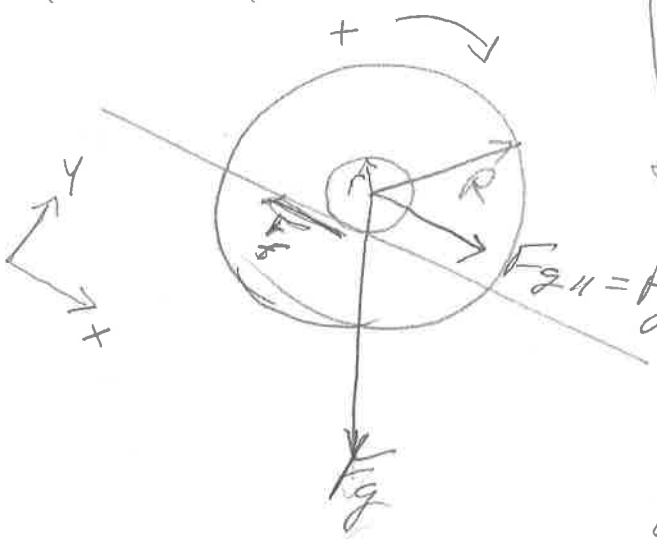
PS #10 Q5

$\sum \vec{\tau} = I\vec{\alpha}$ $\quad a = \alpha r$

$\sum \vec{F} = m\vec{a}$




$\sum \vec{\tau} = I\vec{\alpha}$ $\quad \sum F = ma$

$F_f r = I\alpha$ $\quad F_{g\parallel} - F_f = ma$

$F_{g\parallel} r - m\alpha r^2 = I\alpha$ $\quad F_{g\parallel} - ma = F_f$

$F_{g\parallel} - m\alpha r = F_f$

$F_{g\parallel} r = I\alpha + mr^2\alpha$

$$\frac{F_{g\parallel} r}{I + mr^2} = \alpha$$

$I_{PA}$

$$\alpha = \frac{(mg\sin 30^\circ)(0.1\,m)}{\frac{1}{2}m(0.3m)^2 + m(0.1m)^2} \quad \text{mass cancels}$$

$$= \frac{5\,m/s^2\ (.1m)}{.055\,m^2}$$

$$= 9.1/s^2$$

$a = \alpha r = 0.91\,m/s^2$

$\tau_{\text{Pt of contact}} = I_{\text{Parallel axis}}\,\alpha$

$F_{g\parallel} \cdot r = I_{PA}\alpha$

$$\alpha = \frac{F_{g\parallel} \cdot r}{I_{PA}}$$