

$$4 \frac{dy}{dx} = 4(e^{2x} + 2xe^{2x}) \Rightarrow 4e^{2x} + 8xe^{2x}$$

$$4y = 4(xe^{2x}) \Rightarrow 4xe^{2x}$$

$$\text{Then } \frac{d^2y}{dx^2} - 4 \frac{dy}{dx} + 4y = 0$$

$$(4e^{2x} + 4xe^{2x}) - (4e^{2x} + 8xe^{2x}) + 4xe^{2x} = 0$$

$$\therefore \frac{d^2y}{dx^2} - 4 \frac{dy}{dx} + 4y = 0 \text{ is}$$

3) Igboro Joshua, 19/ENG03/013, Civil Engineering

$$4) \int e^x \sin 2x$$

$$u = e^x \text{ and } du = e^x dx \quad dv = e^x dx, \quad u = \frac{\cos 2x}{2}$$

$$\int u dv = uv - \int v du$$

$$\int e^x \sin 2x = -\frac{e^x \cos 2x}{2} + \int \frac{e^x \cos 2x}{2}$$

$$\int \frac{e^x \cos 2x}{2} = \frac{1}{2} \int e^x \cos 2x$$

$$\int e^x \cos 2x = \left(\frac{e^x \sin 2x}{2} - \int \frac{e^x \sin 2x}{2} \right) \frac{1}{2}$$

$$\therefore \int e^x \sin 2x = \frac{e^x \sin 2x}{4} - \frac{e^x \cos 2x}{2} - \int \frac{e^x \sin 2x}{4}$$

$$\text{Let } \int e^x \sin 2x \text{ be } y$$

$$y = \frac{e^x \sin 2x}{4} - \frac{e^x \cos 2x}{2} - \frac{y}{4} + C$$

$$\frac{5y}{4} = \frac{e^x \sin 2x}{4} - \frac{e^x \cos 2x}{2} + C$$

$$5y = e^x \sin 2x - 2e^x \cos 2x + C$$

$$y = \frac{e^x \sin 2x - 2e^x \cos 2x + C}{5}$$

Substitute the value of y

$$\therefore \int e^x \sin 2x = \frac{e^x \sin 2x - 2e^x \cos 2x + C}{5}$$

MAT104 Assignment

Answers

$$1) y = \frac{2 \cos 3x}{x}$$

$$\text{let } u = 2 \cos 3x, v = x^2, \frac{du}{dx} = -6 \sin 3x, \frac{dv}{dx} = 3x^2$$

$$\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2} \Rightarrow \frac{x^2 (-6 \sin 3x) - 2 \cos 3x (3x^2)}{x^4}$$

$$\therefore \frac{dy}{dx} = \frac{-6x^2 (\sin 3x - \cos 3x)}{x^4}$$

$$2) y = xe^{2x}$$

$$\text{Show that } \frac{d^2y}{dx^2} - 4 \frac{dy}{dx} + 4y = 0$$

$$\text{let } u = x$$

$$|v = e^{2x}$$

$$\frac{du}{dx} = 1, \quad \frac{dv}{dx} = 2e^{2x}$$

$$\therefore \frac{dy}{dx} = e^{2x} + 2xe^{2x}$$

$$\frac{dy}{dx} = e^{2x} + 2xe^{2x}$$

$$\text{let } u = \frac{d^2y}{dx^2} = e^{2x} + \frac{d}{dx} (2xe^{2x})$$

$$\frac{d^2y}{dx^2} = 2e^{2x} + \frac{d}{dx} (2xe^{2x})$$

$$= 2e^{2x} + 2e^{2x} + 4xe^{2x}$$

$$\therefore \frac{d^2y}{dx^2} = 4e^{2x} + 4xe^{2x}$$