NAME: AGHATISE OSAHAMEN STEPHANIE
DEPARTMENT: MEDICINE AND SURGERY
COLLEGE: MEDICAL AND HEALTH SCIENCE
MATRIC NO: 19/MHS01/053
COURSE CODE: MAT 104

Assignment

1. $2x^2 \ln x$

$u = \ln x \qquad dv = 2x^2$

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

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

$$= \ln x \cdot \frac{2x^3}{3} - \int \frac{2x^{\cancel{3}^{2}}}{3} \cdot \frac{dx}{\cancel{x}}$$

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

$$= \frac{2x^3}{3}\ln x - \frac{2x^3}{3\times 3} + C$$

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

OR

$$\frac{2x^3}{3}\left(\ln x - \frac{1}{3}\right) + C \;//$$

2. $3te^{2t}$

$u = 3t$ $\quad dv = e^{2t}$

$du = 3dx$ $\quad v = \frac{1}{2}e^{2t}$

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

$= 3t \cdot \frac{1}{2}e^{2t} - \int \frac{1}{2}e^{2t} \cdot 3dx$

$= \frac{3t}{2}e^{2t} - \int \frac{3}{2}e^{2t} \cdot dx$

$= \frac{3t}{2}e^{2t} - \frac{1}{2}\cdot\frac{3}{2}e^{2t} + C$

$= \left[\frac{3te^{2t}}{2} - \frac{3}{4}e^{2t}\right] + C$ //

3. $x^2 \sin x$

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

$\frac{du}{dx} = 2x$ $\quad v = -\cos x$

$du = 2x\,dx$

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

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

$= -x^2\cos x + \int 2x\cos x\,dx$

continuation of No 3

$= -x^2 \cos x + \int \begin{bmatrix} u = 2x & dv = \cos x \\ du = 2dx & v = \sin x \end{bmatrix}$

$= -x^2 \cos x + uv - \int v\,du$

$= -x^2 \cos x + 2x \sin x - \int \sin x \cdot 2dx$

$= -x^2 \cos x + 2x \sin x - \int 2 \sin x$

$= -x^2 \cos x + 2x \sin x + 2\cos x + C$ //

4. $\cos 5x \cos 6x$

$A = 5x$, $B = 6x$

Recall that;

$\cos A \cos B = \frac{1}{2}[\cos(A+B) - \cos(A-B)]$

$= \frac{1}{2} \int \cos 11x + \cos x$

$= \frac{1}{2} \left[\frac{\sin 11x}{11} + \sin x \right] + C$

$= \frac{\sin 11x}{22} + \frac{\sin x}{2} + C$ //

5. $\sin 7x \cos 2x$

$A = 7x, \quad B = 2x$

Recall that

$$\sin A \cos B = \frac{1}{2}\left[\sin(A+B) + \sin(A-B)\right]$$

$$= \frac{1}{2}\int \sin 9x + \sin 5x$$

$$= \frac{1}{2}\left[\frac{-\cos 9x}{9} - \frac{\cos 5x}{5}\right] + C$$

$$= \frac{-\cos 9x}{18} - \frac{\cos 5x}{10} + C$$