Name:- Mgbeze Blessing Ebelechukwu
Matric no:- 19/MH301/244
Department:- MBBS
Course code:- Mat 104

1. $2x^2\ln x$

$\frac{du}{dx} = \frac{1}{x}dx$, $u = \ln x$

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

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

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

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

$= \frac{2x^3}{3}\ln x - \frac{2x^3}{3\times 3} + c$

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

(2) $3te^{2t}$

$u = 3t$, $v = \frac{1}{2}e^{2t}$

$du = 3dx$, $dv = e^{2t}$

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

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

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

$= \frac{3t}{2}e^{2t} - \frac{1}{2} \cdot \frac{3}{2}e^{2t} + c$

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

Mgbaza Blessing Ebelechukwu
19/mhs01/244

3 $x^2 \sin x$

$u = x^2 \qquad v = -\cos x$

$du/dx = 2x dx \qquad dv/dx = \sin x$

$du = 2x dx$

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

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

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

$-x \cos x + \begin{cases} u = 2x & dv = \cos x \\ du = 2dx & v = \sin x \end{cases}$

$= -x^2 \cos x + uv - \int v du$

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

$\int x^2 \sin x = -x^2 \cos x + 2x \sin x - \int 2 \sin x$

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

4 $\cos 5x \cos 6x$

$A = 5x, 6x$

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

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

$= \frac{1}{2}\{\cos 11x - \cos x\}$

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

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

5 $\sin 7x \cos 2x$

$A = 7x, B = 2x$

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

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

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

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