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Serial no: 3

Matric No: 19/ENR02/057

Department: Computer Engineering

Course: MAT 104

Assignment

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

$$\ln y = \ln 2 \cos 3x - \ln x^3$$

$$\frac{d}{dx} (\ln y) = \frac{d}{dx} (\ln 2 \cos 3x) - \frac{d}{dx} (\ln x^3)$$

$$\frac{1}{y} \left(\frac{dy}{dx} \right) = \frac{1}{2} \cos 3x \cdot (-6 \sin 3x) - \frac{1}{x^3} \cdot (3x^2)$$

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

$$\frac{dy}{dx} = y \left(\frac{-3 \sin 3x}{\cos 3x} - \frac{3}{x} \right)$$

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

$$2) y = x e^{2x} \rightarrow u = x, v = e^{2x}$$

$$\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

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

$$= 2x \cdot e^{2x} + e^{2x} \cdot 1$$

$$2x e^{2x} + e^{2x}$$

$$\frac{d^2 y}{dx^2} = \frac{2 \cdot 2e^{2x}}{dx} + \frac{e^{2x} \cdot 2dx}{dx} + \frac{de^{2x}}{dx}$$

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

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

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

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

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

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

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

3) NAME: OSCALUKA MIRACLE

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DEPARTMENT: COMPUTER ENGINEERING

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

$u = \sin 2x \quad dv = e^x$

$du = 2 \cos 2x \, dx \quad v = e^x$

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

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

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

$\int u = 2 \cos 2x \quad dv = e^x$

$[du = -2 \sin 2x \quad v = e^x]$

$[2 \cos 2x (e^x) - \int e^x (-2 \sin 2x)]$

$[e^x 2 \cos 2x + 2 \sin 2x e^x \, dx]$

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

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

Let $I = \int e^x 2 \sin 2x \, dx$

$I = e^x 2 \sin 2x - e^x 2 \cos 2x - I$

$2I = e^x 2 \sin 2x - e^x 2 \cos 2x$

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

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