MBBS Assignment 19/mhs01/235 LEBILE CELINE

① $\int 2x^2 \ln x \, dx$

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

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

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

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

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

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

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

2.) $\int 3te^{2t} dt \qquad$ let $u = t \qquad dv = e^{2t}$

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

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

$= \frac{t \times e^{2t}}{2} - \int \frac{e^{2t}}{2} \times 1$

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

Now solving $\int \frac{e^{2t}}{2} dt$

let $u = 2t \qquad = \int \frac{e^4}{2} \times \frac{1}{2} du$

$du = 2dt$

$dt = \frac{1}{2} du \qquad = \int \frac{e^4}{4} du$

$\therefore \frac{1}{4}\int e^u du$, Now solving $\int e^u du$
Applying exponential rule this is equal to e^u

$$\therefore \frac{1}{4}\int e^u du = \frac{e^u}{4}$$

Substitute for u

$$\frac{e^{2t}}{4}$$

Plug in solved integrals.

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

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

$\therefore$ Remember $3\int te^{2t} dt$

$$\left[\therefore \frac{3te^{2t}}{2} - \frac{3e^{2t}}{4} + C\right]$$

3) $\int x^2 \sin x \, dx$, let $u = x^2$ $\quad dv = \sin x$

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

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

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

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

Now solving $\left[\therefore \int -2x \cos(x) dx\right]$

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

let $u = x$ $\quad dv = \cos x$

$du = dx$ $\quad V = \sin x$

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

$x\sin x - \int \sin(x)\,dx$

$x\sin x - [-\cos(x)]$

$x\sin x + \cos(x)$ } put in $-2\int x\cos x\,dx$

$= -2x\sin x - 2\cos x$, put this in

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

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

$\therefore \int x^2\sin(x)\,dx = \underline{2x\sin x - x^2\cos(x) + 2\cos x + C}$

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

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

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

$\cos 5x\cos 6x = \frac{1}{2}\left[\frac{\cos 11x}{11} + \frac{\cos x}{1}\right] + C$

$\cos 5x\cos 6x = \underline{\frac{\cos 11x}{22} + \frac{\cos x}{2} + C}$

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

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

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

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

$= \frac{1}{2}\left[\frac{\cos 9x}{9} + \frac{\cos 5x}{5}\right] + C$

$= \underline{\frac{\cos 9x}{18} + \frac{\cos 5x}{10} + C}$

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