

Question 8

State the structural cue, then evaluate:

$$\int \sin x \cos^4 x \, dx.$$

Question 8 – Solution

Step 1: Identify the structural cue. The sine power is odd, and $\sin x \, dx$ is the differential of $-\cos x$. Keep the sine factor and use the cosine as the substitution.

Step 2: Substitute $u = \cos x$. Then

$$du = -\sin x \, dx, \quad \sin x \, dx = -du.$$

Step 3: Rewrite and integrate.

$$\begin{aligned} \int \sin x \cos^4 x \, dx &= - \int u^4 \, du \\ &= -\frac{u^5}{5} + C. \end{aligned}$$

Step 4: Return to x .

$$-\frac{1}{5} \cos^5 x + C$$