

MATHEMATICS · JEE MAIN

Hyperbola

Chapter-wise previous year questions, with answer key

33

PYQS

2020–2025

PAPERS

2

TOPICS

Tangent and Normal

Standard Equation

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

Every question has a free step-by-step solution on PrepWiser — tap “Step-by-step solution” under it.

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Tangent and Normal · 15 PYQs

Q1 JEE Main 2023 · 13 Apr · Shift 2

The foci of a hyperbola are $(\pm 2, 0)$ and its eccentricity is $\frac{3}{2}$. A tangent, perpendicular to the line $2x + 3y = 6$, is drawn at a point in the first quadrant on the hyperbola. If the intercepts made by the tangent on the x - and y -axes are a and b respectively, then $|6a| + |5b|$ is equal to _____

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/pToNdRcFX-](https://www.prepwiser.in/questions/pToNdRcFX-)

Q2 JEE Main 2023 · 13 Apr · Shift 1

Let m_1 and m_2 be the slopes of the tangents drawn from the point $P(4, 1)$ to the hyperbola $H : \frac{y^2}{25} - \frac{x^2}{16} = 1$. If Q is the point from which the tangents drawn to H have slopes $|m_1|$ and $|m_2|$ and they make positive intercepts α and β on the x -axis, then $\frac{(PQ)^2}{\alpha\beta}$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/qMLsh0JhS7](https://www.prepwiser.in/questions/qMLsh0JhS7)

Q3 JEE Main 2023 · 1 Feb · Shift 2

Let $P(x_0, y_0)$ be the point on the hyperbola $3x^2 - 4y^2 = 36$, which is nearest to the line $3x + 2y = 1$. Then $\sqrt{2}(y_0 - x_0)$ is equal to :

- (A) 3 (B) -9
(C) -3 (D) 9

[Step-by-step solution ► prepwiser.in/questions/mZILJak4--](https://www.prepwiser.in/questions/mZILJak4--)

Q4 JEE Main 2022 · 26 Jul · Shift 1

Let the tangent drawn to the parabola $y^2 = 24x$ at the point (α, β) is perpendicular to the line $2x + 2y = 5$. Then the normal to the hyperbola $\frac{x^2}{\alpha^2} - \frac{y^2}{\beta^2} = 1$ at the point $(\alpha + 4, \beta + 4)$ does NOT pass through the point :

- (A) (25, 10) (B) (20, 12)
(C) (30, 8) (D) (15, 13)

[Step-by-step solution ► prepwiser.in/questions/YXrGxegBfh](https://www.prepwiser.in/questions/YXrGxegBfh)

Q5 JEE Main 2022 · 25 Jul · Shift 1

Let the equation of two diameters of a circle $x^2 + y^2 - 2x + 2fy + 1 = 0$ be $2px - y = 1$ and $2x + py = 4p$. Then the slope $m \in (0, \infty)$ of the tangent to the hyperbola $3x^2 - y^2 = 3$ passing through the centre of the circle is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/F6eI_E7L2M](https://www.prepwiser.in/questions/F6eI_E7L2M)

Q6 JEE Main 2022 · 28 Jun · Shift 1

Let the eccentricity of the hyperbola $H : \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ be $\sqrt{\frac{5}{2}}$ and length of its latus rectum be $6\sqrt{2}$. If $y = 2x + c$ is a tangent to the hyperbola H , then the value of c^2 is equal to :

- (A) 18 (B) 20
(C) 24 (D) 32

[Step-by-step solution ► prepwiser.in/questions/8dUQM0LuX6](https://www.prepwiser.in/questions/8dUQM0LuX6)

Q7 JEE Main 2022 · 26 Jun · Shift 2

The normal to the hyperbola

$\frac{x^2}{a^2} - \frac{y^2}{9} = 1$ at the point $(8, 3\sqrt{3})$ on it passes through the point :

- (A) $(15, -2\sqrt{3})$ (B) $(9, 2\sqrt{3})$
(C) $(-1, 9\sqrt{3})$ (D) $(-1, 6\sqrt{3})$

[Step-by-step solution ► prepwiser.in/questions/IA9Cki-q8y](https://www.prepwiser.in/questions/IA9Cki-q8y)

Q8 JEE Main 2022 · 26 Jun · Shift 2

Let a line L_1 be tangent to the hyperbola $\frac{x^2}{16} - \frac{y^2}{4} = 1$ and let L_2 be the line passing through the origin and perpendicular to L_1 . If the locus of the point of intersection of L_1 and L_2 is $(x^2 + y^2)^2 = \alpha x^2 + \beta y^2$, then $\alpha + \beta$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/qKgZnd0pCk](https://www.prepwiser.in/questions/qKgZnd0pCk)

Q9 JEE Main 2022 · 25 Jun · Shift 2

Let the eccentricity of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ be $\frac{5}{4}$. If the equation of the normal at the point $(\frac{8}{\sqrt{5}}, \frac{12}{5})$ on the hyperbola is $8\sqrt{5}x + \beta y = \lambda$, then $\lambda - \beta$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/8s1Yp2HAmY](https://www.prepwiser.in/questions/8s1Yp2HAmY)

Q10 JEE Main 2022 · 24 Jun · Shift 1

Let $\lambda x - 2y = \mu$ be a tangent to the hyperbola $a^2x^2 - y^2 = b^2$. Then $(\frac{\lambda}{a})^2 - (\frac{\mu}{b})^2$ is equal to :

- (A) -2 (B) -4
(C) 2 (D) 4

[Step-by-step solution ► prepwiser.in/questions/ANy_ALmC4w](https://www.prepwiser.in/questions/ANy_ALmC4w)

Q11 JEE Main 2021 · 16 Mar · Shift 1

The locus of the midpoints of the chord of the circle, $x^2 + y^2 = 25$ which is tangent to the hyperbola, $\frac{x^2}{9} - \frac{y^2}{16} = 1$ is :

- (A) $(x^2 + y^2)^2 - 9x^2 + 16y^2 = 0$
(B) $(x^2 + y^2)^2 - 9x^2 + 144y^2 = 0$
(C) $(x^2 + y^2)^2 - 16x^2 + 9y^2 = 0$
(D) $(x^2 + y^2)^2 - 9x^2 - 16y^2 = 0$

[Step-by-step solution ► prepwiser.in/questions/fedFsTQuMP](https://www.prepwiser.in/questions/fedFsTQuMP)

Q12 JEE Main 2020 · 5 Sep · Shift 2

If the line $y = mx + c$ is a common tangent to the hyperbola

$\frac{x^2}{100} - \frac{y^2}{64} = 1$ and the circle $x^2 + y^2 = 36$, then which one of the following is true?

(A) $5m = 4$

(B) $8m + 5 = 0$

(C) $c^2 = 369$

(D) $4c^2 = 369$

[Step-by-step solution ► prepwiser.in/questions/uLLgmOQZBi](https://www.prepwiser.in/questions/uLLgmOQZBi)

Q13 JEE Main 2020 · 4 Sep · Shift 1

Let $P(3, 3)$ be a point on the hyperbola,

$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. If the normal to it at P intersects the x -axis at $(9, 0)$ and e is its eccentricity, then the ordered pair (a^2, e^2) is equal to :

(A) $(\frac{9}{2}, 2)$

(B) $(\frac{3}{2}, 2)$

(C) $(9, 3)$

(D) $(\frac{9}{2}, 3)$

[Step-by-step solution ► prepwiser.in/questions/MGF2uF8mDn](https://www.prepwiser.in/questions/MGF2uF8mDn)

Q14 JEE Main 2020 · 2 Sep · Shift 1

A line parallel to the straight line $2x - y = 0$ is tangent to the hyperbola

$\frac{x^2}{4} - \frac{y^2}{2} = 1$ at the point (x_1, y_1) . Then $x_1^2 + 5y_1^2$ is equal to :

(A) 5

(B) 6

(C) 10

(D) 8

[Step-by-step solution ► prepwiser.in/questions/GTrSMOlCWH](https://www.prepwiser.in/questions/GTrSMOlCWH)

Q15 JEE Main 2020 · 8 Jan · Shift 2

If a hyperbola passes through the point $P(10, 16)$ and it has vertices at $(\pm 6, 0)$, then the equation of the normal to it at P is :

(A) $2x + 5y = 100$

(B) $x + 3y = 58$

(C) $x + 2y = 42$

(D) $3x + 4y = 94$

[Step-by-step solution ► prepwiser.in/questions/DQTMcoR9-G](https://www.prepwiser.in/questions/DQTMcoR9-G)

Standard Equation · 18 PYQs

Q16 JEE Main 2025 · 7 Apr · Shift 2

Let the lengths of the transverse and conjugate axes of a hyperbola in standard form be $2a$ and $2b$, respectively, and one focus and the corresponding directrix of this hyperbola be $(-5, 0)$ and $5x + 9 = 0$, respectively. If the product of the focal distances of a point $(\alpha, 2\sqrt{5})$ on the hyperbola is p , then $4p$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/SkAm9bAVEq](https://www.prepwiser.in/questions/SkAm9bAVEq)

Q17 JEE Main 2025 · 3 Apr · Shift 1

Let the product of the focal distances of the point $P(4, 2\sqrt{3})$ on the hyperbola $H : \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ be 32. Let the length of the conjugate axis of H be p and the length of its latus rectum be q . Then $p^2 + q^2$ is equal to _____

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/4E6T0BVeiw](https://www.prepwiser.in/questions/4E6T0BVeiw)

Q18 JEE Main 2025 · 2 Apr · Shift 1

Let one focus of the hyperbola $H : \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ be at $(\sqrt{10}, 0)$ and the corresponding directrix be $x = \frac{9}{\sqrt{10}}$. If e and l respectively are the eccentricity and the length of the latus rectum of H , then $9(e^2 + l)$ is equal to :

- (A) 12 (B) 14
(C) 15 (D) 16

[Step-by-step solution ► prepwiser.in/questions/XvYhhGRVKt](https://www.prepwiser.in/questions/XvYhhGRVKt)

Q19 JEE Main 2025 · 24 Jan · Shift 2

Let $H_1 : \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $H_2 : -\frac{x^2}{A^2} + \frac{y^2}{B^2} = 1$ be two hyperbolas having length of latus rectums $15\sqrt{2}$ and $12\sqrt{5}$ respectively. Let their eccentricities be $e_1 = \sqrt{\frac{5}{2}}$ and e_2 respectively. If the product of the lengths of their transverse axes is $100\sqrt{10}$, then $25e_2^2$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/15fbD6rkqH](https://www.prepwiser.in/questions/15fbD6rkqH)

Q20 JEE Main 2024 · 9 Apr · Shift 2

Let the foci of a hyperbola H coincide with the foci of the ellipse $E : \frac{(x-1)^2}{100} + \frac{(y-1)^2}{75} = 1$ and the eccentricity of the hyperbola H be the reciprocal of the eccentricity of the ellipse E . If the length of the transverse axis of H is α and the length of its conjugate axis is β , then $3\alpha^2 + 2\beta^2$ is equal to

- (A) 225 (B) 237
(C) 242 (D) 205

[Step-by-step solution ► prepwiser.in/questions/IJQq8iaGAN](https://www.prepwiser.in/questions/IJQq8iaGAN)

Q21 JEE Main 2024 · 8 Apr · Shift 1

Let $H : \frac{-x^2}{a^2} + \frac{y^2}{b^2} = 1$ be the hyperbola, whose eccentricity is $\sqrt{3}$ and the length of the latus rectum is $4\sqrt{3}$. Suppose the point $(\alpha, 6)$, $\alpha > 0$ lies on H . If β is the product of the focal distances of the point $(\alpha, 6)$, then $\alpha^2 + \beta$ is equal to

- (A) 170 (B) 171
(C) 169 (D) 172

[Step-by-step solution ► prepwiser.in/questions/-x6uyGb4jp](https://www.prepwiser.in/questions/-x6uyGb4jp)

Q22 JEE Main 2024 · 4 Apr · Shift 1

Let A be a square matrix of order 2 such that $|A| = 2$ and the sum of its diagonal elements is -3 . If the points (x, y) satisfying $A^2 + xA + yI = O$ lie on a hyperbola, whose transverse axis is parallel to the x -axis, eccentricity is e and the length of the latus rectum is l , then $e^4 + l^4$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/S6gS3St_z](https://www.prepwiser.in/questions/S6gS3St_z)

Q23 JEE Main 2024 · 31 Jan · Shift 1

If the foci of a hyperbola are same as that of the ellipse $\frac{x^2}{9} + \frac{y^2}{25} = 1$ and the eccentricity of the hyperbola is $\frac{15}{8}$ times the eccentricity of the ellipse, then the smaller focal distance of the point $(\sqrt{2}, \frac{14}{3}\sqrt{\frac{2}{5}})$ on the hyperbola, is equal to

(A) $14\sqrt{\frac{2}{5}} - \frac{4}{3}$

(B) $7\sqrt{\frac{2}{5}} + \frac{8}{3}$

(C) $7\sqrt{\frac{2}{5}} - \frac{8}{3}$

(D) $14\sqrt{\frac{2}{5}} - \frac{16}{3}$

Step-by-step solution ► [prepwisar.in/questions/eLX909LQfD](https://www.prepwisar.in/questions/eLX909LQfD)

Q24 JEE Main 2024 · 31 Jan · Shift 1

Let the foci and length of the latus rectum of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, a > b$ be $(\pm 5, 0)$ and $\sqrt{50}$, respectively. Then, the square of the eccentricity of the hyperbola $\frac{x^2}{b^2} - \frac{y^2}{a^2 b^2} = 1$ equals

Numerical answer — enter the value.

Step-by-step solution ► [prepwisar.in/questions/G7_LO6xfU9](https://www.prepwisar.in/questions/G7_LO6xfU9)

Q25 JEE Main 2023 · 11 Apr · Shift 1

Let $H_n : \frac{x^2}{1+n} - \frac{y^2}{3+n} = 1, n \in N$. Let k be the smallest even value of n such that the eccentricity of H_k is a rational number. If l is the length of the latus rectum of H_k , then $21l$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisar.in/questions/RJ7TUkMeI4](https://www.prepwisar.in/questions/RJ7TUkMeI4)

Q26 JEE Main 2023 · 31 Jan · Shift 2

Let H be the hyperbola, whose foci are $(1 \pm \sqrt{2}, 0)$ and eccentricity is $\sqrt{2}$. Then the length of its latus rectum is :

(A) $\frac{5}{2}$

(B) 3

(C) 2

(D) $\frac{3}{2}$

Step-by-step solution ► [prepwisar.in/questions/ZcgT_YqYh-](https://www.prepwisar.in/questions/ZcgT_YqYh-)

Q27 JEE Main 2022 · 26 Jul · Shift 2

If the line $x - 1 = 0$ is a directrix of the hyperbola $kx^2 - y^2 = 6$, then the hyperbola passes through the point :

(A) $(-2\sqrt{5}, 6)$

(B) $(-\sqrt{5}, 3)$

(C) $(\sqrt{5}, -2)$

(D) $(2\sqrt{5}, 3\sqrt{6})$

Step-by-step solution ► [prepwisar.in/questions/YtITbqRRSa](https://www.prepwisar.in/questions/YtITbqRRSa)

Q28 JEE Main 2022 · 25 Jul · Shift 2

Let the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{7} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{\alpha} = \frac{1}{25}$ coincide. Then the length of the latus rectum of the hyperbola is :

(A) $\frac{32}{9}$

(B) $\frac{18}{5}$

(C) $\frac{27}{4}$

(D) $\frac{27}{10}$

Step-by-step solution ► [prepwisar.in/questions/ydpEtZTUcQ](https://www.prepwisar.in/questions/ydpEtZTUcQ)

Q29 JEE Main 2022 · 29 Jun · Shift 1

Let $H : \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, $a > 0$, $b > 0$, be a hyperbola such that the sum of lengths of the transverse and the conjugate axes is $4(2\sqrt{2} + \sqrt{14})$. If the eccentricity of H is $\frac{\sqrt{11}}{2}$, then the value of $a^2 + b^2$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/V2gq0PbiX7](https://www.prepwiser.in/questions/V2gq0PbiX7)

Q30 JEE Main 2022 · 28 Jun · Shift 2

Let $a > 0$, $b > 0$. Let e and l respectively be the eccentricity and length of the latus rectum of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. Let e' and l' respectively be the eccentricity and length of the latus rectum of its conjugate hyperbola. If $e^2 = \frac{11}{14}l$ and $(e')^2 = \frac{11}{8}l'$, then the value of $77a + 44b$ is equal to :

(A) 100 (B) 110

(C) 120 (D) 130

[Step-by-step solution ► prepwiser.in/questions/1Ko9FdBmu6](https://www.prepwiser.in/questions/1Ko9FdBmu6)

Q31 JEE Main 2021 · 25 Feb · Shift 1

The locus of the point of intersection of the lines $(\sqrt{3})kx + ky - 4\sqrt{3} = 0$ and $\sqrt{3}x - y - 4(\sqrt{3})k = 0$ is a conic, whose eccentricity is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/mQSQOoroB0](https://www.prepwiser.in/questions/mQSQOoroB0)

Q32 JEE Main 2021 · 25 Feb · Shift 2

A hyperbola passes through the foci of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ and its transverse and conjugate axes coincide with major and minor axes of the ellipse, respectively. If the product of their eccentricities is one, then the equation of the hyperbola is :

(A) $\frac{x^2}{9} - \frac{y^2}{4} = 1$

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

(C) $\frac{x^2}{9} - \frac{y^2}{25} = 1$

(D) $x^2 - y^2 = 9$

[Step-by-step solution ► prepwiser.in/questions/IIX_z0ecLx](https://www.prepwiser.in/questions/IIX_z0ecLx)

Q33 JEE Main 2020 · 3 Sep · Shift 1

A hyperbola having the transverse axis of length $\sqrt{2}$ has the same foci as that of the ellipse $3x^2 + 4y^2 = 12$, then this hyperbola does not pass through which of the following points?

(A) $(1, -\frac{1}{\sqrt{2}})$

(B) $(\sqrt{\frac{3}{2}}, \frac{1}{\sqrt{2}})$

(C) $(-\sqrt{\frac{3}{2}}, 1)$

(D) $(\frac{1}{\sqrt{2}}, 0)$

[Step-by-step solution ► prepwiser.in/questions/MDLzYw3HS9](https://www.prepwiser.in/questions/MDLzYw3HS9)

Answer key — Hyperbola

Numbers match the question numbers above. For full working, open the solution link under each question.

1	12	2	8	3	B	4	D	5	2	6	B	7	C	8	12
9	85	10	D	11	A	12	D	13	D	14	B	15	A	16	189
17	120	18	D	19	55	20	A	21	B	22	25	23	C	24	51
25	306	26	C	27	C	28	D	29	88	30	D	31	2	32	B
33	B														

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