Geometrical Optics Lab

Objectives

- Explore the thin lens and mirror equations
- To play around with some objects and get a sense for real and virtual images and objects

Equipment

- Optical bench, on the shelf near the door between 035 and the prep room, black track about 1 meter long
- Mirrors and Lenses box, on the shelf in the prep room.
    - This should have two converging lenses, one diverging lens, and a converging mirror as well as a large white screen to use for finding images. These parts mount on the optical bench in order to position and hold multiple parts.
    - It should also have a box that has an illuminated cross-hairs and power supply that plugs in and the light turns on. This will serve as a real object.

Procedure-ish

- You should have two double convex lenses in your box. They are labeled with focal lengths but don't cheat. Measure the focal lengths by forming an image from an object that is "infinitely" far away. The best way to do this is to open the exterior door of the prep room and while standing inside the prep room but using the light coming from across the ravine in Beeson Woods. With this as you object and your lens fixed in place, move the screen until you see an image of Beeson Woods appear on the screen. The distance from the center of the lens to the screen is the focal length. What kind of uncertainty do you measure in the position of the screen?
- Now take your converging lenses and position the light box on one end of you optical bench. Adjust the position of the focal length and find an image using the screen. Do this 5 times and compare your object and image distances to the thin lens equation.
- Now take the diverging lens and think about how you would determine its focal length. In order to measure its virtual image location, you have to use a converging lens and find a real image based on the virtual image from the diverging lens. So put your diverging lens in front of your light box and the place one of your now known focal length converging lenses down behind the diverging lens. Use the screen to find the real image. Now calculate where that means the object for that converging lens must be. This object must be the virtual image that the diverging

lens produced, so calculate it and then use the real object and this virtual image to calculate the focal length of the diverging lens. Do this two more times to verify.

- Follow similar steps to these to determine the focal length of a converging mirror. Your kit should include a half screen device that allows light through one half and then forms an image on the other half from the reflected light off the mirror. Point this at Beeson Woods and form an image on the half screen. The distance from the mirror to the screen is the focal length. Check this on you optical bench using the light box as an object and find a few image distances.