Name:- Udoh Imoh Victoria

Dept:- Petroleum Engineering

Matric No:- 19/ENG07/022

Lecturer's Name:- Dr Funmi Oyelami

Date of Submission:- 22-05-2020

Questions

Find the integral of the following (i) $\sin 7x \cos 2x\, dx$ (ii) $\cos 3x \cos x\, dx$ (iii) $\cos x / \sin^2 x\, dx$ (4) double integral with limits from 1 to 2, from 0 to 3 $(9x^2 y)\, dx\, dy$.

Answer

(1) $\sin 7x \cos 2x\, dx \quad A = 7x \quad B = 2x$

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

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

$$= \frac{1}{2}\left[\sin 9x + \sin 5x\right]$$

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

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

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

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

2) $\cos 3x \cos x\, dx \quad A = 3x \quad B = 1x$

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

$$= \frac{1}{2}\left(\cos (3x+1x) + \cos (3x-1x)\right]$$

$$= \frac{1}{2}\left[\cos 4x + \cos 2x\right]$$

$$\int \cos 3x \cos x\, dx = \frac{1}{2}\int \cos 4x + \cos 2x)$$

$$= \frac{1}{2}\left[\frac{\sin 4x}{4} + \frac{\sin 2x}{2}\right]$$

$$= \frac{1}{2}\left[\frac{\sin 4x}{4} + \frac{\sin 2x}{2}\right]$$

$$= \frac{\sin 4x}{8} + \frac{\sin 2x}{4} + C$$

$$\int \cos 3x \cos x\, dx = \frac{\sin 4x}{8} + \frac{\sin 2x}{4} + C$$

Scanned with CamScanner

3) $\cos x / \sin^2 x . dx$

Solution

$$\int \frac{\cos x}{\sin^2 x} dx \quad \text{let } u = \sin x \quad \frac{du}{dx} = \cos$$

$$dx = \frac{du}{\cos x} \quad \cos^2 x = 1 - \sin^2 x$$

$$\int \frac{\cos^2 x}{u^2} \cancel{\cos x} \frac{du}{\cancel{\cos x}}$$

$$\int \frac{1 - \sin^2 x}{u^2} = \int \frac{1 - u^2}{u^2} du$$

$$\int \left(\frac{1}{u^2} - \frac{u^2}{u^2} \right) du$$

$$\int (u^{-2}) du = \frac{u^{-1}}{-1} + C \Rightarrow \frac{u^{-1}}{-1} = \frac{(\sin x)^{-1}}{-1}$$

$$= -\sin x^{-1}$$

$$\int \frac{\cos x}{\sin^2 x} dx = -\sin x^{-1} \text{ or } \frac{-1}{\sin x}$$

4) double integral with limits from 1 to 2, from 0 to 3 $(9x^2y)dxdy$

Solution

$$\int_1^2 \left[\int_0^3 9x^2 y \, dx \right] dy$$

$$\int_0^3 9x^2 y \, dx$$

$$\left[\frac{9x^3 y}{3} \right]_0^3 \Rightarrow 81y$$

$$\int_1^2 81y \, dy$$

$$= \left[\frac{81y^2}{2} \right]_1^2$$

$$= \frac{81(2)^2}{2} - \frac{81(1)^2}{2} = \frac{324}{2} - \frac{81}{2} = \frac{243}{2} = 121.5$$