THIRD MIDTERM

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Discussion Section 

SHOW ALL WORK!!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

Two lenses are arranged as shown. You supply the sign for the focal length. The object is 3500 mm to the left of A.

(a) Find the position of the final image measured from the position of B. State clearly whether it is right or left of B.
(b) What is the magnification of the system?
(c) Is the image erect or inverted? Show clearly why.
(d) Is the image real or virtual? State clearly why.

\[ \frac{1}{s_a} + \frac{1}{s'_a} = \frac{1}{f_a} \Rightarrow s'_a = \left( \frac{1}{f_a} - \frac{1}{s_a} \right)^{-1} = \left[ \frac{1}{200} - \frac{1}{3500} \right] = 212.12 \text{ mm} = s'_a \]

Use image from lens A as object for lens B \( \Rightarrow s_b = 212.12 - 200 = 12.12 \text{ mm} \)

(-) Object for lens B on right of lens B so, use \(-12.12 \text{ mm} = s_b \)

\[ s'_b = \left[ \frac{1}{-10} - \frac{1}{(-12.12)} \right] = -57.1 \text{ mm} \] Image sign is negative, so it is on the left of lens B

b) \( M = \frac{s'_a}{s_a} \) \( M_{tot} = M_A \cdot M_B = - \frac{s'_a}{s_a} \cdot \frac{s'_b}{s_b} = \left( \frac{212.12}{3500} \right) \left( -\frac{57.14}{12.12} \right) = 2.86 \times 10^{-1} \)

c) Image is erect (sign on magnification is +) \( \text{Erect} \)

d) Image is to the left of lens B and \( s'_b < 0 \) so \( \text{virtual image} \)