Homework 9
Physics 1000
Preparatory Physics
Due: Friday April 4, 1997

Reading Assignment

Basic Technical Physics, by Tippens. Chapter 4.1, 4.2, 4.3, 4.8, Ch. 7.

Motion of an Object on a Frictionless Horizontal Plane

1. A 10 kg object rests on a frictionless horizontal plane with no applied forces other than the force of gravity. Choose the coordinate system with origin at the center-bottom of the object such that the positive x-direction is to the right and the positive y-direction is up. (This is the standard coordinate system I always use in class.)

   a. In the space provided directly below, draw the free-body diagram labeling all forces, their directions and their magnitudes, which are applied to the body. Specify units! Label the force of gravity as F_g and the normal force as N, as we did in class.

   b. Which of Newton's Laws is responsible for the guaranteeing the existence and governing the magnitude of the normal force?

2. A 100 N force is applied in the positive x-direction to the object in #1.

   a. In the space provided directly below, draw the free-body diagram labeling all forces and their magnitudes which are applied to the body. Label the applied force as $\mathcal{F}$, as we did in class.

b. What is the resulting acceleration of the object? Specify direction and magnitude. Find acceleration in both the x and y directions.

Motion of an Object on a Horizontal Plane with Friction

3. The same 10 kg object sits on a horizontal plane where the coefficient of friction is $\mu = 0.4$. Gravity is applied as before. Choose the same coordinate system as in #1 and #2.

   a. In the space provided directly below, draw the free-body diagram labeling all forces and their magnitudes which are applied to the body. Assume that a force of unspecified magnitude, $\mathcal{F}$, is applied in the positive x direction. Label the force of friction as F_f.

   b. A 1 N force is applied to the object in the positive x direction. What is the resulting acceleration of the object? Specify direction and magnitude. Find acceleration in both the x and y directions.

   c. A 200 N force is applied to the object in the positive x direction. What is the resulting acceleration of the object? Specify direction and magnitude. Find acceleration in both the x and y directions.