

Questions with Answer Keys

MathonGo

Q1 (22 July 2021 Shift 1)

Let a line $L : 2x + y = k, k > 0$ be a tangent to the hyperbola $x^2 - y^2 = 3$. If L is also a tangent to the parabola $y^2 = \alpha x$, then α is equal to:

(1) 12

(2) -12

(3) 24

(4) -24

Q2 (25 July 2021 Shift 1)

The locus of the centroid of the triangle formed by any point P on the hyperbola $16x^2 - 9y^2 + 32x + 36y - 164 = 0$, and its foci is :

(1) $16x^2 - 9y^2 + 32x + 36y - 36 = 0$ (2) $9x^2 - 16y^2 + 36x + 32y - 144 = 0$ (3) $16x^2 - 9y^2 + 32x + 36y - 144 = 0$ (4) $9x^2 - 16y^2 + 36x + 32y - 36 = 0$

Hyperbola

JEE Main 2021 (July) Chapter-wise Questions

Questions with Answer Keys

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Answer Key

Q1 (4)

Q2 (1)

Hints and Solutions

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Q1 mathongo mathongo mathongo mathongo mathongo mathongo mathongo mathongo

Tangent to hyperbola of mathongo mathongo mathongo mathongo mathongo mathongo mathongo

Slope $m = -2$ (given)

$$y = -2x \pm \sqrt{3(3)}$$

$$(y = mx \pm \sqrt{x^2 m^2 - b^2})$$

$$\Rightarrow y + 2x = \pm 3 \Rightarrow 2x + y = 3 \quad (k > 0)$$

$$\text{For parabola } y^2 = ax$$

$$y = mx + \frac{a}{4m}$$

$$\Rightarrow y = -2x + \frac{a}{-8}$$

$$\Rightarrow \frac{a}{-8} = 3$$

$$\Rightarrow a = -24$$

Q2 mathongo mathongo mathongo mathongo mathongo mathongo mathongo

Given hyperbola is $16(x+1)^2 - 9(y-2)^2 = 164 + 16 - 36 = 144$

$$\Rightarrow \frac{(x+1)^2}{9} - \frac{(y-2)^2}{16} = 1$$

$$\text{Eccentricity, } e = \sqrt{1 + \frac{16}{9}} = \frac{5}{3}$$

\Rightarrow foci are $(4, 2)$ and $(-6, 2)$



Let the centroid be (h, k)

& A(α, β) be point on hyperbola

$$\text{So } h = \frac{\alpha-6+4}{3}, k = \frac{\beta+2+2}{3}$$

$$\Rightarrow \alpha = 3h + 2, \beta = 3k - 4$$

$$(\alpha, \beta) \text{ lies on hyperbola so } 16(3h+2+1)^2 - 9(3k-4-2)^2 = 144$$

$$\Rightarrow 144(h+1)^2 - 81(k-2)^2 = 144$$

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Hyperbola

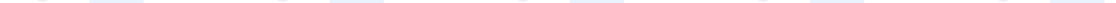
JEE Main 2021 (July) Chapter-wise Questions

Hints and Solutions

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$$\Rightarrow 16(h^2 + 2h + 1) - 9(k^2 - 4k + 4) = 16$$

⇒ $16x^2 - 9y^2 + 32x + 36y - 36 = 0$



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