

Chapter 11: Conic Sections Exercise 11.2

NCERT · Class 11 · Maths

Exercise 11.2

Question 1

Find the coordinates of the focus, axis of the parabola, equation of the directrix and length of the latus rectum.

Given: $y^2 = 12x$

Solution

Solution: Compare the given equation with the standard form:

$$y^2 = 4ax$$

So,

$$4a = 12$$

$$a = 3$$

Now,

$$\text{Focus} = (a, 0) = (3, 0)$$

$$\text{Axis} = x\text{-axis } (y = 0)$$

$$\text{Directrix} = x = -a = x = -3$$

$$\text{Length of latus rectum} = 4a = 12$$

Answer:

$$\text{Focus: } (3, 0)$$

Axis: x-axis

$$\text{Directrix: } x = -3$$

Length of latus rectum: 12 units

Question 2

Given: $x^2 = 6y$

Solution

Solution:

Compare with:

$$x^2 = 4ay$$

$$4a = 6$$

$$a = 3/2$$

Therefore,

$$\text{Focus} = (0, 3/2)$$

Axis = y-axis

$$\text{Directrix} = y = -3/2$$

$$\text{Length of latus rectum} = 6$$

Answer:

$$\text{Focus: } (0, 3/2)$$

Axis: y-axis

$$\text{Directrix: } y = -3/2$$

$$\text{Length of latus rectum: 6 units}$$

Question 3

Given: $y^2 = -8x$

Solution

Solution:

Compare with:

$$y^2 = -4ax$$

$$4a = 8$$

$$a = 2$$

Hence,

$$\text{Focus} = (-2, 0)$$

$$\text{Axis} = x\text{-axis}$$

$$\text{Directrix} = x = 2$$

$$\text{Length of latus rectum} = 8$$

Answer:

$$\text{Focus: } (-2, 0)$$

$$\text{Axis: } x\text{-axis}$$

$$\text{Directrix: } x = 2$$

$$\text{Length of latus rectum: } 8 \text{ units}$$

Question 4

Given: $x^2 = -16y$

Solution

Solution:

Compare with:

$$x^2 = -4ay$$

$$4a = 16$$

$$a = 4$$

Therefore,

$$\text{Focus} = (0, -4)$$

$$\text{Axis} = y\text{-axis}$$

$$\text{Directrix} = y = 4$$

$$\text{Length of latus rectum} = 16$$

Answer:

$$\text{Focus: } (0, -4)$$

$$\text{Axis: } y\text{-axis}$$

$$\text{Directrix: } y = 4$$

$$\text{Length of latus rectum: } 16 \text{ units}$$

Question 5

Given: $y^2 = 10x$

Solution

Solution:

Compare with:

$$y^2 = 4ax$$

$$4a = 10$$

$$a = 5/2$$

Thus,

$$\text{Focus} = (5/2, 0)$$

$$\text{Axis} = x\text{-axis}$$

$$\text{Directrix} = x = -5/2$$

Length of latus rectum = 10

Answer:

Focus: $(5/2, 0)$

Axis: x-axis

Directrix: $x = -5/2$

Length of latus rectum: 10 units

Question 6

Given: $x^2 = -9y$

Solution

Solution:

Compare with:

$$x^2 = -4ay$$

$$4a = 9$$

$$a = 9/4$$

Hence,

$$\text{Focus} = (0, -9/4)$$

Axis = y-axis

$$\text{Directrix} = y = 9/4$$

Length of latus rectum = 9

Answer:

$$\text{Focus} = (0, -9/4)$$

Axis: y-axis

$$\text{Directrix: } y = 9/4$$

Length of latus rectum: 9 units

Question 7

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

Solution

Solution:

For a parabola opening rightward,

$$\text{Focus} = (a, 0)$$

$$\text{Directrix} = x = -a$$

Comparing,

$$a = 6$$

Using the standard equation:

$$y^2 = 4ax$$

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

$$y^2 = 24x$$

$$\text{Answer: } y^2 = 24x$$

Question 8

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

Solution

Solution:

The parabola opens downward.

Compare with:

$$\text{Focus} = (0, -a)$$

Directrix = $y = a$

Therefore,

$$a = 3$$

Standard equation:

$$x^2 = -4ay$$

$$x^2 = -12y$$

Answer: $x^2 = -12y$

Question 9

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

Solution

Solution:

$$\text{Focus} = (a, 0)$$

Therefore,

$$a = 3$$

Equation:

$$y^2 = 4ax$$

$$y^2 = 12x$$

Answer: $y^2 = 12x$

Question 10

Find the equation of the parabola whose vertex is $(0, 0)$ and focus is $(-2, 0)$.

Solution

Solution:

$$\text{Focus} = (-a, 0)$$

$$a = 2$$

Equation:

$$y^2 = -4ax$$

$$y^2 = -8x$$

Answer: $y^2 = -8x$

Question 11

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

Solution

Solution:

Since the axis is the x-axis, the equation is

$$y^2 = 4ax$$

Substitute point (2, 3):

$$3^2 = 4a \times 2$$

$$9 = 8a$$

$$a = 9/8$$

Equation:

$$y^2 = 4 \times (9/8)x$$

$$y^2 = (9/2)x$$

Multiplying by 2:

$$2y^2 = 9x$$

Answer: $2y^2 = 9x$

Question 12

Find the equation of the parabola whose vertex is (0, 0), passes through (5, 2) and is symmetric about y-axis.

Solution

Solution:

A parabola symmetric about the y-axis has the equation:

$$x^2 = 4ay$$

Substitute point (5, 2):

$$25 = 4a \times 2$$

$$25 = 8a$$

$$a = 25/8$$

Equation:

$$x^2 = 4 \times (25/8)y$$

$$x^2 = (25/2)y$$

Multiplying by 2:

$$2x^2 = 25y$$

Answer: $2x^2 = 25y$