

$$1) \quad 2x^2 \ln x$$

$$\text{soln} \\ \int 2x^2 \ln x dx$$

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

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

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

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

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

$$2) \quad \int 3t e^{2t} dx$$

$$\text{soln} \\ \int 3t e^{2t} dt$$

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

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

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

$$= 3t e^{2t} - e^{3t}$$

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

$$3) \quad x^2 \sin x$$

solution

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

$$dv = \sin x dx$$

$$\frac{du}{dx} = 2x$$

$$v = \cos x$$

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

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

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

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

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

Soln

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

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

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

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

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

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

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

Soln

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

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

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

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

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

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