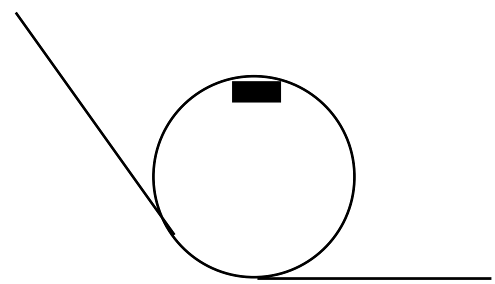
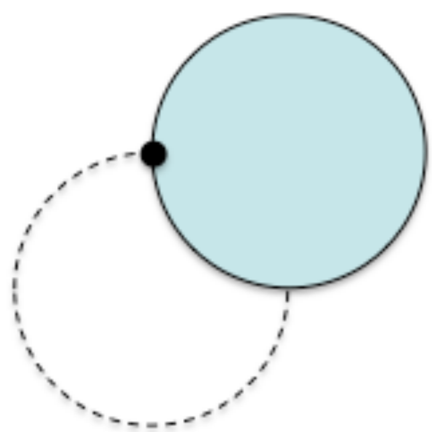
#6 Take a bicycle wheel and spin it very fast, then support the horizontal axel only at one end (some distance "x" from the center of the wheel's hub, letting the other side "fall".

a) Draw a good picture and explain what is happening. Be sure to indicate in the picture the direction of omega of the wheel, and the angular momentum of the wheel… as well as the direction of the torque on the wheel due to gravity… as well as the direction of precession. Yes, please label all of these vectors with the correct direction. This is what students often have difficulty with. You may want to put in more than one picture to get everything labeled correctly.
b) If I spin the wheel in the other direction at the same omega how would this change the precession of the wheel? *Explain why according to the physics model we've been using.*
c) If I spin the wheel with a larger omega how would this change the precession of the wheel? *Explain why according to the physics model we've been using.*
d) If I hold the wheel on my finger closer to the wheel itself how would this change the precession of the wheel? *Explain why according to the physics model we've been using.*
e) If instead of a wheel with all the mass at the rim, it was a disk of uniform density, how would this change the precession of the wheel? *Explain why according to the physics model we've been using.*



#7 You go on a R = 10 m, loop-de-loop ride at the carnival, but you have to choose how high to start the cart. Say you have a mass of 70 kg, like your instructor and you are sitting on a scale that reads in kg.

a) If you start from a vertical height of 40 m, what does the scale under you read as you are at the top of the loop? What does it read at the bottom of the loop as you enter the loop? Is this a good ride for pregnant women? How does it feel as you round the bottom of the loop?
b) What would happen if you decide to start the cart at the same height as the top of the loop? Why would this happen?
c) Please find the minimum vertical height, above the ground that you must start the ride to stay on the track.
d) ** (more difficult question) Repeat part a if instead of a frictionless cart, the object is a <u>*hollow*</u> sphere that is rolling without slipping



#8 * (consider using the parallel axis theorem which we don't address until Tuesday of week 10, so it may be a good idea to wait until then to do the problem) A disk of uniform mass and radius, R is secured to a wall with a frictionless pivot that allows rotation as shown at right. It is started in the higher position where the center of the circle is at the same height as the pivot and allowed to drop and swing. When the disk is at the bottom of the swing (dotted line), please find:

a) Omega, the angular velocity of the disk about the pivot.
b) The angular momentum of the disk about the pivot.
c) The force that the pivot is providing to the disk. Include direction.