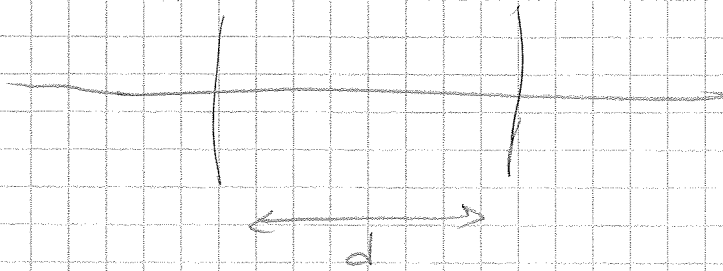


PDP  
2-19

$$f_1 = -5 \text{ cm} \quad +20 \text{ cm}$$



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

$$2) \frac{1}{d-s_1'} + \frac{1}{s_2} = \frac{1}{f_2}$$

$$a) d=0: \frac{1}{s_1} + \frac{1}{s_2} = \frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{f} = \frac{1}{20} - \frac{1}{5}$$

$$\Rightarrow f = \frac{20}{1-4} = -\frac{20}{3}$$

$$= \underline{\underline{-6.7 \text{ cm}}}$$

$$b) \underline{d=10 \text{ cm}}: \left. \begin{array}{l} \text{Let } s_2 \rightarrow \infty \\ D_2^o: f_2 = s_2' \end{array} \right\}$$

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

$$\frac{1}{f_1} = \frac{1}{f_2} - \frac{1}{d-s_1'} = \frac{1}{f_2} - \frac{1}{d-f_2} = \frac{1}{20} - \frac{1}{10+5}$$

$$= \frac{3-4}{60} \Rightarrow -60 \text{ cm} = f_1$$

$$s_2' \rightarrow \infty \Rightarrow s_2 = f_2$$

$$d-s_1' = f_2 \Rightarrow s_1' = d-f_2 = -10 \text{ cm}$$

$$f_0 = s_1 = \frac{1}{\frac{1}{f_1} - \frac{1}{s_1'}} = \frac{1}{-\frac{1}{5} + \frac{1}{10}} = -\frac{10}{1} = \underline{\underline{-10 \text{ cm}}}$$