MATRIC NUMBER: 17/MHS01/514
LEVEL: 200 Level
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DEPARTMENT: Mechanical Engineering
COURSE: MAT 104

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

Using $dy/dx = \frac{V\,dy/dx - U\,dv/dx}{V^2}$

$U = (2\cos 3x) \quad du/dx = -6\sin 3x$

$V = x^3 \quad dv/dx = 3x^2$

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

$$= \frac{-6x^3\sin 3x - 6x^2\cos 3x}{x^5}$$

$$= \frac{-6x^2(x\sin 3x + \cos 3x)}{x^5}$$

$$= \frac{-6(x\sin 3x + \cos 3x)}{x^3}$$

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

2. Given $y = xe^{2x}$, show that $d^2y/dx^2 - 4\,dy/dx + 4y = 0$

SOLUTION

$y = xe^{2x}$

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

$d^2y/dx^2 = 2e^{2x} + 2e^{2x} + 4xe^{2x}$

$d^2y/dx^2 - 4\,dy/dx + 4y = 0$

$\Rightarrow 2e^{2x} + 2e^{2x} + 4xe^{2x} - 4e^{2x} - 8xe^{2x} + 4xe^{2x} = 0$

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

$$8xe^{2x} - 8xe^{2x} = 0$$

$$0 = 0$$

QED

3. UMOH EDIDIONG ENOBONG
17/MHS01/314 (200 LEVEL)
MECHANICAL ENGINEERING

4. $dy/dx = e^x \sin 2x$

$$\int (e^x \cdot \sin 2x) \cdot dx$$

Using integration by parts

$$\int v \, du/dx \cdot dx = uv - \int u \, dv/dx \cdot dx$$

$u = \sin(2x)$ $\quad du/dx = 2\cos 2x$

$dv/dx = e^x$ $\quad v = e^x$

$$\Rightarrow \int e^x \cdot \sin(2x)\cdot dx = e^x \cdot \sin 2x - \int 2e^x \cos(2x)\cdot dx$$

Continuing

$$= e^x \cdot \sin 2x - [2e^x \cos(2x) - \int (-4e^x \cdot \sin 2x)\, dx]$$

$$\int (e^x \cdot \sin 2x)\cdot dx = e^x \sin 2x - 2e^x \cos 2x - 4\int (e^x \sin 2x)\cdot dx$$

$$5\int (e^x \cdot \sin 2x)\, dx = e^x \cdot \sin 2x - 2e^x \cdot \cos 2x$$

$$\therefore \int (e^x \cdot \sin 2x)\, dx = \frac{e^x(\sin 2x - 2\cos 2x)}{5}$$