

ME244: Homework 2

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Submission date: March 5th, 10:00 am

1. Show that the lateral displacement s of a ray of light penetrating a rectangular plate of thickness t is given by:

$$s = \frac{t \sin(\theta_1 - \theta_2)}{\cos \theta_2}$$

2. Two thin lenses have focal lengths of -5 and $+20$ cm. Determine their equivalent focal lengths when (a) cemented together and (b) separated by 10 cm.

3. A lens is moved along the optical axis between a fixed object and a fixed image screen. The object and image positions are separated by a distance L that is more than four times the focal length of the lens. Two positions of the lens are found for which an image is in focus on the screen, magnified in one case and reduced in another. If the two positions differ by a distance D , show that the focal length of the lens is given by

$$f = (L^2 - D^2)/4L$$