

St John Baptist De La Salle Catholic School, Addis Ababa

Homework 3

4th Quarter

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June 9, 2023

Notes, and use of other aids is allowed. Read all directions carefully and write your answers in the space provided. To receive full credit, you must show all of your work.

Cheating or indications of cheating and similar answers will be punished accordingly.

Information

- The homework is due on **Monday, June 12th**.
- You should Work on it **in groups** and consult me if you have any questions. As I have reiterated multiple times, cheating between groups will have a serious consequence.
- For purposes of neatness and simplicity of grading, you should do the homework on an **A-4 paper**.

Questions on Image formation by lenses

1. Explain issues of near-sightedness and far-sightedness pictorial and explain how a solution can be provided to both.
2. Using ray tracing, show the image created when an object is placed at the following places on a converging lens:
 - beyond $2F$
 - at $2F$
 - between $2F$ & F
 - at F
 - between the lens & F
3. In what position(s), will a converging lens of focal length 8cm form images of an object on a screen located 40cm from the object?
4. Assume the projector we use in class has a 100-D lens. If we are observing an upright image of dimension 1.2m x 1.8m 3m away, what dimensions must have the smaller slides in the projector have been?
5. A camera lens used for taking close-up photographs has a focal length of 0.3 cm. The farthest it can be placed from the film is 50.0 mm.
 - What is the closest object that can be photographed?
 - What is the magnification of this closest object?
 - How far away must the screen be to produce a sharp image if the lens is 20cm from the slide?
 - If the slide has dimensions of 2.0mm by 4.0mm, what are the dimensions of the image?

Advanced Problems

6. A glass($n = 1.50$) lens has a focal length of 15cm in air, what is its focal length in water? If the radius of one-half of the lens is 10cm, what is the radius of the other half?
7. For two lenses that are in contact, show that the combination of their focal lengths(f) can be given as follows if one of the lenses has a focal length f_1 and the other has f_2 , $\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$