1. (1 pt.) Which two quantities do you need to find the ball’s velocity when it is shot off the table?

2. (1 pt.) Which quantities are directly measured in the experiment with the pendulum?

3. (9 pts.) The ballistic pendulum has three phases. For each phase, describe whether energy and momentum are conserved and explain why or why not.
   a. The spring releases to propel the ball
   b. The ball collides inelastically with the pendulum
   c. The pendulum swings up to a maximum height and returns
4. (8 pts.) Obtain an explicit formula for the velocity of the ball $v$ leaving the spring gun in terms of the measured quantities, $v(h, \Delta x)$, where $h$ is the height of the spring gun and $\Delta x$ is the horizontal distance traveled by the ball. Include the uncertainty in this velocity, $\delta v$, in terms of the quantities $\delta h$ and $\delta \Delta x$ (the most concise expression for the uncertainty $\delta v$ as a consequence of the uncertainties in the measured quantities that determine $v$ is $\delta v = \left| \frac{\partial v}{\partial h} \right| \delta h + \left| \frac{\partial v}{\partial \Delta x} \right| \delta \Delta x$).

5. (6 pts.) If the table is $1.00 \pm 0.01 \text{ m}$ above the floor and the impact point is $1.50 \pm 0.02 \text{ m}$ horizontally from the gun, what is the velocity of the ball when it leaves the gun (including uncertainty)? What is the time of flight (including uncertainty)?