Special Problem 2-5.15

Determine the surface integral:

$$\iint_S \mathbf{A}(\overline{r}) \cdot \overline{ds}$$

where:

$$\mathbf{A}(\overline{r}) = 3\sin\phi\,\hat{a}_\rho + \frac{\cos\theta\sin\phi}{r}\,\hat{a}_\phi + 4r\sin\phi\,\hat{a}_z$$

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 $\overline{ds}$ consistent!