Physics 233 **Lab 7**

Mirrors and Lenses

Goals

- To determine the focal lengths of a concave mirror and a converging lens.
- To get further practice with graphing, linear regression, and uncertainty propagation.

Equipment:

Optical bench, component holders, light box (the "object"), screen, convex mirrors, converging lenses

Reading:

- Review chapters O2 and O3

Pre-Lab Problems: Perform these in WebAssign, but also copy your answers to your lab notebook for reference when you're doing the lab.

1. Develop the theory for determining the focal length of a concave mirror or a converging lens. This should include the following:
   a. Figure out how you should construct a plot using measurements of object and image distances so that your plot will be a straight line.
   b. Explain how the focal length will be determined from the graph.
2. How is the magnification defined? How do you expect the magnification to be related to the object and image distances?

Lab Procedure:

- Your lab instructor will give you instructions on how to use the optical bench.
- Make a note of the numbers of the mirror and lens that you are using.
- Measure the object height. (This is *not* the distance above the optical bench!)
- For the mirror and lens, measure the image distance and image height for a variety of object distances.

Post-Lab Assignment:

1. Determine the focal lengths of the lens and mirror using linear regression. Be sure to include uncertainties (think carefully about how these should be calculated).
2. Plot the magnification M of the image, which is defined as the image height divided by the object height, versus the ratio of the image distance to the object distance. Explain whether or not this graph matches your expectations.

Note: There is no writing assignment for this lab so that you can have more time to prepare for the exam