20-R-KIN-DK-6

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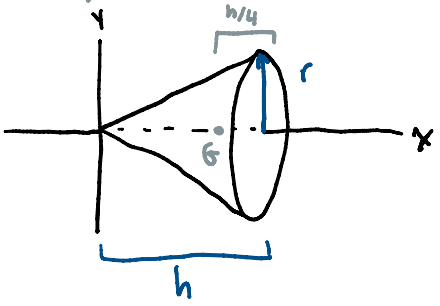
05-27-1 Beginner Radius of Gyration Video

Inspiration: Hibbeler 17-5



Determine the radius of gyration about the y-axis of the cone with a constant density of ***rho = 650 kg/m^3***. The cone has a radius ***r = 30 cm*** and a height ***h = 85 cm***. The center of gravity is found a distance h/4 away from the circular base of the cone.

$$V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi (0.3\,m)^2 (0.85\,m)$$
$$= 0.080110612\ m^3$$
$$m = \rho V = (650)(0.080110612) = \frac{663}{40}\pi$$

G is located at $\frac{h}{4}$ thus the distance from the y-axis would be the difference in height and G

$$I_{yy} = I_{mG} + md^2 = \frac{2}{60}\left(\frac{663}{40}\pi\right)\left(4(0.3)^2 + (0.85)^2\right) + \frac{663}{40}\pi\left(0.85 - \frac{0.85}{4}\right)^2$$
$$= 23.276138851\ kgm^2$$

$$k_y = \sqrt{\frac{I_{yy}}{m}} = \sqrt{\frac{23.276138851}{\left(\frac{663}{40}\pi\right)}} = \boxed{0.668540586\ m}$$