MT1, 141, Schwartz Name_____ ***provide lens for each part of each question***

1. You fire a 5g bullet into a 1 kg mass which embeds itself into the block. The bullet is well known to have a speed of 400 m/s. The mass slides 2.0 meters on a frictionless surface, and then compresses a spring as shown. The spring constant is 1000 N/m. We want to find the speed of the block immediately after the collision with the bullet and the compression of the spring. – more room on back of pg2 if you need it.

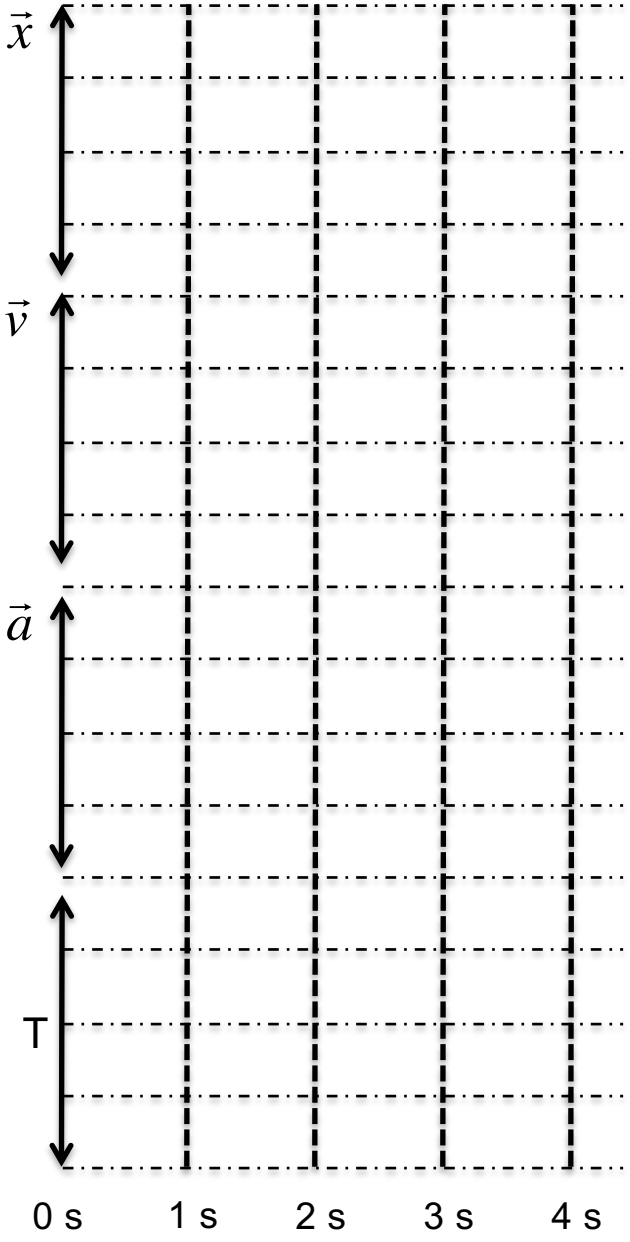
   a) Using the lens approach, explain how you will go about finding the compression of the spring.

   b) $\vec{v}_{Block} =$

   c) $\Delta x_{Spring} =$ _____

   d) What if the bullet and the block instead had a perfectly elastic collision? Please estimate best you can how this would have changed your answers above.

2. A crane lifts a 1000 kg mass off the ground directly upward with a cable. The mass accelerates 2 m/s^2 upward for 2 s, then continues at constant velocity for 2 s, then comes to rest in 1 s and stays there. Please draw as a function of time, the displacement, velocity and acceleration of the box. Also graph the tension in the cable.



3. You see below a potential energy diagram for a **3 kg mass**, as a function of displacement. (positive *x* is to the right). The mass **is at *x* = 6 m moving at 2 m/s** to the right. *There may be more than one correct answer. In this case, list all correct answers.*

a) Is the mass accelerating at this point (x = 6)? If so, estimate the acceleration.

b) Are there any turning points, or does the mass go on forever? If there are turning points, please state their location(s)

c) Is the mass in equilibrium at any point(s) in time? If so where?