General Physics I (PHYS 2010)
Spring 2014
Prof Richard Ignace

HOMEWORK #3

Notes:

- This homework is due by the beginning of class on Feb 25. It covers material from chapter 4.
- You will need a calculator and lots of scrap paper.
- Answers are to be recorded on a scantron that you will turn in. You may keep the questions (i.e., these sheets).
- You may (should) use your book. You may even work with other students. However, you should not copy the answers of other students. The homeworks are exam prep, and so you need to be able to work these problems yourself. If you do not apply yourself and do your own work, you are not likely to perform well on the exams.

1. If we know an object is changing direction of motion, we may assume:

   a. the net force acting on the object is zero.
   b. there are no forces acting on the object.
   c. the object is accelerating.
   d. the object is losing mass.

2. Two forces act on a 8.00-kg object. One of the forces is 12.0 N in the vertical direction, and one is 19 N in the horizontal direction. Determine the acceleration.

   a. 2.8 m/s^2
   b. 3.2 m/s^2
   c. 4.9 m/s^2
   d. 6.1 m/s^2

3. A 2,000-kg sailboat experiences an eastward force of 1,000 N by the ocean tide and a wind force against its sails with magnitude of 4,000 N directed toward the northeast (45° north of east). Determine the components of acceleration in the east (x) and north (y) directions.

   a. $a_x = 1.9$ south and $a_y = 1.4$ m/s^2 west
   b. $a_x = 1.9$ north and $a_y = 1.4$ m/s^2 east
   c. $a_x = 1.9$ south and $a_y = 1.4$ m/s^2 east
   d. $a_x = 1.9$ north and $a_y = 1.4$ m/s^2 west

4. A 80.0 kg man jumps 1.00 m down onto a concrete walkway. His downward motion stops in 0.03 seconds. If he forgets to bend his knees, what force is transmitted to his leg bones?

   a. 51,400 N
   b. 7,100 N
   c. 9,400 N
   d. 11,800 N

5. Two blocks of masses 20 kg and 12 kg are connected together by a light string and rest on a frictionless level surface. Attached to the 12-kg mass is another light string, which a person uses to pull both blocks horizontally. If the two-block system accelerates at 1.8 m/s^2 what is the tension in the string pulled by the person?

   a. 57.6 N
   b. 6.7 N
   c. 21.1 N
   d. 94.0 N

6. An elevator weighing 20,000 N is supported by a steel cable. What is the tension in the cable when the elevator is being accelerated downward at a rate of 3.50 m/s^2? ($g = 9.80\ m/s^2$)

   a. 31,800 N
   b. 12,900 N
   c. 10,100 N
   d. 7,300 N

7. A girl is using a rope to pull a box that weighs 600 N across a level surface with constant velocity. The rope makes an angle of 25° above the horizontal, and the tension in the rope is 390 N. What is the friction force acting on the box?

   a. 202 N
   b. 353 N
   c. 58 N
   d. 320 N

8. A 100-kg box is placed on a ramp. As one end of the ramp is raised, the box begins to move downward just as the angle of inclination reaches 22°. What is the coefficient of static friction between box and ramp?

   a. 0.51
   b. 0.23
   c. 0.70
   d. 0.40

9. A box rests on a ramp inclined at 35°. If the box has a mass of $m = 50$ kg, what is the normal force acting on it?

   a. 800 N
   b. 600 N
   c. 400 N
   d. 300 N

10. A hockey puck moving at 12.0 m/s coasts to a halt in 100 m on a smooth ice surface. What is the coefficient of friction between the ice and the puck?

    a. $\mu = 0.07$
    b. $\mu = 0.03$
    c. $\mu = 0.21$
    d. $\mu = 0.05$

11. A traffic light hangs midway on a cable between two poles 30 meters apart. If the sag in the cable is 0.20 meters and the tension in *each* cable is 8000 N, what is the mass of the traffic light? is the tension in each cable?

    a. 12 kg
    b. 89 kg
    c. 100 kg
    d. 22 kg