Problem Set #3

Due Monday, March 9 by 5pm to Dickinson 104

1. The figure below shows a plane mirror and two reflected rays of light that originated from the same point source.



   a. Draw the incident rays of light associated with the two reflected rays.
   b. Indicate the location of the point source of light that was the origin of these rays.

2. When an object is brought closer to a converging lens (i.e. like the ones we used in lab), does the image move closer to or farther from the lens? Does it increase or decrease in size? Explain, using a drawing of the light rays passing through the lens.

3. How far from the lens must the film (or digital detector) in a camera be if the lens has a 35.0-mm focal length and is being used to photograph a flower 75.0 cm away?

4. To a person (or fish) lying on the bottom of a pool, all objects outside the pool appear to be within a cone, due to total internal reflection. What is the size (angle) of this cone? What does the observer see outside of this cone?

5. Most of the work we've done with lenses to date has been with *converging* lenses, which cause light rays to converge to a single point and bring them to a focus. There are also *diverging* lenses, which cause light rays to diverge from one another. Given the basics of what we know about how lenses work explain, with a drawing, why concave lenses must be *diverging* lenses and convex lenses must be *converging* lenses. (Hint: The fact that a light ray always bends away from the thinnest part of a lens turns out to be critical here).

6. Find some piece of art (other than those from the reading) where the artist has represented refraction. Write a short description of the piece and how refraction is represented in the piece of art. Print out a copy (or provide a link to me) and include it with your problem set.