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19/MHS01/100
MBBS

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

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

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

Using $\int U dv = Uv - \int V du$

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

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

$\int 2x^2 \ln x \, dx = \frac{2x^3}{3} \ln x - \frac{2x^3}{9} + c$

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

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

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

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

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

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

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

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

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

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

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

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

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

$\int -\cos x\, 2x\,dx = 2x \sin x - \int 2 \sin x\,dx$

$[du = 2dx \quad v = \sin x]$

$\int -\cos x\, 2x\,dx = 2x \sin x - (-2\cos x)$

$= 2x \sin x + 2\cos x$

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

$= x^2 - 2x \sin x - 3\cos x + c$

$\int x^2 \sin x\,dx = x^2 - 2x \sin x - 3\cos x + c$

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

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

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

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

$$= \frac{1}{22}\sin 11x - \frac{1}{2}\sin x + C$$

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

Using $\sin A \cos B = \frac{1}{2}\left(\sin(A+B) + \sin(A-B)\right)$

$$\int \sin 7x \cos 2x\, dx = \frac{1}{2}\int\left[\sin 9x + \sin 5x\right]dx$$

$$\int \sin 7x \cos 2x\, dx = \frac{1}{2}\left[\frac{-1}{9}\cos 9x - \frac{1}{5}\cos 5x\right] + C$$

$$\int \sin 7x \cos 2x\, dx = \frac{-1}{18}\cos 9x - \frac{1}{10}\cos 5x + C$$