Special Problem 2-5.6

Evaluate the surface integral:

\[ \iint_S \mathbf{A}(\mathbf{r}) \cdot d\mathbf{s} \]

where:

\[ \mathbf{A}(\mathbf{r}) = \left( \rho^2 + z^2 \right) \mathbf{\hat{a}}_\rho + \rho \mathbf{\hat{a}}_\phi \]

and \( S = S_1 + S_2 \) where:

In other words, \( S_1 \) is a 45 degree cone, and \( S_2 \) is the flat surface that forms the top of the cone.