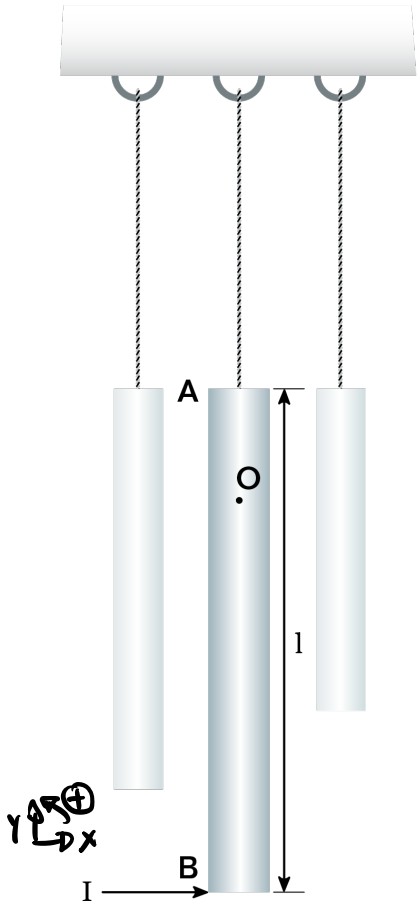
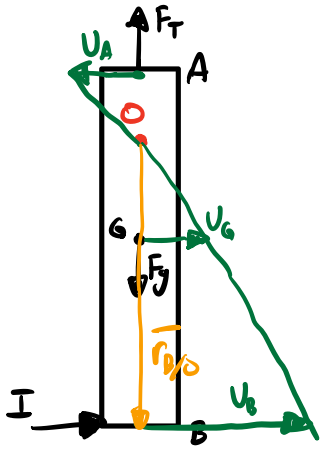
A windchime consists of several slender rods, each suspended on one end by a rope and each with mass m. Consider a singular rod for this problem. As the wind blows, the rod is subjected to an impulse I at its bottom. Determine the vertical location of point O in which the rod appears to rotate.





$$\rightarrow: \quad m v_{Gx1} + \sum \int_{t_1}^{t_2} F_x \, dt = m v_{Gx2}$$

$$0 + I = m v_{Gx2} \qquad (1)$$

$$M_G: \quad I_G \omega_1 + \sum \int_{t_1}^{t_2} M_G \, dt = I_G \omega_2$$

$$0 + I\left(\frac{\ell}{2}\right) = \frac{1}{12} m \ell^2 \omega_2 \qquad (2)$$

(2) $\rightarrow$ $I = \frac{1}{6} m \ell \omega_2$

(1) $\rightarrow$ $v_{Gx2} = \frac{1}{6} \ell \omega_2$

$v_B = \omega_2 r_{B/O}$

$$\frac{v_{B2}}{r_{B/O}} = \frac{v_{Gx2}}{r_{B/O} - \frac{\ell}{2}}$$

$$\frac{\omega_2 r_{B/O}}{r_{B/O}} = \frac{\frac{1}{6}\ell\omega_2}{r_{B/A} - \frac{\ell}{2}}$$

$$r_{B/O} = \frac{1}{6}\ell + \frac{\ell}{2}$$

$$\boxed{r_{B/O} = \frac{3}{2}\ell}$$