Date :

14/6/24

chapter no : 9

Light : Reflection and Refraction

* Notes :

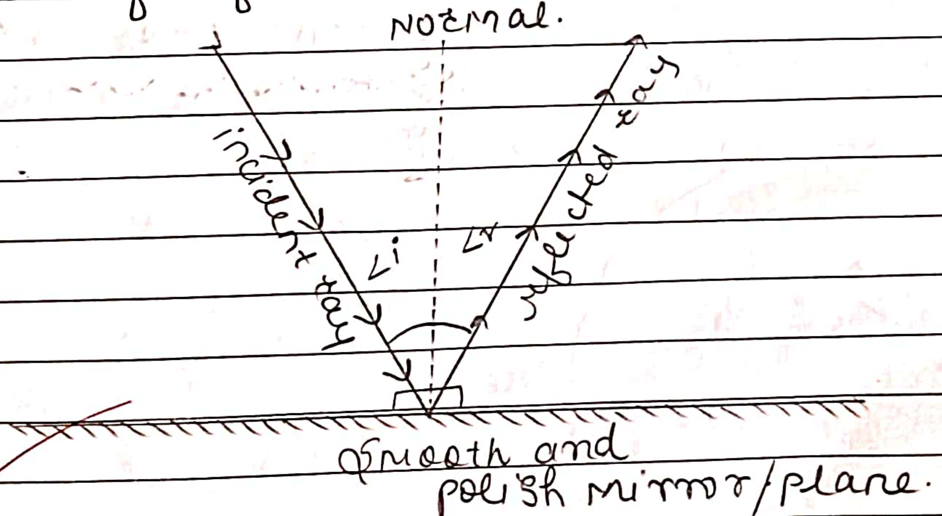
- Light :

- Light refers to electromagnetic radiations that can be detected by human eyes
- it travel through 3×10^8 m/s in (vacumm/air)
- The straightforward movement of ~~the~~ light is called Rectilinear propagation light
- particle of ~~ca~~ light are called "photons"
- Light always travel in straight path

- Reflection

The bouncing back of light from smooth, polish surface is called Reflection.

- Laws of Reflection



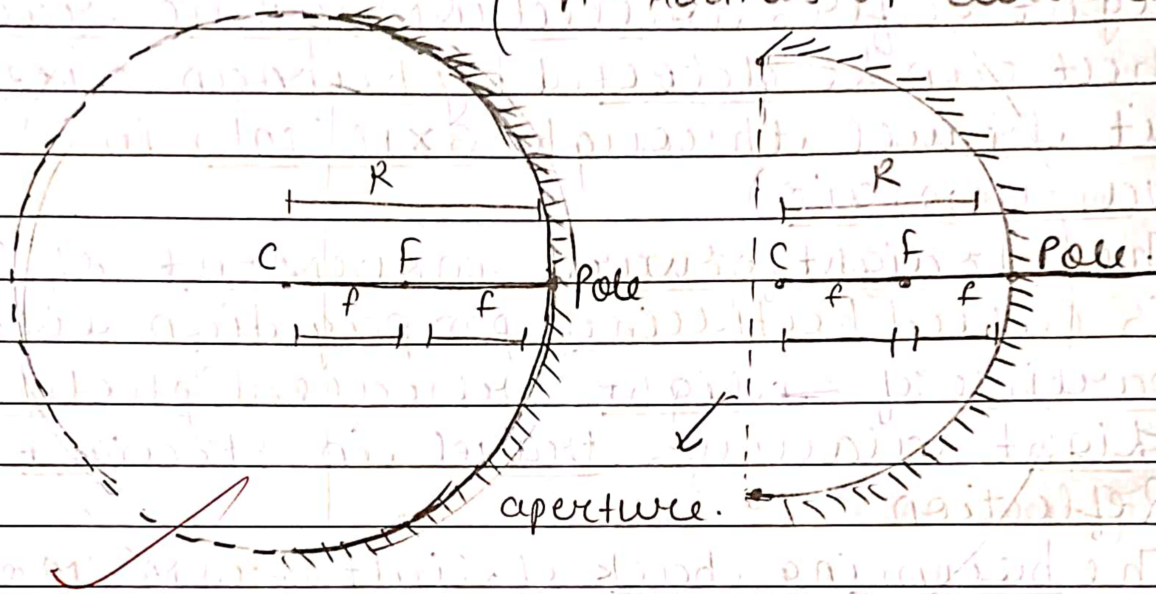
i) $\angle i = \angle r$

ii) The incident ray, reflected ray and normal lie on same plane.

* ~~Speci~~ Spherical Mirrors.

i) concave

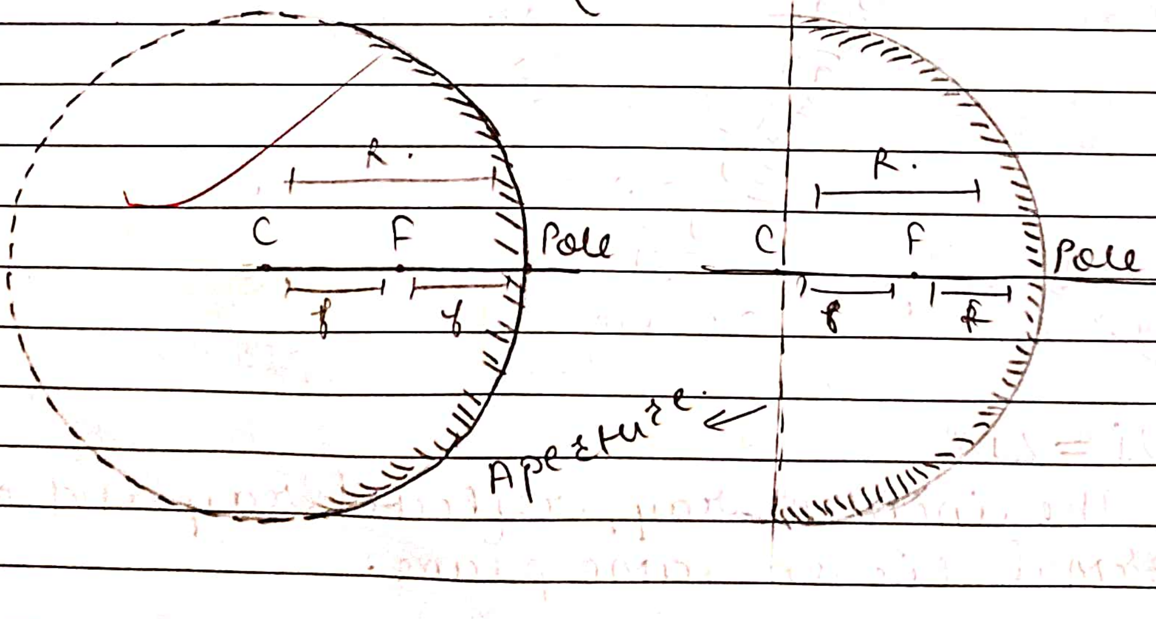
all lies on principle axis. {
F = focus.
f = focal length
C = center of curvature
R = Radius of curvature



ii) Convex.

all lies on principle axis {
F = focus.
f = focal length
C = center of curvature
R = radius of curvature

imagenary line ← principle axis



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- Important terms related to spherical mirros

i) centre of curvature:
The centre of hollow sphere of which the spherical mirror forms a part called centre of curvature denoted by "C."

ii) Radius of curvature:
The Radius of hollow sphere of which spherical mirror form a part is called radius of curvature denoted by "R"

iii) Pole:
The midpoint of spherical mirrors is called pole and is denoted by "P"

iv) Aperture: the part of spherical mirror exposed to the incident light is called the aperture of the mirror.

v) Principal axis:
it is an imagenary line joining centre of curvature is called pricipal axis

vi) principal focus:
a point on the principal axis of spherical Mirror where rays of light parallel to the principle axis meet or apper to meet after refection is called principal focus it is denoted by "F"

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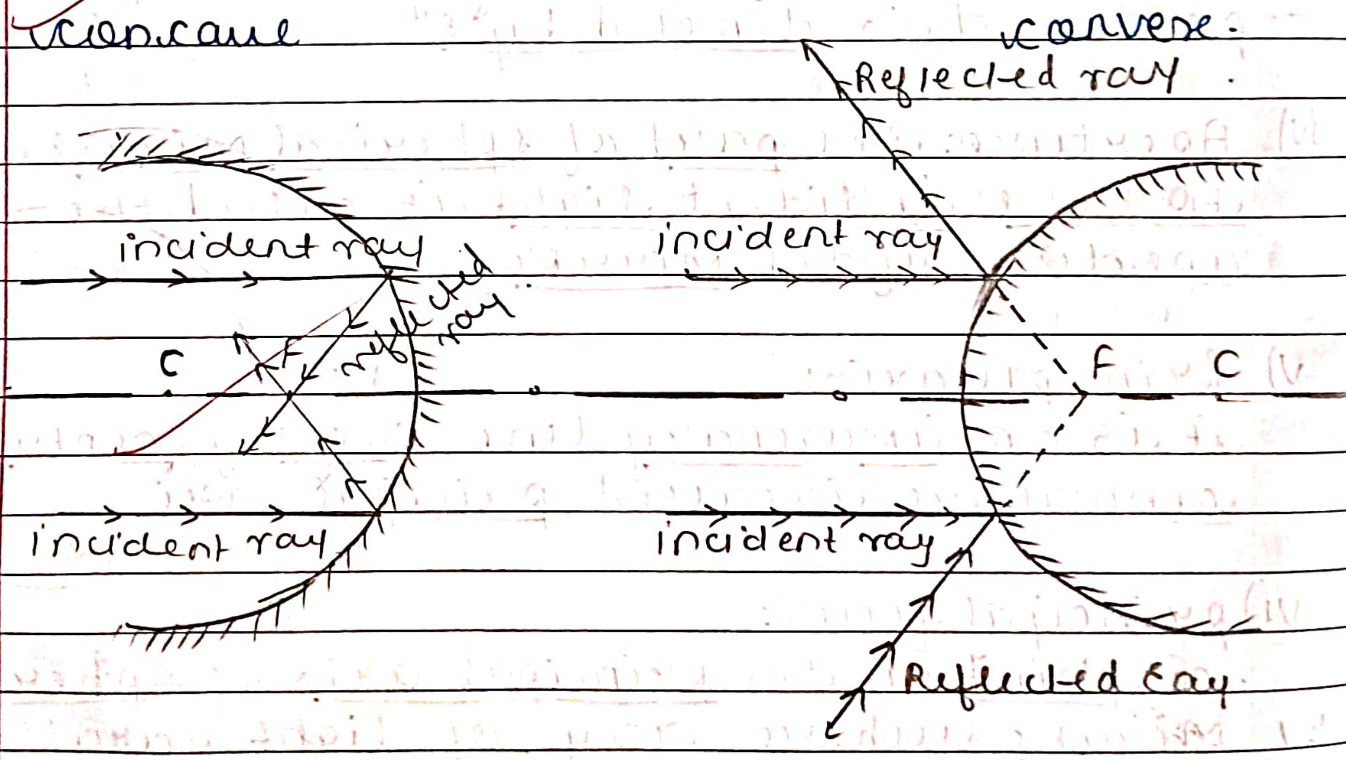
vii) focal length:
the distance between the pole and principal focus of spherical mirror is called focal length (f)

viii) optical centre:
it is a point on principle axis to the lens such that ray passing through goes undeviated.

- Rules to obtain image •

a) if light ray is parallel to principle axis will pass through focus.



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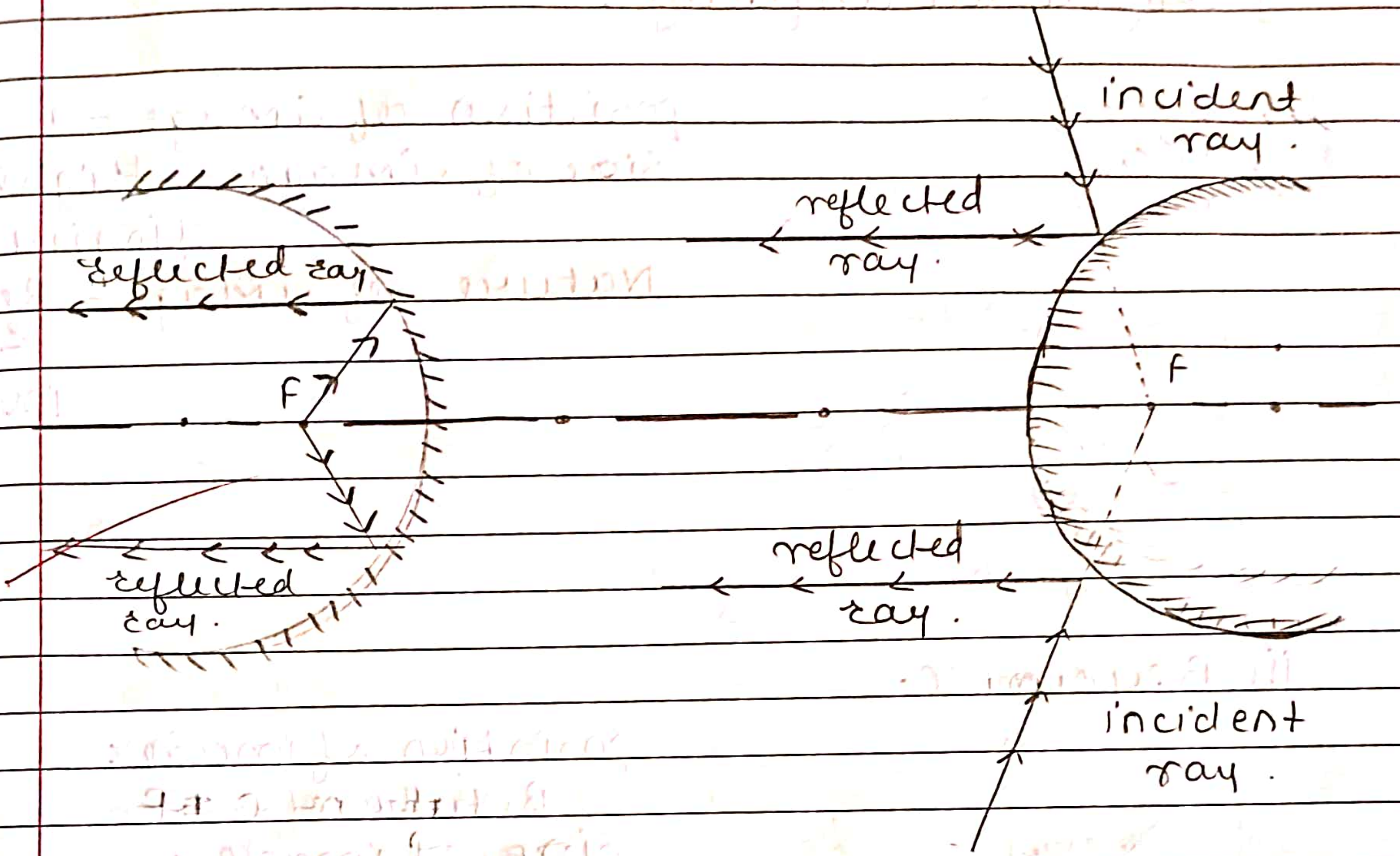
b) light ray passing through focus will be parallel to principal axis.



c) incident ray passing through center of curvature reflect passing through curvature

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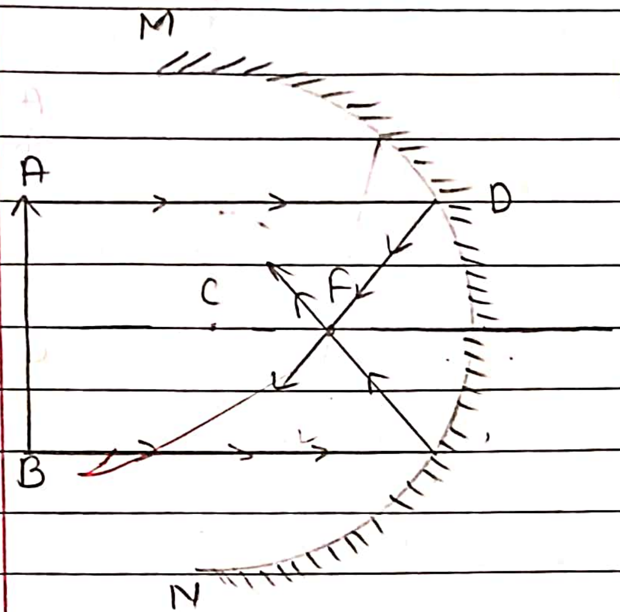
[Concave]

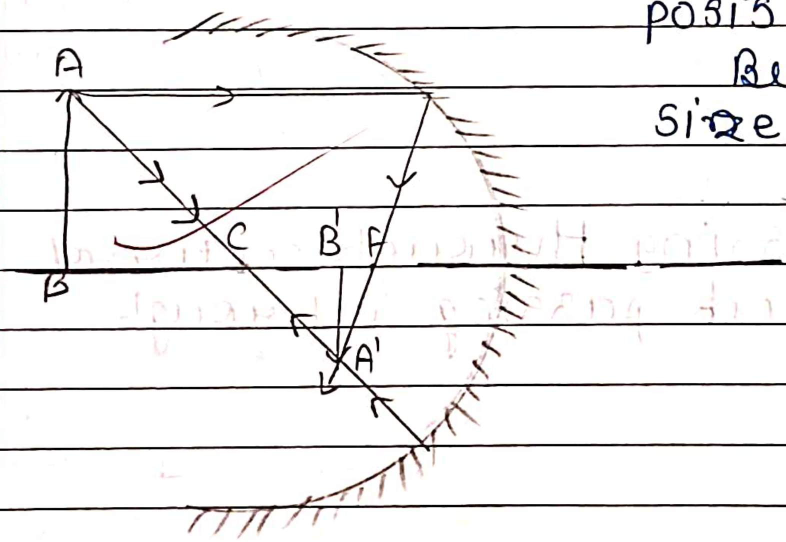
* Ray Diagrams *

i] object at infinity :



position of image = F
Size of image = Highly diminished
Nature of image = Real & inverted

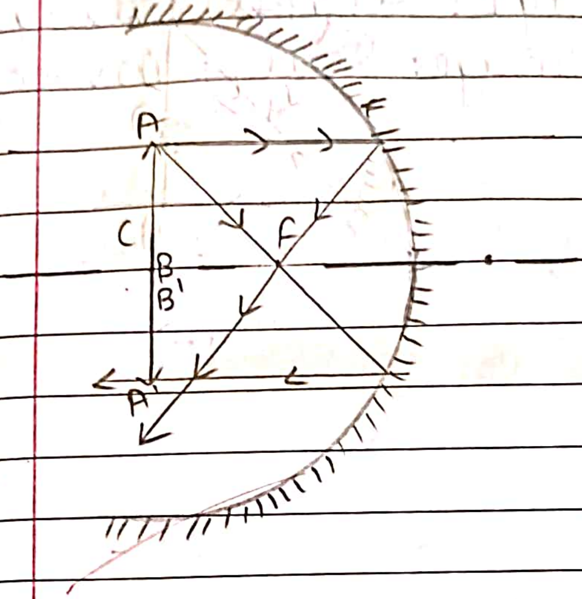
ii] Beyond C.



position of image : Between C & F
Size of image : diminished.
Nature of image : Real & inverted

Date :

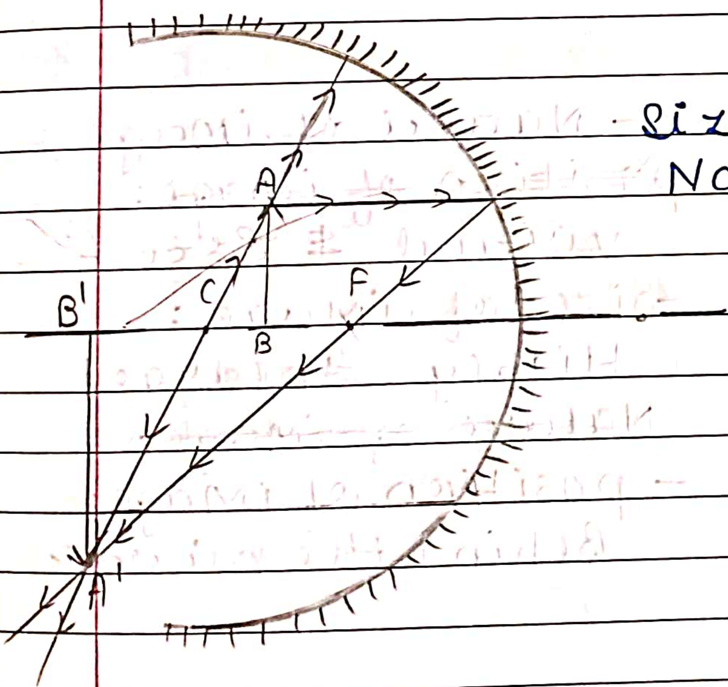
iii) At C



position of image : at C
Size of Image : same size.

Nature of image: real & inverted.

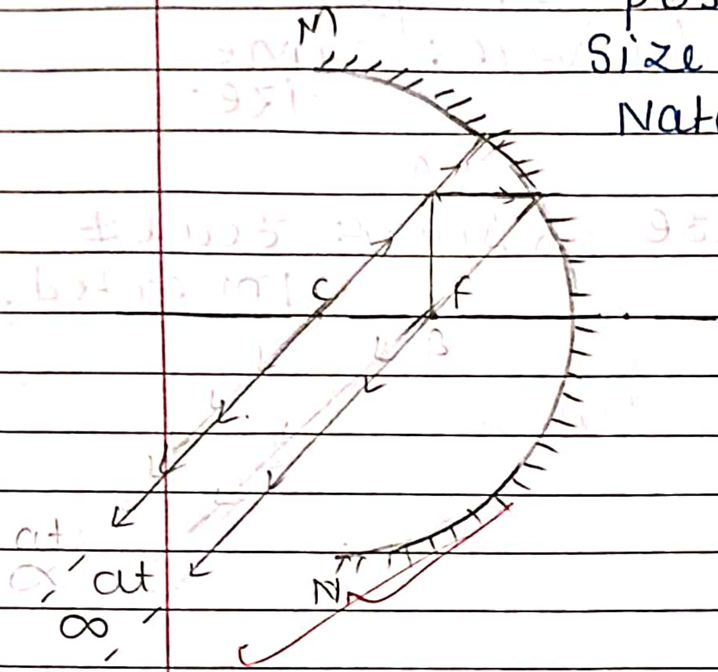
iv) Between C & F



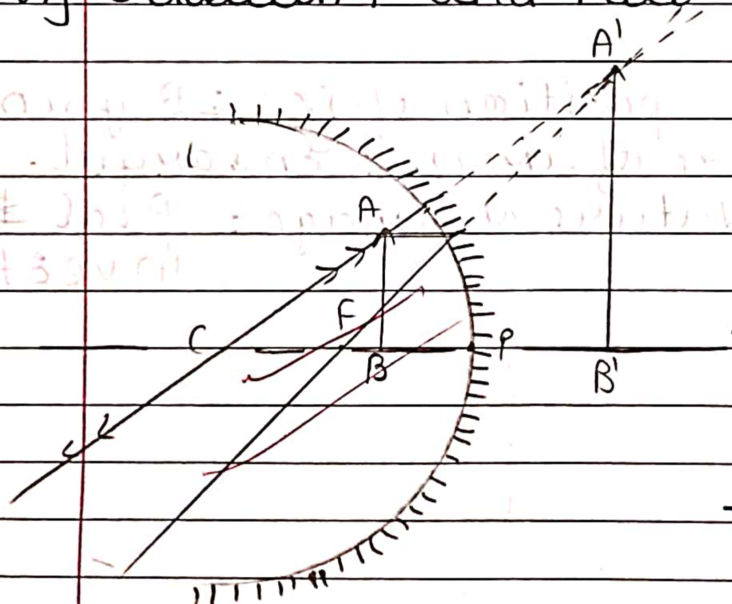
position of size : Beyond C
Size of image : Enlarged.
Nature of image : Real & inverted

V) At F

position of image: at infinity
Size of image: Highly Enlarged
Nature of image: Real & inverted



vi] Between F and Pole



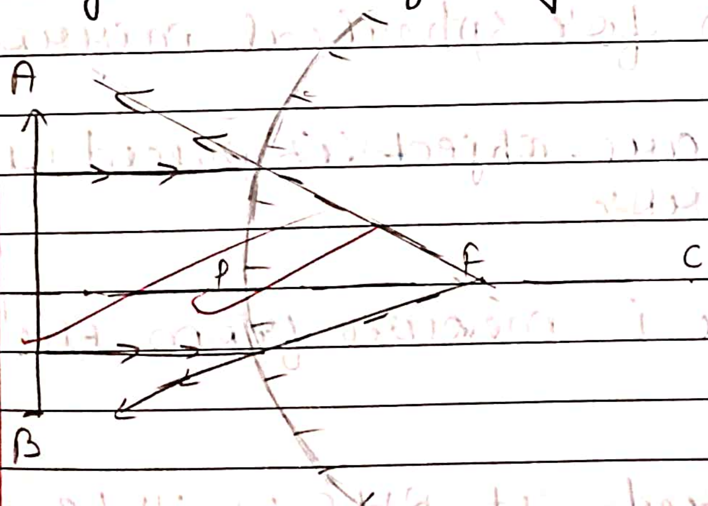
- Nature of image
~~position of image~~:
virtual & Erect
- Size of image:
Highly Enlarged
~~Nature of image~~:
- position of image:
Behind the mirror

- Uses of concave mirror.
- concave mirror are commanly used in troches, search-lights, shaving mirror to see larger image of face
- The dentist use concave mirror to see magnified image of theeth

- Application of convex mirror
- it is used in sungeasses.
- it is used in rear view mirror in automobiles
- it is used in reflector for street lights
- etc

* Ray Diagram *
[Convex]

i] object at infinity



Nature of image:
i) virtual
ii) Erect
iii) Position - At F
iv) Highly Diminished (point size)

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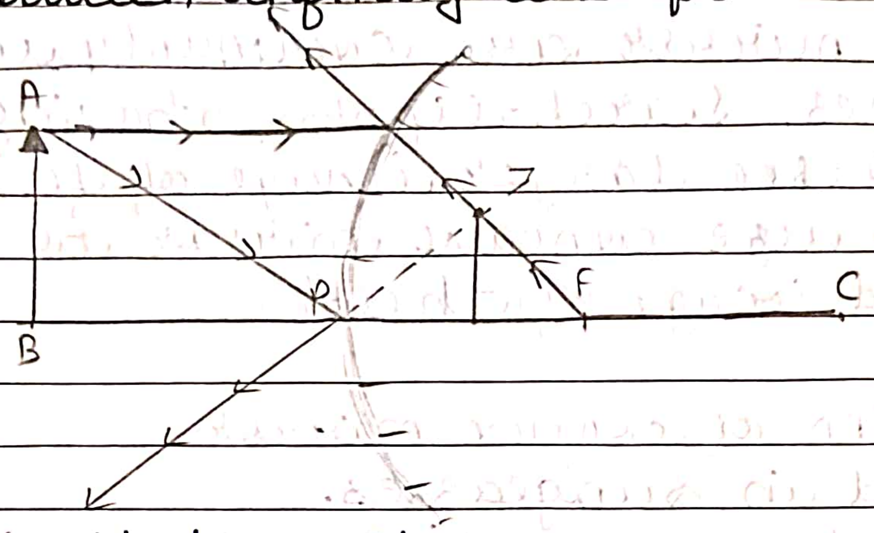
ii] Between infinity and pole.



Nature of image
i) virtual
ii) Erect
iii) Between P and F
iv) Diminished.

Good
keep it up!
2016.

* Sign convention for spherical mirrors *

- The convention are. object is placed on left side of mirror

- All distance is measure from the pole of mirror

- distances mesured at RHS will be +ve
distances mesured at LHS will be -ve

- distances measure perpendicular to and above the principle axis will be +ve.

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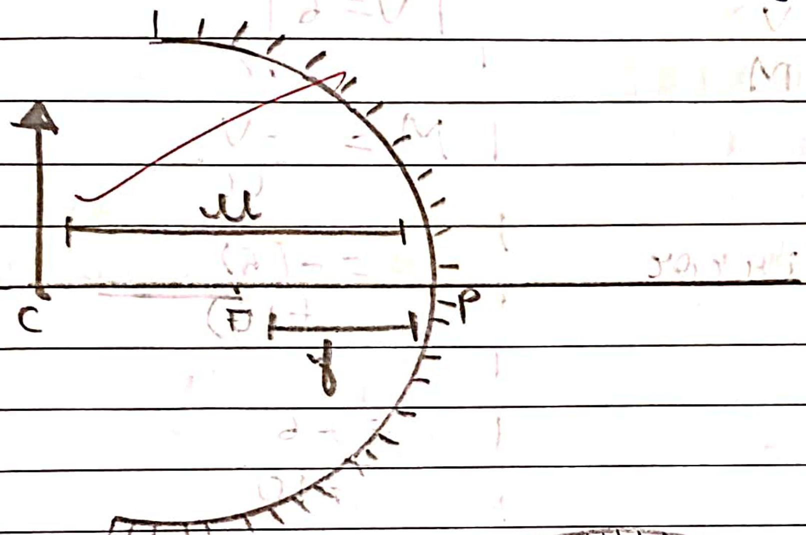
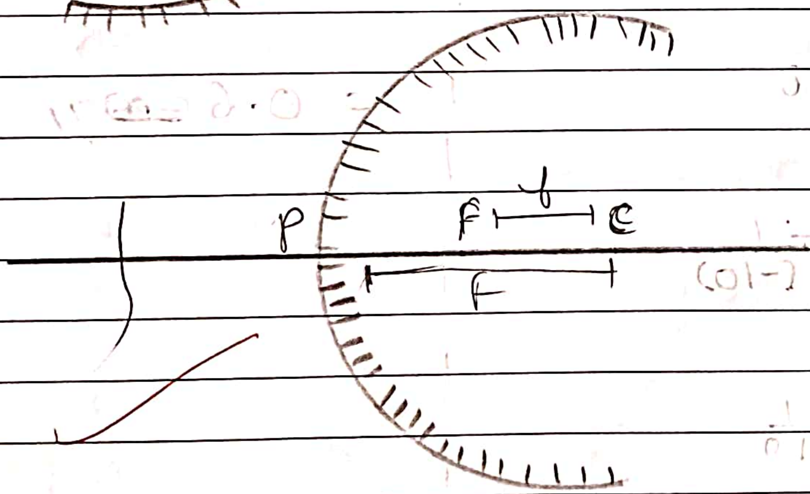
- distances measured perpendicular to and below the principle axis will be -ve

= Mirror formula

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

where
f = focal length
v = distance between image and pole.
u = distance between object and pole.





Mgnification
it is a comparison between the height of object and height of image

$$M = \frac{-v}{u} \Rightarrow \frac{hi}{ho}$$

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* Refraction *

When light rays travel from one medium to another medium they tend to bend this bending of light is called refraction.

-) When light rays travel from rarer medium to denser medium the light ray bends toward the normal
-) When light ray travel from denser to rarer medium the light ray move away from normal.

* Law of Refraction *

-) The incident ray the refracted ray and normal to the interface two transperant media at the point of incidence
-) The ratio of sine of ∠i to the sine ∠ of refraction is a constant

$$\frac{\sin \angle i}{\sin \angle r} = \text{constant}$$

↓

Snell's law.

$0^\circ < i > 90^\circ$

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* Refractive Index

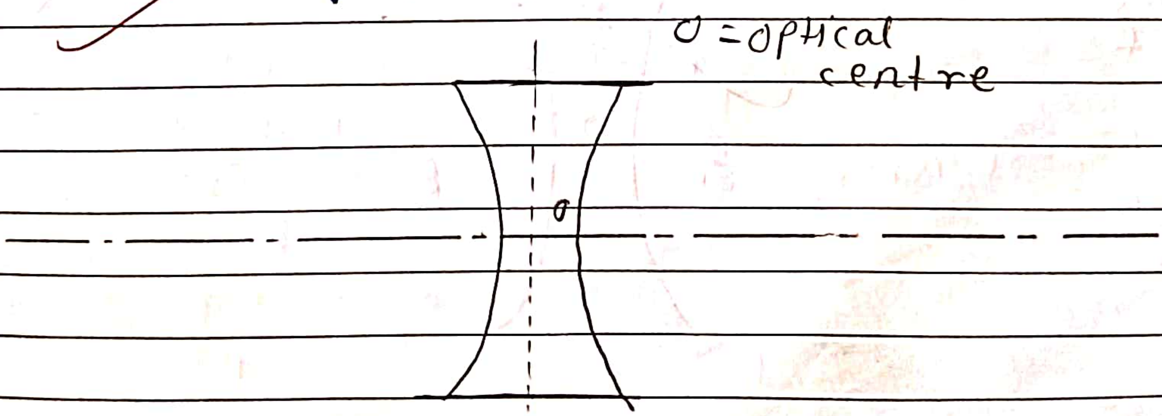
$$n_{2 \text{ to } 1} = \frac{\text{speed of light in medium 1}}{\text{Speed of light in medium 2}}$$

$$n_{1 \text{ to } 2} = \frac{\text{speed of light in medium 2}}{\text{speed of light in medium 1}}$$

if medium 1 is vaccum or air then the refractive indese of medium 2 is considered with respect to vaccum This is called the absolute refractive indese of the medium.

* Characteristics of concave lenses.

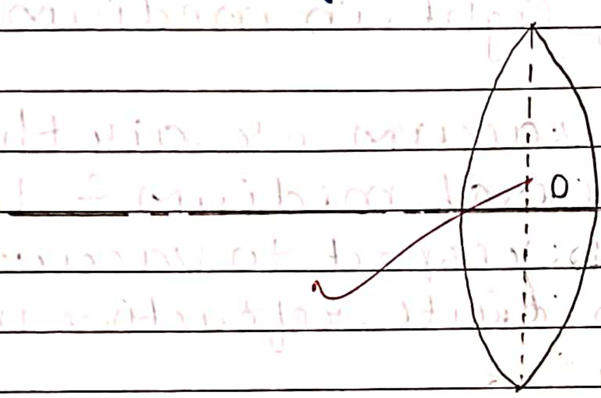
- A Double concave lense is bounded by two Spherical surfaces curved inwards. it is thicker at the edges that at the middle
- such lenses diverg light rays. hence they are called diverging lenses



concave lense.

Date :

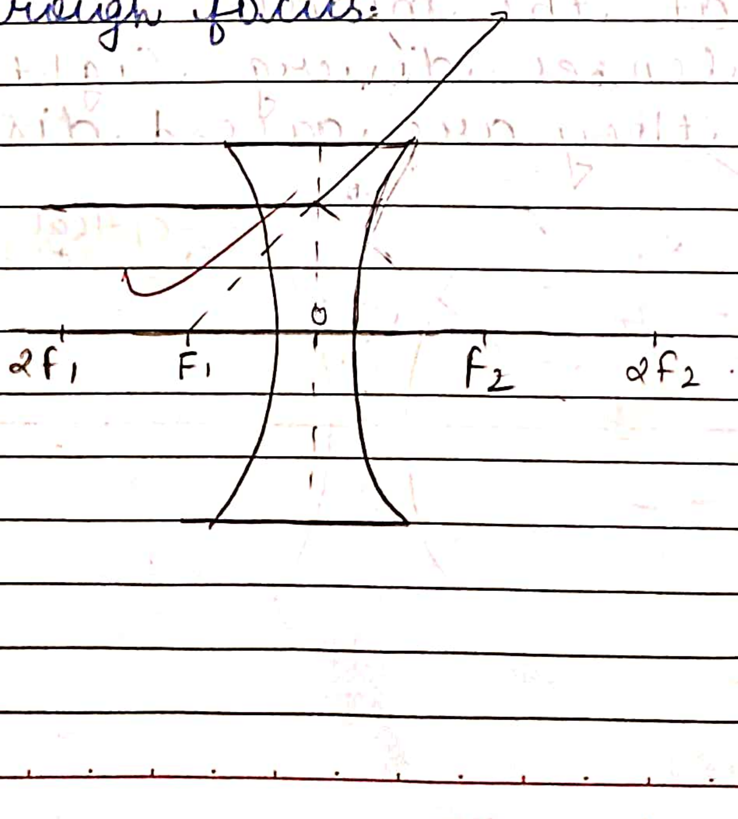
* Characteristics of convex lenses
- it has two ~~Spherical~~ spherical surfa[ces]
bulging outwards
- it is thicker at the middle as compare[d]
to edges.
- Such lens ~~div~~ converge the light ra[ys]
hence they are called converging len[s]



convex lense.

* Rule to draw the ray diagram [lens.

1] line passing parallel to principal axis w[ill]
pass through focus.



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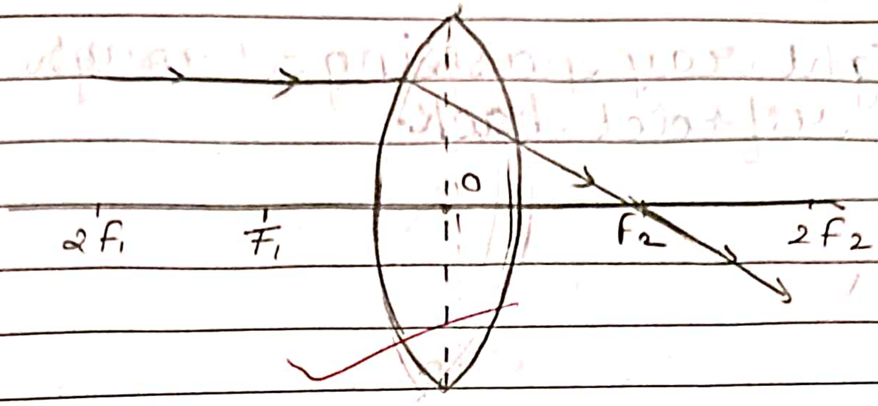
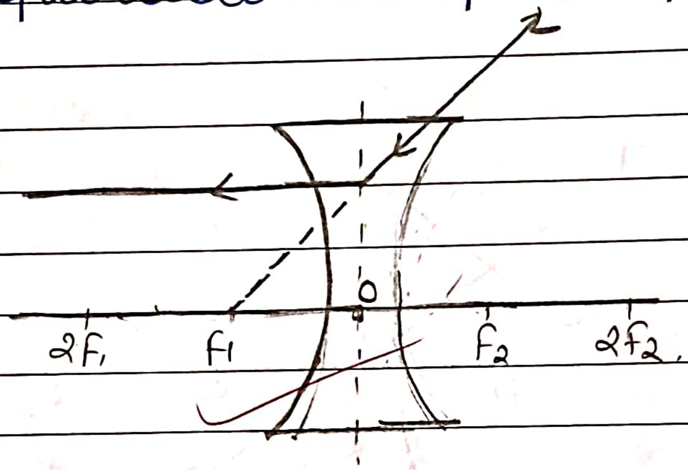
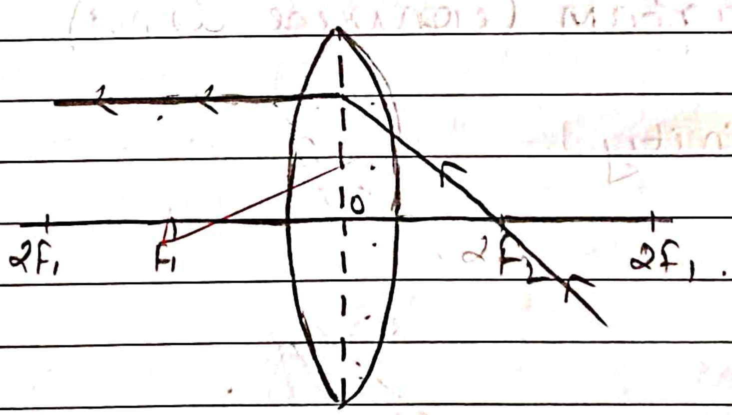


2] light ray travelling through principal focus parallel to principal axis





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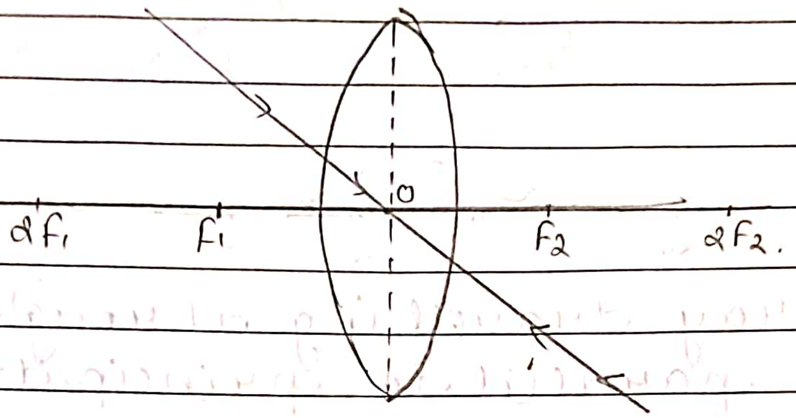
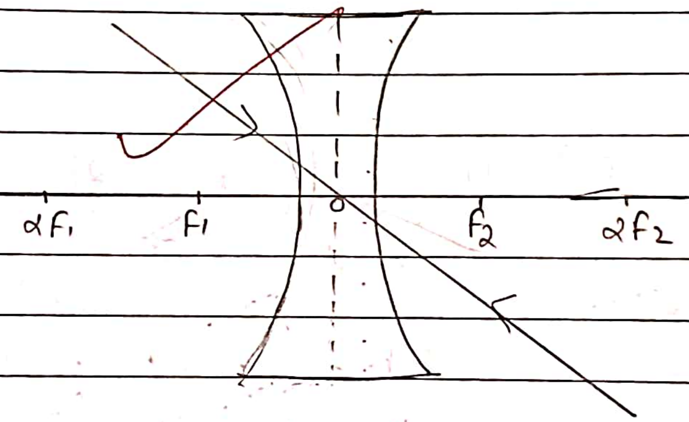
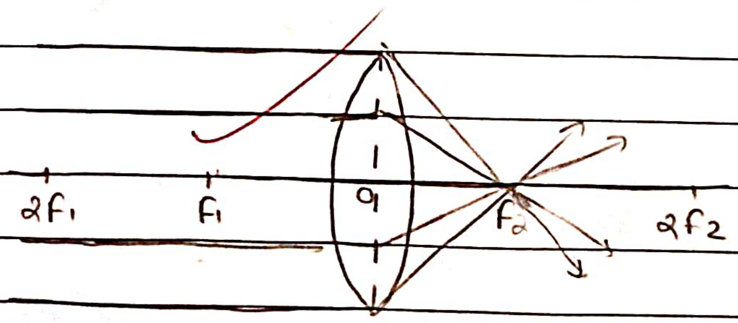
3] the light ray passing through optical centre refract back.





* Ray Diagram (convex lens)

a) at Infinity



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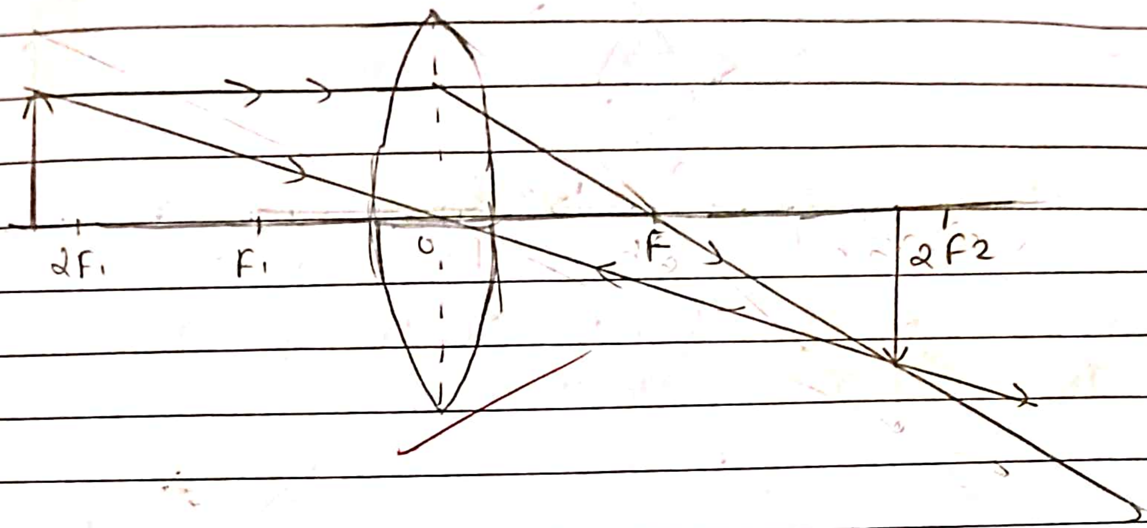
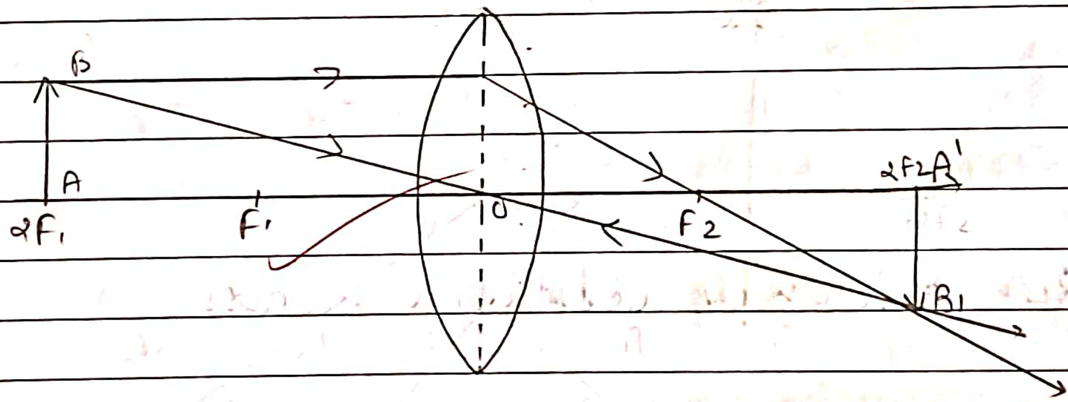
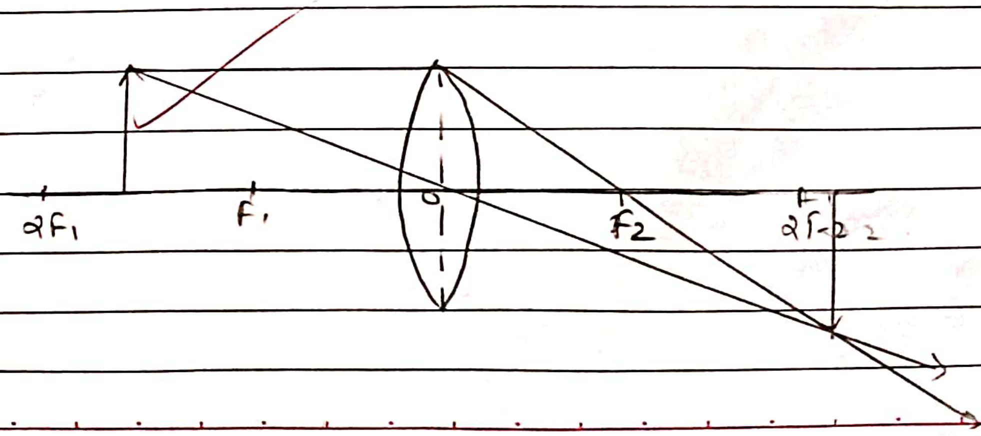
b) Beyond $2F_1$



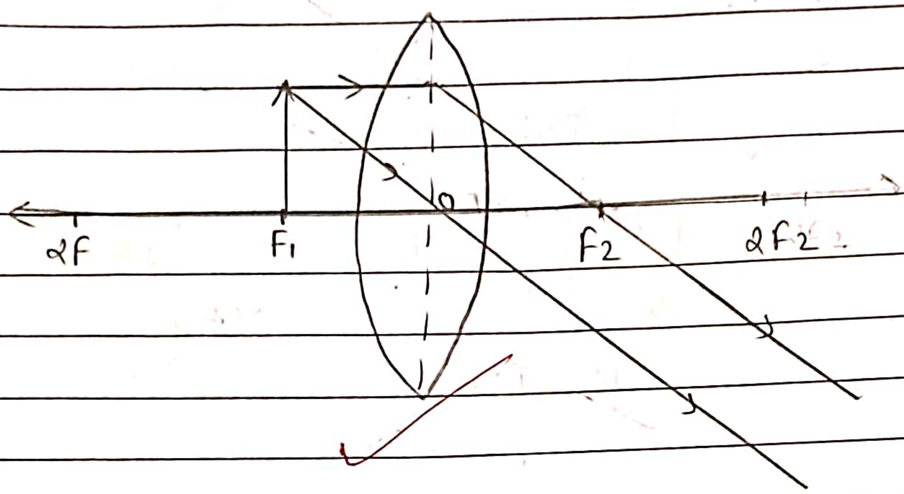
c) at $2F_1$



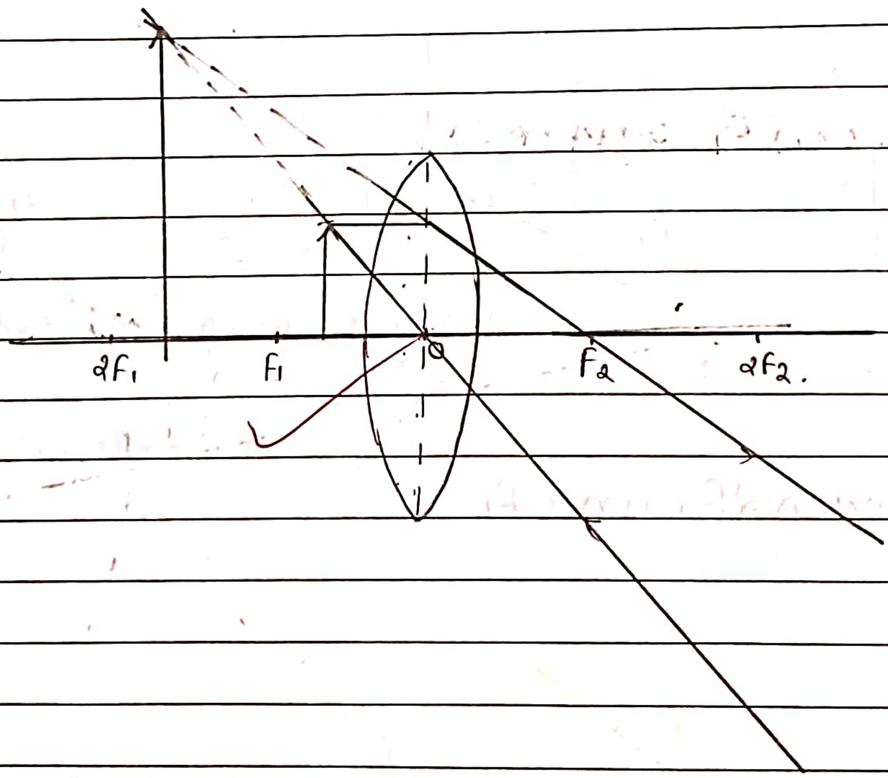
d) Between $2F_1$ and F_1



e. at F_1



f)



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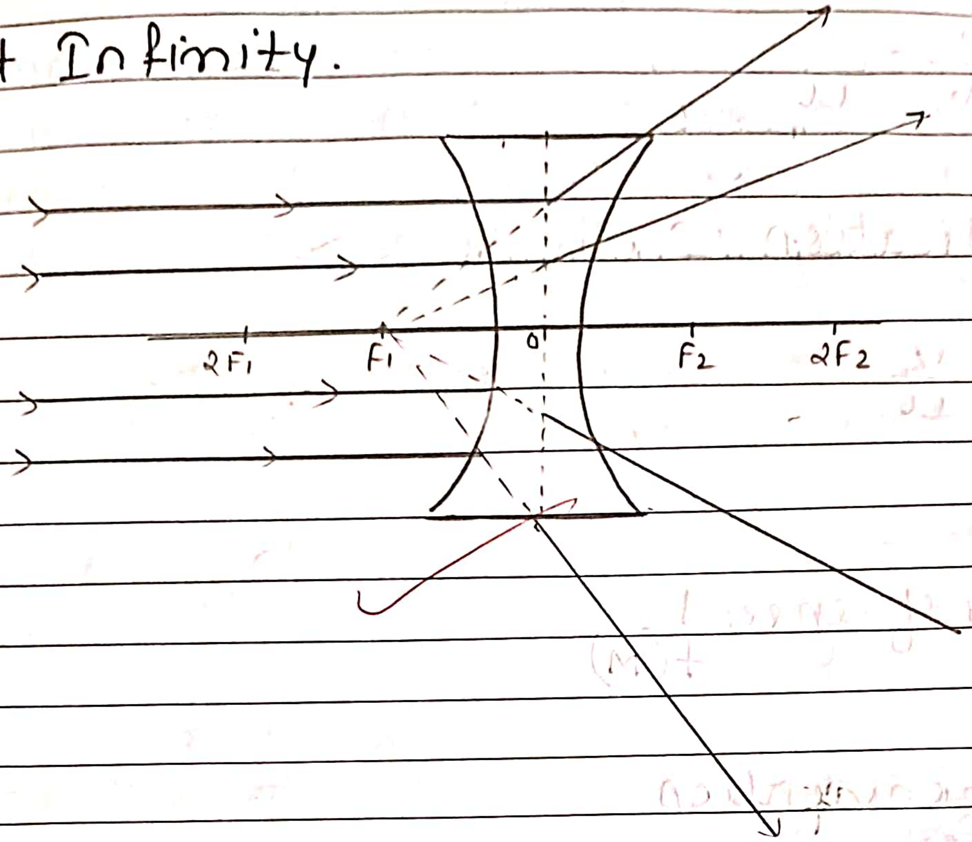
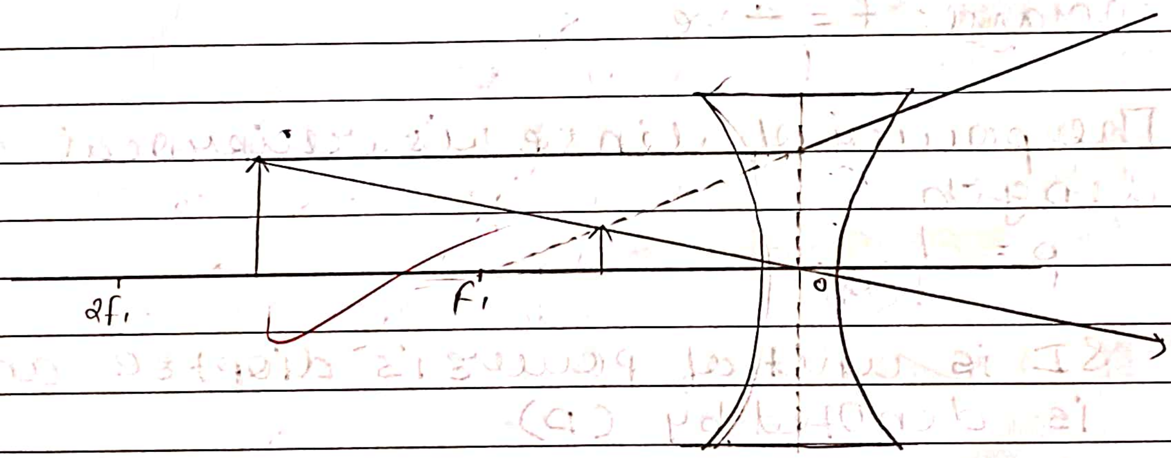
* Ray diagram [concave]

i) at Infinity.



ii) Between F1 and 2F1



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* Lense formula:

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

* Magnification

$$\frac{hi}{ho} = \frac{v}{u}$$

* power of Lense: $\frac{1}{f(M)}$

* Sign convention
convese:
$u = -ve$, $f = +ve$
concave: $f = -ve$

The power of lense is reciprocal of foca length

$$p = \frac{1}{f(M)}$$

SI is unit of power is dioptre and is denoted by (D)