MATHS

BOOKS - SHRI BALAJI MATHS (ENGLISH)

HYPERBOLA

Exercise 1 Single Choice Problems

1. The normal to curve $xy = 4$ at the point (1, 4) meets curve again at :

A. $(-4, -1)$

B. $\left(-8, -\frac{1}{2}\right)$

C. $\left(-16, -\frac{1}{4}\right)$

D. $(-1, -4)$

Answer: C

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2. If $y = mx + c$ be a tangent to the hyperbola $\frac{x^2}{\lambda^2} - \frac{y^2}{(\lambda^3 + \lambda^2 + \lambda)^2} = 1, (\lambda \neq 0),$ then minimum value of 16m^2

A. 0

B. 1

C. 4

D. 9

Answer: D

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3. Let any double ordinate PNP' of the hyperbola $\frac{x^2}{25} - \frac{y^2}{16} = 1$ be produced on both sides to meet the asymptotes in Q and Q' . Then $PQ.P'Q$ is equal to

(a) 25 (b) 16 (c) 41 (d) none of these

A. 3

B. 4

C. 1

D. 5

Answer: A

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4. The eccentricity of the hyperbola $\left|\sqrt{(x-3)^2+(y-2)^2}-\sqrt{(x+1)^2+(y+1)^2}\right|=1$ is _____

A. 12

B. 14

C. 17

D. 10

Answer: D

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5. A normal to the hyperbola $\frac{x^2}{4} - \frac{y^2}{1} = 1$ has equal intercepts on the positive x- and y-axis. If this normal touches the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, then $a^2 + b^2$ is equal to 5 (b) 25 (c) 16 (d) none of these

A. 5

B. 25

C. 16

D. None of these

Answer: B

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6. The locus of a point whose chord of contact with respect to the circle $x^2 + y^2 = 4$ is a tangent to the hyperbola $xy = 1$ is a/an ellipse (b) circle hyperbola (d) parabola

A. ellipse

B. circle

C. hyperbola

D. parabola

Answer: C

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7. If the chord $x\cos\alpha + y\sin\alpha = p$ of the hyperbola $\frac{x^2}{16} - \frac{y^2}{18} = 1$ subtends a right angle at the center, and the diameter of the circle, concentric with the hyperbola, to which the given

chord is a tangent is d, then the value of $\frac{d}{4}$ is_____

A. 4

B. 5

C. 4

D. 7

Answer: C

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8. If the tangent and normal at a point on rectangular hyperbola cut-off intercept a_1, a_2 on x-axis and b_1, b_2 on the y-axis, then $a_1a_2 + b_1b_2$ is equal to :

A. 2

B. $\frac{1}{2}$

C. 0

D. -1

Answer: C

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Exercise 2 One Or More Than One Answer Is Are Correct

1. A common tangent to $9x^2 - 16y^2 = 144$ and $x^2 + y^2 = 9$, is

A. $y = \frac{3}{\sqrt{7}}x + \frac{15}{\sqrt{17}}$

B. $y = 3\sqrt{\frac{2}{\sqrt{17}}}x + \frac{25}{\sqrt{7}}$

C. $y = 2\sqrt{\frac{3}{7}}x + 15\sqrt{7}$

D. $y = -3\sqrt{\frac{2}{\sqrt{7}}}x + \frac{25}{\sqrt{7}}$

Answer: B::D

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2. Tangents are drawn to the hyperbola $x^2 - y^2 = 3$ which are parallel to the line $2x + y + 8 = 0$. Then their points of contact is/are :

A. (2, 1)

B. (2, -1)

C. (-2, -1)

D. (-2, -1)

Answer: B::D

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3. If the line $ax + by + c = 0$ is a normal to the curve $xy = 1$, then $a > 0, b > 0$ $a > 0, b < 0$ $a\langle 0, b\rangle 0$ (d) $a < 0, b < 0$ none of these

A. $a > 0, b > 0$

B. $a > 0, b < 0$

C. $b < 0, a < 0$

D. $a < 0, b > 0$

Answer: B::D

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4. A circle cuts the rectangular hyperbola $xy = 1$ in the points $(x_r, y_r), r = 1, 2, 3, 4.$

Prove that $x_1x_2x_3x_4 = y_1y_2y_3y_4 = 1$

A. $y_1y_2y_3y_4 = 1$

B. $x_1x_2x_3x_4 = 1$

C. $x_1x_2x_3x_4 = y_1y_2y_3y_4 = -1$

D. $y_1y_2y_3y_4 = 0$

Answer: B

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Exercise 3 Comprehension Type Problems

1. A point P moves such that the sum of the slopes of the normals drawn from it to the hyperbola xy = 16 is equal to the sum of ordinates of feet of normals . The locus of P is a curve C.

The equation of the curve C is

A. $x^2 = 4y$

B. $x^2 = 16y$

C. $x^2 = 12y$

D. $y^2 = 8x$

Answer: B

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2. A point P moves such that the sum of the slopes of the normals drawn from it to the hyperbola xy = 16 is equal to the sum of ordinates of feet of normals . The locus of P is a curve C.

The equation of the curve C is

A. $x^2 = 4y$

B. $x^2 = 2y$

C. $x^2 + 2y = 0$

D. $x^2 + 4y = 0$

Answer: C

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3. A point P moves such that the sum of the slopes of the normals drawn from it to the hyperbola xy = 16 is equal to the sum of ordinates of feet of normals . The locus of P is a curve C.

The equation of the curve C is

A. $768\sqrt{3}$

B. $776\sqrt{3}$

C. $760\sqrt{3}$

D. None of these

Answer: A

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Exercise 4 Subjective Type Problems

1. Let $y = mx + c$ be a common tangent to $\frac{x^2}{16} - \frac{y^2}{9} = 1$ and $\frac{x^2}{4} + \frac{y^2}{3} = 1$, then find the value of $m^2 + c^2$.

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2. The maximum number of normals that can be drawn to an ellipse passing through a given point is :

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3. Tangents at P to rectangular hyperbola $xy = 2$ meets coordinate axes at A and B, then area of triangle OAB (where O is origin) is _____.

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