Ray Optics - 05

Image Formation by Concave & Convex Mirrors for different positions of object.

1. Concave Mirror

   Rules for image formation

   i) Between C & F
   ii) Real & Inverted
   iii) Diminished
   iv) \( m = -\text{ve}, |m| < 1 \)

   Linear magnification
   \[
   m = \frac{h_i}{h_o} = \frac{1}{m}
   \]
Case II: Object at C

Image is
i) formed at C
ii) Real & Inverted
iii) Same size
iv) \( m = -1 \)

Case III: Object between C & F

Image is
i) formed beyond C
ii) Real & inverted
iii) Magnified (enlarged)
iv) \( m = \text{re} \left( \frac{1}{m} \right) > 1 \)
Case IV: Object at F

Image is

i) formed at \( \infty \)

ii) Real & inverted

iii) \( m = -ve \) & \( |m| > 1 \)

iv) highly enlarged.

Case V: Object between F & P

Image is

i) formed inside mirror on one side

ii) Virtual & Erect

iii) Magnified/Enlarged

iv) \( m = +ve \) \( (m) > 1 \)

Note: \( m = +ve \) only for this case

Case VI: Object at \( \infty \)

Image is

i) formed at F

ii) Real & Inverted

iii) highly diminished

iv) \( m = +ve \) \( (m) << 1 \)
2. Convex Mirror:

Rules for image formation:

(i) Object at any position except $\infty$

- Image is formed on the opposite side of mirror between Pole & Focus
- Exact & Virtual
- Diminished
- $m = +ve \ (|m| < 1)$
Case II: Object at ∞

Image is
i) formed at F
ii) Erect & Virtual
iii) Highly diminished
iv) m = +ve |m| < 1

Summary:

Concave Mirror can form images:

i) Inverted Magnified  \( m = -ve \ |m| > 1 \)
ii) Inverted Diminished  \( m = -ve \ |m| < 1 \)
iii) Erect Magnified  \( m = +ve \ |m| > 1 \)

Convex Mirror always forms images:

i) Exact Diminished  \( m = +ve \ |m| < 1 \)