

Instructions:

1. Do all of your work on this sheet.
2. **Show all of your steps** in problems for full credit.
3. **Be clear and neat** in your work. Any illegible work, or scribbling in the margins, will not be graded.
4. Place your **answers in a box**.
5. If you need more space, you may use the back of the page and write **On back** in the problem space.

1. **Multiple Guess (4 pts)** Find the answer which best fits the question and write it in the space provided.

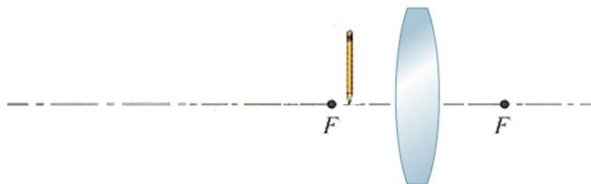
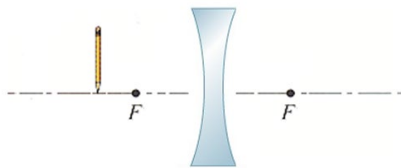
- a. The lens of a farsighted eye can be corrected by
 - a) a converging lens; b) a diverging lens;
 - c) more intense light; d) none of these

- b. Which of the following is bent the most as it passes through a prism?
 - a) red b) green c) blue d) violet.

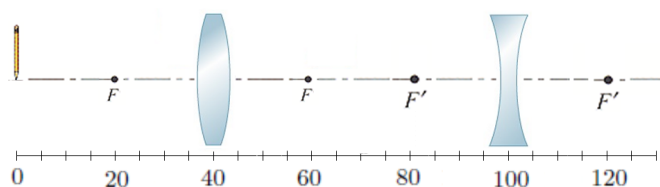
- c. For a diverging lens the image always appears
 - a) real, inverted, smaller; b) virtual, inverted, larger;
 - c) virtual, upright, smaller; d) real, upright, larger;
 - e) none of these.

- d. Performing a diffraction experiment 10.0m deep in a swimming pool has what effect on the position of the maxima on a fixed underwater screen?
 - a) None. b) Maxima get closer together.
 - c) Maxima get farther apart.
 - d) Maxima get cancelled by minima.

2. **Definition/Principle (4 pts)** Sketch the ray diagrams for the following lenses. Clearly show the images and indicate if the final images are **real or virtual**.

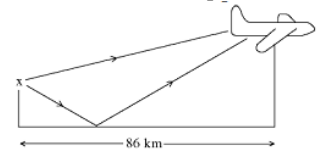


Bonus: Sketch the ray diagram for the system of lenses. Clearly show the images and describe the final image.



3. **Problems (12 pts)**

- a. A forty year old finds that she has to hold a newspaper 45.0 cm from her eyes. What focal length contact lens does she need to correct her vision?
- b. Light of wavelength 620 nm is incident on a double slit. The angle between the central maximum and the second order maximum is 4.90° . Determine the separation of the slits.
- c. 120 MHz radio waves leave a radio tower and reach an airplane following two different paths. At 86.0 km from the tower the pilot loses the signal due to destructive interference. What is a possible path difference between the two paths? [You do not need all of the data.]



- d. A converging lens has a focal length of 20.0 cm. An object, which is 4.0 cm high, is placed at a point 40.0 cm to the left of the lens.
 - i. What is the position and size of the image?
 - ii. Place a diverging lens ($f = -20.0$ cm) 60.0 cm to the right of the converging lens. What is the position and size of the new image?
 - iii. What is the total magnification of this system?