Hooke's Law Practice

1. A horizontal spring (spring constant = 20 N/m) is stretched 10 cm from its equilibrium position. A 1 kg object is then attached to the end of the spring. What is the size and direction of the elastic force acting on the mass? Presuming the mass and spring are on a very slippery surface what is the initial acceleration of the mass?

2. In the previous problem suppose the mass was sitting on a not so slippery table (the coefficient of friction between the object and table is 0.20). When the mass is released what would its acceleration be?

3. A horizontal spring has k = 15 N/m. It exerts a 2.0 Newton force on a 500 gram object. How far is the object from the equilibrium position of the spring? What would be the position of the object if the mass were 1 kg (instead of 500 g) but the restoring force was still 2.0 Newtons? How would the accelerations of the two objects compare?

4. A 1.65 N weight stretches a vertical spring a distance of 11 cm. What is the spring constant?

5. A 1.65 kg mass stretches a vertical spring a distance of 11 cm. What is the spring constant?

6. A 10 kg object is hanging stationary on the end of a vertical spring which has a spring constant of 250 N/m. What is the elongation of the spring?

7. A piece of spaghetti is taped to a table top so half of its length sticks out past the edge of the table. A 5 gram mass is hung from the spaghetti end and the spaghetti end moves down 1 cm. A different, unknown mass causes the spaghetti to bend 23 mm. What is the spring constant of the spaghetti? How much does the unknown object weigh? What is the unknown objects mass?

Answers:
(1) $F = -2 \text{ N}$, $a = 2 \text{ m/s}^2$
(2) net force = 0.04N so $a = 0.04 \text{ m/s}^2$
(3) $x = 0.133 \text{ m}$, $x = 0.133$, acceleration of heavy object half of the light object
(4) $k = 15 \text{ N/m}$
(5) $k = 147 \text{ N/m}$
(6) $x = 0.392 \text{ m}$
(7) $k = 4.9 \text{ N/m}$, $w = 0.1127 \text{ N}$, $m = 0.0115 \text{ kg} = 11.5 \text{ g}$