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COLLEGE : MEDICINE AND HEALTH SCIENCES

DEPARTMENT : MEDICINE AND SURGERY

MATRIC NUMBER : 19/MHS01/163

COURSE CODE : MAT 104

1 $\int 2x^2 \ln x \, dx$

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

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

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

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

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

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

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

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

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

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

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

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

$du = 3dt$

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

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

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

$= \frac{3}{2} te^{2t} - \frac{3}{2} \cdot \frac{e^{2t}}{2} + c$

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

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

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

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

$\frac{du}{dx} = 2x \qquad v = -\cos x$

$du = 2x\,dx$

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

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

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

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

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

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

$= 2x \sin x - 2 \int \sin x$

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

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

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

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

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

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

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

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

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

$= \frac{1}{2}\left(\frac{\sin 11x}{11} + \sin x\right) + c$

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

5 ~~$\sin 7x \cos$~~ $\int \sin 7x \cos 2x \, dx$

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

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

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

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

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