CLASS: XI , CHAPTER: CONIC SECTIONS

EXERCISE 11.2.

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

Q No 1 $y^2 = 12x$

Sol The equation of parabola is

$y^2 = 12x$, which is right handed parabola.

$\therefore 4a = 12$ or $a = 3$

$\therefore$ Focus is $(a, 0)$ ie $(3, 0)$

Axis of Parabola is $y = 0$ (x-axis)

The eqn of directrix is $x = -a$ or $x = -3$ or $x + 3 = 0$

Length of Latus Rectum $= 4a = 4 \times 3 = 12$.

Q No 2 $x^2 = 6y$.

Sol The eqn of parabola is $x^2 = 6y$, an upward parabola.

Comparing it with $x^2 = 4ay$ we get

$4a = 6 \Rightarrow a = 3/2$

$\therefore$ Focus is $(0, a)$ ie $(0, 3/2)$.

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

The eqn of directrix is $y = -a$ ie $y = -3/2$

Length of Latus Rectum $= 4a = 4 \times \frac{3}{2} = 6$.

Q No 3 $y^2 = -8x$

The eqn of parabola is $y^2 = -8x$, Left handed parabola

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

$\therefore$ Focus is $(-a, 0)$ ie $(-2, 0)$

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

The eqn of directrix is $x = a$ ie $x = 2$

Length of latus rectum $= 4a = 4 \times 2 = 8$.

Q No 4 $x^2 = -16y$

Sol Eqn of parabola is $x^2 = -16y$, downward parabola.

$\therefore 4a = 16 \Rightarrow a = 4.$

$\therefore$ Focus is $(0, -a)$ ie $(0, -4)$

Axis of parabola is $x = 0$

The eqn of directrix is $y = a$ or $y = 4$.

Length of Latus Rectum $= 4a = 4 \times 4 = 16$.

Q No. 5 $y^2 = 10x$.

Sol The eqn of given parabola is $y^2 = 10x$, right handed parabola

$\therefore 4a = 10 \Rightarrow a = 5/2$

$\therefore$ focus is $(a, 0)$ ie $(\frac{5}{2}, 0)$

Axis of parabola is $y = 0$

The equation of directrix is $x = -a$ ie $x = -5/2$.

Length of Latus Rectum: $4a = 4 \times \frac{5}{2} = 10$.

Q No 6 $x^2 = -9y$.

Sol: Eqn of parabola is $x^2 = -9y$ which is downward parabola.

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

$\therefore$ Focus is $(0, -a) = (0, -9/4)$

Axis of parabola is $x = 0$

The eqn. of directrix is $y = a$ or $y = \frac{9}{4}$.

Length of Latus Rectum: $4a = 4 \times \frac{9}{4} = 9$.

In each of exercises 7 to 12, find the eqn. of parabola that satisfies the given conditions.

Q No 7. Focus $(6, 0)$, directrix $x = -6$

Sol. Since Focus is $(6, 0)$

$\therefore$ Axis of parabola is X-axis

Directrix is $x = -6$

$\therefore$ Point of intersection of axis and directrix is $(-6, 0)$.

$\therefore$ Vertex of parabola = Mid point joining $(6,0)$ and $(-6,0)$

$= \left(\frac{6-6}{2}, \frac{0+0}{2}\right)$ ie $(0,0)$

$\therefore$ Equation of parabola is $y^2 = 4ax$

ie $y^2 = 4 \times 6x$ or $y^2 = 24x$.

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

Sol: Since focus is $(0,-3)$ which is on y-axis

$\therefore$ y-axis is axis of parabola.

The directrix is $y = 3$.

$\therefore$ Point of intersection of directrix and y-axis is $(0,3)$.

$\therefore$ Vertex of Parabola = mid point of line segment joining $(0,-3)$ and $(0,3)$ is

$= \left(\frac{0+0}{2}, \frac{-3+3}{2}\right)$ ie $(0,0)$

$\therefore a = \sqrt{(0-0)^2+(3-0)^2} = \sqrt{9} = 3$.

$\therefore$ Eqn of parabola is $x^2 = -4ay$ or $x^2 = -4 \times 3y$ or $x^2 = -12y$

QNo. 9 Vertex $(0,0)$; focus $(3,0)$

Sol: Since the vertex is at $(0,0)$ and focus is at $(3,0)$ which lies on x-axis

$\therefore$ Parabola is a right-handed parabola where $a = 3$

$\therefore$ Its eqn is $y^2 = 4ax$ or $y^2 = 4 \times 3x$.

or $y^2 = 12x$.

QNo. 10 Vertex $(0,0)$; focus $(-2,0)$

Sol. Since the vertex is at $(0,0)$ and focus at $(-2,0)$ which lies on x-axis.

$\therefore$ Parabola is left-handed parabola where $a = 2$.

$\therefore$ Its eqn is $y^2 = -4ax$ or $y^2 = -4 \times 2x$

or $y^2 = -8x$

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

Sol: Since vertex is at origin $(0,0)$ and axis along x-axis

$\therefore$ Parabola is right-handed parabola.

Let its eqn be $y^2 = 4ax$. ---(1)

$\because$ It passes through $(2, 3)$.

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

or $9 = 8a$ or $a = 9/8$

Putting value in (1) we get-

$y^2 = \frac{9}{2}x$ or $2y^2 = 9x$ which is reqd eqn.

Q No. 12. Vertex $(0,0)$, passing through $(5,2)$ and symmetric with respect to Y-axis.

Sol.

Since parabola is symmetric with respect to y-axis

$\therefore$ Its eqn is of form $x^2 = 4ay$ ---(1)

$\therefore$ It passes through $(5, 2)$.

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

Putting $a = \frac{25}{8}$ in (1) we get

$x^2 = 4 \times \frac{25}{8} y$, or $x^2 = \frac{25}{2} y$.

Which is required eqn of Parabola.

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