Physics 105 Exam #2

Forces, Uniform Circular Motion, Energy.

Please write your answers on the paper provided and turn in your question sheet and note card with your answers. Make sure to include a clear explanation of your reasoning any relevant drawings and diagrams as I grade with partial credit. Good luck.

1. (6pts) You hold a cart (500g) in the lab still on a level track with a string tied to it. The string passes over a pulley and is tied to a 50g hanging mass. Now you release the cart. Ignoring any friction effects how fast will the cart be going after it has travelled 0.4m?

2. (6pts) You are in an 800kg car travelling down a wet hill that is slanted at 10 degrees from level moving at 100m/s. Given that the coefficients of friction are μ_s=0.7 and μ_k=0.5:

    a. What is the maximum stopping force that you can apply with the brakes?

    b. What is the shortest distance you can stop in?

3. (4pts) A spring has a spring constant of 3,000N/m and is naturally 10cm long.

    a. How long can you stretch it to be with a force of 100N?

    b. How much energy do you store in the spring by doing this?

4. (6pts) While washing your clothes you open the lid on the top of the machine before the spinning has stopped and notice that your red sock is a blur at a steady height on the side of the drum. Looking down into the tub you see it is 20" across and a quick trip to google tells you that under normal conditions the tub spins at 1200rpm. Please determine:

    a. Your sock's centripetal acceleration under normal conditions (i.e., at a steady speed).

    b. The force exerted on your damp 20gram sock by the wall of the machine (make sure you get them all).

5. (3pts) Why don't we ever calculate the potential energy due to friction?

6. (7pts) A sled sits at the top of an icy hill. *You* sit down on the sled (2kg) and slide down to the bottom of the hill with a change in elevation of 20m. At the bottom of the hill is a frozen lake.

    a. How fast will *you* and the sled be going once *you* reach the bottom of the hill? (the sled is smooth so friction is negligible for this part of the trip).

    b. *You* drag *your* feet along the surface of the frozen lake and come to a stop in 100m, how much work did *you* do to stop the sled? (clearly friction is no longer negligible).