name_______________________
ID# ______________________

**Experiment 9**
**Converging and Diverging Lenses**

**Distant Object**

Position of lens ____________  Position of Image ____________

Object distance ____________  Image distance ____________

Focal length of lens = ____________

Characterize the image:

*Show calculation:*

**Nearby object**

Position of object ____________  Position of lens ____________

Position of Image ____________

Object distance ____________  Image distance ____________

Size of object \( (h) \) ____________  Size of image \( (h_i) \) ____________

Characterize the image:

Focal length of lens ____________

\[
m = \frac{-d_i}{d_o} = \underline{\underline{\text{__________________________}}} \quad m = \frac{h_i}{h_o} = \underline{\underline{\text{__________________________}}}\]

% difference=__________________

*Show equations and sample calculations:*
Method of coincidence

Position of object/mirror __________  Position of lens __________

Size of object \( (h_o) \) __________  Size of image \( (h_i) \) __________

Characterize the image:

Object distance __________  Image distance __________

Focal length of lens __________

\[
m = \frac{-d_i}{d_o} = \frac{h_i}{h_o} =
\]

% difference = __________

Show equations and sample calculations:

Parallax method for converging lens

Position of object pin ______  Position of image pin ______

Position of lens __________

Characterize the image

Object distance __________  Image distance __________

Focal length __________

Show equations and sample calculations:

Parallax method for diverging lens

Position of object pin ______  Position of image pin ______

Position of lens __________

Characterize the image

Object distance __________  Image distance __________

Focal length __________

(10 points)
Lenses don't have exactly the same focal length for all wavelengths of light. Why? What problems could this cause for someone who is trying to design a camera or a telescope? Would you have the same problem with a mirror?

**Questions**

1. How did the four values of $f$ for the converging lens compare? Do you think one particular method of finding the focal length was more accurate? Do you think one or more methods might be less accurate? Explain your conclusions. *(4 points)*

2. What did you notice about the image distance as you changed the object distance? What happened to the image as the object got farther away from the converging lens? *(3 points)*

3. What was the magnification of the image that you got using the method of coincidence? Why would you expect to get this value? *(3 points)*

4. Both converging and diverging lenses can be used to get a virtual image. What is the difference between the relative positions of the object and image for the converging and diverging lens? *(4 points)*