

1. Find the flux of $\vec{F} = z^2 \hat{z}$ through the upper hemisphere of the sphere $x^2 + y^2 + z^2 = 25$, oriented away from the origin.
2. Let $\vec{H} = (e^{xy} + 3z + 5) \hat{x} + (e^{xy} + 5z + 3) \hat{y} + (3z + e^{xy}) \hat{z}$. Calculate the flux of \vec{H} through the square of side 2 with one vertex at the origin, one edge along the positive y -axis, one edge in the xz -plane with $x > 0$, $z > 0$, and with normal $\vec{n} = \hat{x} - \hat{z}$.