Special Problem 2-5.15

Determine the surface integral:

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

where:

\[ A(\mathbf{r}) = 3 \sin \phi \hat{\rho} + \frac{\cos \theta \sin \phi}{r} \hat{\phi} + 4r \sin \phi \hat{z} \]

Note surface \( S \) lies entirely on the \( z-y (x=0) \) plane, but entirely above the \( x-y (z=0) \) plane:

**Hint:** Keep the direction of \( \mathbf{ds} \) consistent!