Name; Nwoga Thelma Ozichukwu.
COURSE CODE; MAT 104 ; COLLEGE; MHS DEPT; MBBS
MATRIC NO; 19/MHS01/265

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

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

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

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

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

b. $\int 3 + e^2 t \, dt$

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

$v = 1/2 \, e^{2t}$ $\quad dv = e^2 t$

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

$\int 3t e^{2t} dt = 3t \, 1/2 \, e^{2t} - \int 1/2 \, e^{2t} . 3dt$

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

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

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

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

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

$du = 2x\,dx \qquad v = -\cos x$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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