Hooke's Law + Conservation of Energy Lab

This lab has two parts. Please check out of part one before moving on to the next part.

Part 1: Exploring Hooke's Law

You should have some masses, a spring, and a stand. Hang the spring from the stand and hang various masses off the end of the spring. Make some measurements of the masses and corresponding lengths of the spring, and plot the lengths (horizontal axis) against the force of gravity on the hanging mass (vertical axis) in order to determine the spring constant. What does the slope of the line tell you? Does your y-intercept make physical sense? What would a non-zero y-intercept imply? What is your spring constant?

Part 2: Oscillation Frequency and Conservation of Energy

Select one mass from the set (but <u>not</u> one of the lighter ones). Predict the oscillation frequency of the spring/mass system. Then set the system oscillating, measure the oscillation frequency and check your previous results. Does the oscillation frequency depend on how far back you pull the mass?

Write down an equation modelling the simple harmonic motion exhibited by your mass-spring system if it is stretched some distance and released from rest. That is, model the motion over time as a cosine function: y(t) = $A \cdot \cos(\omega t) + y_{rest}$.

Using the spreadsheet provided to you, fill in the corresponding blanks and equations to show that your system conserves energy (Ask your professor for help if you're not familiar with Excel, e.g.). Plot all three forms of energy, as well as the total energy, versus time (plot provided).

Optional: Plot total energy vs time on a separate plot, and compute a trend line. What does this trend line tell you?