Geometrical Optics – 1

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- ❖ Reflection of plane mirror
- ❖ Reflection of spherical mirror

PLANE MIRROR

1. Virtual image of real object.
2. Real image of virtual object.
3. Magnification $\boxed{m = 1}$
4. $\boxed{v_I = 2v_m - v_0}$ Perpendicular to Mirror.
5. $\boxed{v_I = v_0}$ along the mirror.
6. Size of mirror for a person to see his own image is half the height of person.
7. Number of images (n)

$n = P - 1$	Where P is even
$n = P$	Where P is odd

$n = P - 1$ where P is odd and object is kept at an angle bisector

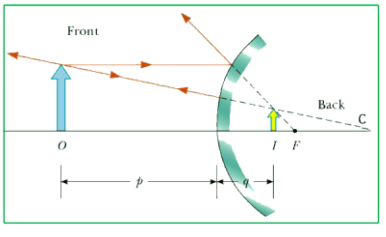
Where, $\boxed{P = \frac{360°}{\theta}}$

8. $\boxed{\hat{r} = \hat{i} - 2(\hat{i}.\hat{n})\hat{n}}$

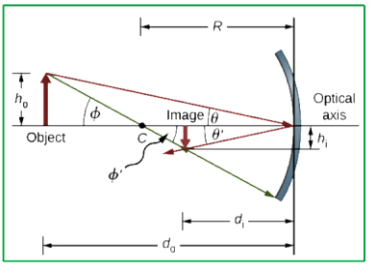
Equation of reflected wave.

Spherical Mirrors

Convex Spherical Mirrors



Concave Spherical Mirrors



Spherical Mirrors

1. Point of intersection of incident rays is object

2. Point of intersection of reflected rays is image.

3.

Real object	Real Image	Inverted
Virtual object	Virtual Image	Inverted
Real object	Virtual Image	Erect
Virtual object	Real Image	Erect

4. Newton's formula $xy = f^2$

5. Both object and image will lie on the same side of focal plane.

6. $f = R\left(1 - \frac{1}{2\cos\theta}\right)$ Point of intersection of reflection rays when rays parallel to principal axis are incident at an angle θ.

Spherical Mirrors

- $\frac{1}{u} + \frac{1}{v} = \frac{1}{f} = \frac{2}{R}$ (Mirror formula)
- Magnification

$$m = \frac{h_I}{h_0} = -\frac{v}{u} = \frac{f}{f-u} = \frac{f-v}{f}$$

- Longitudinal magnification $(m_L) = -m^2$
- $v_m = \frac{v_I + m^2 v_0}{1 + m^2}$

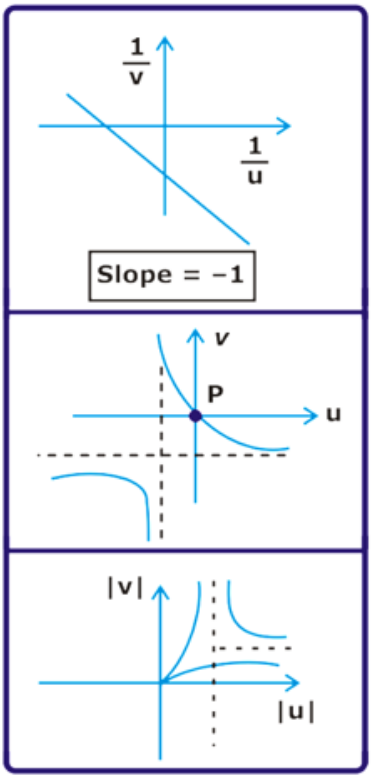
(Along the Principal Axis)

- $v_I = mv_0 + h_0 \frac{d}{dt}(m)$

(Perpendicular to Principal Axis)

Graphs

Concave



Convex