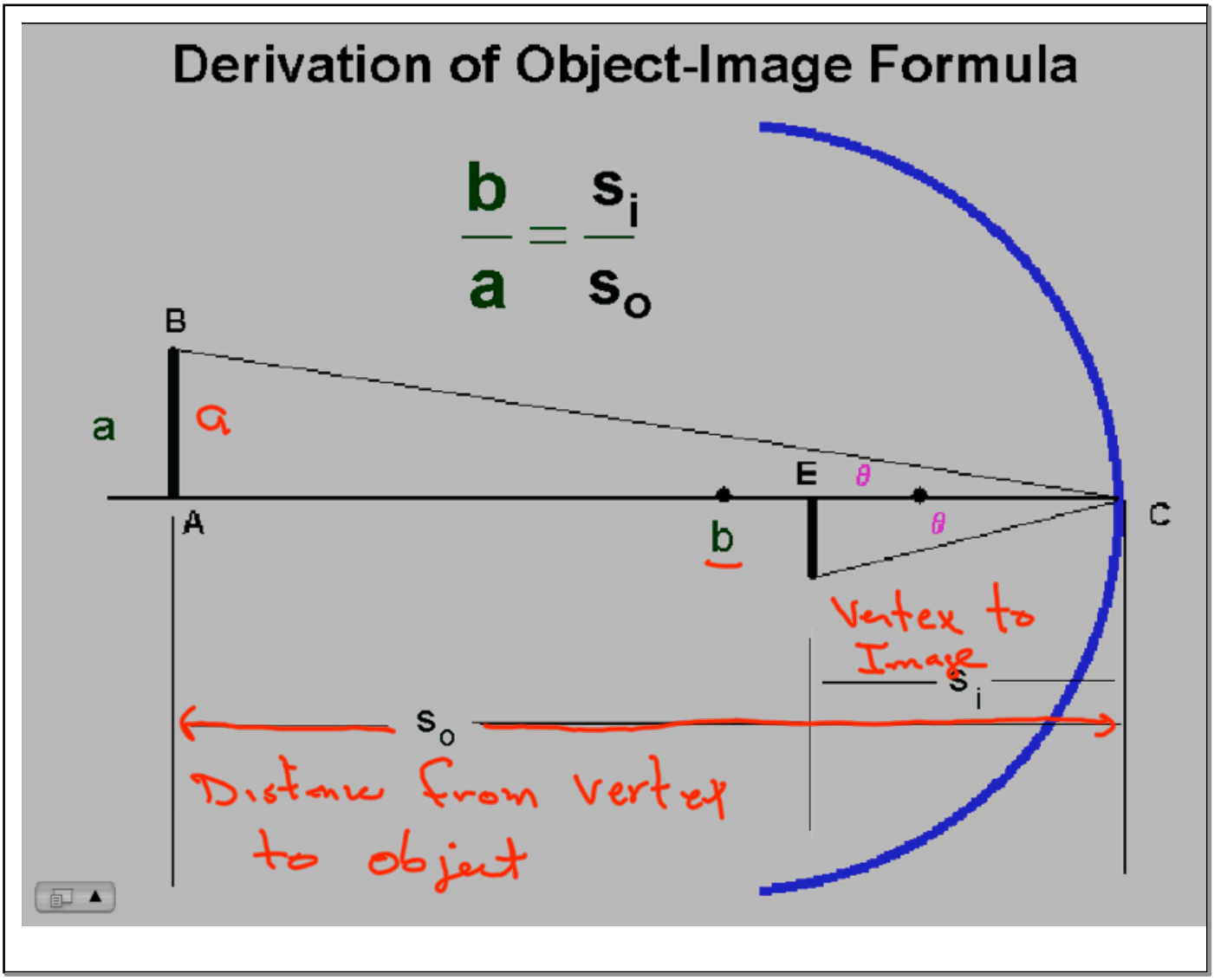
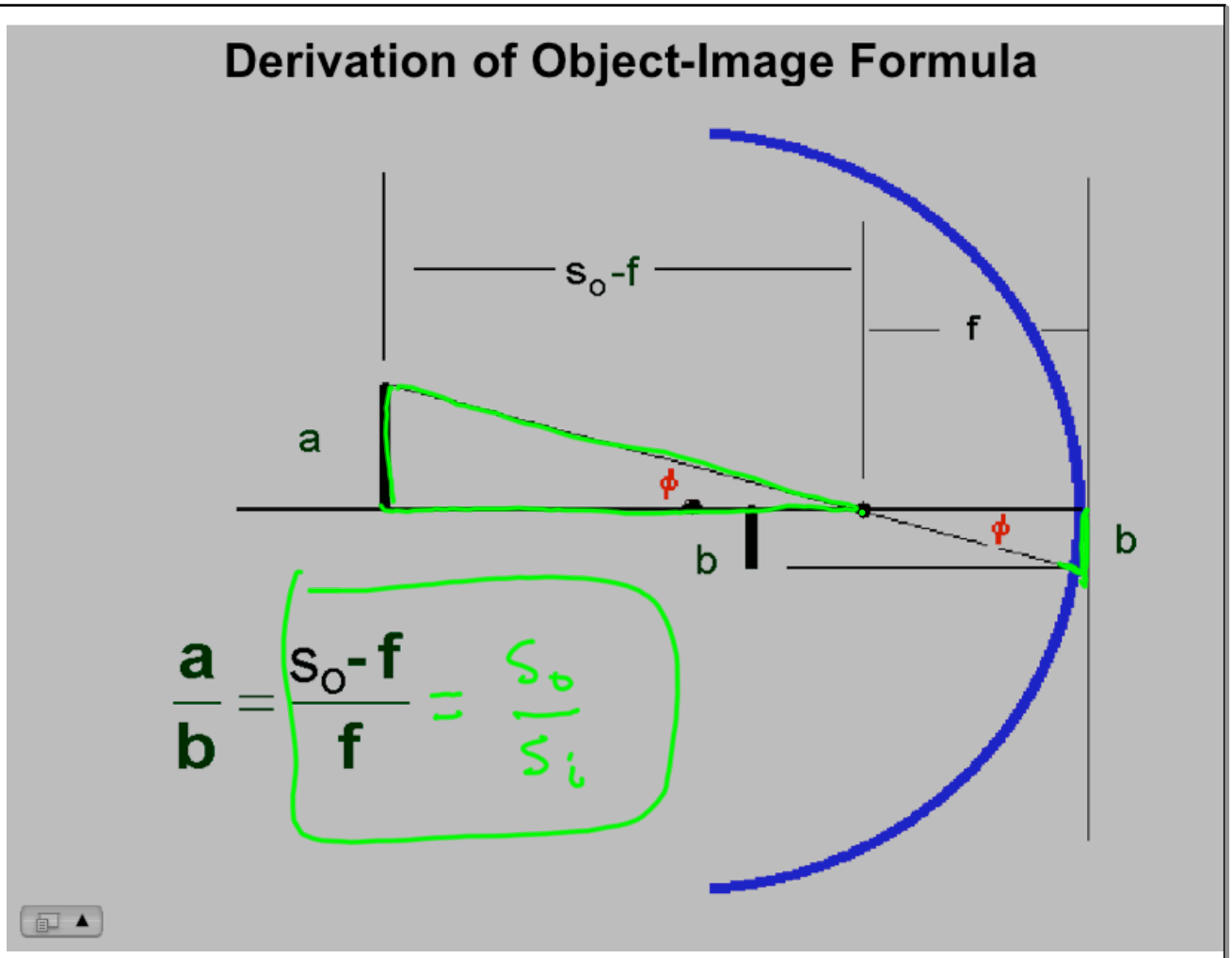
Reminders 4-12-08:
-Conceptual Questions on Color Due in Lab this Week.
-Conceptual Questions on Geometrical Optics due Tuesday.
-Read Chapter 24 and 25
-Lens Lab Has Been Changed

Objectives:
-Interference and Young's Experiment
-Diffraction


Derivation of Object-Image Formula
b/a = s_i/s_o
B
a
a
E
θ
θ
C
A
b
Vertex to Image
s_i
s_o
Distance from vertex to object



$$\frac{s_o - f}{f} = \frac{s_o}{f} - 1 = \frac{s_o}{s_i}$$

Divide both sides by s_o

$$\frac{1}{f} - \frac{1}{s_o} = \frac{1}{s_i}$$

$$\boxed{\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}}$$

Object Image formula

Example

A distant object forms an image 15 cm in front of a concave mirror. Where will the image be located if the object is placed 25 cm from the mirror? Assuming the object is 2 cm high, what is the image height? What is the radius of the mirror? Draw the ray-diagram.

- *Answer: 38 cm; 3 cm inverted;c=3.0x10¹ cm*

$\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}$

$\frac{1}{\infty} + \frac{1}{15} = \frac{1}{f}$

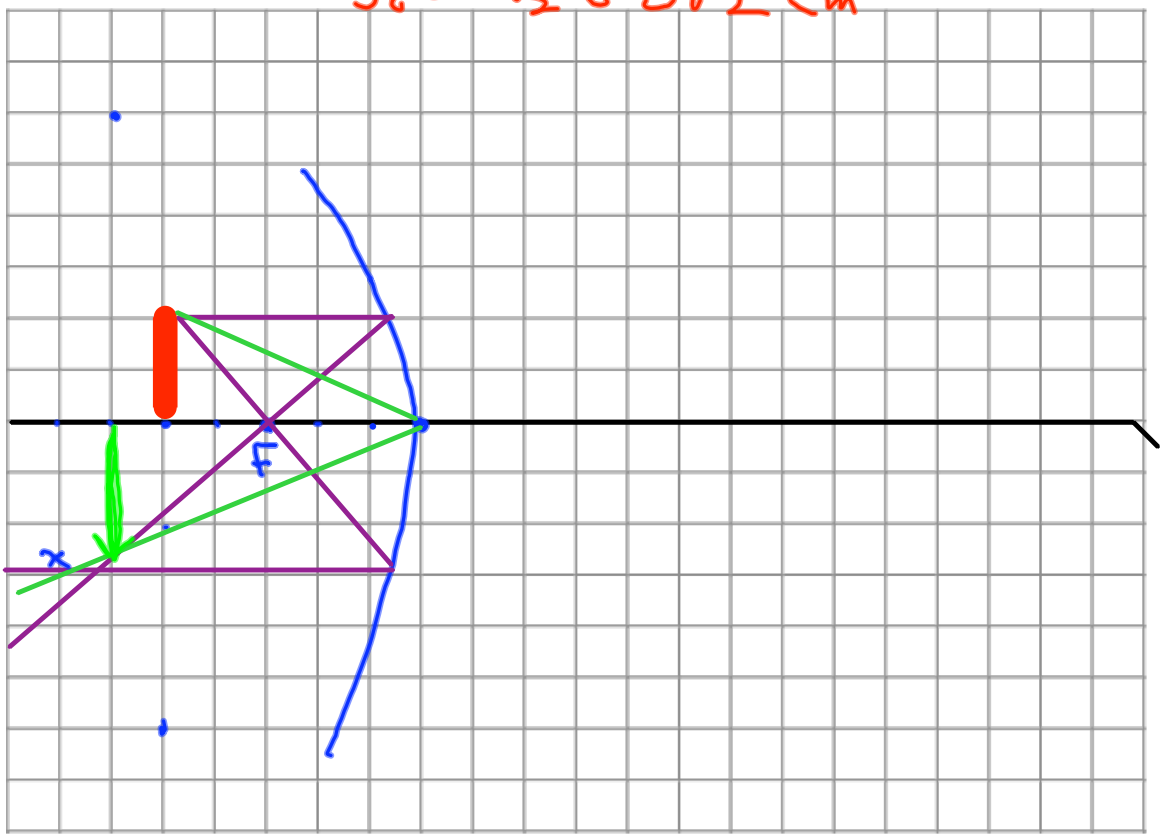
$f = 15\text{ cm}$

$\frac{1}{25} + \frac{1}{s_i} = \frac{1}{15}$

$\frac{1}{s_i} = \frac{1}{15} - \frac{1}{25}$

$= \frac{5}{75} - \frac{3}{75}$

$s_i = \frac{75}{2} = 37\frac{1}{2}\text{ cm}$



$M = -\frac{s_i}{s_o} = -\frac{37.5}{25} = \frac{h_f}{2}$

$|h_f| = 3.0\text{s}$

Example

A distant object forms an image 25 cm from a double convex lens. Where will the image be located if the object is placed 15 cm from the lens? Assuming the object is 2 cm high, what is the image height? Draw the ray-diagram.

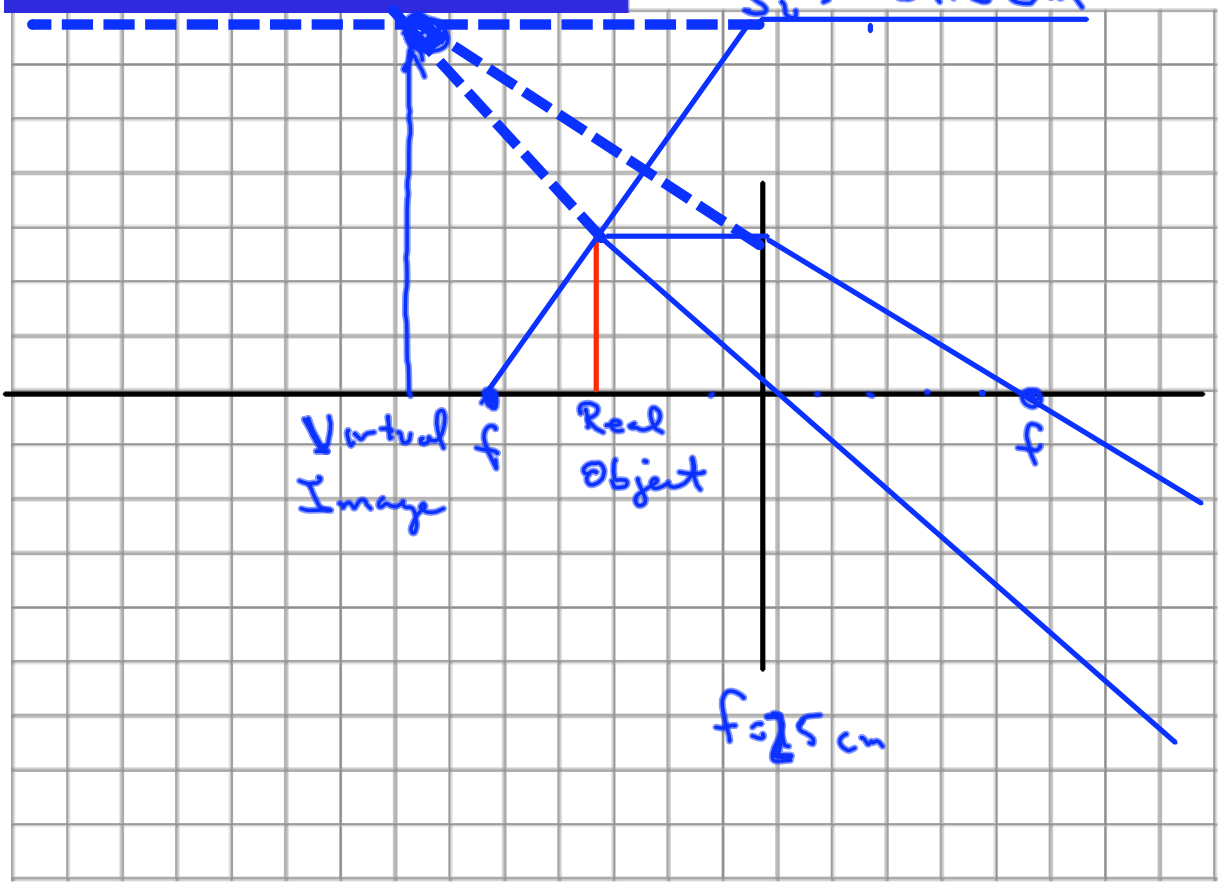
- *Answer: -38 cm; 5.0 cm upright*

$f = 25\,cm$

$\frac{1}{15} + \frac{1}{s_i} = \frac{1}{25}$

$\frac{1}{s_i} = \frac{1}{25} - \frac{1}{15} = \frac{3}{75} - \frac{5}{75}$

$s_i = -37.5\,cm$

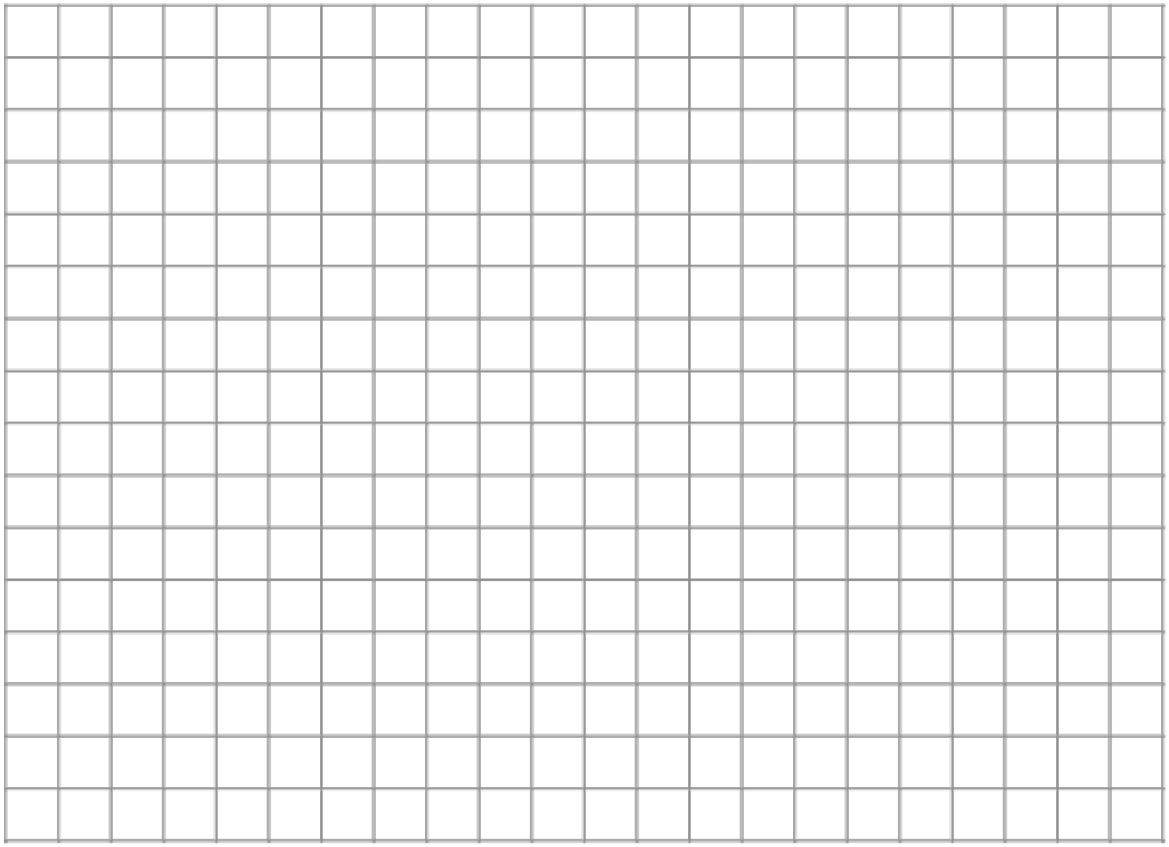


$M = -\frac{-37.5}{15} = \frac{h_i}{2}$

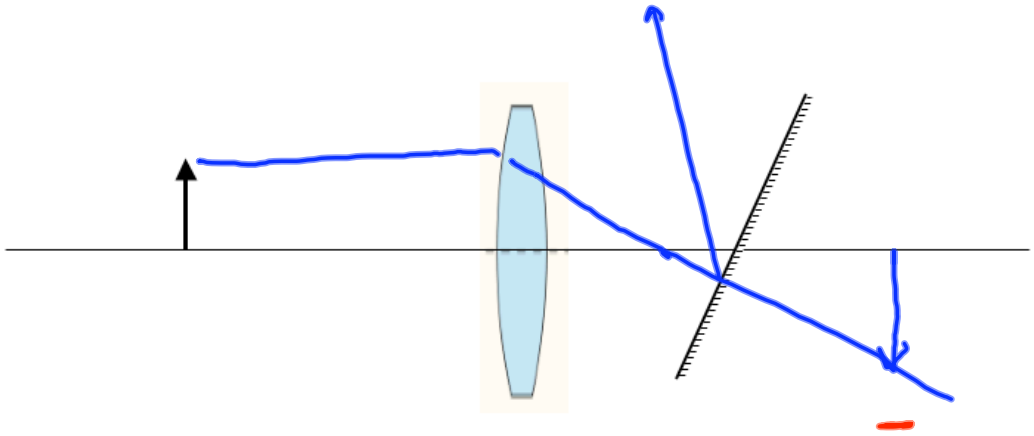
$h_i = 5\,cm$

- An object is placed 4.0cm to the left of a double convex lens of focal length f=12.0cm. Determine the location of the image. Is it real?
- A second lens of focal length f_2=6.0cm is placed 12.0cm to the right of the first lens. Determine the location of the image. Is it real? Draw a ray tracing diagram of the system.

q



An object is placed 15 cm from a biconvex lens of focal length 10 cm. A plane mirror oriented at 45° with respect to the horizontal is placed 15 cm to the right of the lens. Draw a ray diagram (to scale) indicating the location of the final image.



The image of the object in an magnifying glass cannot be Projected directly onto a screen. However when you can see the Image of the object when you view the image through the lens. Why is this so?