

Classifying Differential Equations

For each of the following, identify the order of the differential equation and state (when applicable) whether it's ordinary, partial, linear, non-linear, homogeneous, or inhomogeneous. The quantities a , b , and c are all constants.

1 $a \frac{d^2 x}{dt^2} + 2e^{bt} x = ct^2$

2 $\left(\frac{dx}{dt}\right)^2 + 4x^2 - x = 0$

3 $\frac{df}{dx} + \frac{df}{dy} = a\sqrt{x^2 + y^2}$

4 $x \frac{d^2 y}{dx^2} + a \frac{dy}{dx} - by = 0$

5 $y \frac{d^2 y}{dx^2} - a \frac{dy}{dx} - by = 0$

6 $ax^2 \frac{d^3 y}{dx^3} + \frac{2b}{x^2} \frac{d^2 y}{dx^2} = c \cos x$

7 $\frac{dN}{dt} = -aN e^{-bt}$

8 $a \frac{d^2 x}{dt^2} + 2 \ln(bt)x = cx$

9 $\frac{d^4 x}{dt^4} = ax \sin^2 t - 1$

10 $\frac{1}{y^2} \frac{d^2 N}{dx^2} + \frac{1}{x^2} \frac{d^2 N}{dy^2} = a^2$