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MATRIC NO: 19/MHS01/259

DEPARTMENT: MBBS/MHS

COURSE: MAT104

LEVEL: 100 LVL

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a) $\int 2x^2 \ln x \, dx$

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

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

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

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

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

$$\int \ln x \, 2x^2 dx = \frac{2x^3}{3} (\ln x) - \frac{2}{3} \left(\frac{x^3}{3} \right) + C$$

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

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

$u = 3t \qquad du = 3dt$

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

recall; $\int u\,do = uv - \int v\,du$

$$\int 3te^{2t}\,dt = 3t\,\tfrac{1}{2}e^{2t} - \int \tfrac{1}{2}\,e^{2t}\cdot 3dt$$

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

$$\int 3te^{2t}\,dt = \frac{3}{2}te^{2t} - \frac{3}{2}\left(\frac{1}{2}e^{2t}\right) + C$$

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

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

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

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

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

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

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

$u = 2x$, $du = \cos x$

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

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

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

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

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

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d) $\int \cos 5x \cos 6x \, dx$

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

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

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

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

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

$$\int \cos 5x \cos 6x \, dx = \frac{\sin 11x}{22} - \frac{\sin x}{2} + C$$

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

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

recall:

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

$\therefore \sin 7x \cos 2x = \frac{1}{2}[\sin 9x + \sin 5x]$

$$\int \sin 7x \cos 2x \, dx = \frac{1}{2}\int (\sin 9x + \sin 5x)$$

$$\int \sin 7x \cos 2x \, dx = \frac{1}{2}\left(\frac{-\cos 9x}{9} - \frac{\cos 5x}{5}\right)$$

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