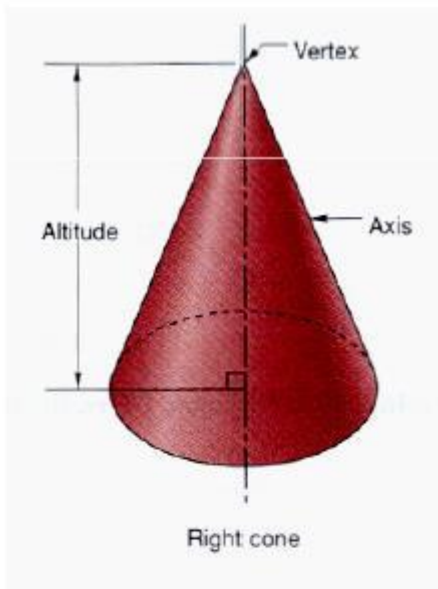
CONIC CURVES (CONICS)

- Curves formed by the intersection of a plane with a right circular cone. e.g. Parabola, hyperbola and ellipse

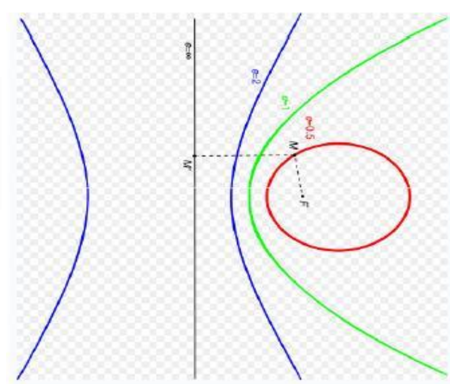
- Right circular cone is a cone that has a circular base and the axis is inclined at 900 to the base and passes through the center of the base.



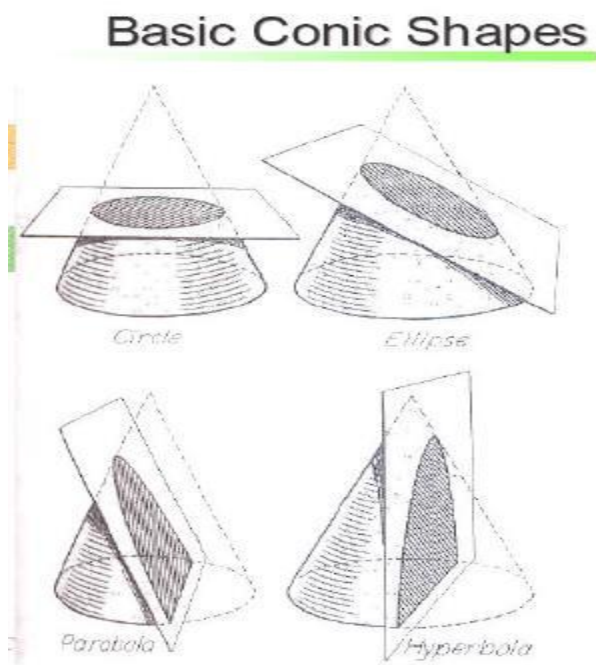
COMMON DEFINATION OF ELLIPSE, PARABOLA & HYPERBOLA

- ❖ These are the loci of points moving in a plane such that the ratio of it's distances from a *fixed point* And a *fixed line* always remains constant. The Ratio is called ECCENTRICITY.(E)

$$\text{Eccentrici ty} = \frac{\text{Distance of the point from the focus}}{\text{Distance of the point from the directric}}$$

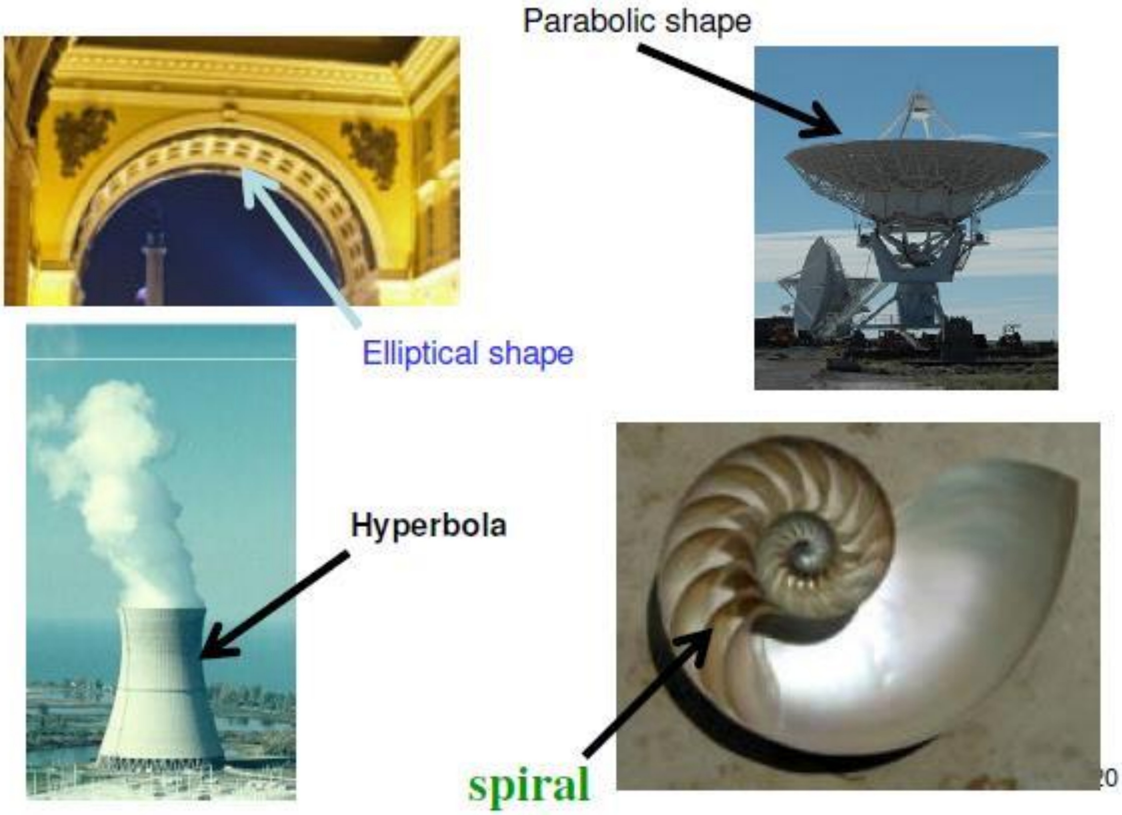


- ❖ For Ellipse E<1
- ❖ For Parabola E=1
- ❖ For Hyperbola E>1



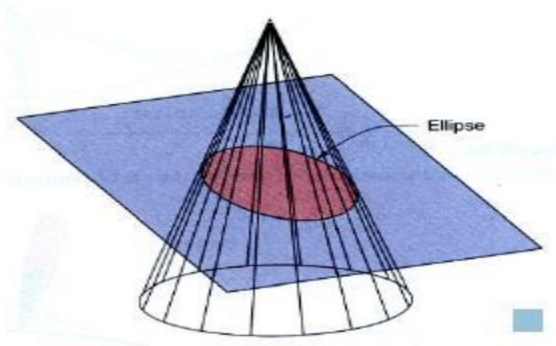
APPLICATION OF THE CONIC CURVES

Common Engineering Curves



ELLIPSE

An ellipse is obtained when a section plane, inclined to the axis, cuts all the generators of the cone.



FOCUS-DIRECTRIX OR ECCENTRICITY METHOD

Given : the distance of focus from the directrix and eccentricity

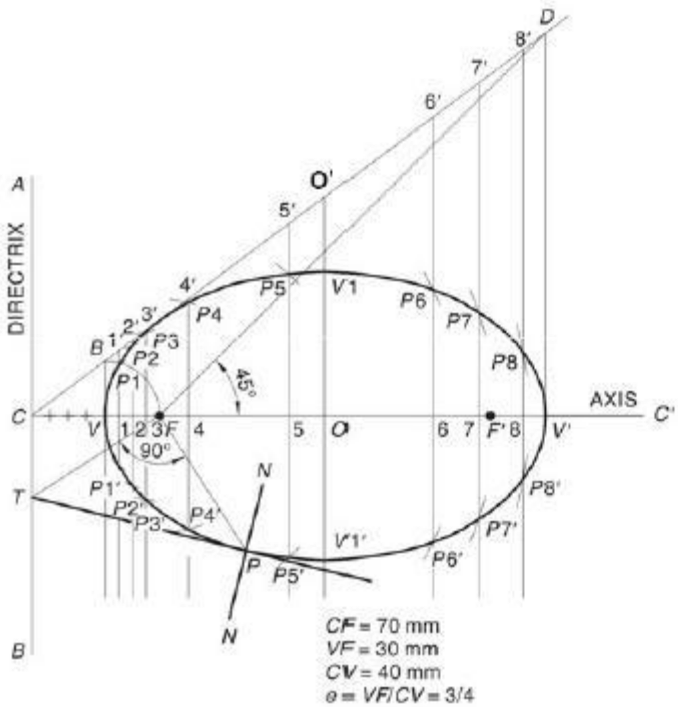
Example : Draw an ellipse if the distance of focus from the directrix is 70 mm and the eccentricity is 3/4.

- Draw the directrix AB and axis CC'
- Mark F on CC' such that CF = 70 mm.
- Divide CF into 7 equal parts and mark V at the fourth division from C. Now, E=FV/ CV = 3/4.
- At V, erect a perpendicular VB = VF. Join CB. ThroughF, draw a line at 45° to meet CB produced at D. Through D, drop a perpendicular DV' on CC'. Mark O at the midpoint of V– V'.
- With F as a centre and radius = 1–1', cut two arcs on the perpendicular through 1 to locate P1 and P1'. Similarly, with F as centre and radii = 2– 2', 3–3', etc., cut arcs on the corresponding perpendiculars to locate P2 and P2',

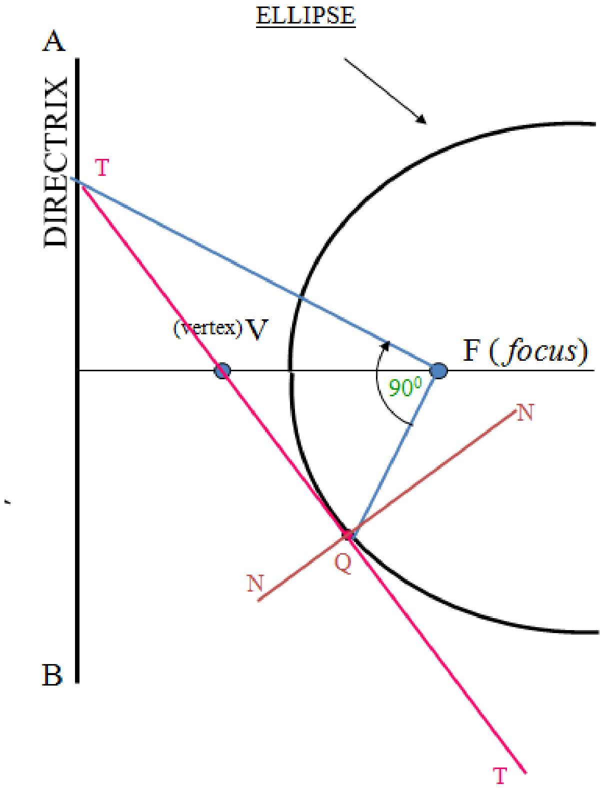
P3 and P3', etc. Also, cut similar arcs on the perpendicular through O to locate V1 and V1'.

❖ Draw a smooth closed curve passing through V, P1, P/2, P/3, …, V1, …, V', …, V1', … P/3', P/2', P1'.

❖ Mark F' on CC' such that V' F' = VF.



TO DRAW TANGENT & NORMAL TO THE CURVE AT A GIVEN POINT (Q)



1.JOIN POINT Q TO F.
2.CONSTRUCT 90^0 ANGLE WITH THIS LINE AT POINT F
3.EXTEND THE LINE TO MEET DIRECTRIX AT T
4. JOIN THIS POINT TO Q AND EXTEND. THIS IS TANGENT TO ELLIPSE FROM Q
5.TO THIS TANGENT DRAW PERPENDICULAR LINE FROM Q. IT IS NORMAL TO CURVE.

PARABOLA -DIRECTRIX-FOCUS METHOD

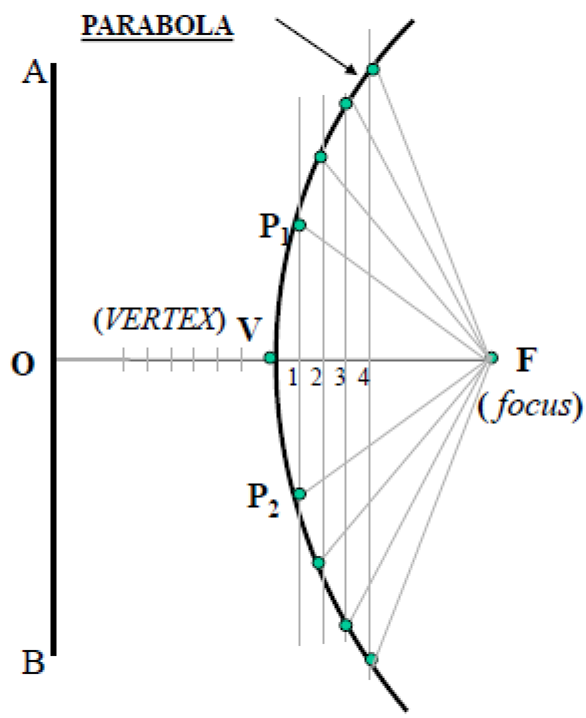
Example:
Point F is 50 mm from a vertical straight line AB. Draw locus of point P, movingin a plane such that it always remains equidistant from point F and line AB

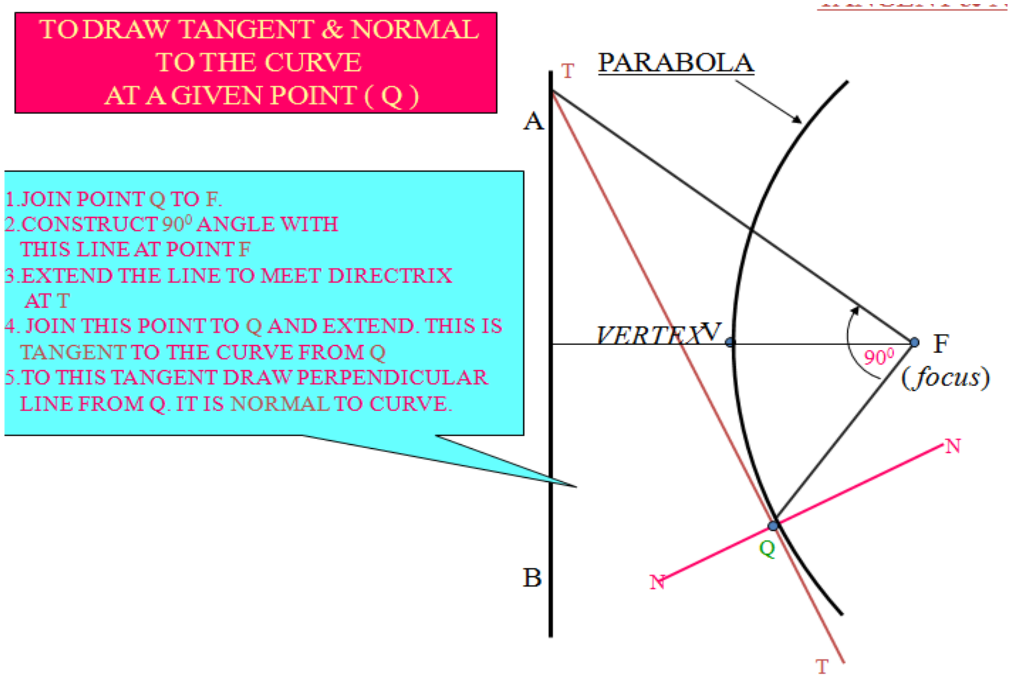
Solution steps:

- Locate center of line, perpendicular to AB from point F. This will be initial point P and also the vertex.
- Mark 5 mm distance to its right side, name those points 1,2,3,4 and from
- Those draw lines parallel to AB.
- Mark 5 mm distance to its left of P and name it 1.

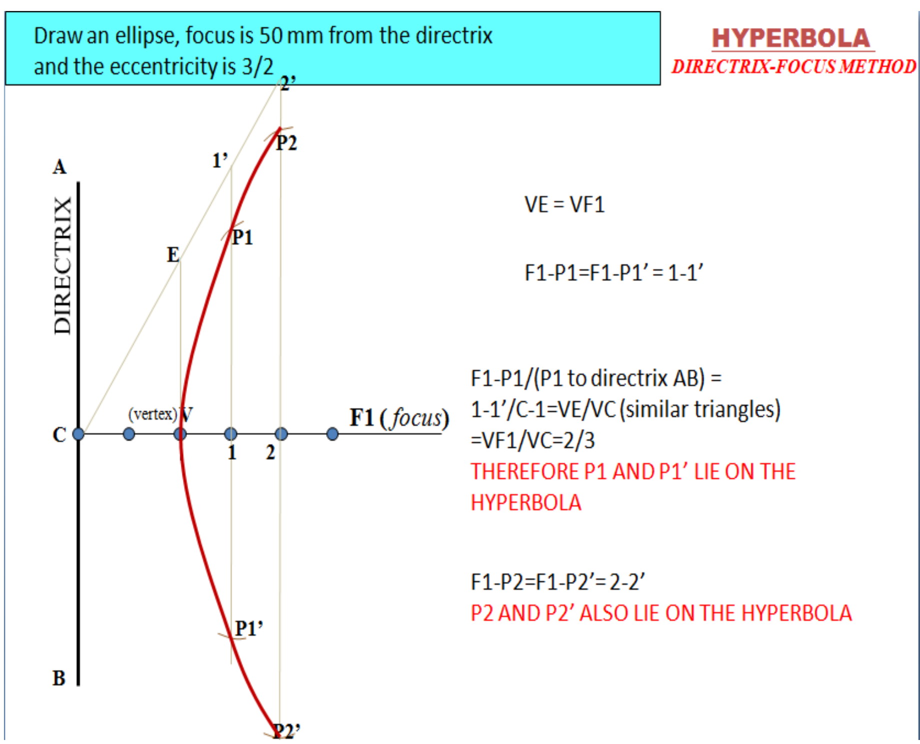
- Take O-1 distance as radius and F as center draw an arc cutting first parallel line to AB. Name upper point P1 and lower point P2. (FP1=O1)
- Similarly repeat this process by taking again 5mm to right and left and locate P3P4.
- Join all these points in smooth curve

It will be the locus of P equidistance from line AB and fixed point F.





HYPERBOLA – ECCENTRICITY METHOD



Problem 16

TO DRAW TANGENT & NORMAL TO THE CURVE FROM A GIVEN POINT (Q)

HYPERBOLA TANGENT & NORMAL

1. JOIN POINT Q TO F.
2. CONSTRUCT 90^0 ANGLE WITH THIS LINE AT POINT F
3. EXTEND THE LINE TO MEET DIRECTRIX AT T
4. JOIN THIS POINT TO Q AND EXTEND. THIS IS TANGENT TO CURVE FROM Q
5. TO THIS TANGENT DRAW PERPENDICULAR LINE FROM Q. IT IS NORMAL TO CURVE.