Homework is due in class. Do all problems and show your work. Credit is not given for answers only. You are welcome to work together, but be sure your homework is your work.

1. This homework assignment is a bit more hands-on and will require some items. First, you will need one of the lenses that we handed out in class. If you don’t have them, talk with one of your classmates to coordinate borrowing the required lens.

For this assignment, we are going to apply the Gaussian imaging and magnification equations to determine the imaging properties of the lens.

(a) Find the convex lens with the focal length of 78.4 mm. We will assume it is a thin lens. You will need a way to hold the lens, and the lens mount will depend on what resources you have available to you. I have seen Play-Doh, Legos and tape all used as inexpensive mounts, so get creative if you need to.

(b) Next, you will need some sort of bright object. A flame (please don’t burn anything down), LED or small light bulb, or flashlight will work well. In a dark room, set up your system with the object 200 mm to the left of the lens. This light source will be the object of your system.

(c) Use a piece of white paper as a screen and find the image formed by the lens. Measure the distance from the lens to the screen. Measure the size of the image. Take a picture of the image formed on the screen and include it in your submission. In the picture make sure there is a piece of paper that shows the date that you took the picture.

(d) Use your object and image distances from (b) and (c) and the Gaussian imaging equation to determine the focal length of the lens. How does this compare to the actual value (percent error)? Remember your sign conventions.

(e) Use the object and image size to determine the magnification of the system. Use the object and image distances from (b) and (c) to determine the magnification of the system. How do these two results compare?

(f) Move the object so that it is 50 mm to the left of the lens. Based on the Gaussian imaging equation, where is the image expected to be located? Based on the magnification equation, what is the expected magnification? Take a picture of the image formed for this set up and include it in your submission. Include the paper that shows the date in this photo too. In this case, the camera will need to look back through the lens to “see” the image.