Name: _____ Date:_____

Mr. Croom's Physics Chapter 5: Work and Energy

Hooke's Law

Solve the following problems

1. (Serway, p. 396, #8) Janet wants to find the spring constant of a given spring, so she hangs the spring vertically and attaches a 0.40 kg mass to the spring's other end. If the spring stretches 3.0 cm, from its equilibrium position, what is the spring constant?

2. (Serway, p. 396, #9) In preparing to shoot an arrow, and archer pulls a bowstring back 0.40 m by exerting a force that increases uniformly from 0 to 230 N. What is the equivalent spring constant of the bow?

3. (Serway, p. 396, #4) How much force is required to pull a spring 3.0 cm from its equilibrium position if the spring constant is 2.7×10^3 N/m?

4. A mass of 0.55 kg is attached to a vertical spring. If the spring constant is 300 N/m, what is the length the string is stretched?

5. A sling shot consists of a light leather cup attached between two rubber bands. If the spring constant for both bands is 2.7×10^3 N/m and the bands stretch 1.2cm, how much force must be applied to them?

6. What load must be attached to a spring with a spring constant of 3.2×10^2 N/m that is hung vertically and stretches the springs 0.14m?

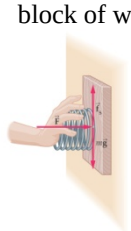
7. (Walker, p. 166, # 156)When a 9.00-kg mass is placed on top of a vertical spring, the spring compresses 4.50 cm. Find the force constant of the spring.

8. (Walker, p. 166, # 17)A 110-kg box is loaded into the trunk of a car. If the height of the car's bumper decreases by 13 cm, what is the force constant of its rear suspension?

9. (Walker, p. 166, # 19)A backpack full of books weighing 52.0 N rests on a table in a physics laboratory classroom. A spring with a force constant of 150 N/m is attached to the backpack and pulled horizontally. **(a)** If the spring is pulled until it stretches 2.00 cm and the pack remains at rest, what is the force of friction exerted on the backpack by the table? **(b)** Does your answer to part (a) change if the mass of the backpack is doubled? Explain.

10. (Walker, p. 166, # 20) If the spring in the last problem k=150 N/m stretches by 2.50 cm before the 52.0-N backpack begins to slip, what is the coefficient of static friction between the backpack and the table?

11. (Walker, p. 166, # 23)A spring with a force constant of 120 N/m is used to push a 0.27-kg block of wood against a wall, as shown in figure below. Find the minimum compression of the spring needed to keep the block from falling, given that the coefficient of static friction between the block and the wall is 0.46. **(b)** Does your answer to part (a) change if the mass of the block of wood is doubled? Explain.



12. (Walker, p. 167, # 27)The equilibrium length of a certain spring with a force constant of $k = 250\ \text{Nm}$ is 0.18 m. **(a)** What force is required to stretch this spring to twice its equilibrium length? **(b)** Is the force required to compress the spring to half its length the same as in part (a)? Explain.