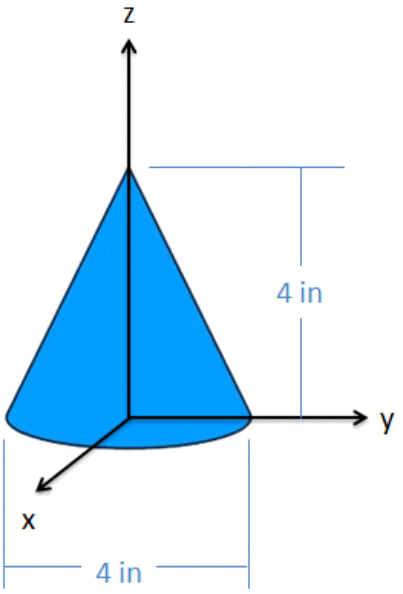
Question 1

The cone shown below is four inches tall and has a four inch diameter base. Find the x, y, and z coordinates of the centroid



Symetric about yz plane

$$\bar{x} = 0$$

Symetric about xz plane

$$\bar{y} = 0$$

not symetric about xy plane

$$\bar{z} \neq 0$$

$$\bar{z} = \frac{\int_{z_{min}}^{z_{max}} (dV)(z)}{V} = \frac{\int_0^4 (\pi r^2)\, dz\, (z)}{\frac{1}{3}\pi r^2 h}$$

$$r = \left(2 - \tfrac{1}{2}z^2\right)$$

$$\bar{z} = \frac{\pi \int_0^4 \left(2-\frac{1}{2}z^2\right)(z)\, dz}{\frac{1}{3}\pi (2)^2 (4)} = \frac{\int_0^4 \left(\frac{1}{4}z^3 - 2z^2 + 4z\right)}{5.33}$$

$$\bar{z} = \frac{\left|_0^4 \frac{1}{16}z^4 - \frac{2}{3}z^3 + 2z^2\right.}{5.33} = \frac{5.33}{5.33} = \boxed{1 \text{ in}}$$