

PHY 117 HS2026

Today:

Cross product

Torque

Static equilibrium

Center of mass

Stability vs. rotation

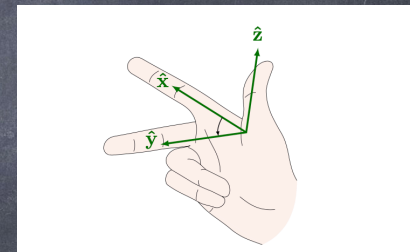
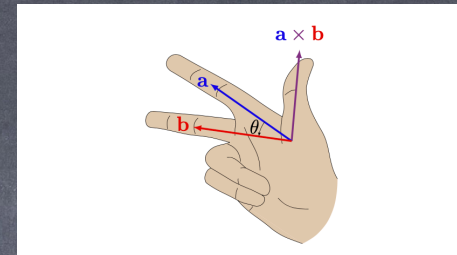
Moment of inertia

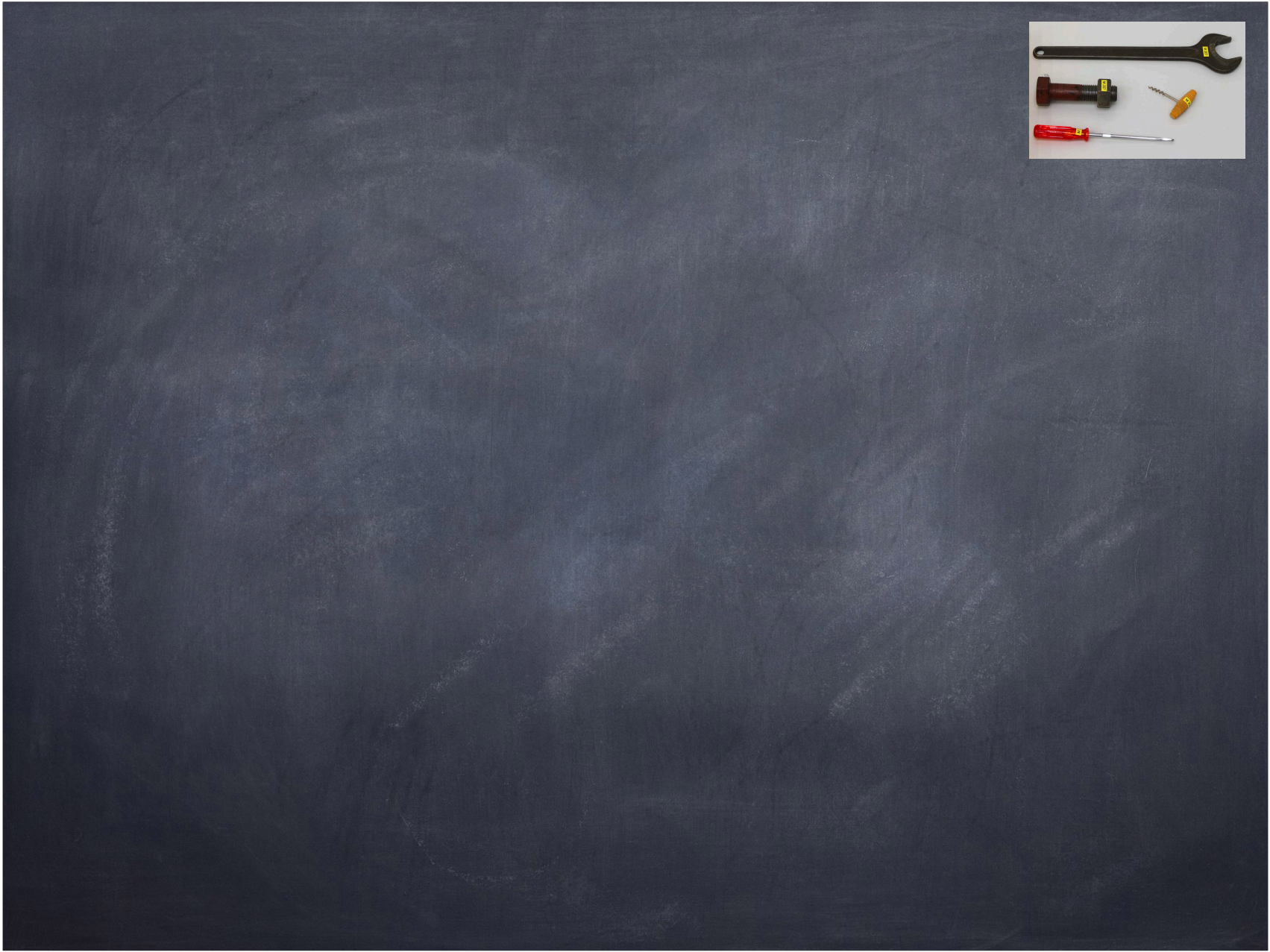
Week 4, Lecture 1

Oct. 6th, 2026

Prof. Ben Kilminster

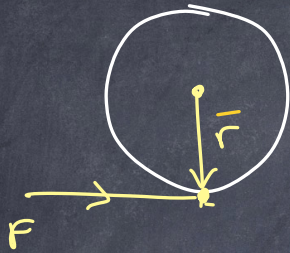
Prof. Florencia Canelli



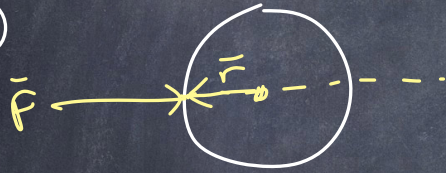


calculate the torque & direction for each case

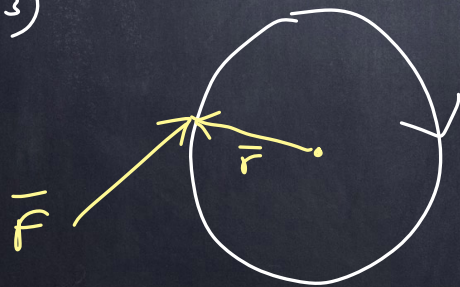
1)

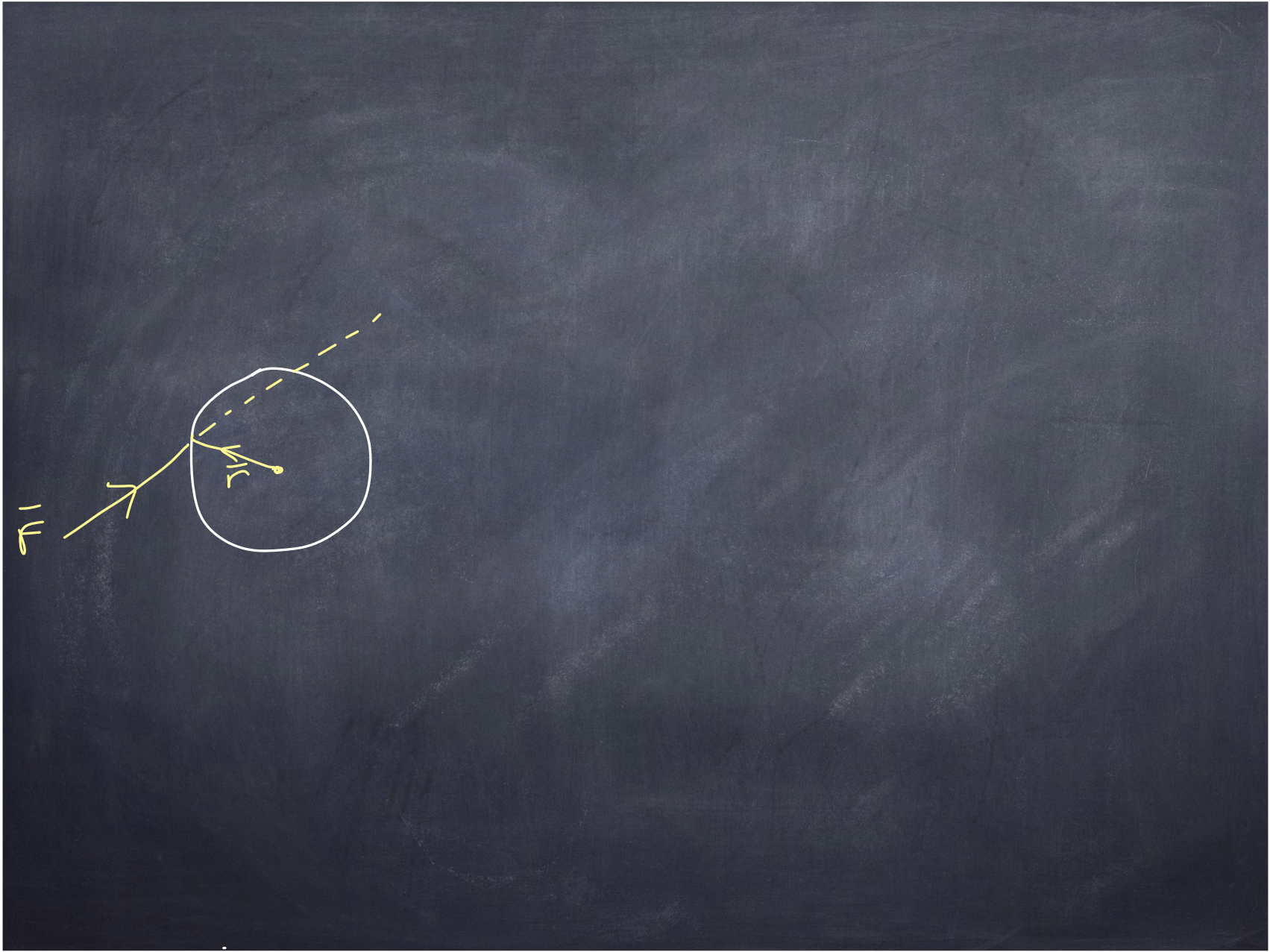


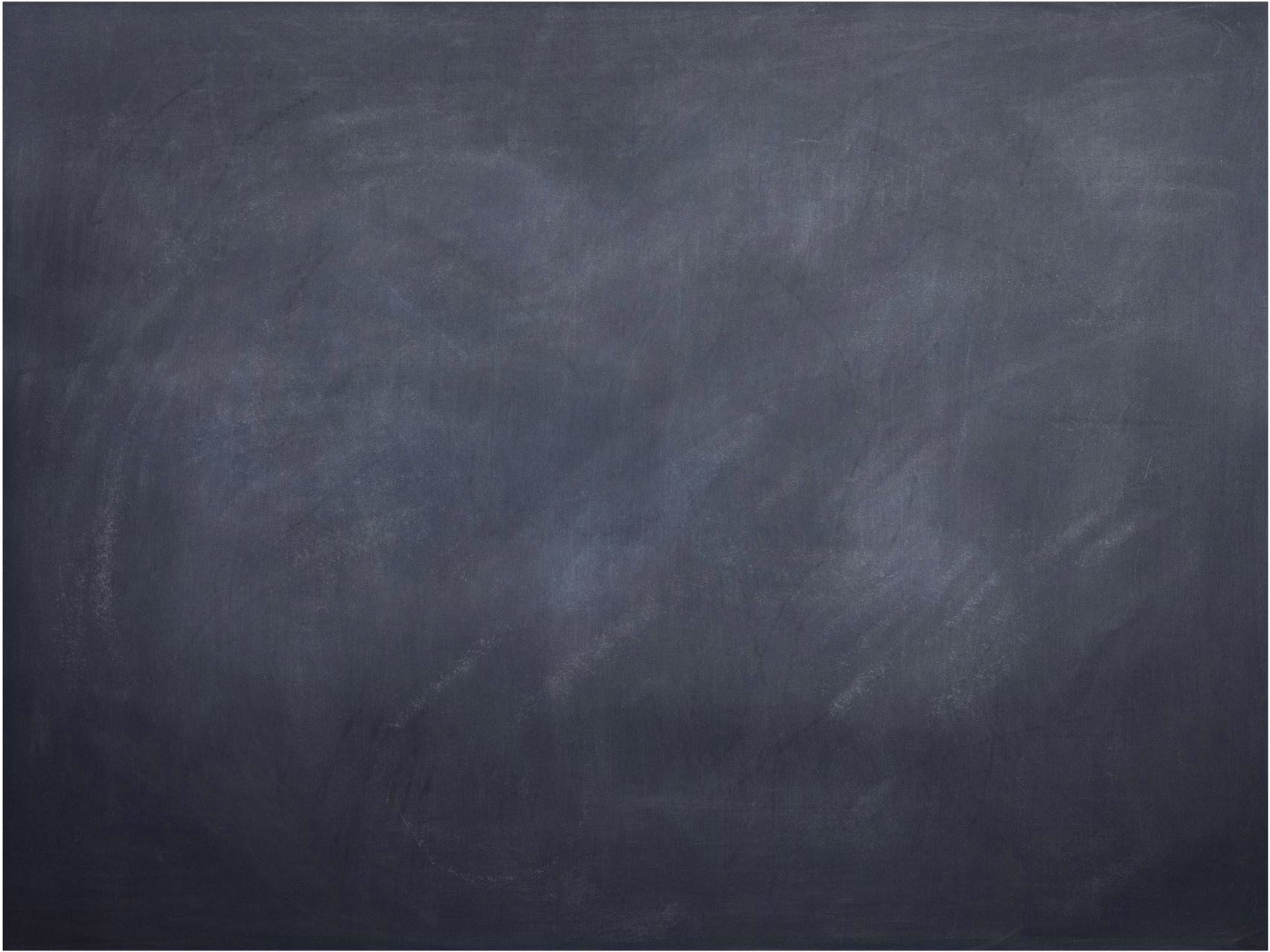
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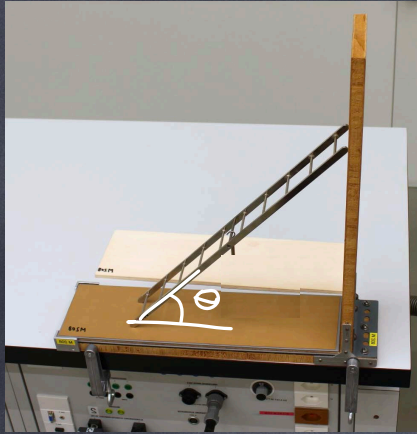


3)





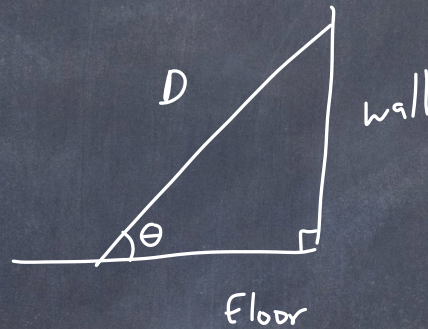




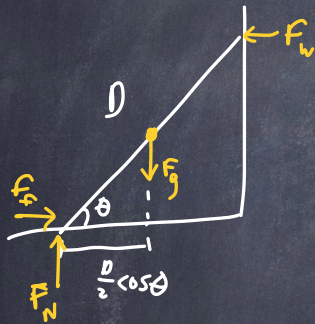
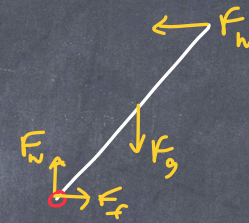
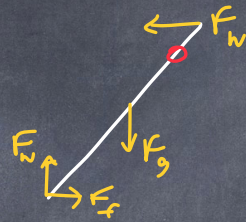
What is the smallest angle, $\theta_{\min}$, such that the ladder does not fall?

Ladder has mass, M
length, D
angle, θ

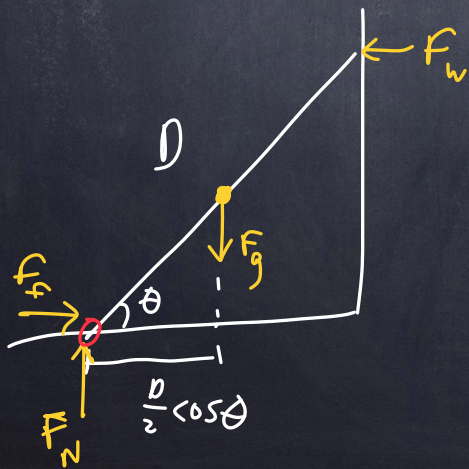
(Consider floor friction, but not wall friction)



Next, we consider $\sum \vec{\tau} = 0$
equilibrium condition
what should be the
rotation point?



What if the wall has friction?
Does $\theta_{\min}$ get smaller or larger?



Center of mass

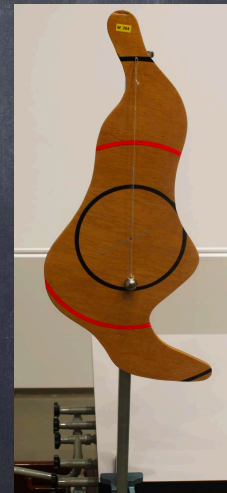
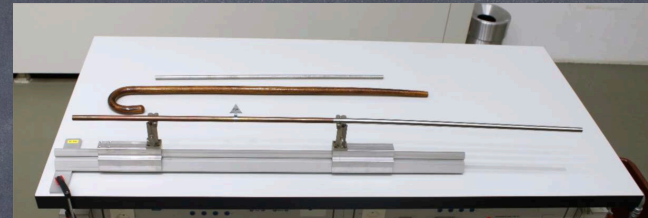
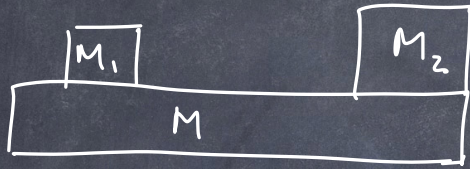
Consider 2 objects of mass :



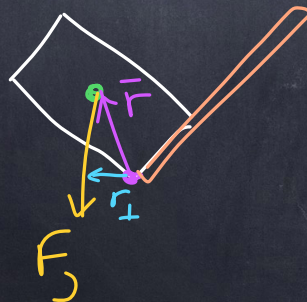
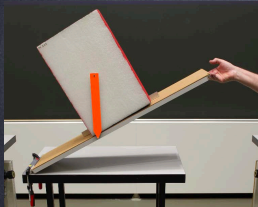
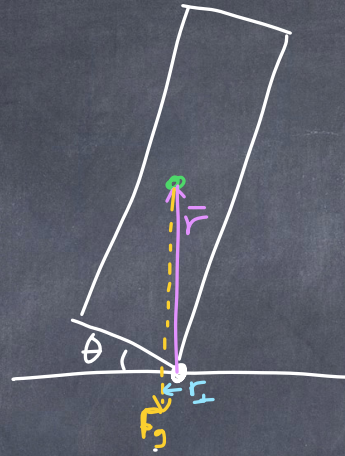
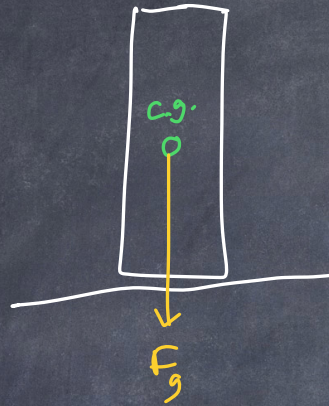
Center of gravity :



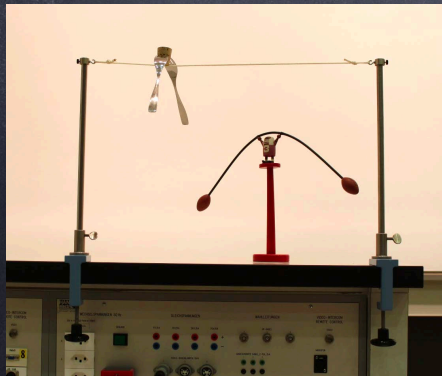
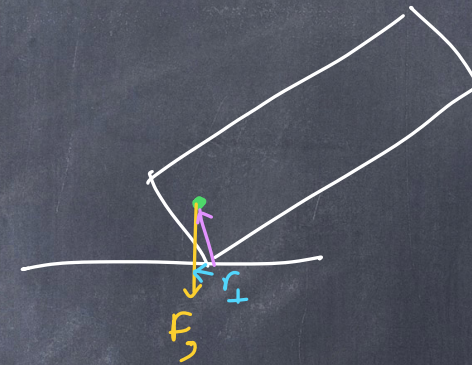
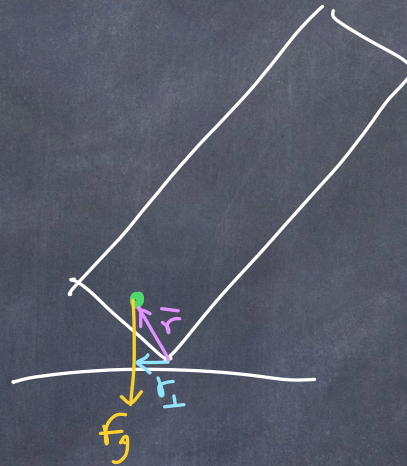
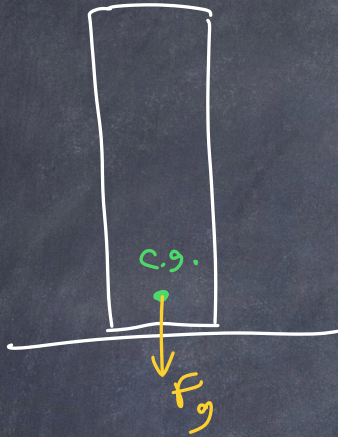
Considering C.g.: choose the axis of rotation through the center of gravity.



Stability



To improve stability, lower the center of gravity,
(heavier at the bottom)



Ladder:
what if we add a person? 

More or less stable
for the cases below?

