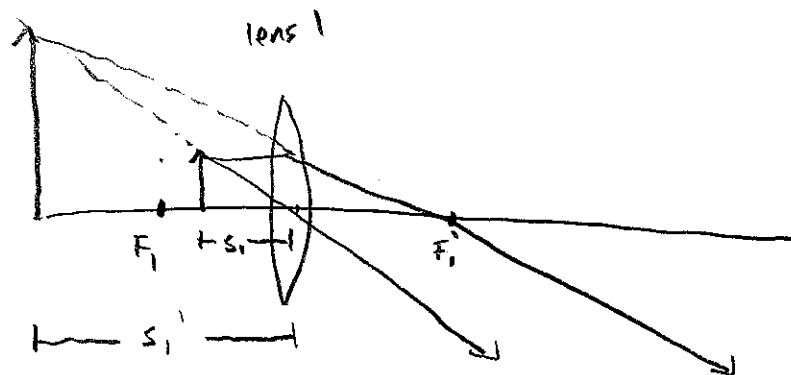
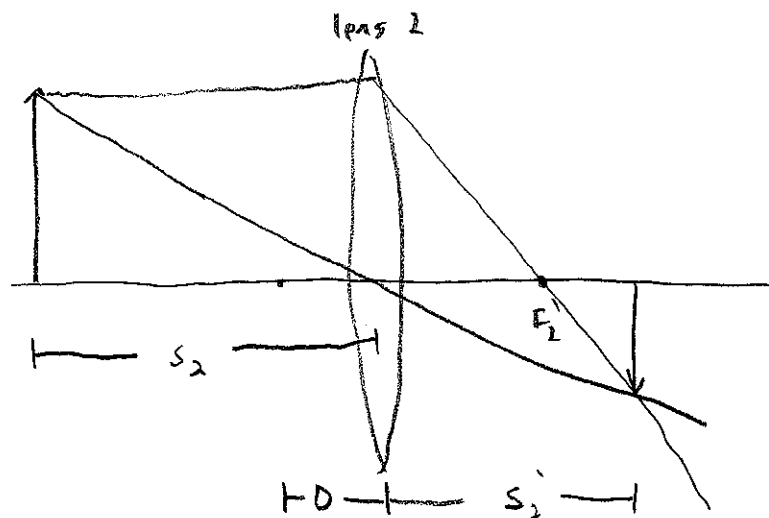


Physics 267 Problem #3 Solution

a.)



use image as object



s_2' is negative since outgoing rays are on opposite side from the image,

$$s_2 = -s_1' + D$$

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

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

$$s_2' = \left(\frac{1}{f_2} - \frac{1}{s_2} \right)^{-1} = \left(\frac{1}{f_2} - \frac{1}{D - s_1'} \right)^{-1}$$

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

$$s_2' = \left(\frac{1}{f_2} - \frac{1}{D - \frac{s_1 f_1}{s_1 - f_1}} \right)^{-1}$$

b.) $D \rightarrow 0$, $s_1 \rightarrow \infty$ then $s_2' = f$

$D \rightarrow 0$

$$s_2' = \left(\frac{1}{f_2} + \frac{1}{0 - \frac{1}{\frac{1}{f_1} - \frac{1}{s_1}}} \right)^{-1}$$

$s_1 \rightarrow \infty$

$$s_2' = f = \left(\frac{1}{f_2} + \frac{1}{f_1} \right)^{-1}$$

or

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

two thin lenses
in contact.