NAME: SODEINDE OLUWASEMILOORE AHOOLUWAPO.

COLLEGE: MEDICINE AND HEALTH SCIENCES.

DEPARTMENT: MEDICINE AND SURGERY.

COURSE: GENERAL MATHEMATICS II (MAT 104).

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

Solution.

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

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

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

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

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

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

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

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

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

$\frac{du}{dt} = 3 dt$ $\quad v = 1/2 e^{2t}$

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

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

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

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

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

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

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

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

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

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

$u = x$; $du = dx$

$dv = \cos x \, dx$

$v = \sin x$;

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

$x \sin x - \int -\cos x$

$x \sin x + \cos x$.

$\int x^2 \sin x \, dx \quad -x^2 . \cos x + 2(x \sin x + \cos x)$

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

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

Solution

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

$\frac{1}{2}\int[\cos 11x + \cos x]$

$\frac{1}{2}\left[\frac{\sin 11x}{11} = \frac{\cos x}{1}\right]$

$\frac{\sin 11x}{22} - \frac{\cos x}{2} + c$.

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

Solution.

$\frac{1}{2}[\sin(7x + 2x) + \sin(7x - 2x)]$

$\frac{1}{2}\int[\sin 9x + \sin 5x]$

$\frac{1}{2}\left[\frac{-\cos 9x}{9} - \frac{\cos 5x}{5}\right]$

$-\frac{\cos 9x}{18} - \frac{\cos 5x}{10} + C$.