

3. (5 points) E is the solid bounded by $z^2 = x^2 + y^2$, $z = 1$ and $z = 4$. Use the Divergence Theorem to find the flux of $\vec{F}(x, y, z) = \langle z, y, z \rangle$ out of the boundary of E if it is oriented out. Hint: Use cylindrical coordinates, not spherical coordinates.

4. (5 points) Let C be a simple closed smooth curve that lies in the plane $x + y + z = 1$. Show the work done by $\vec{F}(x, y, z) = \langle z, -2x, 3y \rangle$ on a particle traveling once around C depends only on the area of the region Σ enclosed by C in the plane and the orientation of C , but not on the shape or location of C in the plane. Hint: $\text{Area}(\Sigma) = \iint_{\Sigma} dS$.