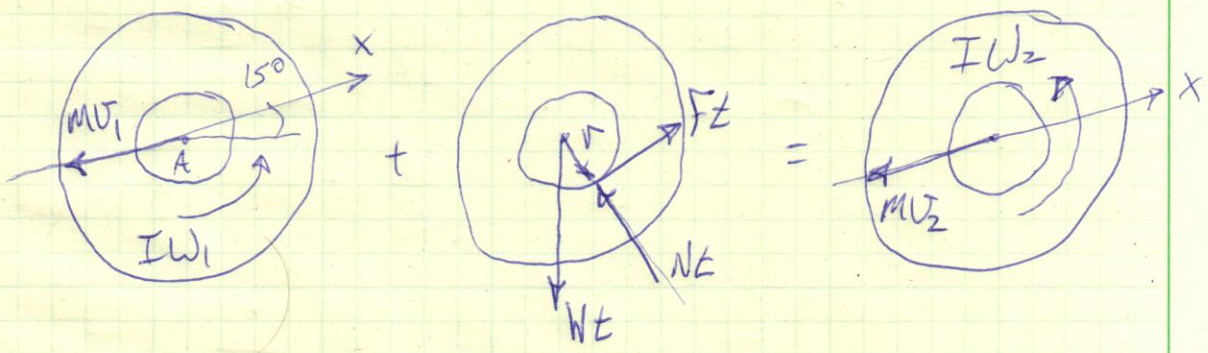
$r = 1.5^{in} = 0.125^{ft}$, $\omega_1 = 0$, $v = (6\frac{in}{s}) = \frac{1}{2}\frac{ft}{s}$

$t = 30^{s}$, FIND K



X-DIR. LINEAR MOMENTUM:

$-m\cancel{v_1}^{0} + Ft - Wt\sin\theta = -mv_2$

$\boxed{Ft = -mv_2 + Wt\sin\theta}$ ①

ANGULAR MOMENTUM ABOUT A $+\circlearrowleft$:

$I\cancel{\omega_1}^{0} + Ft \cdot r = I\omega_2$

$\boxed{Ft = \frac{I\omega_2}{r}}$ ②

SET ① = ②

$-mv_2 + Wt\sin\theta = \frac{I\omega_2}{r}$

$I = mK^2$

FOR NO SLIPPING, $v_2 = r\omega_2$, $\omega_2 = \frac{v_2}{r}$

$$-mv_2 + Wt\sin\theta = \frac{(mK^2)\left(\frac{v_2}{r}\right)}{r}$$

$$K = \sqrt{\frac{r^2(Wt\sin\theta - mv_2)}{mv_2}}$$

$$K = r\sqrt{\left(\frac{Wt\sin\theta}{mv_2}\right) - 1}$$

$$W = mg$$

$$K = r\sqrt{\left(\frac{gt\sin\theta}{v_2}\right) - 1}$$

$$K = (0.125\,ft)\sqrt{\left[\frac{\left(32.2\,\frac{ft}{s^2}\right)(30^s)\sin 15^\circ}{\left(\frac{1}{2}\,\frac{ft}{s}\right)}\right] - 1}$$

$$\boxed{K = 2.792\,ft}$$