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Solution.

$$\frac{dy}{dx} = -4Ae^{-4x} - 6Be^{-6x} \quad \text{--- (i)}$$

$$\frac{d^2y}{dx^2} = 16Ae^{-4x} + 36Be^{-6x} \quad \text{--- (ii)}$$

Solving eqn (i) and (ii) simultaneously.

multiply eqn (i) by 6.

$$\therefore 6\frac{dy}{dx} = -24Ae^{-4x} - 36Be^{-6x} \quad \text{---- (iii)}$$

$$\frac{d^2y}{dx^2} = 16Ae^{-4x} - 36Be^{-6x} \quad \text{---- (iv)}$$

$$6\frac{dy}{dx} + \frac{d^2y}{dx^2} = -8Ae^{-4}$$

$$\therefore A = \frac{6\,dy/dx + d^2y/dx^2}{-8e^{-4x}} \quad \text{------ (v)}$$

Substituting eqn (v) into eqn (i)

$$dy/dx = -4\left(\frac{6\,dy/dx + d^2y/dx^2}{8e^{-4x}}\right)e^{-4x} - 6Be^{-6x}.$$

$$\frac{\partial y}{\partial x} = \frac{6\,dy/dx + d^2y/dx^2}{2} - 6Be^{-6x}$$

Multiply through by 2.

$$\therefore 2\,dy/dx = 6\frac{dy}{dx} + \frac{\partial^2 y}{\partial x^2} - 12Be^{-6x}$$

$$2\frac{dy}{dx} - \frac{6dy}{dx} = \frac{\partial^2 y}{\partial x^2} - 12Be^{-6x}$$

$$-4\,dy/dx = \frac{\partial^2 y}{\partial x^2} = -12Be^{-6x}$$

$$-\frac{4\,dy/dx - \partial^2 y/\partial x^2}{-12e^{-6x}} = B$$

$$\therefore \frac{4\,dy/dx + \partial^2 y/\partial x^2}{12e^{-6x}} = 0$$

Substitute A and B into the degenerate eqn.

$$\therefore y = \frac{6\frac{dy}{dx} + \frac{d^2y}{dx^2}}{-8e^{-4x}} \times e^{-4x} + \frac{4\,dy/dx + d^2y/dx^2}{12e^{6x}} \times e^{6x}$$

$$\therefore y = \frac{6\,dy/dx + \frac{\partial^2 y}{\partial x^2}}{-8} + \frac{4\,\partial y/\partial x + \partial^2 y/\partial x^2}{12}$$

$$y = -72\,dy/dx - 12\,\partial^2 y/\partial x^2 + 32\,\partial y/\partial x + 8\,\partial^2 y/\partial x^2.$$