LECTURE # 5

In this lecture you will learn about:

- Cone.
- Conics.

Types of Conics:

- Triangle.
- Circle.
- Ellipse.
- Parabola.
- Hyperbola.

Course Name:

"Engineering Drawing For Civil Engineers"

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CONE

- It is a surface generated by moving a Straight line keeping one of its end fixed & other end makes a closed curve.

- The fixed point is known as vertex or apex.

- The closed curve is known as base.

- If the base/closed curve is a circle, we get a cone.

- If the base/closed curve is a polygon, we get a pyramid.

Vertex/Apex

90°

Base

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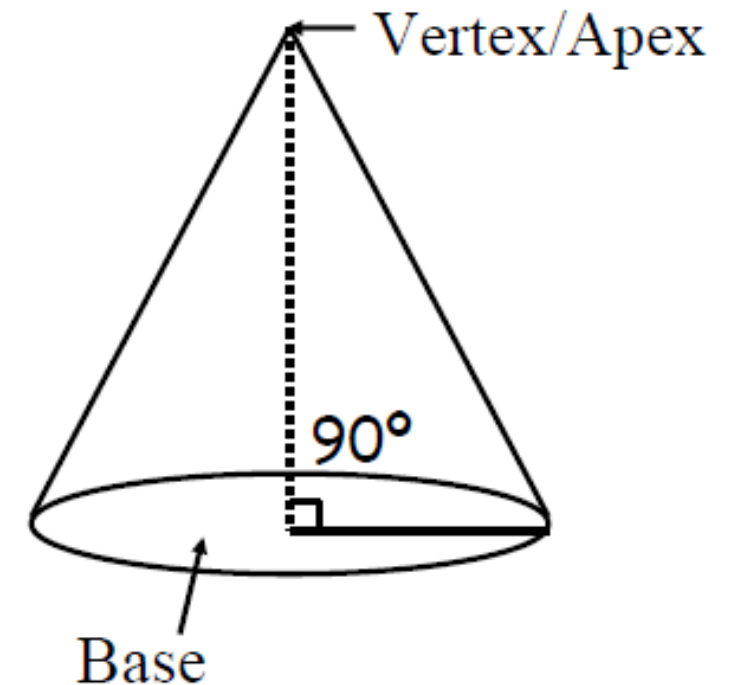
CONE

- The line joins apex to the center of base is called axis

- If axes is perpendicular to base, it is called as right circular cone.

- If axis of cone is not perpendicular to base, it is called as oblique cone.

- The line joins vertex/ apex to the circumference of a cone is known as generator.

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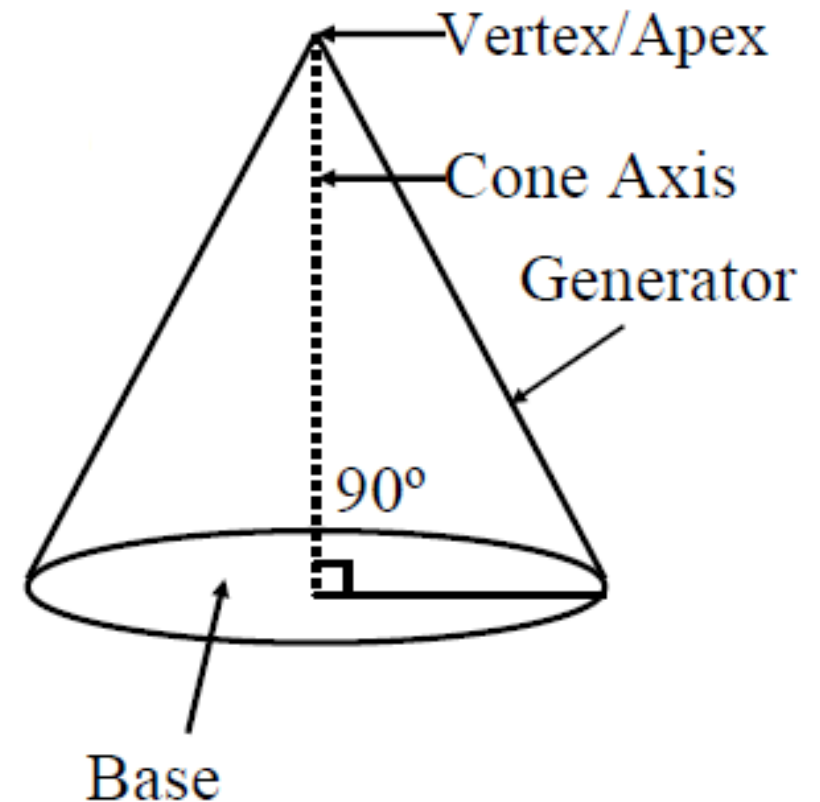
CONICS

The section obtained by the intersection of a right circular cone by a cutting plane in different position relative to the axis of the cone are called <u>conics.</u>
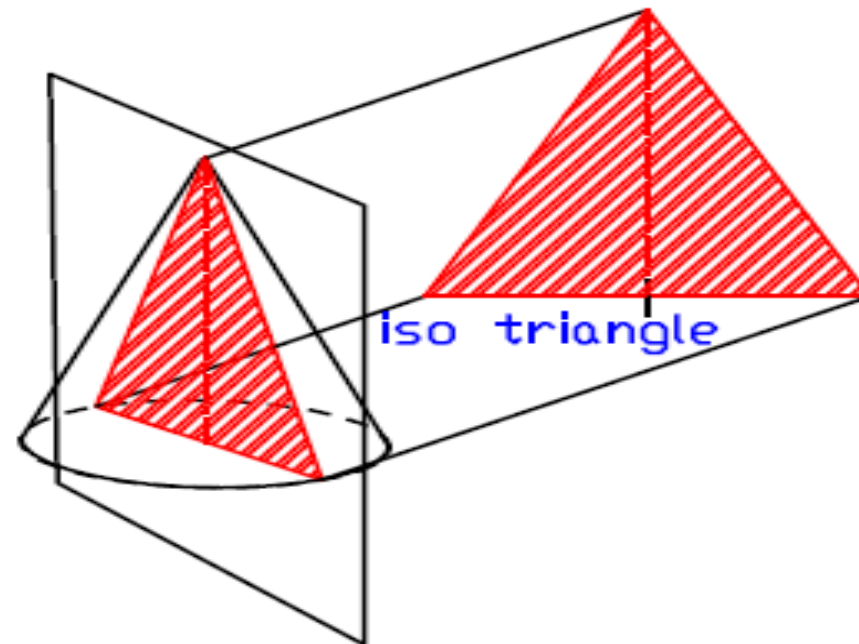
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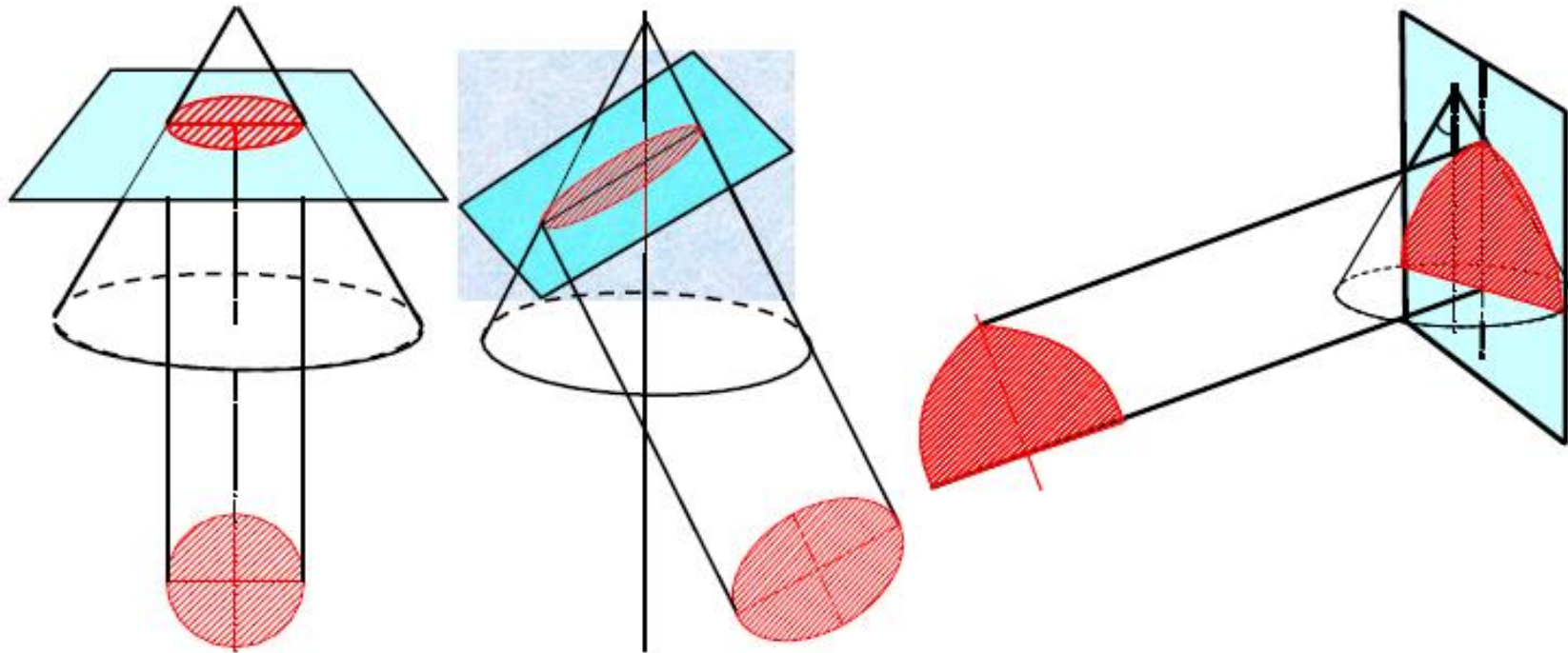
CONICS

A. Triangle

B. Circle

C. Ellipse

D. Parabola

E. Hyperbola

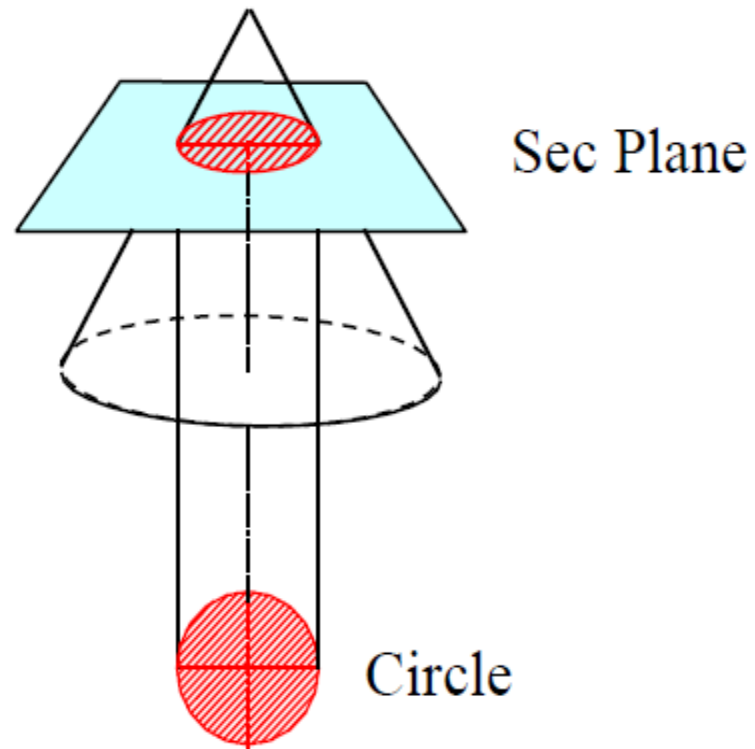*Prepared By: Engr. Khurshid Alam*

TRIANGLE

When the cutting plane contains the apex, we get a triangle as the section.

iso triangle

CIRCLE

When the cutting plane is perpendicular to the axis or parallel to the base in a right cone we get circle the section.
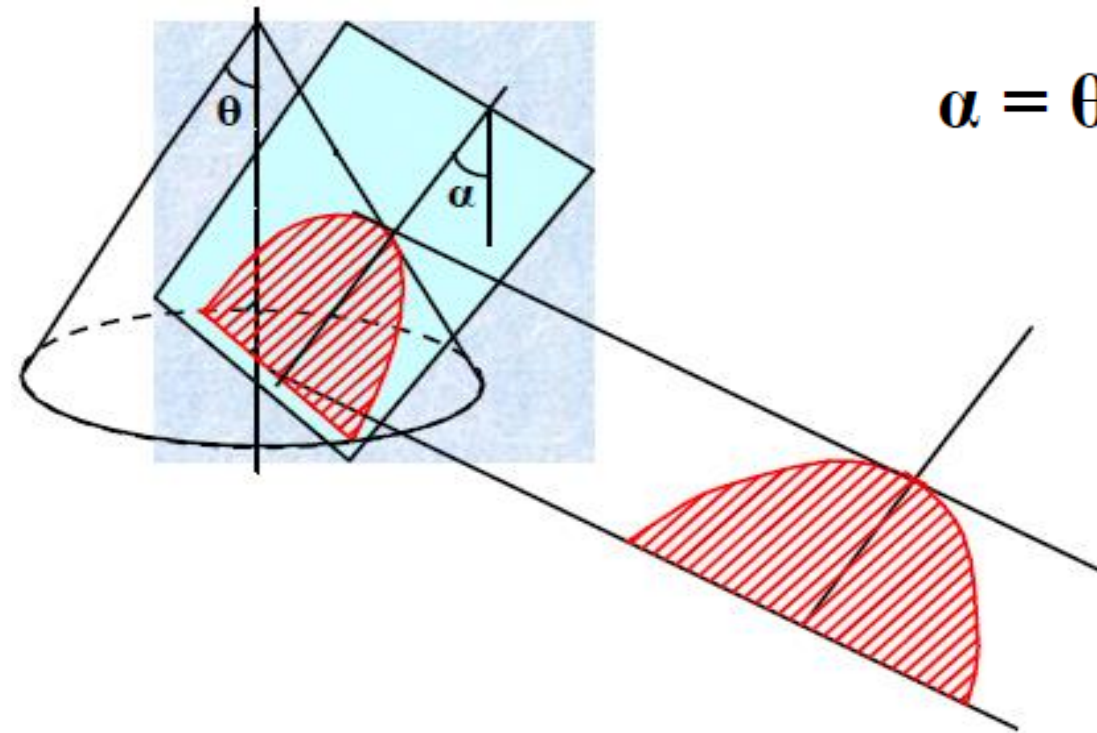

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ELLIPSE

When the cutting plane is inclined to the axis but not parallel to generator or the inclination of the cutting plane(α) is greater than the semi cone angle(θ), we get an ellipse as the section.

$\alpha > \theta$
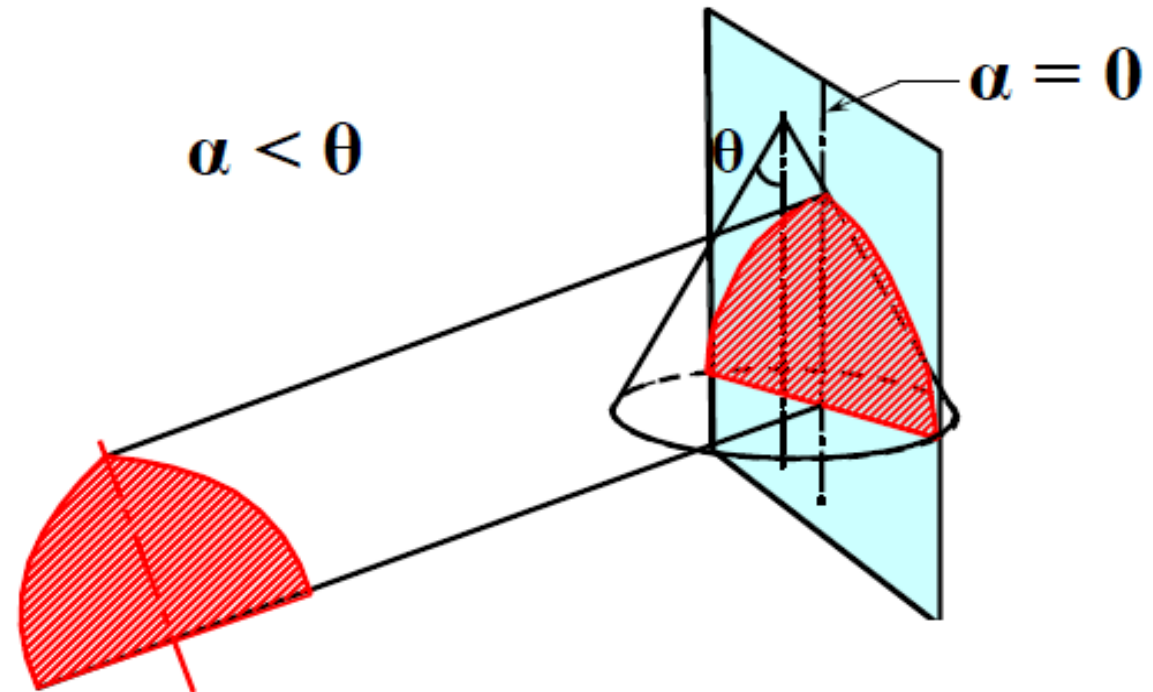
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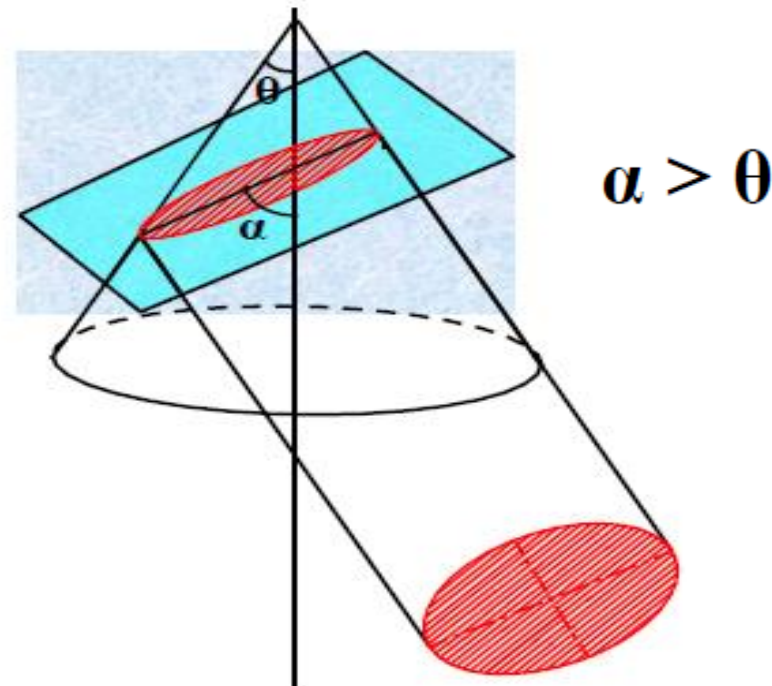
PARABOLA

When the cutting plane is inclined to the axis and parallel to one of the generators of the cone or the inclination of the plane(α) is equal to semi cone angle(θ), we get a parabola as the section.

$$\alpha = \theta$$

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HYPERBOLA

When the cutting plane is parallel to the axis or the inclination of the plane with cone axis(α) is less than semi cone angle(θ), we get a hyperbola as the section.

$\alpha < \theta$
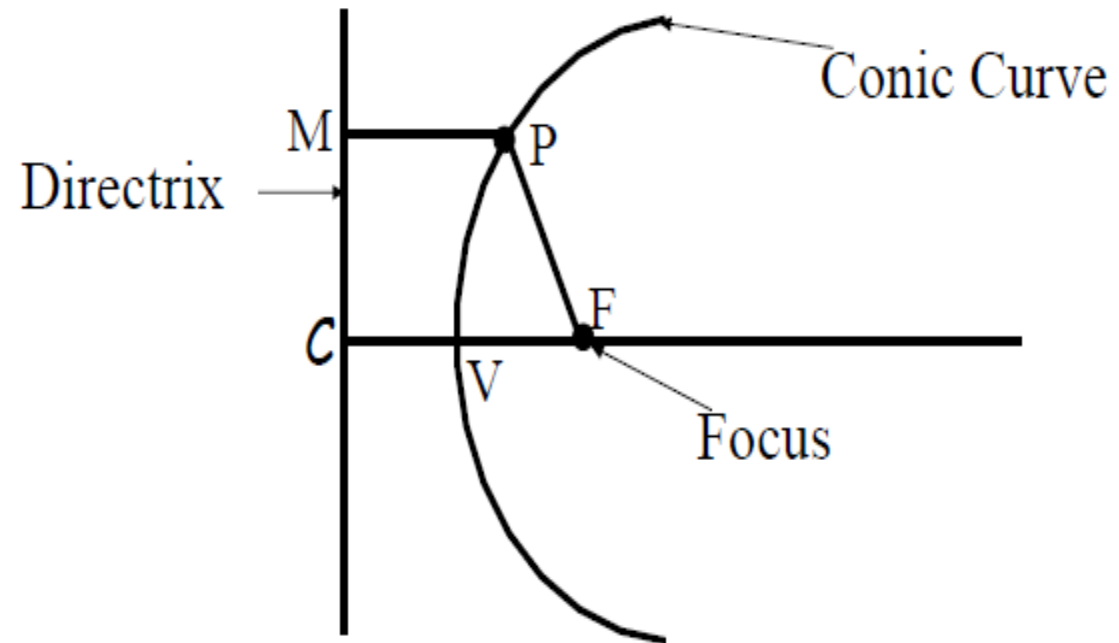
$\alpha = 0$

θ

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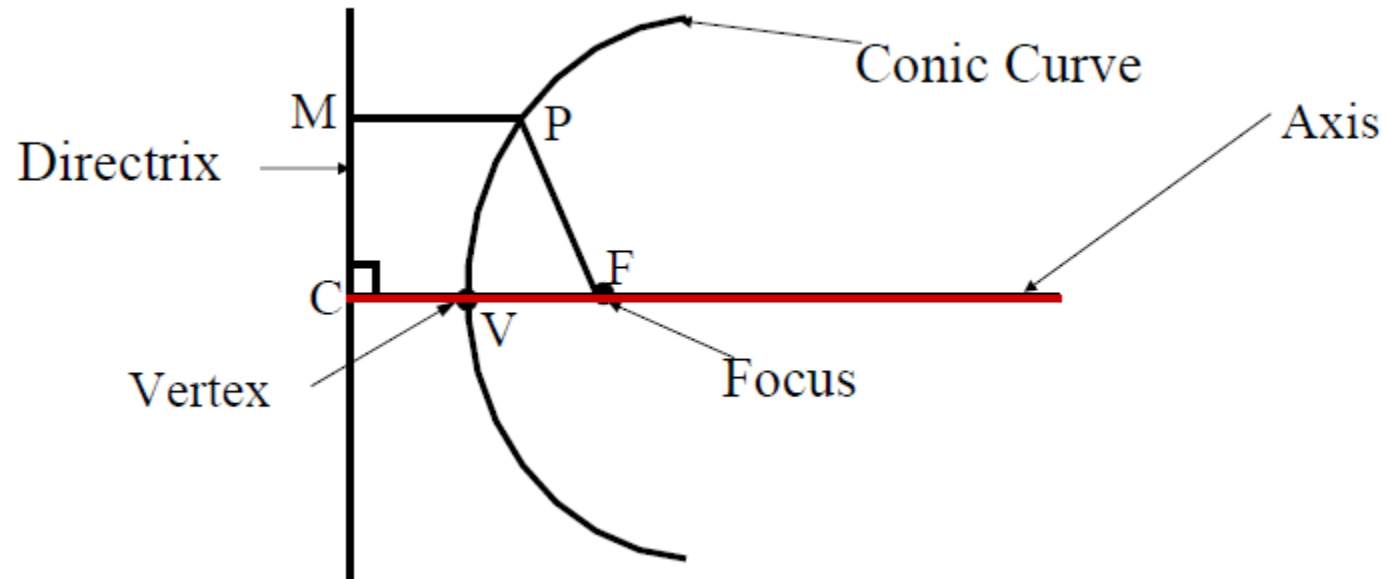
CONICS

Definition : The locus of point moves in a plane such a way that the ratio of its distance from <u>fixed point (focus)</u> to a <u>fixed Straight line (Directrix)</u> is always constant.

- Fixed straight line is called as <u>directrix</u>.

- Fixed point is called as <u>focus</u>.

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CONICS CONTD…

The line passing through focus & perpendicular to directrix is called as <u>axis</u>. The intersection of conic curve with axis is called as <u>vertex</u>.


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CONICS CONTD…

$$\text{Ratio} = \frac{\text{Distance of a point from focus}}{\text{Distance of a point from directrix}}$$

= Eccentricity

= PF/PM = QF/QN = VF/VC

= e

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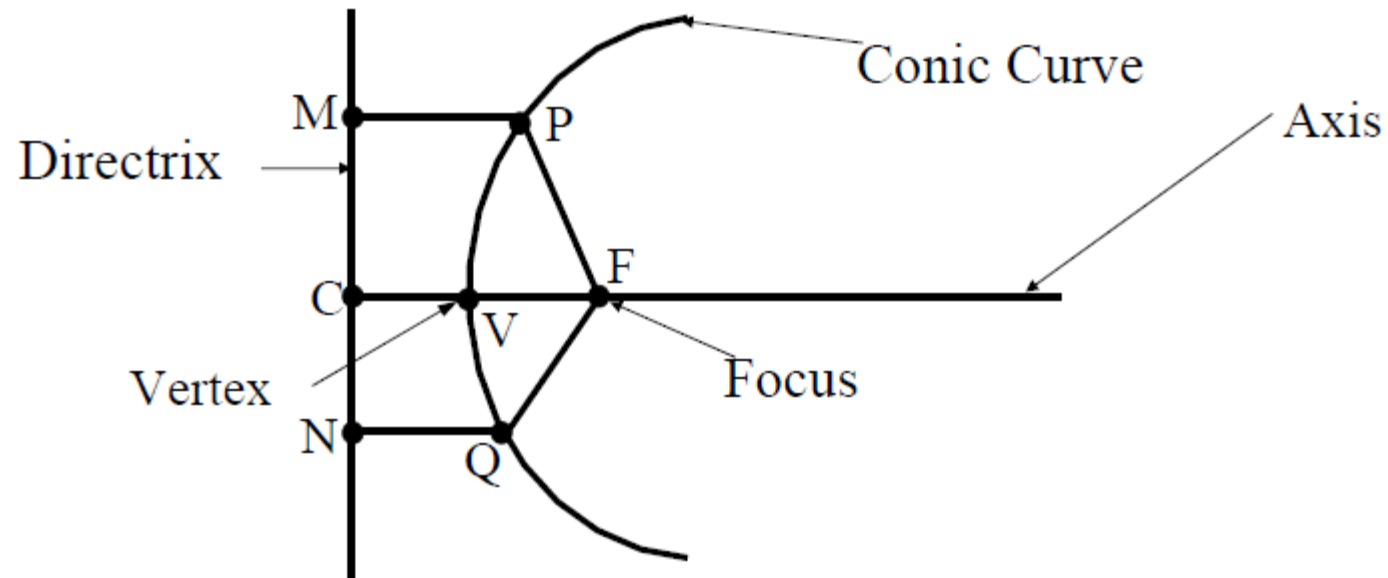
ELLIPSE

Ellipse is the locus of a point which moves in a plane so that the ratio of its distance from a <u>fixed point (focus)</u> and a <u>fixed straight line (Directrix)</u> is a constant and <u>less than one</u>.
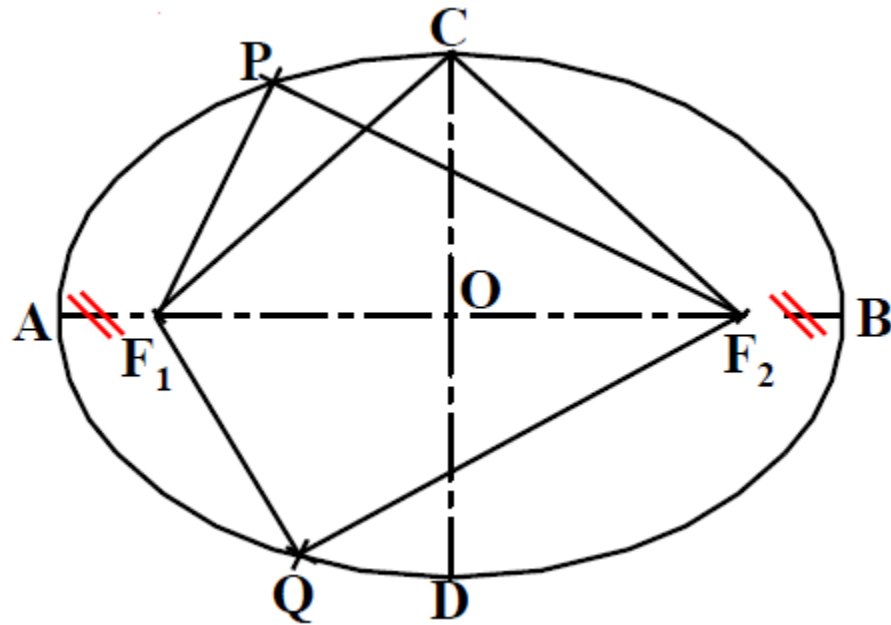

Eccentricity = PF/PM
= QF/QN
< 1.
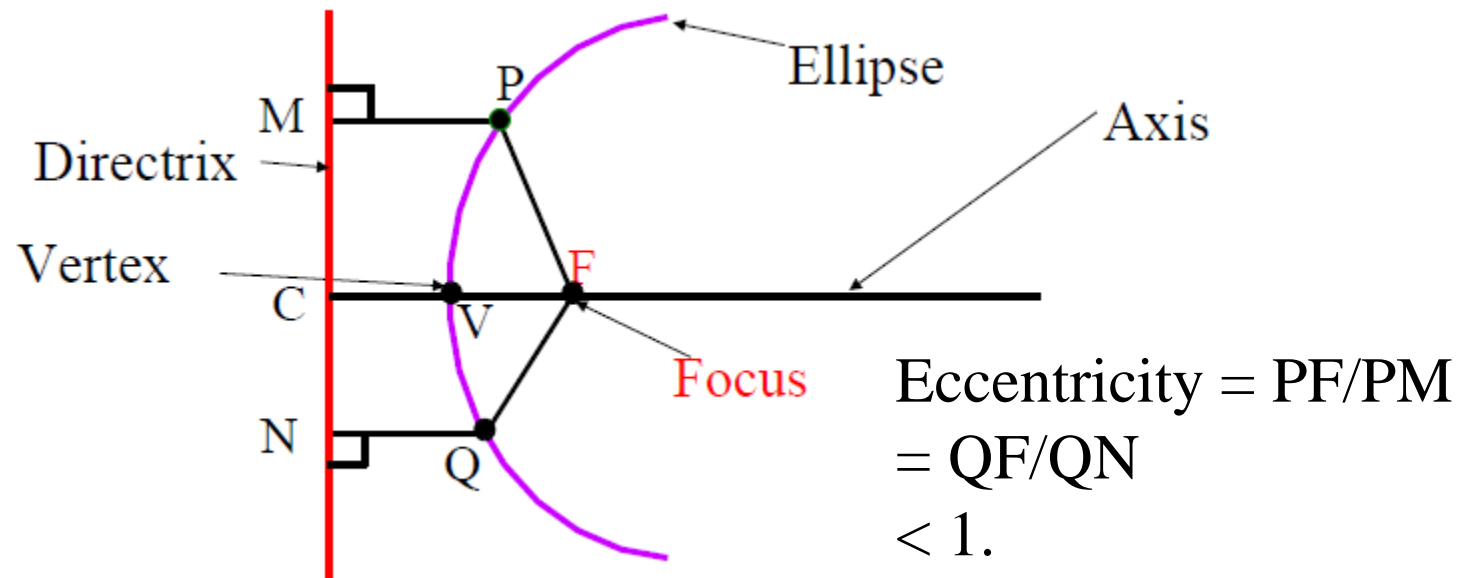
ELLIPSE CONTD…

Ellipse is the locus of a point, which moves in a plane so that the sum of its distance from two fixed points, called focal points or foci, is a constant. The <u>sum of distances</u> is equal to the <u>major axis</u> of the ellipse.

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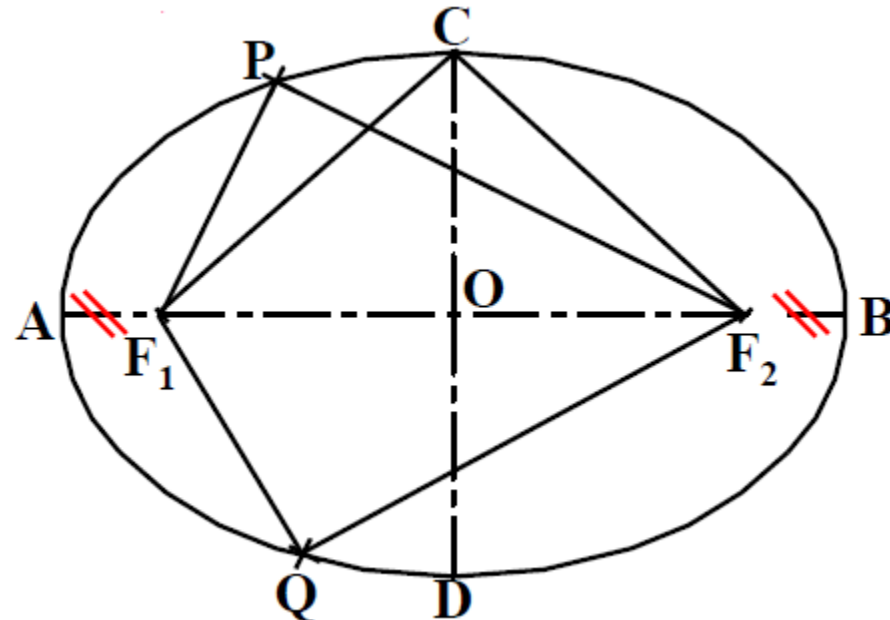
ELLIPSE CONTD…

$CF_1 + CF_2 = AB$

but $CF_1 = CF_2$

hence, $CF_1 = 1/2AB$

$PF_1 + PF_2 = QF_1 + QF_2 = CF_1 + CF_2 = $ constant

$= F_1A + F_1B = F_2A + F_2B$
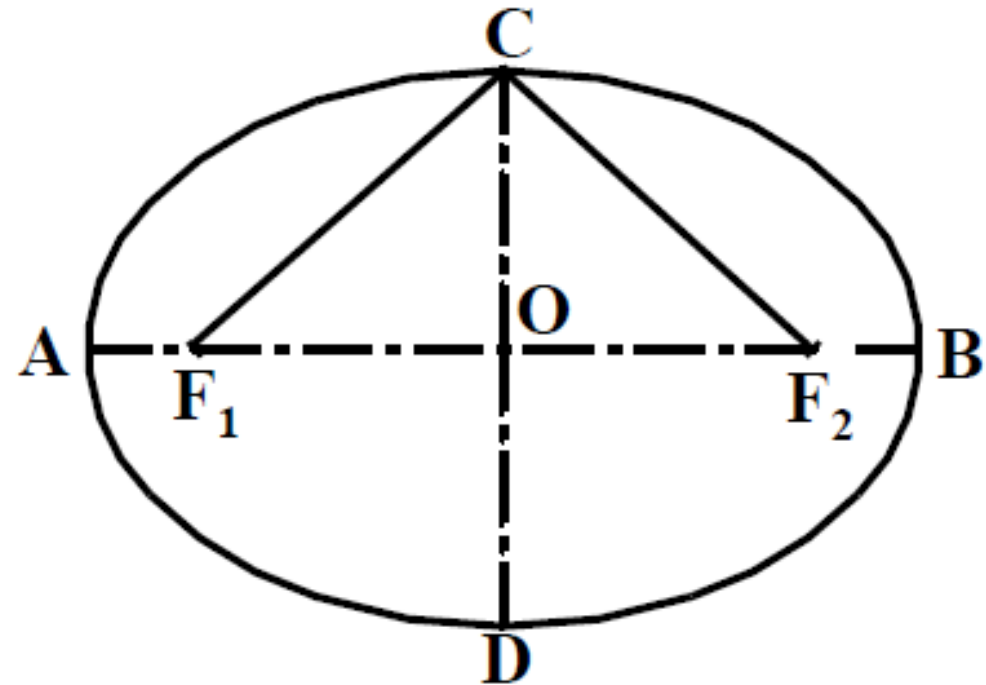
But $F_1A = F_2B$

$F_1A + F_1B = F_2B + F_1B = AB$

$= $ Major Axis

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ELLIPSE CONTD…

Major Axis = 100 mm

Minor Axis = 60 mm

$CF_1 = ½ AB = AO$

ELLIPSE CONTD…

USES

- Shape of a man-hole.

- Flanges of pipes, glands and stuffing boxes.

- Shape of tank in a tanker.

- Shape used in bridges and arches.

- Monuments.

- Path of earth around the sun.

- Shape of trays etc.

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PARABOLA

The parabola is the locus of a point, which moves in a plane so that its distance from a fixed point (focus) and a fixed straight line (directrix) are always equal.

Ratio (known as eccentricity) of its distances from <u>focus</u> to that of <u>directrix</u> is constant and <u>equal to one (1).</u>

Eccentricity = PF/PM
= QF/QN
= 1.

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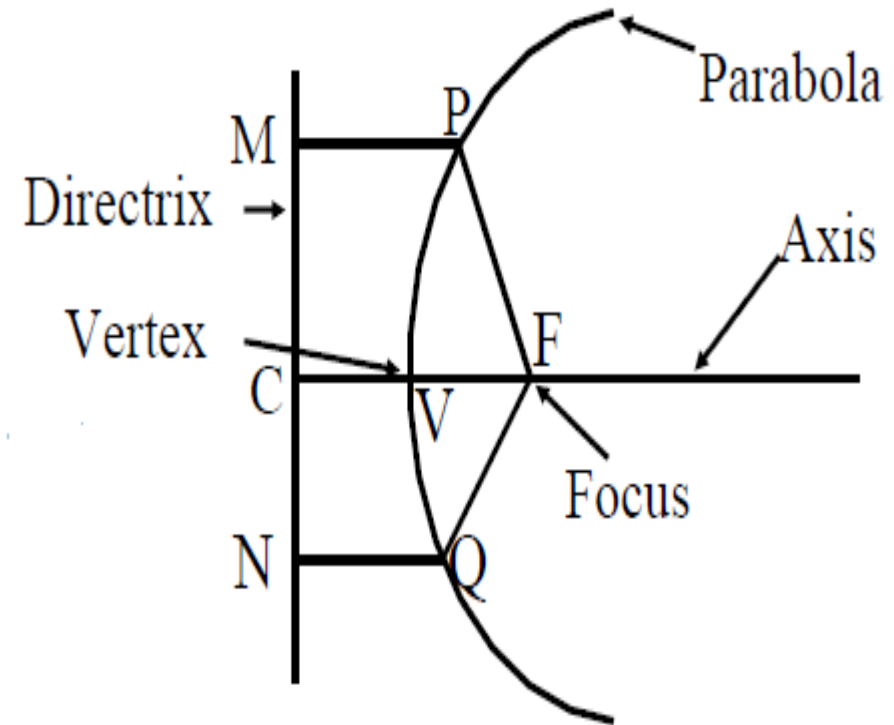
PARABOLA CONTD…

USES

- Motor car head lamp reflector.

- Sound reflector and detector.

- Shape of cooling towers.

- Path of particle thrown at any angle with

- earth, etc.

HYPERBOLA

It is the locus of a point which moves in a plane so that the ratio of its distances from a fixed point (focus) and a fixed straight line (directrix) is constant and grater than one.
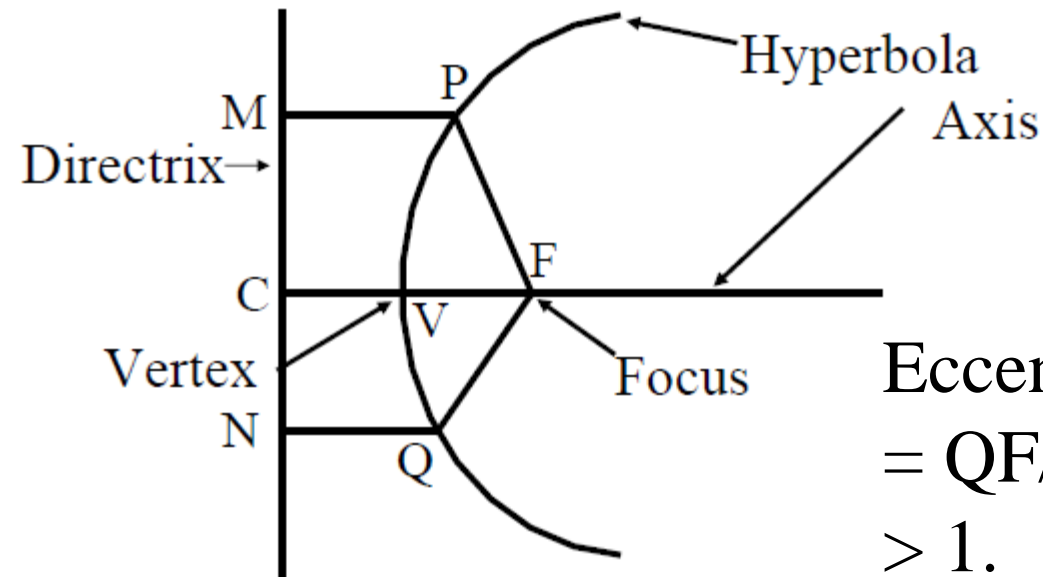
Eccentricity = PF/PM
= QF/QN
> 1.

HYPERBOLA CONTD…

Uses

- Nature of graph of Boyle's law
- Shape of overhead water tanks
- Shape of cooling towers etc.

METHODS FOR DRAWING ELLIPSE

1. Arc of Circle's Method

2. Concentric Circle Method

3. Loop Method

4. Oblong Method

5. Ellipse in Parallelogram

6. Trammel Method

7. Parallel Ellipse

8. Directrix Focus Method

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METHODS FOR DRAWING PARABOLA

1. Rectangle Method

2. Parabola in Parallelogram

3. Tangent Method

4. Directrix Focus Method

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METHODS FOR DRAWING HYPERBOLA

1. Rectangle Method

2. Oblique Method

3. Directrix Focus Method

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Thank You