

CBSE Class-11 Mathematics
NCERT Solutions
Chapter - 11 Conic Sections
Exercise 11.2

In each of the following Exercises 1 to 6, find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum.

1. $y^2 = 12x$

Ans. Given: Equation of parabola

$$y^2 = 12x$$

Comparing with $y^2 = 4ax$, we have $4a = 12$

$$\Rightarrow a = 3$$

\therefore Coordinates of focus are (3, 0).

Axis of parabola is x - axis or $y = 0$

Equation of the directrix is $x = -3$

$$\Rightarrow x + 3 = 0$$

Length of latus rectum = $4 \times 3 = 12$ units

2. $x^2 = 6y$

Ans. Given: Equation of parabola

$$x^2 = 6y$$

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

$$\Rightarrow a = \frac{3}{2}$$

\therefore Coordinates of focus are $\left(0, \frac{3}{2}\right)$.

Axis of parabola is y axis or $x = 0$

Equation of the directrix is $y = \frac{-3}{2}$

$$\Rightarrow 2y + 3 = 0$$

Length of latus rectum = $\frac{4 \times 3}{2} = 6$ units

3. $y^2 = -8x$

Ans. Given: Equation of parabola

$$y^2 = -8x$$

Comparing with $y^2 = -4ax$, we have $4a = 8$

$$\Rightarrow a = 2$$

\therefore Coordinates of focus are $(-2, 0)$.

Axis of parabola is x axis or $y = 0$

Equation of the directrix is $x = 2$

$$\Rightarrow x - 2 = 0$$

Length of latus rectum = $4 \times 2 = 8$ units

4. $x^2 = -16y$

Ans. Given: Equation of parabola

$$x^2 = -16y$$

Comparing with $x^2 = -4ay$, we have $4a = 16$

$$\Rightarrow a = 4$$

\therefore Coordinates of focus are $(0, -4)$.

Axis of parabola is y axis or $x = 0$

Equation of the directrix is $y = 4$

$$\Rightarrow y - 4 = 0$$

Length of latus rectum = $4 \times 4 = 16$ units

5. $y^2 = 10x$

Ans. Given: Equation of parabola $y^2 = 10x$

Comparing with $y^2 = 4ax$, we have $4a = 10$

$$\Rightarrow a = \frac{10}{4} = \frac{5}{2}$$

\therefore Coordinates of focus are $\left(\frac{5}{2}, 0\right)$.

Axis of parabola is x axis or $y = 0$

Equation of the directrix is $x = \frac{-5}{2}$

$$\Rightarrow 2x + 5 = 0$$

Length of latus rectum = $\frac{4 \times 5}{2} = 10$ units

6. $x^2 = -9y$

Ans. Given: Equation of parabola

$$x^2 = -9y$$

Comparing with $x^2 = -4ay$, we have $4a = 9$

$$\Rightarrow a = \frac{9}{4}$$

\therefore Coordinates of focus are $\left(0, -\frac{9}{4}\right)$.

Axis of parabola is y axis or $x = 0$

Equation of the directrix is $y = \frac{9}{4}$

$$\Rightarrow 4y - 9 = 0$$

Length of latus rectum = $\frac{4 \times 9}{4} = 9$ units

In each of the following Exercises 7 to 12, find the equation of the parabola that satisfies the given conditions:

7. Focus (6, 0); directrix $x = -6$

Ans. Given: Directrix : $x = -6$ and $a = 6$

Axis of parabola is x -axis.

\therefore The required equation of parabola $y^2 = 4ax$

$$\Rightarrow y^2 = 4 \times 6x$$

$$\Rightarrow y^2 = 24x$$

8. Focus $(0, -3)$; directrix $y = 3$

Ans. Given: Directrix: $y = 3$ and $a = 3$

Axis of parabola is y - axis.

\therefore The required equation of parabola $x^2 = -4ay$

$$\Rightarrow x^2 = -4 \times 3y$$

$$\Rightarrow x^2 = -12y$$

9. Vertex $(0, 0)$; Focus $(3, 0)$

Ans. Given: vertex is at $(0, 0)$, $y = 0$ and $a = 3$

Axis of parabola is x - axis.

\therefore The required equation of parabola $y^2 = 4ax$

$$\Rightarrow y^2 = 4 \times 3x$$

$$\Rightarrow y^2 = 12x$$

10. Vertex $(0, 0)$; Focus $(-2, 0)$

Ans. Given: vertex is at $(0, 0)$, $y = 0$ and focus is $a = 2$

Axis of parabola is x - axis.

\therefore The required equation of parabola

$$\Rightarrow y^2 = -4ax$$

$$\Rightarrow y^2 = -8x$$

11. Vertex $(0, 0)$ passing through $(2, 3)$ and axis is along x - axis.

Ans. Given: vertex (0, 0) and axis is along x – axis.

\therefore Parabola is of the form $y^2 = 4ax$

Since the parabola passes through the point (2, 3).

$$\therefore (3)^2 = 4a \times 2$$

$$\Rightarrow 9 = 8a$$

$$\Rightarrow a = \frac{9}{8}$$

\therefore The required equation of parabola $y^2 = \frac{4 \times 9}{8}x$

$$\Rightarrow y^2 = \frac{9}{2}x$$

$$\Rightarrow 2y^2 = 9x$$

12. Vertex (0, 0) passing through (5, 2) and symmetric with respect to y – axis.

Ans. Given: vertex (0, 0) and axis is along y – axis.

\therefore Parabola is of the form $x^2 = 4ay$

Since the parabola passes through the point (5, 2).

$$\therefore (5)^2 = 4a \times 2$$

$$\Rightarrow 25 = 8a$$

$$\Rightarrow a = \frac{25}{8}$$

\therefore The required equation of parabola $x^2 = \frac{4 \times 25}{8}y$

$$\Rightarrow x^2 = \frac{25}{2}y$$

$$\Rightarrow 2x^2 = 25y$$
