

# MARI KHADIJAH USMAN

19/sci01/063

① Find the Integral for the following

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

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

c)  $\int \cos x / \sin^2 x \, dx$

Solution

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

$$= \int \frac{1}{2} [\sin(7x+2x) + \sin(7x-2x)] \, dx = \frac{1}{2} \int [\sin(9x) + \sin(5x)] \, dx$$

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

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

②  $\int \cos 3x \cos x \, dx = \int \frac{1}{2} [\cos(A+B) + \cos(A-B)]$

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

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

③  $\int \cos x / \sin^2 x \, dx$

Let  $u = \sin x$

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

$$\int \frac{\cos x}{u^2} \cdot \frac{du}{\cos x} = \int \frac{1}{u^2} du = \left[ \frac{u^{-2+1}}{-2+1} \right]$$

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

④ Double integral with limits from 1 to 2, from 0 to 3  
 $(9x^2y) \, dx \, dy$

Solution

$$\int_1^2 \int_0^3 9x^2y \, dx \, dy = \frac{243}{2}$$