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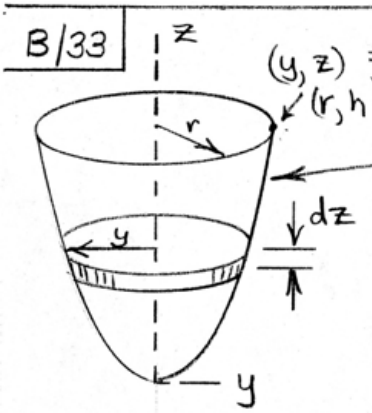

$z = ky^2$: $h = kr^2$, $k = \frac{h}{r^2}$

$\therefore z = \frac{h}{r^2} y^2$

$$\begin{cases} dm = \rho \pi y^2 dz \\ dI_{zz} = \frac{1}{2} \rho \pi y^4 dz \end{cases}$$

$$I_{zz} = \int dI_{zz}$$

$$= \int_0^h \frac{1}{2} \rho \pi \left(\frac{r^2}{h} z \right)^2 dz$$

$$I_{zz} = \frac{1}{2} \rho \pi \frac{r^4}{h^2} \cdot \frac{h^3}{3} = \frac{1}{6} \rho \pi r^4 h$$

$$m = \rho V = \rho \int_0^h \pi y^2 dz = \rho \pi \int_0^h \frac{r^2}{h} z \, dz$$

$$= \rho \pi \frac{r^2}{h} \frac{h^2}{2} = \frac{1}{2} \rho \pi r^2 h$$

So $I_{zz} = \frac{1}{6} \rho \pi r^4 h \left(\frac{m}{\frac{1}{2} \rho \pi r^2 h} \right) = \frac{1}{3} m r^2$

$$k_z = \sqrt{\frac{I_{zz}}{m}} = \underline{\underline{\frac{r}{\sqrt{3}}}}$$