PHYSICS 191
Test # 2: FORCE & ENERGY
31 October 1995

1. One end of a 0.75 m long string is fixed, and the other end is attached
   to a 1.5 kg stone to form a pendulum. The pendulum is held at a
   40°angle from vertical, then released. At the bottom of its swing, find

   (a) the speed of the stone.

   (b) the tension in the string.

2. A force **F=8i+3j-5k** acts on a happy little butterfly, which undergoes
   a displacement **d=5i+2j-3k**. What work was done on the butterfly
   by this force?

3. A 3 kg block sits on a 35°hill, and the static friction coefficient of their
   surfaces is 0.2. Another mass m is attached by a string as shown.

   (a) What is the smallest mass m that can remain at rest?

   (b) What is the largest mass m that can remain at rest?

4. A 2 kg stone placed on top of a vertical spring compresses the spring
   downward 6 cm. How far will it compress the spring if it is dropped
   from 5 cm above the spring?

5. A 20 kg mass is being pulled at constant speed by a rope at a 20°angle
   from horizontal. The coefficient of kinetic friction is 0.4. What is the
   tension in the rope?

6. Suppose a 60 kg man steps off the back porch of his house. What is the resulting acceleration of the Earth, which has a mass of 6×10^{24} kg?

7. A car of mass $2m$ accelerates from speed $5v$ to $6v$, and then slows to a stop. What was the total work was done on the car?

8. Give two examples of noninertial reference frames.

9. How much work is done by a force $F = 3x^4$ N that moves an object from $x = 0$ to $x = 4$, where x is in meters?

10. A force of 4 N north, another force of 5 N east, and a third force of 7 N northeast cause a mass m to accelerate at 5 m/s². What is the mass m?