MIND MAP : LEARNING MADE SIMPLE CHAPTER - 11

Conic Sections

Definition

Circles, ellipses, parabolas and hyperbolas are known as conic sections because they can be obtained as intersections of plane with a double napped right circular cone.

Ellipse

- An ellipse is the set of all points in a plane, the sum of whose distances from two fixed points in the plane is constant.
- The two fixed points are called the 'foci' of the ellipse.
- The midpoint of line segment joining foci is called the 'centre' of the ellipse.
- The line segment through the foci of the ellipse is called' major axis'.
- The line segment through centre & perpendicular to major axis is called minor axis.
- The end point of the major axis are called the vertices of the ellipse.
- The equation of ellipse with 'foci' on the x-axis is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.
- Length of the latus rectum of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is $\frac{2b^2}{a}$
- The eccentricity of an ellipse is the ratio of distances from centre of ellipse to one of foci and to one of the vertices of ellipse i.e., $e = c/a$

Parabola

- A parabola is the set of all points in a plane that are equidistant from a fixed line and a fixed point in the plane. Fixed line is called 'directrix' of parabola. Fixed point F is called the 'focus'. A line through focus & perpendicular to directrix is called 'axis'. Point of intersection of parabola with axis is called 'vertex'.
- The equation of parabola with focus at (a, 0), a > 0 and directrix x= –a is $y^2=4ax$, where 4a is the length of the latus rectum

Eg: Find the equation of the parabola with vertex at (0, 0) and focus at (0, 2).

Sol: Since, vertex is at (0, 0) and focus is at (0, 2) which lies on y-axis, the y-axis is the axis of parabola. Therefore, equation of the parabola is of the form $x^2 = 4ay$. Thus we have $x^2 = 4(2)y$

i.e., $x^2 = 8y$

Hyperbola

- A hyperbola is the set of all points in a plane, the difference of whose distances from two fixed points in the plane is a constant.
- The equation of a hyperbola with foci on the x-axis is $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$
- The two fixed points are called the 'foci' of the hyperbola.
- The mid-point of the line segment joining the foci is called the 'centre' of the hyperbola.
- The line through the foci is called 'transverse axis'.
- Line through centre and perpendicular to transverse axis is called 'conjugate axis'.
- Points at which hyperbola intersects transverse axis are called 'vertices'.
- Length of the latus rectum of the hyperbola : $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is $\frac{2b^2}{a}$
- The eccentricity of a hyperbola is the ratio of the distances from the centre of the hyperbola to one of the foci and to one of the vertices of the hyperbola.

Circle

A circle is a set of all points in a plane that are equidistant from a fixed point in the plane. The fixed point is called the 'centre' of the circle and the distance from the centre to a point on the circle is called the 'radius' of the circle.

The equation of a circle with centre (h, k) and the radius r is

$$(x-h)^2+(y-k)^2=r^2$$

Eg: Find the equation of the circle with centre (–3, 2) and radius 4.

Sol: Here, h = – 3, k = 2 and r = 4

Therefore, the equation of the required circle is $(x+3)^2+(y-2)^2=16$