BILIAMEGN ADEDOKAPO ABDULFATTAH 19/ENG05/019.

DR OYELAMI

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

Solution

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

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

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

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

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

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

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

$= -\frac{1}{18}\cos 9x - \frac{1}{10}\cos 5x + C$

2 $\int \cos 3x \cos x \, dx$

Solution

$A = 3x \quad B = x$

Recall

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

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

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

$$\int \cos 3x \cos x = \frac{1}{2}\left[\int \cos 4x + \int \cos 2x\right]$$

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

$$= \frac{1}{8}\sin 4x + \frac{1}{4}\sin 2x + C$$

3 $\cos x / \sin^2 x \, dx$

Solution

$u = \sin x \quad du/dx = \cos x \quad dx = \frac{du}{\cos x}$

$$\int \frac{\cos x}{\sin^2 x} dx = \int \frac{\cancel{\cos x}}{u^2} \times \frac{du}{\cancel{\cos x}}$$

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

$$= \int u^{-2} du$$

$$= \frac{u^{-2+1}}{-2+1}$$

$$= \frac{u^{-1}}{-1}$$

$$= -u^{-1}$$

$$= -\frac{1}{u} = -1/u$$

$u = \sin x$

$$= -\frac{1}{\sin x} + C$$

4 $\int_1^2 \int_0^3 9x^2 y \, dx \, dy$

Solution

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

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

$$= (3x^3 y)_0^3$$

$$= [3(3)^3 y] - [0]$$

$$= 81y - 0$$

$$= 81y$$

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

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

$$= \left[\frac{81(2)^2}{2}\right] - \left[\frac{81(1)^2}{2}\right]$$

$$\left[\frac{81(4)}{2}\right] - \left[\frac{81}{2}\right]$$

$$\left(\frac{324}{2}\right) - \frac{81}{2}$$

$$162 - 40.5 = 121.5$$