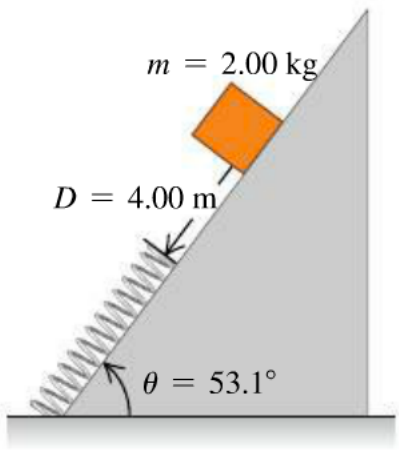
Wentworth Institute of Technology Engineering Physics I, Fall 2015
Instructor: Dr. Marissa Vogt
Problem Set #7
Due: before 4:30 p.m. in my mailbox in Ira Allen 316 *or* turned in at the beginning of lab, Monday, October 26, 2015
Remember to write down the names of any classmates you worked with.

Problem 1 (36 points)

I roll a ball of mass 2 kg up a ramp starting from the ground with an initial velocity of 5 m/s. The ramp makes an angle θ = 30° with respect to the horizontal.

a) Using conservation of mechanical energy, what is the maximum distance the ball will travel along the ramp if there is no friction?
b) What is the maximum distance the ball will travel if the coefficient of kinetic friction $\mu_k = 0.2$?
c) How much work does friction do on the ball?

Problem 2 (40 points)



A block with mass 2 kg is released on a ramp, with no initial velocity. It travels a distance of 4 m along the ramp, which is inclined 53.1° with respect to the horizontal, before it encounters a spring with spring constant k = 120 N/m.

a) If there is no friction, what is the block's speed when it hits the spring?
b) If there is no friction, what is the maximum compression of the spring?
c) If the coefficient of kinetic friction is μ_k = 0.2, what is the maximum compression of the spring?

Problem 3 (34 points)

A half pipe is a U-shaped structure used in gravity sports like skateboarding or snowboarding like the figure shown at left.

a) Assuming there is no friction: if a 70 kg snowboarder enters the half pipe from the top left at a height of 3 m, what will her speed be at the bottom? Will she be able to exit the half pipe at the right? Why or why not?
b) In the case that there is kinetic friction, the snowboarder enters the half pipe from the top left and slides through the bottom but only reaches a height of 2.7 m on the right side. How much energy is lost to friction?