

NAME: UNIAKOLAM DIVINE CHIZIMUZU

DEPT: MECHATRONICS ENGINEERING

COURSE TITLE/CODE: GENERAL MATHEMATICS (MATHS)

MATRIC NO: 19/ENG108/06H

Congratulations  
ON YOUR  
Graduation

Assignment for Dr. Ogelami's group  
find the integral of the following

1)  $\int \sin 7x \cos 2x dx$

Solution

$\int \sin ax \cos bx dx$ , using identity, we have:-  
 $\sin a \cdot \cos b = \frac{1}{2} (\sin(a+b) + \sin(a-b))$

$\therefore a = 7x, b = 2x$

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

$\sin 7x \cos 2x = \frac{1}{2} (\sin 9x + \sin 5x)$

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

$\therefore \int \sin 7x \cos 2x dx = \frac{1}{2} \left( -\frac{\cos 9x}{9} \right) + \frac{1}{2} \left( -\frac{\cos 5x}{5} \right) + C$

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

ans.

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

Solution

$$\int \cos 3x \cos x \, dx, \text{ using}$$

$$\cos a \cos b = \frac{1}{2} (\cos(a+b) + \cos(a-b)) \quad \text{where } a=3x \quad b=x$$

$$\therefore \cos 3x \cos x = \frac{1}{2} (\cos(3x-x) + \cos(3x+x))$$

$$\cos 3x \cos x = \frac{1}{2} (\cos 2x + \cos 4x)$$

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

$$= \frac{1}{2} \left( \frac{1}{2} \sin 2x \right) + \frac{1}{2} \left( \frac{1}{4} \sin 4x \right) + C$$

$$\therefore \int \cos 3x \cos x \, dx = \frac{1}{4} \sin 2x + \frac{1}{8} \sin 4x + C$$

ans.

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

Solution

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

$$\text{let } u = \sin x, \quad du = \cos x \, dx$$

$$\therefore \int \frac{\cos x}{\sin^2 x} \, dx = \int \frac{du}{u^2} = -\frac{1}{u}$$

$$\therefore = -\frac{1}{\sin x} = -\operatorname{cosecant} x \quad \text{or} \quad -\operatorname{csc} x$$

ans

Q1) Double Integral with limits from 1 to 2, from 0 to 3  $(9x^2y) dx dy$   
solution

Congratulations  
ON YOUR  
Graduation

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

$$\therefore \int_1^2 \left[ \frac{9x^3y}{3} \Big|_0^3 \right] dy = \int_1^2 \left[ \frac{9(3)^3y}{3} - \frac{9(0)^3y}{3} \right] dy$$

$$= \int_1^2 3^4 y dy = \frac{3^4 y^2}{2} \Big|_1^2$$

$$= \left[ \frac{3^4 (2)^2}{2} - \frac{3^4 (1)^2}{2} \right] = \frac{162}{1} - \frac{81}{2} = \frac{324 - 81}{2}$$

$$= \frac{243}{2} \text{ ans.}$$