HYPERBOLA

SYNOPSIS

- A Conic is said to be hyperbola if its eccentricity > 1
- If $e = \sqrt{2}$ then the Hyperbola is called Rectangular Hyperbola.
- If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents the Hyperbola then $h^2 - ab > 0$ and $\Delta \neq 0$.
- If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents the Rectangular Hyperbola then $h^2 - ab > 0$ and $\Delta \neq 0$ and $a + b = 0$.
- If $S \equiv ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ and $S = 0$ represents the hyperbola, then, to find the centre of the hyperbola then solve the equations $\frac{\partial s}{\partial x} = 0$, $\frac{\partial s}{\partial y} = 0$

	HYPERBOLA	CONJUGATE HYPERBOLA
General Equation	$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$	$\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1$
• Centre	(0,0)	(0,0)
• Eccentricity	$e = \frac{\sqrt{a^2 + b^2}}{a}$ (or) $b^2 = a^2(e^2 - 1)$	$e = \frac{\sqrt{a^2 + b^2}}{b}$ (or) $a^2 = b^2(e^2 - 1)$
• Foci	$(\pm ae, 0)$	$(0, \pm be)$
• Vertices	$(\pm a, 0)$	$(0, \pm b)$
• Length of the latusrectum	$\frac{2b^2}{a}$	$\frac{2a^2}{b}$
• Length of the transverse axis	2a	2b
• Length of the conjugate axis	2b	2a
• Equations of directrices	$x = \pm \frac{a}{e}$	$y = \pm \frac{b}{e}$
• Equations of latusrecta	$x = \pm ae$	$y = \pm be$
• Equation of the transverse axis	y=0	x=0
• Equation of the conjugate axis	x=0	y=0
• Equation of the director circle	$x^2 + y^2 = a^2 - b^2$	$x^2 + y^2 = b^2 - a^2$
• Equation of the auxiliary circle	$x^2 + y^2 = a^2$	$x^2 + y^2 = b^2$
• If P is any point on the hyperbola and S, S^1 are foci then	$\lvert SP - S^1P \rvert = 2a$	$\lvert SP - S^1P \rvert = 2b$

• Ends of latusrectum	$\left(\pm ae, \pm \frac{b^2}{a}\right)$	$\left(\pm \frac{a^2}{b}, \pm be\right)$
• General equation	$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$	$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = -1$
• Centre	$(x-h, y-k) = (0,0)$	$(x-h, y-k) = (0,0)$
• Eccentricity	$e = \frac{\sqrt{a^2+b^2}}{a}$	$e = \frac{\sqrt{a^2+b^2}}{b}$
• Foci	$(\pm ae, 0) = (x-h, y-k)$	$(0, \pm be) = (x-h, y-k)$
• Length of the latusrectum	$\frac{2b^2}{a}$	$\frac{2a^2}{b}$
• Length of the transverse axis	2a	2b
• Length of the conjugate axis	2b	2a
• Equation of the directrices	$x - h = \pm \frac{a}{e}$	$y - k = \pm \frac{b}{e}$
• Equation of the latusrecta	$x - h = \pm ae$	$y - k = \pm be$
• Equation of the transverse axis	$y - k = 0$	$x - h = 0$
• Equation of the conjugate axis	$x - h = 0$	$y - k = 0$
• Equation of the director circle	$(x-h)^2 + (y-k)^2 = a^2 - b^2$	$(x-h)^2 + (y-k)^2 = b^2 - a^2$
• Equation of the auxiliary circle	$(x-h)^2 + (y-k)^2 = a^2$	$(x-h)^2 + (y-k)^2 = b^2$
• If "P" is any point on hyperbola and S and S^1 are foci, then	$\lvert SP - S^1P \rvert = 2a$	$\lvert SP - S^1P \rvert = 2b$
• Ends of the latusrectum	$(x-h, y-k) = \left(\pm ae, \pm \frac{b^2}{a}\right)$	$(x-h, y-k) = \left(\pm \frac{a^2}{b}, \pm be\right)$

- The equation of the tangent at (x_1, y_1) to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is $\frac{xx_1}{a^2} - \frac{yy_1}{b^2} = 1$.
- The equation of the normal to the hyperbola S=0 at (x_1, y_1) is $\frac{a^2x}{x_1} + \frac{b^2y}{y_1} = a^2 + b^2$.
- The condition that the line y=mx+c may be tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is $c^2 = a^2m^2 - b^2$ and the point of contact is $\left(\frac{a^2m}{c}, \frac{-b^2}{c}\right)$.

- The condition that the line $lx + my + n = 0$ may be tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is $a^2l^2 - b^2m^2 = n^2$ and the point of contact is $\left(\frac{-a^2l}{n}, \frac{b^2m}{n}\right)$.
- If $m_1 \& m_2$ are the slopes of the tangents to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ through (x_1, y_1) then
  - m_1, m_2 are satisfying the equation $(x_1^2 - a^2)m^2 - 2x_1y_1m + (y_1^2 + b^2) = 0$.
  - $m_1 + m_2 = \frac{2x_1y_1}{x_1^2 - a^2}$
  - $m_1m_2 = \frac{y_1^2 + b^2}{x_1^2 - a^2}$
- If "θ" is the angle between the tangents from (x_1, y_1) to the hyperbola S=0 then $\tan\theta = \frac{2ab\sqrt{-s_{11}}}{x_1^2 + y_1^2 - a^2 + b^2}$
- The condition that the line $lx + my + n = 0$ may be normal to the hyperbola S=0 is $\frac{a^2}{l^2} - \frac{b^2}{m^2} = \frac{(a^2 + b^2)^2}{n^2}$.
- The pole of the line $lx + my + n = 0$ w.r. to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is $\left(\frac{-a^2l}{n}, \frac{b^2m}{n}\right)$.
- The pole of the line $y = mx + c$ w.r. to the hyperbola S=0 is $\left(\frac{-a^2m}{c}, \frac{-b^2}{c}\right)$.
- The condition that the lines $l_1x + m_1y + n_1 = 0$, $l_2x + m_2y + n_2 = 0$ are conjugate lines w.r. to the hyperbola S=0 is $a^2l_1l_2 - b^2m_1m_2 = n_1n_2$.
- The condition that the points (x_1, y_1) and (x_2, y_2) are conjugate points w.r. to the hyperbola S=0 is $S_{12} = 0$.
- Slope of the chord of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ having mid point at (x_1, y_1) is $\frac{b^2x_1}{a^2y_1}$.
- The midpoing of the chord of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ on the line $lx + my + n = 0$ is $\left(\frac{-a^2ln}{a^2l^2 - b^2m^2}, \frac{b^2mn}{a^2l^2 - b^2m^2}\right)$.
- The tangents at infinity to the hyperbola are called asymptotes of the hyperbola.
- The equation of the asymptotes of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ are $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 0$ (or) $\frac{x}{a} + \frac{y}{b} = 0$, $\frac{x}{a} - \frac{y}{b} = 0$
- The angle between the asymptotes of the hyperbola S=0 is $2\sec^{-1}(e)$ or $2Tan^{-1}\frac{b}{a}$.
- The angle between the asymptotes of the hyperbola $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ is $Tan^{-1}\left(\frac{2\sqrt{h^2 - ab}}{a + b}\right)$.
- Each asymptote makes an angle $Tan^{-1}\frac{b}{a}$ with the x-axis.
- The angle between the asymptotes of the rectangular hyperbola is $\frac{\pi}{2}$.
- The equations of a hyperbola and its asymptotes always differ by a constant

- Equation of the pair of asymptotes of the hyperbola $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ is
$$ax^2 + 2hxy + by^2 + 2gx + 2fy + c - \frac{D}{ab - h^2} = 0$$
- If (x_1, y_1) is the centre of the hyperbola S=0, then the equation to its asymptotes is $S = S_{11}$.
- The product of the perpendiculars from any point on the hyperbola to its asymptotes is $\frac{a^2b^2}{a^2 + b^2}$.
- The product of the perpendiculars from foci to any tangent to the hyperbola S=0 is b^2.
- The parametric equations of the hyperbola S=0 are $x = a\sec\theta, y = b\tan\theta$.
- The equation of the tangent at "θ" is $\frac{x}{a}\sec\theta - \frac{y}{b}\tan\theta = 1$.
- The equation of the normal at "θ" is $\frac{ax}{\sec\theta} + \frac{by}{\tan\theta} = a^2 + b^2$.
- Equation of the chord joining "α" and "β" is
$$\frac{x}{a}\cos\left(\frac{\alpha - \beta}{2}\right) - \frac{y}{b}\sin\left(\frac{\alpha + \beta}{2}\right) = \cos\left(\frac{\alpha + \beta}{2}\right)$$
- If α and β are the eccentric angles of the extremities of a focal chord of the hyperbola then $e\cos\left(\frac{\alpha - \beta}{2}\right) = \cos\left(\frac{\alpha + \beta}{2}\right)$.
- If the chord joining the two points $(a\sec\theta_1, b\tan\theta_1)$ and $(a\sec\theta_2, b\tan\theta_2)$ passes through the focus of the hyeprbola S=0 then $\tan\frac{\theta_1}{2}\tan\frac{\theta_2}{2} = \frac{1-e}{1+e}$.
- Let e_1 and e_2 be the eccentricities of the hyperbola and its conjugate. Then $\frac{1}{e_1^2} + \frac{1}{e_2^2} = 1$.
- Let e_1 and e_2 be the eccentricities of the hyperbolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{x^2}{b^2} - \frac{y^2}{a^2} = 1$ respectively then $ae_1 = be_2$.
- The equations to the common tangents to the two hypebrolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$ are $y = \pm x \pm \sqrt{a^2 - b^2}$.
- Equation of the chord joining two points (x_1, y_1) and (x_2, y_2) on the rectangular hyperbola $xy = c^2$ is $\frac{x}{x_1 + x_2} + \frac{y}{y_1 + y_2} = 1$.
- If (x_1, y_1) is the centre of the hyperbola S=0. Then the equation of its conjugate hyperbola is $S = 2S_{11}$.
- The asymptotes of the hyperbola $xy = c^2$ are the co-ordinate axes. i.e., x=0, y=0
- Equation of the tangent at the point (x_1, y_1) to the hyperbola $xy = c^2$ is $\frac{x}{x_1} + \frac{y}{y_1} = 2$.
- Equation of the normal at the point (x_1, y_1) to the hyperbola $xy = c^2$ is $xx_1 - yy_1 = x_1^2 - y_1^2$.
- Let $P(x_1, y_1)$ be a point and $S \equiv \frac{x^2}{a^2} - \frac{y^2}{b^2} - 1 = 0$ be a hyperbola. Then
  - P lies on the hyperbola then $S_{11} = 0$
  - P lies inside the hyperbola then $S_{11} > 0$
  - P lies outside the hyperbola then $S_{11} < 0$
- Any straight line parallel to an asymptote of a hyperbola intersects the hyperbola at only one point.
- At most four normals can be drawn from any point to a hyperbola

CONCEPTUAL QUESTIONS

1. If a triangle is inscribed in a rectangular hyperbola, then its orthocentre lies on.
   1) circle 2) parabola
   3) Ellipse 4) same curve
2. The points of intersection of asymptotes with directrices lies on
   1) Auxiliary circle 2) Director circle
   3) Transverse axis 4) Conjugate axis
3. The product of lengths of latusrectums of $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ and its conjugate hyperbola's is
   1) 2ab 2) 3ab 3) 4ab 4) 6ab.
4. If a rectangular hyperbola circumscribes a triangle by t_1, t_2, t_3 it also passes through the orthocentre t_4 of the triangle then $t_1t_2t_3t_4$ =
   1) 1 2) -1 3) 2 4) -2
5. If a triangle is inscribed in a rectangular hyperbola $xy=c^2$ with vertices A,B,C with its parameters t_1, t_2 and t_3 then orthocentre of ∇ABC is
   1) $\left(c\left(t_1+t_2+t_3\right); -ct_1t_2t_3\right)$
   2) $\left(\frac{-c}{t_1t_2t_3}, -ct_1t_2t_3\right)$
   3) $\left(-c\left(t_1+t_2+t_3\right), ct_1t_2t_3\right)$
   4) $\left(-c+t_1+t_2+t_3, t_1t_2t_3-c\right)$
6. Two straight lines passing through the fixed points $(\pm a, 0)$ and having slopes whose product is k > 0 , then the locus of point of intersection of the lines is
   1) A circle 2) A parabola
   3) An ellipse 4) A hyperbola
7. If PN is the perpendicular from a point 'P' on a rectangular hyperbola to its asymptotes, then locus of the mid points of PN is
   1) circle 2) parabola
   3) ellipse 4) hyperbola
8. If P is a point on the rectangular hyperbola $x^2-y^2=a^2$, "C" is its centre and S, S^1 are focii, then $SP.S^1P=$
   1) 2 2) $(CP)^2$ 3) $(CS)^2$ 4) $\left(SS^1\right)^2$

KEY

1) 4	2) 1	3) 3	4) 2
5) 2	6) 4	7) 4	8) 2

LEVEL - I
ECCENTRICITY

1. In a hyperbola the distance between the foci is three times the distance between the directrices then its eccentricity is
   1) $\frac{5}{2}$ 2) $\frac{3}{2}$ 3) $\frac{5}{4}$ 4) $\sqrt{3}$
2. In a hyperbola the distance between the foci is 2 and the distance between the directrices is 1 its eccentricity is
   1) $\sqrt{3}$ 2) $\frac{3}{2}$ 3) $\sqrt{2}$ 4) $\frac{5}{2}$
3. In a hyperbola the latusrectum equals to semitransverse axis its eccentricity is
   1) $\frac{3}{2}$ 2) $\frac{4}{3}$ 3) $\frac{5}{2}$ 4) $\sqrt{\frac{3}{2}}$
4. e and e^1 are the eccentricities of the hyperbolas $16x^2-9y^2=144$ and $9x^2-16y^2=-144$ then $e-e^1=$
   1) 2 2) 1 3) 0 4) 3/2
5. The ratio between the transverse axis and conjugate axes of a hyperbola is 5:2 then its e=
   1) $\frac{\sqrt{31}}{5}$ 2) $\frac{\sqrt{29}}{5}$
   3) $\frac{\sqrt{33}}{5}$ 4) $\frac{\sqrt{29}}{4}$
6. The latusrectum of a hyperbola subtends a right angle at its centre its e=
   1) $\frac{\sqrt{3}+1}{2}$ 2) $\frac{\sqrt{7}+1}{2}$
   3) $\frac{\sqrt{5}+1}{2}$ 4) $\frac{\sqrt{5}}{2}$
7. If the latusrectum of a hyperbola subtends an angle 60^0 at the other focus then its e=
   1) $\sqrt{2}$ 2) $\sqrt{3}$ 3) $\sqrt{5}$ 4) $\sqrt{6}$
8. The length of the latusrectum of a hyperbola is 12 and semiconjugate axis is $2\sqrt{3}$ then its e=
   1) 2 2) 5/2 3) $\sqrt{3}$ 4) $\sqrt{2}$
9. The length of latusrectum of a hyperbola $\frac{x^2}{k}-\frac{y^2}{25}=-1$ is $\frac{22}{5}$ then its e is
   1) $\frac{7}{3}$ 2) $\frac{7}{5}$ 3) $\frac{6}{5}$ 4) $\frac{7}{2}$

10. The eccentricity of the conjugate hyperbola of the hyperbola $9y^2 - 4x^2 = 36$ is

1) $\frac{\sqrt{13}}{2}$ 2) $\frac{\sqrt{13}}{3}$ 3) $\frac{5}{3}$ 4) $\frac{4}{3}$

11. The eccentricity of the conjugate hyperbola of the hyperbola $4x^2 - 9y^2 - 8x - 32 = 0$ is

1) $\frac{\sqrt{13}}{3}$ 2) $\frac{5}{3}$ 3) $\frac{5}{4}$ 4) $\frac{\sqrt{13}}{2}$

12. The "e" of the hyperbola with centre at origin transverse axis is x axis and passing through the points (3,0), $\left(3\sqrt{2},2\right)$ is

1) $\frac{7}{2}$ 2) $\frac{\sqrt{13}}{3}$ 3) $\frac{\sqrt{13}}{2}$ 4) $\frac{5}{3}$

13. The locus of the point $\left(\frac{e^t + e^{-t}}{2}, \frac{e^t - e^{-t}}{2}\right)$ is a hyperbola of eccentricity

1) $\sqrt{3}$ 2) 3 3) $\sqrt{2}$ 4) 2

14. The eccentricity of a hyperbola is $\frac{5}{3}$ then the eccentricity of the conjugate hyperbola is

1) $\frac{5}{2}$ 2) $\frac{7}{2}$ 3) $\frac{7}{3}$ 4) $\frac{5}{4}$

15. A point P moves so that the product of the slopes of the two lines joining it to $(-2,1),(4,5)$ is 3. If the locus of P is a hyperbola then its e=

1) 5 2) $\frac{5}{2}$ 3) $\frac{3}{2}$ 4) 2

16. If e_1 and e_2 are the eccentricities of the hyperbolas $x^2 - y^2 = 7$ and $xy = 3$ then $e_1^2 + e_2^2 =$

1) 6 2) 8 3) 12 4) 4

17. The eccentricity of $xy = 10$ is

1) 2 2) $\frac{3}{2}$ 3) $\frac{5}{2}$ 4) $\sqrt{2}$

18. The eccentricity of the hyperbola $25x^2 - y^2 + 200x - 375 = 0$ is

1) $2\sqrt{5}$ 2) $2\sqrt{6}$ 3) $\sqrt{22}$ 4) $\sqrt{26}$

19. A hyperbola with foci $\left(0, \pm\sqrt{10}\right)$ passes through (2,3) then its e=

1) $\sqrt{3}$ 2) $\sqrt{5}$ 3) $\frac{5}{3}$ 4) $\sqrt{2}$

20. In a hyperbola the transverse axis is double the conjugate axis then its eccentricity is

1) $\sqrt{3}$ 2) $\frac{\sqrt{5}}{2}$ 3) $\frac{7}{2}$ 4) $\frac{5}{2}$

21. z=x+iy is a complex number. If the imaginary part of z^2 is 32, then Locus of z is a hyperbola of eccentricity

1) $\sqrt{2}$ 2) 2 3) $\frac{3}{2}$ 4) $\frac{4}{3}$

22. e_1 and e_2 are the eccentricities of two conics S and S[1]. If $e_1^2 + e_2^2 = 3$ then both S and S[1] can be

1) ellipse 2) parabolas
3) hyperbolas 4) circles

23. If $\sec\theta$ is the eccentricity of a hyperbola then the eccentricity of the conjugate hyperbola is

1) $\tan\theta$ 2) $\cot\theta$
3) $\cos\theta$ 4) $\operatorname{cosec}\theta$

24. If the angle between the asymptotes of a hyperbola is 30^0 then eccentricity =

1) $\sqrt{6} + \sqrt{2}$ 2) $\sqrt{6} - \sqrt{2}$
3) $\sqrt{5} - \sqrt{3}$ 4) $\sqrt{5} + \sqrt{3}$

25. In the hyperbola the distance between the foci is equal to distance between one focus to one end of conjugate axis then its eccentricity

1) 5/2 2) 7/2
3) 7/3 4) does not exist

26. The latusrectum of the hyperbola $\frac{x^2}{16} - \frac{y^2}{p} = 1$ is $4\frac{1}{2}$. Its eccentricity e=

1) 4/5 2) 5/4
3) 3/4 4) 4/3

FOCI:

27. The foci of the conjugate hyperbola of the hyperbola $\frac{x^2}{4} - \frac{y^2}{12} = 1$.

1) $\left(0, \pm 2\sqrt{2}\right)$ 2) $(0, \pm 3)$
3) $(0, \pm 4)$ 4) $(0, \pm 5)$

28. The distance between the foci of the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ is

1) $2\sqrt{7}$ 2) 10 3) 8 4) 6

29. If the lengths of transverse and conjugate axes of the hyperbola are 4,2 then the distance between the foci is

1) $4\sqrt{5}$ 2) $8\sqrt{5}$ 3) $\sqrt{5}$ 4) $2\sqrt{5}$

30. The foci of the hyperbola $9x^2 - 18x - 16y^2 - 64y + 89 = 0$ are

1) $(1,3),(1,-7)$ 2) $(1,5),(1,-9)$
3) $(1,1),(1,-5)$ 4) $(1,5),(1,-11)$

31. The foci of the hyperbola $x^2 - y^2 - 4x + 10y - 22 = 0$ are

1) $\left(\pm 2 + \sqrt{2}, 5\right)$ 2) $\left(2 \pm \sqrt{2}, 5\right)$
3) $\left(\pm 3 + \sqrt{2}, 5\right)$ 4) $\left(\pm 4 + \sqrt{2}, 5\right)$

32. The distance between the foci of the hyperbola $9x^2 - 16y^2 + 18x + 32y - 151 = 0$ is

1) 2 2) 8 3) 10 4) 6

33. S and S^1 are the foci and A is one vertex of $x^2 - 2y^2 = 1$ then SA.S^{1}A=

1) 2 2) 1 3) ½ 4) 1/4

34. S and S^1 are the foci and B is one vertex of $y^2 - 3x^2 = 4$ then $SB.S^1B$ =

1) 3/4 2) 4/3 3) 1 4) 1/2

LENGTH OF LATUSRECTUM:

35. The eccentricity of a hyperbola is $\frac{\sqrt{5}}{2}$, then its length of latusrectum is

1) $\frac{1}{4}$(length of transverse axis)
2) $\frac{1}{2}$(length of transverse axis)
3) $\frac{2}{3}$(length of transverse axis)
4) $\frac{1}{3}$(length of transverse axis)

36. The length of latusrectum of the hyperbola $\frac{x^2}{36} - \frac{y^2}{64} = 1$ is

1) $\frac{32}{3}$ 2) $\frac{18}{5}$ 3) 9 4) $\frac{64}{3}$

37. The length of latusrectum of $\frac{(x-1)^2}{25} - \frac{y^2}{9} = 1$ is

1) 50/3 2) 18/5 3) 9/5 4) 25/3

38. The length of latusrectum of the hyperbola $4x^2 - 9y^2 - 16x - 54y - 101 = 0$

1) 8/5 2) 8/7 3) 8/9 4) 8/3

TRANSVERSE AND CONJUGATE AXES:

39. In a hyperbola e=2 and the length of semitransverse axis is 3 and the length of conjugate axis is

1) $3\sqrt{3}$ 2) $6\sqrt{3}$
3) $6\sqrt{2}$ 4) $3\sqrt{2}$

40. In a hyperbola $e = \frac{9}{4}$ and the distance between the directrices is 3. Then the length of transverse axis is

1) 27/2 2) 27/8 3) 27/4 4) 17/4

41. In the hyperbola the length of conjugate axis is 5 and the distance between the foci is 13 then the length of transverse axis is

1) 10 2) 14 3) 16 4) 12

42. The centre of the hyperbola is origin and one directrix is x+3=0. Its e=5. Then the length of semitransverse axis is

1) 20 2) 25 3) 30 4) 15

43. The lengths of the axes of the hyperbola $9x^2 - 16y^2 + 72x - 32y - 16 = 0$ are

1) 16,9 2) 8, 6 3) 4, 3 4) 18, 8

44. Equation of the transverse axis of the hyperbola $\frac{(y-2)^2}{9} - \frac{(x+3)^2}{16} = 1$ is

1) $x + 3 = 0$ 2) $x - 5 = 0$
3) $x - 7 = 0$ 4) $x - 9 = 0$

45. Equation of the conjugate axis of the hyperbola $5x^2 - 4y^2 - 30x - 8y - 39 = 0$

1) $x - 3 = 0$ 2) $y + 1 = 0$
3) $x + 3 = 0$ 4) $y - 1 = 0$

EQUATIONS OF LATUSRECTA AND DIRECTRICES:

46. The equations of latusrecta of the hyperbola $5x^2 - 4y^2 - 30x - 8y - 39 = 0$ are

1) $x = 9, x = -3$ 2) $x = 6, x = 3$

3) $x = -9, x = 3$ 4) $x = -6, x = -3$

47. Equation of one of the latusrectum of the hyperbola $(10x - 5)^2 + (10y - 2)^2 = 9(3x + 4y - 7)^2$ is

1) $30x + 40y - 23 = 0$

2) $40x + 30y - 23 = 0$

3) $30x + 40y + 23 = 0$

4) $40x + 30y + 23 = 0$

48. Equations of the directrices of the hyperbola $9x^2 - 16y^2 + 72x - 32y - 16 = 0$ are

1) $x - 1 = 0, x + 9 = 0$

2) $x + 4 = 0, x + 1 = 0$

3) $x = 0, x = 8$

4) $5x + 36 = 0, 5x + 4 = 0$

49. If the locus of the point $\left(\frac{a}{2}\left(t + \frac{1}{t}\right), \frac{a}{2}\left(t - \frac{1}{t}\right)\right)$ represents a conic the distance between the directrices is

1) $a\sqrt{2}$ 2) $4a\sqrt{2}$ 3) $2a\sqrt{2}$ 4) $3a\sqrt{2}$

50. The foci of the hyperbola are $S(-3,-2)$, $S^1(5,6)$. If its e=2 then the equation of its directrix corresponding to focus S is

1) $x + y - 3 = 0$ 2) $x + y - 5 = 0$

3) $x + y - 7 = 0$ 4) $x + y - 1 = 0$

51. The foci of the hyperbola are $S(-3,-2)$, $S^1(5,6)$. If its $e = 2$ then the equation of its directrix corresponding to the focus S^1 is

1) $x + y - 5 = 0$ 2) $x + y - 7 = 0$

3) $x + y - 6 = 0$ 4) $x + y - 9 = 0$

CENTRE

52. The centre of the hyperbola $2xy + 3x + 4y + 1 = 0$ is

1) $\left(\frac{-3}{2}, -2\right)$ 2) $\left(-2, \frac{-3}{2}\right)$

3) $\left(2, \frac{3}{2}\right)$ 4) $\left(\frac{3}{2}, 2\right)$

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

1) $(-1,-3)$ 2) $(1,3)$

3) $(-1,3)$ 4) $(1,-3)$

54. The centre of the hyperbola $\frac{(3x - 4y - 12)^2}{225} - \frac{(4x + 3y - 12)^2}{100} = 1$ is

1) $\left(\frac{-84}{25}, \frac{12}{25}\right)$ 2) $\left(\frac{84}{25}, \frac{-12}{25}\right)$

3) $\left(\frac{84}{25}, \frac{12}{25}\right)$ 4) $\left(\frac{-84}{25}, \frac{-12}{25}\right)$

EQUATIONS OF HYPERBOLAS:

55. Equation of the hyperbola with focus (-3,4) directrix $3x - 4y + 5 = 0$ and $e = \frac{5}{2}$ is

1) $5x^2 - 24xy + 12y^2 + 6x - 8y - 75 = 0$

2) $5x^2 - 24xy + 12y^2 - 8x - 6y - 25 = 0$

3) $5x^2 - 24xy + 12y^2 - 12x + 8y - 55 = 0$

4) $5x^2 - 24xy + 12y^2 - 7x - 12y - 65 = 0$

56. Origin is one focus and the corresponding directrix is x+3=0. If the eccentricity is of the hyperbola $\sqrt{3}$ its equation is

1) $x^2 - 2y^2 - 18x + 27 = 0$

2) $2x^2 - y^2 + 18x + 27 = 0$

3) $3x^2 + y^2 + 16x + 25 = 0$

4) $2x^2 - y^2 - 20x + 19 = 0$

57. Equation of the hyperbola passing through (2,1) and having the distance between the directrices $\frac{4}{\sqrt{3}}$ is

1) $5x^2 - 2y^2 = 18$ 2) $3x^2 - 2y^2 = 10$

3) $2x^2 - y^2 = 7$ 4) $3x^2 - 5y^2 = 7$

58. Equation of the hyperbola with $e = \sqrt{2}$ and having the distance between the foci 1 is

1) $x^2 - y^2 = \frac{1}{4}$ 2) $x^2 - y^2 = 5$

3) $x^2 - y^2 = \frac{1}{6}$ 4) $x^2 - y^2 = \frac{1}{8}$

59. Equation of the hyperbola with length of the latusrectum 4 and e=3 is

1) $2x^2 - 16y^2 = 1$ 2) $3x^2 - 15y^2 = 1$

3) $16x^2 - 2y^2 = 1$ 4) $8x^2 - y^2 = 1$

60. Equation of the hyperbola with vertex (4,0) and focus (6,0) is

1) $\frac{x^2}{16} - \frac{y^2}{20} = 1$ 2) $\frac{x^2}{20} - \frac{y^2}{16} = 1$

3) $\frac{x^2}{16} - \frac{y^2}{36} = 1$ 4) $\frac{x^2}{36} - \frac{y^2}{16} = 1$

61. Equation of the hyperbola with centre (0,3) focus (0,5) and semi conjugate axis 1 is

1) $(y - 3)^2 - 3x^2 = 6$

2) $(y - 3)^2 - 3x^2 = 8$

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

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

62. Equation of the hyperbola with conjugate axis 4 and the distance between the foci 12 is

1) $\frac{x^2}{4} - \frac{y^2}{32} = 1$ 2) $\frac{x^2}{32} - \frac{y^2}{4} = 1$

3) $\frac{x^2}{32} - \frac{y^2}{16} = 1$ 4) $\frac{x^2}{16} - \frac{y^2}{32} = 1$

63. Equation of the hyperbola with length of the latusrectum 9/2 and e=5/4 is

1) $\frac{x^2}{45} - \frac{y^2}{36} = 1$ 2) $\frac{x^2}{16} - \frac{y^2}{45} = 1$

3) $\frac{x^2}{16} - \frac{y^2}{32} = 1$ 4) $\frac{x^2}{16} - \frac{y^2}{9} = 1$

64. Equation of the hyperbola with centre (0,0) distance between the foci 18 and distance between directrices 8 is

1) $\frac{x^2}{36} - \frac{y^2}{45} = 1$ 2) $\frac{x^2}{45} - \frac{y^2}{36} = 1$

3) $\frac{x^2}{64} - \frac{y^2}{32} = 1$ 4) $\frac{x^2}{32} - \frac{y^2}{65} = 1$

65. The foci of the hyperbola coincides with the foci of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$. Then the equation of the hyperbola if its e=2.

1) $\frac{x^2}{12} - \frac{y^2}{4} = 1$ 2) $\frac{x^2}{4} - \frac{y^2}{12} = 1$

3) $\frac{x^2}{16} - \frac{y^2}{8} = 1$ 4) $\frac{x^2}{8} - \frac{y^2}{16} = 1$

66. Equation of the hyperbola with foci $(0, \pm 5)$ and $e = \frac{5}{3}$ is

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

3) $\frac{x^2}{16} - \frac{y^2}{9} = 1$ 4) $\frac{x^2}{12} - \frac{y^2}{13} = 1$

67. The length of transverse axis of the hyperbola is 14. If the vertex bisects the distance between centre and focus then its equation is

1) $\frac{x^2}{14} - \frac{y^2}{49} = 1$ 2) $\frac{x^2}{147} - \frac{y^2}{14} = 1$

3) $\frac{x^2}{49} - \frac{y^2}{147} = 1$ 4) $\frac{x^2}{147} - \frac{y^2}{49} = 1$

68. The vertices of the hyperbola are $(\pm 2, 0)$ and the foci are $(\pm 3, 0)$ then its equation is

1) $\frac{x^2}{5} - \frac{y^2}{4} = 1$ 2) $\frac{x^2}{4} - \frac{y^2}{5} = 1$

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

69. Equation of the locus of all points such that the difference of its distances from (-3,-7) , (-3,3) is 8 is

1) $\frac{(x + 3)^2}{16} - \frac{(y + 2)^2}{9} = 1$

2) $\frac{(x + 3)^2}{9} - \frac{(y + 2)^2}{16} = -1$

3) $\frac{(x + 3)^2}{9} - \frac{(y + 2)^2}{19} = 1$

4) $\frac{(x + 3)^2}{7} - \frac{(y + 2)^2}{19} = -1$

70. Equation of the hyperbola with centre at the origin, transverse axis Y axis and passing through the points $(4,6)$ and $(-1,-3)$ is

1) $5x^2 - 9y^2 = -36$
2) $9x^2 - 5y^2 = -36$
3) $4x^2 - 7y^2 = -62$
4) $7x^2 - 4y^2 = -62$

71. e=2 and the difference of the focal distances of any point on the hyperbola is 24. If the origin is the centre then the equation of the hyperbola is

1) $\frac{x^2}{144} - \frac{y^2}{432} = 1$ 2) $\frac{x^2}{432} - \frac{y^2}{144} = 1$
3) $\frac{x^2}{144} - \frac{y^2}{236} = 1$ 4) $\frac{x^2}{144} - \frac{y^2}{128} = 1$

72. As "t" varies the locus of point of intersection of the lines $\frac{x}{a} + \frac{y}{b} = t, \frac{x}{a} - \frac{y}{b} = \frac{1}{t}$

1) Circle 2) Parabola
3) Ellipse 4) Hyperbola

73. The curve represented by $x = \cosh t + \sinh t$ and $y = \cosh t - \sinh t$ is $(where\ \ t \in R)$

1) Parabola
2) Rectangular hyperbola with asymptotes x=y and x+y=0
3) half of rectangular hyperbola transverse axis is x+y=0
4) half of rectangular hyperbola which is in the first quadrant having asymptotes xy=0

74. Which of the following equations (t being the parameter) can't represent a hyperbola?

1) $\frac{tx}{a} - \frac{y}{b} + t = 0, \frac{x}{a} + \frac{ty}{b} - 1 = 0$
2) $x = \frac{a}{2}\left(t + \frac{1}{t}\right), y = \frac{b}{2}\left(t - \frac{1}{t}\right)$
3) $x = e^t + e^{-t}, y = e^t - e^{-t}$
4) $x^2 = 2(\cos t + 3), y^2 = 2\left(\cos^2\frac{t}{2} - 1\right)$

TANGENTS

75. Equation of the tangent to the conic $x^2 - y^2 - 8x + 2y + 11 = 0$ at (2,1) is

1) $x + 2 = 0$ 2) $2x + y - 5 = 0$
3) $x + y - 3 = 0$ 4) $x - 2 = 0$

76. Equation of the tangent to $5x^2 - y^2 = 5$ through the point (2,8) is

1) $3x - 2y + 10 = 0$
2) $3x - 23y + 178 = 0$
3) $23x - 3y - 22 = 0$
4) $23x - 3y + 22 = 0$

77. Equation of the tangent to the hyperbola $3x^2 - y^2 = 3$ parallel to the line y=2x+4 is

1) y=2x+3 2) y=2x-3
3) y=2x+1 4) y=2x+5

78. If the line $y = x + c$ is a tangent to the hyperbola $\frac{x^2}{25} - \frac{y^2}{9} = 1$ then c is

1) ± 4 2) ± 5 3) ± 3 4) ± 6

79. A tangent to the hyperbola $3x^2 - 4y^2 = 12$ makes equal intercepts on the axes. Then the area of the triangle formed by the tangent with coordinate axes is

1) 2 2) 1/4 3) 4 4) 1/2

80. If $y = 4x + k$ touches the hyperbola $\frac{x^2}{64} - \frac{y^2}{49} = 1$ then K is

1) $\sqrt{875}$ 2) $\sqrt{775}$
3) $\sqrt{675}$ 4) $\sqrt{975}$

81. The condition that the line $\frac{x}{p} + \frac{y}{q} = 1$ to be tangent to $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

1) $\frac{a^2}{p^2} + \frac{b^2}{q^2} = 1$ 2) $\frac{a^2}{p^2} - \frac{b^2}{q^2} = 1$
3) $\frac{a^2}{q^2} - \frac{b^2}{p^2} = 1$ 4) $\frac{a^2}{q^2} + \frac{b^2}{p^2} = 1$

82. Equation of the tangent to the hyperbola $\frac{x^2}{36} - \frac{y^2}{5} = 1$ which is perpendicular to the line $4x + 2y - 3 = 0$ is

1) $x - 2y + 4 = 0$ 2) $x - 2y + 7 = 0$
3) $x - 2y + 9 = 0$ 4) $x - 2y + 8 = 0$

83. If the line $y = mx + 1$ touches the hypebola $\frac{x^2}{9} - \frac{y^2}{2} = 1$ then m=

1) $\pm \frac{1}{\sqrt{2}}$ 2) $\pm \frac{1}{3}$

3) $\pm \frac{1}{\sqrt{3}}$ 4) $\pm \frac{1}{2}$

84. Equation of the tangent to the hyperbola $4x^2 - 3y^2 = 24$ which make an angle 60^0 with x - axis is

1) $y = x\sqrt{3} \pm 12$ 2) $y = x\sqrt{3} \pm \sqrt{10}$

3) $y = x\sqrt{3} \pm 9$ 4) $y = x\sqrt{3} \pm 5$

85. The equations of tangents to the hyperbola $3x^2 - 4y^2 = 12$ which make equal intercepts on the axes are

1) $x + y = \pm 1$ 2) $x + y = 2$

3) $x + y = 3$ 4) $x + y = 4$

86. Total number of tangents of the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$, that are perpendicular to the line $5x + 2y - 3 = 0$ is/are

1) 0 2) 1 3) 2 4) 4

87. The slopes of the common tangents to the parabola $y^2 = 24x$ and the hyperbola $5x^2 - y^2 = 5$ are

1) ± 3 2) ± 2 3) ± 6 4) ± 5

88. If $4x - 3y = \sqrt{3}$ is a tangent to $4x^2 - 9y^2 = 1$ then the eccentric angle of the point of contact is

1) $\frac{p}{4}$ 2) $\frac{p}{6}$ 3) $\frac{p}{3}$ 4) $\frac{p}{2}$

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

1) 45^0 2) 60^0 3) 30^0 4) 75^0

90. If the line $y = mx + \sqrt{a^2m^2 - b^2}$ touches the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at the point q then $\sin q =$

1) $\frac{b}{am}$ 2) $\frac{a}{bm}$ 3) $\frac{am}{b}$ 4) $\frac{bm}{a}$

91. Number of tangents drawn from (-2,-1) to $2x^2 - 3y^2 = 6$ are

1) 3 2) 0 3) 1 4) 2

92. The number of tangents drawn from (3,0) to the hyperbola $\frac{x^2}{9} - \frac{y^2}{1} = 1$ is

1) 0 2) 1 3) 2 4) 3

93. Sum of the slopes of the two tangents drawn from (-2,-1) to $2x^2 - 3y^2 = 6$

1) 4 2) 9/2 3) 7/2 4) 7

94. Product of the slopes of two tangents drawn from (0,2) to $5x^2 - y^2 = 5$

1) 9 2) -8 3) -9 4) 8

95. 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

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

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

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

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

96. From any point $(x, y) \neq (\pm a, \pm b)$ on the hyperbola $x^2 - y^2 = a^2 - b^2$, two tangents are drawn to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. Then they make angles a and b with X-axis such that

1) $\tan a - \tan b = 1$

2) $\tan a + \tan b = 1$

3) $\tan a \tan b = 1$ 4) $\tan a \tan b = 2$

97. The locus point of intersection of the two tangents to the hyperbola $b^2x^2 - a^2y^2 = a^2b^2$ making an angle 60^0 with another is

1) $(x^2 + y^2 - a^2 + b^2)^2 = 4(a^2y^2 - b^2x^2 + a^2b^2)$

2) $3(x^2 + y^2 - a^2 + b^2)^2 = 4(a^2y^2 - b^2x^2 + a^2b^2)$

3) $\left(x^2+y^2-a^2-b^2\right)^2=4\left(b^2x^2+a^2y^2-a^2b^2\right)$

4) $\left(x^2+y^2-a^2-b^2\right)^2=12\left(b^2y^2+a^2x^2-a^2b^2\right)$

AUXILIARY & DIRECTOR CIRCLES:

98. If SK is the perpendicular from focus S of the hyperbola $\frac{x^2}{12}-\frac{y^2}{6}=1$ on any tangent to it then K lies on

1) $x^2+y^2=12$ 2) $x^2+y^2=18$

3) $x^2+y^2=6$ 4) $x^2+y^2=9$

99. The locus of the foot of the perpendicular drawn from the focus to any tangent to the hyperbola $\frac{(y-4)^2}{3}-\frac{(x-3)^2}{10}=1$

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

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

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

4) $(x-3)^2+(y+4)^2=13$

100. Equation of the auxiliary circle of the hyperbola $\frac{x^2}{25}-\frac{y^2}{9}=1$ is

1) $x^2+y^2=16$ 2) $x^2+y^2=9$

3) $x^2+y^2=7$ 4) $x^2+y^2=25$

101. For which one of the following curves tangents at right angles can not be drawn from any point

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

3) $\frac{x^2}{4}+\frac{y^2}{9}=1$ 4) $\frac{x^2}{4}-\frac{y^2}{9}=1$

102. Equation of the director circle of the hyperbola $\frac{x^2}{25}-\frac{y^2}{9}=1$ is

1) $x^2+y^2=18$ 2) $x^2+y^2=9$

3) $x^2+y^2=25$ 4) $x^2+y^2=16$

103. The equation of the director circle of the hyperbola $\frac{x^2}{16}-\frac{y^2}{25}=1$ is

1) $x^2+y^2=9$ 2) $x^2+y^2=16$

3) $x^2+y^2=25$ 4) empty set

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

1) b^2 2) a^2 3) $-b^2$ 4) $2b^2$

105. Product of the perpendiculars from the foci on any tangent to the hyperbola $\frac{x^2}{12}-\frac{y^2}{9}=1$ is

1) 12 2) 21 3) 9 4) 8

106. The tangent at a point P on $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ cuts one of its directrices in Q. The PQ subtends at the corresponding focus an angle of

1) $\frac{p}{4}$ 2) $\frac{p}{6}$ 3) $\frac{p}{3}$ 4) $\frac{p}{2}$

NORMALS:

107. Equation of the normal to $9x^2-16y^2=144$ at $q=\frac{p}{6}$ is

1) $2x\sqrt{3}+3y\sqrt{3}=25$

2) $2x\sqrt{3}+5y\sqrt{3}=22$

3) $2x\sqrt{3}+5y\sqrt{3}=10$

4) $5x\sqrt{3}+2y\sqrt{3}=8$

108. Equation of the normal to the hyperbola $3x^2-y^2=3$ at (2,-3) is

1) $x-2y-8=0$ 2) $3x-2y-12=0$

3) $x+2y+4=0$ 4) $3x+2y-14=0$

109. The line $4x-3y-15=0$ is a normal to $x^2-4y^2=5$ at the point

1) $(1,2)$ 2) $(-1,3)$ 3) $(3,-1)$ 4) $(3,3)$

110. A normal to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ meets the axes in M and N . The perpendiculars to the axes through M and N meet at P. Then the equation to the locus of P is

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

2) $a^2x^2-b^2y^2=\left(a^2+b^2\right)^2$

3) $4\left(a^2x^2 - b^2y^2\right) = \left(a^2 + b^2\right)^2$

4) $a^2x^2 - b^2y^2 = 4\left(a^2 + b^2\right)^2$

111. Number of normals to the hyperbola drawn from the external point are

1) 2 2) 4 3) 6 4) 5

112. For the hyperbola $3x^2 - y^2 = 3$ the line $3x - y = 3$ is

1) a tangent line 2) not a chord
3) a chord 4) normal chord

CHORD OF CONTACT, POLE, POLAR, CONJUGATE POINTS, CONJUGATE LINES:

113. If the chord of contact of tangents from a point P to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ subtends a right angle at the centre, then the locus of P is

1) a parabola 2) an ellipse
3) a hyperbola 4) a circle

114. Pole of $2x - 5y - 12 = 0$ w.r. to the hyperbola $4x^2 - 5y^2 = 24$ is

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

3) $\left(1, -\frac{2}{5}\right)$ 4) $(1,2)$

115. The locus of poles w.r. to the parabola $y^2 = 4ax$ of tangents to the hyperbola $x^2 - y^2 = a^2$ is

1) $x^2 + 4y^2 = 8a^2$ 2) $x^2 + 4y^2 = 2a^2$

3) $4x^2 + y^2 = 4a^2$ 4) $2x^2 + y^2 = 4a^2$

116. The locus of poles w.r. to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ of tangents to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

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

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

3) $\frac{a^2x^2}{b^4} - \frac{b^2y^2}{a^4} = 1$

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

117. The locus of poles w.r. to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ of tangents to $y^2 = 4ax$ is

1) $a^2y^2 + b^4x = 0$

2) $a^3y^2 + b^3x = 0$

3) $a^3y^2 + b^4x = 0$

4) $a^3y^2 + b^2x = 0$

118. If the polars of the points (x_1, y_1) and (x_2, y_2) w.r. to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ are at right angles then $\frac{x_1x_2}{y_1y_2} =$

1) $\frac{-a^3}{b^3}$ 2) $\frac{4a^4}{b^4}$ 3) $\frac{a^4}{4b^4}$ 4) $\frac{-a^4}{b^4}$

119. The locus of poles with respect to the hyperbola S=0 of tangents to the circle $x^2 + y^2 = d^2$ is

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

3) $\frac{x^2}{b^4} - \frac{y^2}{a^4} = \frac{1}{d^2}$ 4) $\frac{x^2}{b^4} - \frac{y^2}{a^4} = \frac{1}{3d^2}$

120. For the point (-1,-3) the line $3x - 16y + 48 = 0$ with respect to $9x^2 - 16y^2 = 144$ is a

1) tangent line 2) normal
3) chord of contact 4) polar

121. Any chord passing through the focus $(ae, 0)$ of the hyperbola $x^2 - y^2 = a^2$ is conjugate to the line

1) $ex - a = 0$ 2) $ae + x = 0$
3) $ax + e = 0$ 4) $ax - e = 0$

122. Equation of the line through the point (-2,1) and conjugate to the line $8x+3y-4=0$ w.r.to $2x^2-y^2=4$ is

1) $2x+3y+1=0$ 2) $3x+7y-3=0$

3) $4x-y+9=0$ 4) $x-y+3=0$

123. If the lines $2x+5y-3=0$, $3x+y+l=0$ are the conjugate lines with respect to $3x^2-2y^2=6$ then the value of l is

1) 5 2) 4 3) 1 4) 2

124. If the line $x+3y+2=0$ and its perpendicular line are conjugate w.r.to $3x^2-5y^2=15$ then the equation of the conjugate line is

1) $3x-y=15$ 2) $3x-y+12=0$

3) $3x-y+10=0$ 4) $3x-y=4$

MID POINT OF THE CHORD:

125. The line $9x-8y-10=0$ meets the hyperbola $9x^2-16y^2=144$ in the points A and B. Then the mid point of chord AB is

1) $(2,1)$ 2) $(2,-1)$

3) $(-2,1)$ 4) $(-2,-1)$

126. The locus of middle points of chords of the hyperbola $3x^2-2y^2+4x-6y=0$ parallel to $y=2x$

1) $3x-4y=4$ 2) $3y-4x=0$

3) $4x-4y=3$ 4) $3x-4y=2$

127. All chords of the curve $3x^2-y^2-2x+4y=0$. Which subtends a right angle at the origin passes through a fixed point

1) $(2,-1)$ 2) $(1,1)$ 3) $(2,3)$ 4) $(1,-2)$

128. Chords of the hyperbola $x^2-y^2=a^2$ touch the parabola $y^2=4ax$ then the locus of their mid points is

1) $x^2(y-a)=y^3$ 2) $y^2(x-a)=x^2$

3) $y^2(x-a)=x^3$ 4) $x^2(y+a)=y^3$

129. The locus of middle points of chords of the hyperbola $2x^2-3y^2=5$ which passes through the point (1,-2) is

1) $2x^2-3y^2-2x-6y=0$

2) $3x^2-2y^2-6x-2y=0$

3) $x^2-3y^2-4x-y=0$

4) $3x^2-y^2-x-4y=0$

ASYMPTOTES:

130. The asymptotes of the hyperbola are $3x=\pm 5y$ and its vertices are $(\pm 5,0)$ then the length of latusrectum of the hyperbola is

1) 9/5 2) 18/5 3) 50/3 4) 25/3

131. The asymptotes of a hyperbola $7x+5y-12=0$, $2x+3y-5=0$. Its centre is

1) $(1,1)$ 2) $(1,2)$ 3) $(2,1)$ 4) $(2,2)$

132. The asymptotes of a hyperbola are $2x-y-3=0$ and $3x+y-7=0$ If the hyperbola passes through (1,1) then the equation of the hyperbola is

1) $6x^2-xy-y^2-23x+4y+17=0$

2) $6x^2-xy-y^2-23x+4y+15=0$

3) $6x^2-xy-y^2-23x+4y-18=0$

4) $6x^2-xy-y^2-23x+4y-19=0$

133. The equation of a rectangular hyperbola is $2x^2+3xy-2y^2-6x+13y-36=0$. If one asymptote is $x+2y-5=0$ then the other asymptote is

1) $2x-y+6=0$ 2) $2x-y-7=0$

3) $2x-y+4=0$ 4) $2x-y-5=0$

134. The equation of the asymptotes of the hyperbola $2xy+7x-6y-18=0$ is

1) $2xy+7x-6y+19=0$

2) $2xy+7x-6y+22=0$

3) $xy+7x-6y+23=0$

4) $2xy+7x-6y-21=0$

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

1) $2x^2+5xy+2y^2-11x-7y+7=0$

2) $2x^2+5xy+2y^2-11x-7y+9=0$

3) $2x^2+5xy+2y^2-11x-7y+5=0$

4) $2x^2+5xy+2y^2-11x-7y+8=0$

136. The focus and directrix of a rectangular hyperbola are $(1, -1)$ and $x - y + 1 = 0$. Then the equation of asymptotes is

1) $xy - 2x + 2y - 4 = 0$
2) $xy - 2x + 2y + 5 = 0$
3) $xy - 2x + 2y + 7 = 0$
4) $xy - 2x + 2y - 6 = 0$

137. The product of the distances from any point on the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ to its asymptotes is

1) $\frac{124}{25}$ 2) $\frac{25}{124}$ 3) $\frac{25}{14}$ 4) $\frac{144}{25}$

138. The asymptotes of a hyperbola are $y = \pm x\sqrt{3}$. If the hyperbola passes through (4,6) its e is

1) 3/2 2) 5/2 3) 2 4) 5/3

139. Equations of the asymptotes of the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ are

1) $\frac{x}{2} \pm \frac{y}{3} = 0$ 2) $2x \pm 5y = 0$
3) $\frac{x}{3} \pm \frac{y}{2} = 0$ 4) $5x \pm 2y = 0$

140. Angle between the asymptotes of the hyperbola $2xy + 2x + 2y + 1 = 0$ is

1) $\frac{\pi}{2}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{6}$

141. If θ is the angle between the asymptotes of the hyperbola $x^2 + 2xy - 3y^2 + x + 7y + 9 = 0$ then $\tan\theta =$

1) 2/3 2) 1/5 3) 2 4) 4/5

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

1) $\frac{\pi}{3}$ 2) $\frac{\pi}{2}$ 3) $\frac{2\pi}{3}$ 4) $\frac{\pi}{6}$

143. The points of intersection of the asymptotes with directrices of a hyperbola lie on

1) Director circle 2) Auxiliary circle
3) Circle on the foci as diameter
4) Circle on the ends of conjugate axis as diameter

144. The angle between the asymptotes of the hyperbola $x^2 + 3xy + 2y^2 + 2x + 3y = 0$ is

1) $Tan^{-1}\left(\frac{1}{2}\right)$ 2) $Tan^{-1}\left(\frac{1}{3}\right)$
3) $Tan^{-1}\left(\frac{1}{5}\right)$ 4) $Tan^{-1}\left(\frac{1}{7}\right)$

145. If the angle between the asymptotes of a hyperbola is 30^0 then eccentricity =

1) $\sqrt{6} + \sqrt{2}$ 2) $\sqrt{6} - \sqrt{2}$
3) $\sqrt{5} - \sqrt{3}$ 4) $\sqrt{5} + \sqrt{3}$

146. Rectangular hyperbola has one of its asymptotes as $x + 2y - 5 = 0$. If it passes through $(6, 0)$ and $(-3, 0)$ then its equation is

1) $2x^2 + 3xy - 2y^2 - 6x + 13y - 36 = 0$
2) $2x^2 + 3xy + 2y^2 - 6x + 13y - 36 = 0$
3) $2x^2 + 3xy - 2y^2 + 6x + 13y - 36 = 0$
4) $2x^2 - 3xy - 2y^2 - 6x - 13y - 36 = 0$

147. S=0 is a hyperbola , if $S + K = 0$ (K is real number) represents equation of the asymptotes then $S + 2K = 0$ represents

1) Hyperbola 2) Ellipse
3) Parabola 4) Circle

148. The asymptotes of the hyperbola $xy = hx + ky$ are

1) $x = k, y = h$ 2) $x = h, y = k$
3) $x = k, y = k$ 4) $x = h, y = h$

149. The eccentricity of the conic represented by $2x^2 + 5xy + 2y^2 + 11x - 7y - 4 = 0$ is

1) $\frac{\sqrt{10}}{3}$ 2) $\frac{\sqrt{10}}{4}$ 3) $\frac{5}{4}$ 4) $\frac{3}{5}$

150. If $3x - 2y + 7 = 0$ and $2x + 3y + 4 = 0$ are the asymptotes of a hyperbola then its eccentricity is

1) $\frac{3}{2}$ 2) $\sqrt{2}$
3) 2 4) can't be determined

151. The equation to the conjugate hyperbola of $xy + 3x - 4y + 13 = 0$ is

1) $(x - 4)(y + 3) = 0$
2) $xy + 3x - 4y - 13 = 0$
3) $(x - 4)(y + 3) = 25$
4) $(x - 4)(y + 3) = -25$

152. The equation to the conjugate hyperbola of $2x^2 - 3y^2 - 4x + 6y - 15 = 0$ is

1) $2x^2 - 3y^2 - 4x + 6y + 13 = 0$

2) $2x^2 - 3y^2 - 4x + 6y - 1 = 0$

3) $2x^2 - 3y^2 - 4x + 6y + 15 = 0$

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

FOCAL DISTANCES:

153. The difference of focal distances of any point on the hyperbola $\frac{x^2}{36} - \frac{y^2}{9} = 1$ is

1) 36 2) 9 3) 12 4) 6

154. 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

1) a hyperbola
2) a branch of the hyperbola
3) a parabola 4) an ellipse

155. The product of focal distances of the point (4,3) on the hyperbola $x^2 - y^2 = 7$ is

1) 25 2) 12 3) 9 4) 16

156. $A = (3,2), B = (7,-1)$ are two points. Then the locus of P such that $PA - PB = 4$ is

1) Parabola 2) Ellipse
3) Hyperbola 4) Rectangular hyperbola

157. The locus of centres of the circles which touch the given two circles externally is

1) Radical axis 2) Parabola
3) Ellipse 4) Hyperbola

158. If the locus of the centre of the circle which touch both the circles $x^2 + y^2 = a^2$ and $x^2 + y^2 = 4ax$ externally is a hyperbola then the length of its transverse axis is

1) 3a 2) a 3) 4a 4) a/2

MISCELLENEOUS PROBLEMS:

159. Focus is (1,2) directrix is $7x - y - 30 = 0$ and latusrectum is 10 units then the conic is

1) Parabola 2) Ellipse
3) Hyperbola 4) Rectangular hyperbola

160. $\frac{x^2}{12-k} + \frac{y^2}{8-k} = 1$ represents a hyperbola if

1) k=8 2) k<12
3) 8<k<12 4) Both 1 and 2

161. The equation of the circle described on the line joining the foci of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ as diameter is

1) $x^2 + y^2 = a^2 + b^2$

2) $x^2 + y^2 = a^2 - b^2$

3) $x^2 + y^2 = a^2$

4) $x^2 + y^2 = b^2$

162. If the eccentricity of a conic is $\frac{3}{\sqrt{5}}$ then the conic is

1) an ellipse 2) a hyperbola
3) a parabola 4) a circle

163. The equation $2x^2 + 5xy + 2y^2 - 11x - 7y - 4 = 0$ represents

1) a pair of lines 2) Parabola
3) Ellipse 4) Hyperbola

164. Theequation represents

1) no locus if k>0
2) an ellipse if k<0
3) a point if k=0 4) a hyperbola if k>0

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

1) all values of t 2) $t^2 = 2 + \sqrt{5}$

3) $t^2 = 2 - \sqrt{3}$ 4) no real value of t

166. If $5x^2 + l y^2 = 20$ represents a rectangular hyperbola, then l is equal to

1) 5 2) 4 3) -5 4) -4

167. No part of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ lies between which of the following

1) $x = -2a \text{ and } x = 2a$

2) $x = -a \text{ and } x = a$

3) $y = -2b \text{ and } y = 2b$

4) $y = -b \text{ and } y = b$

168. The positions of the points $P(3,-4)$ and $Q(-4,1)$ with respect to the hyperbola $2x^2 - y^2 + 20x + 6y + 37 = 0$ are that

1) both P and Q lie inside
2) both P and Q lie outside
3) P lies outside, Q inside
4) P lies inside, Q outside

169. The foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ coincides with the foci of the hyperbola $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$ then the value of b^2 is

1) 7 2) 5 3) 9 4) 11

170. Shortest distance between the curves $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1, 4x^2 + 4y^2 = a^2 (b > a)$, is

1) $\frac{b}{2}$ 2) $\frac{b}{\sqrt{2}}$ 3) $\frac{a}{2}$ 4) $\frac{a}{\sqrt{2}}$

KEY

1-10	4	3	4	3	2
	3	2	1	3	2
11-20	4	2	3	4	4
	4	4	4	4	2
21-30	1	3	4	2	4
	2	3	2	4	1
31-40	2	3	3	2	1
	4	2	4	2	3
41-50	4	4	2	1	1
	1	1	4	1	4
51-60	1	2	3	2	1
	2	2	4	3	1
61-70	3	2	4	1	2
	2	3	2	2	2
71-80	1	4	4	4	4
	3	3	1	4	4
81-90	2	1	3	2	1
	1	1	2	3	1
91-100	4	2	1	3	4
	3	2	1	3	4
101-110	4	4	4	1	3
	4	1	1	3	2
111-120	2	3	2	4	3
	1	3	4	1	4
121-130	1	1	3	2	1
	1	4	3	1	2
131-140	1	2	3	4	3
	1	4	3	3	1
141-150	3	3	2	2	2
	1	1	1	1	2
151-160	3	1	3	2	1
	3	4	2	4	3
161-170	1	2	4	1	2
	3	2	4	1	3

HINTS:

11. For the given hyperbola $e_1 = \frac{\sqrt{13}}{3}$ use $\frac{1}{e_1^2} + \frac{1}{e_2^2} = 1$.

24. Use $\theta = 2Sec^{-1} e$

27. For the given hyperbola $e_1 = \frac{2}{\sqrt{3}}$. Find e_2.

33. $SA.SA^1 = b^2$

42. a/e=perpendicular distance (0,0) to $x + 3 = 0 \Rightarrow a = 15$

54. Intersection point of $3x - 4y - 12 = 0; 4x + 3y - 12 = 0$.

56. $S(0,0); l; x + 3 = 0; SP^2 = e^2 PM^2$.

64. $2ae = 18, \frac{2a}{e} = 8 \Rightarrow 4a^2$

$= 144 \Rightarrow a = 6 \Rightarrow b^2 = 36\left(\frac{9}{4} - 1\right) = 45$

67. . $a = 7, (a,0) = \left(\frac{ae}{2}, 0\right) \Rightarrow e = 2 \Rightarrow b^2 = 45$

69. $SP - S^1P = 8 \Rightarrow b = 4$

93. $m_1 + m_2 = \frac{2x_1y_1}{x_1^2 - a^2}$

97. Use $\tan\theta = \frac{2ab - \sqrt{-S_{11}}}{x_1^2 + y_1^2 - a^2 + b^2}$

98. K lies on auxiliary circle.

125. Use $\left(\frac{-a^2 ln}{a^2l^2 - b^2m^2}, \frac{b^2mn}{a^2m^2 - b^2n^2}\right)$

126. Write $S_1 = S_{11}$ its slope =2

127. Let $lx + my = 1$ be the line. Homogenise the curve with $(x,y) = (1,-2)$.

133. Perpendicular to $x + 2y - 5 = 0$ and passes through the centre.

137. Use $\frac{a^2b^2}{a^2 + b^2}$.

140. $(x + 1)(y + 1) = 0$

141. Formulae $\tan\theta = \dfrac{2\sqrt{h^2 - ab}}{a+b}$

145. By verificcation

156. $PA - PB = k; (k = 4);$

$AB = 5; AB > k$

157. $PA = r + r_1; PB = r + r_2; PA - PB = r_1 - r_2$ a constant, a hyperbola.

159. $ae - \dfrac{a}{e} = \left|\dfrac{-25}{\sqrt{50}}\right|; \dfrac{2b^2}{a} = 10$

$\dfrac{a\left(e^2 - 1\right)}{e} = \dfrac{5}{\sqrt{2}} \Rightarrow a\left(e^2 - 1\right) = 5 \Rightarrow e = \sqrt{2}$

160. $12 - k > 0, 8 - k < 0$

LEVEL - II

1. The eccentricity of the hyperbola whose transverse axis is 2a having coordinate axes as its axes and passing through the point (h,k) is

1) $\sqrt{\dfrac{h^2 + k^2 - a^2}{k^2 + a^2}}$ 2) $\sqrt{\dfrac{h^2 + k^2 - a^2}{h^2 - a^2}}$

3) $\sqrt{\dfrac{h^2 - k^2 + a^2}{k^2 - a^2}}$ 4) $\sqrt{\dfrac{h^2 - k^2 - a^2}{h^2 - a^2}}$

2. The centre, vertex, focus of a conic are (0,0), (0,5), (0,6) its length of latusrectum is

1) 11/5 2) 7/5 3) 14/5 4) 22/5

3.. For different values of k if the locus of point of intersection of the lines $\sqrt{3}x - y - 4\sqrt{3}k = 0$, $\sqrt{3}kx + ky - 4\sqrt{3} = 0$ represents the hyperbola then the equations of latusrecta are

1) $x = \pm 8$ 2) $x = \pm\sqrt{2}$

3) $y = \pm 8$ 4) $y = \pm 4\sqrt{2}$

4. The centre , one vertex, one focus of a hyperbola are $(1,-1),(5,-1),(6,-1)$ its directrices are

1) $5x - 21 = 0, 5x + 11 = 0$.

2) $5x + 4 = 0, x + 1 = 0$

3) $5x - 7 = 0, 5x - 19 = 0$

4) $5x - 17 = 0, 5x - 6 = 0$

5. The centre, one vertex, one focus of a hyperbola are $(5,4),(5,7),(5,9)$ its directrices are

1) $5y - 27 = 0, 5y - 9 = 0$

2) $5y - 17 = 0, 5y - 11 = 0$

3) $5y - 29 = 0, 5y - 11 = 0$

4) $5y - 7 = 0, 5y - 17 = 0$

6. If the equation $\sqrt{(x+4)^2 + (y-3)^2} - \sqrt{(x-4)^2 + (y-3)^2} = 6$ represents a conic its directrices are

1) $x = \pm\dfrac{9}{4}$ 2) $x = \pm\dfrac{9}{2}$

3) $x = \pm\dfrac{7}{3}$ 4) $x = \pm\dfrac{7}{2}$

7. The equation $\left|\sqrt{(x-2)^2 + (y-1)^2} - \sqrt{(x+2)^2 + y^2}\right| = c$ will represent a hyperbola if

1) $c \in (0,6)$ 2) $c \in (0,5)$

3) $c \in \left(0,\sqrt{17}\right)$ 4) $c \in \left(0,\sqrt{19}\right)$

8. The locus of the foot of the perpendicular from the centre of the hyperbola $2x^2 - 3y^2 = 6$ on any tangent to it is

1) $\left(x^2 + y^2\right)^2 = 2x^2 + 3y^2$

2) $\left(x^2 - y^2\right)^2 = 2x^2 - 3y^2$

3) $\left(x^2 + y^2\right)^2 = 3x^2 + 2y^2$

4) $\left(x^2 + y^2\right)^2 = 3x^2 - 2y^2$

9. Length of the latusrectum of the hyperbola $xy = c^2$, is equal to

1) $2c$ 2) $\sqrt{2}c$ 3) $2\sqrt{2}c$ 4) $4c$

10. Equation of the common tangent to $y^2 = 8x$ and $3x^2 - y^2 = 3$ is

1) $2x + y + 1 = 0$ 2) $x + 2y - 5 = 0$

3) $2x + y - 6 = 0$ 4) $2x - y + 7 = 0$

11. Tangents are drawn from (a, b) to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ making angles q_1, q_2 with x-axis. If $\tan q_1 . \tan q_2 = 1$ then $a^2 - b^2 =$

1) $a^2 + 2b^2$ 2) $2a^2 + b^2$

3) $a^2 + b^2$ 4) $a^2 - b^2$

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

1) $2a^2$ 2) a^2 3) $\frac{a^2}{2}$ 4) $4a^2$

13. The line y=mx+c is a normal to $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ then $\frac{a^2}{m^2} - b^2$

1) $\frac{(a^2 - b^2)^2}{2c^2}$ 2) $\frac{(a^2 + b^2)^2}{4c^2}$

3) $\frac{(a^2 + b^2)^2}{c^2}$ 4) $\frac{(a^2 - b^2)^2}{4c^2}$

14. A normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ meets the axes in Q and R . Then the locus of the mid-point of QR is

1) $2(a^2x^2 - b^2y^2) = (a^2 + b^2)^2$

2) $a^2x^2 - b^2y^2 = 4(a^2 + b^2)^2$

3) $4(a^2x^2 - b^2y^2) = (a^2 + b^2)^2$

4) $a^2x^2 - b^2y^2 = (a^2 + b^2)^2$

15. If the tangent and normal to $x^2 - y^2 = a^2$ at a point cut off intercepts a_1, a_2 and b_1, b_2 on the x-axis and y-axis respectively then $a_1a_2 + b_1b_2 =$

1) 0 2) a^2 3) 1 4) -1

16. P(3,1) is a point on $x^2 - 4y^2 = 5$ and the tangent and normal at P meets the x-axis at T and N. If C is the centre of the hyperbola then CT. CN=

1) 25/8 2) 25/6 3) 25 4) 25/4

17. If the locus of middle points of the chords of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ which passes through a fixed point (h,k) is a hyperbola its centre is

1) $\left(\frac{k}{2}, \frac{h}{2}\right)$ 2) $\left(\frac{h}{2}, \frac{k}{2}\right)$ 3) $\left(\frac{h}{4}, \frac{k}{4}\right)$ 4) $\left(\frac{k}{4}, \frac{h}{4}\right)$

18. The locus of middle points of normal chords of $x^2 - y^2 = a^2$ is

1) $(y^2 - x^2)^3 = 4a^2x^2y^2$

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

3) $(y^2 + x^2)^3 = 2a^4x^2y^2$

4) $(y^2 + x^2)^3 = 2a^2x^2y^2$

19. A tangent to auxiliary circle of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ intersects the hyperbola in P and Q. Then the locus of mid point of PQ is

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

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

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

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

20. The foot of the perpendicular from the focus of the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ on its asymptote is

1) $\left(\frac{4}{5}, \frac{3}{5}\right)$ 2) $\left(\frac{3}{5}, \frac{4}{5}\right)$ 3) $\left(\frac{16}{5}, \frac{9}{5}\right)$ 4) $\left(\frac{16}{5}, \frac{12}{5}\right)$

21. Any straight line parallel to an asymptote of a hyperbola intersects the hyperbola at how many points
1) One 2) Two 3) Three 4) Four

22. The eccentricity of a hyperbola is $\sqrt{2}$ and its centre is (1,1) if the equation of one asymptote is $2x + 3y - 5 = 0$ then the equation of the other asymptote is
1) $3x - 2y = 0$ 2) $3x - 2y = 1$
3) $3x - 2y + 1 = 0$ 4) $3x - 2y + 3 = 0$

23. The separate equations of the asymptotes of rectangular hyperbola $x^2 + 2xy\cot 2\alpha - y^2 = a^2$ are
1) $x\cot\alpha - y = 0, x\tan\alpha + y = 0$
2) $x\cot\alpha + y = 0, x\tan\alpha + y = 0$
3. $x\cot\alpha + y = 0, x\tan\alpha - y = 0$
4) $x\cot\alpha - y = 0, x\tan\alpha - y = 0$

24. The equation of one asymptote of the hyperbola $14x^2 + 38xy + 20y^2 + x - 7y - 91 = 0$ is $7x + 5y - 3 = 0$ then the other asymptote is
1) $2x + 4y = 1$ 2) $2x - 4y = 1$
3) $2x + 4y + 1 = 0$ 4) $2x - 4y + 1 = 0$

25. If PN is perpendicular from a point on the rectangular hyperbola to its asymptotes. Then the locus of the mid point of PN is
1) Circle 2) Parabola
3) Ellipse 4) Hyperbola

26. The polar of any point on a asymptote of a hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ with respect to it is
1) Parallel to that asymptote
2) Perpendicular to that asymptote
3) not parallel to that asymptote
4) not perpendicular to that asymptote

27. The curve described parametrically by $x = t^2 + t + 1, y = t^2 - t + 1$ represents
1) a pair of straight lines
2) an ellipse
3) a parabola 4) a hyperbola

28. Two straight lines passes through the fixed points $(\pm a, 0)$ have gradients whose product is k(>0). Then the locus of the point of intersection of the lines is
1) a circle 2) an ellipse
3) a straight line 4) a hyperbola

29. One focus of a hyperbola is (3,0) and its corresponding directrix is $4x - 3y - 3 = 0$. If its $e = \frac{5}{4}$ then one vertex is
1) $\left(\frac{3}{5}, \frac{11}{5}\right)$ 2) $\left(\frac{11}{5}, \frac{3}{5}\right)$ 3) $\left(\frac{7}{5}, \frac{4}{5}\right)$ 4) $\left(\frac{4}{5}, \frac{7}{5}\right)$

30. 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 $2PC =$
1) PG 2) Gg 3) Pg 4) 2PG

31. If the line $ax + by + c = 0$ is a normal to the hyperbola $xy = 1$, then
1) $a > 0, b < 0$ 2) $a > 0, b > 0$
3) $a < 0, b < 0$ 4) $a = 0, b = 0$

KEY

1-10	2	4	1	1	3
	1	4	4	3	1
11-20	3	2	3	3	1
	4	2	1	1	4
21-30	1	2	1	3	4
	1	3	4	2	2
31-40	1				

Hints

1) $\frac{x^2}{a^2} - \frac{y^2}{a^2\left(e^2 - 1\right)} = 1$, Find e.

2) $C(0,0), A(0,5), S(0,6)$

b=5, be=6, $e = \frac{6}{5} \Rightarrow a^2 = 11$. Find $\frac{2a^2}{b}$.

3) $\sqrt{3}x - y = 4\sqrt{3k} \rightarrow, \sqrt{3}x + y$

$= \frac{4\sqrt{3}}{k} \rightarrow x \Rightarrow 3x^2 - y^2 = 48$

4) $a = 4, ae = 5 \Rightarrow e = \frac{5}{4}; x = 1 \pm \frac{16}{5}$.

6) It is in the form of $SP - S^1P = 2a$ where

$S(-4,3), S^1(4,3); a = 3; 2ae = 8 \Rightarrow e = \frac{4}{3}$.

$c(0,3), x = 0 \pm \frac{9}{4}$.

8) Use $\left(x^2 + y^2\right)^2 = \left(a^2x^2 - b^2y^2\right)$.

14) At θ equation of normal is

$$\frac{ax}{\sec\theta} + \frac{by}{\tan\theta} = a^2 + b^2;$$

$Q\left(\frac{(a^2+b^2)\sec\theta}{a},0\right), R\left(0,\frac{(a^2+b^2)\tan\theta}{b}\right)$

$x_1=\frac{(a^2+b^2)\sec\theta}{2a}, y_1=\frac{(a^2+b^2)\tan\theta}{2b}$.

Eliminate θ.

16) $CT.CN=a^2+b^2$.

17) $S_1=S_{11}$

$\frac{hx_1}{a^2}-\frac{ky_1}{b^2}=\frac{x_1^2}{a^2}-\frac{y_1^2}{b^2}$. Centre $\left(\frac{h}{2},\frac{k}{2}\right)$.

27) $\frac{x-y}{2}=t; x=\left(\frac{x-1}{2}\right)^2+\left(\frac{x-1}{2}\right)+1$ in which $h^2=ab$, a parabola.

28) $y=mx+c; y=mx-am; y=mx+am; y^2=k\left(x^2-a^2\right)$, a hyperbola.

LEVEL - III

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

   1) $\frac{1}{k}$ 2) $\frac{1}{k^2}$ 3) $\frac{4}{k^2}$ 4) $\frac{2}{k}$

2. P is a point on the hyperbola $\frac{x^2}{12}-\frac{y^2}{9}=1$ the ordinate of P meets the asymptotes in Q and Q[1] then QP. Q[1]P=

   1) 6 2) 21 3) 9 4) 12

3. $P(\theta)$ and $Q(\phi)$ are two points on the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ such that $\theta-\phi=2\alpha$. Then PQ touches the conic

   1) $\frac{x^2}{a^2}-\frac{y^2}{b^2}=\cos^2\alpha$

   2) $\frac{x^2}{a^2}-\frac{y^2\cos^2\alpha}{b^2}=1$

   3) $\frac{x^2\cos^2\alpha}{a^2}-\frac{y^2}{b^2}=1$

   4) $\frac{x^2}{b^2}-\frac{y^2}{a^2}=\cos^2\alpha$

4. If the normal to the rectangular hyperbola $xy=c^2$ at the point "t" meets the curve again at a point "t[1]" then

   1) $t^3t^1=1$ 2) $t^3t^1=-1$

   3) $t^2t^1=-1$ 4) $tt^1=-1$

5. If a triangle is inscribed in a rectangular hyperbola, its orthocentre lies

   1) inside the curve 2) outside the curve

   3) on the curve 4) can't be determined

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

   1) $x_1+x_2+x_3+x_4=1$

   2) $y_1+y_2+y_3+y_4=1$

   3) $x_1x_2x_3x_4=c^2$

   4) $y_1y_2y_3y_4=c^4$

7. PN is the ordinate of any point P on the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ and AA^1 is its transverse axis. If Q divides AP in the ratio $a^2:b^2$, then NQ is

   1) perpendicular to A^1P

   2) parallel to A^1P

   3) perpendicular to OP

   4) parallel to OP.

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

   1) r^2 2) $2r^2$ 3) $3r^2$ 4) $4r^2$

9. The length of latusrectum of a hyperbola $xy-3x-3y+7=0$ is

1) 4 2) 3 3) 2 4) 1

10. The normal at θ on the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ meets the transverse axis in G then $AG.A^1G=$

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

3) $a^2\left(e^4\sec^2\theta+1\right)$ 4) $a^2\left(1-e^4\sec^2\theta\right)$

KEY

1-10	4	3	3	2	3
	4	1	4	1	2

Hints :-

2) $QP.Q^1P=b^2$

3) $\frac{x}{a}\cos\left(\frac{\theta-\phi}{2}\right)-\frac{y}{b}\sin\left(\frac{\theta+\phi}{2}\right)=\cos\left(\frac{\theta+\phi}{2}\right)$

$\frac{x}{a}\cos\alpha-\frac{y}{b}\sin(\alpha+\theta)=\cos(\alpha+\theta)$ touches

$\frac{x^2\cos^2\alpha}{a^2}-\frac{y^2}{b^2}=1$

NEW PATTERN QUESTIONS
TYPE - 1

1.Observe the following lists.

HYPERBOLA	ECCENTRICITY
A. $x^2-y^2=9$	1. 1
B. $xy=5$	2. $\sqrt{2}$
C. $2x^2-3y^2=6$	3. $\sqrt{\frac{5}{3}}$
D. $4(x-1)^2-2(y+2)^2=10$	4. $\sqrt{3}$

The correct match is

	A	B	C	D
1.	1	2	3	4
2.	2	1	3	4
3.	2	2	3	4
4.	2	4	1	3

2) Observe the following list

HYPERBOLA	CENTRE
A. $2x^2+5xy+2y^2-11x-7y-4=0$	1. $\left(\frac{84}{25},\frac{-12}{25}\right)$
B. $2xy+3x+4y+1=0$	2. $(-1,3)$
C. $\frac{(3x-4y-12)^2}{225}-\frac{(4x+3y-12)^2}{100}=1$	3. $(6,2)$
D. $72(x-6)^2-9(y-2)^2=32$	4. $(3,-1)$
	5. $\left(-2,\frac{-3}{2}\right)$

The correct match is

	A	B	C	D
1)	1	3	2	5
2)	2	5	1	3
3)	2	5	3	1
4)	1	3	5	2

3. Match the following:

Equations of the curve	Nature of the curve
A. $x=2(\cos t+\sin t)$, $y=5(\cos t-\sin t)$	1. Parabola
B. $x=3(\cosh\theta+\sinh\theta)$, $y=4(\cosh\theta-\sinh\theta)$	2. Ellipse
C. $x=\sin^2 t, y=2\cos t$	3. Hyperbola
	4. Rectangular hyperbola

The correct match is

	A	B	C
1)	1	2	3
2)	2	3	1
3)	3	2	1
4)	2	4	1

4. Match the following

Hyperbola	*Length of Latusrectum*
I. $x^2-4y^2=4$	a. 1
II. $25y^2-16x^2=400$	b. 12
III. $2x^2-y^2-4x-4y-20=0$	c. $\frac{9}{2}$
IV. $9x^2-16y^2+72x-32y-16=0$	d. $\frac{25}{2}$

The correct match is

	I	II	III	IV
1.	a	b	c	d
2.	a	d	b	c
3.	c	a	b	d
4.	b	c	d	a

5. Match the following:

Hyperbola	**Auxiliary circle**
I. $5x^2 - 9y^2 = 45$	a. $x^2 + y^2 = 2$
II. $2x^2 - 5y^2 + 10 = 0$	b. $x^2 + y^2 = 9$
III. $x^2 - 4y^2 + 16 = 0$	c. $x^2 + y^2 = 16$
IV. $xy = 8$	d. $x^2 + y^2 = 4$
	e. $x^2 + y^2 = 8$

1) b,a,d,c 2) b,a,d,e 3) a,b,c,d 4) b,c,d,e

KEY

1-5	3	2	4	2	1

TYPE - 2

1. The ascending order of lengths of the transverse axis (a), conjugate axis (b) and eccentricity(g) of the hyperbola is

1) a, b, g 2) a, g, b
3) g, a, b 4) b, a, g

2. Arrange the eccentricities of the following hyperbola in the descending order
A. In a hyperbola, the distance between the foci is three times the distance between the directrices
B. In a hyperbola, the transverse axis is double the conjugate axis
C. $axy = b + c\,(abc > 0)$
1) A,C,B 2) B,C,A 3) A,B,C 4) C,A,B

3. The arrangement of the following hyperbolas in the ascending order of the radius of their director circles.
A) $16x^2 - 25y^2 = 400$
B) $4x^2 - 9y^2 = 36$
C) $9x^2 - 16y^2 = 144$
D) $3x^2 - 4y^2 = 12$
1) A,B,C,D 2) A,C,B,D
3) D,B,C,A 4) D,C,B,A

4. The equation of the tangent to the hyperbola $3x^2 - 2y^2 = 10$ at (2,1) is $ax + by + c = 0$ then the descending order of a,b,c is
1) a,b,c 2) b,c,a 3) c,a,b 4) c,b,a

5. Asymptotes of a rectangular hyperbola $2x^2 + 3xy - 2y^2 - 6x + 13y - 36 = 0$ are $x + 2y - 5 = 0$ and $ax + by + c = 0$ (a>0). The ascending order of a,b,c is
1) b,a,c 2) a,b,c
3) c,a,b 4) b,c,a

KEY

1-5	3	1	3	1	1

TYPE - 3

1. I: If P,Q,R,S are the ends of the latusrecta of the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ then the area of the rectangle PQRS is 45 sq. units.

II: The centre of the hyerbola $\frac{(x + y - 1)^2}{3} - \frac{(x - y - 3)^2}{6} = 1$ lies in second quadrant.

Which of the above statement is correct?
1) Only I 2) Only II
3) Both I and II 4) Neither I nor II

2. I: The number of integral values of k for which the equation $\frac{x^2}{3k - 2} + \frac{y^2}{k - 10} = 1$ represents a hyperbola is 10.
II: The equation $\frac{x^2}{3k - 2} + \frac{y^2}{k - 10} = 1$ represents a rectangular hyperbola if k=3
Which of the above statement is correct?
1) Only I 2) Only II
3) Both I and II 4) Neither I nor II

3. I: The orthocentre of the triangle formed by any three poins on $xy = c^2$ lies on the same hyperbola.
II: The triangle formed by any three points on $xy = c^2$ (x>0,y>0) is an obtuse angled triangle.
Which of the above statement is correct?
1) Only I 2) Only II
3) Both I and II 4) Neither I nor II

4. I: The combined equation of the pair of asymptotes of the hyperbola $2xy + 6x + y + 5 = 0$ is $2xy + 6x + y + 3 = 0$.
II: The angle between the asymptotes of the hyperbola $xy - 2y + 3x + \sqrt{3} = 0$ is 60^0.
Which of the above statement is correct?
1) Only I 2) Only II
3) Both I and II 4) Neither I nor II

5. I: The angle between the asymptotes of the hyperbola $x^2 - 3y^2 = 3$ is 30^0.

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

Which of the above statement is correct?

1) Only I   2) Only II

3) Both I and II   4) Neither I nor II

KEY

1-5	1	2	3	1	2

TYPE - 4

1. Assertion(A): The number of tangents to the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ having slope $\frac{1}{2}$ is zero.

Reason(R): If slope of a tangent to $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is m then $m \in \left(-\infty, -\frac{b}{a}\right] \cup \left[\frac{b}{a}, \infty\right)$.

1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true but R is not correct explanation of A.
3) A is true but R is false.
4) A is false but R is true.

2. Assertion(A): The equation $(x+1)(y-3) = 4$ represents a rectangular hyperbola.

Reason(R): The equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a rectangular hyperbola if . $a + b = 0, h^2 > ab, abc + 2fgh - af^2 - bg^2 - ch^2 \neq 0$

1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true but R is not correct explanation of A.
3) A is true but R is false.
4) A is false but R is true.

3. Assertion(A): The difference of the focal distances of any point on the hyperbola $\frac{x^2}{36} - \frac{y^2}{9} = 1$ is 12.

Reason(R): The difference of the focal distances of any point on the hyperbola is equal to the length of it transverse axis.

1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true but R is not the correct explanation of A.
3) A is true but R is false.
4) A is false but R is true.

4. Assertion(A): The product of the perpendiculars from the foci to any tangent to the hyperbola $\frac{x^2}{12} - \frac{y^2}{9} = 1$ is 9.

Reason(R): The product of the perpendiculars from the foci on any tangent to the hyperbola is square of the semi transverse axis.

1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true but R is not correct explanation of A.
3) A is true but R is false.
4) A is false but R is true.

5. Assertion(A): The points of intersection of asymptotes of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and the directrices lie on the circle $x^2 + y^2 = a^2$.

Reason(R): The locus of the feet of perpendiculars from the foci of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ to any of its tangents is the auxiliary circle $x^2 + y^2 = a^2$.

1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true but R is not correct explanation of A.
3) A is true but R is false.
4) A is false but R is true.

6. Assertion(A): The angle between the asymptotes of $3x^2 - y^2 = 3$ is 120^0.

Reason(R): The angle between the asymptotes of $x^2 - y^2 = a^2$ is 90^0.

1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true but R is not correct explanation of A.
3) A is true but R is false.
4) A is false but R is true.

7. Assertion(A): If the lines $3x + y + p = 0$ and $2x + 5y - 3 = 0$ are conjugate with respect to $3x^2 - 2y^2 = 6$ then p=1

Reason(R): If the lines $l_1x + m_1y + n_1 = 0$ and $l_2x + m_2y + n_2 = 0$ are conjugate with respect to the hyperbola S=0 is $a^2l_1l_2 + b^2m_1m_2 = n_1n_2$

1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true but R is not correct explanation of A.
3) A is true but R is false.
4) A is false but R is true.

8. Assertion(A): If the line $x + 3y + 2 = 0$ and its perpendicular line are conjugate w.r. to $3x^2 - 5y^2 = 15$ then the equation of the conjugate line is $3x - y + 12 = 0$.
Reason(R): If (x_1, y_1) and (x_2, y_2) are conjugate with respect to the hyperbola S=0 then $S_{12} = 0$.
1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true but R is not correct explanation of A.
3) A is true but R is false.
4) A is false but R is true.

KEY

1-8	1	1	1	3	2
	2	3	2		

PREVIOUS EAMCET QUESTIONS

(2005)

In this year Questions were not given in this lesson.

(2004)

1. The eccentricity of the conic $36x^2 + 144y^2 - 36x - 96y - 119 = 0$ is
1) $\frac{\sqrt{3}}{2}$ 2) $\frac{1}{2}$ 3) $\sqrt{\frac{3}{4}}$ 4) $\sqrt{\frac{1}{3}}$

(2003)

2. The product of the lengths of perpendiculars drawn from any point on the hyperbola $x^2 - 2y^2 = 2$ to its asymptotes is
1) $\frac{1}{2}$ 2) $\frac{2}{3}$ 3) $\frac{3}{2}$ 4) 2

(2002)

3. If e and e[1] are the eccentricities of the ellipse $5x^2 + 9y^2 = 45$ and the hyperbola $5x^2 - 4y^2 = 45$ respectively then ee^1
1) 9 2) 5 3) 4 4) 1

(2001)

4. The products of the lengths of perpendiculars from any point on the hyperbola $x^2 - y^2 = 8$ to its asymptotes is
1) 2 2) 3 3) 4 4) 8

(2000)

In this year Questions were not given in this lesson

(1999)

5. The equation $\frac{1}{r} = \frac{1}{8} + \frac{3}{8}\cos q$ represents a
1) circle 2) parabola
3) ellipse 4) hyperbola

6. The eccentricity of the hyperbola $4x^2 - 9y^2 = 2ax + b^2$ is
1) $\frac{a}{b}$ 2) $\frac{\sqrt{b}}{a}$ 3) $\frac{\sqrt{13}}{2}$ 4) $\frac{\sqrt{13}}{3}$

(1998)

In this year Questions were not given in this lesson

(1997)

7. Radius of the director circle of the hyperbola $\frac{x^2}{81} - \frac{y^2}{36} = 1$
1) $\frac{2}{\sqrt{5}}$ 2) $\sqrt{5}$ 3) $3\sqrt{5}$ 4) $\frac{\sqrt{5}}{2}$

8. The product of lengths of the perpendiculars from any point on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ to its asymptotes is
1) a^2b^2 2) $a^2 + b^2$
3) $\frac{a^2 + b^2}{a^2b^2}$ 4) $\frac{a^2b^2}{a^2 + b^2}$

9. The equation of a line which touches both the curves $y^2 = 4x$ and $3x^2 - 4y^2 = 12$ is
1) $y = x - 1$ 2) $x + 2y + 1 = 0$
3) $y = x + 1$ 4) $y = 1 - x$

(1996 - Re - exam)

10. The eccentricity of the hyperbola $9x^2 - 16y^2 + 72x - 32y - 16 = 0$ is
1) $\frac{5}{4}$ 2) $\frac{4}{5}$ 3) $\frac{9}{16}$ 4) $\frac{16}{9}$

11. The condition that the line $y = mx + c$ may be a tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is
1) $c^2 = a^2m^2 - b^2$ 2) $c^2 = b^2 - a^2m^2$
3) $c^2 = a^2 - b^2m^2$ 4) $c^2 = a^2 + b^2m^2$

12. The length of the latus rectum of the hyperbola $x^2 - 4y^2 = 4$ is

1) 2 2) 1 3) 4 4) 3

(1996)

13. The vertices of a hyperbola are (2,0), (-2,0) and the foci are (3,0), (-3,0). The equation of the hyperbola is

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

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

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

1) 30^0 2) 60^0 3) 90^0 4) 45^0

(1995)

15. 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

1) 1 2) 4 3) 6 4) 8

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

1) 2 2) 4 3) 6 4) 5

17. If e and e¹ are the eccentricities of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and its conjugate hyperbola, the value of $\frac{1}{e^2} + \frac{1}{e^{1^2}}$

1) 3 2) 2 3) 1 4) 0

(1994)

18. The equation of the conic with focus at (1,-1), directrix along $x - y + 1 = 0$ and with eccentricity $\sqrt{2}$ is

1) $x^2 - y^2 = 1$ 2) $xy = 1$

3) $2xy - 4x + 4y + 1 = 0$

4) $2xy + 4x - 4y + 1 = 0$

19. The curve represented by $x = a(\cosh q + \sinh q)$, $y = b(\cosh q - \sinh q)$ is

1) hyperbola 2) parabola

3) ellipse 4) circle

20. If e_1 and e_2 are the eccentricities of a hyperbola and its conjugate then

1) $e_1^2 + e_2^2 = 3$

2) $e_1^2 + e_2^2 = e_1^2 e_2^2$

3) $e_1^2 + e_2^2 = 4$ 4) $e_1 = e_2$

21. The combined equation of the asymptotes of the hyperbola $xy + x + y + 5 = 0$ is

1) $xy = 0$

2) $(x - 1)(y - 1) = 0$

3) $(x - 1)(y + 1) = 0$

4) $(x + 1)(y + 1) = 0$

(1993)

22. The product of the distances from any point on the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ to its two asymptotes is

1) 144/25 2) 144/2 3) 144/20 4) 134/5

1992

n this year Questions were not given in this lesson.

1991

In this year Questions were not given in this lesson.

23. A and B are two fixed points. If PA-PB is a constant, the locus of P is

1) hyperbola2) parabola

3) circle 4) ellipse

(1989)

24. The foci of the hyperbola $9x^2 - 16y^2 - 18x + 32y - 151 = 0$ are

1) $(1 \pm 5, 1)$ 2) $(1 \pm 5, -1)$

3) $(-1 \pm 5, -1)$ 4) $(1 \pm 5, +2)$

25. The locus of the middle points of chords of hyperbola $3x^2 - 2y^2 + 4x - 6y = 0$ parallel to y=2x is

1) $3x - 4y = 4$ 2) $3y - 4x = 0$

3) $4x - 4y = 3$ 4) $3x - 4y = 2$

West Bengal JEE - 2002

26. The equation of the hyperbola whose foci are (4,2) and (8,2) and eccentricity is 3, is

1) $72(x - 6)^2 - 9(y - 2)^2 = 32$

2) $9(x - 6)^2 - 9(y - 2)^2 = 32$

3) $6(x - 3)^2 - 4(y - 2)^2 = 8$

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

NDA - 2002

27. The equation $2x^2 - 3y^2 = 6$ represents

1) circle

2) pair of real and distinct lines

3) ellipse 4) hyperbola

NDA-2001

28. The standard equation of the hyperbola having the distance between the foci as 32 and eccentricity $2\sqrt{2}$ is

1) $7x^2 - y^2 = 56$ 2) $x^2 - 7y^2 = 56$

3) $7x^2 - y^2 = 224$ 4) $x^2 - 7y^2 = 224$

Kerala PET - 2001

29. The equations $x = \frac{e^t + e^{-t}}{2}, y = \frac{e^t - e^{-t}}{2}$ represents the hyperbola then t is

1) set of real numbers
2) set of imaginary numbers
3) set of negative integers
4) set of natural numbers

30. A triangle formed by the latusrectum of the hyperbola with the farther vertex of the conic is equilateral triangle then the eccentricity is equal to

1) $\sqrt{3}$ 2) $\sqrt{3} + 1$

3) $\frac{\sqrt{3} + 1}{\sqrt{2}}$ 4) $\frac{\sqrt{3} + 1}{\sqrt{3}}$

31. If e and e_1 are the eccentricities of the hyperbola and its conjugate then $e_1^2 - e^2 =$

1) $e^2 e_1^2 - 2e^2$ 2) $e^2 e_1^2 + 2e^2$

3) $2e^2 - e^2 e_1^2$ 4) $2e^2 + e_1^2$

Eamcet-2007

32. If the line $lx + my = 1$ is a normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ then $\frac{a^2}{l^2} - \frac{b^2}{m^2} =$

1) $a^2 - b^2$ 2) $a^2 + b^2$

3) $\left(a^2 + b^2\right)^2$ 4) $\left(a^2 - b^2\right)^2$

KEY

1-10	1	2	4	3	4
	4	3	4	3	1
11-20	1	2	1	2	2
	2	3	3	1	2
21-30	4	1	1	1	1
	1	4	3	1	4
31-40	1	3			

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