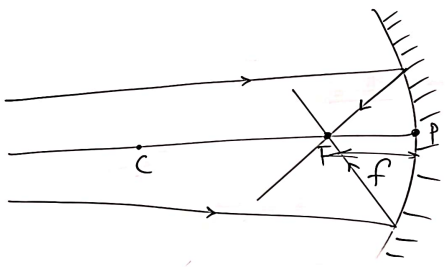
Princip Focus (F)

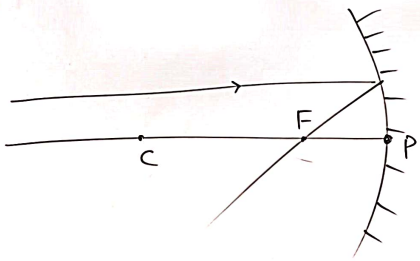
Focal Length (f)



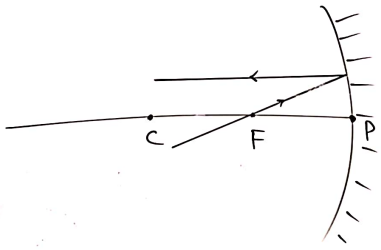
Concave Mirror

Rules for ...ing ray diagrams.

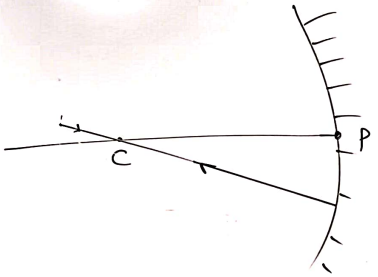
①



②

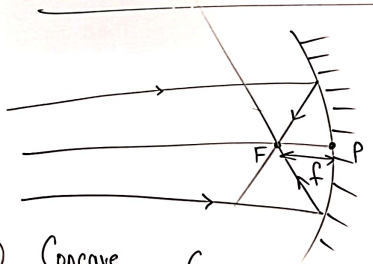


③



Convergence & divergence.
(Concave) (Convex)

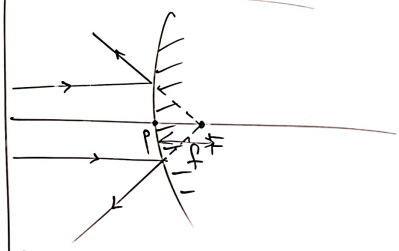
Concave Mirror



① Concave mirror = Converging mirror.

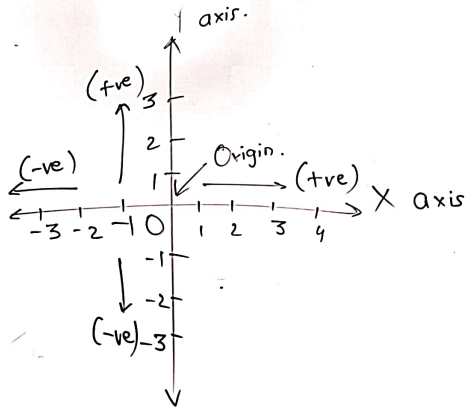
② Focal length = Negative.

Convex Mirror.



① Convex mirror = Diverging mirror

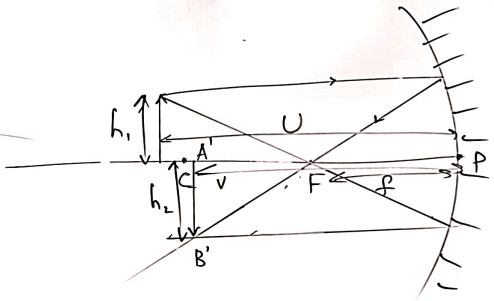
② Focal Length = positive.



Mirror formula.

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

u = Object distance
v = Image distance
f = Focal length
h_1 = Height of object
h_2 = Height of image



Magnification (M)

① $M = \frac{h_2}{h_1}$

② $M = -\frac{v}{u}$

③ $\frac{h_2}{h_1} = -\frac{v}{u}$

Q5

a) Given: $h_1 = 7\text{cm}$

$u = -25\text{cm}$

$f = -15\text{cm}$

To find: ① v

② h_2

③ Nature of image

Sol: $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$

$\frac{1}{v} = \frac{1}{(-15)} - \frac{1}{(-25)}$

$\frac{1}{v} = \frac{-25 + 15}{375}$

$\frac{1}{v} = \frac{-10}{375}$

$v = \frac{375}{-10}$

$\boxed{v = -37.5\text{ cm}}$

$\frac{h_2}{h_1} = -\frac{v}{u}$

$\frac{h_2}{7} = \frac{-(-37.5)}{25}$

$\frac{h_2}{7} = \frac{37.5}{25}$

$h_2 = \frac{-37.5 \times 7}{25}$

$h_2 = \frac{-262.5}{25}$

$\boxed{h_2 = -10.5\text{cm}}$

$\therefore h_2$ is negative

$\therefore$ Nature of image = Real and inverted

b) Given: $f = 18\text{cm}$.

Height of image $= \frac{1}{2} \times$ Height of object

$h_2 = \frac{1}{2} \times h_1$

$h_2 = \frac{h_1}{2}$

$\frac{h_2}{h_1} = \frac{1}{2}$

To find: u

Sol: $\frac{h_2}{h_1} = -\frac{v}{u}$

$\frac{1}{2} = -\frac{v}{u}$ (Given)

$-\frac{v}{u} = \frac{1}{2}$

$-v = \frac{u}{2}$

$\boxed{v = -\frac{u}{2}} - (1)$

$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$\frac{1}{\left(\frac{-u}{2}\right)} + \frac{1}{u} = \frac{1}{18}$

$-\frac{2}{u} + \frac{1}{u} = \frac{1}{18}$

$-\frac{2+1}{u} = \frac{1}{18}$

$-\frac{1}{u} = \frac{1}{18}$

$u = 18$

$\boxed{u = -18\text{ cm}}$

c] Given: $h_1 =$ 10 cm

$f = -10\,cm$

$U = -20\,cm$

To find: $h_2 = ?$

Sol: $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$

$\frac{1}{v} = \frac{1}{(-10)} - \frac{1}{(-20)}$

$\frac{1}{v} = -\frac{1}{10} + \frac{1}{20}$

$\frac{1}{v} = \frac{-20 + 10}{200}$

$\frac{1}{v} = \frac{-10}{200}$

$v = \frac{200}{-10}$

$\boxed{v = -20\,cm}$

$\frac{h_2}{h_1} = -\frac{v}{u}$

$\frac{h_2}{10} = -\frac{(-20)}{(-20)}$

$\frac{h_2}{10} = -1$

$\boxed{h_2 = -10\,cm}$