

OLAVUYI AFANWOLUWAPD CHRISTIANAMA

19/MH801/334 MAT 104

① Integrate $2x^2 \ln x dx$

Solution

$$\int 2x^2 \ln x dx$$

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

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

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

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

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

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

$$\therefore \int 2x^2 \ln x dx = \frac{2x^3 \ln x}{3} + C$$

② $\int 3te^{2t} dx$

Sol

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

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

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

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

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

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

③ $\int x^2 \sin x$

Solution

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

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

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

$$= \sin x \times \int x^2 dx$$

$$= \sin x \times \frac{x^3}{3}$$

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

$$= \frac{x^3 \sin x}{3} + C$$

$$\therefore \int x^2 \sin x = \frac{x^3 \sin x}{3} + C$$

④ $\int \cos 5x \cos 6x dx$

Solution

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

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

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

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

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

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

$$= \frac{\cos 11x}{2} + \frac{\cos x}{2} + C$$

$$\therefore \int \cos 5x \cos 6x dx =$$

$$\frac{\cos 11x}{22} + \frac{\cos x}{2} + C$$

$$8 \int \sin 7x \cos 2x$$

SOLUTION

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

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

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

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

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

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19 | MHS01 | 334 MAT104