Problem 3: (20 pts.) A 4.00-cm tall object is placed at the origin of an optical bench, and a converging lens with a focal length of 12.0 cm is placed 18.0 cm to the right of the object.

a. (10 pts.) How far away from the object is the image located?

b. (10 pts.) Now a second converging lens with focal length 48.00 cm is placed on the optical bench 12.00 cm to the right of the first lens. How far away from the original object is the final image?

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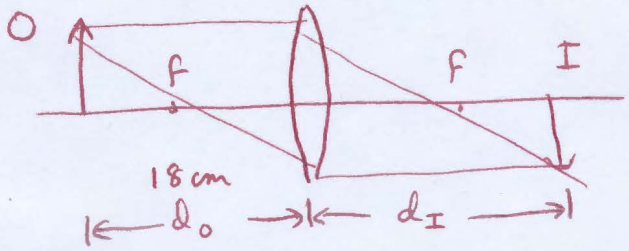
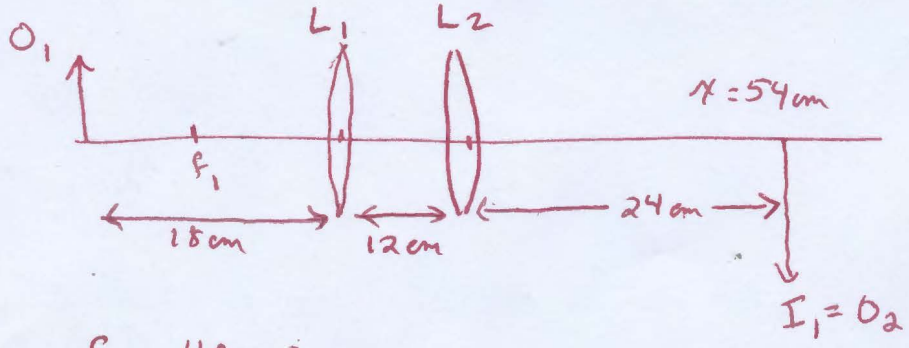


$$\frac{1}{f} = \frac{1}{d_O} + \frac{1}{d_I} \Rightarrow \frac{1}{d_I} = \frac{1}{f} - \frac{1}{d_O} = \frac{1}{12\,cm} - \frac{1}{18\,cm} = \frac{1}{36\,cm}$$

$d_I = 36$ cm. That is 36 cm to the right of the lens, or $36 + 18 = \boxed{54\,cm}$ from the object

b. (10 pts.) Now a second converging lens with focal length 48.00 cm is placed on the optical bench 12.00 cm to the right of the first lens. How far away from the original object is the final image?



$f_2 = 48$ cm

$d_{O_2} = -24$ cm

$$\frac{1}{d_{I_2}} = \frac{1}{f_2} - \frac{1}{d_{O_2}} = \frac{1}{48\,cm} - \frac{1}{-24\,cm} = \frac{1}{16\,cm}$$

$$\Rightarrow \boxed{d_{I_2} = 16\,cm}$$

This would be 16 cm from Lens 2, or 46 cm from the original object.