DARE BENEDICT OLUBUKOLA

MECHANICAL ENGINEERING

19/ENG06/016 SERIAL NO.; 111

MAT 104 ASSIGNMENT (Mrs. Funmilayo Saka)

Integrate the following with respect to their variables;

1. $x^{1/2} \ln x$

solution

$$\int x^{1/2} \ln x \, dx$$

$u = \ln x$ , $dv = x^{1/2}$

$du = \frac{1}{x} dx$ $v = \frac{2x^{3/2}}{3}$

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

$$= \ln x \left(\frac{2x^{3/2}}{3}\right) - \int \frac{2x^{3/2}}{3} \cdot \frac{1}{x} dx$$

$$= \frac{2x^{3/2}}{3} \ln x - \int \frac{2x^{1/2}}{3} dx$$

$$= \frac{2x^{3/2}}{3} \ln x - \frac{4x^{3/2}}{9} + C$$

$=$

2. $2 \cos 6t \cos t$

solution

$$\int 2 \cos 6t \cos t = 2 \int \cos 6t \cos t$$

$A = 6t \quad , \quad B = t$

$$\Rightarrow \int \left( \frac{1}{2} [\cos(6t+t) + \cos(6t-t)] \right)$$

$$= \int [\cos 7t + \cos 5t]$$

$$= \frac{\cos 7t}{7} + \frac{\cos 5t}{5} + C$$

3. $\sin^3 x \cos^4 x$

Solution

$$\int \sin^3 x \cos^4 x \, dx$$

$u = \cos x$

$\frac{du}{dx} = -\sin x \quad , \quad dx = \frac{-du}{\sin x}$

$\sin^2 x = 1 - \cos^2 x$

$$\Rightarrow \int \cancel{\sin x} \cdot \sin^2 x \cdot u^4 \cdot \frac{-du}{\cancel{\sin x}}$$

$$= -\int \sin^2 x \cdot u^4 \, du$$

$$= -\int (1 - \cos^2 x) \cdot u^4 \, du$$

$$= \int (\cos^2 x - 1) \cdot u^4 \, du$$

$$= \int (u^2 - 1) \cdot u^4 \, du$$

$$= \int (u^8 - u^4) \, du$$

$$= \frac{u^9}{9} - \frac{u^5}{5} + C$$

$$= \frac{(\cos x)^7}{7} - \frac{(\cos x)^5}{5} + C$$