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DEPARTMENT: MECHATRONICS

MATRIC NO: 19/ENG05/001.

Assignment.

find the integral of the following

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

solution

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

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

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

$$A+B = 7x+2x = 9x$$

$$A-B = 7x-2x = 5x$$

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

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

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

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

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

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

=

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

solution

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

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

$A+B = 3x + x = 4x$ $\quad$ $A-B = 3x - x = 2x$

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

$$= \int \frac{1}{2}(\cos 4x + \cos 2x)$$

$$= \frac{1}{2}\int \cos 4x + \cos 2x$$

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

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

3 $\int \frac{\cos x}{\sin^2 x}\, dx$

solution

$$\int \frac{\cos x}{\sin^2 x}\, dx$$

let $u = \sin x$

$$\frac{du}{dx} \cdot \cos x$$

$$dx = \frac{du}{\cos x}$$

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

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

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

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

$$\left[\frac{u^{-2+1}}{-2+1}\right] du$$

$$\frac{u^{-1}}{-1}\, du$$

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

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

4. find the double integral with limits

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

solution

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

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

$$\int_0^3 \frac{9x^3}{3} y$$

$$\int_0^3 3x^3 y$$

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

$$= 3(27)y - 0$$

$$= 81y - 0$$

$$= 81y$$

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

$$\int_1^2 \frac{81y^2}{2} \, dy$$

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

$$= \frac{81(\cancel{4})}{\cancel{2}_1} - \frac{81}{2}$$

$$\frac{162}{1} - \frac{81}{2}$$

$$= \frac{324 - 81}{2} = \frac{243}{2} = 121.5$$