Name: OGWUCHA GLORY UYIOGHOSA
College: MHS Department: MBBS
Course Code: MAT 104.
Matric Number: 19/MHS01/290.

MAT 104 Assignment

1. $\int 2x^2 \ln x$

sol

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

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

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

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

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

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

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

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

2. $\int 3te^{2t}$

solution

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

$du = 3dt \qquad v = \frac{1}{2} e^{2t}$

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

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

$= \frac{3}{2} te^{2t} - \frac{3}{2} \int e^{2t} dt$

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

$= \frac{3}{2} te^{2t} - \frac{3}{4} e^{2t} + C$

$\int 3te^{2t} = \frac{3e^{2t}}{2} \left(t - \frac{1}{2} \right) + C$

3 $\int x^2 \sin x$

solution

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

$du = 2x\,dx$ $\quad v = -\cos x$

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

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

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

$$= -x^2 \cos x + 2x \sin x - (-2\cos x) + C$$

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

4) $\int \cos 5x \cos 6x$

- solution,

Recall; $\cos Ax \cos Bx = \frac{1}{2}\left[\cos(A-B)x + \cos(A+B)x\right]$

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

$$\int \cos 5x \cos 6x = \int \frac{1}{2}\left[\cos(-x) + \cos(11x)\right]$$

$$= \frac{1}{2}\int \cos(-x)\,dx + \frac{1}{2}\int \cos(11x)\,dx.$$

Recall; $\cos(-x) = \cos x$

$$= \frac{1}{2}\int \cos(x)\,dx + \frac{1}{2}\int \cos(11x)\,dx$$

$$= \frac{1}{2} \times \frac{\sin x}{1} + \frac{1}{2} \times \frac{\sin 11x}{11} + C$$

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

5) $\int \sin 7x \cos 2x$

solution.

$A = 7x,\ B = \cos 2x.$ $\quad \sin Ax \cos Bx = \frac{1}{2}\left[\sin(A+B)x + \sin(A-B)x\right]$

$$\int \sin 7x \cos 2x = \frac{1}{2}\int\left[\sin 9x + \sin 5x\right]$$

$$= \frac{1}{2}\int \sin(9x)\,dx + \frac{1}{2}\int \sin(5x)\,dx$$

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

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

$$\therefore \int \sin 7x \cos 5x = \frac{-\cos 9x}{18} - \frac{\cos 5x}{10} + C$$