

FIFTH MIDTERM

2

Name: _____ Student ID #: _____

Discussion Instructor (circle): Eric Gary Jose Monica

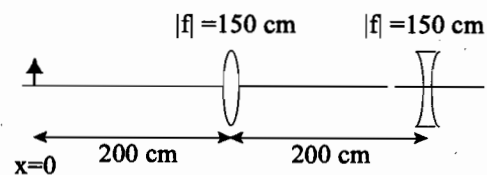
SHOW ALL WORK!!!!

REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!

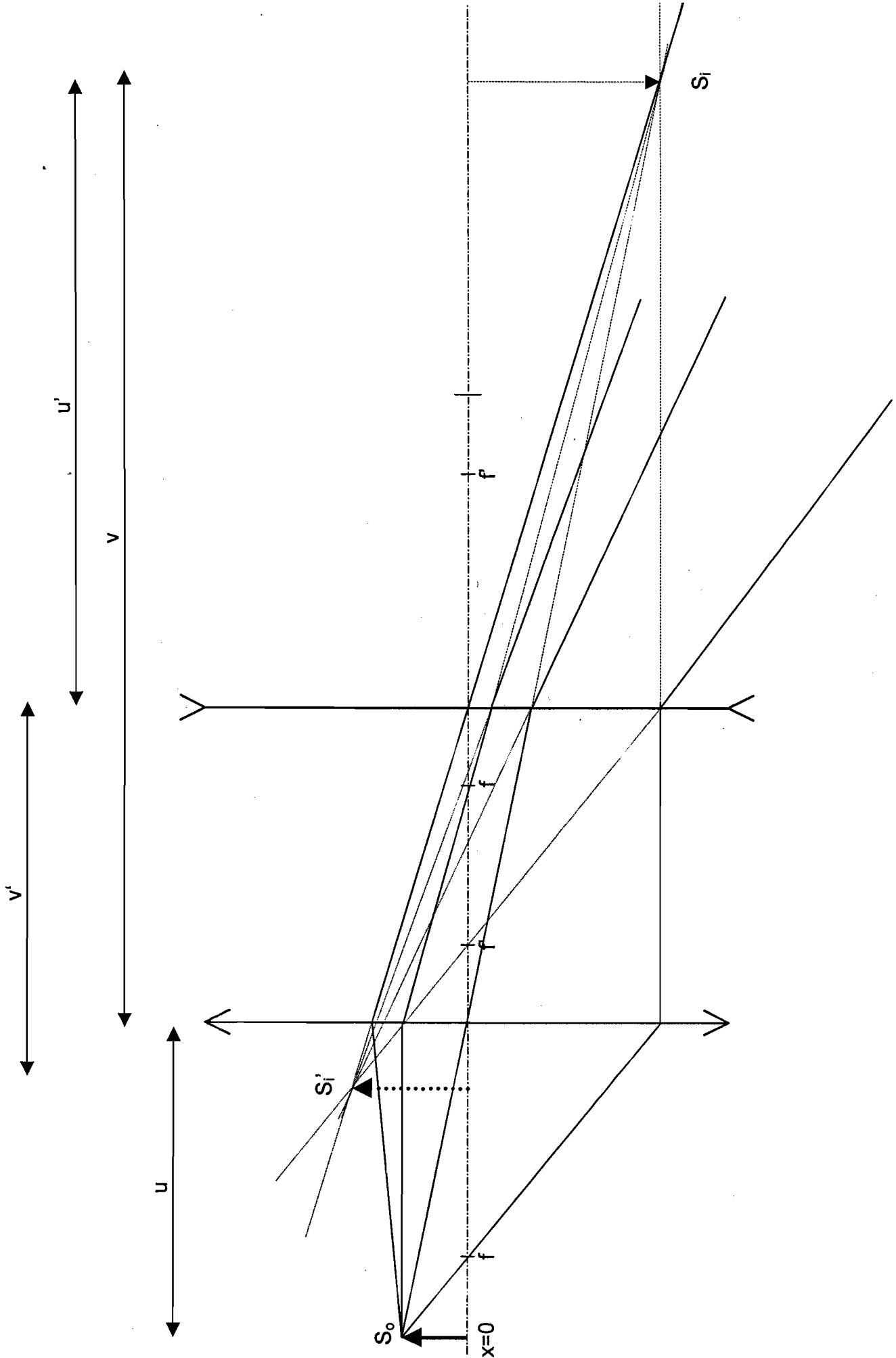
Use the conversion constants and data given on the front page.

Given the lens system shown.

- (a) Calculate the position, measured with respect to the original object as $x = 0$, of the final image.
- (b) Find the magnification, including sign, of the final image.
- (c) Is the final image real or virtual? For full credit, give an explanation.



See next page.



(a) for converging lens

$$\frac{1}{|f|} = \frac{1}{P} + \frac{1}{i}$$

here: $|f| = 150 \text{ cm}$ $P = 200 \text{ cm}$

$$\Rightarrow \boxed{\begin{array}{l} i = 600 \text{ cm} \\ M = -\frac{i}{P} = -3 \end{array}}$$

for diverging lens

$$-\frac{1}{|f|} = \frac{1}{P'} + \frac{1}{i'}$$

here: $|f| = 150 \text{ cm}$

$$|P'| = 600 \text{ cm} - 200 \text{ cm}$$

due to the sign agreement

P' is negative, because it is on the behind side.

$$P' = -|P'| = -400 \text{ cm}$$

$$\Rightarrow \boxed{i' = -240 \text{ cm}}$$

negative sign means it is on the front side

$$M' = - \frac{-240}{-400} = -\frac{3}{5}$$

So the distance between final image and the $x=0$ point is

$$D = (400 - 240) \text{ cm} = \underline{\underline{160 \text{ cm}}}$$

$$(b) \quad M_{\text{tot}} = M \cdot M' = -3 \cdot -\frac{3}{5} = \frac{9}{5}$$

positive value means virtual image.

(c) The image formed on the left side of second lens, which means it is virtual image.