

MATRIC NO : 19/MHS01/1407

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MAT 104 ASSIGNMENT

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

Soln

let $u = \ln x$

$dv = 2x^2$

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

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

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

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

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

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

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

let $u = 3t$

let $v = e^{2t}$

$du = \frac{3t^2}{2}$

$dv = \frac{1}{2} e^{2t}$

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

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

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

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

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

Solw

$$\text{let } u = x^2$$

$$du = \sin x$$

$$du = \frac{u^3}{3} dx$$

$$v = -\cos x$$

$$1. \quad UV - \int U \, dv$$

$$\int x^2 \sin x \, dx = x^2 \cdot (-\cos x) - \int (-\cos x) \cdot \frac{x^3}{3} dx$$

$$\int x^2 \sin x \, dx = -\cos x (x^2) - (-\sin x \cdot \frac{x^4}{4}) + C$$

$$\int x^2 \sin x \, dx = -\cos x (x^2) + \sin x \left(\frac{x^4}{4} \right) + C //$$

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

Solw

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

$$\text{Where } A = 5x \quad B = 6x$$

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

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

$$\int \cos 5x \cos 6x = \frac{1}{2} [\cos 11x - \cos x] dx$$

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

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

Solw

$$\text{where } A = 7x, \quad B = 2x$$

$$\therefore \int \sin 7x \cos 2x \, dx = \frac{1}{2} [\sin(7x+2x) + \sin(7x-2x)]$$

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

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

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