MATHS

BOOKS - VIKAS GUPTA MATHS (HINGLISH)

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. Let $PQ: 2x + y + 6 = 0$ is a chord of the curve $x^2 - 4y^2 = 4$. Coordinates of the point $R(\alpha, \beta)$ that satisfy $\alpha^2 + \beta^2 - 1 \leq 0$, such that area of triangle PQR is minimum, are given by :

A. $\left(\frac{-2}{\sqrt{5}}, \frac{1}{\sqrt{5}}\right)$

B. $\left(\frac{-2}{\sqrt{5}}, \frac{-1}{\sqrt{5}}\right)$

C. $\left(\frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}}\right)$

D. $\left(\frac{2}{\sqrt{5}}, \frac{-1}{\sqrt{5}}\right)$

Answer: B

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3. If $y = mx + c$ be a tangent to hyperbola $\frac{x^2}{\lambda^2} - \frac{y^2}{\left(\lambda^3 + \lambda^2 + \lambda\right)^2} = 1$, then least value of $16m^2$ equals to :

A. 0

B. 1

C. 4

D. 9

Answer: D

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4. Let the couble ordinate pp' of the hyperbola $\frac{x^2}{4} - \frac{y^2}{3} = 1$ is produced both sides to meet asymptotes of hyperbola in Q and Q'. The product (PQ)(PQ)' is equal to :

A. 3

B. 4

C. 1

D. 5

Answer: A

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5. If eccentricity of conjugate hyperbola of the given hyperbola :

$$\left|\sqrt{(x-1)^2+(y-2)^2}-\sqrt{(x-5)^2+(y-5)^2}\right|=3$$

is e', then value of 8e' is :

A. 12

B. 14

C. 17

D. 10

Answer: D

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6. A normal to the hyperbola $\frac{x^2}{4} - \frac{y^2}{1} = 1$ has equal intercepts on positive x and positive y-axes. If this normal touches the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, then $3\left(a^2 + b^2\right)$ is equal to :

A. 5

B. 25

C. 16

D. None of these

Answer: B

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7. Locus of a point, w hose chord of contact with respect to the circle $x^2 + y^2 = 4$ is a tangent to the hyperbola $xy = 1$ is a/an :

A. ellipse

B. circle

C. hyperbola

D. parabola

Answer: C

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8. 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. 6

D. 7

Answer: C

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9. If the tangent and the normal to a rectangular hyperbola $xy = c^2$, at a point , cuts off intercepts a_1 and a_2 on the x- axis and $b_1 b_2$ on the y- axis, then $a_1 a_2 + b_1 b_2$ 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. The tangent to the hyperbola $x^2 - y^2 = 3$ are parallel to the straight line $2x + y + 8 = 0$ at the following points

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 $(x_1, y_1), r = 1, 2, 3, 4.$

Prove that $x_1x_2x_3x_4 = y_1y_2y_3y_4 = 1$

A. $y_1y_2y_3y_4 = 1$

B. $x_1x_2x_3x_4 =$

C. $x_1x_2x_3x_4 = y_1y_2y_3y_4 = -1$

D. $y_1y_2y_3y_4 = 0$

Answer: A::B

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Exercise 3 Comprehension Type Problems

1. A point P moves such that sum of the slopes of the normals drawn from it to the hyperbola $xy = 16$ is equal to the sum of the ordinates of the feet of the normals. Let 'P' lies on the curve C, then :

Q. The equation of '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 sum of the slopes of the normals drawn from it to the hyperbola $xy = 16$ is equal to the sum of the ordinates of the feet of the normals. Let 'P' lies on the curve C, then :

Q. If tangents are drawn to the curve C, then the locus of the midpoint of the portion of tangent intercepted between the co-ordinate axes, 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 sum of the slopes of the normals drawn from it to the hyperbola $xy = 16$ is equal to the sum of the ordinates of the feet of the normals. Let 'P' lies on the curve C, then :

Q. Area of the equilateral triangle, inscribed in the curve C, and having one vertex same as the vertex of 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/hyperbola 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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