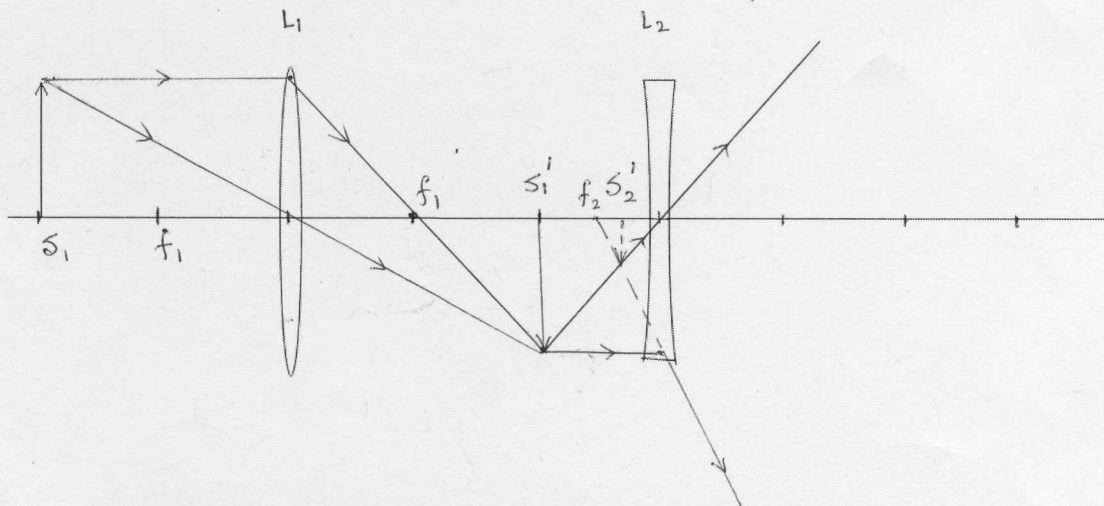


Solution Q6.

NAME: _____	Quiz #6b: Phys270 Sec 102/104
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1. [10 pts] A 10.0-cm-tall object is 20 cm to the left of a lens with a focal length of 10 cm. A second lens with a focal length of -5.0 cm is 30 cm to the right of the first lens.

a. [5 pts] Use your formula card as a straight edge to draw the ray diagram on the schematic below. Each tick mark represents 10 cm. Make sure to label the focal points, the image produced by the first lens, and the image produced by the second lens.



b. [5 pts] Calculate the image position and height.

FIRST REFRACTION

$$s_1 = 20 \text{ cm} \quad f_1 = 10 \text{ cm}$$

$$\frac{1}{s_1} + \frac{1}{s_1'} = \frac{1}{f_1}$$

$$\therefore \frac{1}{s_1'} = \frac{1}{10} - \frac{1}{20} = \frac{1}{20}$$

$$s_1' = 20 \text{ cm}$$

$$m_1 = -1$$

2ND REFRACTION

THE IMAGE AFTER 1ST REFRACTION BEHAVES LIKE THE OBJECT FOR 2ND REFRACTION

$$s_2 = 30 \text{ cm} - 20 \text{ cm} = 10 \text{ cm}$$

$$f_2 = -5 \text{ cm}$$

$$\frac{1}{s_2} + \frac{1}{s_2'} = \frac{1}{f_2}$$

$$\Rightarrow \frac{1}{s_2'} = -\frac{1}{5} - \frac{1}{10} = -\frac{3}{10} \Rightarrow s_2' = -\frac{10}{3} \text{ cm}$$

$$m_2 = \frac{1}{3}$$

$$m = m_1 m_2 = -\frac{1}{3}$$

$$\therefore h' = -\frac{1}{3} h = -\frac{10}{3} \text{ cm} \quad (\text{inverted})$$

position =  $\frac{10}{3} \text{ cm}$  to the left of  $L_2$