Physics 5B: Mirror I

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- In a flat mirror, the Θ_{incident}=$\Theta_{\text{reflection}}$

  Image is inverted in mirror and is full-size (no magnification)!

  considered a virtual image, since light rays do not pass through mirror.

- Images formed in Spherical mirror

  - In a concave mirror, if a light ray....

    comes into the middle, or the principal axis, the Θ_{incident} will reflect at 0^o

    Rays used for tracing: paraxial rays are parallel to principal axis (mimicking far-away source)

    Paraxial rays falling on central part of mirrior are reflected to common point, or the focal point.

    Focal length f: focal point F to mirrior

    $$f = \frac{R}{2} \quad \text{Where } R = \text{radius of curveature}$$

  - In a convex mirror

    focal length: f<0

    Convex mirriors will have similar properties to concave. All $\Theta_{\text{reflection}}$ get relfected back to the Focal point.

    Image located where lines cross!

    In this case, $d_I > d_o$ Image is inverted, real, and larger than object

  - Convex mirrior, upright, virtual, smaller magnification

  - Sign conventions:

    f>0 for concave f<0 for convex

    d_i>0 for image in front of mirrior $d_i < 0$ for image behind of mirrior

  - Mirror Equation

    $$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$$

  - Magnification $m = \frac{h_i}{h_o} = -\frac{d_i}{d_o}$

    positive = upright, negative = inverted

  - EXAMPLE:

    In a concave mirror,

    An object is 35 cm away from a concave mirrior and the concave mirror has R=24cm.

    a) Focal length: $f = \frac{R}{2} \Rightarrow f = \frac{24\text{cm}}{2} \Rightarrow f = 12\text{cm}$

    b) Where is d_i (image)?

    $\frac{1}{d_i} + \frac{1}{d_o} = \frac{1}{f} \Rightarrow \frac{1}{d_1} = \frac{1}{f} - \frac{1}{d_o} \Rightarrow \frac{1}{12\text{cm}} - \frac{1}{35\text{cm}} \Rightarrow \frac{1}{d_i} = \frac{1}{18\text{cm}} \Rightarrow d_i = 18\text{cm}$

    c) Upright or inverted?

    $m = -\frac{d_i}{d_o} \Rightarrow -\frac{18.26\text{cm}}{35\text{cm}} = -.52\text{cm}$ SO, smaller magnification and inverted!