

Question 7

Choose the best method and evaluate:

$$\int \frac{x^2}{x^3 + 8} dx.$$

Question 7 – Solution

Step 1: Identify the structure. The denominator is $x^3 + 8$, and its derivative is $3x^2$. The numerator contains x^2 , so substitution is the shortest method.

Step 2: Substitute $u = x^3 + 8$. Then

$$du = 3x^2 dx, \quad x^2 dx = \frac{1}{3} du.$$

Step 3: Rewrite and integrate.

$$\begin{aligned} \int \frac{x^2}{x^3 + 8} dx &= \frac{1}{3} \int \frac{du}{u} \\ &= \frac{1}{3} \ln |u| + C. \end{aligned}$$

Step 4: Return to x .

$$\boxed{\frac{1}{3} \ln |x^3 + 8| + C}$$