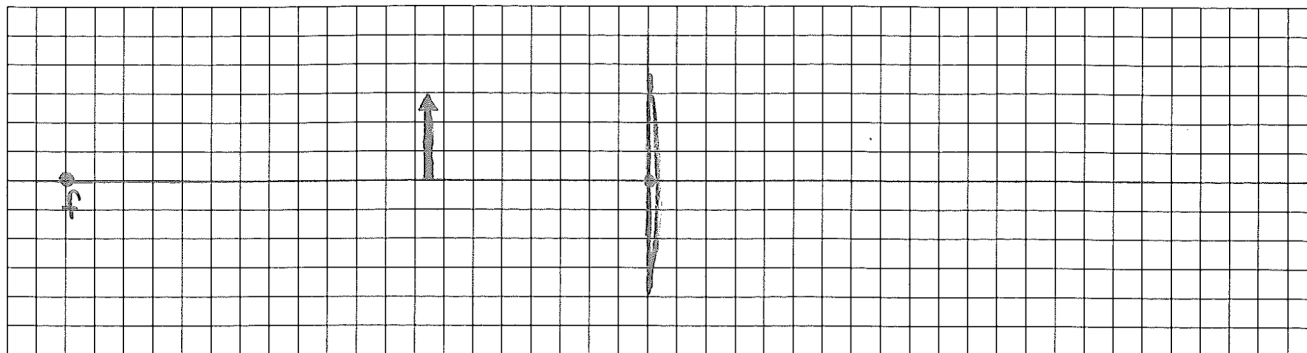


Physics 262 Exam 2. Geometric Optics & Interference. Enter  $0 \times 10^0$  for zero.

**If you can't remember an equation you need, ask.**

Use ray tracing (or any other correct method) to find the image of the arrow formed by the converging thin lens. One focal point is shown, 20 cm to the left of the lens. (1 square is 1 cm.) The arrow is 7.5 cm to the left of the lens.

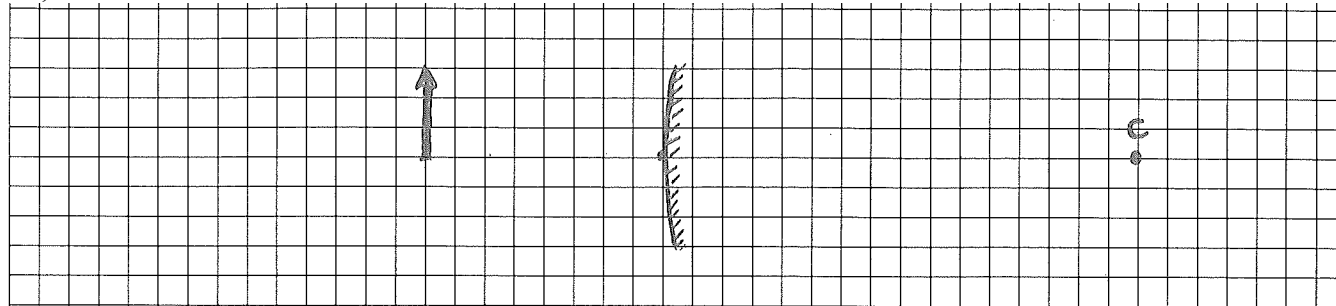


1&2] How far is the image from the lens (in cm,  $a1 \times 10^{a2}$ )

3] The image is to the (a) left or (b) right of the lens, or (c) at infinity.

4] The image is (a) real, (b) virtual, or (c) at infinity.

Use ray tracing (or any other correct method) to find the image of the arrow formed by the convex mirror shown. The center of curvature of the mirror is shown, and is 16 cm to the right of the mirror vertex. The object is 3 cm tall, and is 8 cm to the left of the mirror vertex.



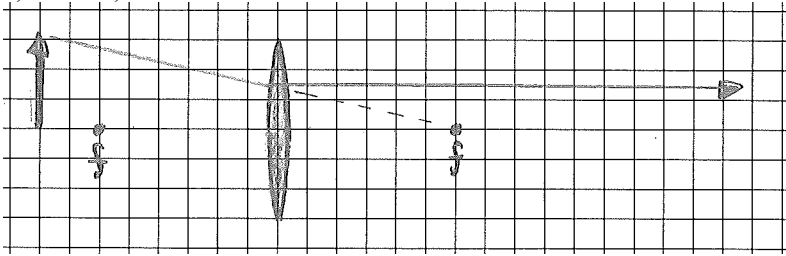
5&6] How far is the image from the mirror (in cm,  $a5 \times 10^{a6}$ )

7] The image is to the (a) left or (b) right of the lens, or (c) at infinity.

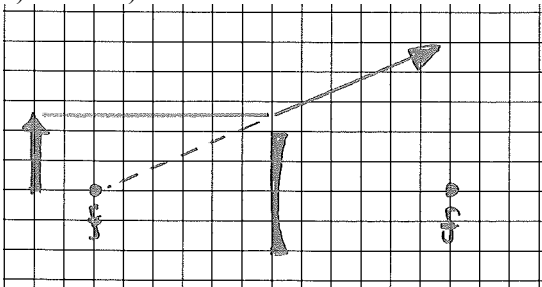
8] The image is (a) real, (b) virtual, or (c) at infinity.

9&10] What is the magnitude of the magnification, in %? ( $a9 \times 10^{a10}$ )

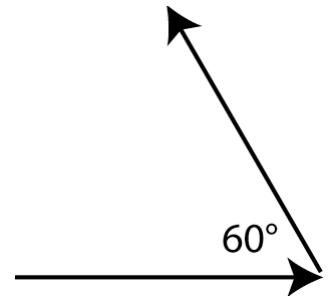
11] The drawing shows a converging lens, an object, and the focal points. Is the ray shown correctly traced?  
 a) Yes b) No



12] The drawing shows a diverging lens, an object, and the focal points. Is the ray shown correctly traced?  
 a) Yes b) No



13] The diagram shows phasors for a two slit interference pattern at an angle of  $\theta = 1.6^\circ$  ( $1/36^{\text{th}}$  of a radian) above the central maximum. (This is the smallest angle  $\theta$  for which this diagram is correct.) The horizontal phasor represents the light from the lower of the two slits. If the wavelength of light used is  $0.5 \mu\text{m}$ , what is the slit separation in  $\mu\text{m}$ ? Answer to the nearest micron, 0-9.



14] If the intensity at the central maximum of the interference pattern is  $12 \text{ W/cm}^2$ , what is the intensity at an angle of  $1.6^\circ$  above the central maximum? Answer to the nearest  $\text{W/cm}^2$ , 0-9.

15] What is the intensity at an angle of  $1.2^\circ$  above the central maximum? Answer to the nearest  $\text{W/cm}^2$ , 0-9.

16] If a third identical slit is added above the other two, with all three slits equally spaced, what is the intensity at  $1.6^\circ$  above the central maximum? Answer to the nearest  $\text{W/cm}^2$ , 0-9.

17&18] What is the the thinnest soap film (in nm) that will give a maximum reflection for red light,  $\lambda = 700 \text{ nm}$ . The index of refraction of soapy water is 1.33. ( $\boxed{\text{a17}} \times 10^{\boxed{\text{a18}}}$ )

Extra credit (if you have time)

19&20] Returning to the 3-slit interference pattern above: what is the smallest angle  $\theta$  above the central maximum where the intensity would be **unchanged** if you cover the *middle* slit?

Give your answer in milliradians.  $\boxed{\text{a19}} \times 10^{\boxed{\text{a20}}}$