CBSE Class 11 Maths Notes Chapter 11: In CBSE Class 11 Maths Notes Chapter 11: Conic Sections, you'll learn about different kinds of curves made by slicing a cone in different ways.

There are four main types: circles, ovals (like squished circles), U-shapes called parabolas, and curves called hyperbolas. You'll learn how to write equations for these curves and draw them on graphs.

You'll also see how they're used in things like mapping out orbits in space, building bridges, and even making beautiful designs.

CBSE Class 11 Maths Notes Chapter 11 PDF

You can access the CBSE Class 11 Maths Notes for Chapter 11 on Conic Sections through the provided PDF link.

By studying these notes, students can deepen their knowledge of these geometric shapes and their properties.

CBSE Class 11 Maths Notes Chapter 11 PDF

CBSE Class 11 Maths Notes Chapter 11 Conic Sections

The solutions for CBSE Class 11 Maths Notes Chapter 11 on Conic Sections are available below. With detailed explanations and examples, these solutions aim to aid students in understanding the properties and characteristics of conic sections.

By referring to these notes, students can strengthen their grasp on the concepts and improve their problem-solving skills in mathematics.

Conic Sections

A conic section is the locus of a point that moves in a plane such that its distance from a fixed point, called the focus, is always in a constant ratio to its perpendicular distance from a fixed straight line, known as the directrix.

This constant ratio is termed the eccentricity, denoted by 'e'. In the context of conic sections, the directrix and focus play crucial roles. The directrix is the fixed straight line, while the focus is the fixed point. A point where a conic intersects its axis is called a vertex. The axis of a conic section is the line passing through the focus and perpendicular to the directrix, which helps define the orientation and shape of the conic section.

General Equation of a conic: Focal directrix property

The general equation of a conic section can be derived from its focal-directrix property. This property states that for any point on the conic section, the distance from the point to the focus divided by the distance from the point to the directrix is equal to the eccentricity, denoted by 'e'.

Distinguishing various conics

The nature of conic section depends upon value of eccentricity as well as the position of the focus and the directrix. So, there are two different cases:

Case 1: When the Focus Lies on the Directrix.

In this case,

$\Delta \equiv abc + 2fgh -- af2 -- bg2 -- ch2 = 0\Delta \equiv abc + 2fgh -- af2 -- bg2 -- ch2 = 0$

The general equation of a conic represents a pair of straight lines if:

$e > 1 \equiv h2 > abe > 1 \equiv \hbar 2 > ab$

, Real and distinct lines intersecting at focus

$e = 1 \equiv h2 \geqslant abe = 1 \equiv \hbar 2 \geqslant ab$

, Coincident lines

$e < 1 \equiv h2 < abe < 1 \equiv \hbar 2 < ab$

, Imaginary lines

Case 2: When the Focus Does not Lies on the Directrix.

A parabola

An ellipse

A hyperbola

A rectangular hyperbola

Parabola

The definition of a parabola is a curve formed by the locus of a point, where its distance from a fixed point (called the focus) is equal to its perpendicular distance from a fixed straight line (called the directrix).

There are four standard forms of a parabola:

1. $y^2=4ax$
2. $y^2=-4ax$
3. $x^2=4ay$
4. $x^2=-4ay$

For the form $y^2=4ax$: (i) The vertex is at (0,0). (ii) The focus is at (a,0). (iii) The axis is the line y = 0. (iv) The directrix is the line x + a = 0.

The focal distance is the distance of a point on the parabola from the focus. A chord passing through the focus is called a focal chord. A chord perpendicular to the axis of symmetry is called a double ordinate. The Latus Rectum is a double ordinate passing through the focus or a focal chord perpendicular to the axis of the parabola.

For $y^2=4ax$: The length of the Latus Rectum is $4a$, and its ends are at (a,2a) and (a,-2a).

Perpendicular distance from the focus to the directrix is half the Latus Rectum. The vertex is the midpoint of the focus and the point where the directrix intersects the axis.

Two parabolas are considered equal if they have the same Latus Rectum.

Position of a Point Relative to Parabola

Point (x_1,y_1) lies inside, on or outside the parabola $y^2=4ax$ depends upon the value of $y_1^2-4ax_1$ whether it is positive, negative or zero.

Line and Parabola:

The line $y=mx+c$ meets parabola $y^2=4ax$

at:

- Two real points if $a>mc$
- Two coincident points if $a=mc$
- Two non real points if $a<mc$

Condition of Tangency is $c=am$

Length of chord that line $y=mx+c$ intercepts on parabola $y^2=4ax$ is:

$$\sqrt{(4m^2)a(1+m^2)(a-mc)}$$

Parametric Representation:

$(at^2, 2at)$ represents the co-ordinates of a point on the parabola is $y^2 = 4ax$ i.e. the equations $x = at^2, y = 2at$ at together represents the parabola with t being the parameter.

The equation of a chord joining t_1 & t_2 is $2x - (t_1 + t_2)y + 2at_1t_2 = 0$.

Pair of Tangents

The equation to the pair of tangents which can be drawn from any point (x_1, y_1) to the parabola $y^2 = 4ax$ is given by: $SS_1 = T^2$ where: $S \equiv y^2 - 4ax, S_1 = y_1^2 - 4ax_1, T \equiv yy_1 - 2a(x + x_1)$

Director Circle

The director circle is defined as the locus of the point of intersection of perpendicular tangents to a curve. For the parabola $y^2 = 4ax$, its equation is $x + a = 0$, which coincides with the parabola's own directrix.

Chord of Contact

The equation to the chord of contact of tangents drawn from a point $P(x_1, y_1)$ is $yy_1 = 2a(x + x_1)$, denoted as $T = 0$. It's worth noting that the area of the triangle formed by the tangents from the point (x_1, y_1) and the chord of contact is given by $\frac{(y_1^2 - 4ax_1)^{3/2}}{2a}$.

For a chord of the parabola $y^2 = 4ax$ with a given middle point (x_1, y_1), the equation is $y - y_1 = \frac{2a}{y_1}(x - x_1)$, which can also be expressed as $T = S_1$.

Ellipse

Ellipse is a curved shape defined by its standard equation in terms of its principal axes along the coordinate axes:

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

where $a > b$, and $b^2 = a^2(1 - e^2)$.

The eccentricity ee of the ellipse is given by $e=1-b2a2$e=1−a2b2, where $0<e<1$0<e<1.

The ellipse has two foci SS and S'S′ located at $(ae,0)$(ae,0) and $(-ae,0)$(−ae,0) respectively. The equations of the directrices are $x=ae$x=ae and $x=-ae$x=−ae.

The major axis is the line segment $A'A$A′A, where A'A′ and AA are the vertices of the ellipse, and has a length of $2a$2a.

The minor axis is the line segment $B'B$B′B, perpendicular to the major axis, with length $2b$2b.

The major and minor axes together are called the principal axis of the ellipse.

The vertices of the ellipse are $A'\equiv(-a,0)$A′≡(−a,0) and $A\equiv(a,0)$A≡(a,0).

A focal chord is a chord that passes through a focus, while a double ordinate is a chord perpendicular to the major axis.

The latus rectum is the focal chord perpendicular to the major axis. Its length is given by $2b2a=2a(1-e2)=2e$a2b2=2a(1−e2)=2e, which is the distance from the focus to the corresponding directrix.

The center of the ellipse is the point $(0,0)$(0,0), which bisects every chord of the ellipse drawn through it.

If the equation of the ellipse is given as $x2a2+y2b2=1$a2x2+b2y2=1 without any further information, it is assumed that $a>b$a>b. If $b>a$b>a is given, then the y-axis becomes the major axis and the x-axis becomes the minor axis, and all other points and lines change accordingly.d