

NCERT Solutions Class 11 Maths

Chapter 10: Conic Sections

EXERCISE 10.2

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Quick Summary: In NCERT Solutions Class 11 Maths Chapter 10 Exercise 10.2, students learn to identify and analyze the standard forms of parabolas and their key properties. This exercise covers finding focus, directrix, axis of symmetry, and latus rectum of parabolas in different orientations, which are essential concepts for CBSE Class 11 exams and form the foundation for advanced conic sections problems.

Key Takeaways:

- Standard parabola forms: $y^2 = 4ax$ (opens right), $x^2 = 4ay$ (opens up), $y^2 = -4ax$ (opens left), $x^2 = -4ay$ (opens down)
- For parabola $y^2 = 4ax$: focus at $(a, 0)$, directrix $x = -a$, and latus rectum length $4a$
- The axis of symmetry passes through the vertex and focus, helping determine parabola orientation
- Converting given equations to standard form reveals all geometric properties needed for graphing and problem-solving

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Question 1

QUESTION

For the parabola $y^2 = 12x$, find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum.

SOLUTION

We are given the equation of a parabola and asked to find the coordinates of the focus, the axis of the parabola, the equation of the directrix, and the length of the latus rectum.

Step 1: Compare with the standard equation

The given equation is of the form $y^2 = 4ax$, which represents a parabola opening to the right with the vertex at the origin $(0, 0)$.

Step 2: Find the value of 'a'

Comparing with $y^2 = 4ax$, we have:

Dividing both sides by 4:

Step 3: Determine the coordinates of the focus

For the parabola $y^2 = 4ax$, the focus is at the point $(a, 0)$. Since $4a = 12$, the coordinates of the focus are $(3, 0)$.

Therefore, F $(3, 0)$

Step 4: Determine the axis of the parabola

The axis of the parabola is the x-axis ($y = 0$).

Therefore, axis – x-axis

Step 5: Determine the equation of the directrix

The equation of the directrix for the parabola is $x = -a$. Since $a = 3$, the equation of the directrix is $x = -3$.

Therefore, directrix $x = -3$

Step 6: Determine the length of the latus rectum

The length of the latus rectum for the parabola is $4a$. Since $a = 3$, the length of the latus rectum is 12 .

Therefore, length of latus rectum = 12

Final Answer:

F $(3, 0)$, axis – x-axis, directrix $x = -3$, length of latus rectum = 12

ANSWER

F $(3, 0)$, axis – x-axis, directrix $x = -3$, length of latus rectum = 12

Question 2

QUESTION

For the parabola $x^2 = 6y$, find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum.

SOLUTION

We are given the equation of a parabola, $x^2 = 6y$, and we need to find the coordinates of the focus, the axis of the parabola, the equation of the directrix, and the length of the latus rectum.

Step 1: Compare with the standard equation

The given equation can be compared with the standard equation of a parabola with its vertex at the origin and opening upwards, which is $x^2 = 4ay$. This form indicates that the axis of the parabola is the y-axis.

Step 2: Find the value of 'a'

Comparing $x^2 = 6y$ with $x^2 = 4ay$, we have:

Dividing both sides by 4:

Step 3: Determine the coordinates of the focus

For a parabola of the form $x^2 = 4ay$, the coordinates of the focus are $(0, a)$. Since we found $a = \frac{3}{2}$, the coordinates of the focus are:

Step 4: Determine the equation of the directrix

For a parabola of the form $x^2 = 4ay$, the equation of the directrix is $y = -a$. Since $a = \frac{3}{2}$, the equation of the directrix is:

Step 5: Determine the length of the latus rectum

The length of the latus rectum for a parabola of the form $x^2 = 4ay$ is $4a$. We already know that $a = \frac{3}{2}$, so the length of the latus rectum is 6.

Final Answer:

Focus: $(0, \frac{3}{2})$, Axis: y-axis, Directrix: $y = -\frac{3}{2}$, Length of latus rectum = 6

ANSWER

F $(0, \frac{3}{2})$, axis – y-axis, directrix $y = -\frac{3}{2}$, length of latus rectum = 6

Question 3

QUESTION

For the parabola $y^2 = -8x$, find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum.

SOLUTION

This question asks us to find the focus, axis, directrix, and latus rectum of the given parabola. This tests our understanding of the standard forms of parabolas and their properties.

Step 1: Compare with the standard equation

The given equation is $y^2 = -8x$. We compare this with the standard form of a parabola opening to the left, which is $y^2 = -4ax$.

Step 2: Find the value of 'a'

By comparing the two equations, we have $4a = 8$. Dividing both sides by 4, we get:

Step 3: Determine the coordinates of the focus

For a parabola of the form $y^2 = -4ax$, the focus is at the point $(-a, 0)$. Since $a = 2$, the focus is at $(-2, 0)$.

Therefore, the focus is $F(-2, 0)$.

Step 4: Determine the axis of the parabola

The axis of the parabola is the x-axis (i.e., $y = 0$).

Therefore, the axis of the parabola is the x-axis.

Step 5: Determine the equation of the directrix

The equation of the directrix for the parabola is $x = a$. Since $a = 2$, the equation of the directrix is $x = 2$.

Step 6: Determine the length of the latus rectum

The length of the latus rectum for any parabola of the form $y^2 = -4ax$ is $4a$. Since $a = 2$, the length of the latus rectum is $4 \times 2 = 8$.

Final Answer:

Focus: $F(-2, 0)$, axis: x-axis, directrix: $x = 2$, length of latus rectum = 8

ANSWER

$F(-2, 0)$, axis – x-axis, directrix $x = 2$, length of latus rectum = 8

Question 4

QUESTION

For the parabola $x^2 = -16y$, find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum.

SOLUTION

We are given the equation of a parabola and asked to find its focus, axis, directrix, and length of the latus rectum.

Step 1: Compare with the standard form

The given equation is of the form $x^2 = -4ay$, which represents a parabola opening downwards with the vertex at the origin $(0, 0)$.

Step 2: Find the value of 'a'

Comparing with $x^2 = -4ay$, we have:

Dividing both sides by -4 :

Step 3: Determine the coordinates of the focus

For a parabola of the form $x^2 = -4ay$, the coordinates of the focus are $(0, -a)$. Since $a = 4$, the focus is at:

F $(0, -4)$

Step 4: Find the axis of the parabola

For the parabola $x^2 = -4ay$, the axis is the y-axis ($x = 0$).

Step 5: Find the equation of the directrix

For the parabola $x^2 = -4ay$, the equation of the directrix is $y = a$. Since $a = 4$, the equation of the directrix is:

Step 6: Find the length of the latus rectum

The length of the latus rectum for any parabola of the form $x^2 = -4ay$ is $4a$. Since $a = 4$, the length of the latus rectum is:

Final Answer:

Focus: F $(0, -4)$, Axis: y-axis, Directrix: $y = 4$, Length of latus rectum = 16

ANSWER

F $(0, -4)$, axis – y-axis, directrix $y = 4$, length of latus rectum = 16

Question 5

QUESTION

For the parabola $y^2 = 10x$, find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum.

SOLUTION

We are given the equation of a parabola and need to find its focus, axis, directrix, and length of the latus rectum.

Step 1: Compare with the standard equation

The given equation is of the form $y^2 = 4ax$, which represents a parabola opening to the right with the vertex at the origin $(0, 0)$.

Step 2: Find the value of 'a'

Comparing with $y^2 = 4ax$, we have:

Dividing both sides by 4:

Step 3: Determine the coordinates of the focus

For the parabola $y^2 = 4ax$, the focus is at the point $(a, 0)$. Since $a = \frac{5}{2}$, the coordinates of the focus are $(\frac{5}{2}, 0)$.

Therefore, F

Step 4: Find the axis of the parabola

The axis of the parabola is the x-axis ($y = 0$).

Axis: x-axis

Step 5: Find the equation of the directrix

The equation of the directrix for the parabola $y^2 = 4ax$ is $x = -a$. Since $a = \frac{5}{2}$, the equation of the directrix is $x = -\frac{5}{2}$.

Directrix:

Step 6: Find the length of the latus rectum

The length of the latus rectum for the parabola $y^2 = 4ax$ is $4a$. We already know that $a = \frac{5}{2}$.

Length of latus rectum = $4a = 10$

Final Answer:

F $(\frac{5}{2}, 0)$, axis – x-axis, directrix $x = -\frac{5}{2}$, length of latus rectum = 10

ANSWER

F $(\frac{5}{2}, 0)$, axis – x-axis, directrix $x = -\frac{5}{2}$, length of latus rectum = 10

Question 6

QUESTION

For the parabola $x^2 = -9y$, find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum.

SOLUTION

We are given the equation of a parabola and asked to find its focus, axis, directrix, and length of the latus rectum.

Step 1: Compare with the standard equation

The given equation is of the form $x^2 = -4ay$, which represents a parabola opening downwards with the vertex at the origin (0,0).

Step 2: Find the value of 'a'

Comparing with $x^2 = -4ay$, we have:

Dividing both sides by -4:

Step 3: Determine the coordinates of the focus

For a parabola of the form $x^2 = -4ay$, the focus is at $(0, -a)$.

Substituting $a = \frac{9}{4}$, the focus is at $(0, -\frac{9}{4})$.

Step 4: Determine the axis of the parabola

For a parabola of the form $x^2 = -4ay$, the axis is the y-axis ($x=0$).

Step 5: Determine the equation of the directrix

For a parabola of the form $x^2 = -4ay$, the equation of the directrix is $y = a$.

Substituting $a = \frac{9}{4}$, the equation of the directrix is $y = \frac{9}{4}$.

Step 6: Determine the length of the latus rectum

The length of the latus rectum for any parabola of the form $x^2 = -4ay$ is $4a$.

Since $a = \frac{9}{4}$, the length of the latus rectum is 9 .

Final Answer:

Focus: $(0, -\frac{9}{4})$, Axis: y-axis, Directrix: $y = \frac{9}{4}$, Length of latus rectum: 9

ANSWER

F $(0, -\frac{9}{4})$, axis – y-axis, directrix $y = \frac{9}{4}$, length of latus rectum = 9

Question 7

QUESTION

Find the equation of the parabola whose focus is $(6, 0)$ and directrix is $x = -6$.

SOLUTION

We need to find the equation of a parabola given its focus and directrix.

Step 1: Recall the definition of a parabola

A parabola is the set of all points that are equidistant from the focus and the directrix. Let $P(x, y)$ be any point on the parabola. The focus is given as $F(6, 0)$, and the directrix is the line $x = -6$.

Step 2: Calculate the distance from point P to the focus F

The distance between $P(x, y)$ and $F(6, 0)$ is given by the distance formula:

Step 3: Calculate the distance from point P to the directrix

The distance from $P(x, y)$ to the line $x = -6$ is the perpendicular distance, which is the absolute difference in the x-coordinates:

Step 4: Apply the definition of the parabola

Since the point $P(x, y)$ lies on the parabola, the distance to the focus must equal the distance to the directrix:

Step 5: Square both sides to eliminate the square root

Step 6: Expand and simplify the equation

Subtract 36 from both sides:

Add 36 to both sides:

Final Answer:

The equation of the parabola is $y^2 = 24x$.

ANSWER

$$y^2 = 24x$$

Question 8

QUESTION

Find the equation of the parabola whose focus is $(0, -3)$ and directrix is $y = 3$.

SOLUTION

We need to find the equation of a parabola given its focus and directrix. The definition of a parabola is the set of all points equidistant from the focus and the directrix.

Step 1: Define a general point on the parabola

Let (x, y) be any point on the parabola.

Step 2: Calculate the distance from the point to the focus

The focus is given as $(0, -3)$. The distance between (x, y) and $(0, -3)$ is:

Step 3: Calculate the distance from the point to the directrix

The directrix is given by the equation $y = 3$. The perpendicular distance from (x, y) to the directrix is:

Step 4: Apply the definition of a parabola

For a parabola, the distance from any point on the parabola to the focus is equal to the distance from the same point to the directrix. Therefore:

Step 5: Square both sides to eliminate the square root

Step 6: Expand and simplify the equation

Final Answer: The equation of the parabola is $x^2 = -12y$.

ANSWER

$$x^2 = -12y$$

Question 9

QUESTION

Find the equation of the parabola with vertex $(0,0)$ and focus $(3,0)$.

SOLUTION

We are asked to find the equation of a parabola given its vertex and focus. This problem tests our understanding of the standard equation of a parabola and how the focus relates to the equation.

Step 1: Identify the type of parabola

The vertex is at $(0,0)$ and the focus is at $(3,0)$. Since the focus lies on the x-axis and to the right of the vertex, the parabola opens to the right. This means the equation will be of the form $y^2 = 4ax$, where 'a' is the distance from the vertex to the focus.

Step 2: Determine the value of 'a'

The distance between the vertex $(0,0)$ and the focus $(3,0)$ is given by:

Step 3: Substitute the value of 'a' into the standard equation

The standard equation for a parabola opening to the right with vertex at the origin is:

Substituting $a = 3$, we get:

Final Answer:

The equation of the parabola is $y^2 = 12x$.

Conclusion:

By recognizing the orientation of the parabola from the vertex and focus, we could apply the appropriate standard equation. The key was correctly identifying 'a' as the distance between the vertex and focus and substituting it into the equation. A common mistake is to use the wrong standard equation (e.g., $x^2 = 4ay$) if the orientation isn't carefully considered.

ANSWER

$$y^2 = 12x$$

Question 10

QUESTION

Find the equation of the parabola with vertex (0,0) and focus (-2,0).

SOLUTION

We are asked to find the equation of a parabola given its vertex and focus.

Step 1: Identify the orientation of the parabola

The vertex is at (0, 0) and the focus is at (-2, 0). Since the y-coordinates of the vertex and focus are the same, the axis of the parabola is the x-axis.

Since the x-coordinate of the focus (-2) is less than the x-coordinate of the vertex (0), the parabola opens to the left (negative x-direction).

Step 2: Determine the standard form of the equation

For a parabola with vertex at (0, 0) that opens to the left, the standard form of the equation is:

, where 'a' is the distance between the vertex and the focus.

Step 3: Calculate the value of 'a'

The distance between the vertex (0, 0) and the focus (-2, 0) is:

Step 4: Substitute the value of 'a' into the equation

Substitute into the equation :

Final Answer:

The equation of the parabola is .

ANSWER

$$y^2 = -8x$$

Question 11

QUESTION

Find the equation of the parabola with vertex $(0,0)$ passing through $(2,3)$ and whose axis is along the x-axis.

SOLUTION

This question asks us to find the equation of a parabola given its vertex, a point it passes through, and the axis of the parabola. This tests our understanding of the standard forms of parabola equations.

Step 1: Identify the standard form of the parabola

Since the vertex is at $(0,0)$ and the axis is along the x-axis, the equation of the parabola is of the form:

where 'a' is the distance from the vertex to the focus.

Step 2: Use the given point to find the value of 'a'

The parabola passes through the point $(2,3)$. This means that when $x=2$, $y=3$. Substitute these values into the equation:

Now, solve for 'a':

Step 3: Substitute the value of 'a' back into the standard equation

Now that we have the value of 'a', we can substitute it back into the equation :

Step 4: Simplify the equation

Simplify the equation to get the final form:

Multiply both sides by 2 to eliminate the fraction:

Final Answer: The equation of the parabola is

ANSWER

$$2y^2 = 9x$$

Question 12

QUESTION

Find the equation of the parabola with vertex (0,0), passing through (5,2) and symmetric with respect to the y-axis.

SOLUTION

The question asks us to find the equation of a parabola given its vertex, a point it passes through, and its axis of symmetry. This tests our understanding of the standard equation of a parabola.

Step 1: Recall the standard equation of a parabola symmetric about the y-axis with vertex at (0,0).

Since the parabola is symmetric with respect to the y-axis and has its vertex at the origin (0,0), its equation is of the form:

where a is a constant that determines the shape and direction of the parabola.

Step 2: Use the given point (5,2) to find the value of 'a'.

The parabola passes through the point (5,2). This means that when $x = 5$, $y = 2$. Substitute these values into the equation:

Step 3: Solve for 'a'.

Divide both sides by 8 to isolate a :

Step 4: Substitute the value of 'a' back into the standard equation.

Now that we have the value of a , we can substitute it back into the equation:

Step 5: Simplify the equation.

Multiply both sides of the equation by 2 to eliminate the fraction:

Final Answer: The equation of the parabola is $y = \frac{2}{25}x^2$.

ANSWER

$$2x^2 = 25y$$

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Key Formulas

Important Formulas for Exercise 10.2

Formula / Concept	Description
Definition of a Circle	A circle is the set of all points in a plane that are at a fixed distance (the radius) from a fixed point (the center).
Standard Equation of a Circle	The equation of a circle with center at (h, k) and radius r is given by: $(x - h)^2 + (y - k)^2 = r^2$
Circle with Center at Origin	If the center of the circle is at the origin $(0, 0)$, the equation simplifies to: $x^2 + y^2 = r^2$
General Equation of a Circle	The general second-degree equation in x and y , $x^2 + y^2 + 2gx + 2fy + c = 0$, represents a circle.
Center from General Equation	For the general equation $x^2 + y^2 + 2gx + 2fy + c = 0$, the center of the circle is at $(-g, -f)$.
Radius from General Equation	For the general equation $x^2 + y^2 + 2gx + 2fy + c = 0$, the radius r is calculated as: $r = \sqrt{g^2 + f^2 - c}$
Condition for a Real Circle	For the general equation to represent a real circle, the radius must be a real, positive value, which means: $g^2 + f^2 - c > 0$
Point Circle	If $g^2 + f^2 - c = 0$, the radius is zero, and the circle is a single point, known as a point circle.

Top FAQs

Q1. How many questions are in NCERT Solutions Class 11 Maths Chapter 10 Conic Sections Exercise 10.2?

Exercise 10.2 of NCERT Solutions for Class 11 Maths Chapter 10 Conic Sections contains exactly 12 questions. These questions focus on the circle and its standard equation, which is an important topic in the Coordinate Geometry unit for CBSE board exam 2025-26.

Q2. Where can I download free PDF of NCERT Solutions for Class 11 Maths Chapter 10 Conic Sections Exercise 10.2 with step by step solutions?

You can download the free PDF of NCERT Solutions for Class 11 Maths Chapter 10 Conic Sections Exercise 10.2 from the official NCERT website or various educational platforms offering step by step solutions. These PDFs are updated as per the latest CBSE syllabus 2025-26 and include detailed explanations for all 12 questions on circles.

Q3. How many marks does Chapter 10 Conic Sections carry in CBSE Class 11 Maths board exam 2025-26?

Conic Sections carries 5 marks weight in CBSE Class 11 Maths board exam 2025-26 as part of Unit III - Coordinate Geometry. This weightage is shared among different topics including circles, parabolas, ellipses, and hyperbolas, making Exercise 10.2 focusing on circles crucial for exam preparation.

Q4. Which is the most difficult question in NCERT Solutions Class 11 Maths Chapter 10 Conic Sections Exercise 10.2?

Questions 10, 11, and 12 of Exercise 10.2 in NCERT Solutions for Class 11 Maths Chapter 10 Conic Sections are considered the most challenging by students. These questions involve finding equations of circles passing through given points and satisfying multiple conditions, requiring thorough understanding of standard equations of conics and their focal properties.

Q5. What is the Standard Equation of Circle covered in NCERT Class 11 Maths Chapter 10 Conic Sections Exercise 10.2?

The Standard Equation of Circle in NCERT Class 11 Maths Chapter 10 Exercise 10.2 is $(x-h)^2 + (y-k)^2 = r^2$, where (h,k) is the center and r is the radius. Students also learn the general form $x^2 + y^2 + 2gx + 2fy + c = 0$, which is essential for solving all 12 questions in this exercise and for CBSE board exam 2025-26.

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