Lecture 23

Images from spherical mirrors

We can use the focal point of a spherical mirror to find the relation between the image distance i & object distance

(show slides)

(show video demo)

Real image - rays actually intersect to make image.

real images form on the side of the mirror where the object is & virtual images form on opposite side.

Magnification - size of object or image as measured perpendicular to mirror's central axis is object or image height

Let h be object height &
h' be image height

Lateral Magnification is defined as

$$|m| = \frac{h'}{h}$$

sign of m is negative when image has opposite orientation

can also write as

$$m = \frac{-i}{p}$$

show slides for Locating an Image

can use any two of four special rays.

1. ray parallel to central axis (reflects through focal point)

2. ray that passes through focal point (reflects to be parallel to central axis)

3. ray that passes through center of curvature

4. ray that reflects from end of central axis

Question suppose the arrow is on central axis of concave mirror & has magnification $m = -4$

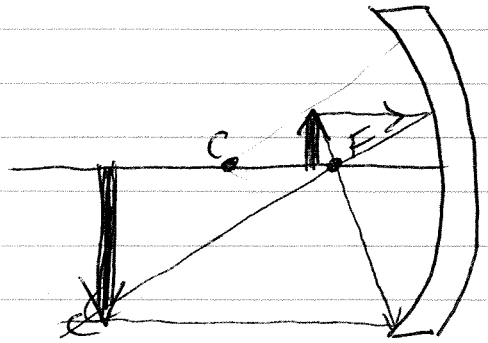
Is its image a) real or virtual

b) inverted or w/ same orientation

c) on same side of mirror or opposite side?

real, inverted (due to minus sign), same side

corresponds to real b/c rays intersect, same side



Spherical refracting surfaces

- Now consider images formed by refraction w/ spherical refracting surfaces

- Light is emitted by a point object in medium w/ index of refraction n_1
  - refracts through spherical surface into medium w/ index of refraction n_2

- show some examples of what happens (show slides)

- medium w/ greater index of refraction is shaded

- rule is opposite images from reflection: real images form on side of refracting surface opposite object, virtual images on same side

relationship between physical distance, image distance, & radius of curvature

$$\frac{n_1}{p} + \frac{n_2}{i} = \frac{n_2 - n_1}{r}$$

convention for r,

when object faces convex refracting surface, r is positive ($r > 0$)

when object faces concave surface, $r < 0$