$du = \frac{dx}{x}$

NAME: ADELEKE MAHFUS ADEMOLA
MATRIC NUMBER: 19/MHS01/029
SERIAL NO: 182
DEPARTMENT: MBBS

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

Solution

let $u = \ln x$

$\frac{du}{dx} = \frac{1}{x}$, $du = \frac{1}{x} dx$

$dv = 2x^2 \, dx$

$\int dv = \int 2x^2 dx$

$v = \frac{2x^3}{3}$

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

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

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

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

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

Solution

$u = 3t$

$\frac{du}{dt} = 3 \Rightarrow du = 3dt$

$dv = e^{2t} dt$

$V = \frac{e^{2t}}{2}$

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

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

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

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

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

3. $\int x^2 \sin x \, dx$

Solution

let $u = x^2$

$du = 2x dx$

$dv = \sin x \, dx$

$v = -\cos x$

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

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

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

$\int x \cos x \, dx$

let $u = x$

$du = dx$

$dv = \cos x \, dx$

$v = \sin x$

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

$= x \sin x - (-\cos x)$

$= x \sin x + \cos x$

19/MHS01/029

Sin -Cos
Cos Si

19/MHS01/029

$$\therefore \int x^2 \sin x\,dx = -x^2\cos x + 2(x\sin x + \cos x) + C$$

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

4. $\int \cos 5x \cos 6x \, dx$

Solution

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

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

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

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

but $\cos(-x) = \cos x$

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

$$\int \cos 5x \cos 6x = \frac{1}{2}\int (\cos 11x + \cos x)\,dx$$

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

$$\int \cos 5x \cos 6x = \frac{\sin 11x}{22} + \frac{\sin x}{2} + C$$

5. $\int \sin 7x \cos 2x \, dx$

Solution

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

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

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

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

$$\therefore \int \sin 7x \cos 2x\,dx = \frac{-\cos 9x}{18} - \frac{\cos 5x}{10} + C$$

19/MHS01/029