Parabola

Question1

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

KCET 2024

Options:

A. $y^2 = 24x$

B. $y^2 = -24x$

C. $x^2 = 24y$

D. $x^2 = -24y$

Answer: A

Solution:

$\because$ Focus has positive x-coordinate.

So, coordinate of focus $= (a, 0) \equiv (6, 0)$

$\therefore \quad a = 6 \quad$ .... (i)

Hence, equation of parabola is

$y^2 = 24x \quad [\because y^2 = 4ax$ and using Eq. (i) $]$

Question2

If the parabola $y = \alpha x^2 - 6x + \beta$ passes through the point $(0, 2)$ and has its tangent at $x = \frac{3}{2}$ parallel to X-axis, then

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Options:

A. $\alpha = 2, \beta = -2$

B. $\alpha = 2, \beta = 2$

C. $\alpha = -2, \beta = 2$

D. $\alpha = -2, \beta = -2$

Answer: C

Solution:

$y = \alpha x^2 - 6x + \beta$ ..... (i)

Equation of parabola passes through

$(0, 2) \Rightarrow 2 = 0 - 0 + \beta$
$\Rightarrow \beta = 2$

Differentiating Eq. (i) w.r.t. x,

$\frac{dy}{dx} = 20x - 6$

$$\therefore \quad \left(\frac{dy}{dx}\right)_{x=\frac{3}{2}} = 2 \times \alpha \times \frac{3}{2} - 6$$
$$= 3\alpha - 6$$

As, the tangent is parallel to X-axis,

$\frac{dy}{dx} = 0$
$\Rightarrow \quad 3\alpha - 6 = 0$
$\Rightarrow \quad \alpha = 2$

Question3

If the parabola $x^2 = 4$ ay passes through the point $(2, 1)$, then the length of the latus rectum is

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Options:

A. 1

B. 4

C. 2

D. 8

Answer: A

Solution:

Given parabola $x^2 = 4ay$

It is passes through $(2, 1)$

$\therefore \quad 4 = 4a$

$\therefore$ Length of latus rectum of parabola $x^2 = 4ay$ is $4a$

$\therefore \quad 4a = 4$

$\therefore \quad a = 1$
