NCERT Solutions Class 11 Maths
Chapter 10: Conic Sections
EXERCISE 10.4

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Quick Summary: In NCERT Solutions Class 11 Maths Chapter 10 Exercise 10.4, students learn to find key properties of ellipses including foci, vertices, eccentricity, and latus rectum from their standard equations. This exercise covers essential concepts of ellipse geometry and coordinate analysis which are crucial for CBSE Class 11 board exams and competitive entrance tests.

Key Takeaways:

- Standard form of ellipse equation: (x^2)/(a^2) + (y^2)/(b^2) = 1 where a > b
- Eccentricity formula: e = (c)/(a) where c^2 = a^2 - b^2 for ellipse
- Length of latus rectum = (2b^2)/(a) and foci are located at (± c, 0)
- Step-by-step methods to identify vertices, major axis, minor axis, and focal properties from given equations

Complete Solutions

Question 1

QUESTION

For the hyperbola (x^2)/(16) - (y^2)/(9) = 1, find the coordinates of the foci and the vertices, the eccentricity, and the length of the latus rectum.

SOLUTION

We are given the equation of a hyperbola and asked to find its foci, vertices, eccentricity, and length of the latus rectum.

Step 1: Identify the standard form and parameters

The given equation is . This is in the standard form , where the hyperbola opens along the x-axis.

Comparing the given equation with the standard form, we have:

and

Therefore, and

Step 2: Find the coordinates of the vertices

For a hyperbola of the form , the vertices are located at .

So, the vertices are .

Step 3: Calculate the eccentricity

The eccentricity is given by the formula .

Substituting the values of and , we get:

Thus, .

Step 4: Find the coordinates of the foci

The foci are located at , where .

We have and , so .

Therefore, the foci are .

Step 5: Calculate the length of the latus rectum

The length of the latus rectum is given by the formula .

Substituting the values of and , we get:

Thus, the length of the latus rectum is .

Final Answer:

Foci

Vertices

Latus rectum =

ANSWER

Foci (± 5, 0)

Vertices (± 4, 0)

e = (5)/(4)

Latus rectum = (9)/(2)

Question 2

QUESTION

For the hyperbola (y^2)/(9) - (x^2)/(27) = 1, find the coordinates of the foci and the vertices, the eccentricity, and the length of the latus rectum.

SOLUTION

We are given the equation of a hyperbola and asked to find its foci, vertices, eccentricity, and length of the latus rectum.

Step 1: Identify the form of the hyperbola equation

The given equation is . This is of the form , which represents a hyperbola with its transverse axis along the y-axis.

Step 2: Determine the values of and

Comparing the given equation with the standard form, we have and . Therefore, and .

Step 3: Calculate the coordinates of the vertices

Since the transverse axis is along the y-axis, the vertices are at . Thus, the vertices are .

Step 4: Calculate to find the foci

For a hyperbola, . So, , which means .

Step 5: Calculate the coordinates of the foci

The foci are at , so the foci are .

Step 6: Calculate the eccentricity

The eccentricity is given by .

Step 7: Calculate the length of the latus rectum

The length of the latus rectum is given by .

Final Answer:

Foci

Vertices

Latus rectum = 18

ANSWER

Foci (0, ± 6)

Vertices (0, ± 3)

$e = 2$

Latus rectum = 18

Question 3

QUESTION

For the hyperbola 9y^2 - 4x^2 = 36, find the coordinates of the foci and the vertices, the eccentricity, and the length of the latus rectum.

SOLUTION

We are given the equation of a hyperbola and asked to find its foci, vertices, eccentricity, and length of the latus rectum.

Step 1: Rewrite the equation in standard form

Divide both sides of the equation by 36:

Simplify:

This is the standard form of a hyperbola with a vertical transverse axis, where and .

Step 2: Find the values of a and b

Since , we have .

Since , we have .

Step 3: Find the coordinates of the vertices

For a hyperbola with a vertical transverse axis, the vertices are at . Therefore, the vertices are .

Step 4: Find the value of c

We know that . Substituting the values of and , we get:

Therefore, .

Step 5: Find the coordinates of the foci

For a hyperbola with a vertical transverse axis, the foci are at . Therefore, the foci are .

Step 6: Find the eccentricity

The eccentricity is given by . Substituting the values of and , we get:

Step 7: Find the length of the latus rectum

The length of the latus rectum is given by . Substituting the values of and , we get:

Final Answer:

Foci

Vertices

Latus rectum = 9

ANSWER

Foci (0, ± √13)

Vertices (0, ± 2)

e = √132

Latus rectum = 9

Question 4

QUESTION

For the hyperbola 16x^2 - 9y^2 = 576, find the coordinates of the foci and the vertices, the eccentricity, and the length of the latus rectum.

SOLUTION

We are given the equation of a hyperbola and asked to find its foci, vertices, eccentricity, and length of the latus rectum.

Step 1: Rewrite the equation in standard form

The given equation is . To get the standard form, we divide both sides by 576:

Simplifying, we get:

This is the standard form of a hyperbola with a horizontal transverse axis: , where and .

Step 2: Find the values of a and b

From , we have .

From , we have .

Step 3: Find the coordinates of the vertices

For a hyperbola with a horizontal transverse axis, the vertices are at . Therefore, the vertices are .

Step 4: Find the value of c (distance from center to foci)

We use the relationship . Substituting the values of and , we get:

Therefore, .

Step 5: Find the coordinates of the foci

For a hyperbola with a horizontal transverse axis, the foci are at . Therefore, the foci are .

Step 6: Find the eccentricity (e)

The eccentricity is given by . Substituting the values of and , we get:

Step 7: Find the length of the latus rectum

The length of the latus rectum is given by . Substituting the values of and , we get:

Final Answer:

Foci

Vertices

Latus rectum =

ANSWER

Foci (± 10, 0)

Vertices (± 6, 0)

e = (5)/(3)

Latus rectum = (64)/(3)

Question 5

QUESTION

For the hyperbola 5y^2 - 9x^2 = 36, find the coordinates of the foci and the vertices, the eccentricity, and the length of the latus rectum.

SOLUTION

We are given the equation of a hyperbola and need to find its foci, vertices, eccentricity, and the length of the latus rectum.

Step 1: Rewrite the equation in standard form

Divide both sides of the equation by 36 to get the standard form:

This is a hyperbola with a vertical transverse axis. We can identify and .

Step 2: Find the values of a and b

Step 3: Calculate c (distance from center to foci)

For a hyperbola, . So:

Step 4: Determine the coordinates of the foci and vertices

Since the transverse axis is vertical, the foci are at and the vertices are at .

Foci:

Vertices:

Step 5: Calculate the eccentricity (e)

The eccentricity is given by .

Step 6: Calculate the length of the latus rectum

The length of the latus rectum is given by .

Latus rectum =

Final Answers:

Foci

Vertices

Latus rectum =

ANSWER

Foci \left(0, ± 2√14√5\right)

Vertices \left(0, ± (6)/(√5)\right)

e = √143

Latus rectum = 4√53

Question 6

QUESTION

For the hyperbola 49y^2 - 16x^2 = 784, find the coordinates of the foci and the vertices, the eccentricity, and the length of the latus rectum.

SOLUTION

We are given the equation of a hyperbola and asked to find its foci, vertices, eccentricity, and length of the latus rectum.

Step 1: Rewrite the equation in standard form

The given equation is . Divide both sides by 784 to get the standard form:

Simplify the fractions:

This is a hyperbola with the equation of the form , where and . Thus, and .

Step 2: Find the coordinates of the vertices

Since the equation is of the form , the vertices are on the y-axis at . Therefore, the vertices are .

Step 3: Calculate to find the foci

For a hyperbola, . In this case, , so .

The foci are located at , which are .

Step 4: Calculate the eccentricity

The eccentricity is given by . Therefore, .

Step 5: Calculate the length of the latus rectum

The length of the latus rectum is given by . In this case, it is .

Final Answer:

Foci

Vertices

Latus rectum =

ANSWER

Foci (0, ± √65)

Vertices (0, ± 4)

e = √654

Latus rectum = (49)/(2)

Question 7

QUESTION

Find the equation of the hyperbola with vertices (± 2, 0) and foci (± 3, 0).

SOLUTION

We are asked to find the equation of a hyperbola given its vertices and foci.

Step 1: Identify the type of hyperbola

The vertices are and the foci are . Since both lie on the x-axis, this is a hyperbola with a horizontal transverse axis. The standard form of its equation is:

Step 2: Determine the value of 'a'

The vertices of a hyperbola with a horizontal transverse axis are located at . We are given that the vertices are . Therefore, .

So, .

Step 3: Determine the value of 'c'

The foci of a hyperbola with a horizontal transverse axis are located at . We are given that the foci are . Therefore, .

Step 4: Find the value of 'b'

For a hyperbola, the relationship between , , and is given by:

We know and , so we can solve for :

Step 5: Write the equation of the hyperbola

Now that we have and , we can substitute these values into the standard equation of the hyperbola:

Final Answer: The equation of the hyperbola is .

ANSWER

(x^2)/(4) - (y^2)/(5) = 1

Question 8

QUESTION

Find the equation of the hyperbola with vertices (0, ± 5) and foci (0, ± 8).

SOLUTION

We are asked to find the equation of a hyperbola given its vertices and foci. This problem tests our understanding of the standard form of a hyperbola and the relationship between its parameters.

Step 1: Identify the orientation of the hyperbola

The vertices are at and the foci are at . Since both lie on the y-axis, the hyperbola has a vertical transverse axis. This means its standard equation is of the form:

Step 2: Determine the value of 'a'

For a hyperbola with a vertical transverse axis, the vertices are at . We are given the vertices as . Therefore:

So,

Step 3: Determine the value of 'c'

The foci are at . We are given the foci as . Therefore:

So,

Step 4: Find the value of 'b'

We know the relationship between , , and for a hyperbola is:

Substituting the values we have:

Solving for :

Step 5: Write the equation of the hyperbola

Now we have and . Substituting these values into the standard equation:

We get:

Final Answer:

ANSWER

(y^2)/(25) - (x^2)/(39) = 1

Question 9

QUESTION

Find the equation of the hyperbola with vertices (0, ± 3) and foci (0, ± 5).

SOLUTION

We are asked to find the equation of a hyperbola given its vertices and foci. This problem tests our understanding of the standard form of a hyperbola and the relationship between its parameters.

Step 1: Identify the orientation of the hyperbola

The vertices are given as and the foci as . Since both the vertices and foci lie on the y-axis, the hyperbola has a vertical transverse axis.

Step 2: Recall the standard form of a hyperbola with a vertical transverse axis

The standard form of the equation of a hyperbola with a vertical transverse axis is: where is the distance from the center to each vertex, and is related to the distance from the center to each focus, , by the equation .

Step 3: Determine the value of

The vertices are at , so the distance from the center (which is at the origin (0,0) in this case) to each vertex is . Therefore, .

Step 4: Determine the value of

The foci are at , so the distance from the center to each focus is . Therefore, .

Step 5: Calculate the value of

We know that . Substituting the values we found for and , we get:

Step 6: Write the equation of the hyperbola

Now that we have the values of and , we can write the equation of the hyperbola:

Final Answer:

ANSWER

(y^2)/(9) - (x^2)/(16) = 1

Question 10

QUESTION

Find the equation of the hyperbola whose foci are (± 5, 0) and whose transverse axis is of length 8.

SOLUTION

We are asked to find the equation of a hyperbola given its foci and the length of its transverse axis. This problem tests our understanding of the standard equation of a hyperbola and the relationship between its parameters.

Step 1: Identify the given information

The foci are , which means , where is the distance from the center to each focus. Since the foci are on the x-axis, the hyperbola has a horizontal transverse axis.

The length of the transverse axis is 8, which means , where is the distance from the center to each vertex.

Step 2: Find the value of

Since , we have .

Step 3: Find the value of

We know the relationship between , , and for a hyperbola is .

Substituting the values of and , we get:

Therefore, .

Step 4: Write the equation of the hyperbola

Since the hyperbola has a horizontal transverse axis and its center is at the origin, its equation is of the form:

Substituting the values of and , we get:

Final Answer: The equation of the hyperbola is .

ANSWER

(x^2)/(16) - (y^2)/(9) = 1

Question 11

QUESTION

Find the equation of the hyperbola whose foci are (0, ± 13) and whose conjugate axis is of length 24.

SOLUTION

We are asked to find the equation of a hyperbola given its foci and the length of its conjugate axis. This problem tests our understanding of the standard form of a hyperbola and the relationship between its parameters.

Step 1: Identify the type of hyperbola

The foci are given as . Since the foci lie on the y-axis, the hyperbola has a vertical transverse axis. Its standard equation is of the form:

Step 2: Determine the value of 'c'

For a hyperbola with a vertical transverse axis, the foci are at . Therefore, .

Step 3: Determine the value of 'b'

The length of the conjugate axis is given as 24. The length of the conjugate axis is . Thus, , which implies .

Step 4: Find the value of 'a'

We know the relationship between , , and for a hyperbola is . Plugging in the values we have:

Step 5: Write the equation of the hyperbola

Now that we have and , we can write the equation of the hyperbola:

Final Answer: The equation of the hyperbola is .

ANSWER

(y^2)/(25) - (x^2)/(144) = 1

Question 12

QUESTION

Find the equation of the hyperbola whose foci are (± 3√5, 0) and whose latus rectum is of length 8.

SOLUTION

We are asked to find the equation of a hyperbola given its foci and the length of its latus rectum. This question tests our understanding of the standard equation of a hyperbola, its foci, and latus rectum.

Step 1: Identify the given information

The foci are , which means (where is the distance from the center to each focus).

The length of the latus rectum is 8. For a hyperbola, the length of the latus rectum is given by , where and are the semi-major and semi-minor axes, respectively.

So, , which simplifies to .

Step 2: Use the relationship between a, b, and c

For a hyperbola, we have the relationship .

Substituting the given value of , we get , which simplifies to .

Step 3: Solve for a and b

We have two equations:

Substitute the first equation into the second:

Factor the quadratic equation:

So, or . Since must be positive, we have .

Now, find :

Step 4: Write the equation of the hyperbola

Since the foci are on the x-axis, the equation of the hyperbola is of the form .

Substituting the values of and , we get:

Final Answer:

ANSWER

(x^2)/(25) - (y^2)/(20) = 1

Question 13

QUESTION

Find the equation of the hyperbola whose foci are (± 4, 0) and whose latus rectum is of length 12.

SOLUTION

We are asked to find the equation of a hyperbola given its foci and the length of its latus rectum. This problem tests our understanding of the standard equation of a hyperbola and related parameters like , , , and the latus rectum.

Step 1: Identify the type of hyperbola

Since the foci are on the x-axis, the equation of the hyperbola is of the form: where is the distance from the center to a vertex, and is related to the distance from the center to a co-vertex.

Step 2: Use the given foci to find

The foci are given as . In a hyperbola, the foci are located at , where . Therefore, .

Step 3: Use the latus rectum to relate and

The length of the latus rectum is given as 12. The formula for the latus rectum of a hyperbola is . So, we have:

Step 4: Use the relationship between , , and

We know that and , so . Substitute into this equation:

Step 5: Solve for

Factor the quadratic equation: Since must be positive, we have .

Step 6: Solve for

Using , we have .

Step 7: Write the equation of the hyperbola

Substitute the values of and into the standard equation:

Final Answer:

ANSWER

(x^2)/(4) - (y^2)/(12) = 1

Question 14

QUESTION

Find the equation of the hyperbola whose vertices are (± 7, 0) and whose eccentricity is e = (4)/(3).

SOLUTION

We are asked to find the equation of a hyperbola given its vertices and eccentricity.

Step 1: Identify the type of hyperbola

The vertices are given as . This means the vertices lie on the x-axis. Therefore, the equation of the hyperbola is of the form: where is the distance from the center to each vertex.

Step 2: Determine the value of

Since the vertices are , the value of is 7. Thus, and .

Step 3: Use the eccentricity to find the relationship between , , and

The eccentricity of a hyperbola is given by the formula: where is the distance from the center to each focus. We are given . Therefore, Solving for , we get: We also know that for a hyperbola, . Therefore,

Step 4: Write the equation of the hyperbola

Now we have and . Substituting these values into the equation of the hyperbola, we get:

Final Answer: The equation of the hyperbola is .

ANSWER

(x^2)/(49) - (9y^2)/(343) = 1

Question 15

QUESTION

Find the equation of the hyperbola whose foci are (0, ± √10) and which passes through the point (2, 3).

SOLUTION

We are asked to find the equation of a hyperbola given its foci and a point it passes through. This problem tests our understanding of the standard equation of a hyperbola and its properties.

Step 1: Identify the type of hyperbola

The foci are given as . Since the foci lie on the y-axis, this is a hyperbola with a vertical transverse axis. The standard equation for such a hyperbola is:

Step 2: Use the foci to find a relationship between a and b

For a hyperbola with a vertical transverse axis, the foci are at , where . We are given that , so:

Step 3: Use the given point to form another equation

The hyperbola passes through the point . Substituting these coordinates into the hyperbola's equation:

Step 4: Solve the system of equations

We have two equations:

(1)

(2)

From (1), we can write . Substitute this into (2):

Multiplying through by to clear the denominators:

Let . Then . Factoring, we get . So or .

If , then , which is impossible since must be positive.

If , then .

Step 5: Write the equation of the hyperbola

With and , the equation of the hyperbola is:

Final Answer:

ANSWER

(y^2)/(5) - (x^2)/(5) = 1

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📐 Key Formulas

Important Formulas for Ellipse

Formula / Concept	Description
Definition of Ellipse	An ellipse is the set of all points in a plane, the sum of whose distances from two fixed points (the foci) in the plane is a constant.
Standard Equation (Major Axis along X-axis)	$(x^2)/(a^2) + (y^2)/(b^2) = 1$ where $a > b$.
Standard Equation (Major Axis along Y-axis)	$(x^2)/(b^2) + (y^2)/(a^2) = 1$ where $a > b$.
Coordinates of the Centre	(0, 0)
Coordinates of Vertices	For $(x^2)/(a^2) + (y^2)/(b^2) = 1$: $(\pm a, 0)$ For $(x^2)/(b^2) + (y^2)/(a^2) = 1$: $(0, \pm a)$
Coordinates of Foci	For $(x^2)/(a^2) + (y^2)/(b^2) = 1$: $(\pm c, 0)$ or $(\pm ae, 0)$ For $(x^2)/(b^2) + (y^2)/(a^2) = 1$: $(0, \pm c)$ or $(0, \pm ae)$
Length of Major Axis	2a
Length of Minor Axis	2b
Relationship between a, b, and c	$c^2 = a^2 - b^2$ where 'c' is the distance from the center to a focus.
Eccentricity (e)	A measure of how much the ellipse deviates from being a circle. It is the ratio of the distance from the center to a focus (c) to the distance from the center to a vertex (a). $e = (c)/(a) = \sqrt{(1 - b^2)/(a^2)}$ The value of eccentricity for an ellipse is always 0 \le e < 1.

Formula / Concept	Description
Latus Rectum	The latus rectum of an ellipse is a chord passing through a focus which is perpendicular to the major axis.
Length of the Latus Rectum	(2b^2)/(a)

❓ Top FAQs

Q1. How many questions are in NCERT Solutions Class 11 Maths Chapter 10 Conic Sections Exercise 10.4 for CBSE board exam 2025-26?

Exercise 10.4 of NCERT Solutions for Class 11 Maths Chapter 10 Conic Sections contains exactly 15 questions focused on Ellipse and its properties. These questions cover standard equations of ellipse, focal properties, and coordinate geometry concepts essential for CBSE board exam 2025-26. All 15 questions with step by step solutions are available for free PDF download.

Q2. Where can I download free PDF of NCERT Solutions for Class 11 Maths Chapter 10 Conic Sections Exercise 10.4 with step by step solutions?

Free PDF download of NCERT Solutions for Class 11 Maths Chapter 10 Conic Sections Exercise 10.4 is available on various educational platforms including the official NCERT website and trusted educational portals. These PDFs contain detailed step by step solutions for all 15 questions on Ellipse, prepared according to the latest CBSE syllabus 2025-26. The solutions are completely free and can be accessed for offline study preparation.

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

Chapter 10 Conic Sections carries approximately 5 marks weight in CBSE Class 11 Maths board exam 2025-26 as part of Unit III - Coordinate Geometry. This weightage is shared within the coordinate geometry unit, making Exercise 10.4 on Ellipse an important topic for exam preparation. Students should focus on standard equations of conics and focal properties to score full marks.

Q4. Which is the most difficult question in NCERT Solutions Class 11 Maths Chapter 10 Conic Sections Exercise 10.4 for CBSE 2025-26?

Questions 13, 14, and 15 in Exercise 10.4 of NCERT Solutions Class 11 Maths Chapter 10 Conic Sections are considered most difficult as they involve complex applications of ellipse properties and coordinate geometry. These questions require thorough understanding of standard equations of conics, focal chord properties, and latus rectum concepts. Step by step solutions for these challenging problems are essential for CBSE board exam 2025-26 preparation.

Q5. What is Standard Equations of Conics covered in NCERT Solutions for Class 11 Maths Chapter 10 Exercise 10.4 Ellipse?

Standard Equations of Conics in Exercise 10.4 specifically covers ellipse equations: $x^2/a^2 + y^2/b^2 = 1$ (horizontal major axis) and $x^2/b^2 + y^2/a^2 = 1$ (vertical major axis) where a > b. The chapter explains focal properties, eccentricity ($e = \sqrt{(1-b^2/a^2)}$), foci positions, vertices, and latus rectum for CBSE Class 11 Maths 2025-26. These standard forms are crucial for solving all 15 questions in the exercise with step by step solutions.

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