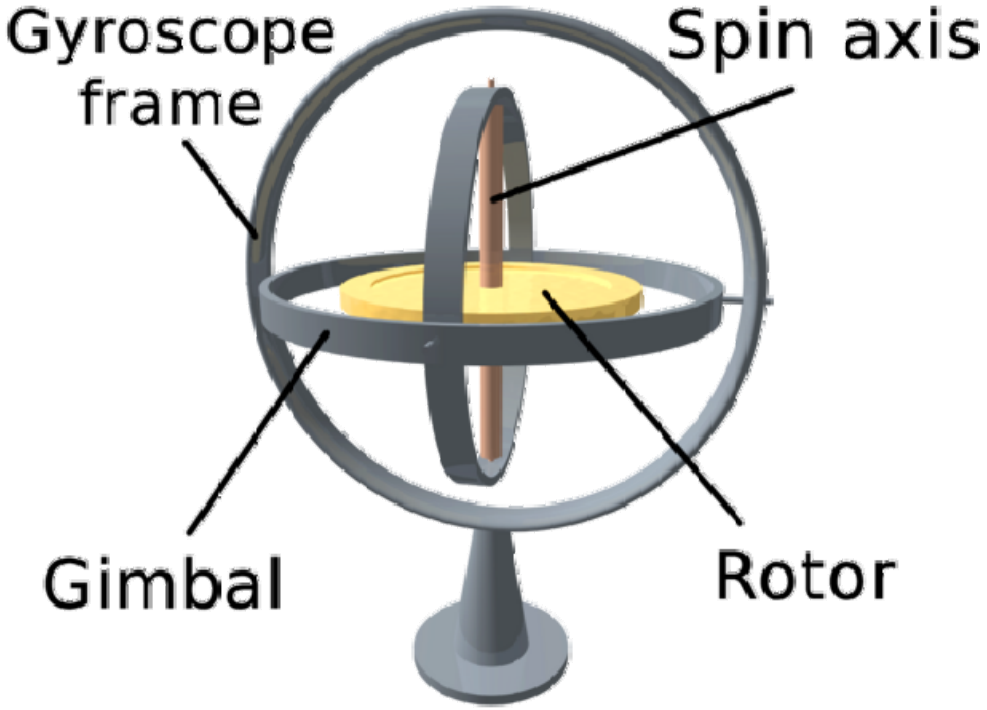
Physics 113 - November 13, 2012

$$\vec{L} = \vec{r} \times \vec{F}$$

$$\vec{L} = I\vec{\omega}$$

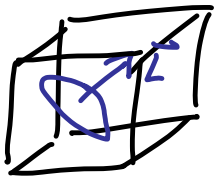
$$\vec{\tau} = \frac{d\vec{L}}{dt} = I\frac{d\vec{\omega}}{dt}$$

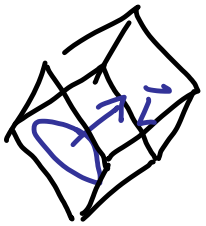
Angular Momentum is conserved
(isolated system)
(vector!)



Free Spinning wheel from external torques ... orientation is fixed due to Ang. Mom. conservation

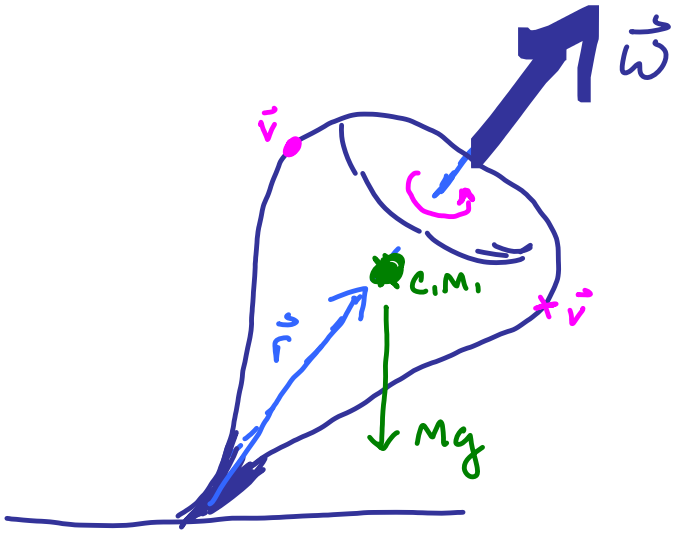
The gyroscope





very impt. development for navigation

Spinning Top

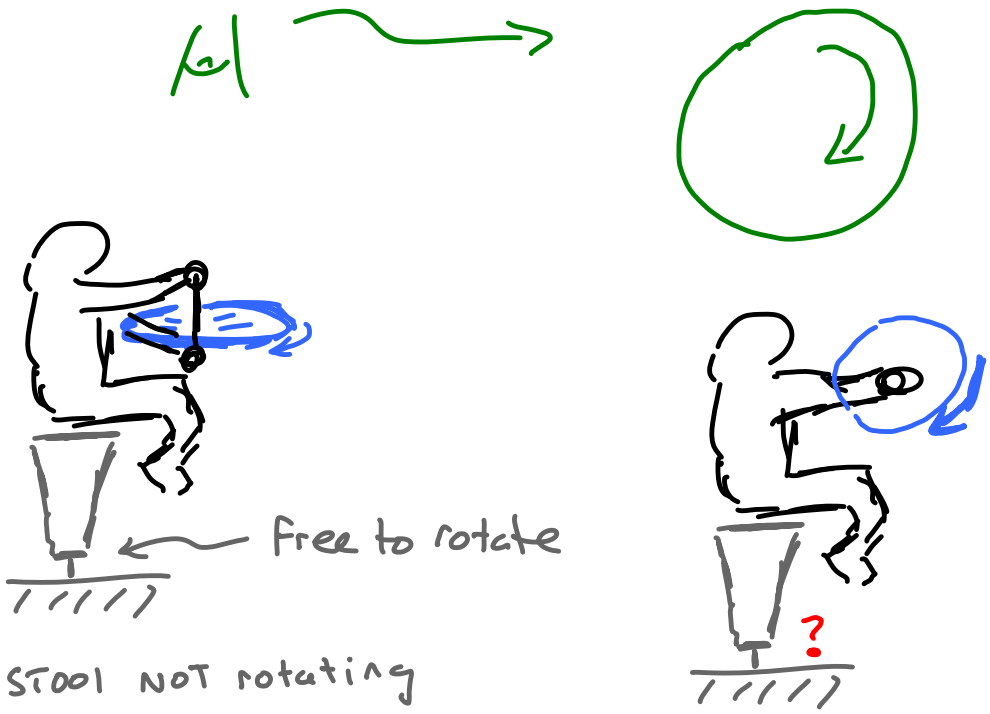


what direction is $\vec{\omega}$

what direction is $\vec{L}$

into paper — what direction is $\vec{L}$

into paper — What direction will the top precess?

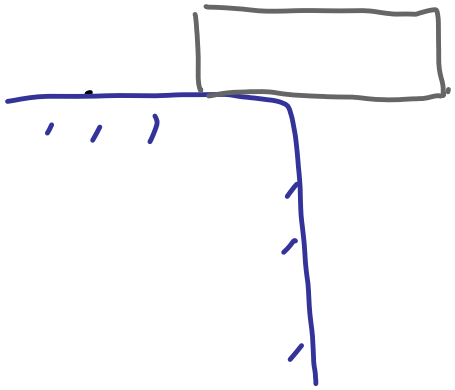


How does stool rotate as viewed from above?

A) Clockwise

B) Counter-clockwise

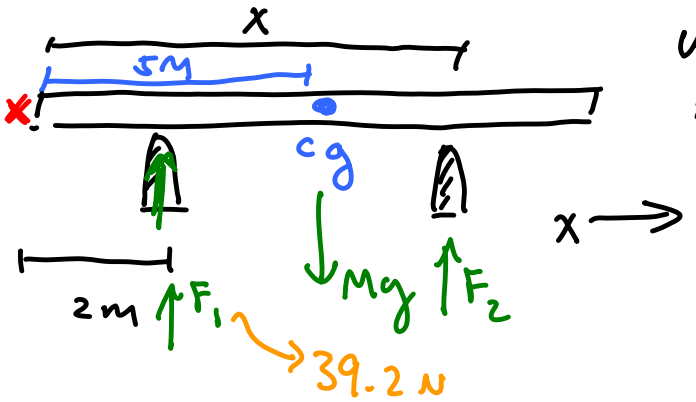
C) No rotation



Static Equilibrium

$$\sum \vec{F} = 0$$

$$\sum \vec{\tau} = 0$$



uniform beam

$M = 12\ kg$

Length = 10m

y^+

Static equilibrium

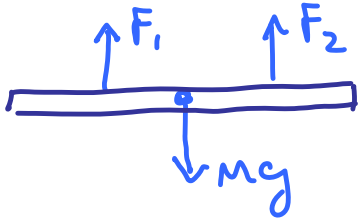
where is 2ND support located?

How much weight does it support?

$\sum \vec{F} = 0$

$\Downarrow$

$\sum F_y = 0$



$F_1 + F_2 - Mg = 0$

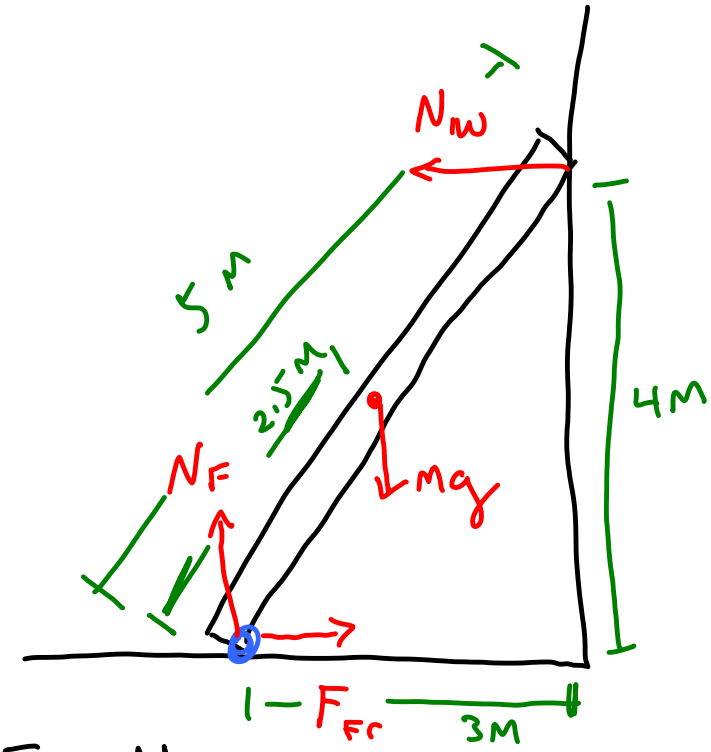
$\Sigma \tau = 0$

about $x = 0$

counterclockwise

↺ +

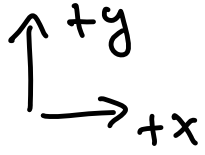
$$\Sigma \tau = 0 = F_1 2 - mg 5 + x F_2$$



Ladder against frictionless wall

Weight ladder = 60 N

what is minimum μ_s betw. ladder + floors such that ladder will not slip

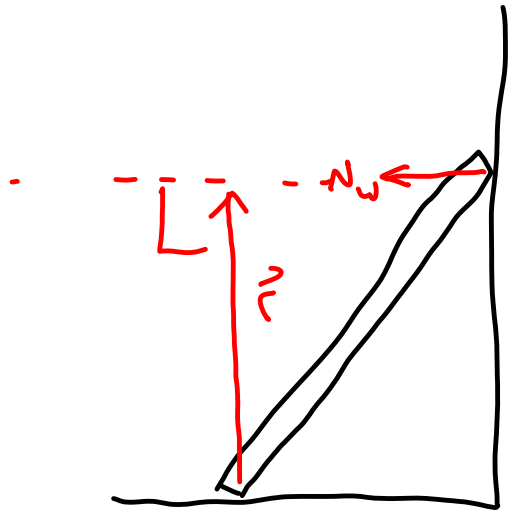


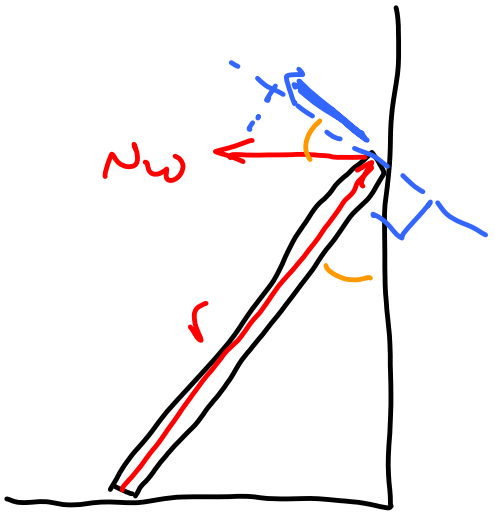
$$\Sigma \vec{F}_x = 0 = F_{Fr} - N_W = N_F \mu_s - N_W \rightarrow \boxed{60\mu_s - N_W = 0}$$

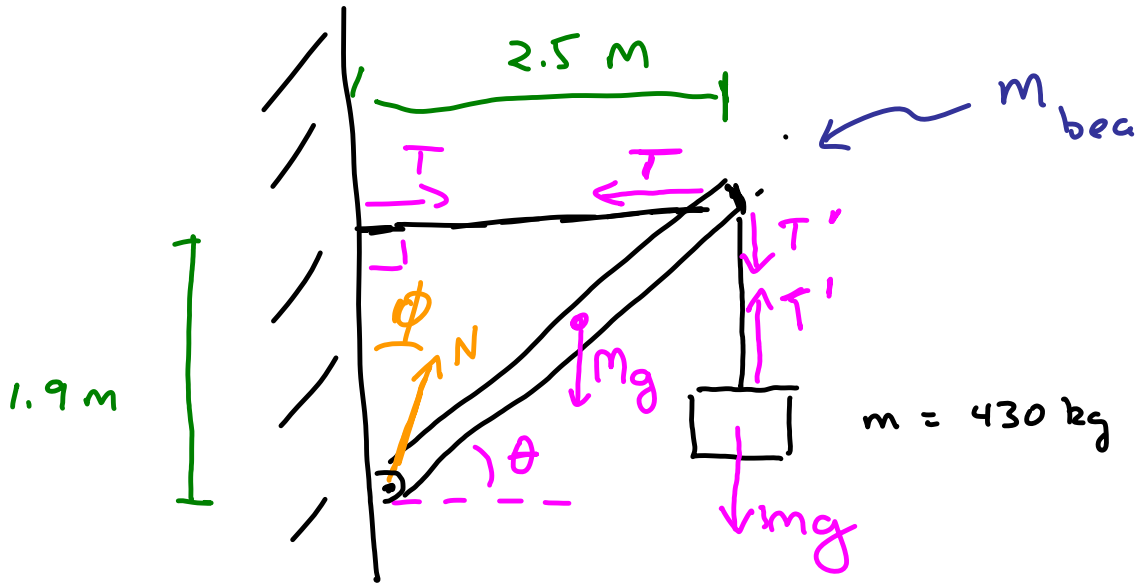
$$\Sigma \vec{F}_y = 0 = N_F - mg \Rightarrow N_F = 60\,N$$

$$\Sigma \tau = 0 = N_w\, 4 - Mg\,(1.5)$$

$\mu_s = 3/8$







$m_{beam} = 85$ kg

Find T in upper cable

$T' = Mg = (430)(9.8)$

$+\rightarrow$

$\Sigma F_x = 0 \qquad N \sin\phi - T = 0$

$N \cos\phi - Mg - T' = 0$

$\Sigma \tau = 0 = 1.25(Mg) - T(1.9) + T'(2.5)$

$+\circlearrowright$