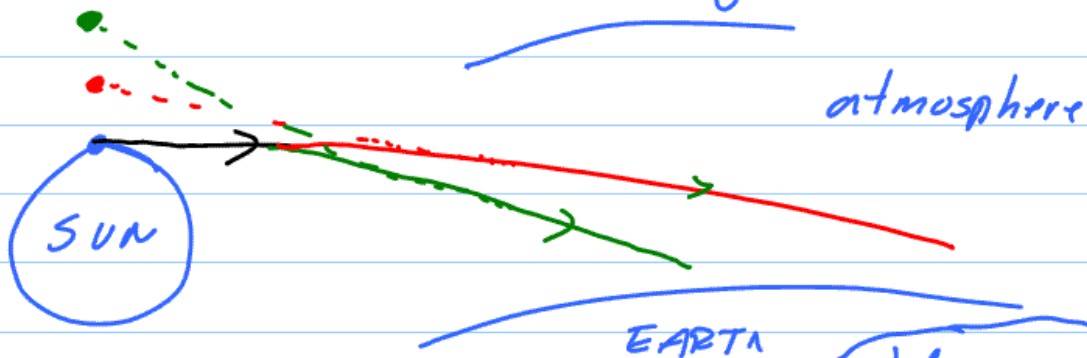


## PHY132 - Class 8 - Wednesday January 28

Green Flash

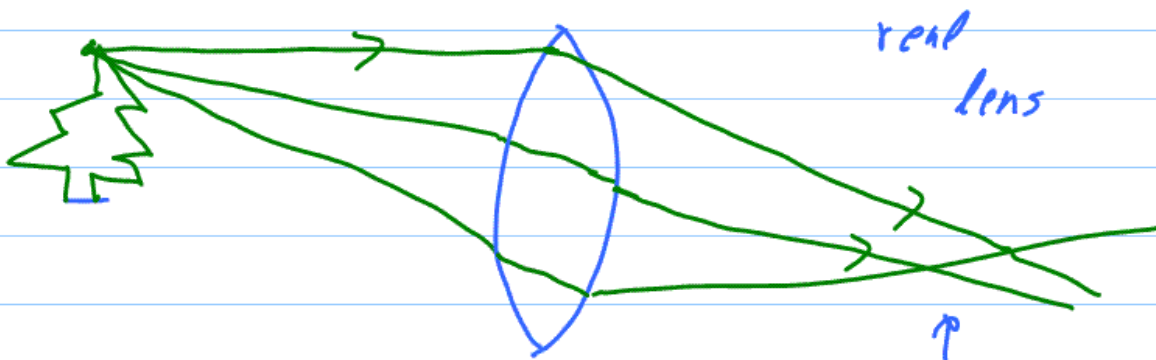
air:  $n$  depends on  $\lambda$   
similar to glass

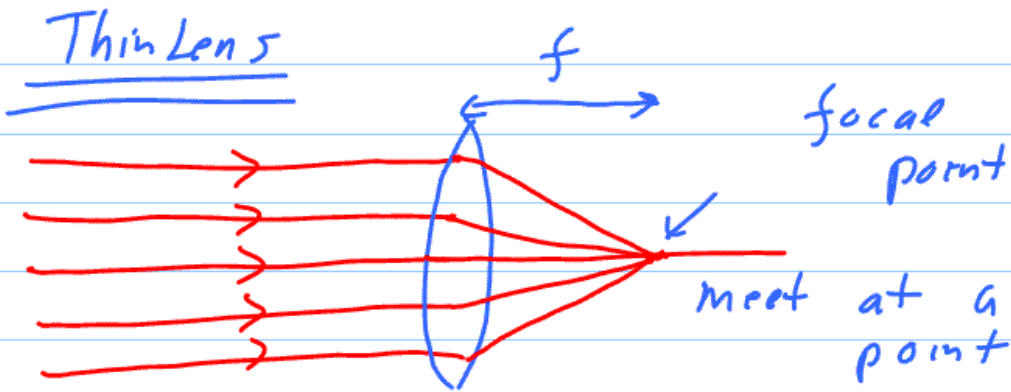
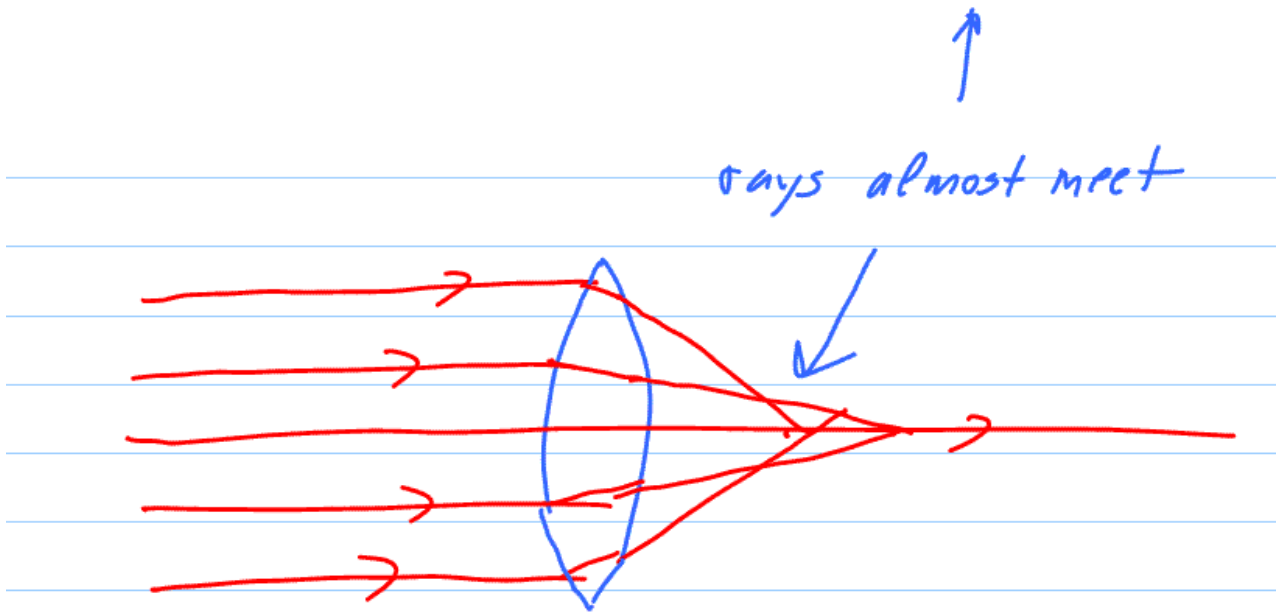


Green virtual image  
last to sink below  
the horizon.

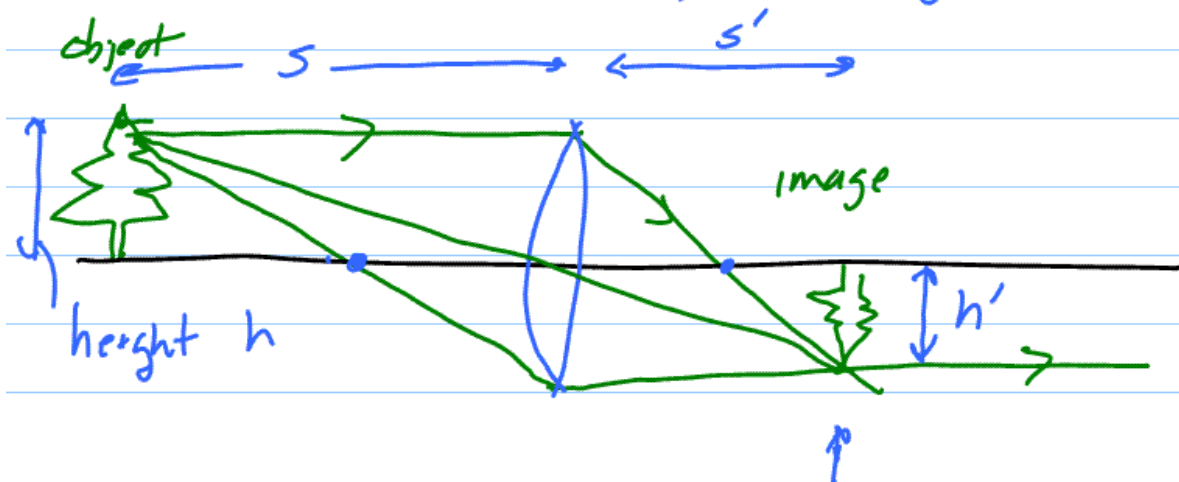
blue  
scattered

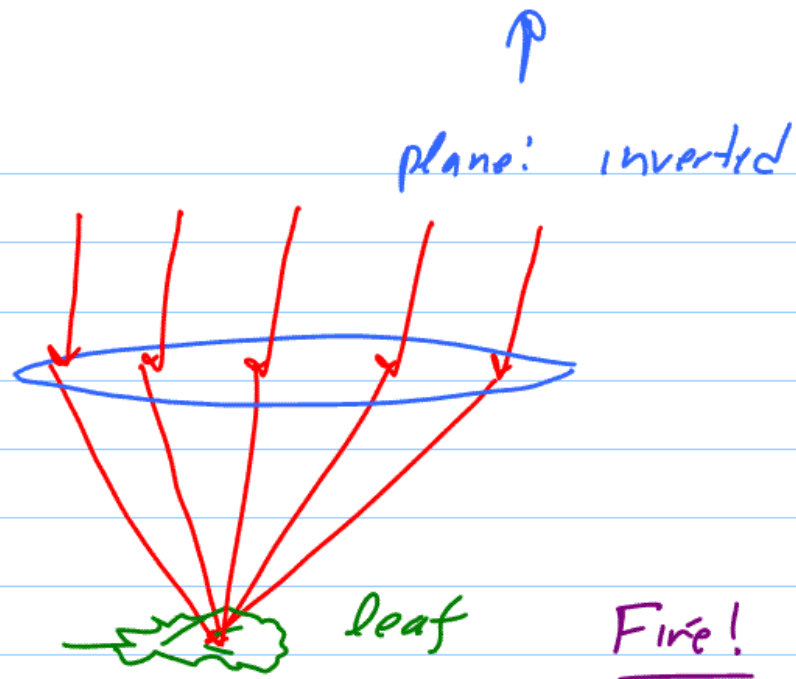
§23.6 - §23.7 combine





$f = \text{focal length}$





Geometry:

$$\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}$$

$$\frac{h'}{h} = \frac{s'}{s}$$

Virtual image :  $s < f$

$$s' < 0$$



magnification (lateral)!

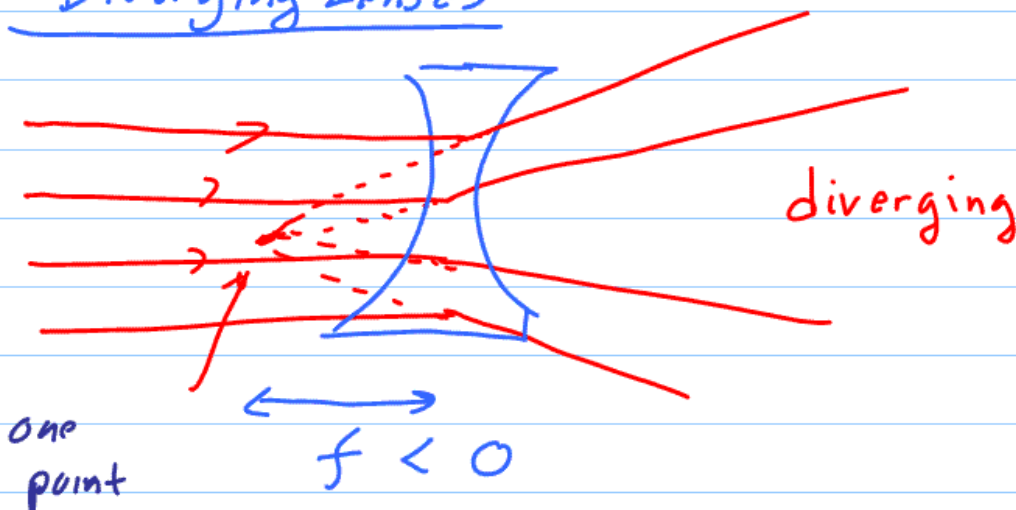
$$M \equiv -\frac{s'}{s} = -\frac{h'}{h}$$

minus sign!

$m < 0$  ! image inverted

$m > 0$  : image not inverted

## Diverging Lenses



## Multiple Lenses

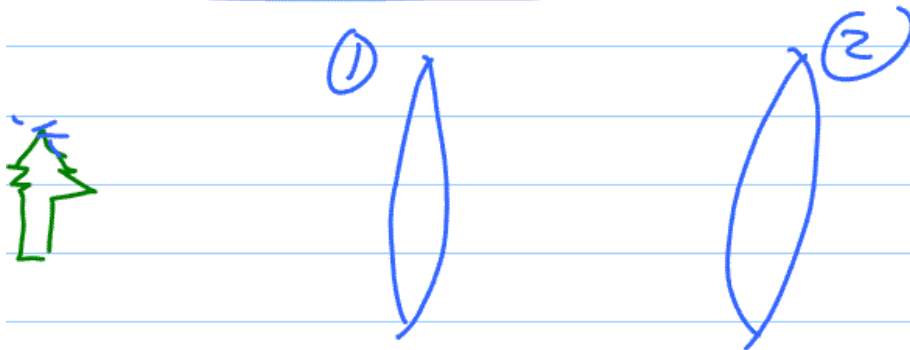
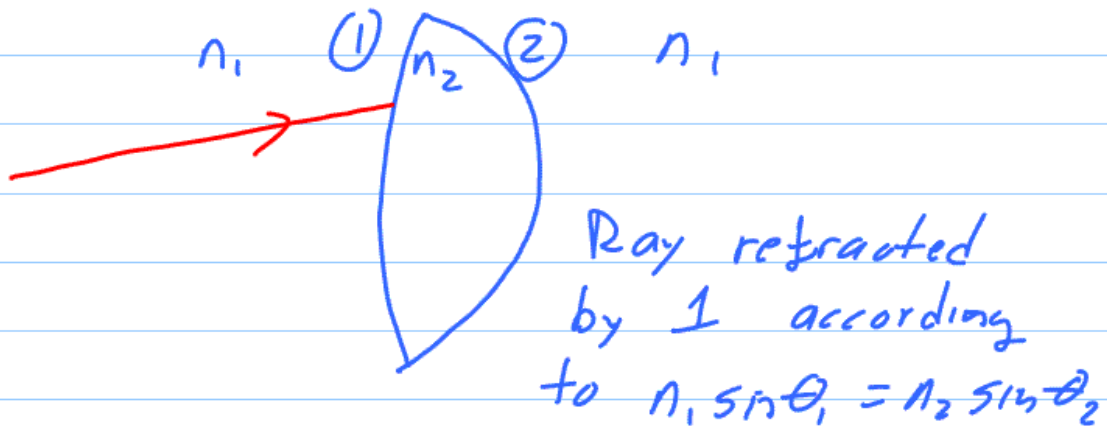


Image by (1) becomes the  
object for (2)

## Real (non-thin) lens



(1) forms an image

Image by (1) becomes the  
object for (2)

Done by programs.

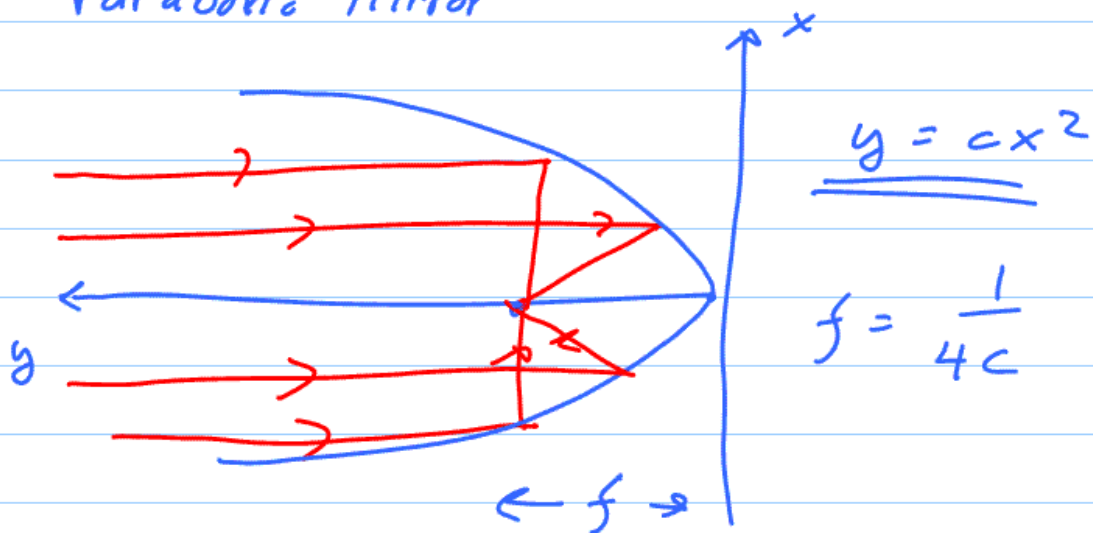
Aberration of Lenses:

(1) Non-thin: "spherical"

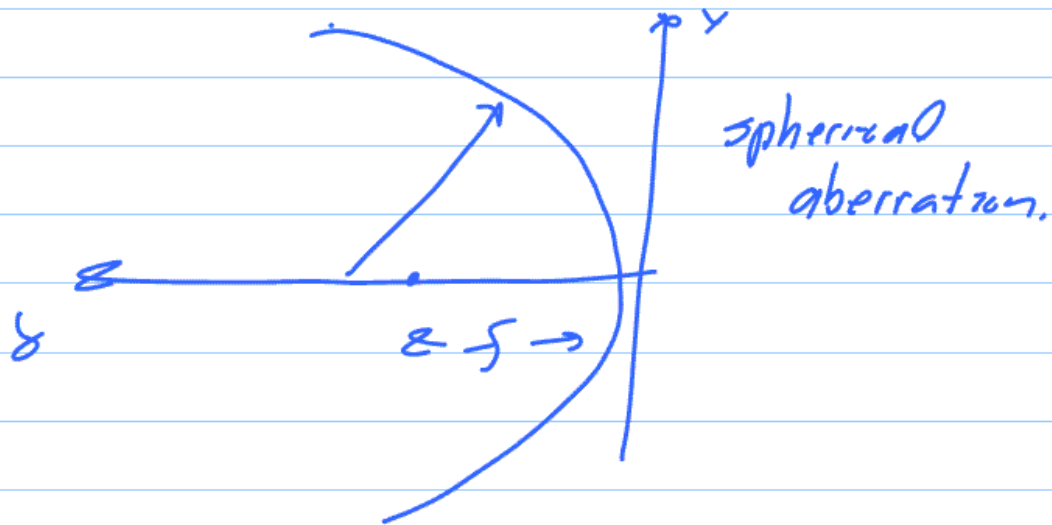
(2)  $f$  depends on  $\lambda$   
"chromatic"

§ 23.8 - Mirrors

## Parabolic Mirror



## Spherical Mirror



rays close to axis!  
spherical aberration  
negligible