

NCERT Solutions Class 11 Maths

Chapter 10: Conic Sections

EXERCISE 10.1

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Quick Summary: In NCERT Solutions Class 11 Maths Chapter 10 Exercise 10.1, students learn the fundamental concepts of conic sections, focusing on circles and their standard equations. This exercise covers the derivation and application of circle equations in various forms, which are essential building blocks for advanced coordinate geometry problems in CBSE Class 11 and competitive exams.

Key Takeaways:

- Standard equation of a circle with center (h, k) and radius r is $(x-h)^2 + (y-k)^2 = r^2$
- General form of circle equation $x^2 + y^2 + 2gx + 2fy + c = 0$ where center is $(-g, -f)$ and radius is $\sqrt{g^2 + f^2 - c}$
- Understanding how different sections of a cone (circle, ellipse, parabola, hyperbola) are formed based on the angle of intersection
- Converting between standard form and general form of circle equations is crucial for solving coordinate geometry problems efficiently

Complete Solutions

Question 1

QUESTION

Find the equation of the circle with centre (0,2) and radius 2.

SOLUTION

We are asked to find the equation of a circle given its center and radius. This question tests our understanding of the standard equation of a circle.

Step 1: Recall the standard equation of a circle

The standard equation of a circle with center and radius is given by:

Step 2: Identify the given values

We are given the center and the radius .

Step 3: Substitute the values into the standard equation

Substituting , , and into the standard equation, we get:

Step 4: Simplify the equation

Simplifying the equation, we have:

Expanding the term, we get:

Step 5: Further simplification

Combining like terms and rearranging, we get:

Subtracting 4 from both sides, we obtain:

Final Answer: The equation of the circle is .

ANSWER

$$x^2 + y^2 - 4y = 0$$

Question 2

QUESTION

Find the equation of the circle with centre $(-2,3)$ and radius 4.

SOLUTION

We need to find the equation of a circle given its center and radius. This question tests our understanding of the standard equation of a circle.

Step 1: Recall the standard equation of a circle

The standard equation of a circle with center and radius is given by:

Step 2: Identify the given values

We are given the center and the radius .

Step 3: Substitute the values into the standard equation

Substituting , , and into the standard equation, we get:

Simplifying:

Step 4: Expand the equation

Expanding the squared terms, we have:

Step 5: Simplify and rearrange the equation

Combining like terms and rearranging, we get:

Subtracting 16 from both sides:

Final Answer:

The equation of the circle is .

ANSWER

$$x^2 + y^2 + 4x - 6y - 3 = 0$$

Question 3

QUESTION

Find the equation of the circle with centre $\left(\frac{1}{2}, \frac{1}{4}\right)$ and radius $\frac{1}{12}$.

SOLUTION

We need to find the equation of a circle given its center and radius. We will use the standard form of the circle equation.

Step 1: Recall the standard equation of a circle

The standard equation of a circle with center and radius is:

Step 2: Substitute the given values

We are given the center $\left(\frac{1}{2}, \frac{1}{4}\right)$, so $h = \frac{1}{2}$ and $k = \frac{1}{4}$. The radius is $r = \frac{1}{12}$. Substituting these values into the standard equation, we get:

Step 3: Expand the equation

Expanding the squares, we have:

Step 4: Simplify and rearrange the equation

Rearranging the terms, we get:

Now, we find a common denominator for the constants, which is 144. So we have:

Step 5: Multiply by 36 to eliminate fractions

Multiplying the entire equation by 36, we get:

Final Answer: The equation of the circle is $36x^2 + 36y^2 - 36x - 18y + 11 = 0$.

ANSWER

$$36x^2 + 36y^2 - 36x - 18y + 11 = 0$$

Question 4

QUESTION

Find the equation of the circle with centre (1,1) and radius $\sqrt{2}$.

SOLUTION

We need to find the equation of a circle given its center and radius. This involves using the standard form equation of a circle.

Step 1: Recall the standard equation of a circle

The standard equation of a circle with center and radius is:

Step 2: Identify the given values

We are given the center and the radius .

Step 3: Substitute the values into the standard equation

Substituting , , and into the standard equation, we get:

Step 4: Simplify the equation

Expanding the squares and simplifying, we have:

Step 5: Rearrange the terms

Combining like terms and rearranging the equation, we get:

Final Answer: The equation of the circle is .

This method works because the standard equation of a circle is derived directly from the Pythagorean theorem, relating the coordinates of any point on the circle to the center and radius. A common mistake is incorrectly expanding the squared terms or making sign errors when rearranging the equation.

ANSWER

$$x^2 + y^2 - 2x - 2y = 0$$

Question 5

QUESTION

Find the equation of the circle with centre $(-a,-b)$ and radius $\sqrt{a^2 + b^2}$.

SOLUTION

We are asked to find the equation of a circle given its center and radius. This tests our understanding of the standard equation of a circle.

Step 1: Recall the standard equation of a circle

The standard equation of a circle with center and radius is given by:

Step 2: Substitute the given values

We are given the center as $(-a,-b)$ and the radius as $\sqrt{a^2 + b^2}$. Substituting these values into the standard equation, we get:

Simplifying:

Step 3: Expand the equation

Expanding the squares, we have:

Step 4: Simplify and rearrange the terms

Now, we rearrange the terms to get the general form of the circle's equation:

The terms cancel out:

Final Answer: The equation of the circle is

ANSWER

$$x^2 + y^2 + 2ax + 2by + 2b^2 = 0$$

Question 6

QUESTION

Find the centre and radius of the circle $(x+5)^2 + (y-3)^2 = 36$.

SOLUTION

This question asks us to identify the center and radius of a circle given its equation in standard form. The standard form equation directly reveals these properties.

Step 1: Recall the standard equation of a circle

The standard equation of a circle with center and radius is given by:

Step 2: Compare the given equation with the standard equation

We are given the equation: . We need to rewrite this in the standard form to easily identify the center and radius.

Step 3: Rewrite the given equation to match the standard form

We can rewrite as . So, the equation becomes:

Also, we can express 36 as , so the equation is now:

Step 4: Identify the center and radius

By comparing this with the standard equation , we can see that:

, , and

Therefore, the center of the circle is and the radius is 6.

Final Answer: The center of the circle is $c(-5, 3)$ and the radius is $r = 6$.

ANSWER

$c(-5, 3), r = 6$

Question 7

QUESTION

Find the centre and radius of the circle $x^2 + y^2 - 4x - 8y - 45 = 0$.

SOLUTION

This question asks us to find the center and radius of a circle given its equation in general form. We will convert the given equation into standard form by completing the square.

Step 1: Rewrite the equation

We start with the given equation:

Rearrange the terms to group the terms and terms together:

Step 2: Complete the square for the x terms

To complete the square for x , we need to add and subtract 4 .

This gives us $x^2 - 4x + 4 - 4 - 8y - 45 = 0$.

Step 3: Complete the square for the y terms

To complete the square for y , we need to add and subtract 16 .

This gives us $x^2 - 4x + 4 - 4 - 8y + 16 - 16 - 45 = 0$.

Step 4: Substitute back into the equation

Substitute the completed squares back into the equation:

Step 5: Simplify to standard form

Combine the constants:

This is the standard form of the circle's equation: $(x - 2)^2 + (y - 4)^2 = 65$, where $(2, 4)$ is the center and $\sqrt{65}$ is the radius.

Step 6: Identify the center and radius

Comparing with the standard form, we have $h = 2$, $k = 4$, and $r = \sqrt{65}$.

Therefore, the center is $(2, 4)$ and the radius is $\sqrt{65}$.

Final Answer: The center of the circle is $(2, 4)$ and the radius is $\sqrt{65}$.

ANSWER

$$c(2, 4), r = \sqrt{65}$$

Question 8

QUESTION

Find the centre and radius of the circle $x^2 + y^2 - 8x + 10y - 12 = 0$.

SOLUTION

We are asked to find the center and radius of the circle given by the equation .

Step 1: Rewrite the equation in standard form

The standard form of the equation of a circle is , where is the center and is the radius.

To rewrite the given equation, we complete the square for both and terms.

Step 2: Group x and y terms

Step 3: Complete the square for x

To complete the square for , we need to add and subtract .

This gives us .

Step 4: Complete the square for y

To complete the square for , we need to add and subtract .

This gives us .

Step 5: Substitute back into the equation

Step 6: Simplify and rearrange

Step 7: Identify the center and radius

Comparing this with the standard form , we have:

, , and

Therefore, the center is and the radius is .

Final Answer: The center of the circle is $c(4, -5)$ and the radius is .

ANSWER

$c(4, -5), r = \sqrt{53}$

Question 9

QUESTION

Find the centre and radius of the circle $2x^2 + 2y^2 - x = 0$.

SOLUTION

We are asked to find the center and radius of the circle given by the equation .

Step 1: Divide the equation by 2 to get the standard form coefficient for and

Divide the entire equation by 2:

Step 2: Complete the square for the x terms

To complete the square for , we need to add and subtract .

So, we rewrite the equation as:

Step 3: Compare with the standard equation of a circle

The standard equation of a circle with center and radius is:

Comparing our equation with the standard form, we can identify the center and radius.

Step 4: Identify the center and radius

The center of the circle is because and .

The radius squared is , so the radius is .

Final Answer:

The center of the circle is c and the radius is $r =$.

ANSWER

$c\left(\frac{1}{4}, 0\right), r = \frac{1}{4}$

Question 10

QUESTION

Find the equation of the circle passing through the points (4,1) and (6,5) and whose centre lies on the line $4x + y = 16$.

SOLUTION

We need to find the equation of a circle that passes through the points (4,1) and (6,5), and whose center lies on the line .

Step 1: General equation of a circle

The general equation of a circle is given by: where (h, k) is the center of the circle and r is the radius.

Step 2: Using the given points

Since the circle passes through (4,1) and (6,5), these points must satisfy the circle's equation. Substituting these points, we get:

For (4,1):

For (6,5):

Step 3: Equating the two equations

Since both equations are equal to , we can equate them:

Simplifying, we get:

--- (1)

Step 4: Using the center's location

The center (h, k) lies on the line , so:

--- (2)

Step 5: Solving for h and k

Now we have a system of two linear equations:

--- (1)

--- (2)

Multiply equation (2) by 2: --- (3)

Subtract equation (1) from equation (3): , so

Substitute into equation (1): , so , and

Thus, the center of the circle is (3, 4).

Step 6: Finding the radius

Now we can find the radius using the point (4,1) and the center (3,4):

Step 7: Writing the equation of the circle

The equation of the circle is:

Final Answer:

ANSWER

$$x^2 + y^2 - 6x - 8y + 15 = 0$$

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Question 11

QUESTION

Find the equation of the circle passing through the points (2,3) and (-1,1) and whose centre is on the line $x - 3y - 11 = 0$.

SOLUTION

We need to find the equation of a circle that passes through the points (2,3) and (-1,1), and whose center lies on the line .

Step 1: General equation of a circle

The general equation of a circle is given by: where (h, k) is the center of the circle and r is the radius.

Step 2: Using the given points

Since the circle passes through (2,3) and (-1,1), these points must satisfy the circle's equation. Substituting these points, we get:

For (2,3):

For (-1,1):

Step 3: Equating the two equations

Since both equations are equal to , we can equate them:

Expanding both sides:

Simplifying:

Step 4: Using the center's location

The center (h, k) lies on the line , so:

Step 5: Solving for h and k

Substitute into :

Now find h:

So, the center is .

Step 6: Finding the radius

Use the point (2,3) to find :

Step 7: Writing the equation of the circle

Final Answer:

ANSWER

$$x^2 + y^2 - 7x + 5y - 14 = 0$$

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Question 12

QUESTION

Find the equation of the circle with radius 5 whose centre lies on the x-axis and passes through the point (2,3).

SOLUTION

We are asked to find the equation of a circle with a given radius, whose center lies on the x-axis, and which passes through a given point.

Step 1: Define the center of the circle

Since the center of the circle lies on the x-axis, its y-coordinate is 0. Let the center be $(h, 0)$.

Step 2: Write the general equation of the circle

The general equation of a circle with center (h, k) and radius r is:

In our case, $k = 0$ and $r = 5$, so the equation becomes:

Step 3: Use the given point to find the possible values of h

The circle passes through the point $(2, 3)$. Substituting $(2, 3)$ into the equation:

Step 4: Solve for h

Taking the square root of both sides:

This gives us two possible values for h :

Case 1:

Case 2:

Step 5: Write the equations of the circles

For $h = -4$, the equation is:

For $h = 12$, the equation is:

Final Answer: The equations of the circles are $x^2 + y^2 + 4x - 21 = 0$ and $x^2 + y^2 - 12x + 11 = 0$.

ANSWER

$$x^2 + y^2 + 4x - 21 = 0 \text{ and } x^2 + y^2 - 12x + 11 = 0$$

Question 13

QUESTION

Find the equation of the circle passing through (0,0) and making intercepts a and b on the coordinate axes.

SOLUTION

We need to find the equation of a circle that passes through the origin (0,0) and makes intercepts on the x and y axes, respectively.

Step 1: Define the points on the circle

Since the circle makes an intercept of a on the x-axis, it passes through the point $(a, 0)$. Similarly, since it makes an intercept of b on the y-axis, it passes through the point $(0, b)$. We also know it passes through the origin $(0, 0)$.

Step 2: General equation of a circle

The general equation of a circle is given by: $x^2 + y^2 + 2gx + 2fy + c = 0$ where $(-g, -f)$ is the center of the circle and $\sqrt{g^2 + f^2 - c}$ is the radius.

Step 3: Apply the conditions

Since the circle passes through $(a, 0)$, substituting $x = a$ and $y = 0$ into the general equation gives: $a^2 + 2ga + c = 0$. This simplifies to $2ga + c = -a^2$.

Now the equation becomes: $x^2 + y^2 + 2gx + 2fy + c = 0$

Since the circle passes through $(0, b)$, substituting $x = 0$ and $y = b$ gives: $b^2 + 2fb + c = 0$. Since $c = -a^2 - 2ga$, we have $b^2 + 2fb - a^2 - 2ga = 0$, which implies $2fb - 2ga = a^2 - b^2$, or $fb - ga = \frac{a^2 - b^2}{2}$.

Since the circle passes through $(0, 0)$, substituting $x = 0$ and $y = 0$ gives: $c = 0$. Since $c = -a^2 - 2ga$, we have $-a^2 - 2ga = 0$, which implies $-2ga = a^2$, or $g = -\frac{a}{2}$.

Step 4: Substitute the values of g, f, and c

Substituting $g = -\frac{a}{2}$, $f = \frac{b}{2}$, and $c = 0$ into the general equation, we get:

Final Answer: The equation of the circle is $x^2 + y^2 - ax - by = 0$.

ANSWER

$$x^2 + y^2 - ax - by = 0$$

Question 14

QUESTION

Find the equation of the circle with centre (2,2) and passing through the point (4,5).

SOLUTION

We need to find the equation of a circle given its center and a point it passes through. This requires using the standard equation of a circle and the distance formula.

Step 1: Recall the standard equation of a circle

The standard equation of a circle with center and radius is:

Step 2: Identify the center (h, k)

The center of the circle is given as (2, 2). Therefore, and .

Step 3: Find the radius r

The circle passes through the point (4, 5). The radius is the distance between the center (2, 2) and this point. We use the distance formula:

Substituting the coordinates (2, 2) and (4, 5):

Step 4: Substitute h, k, and r into the standard equation

We have , , and . Substituting these values into the standard equation:

Step 5: Expand and simplify the equation

Expanding the squares:

Combining like terms:

Final Answer: The equation of the circle is .

ANSWER

$$x^2 + y^2 - 4x - 4y = 5$$

Question 15

QUESTION

Does the point $(-2.5, 3.5)$ lie inside, outside or on the circle $x^2 + y^2 = 25$?

SOLUTION

We need to determine whether the point lies inside, outside, or on the circle defined by the equation .

Step 1: Understand the equation of the circle

The equation represents a circle centered at the origin with a radius of .

Step 2: Calculate the distance of the point from the center

We need to find the distance between the point and the center of the circle . We use the distance formula:

In our case, and . Therefore:

Step 3: Compare the distance with the radius

We have and . Since , we need to compare and .

Since , we have , which means .

Step 4: Determine the location of the point

Since the distance of the point from the center is less than the radius of the circle, the point lies inside the circle.

Final Answer: Inside the circle; since the distance of the point to the centre of the circle is less than the radius of the circle.

ANSWER

Inside the circle; since the distance of the point to the centre of the circle is less than the radius of the circle.

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Key Formulas

Important Formulas for Exercise 10.1

Formula / Concept	Description
Standard Equation of a Circle	The equation of a circle with center at (h, k) and radius r is given by $(x - h)^2 + (y - k)^2 = r^2$.
Equation of a Circle with Center at the Origin	When 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 equation of a circle is $x^2 + y^2 + 2gx + 2fy + c = 0$.
Center and Radius from General Equation	For a circle with the general equation $x^2 + y^2 + 2gx + 2fy + c = 0$, the center is at $(-g, -f)$ and the radius is $\sqrt{g^2 + f^2 - c}$.
Distance Formula	The distance between two points (x_1, y_1) and (x_2, y_2) is given by $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. This can be used to find the radius if the center and a point on the circle are known.

Top FAQs

Q1. How many questions are in NCERT Solutions Class 11 Maths Chapter 10 Conic Sections Exercise 10.1?

Exercise 10.1 of NCERT Solutions Class 11 Maths Chapter 10 Conic Sections contains exactly 15 questions. These questions cover fundamental concepts of Sections of a Cone including standard equations of parabola, ellipse, and hyperbola. All 15 questions are important for CBSE board exam 2025-26 preparation.

Q2. Where can I download free PDF of NCERT Solutions for Class 11 Maths Chapter 10 Conic Sections Exercise 10.1?

You can download the free PDF of NCERT Solutions for Class 11 Maths Chapter 10 Conic Sections Exercise 10.1 from the official NCERT website or various educational portals offering step by step solutions. These PDFs are updated according to the CBSE syllabus 2025-26 and include detailed explanations for all 15 questions. The free PDF download includes standard equations of conics and focal properties with solved examples.

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

Conic Sections Chapter 10 carries 5 marks in CBSE Class 11 Maths board exam 2025-26 as part of Unit III - Coordinate Geometry. These marks are shared with other topics in the unit, making Exercise 10.1 crucial for scoring well. Students should focus on standard equations of conics and focal properties for optimal preparation.

Q4. Which is the most difficult question in NCERT Solutions Class 11 Maths Chapter 10 Exercise 10.1 Conic Sections?

Questions involving derivation of standard equations and application of focal properties (typically questions 12-15) are considered most difficult in Exercise 10.1 of Class 11 Maths Chapter 10 Conic Sections. These questions require strong understanding of coordinate geometry concepts and step by step solutions approach. Practicing these difficult questions is essential for CBSE board exam 2025-26 preparation.

Q5. What is Standard Equations of Conics covered in NCERT Solutions Class 11 Maths Chapter 10 Exercise 10.1?

Standard Equations of Conics in NCERT Class 11 Maths Chapter 10 Exercise 10.1 include equations for parabola ($y^2=4ax$), ellipse ($x^2/a^2+y^2/b^2=1$), and hyperbola ($x^2/a^2-y^2/b^2=1$). These fundamental equations are derived from sections of a cone and are crucial for solving all 15 questions in the exercise. Understanding these standard forms is essential for CBSE board exam 2025-26 and competitive exams like JEE.

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