

Find the upward pointing flux of the electric field $\vec{E} = E_0 z \hat{z}$ through the part of the surface $z = -3s^2 + 12$ (cylindrical coordinates) that sits above the (x, y) -plane.

Break this problem into steps:

- Sketch the paraboloid and the vector field.
- Sketch a representative $d\vec{A}$ and calculate $d\vec{A}$ algebraically.
- Calculate the flux.