

Question 6

Evaluate $\iiint_B (x^3 y z^2 + 4) \, dV$ on $B = [-2, 2] \times [-1, 1] \times [0, 3]$.

Tasks

1. Identify a cancellation symmetry.
2. Evaluate the integral.
3. State why the region matters.

Question 6 – Solution

Strategy. Pair x with $-x$; the nonconstant term is odd in x .

Step 1: Cancellation x^3yz^2 integrates to zero over the symmetric x -interval.

Step 2: Constant term The box volume is $(4)(2)(3) = 24$, so $\boxed{\iiint_B (x^3yz^2 + 4)dV = 4(24) = 96}$.

Verification Reflection $(x, y, z) \mapsto (-x, y, z)$ preserves B and reverses only the nonconstant term. Without that regional symmetry the cancellation would not follow.