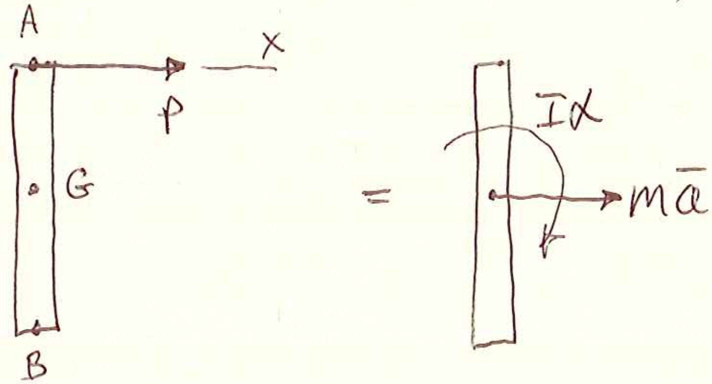
PROB. 16-48

$\vec{P} = (0.25)\hat{i}$ LB, $\vec{W} = (1.75)\hat{j}$ LB, FIND a_A, a_B



$\Sigma F_x = ma_x$: $P = m\bar{a}$, $\bar{a} = \frac{P}{m} = \frac{Pg}{W}$

$$\bar{a} = \frac{(0.25\text{ LB})(32.2\ \frac{ft}{s^2})}{(1.75\text{ LB})} = 4.6\ \frac{ft}{s^2} \rightarrow$$

$\Sigma \vec{M}_G = \Sigma (\vec{M}_G)_{EFF}$ $+\circlearrowright$: $-\left(\frac{L}{2}\right)P = -I\alpha$, $\alpha = \frac{LP}{2I}$

$I = \frac{1}{12}mL^2 = \frac{1}{12}\left(\frac{W}{g}\right)L^2$ (SLENDER ROD)

$$\alpha = \frac{LP}{2\left(\frac{1}{12}\cdot\frac{WL^2}{g}\right)} = \frac{6gP}{WL} = \frac{6(32.2\ \frac{ft}{s^2})(0.25\text{ LB})}{(1.75\text{ LB})(3\text{ ft})} = 9.2\ \frac{RAD}{s^2}$$

$$a_A = \bar{a} + \left(\frac{L}{2}\right)\alpha = \left(4.6\ \frac{ft}{s^2}\right) + \left(\frac{3\text{ ft}}{2}\right)\left(9.2\ \frac{RAD}{s^2}\right) = 18.4\ \frac{ft}{s^2} \rightarrow$$

$$a_B = \bar{a} - \left(\frac{L}{2}\right)\alpha = \left(4.6\ \frac{ft}{s^2}\right) - \left(\frac{3\text{ ft}}{2}\right)\left(9.2\ \frac{RAD}{s^2}\right) = -9.2\ \frac{ft}{s^2} \leftarrow$$