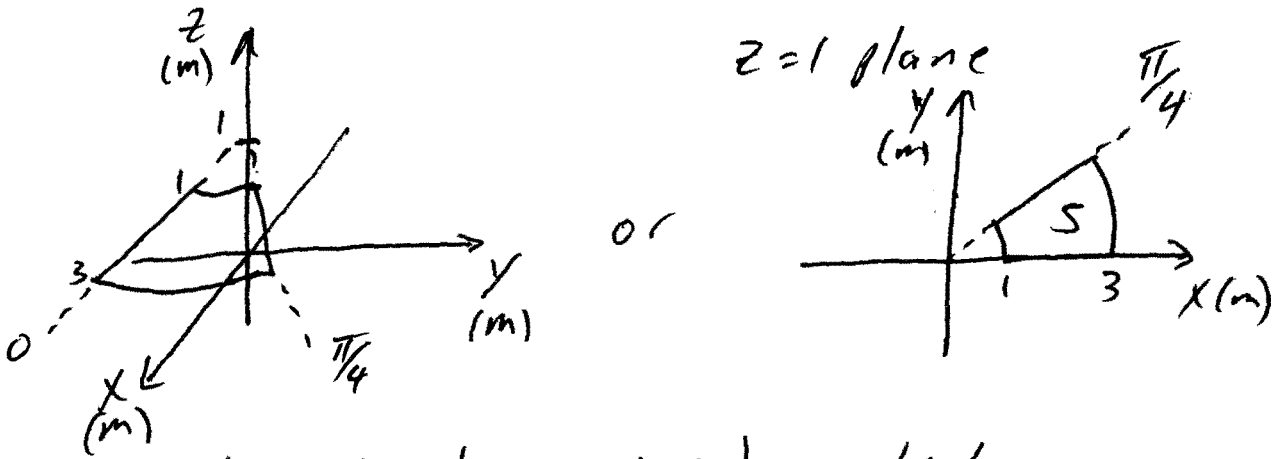
3.2 Calculate the areas of the following surfaces using the differential surface area *dS*:

- Sketch surface.

b) $z = 1,\ 1 < \rho < 3,\ 0 < \phi < \pi/4$



$$|d\bar{S}_z| = |\rho\, d\phi\, d\rho\, \hat{a}_z| = \rho\, d\phi\, d\rho$$

$$\text{Area} = \iint_S \rho\, d\rho\, d\phi = \int_{\rho=1}^{3} \rho\, d\rho \int_{\phi=0}^{\pi/4} d\phi$$

$$= \frac{\rho^2}{2}\Big|_{\rho=1}^{3} \phi\Big|_{\phi=0}^{\pi/4}$$

$$= \left(\frac{3^2}{2} - \frac{1^2}{2}\right)\left(\frac{\pi}{4} - 0\right) = \pi$$

$$\text{Area} = 3.14159\ m^2$$