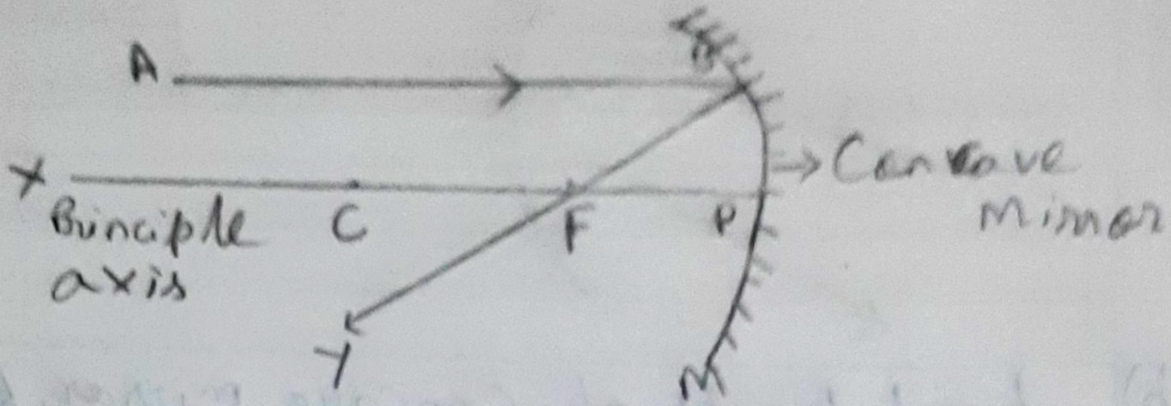
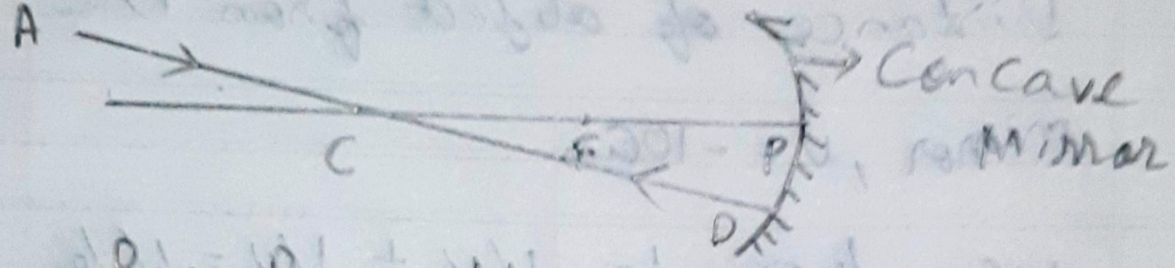


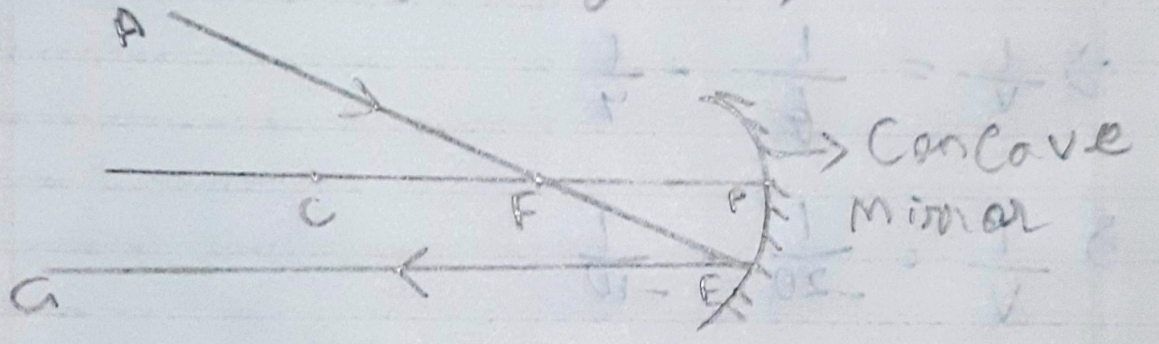
Ray from infinite Parallel to P

ii)



Ray Passing through (C)

iii)



i)

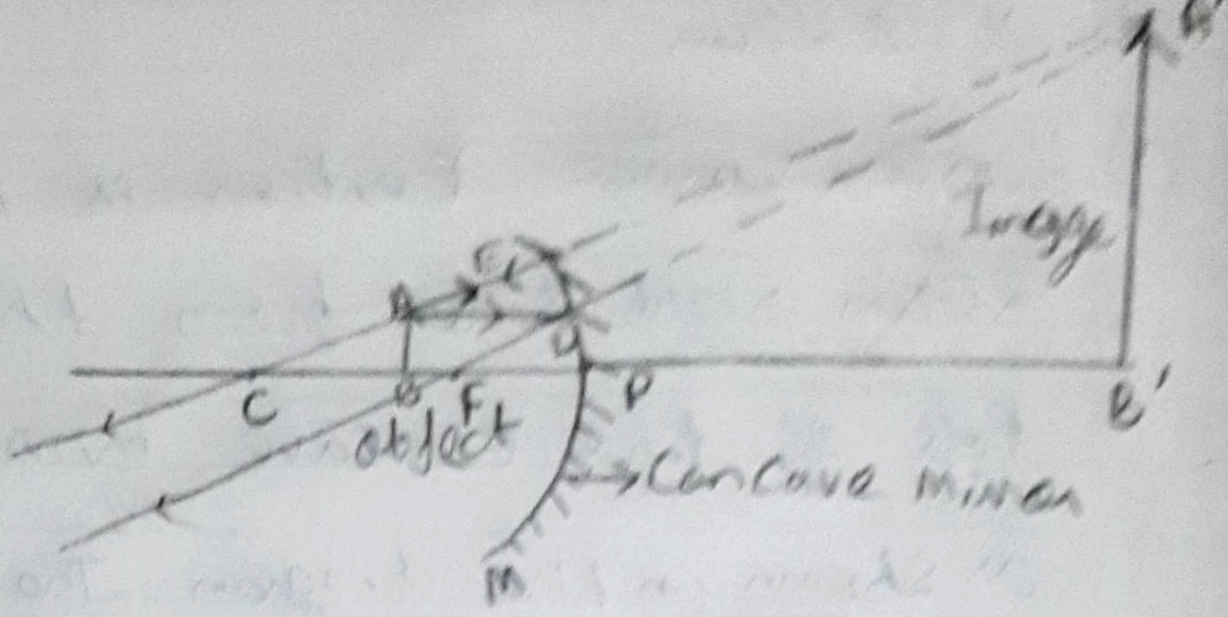
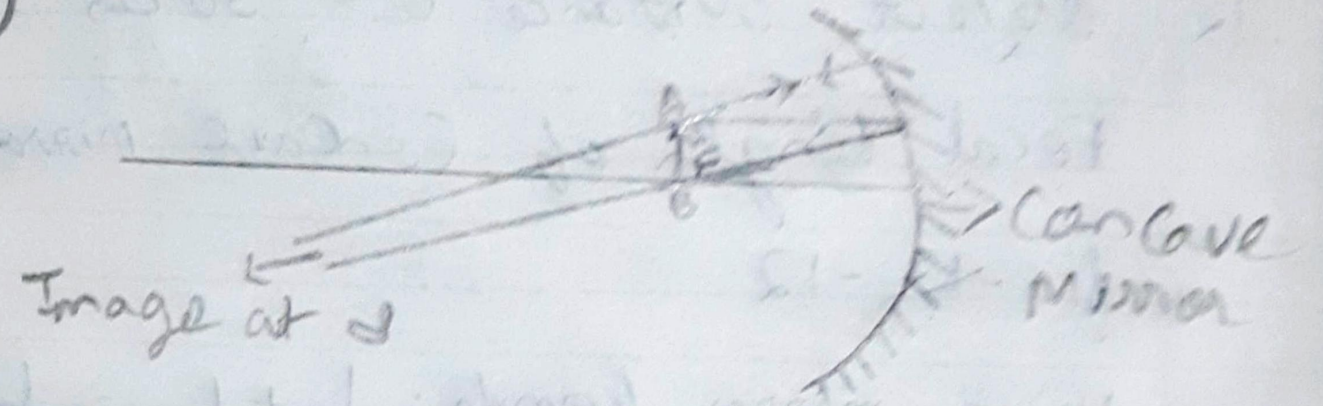


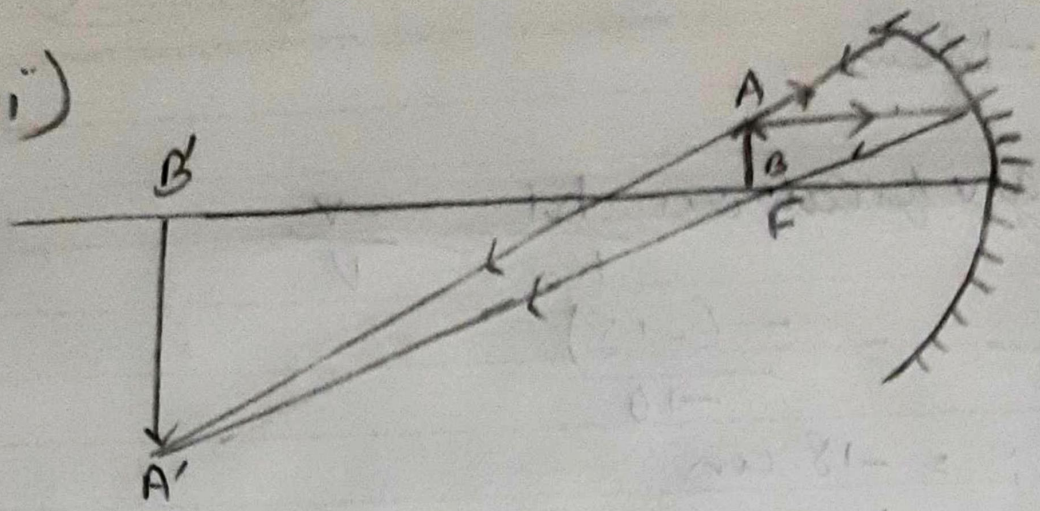
Image formed between Pole and Focus

ii)

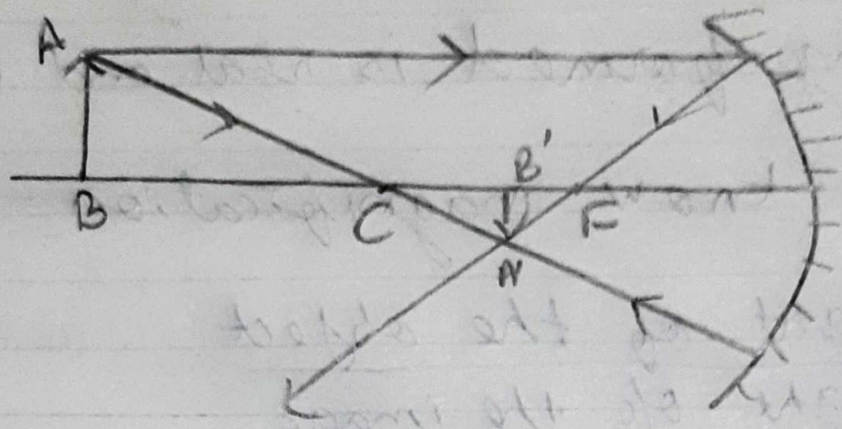


Object formed at Focus.

iii)

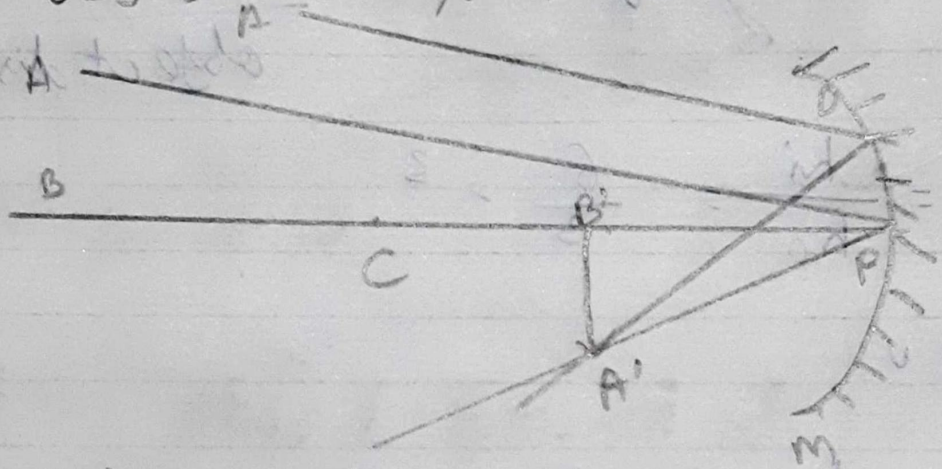


iv)

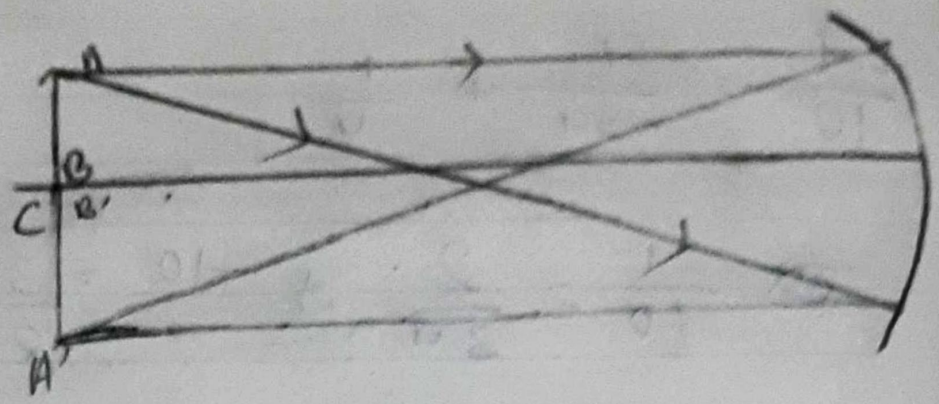


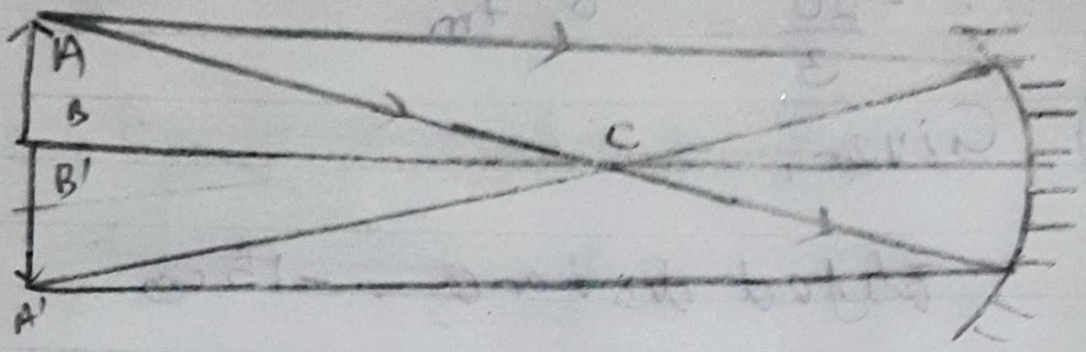
object in beyond C

v)

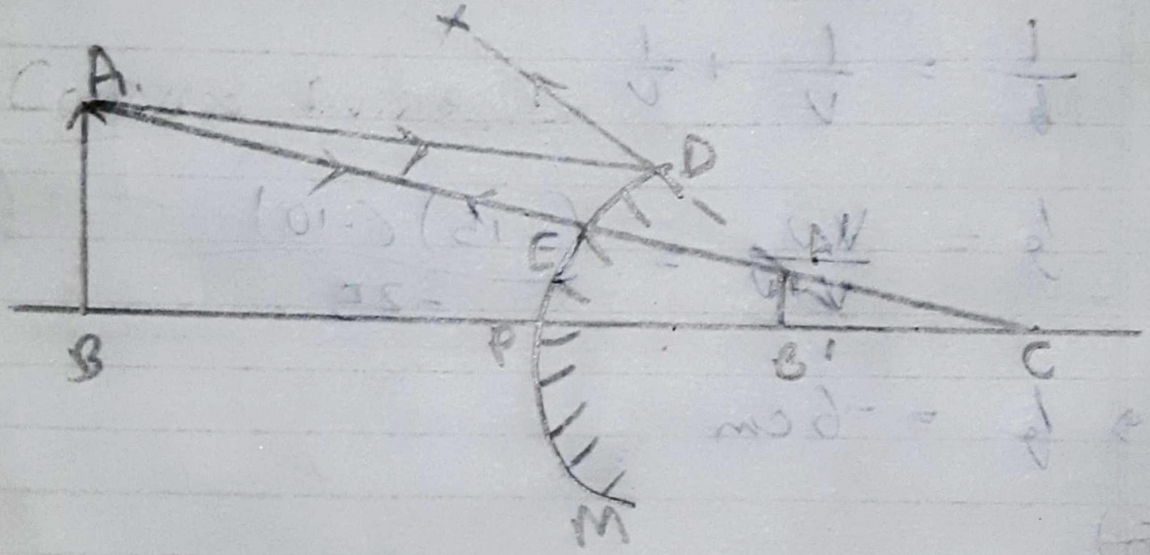


when object is in Infinity



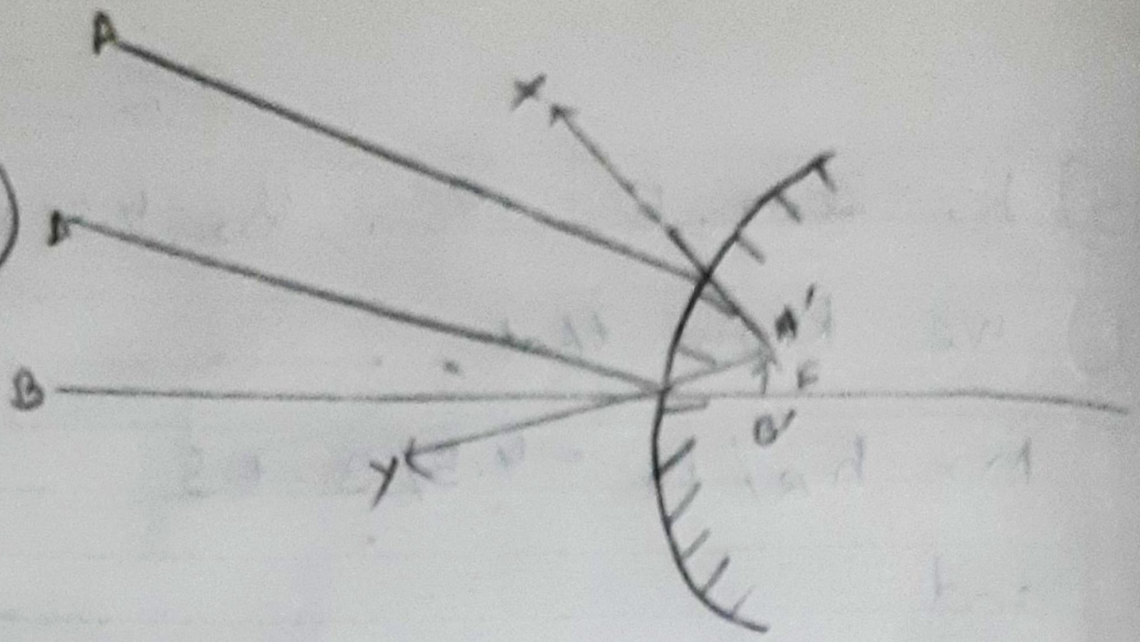


object at C



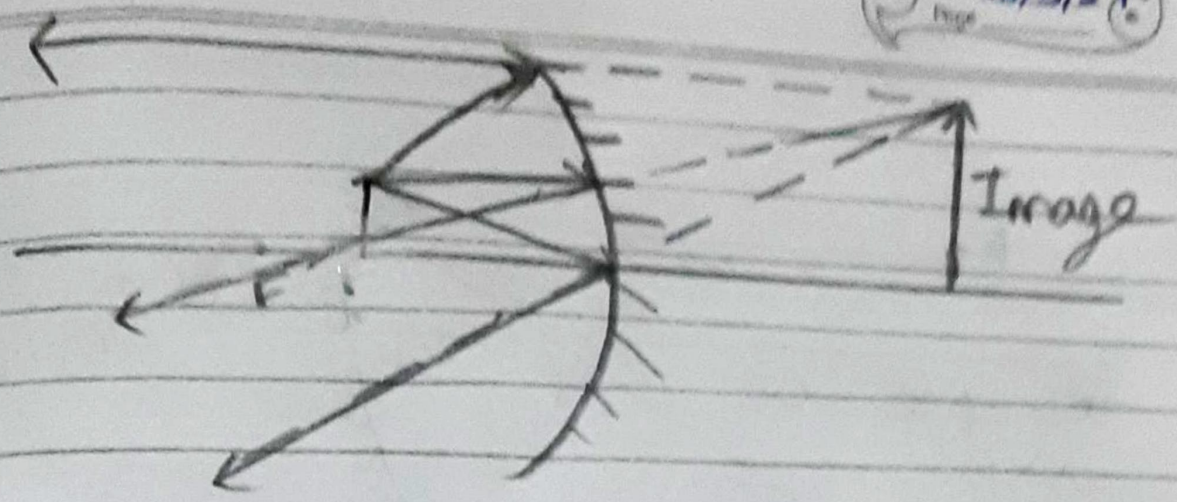
when object is placed anywhere between Pole and infinity of convex M

viii)



Object at infinity in a Convex mirror

11)



b) focal length of Concave mirror, f

$f = -20cm$

Distance of object from the mirror, $v = -10cm$

use formula, $1/v + 1/v = 1/f$

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

$\Rightarrow \frac{1}{V} = \frac{1}{-20} - \frac{1}{-10}$

$\Rightarrow \frac{1}{V} = \frac{-1}{20} + \frac{1}{10} = \frac{1}{20}$

⇒ $v = \pm 20\,cm$

c) Hence, image Position is the 20cm right side from the Pole of the concave mirror as shown in the diagram. The image is straight and bigger than the object

12) object distance $u = -36\,cm$

Focal length of concave mirror $f = -12$

Using mirror formula: $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

⇒ $\frac{1}{v} + \frac{1}{-36} = \frac{1}{-12}$

$\Rightarrow$ $V = -18\,cm$

Magnification $\frac{h_i}{h_o} = \frac{-v}{u}$

$\Rightarrow \frac{h_i}{10} = \frac{-(-18)}{-10}$

$\Rightarrow h_i = -18\,cm$

Image formed is real and inverted

13) We know magnification =

$$\frac{\text{height of the object}}{\text{height of the image}}$$

Also, magnification $= \frac{-\text{image distance}}{\text{object distance}}$

$$\frac{-v}{u} = \frac{h_i}{h_o} = \frac{6}{3} = 3$$

$$-v = 3u$$

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

$\Rightarrow \frac{1}{10} = \frac{1}{-3v} + \frac{1}{v}$

$\Rightarrow \frac{1}{10} = \frac{2}{3v} \Rightarrow -10 = \frac{3v}{2}$

$\Rightarrow v = \frac{-20}{3} = 6.7m$

14) Given,

object distance $= -15$ cm

image distance $= -10$ cm

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

$$\Rightarrow f = \frac{vu}{v+u} = \frac{(-15)(-10)}{-25}$$

$$\Rightarrow f = -6 \text{ cm}$$

15)

15) $h_1 = 3cm$, $u = -8cm$, $h_2 = 4.5$

i) we know that

$m = h_2 / h_1 = 4.5/3 = 1.5$

and

$m = -(v/u)$

$\Rightarrow 1.5 = -(v/(-8))$

$\Rightarrow v = 1.5 \times 8 = 12cm$

we have

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

$$\Rightarrow \frac{1}{12} + \frac{1}{-8} = \frac{1}{f}$$

$$\Rightarrow \frac{1}{f} = \frac{1}{12} - \frac{1}{8} = \frac{(2-3)}{24}$$

$= \frac{-1}{24}$

$\therefore f = -24\text{cm}$

(ii) $v = 12\text{cm}$

16) $h_o = -4\text{cm}, \; h_i = 1\text{cm} \quad u = -20\text{cm}$

$m = h_o / h_i = -(v/u)$

$\frac{-4}{1} = \frac{v}{-20}$

$\Rightarrow v = -80$

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

$= \frac{1}{-80} + \frac{1}{-20} = \frac{1}{f}$

$\Rightarrow \frac{-1-4}{80} = \frac{1}{f}$

$\Rightarrow \frac{-5}{80} = \frac{1}{f} = f = \frac{80}{-5} = -16$

17) $h_1 = 7\text{cm}$, $f = -18$, $u = -27$

Now,

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

$$\Rightarrow \frac{1}{v} = \frac{1}{-18} + \frac{1}{27}$$

$$\Rightarrow \frac{1}{v} = \frac{-3+2}{54}$$

$$\Rightarrow \frac{1}{v} = \frac{-1}{54}$$

$$\Rightarrow v = -54$$

18) The screen will be placed at a distance of 54cm,

$$m = \frac{-v}{u} \Rightarrow m = \frac{54}{-27} = -2$$

$\therefore, m = -2$

(18) $m = \frac{h_{all}}{h_1}$

$\Rightarrow -2 = \frac{h_2}{7}$

$\Rightarrow h_2 = -14$

(18) $h_1 = 3cm$, $V = -10cm$, $f = -20$

Alq

$$\frac{1}{V} + \frac{1}{U} = \frac{1}{f}$$

$$\Rightarrow \frac{1}{-10} + \frac{1}{V} = \frac{1}{-20}$$

$$\Rightarrow \frac{1}{V} = \frac{1}{-20} + \frac{1}{10}$$

$$\Rightarrow \frac{1}{V} = \frac{-1+2}{20}$$

$$\Rightarrow V = 20$$

$$m = \left(\frac{-v}{u}\right) = \frac{h_2}{h_1}$$

$$= \frac{-20}{-10} = \frac{h_2}{3}$$

$$\Rightarrow h_2 = 6$$

19) $u = -9\,cm$, $f = -4$, $h_1 = 2\,cm$

A/q

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

$$\Rightarrow \frac{1}{v} - \frac{1}{9} = \frac{1}{-4}$$

$$\Rightarrow \frac{1}{v} = \frac{-1}{4} + \frac{1}{9}$$

$$\Rightarrow \frac{1}{v} = \frac{-9+4}{36}$$

$$\Rightarrow v = \frac{-36}{5} = -7.2$$

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

$$-0.8$$

$$\Rightarrow \frac{-8 \cdot 2}{-4} = \frac{h_2}{3}$$

$$\Rightarrow h_2 = -2.4$$

Size of the image will be deminshed, Nature, real and inverted.

20) a) $m = \frac{-v}{20}$ $v = -20\,cm$, $m = -3$

$$\Rightarrow m = \frac{-v}{-20} \qquad \frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\Rightarrow v = -60 \qquad \Rightarrow \frac{1}{f} = \frac{1}{-20} + \frac{-1}{60}$$

b) $m = +3$

$$\Rightarrow \frac{-3-1}{60} = \frac{-4}{60} = \frac{-1}{15}$$

$$\Rightarrow m = \frac{-v}{u} = 3 = , f = -15$$

b) for virtual image, $m = 3$;

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

$\therefore$ $m = 3 = -\frac{v}{u} \Rightarrow v = -3u$

we have,

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

$$\Rightarrow \frac{1}{(-3u)} + \frac{1}{u} = \frac{1}{(-15)}$$

$$\Rightarrow \frac{-1+3}{3u} = \frac{-1}{5}$$

$$\Rightarrow u = -\frac{2 \times 15}{3} = -10\,cm$$

$\therefore$ the object should be placed 10cm from

21) $m = 5 = \frac{-v}{u}$

$v = -5u$

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

$\frac{-1}{5u} + \frac{1}{u} = \frac{-2}{3}$

$\frac{5-1}{5u} = \frac{-2}{3}$

$\Rightarrow u = \frac{-3}{10}$

$\Rightarrow u = \frac{-6}{5} = -1.2$

22) $f = \frac{-15}{2}$, $u = -10$

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

$\Rightarrow \frac{1}{v} + \frac{-1}{10} = \frac{-1.5}{2} \quad \frac{-2}{1.5}$

$\frac{1}{V} = \frac{-1.5}{2} + \frac{1}{10}$

$\frac{1}{V} = \frac{-15+2}{20}$

$\frac{1}{V} = \frac{-13}{20}$

$V = \frac{20}{-13}$

$\frac{1}{V} = \frac{-20}{15} + \frac{1}{10}$

$\frac{1}{V} = \frac{-40+3}{30}$

$V = \frac{-30}{37}$ cm

23) $U = -20$, $f = 15$

$$\frac{1}{V} + \frac{1}{U} = \frac{1}{f}$$

$$\frac{1}{V} = \frac{1}{f} - \frac{1}{U}$$

$$\frac{1}{V} = \frac{1}{-15} - \frac{1}{-20}$$

$$\frac{1}{V} = \frac{1}{-15} + \frac{1}{20}$$

$\frac{1}{v} = \frac{6+4}{60} \quad \frac{-1}{60}$

$v = \frac{}{60} - 60$

$m = \frac{-60}{-20} \Rightarrow m = 4 - 3$

$\frac{h_2}{h_1} = 4 - 3$

$h_2 = 20 - 15$

24) $m = 3, \; v = -10$

Area

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

$3 = \frac{-v}{-10}$

$v = 30$

$V = 30, \quad V = -10$

$$\frac{1}{f} = \frac{1}{V} + \frac{1}{V}$$

$$\Rightarrow \frac{1}{f} = \frac{1}{30} - \frac{1}{10}$$

$$\Rightarrow \frac{1}{f} = \frac{3-1}{30}$$

$$\Rightarrow f = 15 \text{ cm}$$

$\because$ $C = 4f$

$\Rightarrow$ ~~$C = 60$ cm~~ $R = 2f$

$\Rightarrow R = 30$ cm

25) $h_1 = 50$ mm, $f = -100$ mm, $V = -300$ mm

Arq

$$\frac{1}{V} + \frac{1}{U} = \frac{1}{f}$$

$$\frac{1}{V} + \frac{1}{-300} = \frac{1}{-100}$$

$$\frac{1}{V} = \frac{1}{-100} + \frac{1}{300}$$

$$\frac{1}{V} = \frac{-3+1}{300}$$

$$V = -150 \text{ mm}$$

$$M = \frac{-V}{U}$$

$$= \frac{-150}{+300} = \frac{-1}{2}$$

Again

$$\frac{-1}{2} = \frac{h_2}{50}$$

$$h_2 = -25 \text{ mm}$$

26) $M = \frac{-1}{4}$, $f = -20$,

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

$$\Rightarrow \frac{-1}{4} = \frac{-v}{u}$$

$$\Rightarrow v = \frac{u}{4}$$

Using mirror formula,

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

$$\Rightarrow \frac{-4}{u} + \frac{-1}{u} = \frac{-1}{20}$$

$$\Rightarrow \frac{5}{u} = \frac{1}{-20}$$

$$\Rightarrow u = -100 \text{ cm.}$$

2 ⇒) $v = -50\,cm$, $m = \frac{-1}{2}$

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

$\Rightarrow \frac{-1}{2} = \frac{-v}{-50}$

$\therefore v = -25\,cm$

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

~~$f = \frac{-50}{3}$~~ $\frac{1}{f} = \frac{1}{-25} + \frac{-1}{50}$

~~$m = \frac{-v}{u}$~~ $\frac{1}{f} = \frac{-2-1}{50}$

$\Rightarrow f = \frac{-50}{3}$ ---(i)

Now, when the magnification

$m = \frac{-1}{5}$

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

$$-\frac{1}{5} = -\frac{V}{U}$$

$$\Rightarrow V = \frac{U}{5} \quad \text{--- (ii)}$$

$$\frac{1}{f} = \frac{1}{V} + \frac{1}{U}$$

$$\Rightarrow \frac{-3}{50} = \frac{5}{U} + \frac{1}{U}$$

$$\Rightarrow \frac{-3}{50} = \frac{6}{U}$$

$$\Rightarrow \frac{-3}{50} = \frac{6}{U}$$

$$\Rightarrow U = -100 \text{ cm}.$$

Thus the object must be ~~Star~~ Placed at a ~~distance~~ distance of 100 cm in front of the Spherical mirror.

28) a) $u = -20$, $f = -12$

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

$$\frac{1}{v} = \frac{1}{-12} + \frac{1}{20}$$

$$\frac{1}{v} = \frac{-5+3}{60}$$

$$v = \frac{60}{-2} = \frac{-15}{2} = \frac{60}{-2} = -30$$

~~$v = -7.5$ cm~~ $\therefore v = -30$

b) $u = -4$, $f = -12$

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

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

$$\frac{1}{v} = \frac{1}{-12} + \frac{1}{4}$$

$$\Rightarrow \frac{1}{V} = \frac{-1+3}{+12}$$

$$\Rightarrow V = 6$$

∴ So, in case I Image is ~~real~~ real and in second case Image will be Virtual

29) Given,

$u = -5$ cm

Height of Image, $h_2 = -1$ cm

Height of the object = 0.25 cm

A/q

$$m = \frac{h_2}{h_1} = \frac{-V}{U}$$

$$\Rightarrow \frac{-1}{0.25} = \frac{-V}{-5}$$

$$\frac{-1}{0.25} = \frac{V}{5}$$

$$V = \frac{-5}{0.25}$$

$$V = -20\text{cm}$$

Thus, the distance of the image

$V = -20\text{cm}$

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

$$\frac{1}{f} = \frac{1}{-20} + \frac{1}{-5}$$

$$\frac{1}{f} = \frac{-1-4}{20}$$

$$\frac{1}{f} = \frac{-5}{20}$$

$$f = -4\text{cm}$$

$\therefore$ $f = -4$ cm.

30) ~~$f = 2R$~~ $\quad 2f = R$

~~$R = f$~~ $\quad f = \frac{R}{2}$

$\Rightarrow f = -30$ cm

$v = -15$ cm

Arq

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

$$\Rightarrow \frac{1}{v} - \frac{1}{15} = \frac{1}{-30}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{-30} + \frac{1}{15}$$

$$\Rightarrow \frac{1}{v} = \frac{-1+2}{30}$$

$\Rightarrow$ ~~$= 1$~~

$\therefore$ $V = 30\,cm$

$\therefore$ The Position of the Image is 30 cm.

Again

$$m = \frac{-V}{v}$$

$$\Rightarrow \frac{-30\,cm}{-15\,cm}$$

$$\Rightarrow m = 2$$

$\therefore$ magnification = 2 cm.