MATHS

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MATHS (HINGLISH)

HYPERBOLA

Illustration

1. Find the eccentricity, length of a latus rectum, equations of the latus rectum of the

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

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2. Find the centre, foci and the eccentricity of the hyperbola.

$11x^2 - 25y^2 - 44x + 50y - 256 = 0$

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3. e_1 is the eccentricity of the ellipse $\frac{x^2}{25} + \frac{y^2}{b^2} = 1$ and e_2 is the eccentricity of the

hyperbola $\frac{x^2}{16} - \frac{y^2}{b^2} = 1$ such that $e_1, e_2 = 1$

find the value of b

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4. If $y = mx + 1$ is a tangent to the hyperbola $4x^2 - 25y^2 = 100$, find the value of $25m^4 + 5m^2 + 1$.

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5. Find the equation of the normal to the hyperbola $4x^2 - 9y^2 = 144$ at the point whose eccentric angle θ is $\pi/3$

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6. Find the equation of the chord of contact of the point (5, 1) to the hyperbola, $x^2 - 4y^2 = 16$. Also find the mid-point of this chord.

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7. Find the points on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 2$ from which two perpendicular tangents can be drawn to the circle $x^2 + y^2 = a^2$

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8. If the circle $x^2 + y^2 = a^2$ intersects the hyperbola xy = 25 in four points, then find the product of the ordinates of these points.

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Solved Examples Concept Based Single Correct Answer Type Questions

1. If e_1, and e_2 are respectively the eccentricities of the conics $\frac{x^2}{25} - \frac{y^2}{11} = 1$ and $\frac{x^2}{16} + \frac{y^2}{7} = 1$ then $e_1 e_2$ is equal to

A. $\frac{10}{9}$

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

C. $\frac{9}{10}$

D. $\frac{8}{5}$

Answer: C

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2. If $x - \sqrt{5}y + c = 0$ is a tangent to the hyperbola $\frac{x^2}{25} - \frac{y^2}{4} = 1$ then the value of c is

A. $\pm 3\sqrt{5}$

B. $\pm \sqrt{5}$

C. $\pm 2\sqrt{5}$

D. none of these

Answer: B

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3. If the tangent at the point $P(a\sec\theta, b\tan\theta)$ to the hyperbola passes through the point where a directrix of the hyperbola meets the positive side of the transverse axis, then θ is equal to

A. $\cos^{-1}(1/e)$

B. $\tan^{-1}(1/e)$

C. $\cot^{-1}(1/e)$

D. $\sec^{-1}(1/e)$

Answer: A

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4. The circle described on the line joining the foci of the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ as a diameter passes through an end of the latus

rectum of the parabola $y^2 = 4ax$, the length of the latus rectum of the parabola is

A. $2\sqrt{5}$ units

B. 5 units

C. $4\sqrt{5}$ units

D. $5\sqrt{5}$ units

Answer: C

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5. The curve repersented by $x = 5\left(t + \frac{1}{t}\right), y = \left(t - \frac{1}{t}\right), t \neq 0$ is

A. a point of straight lines

B. an ellipse

C. a hyperbola

D. a rectangular hyperbola

Answer: C

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6. If the distance between two directrices of a rectangular hyperbola is 15, then the distance between its foci in units is:

A. $15\sqrt{2}$

B. 30

C. 60

D. 45

Answer: B

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7. If two perpendicular tangents can be drawn from the point (α, β) to the hyperbola $x^2 - y^2 = a^2$ then (α, β) lies on

A. $y = \pm x$

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

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

D. $y^2 = 4ax$

Answer: A

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8. The tangent at an extremity (in the first quadrant) of latus rectum of the hyperbola $\frac{x^2}{4} - \frac{y^2}{5} = 1$ meets x-axis and y- axis at A and B respectively. Then $(OA)^2 - (OB)^2$, where O is the origin, equal to

A. $-\frac{20}{9}$

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

C. 4

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

Answer: A

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9. If PQ is a double ordinate of the hyperbola such that OPQ is an equilateral triangle, being the centre of the hyperbola, then eccentricity e of the hyperbola satisfies

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

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

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

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

Answer: C

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10. If the tangent and normal to the hyperbola $x^2 - y^2 = 4$ at a point cut off intercepts a_1 and a^2 respectively on the x-axis, and b_1 and b_2 respectively on the y-axis, then the value of $a_1a_2 + b_1b_2$ is

A. -1

B. 0

C. 4

D. 1

Answer: B

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11. The rectangular hyperbola xy = 16 and the circle $x^2 + y^2 = 32$ meet at a point P in the first quadrant. Equation of the common tangent to two curves at P is

A. x+y-4=0

B. x+y+4=0

C. x+y-8=0

D. x+y+8=0

Answer: C

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12. If hyperbola $\frac{x^2}{b^2} - \frac{y^2}{a^2} = 1$ passes through the focus of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, then find

the eccentricity of hyperbola.

A. $\sqrt{2}$

B. $\sqrt{3}$

C. $3/2$

D. $\sqrt{3/2}$

Answer: B

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13. Which one of the following is independent of $(0 < \alpha < \pi/2)$ for the hyperbola $\frac{x^2}{\cos^2\alpha} - \frac{y^2}{\sin^2\alpha} = 1$

A. eccentricity

B. equation of a directrix

C. absicssa of foci

D. abscissa of vertices

Answer: C

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14. If e_1 and e_2 are the eccentricities of the hyperbola and its conjugate hyperbola respectively then $\frac{1}{e_1^2} + \frac{1}{e_2^2}$ is equal to

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

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

C. 1

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

Answer: C

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15. The normal at $P(x_1, y_1)$ on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ meets the coordinate axes at A and B. If O, is u b the origin and e, the eccentricity of the hyperbola, then

A. $OA = e^2 x_1$

B. $OB = e^2 x_1$

C. $OA = e^2 y_1$

D. $OB = e^2 x_1$

Answer: A

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Solved Examples Level 1 Single Correct Answer Type Questions

1. If the latus rectum of a hyperbola subtend an angle of $60A^\circ$ at the other focus, then eccentricity of the hyperbola is

A. 2

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

C. $2\sqrt{3}$

D. $\sqrt{3}$

Answer: D

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2. The locus of the foot of the perpendicular drawn from the origin to any tangent to the hyperbola $\frac{x^2}{36} - \frac{y^2}{16} = 1$ is

A. $\left(x^2 + y^2\right)^2 = 36x^2 - 16y^2$

B. $\left(x^2 - y^2\right)^2 = 36x^2 - 16y^2$

C. $\left(x^2+y^2\right)^2=36x^2+16y^2$

D. $\left(x^2-y^2\right)^2=36x^2+16y^2$

Answer: A

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3. The locus of the middle points of the portions of the tangents of the hyperbola. $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ included between the axes is

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

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

C. $b^2x^2 - a^2y^2 = 4x^2y^2$

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

Answer: C

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4. If the slope of a tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is $2\sqrt{2}$ then the eccentricity e of the hyperbola lies in the interval

A. $1, \sqrt{2}$

B. $1, 2\sqrt{2}$

C. $1, 3$

D. $1, 4$

Answer: C

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5. If $\frac{x^2}{\lambda+3} + \frac{y^2}{2-\lambda} = 1$ represents a hyperbola then

A. $\lambda \in (2, 3)$

B. $\lambda \in (-2, 3)$

C. $\lambda \in (-3, 2)$

D. $\lambda \in (2, \infty)$

Answer: C

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6. The normal to the curve at P(x, y) meets the x-axis at G. If the distance of G from the origin is twice the abscissa of P, then the curve is

A. ellipse

B. parabola

C. circle

D. hyperbola or ellipse

Answer: D

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7. If the circle $x^2 + y^2 = a^2$ intersects the hyperbola $xy = c^2$ in four points $P(x_1, y_1)$, $Q(x_2, y_2)$,$R(x_3, y_3)$,$S(x_4, y_4)$, then which of

the following need not hold.

(a) $x_1 + x_2 + x_3 + x_4 = 0$

(b) $x_1x_2x_3x_4 = y_1y_2y_3y_4 = c^4$

(c) $y_1 + y_2 + y_3 + y_4 = 0$

(d) $x_1 + y_2 + x_3 + y_4 = 0$

A. $x_1 + x_2 + x_3 + x_4 = 0$

B. $x_1x_2x_3x_4 = y_1y_2y_3y_4 = c^4$

C. $y_1 + y_2 + y_3 + y_4 = 0$

D. $x_1 + y_2 + x_3 + y_4 = 0$

Answer: D

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8. Show that the normal to the rectangular hyperbola $xy = c^2$ at the point t meets the curve again at a point t' such that $t^3t' = -1$.

A. $t^3t' = 1$

B. $t^3t' = -1$

C. tt'=1

D. tt'=-1

Answer: B

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9. If the normal at P to the rectangular hyperbola $x^2 - y^2 = 4$ meets the axes of x and y in G and g respectively and C is the centre of the hyperbola, then 2PC =

A. PG

B. pg

C. Gg

D. none of these

Answer: C

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10. If e_1, e_2 are the eccentricites of the hyperbla $2x^2 - 2y^2 = 1$ and the ellipse $x^2 + 2y^2 = 2$ respectively then

A. $e_1 + e_2 = 1$

B. $e_1 e_2 = 1$

C. $e_1^2 + e_2^2 = 1$

D. none of these

Answer: B

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11. The line 2x + y = 1 touches a hyperbola and passes through the point of intersection of a directrix and the x-axis. The equation of the hyperbola is

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

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

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

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

Answer: A

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

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

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

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

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

Answer: B

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13. 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. the equation of the hyperbola is

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

B. a focus of the hypberbola is $\sqrt{(3), 0}$

C. the eccentricity of the hyperbola is

$$\sqrt{5/3}$$

D. the equation of the hyperbola is

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

Answer: D

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14. If the normal at the point P 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: B

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15. The foci of the ellips $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$ coincide ,then the value of b^2 is

A. 9

B. 7

C. 41

D. 12

Answer: B

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16. 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. $a(e - \cos\alpha)$

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

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

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

Answer: A

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17. The distannce between the tangent to the hyperbola $\frac{x^2}{4} - \frac{y^2}{3}$ =1 parallel to the line y=x +2 is

A. 2

B. $2\sqrt{2}$

C. $\sqrt{2}$

D. 1

Answer: C

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18. Find the locus of the middle points of the normals chords of the rectangular hyperbola $x^2 - y^2 = a^2$.

A. $\left(y^2 - x^2\right)^3 = 4a^2x^2y^2$

B. $\left(y^2 - x^2\right)^2 = 4a^2x^2y^2$

C. $\left(y^2 + x^2\right)^3 = 4a^2x^2y^2$

D. $\left(y^2 + x^2\right)^2 = 4a^2x^2y^2$

Answer: A

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19. If y = mx + 6 is a tangent to the hyperbola he parabola $y^2 = 4ax$, then the length of the latus rectum of the parabola is

A. $6\sqrt{\frac{17}{20}}$

B. $4\sqrt{\frac{17}{20}}$

C. $24\sqrt{\frac{17}{20}}$

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

Answer: C

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20. P is a point on the hyperbola The tangent at P meets the transverse axis at T, N is the foot of the perpendicular from P to the

transverse axis. If O is the origin, then ON.OT is equal to.

A. 81

B. 49

C. 81

D. -49

Answer: A

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21. The product of the perpendiculars from the foci on any tangent to the hyperbol $\frac{x^2}{64} - \frac{y^2}{9} = 1$ is

A. 8

B. 9

C. 16

D. 18

Answer: B

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22. If the normal at P on the hyperbola meets the transverse axis at G, S is a foci and the eccentricity of the hyperbola then SG : SP is equal to

A. a

B. b

C. e

D. $1/e$

Answer: C

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23. If the chords of contacts of the tangents from the points (x y,) and (x_2, y_2) to the hyperbola $2x^2 - 3y^2 = 6$ are at right angle, then $4x_1x_2 + 9y_1y_2$ is equal to

A. -1

B. 0

C. 6

D. -12

Answer: B

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24. 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) $\sqrt{\frac{3}{2}} + 1$

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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25. Normal at point (5, 3) to the rectangular hyperbola x y - y - 2 x - 2 = 0 meets the curve at the point whose coordinates are

A. $0, \ -2$

B. $-1, 0$

C. $\frac{1}{4}, \ -\frac{10}{3}$

D. $\frac{3}{4}, \ -14$

Answer: D

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Solved Examples Level 2 Single Correct Answer Type Questions

1. If $(a\sec\alpha, b\tan\alpha)$ and $(a\sec\beta, b\tan\beta)$ be the ends of a chord of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ passing through the focus (ae,0) then $\tan\left(\frac{\alpha}{2}\right)\tan\left(\frac{\beta}{2}\right)$ is equal to

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

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

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

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

Answer: C

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2. Find the equation of the asymptotes of the hyperbola

$$3x^2 + 10xy + 9y^2 + 14x + 22y + 7 = 0$$

A.

$$3x^2 + 10xy + 8y^2 + 14x + 22y + 11 = 0$$

B.

$$3x^2 + 10xy + 8y^2 - 14x - 22y + 13 = 0$$

C.

$$3x^2 - 10xy + 8y^2 + 14x + 22y + 15 = 0$$

D.

$$3x^2 + 10xy + 8y^2 + 14x + 22y + 15 = 0$$

Answer: D

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3. The product of perpendicular drawn from any points on a hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ to

its asymptotes is

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

B. $\frac{1}{(a^2)+\frac{1}{b^2}}$

C. $(1)(a^2)-(1)(b^2)$

D. a^2b^2

Answer: A

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4. If $(5, 12)$ and $(24, 7)$ are the focii of a hyperbola passing through origin, then

A. $\sqrt{386/12}$

B. $\sqrt{386/13}$

C. $\sqrt{386/25}$

D. $\sqrt{386/38}$

Answer: A

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5. 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+4

C. x=y+3

D. x+y+2=0

Answer: A

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6. Let $P(a\sec\theta, b\tan\theta)$ and $Q(a\sec\phi, b\tan\phi)$ where is the point of intersection of 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. $-\left[\frac{a^2+b^2}{b}\right]$

Answer: D

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7. If P is a point on the rectangular hyperbola $x^2 - y^2 = a^2$, C is its centre and S, S' are the two foci , then the product $(SP.\ S'P) =$

A. 2

B. CP^2

C. CS^2

D. SS^2

Answer: B

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8. If p is the length of the perpendicular from a focus upon the tangent at any point P of the the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and r is the distance of P from the foicus , then $\frac{2a}{r}-\frac{b^2}{p^2}$ is equal to

A. -1

B. 0

C. 1

D. 2

Answer: C

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9. 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

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

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

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

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

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: A

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10. 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

B. x-7y-5=0

C. x-y-1=0

D. x+y-1=0

Answer: B

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Solved Examples Numerical Answer Type Questions

1. If the tangent and normal to the rectangular hyperbola xy=16 at point (8,2) cut off intercepts a_1, a_2 on the x axis and $b_1 b_2$ on the y axis then $a_1 a_2 + b_1 b_2 + 7/2$ equals

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2. A circle meets the rectangular hyperbola xy= 1 at A_1A_2, A_3 and A_4 be the distances from the y axis then minimum value of $d_1 + d_2 + d_3 + d_4$ is

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3. Let I be the length of the chord of the hyperbola $x^2 - y^2 = 8$, whose mid-point is (4,2), then I equals

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4. Suppose the normal to the hyperbola xy=4 at (2,2) meets hyperbola again at $A\left(2a, \frac{2}{a}\right)$ and the normal to the hyperbola xy = 4 at A meets the hyperbola at B(h, k), then h/4 is equal to

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5. Let $e(\lambda)$ be eccentricity of the hyperbola

$$\frac{x^2}{a^2+\lambda} - \frac{y^2}{b^2+\gamma} = 1$$

where $a^2 > b^2$ and $\gamma \geq 1$ if $e(\lambda)$ is least when $\lambda = \lambda_0$ then λ_0 is equal to

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6. If for different values of α, the locus of point of intersection of two straight lines $\sqrt{3}ax + ay - 4\sqrt{3}\alpha = 0$ is hyperbola with eccentricity e, then e is equal to

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

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8. Suppose $0 < \theta < \frac{\pi}{2}$ if the eccentricity of the hyperbola $x^2 - y^2 \cos ec^2\theta = 5$ is $\sqrt{7}$

times the eccentricity of the ellipse $x^2 \cos ec^2\theta + y^2 = 5$ then θ is equal to _____

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9. Suppose equation of a hyperbola H is f distance between two parallel tangents of slope 3 is 4, then value of b is

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10. Ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1,(a>b),$ If the extremities of the latus rectum of the with positive ordinates lie on the parabola $x^2=3(y+3)$, then length of the transverse axis of ellipse is

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11. Let a hyperbola passes through the focus of the ellipse $\frac{x^2}{25}-\frac{y^2}{16}=1$. The transverse and conjugate axes of this hyperbola coincide with

the major and minor axes of the given ellipse, also the product of eccentricities of given ellipse and hyperbola is 1, then

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Exercise Concept Based Single Correct Answer Type Questions

1. If e is the eccentricity of the hyperbol and r is the radius of the circle

$x^2 + y^2 - 6x - 18y + 87 = 0$, then the value of er is equal to

A. $2\sqrt{3}$

B. $2/\sqrt{3}$

C. 2

D. 3

Answer: c

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2. If m_1 and m_2 are two values of m for which the line y = $mx + 2\sqrt{5}$ is a tangent to the hyperbola $\frac{x^2}{4} - \frac{y^2}{16} = 1$ then the value of $\left|m_1 + \frac{1}{m_2}\right|$ is equal to

A. $\frac{8}{3}$

B. $\frac{10}{3}$

C. 0

D. 9

Answer: a

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3. Distance between the directrices of the hyperbola $\frac{x^2}{49} - \frac{y^2}{16} = 1$ is

A. $\frac{\sqrt{65}}{7}$

B. $\frac{49}{\sqrt{65}}$

C. $\frac{\sqrt{33}}{4}$

D. $\frac{98}{\sqrt{65}}$

Answer: d

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4. If A line with slope m touches the hyperbola $\frac{x^2}{25} - \frac{y^2}{4}$ =1 and the parablola $y^2 = 20x$ then the value of $25m^4 - 4m^2$ is equal to

A. 29

B. 21

C. 25

D. 4

Answer: c

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5. If length of the transverse axis of a hyperbola is 8 and its eccentricity is $\sqrt{5}/2$ then the length of a latus rectum of the hyperbola is

A. 1

B. 2

C. $2\sqrt{5}$

D. $8/\sqrt{5}$

Answer: b

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6. A tangent to the hyperbola at P and y-axis at Q. Lines PR and QR are drawn such that OPRQ is a rectangle (where O is the origin), then R lies on

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

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

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

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

Answer: d

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7. If $P(3\sec\theta, 2\tan\theta)$ and $Q(3\sec\phi, 2\tan\phi)$ where $\theta + \pi = \frac{\phi}{2}$ be two distainct points on the hyperbola then the ordinate of the point of intersection of the normals at p and Q is

A. $11/3$

B. $-11/3$

C. $13/2$

D. $-13/2$

Answer: d

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8. A common tangent to $x^2 - 2y^2 = 18$ and $x^2 + y^2 = 9$ is

A. $y = 2x + 3\sqrt{5}$

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

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

D. $y = \sqrt{2}x + 3\sqrt{5}$

Answer: b

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9. If the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the hyperbola coincide then b^2 equals

A. 5

B. 7

C. 9

D. 1

Answer: b

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10. 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. 73

B. 55

C. 64

D. 9

Answer: a

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11. If the vertex of a hyperbola bisects the distance between its centre and the corresponding focus, then the ratio of the

square of its conjugate axis to the square of half the distance between the foci is

A. $4/3$

B. $4/\sqrt{3}$

C. $2/\sqrt{3}$

D. $3/4$

Answer: d

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12. If the chords of contact of the tangents from two points to the hyperbola $4x^2 - 5y^2 = a^2$ are at right angles then $16x_1x_2 + 25y_1y_2$ is equal to

A. -1

B. 0

C. a^2

D. 1

Answer: b

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13. If two perpendicular tangents are drawn from a point (α, β) to the hyperbola $x^2 - y^2 = 16$, then the locus of (α, β) is

A. a pair of straight line

B. a circle

C. a parabola

D. an ellipse

Answer: a

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14. If $\frac{x^2}{a+7}+\frac{y^2}{5-a}=1$ represent a hyperbola then

A. $a>5$

B. $a<-7$

C. $a<5$

D. $a<-7$ or $a>5$

Answer: d

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15. If e_1 is the eccentricity of the hyperbola $\frac{x^2}{36} - \frac{y^2}{49} = 1$ and e_2 is the eccentricity of the hyperbola $\frac{x^2}{36} - \frac{y^2}{49} = -1$ then

A. $e_1 e_2 = 1$

B. $\frac{e_1}{e_2} = 1$

C. $\frac{1}{e_1^2} + \frac{1}{e_2^2} = 1$

D. $e_1^2 + e_2^2 = 1$

Answer: c

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Exercise Level 1 Single Correct Answer Type Questions

1. The line $4\sqrt{2x} - 5y = 40$ touches the hyperbola $\frac{x^2}{100} - \frac{y^2}{64} = 1$ at the point

A. $10, 8\sqrt{2}$

B. $10, 8\sqrt{2}$

C. $20, 8\sqrt{2}$

D. $(20)\sqrt{3}, \frac{8}{\sqrt{3}}$

Answer: b

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2. The line $9\sqrt{3x} + 12y = 234\sqrt{3}$ is a normal to the hyperbola $\frac{x^2}{81} - \frac{y^2}{36} = 1$ at the points

A. $18, 6\sqrt{3}$

B. $9\sqrt{2}, 6$

C. $9\sqrt{3}, 6$

D. $\frac{18}{\sqrt{3}}, \frac{6}{\sqrt{3}}$

Answer: a

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3. If latus recturn of the ellipse $x^2 \tan^2 \alpha + y^2 \sec^2 \alpha = 1$ is $\frac{1}{2}$ then $\alpha (0 < \alpha < \pi)$ is equal to

A. $2\sqrt{\cot \alpha}$

B. $2\sqrt{\tan \alpha}$

C. $2\sqrt{\tan \alpha}^{3/2}$

D. $2\sqrt{\cot \alpha}^{3/2}$

Answer: c

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

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

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

C. $\frac{a}{be}$

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

Answer: d

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5. Asymptotes of the hyperbola $xy = 4x + 3y$ are

A. $2, 3/2$

B. 2,3

C. $3/2, 2$

D. 0,0

Answer: c

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6. The curve described parametrically by $x = t^2 + t + 1$, and $y = t^2 - t + 1$ represents. a pair of straight lines (b) an ellipse a parabola (d) a hyperbola

A. a pari of straight lines

B. an ellipse

C. a parabola

D. a hyperbola

Answer: c

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7. The point $\left(at^2, 2bt\right)$ lies on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ for

A. all real values of t

B. $t^2 = 2 + \sqrt{5}$

C. $t^2 = 2 - \sqrt{5}$

D. no real value of t

Answer: b

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8. If the coordinates of four concyclic point on the rectangular hyperbola xy $=c^2$ are i=1,2,3,4 then

A. $t_1t_2t_3t_4 = -1$

B. $t_1t_2t_3t_4 = 1$

C. $t_1t_3 = t_2t_4$

D. $t_1t_2t_3t_4 = c^2$

Answer: b

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9. The eccentricity of a rectangular hyperbola, is

A. 2

B. $\sqrt{2}$

C. $2+\sqrt{2}$

D. none of these

Answer: b

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

A. -1

B. 0

C. 1

D. none of these

Answer: c

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11. Foci of the rectangular hyperbola are (± 7) the equation of the hyperbola is

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

B. $x^2 - y^2 = 98$

C. $2x^2 - 2y^2 = 49$

D. none of these

Answer: c

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12. The is a point P on the hyperbola $\frac{x^2}{16} - \frac{y^2}{6} = 1$ such that its distance from the right directrix is the average of its distance from the two foci. Then the x-coordinate of P is

A. $4\sqrt{2}, 3$

B. $4\sqrt{3}, 3\sqrt{2}$

C. $4\sqrt{5}, 6$

D. none of these

Answer: a

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13. The normal at a point P to the parabola $y^2 = 4x$ is parallel to the tangent at $Q\sqrt{2, 2}$ to the hyperbola nd meets the axis of the

parabola at If 5 is the focus of the parabola, area of the triangle PSR in sq. units is

A. $9\sqrt{2}$

B. $10\sqrt{2}$

C. $18\sqrt{2}$

D. $20\sqrt{2}$

Answer: c

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14. The difference between the length 2a of the transverse axis of a hyperbola of eccentricity e and the length of its latus rectum is

A. $2a\left|3-e^2\right|$

B. $2a\left|2-e^2\right|$

C. $2a\left|e^2-1\right|$

D. $a\left|2e^2-1\right|$

Answer: c

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15. The locus of the point of intersection of the tangents to the hyperbol which are at right an gles i

A. $x^2 + y^2 = 20$

B. $x^2 - y^2 = 20$

C. $x^2 + y^2 = 52$

D. none of these

Answer: d

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16. If the asymptotes of the hyperbola perpendicular to the asymptotes of the hyperbola $\frac{x^2}{49} - \frac{y^2}{b^2}$=1 then

A. $7a \pm 6b = 0$

B. $6a + 7b = 0$

C. $a^2 - b^2 = 1$

D. a-b=1

Answer: a

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17. P and Q are two points on the rectangular hyperbola $xy = C^2$ such that the abscissa of P and Q are the roots of the equations $x^2 - 6x - 16 = 0$. Equation of the chord joining P and Q is

A. $16x - c^2y = 6c^2$

B. $c^2x - 16y = c^2$

C. $c^2x - 16y = 6c^2$

D. $c^2x - 16y = 6c^2$

Answer: c

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18. Normal at (3, 4) to the rectangular hyperbola x y - y - 2 x - 2 = 0 meets the curve again at the points

A. 1,2

B. 2,3

C. $-1, 0$

D. none of these

Answer: c

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

Answer: c

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20. If the eccentricity of the hyperbola is $\sqrt{5}$ and the distance between the foci is 12 then b^2-a^2 is equal to (3/5) k^2 where k is equal to

A. 5

B. 3

C. 2

D. 6

Answer: d

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21. If the extremities of the latus rectum of the hyperbola with positive coordinates lie on the parabola $x^2 = 3(y + 3)$, then length of the

latus rectum of the hyperbola when its eccentricity is $\sqrt{3}$ is

A. 3

B. 6

C. 12

D. none of these

Answer: c

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22. The locus of the point of intersection of the lines $\sqrt{3}x - y - 4\sqrt{3}t = 0 \& \sqrt{3}tx + ty - 4\sqrt{3} = 0$ (where t is a parameter) is a hyperbola whose eccentricity is:

A. 0

B. 7

C. 3

D. 4

Answer: b

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

A. 4x-3y=0

B. 3x-4y=0

C. 3x+4y=0

D. 4x+3y=0

Answer: b

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24. The parametric equation

$x = a(\sec\theta + \tan\theta), y = b(\sec\theta - \tan\theta)$

repersents

A. a parabola

B. an ellipse

C. a hyperbola

D. a rectangular hyperbola

Answer: d

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25. If a normal to the hyperbola $x^2 - 4y^2 = 4$ having equal positive intercepts on the axes is a tangent to the ellipse $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ then the distance between the foci of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

A. $\frac{10}{\sqrt{3}}$

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

C. $10\sqrt{3}$

D. $5\sqrt{3}$

Answer: a

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Exercise Level 2 Single Correct Answer Type Questions

1. Locus of the mid-point of the chord of the hyperbola which is a tangent to the circle $x^2 + y^2 = c$ is

A. $\left(\frac{x^2}{a^2}-\frac{y^2}{b^2}\right)=c^2\left(\frac{x^2}{a^4}+\frac{y^2}{b^4}\right)$

B. $\left(\frac{x^2}{a^2}-\frac{y^2}{b^2}\right)=c^2\left(\frac{x^2}{a^4}-\frac{y^2}{b^4}\right)$

C. $\left(\frac{x^2}{a^2}-\frac{y^2}{b^2}\right)=c^2\left(\frac{x^2}{a^4}+\frac{y^2}{b^2}\right)$

D. $\left(\frac{x^2}{a^4}-\frac{y^2}{b^4}\right)=c^2\left(\frac{x^2}{a^4}+\frac{y^2}{b^4}\right)$

Answer: a

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2. H_1 xy = CA^2 and H_2 : xy = k^2 are two different hyperbolas. From a point on H_1 tangents are drawn to H_2. Area of the triangle

formed by the chord of contact and the asymptote to H_2 is

A. $\frac{k^2}{c^2}$

B. $\frac{k}{c^2}$

C. $\frac{2k^4}{c^2}$

D. none of these

Answer: c

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3. e_1, e_2 are respectively the eccentricites of the hfyperbola $x^2 - y^2 \cos ec^2\theta = 5$ and the ellipse$x^2 \cos ect^2\theta + y^2 = 5$ if $0 < \theta < \pi/2$ and $e_1 = \sqrt{7}$ then θ is equal to

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

B. $\frac{\pi}{6}$

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

D. none of these

Answer: c

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4. If θ is an angle between the two asymptotes of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ then $\frac{\cos(\theta)}{2}$ is equal to

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

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

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

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

Answer: c

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5. A and B are two points on the hyperbola O is the centre. If OA is perpendicular to OB then $\frac{1}{(OA)^2} + \frac{1}{(OB)^2}$ is equal to

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

B. $\frac{1}{a^2} - \frac{1}{b^2}$

C. $\frac{1}{b^2} - \frac{1}{a^2}$

D. $a^2 + b^2$

Answer: b

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6. The coordinates of a point common to a directrix and an asymptote of the hyperbola $\frac{x^2}{25} - \frac{y^2}{16} = 1$ are

A. $\left(\frac{25}{\sqrt{41}}, \frac{20}{3}\right)$

B. $\left(\frac{20}{\sqrt{41}}, \frac{-25}{\sqrt{41}}\right)$

C. $\left(\frac{25}{3}, \frac{20}{3}\right)$

D. $\left(\frac{-25}{\sqrt{41}}, \frac{20}{41}\right)$

Answer: d

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7. If the normals at P, Q, R on the rectangular hyperbola xy = c2 intersect at a point S on the hyperbola, then centroid of the triangle PQR is at

A. it meets the conjugate hyperbola in imaginary points

B. the conjugate diameter meets the given hyperbola in real points

C. the conjugate diameter meets the conjugate hyperbola in imaginary points

D. none of these

Answer: b

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8. If a diameter of a hyperbola meets the hyperbola in real points then

A. $3x^2 + 4y^2 - 6x - 8y + 4 = 0$

B. $3x^2 + 4y^2 - 2x - 8y + 4 = 0$

C. $4x^2 + 3y^2 - 8x - 6y + 4 = 0$

D. $4x^2 + 3y^2 - 8x - 2y + 4 = 0$

Answer: a

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9. An ellipse has eccentricity $\frac{1}{2}$ and one focus at the point $P\left(\frac{1}{2}, 1\right)$. Its one directrix is the comionand tangent nearer to the point the P to the hyperbolaof $x^2 - y^2 = 1$ and the circle $x^2 + y^2 = 1$.Find the equation of the ellipse.

A. x=h,y=k

B. x=-h,y=-k

C. x=h,y=k

D. x=-k,y=-h

Answer: b

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10. Find the equation of the asymptotes of the hyperbola $xy = hx + ky$.

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11. 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

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12. A rectangular hyperbola of latus rectum 2 units passes through (0,0) and has S(l, 0) as one of its foci. The other focus lies on a circle of diameter

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13. Let H be a hyperbola of eccentricity 3. A normal to the hyperbola meets the transverse axis and the conjugate axis at P and Q, respectively. If locus of midpoint of PQ is a hyperbola of eccentricity elt then er is equal to

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14. Tangent at point P $(a\sec\theta, b\tan\theta)$ to the hyperbola meets the auxiliary circle of the

hyperbola at points whose ordinates are y_1 and y_2, then $4b \tan\theta \frac{y_1 + y_2}{y_1 y_2}$ is equal to

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15. If two tangents drawn from the point (2, a) to the hyperbola are at right angles, then a equal to

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16. 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

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17. If eccentricity of the hyperbola 4 and y = mx + c is a tangent to the hyperbola H, then least positive integral value of m is equal to

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18. Asymptotes of a rectangular hyperbola are $x = 5$ and $y = 4$. If the hyperbola passes through $(6, 8)$ and length of its latus rectum is I, then I is equal to

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Question From Previous Years Aieee Jee Main Papers

1. 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. 5

B. 7

C. 9

D. 1

Answer: b

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2. 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 parabola (B) an ellipse (C) a hyperbola (D) a circle

A. a parabola

B. a hyperbola

C. an ellipse

D. a circle

Answer: b

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3. The normal to a curve at P(x, y) meets the x-axis at G. If the distance of G from the origin is twice the abscissa of P, then the curve is a (1) ellipse (2) parabola (3) circle (4) hyperbola

A. ellipse

B. parabola

C. circle

D. hyperbola

Answer: a

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4. For the hyperbola $\frac{x^2}{\cos^2\alpha} - \frac{y^2}{\sin^2\alpha} = 1$`; (0

A. eccentricity

B. directrix

C. abscisae of vertices

D. abscissae of foci

Answer: d

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

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

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

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

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

Answer: b

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6. A tangent to the hyperbola meets x-axis at P and y-axis at Q. Lines PR and QR are drawn such that OPRQ is a rectangle (where O is the origin) then R lies on

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

B. $\frac{2}{x^2} - \frac{4}{y^2} = 1$

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

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

Answer: d

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7. A common tangent to the conics $x^2 = 6y$ and $2x^2 - 4y^2 = 9$ is

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

B. $x + y = 1$

C. $x + y = \frac{9}{2}$

D. $x - y = 1$

Answer: a

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8. If $P(3\sec\theta, 2\tan\theta)$ and $Q(3\sec\phi, 2\tan\phi)$ where $\theta + \pi = \frac{\phi}{2}$ be two distainct points on the hyperbola then the ordinate of the point of intersection of the normals at p and Q is

A. $\frac{11}{3}$

B. $\frac{11}{3}$

C. $\frac{13}{2}$

D. $-\frac{13}{2}$

Answer: d

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9. The tangent at an extremity (in the first quadrant) of latus rectum of the hyperbola $\frac{x^2}{4} - \frac{y^2}{5} = 1$ meets x-axis and y-axis at A

and B respectively. Then $(OA)^2 - (OB)^2$, where O is the origin, equals:

A. $-\frac{20}{9}$

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

C. 4

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

Answer: a

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10. An ellipse passes through the foci of the hyperbola, $9x^2 - 4y^2 = 36$ and its major and minor axes lie along the transverse and conjugate axes of the hyperbola respectively. If the product of eccentricities of the two conics is $\frac{1}{2}$, then which of the following points does not lie on the ellipse?

A. $\sqrt{3}, 0$

B. $\frac{\sqrt{39}}{2}, \sqrt{3}$

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

D. $\frac{\sqrt{13}}{2}, \sqrt{6}$

Answer: c

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11. 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 : (1) $\frac{4}{3}$ (2) $\frac{4}{\sqrt{3}}$ (3) $\frac{2}{\sqrt{3}}$ (4) $\sqrt{3}$

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

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

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

D. $\sqrt{3}$

Answer: c

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12. 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. $\sqrt{5}, 2\sqrt{2}$

B. 0,2

C. $5, 2\sqrt{3}$

D. $\sqrt{10}, 2\sqrt{3}$

Answer: c

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13. 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: a

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14. The locus of the point of intersection of thestraight lines $tx - 2y - 3t = 0, x - 2ty + 3 = 0 (t \in R,$ is

A. an ellipse with essentircity $2/\sqrt{5}$

B. an ellipse with length of major axis 6

C. a hyperbola with eccentricity $\sqrt{5}$

D. a hyperbola with the length of conjugate axis 3

Answer: d

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15. 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 : $(\sqrt{3}, \sqrt{2})$ (2)

$(-\sqrt{2}, -\sqrt{3})$ (3) $(3\sqrt{2}, 2\sqrt{3})$ (4)

$(2\sqrt{2}, 3\sqrt{3}$

A. $-\sqrt{2}, -\sqrt{3}$

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

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

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

Answer: c

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16. Tangents are drawn to the hyperbola $4x^2 - y^2 = 36$ at the points P and Q. If these tangents intersect at the point T(0,3) then the area (in sq units) of $\triangle PTQ$ is

A. $54\sqrt{3}$

B. $60\sqrt{3}$

C. $36\sqrt{3}$

D. $45\sqrt{3}$

Answer: d

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17. If the tangent drawn to the hyperbola $4y^2 = x^2 + 1$ intersect the co-ordinate axes at the distinct points A and B, then the locus of the mid-point of AB is:

A. $4x^2 - y^2 - 16x^2y^2 = 0$

B. $4x^2 - y^2 + 16x^2y^2 = 0$

C. $4x^2 - y^2 + 16x^2y^2 = 0$

D. $4x^2 - y^2 - 16x^2y^2 = 0$

Answer: d

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18. If a hyperbola has length of its conjugate axis equal to 5 and the distance between its foci is 13, then the eccentricity of the hyperbola is

A. $13/12$

B. 2

C. $13/6$

D. $13/8$

Answer: a

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19. Equation of a common tangent to the parabola $y^2 = 4x$ and the hyperbola xy=2 is

A. x+y+1=0

B. x-2y+4=0

C. x+2y+4=0

D. 4x+2y+1=0

Answer: c

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20. Let $0 < \theta < \frac{\pi}{2}$. If the eccentricity of the hyperbola $\frac{x^2}{\cos^2\theta} - \frac{y^2}{\sin^2\theta} = 1$ is greater ten 2, then the length of its latus rectum lies in the interval,

A. $3, \infty$

B. $3/2, 2$

C. 2,3

D. $1, 3/2$

Answer: a

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21. The equation of tangent to hyperbola $4x^2 - 5y^2 = 20$ which is parallel to $x - y = 2$ is (a) $x - y + 3 = 0$ (b) $x - y + 1 = 0$ (c) $x - y = 0$ (d) $x - y - 3 = 0$

A. x-y+1=0

B. x-y+7=0

C. x-y+9=0

D. x-y-3=0

Answer: a

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22. A hyperbola has its centre at the origin, passes through the point (4, 2) and has

transverse axis of length 4 along the x-axis. Then the eccentricity of the hyperbola is

A. $x-y+1=0$

B. $x-y+7=0$

C. $x-y+9=0$

D. $x-y-3=0$

Answer: d

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23. Let

$$S = \left\{(x, y) \in R^2 : \frac{y^2}{1+r} - \frac{x^2}{1-r} = 1\right\},$$

where $r \neq \pm 1$. Then S represents:

A. a hyperbola whose eccentricity is $\frac{2}{\sqrt{1-r}}$ when $0 < r < 1$

B. an ellispe whose eccentricity is $\frac{\sqrt{2}}{r+1}$ when $0 < r < 1$

C. a hypberbla whose eccentricity is $\frac{\sqrt{2}}{r+1}$ when $0 < r < 1$

D. an ellipse whose eccentricity is $\frac{1}{\sqrt{r+1}}$

when $0 < r < 1$

Answer: b

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Question From Previous Years B Architecture Entrance Examination Papers

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

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

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

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

Answer: c

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2. 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. -1

B. 0

C. 4

D. 1

Answer: b

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3. A common tangent to $x^2 - 2y^2 = 18$ and $x^2 + y^2 = 9$ is

A. $y = 2x + 3\sqrt{5}$

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

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

D. $y = \sqrt{2x} + 3\sqrt{5}$

Answer: b

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4. If the point R divides the line segment joining the point (2, 3) and $(2\tan\theta, 3\sec\theta), 0 < \theta < \frac{\pi}{2}$ internally in the ratio 2 :3 , then the locus of R is

A. an ellipse length of whose major axis is 12.

B. an ellipse length of whose major axis is 8.

C. a hyperbola length of whose transverse axis is 12.

D. a hyperbola length of whose transverse axis is 8

Answer: c

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5. 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. 3x-2y=0

B. 2x-3y+10=0

C. x-2y+8=0

D. 2x-y-2=0

Answer: d

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6. Which one of the following points does not lie on the normal to the hyperbol $\frac{x^2}{16} + \frac{y^2}{9} = 1$ drawn at the point $\left(8, 3\sqrt{3}\right)$

A. $10, \frac{1}{\sqrt{3}}$

B. $13, \frac{1}{\sqrt{3}}$

C. $12, \frac{1}{\sqrt{3}}$

D. $11, \sqrt{3}$

Answer: a

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7. Let $\theta \in (0, \pi/2)$. If the eccentricity of the hyperbola $x^2 \cos^2\theta - y^2 = 6\cos^2\theta$ is $\sqrt{3}$ times the eccentricity of the ellipse $x^2 + y^2\cos^2\theta = 3\theta\cos^2\theta$ then θ is equal to

A. $\pi/6$

B. $\pi/4$

C. $\cos^{-1}\left(1/\sqrt{3}\right)$

D. $\pi/3$

Answer: b

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8. If any tangent to the parabola $x^2 = 4y$ intersects the hyperbola xy = 2 at two points P and Q, then the mid point of line segment PQ lies on a parabola with axis along:

A. x-axis and focus on positive x-axis

B. y-axis and focus on positive y-axis

C. x-axis and focus on negative x-axis

D. y-axis and focus on negative y-axis

Answer: c

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