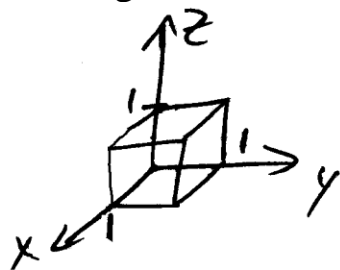


Verify Divergence Theorem, $\oiint_S \bar{A} \cdot d\bar{s} = \iiint_V \bar{\nabla} \cdot \bar{A} dv$, for $\bar{A} = x^2 y \hat{a}_x$ for surface S surrounding the volume $0 < x < 1$, $0 < y < 1$, and $0 < z < 1$.



$$\bar{\nabla} \cdot \bar{A} = \frac{d}{dx} x^2 y = \underline{\underline{2xy}}$$

$$\iiint_V \bar{\nabla} \cdot \bar{A} dv = \int_{z=0}^1 \int_{y=0}^1 \int_{x=0}^1 2xy dx dy dz$$

$$= 2 \int_{z=0}^1 dz \int_{y=0}^1 y dy \int_{x=0}^1 x dx$$

$$= 2(1-0) \left(\frac{y^2}{2} \right) \Big|_0^1 \left(\frac{x^2}{2} \right) \Big|_0^1 = 2 \left(\frac{1}{2} \right) \left(\frac{1}{2} \right)$$

$$\iiint_V \bar{\nabla} \cdot \bar{A} dv = \underline{\underline{0.5}}$$

$$\hat{a}_x \cdot \hat{a}_z = 0$$

$$\tilde{a}_x \cdot \tilde{a}_y = 0$$

$$\oiint_S \bar{A} \cdot d\bar{s} = \left[\begin{array}{l} \iint_{\text{top}} \bar{A} \cdot d\bar{s}_z + \iint_{\text{bot}} \bar{A} \cdot -d\bar{s}_z + \iint_{\text{right}} \bar{A} \cdot d\bar{s}_y \\ + \iint_{\text{left}} \bar{A} \cdot -d\bar{s}_y \end{array} \right]$$

$$+ \iint_{\text{front}} \bar{A} \cdot d\bar{s}_x + \iint_{\text{back}} \bar{A} \cdot -d\bar{s}_x \quad d\bar{s}_x = \hat{a}_x dy dz$$

$$= \int_{z=0}^1 \int_{y=0}^1 x^2 y dy dz + \int_{z=0}^1 \int_{y=0}^1 x^2 y dy dz = \underline{\underline{0.5}}$$