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COURSE : MAT 1074 ASSIGNMENT
DEPARTMENT: COMPUTER SCIENCE
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$$1. \int \sin 7x \cos 2x \, dx$$

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

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

$$\begin{aligned} \int \sin 7x \cos 2x \, dx &= \frac{1}{2} \int (\sin 9x + \sin 5x) \, dx \\ &= \frac{1}{2} \left[-\frac{\cos 9x}{9} - \frac{\sin 5x}{5} \right] \\ &= -\frac{\cos 9x}{18} - \frac{\sin 5x}{10} + C \end{aligned}$$

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

$$A = 3x, \quad B = x$$

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

$$\begin{aligned} \int \cos 3x \cos x \, dx &= \frac{1}{2} \int (\cos 4x + \cos 2x) \, dx \\ &= \frac{1}{2} \left[\frac{\sin 4x}{4} + \frac{\sin 2x}{2} \right] \\ &= \frac{\sin 4x}{8} + \frac{\sin 2x}{4} + C \end{aligned}$$

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

$$\text{Let } u = \sin x$$

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

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

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

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

$$\text{Recall, } u = \sin x$$

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

$$4. \int_1^2 \left[\int_0^3 (9x^2 y) dx \right] dy$$

$$\int_0^3 (9x^2 y) dx$$

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

$$= [3x^3 y]_0^3 = [3(3)^3 y] - [3(0)^3 y]$$

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

$$= 81y$$

$$\int_1^2 81y dy$$

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

$$= \frac{81(2)^2}{2} - \frac{81(1)^2}{2} = \frac{81(4)}{2} - \frac{81(1)}{2}$$

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

$$= \frac{243}{2}$$

$$= 121.5$$