# PHY 105-703 midterm exam 2

2-D forces uniform circular motion, energy and power

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. (4pts) A carnival merry-go-round rotates about a vertical axis at a constant rate. A passenger standing on the edge of the merry-go-round has a constant speed of 3.66m/s. For each of the following instantaneous situations, state how far the passenger is from the center of the merry-go-round and in which direction.
   a. The passenger has an acceleration of 1.83 m/s², east.
   b. The passenger has an acceleration of 1.83 m/s², south
   c.

2. (6pts) A 110 g hockey puck sent sliding over ice is stopped in 15m by the frictional force on it from the ice.
   a. If its initial speed is 6.0m/s, what is the magnitude of the frictional force?
   b. What is the coefficient of friction between the puck and the ice?

3. (8pts) A loaded penguin sled weighing 15lbs rests on a plane inclined at 20° to the horizontal. Between the sled and the plane, the coefficient of static friction is 0.25, the coefficient of kinetic friction is 0.15.

   a. What is the minimum magnitude of the force $\vec{F}$, parallel to the plane, that will prevent the sled from slipping down the hill?
   b. What is the minimum magnitude of $\vec{F}$ that will start the sled moving up the hill?
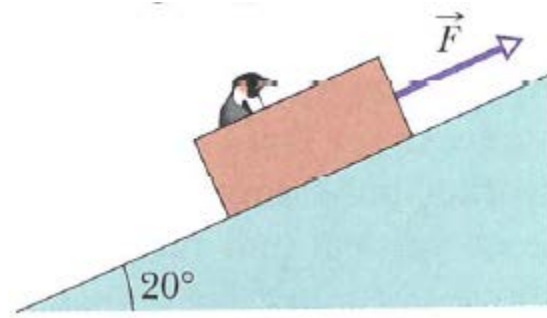
4. (6pts) Two snowy peaks are 850m and 750m above the valley between them. A ski run extends down from the top of the higher peak and then back up to the top of the lower one. With a total length of 3.2km and an average slope of 30°. *You* start from rest at the top of the higher peak. At what speed will *you* arrive at the top of the lower peak if *you* coast without using ski poles? Ignore friction.

5. (6pts) A 2.0kg block is dropped from as height of 40cm onto a spring of spring constant k=1960N/m. Find the maximum distance the spring is compressed.
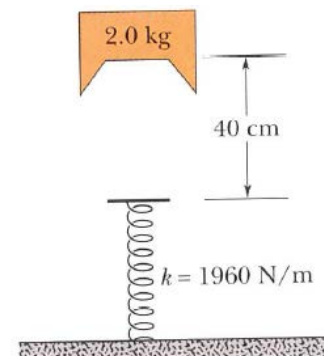
6. (2 pts) How are work and power related to each other?