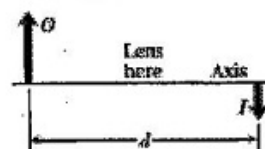1. A real inverted image I of an object O is formed by a certain lens (not shown); the object–image separation is $d = 40.0$ cm, measured along the central axis of the lens. The image is just half the size of the object.

   a. What kind of lens must be used to produce this image?

   b. How far from the object must the lens be placed?

   c. What is the focal length of the lens?

2. White light, traveling parallel to the base of a prism with an apex angle of 30°, and enters the prism near the top Apex angle. After the light exits the prism on opposite face, what is the angle (angular spread) between the red light and light if the index of refraction is 1.51 for red light and 1.53 for violet light.
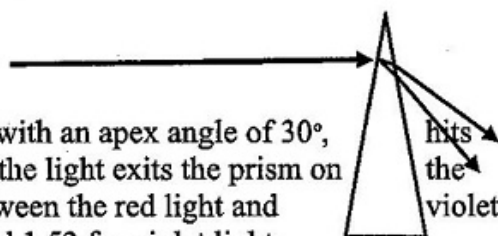
3. If the distance between the first and tenth minima of a double-slit pattern is 18.0 mm and the slits are separated by 0.150 mm with the screen 50.0 cm from the slits,

   a. what is the wavelength of the light used? (assume experiment is in air)

   b. What would be the spacing between the first and tenth minima if this same experiment (with same light source) was done underwater ($n = 1.33$)?

4. Light of wavelength 440 nm passes through a double slit, yielding a diffraction pattern whose graph of intensity I versus angular position θ is shown in the figure. Calculate

   a. the slit width.

   b. the slit separation.
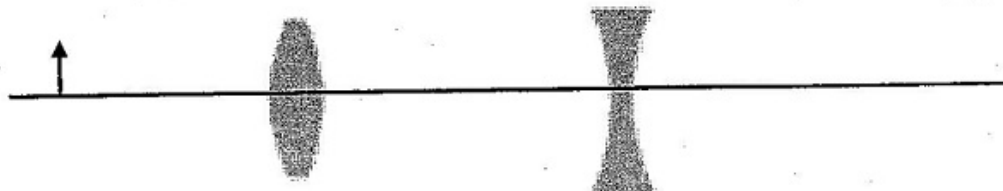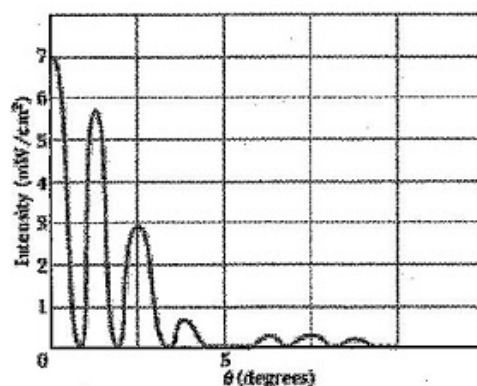
5. An object is 20 cm from a convex lens. A concave lens is 15 cm from the convex lens. For both lenses the magnitude of their focal lengths is 7.5cm.

   a. How far is the object from the final image?

   b. With the spacing describe above, if the concave lens is moving with an instantaneous speed of 2m/s toward the convex lens, what is the speed and direction of the final image?