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$$y = Ae^{-4x} + Be^{-6x} \dots (1)$$

$$\frac{dy}{dx} = -4Ae^{-4x} - 6Be^{-6x} \dots (2)$$

$$\frac{d^2y}{dx^2} = 16Ae^{-4x} + 36Be^{-6x} \dots (3)$$

$$Ae^{-4x} = y - Be^{-6x} \dots (4)$$

Sub (iv) in eq (2)

$$\frac{dy}{dx} = -4(y - Be^{-6x}) - 6Be^{-6x}$$

$$\frac{dy}{dx} = -4y + 4Be^{-6x} - 6Be^{-6x}$$

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

$$Be^{-6x} = y - Ae^{-4x}$$

$$\frac{dy}{dx} = -4Ae^{-4x} - 6(y - Ae^{-4x})$$

$$\frac{dy}{dx} = -4Ae^{-4x} - 6y + 6Ae^{-4x}$$

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

$$2Ae^{-4x} = \frac{-y - \frac{dy}{dx}}{dx}$$

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

$$\frac{d^2y}{dx^2} \cdot \left(\frac{dy}{dx} + 6y \right) + 1(-4y - \frac{dy}{dx})$$

$$\frac{d^2y}{dx^2} = \frac{dy}{dx} + 48y - 72y - 1 \cdot \frac{dy}{dx}$$

$$\frac{d^2y}{dx^2} + \frac{16dy}{dx} + 24y = 0$$