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19/MHS01/093
MEDICINE & SURGERY

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

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

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

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

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

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

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

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

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

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

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

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

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

$\int u dv = 3t \cdot \frac{1}{2} e^{2t} - \int \frac{1}{2} e^{2t} \cdot 3 dt$

$\int u dv = \frac{3}{2} t e^{2t} - \frac{3}{2} \int e^{2t} \cdot dt$

$\int u dv = \frac{3}{2} t e^{2t} - \frac{3}{2} \cdot \frac{1}{2} e^{2t} + C$

$$\int u\,dv = \frac{3}{2}te^{2t} - \frac{3}{4}e^{2t} + C$$

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

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

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

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

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

$= -\cos x \cdot x^2 + \int \cos x \, 2x\,dx$ —— (i)

from $\int \cos x \, 2x\,dx$

$u = 2x \qquad dv = \cos x$

$du = 2\,dx \qquad v = \sin x$

$uv - \int v\,du$

$2x \sin x - \int \sin x \, 2\,dx$ —— (ii)

Equation (ii) to (i)

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

$-x^2 \cos x + 2x \sin x - 2(-\cos x) + C$

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

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

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

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

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

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

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

(5) $\int$ s

$$\int \cos 5x \cos 6x = \frac{\sin 11x}{22} + \left(\frac{\sin -x}{-2}\right) + c$$

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

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

$$= \frac{1}{2}\left(\sin 7x + 2x) + \sin(7x - 2x)\right]$$

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

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

$$\int \sin 7x \cos 2x = \frac{-\cos 9x}{18} - \frac{\cos 5x}{10} + c$$