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MATRIC NO: 19/MHS01/245
COURSE CODE: COURSE MATHS 104
ASSIGNMENT

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

Solution

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

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

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

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

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

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

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

2. $\int 3t\, e^{2t} \, dt$

Solution

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

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

$du = 3dt$

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

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

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

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

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

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

solution

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

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

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

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

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

$= -x^2 \cos x + \sin x \frac{dx^2}{7}$

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

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

solution

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

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

$= \frac{1}{2}[\cos 11x - \cos x]$

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

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

$\int \cos 5x \cos 6x \, dx = \frac{\sin 11x}{2} - \frac{\sin x}{2} + c$

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

solution

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

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

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

$$\int \sin 7x \cos 2x \, dx = \frac{1}{2} \int (\sin 9x + \sin 5x) \, dx$$

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

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