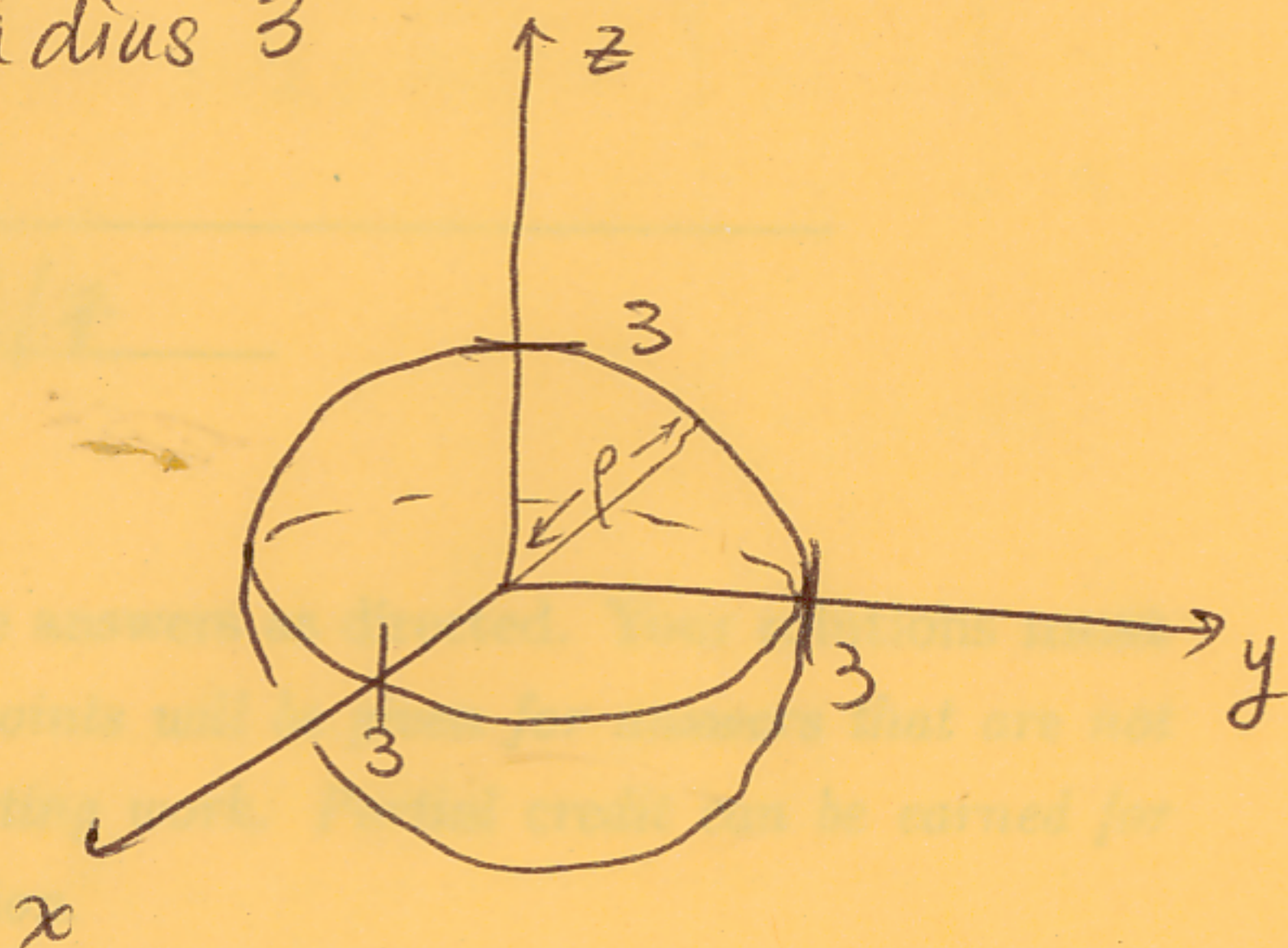


5. Identify the equations below, either by sketching or by describing their graphs.

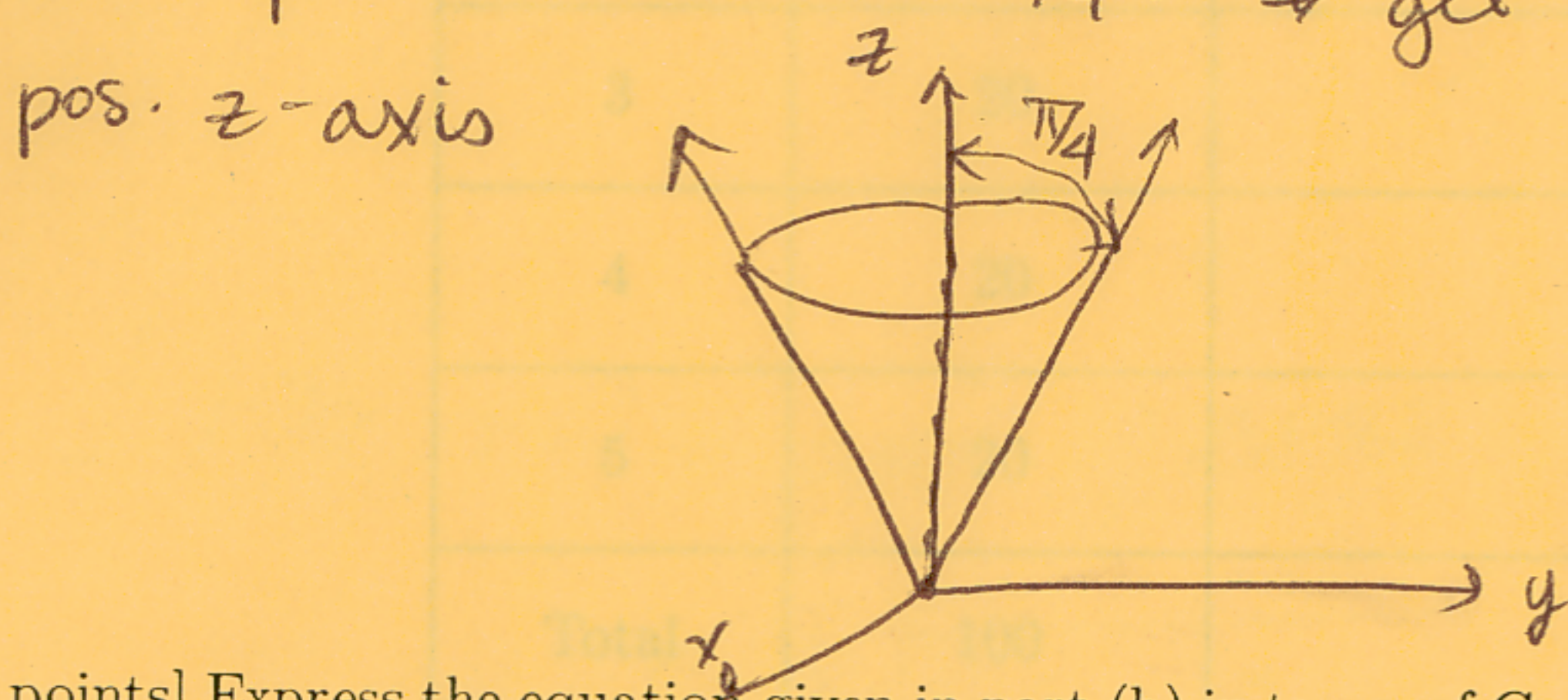
(a)  $\rho = 3$

$\theta$  and  $\phi$  are free to take on any values, so this describes the set of all points whose distance to the origin is 3  $\rightarrow$  it's a sphere of radius 3



(b)  $\phi = \pi/4$

$\phi$  is the angle with the positive z-axis, and  $\theta$  and  $\rho$  are free to take on any values, so this is the set of all points whose angle with the pos. z-axis is  $\pi/4$ :  $\Rightarrow$  get a cone around the pos. z-axis



Extra Credit [5 points] Express the equation given in part (b) in terms of Cartesian Coordinates (x,y,z).

$\phi = \pi/4$

$\Rightarrow$  since  $z = \rho \cos \phi \Rightarrow z = \rho \frac{1}{\sqrt{2}}$

$r = \sqrt{x^2 + y^2 + z^2} \Rightarrow z = \frac{1}{\sqrt{2}} (\sqrt{x^2 + y^2 + z^2})$

$\Downarrow$

$z^2 = \frac{1}{2} (x^2 + y^2 + z^2)$

$\Downarrow$

$\boxed{z^2 = x^2 + y^2}$

equation of a cone with angle  $\phi = \pi/4$  in cart. coord.