ISP209 Spring 2002 **Homework 8** Name: _____
Due: Thurs., Mar. 21, 2:40 pm, in Rm 118PA. ID:_____

1. A force is not gravity nor a nuclear force. What kind of force is it? _____
2. A net force acts on a mass in the direction opposite to its motion. As the mass moves, is the work done on it by that force *positive* or *negative*? _____
3. The net force acting on a mass is in the same direction as its motion. As it moves, is the work done on it *positive* or *negative*? _____
4. Compared to the direction of a net force that does a positive amount of work on a mass, does the mass move in the *same* or *opposite* direction? _____.
5. The two forces acting on a mass when it is slowly raised, by the hand of a human being, from the floor to a table are the human's force and _____. Are the signs of the work done by these two forces the *same* or *opposite*? _____
6. A mass travels 100 m in the same direction as the applied force of 50 N. How much work was done by this force? _____Nm. Express this answer in joules. _____J. What is the compression of a spring with spring constant 50 N/m, that stores the same energy? _____

The mass in the figure to the right (all other objects are massless) is raised when the end of the rope is *slowly* pulled down a distance *x* (see Ch. 5, HW problems 18 – 24), for information relevant to this situation).

7. What force must be applied to the end of the rope to keep the mass stationary. _____
8. What force must be applied to the end of the rope to move the end of the rope slowly downward a distance *x* ? _____
9. How much work is done by the person pulling down on the rope a distance, *x* ? _____
   What is the sign of this work? _____
10. What is the force in the bar (dark line) attached to the mass during the motion? _____
11. How far upward does the mass move when the rope is pulled down the distance *x* ? _____
12. What is the work done on the mass by the bar? What is its sign? _____
13. Compare the work done by the person to the work done on the mass. Are they equal to each other? _____ Why is that so? _____

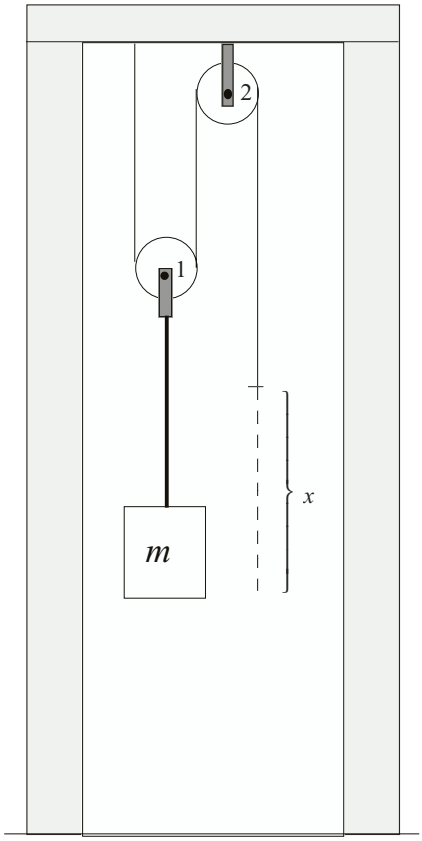

Figure for problems 7-13

14. What is the potential energy stored in an ideal spring with spring constant, k , that is *stretched* a distance, x , from its normal length? _____
    Is the stored potential energy the same if the spring is *compressed* by the same distance? _____
    What is the sign of the work done on the spring by the external force when it is stretched and when it is compressed? _____
15. Two springs have spring constants, k_1, and k_2, and are stretched from their normal length by distances, x_1 and x_2, respectively. What is the ratio of the spring constants needed to make the potential energy stored the same in both? _____

(show work here)

16. Should I connect two identical springs in a parallel or series combination, if I want to store the most energy for a given stretch of the combination? _____
17. Should I connect two identical springs in a parallel or series combination, if I want to store the most energy for a given force applied to the combination? _____

(First find the potential energy of a spring, spring constant k, distorted by a force, F.)

18. A stretched spring stores an initial potential energy, PE_0. What is the potential energy stored by the spring if the amount of stretch is doubled? _____

19. A spring with spring constant, k , is stretched by a distance, x_0, and is then stretched to a distance $x = 3x_0$. How much potential energy is *added* (ΔPE) to the spring during the second stretch. (express your answer using only k and x_0)

(show work here)

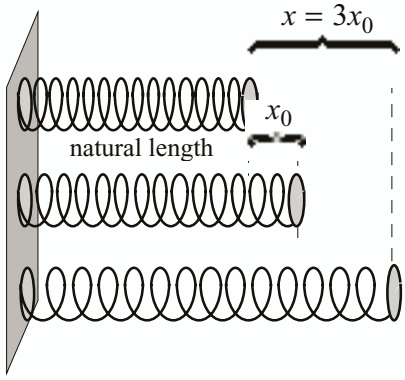

Figure for Problem 19