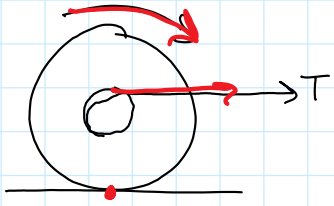
Phy 4A 11/28

Monday, November 28, 2016 10:06 AM

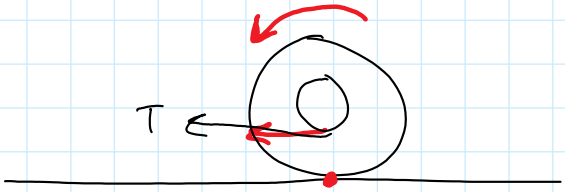
Review for exam

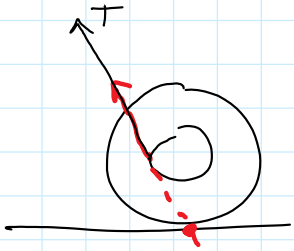
Torque:



pull on string: what happens to wheel?

rotates clockwise





No torque → no rotation

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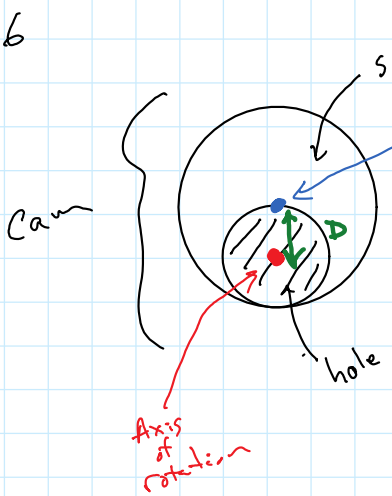


$$I_{cam} = I_{\substack{solid\\disk}} - I_{hole}$$

(Parallel axis theorem)

$$I_{\substack{solid\\disk}} = I_{cm} + M_{\substack{solid\\disk}} D^2$$

$$= \frac{1}{2} M_{\substack{solid\\disk}} R^2 + M_{\substack{solid\\disk}} \left(\frac{R}{2}\right)^2$$

$$= \frac{1}{2} M_{\substack{solid \\ disk}} R^2 + M_{\substack{solid \\ disk}} \left(\frac{R}{2}\right)^2$$

$$= \frac{3}{4} M_{\substack{solid \\ disk}} R^2 = \frac{3}{4}\left(\frac{4}{3} M_{cam}\right) R^2$$

$$M_{\substack{solid \\ disk}} = M_{cam} + M_{hole}$$

$$I_{\substack{solid \\ disk}} = M_{cam} R^2$$

$$A_{Disk} = \pi R^2$$

$$A_{hole} = \pi \left(\frac{R}{2}\right)^2 = \frac{1}{4}\pi R^2$$

$$\frac{3}{4} M_{\substack{solid \\ disk}} = M_{cam}$$

$$M_{\substack{solid \\ disk}} = \frac{4}{3} M_{cam}$$

$$I_{hole} = \frac{1}{2} M_{hole} \left(\frac{R}{2}\right)^2$$

$$= \frac{1}{2}\left(\frac{1}{3} M_{cam}\right)\left(\frac{R}{2}\right)^2$$

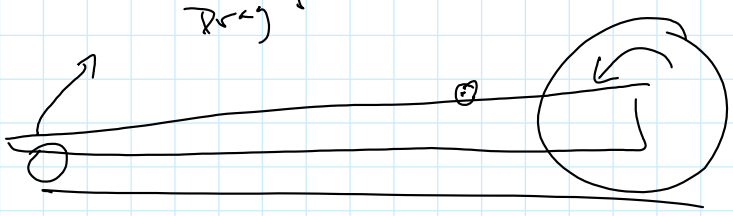
$$I_{cam} = I_{\substack{solid \\ disk}} - I_{hole}$$

$$L_i = L_f$$

$$I_i \omega_i = I_f \omega_f$$

- Divers
- Ice skaters

Drag race car

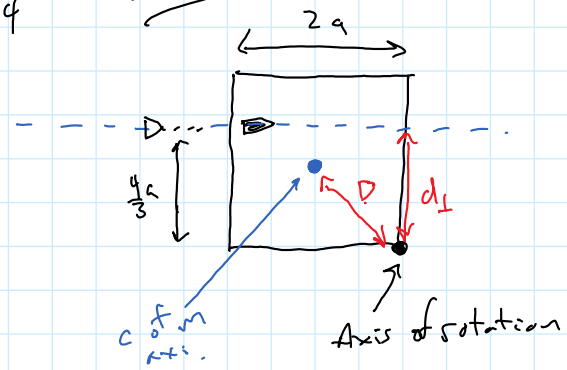


Big I

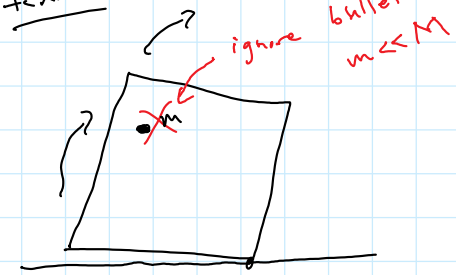
So car doesn't flip over

Ch 11 # 64

Initial



final



$$L_i = L_f$$

Collision

$$L_{bullet} + L_{block} = L_{(bullet + block)}$$

$$p d_\perp + 0 = I_{block}\,\omega \qquad (m \ll M)$$

$$mv\left(\frac{4a}{3}\right) + 0 = \left[I_{cm} + M_{block} D^2\right]\omega$$

$$= \left[\frac{1}{12} M\left[2(2a)^2\right] + M\left[\sqrt{2}\,a\right]^2\right]\omega$$

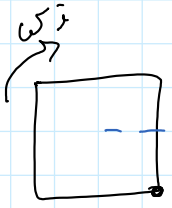
$$= \left[\frac{2}{3} Ma^2 + 2Ma^2\right]\omega$$

$$\frac{4}{3} mva = \underbrace{\frac{8}{3} M a^2}_{I}\,\omega$$

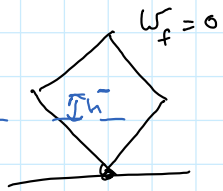
after Collision

$$E_i = E_f$$

initial



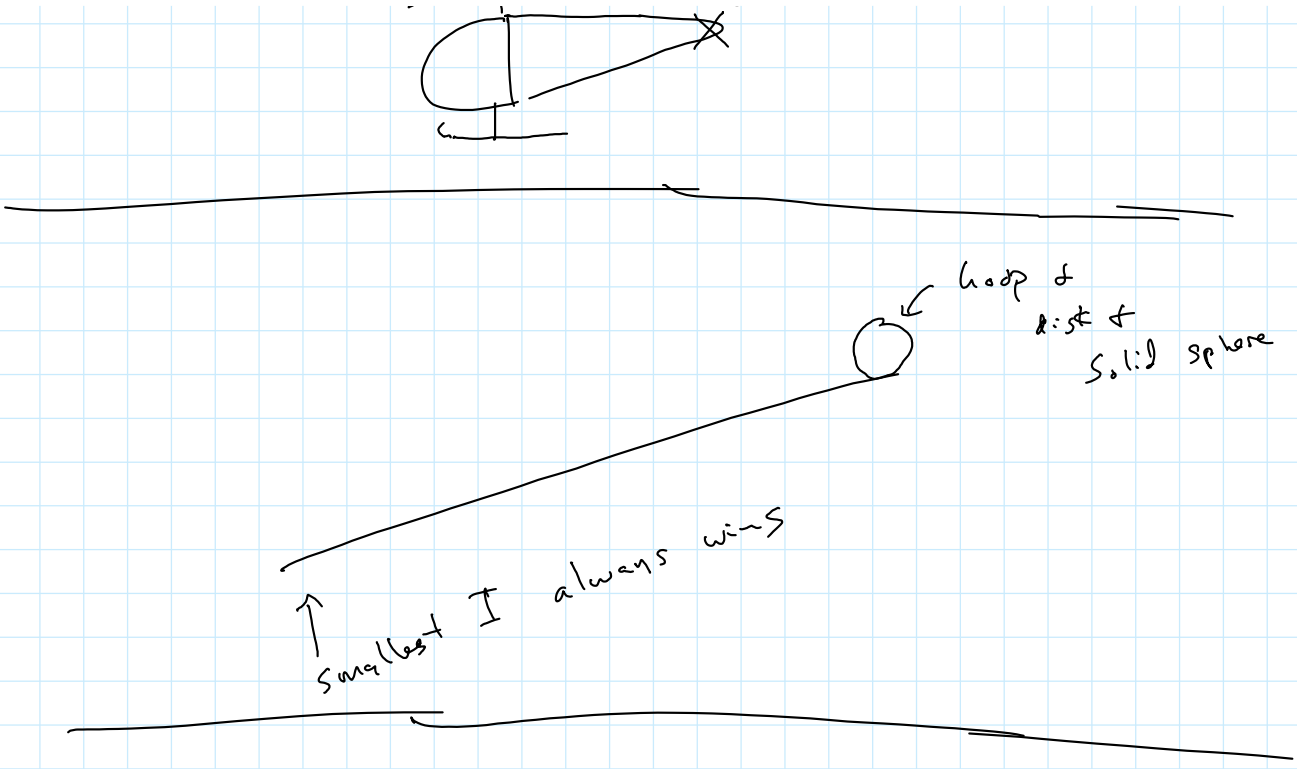
final



$$K_R = U_g$$

$$\frac{1}{2} I \omega_i^2 = Mgh$$

helicopters


hoop &
disk &
Solid sphere
smallest I always wins