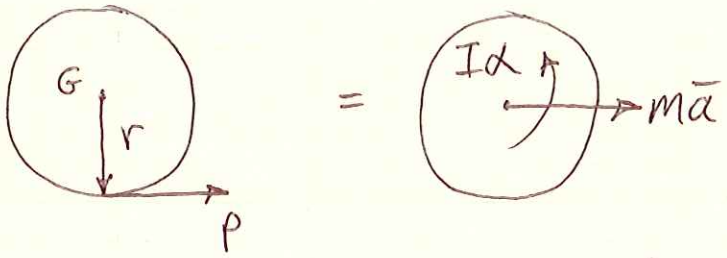
PROB. 16-52

$\theta = 2\pi$



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

$\Sigma \vec{M}_G = \Sigma (\vec{M}_G)_{EFF}$ $\circlearrowleft$: $rP = I\alpha$, $\alpha = \frac{rP}{I}$

$I = \frac{1}{2} m r^2$

$\alpha = \frac{rP}{\frac{1}{2} m r^2} = \frac{2P}{mr}$

$\theta = \cancel{\theta_0}^{\,0} + \cancel{\omega_0}^{\,0} t + \frac{1}{2}\alpha t^2$ UNIFORMLY ACCELERATED MOTION

$t^2 = \frac{2\theta}{\alpha} = \frac{2\theta}{\left(\frac{2P}{mr}\right)} = \frac{mr\theta}{P}$

FOR $\theta = 2\pi$, $t^2 = \frac{2\pi mr}{P}$

DISTANCE TRAVELED BY CENTER POINT:

$X = \cancel{X_0}^{\,0} + \cancel{v_0}^{\,0} t + \frac{1}{2} a t^2$

$X = \frac{1}{2}\bar{a}t^2 = \frac{1}{2}\left(\frac{P}{m}\right)\left(\frac{2\pi mr}{P}\right) = r\pi$