(x)+(x^2-1)y''(x)+2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0098459 (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]
```

$$\{ \{ y(x) \rightarrow c_1 P_v(x) + c_2 Q_v(x) \} \}$$

✓ **Maple** : cpu = 0.059 (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))
```

$$y(x)=c_1 \operatorname{LegendreP}(v,x)+c_2 \operatorname{LegendreQ}(v,x)$$

2.1241

ODE No. 1241

$$(1 - v)(v + 2)y(x) + (x^2 - 1) y''(x) - 2xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0091675 (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]

$$\left\{ \left\{ y(x) \rightarrow c_1 (x^2 - 1) P_v^2(x) + c_2 (x^2 - 1) Q_v^2(x) \right\} \right\}$$

✓ **Maple** : cpu = 0.066 (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))

$$y(x) = (x - 1) (1 + x) (c_2 \operatorname{LegendreQ}(v, 2, x) + c_1 \operatorname{LegendreP}(v, 2, x))$$

2.1242

ODE No. 1242

$$(x^2-1)y''(x)+(x-x^2)y(x)-(3x+1)y'(x)=0$$

✓ **Mathematica** : cpu = 0.420824 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{-x}(x+1)^2-c_2e^{-x-2}\left(x^2(-\operatorname{Ei}(2(x+1)))-2x\operatorname{Ei}(2(x+1))-\operatorname{Ei}(2(x+1))+2e^{2x+2})\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.085 (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))
```

$$y(x)=e^{-x-2}c_2(1+x)^2\operatorname{Ei}_1(-2x-2)+c_1e^{-x}(1+x)^2+2e^xc_2$$

2.1243

ODE No. 1243

$$(x^2-1)y''(x)+(x^2+1)y(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0159574 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_1e^{-ix}}{x^2-1}-\frac{ic_2e^{ix}}{2(x^2-1)}\right\}\right\}$$

✓ **Maple** : cpu = 0.048 (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

$$(n-v)(n+v+1)y(x)+2(n+1)xy'(x)+(x^2-1)y''(x)=0$$

✓

Mathematica : cpu = 0.0132292 (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] == 0, y[x], x]

$$\left\{\left\{y(x)\rightarrow c_1(x^2-1)^{-n/2}P_v^n(x)+c_2(x^2-1)^{-n/2}Q_v^n(x)\right\}\right\}$$

✓

Maple : cpu = 0.096 (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))

$$y(x)=(x^2-1)^{-\frac{n}{2}}(\operatorname{LegendreQ}(v,n,x)c_2+\operatorname{LegendreP}(v,n,x)c_1)$$

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 = 0.0113849 (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] == 0, y[x], x]

$$\left\{\left\{y(x) \rightarrow c_1(x^2-1)^{n/2}P_v^n(x)+c_2(x^2-1)^{n/2}Q_v^n(x)\right\}\right\}$$

✓

Maple : cpu = 0.082 (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))

$$y(x)=(x^2-1)^{\frac{n}{2}}(\text{LegendreQ}(v,n,x)c_2+\text{LegendreP}(v,n,x)c_1)$$

2.1246

ODE No. 1246

$$-2(v-1)xy'(x)-2vy(x)+(x^2-1)y''(x)=0$$

✓ **Mathematica** : cpu = 0.0108977 (sec), leaf count = 42

```
DSolve[-2*v*y[x] - 2*(-1 + v)*x*Derivative[1][y][x] + (-1 + x^2)*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\rightarrow c_1(x^2-1)^{v/2}P_v^v(x)+c_2(x^2-1)^{v/2}Q_v^v(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.218 (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))
```

$$y(x)=(x^2-1)^v\left(\operatorname{hypergeom}\left(\left[\frac{1}{2},v+1\right],\left[\frac{3}{2}\right],x^2\right)c_2x+c_1\right)$$

2.1247 ODE No. 1247

$$2axy'(x) + (a - 1)ay(x) + (x^2 - 1)y''(x) = 0$$

✓ **Mathematica** : cpu = 0.384045 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_2(x+1)^{\frac{1}{2}\sqrt{(a-1)^2}+\frac{1}{2}}(x^2-1)^{-a/2}(1-x)^{\frac{1}{2}-\frac{1}{2}\sqrt{(a-1)^2}}}{2\sqrt{(a-1)^2}} + c_1(x+1)^{\frac{1}{2}-\frac{1}{2}\sqrt{(a-1)^2}}(x^2-1)^{-a/2}(1-x)^{\frac{1}{2}} \right. \right.$$

✓ **Maple** : cpu = 0.05 (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))
```

$$y(x) = c_1(x - 1)^{1-a} + c_2(1 + x)^{1-a}$$

2.1248

ODE No. 1248

$$ax y'(x) + y(x) \left(bx^2 + cx + d\right) + \left(x^2 - 1\right) y''(x) = 0$$

✓

Mathematica : cpu = 0.176943 (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]

$$\left\{\left\{y(x) \rightarrow c_2 \left(\frac{x}{2} - \frac{1}{2}\right)^{a/4} \left(x^2 - 1\right)^{-a/4} \left(\frac{x}{2} + \frac{1}{2}\right)^{1-\frac{a}{4}} e^{\sqrt{-b}x} \operatorname{HeunC}\left[\frac{1}{4}a\left(a - 4\sqrt{-b} - 2\right) - b + 4\sqrt{-b} + c - a, 1, 2c, d - c - \frac{a^2}{8} + b + \frac{1}{2}, \frac{1}{2} + \frac{x}{2}\right] \right\}\right.$$

✓

Maple : cpu = 0.318 (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))

$$y(x) = e^{\sqrt{-b}x} \left(x^2 - 1\right)^{-\frac{a}{4}} \left(\left(\frac{1}{2} + \frac{x}{2}\right)^{-\frac{a}{4}+1} \operatorname{HeunC}\left(4\sqrt{-b}, 1 - \frac{a}{2}, \frac{a}{2} - 1, 2c, d - c - \frac{a^2}{8} + b + \frac{1}{2}, \frac{1}{2} + \frac{x}{2}\right) \left(-\frac{1}{2} + \frac{x}{2}\right)^{\frac{a}{4}}\right)$$

2.1249

ODE No. 1249

$$(ax + b)y'(x) + cy(x) + (x^2 - 1) y''(x) = 0$$

✓

Mathematica : cpu = 0.0834617 (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]

$$\left\{ \left\{ y(x) \rightarrow c_2 2^{\frac{1}{2}(a+b-2)} (x-1)^{\frac{1}{2}(-a-b+2)} {}_2F_1\left(-\frac{b}{2} - \frac{1}{2}\sqrt{a^2 - 2a - 4c + 1} + \frac{1}{2}, -\frac{b}{2} + \frac{1}{2}\sqrt{a^2 - 2a - 4c + 1} + \frac{1}{2}\right. \right. \right.$$

✓

Maple : cpu = 0.112 (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))

$$y(x) = c_1 \operatorname{hypergeom}\left(\left[-\frac{1}{2} + \frac{\sqrt{a^2 - 2a - 4c + 1}}{2} + \frac{a}{2}, -\frac{1}{2} - \frac{\sqrt{a^2 - 2a - 4c + 1}}{2} + \frac{a}{2}\right], \left[\frac{a}{2} - \frac{b}{2}\right], \frac{1}{2} + \frac{x}{2}\right) -$$

2.1250

ODE No. 1250

$$(x^2 - a^2) y''(x) + 8xy'(x) + 12y(x) = 0$$

✓ **Mathematica** : cpu = 0.029998 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_2(a^2 + 3x^2)}{3(a - x)^3(a + x)^3} + \frac{c_1}{(a + x)^3} \right\} \right\}$$

✓ **Maple** : cpu = 0.033 (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))
```

$$y(x) = \frac{3a^2c_2x + c_2x^3 + a^2c_1 + 3c_1x^2}{(a - x)^3(x + a)^3}$$

2.1251

ODE No. 1251

$$x(x+1)y''(x)-(x-1)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.0230958 (sec), leaf count = 25

```
DSolve[y[x] - (-1 + x)*Derivative[1][y][x] + x*(1 + x)*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \rightarrow c_1(x-1)+c_2(x\log(x)-\log(x)-4)\}\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 20

```
dsolve(x*(1+x)*diff(diff(y(x),x),x)-(x-1)*diff(y(x),x)+y(x)=0,y(x))
```

$$y(x)=c_2(x-1)\ln(x)-4c_2+c_1(x-1)$$

2.1252

ODE No. 1252

$$(ax + b)y'(x) + cy(x) + x(x + 1)y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0783514 (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]`

$$\left\{ \left\{ y(x) \rightarrow c_2 x^{1-b} {}_2F_1\left(\frac{a}{2} - b - \frac{1}{2}\sqrt{a^2 - 2a - 4c + 1} + \frac{1}{2}, \frac{a}{2} - b + \frac{1}{2}\sqrt{a^2 - 2a - 4c + 1} + \frac{1}{2}; 2 - b; -x\right) + c_1 \right. \right.$$

✓ **Maple** : cpu = 0.087 (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))`

$$y(x) = c_1 \operatorname{hypergeom}\left(\left[-\frac{1}{2} + \frac{\sqrt{a^2 - 2a - 4c + 1}}{2} + \frac{a}{2}, -\frac{1}{2} - \frac{\sqrt{a^2 - 2a - 4c + 1}}{2} + \frac{a}{2}\right], [a - b], 1 + x\right) + c_2$$

2.1253

ODE No. 1253

$$x(x+1)y''(x)+(3x+2)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.0162399 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{\sqrt{2}c_1}{x}+\frac{c_2\log(2x+2)}{\sqrt{2}x}\right\}\right\}$$

✓ **Maple** : cpu = 0.009 (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 = 0.400577 (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],y[x],x]

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{5} c_2 e^{-3x-5} (195 e^{5x} x \operatorname{Ei}(5-5x) - 195 e^{5x} \operatorname{Ei}(5-5x) + e^5 x + 44 e^5) - c_1 e^{2x} (x-1) \right\} \right\}$$

✓

Maple : cpu = 0.088 (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))

$$y(x) = 195 \, e^{-5+2x} c_2 (x-1) \operatorname{Ei}_1(5x-5) - c_2 (x+44) e^{-3x} + c_1 e^{2x} (x-1)$$

2.1255

ODE No. 1255

$$ay'(x) + (x - 1)xy''(x) - 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.320946 (sec), leaf count = 118

```
DSolve[-2*y[x] + a*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1(a^2 + 2ax - a + 2x^2 - 2x)}{a^2 + 3a + 4} + \frac{c_2x^{a+1}(a^2 + 2ax - a + 2x^2 - 2x)(1 - x)^{1-a}}{(a - 1)a(a + 1)(a^2 + 3a + 4)(a^2 + a(2x - 1) + 2(x - 1)x)} \right\} \right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 42

```
dsolve(x*(x-1)*diff(diff(y(x),x),x)+a*diff(y(x),x)-2*y(x)=0,y(x))
```

$$y(x) = \left(a^2 + a(2x - 1) + 2x^2 - 2x\right) c_1 + c_2(x - 1)^{-a} x^a(x - 1) x$$

2.1256

ODE No. 1256

$$-v(v+1)y(x)+(x-1)xy''(x)+(2x-1)y'(x)=0$$

✓ **Mathematica** : cpu = 0.0119486 (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,x]

$$\{\{y(x) \rightarrow c_1P_v(2x-1)+c_2Q_v(2x-1)\}\}$$

✓ **Maple** : cpu = 0.155 (sec), leaf count = 51

dsolve(x*(x-1)*diff(diff(y(x),x),x)+(2*x-1)*diff(y(x),x)-v*(v+1)*y(x)=0,y(x))

$$y(x)=c_1\operatorname{hypergeom}\left(\left[-v,-v\right],\left[-2v\right],\frac{1}{x}\right)x^v+c_2\operatorname{hypergeom}\left(\left[v+1,v+1\right],\left[2v+2\right],\frac{1}{x}\right)x^{-v-1}$$

2.1257

ODE No. 1257

$$((a+1)x+b)y'(x)+(x-1)xy''(x)=0$$

✓ **Mathematica** : cpu = 0.105364 (sec), leaf count = 33

```
DSolve[(b + (1 + a)*x)*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_1x^{b+1}{}_2F_1(b+1,a+b+1;b+2;x)}{b+1}+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.275 (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))
```

$$y(x)=c_1+x^{1+b}\operatorname{hypergeom}\left([1+b,a+b+1],[b+2],x\right)c_2$$

2.1258

ODE No. 1258

$$(ax + b)y'(x) + cy(x) + (x - 1)xy''(x) = 0$$

✓

Mathematica : cpu = 0.0809417 (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]

$$\left\{ \left\{ y(x) \rightarrow (-1)^{b+1} c_2 x^{b+1} {}_2F_1 \left(\frac{a}{2} + b - \frac{1}{2} \sqrt{a^2 - 2a - 4c + 1} + \frac{1}{2}, \frac{a}{2} + b + \frac{1}{2} \sqrt{a^2 - 2a - 4c + 1} + \frac{1}{2}; b + 2; x \right) \right\} \right.$$

✓

Maple : cpu = 0.084 (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))

$$y(x) = c_1 \operatorname{hypergeom} \left(\left[-\frac{1}{2} + \frac{\sqrt{a^2 - 2a - 4c + 1}}{2} + \frac{a}{2}, -\frac{1}{2} - \frac{\sqrt{a^2 - 2a - 4c + 1}}{2} + \frac{a}{2} \right], [-b], x \right) + c_2 x^{1+b} \operatorname{hy}$$

2.1259

ODE No. 1259

$$((a+1)x+b)y'(x)-ly(x)+(x-1)xy''(x)=0$$

✓

Mathematica : cpu = 0.0728294 (sec), leaf count = 120

`DSolve[-(1*y[x]) + (b + (1 + a)*x)*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x] == 0,y`

$$\left\{\left\{y(x) \rightarrow (-1)^{b+1} c_2 x^{b+1} {}_2F_1\left(\frac{a}{2}+b-\frac{1}{2}\sqrt{a^2+4l}+1,\frac{a}{2}+b+\frac{1}{2}\sqrt{a^2+4l}+1;b+2;x\right)+c_1 {}_2F_1\left(\frac{a}{2}-\frac{1}{2}\sqrt{a^2+4l}+1,\frac{a}{2}+b+\frac{1}{2}\sqrt{a^2+4l}+1;b+2;x\right)\right.\right.$$

✓

Maple : cpu = 0.092 (sec), leaf count = 92

`dsolve(x*(x-1)*diff(diff(y(x),x),x)+((a+1)*x+b)*diff(y(x),x)-1*y(x)=0,y(x))`

$$y(x)=c_1 \operatorname{hypergeom}\left(\left[\frac{a}{2}-\frac{\sqrt{a^2+4l}}{2},\frac{a}{2}+\frac{\sqrt{a^2+4l}}{2}\right],[-b],x\right)+c_2 x^{1+b} \operatorname{hypergeom}\left(\left[\frac{a}{2}-\frac{\sqrt{a^2+4l}}{2}+b,\frac{a}{2}+\frac{\sqrt{a^2+4l}}{2}+b\right],-b,x\right)$$

2.1260

ODE No. 1260

$$y'(x)(x(a_1+b_1+1)-d_1)+a_1b_1d_1+(x-1)xy''(x)=0$$

✓

Mathematica : cpu = 0.363539 (sec), leaf count = 65

`DSolve[a1*b1*d1 + (-d1 + (1 + a1 + b1)*x)*Derivative[1][y][x] + (-1 + x)*x*Derivative[2][y][x]`

$$\left\{\left\{y(x) \rightarrow a_1b_1x\Gamma(d_1+1){}_3\tilde{F}_2(1,a_1+b_1+1,1;d_1+1,2;x)-\frac{c_1x^{1-d_1}{}_2F_1(1-d_1,a_1+b_1-d_1+1;2-d_1;d_1-1)}{d_1-1}\right.\right.$$

✓

Maple : cpu = 0.713 (sec), leaf count = 80

`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))`

$$y(x)=\int -(x-1)^{-a_1-b_1-1+d_1}x^{-d_1}\left(\operatorname{signum}(x-1)^{a_1+b_1-d_1}(-\operatorname{signum}(x-1))^{-a_1-b_1+d_1}b_1a_1x^{d_1}\operatorname{hypergeometric2F1}\left(1,a_1+b_1+1,1;d_1+1;x\right)-\frac{c_1x^{1-d_1}{}_2F_1(1-d_1,a_1+b_1-d_1+1;2-d_1;d_1-1)}{d_1-1}\right)dx$$

2.1261

ODE No. 1261

$y(x)(2lx(-n+p-1)+2lp+m)+2(x(-2l+n+1)-lx^2+n+1)\,y'(x)+x(x+2)y''(x)=0$

✓ **Mathematica** : cpu = 0.354828 (sec), leaf count = 148

```
DSolve[(m + 2*l*p + 2*l*(-1 - n + p)*x)*y[x] + 2*(1 + n + (1 - 2*l + n)*x - l*x^2)*Derivative[
```

$\left\{\left\{y(x) \rightarrow c_2\left(-\frac{x}{2}-1\right)^{\frac{n}{2}+\frac{1}{2}} x^{-n}(x+2)^{-\frac{n}{2}-\frac{1}{2}} \operatorname{HeunC}\left[-4 l n-2 l p-m+n^2+n,-4 l(p-1), 1-n, n+1, 4 l,\right.\right.$

✓ **Maple** : cpu = 0.302 (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)*
```

$y(x)=(x+2)^{-\frac{n}{2}-\frac{1}{2}}\left(-\frac{x}{2}-1\right)^{\frac{n}{2}+\frac{1}{2}}\left(\operatorname{HeunC}\left(4 l,-n, n,-4 p l, 2(n+1+p) l-\frac{n^2}{2}+m-n,-\frac{x}{2}\right) x^{-n} c_2+\mathrm{H}\right.$

2.1262

ODE No. 1262

$$(x^2 + x - 1) \, y'(x) + (x + 1)^2 y''(x) + (-x - 2)y(x) = 0$$

✓

Mathematica : cpu = 0.244824 (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

$$\left\{ \left\{ y(x) \rightarrow c_2 e^{-x} \int_1^x \exp \left(-\frac{K[1]^2}{K[1] + 1} - \frac{K[1]}{K[1] + 1} + 2K[1] - \frac{1}{K[1] + 1} \right) (K[1] + 1)^{\frac{K[1]}{K[1] + 1} + \frac{1}{K[1] + 1}} dK[1] + c_1 e^{-x} \right. \right.$$

✓

Maple : cpu = 0.378 (sec), leaf count = 53

dsolve((1+x)^2*diff(diff(y(x),x),x)+(x^2+x-1)*diff(y(x),x)-(x+2)*y(x)=0,y(x))

$$y(x) = (1 + x) \left(c_1 e^{-x} \operatorname{HeunD} \left(4, 4, -8, 12, \frac{x}{x + 2} \right) + c_2 \operatorname{HeunD} \left(-4, 4, -8, 12, \frac{x}{x + 2} \right) e^{\frac{x-1}{2+2x}} \right)$$

2.1263

ODE No. 1263

$$(-20x - 30) (x^2 + 3x)^{7/3} + x(x + 3)y''(x) + (3x - 1)y'(x) + y(x) = 0$$

✓

Mathematica : cpu = 0.683353 (sec), leaf count = 349

DSolve[(-30 - 20*x)*(3*x + x^2)^(7/3) + y[x] + (-1 + 3*x)*Derivative[1][y][x] + x*(3 + x)*Deri

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 x^{4/3}}{(x + 3)^{7/3}} + \frac{c_2 \left(-15 x^{4/3} - 4 \sqrt[3]{\frac{x}{x+3}} x^{4/3} \log \left(\sqrt[3]{x+3} - \sqrt[3]{x} \right) + 2 \sqrt[3]{\frac{x}{x+3}} x^{4/3} \log \left(x^{2/3} + \sqrt[3]{x+3} \sqrt[3]{x} \right)}{4 \sqrt[3]{\frac{x}{x+3}} (x + 3)^{7/3}} \right. \right.$$

✓

Maple : cpu = 0.116 (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)=

$$y(x) = \frac{\left(c_2 + \int \frac{\left(c_1 + 3 (x^2 + 3x)^{7/3} x (x + 3) \right) (x + 3)^{7/3}}{x^{4/3} (x^2 + 3x)} dx \right) x^{4/3}}{(x + 3)^{7/3}}$$

2.1264

ODE No. 1264

$$(x^2 + 3x + 4) \, y''(x) + (x^2 + x + 1) \, y'(x) + (-2x - 3)y(x) = 0$$

✓

Mathematica : cpu = 0.0625556 (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], x]

$$\left\{ \left\{ y(x) \rightarrow c_2(x^2 + x + 3) + c_1e^{-x} \right\} \right\}$$

✓

Maple : cpu = 0.047 (sec), leaf count = 19

dsolve((x^2+3*x+4)*diff(diff(y(x),x),x)+(x^2+x+1)*diff(y(x),x)-(2*x+3)*y(x)=0,y(x))

$$y(x) = c_1e^{-x} + c_2(x^2 + x + 3)$$

2.1265

ODE No. 1265

$$(x-2)(x-1)y''(x)-(2x-3)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.0225881 (sec), leaf count = 64

```
DSolve[y[x] - (-3 + 2*x)*Derivative[1][y][x] + (-2 + x)*(-1 + x)*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x) \rightarrow c_1(x^2-3x+2) P_{\frac{1}{2}(-1+\sqrt{5})}^2(2x-3)+c_2(x^2-3x+2) Q_{\frac{1}{2}(-1+\sqrt{5})}^2(2x-3)\right\}\right\}$$

✓ **Maple** : cpu = 1.908 (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))
```

$$y(x)=(x-2)^2\left(c_1\operatorname{hypergeom}\left(\left[\frac{1}{2}-\frac{\sqrt{5}}{2},\frac{5}{2}-\frac{\sqrt{5}}{2}\right],\left[-\sqrt{5}+1\right],\frac{1}{x-1}\right)(x-1)^{\frac{\sqrt{5}}{2}-\frac{1}{2}}+c_2\operatorname{hypergeom}\left(\right.$$

2.1266

ODE No. 1266

$$(x-2)^2y''(x)-(x-2)y'(x)-3y(x)=0$$

✓ **Mathematica** : cpu = 0.0140484 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1(x-2)^3+\frac{c_2}{x-2}\right\}\right\}$$

✓ **Maple** : cpu = 0.011 (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

$$-(l+2x^2-5x)\,y'(x)+2x^2y''(x)+(1-4x)y(x)=0$$

✓

Mathematica : cpu = 0.128177 (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

$$\left\{\left\{y(x)\rightarrow\frac{c_2e^{x-\frac{l}{2x}}\int_1^x\frac{e^{\frac{l}{2K[1]}-K[1]}}{K[1]^{3/2}}dK[1]}{\sqrt{x}}+\frac{c_1e^{x-\frac{l}{2x}}}{\sqrt{x}}\right\}\right\}$$

✓

Maple : cpu = 0.342 (sec), leaf count = 41

dsolve(2*x^2*diff(diff(y(x),x),x)-(2*x^2+1-5*x)*diff(y(x),x)-(4*x-1)*y(x)=0,y(x))

$$y(x)=\frac{\left(c_1\left(\int\frac{e^{-x}e^{\frac{l}{2x}}}{2x^{3/2}}dx\right)+c_2\right)e^xe^{-\frac{l}{2x}}}{\sqrt{x}}$$

2.1268

ODE No. 1268

$$y(x)(ax + b) + 2(x - 1)xy''(x) + (2x - 1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0655249 (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
```

$$\left\{\left\{y(x) \rightarrow c_1 \text{MathieuC}\left[-a - 2b, \frac{a}{2}, \cos^{-1}(\sqrt{x})\right] + c_2 \text{MathieuS}\left[-a - 2b, \frac{a}{2}, \cos^{-1}(\sqrt{x})\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.171 (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))
```

$$y(x) = c_1 \text{MathieuC}\left(-a - 2b, \frac{a}{2}, \arccos(\sqrt{x})\right) + c_2 \text{MathieuS}\left(-a - 2b, \frac{a}{2}, \arccos(\sqrt{x})\right)$$

2.1269

ODE No. 1269

$$((2v+5)x-2v-3)y'(x)+(v+1)y(x)+2(x-1)xy''(x)=0$$

✓

Mathematica : cpu = 0.0470976 (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] == 0, y[x], x]

$$\left\{\left\{y(x) \rightarrow c_2 i^{-2v-1} x^{\frac{1}{2}(-2v-1)} {}_2F_1\left(\frac{1}{2}, -v; \frac{1}{2} - v; x\right) + c_1 {}_2F_1\left(\frac{1}{2}, v + 1; v + \frac{3}{2}; x\right)\right\}\right\}$$

✓

Maple : cpu = 0.129 (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))

$$y(x)=c_1 \operatorname{hypergeom}\left(\left[\frac{1}{2},v+1\right],\left[\frac{3}{2}+v\right],x\right)+c_2 x^{-\frac{1}{2}-v} \operatorname{hypergeom}\left(\left[\frac{1}{2},-v\right],\left[\frac{1}{2}-v\right],x\right)$$

2.1270

ODE No. 1270

$$(2x^2 + 6x + 4) y''(x) + (10x^2 + 21x + 8) y'(x) + (12x^2 + 17x + 8) y(x) = 0$$

✓ **Mathematica** : cpu = 2.89182 (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)*y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 e^{-3x} (x+2)^4 \int_1^x \frac{e^{K[1]} (K[1]+1)^{3/2}}{(K[1]+2)^5} dK[1] + c_1 e^{-3x} (x+2)^4 \right\} \right\}$$

✓ **Maple** : cpu = 0.251 (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),x))
```

$$y(x) = e^{-2x} (x+2)^4 \left(c_2 \operatorname{HeunC} \left(-1, \frac{5}{2}, 4, -\frac{7}{4}, \frac{7}{2}, -1-x \right) (1+x)^{5/2} + c_1 \operatorname{HeunC} \left(-1, -\frac{5}{2}, 4, -\frac{7}{4}, \frac{7}{2}, -1-x \right) (1+x)^{5/2} \right)$$

2.1271

ODE No. 1271

$$4x^2y''(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.0070393 (sec), leaf count = 27

```
DSolve[y[x] + 4*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1\sqrt{x}+\frac{1}{2}c_2\sqrt{x}\log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.007 (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

$$(4a^2x^2 + 1)y(x) + 4x^2y''(x) = 0$$

✓ **Mathematica** : cpu = 0.007621 (sec), leaf count = 32

```
DSolve[(1 + 4*a^2*x^2)*y[x] + 4*x^2*Derivative[2][y][x] == 0, y[x], x]
```

$$\{ \{ y(x) \rightarrow c_1 \sqrt{x} J_0(ax) + c_2 \sqrt{x} Y_0(ax) \} \}$$

✓ **Maple** : cpu = 0.049 (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))
```

$$y(x) = \sqrt{x} (\text{BesselY}(0, ax) c_2 + \text{BesselJ}(0, ax) c_1)$$

2.1273 ODE No. 1273

$$y(x) (4kx - 4m^2 - x^2 + 1) + 4x^2 y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0094597 (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]
```

$$\{ \{ y(x) \rightarrow c_1 M_{k,m}(x) + c_2 W_{k,m}(x) \} \}$$

✓ **Maple** : cpu = 0.099 (sec), leaf count = 17

```
dsolve(4*x^2*diff(diff(y(x),x),x)-(-4*k*x+4*m^2+x^2-1)*y(x)=0,y(x))
```

$$y(x) = c_1 \text{WhittakerM}(k, m, x) + c_2 \text{WhittakerW}(k, m, x)$$

2.1274

ODE No. 1274

$$(x - v^2) y(x) + 4x^2 y''(x) + 4xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.0250647 (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]
```

$$\{ \{ y(x) \rightarrow c_1 \Gamma(1 - v) J_{-v}(\sqrt{x}) + c_2 \Gamma(v + 1) J_v(\sqrt{x}) \} \}$$

✓ **Maple** : cpu = 0.012 (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))
```

$$y(x) = c_1 \operatorname{BesselJ}(v, \sqrt{x}) + c_2 \operatorname{BesselY}(v, \sqrt{x})$$

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 = 0.0183453 (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] == 0, y[x], x]

$$\left\{\left\{y(x) \rightarrow c_1 e^{\frac{1}{2}(\sqrt{m^2-1} \log(x)-x)} U\left(\frac{1}{2}(-2l+m+\sqrt{m^2-1}), \sqrt{m^2-1}+1, x\right)+c_2 e^{\frac{1}{2}(\sqrt{m^2-1} \log(x)-x)} L_{\frac{1}{2}(2l-m)}^{\sqrt{m^2-1}}(x)\right\}\right.$$

✓

Maple : cpu = 0.236 (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),x)

$$y(x)=\frac{c_2 \operatorname{WhittakerW}\left(l-\frac{m}{2}+\frac{1}{2}, \frac{\sqrt{m+1} \sqrt{m-1}}{2}, x\right)+c_1 \operatorname{WhittakerM}\left(l-\frac{m}{2}+\frac{1}{2}, \frac{\sqrt{m+1} \sqrt{m-1}}{2}, x\right)}{\sqrt{x}}$$

2.1276

ODE No. 1276

$$-4e^x\sqrt{x^3}+4x^2y''(x)-(4x^2+1)y(x)+4xy'(x)=0$$

✓

Mathematica : cpu = 0.0316255 (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]

$$\left\{\left\{y(x)\rightarrow \frac{e^x\sqrt{x^3}(2x-1)}{4x^2}+\frac{c_1e^{-x}}{\sqrt{x}}+\frac{c_2e^x}{2\sqrt{x}}\right\}\right\}$$

✓

Maple : cpu = 0.082 (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

$$y(x)=\frac{\sinh(x)c_2}{\sqrt{x}}+\frac{\cosh(x)c_1}{\sqrt{x}}+\frac{\sqrt{x^3}e^x}{2x}$$

2.1277

ODE No. 1277

$$(-ax^2-1)y(x)+4x^2y''(x)+4xy'(x)=0$$

✓ **Mathematica** : cpu = 0.021552 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_1e^{-\frac{\sqrt{a}x}{2}}}{\sqrt{x}}+\frac{c_2e^{\frac{\sqrt{a}x}{2}}}{\sqrt{a}\sqrt{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.079 (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 = 0.13345 (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 = 0.0719384 (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]
```

$$\left\{\left\{y(x)\rightarrow c_2x^{\frac{1}{2}\left(\frac{\sqrt{17}}{4}-\frac{1}{4}\right)}+c_1x^{\frac{1}{2}\left(-\frac{1}{4}-\frac{\sqrt{17}}{4}\right)}-\frac{256(\log(x)+1)}{\left(\sqrt{17}-1\right)^2\left(1+\sqrt{17}\right)^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.197 (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 = 0.0452036 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_2 e^{-x} (4 e^{2 x} x^2 \operatorname{Ei}(-2 x)+2 x-1)}{2 x^{3 / 2}}+c_1 e^x \sqrt{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.059 (sec), leaf count = 40

```
dsolve(4*x^2*diff(diff(y(x),x),x)+8*x*diff(y(x),x)-(4*x^2+12*x+3)*y(x)=0,y(x))
```

$$y(x) = \frac{-4 e^x \operatorname{Ei}_1(2 x) c_2 x^2+c_2 (2 x-1) e^{-x}+c_1 x^2 e^x}{x^{3 / 2}}$$

2.1281

ODE No. 1281

$$4x^2y''(x) + (4x^2 - 4x - 1)y(x) - 4(2x - 1)xy'(x) = 0$$

✓

Mathematica : cpu = 0.0107898 (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]

$$\left\{\left\{y(x) \rightarrow \frac{c_1 e^x}{\sqrt{x}} + c_2 e^x \sqrt{x}\right\}\right\}$$

✓

Maple : cpu = 0.049 (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))

$$y(x) = \frac{e^x(c_2x + c_1)}{\sqrt{x}}$$

2.1282

ODE No. 1282

$$4x^3y'(x)+4x^2y''(x)+(x^2-4)(x^2+6)y(x)=0$$

✓ **Mathematica** : cpu = 0.0121848 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_1e^{-\frac{x^2}{4}}}{x^2}+\frac{1}{5}c_2e^{-\frac{x^2}{4}}x^3\right\}\right\}$$

✓ **Maple** : cpu = 0.046 (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))
```

$$y(x)=\frac{e^{-\frac{x^2}{4}}(c_2x^5+c_1)}{x^2}$$

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 = 0.0444982 (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]

$$\left\{\left\{y(x)\rightarrow c_1e^{x/2}x^{-\frac{x}{2}-1}+\frac{1}{3}c_2e^{x/2}x^{2-\frac{x}{2}}+\frac{1}{9}\left(3x^2\sqrt{e^xx^{-x}}\log(x)-x^2\sqrt{e^xx^{-x}}\right)\right\}\right\}$$

✓

Maple : cpu = 0.213 (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^

$$y(x)=\frac{\left(\ln\left(x\right)-\frac{1}{3}\right)x^2\sqrt{x^{-x}}e^x}{3}+e^{\frac{x}{2}}\left(c_1x^{-\frac{x}{2}+2}+c_2x^{-\frac{x}{2}-1}\right)$$

2.1284

ODE No. 1284

$$(2x+1)^2y''(x)-2(2x+1)y'(x)-12y(x)-3x-1=0$$

✓ **Mathematica** : cpu = 0.0224189 (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[x], x]
```

$$\left\{\left\{y(x)\rightarrow \frac{-72x^2-56x-7}{192(2x+1)}+c_1(2x+1)^3+\frac{c_2}{2x+1}\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (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))
```

$$y(x)=\frac{c_1}{2x+1}+(2x+1)^3c_2+\frac{-72x^2-56x-7}{384x+192}$$

2.1285

ODE No. 1285

$$((4a + 2)x - a)y'(x) + (a - 1)ay(x) + x(4x - 1)y''(x) = 0$$

✓

Mathematica : cpu = 0.515029 (sec), leaf count = 192

`DSolve[(-1 + a)*a*y[x] + (-a + (2 + 4*a)*x)*Derivative[1][y][x] + x*(-1 + 4*x)*Derivative[2][y][x], y[x], x]`

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 \sqrt[4]{4x-1} x^{\frac{1}{2}-\frac{a}{2}} e^{\sqrt{-(a-1)^2} \tan^{-1}(\sqrt{4x-1})}}{\sqrt[4]{1-4x}} - \frac{c_2 \sqrt[4]{4x-1} x^{\frac{1}{2}-\frac{a}{2}} (1-i\sqrt{4x-1})^{-i\sqrt{-(a-1)^2}} (1+i\sqrt{4x-1})}{\sqrt{-(a-1)^2} \sqrt[4]{1-4x}} \right. \right.$$

✓

Maple : cpu = 0.14 (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))`

$$y(x) = c_1 \operatorname{hypergeom}\left(\left[\frac{a}{2}, \frac{a}{2} - \frac{1}{2}\right], [a], 4x\right) + c_2 x^{1-a} \operatorname{hypergeom}\left(\left[1 - \frac{a}{2}, -\frac{a}{2} + \frac{1}{2}\right], [-a + 2], 4x\right)$$

2.1286

ODE No. 1286

$$(3x-1)^2y''(x)+3(3x-1)y'(x)-9y(x)-\log^2(3x-1)=0$$

✓

Mathematica : cpu = 0.0666666 (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[1][y][x], y[x], x]`

$$\left\{\left\{y(x)\rightarrow \frac{-6x-3x\log^2(3x-1)+\log^2(3x-1)+\log(3x-1)-\log(1-3x)+1}{9(3x-1)}+\frac{c_1((1-3x)^2+1)}{2(1-3x)}+\frac{ic_2}{2(1-3x)}\right\}\right\}$$

✓

Maple : cpu = 0.03 (sec), leaf count = 32

`dsolve((3*x-1)^2*diff(diff(y(x),x),x)+3*(3*x-1)*diff(y(x),x)-9*y(x)-ln(3*x-1)^2=0,y(x))`

$$y(x)=\frac{c_1}{3x-1}+(3x-1)c_2-\frac{\ln(3x-1)^2}{9}-\frac{2}{9}$$

2.1287

ODE No. 1287

$$9(x-1)xy''(x)+3(2x-1)y'(x)-20y(x)=0$$

✓ **Mathematica** : cpu = 0.0116105 (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]
```

$$\left\{\left\{y(x)\rightarrow c_2\sqrt[3]{1-x}\sqrt[3]{x}Q_1^{\frac{2}{3}}(2x-1)-\frac{c_1(2-2x)^{2/3}\sqrt[3]{1-x}x^{2/3}(6x-5)}{3\,2^{2/3}(x-1)\Gamma\left(\frac{4}{3}\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.029 (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))
```

$$y(x)=c_1(6x-5)\,x^{2/3}+c_2(6x-1)\,(x-1)^{2/3}$$

2.1288 ODE No. 1288

$$16x^2y''(x) + (4x + 3)y(x) = 0$$

✓ **Mathematica** : cpu = 0.0225784 (sec), leaf count = 47

```
DSolve[(3 + 4*x)*y[x] + 16*x^2*Derivative[2][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{i\sqrt{x}} \sqrt[4]{x} + i c_2 e^{-i\sqrt{x}} \sqrt[4]{x} \right\} \right\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 21

```
dsolve(16*x^2*diff(diff(y(x), x), x) + (4*x+3)*y(x)=0, y(x))
```

$$y(x) = x^{1/4} \left(\cos(\sqrt{x}) c_2 + \sin(\sqrt{x}) c_1 \right)$$

2.1289

ODE No. 1289

$$16x^2y''(x)+32xy'(x)+(-4x-5)y(x)=0$$

✓ **Mathematica** : cpu = 0.0797204 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_1e^{\sqrt{x}}(\sqrt{x}-1)}{x^{5/4}}-\frac{c_2e^{-\sqrt{x}}(\sqrt{x}+1)}{x^{5/4}}\right\}\right\}$$

✓ **Maple** : cpu = 0.14 (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))
```

$$y(x)=\frac{c_2(\sqrt{x}+1)e^{-\sqrt{x}}+c_1e^{\sqrt{x}}(\sqrt{x}-1)}{x^{5/4}}$$

2.1290

ODE No. 1290

$$(27x^2 + 4) y''(x) + 27xy'(x) - 3y(x) = 0$$

✓

Mathematica : cpu = 0.0965781 (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]

$$\left\{ \left\{ y(x) \rightarrow c_1 \cosh \left(\frac{\sqrt{-27x^2 - 4} \tan^{-1} \left(\frac{3x}{\sqrt{-9x^2 - \frac{4}{3}}} \right)}{3\sqrt{27x^2 + 4}} \right) + ic_2 \sinh \left(\frac{\sqrt{-27x^2 - 4} \tan^{-1} \left(\frac{3x}{\sqrt{-9x^2 - \frac{4}{3}}} \right)}{3\sqrt{27x^2 + 4}} \right) \right\} \right\}$$

✓

Maple : cpu = 0.041 (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 = 0.0424462 (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]]
```

$$\left\{\left\{y(x)\rightarrow c_1 {}_2F_1\left(\frac{13}{12}-\frac{\sqrt{5}}{6},\frac{13}{12}+\frac{\sqrt{5}}{6};\frac{5}{6};x\right)+\sqrt[6]{-1}c_2\sqrt[6]{x} {}_2F_1\left(\frac{5}{4}-\frac{\sqrt{5}}{6},\frac{5}{4}+\frac{\sqrt{5}}{6};\frac{7}{6};x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.881 (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))
```

$$y(x)=c_1\operatorname{hypergeom}\left(\left[\frac{13}{12}-\frac{\sqrt{10}}{12},\frac{13}{12}+\frac{\sqrt{10}}{12}\right],\left[\frac{5}{6}\right],x\right)+c_2x^{1/6}\operatorname{hypergeom}\left(\left[\frac{5}{4}-\frac{\sqrt{10}}{12},\frac{5}{4}+\frac{\sqrt{10}}{12}\right],\left[\frac{7}{6}\right],x\right)$$

2.1292

ODE No. 1292

$$50(x-1)xy''(x)+25(2x-1)y'(x)-2y(x)=0$$

✓ **Mathematica** : cpu = 0.0467636 (sec), leaf count = 61

```
DSolve[-2*y[x] + 25*(-1 + 2*x)*Derivative[1][y][x] + 50*(-1 + x)*x*Derivative[2][y][x] == 0,y[x]]
```

$$\left\{\left\{y(x)\rightarrow c_1\cosh\left(\frac{4}{5}\tanh^{-1}\left(\frac{\sqrt{x-1}}{\sqrt{x+1}}\right)\right)+ic_2\sinh\left(\frac{4}{5}\tanh^{-1}\left(\frac{\sqrt{x-1}}{\sqrt{x+1}}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.083 (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))
```

$$y(x)=\frac{c_1\left(\sqrt{x}+\sqrt{x-1}\right)^{4/5}+c_2}{\left(\sqrt{x}+\sqrt{x-1}\right)^{2/5}}$$

2.1293

ODE No. 1293

$$144(x-1)xy''(x)+(120x-48)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.184649 (sec), leaf count = 44

```
DSolve[y[x] + (-48 + 120*x)*Derivative[1][y][x] + 144*(-1 + x)*x*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\rightarrow (-1)^{2/3}c_2x^{2/3}{}_2F_1\left(\frac{7}{12},\frac{7}{12};\frac{5}{3};x\right)+c_1{}_2F_1\left(-\frac{1}{12},-\frac{1}{12};\frac{1}{3};x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.096 (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))
```

$$y(x)=x^{1/3}\left(\operatorname{LegendreQ}\left(-\frac{1}{2},\frac{2}{3},\sqrt{1-x}\right)c_2+\operatorname{LegendreP}\left(-\frac{1}{2},\frac{2}{3},\sqrt{1-x}\right)c_1\right)$$

2.1294

ODE No. 1294

$$144(x-1)xy''(x)+(168x-96)y'(x)+y(x)=0$$

✓ **Mathematica** : cpu = 0.041801 (sec), leaf count = 44

```
DSolve[y[x] + (-96 + 168*x)*Derivative[1][y][x] + 144*(-1 + x)*x*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\rightarrow c_1{}_2F_1\left(\frac{1}{12},\frac{1}{12};\frac{2}{3};x\right)+\sqrt[3]{-1}c_2\sqrt[3]{x}{}_2F_1\left(\frac{5}{12},\frac{5}{12};\frac{4}{3};x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.096 (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))
```

$$y(x)=x^{1/6}\left(\operatorname{LegendreQ}\left(-\frac{1}{2},\frac{1}{3},\sqrt{1-x}\right)c_2+\operatorname{LegendreP}\left(-\frac{1}{2},\frac{1}{3},\sqrt{1-x}\right)c_1\right)$$

2.1295

ODE No. 1295

$$ax^2y''(x)+bxy'(x)+y(x)\left(cx^2+dx+f\right)=0$$

✓

Mathematica : cpu = 0.107624 (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]`

$$\left\{\left\{y(x)\rightarrow c_1U\left(-\frac{-\sqrt{c}a-id\sqrt{a}-\sqrt{c}\sqrt{a^2-2ba-4fa+b^2}}{2a\sqrt{c}},\frac{\sqrt{a^2-2ba-4fa+b^2}}{a}+1,\frac{2i\sqrt{c}x}{\sqrt{a}}\right)\exp\left(\frac{\log\left(\frac{a^2-2ba-4fa+b^2}{a^2}\right)}{2}\right)\right.\right.$$

✓

Maple : cpu = 0.586 (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))`

$$y(x)=x^{-\frac{b}{2a}}\left(\text{WhittakerM}\left(-\frac{id}{2\sqrt{a}\sqrt{c}},\frac{\sqrt{a^2+(-2b-4f)a+b^2}}{2a},\frac{2i\sqrt{c}x}{\sqrt{a}}\right)c_1+\text{WhittakerW}\left(-\frac{id}{2\sqrt{a}\sqrt{c}},\frac{\sqrt{a^2+(-2b-4f)a+b^2}}{2a},\frac{2i\sqrt{c}x}{\sqrt{a}}\right)c_2\right)$$

2.1296

ODE No. 1296

$$y(x)\left(a_0x^2+b_0x+c_0\right)+\left(a_1x^2+b_1x\right)y'(x)+a_2x^2y''(x)=0$$

✓

Mathematica : cpu = 0.21403 (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] == 0,x,Assumptions->{a2!=0}]

$$\left\{\left\{y(x)\rightarrow c_1U\left(-\frac{2b_0a_2-\sqrt{a_1^2-4a_0a_2}a_2-a_1b_1-\sqrt{a_1^2-4a_0a_2}\sqrt{a_2^2-2b_1a_2-4c_0a_2+b_1^2}}{2a_2\sqrt{a_1^2-4a_0a_2}},\frac{\sqrt{a_2^2-2b_1a_2-4c_0a_2+b_1^2}}{a_2}\right)\right\}\right.$$

✓

Maple : cpu = 0.552 (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))

$$y(x)=e^{-\frac{x\,a_1}{2\,a_2}}x^{-\frac{b_1}{2\,a_2}}\left(\text{WhittakerW}\left(-\frac{a_1\,b_1-2\,a_2\,b_0}{2\,a_2\sqrt{-4\,a_0\,a_2+a_1^2}},\frac{\sqrt{a_2^2+(-2\,b_1-4\,c_0)\,a_2+b_1^2}}{2\,a_2},\frac{\sqrt{-4\,a_0\,a_2+a_1^2}}{a_2}\right)\right)$$

2.1297 ODE No. 1297

$$(ax^2 + 1) y''(x) + axy'(x) + by(x) = 0$$

✓ **Mathematica** : cpu = 0.048203 (sec), leaf count = 74

```
DSolve[b*y[x] + a*x*Derivative[1][y][x] + (1 + a*x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \cos \left(\frac{\sqrt{b} \tanh^{-1} \left(\frac{\sqrt{a} x}{\sqrt{a x^2 + 1}} \right)}{\sqrt{a}} \right) + c_2 \sin \left(\frac{\sqrt{b} \tanh^{-1} \left(\frac{\sqrt{a} x}{\sqrt{a x^2 + 1}} \right)}{\sqrt{a}} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.061 (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

$$(ax^2+1)y''(x)+bxy'(x)+cy(x)=0$$

✓ **Mathematica** : cpu = 0.0330778 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1(a x^2+1)^{\frac{2 a-b}{4 a}} P_{\frac{\frac{b-2 a}{2 a}}{\frac{\sqrt{a^2-2 b a-4 c a+b^2}-a}{2 a}}}\left(i \sqrt{a} x\right)+c_2(a x^2+1)^{\frac{2 a-b}{4 a}} Q_{\frac{\frac{b-2 a}{2 a}}{\frac{\sqrt{a^2-2 b a-4 c a+b^2}-a}{2 a}}}\left(i \sqrt{a} x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.191 (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))
```

$$y(x)=\left(a x^2+1\right)^{\frac{2 a-b}{4 a}}\left(\text {LegendreP}\left(\frac{\sqrt{a^2+(-2 b-4 c) a+b^2}-a}{2 a}, \frac{2 a-b}{2 a}, x \sqrt{-a}\right) c_1+\text {LegendreQ}\left(\frac{\sqrt{a^2+(-2 b-4 c) a+b^2}-a}{2 a}, \frac{2 a-b}{2 a}, x \sqrt{-a}\right) c_2\right)$$

2.1299

ODE No. 1299

$$(a^2x^2-1)y''(x)+2a^2xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0212264 (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]
```

$$\left\{\left\{y(x)\rightarrow c_2-\frac{c_1\tanh^{-1}(ax)}{a}\right\}\right\}$$

✓ **Maple** : cpu = 0.017 (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))
```

$$y(x)=c_1-\frac{(\ln(ax+1)-\ln(ax-1))c_2}{2a}$$

2.1300

ODE No. 1300

$$(a^2x^2-1)y''(x)+2a^2xy'(x)-2a^2y(x)=0$$

✓ **Mathematica** : cpu = 0.0087853 (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]
```

$$\left\{\left\{y(x)\rightarrow ac_1x+c_2\left(ax\left(\frac{1}{2}\log(ax+1)-\frac{1}{2}\log(1-ax)\right)-1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.049 (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

$$(ax^2+bx)y''(x)-2ay(x)+2by'(x)=0$$

✓ **Mathematica** : cpu = 0.0184684 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_2(ax+b)^3}{3ax}+\frac{c_1}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (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

$$A0y(x)(ax + b) + A1(ax + b)y'(x) + A2(ax + b)^2y''(x) = 0$$

✓

Mathematica : cpu = 0.0472563 (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]`

$$\left\{\left\{y(x) \rightarrow c_1 \left(\frac{2b}{a} + 2x\right)^{\frac{A1}{2aA2}} (2aA2x + 2A2b)^{-\frac{A1}{2aA2}} \left(-\frac{A0\left(\frac{b}{a} + x\right)}{aA2}\right)^{\frac{1}{2} - \frac{A1}{2aA2}} I_{\frac{A1}{aA2} - 1}\left(2\sqrt{-\frac{A0\left(\frac{b}{a} + x\right)}{aA2}}\right) + c_2\right.\right.$$

✓

Maple : cpu = 0.1 (sec), leaf count = 98

`dsolve(A2*(a*x+b)^2*diff(diff(y(x),x),x)+A1*(a*x+b)*diff(y(x),x)+A0*(a*x+b)*y(x)=0,y(x))`

$$y(x) = (ax + b)^{-\frac{-aA2 + A1}{2aA2}} \left(\text{BesselY}\left(\frac{aA2 - A1}{aA2}, 2\sqrt{A0}\sqrt{\frac{ax + b}{a^2A2}}\right) c_2 + \text{BesselJ}\left(\frac{aA2 - A1}{aA2}, 2\sqrt{A0}\sqrt{\frac{ax + b}{a^2A2}}\right) c_1 \right)$$

2.1303

ODE No. 1303

$$y''(x) \left(ax^2 + bx + c\right) + (dx + f)y'(x) + gy(x) = 0$$

✓ **Mathematica** : cpu = 3.45118 (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]
```

$$\left\{\left\{y(x) \rightarrow c_1 {}_2F_1\left(-\frac{a-d+\sqrt{(a-d)^2-4ag}}{2a},\frac{-a+d+\sqrt{(a-d)^2-4ag}}{2a};\frac{(b+\sqrt{b^2-4ac})d-2af}{2a\sqrt{b^2-4ac}};\frac{b+d+\sqrt{b^2-4ac}}{2a}\right)\right\}\right.$$

✓ **Maple** : cpu = 0.314 (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))
```

$$y(x) = c_1 \operatorname{hypergeom}\left(\left[\frac{-a+d+\sqrt{a^2+(-2d-4g)a+d^2}}{2a},-\frac{a-d+\sqrt{a^2+(-2d-4g)a+d^2}}{2a}\right],\left[\frac{d\sqrt{b^2-4ac}}{2a}\right],\frac{d\sqrt{b^2-4ac}}{2a}\right)$$

2.1304

ODE No. 1304

$$x^3y''(x)+xy'(x)+(-2x-3)y(x)=0$$

✓ **Mathematica** : cpu = 0.0618107 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_2\left(e^{\frac{1}{x}}\text{Ei}\left(-\frac{1}{x}\right)+2x^3-x^2+x\right)}{6x}+\frac{c_1e^{\frac{1}{x}}}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.046 (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))
```

$$y(x)=\frac{\text{Ei}_1\left(\frac{1}{x}\right)e^{\frac{1}{x}}c_2+c_1e^{\frac{1}{x}}-2\left(x^2-\frac{1}{2}x+\frac{1}{2}\right)c_2x}{x}$$

2.1305

ODE No. 1305

$$x^3y''(x)+2xy'(x)-y(x)=0$$

✓

Mathematica : cpu = 0.0630419 (sec), leaf count = 47

`DSolve[-y[x] + 2*x*Derivative[1][y][x] + x^3*Derivative[2][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow c_2G_{1,2}^{2,0}\left(-\frac{2}{x}\middle|\begin{array}{c}\frac{1}{2}\\-1,0\end{array}\right)+c_1e^{\frac{1}{x}}\left(I_0\left(\frac{1}{x}\right)-I_1\left(\frac{1}{x}\right)\right)\right\}\right\}$$

✓

Maple : cpu = 0.099 (sec), leaf count = 44

`dsolve(x^3*diff(diff(y(x),x),x)+2*x*diff(y(x),x)-y(x)=0,y(x))`

$$y(x)=\left(c_2\operatorname{BesselK}\left(1,-\frac{1}{x}\right)-c_2\operatorname{BesselK}\left(0,-\frac{1}{x}\right)+c_1\left(\operatorname{BesselI}\left(0,\frac{1}{x}\right)-\operatorname{BesselI}\left(1,\frac{1}{x}\right)\right)\right)e^{\frac{1}{x}}$$

2.1306

ODE No. 1306

$$y(x)\left(ax^2+a+bx\right)+x^3y''(x)+x^2y'(x)=0$$

 **Mathematica** : cpu = 0.557351 (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

$$\{\{y(x)\rightarrow (x)\}\}$$

 **Maple** : cpu = 0.234 (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))
```

$$y(x)=\operatorname{HeunD}\left(0,8a+4b,0,8a-4b,\frac{1+x}{x-1}\right)\left(\left(\int\frac{1}{x\operatorname{HeunD}\left(0,8a+4b,0,8a-4b,\frac{1+x}{x-1}\right)^2}dx\right)c_2+c_1\right)$$

2.1307

ODE No. 1307

$$x^3y''(x) + (x + 1)xy'(x) - 2y(x) = 0$$

✓

Mathematica : cpu = 0.132893 (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]

$$\left\{\left\{y(x) \rightarrow \frac{c_1 e^{\frac{1}{x}}(x + 1)}{x} - \frac{c_2 \left(e^{\frac{1}{x}} x \operatorname{Ei}\left(-\frac{1}{x}\right) + e^{\frac{1}{x}} \operatorname{Ei}\left(-\frac{1}{x}\right) + x\right)}{x}\right\}\right\}$$

✓

Maple : cpu = 0.066 (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))

$$y(x) = \frac{e^{\frac{1}{x}} c_2 (1 + x) \operatorname{Ei}_1\left(\frac{1}{x}\right) + c_1 (1 + x) e^{\frac{1}{x}} - c_2 x}{x}$$

2.1308

ODE No. 1308

$$x^3y''(x) - x^2y'(x) + xy(x) - \log^3(x) = 0$$

✓ **Mathematica** : cpu = 0.0164369 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{2 \log^3(x) + 6 \log^2(x) + 9 \log(x) + 6}{8x} + c_1x + c_2x \log(x) \right\} \right\}$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 40

```
dsolve(x^3*diff(diff(y(x),x),x)-x^2*diff(y(x),x)+x*y(x)-ln(x)^3=0,y(x))
```

$$y(x) = \frac{2 \ln(x)^3 + 6 \ln(x)^2 + (8c_1x^2 + 9) \ln(x) + 8c_2x^2 + 6}{8x}$$

2.1309

ODE No. 1309

$$x^3y''(x) - (x^2 - 1)y'(x) + xy(x) = 0$$

✓

Mathematica : cpu = 0.0711466 (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]`

$$\left\{\left\{y(x) \rightarrow c_2 G_{1,2}^{2,0}\left(-\frac{1}{2x^2} \middle| -\frac{1}{2}, -\frac{1}{2}\right) + \sqrt{2} c_1 e^{\frac{1}{4x^2}} x \left(\left(1 - \frac{1}{2x^2}\right) I_0\left(\frac{1}{4x^2}\right) + \frac{I_1\left(\frac{1}{4x^2}\right)}{2x^2}\right)\right\}\right\}$$

✓

Maple : cpu = 0.135 (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))`

$$y(x) = \frac{e^{\frac{1}{4x^2}} \left(c_1 (2x^2 - 1) \operatorname{BesselI}\left(0, \frac{1}{4x^2}\right) + (2x^2 - 1) c_2 \operatorname{BesselK}\left(0, -\frac{1}{4x^2}\right) + \operatorname{BesselI}\left(1, \frac{1}{4x^2}\right) c_1 + \operatorname{BesselK}\left(1, -\frac{1}{4x^2}\right) c_2\right)}{x}$$

2.1310

ODE No. 1310

$$x^3y''(x)+3x^2y'(x)+xy(x)-1=0$$

✓ **Mathematica** : cpu = 0.0088291 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{\log^2(x)}{2x}+\frac{c_1}{x}+\frac{c_2\log(x)}{x}\right\}\right\}$$

✓ **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))
```

$$y(x)=\frac{c_1\ln(x)+\frac{\ln(x)^2}{2}+c_2}{x}$$

2.1311

ODE No. 1311

$$-v(v+1)xy(x)+x(x^2+1)y''(x)+(2x^2+1)y'(x)=0$$

✓

Mathematica : cpu = 0.0784966 (sec), leaf count = 63

DSolve[-(v*(1 + v)*x*y[x]) + (1 + 2*x^2)*Derivative[1][y][x] + x*(1 + x^2)*Derivative[2][y][x]

$$\left\{\left\{y(x)\rightarrow c_2G_{2,2}^{2,0}\left(-x^2\middle|\begin{array}{c}\frac{1-v}{2},\frac{v+2}{2}\\0,0\end{array}\right)+c_1{}_2F_1\left(\frac{v}{2}+\frac{1}{2},-\frac{v}{2};1;-x^2\right)\right\}\right\}$$

✓

Maple : cpu = 0.21 (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))

$$y(x)=c_1\operatorname{hypergeom}\left(\left[-\frac{v}{2},\frac{1}{2}+\frac{v}{2}\right],\left[\frac{1}{2}\right],x^2+1\right)+c_2\sqrt{x^2+1}\operatorname{hypergeom}\left(\left[1+\frac{v}{2},\frac{1}{2}-\frac{v}{2}\right],\left[\frac{3}{2}\right],x^2+1\right)$$

2.1312

ODE No. 1312

$$x\left(x^2+1\right)y''(x)+2\left(x^2-1\right)y'(x)-2xy(x)=0$$

✓ **Mathematica** : cpu = 0.0155062 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_1}{x^2+1}+\frac{c_2x^3}{3\left(x^2+1\right)}\right\}\right\}$$

✓ **Maple** : cpu = 0.026 (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))
```

$$y(x)=\frac{c_2x^3+c_1}{x^2+1}$$

2.1313

ODE No. 1313

$$x(n-v)(n+v+1)y(x) + (2(n+1)x^2 + 2n+1)\,y'(x) + x(x^2+1)\,y''(x) = 0$$

✓

Mathematica

: cpu = 0.123261 (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)

$$\left\{\left\{y(x) \rightarrow c_1\,{}_2F_1\left(\frac{n}{2}-\frac{v}{2},\frac{n}{2}+\frac{v}{2}+\frac{1}{2};n+1;-x^2\right) + c_2x^{-2n}\,{}_2F_1\left(-\frac{n}{2}-\frac{v}{2},-\frac{n}{2}+\frac{v}{2}+\frac{1}{2};1-n;-x^2\right)\right\}\right\}$$

✓

Maple

: cpu = 0.127 (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

$$y(x) = x^{-n}\Big(\text{LegendreQ}\Big(v,n,\sqrt{x^2+1}\Big)\,c_2 + \text{LegendreP}\Big(v,n,\sqrt{x^2+1}\Big)\,c_1\Big)$$

2.1314

ODE No. 1314

$$x(n-v-1)(n+v)y(x)-(2(n-1)x^2+2n-1)y'(x)+x(x^2+1)y''(x)=0$$

✓ **Mathematica** : cpu = 0.114649 (sec), leaf count = 87

```
DSolve[(-1 + n - v)*(n + v)*x*y[x] - (-1 + 2*n + 2*(-1 + n)*x^2)*Derivative[1][y][x] + x*(1 +
```

$$\left\{\left\{y(x) \rightarrow c_1 {}_2F_1\left(-\frac{n}{2}-\frac{v}{2},-\frac{n}{2}+\frac{v}{2}+\frac{1}{2};1-n;-x^2\right)+c_2 x^{2 n} {}_2F_1\left(\frac{n}{2}-\frac{v}{2},\frac{n}{2}+\frac{v}{2}+\frac{1}{2};n+1;-x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.114 (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*
```

$$y(x)=x^n\left(\operatorname{LegendreQ}\left(v,n,\sqrt{x^2+1}\right)c_2+\operatorname{LegendreP}\left(v,n,\sqrt{x^2+1}\right)c_1\right)$$

2.1315

ODE No. 1315

$$ax^3y(x) + (x^2 - 1)xy''(x) + y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0160359 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \cos \left(\sqrt{a} \sqrt{x^2 - 1} \right) + c_2 \sin \left(\sqrt{a} \sqrt{x^2 - 1} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.044 (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

$$x\left(x^2-1\right)y''(x)+\left(x^2-1\right)y'(x)-xy(x)=0$$

✓ **Mathematica** : cpu = 0.0567553 (sec), leaf count = 38

```
DSolve[-(x*y[x]) + (-1 + x^2)*Derivative[1][y][x] + x*(-1 + x^2)*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\rightarrow c_2G_{2,2}^{2,0}\left(x^2\left|\begin{array}{c}\frac{1}{2},\frac{3}{2}\\0,0\end{array}\right.\right)+\frac{2c_1E(x^2)}{\pi}\right\}\right\}$$

✓ **Maple** : cpu = 0.049 (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))
```

$$y(x)=c_1\operatorname{EllipticE}(x)+c_2(\operatorname{EllipticCE}(x)-\operatorname{EllipticCK}(x))$$

2.1317

ODE No. 1317

$$x\left(x^2-1\right)y''(x)+\left(3x^2-1\right)y'(x)+xy(x)=0$$

✓ **Mathematica** : cpu = 0.0574234 (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]
```

$$\left\{\left\{y(x)\rightarrow c_2G_{2,2}^{2,0}\left(x^2\middle|\begin{array}{c}\frac{1}{2},\frac{1}{2}\\0,0\end{array}\right)+\frac{2c_1K(x^2)}{\pi}\right\}\right\}$$

✓ **Maple** : cpu = 0.057 (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))
```

$$y(x)=c_1\operatorname{EllipticK}(x)+c_2\operatorname{EllipticCK}(x)$$

2.1318

ODE No. 1318

$$(ax^2 + b) \, y'(x) + cxy(x) + x(x^2 - 1) \, y''(x) = 0$$

✓

Mathematica : cpu = 0.161403 (sec), leaf count = 172

DSolve[c*x*y[x] + (b + a*x^2)*Derivative[1][y][x] + x*(-1 + x^2)*Derivative[2][y][x] == 0,y[x]

$$\left\{ \left\{ y(x) \rightarrow c_1 {}_2F_1\left(\frac{a}{4} - \frac{1}{4}\sqrt{a^2 - 2a - 4c + 1} - \frac{1}{4}, \frac{a}{4} + \frac{1}{4}\sqrt{a^2 - 2a - 4c + 1} - \frac{1}{4}; \frac{1}{2} - \frac{b}{2}; x^2\right) + i^{b+1} c_2 x^{b+1} {}_2F_1\right. \right.$$

✓

Maple : cpu = 0.191 (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))

$$y(x) = c_1 \operatorname{hypergeom}\left(\left[-\frac{1}{4} + \frac{a}{4} + \frac{\sqrt{a^2 - 2a - 4c + 1}}{4}, -\frac{1}{4} + \frac{a}{4} - \frac{\sqrt{a^2 - 2a - 4c + 1}}{4}\right], \left[-\frac{b}{2} + \frac{1}{2}\right], x^2\right) + c$$

2.1319

ODE No. 1319

$$x\left(x^2+2\right)y''(x)-y'(x)-6xy(x)=0$$

✓

Mathematica : cpu = 0.0436135 (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]

$$\left\{\left\{y(x) \rightarrow c_1 x^{3/2} \left(x^2+2\right)^{3/4}-\frac{c_2 \left(x^2+2\right)^{3/4} {}_2F_1\left(-\frac{3}{4}, \frac{7}{4}; \frac{1}{4}; -\frac{x^2}{2}\right)}{3 2^{3/4}}\right\}\right\}$$

✓

Maple : cpu = 0.166 (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))

$$y(x)=\left(x^2+2\right)^{3/4}\left(x^{3/2} c_1+\operatorname{hypergeom}\left(\left[-\frac{3}{4}, \frac{7}{4}\right],\left[\frac{1}{4}\right],-\frac{x^2}{2}\right) c_2\right)$$

2.1320

ODE No. 1320

$$x\left(x^2-2\right)y''(x)+\left(x^2+4x+2\right)y(x)-\left(x^3+3x^2-2x-2\right)y'(x)=0$$

✓ **Mathematica** : cpu = 0.106049 (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[2][y][x] == 0, y[x], x]
```

$$\left\{\left\{y(x)\rightarrow c_1e^xx^2+c_2(x-1)\right\}\right\}$$

✓ **Maple** : cpu = 0.048 (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,x),y(x))
```

$$y(x)=c_1(x-1)+c_2e^xx^2$$

2.1321

ODE No. 1321

$$(x+1)x^2y''(x)-(2x+1)xy'(x)+(2x+1)y(x)=0$$

✓ **Mathematica** : cpu = 0.0187738 (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
```

$$\{ \{ y(x) \rightarrow c_1 x + c_2 x (x + \log(x)) \} \}$$

✓ **Maple** : cpu = 0.03 (sec), leaf count = 15

```
dsolve(x^2*(1+x)*diff(diff(y(x),x),x)-x*(2*x+1)*diff(y(x),x)+(2*x+1)*y(x)=0,y(x))
```

$$y(x)=x(c_2\ln(x)+c_2x+c_1)$$

2.1322 ODE No. 1322

$$(x+1)x^2y''(x)+2(3x+2)xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0335556 (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]
```

$$\left\{\left\{y(x)\rightarrow c_1\left(-\frac{1}{3x^3}+\frac{1}{x^2}-\frac{3}{x}-\frac{1}{x+1}-4\log(x)+4\log(x+1)\right)+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.031 (sec), leaf count = 44

```
dsolve(x^2*(1+x)*diff(diff(y(x),x),x)+2*x*(3*x+2)*diff(y(x),x)=0,y(x))
```

$$y(x)=c_1+\left(-4\ln(x)+4\ln(1+x)-\frac{12x^3+6x^2-2x+1}{3(1+x)x^3}\right)c_2$$

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 = 0.385308 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == (2*(1 + x)*y[x])/((-1 + x)*x) - (2*(-2 + x)*Derivative[1][y][x]), y[x], x]
```

, DifferentialRoot result

$$\{\{y(x) \rightarrow (x)\}\}$$

 **Maple** : cpu = 0.026 (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))
```

$$y(x) = \frac{c_1 + c_2(x-1)^3}{x^2}$$

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 = 0.0195078 (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])/(( -1 + x)*x^2), y[x], x]
```

$$\left\{\left\{y(x) \rightarrow c_1 x^3 - c_2 x^2(x \log(x) + 1)\right\}\right\}$$

✓ **Maple** : cpu = 0.036 (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)), x)
```

$$y(x) = x^2(\ln(x) c_2 x + x c_1 + c_2)$$

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 = 0.142562 (sec), leaf count = 52

```
DSolve[Derivative[2][y][x] == -(((-(alpha*beta) + a*b*x)*y[x])/((-1 + x)*x^2)) - ((-1 + alpha +
```

$$\left\{\left\{y(x) \rightarrow (-1)^{\alpha} c_1 x^{\alpha} {}_2F_1(a + \alpha, \alpha + b; \alpha - \beta + 1; x) + (-1)^{\beta} c_2 x^{\beta} {}_2F_1(a + \beta, b + \beta; -\alpha + \beta + 1; x)\right\}\right\}$$

✓ **Maple** : cpu = 0.191 (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
```

$$y(x) = (x - 1)^{1-a-\alpha-b-\beta} \left(\text{hypergeom}([1 - b - \beta, 1 - a - \beta], [1 + \alpha - \beta], x) x^{\alpha} c_1 + \text{hypergeom}([1 - \alpha - b,$$

2.1326

ODE No. 1326

$$y''(x) = -\frac{y'(x)}{x+1} - \frac{y(x)}{x(x+1)^2}$$

✓ **Mathematica** : cpu = 0.015951 (sec), leaf count = 29

```
DSolve[Derivative[2][y][x] == -(y[x]/(x*(1 + x)^2)) - Derivative[1][y][x]/(1 + x),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 x}{x+1} + \frac{c_2 (x \log(x) - 1)}{x+1} \right\} \right\}$$

✓ **Maple** : cpu = 0.036 (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 = 0.103235 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \left(-\frac{1}{2}\right)^{-\frac{1}{\sqrt{2}}} c_1 x^{-\frac{1}{\sqrt{2}}} {}_2F_1\left(-\frac{1}{\sqrt{2}}, -1 - \frac{1}{\sqrt{2}}; 1 - \sqrt{2}; \frac{x}{2}\right) + \left(-\frac{1}{2}\right)^{\frac{1}{\sqrt{2}}} c_2 x^{\frac{1}{\sqrt{2}}} {}_2F_1\left(\frac{1}{\sqrt{2}}, -1 + \frac{1}{\sqrt{2}}; 1 + \sqrt{2}; \frac{x}{2}\right) \right. \right.$$

✓ **Maple** : cpu = 1.716 (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))
```

$$y(x) = (x-2)^2 \left(c_2 x^{\frac{\sqrt{2}}{2}} \text{hypergeom}\left(\left[2 + \frac{\sqrt{2}}{2}, 1 + \frac{\sqrt{2}}{2}\right], \left[1 + \sqrt{2}\right], \frac{x}{2}\right) + c_1 x^{-\frac{\sqrt{2}}{2}} \text{hypergeom}\left(\left[2 - \frac{\sqrt{2}}{2}, 1 - \frac{\sqrt{2}}{2}\right], \left[1 - \sqrt{2}\right], \frac{x}{2}\right) \right)$$

2.1328

ODE No. 1328

$$y''(x) = \frac{2y(x)}{(x-1)^2x}$$

✓ **Mathematica** : cpu = 0.013956 (sec), leaf count = 36

```
DSolve[Derivative[2][y][x] == (2*y[x])/((-1 + x)^2*x), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_2(-x^2 + 2x \log(x) + 1)}{x - 1} - \frac{c_1 x}{x - 1} \right\} \right\}$$

✓ **Maple** : cpu = 0.036 (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 = 0.445666 (sec), leaf count = 67

```
DSolve[Derivative[2][y][x] == -((( -q + alpha*beta*x)*y[x])/((-1 + x)*x*(-a + x))) - ((a*gamma1
```

$$\{ \{ y(x) \rightarrow c_2 x^{1-\text{gamma1}} \text{HeunG}[a, q - (\text{gamma1} - 1)((a - 1)\delta + \alpha + \beta - \text{gamma1} + 1), \alpha - \text{gamma1} + 1, \beta -$$

✓ **Maple** : cpu = 0.431 (sec), leaf count = 64

```
dsolve(diff(diff(y(x),x),x) = -((alpha+beta+1)*x^2-(alpha+beta+1+a*(gamma1+delta)-delta)
```

$$y(x) = c_1 \text{HeunG}(a, q, \alpha, \beta, \gamma 1, \delta, x) + c_2 x^{1-\gamma 1} \text{HeunG}(a, q - (-1 + \gamma 1)(\delta(a - 1) + \alpha + \beta - \gamma 1 + 1), \beta + 1 -$$

2.1330

ODE No. 1330

$$y''(x) = -\frac{y'(x) \left(Ax^2 + Bx + C\right)}{(x-a)(x-b)(x-c)} - \frac{(DDx + e)y(x)}{(x-a)(x-b)(x-c)}$$

✓ **Mathematica** : cpu = 2.46291 (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)/((x-a)*(x-b)*(x-c))), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 \text{HeunG} \left[\frac{a-c}{a-b}, \frac{A^2ba^4 + B^2a^3 + A(b^2 - ab + (a+b)B + 2C)a^3 + (a-b)^2(aDD + e)a^2 - 2(a-b)(aDD + e)a + (a-b)^2e}{(a-b)^2}, \frac{a-b}{a-b}, \frac{a-b}{a-b}, \frac{a-b}{a-b} \right] \right. \right.$$

✓ **Maple** : cpu = 1.335 (sec), leaf count = 1147

```
dsolve(diff(diff(y(x),x),x) = -(A*x^2+B*x+C)/(x-a)/(x-b)/(x-c)*diff(y(x),x)-(DD*x+E)/(x-a)/(x-b)/(x-c)), y(x))
```

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 = 0.0250588 (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])/(x^2), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 \sqrt[4]{x-2} \sqrt{x}}{\sqrt[4]{2-x}} + \frac{2c_2 (x-2)^{3/4} \sqrt{x}}{\sqrt[4]{2-x}} \right\} \right\}$$

✓ **Maple** : cpu = 0.034 (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)), x)
```

$$y(x) = c_1 \sqrt{x} + c_2 \sqrt{x(x-2)}$$

2.1332

ODE No. 1332

$$y''(x) = \frac{y'(x)}{x+1} - \frac{(3x+1)y(x)}{4x^2(x+1)}$$

✓ **Mathematica** : cpu = 0.0160325 (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], x]
```

$$\{\{y(x) \rightarrow c_1\sqrt{x} + c_2\sqrt{x}(x + \log(x))\}\}$$

✓ **Maple** : cpu = 0.031 (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))
```

$$y(x) = \sqrt{x} \left(c_2 \ln(x) + c_2 x + c_1 \right)$$

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 = 0.0647399 (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*(x-1)), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 i^{-v} x^{-v/2} {}_2F_1\left(\frac{1}{2}, -v; \frac{1}{2} - v; x\right) + c_2 i^{v+1} x^{\frac{v+1}{2}} {}_2F_1\left(\frac{1}{2}, v+1; v+\frac{3}{2}; x\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.128 (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),x)
```

$$y(x) = c_1 x^{-\frac{v}{2}} \operatorname{hypergeom}\left(\left[\frac{1}{2}, -v\right], \left[\frac{1}{2} - v\right], x\right) + c_2 x^{\frac{1}{2} + \frac{v}{2}} \operatorname{hypergeom}\left(\left[\frac{1}{2}, v+1\right], \left[\frac{3}{2} + v\right], x\right)$$

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 = 0.115449 (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)*y'[x])/(x*(x-1)), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow i^{-c} c_1 x^{-c/2} {}_2F_1\left(\frac{a}{2} - \frac{b}{2} - \frac{c}{2}, \frac{a}{2} + \frac{b}{2} - \frac{c}{2}; 1 - c; x\right) + i^c c_2 x^{c/2} {}_2F_1\left(\frac{a}{2} - \frac{b}{2} + \frac{c}{2}, \frac{a}{2} + \frac{b}{2} + \frac{c}{2}; c + 1; x\right) \right\} \right.$$

✓ **Maple** : cpu = 0.143 (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, y(x))
```

$$y(x) = (x-1)^{1-a} \left(x^{-\frac{c}{2}} \operatorname{hypergeom}\left(\left[-\frac{a}{2} + \frac{b}{2} - \frac{c}{2} + 1, -\frac{a}{2} - \frac{b}{2} - \frac{c}{2} + 1\right], [1-c], x\right) c_2 + x^{\frac{c}{2}} \operatorname{hypergeom}\left(\left[\frac{a}{2} - \frac{b}{2} + \frac{c}{2}, \frac{a}{2} + \frac{b}{2} + \frac{c}{2}\right], c+1, x\right) c_1 \right)$$

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 = 0.209539 (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])/(2*(x-1)*x), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow e^{\frac{1}{4}(-2\log(1-x)-\log(x))} \sqrt[4]{x} c_1 {}_2F_1\left(\frac{1}{4}\left(\sqrt{-8a-4b-4\sqrt{4a^2+4ba-a-b}+1}+1\right), \frac{(-8a-4b-4\sqrt{4a^2+4ba-a-b}+1)}{4}\right), \right. \right.$$

✓ **Maple** : cpu = 0.089 (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), x))
```

$$y(x) = c_1 \operatorname{LegendreP}\left(\frac{\sqrt{1-4a}}{2} - \frac{1}{2}, \sqrt{-b-a}, \sqrt{x}\right) + c_2 \operatorname{LegendreQ}\left(\frac{\sqrt{1-4a}}{2} - \frac{1}{2}, \sqrt{-b-a}, \sqrt{x}\right)$$

2.1336

ODE No. 1336

$$y''(x) = -\frac{(1-3x)y(x)}{(x-1)(2x-1)^2}$$

✓ **Mathematica** : cpu = 0.0327586 (sec), leaf count = 70

```
DSolve[Derivative[2][y][x] == -(((1 - 3*x)*y[x])/((-1 + x)*(-1 + 2*x)^2)),y[x],x]
```

$$\{ \{ y(x) \rightarrow c_2 \sqrt{1-2x} (2x \log(2(x-1)+1) - 2 \log(2(x-1)+1) - 2x \log(x-1) + 2 \log(x-1) - 1) - c_1 \sqrt{1-2x} \}$$

✓ **Maple** : cpu = 0.049 (sec), leaf count = 42

```
dsolve(diff(diff(y(x),x),x) = -(-3*x+1)/(x-1)/(2*x-1)^2*y(x),y(x))
```

$$y(x) = (-2c_2(x-1) \ln(2x-1) + 2c_2(x-1) \ln(x-1) + xc_1 - c_1 + c_2) \sqrt{2x-1}$$

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 = 0.0587004 (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)*Deriv
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1}{\sqrt{\frac{b+x}{a-b} + 1}} + \frac{c_2 \sqrt{b+x}}{\sqrt{a-b} \sqrt{\frac{b+x}{a-b} + 1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.066 (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)^
```

$$y(x) = \frac{\sqrt{x+b} c_1 + c_2}{\sqrt{\frac{x+a}{a-b}}}$$

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 = 0.364956 (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), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{3}{935} c_2 x (18 x^2 - 102 x + 187) + c_1 \sqrt[6]{x} (2 - x)^{17/6} \right\} \right\}$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 27

```
dsolve(diff(diff(y(x),x),x) = 1/3/x*(6*x-1)/(x-2)*diff(y(x),x)+1/3/x^2/(x-2)*y(x),y(x))
```

$$y(x) = c_2 (x-2)^{17/6} x^{1/6} + 18 \left(x^2 - \frac{17}{3} x + \frac{187}{18} \right) c_1 x$$

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 = 0.152277 (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
```

$$\left\{\left\{y(x) \rightarrow c_1 a^{-c} x^{-c} {}_2F_1(1-c, b-c; -c-d+1; -a x)+c_2 a^d x^d {}_2F_1(d+1, b+d; c+d+1; -a x)\right\}\right\}$$

✓ **Maple** : cpu = 0.187 (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
```

$$y(x) = (ax+1)^{-b+c-d} \left(\text{hypergeom}\left([-d, 1-b-d], [1-c-d], -ax\right) x^{-c} c_2 + \text{hypergeom}\left([c, 1-b+c], [1-c-d], -ax\right) c_1\right)$$

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 = 0.025259 (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)*Derivat.
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_2 x^3}{ax + b} + \frac{c_1 x^2}{ax + b} \right\} \right\}$$

✓ **Maple** : cpu = 0.033 (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
```

$$y(x) = \frac{x^2(c_2x + c_1)}{ax + b}$$

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 = 11.3913 (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)*Derivati
```

$$\left\{ \left\{ y(x) \rightarrow \frac{ax c_1 {}_2F_1\left(\frac{3}{2} - \frac{1}{2}\sqrt{1-4v}, \frac{1}{2}\sqrt{1-4v} + \frac{3}{2}; 3; -\frac{ax}{b}\right)}{b} + \frac{ax \int_1^x \left(-\frac{1}{a^2 {}_2F_1\left(\frac{1}{2}(5-\sqrt{1-4v}), \frac{1}{2}(\sqrt{1-4v}+5); 4; -\frac{aK}{b}\right)} \right) dx}{b} \right. \right.$$

✓ **Maple** : cpu = 0.268 (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*
```

$$y(x) = \frac{x^{-\frac{1}{2} + \frac{\sqrt{1-4v}}{2}} a^2 c_2 (v+6) (v+2) (v+12) \operatorname{hypergeom}\left(\left[\frac{3}{2} - \frac{\sqrt{1-4v}}{2}, -\frac{1}{2} - \frac{\sqrt{1-4v}}{2}\right], [1 - \sqrt{1-4v}], -\frac{b}{ax}\right)}{b}$$

2.1342

ODE No. 1342

$$y''(x) = -\frac{ay(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.0182933 (sec), leaf count = 52

```
DSolve[Derivative[2][y][x] == -((a*y[x])/x^4),y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1 x e^{\frac{i \sqrt{a}}{x}} - \frac{i c_2 x e^{-\frac{i \sqrt{a}}{x}}}{2 \sqrt{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.04 (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 = 0.123032 (sec), leaf count = 73

```
DSolve[Derivative[2][y][x] == -((((1 - a)*a*x^2 - b*(b + x))*y[x])/x^4),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \left(2 \left(ax + \frac{b}{2} \right) I_a \left(\frac{b}{x} \right) + b I_{a+1} \left(\frac{b}{x} \right) \right) + c_2 \left(2 \left(ax + \frac{b}{2} \right) K_a \left(\frac{b}{x} \right) - b K_{a+1} \left(\frac{b}{x} \right) \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.154 (sec), leaf count = 58

```
dsolve(diff(diff(y(x),x),x) = -(x^2*a*(1-a)-b*(x+b))/x^4*y(x),y(x))
```

$$y(x) = \text{BesselI} \left(a + 1, \frac{b}{x} \right) c_1 b - \text{BesselK} \left(a + 1, \frac{b}{x} \right) c_2 b + 2 \left(c_1 \text{BesselI} \left(a, \frac{b}{x} \right) + c_2 \text{BesselK} \left(a, \frac{b}{x} \right) \right) \left(ax + \right.$$

2.1344

ODE No. 1344

$$y''(x) = -\frac{\left(e^{2/x} - v^2\right) y(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.248149 (sec), leaf count = 173

```
DSolve[Derivative[2][y][x] == -((E^(2/x) - v^2)*y[x])/x^4, y[x], x]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_1 2^{v+\frac{v+1}{2}} \left(e^{2/x}\right)^{\frac{v+1}{2}-\frac{1}{2}} \left(-e^{2/x}\right)^{\frac{1}{2}(-v-1)+\frac{1}{2}} I_v\left(\sqrt{-e^{2/x}}\right)}{\log\left(e^{2/x}\right)} + \frac{c_2 (-1)^{-v} 2^{v+\frac{v+1}{2}} \left(e^{2/x}\right)^{\frac{v+1}{2}-\frac{1}{2}} \left(-e^{2/x}\right)^{\frac{1}{2}(-v-1)+\frac{1}{2}} K_v\left(\sqrt{-e^{2/x}}\right)}{\log\left(e^{2/x}\right)}\right.\right.$$

✓ **Maple** : cpu = 0.101 (sec), leaf count = 23

```
dsolve(diff(diff(y(x),x),x) = -(exp(2/x)-v^2)/x^4*y(x),y(x))
```

$$y(x) = x\left(\operatorname{BesselY}\left(v, e^{\frac{1}{x}}\right) c_2 + \operatorname{BesselJ}\left(v, e^{\frac{1}{x}}\right) c_1\right)$$

2.1345

ODE No. 1345

$$y''(x) = \frac{2y(x)}{x^4} - \frac{y'(x)}{x^3}$$

✓ **Mathematica** : cpu = 0.0409621 (sec), leaf count = 52

```
DSolve[Derivative[2][y][x] == (2*y[x])/x^4 - Derivative[1][y][x]/x^3,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{\frac{1}{2x^2}} x - \sqrt{\frac{\pi}{2}} c_2 e^{\frac{1}{2x^2}} x \operatorname{erf}\left(\frac{1}{\sqrt{2}x}\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.064 (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))
```

$$y(x) = x e^{\frac{1}{2x^2}} \left(\operatorname{erf}\left(\frac{\sqrt{2}}{2x}\right) c_2 + c_1 \right)$$

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 = 0.0644955 (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^3, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_2 x e^{-\frac{a}{x}}}{a-b} + c_1 x e^{-\frac{b}{x}} \right\} \right\}$$

✓ **Maple** : cpu = 0.054 (sec), leaf count = 25

```
dsolve(diff(diff(y(x),x),x) = 1/x^2*(a+b)*diff(y(x),x)-((a+b)*x+a*b)/x^4*y(x),y(x))
```

$$y(x) = x \left(e^{-\frac{a}{x}} c_2 + e^{-\frac{b}{x}} c_1 \right)$$

2.1347 ODE No. 1347

$$y''(x) = -\frac{y(x)}{x^4} - \frac{y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0634039 (sec), leaf count = 31

```
DSolve[Derivative[2][y][x] == -(y[x]/x^4) - Derivative[1][y][x]/x, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 J_0\left(\frac{1}{x}\right) + \frac{c_1 K_0\left(\frac{i}{x}\right)}{\sqrt{\pi}} \right\} \right\}$$

✓ **Maple** : cpu = 0.036 (sec), leaf count = 19

```
dsolve(diff(diff(y(x), x), x) = -1/x*diff(y(x), x)-1/x^4*y(x), y(x))
```

$$y(x) = c_1 \text{BesselJ}\left(0, \frac{1}{x}\right) + c_2 \text{BesselY}\left(0, \frac{1}{x}\right)$$

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 = 0.257117 (sec), leaf count = 34

```
DSolve[Derivative[2][y][x] == -(((b*x^2 + a*(1 + x^4))*y[x])/x^4) - Derivative[1][y][x]/x,y[x]
```

$$\{ \{y(x) \rightarrow c_1 \text{MathieuC}[-b,a,i\log(x)] + c_2 \text{MathieuS}[-b,a,i\log(x)] \} \}$$

✓ **Maple** : cpu = 0.337 (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 = 0.0484693 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 G_{1,2}^{2,0} \left(-\frac{1}{2x^2} \middle| \begin{matrix} \frac{3}{2} \\ 0,0 \end{matrix} \right) + c_1 e^{\frac{1}{4x^2}} \left(\left(1 - \frac{1}{2x^2} \right) I_0 \left(\frac{1}{4x^2} \right) + \frac{I_1 \left(\frac{1}{4x^2} \right)}{2x^2} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.114 (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))
```

$$y(x) = \frac{e^{\frac{1}{4x^2}} \left(c_1 (2x^2 - 1) \operatorname{BesselI} \left(0, \frac{1}{4x^2} \right) + (2x^2 - 1) c_2 \operatorname{BesselK} \left(0, -\frac{1}{4x^2} \right) + \operatorname{BesselI} \left(1, \frac{1}{4x^2} \right) c_1 + \operatorname{BesselK} \left(1, -\frac{1}{4x^2} \right) c_2 \right)}{x^2}$$

2.1350 ODE No. 1350

$$y''(x) = -\frac{a^2 y(x)}{x^4} - \frac{2y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0064939 (sec), leaf count = 25

```
DSolve[Derivative[2][y][x] == -((a^2*y[x])/x^4) - (2*Derivative[1][y][x])/x,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \cos\left(\frac{a}{x}\right) - c_2 \sin\left(\frac{a}{x}\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.019 (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 = 0.0110924 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{\frac{1}{2x^2}} - \sqrt{\frac{\pi}{2}} c_2 e^{\frac{1}{2x^2}} \operatorname{erf}\left(\frac{1}{\sqrt{2}x}\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.052 (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))
```

$$y(x) = e^{\frac{1}{2x^2}} \left(\operatorname{erf}\left(\frac{\sqrt{2}}{2x}\right) c_2 + c_1 \right)$$

2.1352

ODE No. 1352

$$y''(x) = -\frac{2(a+x)y'(x)}{x^2} - \frac{by(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.0094925 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-\frac{\sqrt{b}\left(-\frac{\sqrt{a^2-b}}{\sqrt{b}}-\frac{a}{\sqrt{b}}\right)}{x}} + c_2 e^{-\frac{\sqrt{b}\left(\frac{\sqrt{a^2-b}}{\sqrt{b}}-\frac{a}{\sqrt{b}}\right)}{x}} \right\} \right\}$$

✓ **Maple** : cpu = 0.059 (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))
```

$$y(x) = c_1 e^{\frac{a-\sqrt{a^2-b}}{x}} + c_2 e^{\frac{a+\sqrt{a^2-b}}{x}}$$

2.1353

ODE No. 1353

$$y''(x) = \frac{(2x^2 - 1) y'(x)}{x^3} - \frac{y(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.527717 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \left(x^3 + 2x - \frac{1}{x} \right) - \frac{c_2 \left(\sqrt{2\pi} x^4 \operatorname{erfi} \left(\frac{1}{\sqrt{2x}} \right) + 2\sqrt{2\pi} x^2 \operatorname{erfi} \left(\frac{1}{\sqrt{2x}} \right) - \sqrt{2\pi} \operatorname{erfi} \left(\frac{1}{\sqrt{2x}} \right) + 2e^{\frac{1}{2x^2}} x - 2e^{\frac{1}{2x}} \right)}{16x} \right. \right.$$

✓ **Maple** : cpu = 0.438 (sec), leaf count = 64

```
dsolve(diff(diff(y(x),x),x) = 1/x^3*(2*x^2-1)*diff(y(x),x)-1/x^4*y(x),y(x))
```

$$y(x) = \frac{c_1 \sqrt{2} \sqrt{\pi} (x^4 + 2x^2 - 1) \operatorname{erfi} \left(\frac{\sqrt{2}}{2x} \right) + 2c_1 (-x^3 + x) e^{\frac{1}{2x^2}} + c_2 (x^4 + 2x^2 - 1)}{x}$$

2.1354

ODE No. 1354

$$y''(x) = \frac{(2x^2 - 1) \, y'(x)}{x^3} - \frac{2y(x)}{x^4}$$

✓

Mathematica

: cpu = 0.0991105 (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]

$$\left\{ \left\{ y(x) \rightarrow \frac{c_2 \left(-5 \sqrt{2 \pi} x^2 \operatorname{erfi} \left(\frac{1}{\sqrt{2} x} \right) + \sqrt{2 \pi} \operatorname{erfi} \left(\frac{1}{\sqrt{2} x} \right) - 2 e^{\frac{1}{2 x^2}} x + 4 e^{\frac{1}{2 x^2}} x^5 + 8 e^{\frac{1}{2 x^2}} x^3 \right)}{12 x^2} + c_1 \left(1 - \frac{1}{5 x^2} \right) \right\} \right\}$$

✓

Maple

: cpu = 0.449 (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))

$$y(x) = \frac{c_2 x^5 \operatorname{hypergeom} \left(\left[-\frac{5}{2} \right], \left[-\frac{1}{2} \right], \frac{1}{2 x^2} \right) + 5 c_1 x^2 - c_1}{x^2}$$

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 = 4.79645 (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], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{2} c_2 \sqrt[3]{x^3 + 1} x^2 {}_2F_1\left(\frac{2}{3}, \frac{4}{3}; \frac{5}{3}; -x^3\right) + c_1 \sqrt[3]{x^3 + 1} \right\} \right\}$$

✓ **Maple** : cpu = 0.182 (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))
```

$$y(x) = (x^3 + 1)^{1/3} \left(\operatorname{hypergeom}\left(\left[\frac{2}{3}, \frac{4}{3}\right], \left[\frac{5}{3}\right], -x^3\right) c_1 x^2 + c_2 \right)$$

2.1356

ODE No. 1356

$$y''(x) = -\frac{y(x) \left(-n^2 - v(v + 1)x^2\right)}{x^2 \left(x^2 + 1\right)} - \frac{(2x^2 + 1) y'(x)}{x \left(x^2 + 1\right)}$$

✓ **Mathematica** : cpu = 0.174662 (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)*y'[x])/(x*(1 + x^2)), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x^{-n} {}_2F_1\left(-\frac{n}{2} - \frac{v}{2}, -\frac{n}{2} + \frac{v}{2} + \frac{1}{2}; 1 - n; -x^2\right) + c_2 x^n {}_2F_1\left(\frac{n}{2} - \frac{v}{2}, \frac{n}{2} + \frac{v}{2} + \frac{1}{2}; n + 1; -x^2\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.122 (sec), leaf count = 29

```
dsolve(diff(diff(y(x), x), x) = -(2*x^2+1)/x/(x^2+1)*diff(y(x), x) - (-v*(v+1)*x^2-n^2)/x^2/(x^2+1), y(x))
```

$$y(x) = c_1 \operatorname{LegendreP}\left(v, n, \sqrt{x^2 + 1}\right) + \operatorname{LegendreQ}\left(v, n, \sqrt{x^2 + 1}\right) c_2$$

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 = 0.355893 (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][y][x])/(x^2*(1 + x^2)), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x^{\frac{1}{2} \left(-\sqrt{a^2 - 4a - 4c + 4} - a + 2 \right)} {}_2F_1 \left(-\frac{1}{4} \sqrt{a^2 - 2a - 4b + 1} - \frac{1}{4} \sqrt{a^2 - 4a - 4c + 4} + \frac{1}{4}, \frac{1}{4} \sqrt{a^2 - 2a - 4b + 1} \right), \right. \right.$$

✓ **Maple** : cpu = 0.182 (sec), leaf count = 97

```
dsolve(diff(diff(y(x),x),x) = -1/x*(a*x^2+a-1)/(x^2+1)*diff(y(x),x)-(b*x^2+c)/x^2/(x^2+1)), y(x))
```

$$y(x) = x^{1-\frac{a}{2}} \left(\text{LegendreQ} \left(-\frac{1}{2} + \frac{\sqrt{a^2 - 2a - 4b + 1}}{2}, \frac{\sqrt{a^2 - 4a - 4c + 4}}{2}, \sqrt{x^2 + 1} \right) c_2 + \text{LegendreP} \left(-\frac{1}{2} + \frac{a}{2}, 1, \sqrt{x^2 + 1} \right) c_1 \right)$$

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 = 0.0315657 (sec), leaf count = 66

```
DSolve[Derivative[2][y][x] == -((( -2 + x^2)*y[x])/(x^2*(-1 + x^2))) + ((-2 + x^2)*Derivative[1][y][x])/(x^2*(-1 + x^2)), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 x \sqrt[4]{x^2 - 1}}{\sqrt[4]{1 - x^2}} + \frac{c_2 x \sqrt{x^2 - 1} \tanh^{-1}\left(\frac{x}{\sqrt{x^2 - 1}}\right)}{\sqrt[4]{1 - x^2}} \right\} \right\}$$

✓ **Maple** : cpu = 0.074 (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), 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 = 0.0531723 (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])/(x^2-1), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 i^{-v} x^{-v} {}_2F_1\left(\frac{1}{2} - \frac{v}{2}, -\frac{v}{2}; \frac{1}{2} - v; x^2\right) + c_2 i^{v+1} x^{v+1} {}_2F_1\left(\frac{v}{2} + \frac{1}{2}, \frac{v}{2} + 1; v + \frac{3}{2}; x^2\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.147 (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))
```

$$y(x) = c_1 x^{-v} \operatorname{hypergeom}\left(\left[-\frac{v}{2}, \frac{1}{2} - \frac{v}{2}\right], \left[\frac{1}{2} - v\right], x^2\right) + c_2 x^{v+1} \operatorname{hypergeom}\left(\left[1 + \frac{v}{2}, \frac{1}{2} + \frac{v}{2}\right], \left[\frac{3}{2} + v\right], x^2\right)$$

2.1360

ODE No. 1360

$$y''(x) = \frac{v(v+1)y(x)}{x^2} - \frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.0514002 (sec), leaf count = 68

```
DSolve[Derivative[2][y][x] == (v*(1 + v)*y[x])/x^2 - (2*x*Derivative[1][y][x])/(-1 + x^2),y[x]
```

$$\left\{\left\{y(x) \rightarrow c_1 i^{-v} x^{-v} {}_2F_1\left(\frac{1}{2}, -v; \frac{1}{2} - v; x^2\right) + c_2 i^{v+1} x^{v+1} {}_2F_1\left(\frac{1}{2}, v + 1; v + \frac{3}{2}; x^2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.128 (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))
```

$$y(x) = c_1 x^{-v} \operatorname{hypergeom}\left(\left[\frac{1}{2}, -v\right], \left[\frac{1}{2} - v\right], x^2\right) + c_2 x^{v+1} \operatorname{hypergeom}\left(\left[\frac{1}{2}, v + 1\right], \left[\frac{3}{2} + v\right], x^2\right)$$

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 = 0.259099 (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*Derivative[1][y][x])/(x^2*(-1 + x^2)), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x^{-a} + c_2 \left(-2ax^2 + 2a - x^2 + 3 \right) x^{a+1} \right\} \right\}$$

✓ **Maple** : cpu = 0.047 (sec), leaf count = 33

```
dsolve(diff(diff(y(x),x),x) = 2*x/(x^2-1)*diff(y(x),x)-(a*(a+1)-a*x^2*(a+3))/x^2/(x^2-1), y(x))
```

$$y(x) = c_1 x^{-a} + c_2 x^{a+1} (2a x^2 + x^2 - 2a - 3)$$

2.1362

ODE No. 1362

$$y''(x) = \frac{2xy'(x)}{x^2-1} - \frac{y(x)\left((x^2-1)x^2(a-n)(a+n+1)+2ax^2+n(n+1)(x^2-1)\right)}{x^2(x^2-1)}$$

✖

Mathematica : cpu = 4.9196 (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

, DifferentialRoot result

$$\{\{y(x) \rightarrow (x)\}\}$$

✔

Maple : cpu = 0.345 (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*

$$y(x) = c_1 x^{-n} \operatorname{HeunC}\left(0, -\frac{1}{2} - n, -2, -\frac{1}{4} a^2 + \frac{1}{4} n^2 - \frac{1}{4} a + \frac{1}{4} n, -\frac{1}{4} n^2 - \frac{1}{4} n + \frac{3}{4} + \frac{1}{4} a^2 - \frac{1}{4} a, x^2\right) + c_2 x^{n+1} \operatorname{HeunC}\left(0, \frac{1}{2} + n, -2, -\frac{1}{4} a^2 + \frac{1}{4} n^2 - \frac{1}{4} a + \frac{1}{4} n, -\frac{1}{4} n^2 - \frac{1}{4} n + \frac{3}{4} + \frac{1}{4} a^2 - \frac{1}{4} a, x^2\right)$$

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 = 0.35146 (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)), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 (-1)^{\frac{1}{4} \left(-\sqrt{a^2 - 2a - 4b + 1} + a - 1 \right)} x^{\frac{1}{2} \left(-\sqrt{a^2 - 2a - 4b + 1} + a - 1 \right)} {}_2F_1 \left(\frac{a}{2} - \frac{1}{2}, \frac{a}{2} - \frac{1}{2} \sqrt{a^2 - 2a - 4b + 1} - \frac{1}{2}; 1 - \sqrt{a^2 - 2a - 4b + 1} \right), 1 \right\} \right.$$

✓ **Maple** : cpu = 0.211 (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))
```

$$y(x) = (x^2 - 1)^{-a+2} \left(x^{\frac{a}{2} - \frac{1}{2} - \frac{\sqrt{a^2 - 2a - 4b + 1}}{2}} \operatorname{hypergeom} \left(\left[-\frac{a}{2} + \frac{3}{2}, -\frac{a}{2} + \frac{3}{2} - \frac{\sqrt{a^2 - 2a - 4b + 1}}{2} \right], \left[1 - \frac{\sqrt{a^2 - 2a - 4b + 1}}{2} \right], 1 \right) \right.$$

2.1364

ODE No. 1364

$$y''(x) = \frac{y'(x) \left(2(a-1)x^2 - 2a + 2bc(x^2-1)x^c\right)}{x(x^2-1)} - \frac{y(x) \left(bc(2a-c-1)x^{c+2} - bc(2a-c+1)x^c + x^2((a-1)c - b)\right)}{x^2(x^2-1)}$$

✓ **Mathematica** : cpu = 0.138941 (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)))/x^2, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 P_v(x) e^{\frac{a \log(x^c)}{c} + bx^c} + c_2 Q_v(x) e^{\frac{a \log(x^c)}{c} + bx^c} \right\} \right\}$$

✓ **Maple** : cpu = 0.152 (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))
```

$$y(x) = x^a e^{bx^c} (\text{LegendreQ}(v, x) c_2 + \text{LegendreP}(v, x) c_1)$$

2.1365

ODE No. 1365

$$y''(x) = -\frac{ay(x)}{(x^2 + 1)^2}$$

✓ **Mathematica** : cpu = 0.0538538 (sec), leaf count = 104

```
DSolve[Derivative[2][y][x] == -((a*y[x])/(1 + x^2)^2),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{ic_2\sqrt{x^2+1}(1-ix)^{\sqrt{a+1}}(1+ix)^{-\sqrt{a+1}}e^{i\sqrt{a+1}\tan^{-1}(x)}}{2\sqrt{a+1}} + c_1\sqrt{x^2+1}e^{i\sqrt{a+1}\tan^{-1}(x)} \right\} \right\}$$

✓ **Maple** : cpu = 0.098 (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 = 1.01912 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1}{\sqrt{x^2 + 1}} + \frac{c_2 x}{\sqrt{x^2 + 1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.016 (sec), leaf count = 17

```
dsolve(diff(diff(y(x), x), x) = -2/(x^2+1)*x*diff(y(x), x)-1/(x^2+1)^2*y(x), y(x))
```

$$y(x) = \frac{c_1 x + c_2}{\sqrt{x^2 + 1}}$$

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 = 0.173703 (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), y[x], x]
```

$$\left\{\left\{y(x) \rightarrow c_1(x^2+1)^{\frac{\sqrt{m^2}}{2}}\text{HeunC}\left[\frac{1}{4}\left(-a^2-\sqrt{m^2}\left(\sqrt{m^2}+1\right)+\frac{1}{4}\left(\sqrt{(2n+1)^2}-1\right)^2+\frac{1}{2}\left(\sqrt{(2n+1)^2}-1\right)\right],-\frac{1}{4}\left(\sqrt{(2n+1)^2}-1\right),-\frac{1}{4}\left(\sqrt{(2n+1)^2}-1\right),-x^2\right]c_2x+\text{HeunC}\left(0,-\frac{1}{2},m,-\frac{a^2}{4},\frac{1}{4}+\frac{1}{4}a^2+\frac{1}{4}m^2-\frac{1}{4}n^2-\frac{1}{4}n,-x^2\right)\right.\right.$$

✓ **Maple** : cpu = 0.345 (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)*(x^2+1), y(x)), x)
```

$$y(x) = (x^2+1)^{\frac{m}{2}}\left(\text{HeunC}\left(0,\frac{1}{2},m,-\frac{a^2}{4},\frac{1}{4}+\frac{1}{4}a^2+\frac{1}{4}m^2-\frac{1}{4}n^2-\frac{1}{4}n,-x^2\right)c_2x+\text{HeunC}\left(0,-\frac{1}{2},m,-\frac{a^2}{4},\frac{1}{4}+\frac{1}{4}a^2+\frac{1}{4}m^2-\frac{1}{4}n^2-\frac{1}{4}n,-x^2\right)\right)$$

2.1368

ODE No. 1368

$$y''(x) = -\frac{axy'(x)}{x^2+1} - \frac{by(x)}{(x^2+1)^2}$$

✓ **Mathematica** : cpu = 0.0165227 (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]]
```

$$\left\{\left\{y(x) \rightarrow c_1 \left(x^2+1\right)^{\frac{2-a}{4}} P_{\frac{\frac{a-2}{2}}{\frac{1}{2} \sqrt{a^2-4 a+4 b+4}}}\left(i x\right)+c_2 \left(x^2+1\right)^{\frac{2-a}{4}} Q_{\frac{\frac{a-2}{2}}{\frac{1}{2} \sqrt{a^2-4 a+4 b+4}}}\left(i x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.118 (sec), leaf count = 71

```
dsolve(diff(diff(y(x),x),x) = -a*x/(x^2+1)*diff(y(x),x)-b/(x^2+1)^2*y(x),y(x))
```

$$y(x) = \left(x^2+1\right)^{\frac{1}{2}-\frac{a}{4}} \left(\text{LegendreQ}\left(\frac{a}{2}-1,\frac{\sqrt{a^2-4 a+4 b+4}}{2},i x\right) c_2+\text{LegendreP}\left(\frac{a}{2}-1,\frac{\sqrt{a^2-4 a+4 b+4}}{2},i x\right) c_1\right)$$

2.1369

ODE No. 1369

$$y''(x) = -\frac{ay(x)}{(x^2-1)^2}$$

✓ **Mathematica** : cpu = 0.252076 (sec), leaf count = 110

```
DSolve[Derivative[2][y][x] == -((a*y[x])/(-1 + x^2)^2),y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_2(x+1)^{\frac{\sqrt{1-a}}{2}+\frac{1}{2}}(1-x)^{\frac{1}{2}-\frac{\sqrt{1-a}}{2}}}{2\sqrt{1-a}} + c_1(x+1)^{\frac{1}{2}-\frac{\sqrt{1-a}}{2}}(1-x)^{\frac{1}{2}(\sqrt{1-a}+1)}\right\}\right\}$$

✓ **Maple** : cpu = 0.091 (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 = 1.01943 (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
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \cosh \left(\frac{1}{2} a (\log(1 - x) - \log(x + 1)) \right) + i c_2 \sinh \left(\frac{1}{2} a (\log(1 - x) - \log(x + 1)) \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.021 (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 = 0.0159705 (sec), leaf count = 48

```
DSolve[Derivative[2][y][x] == -(((a^2 - lambda*(-1 + x^2))*y[x])/(-1 + x^2)^2) - (2*x*Derivat
```

$$\left\{\left\{y(x) \rightarrow c_1 P_{\frac{1}{2}(\sqrt{4\lambda+1}-1)}^a(x) + c_2 Q_{\frac{1}{2}(\sqrt{4\lambda+1}-1)}^a(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.081 (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*
```

$$y(x) = c_1 \operatorname{LegendreP}\left(\frac{\sqrt{1+4\lambda}}{2} - \frac{1}{2}, a, x\right) + c_2 \operatorname{LegendreQ}\left(\frac{\sqrt{1+4\lambda}}{2} - \frac{1}{2}, a, x\right)$$

2.1372

ODE No. 1372

$$y''(x) = -\frac{y(x) \left((x^2 - 1) (ax^2 + bx + c) - k^2 \right)}{(x^2 - 1)^2} - \frac{2xy'(x)}{x^2 - 1}$$

✓ **Mathematica** : cpu = 0.213682 (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*y'[x])/(x^2 - 1), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{\sqrt{-a} x} (x^2 - 1)^{k/2} \operatorname{HeunC} \left[(k + 1) (2\sqrt{-a} - k) - a + b - c, 2(2\sqrt{-a}(k + 1) + b), k + 1, k + 1, 4\sqrt{-a} \right] \right. \right.$$

✓ **Maple** : cpu = 0.41 (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)^2), y(x))
```

$$y(x) = e^{x\sqrt{-a}} \left((1+x)^{-\frac{k}{2}} (x-1)^{\frac{k}{2}} \operatorname{HeunC} \left(4\sqrt{-a}, -k, k, 2b, \frac{k^2}{2} + a - b + c, \frac{1}{2} + \frac{x}{2} \right) c_2 + (x^2 - 1)^{\frac{k}{2}} \operatorname{HeunC} \left(4\sqrt{-a}, -k, k, 2b, \frac{k^2}{2} + a - b + c, \frac{1}{2} + \frac{x}{2} \right) c_1 \right)$$

2.1373

ODE No. 1373

$$y''(x) = -\frac{y(x)\left(-a^2(x^2-1)^2-m^2-n(n+1)(x^2-1)\right)}{(x^2-1)^2}-\frac{2xy'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.182841 (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*x*y'[x]/(x^2 - 1)], y[x], x]
```

$$\left\{\left\{y(x) \rightarrow c_1(x^2-1)^{m/2} \operatorname{HeunC}\left[\frac{1}{4}(-a^2-m(m+1)+n^2+n),-\frac{a^2}{4},\frac{1}{2},m+1,0,x^2\right]+c_2x(x^2-1)^{m/2} \operatorname{HeunC}\left[\frac{1}{4}(-a^2-m(m+1)+n^2+n),-\frac{a^2}{4},\frac{1}{2},m+1,0,x^2\right]\right\}\right.$$

✓ **Maple** : cpu = 0.31 (sec), leaf count = 84

```
dsolve(diff(diff(y(x),x),x) = -2*x/(x^2-1)*diff(y(x),x)-(-a^2*(x^2-1)^2-n*(n+1)*(x^2-1)-m^2)*y(x)/(x^2-1)^2, y(x))
```

$$y(x) = (x^2-1)^{\frac{m}{2}} \left(\operatorname{HeunC}\left(0,\frac{1}{2},m,-\frac{a^2}{4},\frac{1}{4}+\frac{1}{4}a^2+\frac{1}{4}m^2-\frac{1}{4}n^2-\frac{1}{4}n,x^2\right)c_2x + \operatorname{HeunC}\left(0,-\frac{1}{2},m,-\frac{a^2}{4},\frac{1}{4}+\frac{1}{4}a^2+\frac{1}{4}m^2-\frac{1}{4}n^2-\frac{1}{4}n,x^2\right)c_1 \right)$$

2.1374

ODE No. 1374

$$y''(x) = \frac{2(2a-1)xy'(x)}{x^2-1} - \frac{y(x)(x^2(2a(2a-1)-v(v+1))+2a+v(v+1))}{(x^2-1)^2}$$

✓ **Mathematica** : cpu = 0.0190257 (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])/(-.
```

$$\{\{y(x) \rightarrow c_1(x^2-1)^a P_v(x) + c_2(x^2-1)^a Q_v(x)\}\}$$

✓ **Maple** : cpu = 0.084 (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)
```

$$y(x) = (x^2-1)^a (\text{LegendreQ}(v,x) c_2 + \text{LegendreP}(v,x) c_1)$$

2.1375

ODE No. 1375

$$y''(x) = -\frac{y(x)\left(4ax^2(a-n)-(x^2-1)(2a+(v-n)(n+v+1))\right)}{(x^2-1)^2} - \frac{2x(-2a+n+1)y'(x)}{x^2-1}$$

✓ **Mathematica** : cpu = 0.0235797 (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

$$\left\{\left\{y(x) \rightarrow c_1\left(x^2-1\right)^{\frac{1}{2}\left(2 a-n\right)} P_v^n(x)+c_2\left(x^2-1\right)^{\frac{1}{2}\left(2 a-n\right)} Q_v^n(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.103 (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)*

$$y(x) = \left(x^2-1\right)^{a-\frac{n}{2}} \left(\text{LegendreQ}\left(v,n,x\right) c_2+\text{LegendreP}\left(v,n,x\right) c_1\right)$$

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 = 0.0390225 (sec), leaf count = 69

```
DSolve[Derivative[2][y][x] == -((b*y[x])/(x^2*(a + x^2))) - ((a + 2*x^2)*Derivative[1][y][x])/
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \cos \left(\frac{\sqrt{b} \tanh^{-1} \left(\frac{\sqrt{a+x^2}}{\sqrt{a}} \right)}{\sqrt{a}} \right) - c_2 \sin \left(\frac{\sqrt{b} \tanh^{-1} \left(\frac{\sqrt{a+x^2}}{\sqrt{a}} \right)}{\sqrt{a}} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.085 (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 = 0.394496 (sec), leaf count = 109

```
DSolve[Derivative[2][y][x] == -((b^2*y[x])/(a^2 + x^2)^2),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \sqrt{a^2 + x^2} e^{-i \sqrt{\frac{b^2}{a^2} + 1} \tan^{-1}(\frac{a}{x})} + \frac{i c_2 \sqrt{a^2 + x^2} e^{i \sqrt{\frac{a^2 + b^2}{a^2}} \tan^{-1}(\frac{a}{x})}}{2 a \sqrt{\frac{a^2 + b^2}{a^2}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.19 (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 = 0.0331202 (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[1][y][x])/(x-1)^2,x]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_1 x^2}{1-x} + \frac{c_2 x(2 x^2 \log(1-x)-2 x^2 \log(x)+2 x-2 x \log(1-x)+2 x \log(x)-1)}{(x-1)^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.052 (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),x))
```

$$y(x) = \frac{\left(-(x-1) c_2 x \ln (x-1)+(x-1) c_2 x \ln (x)+c_1 x^2+\left(-c_1-c_2\right) x+\frac{c_2}{2}\right) x}{(x-1)^2}$$

2.1379

ODE No. 1379

$$y''(x) = \frac{12y(x)}{(x+1)^2(x^2+2x+3)}$$

✓ **Mathematica** : cpu = 0.0487918 (sec), leaf count = 99

```
DSolve[Derivative[2][y][x] == (12*y[x])/((1 + x)^2*(3 + 2*x + x^2)),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_2 \left(2x^3 + 4x^2 - 3\sqrt{2}x^2 \tan^{-1} \left(\frac{x+1}{\sqrt{2}} \right) + 8x - 6\sqrt{2}x \tan^{-1} \left(\frac{x+1}{\sqrt{2}} \right) - 9\sqrt{2} \tan^{-1} \left(\frac{x+1}{\sqrt{2}} \right) + 2 \right)}{2(x+1)^2} + c_1 \right. \right.$$

✓ **Maple** : cpu = 0.066 (sec), leaf count = 60

```
dsolve(diff(diff(y(x),x),x) = 12/(1+x)^2/(x^2+2*x+3)*y(x),y(x))
```

$$y(x) = \frac{3(x^2 + 2x + 3) c_2 \arctan \left(\frac{(1+x)\sqrt{2}}{2} \right) - c_2(x^3 + 2x^2 + 4x + 1) \sqrt{2} + c_1(x^2 + 2x + 3)}{(1+x)^2}$$

2.1380

ODE No. 1380

$$y''(x) = -\frac{by(x)}{x^2(x-a)^2}$$

✓ **Mathematica** : cpu = 9.61648 (sec), leaf count = 132

```
DSolve[Derivative[2][y][x] == -((b*y[x])/(x^2*(-a + x)^2)),y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_2(x-a)^{\frac{1}{2}\sqrt{\frac{a^2-4b}{a^2}}+\frac{1}{2}}x^{\frac{1}{2}-\frac{1}{2}\sqrt{\frac{a^2-4b}{a^2}}}}{a\sqrt{\frac{a^2-4b}{a^2}}}+c_1(x-a)^{\frac{1}{2}-\frac{1}{2}\sqrt{1-\frac{4b}{a^2}}}x^{\frac{1}{2}\sqrt{1-\frac{4b}{a^2}}+\frac{1}{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.151 (sec), leaf count = 67

```
dsolve(diff(diff(y(x),x),x) = -b/x^2/(x-a)^2*y(x),y(x))
```

$$y(x) = \sqrt{x(a-x)}\left(\left(\frac{x}{a-x}\right)^{\frac{\sqrt{a^2-4b}}{2a}}c_2 + \left(\frac{a-x}{x}\right)^{\frac{\sqrt{a^2-4b}}{2a}}c_1\right)$$

2.1381

ODE No. 1381

$$y''(x) = c - \frac{by(x)}{x^2(x-a)^2}$$

✓ **Mathematica** : cpu = 20.0896 (sec), leaf count = 589

```
DSolve[Derivative[2][y][x] == c - (b*y[x])/(x^2*(-a + x)^2),y[x],x]
```

$$\left\{\left\{y(x) \rightarrow -\frac{2cx^2(a-x)\left(1-\frac{x}{a}\right)^{-\frac{1}{2}\sqrt{\frac{a^2-4b}{a^2}}}\left(\sqrt{\frac{a^2-4b}{a^2}}\left(1-\frac{x}{a}\right)^{\sqrt{\frac{a^2-4b}{a^2}}}\,{}_2F_1\left(\frac{1}{2}\sqrt{1-\frac{4b}{a^2}}-\frac{1}{2},\frac{1}{2}\sqrt{1-\frac{4b}{a^2}}+\frac{3}{2};\frac{1}{2}\sqrt{1-\frac{4b}{a^2}}\right)\right.\right.}{\sqrt{a^2-4b}}\right.$$

✓ **Maple** : cpu = 0.287 (sec), leaf count = 175

```
dsolve(diff(diff(y(x),x),x) = -b/x^2/(x-a)^2*y(x)+c,y(x))
```

$$y(x) = \frac{\left(\left(c_2\sqrt{a^2-4b}-\left(\int\sqrt{x(a-x)}\left(\frac{a-x}{x}\right)^{-\frac{\sqrt{a^2-4b}}{2a}}dx\right)c\right)\left(\frac{a-x}{x}\right)^{\frac{\sqrt{a^2-4b}}{2a}}+\left(\frac{x}{a-x}\right)^{\frac{\sqrt{a^2-4b}}{2a}}\left(\left(\int\sqrt{x(a-x)}\right)\right)}{\sqrt{a^2-4b}}$$

2.1382

ODE No. 1382

$$y''(x) = \frac{cy(x)}{(x-a)^2(x-b)^2}$$

✓ **Mathematica** : cpu = 10.4985 (sec), leaf count = 154

```
DSolve[Derivative[2][y][x] == (c*y[x])/((-a + x)^2*(-b + x)^2),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 (x-a)^{\frac{1}{2} \left(\sqrt{\frac{4c}{(a-b)^2} + 1} + 1 \right)} (x-b)^{\frac{1}{2} \left(1 - \sqrt{\frac{4c}{(a-b)^2} + 1 \right)} - \frac{c_2 (x-a)^{\frac{1}{2} - \frac{1}{2} \sqrt{\frac{4c}{(a-b)^2} + 1}} (x-b)^{\frac{1}{2} \sqrt{\frac{4c}{(a-b)^2} + 1} + \frac{1}{2}}}{(a-b) \sqrt{\frac{4c}{(a-b)^2} + 1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.221 (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 = 1.12565 (sec), leaf count = 50

```
DSolve[Derivative[2][y][x] == -((alpha*(a - b)^2*beta*y[x])/((-a + x)^2*(-b + x)^2)) - (((1 + a - b)^2*y[x])/((a - x)^2*(b - x)^2)), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{\alpha(\log(x-a) - \log(x-b))} + c_2 e^{\beta(\log(x-a) - \log(x-b))} \right\} \right\}$$

✓ **Maple** : cpu = 0.079 (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))
```

$$y(x) = c_1 \left(\frac{a-x}{b-x} \right)^{\beta} + c_2 \left(\frac{a-x}{b-x} \right)^{\alpha}$$

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 = 0.0288049 (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]
```

$$\left\{\left\{y(x) \rightarrow c_1 M_{\frac{(a+3)b}{2\sqrt{a^2-1}},\frac{\sqrt{b^2+1}}{2}}\left(\sqrt{a^2-1}x\right) + c_2 W_{\frac{(a+3)b}{2\sqrt{a^2-1}},\frac{\sqrt{b^2+1}}{2}}\left(\sqrt{a^2-1}x\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.436 (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 = 0.0182317 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \sqrt{x^2 + 1} P_{\frac{1}{2}(\sqrt{1-a}-1)}^{\frac{1}{2}}(ix) + c_2 \sqrt{x^2 + 1} Q_{\frac{1}{2}(\sqrt{1-a}-1)}^{\frac{1}{2}}(ix) \right\} \right\}$$

✓ **Maple** : cpu = 0.09 (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))
```

$$y(x) = (x^2 + 1)^{1/4} \left(\left(x + \sqrt{x^2 + 1} \right)^{-\frac{\sqrt{1-a}}{2}} c_2 + \left(x + \sqrt{x^2 + 1} \right)^{\frac{\sqrt{1-a}}{2}} c_1 \right)$$

2.1386

ODE No. 1386

$$y''(x) = \frac{18y(x)}{(2x+1)^2(x^2+x+1)}$$

✓ **Mathematica** : cpu = 0.0781356 (sec), leaf count = 108

```
DSolve[Derivative[2][y][x] == (18*y[x])/((1 + 2*x)^2*(1 + x + x^2)),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1(x^2+x+1)}{(2x+1)^2} + \frac{c_2\left(16x^3+24x^2-12\sqrt{3}x^2\tan^{-1}\left(\frac{2x+1}{\sqrt{3}}\right)+30x-12\sqrt{3}x\tan^{-1}\left(\frac{2x+1}{\sqrt{3}}\right)-12\sqrt{3}\right)}{(2x+1)^2} \right. \right.$$

✓ **Maple** : cpu = 0.07 (sec), leaf count = 58

```
dsolve(diff(diff(y(x),x),x) = 18/(2*x+1)^2/(x^2+x+1)*y(x),y(x))
```

$$y(x) = \frac{-36c_2(x^2+x+1)\arctan\left(\frac{(2x+1)\sqrt{3}}{3}\right)+16c_2\left(x^3+x^2+\frac{11}{8}x+\frac{3}{16}\right)\sqrt{3}+c_1(x^2+x+1)}{(2x+1)^2}$$

2.1387 ODE No. 1387

$$y''(x) = \frac{3y(x)}{4(x^2 + x + 1)^2}$$

✓ **Mathematica** : cpu = 0.0345913 (sec), leaf count = 50

```
DSolve[Derivative[2][y][x] == (3*y[x])/(4*(1 + x + x^2)^2), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \sqrt{x^2 + x + 1} + \frac{2c_2 \sqrt{x^2 + x + 1} \tan^{-1} \left(\frac{2x+1}{\sqrt{3}} \right)}{\sqrt{3}} \right\} \right\}$$

✓ **Maple** : cpu = 0.037 (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 = 0.275714 (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 + x)*y'[x])/(2*(x - 1)*x), y[x], x]
```

$$\left\{\left\{y(x) \rightarrow c_2(-1)^{\frac{1}{2}(-2v-3)+1}x^{\frac{1}{4}(-2v-3)+1}e^{\frac{1}{4}(-2\log(1-x)-\log(x))}(x-1)^{\frac{1}{2}(\frac{1}{2}(a+v+1)+\frac{1}{2}(a+v+2)+\frac{1}{2}(-2v-3)+1)}{}_2F_1\left(\frac{1}{2}(-2v-3),\frac{1}{2}(a+v+1)+\frac{1}{2}(a+v+2)+\frac{1}{2}(-2v-3)+1,\frac{1}{2}(a+v+1)+\frac{1}{2}(a+v+2)+\frac{1}{2}(-2v-3)+1;-1\right)\right.\right.$$

✓ **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^2,y(x))
```

$$y(x) = (x-1)^{-\frac{a}{2}}\left(x^{-\frac{v}{2}}\operatorname{hypergeom}\left(\left[-\frac{v}{2}-\frac{a}{2},\frac{1}{2}-\frac{v}{2}-\frac{a}{2}\right],\left[\frac{1}{2}-v\right],x\right)c_1+x^{\frac{1}{2}+\frac{v}{2}}\operatorname{hypergeom}\left(\left[1+\frac{v}{2}-\frac{a}{2}\right],\left[1+\frac{v}{2}-\frac{a}{2}\right],x\right)c_2\right)$$

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 = 0.311959 (sec), leaf count = 217

```
DSolve[Derivative[2][y][x] == -1/4*((-(v*(1 + v)*(-1 + x)^2) - 4*n^2*x)*y[x])/((-1 + x)^2*x^2)
```

$$\left\{\left\{y(x) \rightarrow c_2(-1)^{\frac{1}{2}(-2v-3)+1}x^{\frac{1}{4}(-2v-3)+1}e^{\frac{1}{4}(-2\log(1-x)-\log(x))}(x-1)^{\frac{1}{2}(n+\frac{1}{2}(2n+1)+\frac{1}{2}(-2v-3)+v+2)}{}_2F_1\left(\frac{1}{2}(2n+1)+\right.\right.$$

✓ **Maple** : cpu = 0.115 (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*
```

$$y(x) = (x-1)^{-n} \left(x^{\frac{1}{2}+\frac{v}{2}} \operatorname{hypergeom}\left(\left[v-n+1, -n+\frac{1}{2}\right], \left[\frac{3}{2}+v\right], x\right) c_2 + x^{-\frac{v}{2}} \operatorname{hypergeom}\left(\left[-v-n, -\right.\right.$$

2.1390

ODE No. 1390

$$y''(x) = -\frac{3y(x)}{16(x-1)^2x^2}$$

✓ **Mathematica** : cpu = 0.0514921 (sec), leaf count = 41

```
DSolve[Derivative[2][y][x] == (-3*y[x])/(16*(-1 + x)^2*x^2), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow 2c_2\sqrt[4]{1-x}x^{3/4} + c_1(1-x)^{3/4}\sqrt[4]{x} \right\} \right\}$$

✓ **Maple** : cpu = 0.044 (sec), leaf count = 25

```
dsolve(diff(diff(y(x), x), x) = -3/16/x^2/(x-1)^2*y(x), y(x))
```

$$y(x) = c_1(x-1)^{1/4}x^{3/4} + c_2(x-1)^{3/4}x^{1/4}$$

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 = 0.0560292 (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)*Deri
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x^5 - \frac{1}{4} c_2 x (2ax^2 + 1) \right\} \right\}$$

✓ **Maple** : cpu = 0.036 (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
```

$$y(x) = c_1 x^5 + 2ac_2 x^3 + c_2 x$$

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 = 300.787 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -(((e + d*x + c*x^2)*y[x])/(a*(-1 + x^2)^2)) - (b*x*Derivative[1][y][x])/(a*(x^2 - 1)), y[x], x]
```

, timed out

\$Aborted

 **Maple** : cpu = 0.318 (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),x))
```

$$y(x) = (x^2-1)^{-\frac{b}{4a}} \left(-\frac{1}{2} + \frac{x}{2}\right)^{\frac{2a + \sqrt{4a^2 + (-4b - 4c - 4d - 4e)a + b^2}}{4a}} \left(\text{hypergeom}\left(\left[-\frac{\sqrt{4a^2 + (-4b - 4c - 4d - 4e)a}}{2a}\right], \left[\frac{1}{2}\right], -\frac{2a(x-1)}{x^2-1}\right)\right)$$

2.1393

ODE No. 1393

$$y''(x) = -\frac{y(x) \left(bx^2 + cx + d\right)}{a(x-1)^2x^2}$$

✓ **Mathematica** : cpu = 200.2 (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 = 0.268 (sec), leaf count = 272

```
dsolve(diff(diff(y(x),x),x) = -(b*x^2+c*x+d)/a/x^2/(x-1)^2*y(x),y(x))
```

$$y(x) = (x-1)^{\frac{-\sqrt{a-4b-4c-4d}+\sqrt{a}}{2\sqrt{a}}} \left(x^{\frac{\sqrt{a}+\sqrt{a-4d}}{2\sqrt{a}}} \operatorname{hypergeom} \left(\left[-\frac{\sqrt{a-4b-4c-4d}-\sqrt{a}-\sqrt{a-4d}+\sqrt{a-4b-4c-4d}}{2\sqrt{a}}, -\frac{\sqrt{a-4b-4c-4d}-\sqrt{a}-\sqrt{a-4d}+\sqrt{a-4b-4c-4d}}{2\sqrt{a}} \right], \right. \right.$$

2.1394

ODE No. 1394

$$y''(x) = -\frac{cy(x)}{x^2(ax+b)^2} - \frac{2y'(x)}{x}$$

✓ **Mathematica** : cpu = 1.05336 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \exp \left(\frac{\sqrt{c} \left(-\frac{\sqrt{b^2-4c}}{\sqrt{c}} - \frac{b}{\sqrt{c}} \right) (\log(x) - \log(ax+b))}{2b} \right) + c_2 \exp \left(\frac{\sqrt{c} \left(\frac{\sqrt{b^2-4c}}{\sqrt{c}} - \frac{b}{\sqrt{c}} \right) (\log(x) - \log(ax+b))}{2b} \right) \right. \right.$$

✓ **Maple** : cpu = 0.178 (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))
```

$$y(x) = \sqrt{\frac{ax+b}{x}} \left(\left(\frac{x}{ax+b} \right)^{-\frac{\sqrt{b^2-4c}}{2b} a} c_2 + \left(\frac{x}{ax+b} \right)^{\frac{\sqrt{b^2-4c}}{2b} a} c_1 \right)$$

2.1395

ODE No. 1395

$$y''(x) = -\frac{y(x)}{(ax+b)^4}$$

✓ **Mathematica** : cpu = 0.087383 (sec), leaf count = 59

```
DSolve[Derivative[2][y][x] == -(y[x]/(b + a*x)^4),y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1 e^{\frac{i}{a(ax+b)}}(ax+b) - \frac{1}{2} i c_2 e^{-\frac{i}{a(ax+b)}}(ax+b)\right\}\right\}$$

✓ **Maple** : cpu = 0.081 (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 = 0.932055 (sec), leaf count = 211

DSolve[Derivative[2][y][x] == -((A*y[x])/(c + b*x + a*x^2)^2),y[x],x]

$$\left\{\left\{y(x) \rightarrow \frac{c_2 \sqrt{ax^2+bx+c} \exp\left(-\frac{\sqrt{4ac-b^2} \sqrt{1-\frac{4A}{b^2-4ac}} \tan^{-1}\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)}{\sqrt{b^2-4ac} \sqrt{1-\frac{4A}{b^2-4ac}}}\right) + c_1 \sqrt{x(ax+b)+c} \exp\left(\frac{\sqrt{4ac-b^2}}{\sqrt{b^2-4ac} \sqrt{1-\frac{4A}{b^2-4ac}}}\right)}{\sqrt{b^2-4ac} \sqrt{1-\frac{4A}{b^2-4ac}}}\right.\right.$$

✓

Maple : cpu = 0.296 (sec), leaf count = 178

dsolve(diff(diff(y(x),x),x) = -A/(a*x^2+b*x+c)^2*y(x),y(x))

$$y(x) = \sqrt{ax^2+bx+c} \left(\left(\frac{i\sqrt{4ca-b^2}-2ax-b}{2ax+b+i\sqrt{4ca-b^2}} \right)^{\frac{a\sqrt{-4ca+b^2-4A}}{2\sqrt{-4ca+b^2}}} c_1 + \left(\frac{i\sqrt{4ca-b^2}-2ax-b}{2ax+b+i\sqrt{4ca-b^2}} \right)^{-\frac{a\sqrt{-4ca+b^2-4A}}{2\sqrt{-4ca+b^2}}} c_2 \right)$$

2.1397 ODE No. 1397

$$y''(x) = \frac{y(x)}{x^5} - \frac{y'(x)}{x^4}$$

✓ **Mathematica** : cpu = 0.0637579 (sec), leaf count = 38

```
DSolve[Derivative[2][y][x] == y[x]/x^5 - Derivative[1][y][x]/x^4,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_2 \Gamma\left(\frac{1}{3}, -\frac{1}{3x^3}\right)}{3^{2/3} \sqrt[3]{-\frac{1}{x^3}}} + c_1 x \right\} \right\}$$

✓ **Maple** : cpu = 0.144 (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))
```

$$y(x) = x \left(2\sqrt{3} \pi c_2 - 3\Gamma\left(\frac{2}{3}\right) \Gamma\left(\frac{1}{3}, -\frac{1}{3x^3}\right) c_2 + c_1 \right)$$

2.1398

ODE No. 1398

$$y''(x) = -\frac{(-(2v+1)^2+x^2-1)y(x)}{(x^2-1)^2} - \frac{(3x^2-1)y'(x)}{x(x^2-1)}$$

✓ **Mathematica** : cpu = 0.148217 (sec), leaf count = 72

```
DSolve[Derivative[2][y][x] == -((( -1 - (1 + 2*v)^2 + x^2)*y[x])/(-1 + x^2)^2) - ((-1 + 3*x^2)*
```

$$\left\{ \left\{ y(x) \rightarrow c_1 (x^2-1)^{-v-\frac{1}{2}} {}_2F_1(-v,-v;-2v;1-x^2) + c_2 (x^2-1)^{v+\frac{1}{2}} {}_2F_1(v+1,v+1;2v+2;1-x^2) \right\} \right\}$$

✓ **Maple** : cpu = 0.267 (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
```

$$y(x) = c_1 (x^2-1)^{-\frac{1}{2}-v} \operatorname{hypergeom}\left([-v,-v],[-2v],-x^2+1\right) + c_2 (x^2-1)^{v+\frac{1}{2}} \operatorname{hypergeom}\left([v+1,v+1],[2v+2],1-x^2\right)$$

2.1399

ODE No. 1399

$$y''(x) = \frac{(3x+1)y'(x)}{(x-1)(x+1)} - \frac{36(x+1)^2y(x)}{(x-1)^2(3x+5)^2}$$

✓ **Mathematica** : cpu = 1.04963 (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)*Deriv
```

$$\left\{\left\{y(x) \rightarrow c_1 e^{\frac{1}{2}(3 \log(1-x)+\log(3x+5))} + \frac{1}{2} c_2 e^{\frac{1}{2}(3 \log(1-x)+\log(3x+5))} (3 \log(1-x) + \log(3x+5))\right\}\right\}$$

✓ **Maple** : cpu = 0.06 (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
```

$$y(x) = \sqrt{3x+5} (x-1)^{3/2} (c_2 \ln(3x+5) + 3c_2 \ln(x-1) + c_1)$$

2.1400

ODE No. 1400

$$y''(x) = \frac{y'(x)}{x} - \frac{ay(x)}{x^6}$$

✓ **Mathematica** : cpu = 0.107933 (sec), leaf count = 60

```
DSolve[Derivative[2][y][x] == -((a*y[x])/x^6) + Derivative[1][y][x]/x,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 x^2 e^{\frac{i \sqrt{a}}{2 x^2}} - \frac{i c_2 x^2 e^{-\frac{i \sqrt{a}}{2 x^2}}}{2 \sqrt{a}} \right\} \right\}$$

✓ **Maple** : cpu = 0.063 (sec), leaf count = 35

```
dsolve(diff(diff(y(x),x),x) = 1/x*diff(y(x),x)-a/x^6*y(x),y(x))
```

$$y(x) = x^2 \left(\cosh \left(\frac{\sqrt{-a}}{2 x^2} \right) c_2 + \sinh \left(\frac{\sqrt{-a}}{2 x^2} \right) c_1 \right)$$

2.1401

ODE No. 1401

$$y''(x) = -\frac{(a + 3x^2)y'(x)}{x^3} - \frac{by(x)}{x^6}$$

✓ **Mathematica** : cpu = 0.0140743 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-\frac{\sqrt{b}\left(-\frac{\sqrt{a^2-4b}}{\sqrt{b}}-\frac{a}{\sqrt{b}}\right)}{4x^2}} + c_2 e^{-\frac{\sqrt{b}\left(\frac{\sqrt{a^2-4b}}{\sqrt{b}}-\frac{a}{\sqrt{b}}\right)}{4x^2}} \right\} \right\}$$

✓ **Maple** : cpu = 0.078 (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))
```

$$y(x) = c_1 e^{\frac{a-\sqrt{a^2-4b}}{4x^2}} + c_2 e^{\frac{a+\sqrt{a^2-4b}}{4x^2}}$$

2.1402

ODE No. 1402

$$y''(x) = -\frac{y(x)\left(4a(a+1)x^4-2a(x^2-1)x^2+(x^2-1)^2(x^2-v^2)\right)}{x^2(x^2-1)^2}-\frac{((1-4a)x^2-1)y'(x)}{x(x^2-1)}$$

✓

Mathematica : cpu = 0.983735 (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 + 1)
```

$$\left\{\left\{y(x) \rightarrow c_2(x^2-1)^{a+1}x^{-v}\text{HeunC}\left[-\frac{a}{2}+v-\frac{3}{4},\frac{1}{4},1-v,2,0,x^2\right]+c_1(x^2-1)^{a+1}x^v\text{HeunC}\left[\frac{1}{4}(-2a-4v\right.\right.$$

✓

Maple : cpu = 0.403 (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
```

$$y(x) = -(x^2-1)(x^2-1)^a\left(c_2x^{-v}\text{HeunC}\left(0,-v,1,\frac{1}{4},\frac{a}{2}+\frac{1}{4},x^2\right)+c_1x^v\text{HeunC}\left(0,v,1,\frac{1}{4},\frac{a}{2}+\frac{1}{4},x^2\right)\right)$$

2.1403

ODE No. 1403

$$y''(x) = -y'(x) \left(\frac{-a_1 - b_1 + 1}{x - c_1} + \frac{-a_2 - b_2 + 1}{x - c_2} + \frac{-a_3 - b_3 + 1}{x - c_3} \right) - \frac{y(x) \left(\frac{a_1 b_1 (c_1 - c_2)(c_1 - c_3)}{x - c_1} + \frac{a_2 b_2 (c_2 - c_1)(c_2 - c_3)}{x - c_2} + \frac{a_3 b_3 (c_3 - c_1)(c_3 - c_2)}{x - c_3} \right)}{(x - c_1)(x - c_2)(x - c_3)}$$

✓

Mathematica : cpu = 16.6516 (sec), leaf count = 316

DSolve[Derivative[2][y][x] == -((((a1*b1*(c1 - c2)*(c1 - c3))/(-c1 + x) + (a2*b2*(-c1 + c2)*(c2 - c3))/(-c2 + x) + (a3*b3*(-c1 + c2)*(c3 - c2))/(-c3 + x)))/(x - c1)(x - c2)(x - c3)), y[x], x]

$$\left\{ \left\{ y(x) \rightarrow c_1 (x - c_1)^{a_1} (x - c_2)^{a_2} (x - c_3)^{b_3} \text{HeunG} \left[\frac{c_1 - c_3}{c_1 - c_2}, \frac{a_1 (c_1 (-a_3 - 2 b_1 - b_2 + 2) + c_2 (a_3 + b_1 - 1))}{c_1 - c_2}, \frac{a_2 (c_2 (-a_3 - 2 b_1 - b_2 + 2) + c_3 (a_3 + b_1 - 1))}{c_1 - c_2}, \frac{a_3 (c_3 (-a_3 - 2 b_1 - b_2 + 2) + c_1 (a_3 + b_1 - 1))}{c_1 - c_2} \right] \right\} \right\}$$

✓

Maple : cpu = 1.04 (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),x), y(x))

$$y(x) = (x - c_2)^{a_2} (x - c_3)^{b_3} \left((x - c_1)^{a_1} \text{HeunG} \left(\frac{c_1 - c_3}{c_1 - c_2}, \frac{((-a_3 - 2 b_1 - b_2 + 2) c_1 + (a_3 + b_1 - 1) c_2 + c_3 (1 - a_1 - b_1))}{c_1 - c_2}, \frac{a_2 (c_2 (-a_3 - 2 b_1 - b_2 + 2) + c_3 (a_3 + b_1 - 1))}{c_1 - c_2}, \frac{a_3 (c_3 (-a_3 - 2 b_1 - b_2 + 2) + c_1 (a_3 + b_1 - 1))}{c_1 - c_2} \right) \right)$$

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 = 0.0241165 (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], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 e^{\frac{1}{4x^2}}}{x} + c_2 e^{\frac{1}{4x^2}} \right\} \right\}$$

✓ **Maple** : cpu = 0.049 (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))
```

$$y(x) = \frac{e^{\frac{1}{4x^2}}(c_1x + c_2)}{x}$$

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 = 0.0667556 (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])/x^6,y[x],x]

$$\left\{\left\{y(x) \rightarrow c_1 e^{-\frac{1}{4x^2} x^{\frac{3}{2}-\frac{\sqrt{9-a}}{2}}} + \frac{c_2 e^{-\frac{1}{4x^2} x^{\frac{\sqrt{9-a}}{2}+\frac{3}{2}}}}{\sqrt{9-a}}\right\}\right\}$$

✓

Maple : cpu = 0.095 (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))

$$y(x) = e^{-\frac{1}{4x^2}} \left(x^{\frac{3}{2}-\frac{\sqrt{-a+9}}{2}} c_2 + x^{\frac{3}{2}+\frac{\sqrt{-a+9}}{2}} c_1 \right)$$

2.1406

ODE No. 1406

$$y''(x) = -\frac{27xy(x)}{16(x^3-1)^2}$$

✓ **Mathematica** : cpu = 31.9758 (sec), leaf count = 707

```
DSolve[Derivative[2][y][x] == (-27*x*y[x])/(16*(-1 + x^3)^2),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{ic_1 \sqrt[4]{2x-i\sqrt{3}+1} \sqrt[4]{2x+i\sqrt{3}+1} \left(\sqrt[6]{-1} \sqrt{2x-i\sqrt{3}+1} - \sqrt{2x+i\sqrt{3}+1} \right)^{3/4} \sqrt[4]{\sqrt[6]{-1} \sqrt{2x-i\sqrt{3}+1}}}{\sqrt{3}} \right. \right.$$

✓ **Maple** : cpu = 0.167 (sec), leaf count = 44

```
dsolve(diff(diff(y(x),x),x) = -27/16*x/(x^3-1)^2*y(x),y(x))
```

$$y(x) = \sqrt{x} \left(x^3-1\right)^{1/4} \left(\text{LegendreQ}\left(-\frac{1}{6},\frac{1}{3},\sqrt{-x^3+1}\right) c_2 + \text{LegendreP}\left(-\frac{1}{6},\frac{1}{3},\sqrt{-x^3+1}\right) c_1\right)$$

2.1407

ODE No. 1407

$$y''(x) = -y'(x) \left(\frac{b_1(-a_1 - b_1 + 1)}{b_1x - a_1} + \frac{b_2(-a_2 - b_2 + 1)}{b_2x - a_2} + \frac{b_3(-a_3 - b_3 + 1)}{b_3x - a_3} \right) - \frac{y(x) \left(\frac{a_1b_1(a_1b_2 - a_2b_1)(a_1b_3 - a_3b_1)}{b_1x - a_1} + \frac{a_2b_2(a_2b_3 - a_3b_2)}{b_2x - a_2} + \frac{a_3b_3(a_3b_1 - a_1b_3)}{b_3x - a_3} \right)}{b_1x - a_1}$$

✓ **Mathematica** : cpu = 88.7591 (sec), leaf count = 2002

```
DSolve[Derivative[2][y][x] == -((((a11*(-(a2*b1) + a1*b2)*(a3*b1 - a1*b3)*b11)/(-a1 + b1*x) +
```

$$\left\{ \left\{ y(x) \rightarrow \left(x - \frac{a_2}{b_2} \right)^{\frac{1}{2} \left(a_2 + b_2 - \sqrt{a_2^2 + 6b_2a_2 + b_2^2} \right)} \left(x - \frac{a_3}{b_3} \right)^{\frac{1}{2} \left(a_3 + b_3 + \sqrt{a_3^2 + 6b_3a_3 + b_3^2} \right)} c_1 \text{HeunG} \left[\frac{a_1}{b_1} - \frac{a_3}{b_3}, \frac{a_1}{b_1} - \frac{a_2}{b_2}, \frac{a_2}{b_2} - \frac{a_3}{b_3}, \frac{a_1}{b_1} - \frac{a_2}{b_2} \right] \right\} \right\}$$

✓ **Maple** : cpu = 2.428 (sec), leaf count = 2829

```
dsolve(diff(diff(y(x),x),x) = -((1-a11-b11)*b1/(b1*x-a1)+(1-a12-b12)*b2/(b2*x-a2)+(1-a13-b13)*b3/(b3*x-a3)),x)
```

Expression too large to display

2.1408

ODE No. 1408

$$y''(x) = -\frac{y(x) \left(A x^2 + B\right)}{x \left(x^2 - a1\right) \left(x^2 - a2\right) \left(x^2 - a3\right)} - \frac{y'(x) \left(x^2 \left(\left(x^2 - a1\right) \left(x^2 - a2\right) + \left(x^2 - a1\right) \left(x^2 - a3\right) + \left(x^2 - a2\right) \left(x^2 - a3\right)\right) - \left(x^2 - a1\right) \left(x^2 - a2\right) \left(x^2 - a3\right)\right)}{x \left(x^2 - a1\right) \left(x^2 - a2\right) \left(x^2 - a3\right)}$$

 **Mathematica** : cpu = 45.8988 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -(((B + A*x^2)*y[x])/(x*(-a1 + x^2)*(-a2 + x^2)*(-a3 + x^2))) -
```

, DifferentialRoot result

$$\{\{y(x) \rightarrow (x)\}\}$$

 **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))-(x^2-a1)*(x^2-a2)*(x^2-a3))
```

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ \frac{d^2}{dx^2} - Y(x) + \frac{x^2 \left((x^2 - a1) (x^2 - a2) + (x^2 - a2) (x^2 - a3) + (x^2 - a3) (x^2 - a1) \right) - (x^2 - a1) (x^2 - a2) (x^2 - a3)}{x (x^2 - a1) (x^2 - a2) (x^2 - a3)} \right\} \right)$$

2.1409

ODE No. 1409

$$y''(x) = -b^2x^{-2a}y(x) - \frac{ay'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0230476 (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]
```

$$\left\{\left\{y(x) \rightarrow c_1 \cos \left(\frac{bx^{1-a}}{a-1}\right) - c_2 \sin \left(\frac{bx^{1-a}}{a-1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.036 (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))
```

$$y(x) = c_1 \sin \left(\frac{bx^{1-a}}{a-1}\right) + c_2 \cos \left(\frac{bx^{1-a}}{a-1}\right)$$

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 = 0.0997543 (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)*Deri
```

$$\left\{ \left\{ y(x) \rightarrow c_1 i^{\frac{-\sqrt{q^2+2q+4s+1}+q+1}{b}} a^{\frac{-\sqrt{q^2+2q+4s+1}+q+1}{2b}} \left(x^b \right)^{\frac{-\sqrt{q^2+2q+4s+1}+q+1}{2b}} {}_2F_1\left(\frac{p}{2b} + \frac{q}{2b} - \frac{\sqrt{p^2-2p-4r+1}}{2b} - \frac{\sqrt{q^2+2q+4s+1}}{2b}, \frac{p+q+\sqrt{q^2+2q+4s+1}}{2b} \right) \right. \right.$$

✓ **Maple** : cpu = 0.415 (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
```

$$y(x) = c_1 x^{\frac{1}{2} + \frac{q}{2} + \frac{\sqrt{q^2+2q+4s+1}}{2}} \text{hypergeom}\left(\left[\frac{p+q+\sqrt{q^2+2q+4s+1}+\sqrt{p^2-2p-4r+1}}{2b}, \frac{p+q+\sqrt{q^2+2q+4s+1}}{2b}\right], \frac{p+q+\sqrt{q^2+2q+4s+1}}{2b}\right)$$

2.1411

ODE No. 1411

$$y''(x) = \frac{y(x)}{e^x + 1}$$

✓ **Mathematica** : cpu = 0.248322 (sec), leaf count = 42

```
DSolve[Derivative[2][y][x] == y[x]/(1 + E^x), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \left(e^{-x} + 1 \right) + c_2 e^{-x} \left(e^x \log \left(e^x + 1 \right) + \log \left(e^x + 1 \right) + 1 \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.039 (sec), leaf count = 27

```
dsolve(diff(diff(y(x), x), x) = 1/(exp(x)+1)*y(x), y(x))
```

$$y(x) = (c_1(e^x + 1) \ln(e^x + 1) + c_2 e^x + c_1 + c_2) e^{-x}$$

2.1412

ODE No. 1412

$$y''(x) = \frac{y'(x)}{x \log(x)} + y(x) \log^2(x)$$

✓ **Mathematica** : cpu = 0.0176397 (sec), leaf count = 29

```
DSolve[Derivative[2][y][x] == Log[x]^2*y[x] + Derivative[1][y][x]/(x*Log[x]),y[x],x]
```

$$\{ \{ y(x) \rightarrow c_1 \cosh(x(\log(x) - 1)) + i c_2 \sinh(x(\log(x) - 1)) \} \}$$

✓ **Maple** : cpu = 0.023 (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))
```

$$y(x) = \sinh \left(x(\ln (x) - 1) \right) c_1 + \cosh \left(x(\ln (x) - 1) \right) c_2$$

2.1413

ODE No. 1413

$$y''(x) = \frac{y'(x)}{x(\log(x) - 1)} - \frac{y(x)}{x^2(\log(x) - 1)}$$

✓ **Mathematica** : cpu = 0.057149 (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]]
```

$$\{ \{ y(x) \rightarrow c_1 x - c_2 \log(x) \} \}$$

✓ **Maple** : cpu = 0.097 (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

$$y''(x) = y(x) \left(-\operatorname{csch}^2(x)\right) \left((1-n)n - a^2 \sinh^2(x)\right)$$

✓

Mathematica : cpu = 0.775049 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_2(-1)^{\frac{1}{2}(-2n-1)+1} \tanh^2(x)^{\frac{1}{4}(-2n-1)+1} \left(\tanh^2(x)-1\right)^{\frac{1}{2}\left(\frac{a+n}{2}+\frac{1}{2}(a+n+1)+\frac{1}{2}(-2n-1)+1\right)-\frac{1}{2}} {}_2F_1\left(\frac{1}{2}(-2n-1),\frac{1}{2}\right)}{\sqrt{\tanh(x)}}\right.\right.$$

✓

Maple : cpu = 0.407 (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))
```

$$y(x) = \frac{\sqrt{\cosh(x)} \sinh(x)^{\frac{1}{2}+n} \left(\cosh(x) \operatorname{hypergeom}\left(\left[\frac{1}{2}-\frac{a}{2}+\frac{n}{2},\frac{1}{2}+\frac{a}{2}+\frac{n}{2}\right],\left[\frac{3}{2}\right],\frac{\cosh(2x)}{2}+\frac{1}{2}\right) c_2 + \operatorname{hypergeom}\left(\left[\frac{1}{2}-\frac{a}{2}+\frac{n}{2},\frac{1}{2}+\frac{a}{2}+\frac{n}{2}\right],\left[\frac{3}{2}\right],\frac{\cosh(2x)}{2}+\frac{1}{2}\right) c_1}{\sqrt{\sinh(2x)}}$$

2.1415

ODE No. 1415

$$y''(x) = \left(a^2 - n^2\right) y(x) - 2n \coth(x) y'(x)$$

✓ **Mathematica** : cpu = 0.602909 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_2 (-1)^{\frac{1}{2} (-2n-1)+1} \tanh^2(x)^{\frac{1}{4} (-2n-1)+1} \left(\tanh^2(x)-1\right)^{\frac{1}{2} \left(\frac{a+n}{2}+\frac{1}{2} (a+n+1)+\frac{1}{2} (-2n-1)+1\right)} {}_2F_1\left(\frac{1}{2} (-2n-1)\right)} \right. \right.$$

✓ **Maple** : cpu = 0.203 (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 = 0.142908 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 (\cos^2(x) - 1)^{-n/2} P_v^n(\cos(x)) + c_2 (\cos^2(x) - 1)^{-n/2} Q_v^n(\cos(x)) \right\} \right\}$$

✓ **Maple** : cpu = 0.257 (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),x))
```

$$y(x) = \sin(x)^{-n} (\text{LegendreP}(v, n, \cos(x)) c_1 + \text{LegendreQ}(v, n, \cos(x)) c_2)$$

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 = 0.113559 (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], x]
```

$$\left\{\left\{y(x) \rightarrow c_1 e^{\frac{\cos(x)}{2}} \cos\left(\frac{1}{2} \sqrt{3} \cos(x)\right) + c_2 e^{\frac{\cos(x)}{2}} \sin\left(\frac{1}{2} \sqrt{3} \cos(x)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.229 (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)),x)
```

$$y(x) = e^{\frac{\cos(x)}{2}} \left(\sin\left(\frac{\sqrt{3} \cos(x)}{2}\right) c_1 + \cos\left(\frac{\sqrt{3} \cos(x)}{2}\right) c_2 \right)$$

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 = 0.113355 (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*Cos[x] - Sin[x]), y[x], x]
```

$$\{\{y(x) \rightarrow c_1 x + c_2 \sin(x)\}\}$$

✓ **Maple** : cpu = 6.048 (sec), leaf count = 44

```
dsolve(diff(diff(y(x),x),x) = -x*sin(x)/(cos(x)*x-sin(x))*diff(y(x),x)+sin(x)/(cos(x)*x-sin(x)), y(x))
```

$$y(x) = \sin(x) \left(\left(\int e^{\int \frac{2 \cos(x) \cot(x) x - 3 \cos(x) + \sec(x)}{-\cos(x) x + \sin(x)} dx} \cos(x) dx \right) c_2 + c_1 \right)$$

2.1419

ODE No. 1419

$$y''(x) = -\frac{\sec(x)y'(x)(x^2\sin(x) - 2x\cos(x))}{x^2} - \frac{y(x)\sec(x)(2x\cos(x) - x\sin(x))}{x^2}$$

✖

Mathematica : cpu = 0.805614 (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^2*Sin[x])*Derivative[1][y][x])/x^2, y[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 = 0.343 (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)

$$y(x) = x(\sin(x) c_2 + c_1)$$

2.1420

ODE No. 1420

$$y(x)\left(-a\cos^2(x)-(n-1)n\right)+\cos^2(x)y''(x)=0$$

✓

Mathematica : cpu = 0.410855 (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]

$$\left\{\left\{y(x)\rightarrow c_1 i^{1-n}\cos^{1-n}(x){}_2F_1\left(-\frac{n}{2}-\frac{i\sqrt{a}}{2}+\frac{1}{2},-\frac{n}{2}+\frac{i\sqrt{a}}{2}+\frac{1}{2};\frac{3}{2}-n;\cos^2(x)\right)+c_2 i^n\cos^n(x){}_2F_1\left(\frac{n}{2}-\frac{i\sqrt{a}}{2},\frac{n}{2}+\frac{i\sqrt{a}}{2};\frac{3}{2};\cos^2(x)\right)\right\}\right.$$

✓

Maple : cpu = 0.543 (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))

$$y(x)=\frac{\sin(x)^{3/2}\left(\left(\frac{\cos(2x)}{2}+\frac{1}{2}\right)^{\frac{3}{4}-\frac{n}{2}}\text{hypergeom}\left(\left[1+\frac{i\sqrt{a}}{2}-\frac{n}{2},1-\frac{i\sqrt{a}}{2}-\frac{n}{2}\right],\left[\frac{3}{2}-n\right],\frac{\cos(2x)}{2}+\frac{1}{2}\right)c_2+\text{hypergeom}\left(\left[1+\frac{i\sqrt{a}}{2}-\frac{n}{2},1-\frac{i\sqrt{a}}{2}-\frac{n}{2}\right],\left[\frac{3}{2}-n\right],\frac{\cos(2x)}{2}+\frac{1}{2}\right)c_1}{\sqrt{\sin(2x)}}$$

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 = 0.141082 (sec), leaf count = 81

```
DSolve[Derivative[2][y][x] == -(a^2*n*Sec[a*x]^2*(Cos[a*x]^2 + (-1 + n)*Sin[a*x]^2)*y[x]) - a*
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{-iax} \cos^{n-1}(ax) - \frac{ic_2 e^{2iax} \left(\frac{1}{2} e^{-iax} + \frac{1}{2} e^{iax} \right)^n}{a(1 + e^{2iax})} \right\} \right\}$$

✓ **Maple** : cpu = 0.12 (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)*s
```

$y(x) = \sec(ax)^{1-n} (\cos(ax) c_2 + \sin(ax) c_1)$

2.1422

ODE No. 1422

$$y''(x) = 2y(x) \csc^2(x)$$

✓ **Mathematica** : cpu = 0.103934 (sec), leaf count = 64

```
DSolve[Derivative[2][y][x] == 2*Csc[x]^2*y[x], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 \cos(x)}{\sqrt{\cos^2(x) - 1}} + \frac{c_2 \left(\cos(x) \tanh^{-1} \left(\frac{\cos(x)}{\sqrt{\cos^2(x) - 1}} \right) - \sqrt{\cos^2(x) - 1} \right)}{\sqrt{\cos^2(x) - 1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.325 (sec), leaf count = 50

```
dsolve(diff(diff(y(x), x), x) = 2/sin(x)^2*y(x), y(x))
```

$$y(x) = \frac{i \sin(2x) \ln(\cos(2x) + i \sin(2x)) c_2 + (\cos(2x) - 1) (c_1 \cot(x) - 2c_2)}{\cos(2x) - 1}$$

2.1423

ODE No. 1423

$$y''(x) = -ay(x) \operatorname{csc}^2(x)$$

✓ **Mathematica** : cpu = 0.0588137 (sec), leaf count = 70

```
DSolve[Derivative[2][y][x] == -(a*Csc[x]^2*y[x]), y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \sqrt[4]{\cos^2(x) - 1} P_{-\frac{1}{2}}^{\frac{1}{2}\sqrt{1-4a}}(\cos(x)) + c_2 \sqrt[4]{\cos^2(x) - 1} Q_{-\frac{1}{2}}^{\frac{1}{2}\sqrt{1-4a}}(\cos(x)) \right\} \right\}$$

✓ **Maple** : cpu = 0.441 (sec), leaf count = 110

```
dsolve(diff(diff(y(x), x), x) = -a/sin(x)^2*y(x), y(x))
```

$$y(x) = \frac{\sqrt{\cos(x)} \left(\frac{\cos(2x)}{2} - \frac{1}{2}\right)^{\frac{1}{2} + \frac{\sqrt{1-4a}}{4}} \left(\cos(x) \operatorname{hypergeom}\left(\left[\frac{\sqrt{1-4a}}{4} + \frac{3}{4}, \frac{\sqrt{1-4a}}{4} + \frac{3}{4}\right], \left[\frac{3}{2}\right], \frac{\cos(2x)}{2} + \frac{1}{2}\right) c_2 + \operatorname{hypergeom}\left(\left[\frac{\sqrt{1-4a}}{4} + \frac{3}{4}, \frac{\sqrt{1-4a}}{4} + \frac{3}{4}\right], \left[\frac{3}{2}\right], \frac{\cos(2x)}{2} + \frac{1}{2}\right) c_1}{\sqrt{\sin(2x)}}$$

2.1424

ODE No. 1424

$y(x) \left(-a \sin^2(x) - (n-1)n\right) + \sin^2(x)y''(x) = 0$

✓ **Mathematica** : cpu = 0.187668 (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]
```

$\left\{\left\{y(x) \rightarrow c_1 \sqrt[4]{\cos^2(x)-1} P_{\frac{1}{2}i(2\sqrt{a}+i)}^{\frac{1}{2}(2n-1)}(\cos(x)) + c_2 \sqrt[4]{\cos^2(x)-1} Q_{\frac{1}{2}i(2\sqrt{a}+i)}^{\frac{1}{2}(2n-1)}(\cos(x))\right\}\right\}$

✓ **Maple** : cpu = 0.433 (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))
```

$y(x) = \frac{\sqrt{\cos(x)} \left(\frac{\cos(2x)}{2} - \frac{1}{2}\right)^{\frac{1}{4} + \frac{n}{2}} \left(\cos(x) \operatorname{hypergeom}\left(\left[\frac{1}{2} + \frac{i\sqrt{a}}{2} + \frac{n}{2}, \frac{1}{2} - \frac{i\sqrt{a}}{2} + \frac{n}{2}\right], \left[\frac{3}{2}\right], \frac{\cos(2x)}{2} + \frac{1}{2}\right) c_2 + \operatorname{hypergeom}\left(\left[\frac{1}{2} + \frac{i\sqrt{a}}{2} + \frac{n}{2}, \frac{1}{2} - \frac{i\sqrt{a}}{2} + \frac{n}{2}\right], \left[\frac{3}{2}\right], \frac{\cos(2x)}{2} + \frac{1}{2}\right) c_1}{\sqrt{\sin(2x)}}$

2.1425

ODE No. 1425

$$y''(x) = y(x) \operatorname{csc}^2(x) \left(a^2 \cos^2(x) + (3 - 2a) \cos(x) - 3a + 3\right)$$

✓

Mathematica : cpu = 21.9354 (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]

$$\left\{\left\{y(x) \rightarrow \frac{c_2 \sqrt{1 - \cos(x)} \left(-\frac{(2a-1)(\cos(x)+1)}{-2a \cos(x)+\cos(x)+2}\right)^{a+\frac{1}{2}} (-2a \cos(x) + \cos(x) + 2) (1 - \cos^2(x))^{-a} \left(\frac{(2a-1)(\cos(x)-1)}{(2a-1) \cos(x)-1}\right)^{a+\frac{1}{2}}}{\sin(x)^{3/2}}\right.\right.$$

✓

Maple : cpu = 0.764 (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))

$$y(x) = \frac{c_1(-2 + (2a - 1) \cos(x)) \sqrt{\cos\left(\frac{x}{2}\right)} \sin(x)^{a-\frac{1}{2}}}{\sin\left(\frac{x}{2}\right)^{3/2}} + \frac{c_2 \left(\frac{\cos(x)}{2} - \frac{1}{2}\right)^{-\frac{3}{4}+\frac{a}{2}} \left(\frac{\cos(x)}{2} + \frac{1}{2}\right)^{\frac{3}{4}-\frac{a}{2}} \operatorname{hypergeom}\left(\left[-\frac{a}{2}, \frac{a}{2}\right], \left[\frac{3}{2}\right], -\frac{\cos(x)}{1-\cos(x)}\right)}{\sqrt{\sin(x)}}$$

2.1427 ODE No. 1427

$y''(x) = y(x) \left(-\csc^2(x)\right) \left(-\left((a^2b^2 - (a + 1)^2\right) \sin^2(x)\right) - a(a + 1)b \sin(2x) + (1 - a)a$

✓ **Mathematica** : cpu = 0.908583 (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 +
```

$\left\{\left\{y(x) \rightarrow c_2\left(e^{-abx} \sin^{-a-1}(x) + \frac{2^{2a+1}(2a + 1) \left(1 - e^{2ix}\right)^{2a} \left(-ie^{-ix}(-1 + e^{2ix})\right)^{-2a} e^{-abx+2ix} \sin^a(x) {}_2F_1(2a$

✓ **Maple** : cpu = 1.102 (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))/
```

$y(x) = \left(c_2(\cot(x) + i)^{\frac{1}{2} + \frac{1}{2}a + \frac{1}{2}iab} \operatorname{hypergeom}\left([a(ib + 1), iab - a + 1], [iab + a + 2], \frac{1}{2} - \frac{i \cot(x)}{2}\right) + c_1(\cot(x) + i)^{\frac{1}{2} + \frac{1}{2}a + \frac{1}{2}iab}\right)$

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 = 0.36981 (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]`

$$\left\{\left\{y(x) \rightarrow c_1 \sqrt[4]{\cos^2(x)-1} P_{\frac{1}{2}(2\sqrt{b-a}-1)}^{\frac{1}{2}\sqrt{-4a-4c+1}}(\cos(x)) + c_2 \sqrt[4]{\cos^2(x)-1} Q_{\frac{1}{2}(2\sqrt{b-a}-1)}^{\frac{1}{2}\sqrt{-4a-4c+1}}(\cos(x))\right\}\right\}$$

✓ **Maple** : cpu = 0.491 (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))`

$$y(x) = \frac{\left(\frac{\cos(2x)}{2} - \frac{1}{2}\right)^{\frac{1}{2} + \frac{\sqrt{-4a+1-4c}}{4}} \sqrt{\cos(x)} \left(\text{hypergeom}\left(\left[\frac{\sqrt{-4a+1-4c}}{4} + \frac{\sqrt{-a+b}}{2} + \frac{3}{4}, \frac{\sqrt{-4a+1-4c}}{4} - \frac{\sqrt{-a+b}}{2} + \frac{3}{4}\right],\right.\right.}$$

2.1429

ODE No. 1429

$$y''(x) = y(x) \csc^2(x) - \cot(x)y'(x)$$

✓ **Mathematica** : cpu = 0.0330725 (sec), leaf count = 41

```
DSolve[Derivative[2][y][x] == Csc[x]^2*y[x] - Cot[x]*Derivative[1][y][x],y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1}{\sqrt{1-\cos^2(x)}} - \frac{ic_2 \cos(x)}{\sqrt{1-\cos^2(x)}} \right\} \right\}$$

✓ **Maple** : cpu = 0.042 (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

$$y''(x) = -\left(y(x) \csc^2(x) \left(v(v+1) \sin^2(x) - n^2\right) - \cot(x)y'(x)\right)$$

✓ **Mathematica** : cpu = 0.385567 (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
```

$$\{ \{y(x) \rightarrow c_1 P_v^n(\cos(x)) + c_2 Q_v^n(\cos(x))\} \}$$

✓ **Maple** : cpu = 0.464 (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)
```

$$y(x) = \left(\frac{\cos(2x)}{2} - \frac{1}{2}\right)^{\frac{n}{2}} \left(\cos(x) \operatorname{hypergeom}\left(\left[1 + \frac{v}{2} + \frac{n}{2}, \frac{1}{2} - \frac{v}{2} + \frac{n}{2}\right], \left[\frac{3}{2}\right], \frac{\cos(2x)}{2} + \frac{1}{2}\right) c_2 + \operatorname{hypergeom}\left(\left[1 + \frac{v}{2} + \frac{n}{2}, \frac{1}{2} - \frac{v}{2} + \frac{n}{2}\right], \left[\frac{3}{2}\right], \frac{\cos(2x)}{2} + \frac{1}{2}\right) c_1\right)$$

2.1431

ODE No. 1431

$$y''(x) = \cot(2x)y'(x) - 2y(x)$$

✓ **Mathematica** : cpu = 10.1753 (sec), leaf count = 80

```
DSolve[Derivative[2][y][x] == -2*y[x] + Cot[2*x]*Derivative[1][y][x],y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \left(\cos^2(x) - \frac{1}{2} \right) - \frac{2}{3} c_2 \cos^{\frac{3}{2}}(x) \left(2 \cos^2(x) {}_2F_1 \left(\frac{1}{4}, \frac{3}{4}; \frac{7}{4}; \cos^2(x) \right) - {}_2F_1 \left(\frac{1}{4}, \frac{3}{4}; \frac{7}{4}; \cos^2(x) \right) + 3 \right($$

✓ **Maple** : cpu = 0.342 (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))
```

$$y(x) = \sin(2x)^{3/4} \left(\text{LegendreP} \left(\frac{1}{4}, \frac{3}{4}, \cos(2x) \right) c_1 + \text{LegendreQ} \left(\frac{1}{4}, \frac{3}{4}, \cos(2x) \right) c_2 \right)$$

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 = 0.0830242 (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[x], x]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_1 e^{-2x}}{\sqrt{\sin(x)}} + \frac{c_2 e^{2x}}{4\sqrt{\sin(x)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.078 (sec), leaf count = 22

```
dsolve(diff(diff(y(x), x), x) = -1/sin(x)*cos(x)*diff(y(x), x)-1/4*(-17*sin(x)^2-1)/sin(x)^2, y(x))
```

$$y(x) = \frac{c_1 \sinh(2x) + c_2 \cosh(2x)}{\sqrt{\sin(x)}}$$

2.1433

ODE No. 1433

$$y''(x) = -\frac{y(x)\sec^2(x)(2x^2+x^2\sin^2(x)-24\cos^2(x))}{4x^2} - \tan(x)y'(x) + \sqrt{\cos(x)}$$

✓ **Mathematica** : cpu = 0.129996 (sec), leaf count = 46

```
DSolve[Derivative[2][y][x] == Sqrt[Cos[x]] - (Sec[x]^2*(2*x^2 - 24*Cos[x]^2 + x^2*Sin[x]^2)*y[
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{5}c_2x^3\sqrt{\cos(x)} - \frac{1}{4}x^2\sqrt{\cos(x)} + \frac{c_1\sqrt{\cos(x)}}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.179 (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
```

$$y(x) = \frac{\sqrt{\cos(x)}(4c_1x^5 - x^4 + 4c_2)}{4x^2}$$

2.1434

ODE No. 1434

$$y''(x) = -\frac{b \cot(x) y'(x)}{a} - \frac{y(x) \csc^2(x) (c \cos^2(x) + d \cos(x) + e)}{a}$$

 **Mathematica** : cpu = 204.192 (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[1][y][x]) , y[x], x]
```

, 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]*Derivative[1][y][x]) , y[x], x]
```

 **Maple** : cpu = 0.995 (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, y(x))
```

$$y(x) = \sin(x)^{-\frac{a+b}{2a}} \left(\frac{\cos(x)}{2} - \frac{1}{2} \right)^{\frac{2a + \sqrt{a^2 + (-2b - 4c - 4d - 4e)a + b^2}}{4a}} \left(\cos\left(\frac{x}{2}\right) - \frac{-2a + \sqrt{a^2 + (-2b - 4c + 4d - 4e)a + b^2}}{2a} \right) \text{hypergeom}\left(\left[\frac{a+b}{2a}, \frac{2a + \sqrt{a^2 + (-2b - 4c - 4d - 4e)a + b^2}}{4a}\right], \left[\frac{2a + \sqrt{a^2 + (-2b - 4c - 4d - 4e)a + b^2}}{4a}\right], \frac{\cos(x)}{2} - \frac{1}{2}\right)$$

2.1435

ODE No. 1435

$$y''(x) = -4y(x) \sin(3x) \csc^3(x)$$

✓ **Mathematica** : cpu = 0.132559 (sec), leaf count = 70

```
DSolve[Derivative[2][y][x] == -4*Csc[x]^3*Sin[3*x]*y[x],y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \sqrt[4]{\cos^2(x)-1} P_{-\frac{1}{2}+4i}^{\frac{i\sqrt{47}}{2}}(\cos(x)) + c_2 \sqrt[4]{\cos^2(x)-1} Q_{-\frac{1}{2}+4i}^{\frac{i\sqrt{47}}{2}}(\cos(x)) \right\} \right\}$$

✓ **Maple** : cpu = 0.247 (sec), leaf count = 38

```
dsolve(diff(diff(y(x),x),x) = -4*sin(3*x)/sin(x)^3*y(x),y(x))
```

$$y(x) = \sqrt{\sin(x)} \left(\text{LegendreQ} \left(-\frac{1}{2} + 4i, \frac{i\sqrt{47}}{2}, \cos(x) \right) c_2 + \text{LegendreP} \left(-\frac{1}{2} + 4i, \frac{i\sqrt{47}}{2}, \cos(x) \right) c_1 \right)$$

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 = 0.491831 (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],x]

$$\left\{\left\{y(x) \rightarrow c_1 \sqrt[4]{\cos^2(x)-1} P_v^n(\cos(x)) + c_2 \sqrt[4]{\cos^2(x)-1} Q_v^n(\cos(x))\right\}\right\}$$

✓

Maple

: cpu = 0.437 (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),x)

$$y(x) = \frac{\sqrt{\cos(x)} \left(\frac{\cos(2x)}{2} - \frac{1}{2}\right)^{\frac{n}{2} + \frac{1}{2}} \left(\cos(x) \operatorname{hypergeom}\left(\left[1 + \frac{v}{2} + \frac{n}{2}, \frac{1}{2} - \frac{v}{2} + \frac{n}{2}\right], \left[\frac{3}{2}\right], \frac{\cos(2x)}{2} + \frac{1}{2}\right) c_2 + \operatorname{hypergeom}\left(\left[1 + \frac{v}{2} + \frac{n}{2}, \frac{1}{2} - \frac{v}{2} + \frac{n}{2}\right], \left[\frac{3}{2}\right], \frac{\cos(2x)}{2} + \frac{1}{2}\right) c_1}{\sqrt{\sin(2x)}}$$

2.1437

ODE No. 1437

$$y''(x) = (3 \sin^2(x) + 1) \csc(x) \sec(x) y'(x) + y(x) \tan^2(x)$$

✓

Mathematica

: cpu = 0.257947 (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], x]

$$\left\{ \left\{ y(x) \rightarrow c_2 \cos^{\frac{1}{2}(\sqrt{13}-3)}(x) + c_1 \cos^{\frac{1}{2}(-3-\sqrt{13})}(x) \right\} \right\}$$

✓

Maple

: cpu = 0.299 (sec), leaf count = 29

dsolve(diff(diff(y(x),x),x) = (3*sin(x)^2+1)/cos(x)/sin(x)*diff(y(x),x)+sin(x)^2/cos(x)^2,y(x))

$$y(x) = c_1 \cos(x)^{-\frac{3}{2}+\frac{\sqrt{13}}{2}} + c_2 \cos(x)^{-\frac{3}{2}-\frac{\sqrt{13}}{2}}$$

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 = 0.960149 (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]^2)), y[x], x]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_2(-1)^{\frac{1}{2}(-2m-1)+1} \cos^2(x)^{\frac{1}{4}(-2m-1)+1} (\cos^2(x)-1)^{\frac{1}{2}\left(\frac{4am+4\sqrt{-a}n^2+4an-4\sqrt{-a}n+4(-a)^{3/2}+8\sqrt{-a}a+\sqrt{-a}+4mn^2-4m^2n}{8a+8n^2-8n+2}\right)}\right.}\right.$$

✓ **Maple** : cpu = 0.299 (sec), leaf count = 102

```
dsolve(diff(diff(y(x),x),x) = -(-a*cos(x)^2*sin(x)^2-m*(m-1)*sin(x)^2-n*(n-1)*cos(x)^2)/cos(x)^2, y(x))
```

$$y(x) = \sin(x)^n \left(\cos(x)^{-m+1} \operatorname{hypergeom}\left(\left[\frac{n}{2} - \frac{m}{2} + \frac{i\sqrt{a}}{2} + \frac{1}{2}, \frac{n}{2} - \frac{m}{2} - \frac{i\sqrt{a}}{2} + \frac{1}{2}\right], \left[\frac{3}{2} - m\right], \cos(x)^2\right) c_2\right)$$

2.1439

ODE No. 1439

$$y''(x) = \frac{\phi'(x)y'(x)}{\phi(x) - \phi(a)} - \frac{y(x) (\phi''(a) - n(n+1)(\phi(x) - \phi(a))^2)}{\phi(x) - \phi(a)}$$

✗ Mathematica : cpu = 0.615224 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == (Derivative[1][phi][x]*Derivative[1][y][x])/(-phi[a] + phi[x]) -
```

, could not solve

```
DSolve[Derivative[2][y][x] == (Derivative[1][phi][x]*Derivative[1][y][x])/(-phi[a] + phi[x]) - (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)-phi(a))^2)+diff(phi(x),x)),y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ \frac{d^2}{dx^2} Y(x) - \frac{\left(\frac{d}{dx} \phi(x)\right) \left(\frac{d}{dx} Y(x)\right)}{\phi(x) - \phi(a)} + \frac{\left(-n(n+1)(\phi(x) - \phi(a))^2 + \frac{d^2}{da^2} \phi(a)\right) - Y(x)}{\phi(x) - \phi(a)} \right\}, \{ \right.$$

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 = 0.581227 (sec), leaf count = 0

```
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]))/(phi[x]^2 + phi[x]*Derivative[1] [phi] [x]), y[x], x]
```

, 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]))/(phi[x]^2 + phi[x]*Derivative[1] [phi] [x]), y[x], 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))/(phi(x)^2+phi(x)*diff(phi(x),x)), y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ \frac{\left(\left(\frac{d}{dx} \phi(x) \right)^2 - \phi(x)^2 \left(\frac{d}{dx} \phi(x) \right) - \phi(x) \left(\frac{d^2}{dx^2} \phi(x) \right) \right) - Y(x)}{\frac{d}{dx} \phi(x) + \phi(x)^2} + \frac{\left(\phi(x^3) - \phi(x) \left(\frac{d}{dx} \phi(x) \right) - \frac{d^2}{dx^2} \phi(x) \right)}{\frac{d}{dx} \phi(x) + \phi(x)^2} \right\} \right)$$

2.1441 ODE No. 1441

$$y''(x) = -\frac{y'(x)(-\operatorname{cn}(x|k)\operatorname{dn}(x|k) - 2\operatorname{sn}(x|k))}{\operatorname{sn}(x|k)^2 - \operatorname{sn}(a|k)^2} - \frac{y(x)(6k^2\operatorname{sn}(a|k)^4 - 4(k^2 + 1)\operatorname{sn}(a|k)^2 + 2)}{\operatorname{sn}(x|k)^2 - \operatorname{sn}(a|k)^2} - \frac{1}{\operatorname{sn}(x|k)^2 - \operatorname{sn}(a|k)^2}$$

X Mathematica : cpu = 0.99137 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -(-JacobiSN[a, k]^2 + JacobiSN[x, k]^2)^(-1) - ((2 - 4*(1 + k^2)*JacobiSN[a, k]^2 + JacobiSN[x, k]^2) - ((-JacobiCN[x, k]*JacobiDN[x, k]) - 2*JacobiSN[x, k]^2), y[x], x]
```

, could not solve

```
DSolve[Derivative[2][y][x] == -(-JacobiSN[a, k]^2 + JacobiSN[x, k]^2)^(-1) - ((2 - 4*(1 + k^2)*JacobiSN[a, k]^2 + JacobiSN[x, k]^2) - ((-JacobiCN[x, k]*JacobiDN[x, k]) - 2*JacobiSN[x, k]^2), y[x], 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 + 4*(k^2*JacobiSN(a,k)^2 - JacobiSN(x,k)^2))
```

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ \frac{d^2}{dx^2} Y(x) - \frac{2 \operatorname{JacobiSN}(x, k) \operatorname{JacobiCN}(x, k) \operatorname{JacobiDN}(x, k) \left(\frac{d}{dx} Y(x) \right)}{\operatorname{JacobiSN}(x, k)^2 - \operatorname{JacobiSN}(a, k)^2} - \frac{(-2 + 4(k^2 \operatorname{JacobiSN}(a, k)^2 - \operatorname{JacobiSN}(x, k)^2))}{\operatorname{JacobiSN}(x, k)^2 - \operatorname{JacobiSN}(a, k)^2} \right\} \right)$$

2.1442

ODE No. 1442

$$y''(x) = \frac{y(x)}{f(x)} - \frac{xy'(x)}{f(x)}$$

✓ **Mathematica** : cpu = 0.0548401 (sec), leaf count = 46

```
DSolve[Derivative[2][y][x] == y[x]/f[x] - (x*Derivative[1][y][x])/f[x],y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_2 x \int_1^x \frac{\exp \left(-\int_1^{K[2]} \frac{K[1]}{f(K[1])} d K[1]\right)}{K[2]^2} d K[2]+c_1 x\right\}\right\}$$

✓ **Maple** : cpu = 0.083 (sec), leaf count = 30

```
dsolve(diff(diff(y(x),x),x) = -x/f(x)*diff(y(x),x)+1/f(x)*y(x),y(x))
```

$$y(x) = x \left(\left(\int e^{\int \frac{-2-\frac{x^2}{f(x)}}{x} dx} dx \right) c_1 + c_2 \right)$$

2.1443

ODE No. 1443

$$y''(x) = -\frac{f'(x)y'(x)}{2f(x)} - \frac{g(x)y(x)}{f(x)}$$

 **Mathematica** : cpu = 0.239385 (sec), leaf count = 0

```
DSolve[Derivative[2][y][x] == -((g[x]*y[x])/f[x]) - (Derivative[1][f][x]*Derivative[1][y][x])/
```

, could not solve

```
DSolve[Derivative[2][y][x] == -((g[x]*y[x])/f[x]) - (Derivative[1][f][x]*Derivative[1][y
```

 **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

$$y(x) = \text{DESol} \left(\left\{ \frac{g(x) - Y(x)}{f(x)} + \frac{\left(\frac{d}{dx}f(x)\right)\left(\frac{d}{dx}Y(x)\right)}{2f(x)} + \frac{d^2}{dx^2}Y(x) \right\}, \{ -Y(x) \} \right)$$

2.1444

ODE No. 1444

$$y''(x) = -by(x)f(x)^{2a} - \frac{af'(x)y'(x)}{f(x)}$$

 **Mathematica** : cpu = 1.2138 (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])

, could not solve

DSolve[Derivative[2] [y] [x] == -(b*f[x]^(2*a)*y[x]) - (a*Derivative[1] [f] [x]*Derivative[1] [y] [x])

 **Maple** : cpu = 0.025 (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),

$$y(x) = c_1e^{\int if(x)^a\sqrt{b}dx} + c_2e^{-\left(\int if(x)^a\sqrt{b}dx\right)}$$

2.1445

ODE No. 1445

$$y''(x) = -\frac{y'(x)\left(2f(x)g(x)g'(x)^2 - (g(x)^2 - 1)\left(2f'(x)g'(x) + f(x)g''(x)\right)\right)}{f(x)\left(g(x)^2 - 1\right)g'(x)} - \frac{y(x)\left((g(x)^2 - 1)\left(f'(x)\left(2f'(x)g'(x) + f(x)g''(x)\right)\right)\right)}{f(x)\left(g(x)^2 - 1\right)g'(x)}$$

✓ **Mathematica** : cpu = 0.156269 (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]^2)*Derivative[1][f][x]*g[x]))/f[x], y[x], x]
```

$$\{\{y(x) \rightarrow c_1 f(x) P_v(g(x)) + c_2 f(x) Q_v(g(x))\}\}$$

✓ **Maple** : cpu = 0.412 (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),x)))/f(x), y(x), x)
```

$$y(x) = f(x)\left(\operatorname{LegendreQ}\left(v,g(x)\right)c_2 + \operatorname{LegendreP}\left(v,g(x)\right)c_1\right)$$

2.1446

ODE No. 1446

$$y''(x) = -\frac{(x-1)y(x)}{x^4} - \frac{y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0538181 (sec), leaf count = 33

```
DSolve[Derivative[2][y][x] == -((( -1 + x)*y[x])/x^4) - Derivative[1][y][x]/x,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1 e^{-1/x} - c_2 e^{-1/x} \operatorname{Ei}\left(\frac{2}{x}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.052 (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))
```

$$y(x) = e^{-\frac{1}{x}} \left(\operatorname{Ei}_1 \left(-\frac{2}{x} \right) c_2 + c_1 \right)$$

2.1447 ODE No. 1447

$$y''(x) = -\frac{(-x-1)y(x)}{x^4} - \frac{y'(x)}{x}$$

✓ **Mathematica** : cpu = 0.0523822 (sec), leaf count = 29

```
DSolve[Derivative[2][y][x] == -((( -1 - x)*y[x])/x^4) - Derivative[1][y][x]/x,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{\frac{1}{x}} - c_2 e^{\frac{1}{x}} \operatorname{Ei}\left(-\frac{2}{x}\right) \right\} \right\}$$

✓ **Maple** : cpu = 0.053 (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))
```

$$y(x) = e^{\frac{1}{x}} \left(\operatorname{Ei}_1\left(\frac{2}{x}\right) c_2 + c_1 \right)$$

2.1448

ODE No. 1448

$$y''(x) = -\frac{b^2 y(x)}{(x^2 - a^2)^2}$$

✓ **Mathematica** : cpu = 10.2335 (sec), leaf count = 149

```
DSolve[Derivative[2][y][x] == -((b^2*y[x])/(-a^2 + x^2)^2),y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 (x-a)^{\frac{1}{2}\sqrt{1-\frac{b^2}{a^2}}+\frac{1}{2}} (a+x)^{\frac{1}{2}-\frac{1}{2}\sqrt{1-\frac{b^2}{a^2}}} - \frac{c_2 (x-a)^{\frac{1}{2}-\frac{1}{2}\sqrt{\frac{a^2-b^2}{a^2}}} (a+x)^{\frac{1}{2}\sqrt{\frac{a^2-b^2}{a^2}}+\frac{1}{2}}}{2a\sqrt{\frac{a^2-b^2}{a^2}}} \right\} \right\}$$

✓ **Maple** : cpu = 0.17 (sec), leaf count = 77

```
dsolve(diff(diff(y(x),x),x) = -b^2/(-a^2+x^2)^2*y(x),y(x))
```

$$y(x) = \sqrt{(a-x)(x+a)} \left(\left(\frac{a-x}{x+a} \right)^{-\frac{\sqrt{a^2-b^2}}{2a}} c_2 + \left(\frac{a-x}{x+a} \right)^{\frac{\sqrt{a^2-b^2}}{2a}} c_1 \right)$$

2.1449

ODE No. 1449

$$y^{(3)}(x) - \lambda y(x) = 0$$

✓ **Mathematica** : cpu = 0.0168951 (sec), leaf count = 53

```
DSolve[-(lambda*y[x]) + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{(-1)^{2/3} \sqrt[3]{\lambda} x} + c_2 e^{-\sqrt[3]{-1} \sqrt[3]{\lambda} x} + c_3 e^{\sqrt[3]{\lambda} x} \right\} \right\}$$

✓ **Maple** : cpu = 0.029 (sec), leaf count = 47

```
dsolve(diff(diff(diff(y(x),x),x),x)-lambda*y(x)=0,y(x))
```

$$y(x) = c_1 e^{-\frac{\lambda^{1/3} (1+i\sqrt{3}) x}{2}} + c_2 e^{\frac{\lambda^{1/3} (i\sqrt{3}-1) x}{2}} + c_3 e^{\lambda^{1/3} x}$$

2.1450

ODE No. 1450

$ax^3y(x) - bx + y^{(3)}(x) = 0$

✓ **Mathematica** : cpu = 18.3577 (sec), leaf count = 3592

```
DSolve[-(b*x) + a*x^3*y[x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{6} \sqrt[3]{a} c_3 {}_0F_2 \left(; \frac{7}{6}, \frac{4}{3}; -\frac{ax^6}{216} \right) x^2 + \frac{1}{6} \sqrt[3]{a} {}_0F_2 \left(; \frac{7}{6}, \frac{4}{3}; -\frac{ax^6}{216} \right) \int_1^x \frac{1}{\sqrt[3]{a} \left(-5096 a^3 {}_0F_2 \left(; \frac{7}{6}, \frac{4}{3}; -\frac{1}{216} a K[3] \right) \right)} dx \right. \right.$$

✓ **Maple** : cpu = 0.595 (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

$y^{(3)}(x) - ax^by(x) = 0$

✓ **Mathematica** : cpu = 0.0183629 (sec), leaf count = 168

```
DSolve[-(a*x^b*y[x]) + Derivative[3][y][x] == 0,y[x],x]
```

$\left\{ \left\{ y(x) \rightarrow (-1)^{\frac{1}{b+3}} (b+3)^{-\frac{3}{b+3}} c_2 x a^{\frac{1}{b+3}} {}_0F_2\left(; 1 - \frac{1}{b+3}, 1 + \frac{1}{b+3}; \frac{ax^{b+3}}{(b+3)^3} \right) + (-1)^{\frac{2}{b+3}} (b+3)^{-\frac{6}{b+3}} c_3 x^2 a^{\frac{2}{b+3}} {}_0F_2\left(; 1 - \frac{2}{b+3}, 1 + \frac{2}{b+3}; \frac{ax^{b+3}}{(b+3)^3} \right) \right\} \right\}$

✓ **Maple** : cpu = 0.166 (sec), leaf count = 114

```
dsolve(diff(diff(diff(y(x),x),x),x)-a*x^b*y(x)=0,y(x))
```

$y(x) = c_1 \operatorname{hypergeom}\left(\left[\right], \left[\frac{1+b}{b+3}, \frac{b+2}{b+3}\right], \frac{ax^{b+3}}{(b+3)^3}\right) + c_2 x \operatorname{hypergeom}\left(\left[\right], \left[\frac{b+4}{b+3}, \frac{b+2}{b+3}\right], \frac{ax^{b+3}}{(b+3)^3}\right) + c_3 x^2 \operatorname{hypergeom}\left(\left[\right], \left[\frac{b+5}{b+3}, \frac{b+2}{b+3}\right], \frac{ax^{b+3}}{(b+3)^3}\right)$

2.1452

ODE No. 1452

$$y^{(3)}(x)+3y'(x)-4y(x)=0$$

✓ **Mathematica** : cpu = 0.0078907 (sec), leaf count = 54

```
DSolve[-4*y[x] + 3*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_3e^x+c_2e^{-x/2}\cos\left(\frac{\sqrt{15}x}{2}\right)+c_1e^{-x/2}\sin\left(\frac{\sqrt{15}x}{2}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.01 (sec), leaf count = 35

```
dsolve(diff(diff(diff(y(x),x),x),x)+3*diff(y(x),x)-4*y(x)=0,y(x))
```

$$y(x)=c_1e^x+c_2e^{-\frac{x}{2}}\sin\left(\frac{\sqrt{15}x}{2}\right)+c_3e^{-\frac{x}{2}}\cos\left(\frac{\sqrt{15}x}{2}\right)$$

2.1453

ODE No. 1453

$$a^2(-y'(x)) - e^{2ax} \sin^2(x) + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 2.7246 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{e^{-ax}(-9(a^2-4)a^4e^{3ax}\cos(2x) - 3(11a^2-4)a^3e^{3ax}\sin(2x) + (9a^6+49a^4+56a^2+16)(12a^2c_1e^{3ax} - 12a^3(9a^6+49a^4+56a^2+16))}{12a^3(9a^6+49a^4+56a^2+16)} \right. \right.$$

✓ **Maple** : cpu = 0.405 (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))
```

$$y(x) = \frac{((-9a^6+36a^4)\cos(2x) + (-33a^5+12a^3)\sin(2x) + 9a^6+49a^4+56a^2+16)e^{2ax} + 108(ac_3 - e^{-ax}c_1)}{108(a^2+1)(a^2+\frac{4}{9})(a^2+4)a^3}$$

2.1454

ODE No. 1454

$$2axy'(x) + ay(x) + y^{(3)}(x) = 0$$

✓

Mathematica

: cpu = 0.009703 (sec), leaf count = 79

DSolve[a*y[x] + 2*a*x*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],x]

$$\left\{\left\{y(x) \rightarrow c_1 \operatorname{Ai}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{ax}\right)^2 + c_3 \operatorname{Bi}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{ax}\right)^2 + c_2 \operatorname{Ai}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{ax}\right) \operatorname{Bi}\left(\sqrt[3]{-\frac{1}{2}}\sqrt[3]{ax}\right)\right\}\right\}$$

✓

Maple

: cpu = 0.064 (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))

$$y(x) = c_1 \operatorname{AiryAi}\left(-\frac{2^{2/3}a^{1/3}x}{2}\right)^2 + c_2 \operatorname{AiryBi}\left(-\frac{2^{2/3}a^{1/3}x}{2}\right)^2 + c_3 \operatorname{AiryAi}\left(-\frac{2^{2/3}a^{1/3}x}{2}\right) \operatorname{AiryBi}\left(-\frac{2^{2/3}a^{1/3}x}{2}\right)$$

2.1455

ODE No. 1455

$$x(a+b-1)y'(x)-aby(x)+x^2(-y''(x))+y^{(3)}(x)=0$$

✓

Mathematica : cpu = 0.0240825 (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][x], y[x], x]

$$\left\{\left\{y(x)\rightarrow \sqrt[3]{-\frac{1}{3}}c_2x\,{}_2F_2\left(\frac{1}{3}-\frac{a}{3},\frac{1}{3}-\frac{b}{3};\frac{2}{3},\frac{4}{3};\frac{x^3}{3}\right)+c_1\,{}_2F_2\left(-\frac{a}{3},-\frac{b}{3};\frac{1}{3},\frac{2}{3};\frac{x^3}{3}\right)+\left(-\frac{1}{3}\right)^{2/3}c_3x^2\,{}_2F_2\left(\frac{2}{3}-\frac{a}{3},\frac{2}{3}-\frac{b}{3};\frac{4}{3},\frac{5}{3};\frac{x^3}{3}\right)\right\}\right.$$

✓

Maple : cpu = 0.145 (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)),y(x))

$$y(x)=c_1\operatorname{hypergeom}\left(\left[-\frac{a}{3},-\frac{b}{3}\right],\left[\frac{1}{3},\frac{2}{3}\right],\frac{x^3}{3}\right)+c_2\operatorname{hypergeom}\left(\left[\frac{1}{3}-\frac{b}{3},\frac{1}{3}-\frac{a}{3}\right],\left[\frac{2}{3},\frac{4}{3}\right],\frac{x^3}{3}\right)x+c_3\operatorname{hypergeom}\left(\left[\frac{2}{3}-\frac{b}{3},\frac{2}{3}-\frac{a}{3}\right],\left[\frac{4}{3},\frac{5}{3}\right],\frac{x^3}{3}\right)x^2$$

2.1456

ODE No. 1456

$$x^{2c-2}y'(x) + (c-1)x^{2c-3}y(x) + y^{(3)}(x) = 0$$

✓

Mathematica : cpu = 0.0295245 (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,x, c]

$$\left\{ \left\{ y(x) \rightarrow c_1 {}_1F_2\left(\frac{1}{2} - \frac{1}{2c}; 1 - \frac{1}{c}, 1 - \frac{1}{2c}; -\frac{x^{2c}}{4c^2}\right) + 4^{-1/c} c^{-2/c} c_3 (x^{2c})^{\frac{1}{c}} {}_1F_2\left(\frac{1}{2} + \frac{1}{2c}; 1 + \frac{1}{2c}, 1 + \frac{1}{c}; -\frac{x^{2c}}{4c^2}\right) + \right. \right.$$

✓

Maple : cpu = 0.103 (sec), leaf count = 73

dsolve(diff(diff(diff(y(x),x),x),x)+x^(2*c-2)*diff(y(x),x)+(c-1)*x^(2*c-3)*y(x)=0,y(x))

$$y(x) = x \left(\text{BesselY}\left(\frac{1}{2c}, \frac{x^c}{2c}\right)^2 c_2 + \text{BesselY}\left(\frac{1}{2c}, \frac{x^c}{2c}\right) \text{BesselJ}\left(\frac{1}{2c}, \frac{x^c}{2c}\right) c_3 + \text{BesselJ}\left(\frac{1}{2c}, \frac{x^c}{2c}\right)^2 c_1 \right)$$

2.1457

ODE No. 1457

$$-3y'(x)(a+2\wp(x;g2,g3))+by(x)+y^{(3)}(x)=0$$

✖

Mathematica : cpu = 0.028443 (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[x], x]

, could not solve

DSolve[b*y[x] - 3*(a + 2*WeierstrassP[x, {g2, g3}])*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)-3*(2*WeierstrassP(x,g2,g3)+a)*diff(y(x),x)+b*y(x)=0,y(x))

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol}\left(\left\{\frac{d^3}{dx^3}Y(x) + (-6 \operatorname{WeierstrassP}(x, g2, g3) - 3a)\left(\frac{d}{dx}Y(x)\right) + bY(x)\right\}, \{Y(x)\}\right)$$

2.1458

ODE No. 1458

$$\frac{1}{2}y(x)\left((1-n^2)\wp'(x;g2,g3)-a\right)+(1-n^2)y'(x)\wp(x;g2,g3)+y^{(3)}(x)=0$$

✗ Mathematica : cpu = 0.0208827 (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, {g2, g3}]]
```

✗ 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)*WeierstrassP(x,g2,g3)-a))
```

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol}\left(\left\{\frac{d^3}{dx^3}Y(x) + (-n^2 \text{WeierstrassP}(x,g2,g3) + \text{WeierstrassP}(x,g2,g3))\left(\frac{d}{dx}Y(x)\right) + (-n^2 \text{WeierstrassP}(x,g2,g3) - a)\right\}\right)$$

2.1459

ODE No. 1459

$$-y'(x)(a+4n(n+1)\wp(x;g_2,g_3))-2n(n+1)y(x)\wp'(x;g_2,g_3)+y^{(3)}(x)=0$$

✖

Mathematica : cpu = 0.0206267 (sec), leaf count = 0

DSolve[-2*n*(1 + n)*WeierstrassPPrime[x, {g2, g3}]*y[x] - (a + 4*n*(1 + n)*WeierstrassP[x, {g2

, could not solve

DSolve[-2*n*(1 + n)*WeierstrassPPrime[x, {g2, g3}]*y[x] - (a + 4*n*(1 + n)*WeierstrassP[

✖

Maple : cpu = 0. (sec), leaf count = 0

dsolve(diff(diff(diff(y(x),x),x),x)-(4*n*(n+1)*WeierstrassP(x,g2,g3)+a)*diff(y(x),x)-2*n

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ \frac{d^2}{dx^2} - Y(x) + \left(-n^2 \text{WeierstrassP}(x, g_2, g_3) - n \text{WeierstrassP}(x, g_2, g_3) - \frac{a}{4} \right) - Y(x) \right\}, \{ - \right.$$

2.1460

ODE No. 1460

$$y'(x)(a+A\wp(x;g2,g3))+By(x)\wp'(x;g2,g3)+y^{(3)}(x)=0$$

✖

Mathematica : cpu = 0.015471 (sec), leaf count = 0

DSolve[B*WeierstrassPPrime[x, {g2, g3}]*y[x] + (a + A*WeierstrassP[x, {g2, g3}])*Derivative[1]

, could not solve

DSolve[B*WeierstrassPPrime[x, {g2, g3}]*y[x] + (a + A*WeierstrassP[x, {g2, g3}])*Derivat

✖

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*Weierstra

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ \frac{d^3}{dx^3} - Y(x) + (A \text{ WeierstrassP}(x, g2, g3) + a) \left(\frac{d}{dx} - Y(x) \right) + B \text{ WeierstrassPPrime}(x, g2, \right. \right.$$

2.1461

ODE No. 1461

$$-y'(x)\left(a+3k^2\operatorname{sn}(z|x)^2\right)+y(x)\left(b+c\operatorname{sn}(z|x)^2-3k^2\operatorname{cn}(z|x)\operatorname{dn}(z|x)\operatorname{sn}(z|x)\right)+y^{(3)}(x)=0$$

✖

Mathematica : cpu = 0.0325914 (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

, 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

, result contains DESol or ODESolStruc

$$y(x)=\text{DESol}\left(\left\{\frac{d^3}{dx^3}-Y(x)+\left(-3k^2\operatorname{JacobiSN}(z,x)^2-a\right)\left(\frac{d}{dx}-Y(x)\right)+\left(b+c\operatorname{JacobiSN}(z,x)^2-3k^2\operatorname{Ja}\right.\right.\right.$$

2.1462

ODE No. 1462

$$-y'(x) \left(a + 6k^2 \sin^2(x)\right) + by(x) + y^{(3)}(x) = 0$$

✖ Mathematica : cpu = 0.0470829 (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]
```

✖ 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

$$y(x) = \text{DESol} \left(\left\{ \frac{d^3}{dx^3} Y(x) + (-6k^2 \sin(x)^2 - a) \left(\frac{d}{dx} Y(x) \right) + b_- Y(x) \right\}, \{ \_ Y(x) \} \right)$$

2.1463

ODE No. 1463

$$y(x)f'(x)+2f(x)y'(x)+y^{(3)}(x)=0$$

 **Mathematica** : cpu = 0.0551595 (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,
```

 **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

$$y(x)=\text{DESol}\left(\left\{\frac{d^2}{dx^2}-Y(x)+\frac{f(x)-Y(x)}{2}\right\},\{-Y(x)\}\right)^2$$

2.1464

ODE No. 1464

$$y^{(3)}(x) - 2y''(x) - 3y'(x) + 10y(x) = 0$$

✓ **Mathematica** : cpu = 0.0068848 (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]
```

$$\left\{\left\{y(x) \rightarrow c_3 e^{-2 x}+c_2 e^{2 x} \cos (x)+c_1 e^{2 x} \sin (x)\right\}\right\}$$

✓ **Maple** : cpu = 0.008 (sec), leaf count = 27

```
dsolve(diff(diff(diff(y(x),x),x),x)-2*diff(diff(y(x),x),x)-3*diff(y(x),x)+10*y(x)=0,y(x)
```

$$y(x)=c_1 e^{-2 x}+c_2 e^{2 x} \sin (x)+c_3 e^{2 x} \cos (x)$$

2.1465

ODE No. 1465

$$-a^2y'(x)+2a^2y(x)+y^{(3)}(x)-2y''(x)-\sinh(x)=0$$

✓

Mathematica : cpu = 0.104324 (sec), leaf count = 95

`DSolve[-Sinh[x] + 2*a^2*y[x] - a^2*Derivative[1][y][x] - 2*Derivative[2][y][x] + Derivative[3]`

$$\left\{\left\{y(x)\rightarrow \frac{e^{-x}(3a^2e^{2x}-a^2-3e^{2x}-12e^x\sinh(x)-6e^x\cosh(x)+1)}{6(a-2)(a+2)(a^2-1)}+c_1e^{-ax}+c_3e^{ax}+c_2e^{2x}\right\}\right\}$$

✓

Maple : cpu = 0.273 (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)-s`

$$y(x) = \frac{2c_3(a^4-5a^2+4)e^{-ax}+2(a+1)\left(c_1a^2+\frac{\sinh(3x)}{6}-4c_1-\frac{\cosh(3x)}{6}\right)(a-1)e^{2x}+2c_2(a^4-5a^2+4)e^{ax}}{2a^4-10a^2+8}$$

2.1466

ODE No. 1466

$$a^3(-y(x)) + 3a^2y'(x) - 3ay''(x) - e^{ax} + y^{(3)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0151017 (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], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{6}x^3e^{ax} + c_3x^2e^{ax} + c_2xe^{ax} + c_1e^{ax} \right\} \right\}$$

✓ **Maple** : cpu = 0.024 (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),x))
```

$$y(x) = \frac{e^{ax}(6c_3x^2 + x^3 + 6c_2x + 6c_1)}{6}$$

2.1467

ODE No. 1467

$a_0y(x) + a_1y'(x) + a_2y''(x) + y^{(3)}(x) = 0$

✓ **Mathematica** : cpu = 0.0069313 (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]
```

$\left\{ \left\{ y(x) \rightarrow c_1 e^{x \text{Root}\left[\#1^3 + \#1^2 a_2 + \#1 a_1 + a_0 \&, 1\right]} + c_2 e^{x \text{Root}\left[\#1^3 + \#1^2 a_2 + \#1 a_1 + a_0 \&, 2\right]} + c_3 e^{x \text{Root}\left[\#1^3 + \#1^2 a_2 + \#1 a_1 + a_0 \&, 3\right]} \right\} \right\}$

✓ **Maple** : cpu = 0.029 (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),x)
```

$y(x) = c_1 e^{-\frac{\left(\left(\frac{i\sqrt{3}}{12} + \frac{1}{12}\right)\left(36 a_1 a_2 - 108 a_0 - 8 a_2^3 + 12 \sqrt{12 a_0 a_2^3 - 3 a_1^2 a_2^2 - 54 a_1 a_2 a_0 + 12 a_1^3 + 81 a_0^2}\right)^{2/3} + \frac{a_2 \left(36 a_1 a_2 - 108 a_0 - 8 a_2^3 + 12 \sqrt{12 a_0 a_2^3 - 3 a_1^2 a_2^2 - 54 a_1 a_2 a_0 + 12 a_1^3 + 81 a_0^2}\right)}{3}\right)^{1/3}}{36 a_1 a_2 - 108 a_0 - 8 a_2^3 + 12 \sqrt{12 a_0 a_2^3 - 3 a_1^2 a_2^2 - 54 a_1 a_2 a_0 + 12 a_1^3 + 81 a_0^2}}}$

2.1468

ODE No. 1468

$$2(2a + 4x^2 - 1) \, y'(x) - 8axy(x) + y^{(3)}(x) - 6xy''(x) = 0$$

✓

Mathematica : cpu = 0.0675274 (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[3][y][x] == 0,x,Assumptions->{a>0}]

$$\left\{ \left\{ y(x) \rightarrow c_2 H_{\frac{a}{2}}(x) {}_1F_1\left(-\frac{a}{4}; \frac{1}{2}; x^2\right) + c_1 H_{\frac{a}{2}}(x)^2 + c_3 {}_1F_1\left(-\frac{a}{4}; \frac{1}{2}; x^2\right)^2 \right\} \right\}$$

✓

Maple : cpu = 0.161 (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),x)

$$y(x) = x^2 \left(\text{KummerU}\left(\frac{1}{2} - \frac{a}{4}, \frac{3}{2}, x^2\right)^2 c_2 + \text{KummerU}\left(\frac{1}{2} - \frac{a}{4}, \frac{3}{2}, x^2\right) \text{KummerM}\left(\frac{1}{2} - \frac{a}{4}, \frac{3}{2}, x^2\right) c_3 + \text{KummerM}\left(\frac{1}{2} - \frac{a}{4}, \frac{3}{2}, x^2\right)^2 c_4 \right)$$

2.1469

ODE No. 1469

$$a^3x^3y(x)+3a^2x^2y'(x)+3axy''(x)+y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.0179419 (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] == 0, y[x], x]
```

$$\left\{\left\{y(x)\rightarrow c_1e^{-\frac{ax^2}{2}}+c_2e^{-\frac{ax^2}{2}-\sqrt{3}\sqrt{a}x}+c_3e^{\sqrt{3}\sqrt{a}x-\frac{ax^2}{2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.038 (sec), leaf count = 37

```
dsolve(diff(diff(diff(y(x),x),x),x)+3*a*x*diff(diff(y(x),x),x)+3*a^2*x^2*diff(y(x),x)+a^3*x^3*y(x)=0,y(x),x)
```

$$y(x)=e^{-\frac{ax^2}{2}}\left(c_1+c_2e^{\sqrt{3}\sqrt{a}x}+c_3e^{-\sqrt{3}\sqrt{a}x}\right)$$

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 = 2.5725 (sec), leaf count = 64

DSolve[-Log[x] + Sin[x]*y[x] - 2*Cos[x]*Derivative[1][y][x] - Sin[x]*Derivative[2][y][x] + Der

$$\left\{\left\{y(x) \rightarrow e^{-\cos(x)} \int_1^x \frac{1}{4} e^{\cos(K[1])} \left(2 \log(K[1]) K[1]^2 - 3 K[1]^2 + 4 c_1 K[1] + 4 c_2\right) d K[1] + c_3 e^{-\cos(x)}\right\}\right\}$$

✓

Maple : cpu = 0.174 (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(

$$y(x) = \left(c_3 + \int \left(2 x c_1 + c_2 - \frac{3 x^2}{4} + \frac{x^2 \ln(x)}{2}\right) e^{\cos(x)} dx\right) e^{-\cos(x)}$$

2.1471

ODE No. 1471

$$f(x)y''(x)+f(x)y(x)+y^{(3)}(x)+y'(x)=0$$

✓ **Mathematica** : cpu = 0.105738 (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
```

$$\left\{\left\{y(x)\rightarrow c_3e^{ix}\int_1^xe^{-2iK[3]}\int_1^{K[3]}\exp\left(\int_1^{K[2]}(i-f(K[1]))dK[1]\right)dK[2]dK[3]+c_1e^{ix}+\frac{1}{2}ic_2e^{-ix}\right\}\right\}$$

✓ **Maple** : cpu = 0.161 (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
```

$$y(x)=e^{ix}\left(\int e^{-2ix}\left(\int c_3e^{\int(-f(x)+i)dx}dx+c_2\right)dx+c_1\right)$$

2.1472

ODE No. 1472

$$f(x)\left(x^2y''(x)-2xy'(x)+2y(x)\right)+y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.112722 (sec), leaf count = 88

```
DSolve[f[x]*(2*y[x] - 2*x*Derivative[1][y][x] + x^2*Derivative[2][y][x]) + Derivative[3][y][x]
```

$$\left\{\left\{y(x)\rightarrow c_3x\left(\int_1^x\frac{\exp\left(-\int_1^{K[2]}f(K[1])K[1]^2dK[1]\right)}{K[2]^2}dK[2]-x\int_1^x\frac{\exp\left(-\int_1^{K[3]}f(K[1])K[1]^2dK[1]\right)}{K[3]^3}dK[3]\right.\right.$$

✓ **Maple** : cpu = 0.212 (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)
```

$$y(x)=\left(\int\left(c_1+c_2\left(\int\mathrm{e}^{-\left(\int\left(x^2f(x)+\frac{3}{x}\right)dx}dx\right)\right)dx+c_3\right)x$$

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 = 0.0155885 (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] + y[x]*Derivative[3][y][x] == 0, y[x], 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][y][x] + 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) + f(x)*diff(diff(y(x), x), x) + g(x)*diff(y(x), x) + (f(x)*g(x) + y(x)*diff(f(x), x) + y(x)*diff(g(x), x)) - y(x)*diff(f(x), x) - y(x)*diff(g(x), x)), y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ \frac{d^3}{dx^3} Y(x) + f(x) \left(\frac{d^2}{dx^2} Y(x) \right) + g(x) \left(\frac{d}{dx} Y(x) \right) + \left(f(x) g(x) + \frac{d}{dx} g(x) \right) Y(x) \right\}, \right.$$

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 = 0.0173594 (sec), leaf count = 0

```
DSolve[y[x]*(4*f[x]*g[x] + 2*Derivative[1][g][x]) + (2*f[x]^2 + 4*g[x] + Derivative[1][f][x])*
```

, could not solve

```
DSolve[y[x]*(4*f[x]*g[x] + 2*Derivative[1][g][x]) + (2*f[x]^2 + 4*g[x] + Derivative[1][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
```

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol}\left(\left\{\frac{d^2}{dx^2}-Y(x)+f(x)\left(\frac{d}{dx}-Y(x)\right)+g(x)-Y(x)\right\},\{-Y(x)\}\right)^2$$

2.1475

ODE No. 1475

$$4y^{(3)}(x) - 8y''(x) - 11y'(x) - 3y(x) + 18e^x = 0$$

✓ **Mathematica** : cpu = 0.0097849 (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], y[x], x]
```

$$\left\{\left\{y(x) \rightarrow e^x + c_1 e^{-x/2} + c_2 e^{-x/2} x + c_3 e^{3x}\right\}\right\}$$

✓ **Maple** : cpu = 0.025 (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*e^x,y(x)),y(x))
```

$$y(x) = (c_3 x + c_2) e^{-\frac{x}{2}} + c_1 e^{3x} + e^x$$

2.1476

ODE No. 1476

$$-36n^2y'(x)\wp(x;g2,g3)-2(n+3)(4n-3)ny(x)\phi'(x)+27y^{(3)}(x)=0$$

 **Mathematica** : cpu = 0.0958939 (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}]*D
```

, could not solve

```
DSolve[-2*n*(3 + n)*(-3 + 4*n)*y[x]*Derivative[1][phi][x] - 36*n^2*WeierstrassP[x, {g2,
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(27*diff(diff(diff(y(x),x),x),x)-36*n^2*WeierstrassP(x,g2,g3)*diff(y(x),x)-2*n*(n+
```

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ 27 \frac{d^3}{dx^3} Y(x) - 36n^2 \text{WeierstrassP}(x, g2, g3) \left(\frac{d}{dx} Y(x) \right) + (-8 \text{WeierstrassPPrime}(x, g2, g3) \right. \right.$$

2.1477

ODE No. 1477

$$xy^{(3)}(x)+3y''(x)+xy(x)=0$$

✓ **Mathematica** : cpu = 0.137599 (sec), leaf count = 48

```
DSolve[x*y[x] + 3*Derivative[2][y][x] + x*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_1e^{-x}}{x}+\frac{c_2e^{\sqrt[3]{-1}x}}{x}+\frac{c_3e^{-(-1)^{2/3}x}}{x}\right\}\right\}$$

✓ **Maple** : cpu = 0.027 (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))
```

$$y(x)=\frac{c_1e^{-x}+e^{\frac{x}{2}}\left(\sin\left(\frac{\sqrt{3}x}{2}\right)c_2+\cos\left(\frac{\sqrt{3}x}{2}\right)c_3\right)}{x}$$

2.1478

ODE No. 1478

$$-ax^2y(x)+xy^{(3)}(x)+3y''(x)=0$$

✓

Mathematica : cpu = 0.0323609 (sec), leaf count = 104

`DSolve[-(a*x^2*y[x]) + 3*Derivative[2][y][x] + x*Derivative[3][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow-\frac{2(-1)^{3/4}\sqrt{2}c_1{}_0F_2\left(;\frac{1}{2},\frac{3}{4};\frac{ax^4}{64}\right)}{\sqrt[4]{ax}}+c_2{}_0F_2\left(;\frac{3}{4},\frac{5}{4};\frac{ax^4}{64}\right)+\frac{\sqrt[4]{-1}\sqrt[4]{a}c_3x{}_0F_2\left(;\frac{5}{4},\frac{3}{2};\frac{ax^4}{64}\right)}{2\sqrt{2}}\right\}\right\}$$

✓

Maple : cpu = 0.115 (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))`

$$y(x)=c_1\operatorname{hypergeom}\left(\left[\right],\left[\frac{3}{4},\frac{5}{4}\right],\frac{ax^4}{64}\right)+\frac{c_2\operatorname{hypergeom}\left(\left[\right],\left[\frac{1}{2},\frac{3}{4}\right],\frac{ax^4}{64}\right)}{x}+c_3x\operatorname{hypergeom}\left(\left[\right],\left[\frac{5}{4},\frac{3}{2}\right],\frac{ax^4}{64}\right)$$

2.1479

ODE No. 1479

$$(a + b)y''(x) - ay(x) + xy^{(3)}(x) - xy'(x) = 0$$

✓ **Mathematica** : cpu = 0.131181 (sec), leaf count = 153

```
DSolve[-(a*y[x]) - x*Derivative[1][y][x] + (a + b)*Derivative[2][y][x] + x*Derivative[3][y][x]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{2} i c_2 x {}_1F_2\left(\frac{a}{2} + \frac{1}{2}; \frac{3}{2}, \frac{a}{2} + \frac{b}{2} + \frac{1}{2}; \frac{x^2}{4}\right) + c_1 {}_1F_2\left(\frac{a}{2}; \frac{1}{2}, \frac{a}{2} + \frac{b}{2}; \frac{x^2}{4}\right) + c_3 \left(\frac{i}{2}\right)^{-a-b+2} x^{-a-b+2} {}_1F_2\left(\frac{a}{2} + \frac{1}{2}; \frac{3}{2}, \frac{a}{2} + \frac{b}{2} + \frac{1}{2}; \frac{x^2}{4}\right)\right.\right.$$

✓ **Maple** : cpu = 0.229 (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
```

$$y(x) = c_1 \operatorname{hypergeom}\left(\left[\frac{a}{2}\right], \left[\frac{1}{2}, \frac{a}{2} + \frac{b}{2}\right], \frac{x^2}{4}\right) + c_2 x \operatorname{hypergeom}\left(\left[\frac{1}{2} + \frac{a}{2}\right], \left[\frac{3}{2}, \frac{a}{2} + \frac{b}{2} + \frac{1}{2}\right], \frac{x^2}{4}\right) + c_3 x^{-a-b+2}$$

2.1480

ODE No. 1480

$$-(2v + x)y''(x) - (-2v + x - 1)y'(x) + xy^{(3)}(x) + (x - 1)y(x) = 0$$

✓

Mathematica : cpu = 0.209096 (sec), leaf count = 93

DSolve[(-1 + x)*y[x] - (-1 - 2*v + x)*Derivative[1][y][x] - (2*v + x)*Derivative[2][y][x] + x*

$$\left\{ \left\{ y(x) \rightarrow \frac{c_3 e^x x^{2v+2} \Gamma\left(v + \frac{3}{2}\right) {}_1\tilde{F}_1\left(v + \frac{3}{2}; 2v + 3; -2x\right)}{\Gamma\left(\frac{1}{2} - v\right)} + c_2 2^{-2v-2} e^x G_{2,3}^{2,1}\left(2x \left| \begin{matrix} 1, v + \frac{3}{2} \\ 1, 2(v + 1), 0 \end{matrix} \right. \right) + c_1 e^x \right\} \right\}$$

✓

Maple : cpu = 0.231 (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)

$$y(x) = c_1 e^x + c_2 x^{v+1} \operatorname{BesselI}(-v - 1, x) + c_3 x^{v+1} \operatorname{BesselK}(v + 1, x)$$

2.1481

ODE No. 1481

$$-f(x) + (x^2 - 3) \, y''(x) + xy^{(3)}(x) + 4xy'(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 0.724026 (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][x], y[x], x]`

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{240} e^{-\frac{x^2}{2}} \left(-240 x^5 \int_1^x \left(-\frac{1}{240} \left(15 \operatorname{Ei} \left(\frac{K[1]^2}{2} \right) + 16 e^{\frac{K[1]^2}{2}} \right) f(K[1]) + \frac{1}{15} \sqrt{\frac{\pi}{2}} \operatorname{erfi} \left(\frac{K[1]}{\sqrt{2}} \right) K[1] \right) dx \right. \right. \right.$$

✓ **Maple** : cpu = 0.165 (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),x))`

$$y(x) = \left(c_3 + \int \frac{(2xc_1 + c_2 - (\int \int -f(x) \, dx \, dx)) e^{\frac{x^2}{2}}}{x^6} dx \right) e^{-\frac{x^2}{2}} x^5$$

2.1482

ODE No. 1482

$$axy(x) - b + 2xy^{(3)}(x) + 3y''(x) = 0$$

✓ **Mathematica** : cpu = 23.6118 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 {}_0F_2\left(\begin{matrix} 2 \\ 3, 6 \end{matrix}; -\frac{ax^3}{54}\right) + \int_1^x \frac{-10192a^3 {}_0F_2\left(\begin{matrix} 7 \\ 6, 3 \end{matrix}; -\frac{1}{54}aK[1]^3\right) {}_0F_2\left(\begin{matrix} 11 \\ 6, 6 \end{matrix}; -\frac{1}{54}aK[1]^3\right) {}_0F_2\left(\begin{matrix} 8 \\ 3 \end{matrix}\right)}{\dots} dx \right\} \right\}$$

✓ **Maple** : cpu = 0.816 (sec), leaf count = 1614

```
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 = 0.141287 (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] == 0,x,nu]

$$\left\{ \left\{ y(x) \rightarrow \frac{c_3 e^x x \Gamma\left(\frac{5}{2} - 3\nu\right) \left(\frac{{}_2F_1\left(\frac{3}{2} - 3\nu; 1 - 2\nu; -x\right)}{3(2\nu - 1)x} + \frac{2}{3x\Gamma(2 - 2\nu)} \right)}{\Gamma\left(\frac{3}{2} - \nu\right)} + c_2 e^x G_{2,3}^{2,1}\left(x \left| \begin{matrix} 1, 3\nu - \frac{1}{2} \\ 1, 2\nu, 0 \end{matrix} \right. \right) + c_1 e^x \right\} \right\}$$

✓ **Maple** : cpu = 0.251 (sec), leaf count = 37

dsolve(2*x*diff(diff(diff(y(x),x),x),x)-4*(x+nu-1)*diff(diff(y(x),x),x)+(2*x+6*nu-5)*diff(y(x),x),x,nu)

$$y(x) = c_1 e^x + c_2 e^{\frac{x}{2}} x^\nu \operatorname{BesselI}\left(\nu, \frac{x}{2}\right) + c_3 e^{\frac{x}{2}} x^\nu \operatorname{BesselK}\left(\nu, \frac{x}{2}\right)$$

2.1484

ODE No. 1484

$$6y'(x)(ak+bx)+3(2ax+k)y''(x)+y(x)(3bk+2cx)+2xy^{(3)}(x)=0$$

✖

Mathematica : cpu = 62.01 (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] + 2*x*Derivative[3][y][x], x]

, DifferentialRoot result

$$\{\{y(x) \rightarrow (x)\}\}$$

✖

Maple : cpu = 0. (sec), leaf count = 0

dsolve(2*x*diff(diff(diff(y(x),x),x),x)+3*(2*a*x+k)*diff(diff(y(x),x),x)+6*(a*k+b*x)*diff(y(x),x),x)

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol}\left(\left\{(3bk+2cx)\_Y(x) + (6ak+6bx)\left(\frac{d}{dx}\_Y(x)\right) + (6ax+3k)\left(\frac{d^2}{dx^2}\_Y(x)\right) + 2x\left(\frac{d^3}{dx^3}\_Y(x)\right)\right.\right.$$

2.1485

ODE No. 1485

$$(x-2)xy^{(3)}(x)-(x-2)xy''(x)-2y'(x)+2y(x)=0$$

✓

Mathematica : cpu = 0.343955 (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][x], y[x], x]

$$\left\{\left\{y(x)\rightarrow \frac{1}{4}c_3x^2\left(-\frac{4e^{x-2}\text{Ei}(2-x)}{x^2}+\frac{2}{x^2}+\frac{2}{x}+\log(2-x)-\log(x)\right)+c_1x^2+c_2e^x\right\}\right\}$$

✓

Maple : cpu = 0.327 (sec), leaf count = 51

dsolve((x-2)*x*diff(diff(diff(y(x),x),x),x)-(x-2)*x*diff(diff(y(x),x),x)-2*diff(y(x),x)+2*y(x),x))=0,y(x))

$$y(x)=c_3\text{Ei}_1\left(x-2\right)e^{x-2}+\frac{c_3x^2\ln\left(x-2\right)}{4}+c_2e^x-\frac{c_3x^2\ln\left(x\right)}{4}+\frac{\left(2+2x\right)c_3}{4}+c_1x^2$$

2.1486

ODE No. 1486

$$(2x-1)y^{(3)}(x)-8xy'(x)+8y(x)=0$$

✓ **Mathematica** : cpu = 0.710633 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{4}c_3x\left(\frac{e^{2x-2}\text{Ei}(2-4x)}{x}-\frac{2\text{Ei}(1-2x)}{e}-\frac{e^{-2x}}{x}\right)+c_1x-c_2e^{2x}\right\}\right\}$$

✓ **Maple** : cpu = 0.249 (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))
```

$$y(x)=xc_1+c_2e^{2x}-\frac{c_3(2xe^{-1}\text{Ei}_1(2x-1)-\text{Ei}_1(-2+4x)e^{2x-2}-e^{-2x})}{4}$$

2.1487

ODE No. 1487

$$(2x-1)y^{(3)}(x)+(x+4)y''(x)+2y'(x)=0$$

✓

Mathematica : cpu = 1.4242 (sec), leaf count = 87

DSolve[2*Derivative[1][y][x] + (4 + x)*Derivative[2][y][x] + (-1 + 2*x)*Derivative[3][y][x] ==

$$\left\{\left\{y(x)\rightarrow \int_1^x\left(\frac{e^{-\frac{K[1]}{2}}c_1\left(1+\frac{1}{4\left(\frac{K[1]}{2}-\frac{1}{4}\right)}\right)+e^{-\frac{K[1]}{2}}c_2L_{-\frac{1}{4}}^{\frac{5}{4}}\left(\frac{K[1]}{2}-\frac{1}{4}\right)}\right)dK[1]+c_3\right\}\right\}$$

✓

Maple : cpu = 0.342 (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,

$$y(x)=\frac{\left(c_3+\int\frac{(2xc_1+c_2)e^{\frac{x}{2}}}{(2x-1)^{3/4}}dx\right)e^{-\frac{x}{2}}}{(2x-1)^{1/4}}$$

2.1488

ODE No. 1488

$$ax^2y(x)+x^2y^{(3)}(x)-6y'(x)=0$$

✓

Mathematica : cpu = 0.434482 (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]`

$$\left\{\left\{y(x)\rightarrow \frac{c_1e^{-\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2\right)}{x}+\frac{c_2e^{\sqrt[3]{-1}\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2(-1)^{2/3}\right)}{x}+\frac{c_3e^{-(-1)^{2/3}\sqrt[3]{a}x}\left(\sqrt[3]{a}x-2\sqrt[3]{-1}\right)}{x}\right\}\right\}$$

✓

Maple : cpu = 0.725 (sec), leaf count = 132

`dsolve(x^2*diff(diff(diff(y(x),x),x),x)-6*diff(y(x),x)+y(x)*a*x^2=0,y(x))`

$$y(x)=\frac{-\left((-i-\sqrt{3})\left(-a^4\right)^{2/3}+ia^3x\right)c_3e^{-\frac{i\left(-a^4\right)^{1/3}x\left(-i+\sqrt{3}\right)}{2a}}+\left((-i+\sqrt{3})\left(-a^4\right)^{2/3}+ia^3x\right)c_2e^{\frac{i\left(-a^4\right)^{1/3}x\left(\sqrt{3}+i\right)}{2a}}}{x}$$

2.1489

ODE No. 1489

$$x^2y^{(3)}(x) + (x + 1)y''(x) - y(x) = 0$$

✗ Mathematica : cpu = 0.644289 (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

$$\{\{y(x) \rightarrow (x)\}\}$$

✗ 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

$$y(x) = \text{DESol}\left(\left\{-\_Y(x) + (1 + x)\left(\frac{d^2}{dx^2}-Y(x)\right) + x^2\left(\frac{d^3}{dx^3}-Y(x)\right)\right\}, \{\_Y(x)\}\right)$$

2.1490

ODE No. 1490

$$x^2y^{(3)}(x) + (x^2 + 1) y'(x) - xy''(x) = 0$$

✓ **Mathematica** : cpu = 0.0278425 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{2} c_1 x^2 {}_0\tilde{F}_1\left(; 2; -\frac{x^2}{4} \right) + c_2 x Y_1(x) + c_3 \right\} \right\}$$

✓ **Maple** : cpu = 0.062 (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),x)
```

$$y(x) = c_1 + c_2 x \operatorname{BesselJ}(1, x) + c_3 x \operatorname{BesselY}(1, x)$$

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 = 0.0427129 (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*Derivative[3][y][x] == 4*a^3*x^(2*a-1)*y[x], y[x], x]

$$\left\{\left\{y(x)\rightarrow c_2\left(x^{2a}\right)^{-\nu}{}_1F_2\left(-\nu-\frac{1}{2};1-2\nu,1-\nu;-x^{2a}\right)+c_3\left(x^{2a}\right)^{\nu}{}_1F_2\left(\nu-\frac{1}{2};\nu+1,2\nu+1;-x^{2a}\right)+c_1{}_1F_2\left(-\nu-\frac{1}{2};1-2\nu,1-\nu;-x^{2a}\right)\right\}\right.$$

✓

Maple : cpu = 0.11 (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)*diff(y(x),x),y(x))

$$y(x)=c_1\operatorname{hypergeom}\left(\left[-\frac{1}{2}\right],\left[-\nu+1,\nu+1\right],-x^{2a}\right)+c_2x^{-2a\nu}\operatorname{hypergeom}\left(\left[-\frac{1}{2}-\nu\right],\left[-\nu+1,1-2\nu\right],-x^{2a}\right)$$

2.1492

ODE No. 1492

$$(4x(n-m)+m(2m-1)+2x^2)\,y'(x)-2n(-2m+2x+1)y(x)-3x(x-m)y''(x)+x^2y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.302456 (sec), leaf count = 43

```
DSolve[-2*n*(1 - 2*m + 2*x)*y[x] + (m*(-1 + 2*m) + 4*(-m + n)*x + 2*x^2)*Derivative[1][y][x] -
```

$$\left\{\left\{y(x)\rightarrow c_2U(-n,m,x)L_n^{m-1}(x)+c_1U(-n,m,x)^2+c_3L_n^{m-1}(x)^2\right\}\right\}$$

✓ **Maple** : cpu = 0.148 (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+
```

$$y(x)=c_1\operatorname{KummerM}(-n,m,x)^2+c_2\operatorname{KummerU}(-n,m,x)^2+c_3\operatorname{KummerM}(-n,m,x)\operatorname{KummerU}(-n,m,x)$$

2.1493

ODE No. 1493

$$-f(x)+x^2y^{(3)}(x)+(x^2+2)\,y'(x)+4xy''(x)+3xy(x)=0$$

✓

Mathematica : cpu = 1.76686 (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*Deriva

$$\left\{\left\{y(x)\rightarrow \frac{{}_2F_2\left(1;\frac{1}{2},\frac{1}{2};-\frac{x^2}{4}\right)\int_1^x\frac{9\pi(J_1(K[3])Y_0(K[3])-J_0(K[3])Y_1(K[3]))f(K[3])K[3]^2}{2(16{}_1F_2(3;\frac{5}{2},\frac{5}{2};-\frac{1}{4}K[3]^2)K[3]^4-9\pi H_0(K[3])K[3]^3+18K[3]^2-9\pi H_0(K[3])K[3]+18)}dK[3]+x}\right.\right.$$

✓

Maple : cpu = 0.475 (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*

Expression too large to display

2.1494

ODE No. 1494

$$x^2y^{(3)}(x)+5xy''(x)+4y'(x)-\log(x)=0$$

✓

Mathematica : cpu = 0.0293878 (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,

$$\left\{\left\{y(x)\rightarrow-\frac{x}{2}+\frac{1}{4}x\log(x)-\frac{c_1}{x}-\frac{2c_2}{x}-\frac{2c_2\log(x)}{x}+c_3\right\}\right\}$$

✓

Maple : cpu = 0.031 (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,

$$y(x)=\frac{(x^2+4c_2)\ln(x)-2x^2+4xc_1+4c_3}{4x}$$

2.1495

ODE No. 1495

$$x^2y^{(3)}(x)+6xy''(x)+6y'(x)=0$$

✓

Mathematica : cpu = 0.0088944 (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]

$$\left\{\left\{y(x)\rightarrow-\frac{c_1}{2x^2}-\frac{c_2}{x}+c_3\right\}\right\}$$

✓

Maple : cpu = 0.011 (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 = 0.199257 (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,x, y]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_1 e^{-\sqrt[3]{a} x}}{x^2} + \frac{c_2 e^{\sqrt[3]{-1} \sqrt[3]{a} x}}{x^2} + \frac{c_3 e^{-(-1)^{2/3} \sqrt[3]{a} x}}{x^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.028 (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),y(x))
```

$$y(x) = \frac{c_1 e^{\frac{(-a)^{1/3} (i \sqrt{3} - 1) x}{2}} + c_2 e^{-\frac{(-a)^{1/3} (1 + i \sqrt{3}) x}{2}} + c_3 e^{(-a)^{1/3} x}}{x^2}$$

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 = 0.338856 (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

$$\left\{\left\{y(x)\rightarrow c_1{}_0F_2\left(\left[\frac{2}{3}-p,\frac{1}{3}-q;\frac{x^3}{27}\right]+c_2(-1)^{\frac{1}{3}(3p+1)}3^{-3p-1}x^{3p+1}{}_0F_2\left(\left[p+\frac{4}{3},p-q+\frac{2}{3};\frac{x^3}{27}\right]+c_3(-1)^{\frac{1}{3}(3q+1)}3^{-3q-1}x^{3q+1}{}_0F_2\left(\left[p+\frac{4}{3},p-q+\frac{2}{3};\frac{x^3}{27}\right]\right)\right\}\right\}$$

✓

Maple : cpu = 0.261 (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),x))=0)

$$y(x)=c_1\operatorname{hypergeom}\left(\left[\right],\left[-p+\frac{2}{3},-q+\frac{1}{3}\right],\frac{x^3}{27}\right)+c_2x^{3p+1}\operatorname{hypergeom}\left(\left[\right],\left[p+\frac{4}{3},\frac{2}{3}-q+p\right],\frac{x^3}{27}\right)+c_3x^{3q+1}\operatorname{hypergeom}\left(\left[\right],\left[p+\frac{4}{3},\frac{2}{3}-q+p\right],\frac{x^3}{27}\right)$$

2.1498

ODE No. 1498

$$(ax^2 + 6n) \, y'(x) - 2axy(x) - 2(n + 1)xy''(x) + x^2y^{(3)}(x) = 0$$

✓

Mathematica : cpu = 204.678 (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

$$\left\{ \left\{ y(x) \rightarrow -\frac{\pi c_3 2^{-n-\frac{3}{2}} x (\sqrt{a} x)^{-n-\frac{1}{2}} \left(-a^{3/2} 2^{2n} x^3 \sec(\pi n) \Gamma\left(\frac{3}{2} - n\right) \Gamma\left(n + \frac{3}{2}\right) J_{\frac{1}{2}(2n+1)}(\sqrt{a} x) {}_1\tilde{F}_2\left(\frac{3}{2} - n; \frac{1}{2} - n, \frac{3}{2} - n; -a x^2\right) \right)}{a^{3/2} 2^{2n} x^3 \sec(\pi n) \Gamma\left(\frac{3}{2} - n\right) \Gamma\left(n + \frac{3}{2}\right) J_{\frac{1}{2}(2n+1)}(\sqrt{a} x) {}_1\tilde{F}_2\left(\frac{3}{2} - n; \frac{1}{2} - n, \frac{3}{2} - n; -a x^2\right)} \right\} \right\}$$

✓

Maple : cpu = 0.249 (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),x),x)

$$y(x) = c_1 x^{\frac{1}{2}+n} \operatorname{BesselJ}\left(-\frac{1}{2}-n, \sqrt{a} x\right) + c_2 x^{\frac{1}{2}+n} \operatorname{BesselY}\left(-\frac{1}{2}-n, \sqrt{a} x\right) + c_3 (a x^2 + 4n - 2)$$

2.1499

ODE No. 1499

$$-\left(\nu^2+x^2-\frac{1}{4}\right)y'(x)+\left(\nu^2+x^2-2x-\frac{1}{4}\right)y(x)+x^2y^{(3)}(x)-(x^2-2x)y''(x)=0$$

✓

Mathematica : cpu = 0.217433 (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)*Derivative[2][y][x], x]

$$\left\{\left\{y(x)\rightarrow \frac{c_3e^xx^{\nu+\frac{1}{2}}\Gamma\left(\nu+\frac{1}{2}\right){}_1\tilde{F}_1\left(\nu+\frac{1}{2};2\nu+1;-2x\right)}{\Gamma\left(\frac{3}{2}-\nu\right)}+c_22^{-\nu-\frac{1}{2}}e^xG_{2,3}^{2,1}\left(2x\left|\begin{array}{c}1,0\\ \frac{1}{2}-\nu,\nu+\frac{1}{2},0\end{array}\right.\right)+c_1e^x\right\}\right\}$$

✓

Maple : cpu = 0.237 (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(x),x),x))

$$y(x)=c_1e^x+c_2\sqrt{x}\operatorname{BesselI}(\nu,x)+c_3\sqrt{x}\operatorname{BesselK}(\nu,x)$$

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 = 29.874 (sec), leaf count = 0

```
DSolve[-(nu*(1 + x)*y[x]) + nu*(1 + 2*x)*Derivative[1][y][x] - x*(v + x)*Derivative[2][y][x] +
```

, DifferentialRoot result

$$\{\{y(x)\rightarrow (x)\}\}$$

 **Maple** : cpu = 0.201 (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(
```

$$y(x)=c_1e^x+c_2x^{\frac{\nu}{2}+\frac{1}{2}}\operatorname{BesselJ}\left(-\nu-1,2\sqrt{\nu}\sqrt{x}\right)+c_3x^{\frac{\nu}{2}+\frac{1}{2}}\operatorname{BesselY}\left(-\nu-1,2\sqrt{\nu}\sqrt{x}\right)$$

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 = 0.18014 (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][y][x] + x^2*Derivative[3][y][x] == 0, y[x], x]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_3e^xx^{\nu+\frac{1}{2}}\Gamma\left(\nu+\frac{1}{2}\right){}_1\tilde{F}_1\left(\nu+\frac{1}{2};2\nu+1;-x\right)}{\Gamma\left(\frac{3}{2}-\nu\right)}+c_2e^xG_{2,3}^{2,1}\left(x\left|\begin{array}{c}1,0\\\frac{1}{2}-\nu,\nu+\frac{1}{2},0\end{array}\right.\right)+c_1e^x\right\}\right\}$$

✓ **Maple** : cpu = 0.205 (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)*y(x)=0,y(x))
```

$$y(x)=c_1e^x+c_2e^{\frac{x}{2}}\sqrt{x}\operatorname{BesselI}\left(\nu,\frac{x}{2}\right)+c_3e^{\frac{x}{2}}\sqrt{x}\operatorname{BesselK}\left(\nu,\frac{x}{2}\right)$$

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 = 0.0891497 (sec), leaf count = 98

DSolve[2*x^2*y[x] - (-6 + 2*x^3)*Derivative[1][y][x] - (-6*x + x^4)*Derivative[2][y][x] + x^2*

$$\left\{\left\{y(x)\rightarrow\frac{c_2\Gamma\left(\frac{1}{3}\right){}_2F_2\left(-\frac{2}{3},\frac{1}{3};\frac{2}{3},\frac{4}{3};\frac{x^3}{3}\right)}{3x\Gamma\left(\frac{4}{3}\right)}+\frac{\sqrt[3]{-\frac{1}{3}}c_3\Gamma\left(\frac{2}{3}\right){}_2F_2\left(-\frac{1}{3},\frac{2}{3};\frac{4}{3},\frac{5}{3};\frac{x^3}{3}\right)}{3\Gamma\left(\frac{5}{3}\right)}+\frac{c_1}{x^2}\right\}\right\}$$

✓

Maple : cpu = 0.562 (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(

$$y(x)=\frac{c_3\left(\int e^{\frac{x^3}{6}}\sqrt{x}\left(\text{BesselK}\left(\frac{5}{6},-\frac{x^3}{6}\right)x^3-\text{BesselK}\left(\frac{1}{6},-\frac{x^3}{6}\right)x^3+2\text{BesselK}\left(\frac{1}{6},-\frac{x^3}{6}\right)\right)dx\right)+c_2\left(\int e^{\frac{x^3}{6}}\sqrt{x}\right)}{x^2}$$

2.1503

ODE No. 1503

$$(x^2 + 1) \, y^{(3)}(x) + \frac{1}{x^2} + 8xy''(x) + 10y'(x) - 2\log(x) - 3 = 0$$

✓

Mathematica : cpu = 0.460894 (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)*D

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{225} \left(-\frac{51x}{x^2 + 1} - \frac{34x}{(x^2 + 1)^2} - \frac{225c_2x}{x^2 + 1} - \frac{150c_2x}{(x^2 + 1)^2} - \frac{225c_1}{4(x^2 + 1)^2} - 9x + \frac{47}{x - i} + \frac{47}{x + i} + 45x \log(x) \right) \right. \right.$$

✓

Maple : cpu = 0.039 (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

$$y(x) = \frac{(45x^5 + 150x^3 + 225x) \ln(x) - 9x^5 + 225c_1x^4 + (225c_2 - 50)x^3 + 450c_1x^2 + (675c_2 - 225)x + 225c_1}{225(x^2 + 1)^2}$$

2.1504

ODE No. 1504

$$(x^2 + 2) \, y^{(3)}(x) + (x^2 + 2) \, y'(x) - 2xy''(x) - 2xy(x) = 0$$

✓

Mathematica : cpu = 0.406451 (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)*Derivat

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 x^2}{2} + \frac{1}{2} i c_2 e^{-i x} - \frac{1}{4} c_3 e^{i x} \right\} \right\}$$

✓

Maple : cpu = 0.184 (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),x

$$y(x) = c_1 x^2 + c_2 \cos(x) + c_3 \sin(x)$$

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 = 60.3333 (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)

$$\left\{ \left\{ y(x) \rightarrow c_3 \text{MathieuC}\left[-\frac{a}{2} - \frac{b}{2} + 1, \frac{a}{4}, \cos^{-1}(\sqrt{x})\right] \text{MathieuS}\left[-\frac{a}{2} - \frac{b}{2} + 1, \frac{a}{4}, \cos^{-1}(\sqrt{x})\right] + c_1 \text{MathieuC}\right.$$

✓

Maple : cpu = 0.213 (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)*d

$$y(x) = c_1 \text{MathieuC}\left(-\frac{a}{2} - \frac{b}{2} + 1, \frac{a}{4}, \arccos(\sqrt{x})\right)^2 + c_2 \text{MathieuS}\left(-\frac{a}{2} - \frac{b}{2} + 1, \frac{a}{4}, \arccos(\sqrt{x})\right)^2 + c_3 \text{Ma}$$

2.1506

ODE No. 1506

$$4x^2y^{(3)}(x) + (x^2 + 14x - 1) \, y''(x) + 4(x + 1)y'(x) + 2y(x) = 0$$

✓

Mathematica : cpu = 0.371785 (sec), leaf count = 150

DSolve[2*y[x] + 4*(1 + x)*Derivative[1][y][x] + (-1 + 14*x + x^2)*Derivative[2][y][x] + 4*x^2*

$$\left\{\left\{y(x) \rightarrow c_2 e^{\frac{1}{4} \left(-x-\frac{1}{x}+2 \log (x)\right)} \int_1^x e^{\frac{K[1]^2-10 \log (K[1]) K[1]+1}{4 K[1]}} d K[1]-\sqrt{\pi } c_3 \left(\operatorname{erfi}\left(\frac{1-x}{2 \sqrt{x}}\right)+\operatorname{erfi}\left(\frac{x+1}{2 \sqrt{x}}\right)-i(e-1)\right.\right.$$

✓

Maple : cpu = 0.501 (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

$$y(x)=\left(c_3+\int \frac{(2xc_1+c_2)\,e^{\frac{x}{4}}e^{\frac{1}{4x}}}{4x^{5/2}}dx\right)e^{-\frac{x}{4}}e^{-\frac{1}{4x}}\sqrt{x}$$

2.1507

ODE No. 1507

$$xy^{(3)}(x)(ax + b) + (\alpha x + \beta)y''(x) - f(x) + xy'(x) + y(x) = 0$$

✓

Mathematica : cpu = 6.78745 (sec), leaf count = 56731

DSolve[-f[x] + y[x] + x*Derivative[1][y][x] + (beta + alpha*x)*Derivative[2][y][x] + x*(b + a*

Too large to display

✓

Maple : cpu = 1.073 (sec), leaf count = 1212

dsolve((a*x+b)*x*diff(diff(diff(y(x),x),x),x)+(alpha*x+beta)*diff(diff(y(x),x),x)+x*diff

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 = 0.587747 (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,x,nu]
```

$$\left\{\left\{y(x) \rightarrow c_2 3^{\nu-1} a^{\frac{1-\nu}{3}} x^{1-\nu} {}_0F_2\left(;\,1-\frac{2\nu}{3},1-\frac{\nu}{3};-\frac{ax^3}{27}\right)+c_3 3^{-\nu-1} a^{\frac{\nu+1}{3}} x^{\nu+1} {}_0F_2\left(;\,\frac{\nu}{3}+1,\frac{2\nu}{3}+1;-\frac{ax^3}{27}\right)+\right.\right.$$

✓ **Maple** : cpu = 0.154 (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),nu)
```

$$y(x)=c_1 x \operatorname{hypergeom}\left(\left[\right],\left[\frac{\nu}{3}+1,-\frac{\nu}{3}+1\right],-\frac{a x^3}{27}\right)+c_2 x^{-\nu+1} \operatorname{hypergeom}\left(\left[\right],\left[-\frac{\nu}{3}+1,1-\frac{2 \nu}{3}\right],-\frac{a x^3}{27}\right)-$$

2.1509

ODE No. 1509

$$\left((1-4\nu^2)x+4x^3\right)y'(x)+\left(4\nu^2-1\right)y(x)+x^3y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.0099202 (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], x]
```

$$\left\{\left\{y(x)\rightarrow c_1xJ_\nu(x)^2+c_3xY_\nu(x)^2+c_2xJ_\nu(x)Y_\nu(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.064 (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),x))
```

$$y(x)=x\left(\operatorname{BesselY}\left(\nu,x\right)^2c_2+\operatorname{BesselY}\left(\nu,x\right)\operatorname{BesselJ}\left(\nu,x\right)c_3+\operatorname{BesselJ}\left(\nu,x\right)^2c_1\right)$$

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 = 0.0402324 (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][y[x]] == 0, x]

$$\left\{\left\{y(x)\rightarrow c_1x^{1-\nu}e^{\frac{x^{\nu\text{Root}\left[\#1^3+\#1a+b\&,1\right]}}{\nu}}+c_2x^{1-\nu}e^{\frac{x^{\nu\text{Root}\left[\#1^3+\#1a+b\&,2\right]}}{\nu}}+c_3x^{1-\nu}e^{\frac{x^{\nu\text{Root}\left[\#1^3+\#1a+b\&,3\right]}}{\nu}}\right\}\right\}$$

✗

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*x^2-nu^2)*diff(y(x),x),x)

, result contains DESol or ODESolStruc

$$y(x)=\text{DESol}\left(\left\{x^3\left(\frac{d^3}{dx^3}-Y(x)\right)+\left(x^{2\nu}ax-\nu^2x+x\right)\left(\frac{d}{dx}-Y(x)\right)+\left(x^{2\nu}a\nu-ax^{2\nu}+bx^{3\nu}+\nu^2-1\right)-Y(x)\right\}\right)$$

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 = 0.0578366 (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*Derivati

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1}{x^2} + \frac{1}{450} \left(-50x^4 + 50x^4\log(x) - 18x^3 - 135x^3\log(x) \right) + c_2x + c_3x\log(x) \right\} \right\}$$

✓

Maple : cpu = 0.039 (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(

$$y(x) = \frac{(50x^6 - 135x^5 + 450c_3x^3)\ln(x) - 50x^6 - 18x^5 + 450c_1x^3 + 450c_2}{450x^2}$$

2.1512

ODE No. 1512

$$(1-a^2)\,xy'(x)+x^3y^{(3)}(x)+3x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0376309 (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], x]
```

$$\left\{\left\{y(x)\rightarrow-\frac{c_1x^{-a}}{a}+\frac{c_2x^a}{a}+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.012 (sec), leaf count = 18

```
dsolve(x^3*diff(diff(diff(y(x),x),x),x)+3*x^2*diff(diff(y(x),x),x)+(-a^2+1)*x*diff(y(x),x), y(x))
```

$$y(x)=c_1+c_2x^{-a}+c_3x^a$$

2.1513

ODE No. 1513

$$x^3y^{(3)}(x) - 4x^2y''(x) + (x^2 + 8)xy'(x) - 2(x^2 + 4)y(x) = 0$$

✓ **Mathematica** : cpu = 0.121711 (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*Derivative[3][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1x^2 + c_3x\cos(x) - c_2x\sin(x) \right\} \right\}$$

✓ **Maple** : cpu = 0.177 (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)=0,y(x),x)
```

$$y(x) = x(\cos(x)c_3 + \sin(x)c_2 + xc_1)$$

2.1514

ODE No. 1514

$$(ax^3-12)\,y(x)+x^3y^{(3)}(x)+6x^2y''(x)=0$$

✓

Mathematica : cpu = 0.545494 (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]

$$\left\{\left\{y(x)\rightarrow \frac{c_1e^{-\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2\right)}{x^3}+\frac{c_2e^{\sqrt[3]{-1}\sqrt[3]{a}x}\left(\sqrt[3]{a}x+2(-1)^{2/3}\right)}{x^3}+\frac{c_3e^{-(-1)^{2/3}\sqrt[3]{a}x}\left(\sqrt[3]{a}x-2\sqrt[3]{-1}\right)}{x^3}\right\}\right\}$$

✓

Maple : cpu = 0.654 (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))

$$y(x)=\frac{-\left((-i-\sqrt{3})\left(-a^4\right)^{2/3}+ia^3x\right)c_3e^{\frac{i\left(i-\sqrt{3}\right)\left(-a^4\right)^{1/3}x}{2a}}-\left((-i+\sqrt{3})\left(-a^4\right)^{2/3}+ia^3x\right)c_2e^{\frac{i\left(-a^4\right)^{1/3}x\left(\sqrt{3}+i\right)}{2a}}}{x^3}.$$

2.1515

ODE No. 1515

$y(x) \left(a(4c^2\nu^2 - a^2) + 4b^2c^2(c - a)x^{2c} \right) + y'(x) \left(3(a - 1)ax + 4b^2c^2x^{2c+1} - 4c^2\nu^2 + 1 \right) + 3(1 - a)x^2y''(x) + x^3y^{(3)}(x)$

✗ Mathematica : cpu = 0.200667 (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)*x^3)*Derivative[1][y][x] + 3*(1 - a)*x^2*Derivative[2][y][x] + 3*a*x^3*Derivative[3][y][x], y[x], 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)*x^3)*Derivative[1][y][x] + 3*(1 - a)*x^2*Derivative[2][y][x] + 3*a*x^3*Derivative[3][y][x], y[x], 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)+3*(1-a)*x^3)*diff(y(x),x),y(x))
```

, 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 = 260.162 (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*Derivative[3][y][x] == 0,x,Assumptions->Element[x,Reals]]

Too large to display

✓

Maple : cpu = 0.438 (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)+(4*x+30)*y(x),x))

$$y(x) = \frac{c_3e^{-x}(x^8 + 28x^7 + 450x^6 + 5100x^5 + 42900x^4 + 267120x^3 + 1179360x^2 + 3326400x + 4536000) \operatorname{Ei}_1(x)}{1}$$

2.1517

ODE No. 1517

$$x^3y^{(3)}(x) - 2x^3 + x^2y''(x) + 2xy'(x) - y(x) + \log(x) = 0$$

✓

Mathematica : cpu = 0.600089 (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][y][x] == 0, y[x], x]

$$\left\{ \left\{ y(x) \rightarrow \frac{i(-)\left(\frac{2x^3}{3-} + \frac{\log(x)}{+} + \frac{1}{2}\right)}{\sqrt{23}} - \frac{i(-)\left(\frac{2x^3}{3-} + \frac{\log(x)}{+} + \frac{1}{2}\right)}{\sqrt{23}} + \frac{i(-)x^{+-2}\left(\frac{2x^3}{++1} - \frac{\log(x)}{+-2} + \frac{1}{(+2)^2}\right)}{\sqrt{23}} + c_1x + c_2 \right\} \right.$$

✓

Maple : cpu = 0.657 (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)-2*y(x),x))

Expression too large to display

2.1518

ODE No. 1518

$$x\left(x^2+1\right)y^{(3)}(x)+3\left(2x^2+1\right)y''(x)-12y(x)=0$$

✓ **Mathematica** : cpu = 0.454191 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{3} c_1\left(2 x^2+1\right)+\frac{1}{3} c_2 x \sqrt{x^2+1}-\frac{c_3\left(2 x^2+1\right)\left(3\left(x^4+x^2\right) \tanh ^{-1}\left(\sqrt{x^2+1}\right)-\sqrt{x^2+1}\left(3 x^2+1\right)\right)}{6 \sqrt{x^2+1}\left(2 x^3+x\right)}\right.\right.$$

✓ **Maple** : cpu = 0.415 (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
```

$$y(x)=\frac{3\operatorname{arctanh}\left(\frac{1}{\sqrt{x^2+1}}\right)\sqrt{x^2+1}c_2x^2+c_1\sqrt{x^2+1}x^2+2c_3x^3-3c_2x^2+c_3x-c_2}{x}$$

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 = 0.027394 (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)*Derivative[3][y][x], y[x], x]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{4}c_1\left(x^3-3x^2+3x+3\right)+\frac{1}{2}c_2\left(-x^3+3x^2-x-1\right)+\frac{1}{8}c_3\left(3x^3-5x^2+x+1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.127 (sec), leaf count = 19

```
dsolve((x+3)*x^2*diff(diff(diff(y(x),x),x),x)-3*x*(x+2)*diff(diff(y(x),x),x)+6*(1+x)*diff(y(x),x),y(x),x)
```

$$y(x)=c_2x^3+c_1x^2+c_3x+c_3$$

2.1520

ODE No. 1520

$y''(x) \left(-6x(a_1 + a_2 + a_3) + 3a_1a_2 + 3a_1a_3 + 3a_2a_3 + 9x^2 \right) + 2(x-a_1)(x-a_2)(x-a_3)y^{(3)}(x) - 2(b + (n^2 + n - 1)x)y'(x) = 0$

✓ **Mathematica** : cpu = 4.54477 (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*a3)*y[x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \operatorname{HeunG} \left[\frac{a_3 - a_1}{a_2 - a_1}, \frac{\frac{1}{4}(a_1 + a_2 + a_3 - b) + \frac{1}{4}a_1(-n^2 - n)}{a_1 - a_2}, \frac{1}{2} \left(\frac{1}{2} - \sqrt{n^2 + n + \frac{1}{4}} \right), \frac{1}{2} \left(\sqrt{n^2 + n + \frac{1}{4}} + \frac{1}{2} \right) \right] \right\} \right.$$

✓ **Maple** : cpu = 0.6 (sec), leaf count = 288

```
dsolve(2*(x-a1)*(x-a2)*(x-a3)*diff(diff(diff(y(x),x),x),x)+(9*x^2-6*(a1+a2+a3)*x+3*a1*a2+3*a1*a3+3*a2*a3)*y(x)=0,y(x))
```

$$y(x) = -c_2(x - a_1) \operatorname{HeunG} \left(\frac{-a_3 + a_1}{-a_2 + a_1}, \frac{(-n^2 - n + 3)a_1 - b}{-4a_2 + 4a_1}, \frac{n}{2} + 1, -\frac{n}{2} + \frac{1}{2}, \frac{3}{2}, \frac{1}{2}, \frac{-x + a_1}{-a_2 + a_1} \right)^2 + c_3 \operatorname{HeunG} \left(\frac{-a_3 + a_1}{-a_2 + a_1}, \frac{(-n^2 - n + 3)a_1 - b}{-4a_2 + 4a_1}, \frac{n}{2} + 1, -\frac{n}{2} + \frac{1}{2}, \frac{3}{2}, \frac{1}{2}, \frac{-x + a_1}{-a_2 + a_1} \right)$$

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 = 0.0567986 (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], y[x], x]
```

$$\left\{\left\{y(x)\rightarrow c_1x^2+c_3x^2\left(x+\frac{1}{x}+\log^2(x)\right)+c_2x^2\log(x)\right\}\right\}$$

✓ **Maple** : cpu = 0.368 (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)*
```

$$y(x)=x\left(\ln(x)\right)^2c_3x+c_2x\ln(x)+c_3x^2+xc_1+c_3)$$

2.1522

ODE No. 1522

$$4x^4y^{(3)}(x) - 4x^3y''(x) + 4x^2y'(x) - 1 = 0$$

✓ **Mathematica** : cpu = 0.0186541 (sec), leaf count = 44

```
DSolve[-1 + 4*x^2*Derivative[1][y][x] - 4*x^3*Derivative[2][y][x] + 4*x^4*Derivative[3][y][x] -
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_1 x^2}{2} - \frac{c_2 x^2}{4} + \frac{1}{2} c_2 x^2 \log(x) - \frac{1}{36 x} + c_3 \right\} \right\}$$

✓ **Maple** : cpu = 0.056 (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)-
```

$$y(x) = \frac{18x^3c_1\ln(x) - 1 + (-9c_1 + 18c_2)x^3 + 36c_3x}{36x}$$

2.1523

ODE No. 1523

$$-(4x^2+2)x^2y''(x)+(10x^2+4)xy'(x)-4(3x^2+1)y(x)+(x^2+1)x^3y^{(3)}(x)=0$$

✓ **Mathematica** : cpu = 0.487857 (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] + x^3*Derivative[3][y][x], x]

$$\left\{\left\{y(x)\rightarrow c_1(-x^3+3x^2-x)+\frac{1}{2}c_2(x^3-2x^2+x)-\frac{c_3x(-x^3+3x^2-x)(\log(x)+1)}{2(x^2-3x+1)}\right\}\right\}$$

✓ **Maple** : cpu = 0.394 (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+2)*x*diff(y(x),x)),x)

$$y(x) = (c_2x\ln(x) + c_3x^2 + (c_1 + c_2)x + c_3)x$$

2.1524

ODE No. 1524

$$x^6y^{(3)}(x)+x^2y''(x)-2y(x)=0$$

✓

Mathematica : cpu = 0.181423 (sec), leaf count = 96

`DSolve[-2*y[x] + x^2*Derivative[2][y][x] + x^6*Derivative[3][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow-\frac{\left(-\frac{1}{3}\right)^{2/3}c_2x\Gamma\left(\frac{1}{3}\right){}_2F_2\left(-\frac{2}{3},\frac{1}{3},\frac{2}{3},\frac{4}{3},\frac{1}{3x^3}\right)+c_3\Gamma\left(\frac{2}{3}\right){}_2F_2\left(-\frac{1}{3},\frac{2}{3},\frac{4}{3},\frac{5}{3},\frac{1}{3x^3}\right)}{3\Gamma\left(\frac{4}{3}\right)}+\frac{c_1x^2}{9\Gamma\left(\frac{5}{3}\right)}+c_1x^2\right\}\right\}$$

✓

Maple : cpu = 0.604 (sec), leaf count = 98

`dsolve(x^6*diff(diff(diff(y(x),x),x),x)+x^2*diff(diff(y(x),x),x)-2*y(x)=0,y(x))`

$$y(x)=x^2\left(\left(\int\frac{e^{\frac{1}{6x^3}}\left(2x^3\operatorname{BesselI}\left(\frac{1}{6},-\frac{1}{6x^3}\right)-\operatorname{BesselI}\left(\frac{1}{6},-\frac{1}{6x^3}\right)-\operatorname{BesselI}\left(-\frac{5}{6},-\frac{1}{6x^3}\right)\right)}{x^{11/2}}dx\right)c_2+\left(\int\frac{e^{\frac{1}{6x^3}}\left(2x^3\operatorname{BesselI}\left(\frac{1}{6},-\frac{1}{6x^3}\right)-\operatorname{BesselI}\left(\frac{1}{6},-\frac{1}{6x^3}\right)-\operatorname{BesselI}\left(-\frac{5}{6},-\frac{1}{6x^3}\right)\right)}{x^{11/2}}dx\right)c_1\right)$$

2.1525

ODE No. 1525

$$ay(x) + x^6y^{(3)}(x) + 6x^5y''(x) = 0$$

✓

Mathematica : cpu = 0.316469 (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]`

$$\left\{\left\{y(x) \rightarrow c_1 e^{\frac{\sqrt[3]{a}}{x}} \left(2x - \sqrt[3]{a}\right) + c_2 e^{\frac{(-1)^{2/3} \sqrt[3]{a}}{x}} \left(x - \frac{1}{2} (-1)^{2/3} \sqrt[3]{a}\right) + c_3 e^{-\frac{\sqrt[3]{-1} \sqrt[3]{a}}{x}} \left(\frac{1}{2} \sqrt[3]{-1} \sqrt[3]{a} + x\right)\right\}\right\}$$

✓

Maple : cpu = 0.866 (sec), leaf count = 291

`dsolve(x^6*diff(diff(diff(y(x),x),x),x)+6*x^5*diff(diff(y(x),x),x)+a*y(x)=0,y(x))`

$$y(x) = \frac{c_1(-8x^3 + a)^4 e^{-\frac{(-a^4)^{1/3}}{ax}}}{\left(2ax + (-a^4)^{1/3}\right)^3 \left(4a^2x^2 - 2x(-a^4)^{1/3}a + (-a^4)^{2/3}\right)^4} + \frac{c_2(-8x^3 + a)^4 e^{\frac{(-a^4)^{1/3}}{ax}}}{\left(2ax + (-a^4)^{1/3}\right)^3 \left(4a^2x^2 - 2x(-a^4)^{1/3}a + (-a^4)^{2/3}\right)^4} + \frac{c_3(-8x^3 + a)^4 e^{-\frac{(-a^4)^{1/3}}{ax}}}{\left(2ax + (-a^4)^{1/3}\right)^3 \left(4a^2x^2 - 2x(-a^4)^{1/3}a + (-a^4)^{2/3}\right)^4}$$

2.1526

ODE No. 1526

$$(x^4 + 2x^2 + 2x + 1) \, x^2 y^{(3)}(x) - (2x^6 + 3x^4 - 6x^2 - 6x - 1) \, y''(x) + (x^6 - 6x^3 - 15x^2 - 12x - 2) \, y'(x) + (x^4 + 2x^2 + 2x + 1) \, y(x) = 0$$

✓ **Mathematica** : cpu = 130.245 (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]] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^x + c_2 e^x x + c_3 e^{\frac{1}{x}} \right\} \right\}$$

✓ **Maple** : cpu = 0.215 (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(y(x),x),x)=0,y(x))
```

$$y(x) = c_2 e^{\frac{1}{x}} + e^x (c_3 x + c_1)$$

2.1527

ODE No. 1527

$$(x-a)^3(x-b)^3y^{(3)}(x)-cy(x)=0$$

✓ **Mathematica** : cpu = 130.14 (sec), leaf count = 165

```
DSolve[-(c*y[x]) + (-a + x)^3*(-b + x)^3*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1(x-b)^2\left(\frac{x-a}{x-b}\right)^{\text{Root}\left[-\#1^3+3\#1^2-2\#1+\frac{c}{(a-b)^3}\&,1\right]}+c_2(x-b)^2\left(\frac{x-a}{x-b}\right)^{\text{Root}\left[-\#1^3+3\#1^2-2\#1+\frac{c}{(a-b)^3}\right]}\right.\right.$$

✓ **Maple** : cpu = 0.801 (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))
```

$$y(x)=(x-a)^{-\frac{2b}{a-b}}(x-b)^{\frac{2a}{a-b}}\left((b-x)^{-\frac{\text{RootOf}\left(\_Z^3+(-3a-3b)\_Z^2+\frac{(2a^2+8ab+2b^2)}{a-b}\_Z-4ba^2-4ab^2-c,\text{index}=1\right)}{a-b}}(a-x)^{\frac{\text{RootOf}\left(\_Z^3+\right)}{a-b}}\right)$$

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 = 1.89158 (sec), leaf count = 72

DSolve[-Cos[x] - Sin[x]*Derivative[1][y][x] + (1 + 2*Cos[x])*Derivative[2][y][x] + Sin[x]*Deri

$$\left\{ \left\{ y(x) \rightarrow \frac{\sin\left(\frac{x}{2}\right) \left(-2 \cos\left(\frac{x}{2}\right) \sin^{-1}(\cos(x)) + \sqrt{2} \left(c_2 x \sin\left(\frac{x}{2}\right) + \cos\left(\frac{x}{2}\right) (c_2 \log(2(\cos(x) + 1)) + 2c_1)\right)\right)}{\cos(x) - 1} + c_3 \right. \right.$$

✓

Maple : cpu = 0.449 (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

$$y(x) = \frac{\ln(\csc(x) - \cot(x)) c_1 - \ln(\sin(x)) c_1 - x \cot(x)^2 + (x c_1 + c_2 + 1) \cot(x) + \csc(x)^2 x + (-x c_1 - c_2}{- \csc(x) + \cot(x)}$$

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 = 0.0886922 (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], y[x], x]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_3x^2}{x+\sin(x)}-\frac{\cos(x)}{x+\sin(x)}+\frac{c_2x}{x+\sin(x)}+\frac{c_1}{x+\sin(x)}\right\}\right\}$$

✓ **Maple** : cpu = 0.139 (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),x)
```

$$y(x)=\frac{c_3+c_1x^2+c_2x-\cos(x)}{\sin(x)+x}$$

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 = 0.0670281 (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] +
```

$\left\{\left\{y(x) \rightarrow c_3 P_\nu(\cos(x)) Q_\nu(\cos(x)) + c_1 P_\nu(\cos(x))^2 + c_2 Q_\nu(\cos(x))^2\right\}\right\}$

✓ **Maple** : cpu = 0.341 (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
```

$y(x) = c_1 \operatorname{hypergeom}\left(\left[-\frac{\nu}{2}, \frac{\nu}{2} + \frac{1}{2}\right], \left[\frac{1}{2}\right], \frac{\cos(2x)}{2} + \frac{1}{2}\right)^2 + c_2 \cos(x)^2 \operatorname{hypergeom}\left(\left[1 + \frac{\nu}{2}, \frac{1}{2} - \frac{\nu}{2}\right], \left[\frac{3}{2}\right], \frac{\cos(2x)}{2} + \frac{1}{2}\right)$

2.1531 ODE No. 1531

$A(x) (f(x)y''(x) + g(x)y'(x) + h(x)y(x)) + f'(x)y''(x) + f(x)y^{(3)}(x) + g'(x)y'(x) + g(x)y''(x) + y(x)h'(x) + h(x)y'(x))$

X Mathematica : cpu = 0.0285001 (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], y[x], x]
```

, could not solve

```
DSolve[y[x]*Derivative[1][h][x] + h[x]*Derivative[1][y][x] + Derivative[1][g][x]*Derivative[1][y][x], y[x], x]
```

X 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(y(x),x)+h(x)*diff(y(x),x)),y(x))
```

, result contains DESol or ODESolStruc

$y(x) = \text{DESol} \left(\left\{ f(x) \left(\frac{d^3}{dx^3} Y(x) \right) + \left(\frac{d}{dx} f(x) + g(x) + A(x) f(x) \right) \left(\frac{d^2}{dx^2} Y(x) \right) + \left(\frac{d}{dx} g(x) + h(x) + A'(x) f(x) \right) Y(x) \right\} \right)$

2.1532

ODE No. 1532

$$ny(x)+y^{(3)}(x)+xy'(x)=0$$

✓

Mathematica : cpu = 0.0159347 (sec), leaf count = 103

`DSolve[n*y[x] + x*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow \frac{c_2x\,{}_1F_2\left(\frac{n}{3}+\frac{1}{3};\frac{2}{3},\frac{4}{3};-\frac{x^3}{9}\right)}{3^{2/3}}+c_1\,{}_1F_2\left(\frac{n}{3};\frac{1}{3},\frac{2}{3};-\frac{x^3}{9}\right)+\frac{c_3x^2\,{}_1F_2\left(\frac{n}{3}+\frac{2}{3};\frac{4}{3},\frac{5}{3};-\frac{x^3}{9}\right)}{3\sqrt[3]{3}}\right\}\right\}$$

✓

Maple : cpu = 0.099 (sec), leaf count = 58

`dsolve(diff(diff(diff(y(x),x),x),x)+x*diff(y(x),x)+n*y(x)=0,y(x))`

$$y(x)=c_1\operatorname{hypergeom}\left(\left[\frac{n}{3}\right],\left[\frac{1}{3},\frac{2}{3}\right],-\frac{x^3}{9}\right)+c_2x\operatorname{hypergeom}\left(\left[\frac{1}{3}+\frac{n}{3}\right],\left[\frac{2}{3},\frac{4}{3}\right],-\frac{x^3}{9}\right)+c_3x^2\operatorname{hypergeom}\left(\left[\frac{2}{3}+\frac{n}{3}\right],\left[\frac{4}{3},\frac{5}{3}\right],-\frac{x^3}{9}\right)$$

2.1533

ODE No. 1533

$$-ny(x)+y^{(3)}(x)-xy'(x)=0$$

✓ **Mathematica** : cpu = 0.0154771 (sec), leaf count = 113

```
DSolve[-(n*y[x]) - x*Derivative[1][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \frac{\sqrt[3]{-1}c_2x\,{}_1F_2\left(\frac{n}{3}+\frac{1}{3},\frac{2}{3},\frac{4}{3},\frac{x^3}{9}\right)}{3^{2/3}}+c_1\,{}_1F_2\left(\frac{n}{3};\frac{1}{3},\frac{2}{3};\frac{x^3}{9}\right)+\frac{(-1)^{2/3}c_3x^2\,{}_1F_2\left(\frac{n}{3}+\frac{2}{3},\frac{4}{3},\frac{5}{3},\frac{x^3}{9}\right)}{3\sqrt[3]{3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.092 (sec), leaf count = 58

```
dsolve(diff(diff(diff(y(x),x),x),x)-x*diff(y(x),x)-n*y(x)=0,y(x))
```

$$y(x)=c_1\operatorname{hypergeom}\left(\left[\frac{n}{3}\right],\left[\frac{1}{3},\frac{2}{3}\right],\frac{x^3}{9}\right)+c_2x\operatorname{hypergeom}\left(\left[\frac{1}{3}+\frac{n}{3}\right],\left[\frac{2}{3},\frac{4}{3}\right],\frac{x^3}{9}\right)+c_3x^2\operatorname{hypergeom}\left(\left[\frac{2}{3}+\frac{n}{3}\right],\left[\frac{4}{3},\frac{5}{3}\right],\frac{x^3}{9}\right)$$

2.1534

ODE No. 1534

$$y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0052298 (sec), leaf count = 24

```
DSolve[Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_4 x^3 + c_3 x^2 + c_2 x + c_1 \right\} \right\}$$

✓ **Maple** : cpu = 0.021 (sec), leaf count = 21

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)=0,y(x))
```

$$y(x) = \frac{1}{6}c_1x^3 + \frac{1}{2}c_2x^2 + c_3x + c_4$$

2.1535

ODE No. 1535

$$-f(x)+y^{(4)}(x)+4y(x)=0$$

✓

Mathematica : cpu = 0.282012 (sec), leaf count = 223

`DSolve[-f[x] + 4*y[x] + Derivative[4][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow e^{-x}\left(\cos(x)\int_1^x\frac{1}{8}e^{K[1]}f(K[1])(\cos(K[1])-\sin(K[1]))\left(\cos^2(K[1])+\sin^2(K[1])\right)dK[1]+\sin(x)\right)\right.\right.$$

✓

Maple : cpu = 0.022 (sec), leaf count = 36

`dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+4*y(x)-f=0,y(x))`

$$y(x)=\frac{f}{4}+c_1e^x\cos(x)+c_2e^x\sin(x)+c_3e^{-x}\cos(x)+c_4e^{-x}\sin(x)$$

2.1536

ODE No. 1536

$$\lambda y(x) + y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0061671 (sec), leaf count = 76

```
DSolve[lambda*y[x] + Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 e^{(-1)^{3/4} \sqrt[4]{\lambda} x} + c_2 e^{-\sqrt[4]{-1} \sqrt[4]{\lambda} x} + c_3 e^{-(-1)^{3/4} \sqrt[4]{\lambda} x} + c_4 e^{\sqrt[4]{-1} \sqrt[4]{\lambda} x} \right\} \right\}$$

✓ **Maple** : cpu = 0.017 (sec), leaf count = 50

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+lambda*y(x)=0,y(x))
```

$$y(x) = c_1 e^{-i(-\lambda)^{1/4} x} + c_2 e^{i(-\lambda)^{1/4} x} + c_3 e^{-(-\lambda)^{1/4} x} + c_4 e^{(-\lambda)^{1/4} x}$$

2.1537

ODE No. 1537

$$-16e^{x^2}x^4 + y^{(4)}(x) - 12y''(x) + 12y(x) = 0$$

✓ **Mathematica** : cpu = 1.5697 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{12}e^{-\left(\left(\sqrt{2(3-\sqrt{6})}-x\right)x\right)-\sqrt{2(3+\sqrt{6})}x-\sqrt{2(3-\sqrt{6})}x}\left(-2\sqrt{3+\sqrt{6}}e^{\sqrt{2(3+\sqrt{6})}x+2\sqrt{2(3-\sqrt{6})}x}x^3+2\sqrt{3+\sqrt{6}}e^{\sqrt{2(3+\sqrt{6})}x+2\sqrt{2(3-\sqrt{6})}x}x^2\right.\right.\right.$$

✓ **Maple** : cpu = 0.175 (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), x))
```

$$y(x) = e^{x^2} + c_1e^{\sqrt{6-2\sqrt{6}}x} + c_2e^{\sqrt{6+2\sqrt{6}}x} + c_3e^{-\sqrt{6-2\sqrt{6}}x} + c_4e^{-\sqrt{6+2\sqrt{6}}x}$$

2.1538

ODE No. 1538

$$a^4y(x)+2a^2y''(x)-\cosh(ax)+y^{(4)}(x)=0$$

✓ **Mathematica** : cpu = 0.171233 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{\cos^2(ax)\cosh(ax)+\sin^2(ax)\cosh(ax)}{4a^4}+c_1\cos(ax)+c_2x\cos(ax)+c_3\sin(ax)+c_4x\sin(ax)\right\}\right\}$$

✓ **Maple** : cpu = 1.504 (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),x))
```

$$y(x)=\frac{(1+e^{2ax})e^{-ax}+8((c_3x+c_1)\cos(ax)+\sin(ax)(c_4x+c_2))a^4}{8a^4}$$

2.1539

ODE No. 1539

$$a^4 \lambda y(x) + a^2 (\lambda + 1) y''(x) + y^{(4)}(x) = 0$$

✓ **Mathematica** : cpu = 0.0082227 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 \cos \left(a \sqrt{\lambda} x \right) + c_2 \sin \left(a \sqrt{\lambda} x \right) + c_3 \cos(ax) + c_4 \sin(ax) \right\} \right\}$$

✓ **Maple** : cpu = 0.04 (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(x),x))
```

$$y(x) = c_1 \sin(ax) + c_2 \cos(ax) + c_3 \sin \left(a \sqrt{\lambda} x \right) + c_4 \cos \left(a \sqrt{\lambda} x \right)$$

2.1540

ODE No. 1540

$$a(bx-1)y''(x)+aby'(x)+\lambda y(x)+y^{(4)}(x)=0$$

 **Mathematica** : cpu = 0.365276 (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], y[x], x]
```

, DifferentialRoot result

$$\{\{y(x)\rightarrow (x)\}\}$$

 **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),x)
```

, result contains DESol or ODESolStruc

$$y(x)=\text{DESol}\left(\left\{\lambda\_Y(x)+ab\left(\frac{d}{dx}\_Y(x)\right)+a(bx-1)\left(\frac{d^2}{dx^2}\_Y(x)\right)+\frac{d^4}{dx^4}\_Y(x)\right\},\{\_Y(x)\}\right)$$

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 = 80.1938 (sec), leaf count = 0

DSolve[(EulerGamma + beta*lambda + a*x^2)*y[x] + (c + b*lambda + a*x^2)*Derivative[2][y][x] + 1

, DifferentialRoot result

$$\{\{y(x)\rightarrow (x)\}\}$$

✖

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

, result contains DESol or ODESolStruc

$$y(x)=\text{DESol}\left(\left\{\left(ax^2+\beta\lambda+\gamma\right)_{-}Y(x)+\left(ax^2+b\lambda+c\right)\left(\frac{d^2}{dx^2}_{-}Y(x)\right)+\frac{d^4}{dx^4}_{-}Y(x)\right\},\left\{_{-}Y(x)\right\}\right)$$

2.1542

ODE No. 1542

$$ay''(x)\wp(x;g2,g3)+by'(x)\wp'(x;g2,g3)+y(x)\left(c\left(6\wp(x;g2,g3)^2-\frac{g2}{2}\right)+d\right)+y^{(4)}(x)=0$$

 **Mathematica** : cpu = 0.0286835 (sec), leaf count = 0

```
DSolve[(d + c*(-1/2*g2 + 6*WeierstrassP[x, {g2, g3}]^2))*y[x] + b*WeierstrassPPrime[x, {g2, g3}]
```

, could not solve

```
DSolve[(d + c*(-1/2*g2 + 6*WeierstrassP[x, {g2, g3}]^2))*y[x] + b*WeierstrassPPrime[x, {g2, g3}]
```

 **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),x)
```

, result contains DESol or ODESolStruc

$$y(x)=\text{DESol}\left(\left\{\frac{d^4}{dx^4}-Y(x)+a\,\text{WeierstrassP}\left(x,g2,g3\right)\left(\frac{d^2}{dx^2}-Y(x)\right)+b\,\text{WeierstrassPPrime}\left(x,g2,g3\right)\left(\frac{d}{dx}-Y(x)\right)\right\}\right)$$

2.1543

ODE No. 1543

$$-y''(x)\left(a+12k^2\operatorname{sn}(z|x)^2\right)+y(x)\left(\alpha\operatorname{sn}(z|x)^2+\beta\right)+by'(x)+y^{(4)}(x)=0$$

✖

Mathematica : cpu = 0.0692692 (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)*y[x], y[x], x]

, could not solve

DSolve[(beta + alpha*JacobiSN[z, x]^2)*y[x] + b*Derivative[1][y][x] - (a + 12*k^2*JacobiSN[z, x]^2)*y[x], y[x], x]

✖

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), x)

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol}\left(\left\{\frac{d^4}{dx^4}-Y(x)+\left(-12k^2\operatorname{JacobiSN}(z,x)^2-a\right)\left(\frac{d^2}{dx^2}-Y(x)\right)+b\left(\frac{d}{dx}-Y(x)\right)+\left(\alpha\operatorname{JacobiSN}(z,x)^2+\beta\right)Y(x)\right\}\right)$$

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 = 0.0163877 (sec), leaf count = 0

```
DSolve[10*Derivative[1][f][x]*Derivative[1][y][x] + y[x]*(3*f[x]^2 + 3*Derivative[2][f][x]) + ...]
```

, could not solve

```
DSolve[10*Derivative[1][f][x]*Derivative[1][y][x] + y[x]*(3*f[x]^2 + 3*Derivative[2][f][x]) + ...]
```

 **Maple** : cpu = 0.016 (sec), leaf count = 41

```
dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+10*f*diff(diff(y(x),x),x)+10*df*diff(y(x),x),x)
```

$$y(x)=\sum_{a=1}^4e^{\text{RootOf}(\_Z^4+10f\_Z^2+10df\_Z+3f^2+3ddf,\text{index}=\_a)x} \_C\_a$$

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 = 0.0107901 (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*
```

$$\left\{\left\{y(x)\rightarrow \sin(2x)+c_1e^{-2x}+c_2e^{-2x}x+c_3e^x+c_4e^xx\right\}\right\}$$

✓ **Maple** : cpu = 0.4 (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
```

$$y(x)=(c_4x+c_2)\mathrm{e}^{-2x}+\sin(2x)+(c_3x+c_1)\mathrm{e}^x$$

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 = 0.882548 (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*Derivative[3][y][x] + y[4][x] == 0,x]

$$\left\{ \left\{ y(x) \rightarrow \frac{2(\sqrt{6}-3)\sqrt{-((\sqrt{6}-3)a)}c_3\exp\left(-\frac{ax^2}{2}-\sqrt{-((\sqrt{6}-3)a)}x-\frac{(-3+\sqrt{3}+\sqrt{6})ax}{\sqrt{-((\sqrt{6}-3)a)}}\right)-2(\sqrt{6}-3)c_3}{(-3-\sqrt{3}+\sqrt{6})(-3+\sqrt{3}+\sqrt{6})a} \right. \right.$$

✓

Maple : cpu = 0.061 (sec), leaf count = 73

dsolve(diff(diff(diff(diff(y(x),x),x),x),x)+4*a*x*diff(diff(diff(y(x),x),x),x)+6*a^2*x^2*diff(diff(y(x),x),x),x)

$$y(x)=e^{-\frac{a x^2}{2}}\left(c_2 e^{\sqrt{-a(\sqrt{6}-3)} x}+c_4 e^{\sqrt{(3+\sqrt{6})} a x}+c_1 e^{-\sqrt{-a(\sqrt{6}-3)} x}+c_3 e^{-\sqrt{(3+\sqrt{6})} a x}\right)$$

2.1547 ODE No. 1547

$3y(x) \left(2g(x)f'(x) + 5f(x)g'(x) + 6f(x)^2g(x) + g''(x) + 3g(x)^2 \right) + y''(x) \left(4f'(x) + 11f(x)^2 + 10g(x) \right) + y'(x) \left(2f(x)g'(x) + 2g(x)f'(x) + 2f(x)g(x) + g'(x) + 2g(x)^2 \right)$

 **Mathematica** : cpu = 0.19127 (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][x]) + y''[x]*(4*f'[x] + 11*f[x]^2 + 10*g[x]) + y'[x]*(2*f[x]*g'[x] + 2*g[x]*f'[x] + 2*f[x]*g[x] + g'[x] + 2*g[x]^2), y[x], x]
```

, 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*Derivative[1][g][x]) + y''[x]*(4*f'[x] + 11*f[x]^2 + 10*g[x]) + y'[x]*(2*f[x]*g'[x] + 2*g[x]*f'[x] + 2*f[x]*g[x] + g'[x] + 2*g[x]^2), y[x], x]
```

 **Maple** : cpu = 0.017 (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*f*g + 4*g^2)*diff(y(x), x) + (2*f*g' + 2*g*f' + 2*f*g + g' + 2*g^2)*y'(x) + (2*g*f' + 2*g*f' + 2*f*g + g' + 2*g^2)*y(x), x)
```

$$y(x) = \sum_{a=1}^4 e^{\text{RootOf}(\_Z^4 + 6f\_Z^3 + (11f^2 + 4df + 10g)\_Z^2 + (6f^3 + 7df f + 30fg + ddf + 10dg)\_Z + 18f^2g + 6df g + 15dg f + 9g^2 + 3ddg, \text{index} = \_a)}$$

2.1548

ODE No. 1548

$$4y^{(4)}(x) - 12y^{(3)}(x) + 11y''(x) - 3y'(x) - 4\cos(x) = 0$$

✓

Mathematica : cpu = 0.110014 (sec), leaf count = 50

DSolve[-4*Cos[x] - 3*Derivative[1][y][x] + 11*Derivative[2][y][x] - 12*Derivative[3][y][x] + 4

$$\left\{\left\{y(x) \rightarrow \frac{18 \sin (x)}{65}-\frac{14 \cos (x)}{65}+2 c_1 e^{x / 2}+\frac{2}{3} c_2 e^{3 x / 2}+c_3 e^x+c_4\right\}\right\}$$

✓

Maple : cpu = 0.118 (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(di

$$y(x)=c_1 e^x+2 c_2 e^{\frac{x}{2}}+\frac{2 c_3 e^{\frac{3 x}{2}}}{3}+\frac{18 \sin (x)}{65}-\frac{14 \cos (x)}{65}+c_4$$

2.1549

ODE No. 1549

$$xy^{(4)}(x)+5y^{(3)}(x)-24=0$$

✓

Mathematica : cpu = 0.028048 (sec), leaf count = 34

```
DSolve[-24 + 5*Derivative[3][y][x] + x*Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \frac{4x^3}{5}+c_4x^2-\frac{c_1}{24x^2}+c_3x+c_2\right\}\right\}$$

✓

Maple : cpu = 0.032 (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 = 1.81083 (sec), leaf count = 270

$$\text{DSolve}[2x^3(-3 + x^2)y[x] - x^2(-7 + 9x^2)\text{Derivative}[1][y][x] + 12x^3\text{Derivative}[2][y][x], y[x], x]$$

$$\left\{ \left\{ y(x) \rightarrow c_3 e^{\frac{x^2}{2}} \int_1^x \frac{e^{\frac{K[1]^2}{2}} \left(\int \frac{\exp\left(\frac{1}{4}\sqrt{5}K[1]^2 + \frac{1}{2}\left(-\frac{1}{2}K[1]^2 - 2\log(K[1])\right)\right) U\left(-\frac{-9+\sqrt{5}}{4\sqrt{5}}, -\frac{1}{2}, -\frac{1}{2}\sqrt{5}K[1]^2\right)}{\sqrt{K[1]}\sqrt[4]{K[1]^2}} dK[1] \right) K[1]}{\sqrt[4]{2}} dK[1] + \right. \right.$$

✓ **Maple** : cpu = 3.313 (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*
```

$$y(x) = -e^{x^2} \left(\int \frac{\text{WhittakerM} \left(\frac{9\sqrt{5}}{20}, \frac{3}{4}, \frac{\sqrt{5}x^2}{2} \right) e^{-\frac{x^2}{4}}}{x^{3/2}} dx \right) c_3 - e^{x^2} \left(\int \frac{\text{WhittakerW} \left(\frac{9\sqrt{5}}{20}, \frac{3}{4}, \frac{\sqrt{5}x^2}{2} \right) e^{-\frac{x^2}{4}}}{x^{3/2}} dx \right) c_4$$

2.1551

ODE No. 1551

$$-2\left(\nu^2x^2+6\right)y''(x)+\nu^2\left(\nu^2x^2+4\right)y(x)+x^2y^{(4)}(x)=0$$

✓

Mathematica : cpu = 0.324606 (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] == 0,x,nu]

$$\left\{\left\{y(x)\rightarrow\frac{c_3(1-x)e^{-\nu x}(\nu^2x^2+\nu^2x+\nu^2+6\nu x+6\nu+15)}{x}+\frac{c_4(1-x)e^{\nu x}(\nu^2x^2+\nu^2x+\nu^2-6\nu x-6\nu+15)}{x}\right.\right.$$

✓

Maple : cpu = 0.247 (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*(diff(y(x),x))^2,x,nu)

$$y(x)=\frac{(c_4\nu^2x^3+6c_4\nu x^2+15c_4x+c_2)e^{-\nu x}+e^{\nu x}(c_3\nu^2x^3-6c_3\nu x^2+15c_3x+c_1)}{x}$$

2.1552

ODE No. 1552

$$ay(x) - bx^2 + x^2y^{(4)}(x) + 2xy^{(3)}(x) = 0$$

 **Mathematica** : cpu = 300.007 (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 = 0.102 (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)-
```

$$y(x) = \frac{bx^2}{a} + c_1\sqrt{x} \operatorname{BesselJ}\left(1, 2(-a)^{1/4}\sqrt{x}\right) + c_2\sqrt{x} \operatorname{BesselY}\left(1, 2(-a)^{1/4}\sqrt{x}\right) + c_3\sqrt{x} \operatorname{BesselJ}\left(1, 2\sqrt{-\sqrt{-a}}\sqrt{x}\right) + c_4\sqrt{x} \operatorname{BesselY}\left(1, 2\sqrt{-\sqrt{-a}}\sqrt{x}\right)$$

2.1553

ODE No. 1553

$$x^2y^{(4)}(x)+4xy^{(3)}(x)+2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0131594 (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]
```

$$\{\{y(x)\rightarrow c_2(-x)+c_4x+c_2x\log(x)-c_1\log(x)+c_3\}\}$$

✓ **Maple** : cpu = 0.011 (sec), leaf count = 17

```
dsolve(x^2*diff(diff(diff(diff(y(x),x),x),x),x)+4*x*diff(diff(diff(y(x),x),x),x)+2*diff(
```

$$y(x)=(c_4x+c_2)\ln(x)+c_3x+c_1$$

2.1554

ODE No. 1554

$$x^2y^{(4)}(x)+6xy^{(3)}(x)+6y''(x)=0$$

✓ **Mathematica** : cpu = 0.0114905 (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]
```

$$\left\{\left\{y(x)\rightarrow c_4x+\frac{1}{2}\left(\frac{c_1}{x}-2c_2\log(x)\right)+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.012 (sec), leaf count = 18

```
dsolve(x^2*diff(diff(diff(diff(y(x),x),x),x),x)+6*x*diff(diff(diff(y(x),x),x),x)+6*diff(y(x),x),x)
```

$$y(x)=c_1+c_2\ln(x)+c_3x+\frac{c_4}{x}$$

2.1555

ODE No. 1555

$$\lambda^2(-y(x)) + x^2y^{(4)}(x) + 6xy^{(3)}(x) + 6y''(x) = 0$$

✓

Mathematica : cpu = 0.0540288 (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], y[x], x]

$$\left\{ \left\{ y(x) \rightarrow c_4 G_{0,4}^{2,0} \left(\frac{\lambda^2 x^2}{16} \middle| -\frac{1}{2}, \frac{1}{2}, 0, 0 \right) + c_2 G_{0,4}^{2,0} \left(\frac{\lambda^2 x^2}{16} \middle| 0, 0, -\frac{1}{2}, \frac{1}{2} \right) + \frac{c_1 \left(J_1 \left(2\sqrt{\lambda}\sqrt{x} \right) + I_1 \left(2\sqrt{\lambda}\sqrt{x} \right) \right)}{2\sqrt{\lambda}\sqrt{x}} \right. \right.$$

✓

Maple : cpu = 0.177 (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(y(x),x),x)

$$y(x) = \frac{c_4 \operatorname{BesselY}\left(1, 2\sqrt{-\lambda}\sqrt{x}\right) + c_3 \operatorname{BesselJ}\left(1, 2\sqrt{-\lambda}\sqrt{x}\right) + c_2 \operatorname{BesselY}\left(1, 2\sqrt{\lambda}\sqrt{x}\right) + c_1 \operatorname{BesselJ}\left(1, 2\sqrt{\lambda}\sqrt{x}\right)}{\sqrt{x}}$$

2.1556

ODE No. 1556

$$x^2y^{(4)}(x)+8xy^{(3)}(x)+12y''(x)=0$$

✓ **Mathematica** : cpu = 0.0129527 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{6}\left(\frac{c_1}{x^2}+\frac{3c_2}{x}\right)+c_4x+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 19

```
dsolve(x^2*diff(diff(diff(diff(y(x),x),x),x),x)+8*x*diff(diff(diff(y(x),x),x),x)+12*diff
```

$$y(x)=c_1+c_2x+\frac{c_3}{x^2}+\frac{c_4}{x}$$

2.1557

ODE No. 1557

$$\lambda^2(-y(x)) + x^2y^{(4)}(x) + 8xy^{(3)}(x) + 12y''(x) = 0$$

✓ **Mathematica** : cpu = 0.0554486 (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], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_4 G_{0,4}^{2,0} \left(\frac{\lambda^2 x^2}{16} \middle| -1, 0, -\frac{1}{2}, \frac{1}{2} \right) + c_2 G_{0,4}^{2,0} \left(\frac{\lambda^2 x^2}{16} \middle| -\frac{1}{2}, \frac{1}{2}, -1, 0 \right) - \frac{3 i c_1 \left(I_2 \left(2 \sqrt{\lambda} \sqrt{x} \right) - J_2 \left(2 \sqrt{\lambda} \sqrt{x} \right) \right)}{4 \lambda x} \right. \right.$$

✓ **Maple** : cpu = 0.118 (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(y(x),x),x)
```

$$y(x) = \frac{c_3 \operatorname{BesselJ}\left(2, 2 \sqrt{-\lambda} \sqrt{x}\right) + c_4 \operatorname{BesselY}\left(2, 2 \sqrt{-\lambda} \sqrt{x}\right) + c_2 \operatorname{BesselY}\left(2, 2 \sqrt{\lambda} \sqrt{x}\right) + c_1 \operatorname{BesselJ}\left(2, 2 \sqrt{\lambda} \sqrt{x}\right)}{x}$$

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 = 0.131117 (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*Derivative[3][y][x] + x^2*Derivative[4][y][x], y[x], x]
```

$$\left\{\left\{y(x)\rightarrow c_4i^{-n+\nu+1}2^{3n-3\nu-3}b^{2(-n+\nu+1)+n-\nu-2}x^{\frac{1}{2}(n-\nu-2)-n+\nu+1}\Gamma(-n+\nu+2)\left(I_{\nu-n}(b\sqrt{x})-J_{\nu-n}(b\sqrt{x})\right)+c_3\right\}\right.$$

✓ **Maple** : cpu = 0.175 (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),x)
```

$$y(x)=x^{-\frac{n}{2}+\frac{\nu}{2}}\left(\text{BesselK}\left(n-\nu,b\sqrt{x}\right)c_3+\text{BesselI}\left(n-\nu,b\sqrt{x}\right)c_1+\text{BesselY}\left(n-\nu,b\sqrt{x}\right)c_4+\text{BesselJ}\left(n-\nu,b\sqrt{x}\right)c_2\right)$$

2.1559

ODE No. 1559

$$a^4(-x^3)y(x)+x^3y^{(4)}(x)+2x^2y^{(3)}(x)-xy''(x)+y'(x)=0$$

✓ **Mathematica** : cpu = 0.230435 (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]
```

$$\left\{\left\{y(x)\rightarrow c_4G_{0,4}^{2,0}\left(\frac{a^4x^4}{256}\middle|0,0,\frac{1}{2},\frac{1}{2}\right)+c_2G_{0,4}^{2,0}\left(\frac{a^4x^4}{256}\middle|\frac{1}{2},\frac{1}{2},0,0\right)+\frac{1}{8}ic_1(I_0(ax)-J_0(ax))+\frac{1}{2}c_3(J_0(ax)+I_0(ax))\right\}\right.$$

✓ **Maple** : cpu = 0.162 (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
```

$$y(x)=c_1\operatorname{BesselI}(0,ax)+c_2\operatorname{BesselJ}(0,ax)+c_3\operatorname{BesselK}(0,ax)+c_4\operatorname{BesselY}(0,ax)$$

2.1560

ODE No. 1560

$$x^3y^{(4)}(x)+6x^2y^{(3)}(x)+6xy''(x)=0$$

✓ **Mathematica** : cpu = 0.009907 (sec), leaf count = 29

```
DSolve[6*x*Derivative[2][y][x] + 6*x^2*Derivative[3][y][x] + x^3*Derivative[4][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\rightarrow c_4x+\frac{1}{2}\left(\frac{c_1}{x}-2c_2\log(x)\right)+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.012 (sec), leaf count = 18

```
dsolve(x^3*diff(diff(diff(diff(y(x),x),x),x),x)+6*x^2*diff(diff(diff(y(x),x),x),x)+6*x*d
```

$$y(x)=c_1+c_2\ln(x)+c_3x+\frac{c_4}{x}$$

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 = 2.70571 (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^2*Derivative[2][y][x] + n^2*x^4*Derivative[4][y][x] == 0, y[x], x]
```

$\left\{\left\{y(x) \rightarrow c_1\left(-2^{n-\frac{5}{2}}\right) \sqrt{x} a^{\frac{2-n}{4}+\frac{1}{4}\left(n-\frac{3}{2}\right)} \Gamma\left(\frac{3}{2}-n\right)\left(\cos \left(\frac{3}{4} \pi\left(\frac{3}{2}-n\right)\right) \operatorname{ber}_{-n-\frac{1}{2}}\left(\sqrt[4]{a} x\right)+\sin \left(\frac{3}{4} \pi\left(\frac{3}{2}-n\right)\right) \operatorname{ber}_{-n-\frac{1}{2}}\left(\sqrt[4]{a} x\right)\right.\right.\right.$

✓ **Maple** : cpu = 0.424 (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)*x*diff(y(x),x),x)
```

$y(x)=\sqrt{x}\left(\operatorname{BesselJ}\left(\frac{1}{2}+n,\sqrt{-\sqrt{-a}} x\right) c_3+\operatorname{BesselY}\left(\frac{1}{2}+n,\left(-a\right)^{1 / 4} x\right) c_2+\operatorname{BesselJ}\left(\frac{1}{2}+n,\left(-a\right)^{1 / 4} x\right) c_1+\operatorname{BesselY}\left(\frac{1}{2}+n,\left(-a\right)^{1 / 4} x\right) c_4\right)$

2.1562

ODE No. 1562

$$-(4n^2-1)x^2y''(x)+(4n^2-1)xy'(x)+x^4y^{(4)}(x)-4x^4y(x)+4x^3y^{(3)}(x)=0$$

✓

Mathematica : cpu = 0.839655 (sec), leaf count = 140

`DSolve[-4*x^4*y[x] + (-1 + 4*n^2)*x*Derivative[1][y][x] - (-1 + 4*n^2)*x^2*Derivative[2][y][x]`

$$\left\{\left\{y(x)\rightarrow c_1{}_0F_3\left(\left(\frac{1}{2},1-\frac{n}{2},\frac{n}{2}+1;\frac{x^4}{64}\right)+\frac{1}{8}ic_2x^2{}_0F_3\left(\left(\frac{3}{2},\frac{3}{2}-\frac{n}{2},\frac{n}{2}+\frac{3}{2};\frac{x^4}{64}\right)+c_3\left(\frac{i}{2}\right)^{-n}\Gamma(1-n)^2\right.\right.\right.$$

✓

Maple : cpu = 0.411 (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),x)-(4*n^2`

$$y(x)=\left(\text{BesselY}\left(n,\left(\frac{1}{2}-\frac{i}{2}\right)\sqrt{2}x\right)c_3+\text{BesselJ}\left(n,\left(\frac{1}{2}-\frac{i}{2}\right)\sqrt{2}x\right)c_1\right)\text{BesselJ}\left(n,\left(\frac{1}{2}+\frac{i}{2}\right)\sqrt{2}x\right)+$$

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 = 1.51929 (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*Deriv
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[4]{-1} c_2 x {}_0F_3\left(\frac{3}{2}, 1 - \frac{n}{2}, \frac{n}{2} + 1; \frac{x^4}{64}\right)}{2\sqrt{2}} - \frac{2(-1)^{3/4} \sqrt{2} c_1 {}_0F_3\left(\frac{1}{2}, \frac{1}{2} - \frac{n}{2}, \frac{n}{2} + \frac{1}{2}; \frac{x^4}{64}\right)}{x} + c_3 (-1)^{\frac{1}{4}(1-2n)} 2^2 \right. \right.$$

✓ **Maple** : cpu = 0.287 (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^
```

$$y(x) = \frac{c_4 \operatorname{hypergeom}\left(\left[\right], \left[\frac{1}{2}, -\frac{n}{2} + \frac{1}{2}, \frac{n}{2} + \frac{1}{2}\right], \frac{x^4}{64}\right) + \left(\operatorname{hypergeom}\left(\left[\right], \left[\frac{3}{2}, \frac{n}{2} + 1, -\frac{n}{2} + 1\right], \frac{x^4}{64}\right) c_3 + c_2 \operatorname{KelvinI}\right)}{x}$$

2.1564 ODE No. 1564

$(-12n^2 - 4x^4 + 3) y(x) - (4n^2 + 3) x^2 y''(x) + (12n^2 - 3) xy'(x) + x^4 y^{(4)}(x) + 4x^3 y^{(3)}(x) = 0$

✓ **Mathematica** : cpu = 1.03295 (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*Deriv
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\sqrt[4]{-1} c_1 x {}_0F_3\left(\left(\frac{1}{2}, \frac{3}{2} - \frac{n}{2}, \frac{n}{2} + \frac{3}{2}; \frac{x^4}{64}\right)\right)}{2\sqrt{2}} + c_3 (-1)^{\frac{1}{4}(-2n-1)} 2^{2n+\frac{1}{2}(2n+1)+1} x^{-2n-1} {}_0F_3\left(\left(1-n, \frac{1}{2} - \frac{n}{2}, -\frac{n}{2}\right)\right) \right. \right.$$

✓ **Maple** : cpu = 0.279 (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
```

$$y(x) = \frac{c_4 x^2 \operatorname{hypergeom}\left(\left[\right], \left[\frac{1}{2}, \frac{n}{2} + \frac{3}{2}, \frac{3}{2} - \frac{n}{2}\right], \frac{x^4}{64}\right) + c_3 x^4 \operatorname{hypergeom}\left(\left[\right], \left[\frac{3}{2}, \frac{n}{2} + 2, -\frac{n}{2} + 2\right], \frac{x^4}{64}\right) + c_2 \operatorname{KelvinY}\left(\sqrt{x}\right)}{x}$$

2.1565

ODE No. 1565

$$\left(x\left(-\rho^2-\sigma^2+1\right)+16 x^3\right) y'(x)+y(x)\left(\rho^2 \sigma^2+8 x^2\right)+\left(x^2\left(-\rho^2-\sigma^2+7\right)+4 x^4\right) y''(x)+x^4 y^{(4)}(x)+6 x^3 y^{(3)}(x)$$

✓ **Mathematica** : cpu = 0.423671 (sec), leaf count = 242

```
DSolve[(rho^2*sigma^2 + 8*x^2)*y[x] + ((1 - rho^2 - sigma^2)*x + 16*x^3)*Derivative[1][y][x] +
```

$$\left\{\left\{y(x) \rightarrow c_1 x^{-\rho} {}_2 F_3\left(\frac{1}{2}-\frac{\rho}{2}, 1-\frac{\rho}{2} ; 1-\rho,-\frac{\rho}{2}-\frac{\sigma}{2}+1,-\frac{\rho}{2}+\frac{\sigma}{2}+1 ;-x^2\right)+c_3 x^{-\sigma} {}_2 F_3\left(\frac{1}{2}-\frac{\sigma}{2}, 1-\frac{\sigma}{2} ; 1-\right.\right.$$

✓ **Maple** : cpu = 0.399 (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^
```

$$y(x)=\left(c_2 \operatorname{BesselY}\left(\frac{\rho}{2}-\frac{\sigma}{2}, x\right)+c_1 \operatorname{BesselJ}\left(\frac{\rho}{2}-\frac{\sigma}{2}, x\right)\right) \operatorname{BesselJ}\left(\frac{\rho}{2}+\frac{\sigma}{2}, x\right)+\operatorname{BesselY}\left(\frac{\rho}{2}+\frac{\sigma}{2}, x\right)\left(\operatorname{BesselJ}\left(\frac{\rho}{2}-\frac{\sigma}{2}, x\right)+\operatorname{BesselY}\left(\frac{\rho}{2}-\frac{\sigma}{2}, x\right)\right) \operatorname{BesselY}\left(\frac{\rho}{2}+\frac{\sigma}{2}, x\right)$$

2.1566

ODE No. 1566

$$\left(x\left(-2\mu^2-2\nu^2+1\right)+16x^3\right)y'(x)+y(x)\left(\left(\mu^2-\nu^2\right)^2+8x^2\right)+\left(x^2\left(-2\mu^2-2\nu^2+7\right)+4x^4\right)y''(x)+x^4y^{(4)}(x)$$

✓ **Mathematica** : cpu = 0.483112 (sec), leaf count = 238

```
DSolve[((mu^2 - nu^2)^2 + 8*x^2)*y[x] + ((1 - 2*mu^2 - 2*nu^2)*x + 16*x^3)*Derivative[1][y][x]
```

$$\left\{\left\{y(x)\rightarrow c_1x^{-\mu-\nu}{}_2F_3\left(-\frac{\mu}{2}-\frac{\nu}{2}+\frac{1}{2},-\frac{\mu}{2}-\frac{\nu}{2}+1;1-\mu,1-\nu,-\mu-\nu+1;-x^2\right)+c_2x^{\mu-\nu}{}_2F_3\left(\frac{\mu}{2}-\frac{\nu}{2}+\right.\right.$$

✓ **Maple** : cpu = 0.341 (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^2
```

$$y(x)=\left(\operatorname{BesselY}\left(\mu,x\right)c_2+c_1\operatorname{BesselJ}\left(\mu,x\right)\right)\operatorname{BesselJ}\left(\nu,x\right)+\operatorname{BesselY}\left(\nu,x\right)\left(\operatorname{BesselY}\left(\mu,x\right)c_4+c_3\operatorname{BesselJ}\left(\mu,x\right)\right)$$

2.1567

ODE No. 1567

$$x^4y^{(4)}(x)+8x^3y^{(3)}(x)+12x^2y''(x)=0$$

✓ **Mathematica** : cpu = 0.0094219 (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
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{6}\left(\frac{c_1}{x^2}+\frac{3c_2}{x}\right)+c_4x+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.014 (sec), leaf count = 19

```
dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)+8*x^3*diff(diff(diff(y(x),x),x),x)+12*x^2
```

$$y(x)=c_1+c_2x+\frac{c_3}{x^2}+\frac{c_4}{x}$$

2.1568

ODE No. 1568

$$ay(x) + x^4y^{(4)}(x) + 8x^3y^{(3)}(x) + 12x^2y''(x) = 0$$

✓

Mathematica : cpu = 0.0119389 (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]

$$\left\{\left\{y(x) \rightarrow c_1x^{\frac{1}{2}\left(-\sqrt{5-4\sqrt{1-a}}-1\right)} + c_2x^{\frac{1}{2}\left(\sqrt{5-4\sqrt{1-a}}-1\right)} + c_3x^{\frac{1}{2}\left(-\sqrt{4\sqrt{1-a}+5}-1\right)} + c_4x^{\frac{1}{2}\left(\sqrt{4\sqrt{1-a}+5}-1\right)}\right\}\right\}$$

✓

Maple : cpu = 0.033 (sec), leaf count = 89

dsolve(x^4*diff(diff(diff(diff(y(x),x),x),x),x)+8*x^3*diff(diff(diff(y(x),x),x),x)+12*x^2

$$y(x) = c_1x^{-\frac{1}{2}-\frac{\sqrt{5-4\sqrt{1-a}}}{2}} + c_2x^{-\frac{1}{2}+\frac{\sqrt{5-4\sqrt{1-a}}}{2}} + c_3x^{-\frac{1}{2}-\frac{\sqrt{5+4\sqrt{1-a}}}{2}} + c_4x^{-\frac{1}{2}+\frac{\sqrt{5+4\sqrt{1-a}}}{2}}$$

2.1569

ODE No. 1569

$xy'(x) \left((2a-1)C_0 + 4b^2B_0c^2x^{2c} \right) + (6-4a)x^3y^{(3)}(x) + x^2y''(x) \left(A_0 + 4b^2c^2x^{2c} \right) + y(x) \left(4b^2c^2D_0x^{2c} + E_0 \right) + x^4y^{(4)}(x) \left(F_0 + 4b^2c^2x^{2c} \right) = 0$

 **Mathematica** : cpu = 300.848 (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]] + x^2*Derivative[2][y[x]]*(A0 + 4*b^2*c^2*x^(2*c)) + x^3*Derivative[3][y[x]]*(6 - 4*a) + x^4*Derivative[4][y[x]]*(F0 + 4*b^2*c^2*x^(2*c)) == 0,x]
```

, timed out

\$Aborted

 **Maple** : cpu = 0.467 (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)+x^2*diff(diff(y(x),x),x)*(A0+4*b^2*c^2*x^(2*c))+x*(4*b^2*c^2*D0*x^(2*c)+E0)+y(x)*(4*b^2*c^2*D0*x^(2*c)+E0)+x^4*y^(4)(x)*(F0+4*b^2*c^2*x^(2*c)))=0,x)
```

$y(x) = ((\text{BesselJ}(\mu, x^c b) c_1 + \text{BesselY}(\mu, x^c b) c_3) \text{BesselJ}(\nu, x^c b) + \text{BesselY}(\nu, x^c b) (c_4 \text{BesselY}(\mu, x^c b) + \text{BesselJ}(\mu, x^c b) c_2))$

2.1570

ODE No. 1570

$y(x) \left((a^2 - c^2 \nu^2) (a^2 + 4ac - c^2 \nu^2 + 4c^2) - b^4 c^4 x^{4c} \right) + x^2 (2a^2 + 4(a + c - 1)^2 + 4(a - 1)(c - 1) - 2c^2 \nu^2 - 1)$

✓ **Mathematica** : cpu = 0.103642 (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^2*nu^2 - 2*(a + c - 1)^2)*x^2, y[x], x]
```

$\left\{ \left\{ y(x) \rightarrow c_1 \Gamma(1 - \nu) (-1)^{\frac{a - c \nu}{4c}} 2^{-\frac{2(a - c \nu)}{c} - \nu - 1} b^{\frac{a - c \nu}{c} + \nu} (x^{4c})^{\frac{a - c \nu}{4c} + \frac{\nu}{4}} \left(J_{-\nu} \left(b \sqrt[4]{x^{4c}} \right) + I_{-\nu} \left(b \sqrt[4]{x^{4c}} \right) \right) + c_2 \Gamma(2 - \nu) \right\} \right\}$

✓ **Maple** : cpu = 0.102 (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),x)
```

$y(x) = x^a (\text{BesselY}(\nu, i b x^c) c_4 + \text{BesselY}(\nu, x^c b) c_2 + \text{BesselJ}(\nu, i b x^c) c_3 + \text{BesselJ}(\nu, x^c b) c_1)$

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 = 0.0714884 (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*(-1 + 2*nu)*x^3*Derivative[3][y][x], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_1 {}_0F_3\left(; 1-\frac{v}{2}, 1-\frac{v}{2\nu}, -\frac{v}{2\nu}-\frac{v}{2}+1; \frac{b^4v^4x^{2/v}}{256\nu^4} \right) + c_2 \left(\frac{i}{16} \right)^v v^{2v} b^{2v} \nu^{-2v} \left(x^{2/v} \right)^{v/2} {}_0F_3\left(; \frac{v}{2}+1, 1-\frac{v}{2}, 1-\frac{v}{2\nu} \right) \right. \right.$$

✓ **Maple** : cpu = 0.382 (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),x),x),x))
```

$$y(x)=\sqrt{x}\left(\text{BesselJ}\left(\frac{1}{\lfloor \frac{1}{\nu} \rfloor},\frac{\sqrt{\frac{b^2}{\nu^2}}x^{\frac{\lfloor \frac{1}{\nu} \rfloor}{2}}}{\lfloor \frac{1}{\nu} \rfloor}\right)c_1+\text{BesselJ}\left(\frac{1}{\lfloor \frac{1}{\nu} \rfloor},\frac{\sqrt{-\frac{b^2}{\nu^2}}x^{\frac{\lfloor \frac{1}{\nu} \rfloor}{2}}}{\lfloor \frac{1}{\nu} \rfloor}\right)c_3+\text{BesselY}\left(\frac{1}{\lfloor \frac{1}{\nu} \rfloor},\frac{\sqrt{\frac{b^2}{\nu^2}}x^{\frac{\lfloor \frac{1}{\nu} \rfloor}{2}}}{\lfloor \frac{1}{\nu} \rfloor}\right)\right)$$

2.1572

ODE No. 1572

$$\left(-2\left(x^2-1\right)\left(\mu\left(\mu+1\right)+\nu\left(\nu+1\right)\right)+24 x^3-8\right) y''(x)-6 x\left(\mu(\mu+1)+\nu(\nu+1)-2\right) y'(x)+\left(\mu(\mu+1)-\nu(\nu+1)\right) y(x)=0$$

 **Mathematica** : cpu = 86.7146 (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 + nu) - nu*(1 + mu))*y'[x] + (mu*(mu + 1) - nu*(nu + 1))*y[x] == 0, y[x], x]
```

, DifferentialRoot result

$$\{\{y(x) \rightarrow (x)\}\}$$

 **Maple** : cpu = 0.473 (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),x)+5*(x^2-1)*diff(diff(y(x),x),x))-5*(x^2-1)*diff(y(x),x)+5*(x^2-1)*y(x)=0,y(x))
```

$$y(x) = \left(\text{LegendreQ}\left(\mu,x\right)c_2 + c_1 \text{LegendreP}\left(\mu,x\right)\right) \text{LegendreP}\left(\nu,x\right) + \text{LegendreQ}\left(\nu,x\right) \left(\text{LegendreQ}\left(\mu,x\right)c_4 + c_3 \text{LegendreP}\left(\mu,x\right)\right)$$

2.1573

ODE No. 1573

$$-\frac{1}{x^5} + (2x + e^x) y^{(4)}(x) + 4(e^x + 2) y^{(3)}(x) + 6e^x y''(x) + 4e^x y'(x) + e^x y(x) = 0$$

✓ **Mathematica** : cpu = 0.138313 (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)*Derivative[3][y][x] + 4*E^x*Derivative[4][y][x] == 0, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_4 x^3}{2x + e^x} + \frac{c_3 x^2}{2x + e^x} + \frac{1}{24(2x + e^x)x} + \frac{c_2 x}{2x + e^x} + \frac{c_1}{2x + e^x} \right\} \right\}$$

✓ **Maple** : cpu = 0.05 (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),x),x)+4*exp(x)*diff(diff(y(x),x),x)+4*exp(x)*diff(y(x),x)+exp(x)*y(x))=0,y(x))
```

$$y(x) = \frac{24c_1x^4 + 24c_2x^3 + 24c_3x^2 + 24c_4x + 1}{24(e^x + 2x)x}$$

2.1574 ODE No. 1574

$y(x) \left(a^4 \sin^4(x) - 3\right) + y^{(4)}(x) \sin^4(x) + 2y^{(3)}(x) \sin^3(x) \cos(x) + \left(\sin^2(x) - 3\right) \sin^2(x) y''(x) + \left(2 \sin^2(x) + 3\right) \sin(x) y'(x) = 0$

✓ **Mathematica** : cpu = 0.185693 (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*Derivative[2][y][x] + 2*Sin[x]*Cos[x]*Derivative[3][y][x] + y[x]^4 == 0, x]
```

$\left\{ \left\{ y(x) \rightarrow c_1 \sin(x) {}_2F_1\left(\frac{1}{4}\left(3 - \sqrt{5 - 4\sqrt{1 - a^4}}\right), \frac{1}{4}\left(\sqrt{5 - 4\sqrt{1 - a^4}} + 3\right); \frac{1}{2}; \cos^2(x)\right) + c_3 \sin(x) \cos(x) \right\} \right\}$

✓ **Maple** : cpu = 1.115 (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+2*diff(diff(y(x), x), x)*sin(x)^2+2*diff(y(x), x)*sin(x)+y(x)^4=0, x))
```

$$y(x) = \sin(x) \left(\text{hypergeom} \left(\left[\frac{3}{4} - \frac{\sqrt{-4\sqrt{-(a-1)(a+1)(a^2+1)}+5}}{4}, \frac{3}{4} + \frac{\sqrt{-4\sqrt{-(a-1)(a+1)(a^2+1)}}}{4} \right], \left[\frac{3}{2} \right], 1 \right) \right)$$

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 = 7.52251 (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] + 4*Sin[x]^5*Cos[x]*Derivative[3][y][x] - 4*Sin[x]^4*Cos[x]^2*Derivative[4][y][x] + y[x]*Sin[x]^6, y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow x^3 \csc(x) \int_1^x \frac{1}{6} \csc^5(K[4]) f(K[4]) dK[4] + x^2 \csc(x) \int_1^x -\frac{1}{2} \csc^5(K[3]) f(K[3]) K[3] dK[3] + x \csc(x) \int_1^x \csc^5(K[2]) f(K[2]) K[2] dK[2] + \int_1^x \csc^5(K[1]) f(K[1]) K[1] dK[1] \right\} \right\}$$

✓ **Maple** : cpu = 0.767 (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)^5-4*diff(diff(y(x), x), x)*sin(x)^4+4*y(x)*sin(x)^6, x)
```

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 = 0.1746 (sec), leaf count = 0

```
DSolve[2*Derivative[1][f][x]*(-(a^2*Derivative[1][y][x]) + Derivative[3][y][x]) + f[x]*(a^4*y[
```

, could not solve

```
DSolve[2*Derivative[1][f][x]*(-(a^2*Derivative[1][y][x]) + Derivative[3][y][x]) + f[x]*(
```

 **Maple** : cpu = 0.02 (sec), leaf count = 67

```
dsolve(f*(diff(diff(diff(diff(y(x),x),x),x),x)-2*a^2*diff(diff(y(x),x),x)+a^4*y(x))+2*df
```

$$y(x)=e^{-ax}c_1+c_2e^{ax}+c_3e^{\frac{\left(-df+\sqrt{a^2f^2+df^2}\right)x}{f}}+c_4e^{-\frac{\left(df+\sqrt{a^2f^2+df^2}\right)x}{f}}$$

2.1577

ODE No. 1577

$$f''(x)y''(x)+2y^{(3)}(x)f'(x)+f(x)y^{(4)}(x)=0$$

✓ **Mathematica** : cpu = 0.0630112 (sec), leaf count = 46

```
DSolve[Derivative[2][f][x]*Derivative[2][y][x] + 2*Derivative[1][f][x]*Derivative[3][y][x] + f
```

$$\left\{\left\{y(x)\rightarrow \int_1^x\int_1^{K[2]}\left(\frac{c_1}{f(K[1])}+\frac{c_2K[1]}{f(K[1])}\right)dK[1]dK[2]+c_4x+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.019 (sec), leaf count = 21

```
dsolve(f*diff(diff(diff(diff(y(x),x),x),x),x)=0,y(x))
```

$$y(x)=\frac{1}{6}c_1x^3+\frac{1}{2}c_2x^2+c_3x+c_4$$

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 = 39.0558 (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]) == 0, y[x], x]

$$\left\{ \left\{ y(x) \rightarrow c_3 e^{-ax} \int_1^x 2a e^{2aK[1]} \int e^{-aK[1]} \text{Ai} \left(\frac{a^2 + \lambda K[1] a - b \lambda}{(a \lambda)^{2/3}} \right) dK[1] dK[1] + c_4 e^{-ax} \int_1^x 2a e^{2aK[2]} \int e^{-aK[2]} \text{Ai} \left(\frac{a^2 + \lambda K[2] a - b \lambda}{(a \lambda)^{2/3}} \right) dK[2] dK[2] \right. \right.$$

✓

Maple : cpu = 0.603 (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*(ax - b)*diff(y(x), x), x)

$$y(x) = e^{ax} \left(\int e^{-2ax} \left(\int e^{ax} \left(\text{AiryBi} \left(-\frac{(\lambda(ax - b) + a^2)(-a\lambda)^{1/3}}{a\lambda} \right) c_4 + c_3 \text{AiryAi} \left(-\frac{(\lambda(ax - b) + a^2)(-a\lambda)^{1/3}}{a\lambda} \right) \right) dx \right) dx + c_2 \int e^{-2ax} \left(\int e^{ax} \left(\text{AiryBi} \left(-\frac{(\lambda(ax - b) + a^2)(-a\lambda)^{1/3}}{a\lambda} \right) c_4 + c_3 \text{AiryAi} \left(-\frac{(\lambda(ax - b) + a^2)(-a\lambda)^{1/3}}{a\lambda} \right) \right) dx \right) dx + c_1 \int e^{-2ax} \left(\int e^{ax} \left(\text{AiryBi} \left(-\frac{(\lambda(ax - b) + a^2)(-a\lambda)^{1/3}}{a\lambda} \right) c_4 + c_3 \text{AiryAi} \left(-\frac{(\lambda(ax - b) + a^2)(-a\lambda)^{1/3}}{a\lambda} \right) \right) dx \right) dx + c_0 \int e^{-2ax} \left(\int e^{ax} \left(\text{AiryBi} \left(-\frac{(\lambda(ax - b) + a^2)(-a\lambda)^{1/3}}{a\lambda} \right) c_4 + c_3 \text{AiryAi} \left(-\frac{(\lambda(ax - b) + a^2)(-a\lambda)^{1/3}}{a\lambda} \right) \right) dx \right) dx \right)$$

2.1579

ODE No. 1579

$$-ax-b\sin(x)-c\cos(x)+y^{(n)}(x)+2y^{(3)}(x)+y'(x)=0$$

✓

Mathematica : cpu = 1.14982 (sec), leaf count = 80

DSolve[-(a*x) - c*Cos[x] - b*Sin[x] + Derivative[1][y][x] + 2*Derivative[3][y][x] + Derivative

$$\left\{\left\{y(x)\rightarrow \frac{1}{16}(8ax^2+\cos(x)\left(b(2x^2-9)-2(5cx+8(c_4x-c_2+c_3))\right)+\sin(x)\left(-6bx+c(13-2x^2)+16(\right.\right.\right.$$

✓

Maple : cpu = 1.274 (sec), leaf count = 69

dsolve(diff(diff(diff(diff(diff(y(x),x),x),x),x)+2*diff(diff(diff(y(x),x),x),x)+diff(

$$y(x)=\frac{(bx^2+(-4c-8c_4)x-6b-8c_2+8c_3)\cos(x)}{8}+\frac{(-cx^2+(-4b+8c_3)x+6c+8c_1+8c_4)\sin(x)}{8}+\frac{a}{8}$$

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 = 4.56545 (sec), leaf count = 234

```
DSolve[-(Sin[x/2]*Sin[(3*x)/2]) + y[x] + Derivative[6][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow\frac{1}{504}\left(-42\sin^2\left(\frac{x}{2}\right)-42\sin^2(x)+42x\sin(x)+42\sin\left(\frac{x}{2}\right)\sin\left(\frac{3x}{2}\right)+21\sin(x)\sin(2x)-24\sin(3x)\right)\right.\right.$$

✓ **Maple** : cpu = 4.115 (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,x))
```

$$y(x)=\left(\cos\left(\frac{x}{2}\right)c_3+\sin\left(\frac{x}{2}\right)c_4\right)e^{-\frac{\sqrt{3}x}{2}}+\left(\cos\left(\frac{x}{2}\right)c_5+\sin\left(\frac{x}{2}\right)c_6\right)e^{\frac{\sqrt{3}x}{2}}+\frac{\cos(2x)}{126}+\frac{(5+24c_1)\cos(x)}{24}+\frac{(x-1)\sin(x)}{24}$$

2.1581

ODE No. 1581

$$-axy(x)-b+y^{(5)}(x)=0$$

 **Mathematica** : cpu = 10.2186 (sec), leaf count = 0

```
DSolve[-b - a*x*y[x] + Derivative[5][y][x] == 0,y[x],x]
```

, DifferentialRoot result

$$\{\{y(x)\rightarrow (x)\}\}$$

 **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

$$a \nu x^{\nu-1} y(x) + a x^{\nu} y'(x) + y^{(5)}(x) = 0$$

✓

Mathematica : cpu = 10.1841 (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]`

$$\left\{ \left\{ y(x) \rightarrow c_5 \left(\frac{4}{\nu} + 1 \right)^{-\frac{16}{\nu+4}} \nu^{-\frac{16}{\nu+4}} a^{\frac{4}{\nu+4}} (x^{\nu})^{\frac{4(\frac{4}{\nu}+1)}{\nu+4}} {}_1F_4 \left(\frac{4}{\nu \left(1 + \frac{4}{\nu} \right)} + \frac{1}{1 + \frac{4}{\nu}}; 1 + \frac{1}{\left(1 + \frac{4}{\nu} \right) \nu}, 1 + \frac{2}{\left(1 + \frac{4}{\nu} \right) \nu}, 1 + \frac{3}{\left(1 + \frac{4}{\nu} \right) \nu}, 1 + \frac{4}{\left(1 + \frac{4}{\nu} \right) \nu} \right) \right. \right. \right.$$

✗

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),x)`

, result contains DESol or ODESolStruc

$$y(x) = \text{DESol} \left(\left\{ \frac{d^5}{dx^5} Y(x) + a x^{\nu} \left(\frac{d}{dx} Y(x) \right) + a \nu x^{\nu-1} Y(x) \right\}, \{ Y(x) \} \right)$$

2.1583

ODE No. 1583

$$ay^{(4)}(x)-f(x)+y^{(5)}(x)=0$$

✓ **Mathematica** : cpu = 0.110071 (sec), leaf count = 92

```
DSolve[-f[x] + a*Derivative[4][y][x] + Derivative[5][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow\int_1^x\int_1^{K[5]}\int_1^{K[4]}\int_1^{K[3]}\left(e^{-aK[2]}c_1+e^{-aK[2]}\int_1^{K[2]}e^{aK[1]}f(K[1])dK[1]\right)dK[2]dK[3]dK[4]dK[5]+\right.\right.$$

✓ **Maple** : cpu = 0.057 (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),x),x),x),x),x)
```

$$y(x)=\frac{f\,x^4}{24a}+\frac{c_3x^2}{2}+\frac{c_2x^3}{6}+\frac{c_1\mathrm{e}^{-ax}}{a^4}+c_4x+c_5$$

2.1584

ODE No. 1584

$$axy(x) - 5my^{(4)}(x) + xy^{(5)}(x) = 0$$

✓

Mathematica : cpu = 1.87301 (sec), leaf count = 216

`DSolve[a*x*y[x] - 5*m*Derivative[4][y][x] + x*Derivative[5][y][x] == 0,y[x],x]`

$$\left\{ \left\{ y(x) \rightarrow c_5 5^{-5m-4} a^{\frac{1}{5}(5m+4)} x^{5m+4} {}_0F_4\left(; m + \frac{6}{5}, m + \frac{7}{5}, m + \frac{8}{5}, m + \frac{9}{5}; -\frac{ax^5}{3125} \right) + \frac{1}{125} a^{3/5} c_4 x^3 {}_0F_4\left(; \frac{6}{5}, \frac{7}{5}, \frac{8}{5}, \frac{9}{5}; -\frac{ax^5}{3125} \right) \right. \right.$$

✓

Maple : cpu = 0.274 (sec), leaf count = 118

`dsolve(x*diff(diff(diff(diff(diff(y(x),x),x),x),x),x)-5*m*diff(diff(diff(diff(y(x),x),x),x),x)`

$$y(x) = c_1 \operatorname{hypergeom}\left(\left[\right], \left[\frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \frac{1}{5} - m\right], -\frac{x^5 a}{3125}\right) + c_2 x \operatorname{hypergeom}\left(\left[\right], \left[\frac{3}{5}, \frac{4}{5}, \frac{6}{5}, \frac{2}{5} - m\right], -\frac{x^5 a}{3125}\right) + c_3 x^3 \operatorname{hypergeom}\left(\left[\right], \left[\frac{6}{5}, \frac{7}{5}, \frac{8}{5}, \frac{9}{5} - m\right], -\frac{x^5 a}{3125}\right)$$

2.1585

ODE No. 1585

$$xy(x)\left(ay'(x)+by''(x)+cy^{(3)}(x)+ey^{(4)}(x)\right)=0$$

✓

Mathematica : cpu = 0.263818 (sec), leaf count = 214

DSolve[x*y[x]*(a*Derivative[1][y][x] + b*Derivative[2][y][x] + c*Derivative[3][y][x] + e*Deriv

$$\left\{\left\{y(x)\rightarrow 0\right\},\left\{y(x)\rightarrow \frac{c_1e^{x\text{Root}\left[\#1^3+\frac{\#1^2c}{e}+\frac{\#1b}{e}+\frac{a}{e}\&,1\right]}}{\text{Root}\left[\#1^3+\frac{\#1^2c}{e}+\frac{\#1b}{e}+\frac{a}{e}\&,1\right]}+\frac{c_2e^{x\text{Root}\left[\#1^3+\frac{\#1^2c}{e}+\frac{\#1b}{e}+\frac{a}{e}\&,2\right]}}{\text{Root}\left[\#1^3+\frac{\#1^2c}{e}+\frac{\#1b}{e}+\frac{a}{e}\&,2\right]}+\frac{c_3e^{x\text{Root}\left[\#1^3+\frac{\#1^2c}{e}+\frac{\#1b}{e}+\frac{a}{e}\&,3\right]}}{\text{Root}\left[\#1^3+\frac{\#1^2c}{e}+\frac{\#1b}{e}+\frac{a}{e}\&,3\right]}\right\}\right\}$$

✓

Maple : cpu = 0.11 (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(di

$$y(x)=0$$

2.1586

ODE No. 1586

$$-y^{(4)}(x)(x(aA(5)-A(4))+A(5))-y^{(3)}(x)(x(aA(4)-A(3))+A(4))-(x(aA(3)-A(2))+A(3))y''(x)-(x(aA(2)-A(1))+A(2))y'(x)-A(1)y(x)=A(0)$$

✖ Mathematica : cpu = 82.6826 (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] - A[1]))*Derivative[2][y][x] - (A[4] + x*(A[3] - A[2]))*Derivative[3][y][x] - (A[5] + x*(A[4] - A[3]))*Derivative[4][y][x], y[x], x]
```

, DifferentialRoot result

$$\{\{y(x) \rightarrow (x)\}\}$$

✖ 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])*diff(y(x),x))-((a*A[3]-A[2])*diff(y(x),x,x))-((a*A[4]-A[3])*diff(y(x),x,x,x))-((a*A[5]-A[4])*diff(y(x),x,x,x,x))),y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \int \text{DESol} \left(\left\{ -\frac{(axA_2 - xA_1 + A_2)Y(x)}{x} - \frac{(axA_3 - xA_2 + A_3)\left(\frac{d}{dx}Y(x)\right)}{x} - \frac{(axA_4 - xA_3 + A_4)\left(\frac{d^2}{dx^2}Y(x)\right)}{x} - \frac{(axA_5 - xA_4 + A_5)\left(\frac{d^3}{dx^3}Y(x)\right)}{x} - \frac{(axA_6 - xA_5 + A_6)\left(\frac{d^4}{dx^4}Y(x)\right)}{x} \right\} \right) dx$$

2.1587

ODE No. 1587

$x^5y^{(10)}(x) - ay(x) = 0$

✓ **Mathematica** : cpu = 0.285128 (sec), leaf count = 492

```
DSolve[-(a*y[x]) + x^5*Derivative[10][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{(-1)^{4/5} a^{9/5} c_1 x^9 {}_0F_9\left(; \frac{6}{5}, \frac{7}{5}, \frac{8}{5}, \frac{9}{5}, 2, \frac{11}{5}, \frac{12}{5}, \frac{13}{5}, \frac{14}{5}; \frac{ax^5}{9765625} \right)}{3814697265625} + \frac{(-1)^{3/5} a^{8/5} c_3 x^8 {}_0F_9\left(; \frac{4}{5}, \frac{6}{5}, \frac{7}{5}, \frac{8}{5}, \frac{9}{5}, 2, \frac{11}{5} \right)}{152587890625} \right. \right.$$

✓ **Maple** : cpu = 0.745 (sec), leaf count = 154

```
dsolve(x^5*diff(diff(diff(diff(diff(diff(diff(diff(diff(y(x),x),x),x),x),x),x),x),x),x),x)
```

$$y(x) = x^{5/2} \left(c_{10} \operatorname{BesselY}\left(5, 2(-1)^{9/10} a^{1/10} \sqrt{x}\right) + c_9 \operatorname{BesselY}\left(5, 2(-1)^{7/10} a^{1/10} \sqrt{x}\right) + c_8 \operatorname{BesselY}\left(5, 2(-1)^{5/10} a^{1/10} \sqrt{x}\right) + c_7 \operatorname{BesselY}\left(5, 2(-1)^{3/10} a^{1/10} \sqrt{x}\right) + c_6 \operatorname{BesselY}\left(5, 2(-1)^{1/10} a^{1/10} \sqrt{x}\right) + c_5 \operatorname{BesselY}\left(5, 2 a^{1/10} \sqrt{x}\right) + c_4 \operatorname{BesselY}\left(5, 2 a^{1/10} \sqrt{x}\right) + c_3 \operatorname{BesselY}\left(5, 2 a^{1/10} \sqrt{x}\right) + c_2 \operatorname{BesselY}\left(5, 2 a^{1/10} \sqrt{x}\right) + c_1 \operatorname{BesselY}\left(5, 2 a^{1/10} \sqrt{x}\right) \right)$$

2.1588

ODE No. 1588

$$x^{10}y^{(5)}(x)-ay(x)=0$$

✓

Mathematica : cpu = 9.88743 (sec), leaf count = 114

`DSolve[-(a*y[x]) + x^10*Derivative[5][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x)\rightarrow c_1x^4e^{-\frac{\sqrt[5]{a}}{x}}+c_2x^4e^{\frac{\sqrt[5]{-1}\sqrt[5]{a}}{x}}+c_3x^4e^{-\frac{(-1)^{2/5}\sqrt[5]{a}}{x}}+c_4x^4e^{\frac{(-1)^{3/5}\sqrt[5]{a}}{x}}+c_5x^4e^{-\frac{(-1)^{4/5}\sqrt[5]{a}}{x}}\right\}\right\}$$

✓

Maple : cpu = 0.167 (sec), leaf count = 90

`dsolve(x^10*diff(diff(diff(diff(diff(y(x),x),x),x),x)-a*y(x)=0,y(x))`

$$y(x)=c_1\operatorname{hypergeom}\left(\left[\right],\left[\frac{6}{5},\frac{7}{5},\frac{8}{5},\frac{9}{5}\right],-\frac{a}{3125x^5}\right)+c_2x\operatorname{hypergeom}\left(\left[\right],\left[\frac{4}{5},\frac{6}{5},\frac{7}{5},\frac{8}{5}\right],-\frac{a}{3125x^5}\right)+c_3x^2\operatorname{hypergeom}\left(\left[\right],\left[\frac{2}{5},\frac{4}{5},\frac{6}{5},\frac{7}{5}\right],-\frac{a}{3125x^5}\right)+c_4x^3\operatorname{hypergeom}\left(\left[\right],\left[\frac{1}{5},\frac{3}{5},\frac{5}{5},\frac{6}{5}\right],-\frac{a}{3125x^5}\right)+c_5x^4\operatorname{hypergeom}\left(\left[\right],\left[\frac{0}{5},\frac{2}{5},\frac{4}{5},\frac{5}{5}\right],-\frac{a}{3125x^5}\right)$$

2.1589 ODE No. 1589

$$x^{11/2}y^{(11)}(x) - ay(x) = 0$$

✓ **Mathematica** : cpu = 0.0369562 (sec), leaf count = 670

```
DSolve[-(a*y[x]) + x^(11/2)*Derivative[1][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{4}{121} (-1)^{2/11} a^{2/11} c_2 x {}_0F_{10} \left(; -\frac{7}{11}, -\frac{5}{11}, -\frac{3}{11}, -\frac{1}{11}, \frac{1}{11}, \frac{3}{11}, \frac{5}{11}, \frac{7}{11}, \frac{9}{11}, \frac{13}{11}; \frac{2048ax^{11/2}}{285311670611} \right) - \frac{10}{11} \right. \right.$$

✓ **Maple** : cpu = 43.879 (sec), leaf count = 4046

```
dsolve(x^(11/2)*diff(diff(diff(diff(diff(diff(diff(diff(diff(diff(y(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 = 271.023 (sec), leaf count = 331

```
DSolve[-(c*y[x]) + (-a + x)^5*(-b + x)^5*Derivative[5][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_1(x-b)^4\left(\frac{x-a}{x-b}\right)^{\text{Root}\left[-\#1^5+10\#1^4-35\#1^3+50\#1^2-24\#1+\frac{c}{(a-b)^5}\&,1\right]}+c_2(x-b)^4\left(\frac{x-a}{x-b}\right)^{\text{Root}\left[-\#1^5+10\#1^4-35\#1^3+50\#1^2-24\#1+\frac{c}{(a-b)^5}\&,1\right]}\right.\right.$$

✗ **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)-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 = 0.0369305 (sec), leaf count = 26

```
DSolve[-y[x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \sqrt[3]{6}\wp\left(\frac{x+c_1}{\sqrt[3]{6}};0,c_2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.032 (sec), leaf count = 12

```
dsolve(diff(diff(y(x),x),x)-y(x)^2=0,y(x))
```

$$y(x)=6\operatorname{WeierstrassP}\left(c_1+x,0,c_2\right)$$

2.1592

ODE No. 1592

$$y''(x) - 6y(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0495452 (sec), leaf count = 14

```
DSolve[-6*y[x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \rightarrow \wp(x + c_1; 0, c_2)\}\}$$

✓ **Maple** : cpu = 0.027 (sec), leaf count = 10

```
dsolve(diff(diff(y(x),x),x)-6*y(x)^2=0,y(x))
```

$$y(x) = \text{WeierstrassP}(c_1 + x, 0, c_2)$$

2.1593 ODE No. 1593

$$y''(x) - 6y(x)^2 - x = 0$$

✗ Mathematica : cpu = 20.0896 (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 = 0.443852 (sec), leaf count = 373

```
DSolve[4*y[x] - 6*y[x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

Solve $\left[\frac{4\left(\text{Root}\left[4\#1^3 - 4\#1^2 + c_1\&, 2\right] - \text{Root}\left[4\#1^3 - 4\#1^2 + c_1\&, 3\right]\right) \left(y(x) - \text{Root}\left[4\#1^3 - 4\#1^2 + c_1\&, 2\right]\right)}{\left(4y(x)^3 - 4y(x)^2 + c_1\right) \left(\text{Root}\left[4\#1^3 - 4\#1^2 + c_1\&, 2\right] - \text{Root}\left[4\#1^3 - 4\#1^2 + c_1\&, 3\right]\right)}, y(x) \right]$

✓ **Maple** : cpu = 0.126 (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 = 20.1781 (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 = 20.5974 (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 = 1.8654 (sec), leaf count = 242

DSolve[-(a*y[x]^3) + Derivative[2] [y] [x] == 0,y[x],x]

$$\left\{\left\{y(x)\rightarrow-\frac{\sqrt[4]{2}\sqrt{c_1}\sqrt{\frac{i\sqrt{a}}{\sqrt{c_1}}}\operatorname{sn}\left(\frac{(-1)^{3/4}\sqrt{\sqrt{2}\sqrt{a}\sqrt{c_1}x^2+2\sqrt{2}\sqrt{a}\sqrt{c_1}c_2x+\sqrt{2}\sqrt{a}\sqrt{c_1}c_2^2}}{\sqrt{2}}\right)-1}{\sqrt{a}}\right\},\left\{y(x)\rightarrow\frac{\sqrt[4]{2}\sqrt{c_1}\sqrt{\frac{i\sqrt{a}}{\sqrt{c_1}}}\operatorname{sn}\left(\frac{(-1)^{3/4}\sqrt{\sqrt{2}\sqrt{a}\sqrt{c_1}x^2+2\sqrt{2}\sqrt{a}\sqrt{c_1}c_2x+\sqrt{2}\sqrt{a}\sqrt{c_1}c_2^2}}{\sqrt{2}}\right)+1}{\sqrt{a}}\right\}\right\}$$

✓

Maple : cpu = 0.041 (sec), leaf count = 21

dsolve(diff(diff(y(x),x),x)-a*y(x)^3=0,y(x))

$$y(x)=c_2\operatorname{JacobiSN}\left(\left(\frac{x\sqrt{-2a}}{2}+c_1\right)c_2,i\right)$$

2.1598 ODE No. 1598

$$-2a^2y(x)^3 + 2abxy(x) - b + y''(x) = 0$$

✗ Mathematica : cpu = 22.0478 (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 = 20.8185 (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 = 2.13157 (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]
```

Solve $\left[4F\left(\sin^{-1}\left(\sqrt{\frac{(\text{Root}[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,2]-\text{Root}[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,4])}{(\text{Root}[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,1]-\text{Root}[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,4])}}\right)(y(x)-\text{Root}[3a\#1^4+4b\#1^3+6c\#1^2+12d\#1-6c_1\&,4])\right)$

✓ **Maple** : cpu = 0.117 (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))
```

$$\int^{y(x)} -\frac{6}{\sqrt{-18\_a^4a-24b\_a^3-36c\_a^2-72\_ad+36c_1}}d\_a-x-c_2=0$$

2.1601

ODE No. 1601

$$ax^ry(x)^n + y''(x) = 0$$

 **Mathematica** : cpu = 0.044499 (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

$$y(x) = \left(-a e^{\int -b(-a)d-a+c_1}\right) \&where \left[\left\{ \frac{d}{d-a} b(-a) = \frac{(-a^na n^2 - 2-a^nan + -arn + -a r^2 + -a^na + 2-an}{(r+2)^2} \right. \right.$$

2.1602

ODE No. 1602

$$(n+1)a^{2n}y(x)^{2n+1} + y''(x) - y(x) = 0$$

✓ **Mathematica** : cpu = 0.138287 (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]
```

$$\text{Solve}\left[\int_1^{y(x)} \frac{1}{\sqrt{c_1 - K[1]^2 (a^{2n} K[1]^{2n} - 1)}} dK[1]^2 = (x + c_2)^2, y(x)\right]$$

✓ **Maple** : cpu = 0.306 (sec), leaf count = 73

```
dsolve(diff(diff(y(x),x),x)+(n+1)*a^(2*n)*y(x)^(2*n+1)-y(x)=0,y(x))
```

$$\int^{y(x)} \frac{1}{\sqrt{-a^{2n} - a^{2n+2} + a^2 + c_1}} d_a - x - c_2 = 0$$

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 = 1.13423 (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,y[x],x]
```

 **Maple** : cpu = 51.362 (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,x)
```

Expression too large to display

2.1604

ODE No. 1604

$$y''(x) - e^{y(x)} = 0$$

✓ **Mathematica** : cpu = 0.0494847 (sec), leaf count = 34

```
DSolve[-E^y[x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \log \left(\frac{1}{2} c_1 \left(-1 + \tanh^2 \left(\frac{1}{2} \sqrt{c_1 (x + c_2)^2} \right) \right) \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.394 (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

$$ae^x\sqrt{y(x)}+y''(x)=0$$

✖

Mathematica : cpu = 20.3012 (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

$$y(x)=\left(-ae^{\int 2b(-a)da+2c_1}\right) \& \text{where} \left[\left\{\frac{d}{d-a}b(-a) = \left(\sqrt{-a}a+4-a\right)b(-a)^3+4b(-a)^2\right\},\left\{-a=y(x)\right.\right.$$

2.1606 ODE No. 1606

$$y''(x) + e^x \sin(y(x)) = 0$$

X **Mathematica** : cpu = 20.8332 (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]
```

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 = 0.0839324 (sec), leaf count = 79

```
DSolve[a*Sin[y[x]] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow -2\text{am}\left(\frac{1}{2}\sqrt{(2a+c_1)(x+c_2)^2}\middle|\frac{4a}{2a+c_1}\right)\right\},\left\{y(x)\rightarrow 2\text{am}\left(\frac{1}{2}\sqrt{(2a+c_1)(x+c_2)^2}\middle|\frac{4a}{2a+c_1}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.154 (sec), leaf count = 49

```
dsolve(diff(diff(y(x),x),x)+a*sin(y(x))=0,y(x))
```

$$\int^{y(x)}\frac{1}{\sqrt{2a\cos\left(\_a\right)+c_1}}d\_a-x-c_2=0$$

2.1608 ODE No. 1608

$$a^2 \sin(y(x)) - b \sin(x) + y''(x) = 0$$

✗ Mathematica : cpu = 0.0259989 (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 = 0.0222002 (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 = 5.44076 (sec), leaf count = 754

DSolve[-(h[y[x]/Sqrt[x]]/x^(3/2)) + Derivative[2][y][x] == 0,y[x],x]

$$\left\{\text{Solve}\left[\int_1^{y(x)}\frac{2}{\sqrt{x}\sqrt{\frac{K[3]^2+4xc_1+8x\int_1^{\frac{K[3]}{\sqrt{x}}}h(K[2])dK[2]}{x}}}dK[3]-\int_1^x\frac{2\left(\frac{y(x)}{2\sqrt{K[4]}}-\frac{\sqrt{\frac{y(x)^2}{2K[4]}+2c_1+4\int_1^{\frac{y(x)}{\sqrt{K[4]}}}h(K[2])dK[2]}}{\sqrt{2}}}\right)}{K[4]\sqrt{\frac{y(x)^2+4c_1K[4]+8K[4]\int_1^{\frac{y(x)}{\sqrt{K[4]}}}h(K[2])dK[2]}{K[4]}}}dx\right]=0,y(x)\right\}$$

✓ **Maple** : cpu = 0.347 (sec), leaf count = 92

dsolve(diff(diff(y(x),x),x)-1/x^(3/2)*h(y(x)/x^(1/2))=0,y(x))

$$y(x)=\text{RootOf}\left(-Zx^{3/2}+4h\left(\frac{Z}{\sqrt{x}}\right)x^2\right)$$

2.1611

ODE No. 1611

$$y''(x) - 3y'(x) - y(x)^2 - 2y(x) = 0$$

 **Mathematica** : cpu = 2.77412 (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

$$y(x) = \_a\&where \left[\left\{ \left(\frac{d}{d\_a} \_b(\_a) \right) \_b(\_a) - 3\_b(\_a) - \_a^2 - 2\_a = 0 \right\}, \left\{ \_a = y(x), \_b(\_a) = \frac{d}{dx} y(x) \right\} \right]$$

2.1612

ODE No. 1612

$$y''(x) - 7y'(x) - y(x)^{3/2} + 12y(x) = 0$$

 **Mathematica** : cpu = 21.1914 (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

$$y(x) = \_a\&where \left[\left\{ \left(\frac{d}{d\_a} b(\_a) \right) \_b(\_a) - 7\_b(\_a) - \_a^{3/2} + 12\_a = 0 \right\}, \left\{ \_a = y(x), \_b(\_a) = \frac{d}{dx} \right. \right.$$

2.1613 ODE No. 1613

$$6a^2y(x) + 5ay'(x) + y''(x) - 6y(x)^2 = 0$$

✓ **Mathematica** : cpu = 1.64805 (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]`

$$\left\{ \left\{ y(x) \rightarrow a^2 c_1^2 e^{-2ax} \wp(e^{-ax} c_1 + c_2; 0, -1) \right\} \right\}$$

✓ **Maple** : cpu = 0.041 (sec), leaf count = 27

`dsolve(diff(diff(y(x),x),x)+5*a*diff(y(x),x)-6*y(x)^2+6*a^2*y(x)=0,y(x))`

$$y(x) = \text{WeierstrassP}\left(-\frac{e^{-ax}}{a} + c_1, 0, c_2\right) e^{-2ax}$$

2.1614

ODE No. 1614

$$2a^2y(x)+3ay'(x)+y''(x)-2y(x)^3=0$$

✓ **Mathematica** : cpu = 0.975383 (sec), leaf count = 32

```
DSolve[2*a^2*y[x] - 2*y[x]^3 + 3*a*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x)\rightarrow -iac_1e^{-ax}\mathrm{sn}\big(e^{-ax}c_1+c_2|-1)\}\}$$

✓ **Maple** : cpu = 0.124 (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))
```

$$y(x)=c_2\operatorname{JacobiSN}\left(\left(-\frac{\sqrt{-e^{-2ax}}}{a}+c_1\right)c_2,i\right)e^{-ax}$$

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 = 60.1103 (sec), leaf count = 0

```
DSolve[(-2*(1 + n)*(2 + n)*y[x]*(-1 + y[x]^(n/(1 + n))))/n^2 - ((4 + 3*n)*Derivative[1][y][x])]
```

, could not solve

```
DSolve[(-2*(1 + n)*(2 + n)*y[x]*(-1 + y[x]^(n/(1 + n))))/n^2 - ((4 + 3*n)*Derivative[1][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))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a\&where\left[\left\{\left(\frac{d}{d\_a}-b(\_a)\right)\_b(\_a)-\frac{2\_a^{\frac{n}{n+1}}\_a n^2+6\_a^{\frac{n}{n+1}}\_a n+3\_b(\_a) n^2-2\_a n^2+4\_a \bar{n}}{n^2}\right.\right.$$

2.1616

ODE No. 1616

$$\frac{1}{4}(a^2-1)y(x)+ay'(x)+by(x)^n+y''(x)=0$$

✗ Mathematica : cpu = 14.5127 (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[x],x]
```

✗ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)+b*y(x)^n+1/4*(a^2-1)*y(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a \&where \left[\left\{ \left(\frac{d}{d\_a} b(\_a) \right) \_b(\_a) + a\_b(\_a) + b\_a^n + \frac{a a^2}{4} - \frac{a}{4} = 0 \right\}, \left\{ \_a = y(x), \_b(\_a) \right\} \right]$$

2.1617 ODE No. 1617

$$ay'(x) + bx^r y(x)^n + y''(x) = 0$$

X **Mathematica** : cpu = 0.046195 (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]
```

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

$$ay'(x) - 2a + be^{y(x)} + y''(x) = 0$$

 **Mathematica** : cpu = 26.7837 (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

$$y(x) = \_a\&where \left[\left\{ \left(\frac{d}{d\_a} b(\_a) \right) \_b(\_a) + a\_b(\_a) + b e^{-a} - 2a = 0 \right\}, \left\{ \_a = y(x), \_b(\_a) = \frac{d}{dx} y(x) \right\} \right]$$

2.1619 ODE No. 1619

$$ay'(x) + f(x) \sin(y(x)) + y''(x) = 0$$

X **Mathematica** : cpu = 0.038589 (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]
```

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 = 33.5088 (sec), leaf count = 492

```
DSolve[-y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[\int_1^{\#1} \frac{2}{\frac{e^{6c_1} K[1]^4}{\sqrt[3]{e^{18c_1} K[1]^6 - 2e^{12c_1} + 2\sqrt{e^{24c_1} - e^{30c_1} K[1]^6}}} - K[1]^2 + e^{-6c_1} \sqrt[3]{e^{18c_1} K[1]^6 - 2e^{12c_1} + 2\sqrt{e^{24c_1} - e^{30c_1} K[1]^6}}} - K[1]^2 + e^{-6c_1} \sqrt[3]{e^{18c_1} K[1]^6 - 2e^{12c_1} + 2\sqrt{e^{24c_1} - e^{30c_1} K[1]^6}}}\right.\right.\right.$$

✓ **Maple** : cpu = 0.168 (sec), leaf count = 291

```
dsolve(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3=0,y(x))
```

$$\int^{y(x)} \frac{2}{\frac{-a^4}{\left(-a^6+2c_1+2\sqrt{-a^6c_1+c_1^2}\right)^{1/3}}-a^2+\left(-a^6+2c_1+2\sqrt{-a^6c_1+c_1^2}\right)^{1/3}} da-x-c_2=0$$

2.1622

ODE No. 1622

$$2a^2y(x) + (3a + y(x))y'(x) + ay(x)^2 + y''(x) - y(x)^3 = 0$$

✓

Mathematica : cpu = 23.873 (sec), leaf count = 88

`DSolve[2*a^2*y[x] + a*y[x]^2 - y[x]^3 + (3*a + y[x])*Derivative[1][y][x] + Derivative[2][y][x]`

$$\left\{ \left\{ y(x) \rightarrow \left\{ \begin{array}{ll} \frac{c_1 \wp'(xc_1+c_2;0,1)}{\wp(xc_1+c_2;0,1)} & a=0 \\ -\frac{e^{-ax}c_1\wp'\left(\frac{e^{-ax}c_1}{a}+c_2;0,1\right)}{\wp\left(\frac{e^{-ax}c_1}{a}+c_2;0,1\right)} & \text{True} \end{array} \right. \right\} \right\}$$

✓

Maple : cpu = 0.786 (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))`

$$y(x) = \text{RootOf}\left(\left(\int^{-z} -\underline{f}^8 + c_1 \underline{f}^2 - \left(\left(-\underline{f}^6 + c_1\right)^2 \left(\sqrt{\frac{c_1}{-\underline{f}^6 + c_1}} - 1\right)\right)^{2/3} d\underline{f}\right) a + c_2 a + e^{-ax}\right) e^{-ax}$$

2.1623

ODE No. 1623

$$y(x)\left(f'(x)+2f(x)^2\right)+\left(3f(x)+y(x)\right)y'(x)+f(x)y(x)^2+y''(x)-y(x)^3=0$$

 **Mathematica** : cpu = 0.206214 (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])*Derivati
```

, 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])*De
```

 **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)
```

, 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)
```

2.1624

ODE No. 1624

$$y(x)\left(af(x)^2-\frac{f''(x)}{f(x)}+3f'(x)+\frac{3f'(x)^2}{f(x)^2}\right)+bf(x)^3-\left(\frac{f'(x)}{f(x)}+f(x)\right)\left(3y'(x)+y(x)^2\right)+y''(x)+y(x)y'(x)-y(x)^3=0$$

✗ Mathematica : cpu = 0.970687 (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]^3 - y[x]*Derivative[1][y][x])]
```

, could not solve

```
DSolve[b*f[x]^3 - y[x]^3 + y[x]*Derivative[1][y][x] - (f[x] + Derivative[1][f][x]/f[x])*(y[x]^3 - y[x]*Derivative[1][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)-y(x)*diff(y(x),x))))
```

, result contains DESol or ODESolStruc

$$y(x)=\left(f\left(\text{RootOf}\left(\int\_b(\_a)d\_a+c_1-\left(\int^{\_Z}f(\_f)d\_f\right)\right)\right)\_a\right)\&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a)=(-\_a^3-\_a^2)\right.\right]$$

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 = 0.797874 (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]))
```

, could not solve

```
DSolve[-y[x]^3 - (y[x]^2*Derivative[1][f][x])/(2*f[x]) + (y[x] - (3*Derivative[1][f][x]))
```

✗ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+(y(x)-3/2*diff(f(x),x)/f(x))*diff(y(x),x)-y(x)^3-1/2*diff(f(x),x)/f(x)*y(x)^2+1/2*(f(x)+diff(f(x),x)^2/f(x)-diff(diff(f(x),x),x))/f(x)*
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+(y(x)-3/2*diff(f(x),x)/f(x))*diff(y(x),x)-y(x)^3-1/2*diff(f(x),x)/f(x)*y(x)^2+1/2*(f(x)+diff(f(x),x)^2/f(x)-diff(diff(f(x),x),x))/f(x)*
```

2.1626

ODE No. 1626

$$y(x)f'(x)+f(x)y'(x)+y''(x)+2y(x)y'(x)=0$$

✖

Mathematica : cpu = 29.9985 (sec), leaf count = 0

DSolve[y[x]*Derivative[1][f][x] + f[x]*Derivative[1][y][x] + 2*y[x]*Derivative[1][y][x] + Deriv

, could not solve

DSolve[y[x]*Derivative[1][f][x] + f[x]*Derivative[1][y][x] + 2*y[x]*Derivative[1][y][x]

✖

Maple : cpu = 0. (sec), leaf count = 0

dsolve(diff(diff(y(x),x),x)+2*y(x)*diff(y(x),x)+f(x)*diff(y(x),x)+diff(f(x),x)*y(x)=0,y(

, result contains DESol or ODESolStruc

$$y(x) = \_b(\_a) \&\text{where} \left[\left\{ \frac{d}{d\_a} \_b(\_a) = -\_b(\_a)^2 - f(\_a) \_b(\_a) - c_1 \right\}, \{ \_a = x, \_b(\_a) = y(x) \}, \{ x = \right.$$

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 = 0.173789 (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], y[x], x]
```

, could not solve

```
DSolve[-g[x] + 2*y[x]*Derivative[1][y][x] + f[x]*(y[x]^2 + Derivative[1][y][x]) + Derivative[2][y][x], y[x], x]
```

✗ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+2*y(x)*diff(y(x),x)+f(x)*(diff(y(x),x)+y(x)^2)-g(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_b(\_a) \& \text{where} \left[\left\{ \_b(\_a)^2 e^{\int f(\_a) d\_a} + e^{\int f(\_a) d\_a} \left(\frac{d}{d\_a} \_b(\_a) \right) - \left(\int e^{\int f(\_a) d\_a} g(\_a) d\_a \right) + c_1 \right. \right.$$

2.1628

ODE No. 1628

$$f(x)y(x) - g(x) + y''(x) + 3y(x)y'(x) + y(x)^3 = 0$$

 **Mathematica** : cpu = 2.757 (sec), leaf count = 0

```
DSolve[-g[x] + f[x]*y[x] + y[x]^3 + 3*y[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x]
```

, could not solve

```
DSolve[-g[x] + f[x]*y[x] + y[x]^3 + 3*y[x]*Derivative[1][y][x] + Derivative[2][y][x] ==
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+3*y(x)*diff(y(x),x)+y(x)^3+f(x)*y(x)-g(x)=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \frac{\frac{d}{dx} \text{DESol}\left(\left\{-g(x) - Y(x) + f(x)\left(\frac{d}{dx}Y(x)\right) + \frac{d^3}{dx^3}Y(x)\right\}, \{-Y(x)\}\right)}{\text{DESol}\left(\left\{-g(x) - Y(x) + f(x)\left(\frac{d}{dx}Y(x)\right) + \frac{d^3}{dx^3}Y(x)\right\}, \{-Y(x)\}\right)}$$

2.1629

ODE No. 1629

$$(f(x)+3y(x))y'(x)+f(x)y(x)^2+y''(x)+y(x)^3=0$$

✓ **Mathematica** : cpu = 0.058758 (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
```

$$\left\{\left\{y(x)\rightarrow\frac{\int_1^x\exp\left(-\int_1^{K[2]}f(K[1])dK[1]\right)c_1dK[2]+c_2}{\int_1^x\int_1^{K[5]}\exp\left(-\int_1^{K[4]}f(K[3])dK[3]\right)c_1dK[4]dK[5]+c_2x+1}dK[2]\right\}\right\}$$

✓ **Maple** : cpu = 0.059 (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))
```

$$y(x)=\frac{\int c_1e^{-(\int f(x)dx)}dx+c_2}{\int\int c_1e^{-(\int f(x)dx)}dxdx+c_2x+1}$$

2.1630

ODE No. 1630

$$-4a^2y(x) - 3ay(x)^2 - b + y''(x) - 3y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 7.0262 (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]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{2 \left(-(-1)^{\frac{a^{3/2} \sqrt{4a^3-3b}-2a^3}}{4a^3}} 2^{-\frac{3 \left(a^{3/2} \sqrt{4a^3-3b}-2a^3 \right)}{4a^3} + \frac{3 \sqrt{4a^6-3a^3b}}{4a^3} + 1} 3^{\frac{a^{3/2} \sqrt{4a^3-3b}-2a^3}{4a^3} - \frac{\sqrt{4a^6-3a^3b}}{4a^3}} a^{-\frac{a^{3/2} \sqrt{4a^3-3b}-2a^3}{2a^3}} \right. \right. \right.$$

✓ **Maple** : cpu = 0.959 (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))
```

$$\int^{y(x)} -\frac{-12_a a^3 - 9_a^2 a^2 + \text{RootOf}\left(2 \text{BesselK}\left(\frac{4a^3-3b}{2a\sqrt{4a^4-3ab}}, -\frac{Z}{2a^2}\right) c_1 a^2 + 3 \text{BesselK}\left(\frac{4a^3-3b}{2a\sqrt{4a^4-3ab}}, -\frac{Z}{2a^2}\right) c_1 \right.}{}$$

2.1631

ODE No. 1631

$$-(f(x)+3y(x))y'(x)+f(x)y(x)^2+y''(x)+y(x)^3=0$$

✓

Mathematica : cpu = 0.0602694 (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`

$$\left\{\left\{y(x)\rightarrow\frac{-\int_1^x\exp\left(\int_1^{K[2]}f(K[1])dK[1]\right)c_1dK[2]-c_2}{\int_1^x\int_1^{K[5]}\exp\left(\int_1^{K[4]}f(K[3])dK[3]\right)c_1dK[4]dK[5]+c_2x+1}dK[2]dK[5]\right\}\right\}$$

✓

Maple : cpu = 0.099 (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))`

$$y(x)=\frac{-\left(\int c_1e^{\int f(x)dx}dx\right)-c_2}{\int\int c_1e^{\int f(x)dx}dxdx+c_2x+1}$$

2.1632

ODE No. 1632

$$y''(x) - 2ay(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0678281 (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 = 0.167 (sec), leaf count = 23

```
dsolve(diff(diff(y(x),x),x)-2*a*y(x)*diff(y(x),x)=0,y(x))
```

$$y(x) = \frac{\tan \left(\sqrt{c_1 a} \left(c_2 + x \right) \right) \sqrt{c_1 a}}{a}$$

2.1633

ODE No. 1633

$$ay(x)y'(x)+by(x)^3+y''(x)=0$$

✓

Mathematica : cpu = 33.9703 (sec), leaf count = 92

`DSolve[b*y[x]^3 + a*y[x]*Derivative[1][y][x] + Derivative[2][y][x] == 0,y[x],x]`

Solve

$$\int_1^{y(x)} \frac{1}{K[2]^2 \text{InverseFunction}\left[\frac{1}{4}\left(\log(b+\#1(a+2\#1))-\frac{2a \tan^{-1}\left(\frac{a+4\#1}{\sqrt{8b-a^2}}\right)}{\sqrt{8b-a^2}}\right) \& \right][c_1-\log(K[2])]} dK[2]$$

✓

Maple : cpu = 0.497 (sec), leaf count = 97

`dsolve(diff(diff(y(x),x),x)+a*y(x)*diff(y(x),x)+b*y(x)^3=0,y(x))`

$$\int^{y(x)} \frac{1}{\text{RootOf}\left(-2a\_a^2 \operatorname{arctanh}\left(\frac{-a^2 a+4\_Z}{\sqrt{-a^4(a^2-8b)}}\right)-\ln\left(\_a^4 b+\_Z\_a^2 a+2\_Z^2\right) \sqrt{-a^4(a^2-8b)}+c_1 \sqrt{-a^4(a^2-8b)}\right)} d\_Z$$

2.1634

ODE No. 1634

$$y'(x)h(x,y(x)) + j(x,y(x)) + y''(x) = 0$$

X Mathematica : cpu = 0.177823 (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]
```

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 = 0.737539 (sec), leaf count = 104

```
DSolve[b*y[x] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \text{InverseFunction}\left[\int_1^{\#1}-\frac{\sqrt{2}a}{\sqrt{2e^{-2aK[1]}c_1a^2-2bK[1]a+b}}dK[1]\& \right][x+c_2]\right\},\left\{y(x)\rightarrow \text{InverseFun}$$

✓ **Maple** : cpu = 0.32 (sec), leaf count = 79

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)^2+b*y(x)=0,y(x))
```

$$\int^{y(x)}-\frac{2a}{\sqrt{4e^{-2aa}c_1a^2-4aab+2b}}d_{-}a-x-c_2=0$$

2.1636

ODE No. 1636

$$ay'(x)|y'(x)|+by'(x)+cy(x)+y''(x)=0$$

✖

Mathematica : cpu = 5.39889 (sec), leaf count = 0

DSolve[c*y[x] + b*Derivative[1][y][x] + a*Abs[Derivative[1][y][x]]*Derivative[1][y][x] + Deriv

, could not solve

DSolve[c*y[x] + b*Derivative[1][y][x] + a*Abs[Derivative[1][y][x]]*Derivative[1][y][x] +

✖

Maple : cpu = 0. (sec), leaf count = 0

dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)*abs(diff(y(x),x))+b*diff(y(x),x)+y(x)*c=0,y(x)

, result contains DESol or ODESolStruc

$$y(x) = \_a\&where \left[\left\{ \left(\frac{d}{d\_a} b(\_a) \right) \_b(\_a) + a\_b(\_a) |\_b(\_a)| + \_b(\_a) b + c\_a = 0 \right\}, \left\{ \_a = y(x), \_b \right. \right.$$

2.1637

ODE No. 1637

$$ay'(x)^2 + by'(x) + cy(x) + y''(x) = 0$$

✖

Mathematica : cpu = 16.5253 (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]`

, could not solve

`DSolve[c*y[x] + b*Derivative[1][y][x] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] ==`

✖

Maple : cpu = 0. (sec), leaf count = 0

`dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)^2+b*diff(y(x),x)+y(x)*c=0,y(x))`

, result contains DESol or ODESolStruc

$$y(x) = \_a\&where \left[\left\{ \left(\frac{d}{d\_a} \_b(\_a) \right) \_b(\_a) + a\_b(\_a)^2 + \_b(\_a) b + c\_a = 0 \right\}, \left\{ \_a = y(x), \_b(\_a) = \right. \right.$$

2.1638

ODE No. 1638

$ay'(x)^2 + b\sin(y(x)) + y''(x) = 0$

✓ **Mathematica** : cpu = 5.98527 (sec), leaf count = 146

```
DSolve[b*Sin[y[x]] + a*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[\int_1^{\#1} - \frac{\sqrt{4a^2 + 1}}{\sqrt{4e^{-2aK[1]}c_1a^2 - 4b\sin(K[1])a + e^{-2aK[1]}c_1 + 2b\cos(K[1])}} dK[1] \& \right] \right\} \right\} [x]$$

✓ **Maple** : cpu = 0.394 (sec), leaf count = 115

```
dsolve(diff(diff(y(x),x),x)+a*diff(y(x),x)^2+b*sin(y(x))=0,y(x))
```

$$\int^{y(x)} \frac{4a^2 + 1}{\sqrt{16 \left(a^2 + \frac{1}{4}\right)^2 c_1 e^{-2\_aa} - 16 \left(a \sin(\_a) - \frac{\cos(\_a)}{2}\right) \left(a^2 + \frac{1}{4}\right) b}} d\_a - x - c_2 = 0$$

2.1639

ODE No. 1639

$$ay'(x)|y'(x)|+b\sin(y(x))+y''(x)=0$$

 **Mathematica** : cpu = 32.5455 (sec), leaf count = 0

```
DSolve[b*Sin[y[x]] + a*Abs[Derivative[1][y][x]]*Derivative[1][y][x] + Derivative[2][y][x] == 0
```

, 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

$$y(x) = \_a\&where\left[\left\{\left(\frac{d}{d\_a}-b(\_a)\right)\_b(\_a)+a\_b(\_a)\left|b(\_a)\right|+b\sin(\_a)=0\right\},\left\{\_a=y(x),\_b(\_a)\right\}\right]$$

2.1640

ODE No. 1640

$$ay(x)y'(x)^2+by(x)+y''(x)=0$$

✓ **Mathematica** : cpu = 0.697714 (sec), leaf count = 96

```
DSolve[b*y[x] + a*y[x]*Derivative[1][y][x]^2 + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[\int_1^{\#1}-\frac{\sqrt{a}}{\sqrt{e^{2ac_1-aK[1]^2}-b}}dK[1]\&z\right][x+c_2]\right\},\left\{y(x) \rightarrow \text{InverseFunction}\left[\int_1^{\#1}\frac{1}{\sqrt{e^{2ac_1-aK[1]^2}-b}}dK[1]\&z\right][x+c_2]\right\}\right\}$$

✓ **Maple** : cpu = 0.405 (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))
```

$$\int^{y(x)}\frac{a}{\sqrt{a\left(e^{-a^2a}c_1a-b\right)}}d_a-x-c_2=0$$

2.1641

ODE No. 1641

$$g(x)y'(x)+h(y(x))y'(x)^2+y''(x)=0$$

✓

Mathematica : cpu = 0.049291 (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]`

$$\left\{\left\{y(x)\rightarrow \text{InverseFunction}\left[\int_1^{\#1}\exp\left(-\int_1^{K[4]}-h(K[1])dK[1]\right)dK[4]\&\right]\left[\int_1^x-\exp\left(-\int_1^{K[5]}g(K[2])dK[2]\right)dK[5]\right]\right.\right.$$

✓

Maple : cpu = 0.058 (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))`

$$\int^{y(x)}e^{\int h(\_b)d\_b}d\_b-c_1\left(\int e^{-\left(\int g(x)dx\right)}dx\right)-c_2=0$$

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 = 0.531769 (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]] + Der
```

, could not solve

```
DSolve[f[x]*h[y[x]] + g[x]*Derivative[1][y][x] - (j[y[x]]*Derivative[1][y][x]^2)/h[y[x]]
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)-j(y(x))/h(y(x))*diff(y(x),x)^2+g(x)*diff(y(x),x)+f(x)*h(y(x))
```

, 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))
```

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 = 0.328085 (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],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[2][y][x],y,x]
```

 **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),y(x))
```

, 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),y(x))
```

2.1644

ODE No. 1644

$$h(y(x))y'(x)^2 + j(y(x))y'(x) + k(y(x)) + y''(x) = 0$$

✖

Mathematica : cpu = 38.9014 (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], y[x], 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][y][x], y[x], x]`

✖

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

$$y(x) = \_a \& \text{where} \left[\left\{ \left(\frac{d}{d\_a} \_b(\_a) \right) \_b(\_a) + h(\_a) \_b(\_a)^2 + j(\_a) \_b(\_a) + k(\_a) = 0 \right\}, \left\{ \_a = y(x) \right\} \right]$$

2.1645

ODE No. 1645

$$(y'(x)^2 + 1) (y'(x)h(x,y(x)) + j(x,y(x))) + y''(x) = 0$$

✖

Mathematica : cpu = 0.0684744 (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] == 0, y[x], x]

, could not solve

DSolve[(j[x, y[x]] + h[x, y[x]]*Derivative[1][y][x])*(1 + Derivative[1][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)+(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

$$ay(x)\left(y'(x)^2+1\right)^2+y''(x)=0$$

✓

Mathematica : cpu = 10.6839 (sec), leaf count = 262

DSolve[a*y[x]*(1 + Derivative[1][y][x]^2) ^2 + Derivative[2][y][x] == 0,y[x],x]

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[-\frac{\sqrt{\frac{\#1^2(-a)+1+2c_1}{1+2c_1}}\sqrt{2\#1^2a-4c_1}E\left(\sin^{-1}\left(\sqrt{\frac{a}{2c_1+1}}\#1\right)\left|1+\frac{1}{2c_1}\right.\right)}{\sqrt{\frac{a}{1+2c_1}}\sqrt{\#1^2(-a)+1+2c_1}\sqrt{2-\frac{\#1^2a}{c_1}}}\&\right][x+c_2]\right\}\right\}$$

✓

Maple : cpu = 0.265 (sec), leaf count = 94

dsolve(diff(diff(y(x),x),x)+a*y(x)*(diff(y(x),x)^2+1)^2=0,y(x))

$$\int^{y(x)}\frac{a(\_a^2+2c_1)}{\sqrt{-(-1+a(\_a^2+2c_1))}a(\_a^2+2c_1)}d\_a-x-c_2=0$$

2.1647

ODE No. 1647

$$y''(x) - a(xy'(x) - y(x))^r = 0$$

✓

Mathematica : cpu = 0.596504 (sec), leaf count = 60

`DSolve[-(a*(-y[x] + x*Derivative[1][y][x])^r) + Derivative[2][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x) \rightarrow x \left(\int_1^x \left(\frac{1}{2} a K[2]^{2 r}-\frac{1}{2} a r K[2]^{2 r}+c_1 K[2]^{2 r-2}\right)^{\frac{1}{1-r}} d K[2]+c_2\right)\right\}\right\}$$

✓

Maple : cpu = 8.603 (sec), leaf count = 60

`dsolve(diff(diff(y(x),x),x)-a*(x*diff(y(x),x)-y(x))^r=0,y(x))`

$$y(x)=\left(\int-\frac{\left(-\frac{1}{(r-1) a x^2-c_1}\right)^{\frac{r}{r-1}} 2^{\frac{r}{r-1}}((r-1) a x^2-c_1)}{2 x^2} d x+c_2\right) x$$

2.1648

ODE No. 1648

$$y''(x) - kx^ay(x)^by'(x)^c = 0$$

✖

Mathematica : cpu = 0.0723127 (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

$$y(x) = \left(\_a e^{\int \_b(\_a)d\_a+c_1} \right) \&where \left[\left\{ \frac{d}{d\_a} \_b(\_a) = - \frac{\left(\left(- \frac{(a-c+2)(\_a\_b(\_a)+1)}{\_b(\_a)(b+c-1)} \right)^c \_a^b b^2 k + 2 \left(- \frac{(a-c+2)(\_a\_b(\_a)+1)}{\_b(\_a)(b+c-1)} \right)^c \_a^b b^2 k \right)}{2 \left(- \frac{(a-c+2)(\_a\_b(\_a)+1)}{\_b(\_a)(b+c-1)} \right)^c \_a^b b^2 k} \right\} \right]$$

2.1649

ODE No. 1649

$$h(x,y(x))\left(y'(x)-\frac{y(x)}{x}\right)^a+y''(x)=0$$

 **Mathematica** : cpu = 5.4534 (sec), leaf count = 0

```
DSolve[h[x, y[x]]*(-(y[x]/x) + Derivative[1][y][x])^a + Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[h[x, y[x]]*(-(y[x]/x) + Derivative[1][y][x])^a + Derivative[2][y][x] == 0, y[x],
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)+(diff(y(x),x)-y(x)/x)^a*h(x,y(x))=0,y(x))
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)+(diff(y(x),x)-y(x)/x)^a*h(x,y(x))=0,y(x))
```

2.1650

ODE No. 1650

$$y''(x) - a\sqrt{y'(x)^2 + 1} = 0$$

✓ **Mathematica** : cpu = 0.194775 (sec), leaf count = 50

```
DSolve[-(a*Sqrt[1 + Derivative[1][y][x]^2]) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 - \frac{1}{a\sqrt{\operatorname{sech}^2(ax + c_1)}} \right\}, \left\{ y(x) \rightarrow \frac{1}{a\sqrt{\operatorname{sech}^2(ax + c_1)}} + c_2 \right\} \right\}$$

✓ **Maple** : cpu = 1.203 (sec), leaf count = 16

```
dsolve(diff(diff(y(x),x),x)-a*(diff(y(x),x)^2+1)^(1/2)=0,y(x))
```

$$y(x) = c_2 + \frac{\cosh(a(c_1 + x))}{a}$$

2.1651 ODE No. 1651

$$a\left(-\sqrt{y'(x)^2 + 1}\right) - b + y''(x) = 0$$

✓ **Mathematica** : cpu = 0.574263 (sec), leaf count = 972

$$\text{DSolve}[-b - a\sqrt{1 + \text{Derivative}[1][y][x]^2} + \text{Derivative}[2][y][x] == 0, y[x], x]$$

$$y(x) \rightarrow c_2 - \frac{2a \operatorname{InverseFunction} \left[\frac{2b \tan^{-1} \left(\frac{b+a \left(\sqrt{\#1^2+1}-\#1 \right)}{\sqrt{a^2-b^2}} \right)}{\sqrt{a^2-b^2}} - \log \left(\sqrt{\#1^2+1}-\#1 \right)}{a} \right] \& [x+c_1]^2}{\operatorname{InverseFunction} \left[\frac{2b \tan^{-1} \left(\frac{b+a \left(\sqrt{\#1^2+1}-\#1 \right)}{\sqrt{a^2-b^2}} \right)}{\sqrt{a^2-b^2}} - \log \left(\sqrt{\#1^2+1}-\#1 \right)}{a} \right] \& [x+c_1]^2+1} + b \log \left(\operatorname{InverseFunction} \right)$$

✓ **Maple** : cpu = 0.181 (sec), leaf count = 31

```
dsolve(diff(diff(y(x),x),x)-a*(diff(y(x),x)^2+1)^(1/2)-b=0,y(x))
```

$$y(x) = \int \text{RootOf} \left(x - \left(\int^{-Z} \frac{1}{a \sqrt{-f^2 + 1} + b} d\_f \right) + c_1 \right) dx + c_2$$

2.1652

ODE No. 1652

$$y''(x) - a\sqrt{by(x)^2 + y'(x)^2} = 0$$

✓ **Mathematica** : cpu = 0.529796 (sec), leaf count = 76

```
DSolve[-(a*Sqrt[b*y[x]^2 + Derivative[1][y][x]^2]) + Derivative[2][y][x] == 0,y[x],x]
```

Solve

$$\int_1^{y(x)} \frac{1}{\text{InverseFunction}\left[\int \frac{\#1}{K[1]\left(\frac{\#1^2}{K[1]^2} - a\sqrt{\frac{\#1^2}{K[1]^2} + b}\right)} d\frac{\#1}{K[1]} \& \right][c_1 - \log(K[1])]} dK[1] = x - c_2, y(x)$$

✓ **Maple** : cpu = 0.919 (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))
```

$$y(x) = e^{\int \text{RootOf}\left(x + \int^{-Z} \frac{1}{-a\sqrt{-f^2 + b + -f^2}} d\_f + c_1\right) dx + c_2}$$

2.1653

ODE No. 1653

$$y''(x) - a(y'(x)^2 + 1)^{3/2} = 0$$

✓ **Mathematica** : cpu = 0.188584 (sec), leaf count = 75

```
DSolve[-(a*(1 + Derivative[1][y][x]^2)^(3/2)) + Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 - \frac{i\sqrt{a^2x^2 + 2ac_1x - 1 + c_1^2}}{a} \right\}, \left\{ y(x) \rightarrow \frac{i\sqrt{a^2x^2 + 2ac_1x - 1 + c_1^2}}{a} + c_2 \right\} \right\}$$

✓ **Maple** : cpu = 0.208 (sec), leaf count = 41

```
dsolve(diff(diff(y(x),x),x)-a*(diff(y(x),x)^2+1)^(3/2)=0,y(x))
```

$$y(x) = \frac{\left(-1 + \left(c_1 + x\right)^2 a^2\right) \sqrt{-\frac{1}{-1 + \left(c_1 + x\right)^2 a^2}} + c_2 a}{a}$$

2.1654

ODE No. 1654

$$y''(x) - 2ax(y'(x)^2 + 1)^{3/2} = 0$$

✓ **Mathematica** : cpu = 0.427013 (sec), leaf count = 308

DSolve[-2*a*x*(1 + Derivative[1][y][x]^2)^(3/2) + Derivative[2][y][x] == 0,y[x],x]

$$\left\{ \left\{ y(x) \rightarrow c_2 - \frac{\sqrt{\frac{ax^2-1+c_1}{-1+c_1}} \sqrt{\frac{ax^2+1+c_1}{1+c_1}} \left(F\left(i \sinh^{-1}\left(x \sqrt{\frac{a}{c_1+1}}\right) \middle| \frac{c_1+1}{c_1-1}\right) + (-1+c_1) E\left(i \sinh^{-1}\left(x \sqrt{\frac{a}{c_1+1}}\right) \middle| \frac{c_1+1}{c_1-1}\right) \right)}{\sqrt{\frac{a}{1+c_1}} \sqrt{a^2 x^4 + 2 a c_1 x^2 - 1 + c_1^2}} \right. \right.$$

✓ **Maple** : cpu = 0.21 (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))

$$y(x) = \int \sqrt{-\frac{1}{-1 + (x^2 + 2c_1)^2 a^2}} a(x^2 + 2c_1) \, dx + c_2$$

2.1655

ODE No. 1655

$$y''(x)-ay(x)\left(y'(x)^2+1\right)^{3/2}=0$$

✓ **Mathematica** : cpu = 0.832038 (sec), leaf count = 350

DSolve[-(a*y[x]*(1 + Derivative[1][y][x]^2)^(3/2)) + Derivative[2][y][x] == 0,y[x],x]

$$\left\{\left\{y(x)\rightarrow \text{InverseFunction}\left[-\frac{\sqrt{\frac{\#1^2 a-2+2 c_1}{-1+c_1}} \sqrt{\frac{\#1^2 a+2+2 c_1}{1+c_1}}\left(F\left(i \sinh ^{-1}\left(\sqrt{\frac{a}{2 c_1+2}} \#1\right)\right) \mid \frac{c_1+1}{c_1-1}\right)+(-1+c_1) E\left(i \sqrt{\frac{a}{2+2 c_1}} \sqrt{\#1^4 a^2+4 \#1^2 a c_1-4+4 c_1^2}\right)\right)}{ }\right\}\right\}$$

✓ **Maple** : cpu = 0.328 (sec), leaf count = 84

dsolve(diff(diff(y(x),x),x)-a*y(x)*(diff(y(x),x)^2+1)^(3/2)=0,y(x))

$$\int^{y(x)} \frac{(\_a^2+2c_1) a}{\sqrt{4-(\_a^2+2c_1)^2 a^2}} d\_a-x-c_2=0$$

2.1656

ODE No. 1656

$$y''(x) - a(y'(x)^2 + 1)^{3/2}(bx + c + y(x)) = 0$$

✓ **Mathematica** : cpu = 58.7744 (sec), leaf count = 9706

```
DSolve[-(a*(c + b*x + y[x])*(1 + Derivative[1][y][x]^2)^(3/2)) + Derivative[2][y][x] == 0,y[x]
```

$$\left\{ \text{Solve} \left[\int_1^x \left(\frac{1}{b^2 + 1} - \frac{b \sqrt{-a^2 (c^2 + 2bK[1]c + 2y(x)c + b^2K[1]^2 + y(x)^2 - 2c_1 + 2bK[1]y(x))^2 (a^2c^4 + 4a^2} \right. \right. \right.$$

✓ **Maple** : cpu = 1.125 (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))
```

$$y(x) = -bx + \text{RootOf} \left(-x + \int^{-z} \frac{4b^2a^2\_f^2c^2 + 4a^2b^2c\_f^3 + a^2b^2\_f^4 - 8b^2c_1a^2c\_f - 4c_1a^2b^2\_f^2 + 4c_1^2a^2b^2 - } \right.$$

2.1657

ODE No. 1657

$$y''(x)+y(x)^3y'(x)-y(x)y'(x)\sqrt{4y'(x)+y(x)^4}=0$$

✓ **Mathematica** : cpu = 0.64932 (sec), leaf count = 365

```
DSolve[y[x]^3*Derivative[1][y][x] - y[x]*Derivative[1][y][x]*Sqrt[y[x]^4 + 4*Derivative[1][y][x]]]
```

$$\left\{\left\{y(x)\rightarrow (-1)^{3/4}\sqrt{(\cosh(c_1)+\sinh(c_1))^2}\tan\left(\sqrt[4]{-1}x\cosh^2(c_1)\sqrt{(\cosh(c_1)+\sinh(c_1))^2}+\sqrt[4]{-1}x\sinh^2(c_1)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.324 (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))
```

$$y(x)=\frac{\tan\left(\left(\frac{1}{c_1^2}\right)^{3/2}(c_2+x)\right)}{c_1}$$

2.1658

ODE No. 1658

$$y''(x) - h(y'(x), ax + by(x)) = 0$$

✗ Mathematica : cpu = 0.377513 (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

$$y(x) = \left(-\frac{a(\int -b(_a) d_a + c_1) - b_a}{b} \right) \&\text{where} \left[\left\{ \frac{d}{d_a} - b(_a) = -h\left(-\frac{a_b(_a) - b}{b_b(_a)}, b_a \right) - b(_a)^3 \right\} \right],$$

2.1659

ODE No. 1659

$$y''(x) - y(x)h\left(x, \frac{y'(x)}{y(x)}\right) = 0$$

✗ Mathematica : cpu = 5.68922 (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

$$y(x) = \left(e^{\int -b(\_a)d\_a+c_1}\right) \&where \left[\left\{\frac{d}{d\_a}-b(\_a) = -\_b(\_a)^2 + h(\_a, \_b(\_a))\right\}, \left\{ \_a = x, \_b(\_a) = \frac{\frac{d}{dx}y(\_a)}{y(\_a)}\right\}\right]$$

2.1660

ODE No. 1660

$$y''(x) - x^{n-2}h(x^{-n}y(x), x^{1-n}y'(x)) = 0$$

 **Mathematica** : cpu = 3.96375 (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,y[x],x]

 **Maple** : cpu = 0. (sec), leaf count = 0

dsolve(diff(diff(y(x),x),x)-x^(n-2)*h(y(x)/(x^n),diff(y(x),x)/(x^(n-1))))=0,y(x))

, result contains DESol or ODESolStruc

$$y(x) = \left(\_a e^{(\int \_b(\_a) d\_a + c_1) n} \right) \& \text{where} \left[\left\{ \frac{d}{d\_a} \_b(\_a) = \left(\_a n^2 - \_a n - h \left(\_a, \frac{\_b(\_a) \_a n + 1}{\_b(\_a)} \right) \right) \_b(\_a) \right. \right.$$

2.1661

ODE No. 1661

$$8y''(x)+9y'(x)^4=0$$

✓ **Mathematica** : cpu = 0.0801648 (sec), leaf count = 92

```
DSolve[9*Derivative[1][y][x]^4 + 8*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_2-\frac{1}{3}\sqrt[3]{-\frac{1}{3}(9x-8c_1)^{2/3}}\right\},\left\{y(x)\rightarrow \frac{(9x-8c_1)^{2/3}}{3\sqrt[3]{3}}+c_2\right\},\left\{y(x)\rightarrow \frac{(-1)^{2/3}(9x-8c_1)^{2/3}}{3\sqrt[3]{3}}+c_2\right\}\right.$$

✓ **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))
```

$$y(x)=(c_1+x)^{2/3}+c_2$$

2.1662

ODE No. 1662

$$ay''(x) + cy(x) + h(y'(x)) = 0$$

 **Mathematica** : cpu = 0.952611 (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

$$y(x) = \_a\&where \left[\left\{ \left(\frac{d}{d\_a} \_b(\_a) \right) \_b(\_a) + \frac{h(\_b(\_a)) + c\_a}{a} = 0 \right\}, \left\{ \_a = y(x), \_b(\_a) = \frac{d}{dx} y(x) \right\}, \right.$$

2.1663

ODE No. 1663

$$-xy(x)^n + xy''(x) + 2y'(x) = 0$$

✗ Mathematica : cpu = 0.0372603 (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

$$y(x) = \left(-a e^{\int -b(-a)d-a+c_1}\right) \&where \left[\left\{\frac{d}{d-a}b(-a) = \left(-\frac{a^nn^2}{4} + \frac{a^nn}{2} - \frac{an}{2} - \frac{a^n}{4} + \frac{3-a}{2}\right) - b(-a)^3 - \right.\right.$$

2.1664

ODE No. 1664

$$ax^my(x)^n + xy''(x) + 2y'(x) = 0$$

X Mathematica : cpu = 0.225719 (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]
```

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

$$y(x) = \left(-a e^{\int -b(-a)d-a+c_1}\right) \&where \left\{\frac{d}{d-a}b(-a) = \frac{(-a^na^2n^2 - 2-a^nan + -am^2 - amn + -a^na + 3-a}{(m+1)^2}\right.$$

2.1665

ODE No. 1665

$$xy''(x) + 2y'(x) + xe^{y(x)} = 0$$

 **Mathematica** : cpu = 0.101873 (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

$$y(x) = \left(-a - 2\left(\int -b(_a) d\_a\right) - 2c_1\right) \&where \left[\left\{\frac{d}{d\_a} - b(_a) = (e^{-a} - 2) - b(_a)^3 + -b(_a)^2\right\}, \left\{-a = \right.\right.$$

2.1666

ODE No. 1666

$$ay'(x) + bxe^{y(x)} + xy''(x) = 0$$

 **Mathematica** : cpu = 0.374224 (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

$$y(x) = \left(-a - 2\left(\int -b(_a) d\_a\right) - 2c_1\right) \&where \left[\left\{\frac{d}{d\_a} - b(_a) = (b e^{-a} - 2a + 2) - b(_a)^3 + (a - 1) - b(_a)\right.\right.$$

2.1667

ODE No. 1667

$$bx^{5-2a}e^{y(x)}+ay'(x)+xy''(x)=0$$

 **Mathematica** : cpu = 0.909122 (sec), leaf count = 0

```
DSolve[b*E^y[x]*x^(5 - 2*a) + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[b*E^y[x]*x^(5 - 2*a) + a*Derivative[1][y][x] + x*Derivative[2][y][x] == 0, y[x],
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x*diff(diff(y(x),x),x)+a*diff(y(x),x)+b*x^(5-2*a)*exp(y(x))=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=\left(-a+2a\left(\int -b(\_a)\,d\_a+c_1\right)-6\left(\int -b(\_a)\,d\_a\right)-6c_1\right)\&\text{where}\left[\left\{\frac{d}{d\_a}-b(\_a)=(b\,e^{-a}+2a\right.\right.$$

2.1668

ODE No. 1668

$$xy''(x) + (y(x) - 1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0703509 (sec), leaf count = 60

```
DSolve[(-1 + y[x])*Derivative[1][y][x] + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow 2 + \sqrt{2}\sqrt{2 + c_1} \tanh\left(\frac{1}{2}\left(\sqrt{2}\sqrt{2 + c_1} \log(x) - 2\sqrt{2}\sqrt{2 + c_1}c_2\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.138 (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 = 0.739972 (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
```

Solve $\left[\int_1^{y(x)}-\frac{x}{e^{xK[1]}c_1+2xK[1]+1}dK[1]-\int_1^x\left(\int_1^{y(x)}\left(\frac{\left(e^{K[1]K[2]}c_1K[1]+2K[1]\right)K[2]}{\left(e^{K[1]K[2]}c_1+2K[1]K[2]+1\right)^2}-\frac{1}{e^{K[1]K[2]}c_1+2K[1]K[2]+1}\right)dx\right.\\$

✓ **Maple** : cpu = 0.118 (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))
```

$$y(x)=\frac{\text{RootOf}\left(-\ln\left(x\right)+c_2-\left(\int^{-Z}\frac{1}{-2\_f-1+e^{-f}c_1}d\_f\right)\right)}{x}$$

2.1670

ODE No. 1670

$$a(xy'(x)-y(x))^2-b+xy''(x)=0$$

✓ **Mathematica** : cpu = 7.37579 (sec), leaf count = 51

```
DSolve[-b + a*(-y[x] + x*Derivative[1][y][x])^2 + x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow x \left(\int_1^x \frac{\sqrt{-\frac{b}{a}} \tan \left(c_1 - a \sqrt{-\frac{b}{a}} K[2]\right)}{K[2]^2} dK[2] + c_2\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.632 (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))
```

$$y(x)=\left(\int \frac{i \tan \left(-i x \sqrt{a} \sqrt{b}+c_1\right) \sqrt{b}}{\sqrt{a} x^2} d x+c_2\right) x$$

2.1671

ODE No. 1671

$$2xy''(x)+y'(x)^3+y'(x)=0$$

✓ **Mathematica** : cpu = 0.113913 (sec), leaf count = 59

```
DSolve[Derivative[1][y][x] + Derivative[1][y][x]^3 + 2*x*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_2-2ie^{c_1}\sqrt{-x+e^{2c_1}}\right\},\left\{y(x)\rightarrow 2ie^{c_1}\sqrt{-x+e^{2c_1}}+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.079 (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 = 10.7071 (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

$$y(x) = \_a \&where \left[\left\{ \frac{d}{d\_a} \_b(\_a) = (-\_a^n a + \_a a) \_b(\_a)^3 - \_b(\_a)^2 \right\}, \left\{ \_a = y(x), \_b(\_a) = \frac{1}{x \left(\frac{d}{dx} y \right)} \right\} \right]$$

2.1673

ODE No. 1673

$$a(e^{y(x)}-1)+x^2y''(x)=0$$

 **Mathematica** : cpu = 25.8071 (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

$$y(x) = \_a\&\text{where}\left[\left\{\frac{d}{d\_a}\_b(\_a) = (a\,e^{-a} - a)\_b(\_a)^3 - \_b(\_a)^2\right\},\left\{\_a = y(x), \_b(\_a) = \frac{1}{x\left(\frac{d}{dx}y(x)\right)}\right\}\right]$$

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 = 0.0490129 (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*Derivat

$$\left\{\left\{y(x)\rightarrow c_12^{-\frac{a}{b}}c^{\frac{a}{b}}\left(x^{2b}\right)^{\frac{a}{2b}}\cos\left(c\sqrt{x^{2b}}\right)+c_22^{-\frac{a+b}{b}}c^{\frac{a+b}{b}-1}\left(x^{2b}\right)^{\frac{a+b}{2b}-\frac{1}{2}}\sin\left(c\sqrt{x^{2b}}\right)\right\}\right\}$$

✓

Maple : cpu = 0.076 (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)=

$$y(x)=x^a\left(\sin\left(x^bc\right)c_1+\cos\left(x^bc\right)c_2\right)$$

2.1675

ODE No. 1675

$$x^k\big(-h(x^ky(x),ky(x)+xy'(x))\big)+(a+1)xy'(x)+x^2y''(x)=0$$

✖

Mathematica : cpu = 4.79486 (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

, 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)

, 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)

2.1676

ODE No. 1676

$$a(xy'(x)-y(x))^2-bx^2+x^2y''(x)=0$$

✓

Mathematica

: cpu = 0.389642 (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]

$$\left\{\left\{y(x)\rightarrow x\left(\int_1^x\frac{i\sqrt{a}\sqrt{b}Y_1\left(-i\sqrt{a}\sqrt{b}K[1]\right)-i\sqrt{a}\sqrt{b}J_1\left(i\sqrt{a}\sqrt{b}K[1]\right)c_1}{a\left(Y_0\left(-i\sqrt{a}\sqrt{b}K[1]\right)+J_0\left(i\sqrt{a}\sqrt{b}K[1]\right)c_1\right)K[1]}dK[1]+c_2\right)\right\}\right\}$$

✓

Maple

: cpu = 0.224 (sec), leaf count = 72

dsolve(x^2*diff(diff(y(x),x),x)+a*(x*diff(y(x),x)-y(x))^2-b*x^2=0,y(x))

$$y(x)=\left(\int-\frac{\sqrt{-ab}\left(c_1\operatorname{BesselY}\left(1,\sqrt{-ab}x\right)+\operatorname{BesselJ}\left(1,\sqrt{-ab}x\right)\right)}{xa\left(c_1\operatorname{BesselY}\left(0,\sqrt{-ab}x\right)+\operatorname{BesselJ}\left(0,\sqrt{-ab}x\right)\right)}dx+c_2\right)x$$

2.1677

ODE No. 1677

$$ay(x)y'(x)^2+bx+x^2y''(x)=0$$

 **Mathematica** : cpu = 30.8249 (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

$$y(x)=\left(-ae^{\int -b(-a)d_-a+c_1}\right) \& \text{where} \left[\left\{\frac{d}{d_-a}-b(-a)=\left(-a^3a+b\right)_-b(-a)^3+\left(2_-a^2a+1\right)_-b(-a)^2+_-a_-b(-a)\right.\right.$$

2.1678

ODE No. 1678

$$x^2y''(x) - \sqrt{ax^2y'(x)^2 + by(x)^2} = 0$$

 **Mathematica** : cpu = 1.16828 (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 = 0.306 (sec), leaf count = 57

```
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))
```

$$y(x) - e^{\int^{\ln(x)} \text{RootOf}\left(\int^{-Z} \frac{y(x)}{-_a^2 y(x) + _a y(x) + \sqrt{y(x)^2 (-_a^2 a + b)}} d\_a - _b + c_1\right) d\_b + c_2} = 0$$

2.1679

ODE No. 1679

$$(x^2 + 1) y''(x) + y'(x)^2 + 1 = 0$$

✓ **Mathematica** : cpu = 0.178772 (sec), leaf count = 33

```
DSolve[1 + Derivative[1][y][x]^2 + (1 + x^2)*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -x \cot(c_1) + \csc^2(c_1) \log(-x \sin(c_1) - \cos(c_1)) + c_2 \right\} \right\}$$

✓ **Maple** : cpu = 0.125 (sec), leaf count = 26

```
dsolve((x^2+1)*diff(diff(y(x),x),x)+diff(y(x),x)^2+1=0,y(x))
```

$$y(x) = \frac{x}{c_1} + \frac{(c_1^2 + 1) \ln(xc_1 - 1)}{c_1^2} + c_2$$

2.1680

ODE No. 1680

$$x^4(-y'(x)^2)+4x^2y''(x)+4y(x)=0$$

 **Mathematica** : cpu = 6.44948 (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

$$y(x)=\left(-a e^{\int -2\_b(\_a)d\_a-2c_1}\right) \& \text{where} \left[\left\{\frac{d}{d\_a}b(\_a)=\left(-\_a^2+7\_a\right)\_b(\_a)^3+\left(\_a-5\right)\_b(\_a)^2-\frac{b(\_a)}{\_a}\right.\right.$$

2.1681

ODE No. 1681

$$ay(x)^3 + 9x^2y''(x) + 2y(x) = 0$$

✓ **Mathematica** : cpu = 2.63868 (sec), leaf count = 41

```
DSolve[2*y[x] + a*y[x]^3 + 9*x^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow c_2 \sqrt[3]{x} \operatorname{sn}\left(\left(c_1 + \frac{\sqrt{ax^{20/3}}}{\sqrt{2}x^3}\right)c_2 \middle| -1\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (sec), leaf count = 31

```
dsolve(9*x^2*diff(diff(y(x),x),x)+a*y(x)^3+2*y(x)=0,y(x))
```

$$y(x) = c_2 \operatorname{JacobiSN}\left(\left(\frac{\sqrt{2}\sqrt{x^{20/3}a}}{2x^3} + c_1\right)c_2, i\right)x^{1/3}$$

2.1682

ODE No. 1682

$$x^3(y''(x)+y(x)y'(x)-y(x)^3)+12xy(x)+24=0$$

✓ **Mathematica** : cpu = 21.688 (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]
```

$$\left\{\left\{y(x)\rightarrow \frac{2+x^3\wp'(x+c_1;0,c_2)}{x(-1+x^2\wp(x+c_1;0,c_2))}\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(x^3*(diff(diff(y(x),x),x)+y(x)*diff(y(x),x)-y(x)^3)+12*x*y(x)+24=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x)=\left(-a\mathrm{e}^{\int -b(-a)d-a+c_1}\right)\&\mathrm{where}\left[\left\{\frac{d}{d-a}-b(-a)=\left(-a^3-a^2+14a+24\right)-b(-a)^3+\left(-a+3\right)-b(-a)^2\right\}\right]$$

2.1683

ODE No. 1683

$$x^3y''(x) - a(xy'(x) - y(x))^2 = 0$$

✓ **Mathematica** : cpu = 0.0881766 (sec), leaf count = 26

```
DSolve[-(a*(-y[x] + x*Derivative[1][y][x])^2) + x^3*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow -\frac{x \log \left(a\left(-\frac{c_1}{x} - c_2\right)\right)}{a}\right\}\right\}$$

✓ **Maple** : cpu = 0.062 (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 = 52.0875 (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*y''[x], y[x], x]
```

, 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*x^3*y''[x], y[x], x]
```

✖ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve(2*x^3*diff(diff(y(x),x),x)+x^2*(9+2*x*y(x))*diff(y(x),x)+b+x*y(x)*(a+3*x*y(x)-2*x^2*y(x)^2),y(x))
```

, result contains DESol or ODESolStruc

$y(x) = \left(-a e^{\int -b(-a)d_{-a}+c_1}\right) \&\text{where} \left[\left\{ \frac{d}{d_{-a}} b(-a) = \left(-a^3 + \frac{1}{2}a^2 + \frac{1}{2}aa - \frac{5}{2}a + \frac{1}{2}b\right) - b(-a)^3 + \left(-\right.\right. \right.$

2.1685 ODE No. 1685

$axy(x) + b - (kx^{k-1} - 12x^2) (3y'(x) + y(x)^2) + 2(4x^3 - x^k) (y''(x) + y(x)y'(x) - y(x)^3) = 0$

✗ Mathematica : cpu = 5.10182 (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[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x]) == 0, y[x], x]
```

, could not solve

```
DSolve[b + a*x*y[x] - (-12*x^2 + k*x^(-1 + k))*(y[x]^2 + 3*Derivative[1][y][x]) + 2*(4*x^3 - x^k)*(y[x]^3 + y[x]*Derivative[1][y][x] + Derivative[2][y][x]) == 0, y[x], x]
```

✗ Maple : cpu = 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*diff(y(x),x)+y(x)^2)+a*x*y(x)+b=0,y(x))
```

, 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 = 0.0412874 (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

$$y(x) = \left(-a e^{\int -b(-a)d_-a+c_1}\right) \&where \left[\left\{\frac{d}{d_-a}-b(-a) = \left(\frac{a^2n^2-a^n}{4} - \frac{a^2n-a^n}{2} + \frac{a^2-a^n}{4} - \frac{-an}{2} + \frac{3-a}{2}\right) -b(-a)\right.\right.$$

2.1687

ODE No. 1687

$$x^4y''(x) - x\big(x^2 + 2y(x)\big)y'(x) + 4y(x)^2 = 0$$

✓

Mathematica : cpu = 0.13514 (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]

$$\left\{\left\{y(x) \rightarrow -\frac{x^3\left(i\left(\frac{i}{\sqrt{c_1}}-\frac{\sqrt{-1-c_1}}{\sqrt{c_1}}\right)\sqrt{c_1}c_2x^{-1+i\left(\frac{i}{\sqrt{c_1}}-\frac{\sqrt{-1-c_1}}{\sqrt{c_1}}\right)\sqrt{c_1}}+i\left(\frac{\sqrt{-1-c_1}}{\sqrt{c_1}}+\frac{i}{\sqrt{c_1}}\right)\sqrt{c_1}x^{-1+i\left(\frac{\sqrt{-1-c_1}}{\sqrt{c_1}}+\frac{i}{\sqrt{c_1}}\right)\sqrt{c_1}}}{c_2x^{i\left(\frac{i}{\sqrt{c_1}}-\frac{\sqrt{-1-c_1}}{\sqrt{c_1}}\right)\sqrt{c_1}}+x^{i\left(\frac{\sqrt{-1-c_1}}{\sqrt{c_1}}+\frac{i}{\sqrt{c_1}}\right)\sqrt{c_1}}}\right.\right.$$

✓

Maple : cpu = 0.113 (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))

$$y(x)=x^2(1+\tanh\left(c_1(-\ln(x)+c_2)\right)c_1)$$

2.1688

ODE No. 1688

$$x^4y''(x) - x^2y'(x) \left(y'(x) + x\right) + 4y(x)^2 = 0$$

✓ **Mathematica** : cpu = 1.18588 (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[x], x]
```

Solve $\left[\int_1^{y(x)} \frac{1}{-e^{\frac{K[1]}{x^2}} c_1 x^2 + 2x^2 + 4K[1]} dK[1] - \int_1^x \left(\frac{K[2] \left(e^{\frac{y(x)}{K[2]^2}} c_1 + 2 \left(-\frac{y(x)}{K[2]^2} - 1 \right) \right)}{-e^{\frac{y(x)}{K[2]^2}} c_1 K[2]^2 + 2K[2]^2 + 4y(x)} + \int_1^{y(x)} -\frac{\frac{2e^{\frac{K[1]}{K[2]^2}} c_1 K[2]}{K[2]}}{\left(-e^{\frac{K[1]}{K[2]^2}} c_1 x^2 + 2x^2 + 4K[1] \right)} dK[1] \right) dx, y(x) \right]$

✓ **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))
```

$$y(x) = \text{RootOf} \left(-\ln(x) + c_2 - \left(\int^{-x} \frac{1}{e^{-f} c_1 + 4f + 2} d_{-f} \right) \right) x^2$$

2.1689

ODE No. 1689

$$x^4y''(x) + (xy'(x) - y(x))^3 = 0$$

✓ **Mathematica** : cpu = 0.300892 (sec), leaf count = 104

```
DSolve[(-y[x] + x*Derivative[1][y][x])^3 + x^4*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -ix \log \left(\frac{\frac{e^{c_2}}{x} - \frac{\sqrt{e^{2c_2} - 8ic_1x^2}}{x}}{4c_1} \right) \right\}, \left\{ y(x) \rightarrow -ix \log \left(\frac{\frac{\sqrt{e^{2c_2} - 8ic_1x^2}}{x} + \frac{e^{c_2}}{x}}{4c_1} \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.126 (sec), leaf count = 37

```
dsolve(x^4*diff(diff(y(x),x),x)+(x*diff(y(x),x)-y(x))^3=0,y(x))
```

$$y(x) = \left(-\arctan \left(\frac{1}{\sqrt{c_1x^2 - 1}} \right) + c_2 \right) x$$

2.1690

ODE No. 1690

$$\sqrt{x}y''(x) - y(x)^{3/2} = 0$$

 **Mathematica** : cpu = 21.3862 (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

$$y(x) = \left(\_a e^{\int -3\_b(\_a) d\_a - 3c_1} \right) \&\text{where} \left[\left\{ \frac{d}{d\_a} \_b(\_a) = \left(-\_a^{3/2} + 12\_a \right) \_b(\_a)^3 - 7\_b(\_a)^2 \right\}, \left\{ \_a = \right. \right.$$

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 = 26.2055 (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]
```

$$\left\{ \text{Solve} \left[2a \tan^{-1} \left(\frac{2ax + b}{\sqrt{4ac - b^2}} \right) + 2\sqrt{4ac - b^2} \int_1^{\frac{y(x)}{\sqrt{c + x(b + ax)}}} \frac{a}{\sqrt{4c_1a^2 + (b^2 - 4ac) K[3]^2 + 8 \int_1^{K[3]} f(K[2]) dK[2]}} \right. \right.$$

✓ **Maple** : cpu = 0.946 (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))
```

$$y(x) = \text{RootOf} \left(4\_Zac - b^2\_Z - 4F\left(\frac{-Z}{\sqrt{a\,x^2 + bx + c}}\right) \sqrt{a\,x^2 + bx + c} \right)$$

2.1692

ODE No. 1692

$$x^{\frac{n}{n+1}}y''(x)-y(x)^{\frac{2n+1}{n+1}}=0$$

 **Mathematica** : cpu = 0.0716481 (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

$$y(x)=\left(-a e^{-\frac{(f-b(-a) d_{-a}+c_1)(n+2)}{n}}\right) \& \text { where } \left[\left\{\frac{d}{d_{-a}} b(-a)=-\frac{\left(-a^{\frac{2 n+1}{n+1}} n^2-2_{-a} n^2-6_{-a} n-4_{-a}\right)_{-b}(-a)^3}{n^2}\right.\right.$$

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 = 1.09226 (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]`

, could not solve

`DSolve[-h[y[x], f[x]*Derivative[1][y][x]] + f[x]*Derivative[1][f][x]*Derivative[1][y][x]`

✖

Maple : cpu = 0. (sec), leaf count = 0

`dsolve(f(x)^2*diff(diff(y(x),x),x)+f(x)*diff(f(x),x)*diff(y(x),x)-h(y(x),f(x))*diff(y(x),`

, result contains DESol or ODESolStruc

$$y(x) = \_a \& \text{where} \left[\left\{ \frac{d}{d\_a} \_b(\_a) = -h\left(\_a, \frac{1}{\_b(\_a)}\right) \_b(\_a)^3 \right\}, \left\{ \_a = y(x), \_b(\_a) = \frac{1}{f(x) \left(\frac{d}{dx}y(x)\right)} \right\} \right]$$

2.1694

ODE No. 1694

$$y(x)y''(x)-a=0$$

✓ **Mathematica** : cpu = 0.138161 (sec), leaf count = 115

```
DSolve[-a + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \exp\left(\frac{-2\operatorname{erf}^{-1}\left(-i\sqrt{\frac{2}{\pi}}\sqrt{ae^{\frac{c_1}{a}}(x+c_2)^2}\right)^2-c_1}{2a}\right)\right\},\left\{y(x)\rightarrow \exp\left(\frac{-2\operatorname{erf}^{-1}\left(i\sqrt{\frac{2}{\pi}}\sqrt{ae^{\frac{c_1}{a}}(x+c_2)^2}\right)^2-c_1}{2a}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.102 (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 = 13.9161 (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

$$y(x)=\left(-a\left(e^{\int -b(-a)d-a+c_1}\right)^{3/2}\right) \& \text{where} \left[\left\{\frac{d}{d-a}b(-a)=\frac{(3-a^2-4a)-b(-a)^3}{4-a}+2-b(-a)^2\right\},\left\{-a=\frac{y(-a)}{x^3}\right\}\right]$$

2.1696

ODE No. 1696

$$y(x)y''(x)-ax^2=0$$

✖

Mathematica : cpu = 12.4349 (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

$$y(x)=\left(-ae^{\int 2b(-a)d-a+2c_1}\right) \& \text{where} \left[\left\{\frac{d}{d-a}b(-a)=\frac{(2-a^2-a)b(-a)^3}{-a}+3b(-a)^2\right\},\left\{-a=\frac{y(x)}{x^2},-\right.\right.$$

2.1697

ODE No. 1697

$$-a + y(x)y''(x) + y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.199334 (sec), leaf count = 94

```
DSolve[-a + Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{a^2x^2 + 2a^2c_2x + a^2c_2^2 - e^{2c_1}}}{\sqrt{a}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{a^2x^2 + 2a^2c_2x + a^2c_2^2 - e^{2c_1}}}{\sqrt{a}} \right\} \right\}$$

✓ **Maple** : cpu = 0.045 (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 = 0.0344667 (sec), leaf count = 72

```
DSolve[-b - a*x + Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow -\frac{\sqrt{ax^3 + 3bx^2 + 3c_2x + 6c_1}}{\sqrt{3}} \right\}, \left\{ y(x) \rightarrow \frac{\sqrt{ax^3 + 3bx^2 + 3c_2x + 6c_1}}{\sqrt{3}} \right\} \right\}$$

✗ **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 = 0.134572 (sec), leaf count = 40

```
DSolve[-Derivative[1][y][x] + Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_1\left(-W\left(-\frac{e^{-\frac{x}{c_1}-1-\frac{c_2}{c_1}}}{c_1}\right)\right)-c_1\right\}\right\}$$

✓ **Maple** : cpu = 0.174 (sec), leaf count = 33

```
dsolve(diff(diff(y(x),x),x)*y(x)+diff(y(x),x)^2-diff(y(x),x)=0,y(x))
```

$$y(x)=-c_1\left(\text{LambertW}\left(-\frac{e^{-1}e^{-\frac{c_2}{c_1}}e^{-\frac{x}{c_1}}}{c_1}\right)+1\right)$$

2.1700

ODE No. 1700

$$y(x)y''(x)-y'(x)^2+1=0$$

✓ **Mathematica** : cpu = 0.244491 (sec), leaf count = 85

```
DSolve[1 - Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow-\frac{ie^{-c_1}\tanh(e^{c_1}(x+c_2))}{\sqrt{-1+\tanh^2(e^{c_1}(x+c_2))}}\right\},\left\{y(x)\rightarrow\frac{ie^{-c_1}\tanh(e^{c_1}(x+c_2))}{\sqrt{-1+\tanh^2(e^{c_1}(x+c_2))}}\right\}\right\}$$

✓ **Maple** : cpu = 0.361 (sec), leaf count = 86

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+1=0,y(x))
```

$$y(x)=\frac{\left(-c_1e^{\frac{2x}{c_1}}e^{\frac{2c_2}{c_1}}+c_1\right)e^{-\frac{x}{c_1}}e^{-\frac{c_2}{c_1}}}{2}$$

2.1701

ODE No. 1701

$$y(x)y''(x)-y'(x)^2-1=0$$

✓

Mathematica

: cpu = 0.234392 (sec), leaf count = 80

DSolve[-1 - Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]

$$\left\{\left\{y(x)\rightarrow-\frac{e^{-c_1}\tanh\left(e^{c_1}(x+c_2)\right)}{\sqrt{-1+\tanh^2\left(e^{c_1}(x+c_2)\right)}}\right\},\left\{y(x)\rightarrow\frac{e^{-c_1}\tanh\left(e^{c_1}(x+c_2)\right)}{\sqrt{-1+\tanh^2\left(e^{c_1}(x+c_2)\right)}}\right\}\right\}$$

✓

Maple

: cpu = 0.283 (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

$$e^{2x}(ay(x)^4 + b) + e^xy(x)(cy(x)^2 + d) + y(x)y''(x) - y'(x)^2 = 0$$

✖

Mathematica : cpu = 1.77041 (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]*Derivat

, 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]*D

✖

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

, 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

2.1703

ODE No. 1703

$$y(x)y''(x)-y'(x)^2+y(x)^2(-\log(y(x)))=0$$

✓ **Mathematica** : cpu = 0.382416 (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]
```

$$\left\{\left\{y(x)\rightarrow \exp\left(-\frac{1}{2}\sqrt{c_1}e^{-x-c_2}\left(-1+e^{2x+2c_2}\right)\right)\right\},\left\{y(x)\rightarrow \exp\left(\frac{1}{2}\sqrt{c_1}e^{-x-c_2}\left(-1+e^{2x+2c_2}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.223 (sec), leaf count = 25

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-y(x)^2*ln(y(x))=0,y(x))
```

$$y(x)=e^{-\frac{e^{2x}e^{-x}c_1}{2}}e^{\frac{c_2e^{-x}}{2}}$$

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 = 9.50178 (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])/(f[x]^2)),y[x],x]
```

, could not solve

```
DSolve[f[x]*y[x]^3 - Derivative[1][y][x] - Derivative[1][y][x]^2 + y[x]^2*(-(Derivative[1][f][x])/(f[x]^2)),y[x],x]
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-diff(y(x),x)+f(x)*y(x)^3+y(x)^2*(diff(f(x),x)/f(x)^2)=0,y(x))
```

, 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(f(x),x)/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 = 0.409446 (sec), leaf count = 252

`DSolve[-y[x]^3 - y[x]*Derivative[1][f][x] + f[x]*Derivative[1][y][x] - Derivative[1][y][x]^2 +`

$$\left\{\left\{y(x)\rightarrow -\frac{\exp\left(c_2-\int_1^x\frac{y(K[3])^3+c_1^2y(K[3])^2+\int_1^{K[3]}\frac{-y(K[1])^3-f'(K[1])y(K[1])+f(K[1])y'(K[1])}{y(K[1])^2}dK[1]^2y(K[3])^2+2c_1\int_1^{K[3]}\frac{-y(K[1])^3-f'(K[1])y(K[1])+f(K[1])y'(K[1])}{y(K[1])^2}dK[1]}{y(K[3])^2\left(c_1+\int_1^{K[3]}\frac{-y(K[1])^3-f'(K[1])y(K[1])+f(K[1])y'(K[1])}{y(K[1])^2}dK[1]\right)}\int_1^x\frac{-y(K[1])^3-f'(K[1])y(K[1])+f(K[1])y'(K[1])}{y(K[1])^2}dK[1]\right\}\right\}$$

✗

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,y(x))`

, 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 = 0.645633 (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]^4 == 0,x]`

$$\left\{\left\{y(x) \rightarrow -\frac{\exp\left(c_2 - \int_1^x \frac{y(K[3])^4 - f(K[3])y(K[3])^3 + c_1^2 y(K[3])^2 + \int_1^{K[3]} \frac{-y(K[1])^4 + f(K[1])y(K[1])^3 - f''(K[1])y(K[1]) + f'(K[1])y'(K[1])}{y(K[1])^2} dK[1]}{y(K[3])^2 \left(c_1 + \int_1^{K[3]} \frac{-y(K[1])^4 + f(K[1])y(K[1])^3}{y(K[1])^2} dK[1]\right)}\right.\right. \right.$$

✗

Maple : cpu = 0. (sec), leaf count = 0

`dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+diff(f(x),x)*diff(y(x),x)-diff(diff(f(x),x),x)*y(x)^4=0,y(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),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 = 0.0784927 (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],y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_2e^{-\frac{bx}{a}-\frac{c_1e^{-ax}}{a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.226 (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))
```

$$y(x)=e^{\frac{e^{-ax}c_1}{a}}e^{-\frac{bx}{a}}e^{-\frac{c_2}{a}}e^{\frac{b}{a^2}}$$

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 = 35.4552 (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[2][y][x], y[x], x]`

, 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]*Derivative[2][y][x], y[x], x]`

✖

Maple : cpu = 0. (sec), leaf count = 0

`dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+a*y(x)*diff(y(x),x)-2*a*y(x)^2+b*y(x)^3=0,y(x))`

, result contains DESol or ODESolStruc

$$y(x) = \_a \&where \left[\left\{ \left(\frac{d}{d\_a} b(\_a) \right) \_b(\_a) - \frac{-b\_a^3 + 2\_a^2 a - \_a \_b(\_a) a + \_b(\_a)^2}{\_a} = 0 \right\}, \left\{ \_a = y \right\} \right]$$

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 = 54.6313 (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]^2 == 0,x]`

$$\left\{ \left\{ y(x) \rightarrow -\frac{1}{2a} + e^{2ax} \left(\frac{e^{-2ax} \left(c_1 (\sqrt{a^3 + 2b^2} - a^{3/2}) \Gamma \left(1 - \frac{\sqrt{a^3 + 2b^2}}{2a^{3/2}} \right) J_{-\frac{\sqrt{a^3 + 2b^2}}{2a^{3/2}}} \left(\frac{\sqrt{ab^2 e^{2ax} c_2}}{a^{3/2}} \right) + 2c_1 \Gamma \left(1 - \frac{\sqrt{a^3 + 2b^2}}{2a^{3/2}} \right) \right)}{4a \left(bc_1 \Gamma \left(1 - \frac{\sqrt{a^3 + 2b^2}}{2a^{3/2}} \right) \right)} \right) \right\} \right\}$$

✗

Maple : cpu = 0. (sec), leaf count = 0

`dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-(-1+a*y(x))*diff(y(x),x)+2*a^2*y(x)^2-2*a*y(x),x))`

, result contains DESol or ODESolStruc

$$y(x) = \_a \&where \left[\left\{ \left(\frac{d}{d\_a} b(\_a) \right) \_b(\_a) - \frac{2b^2\_a^3 - 2\_a^2 a^2 + \_a\_b(\_a) a + \_b(\_a)^2 - \_a a - \_b(\_a)}{\_a} \right\} \right]$$

2.1710 ODE No. 1710

$$-y(x)(y(x)+1)\left(b^2y(x)^2-a^2\right)+\left(ay(x)-1\right)y'(x)+y(x)y''(x)-y'(x)^2=0$$

X Mathematica : cpu = 62.7659 (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
```

, could not solve

```
DSolve[-(y[x]*(1 + y[x])*(-a^2 + b^2*y[x]^2)) + (-1 + a*y[x])*Derivative[1][y][x] - Deri
```

X 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))*
```

, result contains DESol or ODESolStruc

$$y(x) = \_a \&where \left[\left\{ \left(\frac{d}{d\_a} b(\_a) \right) \_b(\_a) - \frac{a^4 b^2 + b^2 \_a^3 - \_a^2 a^2 - \_a \_b(\_a) a - \_a a^2 + \_b(\_a)^2}{\_a} \right. \right.$$

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 = 20.3708 (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]
```

$$\left\{ \left\{ y(x) \rightarrow - \frac{(-1)^{-n} (\cos^2(K[1]) - 1)^{-\frac{n}{2} - \frac{1}{2}} \sec(K[1]) \left(2^{n + \frac{3}{2}} K_n \left(\sqrt{\cos^2(K[1]) - 1} \right) \cos^3(K[1]) \log(y(K[1])) y(K[1]) (2 \cos^2(K[1]) - 2) \right)}{c_1 + \int_1^x \frac{(-1)^{-n} (\cos^2(K[1]) - 1)^{-\frac{n}{2} - \frac{1}{2}} \sec(K[1]) \left(2^{n + \frac{3}{2}} K_n \left(\sqrt{\cos^2(K[1]) - 1} \right) \cos^3(K[1]) \log(y(K[1])) y(K[1]) (2 \cos^2(K[1]) - 2) \right)}{t} dt}{(-1)^{-n} 2^{n + \frac{1}{2}} e} \right. \right.$$

✓ **Maple** : cpu = 0.559 (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)
```

$$y(x) = e^{-\frac{c_2 \operatorname{BesselY}(n, \sin(x)) \pi}{2}} e^{\frac{\operatorname{BesselJ}(n, \sin(x)) c_1 \pi}{2}}$$

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 = 0.066564 (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`

$$\left\{\left\{y(x) \rightarrow c_2 \exp \left(\int_1^x \left(\exp \left(\int_1^{K[3]} f(K[1]) d K[1]\right) c_1+\exp \left(\int_1^{K[3]} f(K[1]) d K[1]\right) \int_1^{K[3]} \exp \left(-\int_1^{K[2]} \right.\right.\right.\right.$$

✓

Maple : cpu = 0.263 (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 = 20.7936 (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)*Derivative[1][y][x], y[x], x]

, could not solve

DSolve[-(y[x]*(-(y[x]^2*Derivative[1][f][x]) + Derivative[1][g][x])) + (g[x] + f[x]*y[x]^2)*Derivative[1][y][x], y[x], x]

✖

Maple : cpu = 0. (sec), leaf count = 0

dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+(g(x)+f(x)*y(x)^2)*diff(y(x),x)-y(x)*(diff(g(x),x)-2*f(x)*y(x)),x))

, result contains DESol or ODESolStruc

$$y(x) = \_b(\_a) \&where \left[\left\{ \frac{\frac{d}{d\_a}\_b(\_a)}{\_b(\_a)} + \frac{f(\_a)\_b(\_a)^2 + c1\_b(\_a) - g(\_a)}{\_b(\_a)} = 0 \right\}, \{ \_a = x, \_b(\_a) = y(x) \} \right]$$

2.1714

ODE No. 1714

$$y(x)y''(x)+3y(x)y'(x)-3y'(x)^2-y(x)^2=0$$

✓ **Mathematica** : cpu = 0.170297 (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], y[x], x]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_2e^{x+c_1}}{\sqrt{-1+2e^{x+c_1}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.075 (sec), leaf count = 36

```
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))
```

$$y(x)=\frac{e^x}{\sqrt{2c_2e^x-2c_1}}$$

2.1715

ODE No. 1715

$$y(x)y''(x)-ay'(x)^2=0$$

✓ **Mathematica** : cpu = 0.128384 (sec), leaf count = 26

```
DSolve[-(a*Derivative[1][y][x]^2) + y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_2(-ax+x-c_1)^{\frac{1}{1-a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.067 (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

$$a\big(y'(x)^2+1\big)+y(x)y''(x)=0$$

✓

Mathematica

: cpu = 0.64068 (sec), leaf count = 172

DSolve[a*(1 + Derivative[1][y][x]^2) + y[x]*Derivative[2][y][x] == 0,y[x],x]

$$\left\{\left\{y(x)\rightarrow \text{InverseFunction}\left[-\frac{\#1\sqrt{1-e^{2c_1}\#1^{-2a}}{}_2F_1\left(\frac{1}{2},-\frac{1}{2a};1-\frac{1}{2a};e^{2c_1}\#1^{-2a}\right)}{\sqrt{-1+e^{2c_1}\#1^{-2a}}}\&\right][x+c_2]\right\},\left\{y(x)\rightarrow \text{InverseFunction}\left[\frac{\#1\sqrt{1-e^{2c_1}\#1^{-2a}}{}_2F_1\left(\frac{1}{2},-\frac{1}{2a};1-\frac{1}{2a};e^{2c_1}\#1^{-2a}\right)}{\sqrt{-1+e^{2c_1}\#1^{-2a}}}\&\right][x+c_2]\right\}$$

✓

Maple

: cpu = 0.285 (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 = 52.2558 (sec), leaf count = 277

DSolve[b*y[x]^3 + a*Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] == 0,y[x],x]

$$\left\{\text{Solve}\left[\frac{y(x)\sqrt{(2a+3)y(x)^{2a}}\sqrt{1-\frac{2by(x)^{2a+3}}{2ac_1+3c_1}}{}_2F_1\left(\frac{1}{2},\frac{a+1}{2a+3};\frac{a+1}{2a+3}+1;\frac{2by(x)^{2a+3}}{2ac_1+3c_1}\right)}{(a+1)\sqrt{-2by(x)^{2a+3}+2ac_1+3c_1}}=-x+c_2,y(x)\right],\text{Solve}\left[\frac{y(x)}{\sqrt{-2by(x)^{2a+3}+2ac_1+3c_1}}=-x+c_2,y(x)\right]\right\}$$

✓

Maple : cpu = 0.423 (sec), leaf count = 107

dsolve(diff(diff(y(x),x),x)*y(x)+a*diff(y(x),x)^2+b*y(x)^3=0,y(x))

$$\int^{y(x)}\frac{-a^{2a}(2a+3)}{\sqrt{-a^{2a}(2a+3)(2b-a^{2a+3}-c_1)}}d_a-x-c_2=0$$

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 = 1.7783 (sec), leaf count = 744

```
DSolve[c*y[x]^2 + d*y[x]^(1 - a) + b*y[x]*Derivative[1][y][x] + a*Derivative[1][y][x]^2 + y[x]
```

$$\left\{ \left\{ y(x) \rightarrow \left(-\frac{ad \exp \left(\frac{1}{2} x \left(\sqrt{-4ac + b^2 - 4c} + b \right) - \frac{x \left(b \sqrt{-4ac + b^2 - 4c} - 4(a+1)c + b^2 \right)}{\sqrt{-4ac + b^2 - 4c} + b} - \frac{2(a+1)cx}{\sqrt{-4ac + b^2 - 4c} + b} \right)}{(a+1)c} - \frac{d \exp \left(\right)}{(a+1)c} \right. \right.$$

✓ **Maple** : cpu = 0.382 (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
```

$$y(x) = e^{\frac{x\sqrt{(-4a-4)c+b^2}}{2a+2}} e^{-\frac{bx}{2a+2}} \left(\frac{(-4a-4)c^3 + b^2c^2}{\left(-de^{-\frac{\left(-b+\sqrt{(-4a-4)c+b^2}\right)x}{2}} \sqrt{(-4a-4)c+b^2} + (a+1)c \left(c_2e^{-x\sqrt{(-4a-4)c+b^2}} - c_1 \right) \right)} \right)$$

2.1719

ODE No. 1719

$$ay'(x)^2 + f(x)y(x)y'(x) + g(x)y(x)^2 + y(x)y''(x) = 0$$

✗ Mathematica : cpu = 42.8557 (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
```

, 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]*Deri
```

✗ 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
```

, result contains DESol or ODESolStruc

$$y(x) = \left(e^{\int -b(\_a)d\_a+c_1}\right) \&where \left[\left\{\frac{d}{d\_a}b(\_a) = (-a-1)\_b(\_a)^2 - f(\_a)\_b(\_a) - g(\_a)\right\}, \left\{\_a = x,\right.\right.$$

2.1720

ODE No. 1720

$$ay'(x)^2 + by(x)^2y'(x) + cy(x)^4 + y(x)y''(x) = 0$$

✓

Mathematica : cpu = 94.9633 (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],y[x],x]

Solve

$$\int_1^{y(x)} \frac{1}{K[2]^2 \text{InverseFunction}\left[\frac{\log(c + \#1(b + (a + 2)\#1)) - \frac{2b \tan^{-1}\left(\frac{b + 2(a + 2)\#1}{\sqrt{4(a + 2)c - b^2}}\right)}{\sqrt{4(a + 2)c - b^2}}}{2(a + 2)}\right] \& [c_1 - \log(K[2])]} dK[2] = x -$$

✓

Maple : cpu = 0.441 (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))

$$\int^{y(x)} \frac{2a + 4}{\tan \left(\text{RootOf} \left(2\_Zb\_a^2 - 2a \ln (\_a) \sqrt{\_a^4 (4ca - b^2 + 8c)} - \ln \left(\frac{\_a^4 \left(\tan (\_Z)^2 + 1 \right) (4ca - b^2 + 8c)}{4a + 8} \right) \sqrt{\_a^4 (4ca - b^2 + 8c)} \right)} dy(x)$$

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 = 22.7825 (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*Deri
```

$$\left\{\left\{y(x)\rightarrow-\frac{(a+2)(x+c_1)^a}{a\int_1^xf(K[3])(c_1+K[3])^adK[3]+c_2}\right\}\right\}$$

✗ **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(y(x),x),x)*y(x)-(a-1)/a*diff(y(x),x)^2-f(x)*y(x)^2*diff(y(x),x)+a/(a+2)
```

, could not solve

```
dsolve(diff(diff(y(x),x),x)*y(x)-(a-1)/a*diff(y(x),x)^2-f(x)*y(x)^2*diff(y(x),x)+a/(a+2)
a/(a+2)*diff(f(x),x)*y(x)^3=0,y(x))
```

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 = 1.51061 (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]*Derivati

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[-\frac{\sqrt{1-\frac{2\#1^2a^2}{-2ac_1+\sqrt{1-4ac_1}+1}}\sqrt{1+\frac{2\#1^2a^2}{2ac_1+\sqrt{1-4ac_1}-1}}\left((-2ac_1+\sqrt{1-4ac_1}+1\right)E\left(is\right.\right.\right.\right.$$

✓

Maple : cpu = 0.446 (sec), leaf count = 98

dsolve(diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2-1-2*a*y(x)*(diff(y(x),x)^2+1)^(3/2)=0,y(x)

$$\int^{y(x)}\frac{-a^2a+c_1}{\sqrt{-a^4a^2-2a^2ac_1+a^2-c_1^2}}d_a-x-c_2=0$$

2.1723

ODE No. 1723

$$(y(x)+x)y''(x)+y'(x)^2-y'(x)=0$$

✓ **Mathematica** : cpu = 1.08994 (sec), leaf count = 130

```
DSolve[-Derivative[1][y][x] + Derivative[1][y][x]^2 + (x + y[x])*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{2}\left(2x-\sqrt{2}e^{-2c_1}\sqrt{4e^{3c_1}x+e^{2c_1}+4e^{3c_1}c_2}+e^{-c_1}+4c_2\right)\right\},\left\{y(x)\rightarrow \frac{1}{2}\left(2x+\sqrt{2}e^{-2c_1}\sqrt{4e^{3c_1}x}+\right.\right.\right.$$

✓ **Maple** : cpu = 0.11 (sec), leaf count = 16

```
dsolve(diff(diff(y(x),x),x)*(y(x)+x)+diff(y(x),x)^2-diff(y(x),x)=0,y(x))
```

$$y(x)=\sqrt{c_1+2x}c_2+c_1+x$$

2.1724

ODE No. 1724

$$(x-y(x))y''(x)+2y'(x)\left(y'(x)+1\right)=0$$

✓ **Mathematica** : cpu = 0.535867 (sec), leaf count = 38

```
DSolve[2*Derivative[1][y][x]*(1 + Derivative[1][y][x]) + (x - y[x])*Derivative[2][y][x] == 0,y
```

$$\left\{\left\{y(x)\rightarrow-\frac{e^{-c_1}\left(e^{c_1}c_2x+1+e^{c_1}c_2^2\right)}{x+c_2}\right\}\right\}$$

✓ **Maple** : cpu = 2.273 (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))
```

$$y(x)=\frac{c_2^2-c_2x+c_1}{c_2-x}$$

2.1725

ODE No. 1725

$$(x-y(x))y''(x)+(-y'(x)-1)\left(y'(x)^2+1\right)=0$$

✓ **Mathematica** : cpu = 38.1967 (sec), leaf count = 18840

```
DSolve[(-1 - Derivative[1][y][x])*(1 + Derivative[1][y][x]^2) + (x - y[x])*Derivative[2][y][x]
```

Too large to display

✓ **Maple** : cpu = 0.546 (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))
```

$$y(x)=x+\text{RootOf}\left(-x+\int^{-x}-\frac{c_1^2f^2-1}{c_1^2f^2+\sqrt{-c_1^2f^2+2}c_1f-2}d_f+c_2\right)$$

2.1726

ODE No. 1726

$$(x-y(x))y''(x)-h(y'(x))=0$$

✓

Mathematica

: cpu = 0.317638 (sec), leaf count = 82

DSolve[-h[Derivative[1][y][x]]+(x-y[x])*Derivative[2][y][x]==0,y[x],x]

$$\text{Solve}\left[\left\{x=\int\frac{\exp\left(-\int_1^{K[4]}\frac{K[3]-1}{h(K[3])}dK[3]-c_1\right)}{h(K[4])}dK[4]+c_2,y(x)=x-\exp\left(-\int_1^{K[4]}\frac{K[3]-1}{h(K[3])}dK[3]-c_1\right)\right.\right.$$

✓

Maple

: cpu = 0.149 (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 = 1.43328 (sec), leaf count = 482

```
DSolve[1 + Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[2e^{2c_1} \tan^{-1} \left(\frac{1 - \sqrt{\#1}}{\sqrt{-1 + e^{2c_1}} - \sqrt{-\#1 + e^{2c_1}}} \right) - \frac{(\sqrt{\#1} - 1)(\sqrt{-1 + e^{2c_1}} - \sqrt{-\#1 + e^{2c_1}})}{2e^{2c_1}} \right] \right\} \right\}$

✓ **Maple** : cpu = 0.538 (sec), leaf count = 823

```
dsolve(2*diff(diff(y(x),x),x)*y(x)+diff(y(x),x)^2+1=0,y(x))
```

$y(x) = \frac{(-\text{RootOf}(\tan(\_Z)^2 c_1^2 \_Z^2 - 4 \tan(\_Z)^2 c_1 c_2 \_Z - 4 \tan(\_Z)^2 c_1 x \_Z + 4 \tan(\_Z)^2 c_2^2 + 8 \tan(\_Z)^2 c_1^2 \_Z^2), \_Z)}{2e^{2c_1}}$

2.1728

ODE No. 1728

$$a + 2y(x)y''(x) - y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0067273 (sec), leaf count = 31

```
DSolve[a - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{x^2(-a + c_1^2)}{4c_2} + c_1x + c_2 \right\} \right\}$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 24

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+a=0,y(x))
```

$$y(x) = \frac{(c_1^2 - a) x^2}{4c_2} + xc_1 + c_2$$

2.1729

ODE No. 1729

$$a + f(x)y(x)^2 + 2y(x)y''(x) - y'(x)^2 = 0$$

✗ Mathematica : cpu = 0.0258114 (sec), leaf count = 0

```
DSolve[a + f[x]*y[x]^2 - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[a + f[x]*y[x]^2 - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0, y[x],
```

✗ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+f(x)*y(x)^2+a=0,y(x))
```

, could not solve

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+f(x)*y(x)^2+a=0,y(x))
```

2.1730

ODE No. 1730

$$2y(x)y''(x)-y'(x)^2-8y(x)^3=0$$

✓ **Mathematica** : cpu = 0.844099 (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]
```

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[-\frac{2\sqrt{\#1}\sqrt{1+\frac{4\#1^2}{c_1}}{}_2F_1\left(\frac{1}{4},\frac{1}{2};\frac{5}{4};-\frac{4\#1^2}{c_1}\right)}{\sqrt{4\#1^2+c_1}}\& \right][x+c_2]\right\},\left\{y(x) \rightarrow \text{InverseFunction}\left[\frac{2\sqrt{\#1}\sqrt{1+\frac{4\#1^2}{c_1}}{}_2F_1\left(\frac{1}{4},\frac{1}{2};\frac{5}{4};-\frac{4\#1^2}{c_1}\right)}{\sqrt{4\#1^2+c_1}}\& \right][x+c_2]\right\}\right.$$

✓ **Maple** : cpu = 0.085 (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 = 1.05846 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \right. - \frac{i \# 1 \sqrt{4 + \frac{2c_1}{\# 1 - \# 1 \sqrt{1 - c_1}}} \sqrt{2 + \frac{c_1}{\# 1 + \# 1 \sqrt{1 - c_1}}} F \left(i \sinh^{-1} \left(\frac{\sqrt{\frac{c_1}{2\sqrt{1 - c_1} + 2}}}{\sqrt{\# 1}} \right) \mid \frac{\sqrt{1 - c_1} + 1}{1 - \sqrt{1 - c_1}} \right) \right.}{\sqrt{\frac{c_1}{1 + \sqrt{1 - c_1}}} \sqrt{4 \# 1^2 + 4 \# 1 + c_1}}$$

✓ **Maple** : cpu = 0.081 (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))
```

$$\int^{y(x)} \frac{1}{\sqrt{4a^3 + 4a^2 + -ac_1}} d_{-}a - x - c_2 = 0$$

2.1732

ODE No. 1732

$$2y(x)y''(x) - y'(x)^2 - 4(2y(x) + x)y(x)^2 = 0$$

 **Mathematica** : cpu = 1.05866 (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,
```

 **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 = 1.88527 (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]
```

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[-\frac{i \sqrt{2} \#1^{3/2} \sqrt{2+\frac{4 c_1}{\#1\left(-b+\sqrt{b^2+2 a c_1}\right)}} \sqrt{1-\frac{2 c_1}{\#1\left(b+\sqrt{b^2+2 a c_1}\right)}} F\left(i \sinh ^{-1}\left(\frac{\sqrt{2} \sqrt{\sqrt{b^2+2 a c_1}}}{\sqrt{\#1\left(b+\sqrt{b^2+2 a c_1}\right)}}\right)}{\sqrt{\frac{c_1}{-b+\sqrt{b^2+2 a c_1}}} \sqrt{-\#1\left(\#1^2 a+2 \#1 b-2 c_1\right)}}\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.087 (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 = 1.39979 (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] ==
```

✗ 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 = 0.93899 (sec), leaf count = 0

```
DSolve[y[x]^2*(b*x + a*y[x]) - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[y[x]^2*(b*x + a*y[x]) - Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+(a*y(x)+b*x)*y(x)^2=0,y(x))
```

, could not solve

```
dsolve(2*diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+(a*y(x)+b*x)*y(x)^2=0,y(x))
```

2.1736

ODE No. 1736

$$2y(x)y''(x) - y'(x)^2 - 3y(x)^4 = 0$$

✓

Mathematica : cpu = 6.82397 (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]

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{2\sqrt{\#1}\sqrt{1+\frac{\#1^3}{c_1}}{}_2F_1\left(\frac{1}{6},\frac{1}{2};\frac{7}{6};-\frac{\#1^3}{c_1}\right)}{\sqrt{\#1^3+c_1}}\& \right] [x+c_2] \right\}, \left\{ y(x) \rightarrow \text{InverseFunction} \left[-\frac{2\sqrt{\#1}\sqrt{1+\frac{\#1^3}{c_1}}{}_2F_1\left(\frac{1}{6},\frac{1}{2};\frac{7}{6};-\frac{\#1^3}{c_1}\right)}{\sqrt{\#1^3+c_1}}\& \right] [x+c_2] \right\} \right.$$

✓

Maple : cpu = 0.102 (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 = 20.9561 (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]*Derivat
```

, 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]*D
```

✗ 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(x))
```

, 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 = 0.496083 (sec), leaf count = 0

```
DSolve[-8*y[x]^3 + 2*y[x]^2*(f[x]^2 + Derivative[1][f][x]) + 3*f[x]*y[x]*Derivative[1][y][x] -
```

, could not solve

```
DSolve[-8*y[x]^3 + 2*y[x]^2*(f[x]^2 + Derivative[1][f][x]) + 3*f[x]*y[x]*Derivative[1][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
```

, 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
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 = 0.0643801 (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]^4 + 1 == 0, y[x], x]
```

, 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[x]^4 + 1 == 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+4*y(x)^2*diff(y(x),x)+1+f(x)*y(x)^2+y(x)^4+1,y(x)),y(x))
```

, 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+1,y(x)),y(x))
```

2.1740

ODE No. 1740

$$2y(x)y''(x) - 3y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.121221 (sec), leaf count = 16

```
DSolve[-3*Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{c_2}{(x + 2c_1)^2} \right\} \right\}$$

✓ **Maple** : cpu = 0.098 (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 = 0.134717 (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]
```

$$\left\{\left\{y(x) \rightarrow c_2 \sec^2(x+2c_1)\right\}\right\}$$

✓ **Maple** : cpu = 0.481 (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 = 5.21911 (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

$$y(x) = \left(e^{\int -b(-a)d_{-a}+c_1}\right) \&where \left[\left\{\frac{d}{d_{-a}}b(-a) = \frac{-b(-a)^2}{2} - \frac{f(-a)}{2}\right\}, \left\{-a = x, -b(-a) = \frac{\frac{d}{dx}y(x)}{y(x)}\right\}, \left\{x\right.\right.$$

2.1743

ODE No. 1743

$$y(x)^2\left(ay(x)^3+1\right)+2y(x)y''(x)-6y'(x)^2=0$$

✓ **Mathematica** : cpu = 21.097 (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]
```

$$\left\{\text{Solve}\left[-\frac{4\left(F\left(\sin^{-1}\left(\sqrt{\frac{\left(\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,2\right]-\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,4\right]\right)\left(y(x)-\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,1\right]\right)}{\left(\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,1\right]-\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,4\right]\right)\left(y(x)-\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,2\right]\right)}\right)}{\left(\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,1\right]-\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,4\right]\right)\left(y(x)-\text{Root}\left[4c_1\#1^4+4a\#1^3+1\&,2\right]\right)}\right)}\right|\right.\\$$

✓ **Maple** : cpu = 0.097 (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 = 1.81559 (sec), leaf count = 505

DSolve[-(Derivative[1][y][x]^2*(1 + Derivative[1][y][x]^2)) + 2*y[x]*Derivative[2][y][x] == 0, y[x]]

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[-ie^{-c_1}\left(\frac{(\sqrt{\#1}-1)\left(\sqrt{-1+e^{2c_1}}-\sqrt{-1+\#1e^{2c_1}}\right)\left(-2\#1e^{4c_1}+e^{2c_1}(\#1+\sqrt{-1+e^{2c_1}})\right)}{(\sqrt{\#1}(-e^{2c_1})+\sqrt{-1+e^{2c_1}})}\right)\right]\right\}\right\}$$

✓ **Maple** : cpu = 0.453 (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))

$$y(x) = \frac{(\text{RootOf}(\tan(\_Z)^2 c_1^2 \_Z^2 - 4 \tan(\_Z)^2 c_1 c_2 \_Z - 4 \tan(\_Z)^2 c_1 x \_Z + 4 \tan(\_Z)^2 c_2^2 + 8 \tan(\_Z)^2 c_1^2 \_Z^2 - 4 \tan(\_Z)^2 c_1 c_2 \_Z - 4 \tan(\_Z)^2 c_1 x \_Z + 4 \tan(\_Z)^2 c_2^2 + 8 \tan(\_Z)^2 c_1^2 \_Z^2), \_Z)}{\tan(\_Z)}$$

2.1745

ODE No. 1745

$$2(y(x)-a)y''(x)+y'(x)^2+1=0$$

✓ **Mathematica** : cpu = 0.545866 (sec), leaf count = 195

DSolve[1 + Derivative[1][y][x]^2 + 2*(-a + y[x])*Derivative[2][y][x] == 0,y[x],x]

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[-\frac{2\sqrt{a-\#1}\sqrt{2\#1-2a+e^{2c_1}}+\sqrt{2}e^{2c_1}\tan^{-1}\left(\frac{\sqrt{2\#1-2a+e^{2c_1}}}{\sqrt{2}\sqrt{a-\#1}}\right)}{2\sqrt{2}}\&[x+c_2]\right\}\right\},$$

✓ **Maple** : cpu = 0.638 (sec), leaf count = 117

dsolve(2*(y(x)-a)*diff(diff(y(x),x),x)+diff(y(x),x)^2+1=0,y(x))

$$\frac{\arctan\left(\frac{y(x)-a-\frac{c_1}{2}}{\sqrt{-(-y(x)+a)(a+c_1-y(x))}}\right)c_1}{2}-x-c_2-\sqrt{-(-y(x)+a)(a+c_1-y(x))}=0$$

2.1746

ODE No. 1746

$$-ax^2-bx-c+3y(x)y''(x)-2y'(x)^2=0$$

✓

Mathematica : cpu = 0.216968 (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]`

Solve

$$\int \frac{y(x)^{2/3}}{(ax^2+bx+c)\sqrt{-\frac{2(ax^2+bx+c)^3}{y(x)^2}+\frac{c_1(ax^2+bx+c)}{y(x)^{2/3}}+9(b^2-4ac)}}d\frac{ax^2+bx+c}{y(x)^{2/3}}=-\int \frac{1}{3(ax^2+bx+c)}$$

✓

Maple : cpu = 0.395 (sec), leaf count = 207

`dsolve(3*diff(diff(y(x),x),x)*y(x)-2*diff(y(x),x)^2-a*x^2-b*x-c=0,y(x))`

$$y(x)=\text{RootOf}\left(-2\left(\int^{-Z}\frac{b}{\sqrt{4\_f^{4/3}c_1b^2-36c\_f^2a+9\_f^2b^2-2}}d\_f\right)\sqrt{4ca-b^2}-2\arctan\left(\frac{2ax+b}{\sqrt{4ca-b^2}}\right)\right)$$

2.1747

ODE No. 1747

$$3y(x)y''(x) - 5y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.119367 (sec), leaf count = 20

```
DSolve[-5*Derivative[1][y][x]^2 + 3*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{c_2}{(2x + 3c_1)^{3/2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.025 (sec), leaf count = 17

```
dsolve(3*diff(diff(y(x),x),x)*y(x)-5*diff(y(x),x)^2=0,y(x))
```

$$-\frac{3}{2y(x)^{2/3}} - xc_1 - c_2 = 0$$

2.1748

ODE No. 1748

$$4y(x)y''(x) - 3y'(x)^2 + 4y(x) = 0$$

✓ **Mathematica** : cpu = 0.323465 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{\left(c_1^2 x^2 + 2 c_2 c_1^2 x - 64 + c_2^2 c_1^2\right)^2}{256 c_1^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.123 (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 = 0.50467 (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]

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[-\frac{4 \sqrt{1+\frac{4 x^{3/2}}{c_1}} {}_2F_1\left(\frac{1}{6}, \frac{1}{2}, \frac{7}{6}, -\frac{4 x^{3/2}}{c_1}\right)}{\sqrt{x^{3/2}\left(4 x^{3/2}+c_1\right)}} \& \right][x+c_2]\right\},\left\{y(x) \rightarrow \text{InverseFunction}\left[-\frac{4 \sqrt{1+\frac{4 x^{3/2}}{c_1}} {}_2F_1\left(\frac{1}{6}, \frac{1}{2}, \frac{7}{6}, -\frac{4 x^{3/2}}{c_1}\right)}{\sqrt{x^{3/2}\left(4 x^{3/2}+c_1\right)}} \& \right][x+c_2]\right\}\right\}$$

✓

Maple : cpu = 1.89 (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))

$$\int^{y(x)} \frac{1}{\sqrt{-a^{3/2}c_1+4_-a^3}}d_-a-x-c_2=0$$

2.1750

ODE No. 1750

$$ay(x)^3 + by(x)^2 + cy(x) + 4y(x)y''(x) - 3y'(x)^2 = 0$$

✓

Mathematica : cpu = 0.956988 (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

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[\int_1^{\#1} - \frac{1}{\sqrt{-\frac{1}{3}aK[1]^3 - bK[1]^2 + c_1K[1]^{3/2} + cK[1]}} dK[1] \& \right] [x + c_2] \right\}, \left\{ y(x) \right.$$

✓

Maple : cpu = 1.161 (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 = 9.96883 (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]*D
```

, could not solve

```
DSolve[f[x]*y[x] + g[x]*y[x]^2 + y[x]^4 - 2*y[x]^2*Derivative[1][y][x] + (6*y[x]^2 - (2*
```

✗ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve(4*diff(diff(y(x),x),x)*y(x)-3*diff(y(x),x)^2+(6*y(x)^2-2*diff(f(x),x)*y(x)/f(x))*
```

, could not solve

```
dsolve(4*diff(diff(y(x),x),x)*y(x)-3*diff(y(x),x)^2+(6*y(x)^2-2*diff(f(x),x)*y(x)/f(x))*  
2*y(x)^2*diff(y(x),x)+g(x)*y(x)^2+f(x)*y(x)=0,y(x))
```

2.1752

ODE No. 1752

$$ay(x)^2 + 4y(x)y''(x) - 5y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.187002 (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]
```

$$\left\{ \left\{ y(x) \rightarrow c_2 \operatorname{sech}^4 \left(\frac{1}{4} \sqrt{a} (x - 4c_1) \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.269 (sec), leaf count = 33

```
dsolve(4*diff(diff(y(x),x),x)*y(x)-5*diff(y(x),x)^2+a*y(x)^2=0,y(x))
```

$$y(x) = \frac{16\,e^{\sqrt{a}\,x}a^2}{\left(c_1e^{\frac{\sqrt{a}\,x}{2}} - c_2\right)^4}$$

2.1753

ODE No. 1753

$$12y(x)y''(x) - 15y'(x)^2 + 8y(x)^3 = 0$$

✓ **Mathematica** : cpu = 0.646246 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{2304 c_1^2}{\left(3 c_1^2 x^2 + 6 c_2 c_1^2 x + 128 + 3 c_2^2 c_1^2\right)^2} \right\} \right\}$$

✓ **Maple** : cpu = 0.119 (sec), leaf count = 147

```
dsolve(12*diff(diff(y(x),x),x)*y(x)-15*diff(y(x),x)^2+8*y(x)^3=0,y(x))
```

$$-\frac{12y(x)\left(8\sqrt{y(x)}-c_1\right)\sqrt{8y(x)-\sqrt{y(x)}c_1}}{\sqrt{-24y(x)^3+3c_1y(x)^{5/2}}c_1\sqrt{\sqrt{y(x)}\left(8\sqrt{y(x)}-c_1\right)}}-x-c_2=0$$

2.1754

ODE No. 1754

$$ny(x)y''(x) + (1 - n)y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.131309 (sec), leaf count = 17

```
DSolve[(1 - n)*Derivative[1][y][x]^2 + n*y[x]*Derivative[2][y][x] == 0,y[x],x]
```

$$\{\{y(x) \rightarrow c_2(x - c_1n)^n\}\}$$

✓ **Maple** : cpu = 0.054 (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

$$ay(x)y''(x)+by'(x)^2+c_0+c_1y(x)+c_2y(x)^2+c_3y(x)^3+c_4y(x)^4=0$$

✓

Mathematica

: cpu = 7.39874 (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[1][y][x], y[x], x]

$$\left\{\left\{y(x)\rightarrow \text{InverseFunction}\left[\int_1^{\#1}-\frac{\sqrt{4b^5c_1K[1]^{-\frac{2b}{a}}+20ab^4c_1K[1]^{-\frac{2b}{a}}+35a^2b^3c_1K[1]^{-\frac{2b}{a}}+25a^3b^2c_1K[1]^{-\frac{2b}{a}}+16a^4bK[1]^{-\frac{2b}{a}}+a^5K[1]^{-\frac{2b}{a}}}}{4b^5c_1K[1]^{-\frac{2b}{a}}+20ab^4c_1K[1]^{-\frac{2b}{a}}+35a^2b^3c_1K[1]^{-\frac{2b}{a}}+25a^3b^2c_1K[1]^{-\frac{2b}{a}}+16a^4bK[1]^{-\frac{2b}{a}}+a^5K[1]^{-\frac{2b}{a}}}}dx\right]\right\}$$

✓

Maple

: cpu = 0.54 (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), y(x), x)

$$\int^{y(x)}\frac{-a^{\frac{2b}{a}}b(3a+2b)(2a+b)\sqrt{-36\left(a+\frac{2b}{3}\right)\left(a+\frac{b}{2}\right)(a+2b)-a^{\frac{2b}{a}}b\left(\frac{2\left(a+\frac{b}{2}\right)(a+2b)b(a+b)c_3-a^{\frac{3a+2b}{a}}}{3}+\left(a+\frac{2b}{3}\right)\left(\left(a+\frac{b}{2}\right)c_2(a+2b)b+c_1\right)\right)}}{4b^5c_1K[1]^{-\frac{2b}{a}}+20ab^4c_1K[1]^{-\frac{2b}{a}}+35a^2b^3c_1K[1]^{-\frac{2b}{a}}+25a^3b^2c_1K[1]^{-\frac{2b}{a}}+16a^4bK[1]^{-\frac{2b}{a}}+a^5K[1]^{-\frac{2b}{a}}}}dx$$

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 = 0.50173 (sec), leaf count = 124

`DSolve[-((y[x]*Derivative[1][y][x])/Sqrt[c^2 + x^2]) + b*Derivative[1][y][x]^2 + a*y[x]*Deriva`

$$\left\{\left\{y(x) \rightarrow c_2 \exp \left(\int_1^x \frac{e^{\frac{\tanh^{-1}\left(\frac{K[2]}{\sqrt{c^2+K[2]^2}}\right)}{a}}}{c_1 - \int_1^{K[2]} \frac{e^{\frac{\tanh^{-1}\left(\frac{K[1]}{\sqrt{c^2+K[1]^2}}\right)}{a}} \left(-\sqrt{c^2+K[1]^2} a - b \sqrt{c^2+K[1]^2}\right)}{a \sqrt{c^2+K[1]^2}} dK[1]} dK[2]\right.\right.\right\}\right\}$$

✓ **Maple** : cpu = 0.273 (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,`

$$y(x)=\left(\frac{a(a+1)}{(a+b)\left(c_12^{\frac{1}{a}}ax^{\frac{a+1}{a}}\operatorname{hypergeom}\left(\left[-\frac{1}{2a},-\frac{a+1}{2a}\right],\left[\frac{a-1}{a}\right],-\frac{c^2}{x^2}\right)+c_2a+c_2\right)}\right)^{-\frac{a}{a+b}}$$

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 = 10.4884 (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] - (a - 1)*Derivative[1][y][x]^2 + a*y[x]*Derivative[2][y][x] == 0, y[x], x]
```

, could not solve

```
DSolve[f[x]^2*y[x]^4 + (2 + a)*f[x]*y[x]^2*Derivative[1][y][x] + a*y[x]^3*Derivative[1][y][x] - (a - 1)*Derivative[1][y][x]^2 + a*y[x]*Derivative[2][y][x] == 0, y[x], x]
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(a*y(x)*diff(diff(y(x),x),x)-(a-1)*diff(y(x),x)^2+(a+2)*f(x)*y(x)^2*diff(y(x),x)+f(x)^2*y(x)^4,y(x)),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*y(x)^4,y(x)),x)
```

2.1758

ODE No. 1758

$$y''(x)(ay(x)+b)+cy'(x)^2=0$$

✓ **Mathematica** : cpu = 0.386289 (sec), leaf count = 36

```
DSolve[c*Derivative[1][y][x]^2 + (b + a*y[x])*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow \frac{-b+(-(c_1(a+c)(-x-c_2)))^{\frac{a}{a+c}}}{a}\right\}\right\}$$

✓ **Maple** : cpu = 0.081 (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 = 0.152817 (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

$$\left\{\left\{y(x)\rightarrow c_2\sqrt{x^2+c_1}\right\}\right\}$$

✓

Maple : cpu = 0.032 (sec), leaf count = 31

dsolve(x*y(x)*diff(diff(y(x),x),x)+x*diff(y(x),x)^2-y(x)*diff(y(x),x)=0,y(x))

$$y(x)=\sqrt{c_1x^2+2c_2}$$

2.1760

ODE No. 1760

$$ay(x)y'(x)+f(x)+xy(x)y''(x)+xy'(x)^2=0$$

✓

Mathematica : cpu = 0.0798812 (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],y[x],x]

$$\left\{\left\{y(x)\rightarrow-\sqrt{2}\sqrt{\int_1^x-K[2]^{-a}\left(c_1+\int_1^{K[2]}f(K[1])K[1]^{a-1}dK[1]\right)dK[2]+c_2}\right\},\left\{y(x)\rightarrow\sqrt{2}\sqrt{\int_1^x-K[2]^{-a}\left(c_1+\int_1^{K[2]}f(K[1])K[1]^{a-1}dK[1]\right)dK[2]+c_2}\right\}\right\}$$

✓

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))

$$y(x)=\frac{\sqrt{2}\sqrt{(a-1)\left(x^{1-a}\left(\int\frac{x^af(x)}{x}dx\right)+x^{1-a}c_1-\left(\int f(x)dx\right)-c_2\right)}}{a-1}$$

2.1761

ODE No. 1761

$$x\big(ay(x)^4 + d\big) + y(x)\big(by(x)^2 + c\big) + xy(x)y''(x) - xy'(x)^2 + y(x)y'(x) = 0$$

 **Mathematica** : cpu = 1.27991 (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]
```

, 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][x]
```

 **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)
```

, 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)
```

2.1762

ODE No. 1762

$$ay(x)y'(x)+bxy(x)^3+xy(x)y''(x)-xy'(x)^2=0$$

✖

Mathematica : cpu = 48.0592 (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],y[x],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[2][y][x],y[x],x]`

✖

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),x)`

, result contains DESol or ODESolStruc

$$y(x)=\left(-ae^{\int -2\_b(\_a)d\_a-2c_1}\right) \& \text{where} \left[\left\{\frac{d}{d\_a}\_b(\_a)=-\_a(b\_a-2a+2)\_b(\_a)^3+(a-1)\_b(\_a)^2-\right.\right.$$

2.1763

ODE No. 1763

$$ay(x)y'(x)+xy(x)y''(x)+2xy'(x)^2=0$$

✓ **Mathematica** : cpu = 0.248038 (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,x,y]
```

$$\left\{\left\{y(x)\rightarrow c_2\left(3x^{1-a}-(a-1)c_1\right)^{-\frac{a-1}{3(1-a)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.13 (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))
```

$$y(x)=\frac{x^{-a}3^{1/3}\left((c_2(a-1)x^a-xc_1)x^{2a}(a-1)^2\right)^{1/3}}{a-1}$$

2.1764

ODE No. 1764

$$xy(x)y''(x) - 2xy'(x)^2 + (y(x) + 1)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.0723925 (sec), leaf count = 52

```
DSolve[(1 + y[x])*Derivative[1][y][x] - 2*x*Derivative[1][y][x]^2 + x*y[x]*Derivative[2][y][x]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{\tan\left(\frac{1}{2}(\sqrt{2}\sqrt{c_1}\log(x) - \sqrt{2}\sqrt{c_1}c_2)\right)}{\sqrt{2}\sqrt{c_1}} \right\} \right\}$$

✓ **Maple** : cpu = 0.151 (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

$$ay(x)y'(x)+xy(x)y''(x)-2xy'(x)^2=0$$

✓ **Mathematica** : cpu = 0.264115 (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,x,y]
```

$$\left\{\left\{y(x)\rightarrow c_2\left(x^{1-a}+(a-1)c_1\right)^{\frac{a-1}{1-a}}\right\}\right\}$$

✓ **Maple** : cpu = 0.044 (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))
```

$$y(x)=-\frac{(a-1)x^a}{c_2(a-1)x^a-xc_1}$$

2.1766

ODE No. 1766

$$xy(x)y''(x)-4xy'(x)^2+4y(x)y'(x)=0$$

✓ **Mathematica** : cpu = 0.164691 (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,x,y]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_2x}{\sqrt[3]{1+c_1x^3}}\right\}\right\}$$

✓ **Maple** : cpu = 0.047 (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))
```

$$y(x)=\frac{x}{(-3c_2x^3+c_1)^{1/3}}$$

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 = 0.341847 (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]
```

$$\left\{\left\{y(x)\rightarrow c_2\exp\left(\frac{\sqrt{b^2-x^2}}{a}+\frac{c_1\log\left(a\sqrt{b^2-x^2}-c_1\right)}{a^2}\right)\right\}\right\}$$

✓ **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)
```

$$y(x)=c_2e^{\int-\frac{x\sqrt{b^2-x^2}}{c_1\sqrt{b^2-x^2}+a\left(b^2-x^2\right)}dx}$$

2.1768

ODE No. 1768

$$x(y(x)+x)y''(x)+xy'(x)^2+(x-y(x))y'(x)-y(x)=0$$

✓ **Mathematica** : cpu = 0.0509715 (sec), leaf count = 53

```
DSolve[-y[x] + (x - y[x])*Derivative[1][y][x] + x*Derivative[1][y][x]^2 + x*(x + y[x])*Derivat.
```

$$\left\{\left\{y(x)\rightarrow -x-\sqrt{x^2+2c_2x^2+c_1}\right\},\left\{y(x)\rightarrow -x+\sqrt{x^2+2c_2x^2+c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (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)
```

$$y(x)=-x-\sqrt{\left(-c_1+1\right)x^2+c_2}$$

2.1769

ODE No. 1769

$$2xy(x)y''(x) - xy'(x)^2 + y(x)y'(x) = 0$$

✓ **Mathematica** : cpu = 0.176638 (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,
```

$$\left\{\left\{y(x) \rightarrow c_2 \left(\sqrt{x} + c_1\right)^2\right\}\right\}$$

✓ **Maple** : cpu = 0.113 (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))
```

$$y(x) = c_1 \sqrt{x} c_2 + x c_1^2 + \frac{c_2^2}{4}$$

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 = 0.701536 (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,y[x],x]

$$\left\{\left\{y(x)\rightarrow 1+\frac{1}{x^2\left(-\frac{1}{x^2}-\frac{c_1}{x}+c_2\right)}\right\}\right\}$$

✓

Maple

: cpu = 0.066 (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),x)

$$y(x)=\frac{x(xc_1-c_2)}{c_1x^2-c_2x-1}$$

2.1771

ODE No. 1771

$$x^2(y(x)+x)y''(x)-(xy'(x)-y(x))^2=0$$

✓ **Mathematica** : cpu = 0.0900344 (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]
```

$$\left\{\left\{y(x)\rightarrow -x+c_2xe^{\frac{c_1}{x}}\right\}\right\}$$

✓ **Maple** : cpu = 0.197 (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))
```

$$y(x)=-\frac{x\left(-e^{\frac{c_1}{x}}e^{-1}+c_2\right)}{c_2}$$

2.1772

ODE No. 1772

$$a(xy'(x)-y(x))^2+x^2(x-y(x))y''(x)=0$$

✓ **Mathematica** : cpu = 0.706915 (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]
```

$$\left\{\left\{y(x)\rightarrow x\left(1+\left((a-1)\left(-\frac{(-1)^ac_1}{x}-c_2\right)\right)^{\frac{1}{1-a}}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.148 (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 = 0.403247 (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]
```

$$\left\{\left\{y(x) \rightarrow \frac{x\left(c_1^2 \log ^2(x)-2 c_2 c_1^2 \log (x)+4+c_2^2 c_1^2\right)}{4 c_1}\right\}\right\}$$

✓ **Maple** : cpu = 0.043 (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))
```

$$y(x)=\frac{x\left(4 c_2^2 \ln (x)^2+4 c_1 \ln (x) c_2+c_1^2+1\right)}{4 c_2}$$

2.1774

ODE No. 1774

$$ax^2y(x)y''(x)+bx^2y'(x)^2+cxy(x)y'(x)+dy(x)^2=0$$

✓

Mathematica : cpu = 1.22776 (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[2][y][x],x]

$$\left\{\left\{y(x)\rightarrow c_2\exp\left(-\frac{\log(x)\left(a\left(\sqrt{\frac{a^2-2a(c+2d)-4bd+c^2}{a^2}}-1\right)+c\right)-2a\log\left(x\sqrt{\frac{a^2-2a(c+2d)-4bd+c^2}{a^2}}+c_1\right)}{2(a+b)}\right)\right\}\right\}$$

✓

Maple : cpu = 0.373 (sec), leaf count = 136

dsolve(a*x^2*y(x)*diff(diff(y(x),x),x)+b*x^2*diff(y(x),x)^2+c*x*y(x)*diff(y(x),x)+d*y(x)^2,x)

$$y(x)=x^{-\frac{\sqrt{(-4a-4b)d+(a-c)^2}}{2a+2b}}x^{\frac{a}{2a+2b}}x^{-\frac{c}{2a+2b}}\left(\frac{a^2+(-2c-4d)a-4bd+c^2}{(a+b)^2\left(x^{\frac{\sqrt{(-4a-4b)d+(a-c)^2}}{a}}c_1-c_2\right)^2}\right)^{-\frac{a}{2a+2b}}$$

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 = 0.159932 (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],y[x],x]

$$\left\{\left\{y(x)\rightarrow c_2e^{a\log(x+1)+\frac{-a-c_1}{x}}\right\}\right\}$$

✓

Maple : cpu = 0.244 (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),x),x)

$$y(x)=\frac{(1+x)^ae^{-a}e^{\frac{c_1}{x}}e^{-\frac{a}{x}}}{c_2}$$

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 = 300.026 (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

, timed out

\$Aborted

✔

Maple : cpu = 0.284 (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

$$y(x) = \frac{\left(c_1 \operatorname{LegendreQ}\left(-\frac{1}{6}, \frac{1}{3}, \sqrt{-(x-1)(x^2+x+1)}\right) + \frac{c_2 \operatorname{LegendreP}\left(-\frac{1}{6}, \frac{1}{3}, \sqrt{-(x-1)(x^2+x+1)}\right)}{2}\right)^2}{c_1} x$$

2.1777

ODE No. 1777

$$f_0(x)y(x)y''(x)+f_1(x)y'(x)^2+f_2(x)y(x)y'(x)+f_3(x)y(x)^2=0$$

✖

Mathematica : cpu = 47.4376 (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]

, 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]

✖

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)

, result contains DESol or ODESolStruc

$$y(x)=\left(e^{\int -b(\_a)d\_a+c_1}\right) \& \text{where} \left[\left\{\frac{d}{d\_a}b(\_a)=-\frac{(f1(\_a)+f0(\_a))\_b(\_a)^2}{f0(\_a)}-\frac{f2(\_a)\_b(\_a)}{f0(\_a)}-\frac{f3(\_a)}{f0(\_a)}\right.\right.$$

2.1778

ODE No. 1778

$$y(x)^2y''(x)-a=0$$

✓ **Mathematica** : cpu = 0.282129 (sec), leaf count = 65

```
DSolve[-a + y[x]^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\text{Solve}\left[\left(\frac{y(x)\sqrt{-\frac{2a}{y(x)}+c_1}}{c_1}+\frac{2a\tanh^{-1}\left(\frac{\sqrt{-\frac{2a}{y(x)}+c_1}}{\sqrt{c_1}}\right)}{c_1^{3/2}}\right)^2=(x+c_2)^2,y(x)\right]$$

✓ **Maple** : cpu = 0.549 (sec), leaf count = 245

```
dsolve(y(x)^2*diff(diff(y(x),x),x)-a=0,y(x))
```

$$y(x)=\frac{c_1\left(c_1a+e^{\text{RootOf}\left(\text{csgn}\left(\frac{1}{c_1}\right)c_1^4a^2-2\_Zc_1^3a\,e^{-Z}-\text{csgn}\left(\frac{1}{c_1}\right)e^{2\_Z}c_1^2-2\,\text{csgn}\left(\frac{1}{c_1}\right)e^{-Z}c_2-2\,\text{csgn}\left(\frac{1}{c_1}\right)e^{-Z}x\right)}\right)^2e^{-\text{RootOf}\left(\text{csgn}\left(\frac{1}{c_1}\right)\right)}}{2}$$

2.1779

ODE No. 1779

$ax+y(x)^2y''(x)+y(x)y'(x)^2=0$

✖

Mathematica : cpu = 22.2317 (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 = 0.769 (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))

$$\sqrt{3}\left(\int^{\frac{y(x)}{x}}\frac{-g^2\left(3\left(\frac{a}{-g^3}\right)^{1/3}\tan\left(\text{RootOf}\left(2\_Z\sqrt{3}-\ln\left(\frac{1}{2\sqrt{3}\sin(\_Z)\cos(\_Z)+2\cos(\_Z)^2+1}\right)-6c_1-6\left(\int\frac{\left(\frac{a}{-g^3}\right)^{2/3}-g^2}{-g^3+a}d\_g\right)\right)\right)}{-g^3+a}dx\right)+\sqrt{3}\left(\ln(x)-\frac{6}{6}\right)$$

2.1780

ODE No. 1780

$$-ax-b+y(x)^2y''(x)+y(x)y'(x)^2=0$$

 **Mathematica** : cpu = 20.5195 (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 = 1.094 (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))`

$$y(x)=\text{RootOf}\left(\sqrt{3}b\left(\int^{-Z}-\frac{\left(-\left(-\frac{a}{-g^3b^3}\right)^{1/3}\sqrt{3}b+2\sqrt{3}a-3b\left(-\frac{a}{-g^3b^3}\right)^{1/3}\tan\left(\text{RootOf}\left(-2b^2\left(-\frac{a}{-g^3b^3}\right)\right)}\right)}{ }\right)\right)$$

2.1781

ODE No. 1781

$$(y(x)^2 + 1) y''(x) + (1 - 2y(x)) y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.230052 (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]
```

$$\left\{ \left\{ y(x) \rightarrow \frac{i(1 - c_1^{2i}(x + c_2)^{2i})}{1 + c_1^{2i}(x + c_2)^{2i}} \right\} \right\}$$

✓ **Maple** : cpu = 0.056 (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))
```

$$y(x) = \tan \left(\ln \left(x c_1 + c_2 \right) \right)$$

2.1782

ODE No. 1782

$$(y(x)^2 + 1) y''(x) - 3y(x)y'(x)^2 = 0$$

✓

Mathematica : cpu = 0.202986 (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]

$$\left\{ \left\{ y(x) \rightarrow -\frac{ic_1(x+c_2)}{\sqrt{c_1^2x^2+2c_2c_1^2x-1+c_2^2c_1^2}} \right\}, \left\{ y(x) \rightarrow \frac{ic_1(x+c_2)}{\sqrt{c_1^2x^2+2c_2c_1^2x-1+c_2^2c_1^2}} \right\} \right\}$$

✓

Maple : cpu = 0.067 (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))

$$y(x) = \sqrt{-\frac{1}{c_1^2x^2+2c_1c_2x+c_2^2-1}}(xc_1+c_2)$$

2.1783

ODE No. 1783

$$(y(x)^2+x)\,y''(x)-2(x-y(x)^2)\,y'(x)^3+(4y(x)y'(x)+1)\,y'(x)=0$$

✓ **Mathematica** : cpu = 1.38727 (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]), y[x], x]
```

$$\text{Solve}\Big[x=-y(x)^2+c_2e^{e^{-c_1}y(x)},y(x)\Big]$$

✓ **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)*diff(y(x),x))),y(x))
```

$$\frac{-c_1y(x)+\ln\left(x+y(x)^2\right)+c_2+2}{y(x)}=0$$

2.1784

ODE No. 1784

$$(x^2 + y(x)^2) \, y''(x) + (y(x) - xy'(x)) \, (y'(x)^2 + 1) = 0$$

✓ **Mathematica** : cpu = 0.295086 (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] == 0, y[x], x]
```

$$\text{Solve}\left[\frac{1}{2}\left(\log\left(1 - \frac{iy(x)}{x}\right) + \log\left(1 + \frac{iy(x)}{x}\right) + i \cot(c_1) \left(\log\left(1 - \frac{iy(x)}{x}\right) - \log\left(1 + \frac{iy(x)}{x}\right)\right)\right) = -\log\left(\frac{y(x)}{x}\right), y(x)\right]$$

✓ **Maple** : cpu = 0.86 (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),x)
```

$$y(x) = \tan\left(\text{RootOf}\left(-e^{\frac{2ic_1 - Z}{-1+c_1}} e^{\frac{2c_1c_2}{-1+c_1}} x^{\frac{2c_1}{-1+c_1}} e^{\frac{2i - Z}{-1+c_1}} + e^{\frac{2c_2}{-1+c_1}} x^{\frac{2}{-1+c_1}} \cos\left(\_Z\right)^2\right)\right) x$$

2.1785

ODE No. 1785

$$(x^2 + y(x)^2) \, y''(x) - 2(xy'(x) - y(x)) \, (y'(x)^2 + 1) = 0$$

✓

Mathematica : cpu = 0.328406 (sec), leaf count = 95

DSolve[-2*(-y[x] + x*Derivative[1][y][x])*(1 + Derivative[1][y][x]^2) + (x^2 + y[x]^2)*Derivat.

$$\left\{ \left\{ y(x) \rightarrow \frac{1}{2} \left(-\sqrt{4x \left(-x + e^{c_2} \right) + e^{2c_2} \cot^2(c_1)} - e^{c_2} \cot(c_1) \right) \right\}, \left\{ y(x) \rightarrow \frac{1}{2} \left(\sqrt{4x \left(-x + e^{c_2} \right) + e^{2c_2} \cot^2(c_1)} - e^{c_2} \cot(c_1) \right) \right\} \right.$$

✓

Maple : cpu = 6. (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))

$$y(x) = \frac{c_1 + 1 - \sqrt{c_1^2 + (4ic_2x + 2) c_1 - 4c_2^2x^2 - 4ic_2x + 1}}{2c_2}$$

2.1786

ODE No. 1786

$$f(x)(1-y(x))y(x)y'(x)+2(1-y(x))y(x)y''(x)-((1-2y(x))y'(x)^2)=0$$

✓

Mathematica : cpu = 0.0923249 (sec), leaf count = 98

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])*Derivative[2][y][x],y[x],x]

$$\left\{\left\{y(x)\rightarrow\frac{\left(1-\tan^2\left(\frac{1}{4}\left(\int_1^x-\exp\left(-\int_1^{K[3]}\frac{1}{2}f(K[1])dK[1]\right)c_1dK[3]+c_2\right)\right)^2\right)}{\left(-1-\tan^2\left(\frac{1}{4}\left(\int_1^x-\exp\left(-\int_1^{K[3]}\frac{1}{2}f(K[1])dK[1]\right)c_1dK[3]+c_2\right)\right)^2\right)}\right\}\right\}$$

✓

Maple : cpu = 0.197 (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(f(x),x),y(x))

$$y(x)=\frac{\left(2e^{c_1\left(\int e^{-\frac{(\int f(x)dx)}{2}}dx\right)}c_2+1\right)^2e^{\int -c_1e^{\int -\frac{f(x)}{2}dx}dx}}{8c_2}$$

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 = 0.88305 (sec), leaf count = 170

DSolve[h[y[x]] - (1 - 3*y[x])*Derivative[1][y][x]^2 + 2*(1 - y[x])*y[x]*Derivative[2][y][x] ==

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[\int_1^{\#1} -\frac{1}{(K[2]-1)\sqrt{K[2]}\sqrt{c_1+2\int_1^{K[2]}\frac{e^{-2\left(\log(1-K[1])+\frac{1}{2}\log(K[1])\right)}h(K[1])}{2(K[1]-1)K[1]}dK[1]}dK[2]}\right.\right.$$

✓

Maple : cpu = 0.2 (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

$$-4(1-y(x))y(x)^2\left(-f'(x)-f(x)^2-g'(x)+g(x)^2\right)+4y(x)y'(x)(f(x)y(x)+g(x))-2(1-y(x))y(x)y''(x)+(1-y(x))y'(x)^2$$

 **Mathematica** : cpu = 1.56038 (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]*y'[x]*(f[x]*y[x] + g[x]) - 2*(1 - y[x])*y[x]*y''[x] + (1 - y[x])*y'[x]^2, y[x], 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]) + 4*y[x]*y'[x]*(f[x]*y[x] + g[x]) - 2*(1 - y[x])*y[x]*y''[x] + (1 - y[x])*y'[x]^2, y[x], 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), y(x))

, result contains DESol or ODESolStruc

$$\sqrt{y(x)}-\frac{2\left(\frac{\partial}{\partial x}\text{DESol}\left(\left\{-\frac{e^{-2(\int f(x)dx)+2(\int g(x)dx)}c_1^2-Y(x)}{4}-2g(x)\left(\frac{d}{dx}Y(x)\right)+\frac{d^2}{dx^2}Y(x)\right\},\{Y(x)\}\right)\right)e^{\int (f(x)-g(x))dx}}{\text{DESol}\left(\left\{-\frac{e^{-2(\int f(x)dx)+2(\int g(x)dx)}c_1^2-Y(x)}{4}-2g(x)\left(\frac{d}{dx}Y(x)\right)+\frac{d^2}{dx^2}Y(x)\right\},\{Y(x)\}\right)c_1}$$

2.1789 ODE No. 1789

$4y(x)^2(1-y(x))\left(-f'(x)+f(x)^2-g'(x)-g(x)^2\right)-4y(x)y'(x)(f(x)y(x)+g(x))+(1-y(x))^3\left(f_0(x)^2y(x)^2-f_1(x)^2y(x)^2\right)-4y(x)y'(x)(f(x)y(x)+g(x))+(1-y(x))^3\left(f_0(x)^2y(x)^2-f_1(x)^2y(x)^2\right)$

✗ Mathematica : cpu = 3.76296 (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][f][x]*y[x] + Derivative[1][g][x]*y[x]), y[x], x]
```

, 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 - Derivative[1][f][x]*y[x] + Derivative[1][g][x]*y[x]), y[x], x]
```

✗ 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)^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))
```

, 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)^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 = 0.712151 (sec), leaf count = 186

Dsolve[-h[y[x]] - 2*(1 - 2*y[x])*Derivative[1][y][x]^2 + 3*(1 - y[x])*y[x]*Derivative[2][y][x]

$$\left\{\left\{y(x)\rightarrow \text{InverseFunction}\left[\int_1^{\#1}-\frac{1}{(1-K[2])^{2/3}K[2]^{2/3}\sqrt{c_1+2\int_1^{K[2]}-\frac{\exp(-2(\frac{2}{3}\log(1-K[1])+\frac{2}{3}\log(K[1]))h(K[1])}{3(K[1]-1)K[1]}}}\right.}\right.$$

✓

Maple

: cpu = 0.221 (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))

$$\int^{y(x)}-\frac{1}{\sqrt{(\_b(\_b-1))^{1/3}\_b(\_b-1)\left(c_1-\frac{2\left(\int\frac{h(\_b)}{(\_b^2-\_b)^{4/3}\_b(\_b-1)}d\_b\right)}{3}\right)}}d\_b-x-c_2=0$$

2.1791

ODE No. 1791

$$-h(y(x)) + (1 - y(x))y''(x) - 3(1 - 2y(x))y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.713339 (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`

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[\int_1^{\#1} -\frac{e^{\frac{1}{2}(12-12K[2])}}{(K[2]-1)^3\sqrt{c_1+2\int_1^{K[2]}-\frac{\exp(-2(6(K[1]-1)+3\log(K[1]-1)))h(K[1])}{K[1]-1}dK[1]}}dK[2]\right.\right.\right.$$

✓ **Maple** : cpu = 0.226 (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))`

$$\int^{y(x)}\frac{e^{-6\_b}}{\sqrt{-2\left(\int\frac{e^{-12\_bh(\_b)}}{(\_b-1)^7}d\_b\right)+c_1\left(\_b-1\right)^3}}d\_b-x-c_2=0$$

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 = 1.2644 (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],x]

$$\left\{\left\{y(x)\rightarrow \text{InverseFunction}\left[\int_1^{\#1}-\frac{\left(1-K[2]\right)^{\frac{1}{2}\left(\frac{2b}{a}+\frac{2c}{a}\right)}K[2]^{-\frac{c}{a}}}{\sqrt{c_1+2\int_1^{K[2]}-\frac{\exp\left(-2\left(\frac{c\log(K[1])}{a}-\frac{(b+c)\log(1-K[1])}{a}\right)\right)h(K[1])}{a(K[1]-1)K[1]}dK[1]}}dK[2]\&][x]\right.\right.$$

✓

Maple : cpu = 0.483 (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))

$$\int^{y(x)}\frac{{}_{-}b^{-\frac{c}{a}}({}_{-}b-1)^{-\frac{{}_{-}b-c}{a}}a}{\sqrt{a\left(c_1a-2\left(\int\frac{({}_{-}b-1)^{\frac{2b}{a}}({}_{-}b-1)^{\frac{2c}{a}}{}_{-}b^{-\frac{2c}{a}}h({}_{-}b)}{{}_{-}b({}_{-}b-1)}d{}_{-}b\right)\right)}}d{}_{-}b-x-c_2=0$$

2.1793

ODE No. 1793

$$a(y(x)-1)y(x)y''(x)-((a-1)(2y(x)-1)y'(x)^2)+f(x)(y(x)-1)y(x)y'(x)=0$$

✓

Mathematica

: cpu = 0.408137 (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,f[x],y[x]]

$$\left\{\left\{y(x)\rightarrow \text{InverseFunction}\left[a\#1^{-1/a}(-((\#1-1)\#1))^{\frac{1}{a}}{}_2F_1\left(\frac{1}{a},\frac{a-1}{a};1+\frac{1}{a};1-\#1\right)\&\right]\left[\int_1^x\exp\left(-\int_1^t\right.\right.\right.$$

✓

Maple

: cpu = 0.145 (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)),y(x))

$$c_1\mathrm{e}^{-\frac{x f}{a}}-c_2+\int^{y(x)}\frac{(\_a(\_a-1))^{\frac{1}{a}}}{\_a(\_a-1)}d\_a=0$$

2.1794

ODE No. 1794

$ab(y(x)-1)y(x)y''(x)-(y'(x)^2((2ab-a-b)y(x)+(1-a)b))+f(x)(y(x)-1)y(x)y'(x)=0$

✓ **Mathematica** : cpu = 0.261791 (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])*Derivat.
```

$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[-a\#1^{\frac{1}{a}}{}_2F_1\left(\frac{1}{a},1-\frac{1}{b};1+\frac{1}{a};\#1\right)\&\right]\left[\int_1^x\exp\left(-\int_1^{K[3]}\frac{f(K[1])}{ab}dK[1]\right)c_1dK[1]\right]\right\}\right\}$

✓ **Maple** : cpu = 0.097 (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
```

$c_1e^{-\frac{xf}{ba}}-c_2+\int^{y(x)}\frac{-a^{\frac{1}{a}}(-a-1)^{\frac{1}{b}}}{-a(-a-1)}d-a=0$

2.1795

ODE No. 1795

$xy(x)^2y''(x)-a=0$

✓ **Mathematica** : cpu = 0.323691 (sec), leaf count = 116

```
DSolve[-a + x*y[x]^2*Derivative[2][y][x] == 0,y[x],x]
```

Solve $\left[-\frac{\sqrt{-\frac{2ay(x)}{x}-\frac{2c_1y(x)^2}{x^2}}}{2c_1}-\frac{a\tan^{-1}\left(\frac{\sqrt{2}\sqrt{c_1}\left(\frac{y(x)}{x}+\frac{a}{2c_1}\right)}{\sqrt{-\frac{2ay(x)}{x}-\frac{2c_1y(x)^2}{x^2}}}\right)}{2\sqrt{2}c_1^{3/2}}-\frac{1}{x}-c_2=0,y(x)\right]$

✓ **Maple** : cpu = 1.145 (sec), leaf count = 529

```
dsolve(x*y(x)^2*diff(diff(y(x),x),x)-a=0,y(x))
```

$y(x)=\frac{\left(9c_1a+e^{\operatorname{RootOf}\left(243\operatorname{csgn}\left(\frac{1}{c_1}\right)c_1^4a^2x-54_Ze^{-Z}axc_1^3-3e^{2-Z}\operatorname{csgn}\left(\frac{1}{c_1}\right)c_1^2x-6e^{-Z}\operatorname{csgn}\left(\frac{1}{c_1}\right)c_2x-2e^{-Z}\operatorname{csgn}\left(\frac{1}{c_1}\right)\right)}\right)^2xc_1e^{-\operatorname{RootOf}\left(243\operatorname{csgn}\left(\frac{1}{c_1}\right)c_1^4a^2x-54_Ze^{-Z}axc_1^3-3e^{2-Z}\operatorname{csgn}\left(\frac{1}{c_1}\right)c_1^2x-6e^{-Z}\operatorname{csgn}\left(\frac{1}{c_1}\right)c_2x-2e^{-Z}\operatorname{csgn}\left(\frac{1}{c_1}\right)\right)}}{2}$

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 = 0.334922 (sec), leaf count = 130

`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)*y[x]^2*Derivative[1][y][x], y[x], x]`

$$\left\{ \left\{ y(x) \rightarrow -\frac{a \tanh \left(c_1 \tanh^{-1} \left(\frac{x}{\sqrt{x^2 - a^2}}\right) - c_2\right)}{\sqrt{-1 + \tanh^2 \left(c_1 \tanh^{-1} \left(\frac{x}{\sqrt{x^2 - a^2}}\right) - c_2\right)}} \right\}, \left\{ y(x) \rightarrow \frac{a \tanh \left(c_1 \tanh^{-1} \left(\frac{x}{\sqrt{x^2 - a^2}}\right) - c_2\right)}{\sqrt{-1 + \tanh^2 \left(c_1 \tanh^{-1} \left(\frac{x}{\sqrt{x^2 - a^2}}\right) - c_2\right)}} \right\} \right.$$

✓ **Maple** : cpu = 0.297 (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)^2)*diff(y(x),x), y(x), x)`

$$y(x) = \frac{\left((x + \sqrt{-a^2 + x^2})^{2c_1} c_2^2 + a^2\right) (x + \sqrt{-a^2 + x^2})^{-c_1}}{2c_2}$$

2.1797 ODE No. 1797

$$(y(x)-1)^3\left(ay(x)^2+b\right)+cxy(x)^2(y(x)-1)+dx^2y(x)^2(y(x)+1)+2x^2y(x)(y(x)-1)y''(x)-x^2(3y(x)-1)y'(x)^2+$$

✗ Mathematica : cpu = 11.5791 (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[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]
```

, 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+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))
```

, 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))
```

2.1798

ODE No. 1798

$$x^3y(x)^2y''(x) + (y(x) + x) \left(xy'(x) - y(x)\right)^3 = 0$$

✓ **Mathematica** : cpu = 35.3684 (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]
```

Solve $\left[-\int_1^{\frac{y(x)}{x}} \frac{i\sqrt{3}\sqrt{K[2]}J_{i\sqrt{3}}\left(2\sqrt{K[2]}\right) + \sqrt{K[2]}J_{i\sqrt{3}}\left(2\sqrt{K[2]}\right) - 2J_{1+i\sqrt{3}}\left(2\sqrt{K[2]}\right)K[2] - 2Y_{1+i\sqrt{3}}\left(2\sqrt{K[2]}\right)}{\left(J_{i\sqrt{3}}\left(2\sqrt{K[2]}\right) + Y_{i\sqrt{3}}\left(2\sqrt{K[2]}\right)\right)} dx, y(x) \right]$

✓ **Maple** : cpu = 0.239 (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))
```

$$y(x) = \text{RootOf} \left(-2\ln(x) - \left(\int^{-Z} \frac{i\sqrt{3} \operatorname{BesselY}(i\sqrt{3}, 2\sqrt{-f}) c_1\sqrt{-f} + i\sqrt{3} \operatorname{BesselJ}(i\sqrt{3}, 2\sqrt{-f}) \sqrt{-f} + \operatorname{BesselY}(i\sqrt{3}, 2\sqrt{-f})}{\left(J_{i\sqrt{3}}(2\sqrt{-f}) + Y_{i\sqrt{3}}(2\sqrt{-f}) \right)} dx \right) \right)$$

2.1799

ODE No. 1799

$$y(x)^3y''(x)-a=0$$

✓ **Mathematica** : cpu = 1.53116 (sec), leaf count = 88

```
DSolve[-a + y[x]^3*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow-\frac{\sqrt{a+c_1^2x^2+2c_2c_1^2x+c_2^2c_1^2}}{\sqrt{c_1}}\right\},\left\{y(x)\rightarrow\frac{\sqrt{a+c_1^2x^2+2c_2c_1^2x+c_2^2c_1^2}}{\sqrt{c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.297 (sec), leaf count = 46

```
dsolve(y(x)^3*diff(diff(y(x),x),x)-a=0,y(x))
```

$$y(x)=\frac{\sqrt{c_1\left((c_2+x)^2c_1^2+a\right)}}{c_1}$$

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 = 0.542209 (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]
```

$$\left\{\left\{y(x)\rightarrow-\frac{\sqrt{-2c_1x-1-2c_2c_1}}{\sqrt{2}\sqrt{c_1x+c_2c_1}}\right\},\left\{y(x)\rightarrow\frac{\sqrt{-2c_1x-1-2c_2c_1}}{\sqrt{2}\sqrt{c_1x+c_2c_1}}\right\}\right\}$$

✓ **Maple** : cpu = 0.06 (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 = 6.87638 (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

$$-ax^2 - bx - c + 2y(x)^3y''(x) + y(x)^2y'(x)^2 = 0$$

 **Mathematica** : cpu = 0.299105 (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]
```

, could not solve

```
DSolve[-c - b*x - a*x^2 + y[x]^2*Derivative[1][y][x]^2 + 2*y[x]^3*Derivative[2][y][x] ==
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(2*y(x)^3*diff(diff(y(x),x),x)+y(x)^2*diff(y(x),x)^2-a*x^2-b*x-c=0,y(x))
```

, could not solve

```
dsolve(2*y(x)^3*diff(diff(y(x),x),x)+y(x)^2*diff(y(x),x)^2-a*x^2-b*x-c=0,y(x))
```


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 = 12.8361 (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], x]

Solve

$$\frac{\sqrt{2}\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]}-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,2\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]}-\text{Root}\left[4\#1^3-\#1a-b\&,2\right]}\left(y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]\right)}{c_1\sqrt{ay(x)+b-4y(x)^3}}=0$$

✓

Maple : cpu = 0.038 (sec), leaf count = 31

dsolve((4*y(x)^3-a*y(x)-b)*diff(diff(y(x),x),x)-(6*y(x)^2-1/2*a)*diff(y(x),x)^2=0,y(x))

$$\int^{y(x)}\frac{1}{\sqrt{4\_a^3-\_aa-b}}d\_a-xc_1-c_2=0$$

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 = 10.4237 (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] + y''[x]) + (a/2 - 6*y[x]^2)*y'[x]^2 == 0, y[x], x]

Solve

$$\left[2\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}}\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,2\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]-\text{Root}\left[4\#1^3-\#1a-b\&,2\right]}}\left(y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]\right)\sqrt{ay(x)+b-4y(x)^3}\sqrt{\frac{y(x)-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}{\text{Root}\left[4\#1^3-\#1a-b\&,3\right]-\text{Root}\left[4\#1^3-\#1a-b\&,1\right]}}\right]$$

✓

Maple : cpu = 0.057 (sec), leaf count = 34

dsolve((4*y(x)^3-a*y(x)-b)*(diff(diff(y(x),x),x)+f*diff(y(x),x))-(6*y(x)^2-1/2*a)*diff(y(x),x)),y(x))

$$c_1e^{-xf}-c_2+\int^{y(x)}\frac{1}{\sqrt{4\_a^3-\_aa-b}}d\_a=0$$

2.1806

ODE No. 1806

$$-f(x)((y(x)-1)y(x)(y(x)-x))^{3/2}+2(1-y(x))(x^2-2xy(x)+y(x))y(x)y'(x)-2(1-x)x(1-y(x))(x-y(x))y(x))$$

 **Mathematica** : cpu = 14.8641 (sec), leaf count = 0

```
DSolve[-((1 - y[x])^2*y[x]^2) - f[x]*((-1 + y[x])*y[x]*(-x + y[x]))^(3/2) + 2*(1 - y[x])*y[x]*
```

, could not solve

```
DSolve[-((1 - y[x])^2*y[x]^2) - f[x]*((-1 + y[x])*y[x]*(-x + y[x]))^(3/2) + 2*(1 - y[x])*
```

 **Maple** : cpu = 2.687 (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))
```

Expression too large to display

2.1807 ODE No. 1807

$$a(1-y(x))^2(x-y(x))^2y(x)^2+bx(1-y(x))^2(x-y(x))^2-c(1-x)(x-y(x))^2y(x)^2-d(1-x)x(1-y(x))^2y(x)^2+2(1-x)y(x)^2$$

 **Mathematica** : cpu = 22.8745 (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
```

, 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])^2
```

 **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(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(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))
```

, 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(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 = 11.1934 (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)]*Derivative[1][y][x] == 0, y[x], x]
```

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[\int_1^{\#1} \frac{\exp\left(\frac{b\sqrt{1-K[1]^2}\sqrt{1-a^2K[1]^2}F(\sin^{-1}(K[1])|a^2)}{\sqrt{(K[1]^2-1)(a^2K[1]^2-1)}} + \frac{1}{2}(-\log(1-K[1])-\log(K[1]))\right)}{c_1} \right.\right.$$

✓ **Maple** : cpu = 0.158 (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),y(x))
```

$$\int^{y(x)} e^{\int \frac{-2_-b^3a^2+_ba^2+b\sqrt{(-b^2-1)(-b^2a^2-1)}+_b}{(-b^2-1)(-b^2a^2-1)}d_-b} d_-b - xc_1 - c_2 = 0$$

2.1809

ODE No. 1809

$$y''(x)\left(ax^2+2bx+c+y(x)^2\right)^2+dy(x)=0$$

✓ **Mathematica** : cpu = 29.4863 (sec), leaf count = 260

```
DSolve[d*y[x] + (c + 2*b*x + a*x^2 + y[x]^2)^2*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\text{Solve}\left[a \tan^{-1}\left(\frac{ax+b}{\sqrt{ac-b^2}}\right)+\sqrt{ac-b^2} \int_1^{\frac{y(x)}{\sqrt{c+x(2b+ax)}}} \frac{a(K[2]^2+1)}{\sqrt{(K[2]^2+1)(d+(K[2]^2+1)(c_1a^2+(b^2-ac)K[2]^2)}}\right.\right.$$

✓ **Maple** : cpu = 0.456 (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))
```

$$y(x)=\text{RootOf}\left(\left(\int^{-z}\frac{\sqrt{\left(-_f^4ac+_f^4b^2+_f^2a^2c_1-c_f^2a+_f^2b^2+a^2c_1+d\right)\left(-_f^2+1\right)a}}{-_f^4ac+_f^4b^2+_f^2a^2c_1-c_f^2a+_f^2b^2+a^2c_1+d}d_f\right)\sqrt{ca-}$$

2.1810

ODE No. 1810

$$\sqrt{y(x)}y''(x)-a=0$$

✓ **Mathematica** : cpu = 0.126356 (sec), leaf count = 1677

```
DSolve[-a + Sqrt[y[x]]*Derivative[2][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x) \rightarrow \frac{3 c_1^2}{16 a^2}+\frac{\sqrt[3]{-\frac{221184 c_1^6}{a^6}+\frac{159252480 x^2 c_1^3}{a^2}+\frac{159252480 c_2^2 c_1^3}{a^2}+\frac{318504960 x c_2 c_1^3}{a^2}+2293235712 a^2 x^4+2293235712 a^2 x^2 c_2+2293235712 a^2 c_2^2}}{2}\right\}\right.$$

✓ **Maple** : cpu = 0.113 (sec), leaf count = 91

```
dsolve(y(x)^(1/2)*diff(diff(y(x),x),x)-a=0,y(x))
```

$$\frac{-3\sqrt{4a\sqrt{y(x)}-c_1}c_1-\left(4a\sqrt{y(x)}-c_1\right)^{3/2}}{12a^2}-x-c_2=0$$

2.1811

ODE No. 1811

$$\sqrt{x^2+y(x)^2}y''(x)-a\big(y'(x)^2+1\big)^{3/2}=0$$

 **Mathematica** : cpu = 300.062 (sec), leaf count = 0

```
DSolve[-(a*(1 + Derivative[1][y][x]^2)^(3/2)) + Sqrt[x^2 + y[x]^2]*Derivative[2][y][x] == 0,y[
```

, timed out

\$Aborted

 **Maple** : cpu = 2.12 (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 = 0.299457 (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
```

$$\left\{\left\{y(x)\rightarrow e^{\frac{c_1x-1+c_2c_1}{c_1(x+c_2)}}\right\}\right\}$$

✓ **Maple** : cpu = 0.134 (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))
```

$$y(x)=e^{\frac{xc_1+c_2-1}{xc_1+c_2}}$$

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 = 38.4709 (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]]
```

$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \left[\int_1^{\#1} -\frac{\sqrt{2} \sqrt{\cos(2K[1]) a - a - 2b}}{\sqrt{2aAK[1]^2 + 4AcK[1]^2 - 2aA \sin(2K[1])K[1] + 2c_1 - aA \cos(2K[1])}} dx \right] \right\} \right\}$

✓ **Maple** : cpu = 0.532 (sec), leaf count = 133

```
dsolve((b+a*sin(y(x))^2)*diff(diff(y(x),x),x)+a*diff(y(x),x)^2*cos(y(x))*sin(y(x))+A*y(x)
```

$\int^{y(x)} -\frac{2(b+a \sin(\_a)^2)}{\sqrt{-2(b+a \sin(\_a)^2)(A \sin(\_a)^2 a - 2Aa\_a \cos(\_a) \sin(\_a) + \_a^2(a+2c)A - 2c_1)}} d\_a - x - c_2$

2.1814

ODE No. 1814

$ah(y(x))y'(x)^2+h(y(x))y''(x)+j(y(x))=0$

✓ **Mathematica** : cpu = 0.395846 (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]
```

$$\left\{\left\{y(x) \rightarrow \text{InverseFunction}\left[\int_1^{\#1}-\frac{e^{aK[2]}}{\sqrt{c_1+2\int_1^{K[2]}-\frac{e^{2aK[1]}j(K[1])}{h(K[1])}dK[1]}}dK[2]\&\right][x+c_2]\right\},\left\{y(x) \rightarrow \text{InverseFunction}\left[\int_1^{\#1}-\frac{e^{aK[2]}}{\sqrt{c_1+2\int_1^{K[2]}-\frac{e^{2aK[1]}j(K[1])}{h(K[1])}dK[1]}}dK[2]\&\right][x+c_2]\right\}\right\}$$

✓ **Maple** : cpu = 0.136 (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 = 2.12772 (sec), leaf count = 0

```
DSolve[-(h[y[x]]^2*j[x, Derivative[1][y][x]/h[y[x]]]) - h[y[x]]*Derivative[1][y][x]^2 + h[y[x]]
```

, could not solve

```
DSolve[-(h[y[x]]^2*j[x, Derivative[1][y][x]/h[y[x]]]) - h[y[x]]*Derivative[1][y][x]^2 +
```

 **Maple** : cpu = 0. (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))
```

, result contains DESol or ODESolStruc

$$y(x)=\text{RootOf}\left(\int\_b(\_a)d\_a+c_1-\left(\int^{-Z}\frac{1}{h(\_f)}d\_f\right)\right)\&\text{where}\left[\left\{\frac{d}{d\_a}b(\_a)=j(\_a,\_b(\_a))\right\},\left\{-\right.$$

2.1816

ODE No. 1816

$$x^2(-y(x))y'(x)+y'(x)y''(x)-xy(x)^2=0$$

 **Mathematica** : cpu = 51.506 (sec), leaf count = 0

```
DSolve[-(x*y[x]^2) - x^2*y[x]*Derivative[1][y][x] + Derivative[1][y][x]*Derivative[2][y][x] ==
```

, could not solve

```
DSolve[-(x*y[x]^2) - x^2*y[x]*Derivative[1][y][x] + Derivative[1][y][x]*Derivative[2][y][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

$$y(x) = \_b(\_a) \&\text{where} \left[\left\{ -\_b(\_a)^2 \_a^2 + \left(\frac{d}{d\_a} \_b(\_a) \right)^2 + c_1 = 0 \right\}, \{ \_a = x, \_b(\_a) = y(x) \}, \{ x = \_$$

2.1817

ODE No. 1817

$$4y'(x)^2 + (xy'(x) - y(x))\,y''(x) = 0$$

✓ **Mathematica** : cpu = 14.557 (sec), leaf count = 41

```
DSolve[4*Derivative[1][y][x]^2 + (-y[x] + x*Derivative[1][y][x])*Derivative[2][y][x] == 0,y[x]
```

$$\left\{\left\{y(x) \rightarrow \frac{1}{2}c_2e^{-2-W\left(\frac{2x}{e^2c_1}\right)}\left(2+W\left(\frac{2x}{e^2c_1}\right)\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.246 (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))
```

$$y(x) = e^{\int^{\ln(x)}\left(e^{\operatorname{RootOf}\left(\ln\left(e^{-Z}-1\right)e^{-Z}+c_1e^{-Z}-_Ze^{-Z}-_be^{-Z}+2\right)}-1\right)d\_b+c_2}$$

2.1818

ODE No. 1818

$$(xy'(x)-y(x))\,y''(x)-(y'(x)^2+1)^2=0$$

 **Mathematica** : cpu = 0.98725 (sec), leaf count = 0

Dsolve[-(1 + Derivative[1][y][x]^2)^2 + (-y[x] + x*Derivative[1][y][x])*Derivative[2][y][x] ==

, could not solve

DSolve[-(1 + Derivative[1][y][x]^2)^2 + (-y[x] + x*Derivative[1][y][x])*Derivative[2][y]

 **Maple** : cpu = 0.607 (sec), leaf count = 66

dsolve((x*diff(y(x),x)-y(x))*diff(diff(y(x),x),x)-(diff(y(x),x)^2+1)^2=0,y(x))

$$y(x)=\text{RootOf}\left(-\ln(x)+\int^{-Z}_{-f}\frac{-\tan\left(\frac{1}{-Z}\right)c_1Z+fc_1\tan\left(\frac{1}{-Z}\right)+\tan\left(\frac{1}{-Z}\right)Zf+c_1}{f^2+1}\right)$$

2.1819

ODE No. 1819

$$ax^3y'(x)y''(x)+by(x)^2=0$$

 **Mathematica** : cpu = 1.44393 (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 = 0.065 (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))
```

$$y(x)=e^{\int^{\ln(x)}\text{RootOf}\left(-\left(\int^{-Z}\frac{aa}{-a^3a-a^2a+b}d\_a\right)-\_b+c_1\right)d\_b+c_2}$$

2.1820

ODE No. 1820

$$y''(x) \left(f_1(x)y'(x) + f_2(x)y(x) \right) + f_3(x)y'(x)^2 + f_4(x)y(x)y'(x) + f_5(x)y(x)^2 = 0$$

✖ Mathematica : cpu = 328.211 (sec), leaf count = 0

```
DSolve[f5[x]*y[x]^2 + f4[x]*y[x]*Derivative[1][y][x] + f3[x]*Derivative[1][y][x]^2 + (f2[x]*y[
```

, timed out

\$Aborted

✖ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve((f1*diff(y(x),x)+f2*y(x))*diff(diff(y(x),x),x)+f3*diff(y(x),x)^2+f4(x)*y(x)*diff(
```

, result contains DESol or ODESolStruc

$$y(x) = \left(e^{\int -b(\_a)d\_a+c_1} \right) \&\text{where} \left[\left\{ \frac{d}{d\_a} b(\_a) = -\frac{-b(\_a)^3 f_1 + (f_2 + f_3) \_b(\_a)^2 + f_4(\_a) \_b(\_a) + f_5(\_a)}{\_b(\_a) f_1 + f_2} \right. \right.$$

2.1821

ODE No. 1821

$$(x^2 + 2y(x)^2y'(x))\,y''(x) + 2y(x)y'(x)^3 + 3xy'(x) + y(x) = 0$$

✖

Mathematica : cpu = 41.9179 (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*Derivat

, 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*D

✖

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

, result contains DESol or ODESolStruc

$$y(x) = \_b(\_a) \&where \left[\left\{ \_b(\_a)^2 \left(\frac{d}{d\_a} \_b(\_a) \right)^2 + \_a^2 \left(\frac{d}{d\_a} \_b(\_a) \right) + \_a \_b(\_a) + c_1 = 0 \right\}, \{ \_a = x \} \right]$$

2.1822

ODE No. 1822

$$\left(y'(x)^2+y(x)^2\right)y''(x)+y(x)^3=0$$

✓

Mathematica : cpu = 0.926749 (sec), leaf count = 371

`DSolve[y[x]^3 + (y[x]^2 + Derivative[1][y][x]^2)*Derivative[2][y][x] == 0,y[x],x]`

$$\left\{\left\{y(x) \rightarrow c_2 \exp \left(\frac{1}{12}\right)-2 \sqrt{3} \tan ^{-1}\left(\frac{1+2 \operatorname{InverseFunction}\left[\frac{\left(\sqrt{3}-i\right) \tan ^{-1}\left(\frac{\# 1}{\sqrt{\frac{1}{2}(1-i \sqrt{3})}\right)}\right]+\frac{\left(\sqrt{3}+i\right) \tan ^{-1}\left(\frac{\# 1}{\sqrt{\frac{1}{2}(1+i \sqrt{3})}\right)}}{\sqrt{6(1-i \sqrt{3})}}+\frac{\left(\sqrt{3}+i\right) \tan ^{-1}\left(\frac{\# 1}{\sqrt{\frac{1}{2}(1+i \sqrt{3})}\right)}}{\sqrt{6(1+i \sqrt{3})}}\right)}{\sqrt{3}}\right.\right.$$

✓

Maple : cpu = 1.368 (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))`

$$y(x)=\frac{\sqrt{c_1+\tan (\sqrt{3} x)} e^{\frac{\sqrt{3}\left(\int \frac{\sqrt{\left(9 c_1^2+12\right) \sec (\sqrt{3} x)^2+3 c_1^2+6 c_1 \tan (\sqrt{3} x)-3}}{c_1+\tan (\sqrt{3} x)} d x\right)}{6}}+c_2}{\left(\sec (\sqrt{3} x)^2\right)^{1 / 4}}$$

2.1823

ODE No. 1823

$$y''(x)\left(a(xy'(x)-y(x))+y'(x)^2\right)-b=0$$

✓

Mathematica : cpu = 0.474243 (sec), leaf count = 281

DSolve[-b + (Derivative[1][y][x]^2 + a*(-y[x] + x*Derivative[1][y][x]))*Derivative[2][y][x] ==

$$\left\{\text{Solve}\left[-\int\frac{a\left(\frac{ax^2}{4}+y(x)\right)+\sqrt{4b\left(\frac{ax^2}{4}+y(x)\right)-2c_1}}{\sqrt{\left(a^2\left(\frac{ax^2}{4}+y(x)\right)^2-4b\left(\frac{ax^2}{4}+y(x)\right)+2c_1}\right)\left(a\left(\frac{ax^2}{4}+y(x)\right)+\sqrt{4b\left(\frac{ax^2}{4}+y(x)\right)-2c_1}\right)}d\right.\right.$$

✓

Maple : cpu = 0.301 (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))

$$y(x)=-\frac{ax^2}{4}+\text{RootOf}\left(-x+\int^{-z}\frac{\sqrt{\left(\_fa+\sqrt{4\_fb-2c_1}\right)\left(\_f^2a^2-4\_fb+2c_1\right)}}{\_f^2a^2-4\_fb+2c_1}d\_f+c_2\right)$$

2.1824

ODE No. 1824

$$y''(x)\left(a\sqrt{y'(x)^2+1}-xy'(x)\right)-y'(x)^2-1=0$$

✓ **Mathematica** : cpu = 0.919293 (sec), leaf count = 331

```
DSolve[-1 - Derivative[1][y][x]^2 + (-x*Derivative[1][y][x]) + a*Sqrt[1 + Derivative[1][y][x]^2], y[x], x]
```

$$\left\{\left\{y(x)\rightarrow-\frac{\sqrt{x^2\left(a^2-x^2+c_1^2\right)}\left(2\sqrt{-a^2+x^2-c_1^2}+c_1\tan^{-1}\left(\frac{a^2-ax+c_1^2}{c_1\sqrt{-a^2+x^2-c_1^2}}\right)+c_1\tan^{-1}\left(\frac{a^2+ax+c_1^2}{c_1\sqrt{-a^2+x^2-c_1^2}}\right)\right)}{2x\sqrt{-a^2+x^2-c_1^2}}\right.\right.$$

✓ **Maple** : cpu = 0.979 (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), y(x))
```

$$y(x)=\int\frac{-c_1a^2+x\sqrt{a^2\left(a^2+c_1^2-x^2\right)}}{a^3-ax^2}dx+c_2$$

2.1825

ODE No. 1825

$$f(x)+y''(x)h(y'(x))+j(y(x))y'(x)=0$$

 **Mathematica** : cpu = 0.0389029 (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]]
```

, could not solve

```
DSolve[f[x] + j[y[x]]*Derivative[1][y][x] + h[Derivative[1][y][x]]*Derivative[2][y][x] == 0,y[x]]
```

 **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

$$y(x) = \_f(\_b) \& \text{where} \left[\left\{ \int^{\_f(\_b)} j(\_a) d\_a + \int^{\frac{d}{d\_b} \_f(\_b)} h(\_a) d\_a + \_bf + c_1 = 0 \right\}, \{ \_b = x, \_f(\_b) = \right.$$

2.1826

ODE No. 1826

$$-ay(x)-b+y''(x)^2=0$$

✓

Mathematica : cpu = 0.892922 (sec), leaf count = 201

`DSolve[-b - a*y[x] + Derivative[2][y][x]^2 == 0,y[x],x]`

$$\left\{ \text{Solve}\left[\frac{(ay(x)+b)^2\left(1-\frac{4(ay(x)+b)^{3/2}}{3ac_1}\right){}_2F_1\left(\frac{1}{2},\frac{2}{3},\frac{5}{3},\frac{4(b+ay(x))^{3/2}}{3ac_1}\right)^2}{a^2\left(-\frac{4(ay(x)+b)^{3/2}}{3a}+c_1\right)}=(x+c_2)^2,y(x)\right], \text{Solve}\left[\frac{(ay(x)+b)^2\left(1-\frac{4(ay(x)+b)^{3/2}}{3ac_1}\right){}_2F_1\left(\frac{1}{2},\frac{2}{3},\frac{5}{3},\frac{4(b+ay(x))^{3/2}}{3ac_1}\right)^2}{a^2\left(-\frac{4(ay(x)+b)^{3/2}}{3a}+c_1\right)}=(x+c_2)^2,y(x)\right] \right\}$$

✓

Maple : cpu = 0.725 (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 = 0.798585 (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,
```

 **Maple** : cpu = 4.732 (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))
```

$$y(x) = \int \text{RootOf}\left(8\_Z^{-2a+1}a^3\sqrt{x^2-\_Z}\left(-x+\sqrt{x^2-\_Z}\right)^{-2a}\left(x+\sqrt{x^2-\_Z}\right)^{2a}\left(4\_Za^2-4ax^2+x^2\right),\_Z\right)dx$$

2.1828

ODE No. 1828

$$2\left(x^2+1\right)y''(x)^2+2y'(x)\left(y'(x)+x\right)-x\left(4y'(x)+x\right)y''(x)-2y(x)=0$$

✓ **Mathematica** : cpu = 0.0103238 (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])
```

$$\left\{\left\{y(x)\rightarrow-\frac{1}{2}\sqrt{c_2-c_1^2}x^2+c_1x+c_2\right\}\right\}$$

✓ **Maple** : cpu = 1.131 (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+d
```

$$y(x)=\frac{\left(c_1+\frac{\operatorname{arcsinh}(x)}{4}\right)x\sqrt{x^2+1}}{2}-\frac{3x^2}{16}+c_1^2+\frac{c_1\operatorname{arcsinh}(x)}{2}+\frac{\operatorname{arcsinh}(x)^2}{16}$$

2.1829

ODE No. 1829

$$3x^2y''(x)^2+4y'(x)^2-2(3xy'(x)+y(x))y''(x)=0$$

✓ **Mathematica** : cpu = 0.0067519 (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*Derivative[2][y][x]^2, y[x], x]
```

$$\left\{\left\{y(x)\rightarrow \frac{c_1^2x^2}{c_2}+c_1x+c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.661 (sec), leaf count = 36

```
dsolve(3*x^2*diff(diff(y(x),x),x)^2-2*(3*x*diff(y(x),x)+y(x))*diff(diff(y(x),x),x)+4*diff(y(x),x)^2,y(x))
```

$$y(x)=x^{\frac{2\sqrt{3}}{3}}c_1x$$

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 = 0.0268301 (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], y[x], x]

$$\left\{\left\{y(x)\rightarrow \frac{c_1^2x^3}{c_2}+c_1x+c_2\right\}\right\}$$

✓

Maple : cpu = 0.849 (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)+

$$y(x)=\frac{27c_1\left((9x-1)\sqrt{9}+9\sqrt{9x^2-2x}\right)^{-\frac{2\sqrt{9}}{9}}\left((9x-1)\sqrt{9}+9\sqrt{9x^2-2x}\right)^{-\frac{5\sqrt{9}}{18}}\sqrt{5}\sqrt{\frac{\frac{4}{5}+\frac{\sqrt{16}\left(x-\frac{1}{5}\right)}{\sqrt{9x^2-2x}}}{\sqrt{-\frac{(4x-1)^2}{9x^2-2x}}}}\sqrt{4x-1}}{2}$$

2.1832

ODE No. 1832

$$y(x)y''(x)^2 - ae^{2x} = 0$$

X Mathematica : cpu = 20.4744 (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]
```

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

$$y(x) = \left(-a e^{\int \frac{2-b(-a)}{3} d_{-a} + \frac{2c_1}{3}}\right) \& \text{where} \left[\left\{\frac{d}{d_{-a}} b(-a) = -\frac{(-4_{-a}^2 + 9\sqrt{-aa})_{-b}(-a)^3}{9_{-a}} + \frac{4_{-b}(-a)^2}{3}\right\}, \left\{-a\right.\right.$$

2.1833

ODE No. 1833

$$y''(x)^2\left(a^2y(x)^2-b^2\right)+y'(x)^2\left(a^2y'(x)^2-1\right)-2a^2y(x)y'(x)^2y''(x)=0$$

✓ **Mathematica** : cpu = 3.17879 (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]
```

{}

✓ **Maple** : cpu = 2.641 (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),
```

$$y(x)=\frac{\tan\left(\frac{\sqrt{a^2}\left(-x+c_1\right)}{ab}\right)b}{\sqrt{\tan\left(\frac{\sqrt{a^2}\left(-x+c_1\right)}{ab}\right)^2+1}a}$$

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 = 53.4998 (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

$$\left\{\left\{y(x)\rightarrow c_1xe^{\frac{1}{-x+c_2}}\right\}\right\}$$

✗

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)

, 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 = 0.161519 (sec), leaf count = 143

DSolve[32*Derivative[2][y][x]*(-Derivative[1][y][x] + x*Derivative[2][y][x])^3 + (-Derivative[1][y][x]^2 + 2*y[x]*Derivative[2][y][x])^3 == 0,x]

$$\left\{\left\{y(x)\rightarrow\frac{1}{4}\left(-\frac{8c_1^3}{\sqrt[3]{3}\sqrt[3]{\sqrt{3}\sqrt{27c_1^{10}c_2^{10}-64c_1^9c_2^9-9c_1^5c_2^5}}}\right)+\frac{c_1^2}{c_2}-\frac{2\sqrt[3]{\sqrt{3}\sqrt{27c_1^{10}c_2^{10}-64c_1^9c_2^9-9c_1^5c_2^5}}}{3^{2/3}c_2^3}\right\}\right\}$$

✗

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(x),x),x)-diff(y(x),x)^2))=0,x))

, 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 = 17.341 (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
```

, could not solve

```
DSolve[d*Derivative[1][y][x]^2 + c*y[x]*Derivative[2][y][x] + Sqrt[b*Derivative[1][y][x]
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve((a*diff(diff(y(x),x),x)^2+b*diff(y(x),x)^2)^(1/2)+c*y(x)*diff(diff(y(x),x),x)+d*d
```

, result contains DESol or ODESolStruc

$$y(x) = c_1$$

2.1837

ODE No. 1837

$$y^{(3)}(x)-a^2\big(y'(x)^5+2y'(x)^3+y'(x)\big)=0$$

✓ **Mathematica** : cpu = 10.0977 (sec), leaf count = 145

```
DSolve[-(a^2*(Derivative[1][y][x] + 2*Derivative[1][y][x]^3 + Derivative[1][y][x]^5)) + Derivati
```

$$\left\{\left\{y(x)\rightarrow\int_1^x\text{InverseFunction}\left[-3\int\frac{1}{\sqrt{3\left(a^2\right)^2\#1^6+9\left(a^2\right)^2\#1^4+9\left(a^2\right)^2\#1^2+9c_1}}d\#1\&\right]\left[c_2-K[1]]d\right.\right.$$

✓ **Maple** : cpu = 0.283 (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
```

$$y(x)=\int \text{RootOf}\left(3\left(\int^{-z}\frac{1}{\sqrt{3\_f^6a^2+9a^2\_f^4+9\_f^2a^2+3a^2+9c_1}}d\_f\right)+x+c_2\right)dx+c_3$$

2.1838

ODE No. 1838

$$y^{(3)}(x)+y(x)y''(x)-y'(x)^2+1=0$$

 **Mathematica** : cpu = 0.0414067 (sec), leaf count = 0

```
DSolve[1 - Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[1 - Derivative[1][y][x]^2 + y[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0,
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)+diff(diff(y(x),x),x)*y(x)-diff(y(x),x)^2+1=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \_a\&\text{where}\left[\left\{\left(\frac{d^2}{d\_a^2}b(\_a)\right)\_b(\_a)^2+\left(\frac{d}{d\_a}b(\_a)\right)^2\_b(\_a)+\left(\frac{d}{d\_a}b(\_a)\right)\_b(\_a)\_a-\_$$

2.1839

ODE No. 1839

$$y^{(3)}(x) - y(x)y''(x) + y'(x)^2 = 0$$

✗ Mathematica : cpu = 0.0270008 (sec), leaf count = 0

```
DSolve[Derivative[1][y][x]^2 - y[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0,y[x],x]
```

, could not solve

```
DSolve[Derivative[1][y][x]^2 - y[x]*Derivative[2][y][x] + Derivative[3][y][x] == 0, y[x]
```

✗ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve(diff(diff(diff(y(x),x),x),x)-diff(diff(y(x),x),x)*y(x)+diff(y(x),x)^2=0,y(x))
```

, result contains DESol or ODESolStruc

$$y(x) = \left(e^{\int -g(\_f)d\_f+c_2}\right) \& \text{where} \left[\left\{\frac{d}{d\_f}g(\_f) = (6\_f-1)\_g(\_f)^3 + \frac{(7\_f-1)\_g(\_f)^2}{\_f} + \frac{-g(\_f)}{\_f}\right\}, \left\{-f\right.\right.$$

2.1840

ODE No. 1840

$$ay(x)y''(x)+y^{(3)}(x)=0$$

✖

Mathematica : cpu = 0.0370895 (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

$$y(x)=\left(e^{\int -g(\_f)d\_f+c_2}\right) \& \text{where} \left[\left\{\frac{d}{d\_f}g(\_f)=(6\_f+2a)\_g(\_f)^3+\frac{(7\_f+a)\_g(\_f)^2}{\_f}+\frac{-g(\_f)}{\_f}\right\},\left\{-\right.\right.$$

2.1841

ODE No. 1841

$$-f(x)+x^2y^{(3)}(x)+xy''(x)+(2xy(x)-1)y'(x)+y(x)^2=0$$

✖

Mathematica : cpu = 0.124315 (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[3][y][x], y[x], x]

, 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*Derivative[3][y][x], y[x], x]

✖

Maple : cpu = 0. (sec), leaf count = 0

dsolve(x^2*diff(diff(diff(y(x),x),x),x)+x*diff(diff(y(x),x),x)+(2*x*y(x)-1)*diff(y(x),x),y(x),x)

, result contains DESol or ODESolStruc

$$y(x) = \_b(\_a) \& \text{where} \left[\left\{ -a^2 \left(\frac{d^2}{d\_a^2} b(\_a) \right) + \_a \_b(\_a)^2 - \_a \left(\frac{d}{d\_a} b(\_a) \right) - \left(\int f(\_a) d\_a \right) + c_1 \right. \right.$$

2.1842

ODE No. 1842

$$x^2y^{(3)}(x)+x(y(x)-1)y''(x)+xy'(x)^2+(1-y(x))y'(x)=0$$

✓

Mathematica : cpu = 0.213379 (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], y[x], x]

$$\left\{\left\{y(x)\rightarrow \frac{2x\left(c_3\left(J_{\frac{\sqrt{c_2+2}}{\sqrt{2}}}(-\frac{1}{2}ix\sqrt{c_1})-\frac{1}{4}i\sqrt{c_1}x\left(J_{\frac{\sqrt{c_2+2}}{\sqrt{2}}-1}(-\frac{1}{2}ix\sqrt{c_1})-J_{\frac{\sqrt{c_2+2}}{\sqrt{2}}+1}(-\frac{1}{2}ix\sqrt{c_1})\right)\right)+Y_{\frac{\sqrt{c_2+2}}{\sqrt{2}}}\left(-\frac{1}{2}ix\sqrt{c_1}\right)\right)}{c_3xJ_{\frac{\sqrt{c_2+2}}{\sqrt{2}}}(-\frac{1}{2}ix\sqrt{c_1})+xY_{\frac{\sqrt{c_2+2}}{\sqrt{2}}}(-\frac{1}{2}ix\sqrt{c_1})}\right\}\right\}$$

✓

Maple : cpu = 0.659 (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,y(x),x)

$$\ln(x)+2\left(\int^{y(x)}\frac{2\operatorname{RootOf}\left(-2\sqrt{4+c_1}\operatorname{BesselY}\left(\frac{\sqrt{4+c_1}}{2},\frac{\sqrt{2}z}{2}\right)c_2+2\operatorname{BesselY}\left(\frac{\sqrt{4+c_1}}{2},\frac{\sqrt{2}z}{2}\right)c_2h-4\operatorname{BesselY}\left(\frac{\sqrt{4+c_1}}{2},\frac{\sqrt{2}z}{2}\right)c_2h\right)}{2\operatorname{RootOf}\left(-2\sqrt{4+c_1}\operatorname{BesselY}\left(\frac{\sqrt{4+c_1}}{2},\frac{\sqrt{2}z}{2}\right)c_2+2\operatorname{BesselY}\left(\frac{\sqrt{4+c_1}}{2},\frac{\sqrt{2}z}{2}\right)c_2h-4\operatorname{BesselY}\left(\frac{\sqrt{4+c_1}}{2},\frac{\sqrt{2}z}{2}\right)c_2h\right)}dz\right)$$

2.1843 ODE No. 1843

$$y^{(3)}(x)y(x) + y(x)^3y'(x) - y'(x)y''(x) = 0$$

- ✓ **Mathematica** : cpu = 2.22607 (sec), leaf count = 409

$$\text{DSolve}[y[x]^3 \text{Derivative}[1][y][x] - \text{Derivative}[1][y][x] \text{Derivative}[2][y][x] + y[x] \text{Derivative}[1][y][x], y[x], x]$$

$$\left\{ \left\{ y(x) \rightarrow \text{InverseFunction} \right. - \frac{2i \sqrt{1 + \frac{\#1^2}{2(\sqrt{c_2^2 - c_1} - c_2)}} \sqrt{1 - \frac{\#1^2}{2(c_2 + \sqrt{c_2^2 - c_1})}} F \left(i \sinh^{-1} \left(\frac{\sqrt{\frac{1}{\sqrt{c_2^2 - c_1} - c_2}} \#1}{\sqrt{2}} \right) \right) \Big|_{\frac{c_2 -}{c_2 +}}}{\sqrt{\frac{1}{\sqrt{c_2^2 - c_1} - c_2}} \sqrt{-\frac{\#1^4}{2} + 2\#1^2 c_2 - 2c_1}} \right.$$

✓ **Maple** : cpu = 0.362 (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
```

$$\int^{y(x)} -\frac{2}{\sqrt{-a^4+4a^2c_2-4c_2^2+4c_1}}d_{-a-x-c_3}=0$$

2.1844

ODE No. 1844

$$4y(x)^2y^{(3)}(x)+15y'(x)^3-18y(x)y'(x)y''(x)=0$$

✓ **Mathematica** : cpu = 0.183019 (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*Derivative[3][y][x] == 0,x]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{\left(c_3x^2+c_2x+c_1\right)^2}\right\}\right\}$$

✓ **Maple** : cpu = 0.401 (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*diff(y(x),x)^3,x))
```

$$y(x)=e^{\int \text{RootOf}\left(-2\left(\int^{-Z}\frac{1}{-h^2+\sqrt{-h^2c_1+c_1^2+c_1}}d\_h\right)+x+c_2\right)dx+c_3}$$

2.1845

ODE No. 1845

$$9y(x)^2y^{(3)}(x)+40y'(x)^3-45y(x)y'(x)y''(x)=0$$

✓ **Mathematica** : cpu = 0.194836 (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*Derivative[3][y][x] == 0,x]
```

$$\left\{\left\{y(x)\rightarrow \frac{1}{\left(c_3x^2+c_2x+c_1\right)^{3/2}}\right\}\right\}$$

✓ **Maple** : cpu = 0.383 (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*y(x)^3-9*y(x)^2*diff(y(x),x),x)
```

$$y(x)=e^{\int \text{RootOf}\left(-6\left(\int^{-Z}\frac{1}{4\_h^2+\sqrt{4\_h^2c_1+c_1^2}+c_1}d\_h\right)+x+c_2\right)dx+c_3}$$

2.1846 ODE No. 1846

$$2y^{(3)}(x)y'(x) - 3y'(x)^2 = 0$$

✓ **Mathematica** : cpu = 0.0445675 (sec), leaf count = 51

```
DSolve[-3*Derivative[1][y][x]^2 + 2*Derivative[1][y][x]*Derivative[3][y][x] == 0,y[x],x]
```

$$\left\{ \{y(x) \rightarrow c_1\}, \left\{ y(x) \rightarrow \sqrt{\frac{2}{3}} e^{-\sqrt{\frac{3}{2}}x} (c_1 e^{\sqrt{6}x} - c_2) + c_3 \right\} \right\}$$

✓ **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 = 0.223289 (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], y[x], x]
```

$$\left\{ \left\{ y(x) \rightarrow c_3 - \frac{i\sqrt{c_1^2 x^2 + 2c_2 c_1^2 x - 1 + c_2^2 c_1^2}}{c_1} \right\}, \left\{ y(x) \rightarrow \frac{i\sqrt{c_1^2 x^2 + 2c_2 c_1^2 x - 1 + c_2^2 c_1^2}}{c_1} + c_3 \right\} \right\}$$

✓ **Maple** : cpu = 0.156 (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), y(x))
```

$$y(x) = -\sqrt{-c_2^2 - 2c_2x - x^2 + c_1 + c_3}$$

2.1848

ODE No. 1848

$$y''(x)^2(-a-3y'(x))+y^{(3)}(x)(y'(x)^2+1)=0$$

✓

Mathematica : cpu = 0.473351 (sec), leaf count = 187

DSolve[(-a - 3*Derivative[1][y][x])*Derivative[2][y][x]^2 + (1 + Derivative[1][y][x]^2)*Derivati

$$\left\{\left\{y(x)\rightarrow c_3-\frac{\left(1-i\mathrm{InverseFunction}\left[\frac{(\#1-a)e^{-a\tan^{-1}(\#1)}}{\sqrt{\#1^2+1}(a^2+1)c_1}\right][x+c_2]\right)^{-\frac{1}{2}-\frac{ia}{2}}\left(1+i\mathrm{InverseFunction}\left[\frac{(\#1-a)e^{-a\tan^{-1}(\#1)}}{\sqrt{\#1^2+1}(a^2+1)c_1}\right][x+c_2]\right)^{-\frac{1}{2}+\frac{ia}{2}}}{(a^2+1)c_1}\right.\right.$$

✓

Maple : cpu = 1.201 (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),x))

$$y(x)=\int \tan \left(\mathrm{RootOf}\left(-2\,{\mathrm e}^{a-Z}\cos \left(\_Z\right)c_1c_2a^3-2\,{\mathrm e}^{a-Z}\cos \left(\_Z\right)c_1a^3x+c_2^2a^4{\mathrm e}^{2a-Z}+2c_2a^4x{\mathrm e}^{2a-Z}+a^4x^2{\mathrm e}^{2a-Z}\right)\right)dx$$

2.1849

ODE No. 1849

$$y^{(3)}(x)y''(x)-a\sqrt{b^2y''(x)^2+1}=0$$

✓

Mathematica : cpu = 0.669148 (sec), leaf count = 426

DSolve[-(a*Sqrt[1 + b^2*Derivative[2][y][x]^2]) + Derivative[2][y][x]*Derivative[3][y][x] == 0

$$\left\{\left\{y(x)\rightarrow-\frac{(a^2b^4x^2+2ab^4c_1x+b^4c_1^2-1)^{3/2}}{3ab^2}+\frac{\sqrt{a^2b^4x^2+2ab^4c_1x+b^4c_1^2-1}}{ab^2}-\frac{c_1\log\left(\sqrt{a^2b^4x^2+2ab^4c_1x+b^4c_1^2-1}+ab^2x+b^2c_1\right)}{a}-x\log\right.\right.$$

✓

Maple : cpu = 0.3 (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

$$y(x)=c_2x+\int\frac{-\frac{\ln\left(\sqrt{(1+b^2(c_1+x)a)(-1+b^2(c_1+x)a)}+\frac{(c_1+x)b^4a^2}{\sqrt{a^2b^4}}\right)}{\sqrt{a^2b^4}}+\sqrt{(1+b^2(c_1+x)a)(-1+b^2(c_1+x)a)}(c_1+x)}{2b}$$

2.1850

ODE No. 1850

$$y^{(4)}(x)y'(x)-y^{(3)}(x)y''(x)+y^{(3)}(x)y'(x)^3=0$$

 **Mathematica** : cpu = 0.260789 (sec), leaf count = 0

DSolve[Derivative[1][y][x]^3*Derivative[3][y][x] - Derivative[2][y][x]*Derivative[3][y][x] + D

, 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

, result contains DESol or ODESolStruc

$$y(x)=\left(\int \frac{e^{\int -j(_h)d_h-c_2}j(_h)}{_h}d_h+c_3\right) \&where \left\{\frac{d}{d_h}j(_h)=(12_h+3)_j(_h)^3+\frac{(10_h+1)}{_h}\right.$$

2.1851 ODE No. 1851

$y'(x)^3 (f'(x)y'(x) + f(x)y''(x)) - y''(x) (f''(x)y'(x) + 2f'(x)y''(x) + f(x)y^{(3)}(x)) + y'(x) (f^{(3)}(x)y'(x) + 3f''(x)y''(x) + f'(x)y^{(3)}(x)) = 0$

X Mathematica : cpu = 0.739664 (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[1][q][x] + q[x]*Derivative[2][y][x]) - Derivative[2][y][x]^3*(Derivative[1][f][x]*Derivative[1][q][x] + q[x]*Derivative[2][y][x]) == 0, y[x]]
```

, could not solve

```
DSolve[2*q[x]*Sin[y[x]]*Derivative[1][y][x]^2 + Derivative[1][y][x]^3*(Derivative[1][f][x]*Derivative[1][q][x] + q[x]*Derivative[2][y][x]) - Derivative[2][y][x]^3*(Derivative[1][f][x]*Derivative[1][q][x] + q[x]*Derivative[2][y][x]) == 0, y[x]]
```

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(y(x),x))+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))
```

, 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(y(x),x))+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 = 0.127514 (sec), leaf count = 28

```
DSolve[-5*Derivative[3][y][x]^2 + 3*Derivative[2][y][x]*Derivative[4][y][x] == 0,y[x],x]
```

$$\left\{\left\{y(x)\rightarrow c_2\left(-\sqrt{2x+3c_1}\right)+c_4x+c_3\right\}\right\}$$

✓ **Maple** : cpu = 0.311 (sec), leaf count = 28

```
dsolve(3*diff(diff(y(x),x),x)*diff(diff(diff(diff(y(x),x),x),x),x)-5*diff(diff(diff(y(x),x),x),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 = 0.0906809 (sec), leaf count = 43

```
DSolve[40*Derivative[3][y][x]^3 - 45*Derivative[2][y][x]*Derivative[3][y][x]*Derivative[4][y][x]
```

$$\left\{ \left\{ y(x) \rightarrow c_5 x - \frac{4\sqrt{x(c_3 x + c_2)} + c_1}{c_2^2 - 4c_1 c_3} + c_4 \right\} \right\}$$

✓ **Maple** : cpu = 0.83 (sec), leaf count = 110

```
dsolve(9*diff(diff(y(x),x),x)^2*diff(diff(diff(diff(diff(y(x),x),x),x),x),x)-45*diff(diff
```

$$y(x) = \int \int \text{RootOf} \left(- \left(\int^{-Z} \frac{\text{RootOf} \left(-20 \ln(\_f) + \int^{-Z} \_k \left(e^{\text{RootOf}(81\_k^2 e^{-Z} - 40 e^{-Z} \ln(2) - 20 e^{-Z} \ln(5) + 20 e^{-Z} \ln(10) - 10 e^{-Z} \ln(15) - 10 e^{-Z} \ln(20) - 10 e^{-Z} \ln(30) - 10 e^{-Z} \ln(40) - 10 e^{-Z} \ln(60) - 10 e^{-Z} \ln(80) - 10 e^{-Z} \ln(120) - 10 e^{-Z} \ln(160) - 10 e^{-Z} \ln(240) - 10 e^{-Z} \ln(320) - 10 e^{-Z} \ln(480) - 10 e^{-Z} \ln(640) - 10 e^{-Z} \ln(960) - 10 e^{-Z} \ln(1280) - 10 e^{-Z} \ln(1920) - 10 e^{-Z} \ln(2560) - 10 e^{-Z} \ln(3840) - 10 e^{-Z} \ln(5120) - 10 e^{-Z} \ln(7680) - 10 e^{-Z} \ln(10240) - 10 e^{-Z} \ln(15360) - 10 e^{-Z} \ln(20480) - 10 e^{-Z} \ln(30720) - 10 e^{-Z} \ln(40960) - 10 e^{-Z} \ln(61440) - 10 e^{-Z} \ln(81920) - 10 e^{-Z} \ln(122880) - 10 e^{-Z} \ln(163840) - 10 e^{-Z} \ln(245760) - 10 e^{-Z} \ln(327680) - 10 e^{-Z} \ln(491520) - 10 e^{-Z} \ln(655360) - 10 e^{-Z} \ln(983040) - 10 e^{-Z} \ln(1310720) - 10 e^{-Z} \ln(1966080) - 10 e^{-Z} \ln(2621440) - 10 e^{-Z} \ln(3932160) - 10 e^{-Z} \ln(5242880) - 10 e^{-Z} \ln(7864320) - 10 e^{-Z} \ln(10485760) - 10 e^{-Z} \ln(15728640) - 10 e^{-Z} \ln(20971520) - 10 e^{-Z} \ln(31457280) - 10 e^{-Z} \ln(41943040) - 10 e^{-Z} \ln(62864640) - 10 e^{-Z} \ln(83786240) - 10 e^{-Z} \ln(125679360) - 10 e^{-Z} \ln(167572480) - 10 e^{-Z} \ln(251359680) - 10 e^{-Z} \ln(335146880) - 10 e^{-Z} \ln(502720000) - 10 e^{-Z} \ln(670293120) - 10 e^{-Z} \ln(1005440000) - 10 e^{-Z} \ln(1340587200) - 10 e^{-Z} \ln(2010880000) - 10 e^{-Z} \ln(2681173120) - 10 e^{-Z} \ln(4021760000) - 10 e^{-Z} \ln(5362347200) - 10 e^{-Z} \ln(8043008000) - 10 e^{-Z} \ln(10723668480) - 10 e^{-Z} \ln(16085376000) - 10 e^{-Z} \ln(21447084800) - 10 e^{-Z} \ln(32169600000) - 10 e^{-Z} \ln(42892121600) - 10 e^{-Z} \ln(64339200000) - 10 e^{-Z} \ln(85786284800) - 10 e^{-Z} \ln(128679360000) - 10 e^{-Z} \ln(171572480000) - 10 e^{-Z} \ln(257359680000) - 10 e^{-Z} \ln(343146880000) - 10 e^{-Z} \ln(514572800000) - 10 e^{-Z} \ln(686000000000) - 10 e^{-Z} \ln(1029000000000) - 10 e^{-Z} \ln(1372000000000) - 10 e^{-Z} \ln(2058000000000) - 10 e^{-Z} \ln(2744000000000) - 10 e^{-Z} \ln(4116000000000) - 10 e^{-Z} \ln(5488000000000) - 10 e^{-Z} \ln(8232000000000) - 10 e^{-Z} \ln(11076000000000) - 10 e^{-Z} \ln(16611200000000) - 10 e^{-Z} \ln(22146400000000) - 10 e^{-Z} \ln(33219200000000) - 10 e^{-Z} \ln(44292000000000) - 10 e^{-Z} \ln(66433600000000) - 10 e^{-Z} \ln(88575200000000) - 10 e^{-Z} \ln(132862400000000) - 10 e^{-Z} \ln(177149600000000) - 10 e^{-Z} \ln(265728000000000) - 10 e^{-Z} \ln(354307200000000) - 10 e^{-Z} \ln(531456000000000) - 10 e^{-Z} \ln(708604800000000) - 10 e^{-Z} \ln(1062912000000000) - 10 e^{-Z} \ln(1417220000000000) - 10 e^{-Z} \ln(2125824000000000) - 10 e^{-Z} \ln(2834428000000000) - 10 e^{-Z} \ln(4251641600000000) - 10 e^{-Z} \ln(5668854400000000) - 10 e^{-Z} \ln(8503281600000000) - 10 e^{-Z} \ln(11337708800000000) - 10 e^{-Z} \ln(17006592000000000) - 10 e^{-Z} \ln(22675476000000000) - 10 e^{-Z} \ln(34013209600000000) - 10 e^{-Z} \ln(45350942400000000) - 10 e^{-Z} \ln(67996800000000000) - 10 e^{-Z} \ln(90642656000000000) - 10 e^{-Z} \ln(135964000000000000) - 10 e^{-Z} \ln(181285344000000000) - 10 e^{-Z} \ln(271928000000000000) - 10 e^{-Z} \ln(407891840000000000) - 10 e^{-Z} \ln(543855680000000000) - 10 e^{-Z} \ln(815783040000000000) - 10 e^{-Z} \ln(1087710400000000000) - 10 e^{-Z} \ln(1631520000000000000) - 10 e^{-Z} \ln(2175328000000000000) - 10 e^{-Z} \ln(3263040000000000000) - 10 e^{-Z} \ln(4350752000000000000) - 10 e^{-Z} \ln(6526080000000000000) - 10 e^{-Z} \ln(8701408000000000000) - 10 e^{-Z} \ln(13052160000000000000) - 10 e^{-Z} \ln(17402880000000000000) - 10 e^{-Z} \ln(26104320000000000000) - 10 e^{-Z} \ln(39155200000000000000) - 10 e^{-Z} \ln(58206080000000000000) - 10 e^{-Z} \ln(87307040000000000000) - 10 e^{-Z} \ln(130814080000000000000) - 10 e^{-Z} \ln(174321120000000000000) - 10 e^{-Z} \ln(261335520000000000000) - 10 e^{-Z} \ln(391844160000000000000) - 10 e^{-Z} \ln(582352800000000000000) - 10 e^{-Z} \ln(872861440000000000000) - 10 e^{-Z} \ln(1307931840000000000000) - 10 e^{-Z} \ln(1743002240000000000000) - 10 e^{-Z} \ln(2613146240000000000000) - 10 e^{-Z} \ln(3918232640000000000000) - 10 e^{-Z} \ln(5823319040000000000000) - 10 e^{-Z} \ln(8728405440000000000000) - 10 e^{-Z} \ln(13079109840000000000000) - 10 e^{-Z} \ln(17429813840000000000000) - 10 e^{-Z} \ln(26131253840000000000000) - 10 e^{-Z} \ln(39182117840000000000000) - 10 e^{-Z} \ln(58232981840000000000000) - 10 e^{-Z} \ln(87283845840000000000000) - 10 e^{-Z} \ln(130790182400000000000000) - 10 e^{-Z} \ln(174297182400000000000000) - 10 e^{-Z} \ln(261311582400000000000000) - 10 e^{-Z} \ln(391820218400000000000000) - 10 e^{-Z} \ln(582328818400000000000000) - 10 e^{-Z} \ln(872837458400000000000000) - 10 e^{-Z} \ln(1307891824000000000000000) - 10 e^{-Z} \ln(1742961824000000000000000) - 10 e^{-Z} \ln(2613105824000000000000000) - 10 e^{-Z} \ln(3918192184000000000000000) - 10 e^{-Z} \ln(5823278184000000000000000) - 10 e^{-Z} \ln(8728364584000000000000000) - 10 e^{-Z} \ln(13078818240000000000000000) - 10 e^{-Z} \ln$$

2.1854 ODE No. 1854

$$y^{(n)}(x) - f\left(\frac{\partial^{n-1}y(x)}{\partial x^{n-1}}\right) = 0$$

✗ **Mathematica** : cpu = 0.0408794 (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 = 0.0051772 (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 = 0.0205606 (sec), leaf count = 22

```
DSolve[{Derivative[1][x][t] == a*x[t], Derivative[1][y][t] == b},{x[t], y[t]},t]
```

$$\{\{x(t) \rightarrow c_1 e^{at}, y(t) \rightarrow bt + c_2\}\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 19

```
dsolve({diff(x(t),t) = a*x(t), diff(y(t),t) = b})
```

$$\{x(t) = c_1 e^{ta}, y(t) = bt + c_2\}$$

2.1857 ODE No. 1857

$$\{x'(t) = ay(t), y'(t) = -ax(t)\}$$

✓ **Mathematica** : cpu = 0.0135685 (sec), leaf count = 39

```
DSolve[{Derivative[1][x][t] == a*y[t], Derivative[1][y][t] == -(a*x[t])},{x[t], y[t]},t]
```

$$\{\{x(t) \rightarrow c_1 \cos(at) + c_2 \sin(at), y(t) \rightarrow c_2 \cos(at) - c_1 \sin(at)\}\}$$

✓ **Maple** : cpu = 0.043 (sec), leaf count = 35

```
dsolve({diff(x(t),t) = a*y(t), diff(y(t),t) = -a*x(t)})
```

$$\{x(t) = c_1 \sin(ta) + c_2 \cos(ta), y(t) = \cos(ta) c_1 - \sin(ta) c_2\}$$

2.1858

ODE No. 1858

$$\{x'(t) = ay(t), y'(t) = bx(t)\}$$

✓ **Mathematica** : cpu = 0.009648 (sec), leaf count = 182

DSolve[{Derivative[1][x][t] == a*y[t], Derivative[1][y][t] == b*x[t]}, {x[t], y[t]}, t]

$$\left\{ \left\{ x(t) \rightarrow \frac{1}{2} c_1 e^{-\sqrt{a} \sqrt{b} t} \left(e^{2 \sqrt{a} \sqrt{b} t} + 1 \right) + \frac{\sqrt{a} c_2 e^{-\sqrt{a} \sqrt{b} t} \left(e^{2 \sqrt{a} \sqrt{b} t} - 1 \right)}{2 \sqrt{b}}, y(t) \rightarrow \frac{\sqrt{b} c_1 e^{-\sqrt{a} \sqrt{b} t} \left(e^{2 \sqrt{a} \sqrt{b} t} - 1 \right)}{2 \sqrt{a}} + \frac{1}{2} c_2 e^{-\sqrt{a} \sqrt{b} t} \right\} \right.$$

✓ **Maple** : cpu = 0.04 (sec), leaf count = 64

dsolve({diff(x(t),t) = a*y(t), diff(y(t),t) = b*x(t)})

$$\left\{ x(t) = c_1 e^{\sqrt{a} \sqrt{b} t} + c_2 e^{-\sqrt{a} \sqrt{b} t}, y(t) = \frac{\sqrt{b} \left(c_1 e^{\sqrt{a} \sqrt{b} t} - c_2 e^{-\sqrt{a} \sqrt{b} t} \right)}{\sqrt{a}} \right\}$$

2.1859

ODE No. 1859

$$\{x'(t) = ax(t) - y(t), y'(t) = ay(t) + x(t)\}$$

✓ **Mathematica** : cpu = 0.0054256 (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]}
```

$$\{\{x(t) \rightarrow c_1 e^{at} \cos(t) - c_2 e^{at} \sin(t), y(t) \rightarrow c_2 e^{at} \cos(t) + c_1 e^{at} \sin(t)\}\}$$

✓ **Maple** : cpu = 0.037 (sec), leaf count = 37

```
dsolve({diff(x(t),t) = a*x(t)-y(t), diff(y(t),t) = x(t)+a*y(t)})
```

$$\{x(t) = e^{ta}(c_1 \sin(t) + c_2 \cos(t)), y(t) = e^{ta}(\sin(t) c_2 - \cos(t) c_1)\}$$

2.1860

ODE No. 1860

$$\{x'(t) = ax(t) + by(t), y'(t) = by(t) + cx(t)\}$$

✓

Mathematica : cpu = 0.0310767 (sec), leaf count = 696

DSolve[{Derivative[1][x][t] == a*x[t] + b*y[t], Derivative[1][y][t] == c*x[t] + b*y[t]},{x[t],

$$\left\{\left\{x(t) \rightarrow \frac{c_1 \left(a \left(-e^{\frac{1}{2} t \left(-\sqrt{a^2-2 a b+b^2+4 b c}+a+b\right)}\right)+a e^{\frac{1}{2} t \left(\sqrt{a^2-2 a b+b^2+4 b c}+a+b\right)}+b e^{\frac{1}{2} t \left(-\sqrt{a^2-2 a b+b^2+4 b c}+a+b\right)}+\sqrt{a^2-2 a b+b^2+4 b c}\right)\right\}}{2}\right.$$

✓

Maple : cpu = 0.081 (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)})

$$\left\{x(t)=c_1 e^{\frac{\left(b+a+\sqrt{b^2+(-2 a+4 c) b+a^2}\right) t}{2}}+c_2 e^{\frac{\left(b+a-\sqrt{b^2+(-2 a+4 c) b+a^2}\right) t}{2}}, y(t)=\frac{-c_2 \left(a-b+\sqrt{b^2+(-2 a+4 c) b+a^2}\right) e^{\frac{\left(b+a-\sqrt{b^2+(-2 a+4 c) b+a^2}\right) t}{2}}}{\left(b+a-\sqrt{b^2+(-2 a+4 c) b+a^2}\right)}\right.$$

2.1861

ODE No. 1861

$$\{ax'(t)+by'(t)=\alpha x(t)+\beta y(t),bx'(t)-ay'(t)=\beta x(t)-\alpha y(t)\}$$

✓

Mathematica : cpu = 0.0117313 (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] - a*Derivative[1][y][t] == beta*x[t] - alpha*y[t]}, {x[t], y[t]}, t]`

$$\left\{ \left\{ x(t) \rightarrow c_1 e^{\frac{t(a\alpha+b\beta)}{a^2+b^2}} \cos\left(\frac{t(a\beta-\alpha b)}{a^2+b^2}\right) + c_2 e^{\frac{t(a\alpha+b\beta)}{a^2+b^2}} \sin\left(\frac{t(a\beta-\alpha b)}{a^2+b^2}\right), y(t) \rightarrow c_2 e^{\frac{t(a\alpha+b\beta)}{a^2+b^2}} \cos\left(\frac{t(a\beta-\alpha b)}{a^2+b^2}\right) - c_1 e^{\frac{t(a\alpha+b\beta)}{a^2+b^2}} \sin\left(\frac{t(a\beta-\alpha b)}{a^2+b^2}\right) \right\} \right\}$$

✓

Maple : cpu = 0.096 (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) = beta*x(t)-alpha*y(t)}, {x(t), y(t)})`

$$\left\{ x(t) = c_1 e^{\frac{(i\beta+\alpha)(-ib+a)t}{a^2+b^2}} + c_2 e^{\frac{(-ia+b)t(i\alpha+\beta)}{a^2+b^2}}, y(t) = i\left(c_1 e^{\frac{(i\beta+\alpha)(-ib+a)t}{a^2+b^2}} - c_2 e^{\frac{(-ia+b)t(i\alpha+\beta)}{a^2+b^2}} \right) \right\}$$

2.1862 ODE No. 1862

$$\{x'(t) = -y(t), y'(t) = 2x(t) + 2y(t)\}$$

✓ **Mathematica** : cpu = 0.0175527 (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]
```

$$\{\{x(t) \rightarrow c_1 e^t (\cos(t) - \sin(t)) - c_2 e^t \sin(t), y(t) \rightarrow 2c_1 e^t \sin(t) + c_2 e^t (\sin(t) + \cos(t))\}\}$$

✓ **Maple** : cpu = 0.033 (sec), leaf count = 39

```
dsolve({diff(x(t), t) = -y(t), diff(y(t), t) = 2*x(t)+2*y(t)})
```

$$\{x(t) = e^t (c_1 \sin(t) + c_2 \cos(t)), y(t) = -((c_1 + c_2) \cos(t) + \sin(t) (c_1 - c_2)) e^t\}$$

2.1863

ODE No. 1863

$$\{x'(t) + 3x(t) + 4y(t) = 0, 2x(t) + y'(t) + 5y(t) = 0\}$$

✓ **Mathematica** : cpu = 0.006754 (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,

$$\left\{\left\{x(t) \rightarrow \frac{1}{3}c_1e^{-7t}(2e^{6t} + 1) - \frac{2}{3}c_2e^{-7t}(e^{6t} - 1), y(t) \rightarrow \frac{1}{3}c_2e^{-7t}(e^{6t} + 2) - \frac{1}{3}c_1e^{-7t}(e^{6t} - 1)\right\}\right\}$$

✓ **Maple** : cpu = 0.033 (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})

$$\left\{x(t) = c_1e^{-t} + c_2e^{-7t}, y(t) = -\frac{c_1e^{-t}}{2} + c_2e^{-7t}\right\}$$

2.1864

ODE No. 1864

$$\{x'(t) = -5x(t) - 2y(t), y'(t) = x(t) - 7y(t)\}$$

✓ **Mathematica** : cpu = 0.0104347 (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]

$$\{ \{ x(t) \rightarrow c_1 e^{-6t} (\sin(t) + \cos(t)) - 2c_2 e^{-6t} \sin(t), y(t) \rightarrow c_1 e^{-6t} \sin(t) + c_2 e^{-6t} (\cos(t) - \sin(t)) \} \}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 44

dsolve({diff(x(t),t) = -5*x(t)-2*y(t), diff(y(t),t) = x(t)-7*y(t)})

$$\left\{ x(t) = e^{-6t} (c_1 \sin(t) + c_2 \cos(t)), y(t) = -\frac{((c_1 - c_2) \cos(t) - \sin(t) (c_1 + c_2)) e^{-6t}}{2} \right\}$$

2.1865

ODE No. 1865

$$\{x'(t) = a_1x(t) + b_1y(t) + c_1, y'(t) = a_2x(t) + b_2y(t) + c_2\}$$

✓

Mathematica : cpu = 1.77198 (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]}, {x[t], y[t]}, t]

$$\left\{\left\{x(t) \rightarrow -\frac{b_1 e^{-\frac{1}{2}\left(a_1+b_2+\sqrt{a_1^2-2b_2a_1+b_2^2+4a_2b_1}\right)t}\left(2\left(\left(a_1-b_2+\sqrt{a_1^2-2b_2a_1+b_2^2+4a_2b_1}\right)c_2-2a_2c_1\right)e^{\sqrt{a_1^2-2b_2a_1+b_2^2+4a_2b_1}t}}{-a_1-b_2+\sqrt{a_1^2-2b_2a_1+b_2^2+4a_2b_1}}\right)}{2\left(a_1^2-b_1^2\right)}\right.\right.$$

✓

Maple : cpu = 0.125 (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})

$$\left\{x(t)=e^{\frac{\left(a_1+b_2+\sqrt{a_1^2-2a_1b_2+4a_2b_1+b_2^2}\right)t}{2}}c_2+e^{\frac{\left(a_1+b_2-\sqrt{a_1^2-2a_1b_2+4a_2b_1+b_2^2}\right)t}{2}}c_1+\frac{b_1c_2-b_2c_1}{a_1b_2-a_2b_1},y(t)=\frac{-c_1\left(a_1b_2-b_1^2\right)}{a_1b_2-a_2b_1}\right.$$

2.1866

ODE No. 1866

$$\{x'(t) + 2y(t) = 3t, y'(t) - 2x(t) = 4\}$$

✓ **Mathematica** : cpu = 0.196237 (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]
```

$$\left\{ \left\{ x(t) \rightarrow \cos(2t) \left(\frac{3}{2}t \sin(2t) - \frac{5}{4} \cos(2t) \right) - \sin(2t) \left(\frac{5}{4} \sin(2t) + \frac{3}{2}t \cos(2t) \right) + c_1 \cos(2t) - c_2 \sin(2t), y(t) \rightarrow \sin(2t) \left(\frac{3}{2}t \sin(2t) - \frac{5}{4} \cos(2t) \right) + \cos(2t) \left(\frac{5}{4} \sin(2t) + \frac{3}{2}t \cos(2t) \right) + c_1 \sin(2t) + c_2 \cos(2t) \right\} \right\}$$

✓ **Maple** : cpu = 0.039 (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 = 0.246919 (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}, {x[t], y[t]}, t]
```

$$\left\{\left\{x(t)\rightarrow\cos(t)\left((3t^2-t-13)\cos(t)+(t-12)t\sin(t)\right)-\sin(t)\left((-3t^2+t+13)\sin(t)+(t-12)t\cos(t)\right)\right.\right.$$

✓ **Maple** : cpu = 0.04 (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})
```

$$\{x(t)=\sin(t)c_2+\cos(t)c_1+3t^2-t-13,y(t)=t^2-c_2\cos(t)+c_1\sin(t)-12t\}$$

2.1868

ODE No. 1868

$$\{x'(t)+3x(t)-y(t)=e^{2t}, x(t)+y'(t)+5y(t)=e^t\}$$

✓ **Mathematica** : cpu = 0.245107 (sec), leaf count = 162

```
DSolve[{3*x[t] - y[t] + Derivative[1][x][t] == E^(2*t), x[t] + 5*y[t] + Derivative[1][y][t] ==
```

$$\left\{\left\{x(t) \rightarrow -e^t(t+1)\left(\frac{t}{5}+\frac{1}{36}e^t(6t-7)-\frac{1}{25}\right)+e^t t\left(\frac{t}{5}+\frac{1}{36}e^t(6t-1)+\frac{4}{25}\right)+c_1 e^{-4 t}(t+1)+c_2 e^{-4 t} t, y(t) \rightarrow -e^t(t+1)\left(\frac{t}{5}+\frac{1}{36}e^t(6t-7)-\frac{1}{25}\right)+e^t t\left(\frac{t}{5}+\frac{1}{36}e^t(6t-1)+\frac{4}{25}\right)+c_1 e^{-4 t}(t+1)+c_2 e^{-4 t} t\right\}\right\}$$

✓ **Maple** : cpu = 0.081 (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)})
```

$$\left\{x(t)=\left(c_1 t+c_2\right) e^{-4 t}+\frac{e^t}{25}+\frac{7 e^{2 t}}{36}, y(t)=\left((-t+1) c_1-c_2\right) e^{-4 t}+\frac{4 e^t}{25}-\frac{e^{2 t}}{36}\right\}$$

2.1869

ODE No. 1869

$$\{x'(t)+2x(t)+y'(t)+y(t)=t+e^{2t}, x'(t)-x(t)+y'(t)+3y(t)=e^t-1\}$$

✓ **Mathematica** : cpu = 0.321346 (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] == t - 1}, {x[t], y[t]}, t]

$$\left\{\left\{x(t) \rightarrow \frac{1}{5}(t-e^t+e^{2t}+1)+\frac{5}{72}\left(\frac{12(5712t+833e^t+2352e^{2t}-5508)}{20825}+c_1e^{-7t/5}\right), y(t) \rightarrow \frac{1}{5}(-t+e^t-e^{2t})\right\}\right\}$$

✓ **Maple** : cpu = 0.052 (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(t)=t-1}, t)

$$\left\{x(t)=\frac{3t}{7}-\frac{1}{49}-\frac{e^t}{6}+\frac{5e^{2t}}{17}+e^{-\frac{7t}{5}}c_1, y(t)=-\frac{e^{2t}}{17}+\frac{t}{7}-\frac{26}{49}+\frac{e^t}{4}+\frac{3e^{-\frac{7t}{5}}c_1}{2}\right\}$$

2.1870

ODE No. 1870

$$\{x'(t)+y'(t)-y(t)=e^t, 2x'(t)+y'(t)+2y(t)=\cos(t)\}$$

✓

Mathematica : cpu = 0.172599 (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]

$$\left\{\left\{x(t) \rightarrow -\frac{3}{4}c_2(e^{4t}-1)+\frac{1}{68}e^{-4t}(e^{4t}-1)(34e^t+3\sin(t)-12\cos(t))+\frac{1}{4}\left(2e^{-3t}+2e^t+\frac{3}{17}e^{-4t}\sin(t)+\cos(t)\right)\right\}\right\}$$

✓

Maple : cpu = 0.17 (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 = 0.361992 (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]

$$\left\{\left\{x(t) \rightarrow \frac{1}{442} \left(3 \left(153 e^t-754\right) \sin (t)+31 \left(17 e^t-78\right) \cos (t)\right) (\cos (t)-\sin (t))+\frac{1}{221} \sin (t)\left(\left(493 e^t-2340\right)\right.\right.\right.$$

✓

Maple : cpu = 0.118 (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*

$$\left\{x(t)=e^{-4 t} \sin (t) c_2+e^{-4 t} \cos (t) c_1-\frac{93}{17}+\frac{31 e^t}{26}, y(t)=\frac{6}{17}+\left(\left(-c_1-c_2\right) \cos (t)+\sin (t)\left(c_1-c_2\right)\right) e^{-4 t}-$$

2.1872

ODE No. 1872

$$\{4x'(t) + 11x(t) + 9y'(t) + 31y(t) = e^t, 3x'(t) + 8x(t) + 7y'(t) + 24y(t) = e^{2t}\}$$

✓ **Mathematica** : cpu = 0.369429 (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] + 3*Derivative[1][x][t] + 7*Derivative[1][y][t] == E^(2*t)}, {x[t], y[t]}, t]`

$$\left\{ \left\{ x(t) \rightarrow -e^t t \left(-\frac{4t}{5} + \frac{1}{36} e^t (30t + 19) - \frac{11}{25} \right) - e^t (t - 1) \left(\frac{4t}{5} - \frac{1}{36} e^t (30t + 49) + \frac{31}{25} \right) - c_1 e^{-4t} (t - 1) - c_2 e^{-4t} \right. \right.$$

✓ **Maple** : cpu = 0.063 (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),t)+11*x(t)+31*y(t) = exp(t)}, {x(t), y(t)})`

$$\left. \left\{ x(t) = (c_1 t + c_2) e^{-4t} + \frac{31 e^t}{25} - \frac{49 e^{2t}}{36}, y(t) = ((-1 - t) c_1 - c_2) e^{-4t} - \frac{11 e^t}{25} + \frac{19 e^{2t}}{36} \right\} \right.$$

2.1873

ODE No. 1873

$$\{4x'(t)+44x(t)+9y'(t)+49y(t)=t, 3x'(t)+34x(t)+7y'(t)+38y(t)=e^t\}$$

✓

Mathematica : cpu = 0.302715 (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

$$\left\{\left\{x(t)\rightarrow-\frac{1}{5}e^{-6t}\left(e^{5t}-1\right)\left(\frac{16}{5}e^{6t}\left(\frac{t}{6}-\frac{1}{36}\right)+4e^{2t}-\frac{4e^{7t}}{7}-\frac{31}{5}e^t(t-1)\right)+\frac{1}{25}e^{-6t}\left(4e^{5t}+1\right)\left(e^{6t}\left(\frac{2t}{3}-\right.\right.\right.$$

✓

Maple : cpu = 0.06 (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(

$$\left\{x(t)=\mathrm{e}^{-6t}c_2+c_1\mathrm{e}^{-t}-\frac{56}{9}-\frac{29\,\mathrm{e}^t}{7}+\frac{19t}{3},y(t)=4\,\mathrm{e}^{-6t}c_2-c_1\mathrm{e}^{-t}+\frac{24\,\mathrm{e}^t}{7}+\frac{55}{9}-\frac{17t}{3}\right\}$$

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 = 0.0160707 (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]}, {x[t], y[t]}, t]

$$\left\{ \left\{ x(t) \rightarrow c_1 \exp \left(\int_1^t f(K[2]) dK[2] \right) \cos \left(\int_1^t g(K[1]) dK[1] \right) + c_2 \exp \left(\int_1^t f(K[2]) dK[2] \right) \sin \left(\int_1^t g(K[1]) dK[1] \right) \right. \right.$$

✓

Maple

: cpu = 0.551 (sec), leaf count = 57

dsolve({diff(x(t),t) = x(t)*f(t)+y(t)*g(t), diff(y(t),t) = -x(t)*g(t)+y(t)*f(t)})

$$\{x(t) = e^{\int (\tan(c_1 - (\int g(t) dt)) g(t) + f(t)) dt} c_2, y(t) = e^{\int (\tan(c_1 - (\int g(t) dt)) g(t) + f(t)) dt} c_2 \tan \left(c_1 - \left(\int g(t) dt \right) \right) \}$$

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 = 1.5439 (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]) + Derivat
```

$$\left\{ \left\{ \begin{aligned} x(t) \rightarrow & \frac{\left(-a + d + \sqrt{a^2 - 2da + d^2 + 4bc}\right) e^{\int_1^t -\frac{1}{2}\left(a + d - \sqrt{a^2 - 2da + d^2 + 4bc}\right) f(K[1]) dK[1]} c_1}{2\sqrt{a^2 - 2da + d^2 + 4bc}} + \frac{\left(a - d + \sqrt{a^2 - 2da + d^2 + 4bc}\right) e^{\int_1^t -\frac{1}{2}\left(a + d - \sqrt{a^2 - 2da + d^2 + 4bc}\right) f(K[1]) dK[1]} c_2}{2\sqrt{a^2 - 2da + d^2 + 4bc}} \end{aligned} \right. \right.$$

✓ **Maple** : cpu = 3.392 (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

$$\{x'(t) = x(t) \cos(t), y'(t) = x(t)e^{-\sin(t)}\}$$

✓ **Mathematica** : cpu = 0.021497 (sec), leaf count = 39

```
DSolve[{Derivative[1][x][t] == Cos[t]*x[t], Derivative[1][y][t] == x[t]/E^sin[t]},{x[t], y[t]}
```

$$\left\{\left\{x(t) \rightarrow c_1 e^{\sin(t)}, y(t) \rightarrow c_1 \int_1^t e^{\sin(K[1])-\sin(K[1])} dK[1] + c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.219 (sec), leaf count = 18

```
dsolve({diff(x(t),t) = x(t)*cos(t), diff(y(t),t) = x(t)*exp(-sin(t))})
```

$$\{x(t) = c_2 e^{\sin(t)}, y(t) = c_2 t + c_1\}$$

2.1877

ODE No. 1877

$$\{tx'(t)+y(t)=0, x(t)+ty'(t)=0\}$$

✓ **Mathematica** : cpu = 0.0048843 (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]
```

$$\left\{\left\{x(t)\rightarrow c_1t+\frac{c_2}{t},y(t)\rightarrow \frac{c_2}{t}-c_1t\right\}\right\}$$

✓ **Maple** : cpu = 0.034 (sec), leaf count = 31

```
dsolve({t*diff(x(t),t)+y(t) = 0, t*diff(y(t),t)+x(t) = 0})
```

$$\left\{x(t)=\frac{c_1t^2+c_2}{t},y(t)=\frac{-c_1t^2+c_2}{t}\right\}$$

2.1878

ODE No. 1878

$$\{tx'(t)+2x(t)=t,-((t+2)x(t))+ty'(t)-ty(t)=-t\}$$

✓ **Mathematica** : cpu = 0.0907338 (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}]

$$\left\{\left\{x(t)\rightarrow \frac{t}{3}+\frac{c_1}{t^2},y(t)\rightarrow -\frac{c_1}{t^2}-\frac{t}{3}+c_2e^t\right\}\right\}$$

✓ **Maple** : cpu = 0.056 (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})

$$\left\{x(t)=\frac{t}{3}+\frac{c_2}{t^2},y(t)=\frac{3c_1e^{tt^2}-t^3-3c_2}{3t^2}\right\}$$

2.1879

ODE No. 1879

$$\{tx'(t)+2(x(t)-y(t))=t, x(t)+ty'(t)+5y(t)=t^2\}$$

✓ **Mathematica** : cpu = 0.0293161 (sec), leaf count = 58

```
DSolve[{2*(x[t] - y[t]) + t*Derivative[1][x][t] == t, x[t] + 5*y[t] + t*Derivative[1][y][t] ==
```

$$\left\{\left\{x(t)\rightarrow \frac{c_1}{t^4}+\frac{c_2}{t^3}+\frac{1}{30}t(2t+9), y(t)\rightarrow -\frac{c_1}{t^4}-\frac{c_2}{2t^3}+\frac{1}{60}t(8t-3)\right\}\right\}$$

✓ **Maple** : cpu = 0.046 (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})
```

$$\left\{x(t)=\frac{2t^6+9t^5+30c_2t+30c_1}{30t^4}, y(t)=\frac{8t^6-3t^5-30c_2t-60c_1}{60t^4}\right\}$$

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 = 0.0129444 (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])*Derivative[1][y][t] == x[t]*(t Cos[t] - Sin[t]) + t*y[t]*(1 - t Cos[t])}, {x[t], y[t]}, t]
```

$$\{ \{ x(t) \rightarrow c_1 t^2 + c_2 t, y(t) \rightarrow c_1 t + c_2 \sin(t) \} \}$$

✓ **Maple** : cpu = 0.068 (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),t) = x(t)*(t*cos(t)-sin(t))+t*y(t)*(1-t*cos(t))}, {x(t), y(t)})
```

$$\{x(t)=t(c_2t+c_1),y(t)=c_1\sin(t)+c_2t\}$$

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 = 0.0083953 (sec), leaf count = 44

DSolve[{y[t] + Derivative[1][x][t] + Derivative[1][y][t] == f[t], x[t] + y[t] + Derivative[1][x][t] + Derivative[1][y][t] == g[t]}, {x[t], y[t]}, t]

$$\{\{x(t)\rightarrow -f''(t)-f'(t)-f(t)+g'(t)+g(t),y(t)\rightarrow f''(t)+f(t)-g'(t)\}\}$$

✓

Maple

: cpu = 0.026 (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) = g(t)}, t)

$$\{x(t)=-\frac{d}{dt}f(t)+g(t)-f(t)-\frac{d^2}{dt^2}f(t)+\frac{d}{dt}g(t),y(t)=f(t)+\frac{d^2}{dt^2}f(t)-\frac{d}{dt}g(t)\}$$

2.1882

ODE No. 1882

$$\{2x'(t) - 3x(t) + y'(t) = 0, x''(t) + y'(t) - 2y(t) = e^{2t}\}$$

✓

Mathematica : cpu = 3.65816 (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]}`

$$\left\{\left\{x(t) \rightarrow \frac{1}{46} e^{t/2} c_1 \left(23 \cos \left(\frac{\sqrt{23} t}{2}\right) + 23 e^{t/2} - 3 \sqrt{23} \sin \left(\frac{\sqrt{23} t}{2}\right)\right) + \frac{e^{3 t/2} \left(23 e^{t/2} \cos \left(\frac{\sqrt{23} t}{2}\right) - 7 \sqrt{23} e^{t/2}\right)}{46}\right.\right.$$

✓

Maple : cpu = 0.077 (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)}`

$$\left\{x(t) = \frac{e^{2 t}}{4} + c_1 e^t + c_2 e^{\frac{t}{2}} \cos \left(\frac{\sqrt{23} t}{2}\right) + c_3 e^{\frac{t}{2}} \sin \left(\frac{\sqrt{23} t}{2}\right), y(t) = -\frac{7 e^{\frac{t}{2}} \left(\frac{c_3 \sqrt{23}}{7} + c_2\right) \cos \left(\frac{\sqrt{23} t}{2}\right)}{4} + \frac{e^{\frac{t}{2}} \left(c_2\right)}{46}\right.$$

2.1883

ODE No. 1883

$$\{x'(t)+x(t)-y'(t)=2t, x''(t)-9x(t)+y'(t)+3y(t)=\sin(2t)\}$$

✓

Mathematica : cpu = 1.75842 (sec), leaf count = 602

`DSolve[{x[t] + Derivative[1][x][t] - Derivative[1][y][t] == 2*t, -9*x[t] + 3*y[t] + Derivative`

$$\left\{\left\{x(t) \rightarrow \frac{e^{-4 t}\left(20 e^{4 t} t+7 e^{4 t}+9\right)\left(10400\left(t^2+2 t+2\right)+\left(260 t-225 e^{4 t}-351\right) \sin (2 t)+2\left(260 t+75 e^{4 t}-91\right)\right)}{83200}\right.\right.$$

✓

Maple : cpu = 0.153 (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`

$$\left\{x(t)=4-\frac{2 \cos (2 t)}{325}+c_2 e^{-3 t}-\frac{36 \sin (2 t)}{325}+\left(c_3 t+c_1\right) e^t+2 t, y(t)=10+\frac{16 \cos (2 t)}{325}+\frac{2 c_2 e^{-3 t}}{3}-\frac{37 \sin (2 t)}{325}+\left(c_3 t+c_1\right) e^t+2 t\right\}$$

2.1884

ODE No. 1884

$$\{x'(t) - x(t) + 2y(t) = 0, x''(t) - 2y'(t) = 2t - \cos(2t)\}$$

✓ **Mathematica** : cpu = 0.768653 (sec), leaf count = 224

```
DSolve[{-x[t] + 2*y[t] + Derivative[1][x][t] == 0, -2*Derivative[1][y][t] + Derivative[2][x][t]}
```

$$\left\{\left\{x(t) \rightarrow 7\left(t^2 - \frac{1}{2} \sin(2t) + c_2\right) + 8\left(\frac{1}{136} e^{-t/2} \left(2 e^{t/2} \cos(2t) - 4\left(34 e^{t/2} t^2 + 17 e^{t/2} (t+2) - 15 e^{t/2} \sin(2t)\right)\right)\right.\right.\right.$$

✓ **Maple** : cpu = 0.161 (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 = 0.021659 (sec), leaf count = 66

```
DSolve[{-2*y[t] + t*Derivative[1][x][t] - t*Derivative[1][y][t] == 0, t*x[t] + 2*Derivative[1]
```

$$\left\{\left\{x(t)\rightarrow \frac{c_2\cos(t)}{t}+\frac{c_3\sin(t)}{t},y(t)\rightarrow \frac{c_1}{t^2}+c_2\left(\frac{\cos(t)}{t}-\frac{2\sin(t)}{t^2}\right)+c_3\left(\frac{2\cos(t)}{t^2}+\frac{\sin(t)}{t}\right)\right\}\right\}$$

✓ **Maple** : cpu = 0.112 (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)-
```

$$\left\{x(t)=\frac{\sin(t)c_2+c_3\cos(t)}{t},y(t)=\frac{(c_3t+2c_2)\cos(t)+(c_2t-2c_3)\sin(t)+c_1}{t^2}\right\}$$

2.1886

ODE No. 1886

$$\{ay(t) + x''(t) = 0, y''(t) - a^2y(t) = 0\}$$

✓ **Mathematica** : cpu = 0.0173323 (sec), leaf count = 115

DSolve[{a*y[t] + Derivative[2][x][t] == 0, -(a^2*y[t]) + Derivative[2][y][t] == 0},{x[t], y[t]

$$\left\{ \left\{ x(t) \rightarrow -\frac{c_4 e^{-at} (-2ate^{at} + e^{2at} - 1)}{2a^2} - \frac{c_3 e^{-at} (e^{at} - 1)^2}{2a} + c_2 t + c_1, y(t) \rightarrow \frac{1}{2} c_3 e^{-at} (e^{2at} + 1) + \frac{c_4 e^{-at} (e^{2at} + 1)}{2a} \right. \right.$$

✓ **Maple** : cpu = 0.057 (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})

$$\left\{ x(t) = \frac{-c_3 e^{-ta} - c_4 e^{ta} + a(c_1 t + c_2)}{a}, y(t) = c_3 e^{-ta} + c_4 e^{ta} \right\}$$

2.1887

ODE No. 1887

$\{x''(t) = ax(t) + by(t), y''(t) = cx(t) + dy(t)\}$

✓ **Mathematica** : cpu = 0.331817 (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]}, t]
```

$$\left\{ \begin{array}{l} x(t) \rightarrow \frac{e^{-\frac{\sqrt{a+d-\sqrt{a^2-2da+d^2+4bct}}{\sqrt{2}}}-\frac{\sqrt{a+d+\sqrt{a^2-2da+d^2+4bct}}{\sqrt{2}}}{\left(e^{\frac{\sqrt{a+d-\sqrt{a^2-2da+d^2+4bct}}{\sqrt{2}}}}a-e^{\frac{\sqrt{a+d+\sqrt{a^2-2da+d^2+4bct}}{\sqrt{2}}}}a-e^{\sqrt{2}\sqrt{a^2-2da+d^2+4bct}}\right)}{e^{-\frac{\sqrt{a+d-\sqrt{a^2-2da+d^2+4bct}}{\sqrt{2}}}-\frac{\sqrt{a+d+\sqrt{a^2-2da+d^2+4bct}}{\sqrt{2}}}-e^{\sqrt{2}\sqrt{a^2-2da+d^2+4bct}}}\left(e^{\frac{\sqrt{a+d-\sqrt{a^2-2da+d^2+4bct}}{\sqrt{2}}}}a-e^{\frac{\sqrt{a+d+\sqrt{a^2-2da+d^2+4bct}}{\sqrt{2}}}}a\right)}{e^{-\frac{\sqrt{a+d-\sqrt{a^2-2da+d^2+4bct}}{\sqrt{2}}}-\frac{\sqrt{a+d+\sqrt{a^2-2da+d^2+4bct}}{\sqrt{2}}}-e^{\sqrt{2}\sqrt{a^2-2da+d^2+4bct}}}\left(e^{\frac{\sqrt{a+d-\sqrt{a^2-2da+d^2+4bct}}{\sqrt{2}}}}a-e^{\frac{\sqrt{a+d+\sqrt{a^2-2da+d^2+4bct}}{\sqrt{2}}}}a\right)}\right\}$$

✓ **Maple** : cpu = 0.089 (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)})
```

$$\left\{ \begin{array}{l} x(t) = c_1 e^{-\frac{\sqrt{-2\sqrt{a^2-2da+4bc+d^2}+2a+2d}t}{2}} + c_2 e^{\frac{\sqrt{-2\sqrt{a^2-2da+4bc+d^2}+2a+2d}t}{2}} + c_3 e^{-\frac{\sqrt{2\sqrt{a^2-2da+4bc+d^2}+2a+2d}t}{2}} + c_4 e^{\frac{\sqrt{2\sqrt{a^2-2da+4bc+d^2}+2a+2d}t}{2}} \end{array} \right.$$

2.1888

ODE No. 1888

$\{x''(t) = a_1x(t) + b_1y(t) + c_1, y''(t) = a_2x(t) + b_2y(t) + c_2\}$

✓ **Mathematica** : cpu = 26.6082 (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], x[0] == x0, y[0] == y0}, {x, y}, t]
```

Too large to display

✓ **Maple** : cpu = 0.166 (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, x(0)=x0, y(0)=y0}, [x(t), y(t)])
```

$$\left\{ \begin{array}{l} x(t) = c_4 e^{\frac{\sqrt{2\sqrt{a_1^2 - 2a_1b_2 + 4a_2b_1 + b_2^2} + 2a_1 + 2b_2}t}{2}} + c_3 e^{-\frac{\sqrt{2\sqrt{a_1^2 - 2a_1b_2 + 4a_2b_1 + b_2^2} + 2a_1 + 2b_2}t}{2}} + c_2 e^{\frac{\sqrt{2a_1 + 2b_2 - 2\sqrt{a_1^2 - 2a_1b_2 + 4a_2b_1 + b_2^2}}t}{2}} \end{array} \right.$$

2.1889

ODE No. 1889

$$\{x''(t)+x(t)+y(t)=-5,-4x(t)+y''(t)-3y(t)=-3\}$$

✓ **Mathematica** : cpu = 0.815974 (sec), leaf count = 554

```
DSolve[{x[t] + y[t] + Derivative[2][x][t] == -5, -4*x[t] - 3*y[t] + Derivative[2][y][t] == -3}
```

$$\left\{\left\{x(t) \rightarrow -\frac{1}{8} e^{-t} \left(e^{-t} (-13 t-10)+e^t (10-13 t)\right) \left(e^{2 t} t+t-e^{2 t}+1\right)-\frac{1}{8} e^{-t} \left(e^{2 t}-1\right) t \left(e^{-t} (-13 t-23)+e^t\right)\right.\right.$$

✓ **Maple** : cpu = 0.04 (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})
```

$$\{x(t)=(c_4 t+c_2) e^{-t}+18+\left(c_3 t+c_1\right) e^t, y(t)=\left((-2 t+2) c_4-2 c_2\right) e^{-t}-23+\left((-2 t-2) c_3-2 c_1\right) e^t\}$$

2.1890

ODE No. 1890

$$\left\{ \begin{aligned} x''(t) &= c^2 x(t) \left(3 \cos^2(at + b) - 1 \right) + \frac{3}{2} c^2 y(t) \sin(2abt), \\ y''(t) &= \frac{3}{2} c^2 x(t) \sin(2abt) + c^2 y(t) \left(3 \sin^2(at + b) - 1 \right) \end{aligned} \right.$$

 **Mathematica** : cpu = 0.0627222 (sec), leaf count = 0

```
DSolve[{Derivative[2][x][t] == c^2*(-1 + 3*Cos[b + a*t]^2)*x[t] + (3*c^2*Sin[2*a*b*t]*y[t])/2,
```

, could not solve

```
DSolve[{Derivative[2][x][t] == c^2*(-1 + 3*Cos[b + a*t]^2)*x[t] + (3*c^2*Sin[2*a*b*t]*y[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), di
```

, 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 = 0.863581 (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] == 2t}, {x[t], y[t]}, t]`

$$\left\{ \left\{ x(t) \rightarrow -\frac{7}{200}e^{-t}(e^{2t}-2e^t\cos(3t)+1)\left(-7e^{-t}(e^{2t}(t-1)+t+1)-\frac{2}{9}\sin(3t)+\frac{2}{3}t\cos(3t)\right)+\frac{7}{600}e^{-t}(3t^2-2t+1), y(t) \rightarrow \frac{1}{60}e^{-t}(e^{2t}(3t^2-2t+1)+3t\cos(3t)-\sin(3t))-\frac{1}{60}e^{-t}(3t^2-2t+1) \right\} \right\}$$

✓

Maple : cpu = 0.054 (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}, [x(t), y(t)])`

$$\left\{ x(t)=\frac{14t}{9}+c_1e^t+c_2\cos(3t)+c_3e^{-t}+c_4\sin(3t), y(t)=-c_1e^t+\frac{3c_2\cos(3t)}{7}-c_3e^{-t}+\frac{3c_4\sin(3t)}{7}-\frac{4t}{3} \right\}$$

2.1892

ODE No. 1892

$$\{-ay'(t)+bx(t)+x''(t)=0, ax'(t)+by(t)+y''(t)=0\}$$

✓

Mathematica : cpu = 0.261829 (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]

$$\left\{\left\{x(t) \rightarrow \frac{e^{-\frac{\sqrt{-a^2-2b}-\sqrt{a^2\left(a^2+4b\right)}t}}{\sqrt{2}}-\frac{\sqrt{-a^2-2b}+\sqrt{a^2\left(a^2+4b\right)}t}}{\sqrt{2}}\left(e^{\frac{\sqrt{-a^2-2b}-\sqrt{a^2\left(a^2+4b\right)}t}}{a^2}-e^{\frac{\sqrt{-a^2-2b}+\sqrt{a^2\left(a^2+4b\right)}t}}{a^2}-e^{\sqrt{2}\sqrt{-a^2-2b}t}\right)\right.\right.$$

✓

Maple : cpu = 0.091 (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)

$$\left\{x(t)=c_1e^{-\frac{\sqrt{-2a^2-2\sqrt{a^2\left(a^2+4b\right)}-4b}t}}{2}+c_2e^{\frac{\sqrt{-2a^2-2\sqrt{a^2\left(a^2+4b\right)}-4b}t}}{2}+c_3e^{-\frac{\sqrt{-2a^2+2\sqrt{a^2\left(a^2+4b\right)}-4b}t}}{2}+c_4e^{\frac{\sqrt{-2a^2+2\sqrt{a^2\left(a^2+4b\right)}-4b}t}}{2}\right.$$

2.1893

ODE No. 1893

$\{-A_0y'(t) + a_1x''(t) + b_1x'(t) + c_1x(t) = B_0e^{i\omega t}, A_0x'(t) + a_2y''(t) + b_2y'(t) + c_2y(t) = 0\}$

✓ **Mathematica** : cpu = 0.670403 (sec), leaf count = 5546

```
DSolve[{c1*x[t] + b1*Derivative[1][x][t] - A0*Derivative[1][y][t] + a1*Derivative[2][x][t] == B0*Exp[I*omega*t], A0*x'[t] + a2*Derivative[2][y][t] + b2*y'[t] + c2*y[t] == 0}, {x[t], y[t]}, t]
```

✓ **Maple** : cpu = 0.685 (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), A0*x'(t)+a2*y''(t)+b2*y'(t)+c2*y(t)=0}, {x(t), y(t)}, t)
```

Expression too large to display

2.1894

ODE No. 1894

$$\{a(x'(t)-y'(t))+b_1x(t)+x''(t)=c_1e^{i\omega t},a(y'(t)-x'(t))+b_2y(t)+y''(t)=c_2e^{i\omega t}\}$$

✓ **Mathematica** : cpu = 0.461333 (sec), leaf count = 3386

```
DSolve[{b1*x[t] + a*(Derivative[1][x][t] - Derivative[1][y][t]) + Derivative[2][x][t] == c1*E^
```

$$\left\{\left\{x(t)\rightarrow -ab2c_3\text{RootSum}\left[\#1^4+2a\#1^3+b_1\#1^2+b_2\#1^2+ab_1\#1+ab_2\#1+b_1b_2\&, \frac{\hspace{1cm}}{4\#1^3+6a\#1^2-}\right.\right.$$

✓ **Maple** : cpu = 0.62 (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),
```

Expression too large to display

2.1895

ODE No. 1895

$\{a_{11}x''(t) + a_{12}y''(t) + b_{11}x'(t) + b_{12}y'(t) + c_{11}x(t) + c_{12}y(t) = 0, a_{21}x''(t) + a_{22}y''(t) + b_{21}x'(t) + b_{22}y'(t) + c_{21}x(t) + c_{22}y(t) = 0\}$

✓ **Mathematica** : cpu = 0.226443 (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][t] + a12*Derivative[2][y][t] == 0, c21*x[t] + c22*y[t] + b21*Derivative[1][x][t] + b22*Derivative[1][y][t] + a21*Derivative[2][x][t] + a22*Derivative[2][y][t] == 0}, {x[t], y[t]}, t]
```

✓ **Maple** : cpu = 0.169 (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(y(t),t)+c21*x(t)+c22*y(t)+b21*diff(x(t),t)+b22*diff(y(t),t)+a21*diff(diff(x(t),t),t)+a22*diff(diff(y(t),t),t)}[1], [x(t), y(t)], t)
```

Expression too large to display

2.1896

ODE No. 1896

$$\{x''(t)-2x'(t)-y'(t)+y(t)=0, 2x'(t)-x(t)+y^{(3)}(t)-y''(t)=t\}$$

✓ **Mathematica** : cpu = 0.892212 (sec), leaf count = 1132

```
DSolve[{y[t] - 2*Derivative[1][x][t] - Derivative[1][y][t] + Derivative[2][x][t] == 0, -x[t] +
```

$$\left\{\left\{x(t) \rightarrow \frac{1}{64} e^{-t} \left(2 e^{2 t} t^2-6 e^{2 t} t+7 e^{2 t}+1\right)\left(e^t(1-t)+e^{-t}\left(-2 t^3-8 t^2-17 t-17\right)\right)+\frac{1}{64} e^{-t}\left(2 e^{2 t} t^2+6 e^{2 t} t\right.\right.\right.$$

✓ **Maple** : cpu = 0.054 (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(
```

$$\left\{x(t)=-2-\frac{2 c_2 \mathrm{e}^{-t}}{3}+\left(-3 c_5 t^2-2 c_4 t-c_3-6 c_5\right) \mathrm{e}^t-t, y(t)=c_2 \mathrm{e}^{-t}-2+\left(c_5 t^3+c_4 t^2+c_3 t+c_1\right) \mathrm{e}^t\right\}$$

2.1897

ODE No. 1897

$$\{x''(t)+y''(t)+y'(t)=\sinh(2t), 2x''(t)+y''(t)=2t\}$$

✓

Mathematica : cpu = 0.42863 (sec), leaf count = 280

`DSolve[{Derivative[1][y][t] + Derivative[2][x][t] + Derivative[2][y][t] == Sinh[2*t], 2*Deriva`

$$\left\{\left\{x(t) \rightarrow t\left(\frac{t^2}{2}+\frac{t}{2}-\frac{e^{4 t}}{8}+e^{2 t}\left(\frac{t}{2}-\frac{1}{4}\right)\right)+\frac{1}{48}\left(-4\left(4 t^2-3 t+3\right) t-12 e^{2 t} t-6 e^{-2 t}+3 e^{4 t}\right)+\frac{1}{4} e^{-2 t}\left(-2 e\right.\right.\right.$$

✓

Maple : cpu = 0.695 (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(dif`

$$\left\{x(t)=\frac{\left(-3-2 t+2 c_2\right) \cosh (2 t)}{8}+\frac{\left(1+t-c_2\right) \sinh (2 t)}{4}+\frac{t^3}{6}+\frac{t^2}{4}+c_3 t+c_4, y(t)=\frac{\left(-2 c_2+2 t+3\right) \cosh$$

2.1898

ODE No. 1898

$$\{x''(t)-x'(t)+y'(t)=0, x''(t)-x(t)+y''(t)=0\}$$

✓

Mathematica : cpu = 0.0287242 (sec), leaf count = 420

DSolve[{-Derivative[1][x][t] + Derivative[1][y][t] + Derivative[2][x][t] == 0, -x[t] + Derivat

$$\left\{\left\{x(t) \rightarrow -\frac{1}{5}c_1e^{\frac{t}{2}-\frac{\sqrt{5}t}{2}}\left(\sqrt{5}e^{\sqrt{5}t}-5e^{\frac{\sqrt{5}t}{2}+\frac{t}{2}}-\sqrt{5}\right)+\frac{c_2e^{\frac{t}{2}-\frac{\sqrt{5}t}{2}}\left(e^{\sqrt{5}t}-1\right)}{\sqrt{5}}-\frac{1}{10}c_4e^{\frac{t}{2}-\frac{\sqrt{5}t}{2}}\left(5e^{\sqrt{5}t}+\sqrt{5}e^{\sqrt{5}t}-\right.\right.\right.$$

✓

Maple : cpu = 0.062 (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

$$\left\{x(t)=\frac{c_4(\sqrt{5}-1)}{2}e^{-\frac{(\sqrt{5}-1)t}{2}}-\frac{c_3(\sqrt{5}+1)}{2}e^{\frac{(\sqrt{5}+1)t}{2}}+c_1e^t,y(t)=c_2+c_3e^{\frac{(\sqrt{5}+1)t}{2}}+c_4e^{-\frac{(\sqrt{5}-1)t}{2}}\right\}$$

2.1899

ODE No. 1899

$$\{x'(t) = 2x(t), y'(t) = 3x(t) - 2y(t), z'(t) = 2y(t) + 3z(t)\}$$

✓ **Mathematica** : cpu = 0.0091973 (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] == 2*y[t] + 3*z[t]}, {x, y, z}, t]
```

$$\left\{ \left\{ x(t) \rightarrow c_1 e^{2t}, y(t) \rightarrow \frac{3}{4} c_1 e^{-2t} (e^{4t} - 1) + c_2 e^{-2t}, z(t) \rightarrow \frac{3}{10} c_1 e^{-2t} (2e^t + 3e^{2t} + 4e^{3t} + 1) (e^t - 1)^2 + \frac{2}{5} c_2 e^{-2t} \right\} \right.$$

✓ **Maple** : cpu = 0.083 (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)}, {x(t), y(t), 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 = 0.0089246 (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[t] - 4*y[t] + z[t]}
```

$$\left\{ \left\{ x(t) \rightarrow c_1 e^{4t}, y(t) \rightarrow \frac{1}{6} c_1 e^{-2t} (e^{6t} - 1) + c_2 e^{-2t}, z(t) \rightarrow \frac{1}{9} c_1 e^{-2t} (e^{3t} + e^{6t} - 2) - \frac{4}{3} c_2 e^{-2t} (e^{3t} - 1) + c_3 e^t \right\} \right\}$$

✓ **Maple** : cpu = 0.079 (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 = 0.0103042 (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] + z[t]}, {x[t], y[t], z[t]}, t]

$$\{ \{ x(t) \rightarrow c_2(e^t - 1) + c_3(1 - e^t) + c_1, y(t) \rightarrow c_1(e^t - 1) + c_2(e^t t + 1) + c_3(-e^t t + e^t - 1), z(t) \rightarrow c_1(e^t - 1) + c_2(e^t t + 1) + c_3((t - 1)e^t - c_2) \}$$

✓

Maple

: cpu = 0.064 (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)})

$$\{x(t) = c_2 + c_3 e^t, y(t) = (c_3 t + c_1) e^t - c_2, z(t) = ((t - 1) c_3 + c_1) e^t - c_2\}$$

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 = 0.0273158 (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]

$$\{\{x(t) \rightarrow e^{-t}(1-e^t)(-t-1)+e^{-t}(e^t-1)(-t-1)+c_2(e^t-1)+c_3(1-e^t)+c_1, y(t) \rightarrow e^{-t}(-t-1)(-t-1)+e^{-t}(e^t-1)(-t-1)+c_2(e^t-1)+c_3(1-e^t)+c_1, z(t) \rightarrow e^{-t}(-t-1)(-t-1)+e^{-t}(e^t-1)(-t-1)+c_2(e^t-1)+c_3(1-e^t)+c_1\}$$

✓

Maple

: cpu = 0.059 (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) =

$$\{x(t)=c_2+c_3e^t, y(t)=(c_3t+c_1)e^t-t-c_2-1, z(t)=((t-1)c_3+c_1)e^t-t-c_2-1\}$$

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 = 0.0761817 (sec), leaf count = 1304

```
DSolve[{a*Derivative[1][x][t] == b*c*(y[t] - z[t]), b*Derivative[1][y][t] == a*c*(z[t] - x[t]), c*Derivative[1][z][t] == b*a*(x[t] - y[t])}, {x[t], y[t], z[t]}, t]
```

$$\left\{ \left\{ \begin{aligned} x(t) &\rightarrow \frac{e^{-i\sqrt{a^2+b^2+c^2}t} \left(2e^{i\sqrt{a^2+b^2+c^2}t} a^2 + b^2 e^{2i\sqrt{a^2+b^2+c^2}t} + c^2 e^{2i\sqrt{a^2+b^2+c^2}t} + b^2 + c^2 \right) c_1}{2(a^2+b^2+c^2)} - \frac{b e^{-i\sqrt{a^2+b^2+c^2}t} \left(2e^{i\sqrt{a^2+b^2+c^2}t} a^2 + b^2 e^{2i\sqrt{a^2+b^2+c^2}t} + c^2 e^{2i\sqrt{a^2+b^2+c^2}t} + b^2 + c^2 \right) c_2}{2(a^2+b^2+c^2)} \end{aligned} \right. \right.$$

✓ **Maple** : cpu = 0.122 (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) = a*b*(x(t)-y(t))}, [x(t), y(t), z(t)])
```

$$\left\{ \begin{aligned} x(t) &= c_1 + c_2 \sin\left(\sqrt{a^2+b^2+c^2}t\right) + c_3 \cos\left(\sqrt{a^2+b^2+c^2}t\right), y(t) = \frac{c_1 b^3 + \left((-c_2 \sin\left(\sqrt{a^2+b^2+c^2}t\right) - c_3 \cos\left(\sqrt{a^2+b^2+c^2}t\right)\right) a^2}{b^2+c^2} \\ z(t) &= \frac{c_1 a^3 + \left((-c_2 \sin\left(\sqrt{a^2+b^2+c^2}t\right) - c_3 \cos\left(\sqrt{a^2+b^2+c^2}t\right)\right) b^2}{a^2+c^2} \end{aligned} \right.$$

2.1904

ODE No. 1904

$$\{x'(t) = cy(t) - bz(t), y'(t) = az(t) - cx(t), z'(t) = bx(t) - ay(t)\}$$

✓

Mathematica : cpu = 0.046224 (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[1][z][t] == b*x[t] - a*y[t]}, {x[t], y[t], z[t]}, t]

$$\left\{ \left\{ \begin{aligned} x(t) \rightarrow & \frac{e^{-\sqrt{-a^2-b^2-c^2}t} \left(2e^{\sqrt{-a^2-b^2-c^2}t} a^2 + b^2 e^{2\sqrt{-a^2-b^2-c^2}t} + c^2 e^{2\sqrt{-a^2-b^2-c^2}t} + b^2 + c^2 \right) c_1}{2(a^2 + b^2 + c^2)} - \frac{e^{-\sqrt{-a^2-b^2-c^2}t} (a^2 c_2 + b^2 c_3)}{2(a^2 + b^2 + c^2)} \end{aligned} \right. \right.$$

✓

Maple : cpu = 0.076 (sec), leaf count = 257

dsolve({diff(x(t),t) = c*y(t)-b*z(t), diff(y(t),t) = a*z(t)-c*x(t), diff(z(t),t) = b*x(t)-a*y(t)}, t)

$$\left\{ \begin{aligned} x(t) = & c_1 + c_2 \sin \left(\sqrt{a^2 + b^2 + c^2} t \right) + c_3 \cos \left(\sqrt{a^2 + b^2 + c^2} t \right), y(t) = \frac{(-a^2 b c_3 + a c_2 c \sqrt{a^2 + b^2 + c^2}) \cos \left(\sqrt{a^2 + b^2 + c^2} t \right)}{\sqrt{a^2 + b^2 + c^2}} \\ & - \frac{a^2 c_2 \sin \left(\sqrt{a^2 + b^2 + c^2} t \right)}{\sqrt{a^2 + b^2 + c^2}} + \frac{b^2 c_3 \sin \left(\sqrt{a^2 + b^2 + c^2} t \right)}{\sqrt{a^2 + b^2 + c^2}} + \frac{b^2 c_2 \cos \left(\sqrt{a^2 + b^2 + c^2} t \right)}{\sqrt{a^2 + b^2 + c^2}} \\ & - \frac{c^2 c_3 \cos \left(\sqrt{a^2 + b^2 + c^2} t \right)}{\sqrt{a^2 + b^2 + c^2}} \end{aligned} \right.$$

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 = 0.028195 (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], Derivative[1][z][t] == g[t]*x[t] - f[t]*y[t]}, {x[t], y[t], z[t]}, 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]}, 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) = g(t)*x(t)-f(t)*y(t)}, t)

, result contains DESol or ODESolStruc

Expression too large to display

2.1906

ODE No. 1906

$$\{x'(t) = x(t) + y(t) - z(t), y'(t) = -x(t) + y(t) + z(t), z'(t) = x(t) - y(t) + z(t)\}$$

✓ **Mathematica** : cpu = 0.0451271 (sec), leaf count = 278

```
DSolve[{Derivative[1][x][t] == x[t] + y[t] - z[t], Derivative[1][y][t] == -x[t] + y[t] + z[t],
```

$$\left\{\left\{x(t) \rightarrow \frac{1}{3} c_1 e^t \left(2 \cos \left(\sqrt{3} t\right)+1\right)-\frac{1}{3} c_2 e^t \left(-\sqrt{3} \sin \left(\sqrt{3} t\right)+\cos \left(\sqrt{3} t\right)-1\right)-\frac{1}{3} c_3 e^t \left(\sqrt{3} \sin \left(\sqrt{3} t\right)+\cos \left(\sqrt{3} t\right)-1\right)\right.\right.$$

✓ **Maple** : cpu = 0.064 (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(t)-y(t),
```

$$\left\{x(t)=e^t\left(c_1+\sin \left(\sqrt{3} t\right) c_2+\cos \left(\sqrt{3} t\right) c_3\right), y(t)=\left(\left(\frac{\sqrt{3} c_2}{2}-\frac{c_3}{2}\right) \cos \left(\sqrt{3} t\right)+\left(-\frac{\sqrt{3} c_3}{2}-\frac{c_2}{2}\right) \sin \left(\sqrt{3} t\right)\right)\right.$$

2.1907

ODE No. 1907

$$\{x'(t) = -3x(t) + 48y(t) - 28z(t), y'(t) = -4x(t) + 40y(t) - 22z(t), z'(t) = -6x(t) + 57y(t) - 31z(t)\}$$

✓

Mathematica : cpu = 0.0090654 (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] - 22*z[t], Derivative[1][z][t] == -6*x[t] + 57*y[t] - 31*z[t]}, {x[t], y[t], z[t]}, t]

$$\left\{ \left\{ x(t) \rightarrow c_1 \left(-e^t\right) \left(2e^{2t}-3\right) + 6c_2 e^t \left(2e^t + 3e^{2t}-5\right) - 2c_3 e^t \left(4e^t + 5e^{2t}-9\right), y(t) \rightarrow -2c_1 e^t \left(e^{2t}-1\right) + c_2 e^{2t} - 2c_3 e^{3t}, z(t) \rightarrow c_1 e^t + \frac{c_2 e^{2t}}{2} + \frac{3c_3 e^{3t}}{2} \right\} \right\}$$

✓

Maple : cpu = 0.052 (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(z(t),t) = -6*x(t)+57*y(t)-31*z(t)}, t)

$$\left\{ x(t) = c_1 e^t + c_2 e^{2t} + c_3 e^{3t}, y(t) = \frac{2c_1 e^t}{3} + \frac{c_2 e^{2t}}{4} + c_3 e^{3t}, z(t) = c_1 e^t + \frac{c_2 e^{2t}}{4} + \frac{3c_3 e^{3t}}{2} \right\}$$

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 = 0.0373917 (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] + 26*z[t], Derivative[1][z][t] == 6*x[t] - 63*y[t] + 38*z[t]}, {x, y, z}, t]
```

$\left\{ \left\{ x(t) \rightarrow -36c_2 \text{RootSum}\left[\#1^3 - 40\#1^2 + 1714\#1 + 1404\&, \frac{2\#1e^{\#1t} + e^{\#1t}}{3\#1^2 - 80\#1 + 1714}\&\right] + 4c_3 \text{RootSum}\left[\#1^3 - 40\#1^2 + 1714\#1 + 1404\&, \frac{2\#1e^{\#1t} + e^{\#1t}}{3\#1^2 - 80\#1 + 1714}\&\right] \right\} \right\}$

✓ **Maple** : cpu = 0.349 (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(t),t) = 6*x(t)-63*y(t)+38*z(t)}, [x(t), y(t), z(t)], t)
```

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 = 0.0359817 (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], Derivative[1][z][t] == -beta*x[t] - b*y[t]}, {x, y, z}, t]
```

$$\left\{ \left\{ x(t) \rightarrow -c_2 \text{RootSum} \left[\#1^3 - a\#1^2 - b\#1^2 - c\#1^2 - \alpha^2\#1 - \beta^2\#1 - g^2\#1 + ab\#1 + ac\#1 + bc\#1 + a \right. \right. \right.$$

✓ **Maple** : cpu = 12.766 (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),
```

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 = 0.0091341 (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*Derivative[1][z][t] == t^3*z[t] - t^2*y[t] - x[t] + t}, {x[t], y[t], z[t]}, t]

$$\left\{\left\{x(t) \rightarrow t + c_3t^2, y(t) \rightarrow c_2t + c_3, z(t) \rightarrow c_1t + \frac{c_3}{t} + c_2\right\}\right\}$$

✓

Maple : cpu = 0.079 (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) = t^3*z(t)-t^2*y(t)-x(t)+t}, {x(t), y(t), z(t)})

$$\left\{x(t) = c_3t^2 + t, y(t) = c_2t + c_3, z(t) = \frac{c_1t^2 + c_2t + c_3}{t}\right\}$$

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 = 0.0298039 (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]), c*t*Derivative[1][z][t] == b*c*(x[t] - y[t])}, {x[t], y[t], z[t]}, t]`

$$\left\{ \left\{ \begin{aligned} x(t) \rightarrow & \frac{\left(2a^2t^{i\sqrt{a^2+b^2+c^2}} + b^2\left(t^{2i\sqrt{a^2+b^2+c^2}} + 1\right) + c^2\left(t^{2i\sqrt{a^2+b^2+c^2}} + 1\right)\right)c_1t^{-i\sqrt{a^2+b^2+c^2}} - b\left(t^{i\sqrt{a^2+b^2+c^2}} - 1\right)c_2}{2\left(a^2 + b^2 + c^2\right)} \end{aligned} \right. \right.$$

✓

Maple : cpu = 0.113 (sec), leaf count = 309

`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),t) = a*b*(x(t)-y(t))}, {x(t), y(t), z(t)})`

$$\left\{ \begin{aligned} x(t) = & c_1 + c_2 \sin\left(\sqrt{a^2 + b^2 + c^2} \ln(t)\right) + c_3 \cos\left(\sqrt{a^2 + b^2 + c^2} \ln(t)\right), \\ y(t) = & \frac{\sqrt{a^2 + b^2 + c^2} \cos\left(\sqrt{a^2 + b^2 + c^2} \ln(t)\right)}{a} \end{aligned} \right.$$

2.1912

ODE No. 1912

$\{x_1'(t) = ax_2(t) + bx_3(t) \cos(ct) + bx_4(t) \sin(ct), x_2'(t) = -ax_1(t) + bx_3(t) \sin(ct) - bx_4(t) \cos(ct), x_3'(t) =$

✓ **Mathematica** : cpu = 0.0104602 (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] == -a*x1[t] + b*Sin[c*t]*x3[t] - b*Cos[c*t]*x4[t], Derivative[1][x3][t] == c*x1[t] + c*x2[t], Derivative[1][x4][t] == -c*x1[t] - c*x2[t]}, {x1[t], x2[t], x3[t], x4[t]}, t]
```

$\left\{ \left\{ x_1(t) \rightarrow c_3 \cos \left(\left(\frac{c}{2} - \frac{1}{2} \sqrt{4b^2 + (2a + c)^2} \right) t \right) + c_1 \cos \left(\left(\frac{c}{2} + \frac{1}{2} \sqrt{4b^2 + (2a + c)^2} \right) t \right) + c_4 \sin \left(\left(\frac{c}{2} - \frac{1}{2} \sqrt{4b^2 + (2a + c)^2} \right) t \right) + c_2 \sin \left(\left(\frac{c}{2} + \frac{1}{2} \sqrt{4b^2 + (2a + c)^2} \right) t \right) \right. \right.$

✓ **Maple** : cpu = 0.951 (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)+b*x3(t)*sin(c*t)-b*x4(t)*cos(c*t), diff(x3(t),t) = c*x1(t)+c*x2(t), diff(x4(t),t) = -c*x1(t)-c*x2(t)}, [x1(t), x2(t), x3(t), x4(t)], t)
```

$\left\{ x_1(t) = c_2 + c_3 \sin(ct) + c_4 \cos(ct), x_2(t) = -\cos(ct) c_3 + \sin(ct) c_4 + c_1, x_3(t) = \frac{(\cos(ct) c_1 a - \sin(ct) c_2 a)}{a(a^2 + b^2)} + \frac{(\sin(ct) c_1 a + \cos(ct) c_2 a)}{a(a^2 + b^2)} \right.$

2.1913

ODE No. 1913

$$\{x'(t) = -x(t)(x(t) + y(t)), y'(t) = y(t)(x(t) + y(t))\}$$

✓ **Mathematica** : cpu = 0.0404335 (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], y[t]}, t]
```

$$\{\{y(t) \rightarrow -\sqrt{c_1} \cot(\sqrt{c_1}t - \sqrt{c_1}c_2), x(t) \rightarrow -\sqrt{c_1} \tan(\sqrt{c_1}t - \sqrt{c_1}c_2)\}\}$$

✓ **Maple** : cpu = 0.117 (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))})
```

$$\left[\{x(t) = 0\}, \left\{y(t) = \frac{1}{-t + c_1}\right\}\right]$$

2.1915

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 = 300.04 (sec), leaf count = 0

DSolve[{Derivative[1][x][t] == x[t]*(alpha + a*(p*x[t] + q*y[t])), Derivative[1][y][t] == y[t]

, timed out

\$Aborted

✖

Maple : cpu = 0. (sec), leaf count = 0

dsolve({diff(x(t),t) = x(t)*(a*(p*x(t)+q*y(t))+alpha), diff(y(t),t) = y(t)*(beta+b*(p*x(t)+q*y(t))

, 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 = 0.775371 (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])}, {x[t], y[t]}, t]`

$$\left\{ \left\{ y(t) \rightarrow b \left(ah - h\text{InverseFunction} \left[\int_1^{\#1} \frac{(h(a - K[1]))^{\frac{k}{h}}}{(a - K[1]) \left(c_1 (ah - hK[1])^{\frac{k}{h}} (h(a - K[1]))^{\frac{k}{h}} - c (h(a - K[1]))^{\frac{k}{h}} \right)} dt \right] \right) \right\} \right\}$$

✓ **Maple** : cpu = 0.66 (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))})`

$$\left[\{x(t) = a\}, \left\{ y(t) = \frac{(c - a) e^{k(t+c_1)(-c+a+b)} - b}{-1 + e^{k(t+c_1)(-c+a+b)}} \right\} \right]$$

2.1917

ODE No. 1917

$$\{x'(t) = y(t)^2 - \cos(x(t)), y'(t) = y(t)(-\sin(x(t)))\}$$

✓ **Mathematica** : cpu = 120.75 (sec), leaf count = 3406

```
DSolve[{Derivative[1][x][t] == -Cos[x[t]] + y[t]^2, Derivative[1][y][t] == -(Sin[x[t]]*y[t])},
```

$$\left\{\left\{y(t) \rightarrow \frac{3\sqrt[3]{2}\cos\left(\operatorname{InverseFunction}\left[\int_1^{\#1}\frac{\left(3c_1+\sqrt{9c_1^2-4\cos^3(K[1])}\right)^{2/3}\cos(K[1])+3\sqrt[3]{2}c_1}{2^{2^{2/3}}\cos^2(K[1])+2\left(3c_1+\sqrt{9c_1^2-4\cos^3(K[1])}\right)^{2/3}}dK[1]\right)}{\sqrt[3]{81c_1+\sqrt{6561c_1^2-2916\cos^3\left(\operatorname{InverseFunction}\left[\int_1^{\#1}\frac{\left(3c_1+\sqrt{9c_1^2-4\cos^3(K[1])}\right)^{2/3}\cos(K[1])+3\sqrt[3]{2}c_1}{2^{2^{2/3}}\cos^2(K[1])+2\left(3c_1+\sqrt{9c_1^2-4\cos^3(K[1])}\right)^{2/3}}dK[1]\right)}}\right]}\right\}}\right\}$$

✓ **Maple** : cpu = 1.447 (sec), leaf count = 101

```
dsolve({diff(x(t),t) = y(t)^2-cos(x(t)), diff(y(t),t) = -y(t)*sin(x(t))})
```

$$\left[\left\{x(t)=\operatorname{RootOf}\left(-2\left(\int^{-Z}\frac{1}{-3\tan\left(\operatorname{RootOf}\left(-3\sqrt{-\cos\left(\_f\right)^2}\ln\left(\frac{9\cos\left(\_f\right)^2\left(\tan\left(\_Z\right)^2+1\right)}{4}\right)}\right)+c_1\sqrt{-\cos\left(\_f\right)}\right)}\right\}\right]$$

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 = 0.377096 (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]^2*y[t]}, {x[t], y[t]}, 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 = 0.434694 (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[t] - y[t]*(x[t]^2 + y[t]^2)}, {x[t], y[t]}, t]
```

, could not solve

```
DSolve[{Derivative[1][x][t] == x[t] + y[t] - x[t]*(x[t]^2 + y[t]^2), Derivative[1][y][t] == -x[t] + y[t] - y[t]*(x[t]^2 + y[t]^2)}, {x[t], y[t]}, t]
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = x(t)+y(t)-x(t)*(x(t)^2+y(t)^2), diff(y(t),t) = -x(t)+y(t)-y(t)*(x(t)^2+y(t)^2)}, t)
```

, result contains DESol or ODESolStruc

$$[\{x(t) = 0\}, \{y(t) = 0\}]$$

2.1920

ODE No. 1920

$$\{x'(t) = x(t) \left(x(t)^2 + y(t)^2 - 1\right) - y(t), y'(t) = y(t) \left(x(t)^2 + y(t)^2 - 1\right) + x(t)\}$$

 **Mathematica** : cpu = 0.221862 (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]*(-1 + x[t]^2 + y[t]^2)}, {x[t], y[t]}, 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[t] + y[t]*(-1 + x[t]^2 + y[t]^2)}, {x[t], y[t]}, t]
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = -y(t)+x(t)*(x(t)^2+y(t)^2-1), diff(y(t),t) = x(t)+y(t)*(x(t)^2+y(t)^2-1)}, t)
```

, result contains DESol or ODESolStruc

$$[\{x(t) = 0\}, \{y(t) = 0\}]$$

2.1921 ODE No. 1921

$$\left\{x'(t) = -y(t) \left(x(t)^2 + y(t)^2\right), y'(t) = \begin{pmatrix} \frac{x(t)^2 + y(t)^2}{(x(t)^2 + y(t)^2) \left(\frac{x(t)}{2} - \frac{y(t)^2}{2x(t)}\right)} & x(t)^2 + y(t)^2 \geq 2x(t) \\ \text{True} & \end{pmatrix} \right\}$$

X Mathematica : cpu = 2.19991 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == -(y[t]*(x[t]^2 + y[t]^2)), Derivative[1][y][t] == Piecewise[{{x
```

, could not solve

```
DSolve[{Derivative[1][x][t] == -(y[t]*(x[t]^2 + y[t]^2)), Derivative[1][y][t] == Piecewi
```

X 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+
```

, could not solve

```
dsolve({diff(x(t),t) = -y(t)*(x(t)^2+y(t)^2), diff(y(t),t) = piecewise(2*x(t) <= x(t)^2+
1/2*y(t)^2/x(t))*(x(t)^2+y(t)^2))})
```

2.1922 ODE No. 1922

$$\left\{ \begin{matrix} x'(t) = \begin{pmatrix} \sin\left(\frac{1}{x(t)^2+y(t)^2}\right) x(t) (x(t)^2+y(t)^2-1) & x(t)^2+y(t)^2 \neq 1 \\ 0 & \text{True} \end{pmatrix} - y(t), y'(t) = \begin{pmatrix} \sin\left(\frac{1}{x(t)^2+y(t)^2}\right) y(t) (x(t)^2+y(t)^2-1) & x(t)^2+y(t)^2 \neq 1 \\ 0 & \text{True} \end{pmatrix} + x(t) \end{matrix} \right.$$

X Mathematica : cpu = 5.63991 (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)}, {0, x[t]^2 + y[t]^2 != 1}}, 0] - y[t], Derivative[1][y][t] == Piecewise[{{Sin[(x[t]^2 + y[t]^2)^(-1)]*y[t]*(-1 + x[t]^2 + y[t]^2)}, {0, x[t]^2 + y[t]^2 != 1}}, 0] + x[t]}, {x[t], y[t]}, t]
```

, 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)}, {0, x[t]^2 + y[t]^2 != 1}}, 0] - y[t], Derivative[1][y][t] == Piecewise[{{Sin[(x[t]^2 + y[t]^2)^(-1)]*y[t]*(-1 + x[t]^2 + y[t]^2)}, {0, x[t]^2 + y[t]^2 != 1}}, 0] + x[t]}, {x[t], y[t]}, t]
```

X 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)^2+y(t)^2)),0), diff(y(t),t) = x(t)+piecewise(x(t)^2+y(t)^2 <> 1,x(t)*(x(t)^2+y(t)^2-1)*sin(1/(x(t)^2+y(t)^2)),0)}, x(t), y(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 = 0.0133151 (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]}
```

$$\left\{ \left\{ x(t) \rightarrow \frac{c_1}{t^2 + 1} + \frac{c_2 t}{t^2 + 1}, y(t) \rightarrow \frac{c_2}{t^2 + 1} - \frac{c_1 t}{t^2 + 1} \right\} \right\}$$

✓ **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)})
```

$$\left\{ x(t) = \frac{c_1 t + c_2}{t^2 + 1}, y(t) = \frac{-c_2 t + c_1}{t^2 + 1} \right\}$$

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 = 0.0765247 (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)*Derivative[1][y][t] == -2*t*y[t]}, {x[t], y[t]}, t]

$$\left\{ \left\{ y(t) \rightarrow \frac{c_1 \left(e^{c_2} - \sqrt{-4t^2 - 4c_1^2t^2 + e^{2c_2}}\right)}{2 \left(1 + c_1^2\right)}, x(t) \rightarrow \frac{e^{c_2} - \sqrt{-4t^2 - 4c_1^2t^2 + e^{2c_2}}}{2 \left(1 + c_1^2\right)} \right\}, \left\{ y(t) \rightarrow \frac{c_1 \left(\sqrt{-4t^2 - 4c_1^2t^2 + e^{2c_2}} - e^{c_2}\right)}{2 \left(1 + c_1^2\right)}, x(t) \rightarrow \frac{e^{c_2} - \sqrt{-4t^2 - 4c_1^2t^2 + e^{2c_2}}}{2 \left(1 + c_1^2\right)} \right\} \right\}$$

✓

Maple

: cpu = 0.905 (sec), leaf count = 180

dsolve({(x(t)^2+y(t)^2-t^2)*diff(x(t),t) = -2*t*x(t), (x(t)^2+y(t)^2-t^2)*diff(y(t),t) = -2*t*y(t)}, t)

$$\left[\left\{ x(t) = 0 \right\}, \left\{ y(t) = \frac{1 + \sqrt{-4c_1^2t^2 + 1}}{2c_1}, y(t) = \frac{1 - \sqrt{-4c_1^2t^2 + 1}}{2c_1} \right\} \right]$$

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 = 0.0205026 (sec), leaf count = 31

```
DSolve[{-x[t] + t*Derivative[1][x][t] + a*Derivative[1][y][t] + Derivative[1][y][t]^2 == 0, -y
```

$$\left\{\left\{x(t)\rightarrow ac_2+c_1t+c_2^2,y(t)\rightarrow c_2t+c_1c_2\right\}\right\}$$

✓ **Maple** : cpu = 0.314 (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)
```

$$\left[\left\{x(t)=-\frac{t^2}{3}\right\},\left\{y(t)=-\frac{t^3}{27a}\right\}\right]$$

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 = 0.0068988 (sec), leaf count = 28

DSolve[{x[t] == f[Derivative[1][x][t], Derivative[1][y][t]] + t*Derivative[1][x][t], y[t] == g

$$\{\{x(t)\rightarrow f(c_1,c_2)+c_1t,y(t)\rightarrow g(c_1,c_2)+c_2t\}\}$$

✓

Maple

: cpu = 0.186 (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

$$[\{\int \text{RootOf}\left(g\left(-Z,\frac{d}{dt}y(t)\right)-y(t)+t\left(\frac{d}{dt}y(t)\right)\right)dt+c_1=t\text{RootOf}\left(g\left(-Z,\frac{d}{dt}y(t)\right)-y(t)+t\left(\frac{d}{dt}y(t)\right)\right)$$

2.1927

ODE No. 1927

$$\{x''(t) = ae^{2x(t)} + e^{-2x(t)} \cos^2(y(t)) - e^{-x(t)}, y''(t) = e^{-2x(t)} \sin(y(t)) \cos(y(t)) - \tan(y(t)) \sec^2(y(t))\}$$

 **Mathematica** : cpu = 0.008661 (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] == e^(-2*x[t]) Sin[y[t]] Cos[y[t]] - Tan[y[t]] Sec^2[y[t]]], x[t], y[t], 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])}, Derivative[2][y][t] == e^(-2*x[t]) Sin[y[t]] Cos[y[t]] - Tan[y[t]] Sec^2[y[t]]], x[t], y[t], t]
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(diff(x(t),t),t) = a*exp(2*x(t))-exp(-x(t))+exp(-2*x(t))*cos(y(t))^2, diff(diff(y(t),t),t) = exp(-2*x(t))*sin(y(t))*cos(y(t))-sin(y(t))/cos(y(t))^3}, x(t), y(t), t)
```

, 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(y(t),t),t) = exp(-2*x(t))*sin(y(t))*cos(y(t))-sin(y(t))/cos(y(t))^3}, x(t), y(t), t)
```

2.1928

ODE No. 1928

$$\left\{x''(t) = \frac{kx(t)}{(x(t)^2 + y(t)^2)^{3/2}}, y''(t) = \frac{ky(t)}{(x(t)^2 + y(t)^2)^{3/2}}\right\}$$

✗ Mathematica : cpu = 0.0073863 (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]^2 + y[t]^2)^(3/2)}, {x[t], y[t]}, 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[t])/(x[t]^2 + y[t]^2)^(3/2)}, {x[t], y[t]}, t]
```

✗ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(diff(x(t),t),t) = k*x(t)/(x(t)^2+y(t)^2)^(3/2), diff(diff(y(t),t),t) = k*y(t)/(x(t)^2+y(t)^2)^(3/2)}, 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 = 0.157688 (sec), leaf count = 0

```
DSolve[{Derivative[2][x][t] == -((c*f[Sqrt[Derivative[1][x][t]^2 + Derivative[1][y][t]^2])*y[t]
```

, could not solve

```
DSolve[{Derivative[2][x][t] == -((c*f[Sqrt[Derivative[1][x][t]^2 + Derivative[1][y][t]^2]
g - (c*f[Sqrt[Derivative[1][x][t]^2 + Derivative[1][y][t]^2])*y[t]*Derivative[1][y][t])/
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(diff(x(t),t),t) = -C(y(t))*f((diff(y(t),t)^2)^(1/2))/(diff(y(t),t)^2)^(1/2)
```

, result contains DESol or ODESolStruc

$$\left[\left\{y(t) = \_a \&\text{where} \left[\left\{\left(\frac{d}{d\_a}b(\_a)\right)\_b(\_a) + \frac{C(\_a)f\left(\sqrt{\_b(\_a)^2}\right)\_b(\_a) + g\sqrt{\_b(\_a)^2}}{\sqrt{\_b(\_a)^2}} = 0\right\}, \right.\right.$$

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 = 0.0349476 (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] == x[t]^2 + z[t], x[0] == c2, y[0] == c1, z[0] == c3}, {x, y, z}, t]

$$\left\{ \left\{ x(t) \rightarrow e^{-c_3} \left(e^t + e^{c_3} c_1 \right), y(t) \rightarrow c_2 \left(e^{-c_3} \left(e^t + e^{c_3} c_1 \right) - c_1 \right) + \left(e^{-c_3} \left(e^t + e^{c_3} c_1 \right) - c_1 \right) \left(-\frac{c_1^2}{e^{-c_3} \left(e^t + e^{c_3} c_1 \right) - c_1} \right), z(t) \rightarrow c_3 \left(e^{-c_3} \left(e^t + e^{c_3} c_1 \right) - c_1 \right) + \left(e^{-c_3} \left(e^t + e^{c_3} c_1 \right) - c_1 \right) \left(-\frac{c_1^2}{e^{-c_3} \left(e^t + e^{c_3} c_1 \right) - c_1} \right) \right\} \right.$$

✓

Maple : cpu = 0.051 (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)=c2, y(t)=c1, z(t)=c3, t=0..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 = 4.15075 (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],
```

$$\left. \vphantom{\int_0^1} \right\} x(t) \rightarrow \frac{\sqrt{2}b^2\sqrt{a(a-c)}c_1\operatorname{sn}\left(\frac{\frac{\sqrt{2}\sqrt{a}\sqrt{a-c}c\sqrt{c_2}t}{\sqrt{b}\sqrt{b-c}} - \frac{\sqrt{2}\sqrt{a}\sqrt{b}\sqrt{a-c}\sqrt{c_2}t}{\sqrt{b-c}} - \frac{\sqrt{2}\sqrt{a}\sqrt{a-c}c\sqrt{c_2}c_3}{\sqrt{b}\sqrt{b-c}} + \frac{\sqrt{2}\sqrt{a}\sqrt{b}\sqrt{a-c}\sqrt{c_2}c_3}{\sqrt{b-c}}}{a} \middle| -\frac{(a-b)bc_1}{(a-c)cc_2}\right)}{(a-c)\sqrt{b(b-c)}c_1} - \frac{\sqrt{2}b\sqrt{a(a-c)}c}{a}$$

✓ **Maple** : cpu = 1.475 (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) = (a-b)*x(t)*y(t), x(0)=1, y(0)=1, z(0)=1})
```

$$[\{x(t) = 0\}, \{y(t) = 0\}, \{z(t) = c_1\}]$$

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 = 2.56294 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == x[t]*(y[t] - z[t]), Derivative[1][y][t] == y[t]*(-x[t] + z[t]),
```

, could not solve

```
DSolve[{Derivative[1][x][t] == x[t]*(y[t] - z[t]), Derivative[1][y][t] == y[t]*(-x[t] + z[t]), Derivative[1][z][t] == (x[t] - y[t])*z[t]}, {x[t], y[t], z[t]}, t]
```

 **Maple** : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = x(t)*(y(t)-z(t)), diff(y(t),t) = y(t)*(z(t)-x(t)), diff(z(t),t) =
```

, 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 = 124.766 (sec), leaf count = 0

DSolve[{Derivative[1][x][t] + Derivative[1][y][t] == x[t]*y[t], Derivative[1][y][t] + Derivati

, could not solve

DSolve[{Derivative[1][x][t] + Derivative[1][y][t] == x[t]*y[t], Derivative[1][y][t] + De

✔

Maple : cpu = 1.316 (sec), leaf count = 4309

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), di

$$\left[\left\{x(t)=-\frac{2}{-2c_2+t}\right\},\{y(t)=x(t)\},\left\{z(t)=\left(\int-\frac{x(t)^2\mathrm{e}^{-\left(\int x(t)dt\right)}}{2}dt+c_1\right)\mathrm{e}^{\int x(t)dt}\right\}\right]$$

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 = 61.8545 (sec), leaf count = 0

```
DSolve[{Derivative[1][x][t] == x[t]^2/2 - y[t]/24, Derivative[1][y][t] == 2*x[t]*y[t] - 3*z[t]}
```

, could not solve

```
DSolve[{Derivative[1][x][t] == x[t]^2/2 - y[t]/24, Derivative[1][y][t] == 2*x[t]*y[t] - 1/6*y[t]^2 + 3*x[t]*z[t]}, {x[t], y[t], z[t]}, t]
```

✗ Maple : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = 1/2*x(t)^2-1/24*y(t), diff(y(t),t) = 2*x(t)*y(t)-3*z(t), diff(z(t),t) = 3*x(t)*z(t)-y(t)^2/6}, [x(t), y(t), z(t)])
```

, result contains DESol or ODESolStruc

$$\left[\{y(t) = 0\}, \left\{x(t) = \frac{2}{2c_1 - t}\right\}, \{z(t) = 0\}\right]$$

2.1935

ODE No. 1935

$$\{x'(t) = x(t) \left(y(t)^2 - z(t)^2\right), y'(t) = y(t) \left(z(t)^2 - x(t)^2\right), z'(t) = z(t) \left(x(t)^2 - y(t)^2\right)\}$$

✖

Mathematica : cpu = 0.0416141 (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), Derivative[1][z][t] == (x[t]^2 - y[t]^2)*z[t]}, {x[t], y[t], z[t]}, t]
```

, could not solve

```
DSolve[{Derivative[1][x][t] == x[t]*(y[t]^2 - z[t]^2), Derivative[1][y][t] == y[t]*(-x[t]^2 + z[t]^2), Derivative[1][z][t] == (x[t]^2 - y[t]^2)*z[t]}, {x[t], y[t], z[t]}, t]
```

✖

Maple : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = x(t)*(y(t)^2-z(t)^2), diff(y(t),t) = y(t)*(z(t)^2-x(t)^2), diff(z(t),t) = z(t)*(x(t)^2-y(t)^2)}, [x(t), y(t), 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 = 0.0389329 (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))}, {x[t], y[t], z[t]}, t]
```

, 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 = 0.772 (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),t) = (x(t)^2+y(t)^2)*z(t)}, [x(t), y(t), z(t)]);
```

$$[\{x(t)=0\}, \{y(t)=0\}, \{z(t)=c_1\}]$$

2.1937 ODE No. 1937

$\{x'(t) = -x(t)y(t)^2 + x(t) + y(t), y'(t) = x(t)^2y(t) - x(t) - y(t), z'(t) = y(t)^2 - x(t)^2\}$

X Mathematica : cpu = 0.634812 (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]^2*y[t], Derivative[1][z][t] == -x[t]^2 + y[t]^2}, {x[t], y[t], z[t]}, 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]
```

X Maple : cpu = 0. (sec), leaf count = 0

```
dsolve({diff(x(t),t) = -x(t)*y(t)^2+x(t)+y(t), diff(y(t),t) = x(t)^2*y(t)-x(t)-y(t), diff(z(t),t) = y(t)^2-x(t)^2}, t)
```

, 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 = 0.0079531 (sec), leaf count = 137

```
DSolve[{Derivative[2][x][t] == (x[t]*Derivative[1][f][r])/r, Derivative[2][y][t] == (y[t]*Derivative[1][f][r])/r, Derivative[2][z][t] == (z[t]*Derivative[1][f][r])/r}, {x, y, z}, t]
```

$$\left\{\left\{x(t)\rightarrow c_1e^{-\frac{t\sqrt{f'(r)}}{\sqrt{r}}}+c_2e^{\frac{t\sqrt{f'(r)}}{\sqrt{r}}},y(t)\rightarrow c_3e^{-\frac{t\sqrt{f'(r)}}{\sqrt{r}}}+c_4e^{\frac{t\sqrt{f'(r)}}{\sqrt{r}}},z(t)\rightarrow c_5e^{-\frac{t\sqrt{f'(r)}}{\sqrt{r}}}+c_6e^{\frac{t\sqrt{f'(r)}}{\sqrt{r}}}\right\}\right\}$$

✓ **Maple** : cpu = 0.115 (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(diff(z(t),t),t) = D(F)(r)/r*z(t)}, {x(t), y(t), z(t)}, t)
```

$$\left\{x(t)=c_5e^{\frac{\sqrt{\frac{d}{dr}F(r)}t}{\sqrt{r}}}+c_6e^{-\frac{\sqrt{\frac{d}{dr}F(r)}t}{\sqrt{r}}},y(t)=c_3e^{\frac{\sqrt{\frac{d}{dr}F(r)}t}{\sqrt{r}}}+c_4e^{-\frac{\sqrt{\frac{d}{dr}F(r)}t}{\sqrt{r}}},z(t)=c_1e^{\frac{\sqrt{\frac{d}{dr}F(r)}t}{\sqrt{r}}}+c_2e^{-\frac{\sqrt{\frac{d}{dr}F(r)}t}{\sqrt{r}}}\right\}$$

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 = 0.218251 (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])*Derivative[1][y][t] == f[t], (z[t] - x[t])*(z[t] - y[t])*Derivative[1][z][t] == f[t]}, {x[t], y[t], z[t]}, t]
```

$$\left\{ \left\{ \begin{array}{l} x(t) \rightarrow \frac{c_1}{3} + \frac{\sqrt[3]{2c_1^3 - 9c_2c_1 + 27c_3 + 27 \int_1^t f(K[1])dK[1]} + \sqrt{4(3c_2 - c_1^2)^3 + (2c_1^3 - 9c_2c_1 + 27c_3 + 27 \int_1^t f(K[1])dK[1])^2}}{3\sqrt[3]{2}} \end{array} \right. \right.$$

✓ **Maple** : cpu = 1.859 (sec), leaf count = 899

```
dsolve({(x(t)-y(t))*(x(t)-z(t))*diff(x(t),t) = f(t), (y(t)-x(t))*(y(t)-z(t))*diff(y(t),t) = f(t), (z(t)-x(t))*(z(t)-y(t))*diff(z(t),t) = f(t)}, {x(t), y(t), z(t)}, t)
```

Expression too large to display

2.1940

ODE No. 1940

$\{x_1'(t) \sin(x_2(t)) = x_4(t) \sin(x_3(t)) + x_5(t) \cos(x_3(t)), x_2'(t) = x_4(t) \cos(x_3(t)) - x_5(t) \sin(x_3(t)), x_1'(t) \cos(x_2(t)) = x_4(t) \sin(x_3(t)) - x_5(t) \cos(x_3(t))\}$

 **Mathematica** : cpu = 0.0137651 (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] == Sin[x3[t]]*x4[t] - Cos[x3[t]]*x5[t], Derivative[1][x3][t] == x4[t] Cos[x3[t]] - x5[t] Sin[x3[t]], a*(1 - lambda)*x5[t] + Derivative[1][x4][t] == -(m*Cos[x3[t]]*Sin[x2[t]]), a*(1 - lambda)*x4[t] + Derivative[1][x5][t] == m*Sine[x3[t]]*Cos[x2[t]]}, {x1[t], x2[t], x3[t], x4[t], x5[t]}, t]
```

, could not solve

```
DSolve[{Sin[x2[t]]*Derivative[1][x1][t] == Sin[x3[t]]*x4[t] + Cos[x3[t]]*x5[t], Derivative[1][x2][t] == Sin[x3[t]]*x4[t] - Cos[x3[t]]*x5[t], Derivative[1][x3][t] == x4[t] Cos[x3[t]] - x5[t] Sin[x3[t]], a*(1 - lambda)*x5[t] + Derivative[1][x4][t] == -(m*Cos[x3[t]]*Sin[x2[t]]), a*(1 - lambda)*x4[t] + Derivative[1][x5][t] == m*Sine[x3[t]]*Cos[x2[t]]}, {x1[t], x2[t], x3[t], x4[t], x5[t]}, t]
```

 **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(x4(t),t) == x5(t)*sin(x3(t))-x4(t)*cos(x3(t)), diff(x2(t),t) == x4(t)*cos(x3(t))-x5(t)*sin(x3(t)), a*(1-lambda)*x5(t)+diff(x4(t),t) == -(m*cos(x3(t))*sin(x2(t))), a*(1-lambda)*x4(t)+diff(x5(t),t) == m*sin(x3(t))*cos(x2(t))}, [x1(t), x2(t), x3(t), x4(t), x5(t)], t)
```

, exception

time expired

3 Design of test program

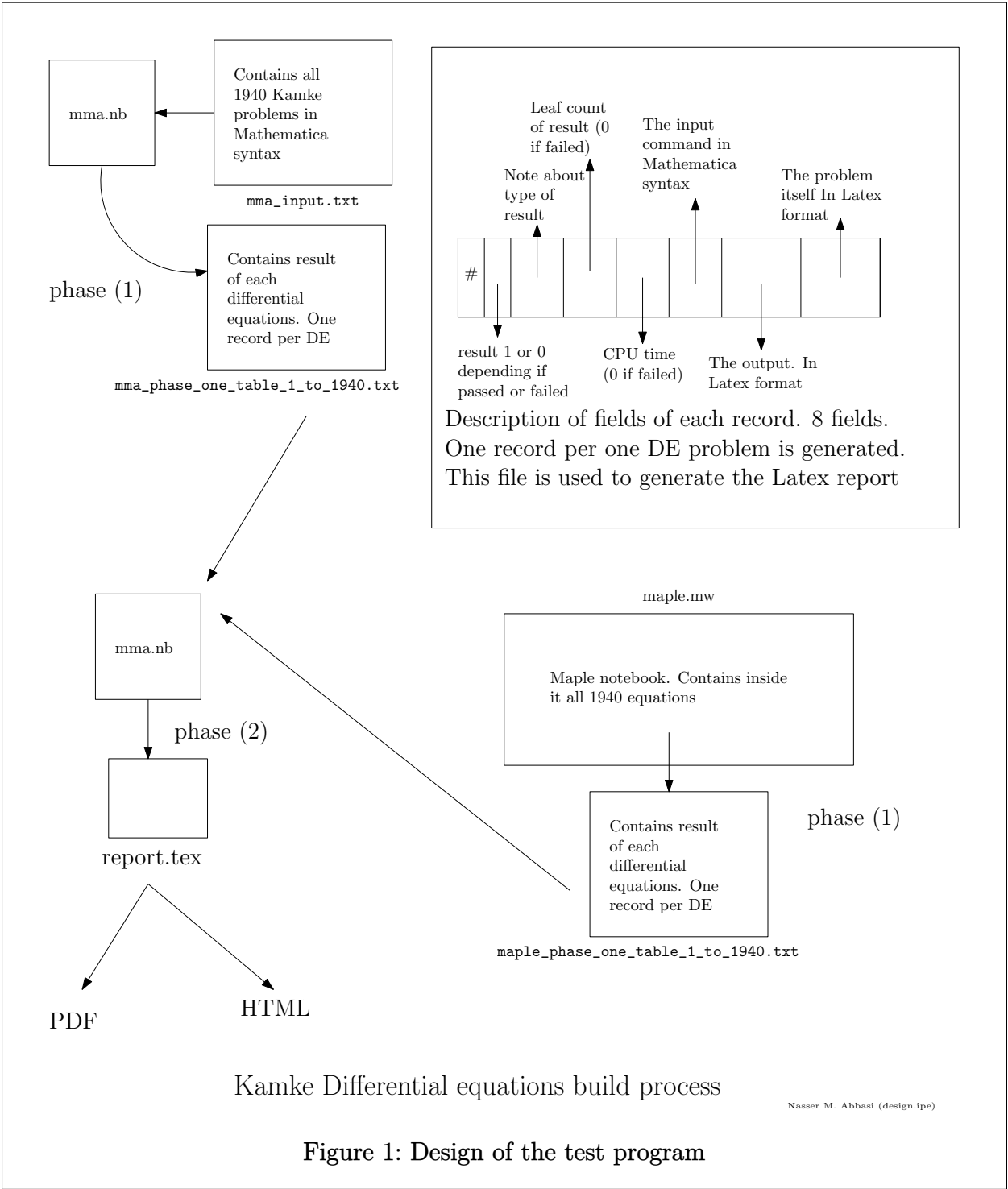


Figure 1: Design of the test program