MATHS

BOOKS - DHANPAT RAI & CO MATHS (HINGLISH)

HYPERBOLA

Illustration

1. The equation of the hyperbola whose focus is $(1, 2)$, directrix is the line $x + y + 1 = 0$ and eccentricity $3/2$, is

A. $x^2 + y^2 + 18xy + 34x + 50y - 31 = 0$

B. $x^2 + y^2 - 18xy - 2x - 14y + 31 = 0$

C. $x^2 + y^2 + 18xy + 34x + 50y + 49 = 0$

D. $x^2 + y^2 - 18xy + 34x + 50y - 31 = 0$

Answer: A

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2. If e and e' the eccentricities of a hyperbola and its conjugate,than $\frac{1}{e^2} + \frac{1}{e'^2} =$.

A. 0

B. 1

C. 2

D. none of these

Answer: B

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3. The eccentricity of the conjugate hyperbola of the hyperbola $x^2 - 3y^2 = 1$ is

A. 2

B. $\frac{2}{\sqrt{3}}$

C. 4

D. $\frac{4}{3}$

Answer: A

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4. The eccentricity of the hyperbola $-\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is given by

A. $\sqrt{\frac{a^2+b^2}{a^2}}$

B. $\sqrt{\frac{a^2-b^2}{a^2}}$

C. $\sqrt{\frac{b^2-a^2}{a^2}}$

D. $\sqrt{\frac{a^2+b^2}{b^2}}$

Answer: D

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5. The equation

$16x^2 - 3y^2 - 3y^2 - 32x + 12y - 44 = 0$

represents a hyperbola.

A. the length of whose transverse axis is $4\sqrt{3}$

B. the length of whose conjugate axis is 4

C. whose centre is $(-1, 2)$

D. whose eccentricity is $\sqrt{\frac{19}{3}}$

Answer: D

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6. If e and e' be the eccentricities of two conics $S=0$ and $S'=0$ and if $e^2+e'^2=3$, then both S and S' can be

A. $hyperbolas$

B. $ellipses$

C. $parabolas$

D. none of these

Answer: A

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7. If e_1 is the eccentricity of the ellipse $\frac{x^2}{16} + \frac{y^2}{25} = 1$ and e_2 is the eccentricity of the hyperbola passing through the foci of the ellipse and $e_1 e_2 = 1$, then equation of the hyperbola is

A. $\frac{x^2}{9} - \frac{y^2}{16} = 1$

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

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

D. none of these

Answer: B

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8. For hyperbola $x^2 \sec^2 \alpha - y \cos ec^2 \alpha = 1,$ which of the following remains constant with change in $'\alpha'$

A. abscissae of vertex

B. abscissae of foci

C. eccentricity

D. directrix

Answer:

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9. The equation of the transvers and conjugate axes of a hyperbola are, respectively, $x + 2y - 3 = 0$ and $2x - y + 4 = 0$, and their respective lengths are $\sqrt{2}$ and $2\sqrt{3}$. The equation of the hyperbola is

A. $\frac{2}{5}(x + 2y - 3)^2 - \frac{3}{5}(2x - y + 4)^2 = 1$

B. $\frac{2}{5}(2x - y + 4)^2 - \frac{3}{5}(x + 2y - 3)^2 = 1$

C. $2(2x - y + 4)^2 - 3(x + 2y - 3)^2 = 1$

D. $2(x+2y-3)^2-3(2x-2y+4)^2=1$

Answer: B

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10. Find the equation of the hyperbola, the length of whose latusrectum is 8 and eccentricity is $3/\sqrt{5}$.

A. $5x^2-4y^2=100$

B. $4x^2-5y^2=100$

C. $-4x^2+5y^2=100$

D. $-5x^2+4y^2=100$

Answer: B

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11. The foci of a hyperbola coincide with the foci of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$. Find the equation of the hyperbola, if its eccentricity is 2.

A. $3x^2 - y^2 = 6$

B. $3x^2 - y^2 = 12$

C. $x^2 - 3y^2 = 12$

D. none of these

Answer: B

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12. Find the equation of the hyperbola whose conjugate axis is 5 and the distance between the foci is 13.

A. $25x^2 - 144y^2 = 900$

B. $-25x^2 + 144y^2 = 900$

C. $144x^2 - 25y^2 = 900$

D. $-144x^2 + 25y^2 = 900$

Answer: A

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13. Find the equation of the hyperbola whose foci are $(8, 3) and (0, 3)$ and eccentricity $= \frac{4}{3}$.

A. $49x^2 - 3y^2 = 147$

B. $7x^2 - 9y^2 = 63$

C. $7(x-4)^2 - 9(y-3)^2 = 63$

D. $7(x+4)^2 - 9(y+3)^2 = 63$

Answer: C

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14. Prove that the locus of the center of the circle which touches the given circle externally and the given line is a parabola.

A. a circle

B. an ellipse

C. a hyperbola

D. a pair of straight lines

Answer:

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15. The eccentricity of the hyperbola $9x^2 - 16y^2 + 72x - 32y - 16 = 0$, is

A. $\frac{5}{4}$

B. $\frac{4}{5}$

C. $\frac{9}{16}$

D. $\frac{16}{9}$

Answer: A

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16. The eccentricity of the hyperbola whose length of the latus rectum is equal to 8 and the length of its conjugate axis is equal to half of the distance between its foci, is :

A. $\frac{4}{3}$

B. $\frac{4}{\sqrt{3}}$

C. $\frac{2}{\sqrt{3}}$

D. $\sqrt{3}$

Answer: C

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17. Let a and b respectively be the semi-transverse and semi-conjugate axes of a hyperbola whose eccentricity satisfies the equation $9e^2 - 18e + 5 = 0$. If $S(5, 0)$ is a focus and $5x = 9$ is the corresponding directrix of this hyperbola, then $a^2 - b^2$ is equal to

A. -7

B. -5

C. 5

D. 7

Answer:

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18. The equation of the hyperbola whose foci are (-2, 0) and (2,0) and eccentricity is 2 is given by

A. $3x^2 - y^2 = 3$

B. $-x^2 + 3y^2 = 3$

C. $-3x^2 + y^2 = 3$

D. $x^2 - 3y^2 = 3$

Answer:

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19. If the chord joining the points $(a\sec\theta_1, b\tan\theta_1)$ and $(a\sec\theta_2, b\tan\theta_2)$ on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is a focal chord, then prove that $\tan\left(\frac{\theta_1}{2}\right)\tan\left(\frac{\theta_2}{2}\right) + \frac{ke-1}{ke+1} = 0$, where $k = \pm 1$

A. $\frac{1-e}{1+e}$

B. $\frac{e-1}{e+1}$

C. $\frac{e+1}{e-1}$

D. $\frac{1+e}{1-e}$

Answer:

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20. If the line $lx + my + n = 0$ touches the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. Then

A. $a^2l^2 + b^2m^2 = n^2$

B. $a^2l^2 - b^2m^2 = n^2$

C. $a^2m^2 - b^2n^2 = l^2$

D. $a^2n^2 - b^2l^2 = m^2$

Answer: B

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21. If the straight line $x\cos\alpha + y\sin\alpha = p$ touches the curve $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then p^2.

A. $a^2\cos^2\alpha - b^2\sin^2\alpha = p^2$

B. $a^2\cos^2\alpha - b^2\sin^2\alpha = p$

C. $a^2\cos^2\alpha + b^2\sin^2\alpha = p^2$

D. $a^2\cos^2\alpha + b^2\sin^2\alpha = p$

Answer: C

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22. If the line $y = 3x + \lambda$ touches the hyperbola $9x^2 - 5y^2 = 45$, then λ=

A. $\pm 3\sqrt{6}$

B. ± 6

C. ± 3

D. ± 4

Answer: B

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23. If the line $y = 2x + \lambda$ be a tangent to the hyperbola $36x^2 - 25y^2 = 3600$, then λ is equal to

A. 16

B. -16

C. ± 16

D. none of these

Answer: C

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24. The locus a point $P(\alpha, \beta)$ moving under the condition that the line $y = \alpha x + \beta$ is a tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

A. a hyperbola

B. a parabola

C. a circle

D. an ellipse

Answer: A

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25. If the line $2x + \sqrt{6}y = 2$ touches the hyperbola $x^2 - 2y^2 = 4$, then the point of contact is

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

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

C. $\left(\frac{1}{2}, \frac{1}{\sqrt{6}}\right)$

D. $(4, -\sqrt{6})$

Answer: D

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26. The line $2x + y = 1$ is tangent to the hyperbla $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. If this line passes through the point of intersection of the nearest directrix and the x-axis, then the eccentricity of the hyperbola is

A. $\sqrt{2}$

B. 2

C. $\sqrt{3}$

D. 1

Answer: B

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27. If $2x - y + 1 = 0$ is a tangent to hyperbola $\frac{x^2}{a^2} + \frac{y^2}{16} = 1$, then which of the following are sides of a right angled triangle ?

A. $2a, 4, 1$

B. $2a, 8, 1$

C. $a, 4, 1$

D. $a, 4, 2$

Answer:

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28. The foci of a hyperbola coincide with the foci of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$. If the eccentricity of the hyperbola is 2, then the equation of the tangent of this hyperbola passing through the point $(4, 6)$ is

A. $2x - y - 2 = 0$

B. $3x - 2y = 0$

C. $2x - 3y + 10 = 0$

D. $x - 2y + 8 = 0$

Answer: A

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29. The equation of the tangent to the hyperbola $2x^2 - 3y^2 = 6$which is parallel to the line $y = 3x + 4$, is

A. $y = 3x + 5$

B. $y = 3x - 5$

C. $y = 3x + 5$ and $y = 3x - 5$

D. none of these

Answer: C

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30. The equation of the tangent to the hyperbola $3x^2 - y^2 - 3$ which is perpendicular to the line $x + 3y - 2 = 0$ is

A. $y = 3x \pm \sqrt{6}$

B. $y = 3x \pm 2\sqrt{3}$

C. $y = 3x \pm \sqrt{3}$

D. none of these

Answer:

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31. The equation of the tangent to the hyperbola $16x^2 - 9y^2 = 144$ at $(5, 8/3)$, is

A. $10x + 3y = 18$

B. $10x - 3y = 18$

C. $10x - 3y = 9$

D. $10x + 3y = 9$

Answer:

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32. The product of the perpendicular from two foci on any tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

A. b^2

B. $2b^2$

C. a^2

D. $2a^2$

Answer:

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33. Let P(6,3) be a point on the hyperbola parabola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$If the normal at the point intersects the x-axis at (9,0), then the eccentricity of the hyperbola is

A. $\sqrt{\frac{5}{2}}$

B. $\sqrt{\frac{3}{2}}$

C. $\sqrt{2}$

D. $\sqrt{3}$

Answer:

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34. A hyperbola passes through the point $P(\sqrt{2}, \sqrt{3})$ and has foci at $(\pm 2, 0)$.Then the tangent to this hyperbola at P also passes through the point

A. $(\sqrt{3}, \sqrt{2})$

B. $(-\sqrt{2}, -\sqrt{3})$

C. $(3\sqrt{2}, 2\sqrt{3})$

D. $(2\sqrt{2}, 3\sqrt{3})$

Answer:

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35. The line $lx + my + n = 0$ will be a normal to the hyperbola $b^2x^2 - a^2y^2 = a^2b^2$ if

A. $\frac{a^2}{l^2} + \frac{b^2}{m^2} = \frac{\left(a^2 + b^2\right)^2}{n^2}$

B. $\frac{a^2}{l^2} - \frac{b^2}{m^2} = \frac{\left(a^2 - b^2\right)^2}{n^2}$

C. $\frac{a^2}{l^2} - \frac{b^2}{m^2} = \frac{\left(a^2 + b^2\right)^2}{n^2}$

D. none of these

Answer: C

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36. If the normal at $'\theta'$ on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ meets the transverse axis at G, and A and A' are the vertices of the hyperbola , then $AC.\, A'G =$

A. $a^2\left(e^2 \sec^2\theta - 1\right)$

B. $a^2\left(e^4 \sec^2\theta - 1\right)$

C. $a^2\left(e^4 \sec^2\theta + 1\right)$

D. none of these

Answer:

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37. Let $P(a\sec\theta, b\tan\theta)$ and $Q(a\sec c\phi, b\tan\phi)$ (where $\theta+\phi=\frac{\pi}{2}$ be two points on the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ If (h,k) is the point of intersection of the normals at P and Q then k is equal to (A) $\frac{a^2+b^2}{a}$ (B) $-\left(\frac{a^2+b^2}{a}\right)$ (C) $\frac{a^2+b^2}{b}$ (D) $-\left(\frac{a^2+b^2}{b}\right)$

A. $\frac{a^2+b^2}{a}$

B. $-\frac{a^2+b^2}{a}$

C. $\frac{a^2+b^2}{b^2}$

D. $-\frac{a^2+b^2}{b}$

Answer:

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38. The equation of the chord of contact of tangents drawn from a point $(2, -1)$ to the hyperbola $16x^2 - 9y^2 = 144$, is

A. $9x + 32y = 144$

B. $32x - 9y = 144$

C. $32x + 9y = 144$

D. none of these

Answer: C

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39. The point of intersection of tangents drawn to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at the points where it is intersected by the line $lx + my + n = 0$, is $\left(\frac{-a^2l}{n}, \frac{b^2m}{n}\right)$ (b) $\left(\frac{-a^2l}{m}, \frac{b^2n}{m}\right)$ $\left(\frac{a^2l}{m}, \frac{-b^2n}{m}\right)$ (d) $\left(\frac{a^2l}{m}, \frac{b^2n}{m}\right)$

A. $\left(\frac{a^2l}{n}, -\frac{b^2m}{n}\right)$

B. $\left(-\frac{a^2l}{n}, \frac{b^2m}{n}\right)$

C. $\left(\frac{a^2l}{n}, \frac{b^2m}{n}\right)$

D. $\left(-\frac{a^2l}{n}, \frac{-b^2m}{n}\right)$

Answer:

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40. The equation of the chord of $x^2 - y^2 = 9$ which is bisected at $(5, -3)$, is

A. $5x + 3y - 16 = 0$

B. $2x - 3y - 19 = 0$

C. $3x + 5y = 0$

D. none of these

Answer:

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41. The locus of the midde points ofchords of hyperbola $3x^2 - 2y^2 + 4x - 6y = 0$ parallel to $y = 2x$ is

A. $3x - 4y = 4$

B. $3y - 4x + 4 = 0$

C. $4x - 4y = 3$

D. $3x - 4y = 2$

Answer:

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42. The pole of the line $lx + my + n = 0$ with respect to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, is

A. $\left(\frac{a^2 l}{n}, \frac{b^2 m}{n}\right)$

B. $\left(-\frac{a^2 l}{n}, \frac{b^2 m}{n}\right)$

C. $\left(\frac{a^2 l}{n}, -\frac{b^2 m}{n}\right)$

D. $\left(-\frac{a^2 l}{n}, \frac{-b^2 m}{n}\right)$

Answer:

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43. The locus of the poles of the chords of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ which subtend a right angle at its centre is

A. $\frac{x^2}{a^4} + \frac{y^2}{b^4} = 1$

B. $\frac{x^2}{a^4} + \frac{y^2}{b^4} = \frac{1}{a^2} + \frac{1}{b^2}$

C. $\frac{x^2}{a^4} + \frac{y^2}{b^4} = \frac{1}{a^2} - \frac{1}{b^2}$

D. $\frac{x^2}{a^4} - \frac{y^2}{b^4} = \frac{1}{a^2} - \frac{1}{b^2}$

Answer:

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44. The equations of the asymptotes of the hyperbola $2x^2 + 5xy + 2y^2 - 11x - 7y - 4 = 0$ are

A. $2x^2 + 5xy + 2y^2 - 11x - 7y - 5 = 0$

B. $2x^2 + 4xy + 2y^2 - 7x - 11y - 5 = 0$

C. $2x^2 + 5xy + 2y^2 - 11x - 7y + 5 = 0$

D. none of these

Answer: C

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45. Find the equation of the hyperbola whose asymptotes are $3x = \pm 5y$ and the vertices are $(\pm 5, 0)$

A. $3x^2 - 5y^2 = 25$

B. $5x^2 - 3y^2 = 25$

C. $9x^2 - 25y^2 = 225$

D. $225x^2 - 9y^2 = 225$

Answer: C

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46. .Find the product of lengths of the perpendiculars from any point on the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ to its asymptotes.

A. $\frac{a^2b^2}{a^2+b^2}$

B. $\frac{ab}{a^2+b^2}$

C. $\frac{a^2b^2}{a+b}$

D. $\frac{1}{a^2+b^2}$

Answer:

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47. If e_1 and e_2 are the eccentricites of hyperbola $xy = c^2$ and $x^2 - y^2 = c^2$, then $e_1^2 + e_2^2 =$

A. 1

B. 4

C. 6

D. 8

Answer: B

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48. The normal to the rectangular hyperbola $xy = 4$ at the point t_1 meets the curve again at the point t_2 Then the value of to t_2 is

A. $t_2 = -\frac{1}{t_1^3}$

B. $t_1 = -\frac{1}{t_2^3}$

C. $t_2^3 = -\frac{1}{t_1^3}$

D. $t_2 = \frac{1}{t_1^3}$

Answer: A

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49. If the tangent and normal to a rectangular hyperbola cut off intercepts a_1 and a_2 on one axis and b_1 and b_2 on the other, then

A. $a_1a_2 + b_1b_2 = 0$

B. $a_1a_2 = -b_1b_2$

C. $a_1b_2 = a_2b_1$

D. $a_1a_2 = b_1b_2$

Answer:

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Section I Solved Mcqs

1. The eccentricity of the conic represented by $x^2 - y^2 - 4x + 4y + 16 = 0$ is 1 (b) $\sqrt{2}$ (c) 2 (d) $\frac{1}{2}$

A. 1

B. $\sqrt{2}$

C. 2

D. $1/2$

Answer:

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2. Find the vertices of the hyperbola $9x^2 = 16y^2 - 36x + 96y - 252 = 0$

A. $(6, 3)$ and $(-6, 3)$

B. $(6, 3)$ and $(-2, 3)$

C. $(-6, 3)$ and $(-6, -3)$

D. none of these

Answer:

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3. The centre of the hyperbola

$9x^2 - 36x - 16y^2 + 96y - 252 = 0$, are

A. $(2, 3)$

B. $(-2, -3)$

C. $(-2, 3)$

D. $(2, -3)$

Answer:

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4. The eccentricity of the hyperbola with latursrectum 12 and semi-conjugate axis is $2\sqrt{3}$, is

A. 2

B. 3

C. $\sqrt{3}/2$

D. $2\sqrt{3}$

Answer:

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5. The equation of the hyperbola with vertices $(3, 0)$ and $(-3, 0)$ and semi-latursrectum 4, is given by

A. $4x^2 - 3y^2 + 36 = 0$

B. $4x^2 - 3y^2 + 12 = 0$

C. $4x^2 - 3y^2 - 36 = 0$

D. none of these

Answer:

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6. Find the equation of tangents to the curve $4x^2 - 9y^2 = 1$ which are parallel to $4y = 5x + 7$.

A. $24y - 30x = 17$

B. $30y - 24x = \pm\sqrt{161}$

C. $24y - 30x = \pm\sqrt{161}$

D. none of these

Answer:

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7. The equation of the tangent parallel to $y = x$ drawn to $\frac{x^2}{3} - \frac{y^2}{2} = 1$, is

A. $x - y + 1 = 0$

B. $x - y + 2 = 0$

C. $x - y + 3 = 0$

D. $x - y - 2 = 0$

Answer:

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8. If m is a variable, then prove that the locus of the point of intersection of the lines $\frac{x}{3} - \frac{y}{2} = m$ and $\frac{x}{3} + \frac{y}{2} = \frac{1}{m}$ is a hyperbola.

A. parabola

B. ellipse

C. hyperbola

D. none of these

Answer:

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9. If the chords of contact of tangents fromtwo points (x_1, y_1) and (x_2, y_2) to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ are at right angles, then $\frac{x_1 x_2}{y_1 y_2}$ is equal to (a) $\frac{a^2}{-b^2}$ (b) $\frac{b^2}{-a^2}$ (c) $\frac{b^4}{-a^4}$

A. $-\frac{a^2}{b^2}$

B. $-\frac{b^2}{a^2}$

C. $-\frac{b^4}{a^4}$

D. $-\frac{a^4}{b^4}$

Answer:

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10. The equation of the chord joining two points (x_1, y_1) and (x_2, y_2) on the rectangular hyperbola $xy = c^2$, is

A. $\frac{x}{x_1 + x_2} + \frac{y}{y_1 + y_2} = 1$

B. $\frac{x}{x_1 - x_2} + \frac{y}{y_1 - y_2} = 1$

C. $\frac{x}{y_1 + y_2} + \frac{y}{x_1 + x_2} = 1$

D. $\frac{x}{y_1 - y_2} + \frac{y}{x_1 - x_2} = 1$

Answer: A

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11. From any point to the hyperbola $\hat{} \frac{2}{a^2} - \frac{y^2}{b^2} = 1,$ tangents are drawn to thehyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 2$ The area cut off bythe chord of contact on the regionbetween the asymptotes is equal to

A. $\frac{ab}{2}$

B. ab

C. $2ab$

D. $4ab$

Answer:

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12. PQ and RS are two perpendicular chords of the rectangular hyperbola $xy = c^2$. If C is the center of the rectangular hyperbola, then find the value of product of the slopes of CP, CQ, CR, and CS.

A. -1

B. 1

C. 0

D. none of these

Answer:

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13. If PN is the perpendicular from a point on a rectangular hyperbola $xy = c^2$ to its asymptotes, then find the locus of the midpoint of PN

A. circle

B. parabola

C. ellipse

D. hyperbola

Answer:

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14. The combined equation of the asymptotes of the hyperbola $2x^2 + 5xy + 2y^2 + 4x + 5y = 0$ is -

A. $2x^2 + 5xy + 2y^2 + 4x + 5y + 2 = 0$

B. $2x^2 + 5xy + 2y^2 + 4x + 5y - 2 = 0$

C. $2x^2 + 5xy + 2y^2 = 0$

D. none of these

Answer:

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15. If $x = 9$ is the chord of contact of the hyperbola $x^2 - y^2 = 9$ then the equation of the corresponding pair of tangents is (A) $9x^2 - 8y^2 + 18x - 9 = 0$ (B) $9x^2 - 8y^2 - 18x + 9 = 0$ (C) $9x^2 - 8y^2 - 18x - 9 = 0$ (D) 9x^2-8y^2+18x+9=0`

A. $9x^2 - 8y^2 + 18x - 9 = 0$

B. $9x^2 - 8y^2 - 18x + 9 = 0$

C. $9x^2 - 8y^2 - 18x - 9 = 0$

D. $9x^2 - 8y^2 + 18x + 9 = 0$

Answer:

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16. The slopes of the common tangents of the hyperbolas $\frac{x^2}{9} - \frac{y^2}{16} = 1$ and $\frac{y^2}{9} - \frac{x^2}{16} = 1$, are

A. ± 2

B. ± 1

C. $\pm 1/2$

D. none of these

Answer:

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17. Consider a branch of the hypebola $x^2 - 2y^2 - 2\sqrt{2}x - 4\sqrt{2}y - 6 = 0$ with vertex at the point A. Let B be one of the end points of its latus rectum. If C is the focus of the hyperbola nearest to the point A, then the area of the triangle ABC is

A. $1 - \sqrt{\frac{2}{3}}$

B. $\sqrt{\frac{3}{2} - 1}$

C. $1 + \sqrt{\frac{2}{3}}$

D. $\sqrt{\frac{3}{2} + 1}$

Answer: B

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18. A hyperbola, having the transverse axis of length $2\sin\theta$, is confocal with the ellipse $3x^2 + 4y^2 = 12$. Then its equation is

A. $x^2 \cos ec^2\theta - y^2 \sec^2\theta = 1$

B. $x^2 \sec^2\theta - y^2 \cos ec^2\theta = 1$

C. $x^2 \sin^2\theta - y^2 \cos^2\theta = 1$

D. $x^2 \cos^2\theta - y^2 \sin^2\theta = 1$

Answer:

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19. The locus of the point of intersection of the tangents at the ends of normal chord of the hyperbola $x^2 - y^2 = a^2$ is

A. $y^4 - x^4 = 4a^2x^2y^2$

B. $y^2 - x^2 = 4a^2x^2y^2$

C. $a^2(y^2 - x^2) = 4x^2y^2$

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

Answer:

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20. If angle subtended by any chord of a rectangular hyperbola at the centre is α and angle between the tangents at ends of chord is β, then

A. $\alpha = 2\beta$

B. $\beta = 2\alpha$

C. $\alpha + \beta = \pi$

D. $\alpha + \beta = \frac{\pi}{2}$

Answer:

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21. If a hyperbola passing through the origin has $3x - 4y - 1 = 0$ and $4x - 3y - 6 = 0$ as its asymptotes, then find the equation of its transvers and conjugate axes.

A. $x - y - 5 = 0$ and $x + y + 1 = 0$

B. $x - y = 0$ and $x + y + 5 = 0$

C. $x - y - 5 = 0$ and $x - y - 1 = 0$

D. $x + y - 1 = 0$ and $x - y - 5 = 0$

Answer:

Watch Video Solution

22. If PQ is a double ordinate of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ such that OPQ is an equilateral triangle, O being the center of the hyperbola, then find the range of the eccentricity e of the hyperbola.

A. $1 < e < \frac{2}{\sqrt{3}}$

B. $e = \frac{2}{\sqrt{3}}$

C. $e = \frac{\sqrt{3}}{2}$

D. $e > \frac{2}{\sqrt{3}}$

Answer:

Watch Video Solution

23. The normal at P to a hyperbola of eccentricity e, intersects its transverse and conjugate axes at L and M respectively. Show that the locus of the middle point of LM is a hyperbola of eccentricity $\frac{e}{\sqrt{e^2-1}}$

A. $\frac{e+1}{e-1}$

B. $\frac{e}{\sqrt{e^2-1}}$

C. e

D. none of these

Answer:

Watch Video Solution

24. An ellipse intersects the hyperbola $2x^2 - 2y^2 = 1$ orthogonally. The eccentricity of the ellipse is reciprocal of that of the hyperbola. If the axes of the ellipse are along the coordinate axes, then

A. Equation of the ellipse is $x^2 + 2y^2 = 2$ with foci at $(\pm 1, 0)$

B. Equation of the ellipse is $x^2 + 2y^2 = 2$ with foci at $\left(\pm \sqrt{2}, 0\right)$

C. Equation of the ellipse is $x^2 + 2y^2 = 4$ with foci at $(\pm 1, 0)$

D. Equation of the ellipse is $x^2 + 2y^2 = 4$ with foci at $\left(\pm \sqrt{2}, 0 \right)$

Answer: A

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25. If a variable straight line $x \cos \alpha + y \sin \alpha = p$ which is a chord of hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 (b > a)$ subtends a right angle at the centre of the hyperbola, then it always touches a fixed circle whose radius, is

A. $\frac{ab}{\sqrt{b - 2a}}$

B. $\frac{a}{a-b}$

C. $\frac{ab}{\sqrt{b^2-a^2}}$

D. $\frac{ab}{\sqrt{b+a}}$

Answer:

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26. If $H(x, y) = 0$ represents the equation of a hyperbola and $A(x, y) = 0$, $C(x, y) = 0$ the joint equation of its asymptotes and the conjugate hyperbola respectively, then for any point (α, β) in the plane $H(\alpha, \beta), A(\alpha, \beta)$, and $C(\alpha, \beta)$ are in

A. $A.P.$

B. $G.P.$

C. $H.P.$

D. none of these

Answer:

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27. The equation of a tangent to the hyperbola $16x^2 - 25y^2 - 96x + 100y - 356 = 0$, which makes an angle $\pi/4$ with the transverse axis, is

A. $y = x + 2$

B. $y = x - 5$

C. $y = x + 3$

D. $x = y + 2$

Answer:

Watch Video Solution

28. The point of intersection of two tangents to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, the product of whose slopes is c^2, lies on the curve

A. $y^2 - b^2 = c^2(x^2 + a^2)$

B. $y^2 + a^2 = c^2(x^2 - b^2)$

C. $y^2 + b^2 = c^2(x^2 - a^2)$

D. $y^2 - a^2 = c^2(x^2 + b^2)$

Answer:

Watch Video Solution

29. Let A and B be two fixed points and P, another point in the plane, moves in such a way that $k_1PA + k_2PB = k_3$, where k_1, k_2 and k_3 are real

constants. The locus of P is

Which one of the above is not true ?

A. a circle if $k_1 = 0$ and $k_2, k_3 > 0$

B. a circle if $k_1 > 0$ and $k_2 < 0, k_3 = 0$

C. an ellipse if $k_1 = k_2 > \ = 0$ and $k_3 > 0$

D. a hyperbola if $k_2 = \ -1$ and $k_1, k_3 > 0$

Answer:

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30. The equation of the line passing through the centre of a rectangular hyperbola is $x - y - 1 = 0$.

If one of its asymptotoes is $3x - 4y - 6 = 0$, the equation of the other asymptote is

A. $4x + 3y + 17 = 0$

B. $4x - 3y + 8 = 0$

C. $3x - 2y + 15 = 0$

D. none of these

Answer: A

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31. If radii of director circles of $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ are $2r$ and r

respectively, let e_E and e_H are the eccentricities of ellipse and hyperbola respectively, then

A. $2e_h^2 - e_e^2 = 6$

B. $e_e^2 - 4e_h^2 = 6$

C. $4e_h^2 - e_e^2 = 6$

D. none of these

Answer:

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32. A variable straight line of slope 4 intersects the hyperbola $xy = 1$ at two points. The locus of the

point which divides the line segment between these two points in the ratio $1:2$ is

A. $16x^2 + 10xy + y^2 = 2$

B. $16x^2 - 10xy + y^2 = 2$

C. $16x^2 + 10xy + y^2 = 4$

D. none of these

Answer:

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33. If $P(a\sec\alpha, b\tan\alpha)$ and $Q(a\sec\beta, b\tan\beta)$ are two points on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ such

that $\alpha - \beta = 2\theta$ (a constant), then PQ touches the hyperbola

A. $\frac{x^2}{a^2 \sec^2 \theta} - \frac{y^2}{b^2} = 1$

B. $\frac{x^2}{a^2} - \frac{y^2}{b^2 \sec^2 \theta} = 1$

C. $\frac{x^2}{a^2} - \frac{y^2}{b^2} = \cos^2 \theta$

D. none of these

Answer:

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34. If the tangents drawn from a point on the hyperbola $x^2 - y^2 = a^2 - b^2$ to ellipse

$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ make angle α and β with the transverse axis of the hyperbola, then

A. $\tan\alpha - \tan\beta = 1$

B. $\tan\alpha + \tan\beta = 1$

C. $\tan\alpha \tan\beta = 1$

D. $\tan\alpha \tan\beta = -1$

Answer:

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35. The locus of the point of intersection of the tangents at the end-points of normal chords of the

hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, is

A. $\frac{a^6}{x^2} + \frac{b^6}{y^2} = \left(a^2 + b^2\right)^2$

B. $\frac{a^6}{x^2} - \frac{b^6}{y^2} = \left(a^2 + b^2\right)^2$

C. $\frac{a^6}{x^2} - \frac{b^6}{y^2} = \left(a^2 - b^2\right)^2$

D. $\frac{a^6}{x^2} + \frac{b^6}{y^2} = \left(a^2 - b^2\right)^2$

Answer:

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36. Find the product of the length of perpendiculars drawn from any point on the hyperbola $x^2 - 2y^2 - 2 = 0$ to its asymptotes.

A. $1/2$

B. $2/3$

C. $3/2$

D. 2

Answer:

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37. The length of the transverse axis of the rectangular hyperbola $xy = 18$ is

A. 6

B. 12

C. 18

D. 9

Answer: B

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38. Find the eccentricity of the hyperbola with asymptotes $3x + 4y = 2$ and $4x - 3y = 2$.

A. 3

B. 2

C. $\sqrt{2}$

D. 4

Answer: C

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39. The foci of a hyperbola are $(-5, 18)$ and $(10, 20)$ and it touches the y-axis . The length of its transverse axis, is

A. 100

B. $\sqrt{89}/2$

C. $\sqrt{89}$

D. $\sqrt{50}$

Answer:

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40. If tangent to any member of family of hyperbolas $xy = 4\sin^2\theta, \theta \in (0, 2\pi) - \{\pi\}$ is not a normal to any member of family of circles $x^2 + y^2 - 2x2y + \mu = 0$, where μ is any real parapmeter, then θ belongs to

A. $\left(\frac{5\pi}{6}, \frac{7\pi}{6}\right)$

B. $\left(0, \frac{\pi}{6}\right)$

C. $\left(\frac{11\pi}{6}, 2\pi\right)$

D. all of these

Answer:

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41. The circle $x^2 + y^2 - 8x = 0$ and hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ intersect at the points A and B. The equation of a common tangent with positive slope to the circle as well as to the hyperbola, is

A. $2x - \sqrt{5}y - 20 = 0$

B. $2x - \sqrt{5}y + 4 = 0$

C. $3x - 4y + 8 = 0$

D. $4x - 3y + 4 = 0$

Answer:

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42. The circle $x^2 + y^2 - 8x = 0$ and hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ intersect at the points A and B

Equation of the circle with AB as its diameter is

A. $x^2 + y^2 - 12x + 24 = 0$

B. $x^2 + y^2 + 12x + 24 = 0$

C. $x^2 + y^2 + 24x - 12 = 0$

D. $x^2 + y^2 - 24x - 12 = 0$

Answer: A

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43. Let the eccentricity of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ be the reciprocal to that of the ellipse $x^2 + 4y^2 = 4$. If the hyperbola passes through a focus of the ellipse, then the equation of the hyperbola, is

A. $\frac{x^2}{3} - \frac{y^2}{2} = 1$

B. $x^2 - 3y^2 = 3$

C. $\frac{x^2}{2} - \frac{y^2}{3} = 1$

D. $3x^2 - y^2 = 3$

Answer:

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44. let the eccentricity of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ be reciprocal to that of the ellipse $x^2 + 4y^2 = 4$. if the hyperbola passes through a focus of the ellipse then: (a) the equation of the

hyperbola is $\frac{x^2}{3} - \frac{y^2}{2} = 1$ (b) a focus of the hyperbola is $(2, 0)$ (c) the eccentricity of the hyperbola is $\sqrt{\frac{5}{3}}$ (d) the equation of the hyperbola is $x^2 - 3y^2 = 3$

A. $(2, 0)$

B. $(0, 2)$

C. $(3, 0)$

D. $(0, 3)$

Answer:

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45. Suppose an ellipse and a hyperbola have the same pair of foci on the x-axis with centres at the origin and they intersect at $(2, 2)$. If the eccentricity of the ellipse is $\frac{1}{2}$, then the eccentricity of the hyperbola, is

A. $\sqrt{\frac{7}{4}}$

B. $\sqrt{\frac{7}{3}}$

C. $\sqrt{\frac{5}{4}}$

D. $\sqrt{\frac{5}{3}}$

Answer:

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46. Tangents are drawn to the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ parallet to the sraight line $2x - y = 1$. The points of contact of the tangents on the hyperbola are (A) $\left(\frac{2}{2\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ (B) $\left(-\frac{9}{2\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ (C) $(3\sqrt{3}, -2\sqrt{2})$ (D) $(-3\sqrt{3}, 2\sqrt{2})$

A. $\left(\pm\frac{9}{2\sqrt{2}}, \pm\frac{1}{\sqrt{2}}\right)$

B. $\left(\pm\frac{1}{\sqrt{2}}, \pm\frac{9}{2\sqrt{2}}\right)$

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

D. $(-3\sqrt{3}, 2\sqrt{2})$

Answer:

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47. If the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$ coincide, then find the value

A. 7

B. 8

C. 10

D. 9

Answer:

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48. Consider the hyperbola $H: x^2 - y^2 = 1$ and a circle S with centre $N(x_2, 0)$ Suppose that H and S touch each other at a point $(P(x_1, y_1)$ with $x_1 > 1$ and $y_1 > 0$ The common tangent to H and S at P intersects the x-axis at point M. If (l,m) is the centroid of the triangle ΔPMN then the correct expression is (A) $\frac{dl}{dx_1} = 1 - \frac{1}{3x_1^2}$ for $x_1 > 1$ (B) $\frac{dm}{dx_1} = \frac{x_!}{3\left(\sqrt{x_1^2 - 1}\right)}\Bigg) f$ or $x_1 > 1$ (C)

$$\frac{dl}{dx_1} = 1 + \frac{1}{3x_1^2} f \text{ or } x_1 > 1 \quad \text{(D)}$$

$$\frac{dm}{dy_1} = \frac{1}{3} f \text{ or } y_1 > 0$$

A. $\frac{dl}{dx_1} = 1 - \frac{1}{3x_1^2}$ for $x_1 > 1$

B. $\frac{dm}{dx_1} = \frac{x_1}{3\left(\sqrt{x_1^2 - 1}\right)}$ for $x_1 > 1$

C. $\frac{dl}{dx_1} = 1 + \frac{1}{3x_1^2}$ for $x_1 > 1$

D. $\frac{dm}{dy} = \frac{1}{3}$ for $y_1 > 0$.

Answer:

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49. The angle between pair of tangents to the curve $7x^2 - 12y^2 = 84$ from the point $M(1, 2)$ is

A. $2\tan^{-1}\frac{1}{2}$

B. $2\tan^{-1}2$

C. $2\left(\tan^{-1}.\frac{1}{3} + \tan^{-1}.\frac{1}{2}\right)$

D. $2\tan^{-1}3$

Answer:

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50. Consider the chords of the parabola $y^2 = 4x$ which touches the hyperbola $x^2 - y^2 = 1$, the locus of the point of intersection of tangents drawn to the parabola at the extremitites of such chords is a conic section having latursrectum λ, the value of λ, is

A. 1

B. 2

C. 3

D. 4

Answer:

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51. There exist two points P and Q on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ such that $PO \perp OQ$, where O is the origin, then the number of points in the xy-plane from where pair of perpendicular tangents can be drawn to the hyperbola , is

A. 0

B. 1

C. 2

D. infinite

Answer:

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52. If four points be taken on a rectangular hyperbola such that the chord joining any two is perpendicular to the chord joining the other two, and if $\alpha, \beta, \gamma, \delta$ be the inclinations to either asymptotes of the straight lines joining these points to the centre, then $\tan\alpha \tan\beta \tan\gamma \tan\delta$ is equal to

A. 1

B. 2

C. -2

D. -1

Answer:

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53. A hyperbola whose transverse axis is along the major axis of the conic, $\frac{x^2}{3} + \frac{y^2}{4} = 4$ and has vertices atthe foci of this conic. If the eccentricity of the hyperbola is $\frac{3}{2}$, then which of the following points does NOT lie on it?

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

B. $\left(\sqrt{5}, 2\sqrt{3}\right)$

C. $(0, 2)$

D. $\left(\sqrt{10}, 2\sqrt{3}\right)$

Answer:

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Section Ii Assertion Reason Type

1. Statement-1 : If the foci of a hyperbola are at $(4, 1)$ and $(-6, 1)$ and eccentricity is $\frac{5}{4}$, then the length of its transverse axis is 4.

Statement-2 : Distance between the foci of a hyperbola is equal to the product of its eccentricity and length of the transverse axis.

A. 1

B. 2

C. 3

D. 4

Answer:

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2. A vertex of a branch of the hyperbola $x^2 - 2y^2 - 2\sqrt{2}x - 4\sqrt{2}y - 6 = 0$, B is one of the end points of its latuscrectum and C is the focus of the hyperbola nearest to the point A.

Statement-1 : The area of ΔABC is $\left(\frac{\sqrt{3}}{2} - 1\right)$ sq. units.

Statement-2 : Eccentricity of the hyperbola is $\frac{\sqrt{3}}{2}$ and length of the conjugate axis is $2\sqrt{2}$.

A. 1

B. 2

C. 3

D. 4

Answer:

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3. Statement-1 : Tangents drawn from the point $(2, -1)$ to the hyperbola $x^2 - 4y^2 = 4$ are at right angle. Statement-2 : The locus of the point of intersection of perpendicular tangents to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is the circle $x^2 + y^2 = a^2 - b^2$.

A. 1

B. 2

C. 3

D. 4

Answer:

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4. Statement-1 : If $5/3$ is the eccentricity of a hyperbola, then the eccentricity of its conjugate hyperbola is $5/4$.

Statement-2 : If e and e' are the eccentricities of

hyperbolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1$ respectively, then $\frac{1}{e^2} + \frac{1}{e'^2} = 1$.

A. 1

B. 2

C. 3

D. 4

Answer:

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Exercise

1. The equation of the hyperbola whose directrix $x + 2y = 1$, focus $(2, 1)$ and eccentricity 2, is

A. $x^2 + 16xy - 11y^2 - 12x + 6y + 21 = 0$

B. $x^2 - 16xy - 11y^2 - 12x + 6y + 21 = 0$

C. $x^2 - 4xy - y^2 - 12x + 6y + 21 = 0$

D. none of these

Answer:

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2. The eccentricity of the hyperbola whose latuscrectum is 8 and conjugate axis is equal to half the distance between the foci, is

A. $4/3$

B. $4/\sqrt{3}$

C. $2/\sqrt{3}$

D. none of these

Answer:

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3. The eccentricity of the hyperbola can never be equal to

A. $\sqrt{\frac{9}{5}}$

B. $2\sqrt{\frac{1}{9}}$

C. $8\sqrt{\frac{1}{8}}$

D. 2

Answer:

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4. The eccentricity of a rectangular hyperbola, is

A. 2

B. $\sqrt{2}$

C. 0

D. none of these

Answer:

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5. If t is a parameter, then $x = a\left(t + \frac{1}{t}\right)$, $y = b\left(t - \frac{1}{t}\right)$ represents

A. an ellipse

B. a circle

C. a pair of straight lines

D. a hyperbola

Answer:

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6. If $5x^2 + \lambda y^2 = 20$ represents a rectangular hyperbola, then λ equals

A. 5

B. 4

C. -5

D. none of these

Answer:

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7. The eccentricity of the hyperbola $3x^2 - 4y^2 = -12$ is

A. $\sqrt{\frac{7}{3}}$

B. $\frac{\sqrt{7}}{2}$

C. $-\sqrt{\frac{7}{3}}$

D. $-\frac{\sqrt{7}}{2}$

Answer:

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8. The locus of the point of intersection of the straight lines $\frac{x}{a}+\frac{y}{b}=\lambda$ and $\frac{x}{a}-\frac{y}{b}=\frac{1}{\lambda}$ (λ is a variable), is

A. a circle

B. a parabola

C. an ellipse

D. a hyperbola

Answer:

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9. The equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ repersents a hyperbola if

A. $\Delta \neq 0, h^2 < ab$

B. $\Delta \neq 0, h^2 > ab$

C. $\Delta \neq 0, h^2 = ab$

D. $\Delta \neq 0, a + b = 0$

Answer:

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10. The equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ repersents a rectangular hyperbola if

A. $\Delta \neq 0, h^2 > ab, a + b = 0$

B. $\Delta \neq 0, h^2 < ab, a + b = 0$

C. $\Delta \neq 0, h^2 = ab, a + b = 0$

D. none of these

Answer:

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11. The locus of the midde points ofchords of hyperbola $3x^2 - 2y^2 + 4x - 6y = 0$ parallel to $y = 2x$ is

A. $3x - 4y = 4$

B. $3y - 4x + 4 = 0$

C. $4x - 3y = 3$

D. $3x - 4y = 2$

Answer:

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12. The value of m, for wnich the line $y = mx + 25\frac{\sqrt{3}}{3}$ is a normal to the conic $\frac{x^2}{16} - \frac{y^2}{9} = 1$, IS

A. $\pm \frac{2}{\sqrt{3}}$

B. $\sqrt{3}$

C. $-\frac{\sqrt{3}}{2}$

D. none of these

Answer:

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13. The value of m for which the line $y = mx + 2$ becomes a tangent to the hyperbola $4x^2 - 9y^2 = 36$ is

A. $\pm \frac{2}{3}$

B. $\pm \frac{\sqrt{2}}{3}$

C. $\pm \frac{8}{9}$

D. $\pm \frac{4\sqrt{2}}{3}$

Answer:

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14. The equaton $\frac{x^2}{12-k} + \frac{y^2}{8-k} = 1$ represents

A. a hyperbola if $k < 8$

B. an ellipse if $k > 8$

C. a hyperbola if $8 < k < 12$

D. none of these

Answer:

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15. If $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1(a > b)$ and $x^2 - y^2 = c^2$ cut at right angles, then:

A. $a^2 + b^2 = 2c^2$

B. $b^2 - a^2 = 2c^2$

C. $a^2 - b^2 = 2c^2$

D. $a^2b^2 = 2c^2$

Answer:

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

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

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

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

D. none of these

Answer:

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17. The equation of a tangent parallel to $y = x$ drawn to $\frac{x^2}{3} - \frac{y^2}{2} = 1$, is

A. $x - y + 1 = 0$

B. $x - y + 2 = 0$

C. $x + y - 1 = 0$

D. $x - y + 2 = 0$

Answer:

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18. The diameter of $16x^2 - 9y^2 = 144$ which is conjugate to $x = 2y$ is

A. $y = \frac{16x}{9}$

B. $y = \frac{32x}{9}$

C. $x = \frac{16y}{9}$

D. $x = \frac{32y}{9}$

Answer:

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19. The tangents from a point $\left(2\sqrt{2}, 1\right)$ to the hyperbola $16x^2 - 25y^2 = 400$ inculde an angle equal to

A. $\pi / 2$

B. $\frac{\pi}{4}$

C. π

D. $\pi / 3$

Answer:

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20. If the line $y = 3x + \lambda$ touches the hyperbola $9x^2 - 5y^2 = 45$, then the value of λ is

A. 36

B. 45

C. 6

D. 15

Answer:

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21. Find the equations to the common tangents to the two hyperbolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$

A. $y = \pm x \pm \sqrt{b^2 - a^2}$

B. $y = \pm x \pm \sqrt{a^2 - b^2}$

C. $y = \pm x \pm (a^2 - b^2)$

D. $y = \pm x \pm \sqrt{a^2 + b^2}$

Answer:

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22. A point moves in a plane so that its distances PA and PB from two fixed points A and B in the plane satisfy the relation $PA - PB = k(k \neq 0)$, then the locus of P, is

A. a parabola

B. an ellipse

C. a hyperbola

D. a branch of a hyperbola

Answer:

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23. If the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$ coincide, then find the value

A. 1

B. 5

C. 7

D. 9

Answer:

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24. The curve represented by $x = a\cos h\theta$, $y = b\sin h\theta$, is

A. a hyperbola

B. an ellipse

C. a parabola

D. a circle

Answer:

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25. The equation oi the conic with focus at (1,-1) directrix along $x - y + 1 = 0$ and eccentricity $\sqrt{2}$ is $xy = 1$ b. $2xy + 4x - 4y - 1 = 0$ c. $x^2 - y^2 = 1$ d. $2xy - 4x + 4y = 1 = 0$

A. $x^2 - y^2 = 1$

B. $xy = 1$

C. $2xy - 4a + 4y + 1 = 0$

D. $2xy + 4x - 4y - 1 = 0$

Answer:

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26. If the eccentricity of a hyperbola is $\sqrt{3}$, the eccentricity of its conjugate hyperbola, is

A. $\sqrt{2}$

B. $\sqrt{3}$

C. $\sqrt{\frac{3}{2}}$

D. $2\sqrt{3}$

Answer:

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27. Area of the triangle formed by the lines $x - y = 0, x + y = 0$ and any tangant to the hyperbola $x^2 - y^2 = a^2$ is

A. $4a^2$

B. $3a^2$

C. $2a^2$

D. a^2

Answer:

Watch Video Solution

28. The angle between the asymptotes of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is equal to

A. $2\tan^{-1}\left(\frac{b}{a}\right)$

B. $\tan^{-1}\left(\frac{a}{b}\right)$

C. $2\tan^{-1}\left(\frac{a}{b}\right)$

D. $\tan^{-1}\left(\frac{b}{a}\right)$

Answer:

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29. If a normal of slope m to the parabola $y^2 = 4ax$ touches the hyperbola $x^2 - y^2 = a^2$, then

A. $m^6 - 4m^4 - 3m^2 + 1 = 0$

B. $m^6 - 4m^4 + 3m^2 - 1 = 0$

C. $m^6 + 4m^4 - 3m^2 + 1 = 0$

D. $m^6 + 4m^4 + 3m^2 + 1 = 0$

Answer:

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30. The equation of common tangent to the parabola $y^2 = 8x$ and hyperbola $3x^2 - y^2 = 3$ is

A. $2x - y - 1 = 0$

B. $x - 2y + 1 = 0$

C. $2x + y - 1 = 0$

D. $2x + y + 1 = 0$

Answer:

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31. The circle drawn on the line segment joining the foci of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ as diameter cuts the asymptotes at (A) (a, a) (B) (b, a) (C) $(\pm b, \pm a)$ (D) $(\pm a, \pm b)$

A. (a, a)

B. (b, a)

C. $(\pm b, \pm a)$

D. $(\pm a, \pm b)$

Answer:

Watch Video Solution

32. The angle between the asymptotes of the hyperbola $2x^2 - 2y^2 = 9$, is

A. $\pi/4$

B. $\pi/3$

C. $\pi/6$

D. $\pi/2$

Answer:

Watch Video Solution

33. The difference of the focal distances of any point on the hyperbola is equal to its

A. latusrectum

B. eccentricity

C. transverse axis

D. conjugate axis

Answer:

Watch Video Solution

34. If $P(x_1, y_1), Q(x_2, y_2), R(x_3, y_3)$ and $S(x_4, y_4)$ are four concyclic points on the rectangular hyperbola) and $xy = c^2$, then coordinates of the orthocentre ofthe triangle PQR is

A. $(x_4, -y_4)$

B. (x_4, y_4)

C. $(-x_4, -y_4)$

D. $(-x_4, y_4)$

Answer:

Watch Video Solution

35. The point of intersection of the curve whose parametrix equations are $x = t^2 + 1, y = 2t$ and $x = 2s, y = \frac{2}{s}$, is given by

A. $(1, -3)$

B. $(2, 2)$

C. $(-2, 4)$

D. $(1, 2)$

Answer:

Watch Video Solution

36. The equation of the hyperbola whose foci are (6.5), (-4,5) and eccentricity 5/4 is

A. $\frac{(x-1)^2}{16} - \frac{(y-5)^2}{9} = 1$

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

C. $\frac{(x-1)^2}{16} - \frac{(y-5)^2}{9} = -1$

D. none of these

Answer:

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37. Find the point on the hyperbola $x^2 - 9y^2 = 9$ where the line $5x + 12y = 9$ touches it.

A. $(-5/4, 3)$

B. $(5, -4/3)$

C. $(3, -1/2)$

D. none of these

Answer:

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38. The length of the latusrectum of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1$, is

A. $\frac{2a^2}{b}$

B. $\frac{2b^2}{a}$

C. $\frac{b^2}{a}$

D. $\frac{a^2}{b}$

Answer:

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39. P is a point on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, N is the foot of the perpendicular from P on the transverse axis. The tangent to the hyperbola at P meets the transverse axis at T. If O is the centre of the hyperbola, then $OT.ON$ is equal to

A. e^2

B. a^2

C. b^2

D. b^2/a^2

Answer:

Watch Video Solution

40. If the tangent at the point $(2\sec\theta, 3\tan\theta)$ to the hyperbola $\frac{x^2}{4} - \frac{y^2}{9} = 1$ is parallel to $3x - y + 4 = 0$, then the value of θ, is

A. 45°

B. 60°

C. 30°

D. 75°

Answer:

Watch Video Solution

41. The eccentricity of the hyperbola $\frac{\sqrt{1999}}{3}\left(x^2 - y^2\right) = 1$, is

A. $\sqrt{2}$

B. 2

C. $2\sqrt{2}$

D. $\sqrt{3}$

Answer:

Watch Video Solution

42. 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. $(2, 1), (1, 2)$

B. $(2, -1), (-2, 1)$

C. $(-2, -1), (1, 2)$

D. $(-2, -1), (-1, -2)$

Answer:

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43. If the tangents at the point $(a\sec\alpha, b\tan\alpha)$ to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ meets the transverse axis at T, then the distance of T from a focus of the hyperbola, is

A. $b(e - \cos\alpha)$

B. $b(e + \cos\alpha)$

C. $a(e + \cos\alpha)$

D. $\sqrt{a^2e^2 + b^2\cot^2\alpha}$

Answer:

Watch Video Solution

44. The equation of the hyperbola of given transverse axis $2a$ with its vertex mid-way between the centre and the corresponding focus, is

A. $3x^2 - y^2 = a^2$

B. $3x^2 - y^2 = 3a^2$

C. $x^2 - 3y^2 = a^2$

D. $x^2 - 3y^2 = a^2$

Answer:

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45. Find the locus of the-mid points of the chords of the circle $x^2 + y^2 = 16$, which are tangent to the hyperbola $9x^2 - 16y^2 = 144$

A. $\left(x^2 + y^2\right)^2 = 16x^2 - 9y^2$

B. $\left(x^2 + y^2\right)^2 = 9x^2 - 16y^2$

C. $\left(x^2 - y^2\right)^2 = 16x^2 - 9y^2$

D. none of these

Answer:

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46. If the latus rectum subtends a right angle at the center of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then find its eccentricity.

A. $\frac{\sqrt{13}}{2}$

B. $\frac{\sqrt{5}-1}{2}$

C. $\frac{\sqrt{5}+1}{2}$

D. $\frac{\sqrt{3}+1}{2}$

Answer:

Watch Video Solution

47. If the latursrectum of a hyperbola through one foucs subtends 60° angle at the other focus, then its eccentricity e, is

A. $\sqrt{2}$

B. $\sqrt{3}$

C. $\sqrt{5}$

D. $\sqrt{6}$

Answer:

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48. If the latus rectum of a hyperbola forms an equilateral triangle with the vertex at the center of the hyperbola ,then find the eccentricity of the hyperbola.

A. $\frac{\sqrt{5}+1}{2}$

B. $\frac{\sqrt{11}+1}{2}$

C. $\frac{\sqrt{13}+1}{2\sqrt{3}}$

D. $\frac{\sqrt{13}-1}{2\sqrt{3}}$

Answer:

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49. Let LL' be the latus rectum through the focus of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and A' be the farther vertex. If $A'LL'$ is equilateral, then the eccentricity of the hyperbola is (axes are coordinate axes).

A. $\sqrt{3}$

B. $\sqrt{3} + 1$

C. $\frac{\sqrt{3}+1}{\sqrt{2}}$

D. $\frac{\sqrt{3}+1}{\sqrt{3}}$

Answer: D

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50. The angle between the asymptotes of the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$, is

A. $\pi - 2\tan^{-1}\frac{3}{4}$

B. $\pi - 2\tan^{-1}\frac{3}{2}$

C. $\tan^{-1}\frac{3}{4}$

D. $\pi - 2\tan^{-1}\frac{4}{3}$

Answer:

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51. The values of 'm' for which a line with slope m is common tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and parabola $y^2 = 4ax$ can lie in interval:

A. $m \in (0, \infty)$

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

C.

$$m \in (-\infty, -1) \cup (1, \infty) - \left\{\pm\sqrt{\frac{\sqrt{5}+1}{2}}\right\}$$

D. none of these

Answer:

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52. The number of integral points on the hyperbola $x^2 - y^2 = (2000)^2$ is (an integral point is a point both of whose co-ordinates are integer) (A) 98 (B) 96 (C) 48 (D) 24

A. 98

B. 96

C. 48

D. 24

Answer:

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53. A straight line intersects the same branch of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ in P_1 and P_2 and meets its asymptotes in Q_1 and Q_2. Then, $P_1Q_2 - P_2Q_1$ is equal to

A. $a - b$

B. $\sqrt{a^2 + b^2} - ab$

C. $\sqrt{a^2 - b^2}$

D. 0

Answer: 4

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54. The locus of the centre of a variable circle touching two circles of radii r_1, r_2 externally , which also touch eath other externally, is conic. If $\frac{r_1}{r_2} = 3 + 2\sqrt{2}$, then eccentricity of the conic, is

A. 1

B. $\sqrt{2}$

C. $1/2$

D. $2\sqrt{2}$

Answer: option 2

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55. If tangents OQ and OR are dawn to variable circles having radius r and the center lying on the rectangular hyperbola $xy = 1$, then the locus of the circumcenter of triangle OQR is (O being the origin). $xy = 4$ (b) $xy = \frac{1}{4}$ $xy = 1$ (d) none of these

A. $xy = 4$

B. $4xy = 1$

C. $xy = 1$

D. none of these

Answer:

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56. Find the equation of tangent to the conic $x^2 - y^2 - 8x + 2y + 11 = 0$ at $(2, 1)$

A. $x + 2 = 0$

B. $2x + 1 = 0$

C. $x - 2 = 0$

D. $x + y + 1 = 0$

Answer:

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Chapter Test

1. The value of m for which $y = mx + 6$ is a tangent to the hyperbola $\frac{x^2}{100} - \frac{y^2}{49} = 1$, is

A. $\sqrt{\frac{17}{20}}$

B. $\sqrt{\frac{20}{17}}$

C. $\sqrt{\frac{3}{20}}$

D. $\sqrt{\frac{20}{3}}$

Answer:

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2. The equation of the tangent to the hyperbola $4y^2 = x^2 - 1$ at the point $(1, 0)$, is

A. $x = 1$

B. $y = 1$

C. $y = 4$

D. $x = 4$

Answer:

Watch Video Solution

3. The number of normals to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ from an external point, is

A. 2

B. 4

C. 6

D. 3

Answer:

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4. If e and e_1, are the eccentricities of the hyperbolas $xy = c^2$ and $x^2 - y^2 = c^2$, then $e^2 + e_1^2$ is equal to

A. 1

B. 4

C. 6

D. 8

Answer:

Watch Video Solution

5. A rectangular hyperbola whose centre is C is cut by any circle of radius r in four points P, Q, R and S. Then, $CP^2 + CQ^2 + CR^2 + CS^2 =$ (A) r^2 (B) $2r^2$ (C) $3r^2$ (D) $4r^2$

A. r^2

B. $2r^2$

C. $3r^2$

D. $4r^2$

Answer:

Watch Video Solution

6. The equation of the pair of asymptotes of the hyperbola $xy - 4x + 3y = 0$, is

A. $xy - 4x + 3y - 1 = 0$

B. $xy - 4x + 3y - 10 = 0$

C. $xy - 4x + 3y - 12 = 0$

D. none of these

Answer:

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7. If the latus rectum of the hyperbola $\frac{x^2}{16} - \frac{y^2}{b^2} = 1$ is $\frac{9}{2}$, then its eccentricity, is

A. $4/5$

B. $5/4$

C. $3/4$

D. $4/3$

Answer:

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8. Chords of the hyperbola, $x^2 - y^2 = a^2$ touch the parabola, $y^2 = 4ax$. Prove that the locus of their middlepoints is the curve, $y^2(x - a) = x^3$.

A. $x^2(y - a) = y^3$

B. $y^2(x - a) = x^3$

C. $x\left(y^2 - a\right) = y$

D. $y\left(x^2 - a\right) = x$

Answer:

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9. Tangents drawn from the point (c, d) to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ make angles α and β with the x-axis. If $\tan\alpha \tan\beta = 1$, then $c^2 - d^2 =$

A. $a^2 - b^2$

B. $b^2 - a^2$

C. $a^2 + b^2$

D. none of these

Answer:

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10. If the tangent at (h, k) on $b^2x^2 - a^2y^2 = a^2b^2$ cuts the auxiliary circle in two points whose ordinates are y_1 and y_2, then $\frac{1}{y_1} + \frac{1}{y_2}$ is

A. $\frac{1}{\alpha}$

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

C. $\frac{1}{\beta}$

D. $\frac{2}{\beta}$

Answer:

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11. If the chords of contact of tangents drawn from P to the hyperbola $x^2 - y^2 = a^2$ and its auxiliary circle are at right angle, then P lies on

A. $x^2 - y^2 = 3a^2$

B. $x^2 - y^2 = 2a^2$

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

D. $x^2 - y^2 = 1$

Answer:

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12. The tangent at a point P on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ meets one of the directrix at F. If PF subtends an angle θ at the corresponding focus, then $\theta = \frac{\pi}{4}$ (b) $\frac{\pi}{2}$ (c) $\frac{3\pi}{4}$ (d) π

A. 45°

B. 30°

C. 60°

D. 90°

Answer:

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13. The mid-point of the chord intercepted by the hyperbola $9x^2 - 16y^2 = 144$ on the line $9x - 8y - 10 = 0$, is

A. $(1, 2)$

B. $(-1, 2)$

C. $(-2, 1)$

D. $(2, 1)$

Answer:

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14. Locus of P such that the chord of contact of P with respect to $y^2 = 4ax$ touches the hyperbola $x^2 - y^2 = a^2$

A. $4x^2 - y^2 = a^2$

B. $y^2 - 4x^2 = 4a^2$

C. $4x^2 + y^2 = 4a^2$

D. $4y^2 - x^2 = 4a^2$

Answer:

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15. C is the center of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ The tangent at any point P on this hyperbola meet the straight lines $bx - ay = 0$ and $bx + ay = 0$ at points $QandR$, respectively. Then prove that $C\dot{Q}\dot{C}R = a^2 + b^2$.

A. a^2b^2

B. $a^2 - b^2$

C. $a^2 + b^2$

D. none of these

Answer:

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16. If $lx + my + n = 0$ is a tangent to the rectangular hyperbola $xy = c^2$, then

A. $l < m < 0$

B. $l > 0, m < 0$

C. $l < 0, m > 0$

D. none of these

Answer:

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17. A tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ cuts the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at $PandQ$. Show that the locus of the midpoint of PQ is $\left(\frac{x^2}{a^2} + \frac{y^2}{b^2}\right)^2 = \frac{x^2}{a^2} - \frac{y^2}{b^2}$.

A. $\left(\frac{x^2}{a^2} + \frac{y^2}{b^2}\right)^2 = \frac{x^2}{a^2} - \frac{y^2}{b^2}$

B. $\left(\frac{x^2}{a^2} - \frac{y^2}{b^2}\right)^2 = \frac{x^2}{a^2} + \frac{y^2}{b^2}$

C. $\left(\frac{x^2}{a^2} - \frac{y^2}{b^2}\right)^2 = \frac{2x^2y^2}{a^2b^2}$

D. none of these

Answer:

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18. The product of lengths of perpendicular from any point on the hyperbola $x^2 - y^2 = 8$ to its asymptotes, is

A. 8

B. 6

C. 2

D. 4

Answer:

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19. The angle between the asymptotes of the hyperbola $3x^2 - y^2 = 3$, is

A. $\frac{\pi}{3}$

B. $\frac{\pi}{5}$

C. $\frac{2\pi}{3}$

D. $\frac{2\pi}{5}$

Answer:

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20. Find the area of the triangle formed by any tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ with its asymptotes.

A. $4a^2b^2$

B. a^2b^2

C. $4ab$

D. ab

Answer:

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21. If e_1 and e_2 are respectively the eccentricities of the ellipse $\frac{x^2}{18} + \frac{y^2}{4} = 1$ and the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$, then the relation between e_1 and e_2, is

A. $2e_1^2 + e_2^2 = 2$

B. $e_1^2 + 2e_2^2 = 3$

C. $2e_1^2 + e_2^2 = 3$

D. $e_1^2 + 3e_2^2 = 2$

Answer:

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22. The distance between the directrices of the hyperbola $x = 8sec\theta,\ y = 8\,tan\theta,\ 8\sqrt{2}$ b. $16\sqrt{2}$ c. $4\sqrt{2}$ d. $6\sqrt{2}$

A. $8\sqrt{2}$

B. $16\sqrt{2}$

C. $4\sqrt{2}$

D. $6\sqrt{2}$

Answer:

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23. The straight line $x + y = \sqrt{2}P$ will touch the hyperbola $4x^2 - 9y^2 = 36$ if (a) $p^2 = 2$ (b) $p^2 = 5$ (c) $5p^2 = 2$

A. $p^2 = 2$

B. $p^2 = 5$

C. $5p^2 = 2$

D. $2p^2 = 5$

Answer:

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24. The locus of the point of intersection of perpendicular tangents to the hyperbola $\frac{x^2}{3} - \frac{y^2}{1} = 1$, is

A. $x^2 + y^2 = 2$

B. $x^2 + y^2 = 3$

C. $x^2 - y^2 = 3$

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

Answer: A

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25. .Find the product of lengths of the perpendiculars from any point on the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ to its asymptotes.

A. $\frac{25}{12}$

B. $\frac{144}{25}$

C. $\frac{144}{7}$

D. $\frac{25}{144}$

Answer:

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26. The angle between the asymptotes of the hyperbola $27x^2 - 9y^2 = 24$, is

A. 30°

B. 120°

C. 45°

D. 240°

Answer:

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27. The equation of the chord of contact of tangents from $(1, 2)$ to the hyperbola $3x^2 - 4y^2 = 3$, is

A. $3x - 16y = 3$

B. $3x - 8y - 3 = 0$

C. $\frac{x}{3} - \frac{y}{4} = 1$

D. $\frac{x}{4} - \frac{y}{3} = 1$

Answer:

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28. Equation of het hyperbola whose vertices are $(\pm 3, 0)$ and foci at $(\pm 5, 0)$ is $16x^2 - 9y^2 = 144$

b. $9x^2 - 16y^2 = 144$ c. $25x^2 - 9y^2 = 225$ d. $9x^2 - 25y^2 = 81$

A. $16x^2 - 9y^2 = 144$

B. $9x^2 - 16y^2 = 144$

C. $25x^2 - 9y^2 = 225$

D. $9x^2 - 25y^2 = 81$

Answer:

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29. The length of the semi-transverse axis of the rectangular hyperbola $xy = 32$, is

A. 32

B. 16

C. 64

D. 8

Answer:

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