

Determine a one-parameter family of solutions of the given differential equation. If an auxiliary condition is provided, determine the corresponding particular solution as well.

1.  $y' + 3y = 3x^2 e^{-3x}$

2.  $2x \frac{dy}{dx} + y = \frac{2x^2}{y^3}, \quad y(1) = 2$

3.  $(5xy + 4y^2 + 1) dx + (x^2 + 2xy) dy = 0$

4.  $y' + 3x^2 y = x^2, \quad y(0) = 2$

5.  $\frac{dy}{dx} - \frac{y}{x} = -\frac{y^2}{x}$

6.  $(2x + \tan y) dx + (x - x^2 \tan y) dy = 0$