NAME: IVUWURIE OGHENEMINE RUTH
COLLEGE: MEDICINE AND HEALTH SCIENCES
DEPARTMENT: MEDICINE AND SURGERY
MATRIC NO: 19/MHS01/211
MAT 104 ASSIGNMENT

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

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

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

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

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

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

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

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

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

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

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

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

$du = 3dt$

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

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

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

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

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

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

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

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

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

$du = 2x\,dx$

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

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

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

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

Let $u = 2x$ $\quad dv = \cos x$

$du = 2$ $\quad v = \sin x$

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

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

$\therefore \int x^2 \sin x\,dx =$

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

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

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

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

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

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

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

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

$= \frac{\sin 11x}{2} + \frac{\sin x}{2} + C$

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

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

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

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

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

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