



5. Higher-Order Nonlinear Ordinary Differential Equations

1. $y'''_{xxx} = Ax^\alpha y^\beta$. *Emden–Fowler equation of the third-order.*
2. $y'''_{xxx} = ay^{-5/2} + by^{-7/2}$.
3. $y'''_{xxx} = f(y)$.
4. $yy'''_{xxx} = f(x)$.
5. $y''''_{xxxx} = Ay^{-5/3}$.
6. $y''''_{xxxx} = f(y)$.
7. $F(x, y'_x, y''_{xx}, \dots, y^{(n)}_x) = 0$. *The equation does not depend on y explicitly.*
8. $F(y, y'_x, y''_{xx}, \dots, y^{(n)}_x) = 0$. *Autonomous equation.*
9. $F(x, xy'_x - my, y_x^{(m+1)}, y_x^{(m+2)}, \dots, y_x^{(n)}) = 0$, $m = 1, 2, \dots, n - 1$.
10. $F\left(x^k y^m, \frac{xy'_x}{y}, \frac{x^2 y''_{xx}}{y}, \dots, \frac{x^n y^{(n)}_x}{y}\right) = 0$. *Generalized homogeneous equation.*
11. $F\left(e^{\alpha x} y^m, \frac{y'_x}{y}, \frac{y''_{xx}}{y}, \dots, \frac{y^{(n)}_x}{y}\right) = 0$.
12. $F(x^m e^{\alpha y}, xy'_x, x^2 y''_{xx}, \dots, x^n y^{(n)}_x) = 0$.

The EqWorld website presents extensive information on solutions to various classes of ordinary differential equations, partial differential equations, integral equations, functional equations, and other mathematical equations.