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MATRIC NO : 19/ENG04/042 S/N = 106

1) find dy/dx if $y = \frac{(2\cos 3x)}{x^3}$

$2\cos 3x \to u$ using quotient rule $\frac{v \, du/dx - u \, dv/dx}{v^2}$

$x^3 \to v$

$du = -6\sin 3x$; $dv = 3x^2$

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

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

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

$$= \frac{-6(x\sin 3x + \cos 3x)}{x^4}$$

2) If $y = xe^{2x}$, show the differential equation $d^2y/dx^2 - 4dy/dx + 4y = 0$

$y = \underset{u}{x}\,\underset{v}{e^{2x}}$, $\frac{dy}{dx} = v\,du/dx + u\,dv/dx$

$= e^{2x}(1) + x(2e^{2x})$

$du/dx = 1$; $dv/dx = 2e^{2x}$ $\quad = e^{2x} + 2xe^{2x}$

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

differentiating $2xe^{2x}$

u v $du/dx = 2$, $dv/dx = 2e^{2x}$

$= e^{2x}(2) + 2x(2e^{2x})$

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

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

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

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

$$4[e^{2x} + xe^{2x} - e^{2x} - 2xe^{2x} + xe^{2x}]$$

$$= 4(0)$$

$$= 0$$

3) Write your name, matric number and department:

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4) Find the Integral of $e^x \sin 2x$ with respect to x

$$\int e^x \sin 2x \, dx$$

$$\text{let } u = \sin 2x \quad , \quad du/dx = -2\cos 2x$$

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

$$\text{let } u = 2\cos 2x \; ; \; du = -4\sin 2x$$

$$= e^x 2\cos 2x - \int e^x -4\sin 2x \, dx$$

$$= e^x 2\cos 2x + 4\int e^x \sin 2x \, dx$$

$$\text{let } A = e^x \sin 2x \, dx$$

$$A = e^x \sin 2x - (e^x 2\cos 2x + 4(A))$$

$$A = e^x \sin 2x - e^x 2\cos 2x - 4A$$

$$5A = e^x \sin 2x - e^x 2\cos 2x$$

$$\text{THUS } \int e^x \sin 2x \, dx = \frac{1}{5}[e^x \sin 2x - e^x 2\cos 2x] + C$$