

NAME: UDECHUKWU CHINONSO IFENNA

DEPT: COMPUTER ENGINEERING

MATRIC NO: 19/ENG02/067

COURSE: MAT104

1. Find  $dy/dx$  if  $y = (2\cos 3x)/x^3$

$$y = (2\cos 3x)/x^3$$

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

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

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

$$\frac{1}{y} \frac{dy}{dx} = \frac{-6\sin 3x}{2\cos 3x} - \frac{3x^2}{x^3}$$

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

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

2. If  $y = xe^{2x}$ , show that the differential equation

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

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

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

$$\therefore 4xe^{2x} - 4(2xe^{2x}) + 4(xe^{2x}) = 0$$

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

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

3. NAME: UDECHUKWU CHINONSO IFENNA

MATRIC NUMBER: 19/ENGO2/067

DEPARTMENT: COMPUTER ENGINEERING

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

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

$$\frac{dy}{dx} = 2 \cos 2x \quad v = e^x$$

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

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

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

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

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

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

$$e^x 2 \cos 2x + \int e^x 2 \sin 2x dx$$

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

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

$$\text{Let } I = \int e^x \sin 2x dx$$

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

$$3I = e^x \sin 2x - e^x 2 \cos 2x$$

$$I = \frac{e^x \sin 2x - e^x 2 \cos 2x}{3}$$

3

$$\therefore \int e^x \sin 2x dx = \frac{1}{3} [e^x \sin 2x - e^x 2 \cos 2x] + C$$