Find the upward pointing flux of the electric field $\vec{E} = E_0\, z\, \hat{\boldsymbol{z}}$ 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 $d\vec{\boldsymbol{A}}$ and calculate $d\vec{\boldsymbol{A}}$ algebraically.
- Calculate the flux.