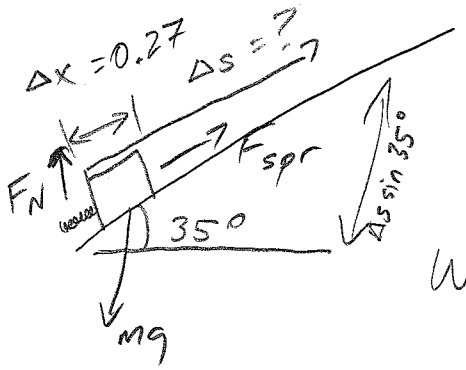
Physics 10154 - Exam #5C

Each problem is worth 50 points. Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work (or if some parts are incorrect) even if you get the right answer. Clearly indicate your answer with a circle or box and remember to include correct units and significant figures.

1. A spring with constant k = 450 N/m is oriented to be parallel to a ramp inclined 35° above the horizontal. A 6.0 kg mass is placed on the spring so that the initial state of the system has the spring compressed by 27 cm. The system is then released from rest, propelling the mass up the frictionless ramp to what distance from its starting point before the mass comes to rest again?



$W_N + W_{grav} + W_{spr} = \Delta K$

$W_N = 0$

$\Delta K = 0$ since $K_i = K_f = 0$

$W_{grav} = -mg\Delta y$

$= -(6.0)(9.8)\Delta s \sin 35$

$= -33.7\,\Delta s$

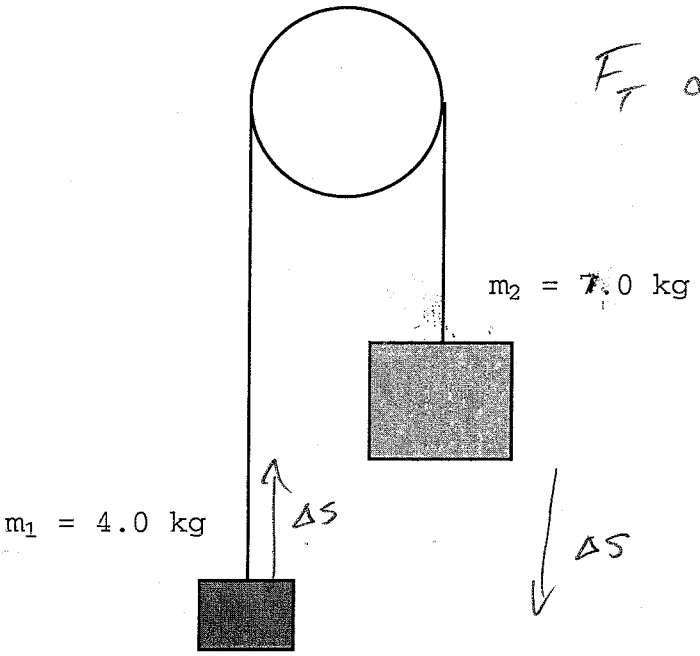
$W_{spr} = \frac{1}{2}kx^2$

$= \frac{1}{2}(450)(.27)^2 = 16.4$

$0 - 33.7\,\Delta s + 16.4 = 0$

$\Delta s = \frac{16.4}{33.7} = \boxed{0.49\ m}$

2. Two masses are connected by a massless string over a frictionless pulley as shown below. The system is released from rest. After the heavier mass falls 1.2 meters, what is its velocity? Use work-energy concepts to solve this problem.



F_T does no net work.

$$W(m_1 g) + W(m_2 g) = \frac{1}{2}(m_1 + m_2)v^2$$

$$-m_1 g \Delta s + m_2 g \Delta s = \frac{1}{2}(m_1 + m_2)v^2$$

$$-(4)(9.8)(1.2) + (7)(9.8)(1.2) = \frac{1}{2}(11)v^2$$

$$-47.04 + 82.32 = 5.5v^2$$

$$\boxed{v = 2.5 \text{ m/s}}$$