# Assignment 3

1. A 500 gm hockey puck experiences two forces $\vec{F_1}$ =(5, 2) and $\vec{F_2}$= (1, -1) Newtons.

   a) What is the magnitude and direction of the net force?

   b) What is the magnitude and direction of the acceleration?

2. A 3 kg mass sits on a table and is connected via a pulley to a 1 kg mass hanging over the table.

   a) What is the acceleration of the 3 kg mass?

   b) What is the tension in the string?

3. A 2 kg block slides down a frictionless plane inclined at angle 30°. What is the acceleration of the block?

4. A 9 kg mass hangs suspended from the ceiling via two cables as shown below. One cable is at 30° and the other at 45°. What are the tensions in the two cables?
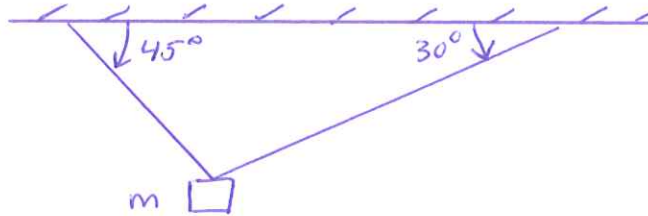
5. An engineer wishes to design a curve of radius 1 km in the road to help prevent cars from flying off the highway. i.e. She/he wishes to incline the road at an angle so that cars traveling 120 km/hr feel a force toward the center of the curve that is given by the gravitational force component.

   a) What are the components of the gravitational force perpendicular and parallel to the inclined road surface?

   b) What angle should the road be inclined in order for the parallel component of the gravitational force found in (a) to equal the centripetal force?

6. Consider a 20 kg mass located on a plane inclined at 60° from the horizontal. The coefficient of friction is 0.1. The mass is attached to a string that is attached to a mass m_2 via a massless pulley as shown below. Find m_2 so that the two masses are stationary?

7.   A grandfather clock is moved from one site where g = 9.80 m/sec² to a site closer to the equator where g = 9.79 m/sec². Assuming the clock owner is not a physicist and does not adjust the length of the clock pendulum.
a) Will the clock be too slow or too fast?

b) By how many minutes is the clock out in one week?

8.   A spring having constant k = 2 Nt/m is connected to a 30 kg mass. The mass is then pulled extending the spring and released.
a) Evaluate the period of the motion.

b) What happens to the period of the motion if:
   i)   the mass is doubled
   ii)   the spring constant is doubled
   iii) the spring constant and mass are doubled
   iv)   the initial extension of the spring is doubled