ABDULSALAM ONIZE EMMA.
17/MHS01/006.
MEDICINE AND SURGERY.
MATH 104 ASSIGNMENT.

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

SOLUTION:

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

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

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

$\int u\,dv = \ln x \left(\frac{2x^3}{3}\right) - \int \frac{2x^3}{3} \cdot \frac{1}{x} dx.$

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

$\int u\,dv = \frac{2x^3}{3}(\ln x) - \frac{2x^3}{9} + c$

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

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

SOLUTION

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

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

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

$= 3t\left(\frac{1}{2}e^{2t}\right) - \int \frac{1}{2}e^{2t} \cdot \frac{3t^2}{2} du.$

$= \frac{3}{2} te^{2t} - \int \frac{3}{4} t^2 e^{2t} du.$

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

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

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

SOLUTION.

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

$du = \frac{x^3}{3} dx$ $\quad v = -\cos x$

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

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

$\int u\, dv = -\cos x (x^2) - \left(-\sin x \cdot \frac{x^4}{12}\right) + C$

$\int x^2 \sin x\, dx = -\cos x (x^2) + \sin x \left(\frac{x^4}{12}\right) + C$

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

SOLUTION.

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

$A = 5x \quad B = 6x$

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

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

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

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

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

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

SOLUTION.

$A = 7x$, $B = 2x$; $\sin A \cos B = \frac{1}{2}[\sin(A+B) + \sin(A-B)]$

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

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

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

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