OLATUNJI ANUOLUWAPO TEMIJOPE MAT 104.
COMPUTER ENGINEERING.
19/ENG02/050.

Assignment

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

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

$\frac{1}{y} \cdot \frac{dy}{dx} = \frac{1}{2} \cdot 0 + \frac{1}{\cos 3x} \cdot -3\sin 3x - \frac{1}{x^3} \cdot 3x^2$.

$\frac{1}{y} \cdot \frac{dy}{dx} = 0 - \frac{3\sin 3x}{\cos 3x} - \frac{3x^2}{x^3}$.

$\frac{1}{y} \cdot \frac{dy}{dx} = 0 - 3\tan 3x - \frac{3}{x}$.

$\frac{dy}{dx} = y\left[-3\tan 3x - \frac{3}{x}\right]$

$\frac{dy}{dx} = \frac{(2\cos 3x)}{x^3}\left[-3\tan 3x - \frac{3}{x}\right]$.

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

$\frac{dy}{dx} = U\frac{dv}{dx} + V\frac{du}{dx}$

$u = x$, $v = e^{2x}$

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

$\frac{dy}{dx} = x(2e^{2x}) + e^{2x}(1)$.

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

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

$$4\frac{dy}{dx} = 4\left(2xe^{2x} + e^{2x}\right).$$

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

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

$$4y = 4xe^{2x}.$$

$$\therefore \frac{d^2y}{dx^2} - \frac{4dy}{dx} + 4y = (4xe^{2x} + 4e^{2x}) - (8xe^{2x} + 4e^{2x}) + 4xe^{2x}$$

$$= \cancel{4xe^{2x} - 4e^{2x} - 8y}$$

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

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

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

Solution.

$u = \sin 2x \qquad dv = e^x.$

$\frac{du}{dx} = 2\cos 2x \qquad v = e^x.$

$du = 2\cos 2x\, dx.$

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

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

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

from $\int e^x 2\cos 2x\, dx$

$u = 2\cos 2x \qquad dv = e^x.$

$\frac{du}{dx} = -4\sin 2x \qquad v = e^x.$

$du = -4\sin 2x\,dx$.

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

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

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

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

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

$-3\int \sin 2x\, e^x\,dx = e^x(\sin 2x - 2\cos 2x$.

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

3.