

# Assignment.

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①  $\int 2x^2 \ln x \, dx$

Soln

$$u = \ln x$$

$$dv = 2x^2$$

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

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

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

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

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

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

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

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②  $\int 3t e^{2t} \, dt$

Soln

$$u = 3t$$

$$dv = e^{2t}$$

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

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

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

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

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

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

$$\int 8te^{2t} dt = \frac{3}{2} te^{2t} - \frac{3}{4} e^{2t} + C$$

$$\therefore \int 8te^{2t} dt = \frac{3}{2} te^{2t} - \frac{3}{4} e^{2t} + C$$

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

Solu

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

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

$$\therefore UV - \int v du$$

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

$$= -\cos x (x^2) - \left[ -\sin x \cdot \frac{2x^4}{4} + C \right]$$

$$= -\cos x (x^2) + \sin x \left[ \frac{2x^4}{4} \right] + C$$

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

Solu

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

$$A = 5x; B = 6x$$

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

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

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

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

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

$$\int \cos bx \cos ax \, dx = \frac{\sin 11x}{2} - \frac{\sin x}{2} + C$$

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

Solu

$$A = 7x; \quad b = 2x$$

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

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

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

$$= \frac{1}{2} \left[ -\frac{\cos 9x}{9} + \left( -\frac{\cos 7x}{7} \right) \right] + C$$

$$\int \sin 7x \cos 2x \, dx = -\frac{\cos 9x}{18} - \frac{\cos 7x}{14} + C$$

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