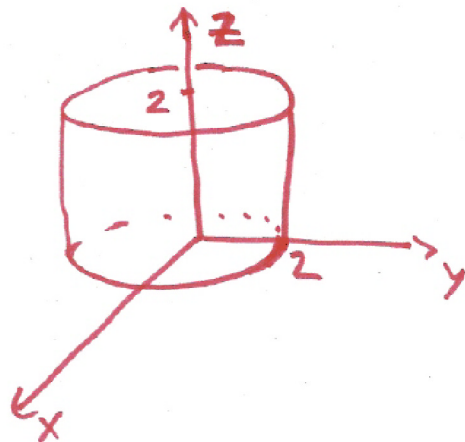


Problem 9. (10 pts) Use the divergence theorem to compute the flux of $\vec{F} = x^2\vec{i} - 2xy\vec{j} + xz\vec{k}$ across the boundary of the cylinder cut from $\{x^2 + y^2 \leq 4\}$ by the planes $z = 0$ and $z = 2$.

LET \mathcal{S} BE THE SURFACE OF THE CYLINDER ORIENTED OUTWARD, AND LET E BE THE INSIDE.



$$\iint_{\mathcal{S}} \vec{F} \cdot d\vec{S} = \iiint_E \operatorname{div} \vec{F} \, dV$$

$$= \iiint_E (2x - 2x + x) \, dV.$$

$$= \iiint_E x \, dV = \boxed{0} \quad (\text{By Symmetry})$$