



## EXERCISE 11.2

### Question 1:

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

Ans:

The given equation is  $y^2 = 12x$ .

Here, the coefficient of  $x$  is positive. Hence, the parabola opens towards the right.

On comparing this equation with  $y^2 = 4ax$ , we obtain

$$4a = 12 \Rightarrow a = 3$$

Coordinates of the focus =  $(a, 0) = (3, 0)$

Since the given equation involves  $y^2$ , the axis of the parabola is the  $x$ -axis.

Equation of directrix,  $x = -a$  i.e.,  $x = -3$  i.e.,  $x + 3 = 0$

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

### Question 2:

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

Ans:

The given equation is  $x^2 = 6y$ .

Here, the coefficient of  $y$  is positive. Hence, the parabola opens upwards.

On comparing this equation with  $x^2 = 4ay$ , we obtain

$$4a = 6 \Rightarrow a = \frac{3}{2}$$

Coordinates of the focus =  $(0, a) = \left(0, \frac{3}{2}\right)$

Since the given equation involves  $x^2$ , the axis of the parabola is the  $y$ -axis.

Equation of directrix,  $y = -a$  i.e.,  $y = -\frac{3}{2}$

Length of latus rectum =  $4a = 6$

### Question 3:

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

Ans:

The given equation is  $y^2 = -8x$ .

Here, the coefficient of  $x$  is negative. Hence, the parabola opens towards the left.

On comparing this equation with  $y^2 = -4ax$ , we obtain

$$-4a = -8 \Rightarrow a = 2$$

$$\square \text{Coordinates of the focus} = (-a, 0) = (-2, 0)$$

Since the given equation involves  $y^2$ , the axis of the parabola is the  $x$ -axis.

Equation of directrix,  $x = a$  i.e.,  $x = 2$

$$\text{Length of latus rectum} = 4a = 8$$

Question 4:

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

Ans:

The given equation is  $x^2 = -16y$ .

Here, the coefficient of  $y$  is negative. Hence, the parabola opens downwards.

On comparing this equation with  $x^2 = -4ay$ , we obtain

$$-4a = -16 \Rightarrow a = 4$$

$$\square \text{Coordinates of the focus} = (0, -a) = (0, -4)$$

Since the given equation involves  $x^2$ , the axis of the parabola is the  $y$ -axis.

Equation of directrix,  $y = a$  i.e.,  $y = 4$

$$\text{Length of latus rectum} = 4a = 16$$

Question 5:

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

Ans:

The given equation is  $y^2 = 10x$ .

Here, the coefficient of  $x$  is positive. Hence, the parabola opens towards the right.

On comparing this equation with  $y^2 = 4ax$ , we obtain

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

$$\square \text{Coordinates of the focus} = (a, 0) = \left(\frac{5}{2}, 0\right)$$

Since the given equation involves  $y^2$ , the axis of the parabola is the  $x$ -axis.

$$\text{Equation of directrix, } x = -a, \text{ i.e., } x = -\frac{5}{2}$$

$$\text{Length of latus rectum} = 4a = 10$$

Question 6:

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

Ans:

The given equation is  $x^2 = -9y$ .

Here, the coefficient of  $y$  is negative. Hence, the parabola opens downwards.

On comparing this equation with  $x^2 = -4ay$ , we obtain

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

$$\text{Coordinates of the focus} = (0, -a) = \left(0, -\frac{9}{4}\right)$$

Since the given equation involves  $x^2$ , the axis of the parabola is the  $y$ -axis.

$$\text{Equation of directrix, } y = a, \text{ i.e., } y = \frac{9}{4}$$

$$\text{Length of latus rectum} = 4a = 9$$

**Question 7:**

Find the equation of the parabola that satisfies the following conditions: Focus (6, 0); directrix  $x = -6$

**Ans:**

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

Since the focus lies on the  $x$ -axis, the  $x$ -axis is the axis of the parabola.

Therefore, the equation of the parabola is either of the form  $y^2 = 4ax$  or

$$y^2 = -4ax.$$

It is also seen that the directrix,  $x = -6$  is to the left of the  $y$ -axis, while the focus (6, 0) is to the right of the  $y$ -axis. Hence, the parabola is of the form  $y^2 = 4ax$ .

Here,  $a = 6$

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

**Question 8:**

Find the equation of the parabola that satisfies the following conditions: Focus (0, -3); directrix  $y = 3$

**Ans:**

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

Since the focus lies on the  $y$ -axis, the  $y$ -axis is the axis of the parabola.

Therefore, the equation of the parabola is either of the form  $x^2 = 4ay$  or

$$x^2 = -4ay.$$

It is also seen that the directrix,  $y = 3$  is above the  $x$ -axis, while the focus

(0, -3) is below the  $x$ -axis. Hence, the parabola is of the form  $x^2 = -4ay$ .

Here,  $a = 3$

Thus, the equation of the parabola is  $x^2 = -12y$ .

**Question 9:**

Find the equation of the parabola that satisfies the following conditions: Vertex (0, 0); focus (3, 0)

**Ans:**

Vertex (0, 0); focus (3, 0)

Since the vertex of the parabola is (0, 0) and the focus lies on the positive  $x$ -axis,  $x$ -axis is the axis of the parabola, while the equation of the parabola is of the form  $y^2 = 4ax$ .

Since the focus is (3, 0),  $a = 3$ .

Thus, the equation of the parabola is  $y^2 = 4 \times 3 \times x$ , i.e.,  $y^2 = 12x$

**Question 10:**

Find the equation of the parabola that satisfies the following conditions: Vertex (0, 0) focus (-2, 0)

**Ans:**

Vertex (0, 0) focus (-2, 0)

Since the vertex of the parabola is (0, 0) and the focus lies on the negative x-axis, x-axis is the axis of the parabola, while the equation of the parabola is of the form  $y^2 = -4ax$ .

Since the focus is (-2, 0),  $a = 2$ .

Thus, the equation of the parabola is  $y^2 = -4(2)x$ , i.e.,  $y^2 = -8x$

#### Question 11:

Find the equation of the parabola that satisfies the following conditions: Vertex (0, 0) passing through (2, 3) and axis is along x-axis

Ans:

Since the vertex is (0, 0) and the axis of the parabola is the x-axis, the equation of the parabola is either of the form  $y^2 = 4ax$  or  $y^2 = -4ax$ .

The parabola passes through point (2, 3), which lies in the first quadrant.

Therefore, the equation of the parabola is of the form  $y^2 = 4ax$ , while point

(2, 3) must satisfy the equation  $y^2 = 4ax$ .

$$\therefore 3^2 = 4a(2) \Rightarrow a = \frac{9}{8}$$

Thus, the equation of the parabola is

$$y^2 = 4\left(\frac{9}{8}\right)x$$

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

$$2y^2 = 9x$$

#### Question 12:

Find the equation of the parabola that satisfies the following conditions: Vertex (0, 0), passing through (5, 2) and symmetric with respect to y-axis

Ans:

Since the vertex is (0, 0) and the parabola is symmetric about the y-axis, the equation of the parabola is either of the form  $x^2 = 4ay$  or  $x^2 = -4ay$ .

The parabola passes through point (5, 2), which lies in the first quadrant.

Therefore, the equation of the parabola is of the form  $x^2 = 4ay$ , while point

(5, 2) must satisfy the equation  $x^2 = 4ay$ .

$$\therefore (5)^2 = 4 \times a \times 2 \Rightarrow 25 = 8a \Rightarrow a = \frac{25}{8}$$

Thus, the equation of the parabola is

$$x^2 = 4\left(\frac{25}{8}\right)y$$

$$2x^2 = 25y$$

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