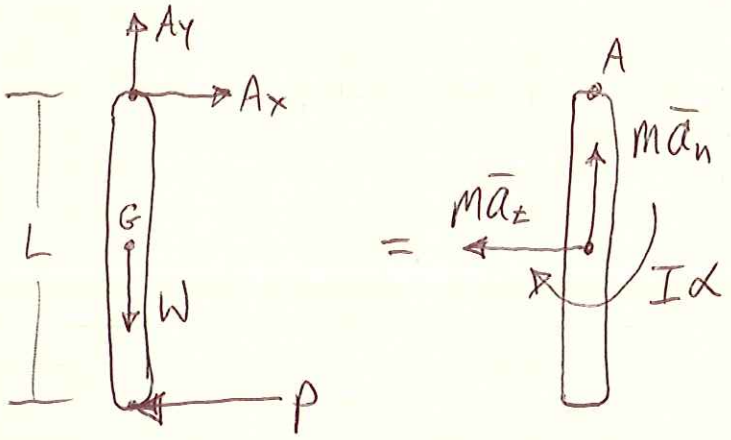
PROB. 16-76

$L = 3^{ft}$, $W = 4^{LB}$, $h = L = 3^{ft}$, FIND α, A_x, A_y

BAR IS INITIALLY AT REST, $\therefore \omega = 0$



$\Sigma F_x = m\bar{a}_x$: $A_x - P = -m\bar{a}_t$, $\bar{a}_t = \left(\frac{L}{2}\right)\alpha$

$A_x = P - m\left(\frac{L}{2}\right)\alpha$ $\boxed{= P - \frac{1}{2}\left(\frac{W}{g}\right)L\alpha}$

$\Sigma F_y = m\bar{a}_y$: $A_y - W = m\bar{a}_n$, $\bar{a}_n = \left(\frac{L}{2}\right)\omega^2$

INITIALLY, THE BAR IS STATIONARY, SO $\omega = 0$

$\boxed{A_y = W = 4^{LB}}$

$\Sigma M_A = \Sigma (M_A)_{EFF}$ $\circlearrowleft$: $-LP = -\left(\frac{L}{2}\right)m\bar{a}_t - I\alpha$

$LP = \left(\frac{L}{2}\right)\left(\frac{W}{g}\right)\left(\frac{L}{2}\right)\alpha + \frac{1}{12}\left(\frac{W}{g}\right)L^2\alpha$

$P = \frac{1}{3}\left(\frac{W}{g}\right)L\alpha$, $\alpha = \frac{3gP}{WL}$

$\alpha = \frac{3\left(32.2\ \frac{ft}{s^2}\right)(1.5^{LB})}{(4^{LB})(3^{ft})}$ $\boxed{= 12.07\ \frac{RAD}{s^2}\ \curvearrowright}$

$a_x = (1.5^{LB}) - \frac{1}{2}\left(\frac{4^{LB}}{32.2\ \frac{ft}{s^2}}\right)(3^{ft})\left(12.07\ \frac{RAD}{s^2}\right)$ $\boxed{= -0.75^{LB} \leftarrow}$