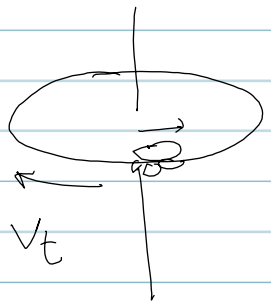
Cons of Ang. Momentum tutorial Qs

(1)



Cons. of ang mom about axis

$$m_c v_c r = m_t v_t r$$

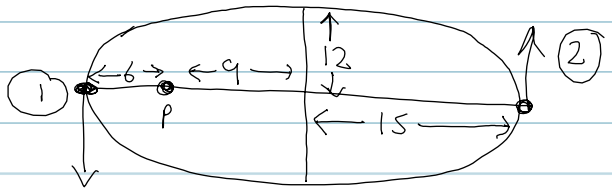
$$m_c (V_t + 0.75) = m_t V_t$$

$$V_t = -0.125 \text{ m/s}.$$

$$\text{But } V_t = \frac{2\pi r}{T} \Rightarrow T = \frac{2\pi r}{0.125} = 15\text{s}$$

Angular speed is ≈ 4 rpm.

(2)



$V_1 = 8000$ m/s

a) $F \rightarrow r \rightarrow$
$\tau = 0$ because $\sin\theta = 0$

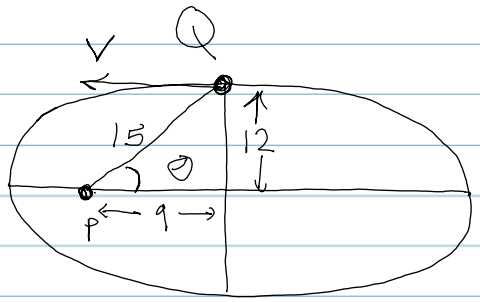
b) $m_s V_1 r_1 = m_s V_2 r_2$

$$V_2 = \frac{r_1}{r_2} V_1$$

$$= \frac{6}{24} 8000$$

$$= 2000 \text{ m/s}$$

c)



Ang mom at Q

$= m_s V_Q r_Q \sin\theta$

$= \cancel{m_s \theta}$

$= m_s V_Q \, 15000 \times 10^3 \times 0.8$

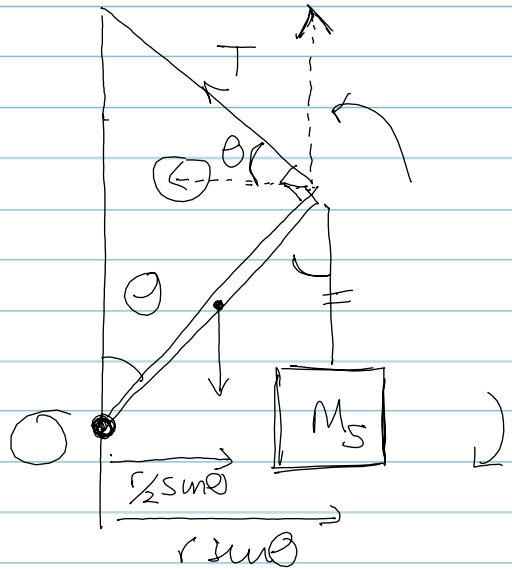
Conserve AM.

$\cancel{m_s V_1 r_1} = \cancel{m_s V_Q} \times 12000 \times 10^3$

$V_Q = \frac{6000}{12000} \times 8000$

$= 4000 \text{ m/s}$

3



a) Torques about O

$Tr = m_s g \frac{r}{2}\sin\theta + M_b g \frac{r}{2}\sin\theta$

$= 74 \text{ N}$

b) Resolve forces

Vertical $\Rightarrow F_V + T\sin\theta = (M_b + M_s)g$

$F_V = 103 \text{ N} \uparrow$

Horiz. $F_H = T\cos\theta$

$= 59 \text{ N} \rightarrow$