ANEJEH AUSTIN MAT104 ASSIGNMENT
19/MHS01/258

Integrate the following.

(1) $\int 2x^2 \ln x$

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

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

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

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

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

$= \ln x \frac{2x^3}{3} - \frac{2x^3}{9} + C = \frac{2x^3}{3}\left(\ln x - \frac{1}{3}\right) + C$

(2) $\int 3t e^{2t}$

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

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

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

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

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

(3) $x^2 \sin x$

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

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

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

$u = 2x \qquad dv = \cos x$

$du = 2dx \qquad v = \sin x$

$\Rightarrow 2x \sin x - \int \sin x\, 2\,dx$

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

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

(4) $\cos 5x \cos 6x$

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

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

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

$= \frac{1}{2}\frac{\sin 11x}{11} + \sin x$

$= \frac{\sin 11x}{22} + \frac{\sin x}{2} + C$ //

(5) $\sin 7x \cos 2x$

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

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

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

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

$= \frac{\sin 9x}{18} + \frac{\sin 5x}{10}$ //