

MISSION NDA MATHEMATICS

COMPLETE TOPICWISE QUESTIONS

HYPERBOLA

- The value of m , for which the line $y = mx + \frac{25\sqrt{3}}{3}$ is a normal to the conic $\frac{x^2}{16} - \frac{y^2}{9} = 1$, is
(a) $-\frac{2}{\sqrt{3}}$ (b) $\sqrt{3}$
(c) $-\frac{\sqrt{3}}{2}$ (d) none of these
- Equations of the common tangents to the hyperbolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$ are
(a) $y = \pm x$ (b) $by = \pm ax$
(c) $y = \pm x \pm \sqrt{a^2 - b^2}$ (d) none of these
- If the line $x + 3y + 2 = 0$ and its perpendicular line are conjugate w.r.t. to $3x^2 - 5y^2 = 15$, then the equation of the conjugate line is
(a) $3x - y = 15$ (b) $3x - y + 12 = 0$
(c) $3x - y + 10 = 0$ (d) $3x - y = 4$
- The foci of the hyperbola $4x^2 - 9y^2 - 36 = 0$ are
(a) $[\pm\sqrt{11}, 0]$ (b) $[\pm\sqrt{12}, 0]$
(c) $[\pm\sqrt{13}, 0]$ (d) $[0, \pm\sqrt{12}]$
- The angle between the two asymptotes of the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ is
(a) $\pi - 2\tan^{-1}\frac{3}{4}$ (b) $\pi - 2\tan^{-1}\frac{3}{2}$
(c) $2\tan^{-1}\frac{3}{4}$ (d) $\pi - 2\tan^{-1}\frac{4}{3}$
- The eccentricity of the conjugate hyperbola of the hyperbola $x^2 - 3y^2 = 1$ is
(a) 2 (b) $\frac{2}{\sqrt{3}}$
(c) 4 (d) $\frac{4}{3}$
- The equation $16x^2 - 3y^2 - 32x + 12y - 44 = 0$ represents a hyperbola whose
(a) transverse axis is $4\sqrt{3}$ (b) conjugate axis is 4
(c) eccentricity is $\frac{\sqrt{19}}{\sqrt{3}}$ (d) centre is $(-1, 2)$
- The coordinates of a focus of the hyperbola $9x^2 - 16y^2 + 18x + 32y - 151 = 0$ are
(a) $(-1, 1)$ and $(-6, 1)$ (b) $(4, 1)$ and $(-6, 1)$
(c) $(4, -1)$ and $(-3, 1)$ (d) $(-1, 1)$ and $(4, -1)$
- A hyperbola has the asymptotes $x + 2y = 3$ and $x - y = 0$ and passes through $(2, 1)$. Its centre is



- (a) (1,2) (b) (2,2)
(c) (1,1) (d) (2,1)
10. The locus of the mid-points of the chords of the circle $x^2 + y^2 = 16$ which are tangent to the hyperbola $9x^2 - 16y^2 = 144$ is
(a) $(x^2 + y^2)^2 = 16x^2 - 9y^2$ (b) $(x^2 + y^2)^2 = 9x^2 - 16y^2$
(c) $(x^2 - y^2)^2 = 16x^2 - 9y^2$ (d) none of these
11. The eccentricity of the hyperbola $-\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is given by
(a) $e = +\sqrt{\frac{a^2+b^2}{a^2}}$ (b) $e = +\sqrt{\frac{a^2-b^2}{a^2}}$
(c) $e = +\sqrt{\frac{b^2-a^2}{a^2}}$ (d) $e = +\sqrt{\frac{a^2+b^2}{b^2}}$
12. If asymptotes of a hyperbola are at 90° , then
(a) eccentricity is $\sqrt{2}$
(b) eccentricity is 2
(c) eccentricity depends on the equation of the asymptotes
(d) none of these
13. If P is a point on the rectangular hyperbola $x^2 - y^2 = a^2$, C is its centre and S and S' are the two foci, then $SP \cdot S'P =$
(a) 2 (b) $(CP)^2$
(c) $(CS)^2$ (d) $(SS')^2$
14. The equation of the hyperbola passing through the origin and whose asymptotes are $3x + 4y = 5$ and $4x + 3y = 5$ is
(a) $x^2 - y^2 = 1$
(b) $12x^2 + 12y^2 + 35xy - 15x - 15y = 0$
(c) $12x^2 + 12y^2 + 25xy - 35x - 35y = 0$
(d) $12x^2 + 12y^2 + 25xy - 25x - 25y = 0$
15. The eccentricity of the conic $9x^2 - 16y^2 = 144$ is
(a) $4/5$ (b) $5/4$
(c) $4/3$ (d) $\sqrt{7}$
16. The equation $\frac{x^2}{12-\lambda} + \frac{y^2}{8-\lambda} = 1$ represents
(a) a hyperbola if $\lambda < 8$ (b) an ellipse if $\lambda > 8$
(c) a hyperbola if $8 < \lambda < 12$ (d) none of these
17. The locus of the poles with respect to $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, of any tangent to the circle, whose diameter is the line joining the foci, is the ellipse $\frac{x^2}{a^4} + \frac{y^2}{b^4}$ equal to
(a) $\frac{1}{a^2-b^2}$ (b) $\frac{1}{a^2+b^2}$
(c) $a^2 + b^2$ (d) none of these
18. If e and e' are the eccentricities of two conics S and S' and if $e^2 + e'^2 = 3$, then both S and S' can be
(a) ellipses (b) parabolas
(c) hyperbolas (d) none of these



19. The equation of the hyperbola whose foci are (6,5) and (-4,5) and eccentricity is $5/4$ is
- (a) $\frac{(x-1)^2}{16} - \frac{(y-5)^2}{9} = 1$ (b) $\frac{x^2}{16} - \frac{y^2}{9} = 1$
 (c) $\frac{(x-1)^2}{16} - \frac{(y-5)^2}{9} = -1$ (d) none of these
20. If the line $2x + \sqrt{6}y = 2$ touches the hyperbola $x^2 - 2y^2 = 4$, then the point of contact is
- (a) $(-2, \sqrt{6})$ (b) $(-5, 2\sqrt{6})$
 (c) $(\frac{1}{2}, \frac{1}{\sqrt{6}})$ (d) $(4, -\sqrt{6})$
21. PQ and RS are two perpendicular chords of the rectangular hyperbola $xy = c^2$. If C is the centre of the rectangular hyperbola, then the product of the slopes of CP , CQ , CR and CS is equal to
- (a) -1 (b) 1
 (c) 0 (d) none of these
22. Suppose a hyperbola has its transverse and conjugate axes coinciding with the major and minor axes of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ respectively. If the hyperbola passes through one of the foci of the ellipse and the product of the eccentricities of the hyperbola and ellipse is one, then
- (a) the equation of the hyperbola is $\frac{x^2}{9} - \frac{y^2}{16} = 1$
 (b) the vertex of the hyperbola is $(5\sqrt{2}, 0)$
 (c) the equation of the hyperbola is $\frac{x^2}{16} - \frac{y^2}{25} = 1$
 (d) none of these
23. The eccentricity of a hyperbola whose asymptotes are $3x - 4y = 7$ and $4x + 3y = 8$ is
- (a) $\sqrt{2}$ (b) 2
 (c) insufficient information (d) none of these
24. The equation of the tangent to the curve $4x^2 - 9y^2 = 1$ which is parallel to $4y = 5x + 7$ is
- (a) $24y - 30x = 17$ (b) $30y - 24x = \pm\sqrt{161}$
 (c) $24y - 30x = \pm\sqrt{161}$ (d) none of these
25. A common tangent to $9x^2 - 16y^2 = 144$ and $x^2 + y^2 = 9$ is
- (a) $y = \frac{3}{\sqrt{7}}x + \frac{15}{\sqrt{7}}$
 (b) $y = 3\sqrt{\frac{2}{7}}x + \frac{15}{\sqrt{7}}$
 (c) $y = 2\sqrt{\frac{3}{7}}x + 15\sqrt{7}$
 (d) none of these
26. 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 slope is c^2 , lies on the curve



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

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

27. The equation $16x^2 - 3y^2 - 12y - 44 = 0$ represents a hyperbola

- (a) the length of whose transverse axis is $4\sqrt{3}$
 (b) the length of whose conjugate axis is 4
 (c) whose centre is $(-1, 2)$
 (d) whose eccentricity is $\sqrt{\frac{19}{3}}$

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

- (a) $a^2 + b^2 = 2c^2$ (b) $b^2 - a^2 = 2c^2$
 (c) $a^2 - b^2 = 2c^2$ (d) $a^2 b^2 = 2c^2$

29. One equation of the common tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 2$ is

- (a) $2y = \sqrt{3}bx + ab$ (b) $y = 2\sqrt{3}\frac{b}{a}x + 2b$
 (c) no common tangent (d) $ay = \sqrt{3}bx + 2ab$

Assertion-Reason Type Questions

Each of these questions contains two statements: Statement I (Assertion) and Statement II (Reason). Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below:
 (a) Statement I is true, Statement II is true;

Statement II is a correct explanation for Statement I.
 (b) Statement I is true, Statement II is true;

Statement II is not a correct explanation for Statement I.
 (c) Statement I is true, Statement II is false.
 (d) Statement I is false, Statement II is true.

30. Statement I. The equation of the director circle to the hyperbola $4x^2 - 3y^2 = 12$ is $x^2 + y^2 = 1$.

Statement II: Director circle is the locus of the point of intersection of perpendicular tangents to a hyperbola.

31. Statement I: The line $bx - ay = 0$ will not meet the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 (a > b > 0)$.

Statement II: The line $y = mx + c$ does not meet the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, if $c^2 = a^2 m^2 - b^2$.

32. Statement I: A hyperbola and its conjugate hyperbola have the same asymptotes.
 Statement II: The difference between the second degree curve and pair of asymptotes is constant.

33. The eccentricity of the hyperbola $3x^2 - y^2 = 4$ is
 (a) 1 (b) 2



(c) -2

(d) 5

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

(a) $\frac{x}{x_1+x_2} + \frac{y}{y_1+y_2} = 1$

(b) $\frac{x}{x_1-x_2} + \frac{y}{y_1-y_2} = 1$

(c) $\frac{x}{y_1+y_2} + \frac{y}{x_1+x_2} = 1$

(d) $\frac{x}{y_1-y_2} + \frac{y}{x_1-x_2} = 1$

35. 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 the value of b^2 is

(a) 1

(b) 5

(c) 7

(d) 9

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

(a) a hyperbola

(b) a parabola

(c) a circle

(d) an ellipse

37. A circle touches the x -axis and also touches the circle with centre $(0,3)$ and radius 2. The locus of the centre of the circle is

(a) a circle

(b) an ellipse

(c) a parabola

(d) a hyperbola

38. For the hyperbola $\frac{x^2}{\cos^2 \alpha} - \frac{y^2}{\sin^2 \alpha} = 1$, which of the following remains constant when α varies?

(a) directrix

(b) abscissa of vertices

(c) abscissa of foci

(d) eccentricity

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

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

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

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

(d) none of these

40. If $(a-2)x^2 + 9y^2 = 4$ represents a rectangular hyperbola, then a is equal to

(a) 0

(b) -7

(c) 1

(d) 3

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

(a) 1

(b) 4

(c) 6

(d) 8

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



- (a) 0 (b) 1
(c) 2 (d) none of these

43. The product of perpendiculars drawn from any point of a hyperbola to its asymptotes is

- (a) $\frac{a^2b^2}{a^2+b^2}$ (b) $\frac{a^2+b^2}{a^2b^2}$
(c) $\frac{ab}{\sqrt{a^2+b^2}}$ (d) $\frac{ab}{a^2+b^2}$

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

- (a) 16 (b) -16
(c) ± 16 (d) none of these

45. The directrix of the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ is

- (a) $x = \frac{9}{\sqrt{13}}$ (b) $y = \frac{9}{\sqrt{13}}$
(c) $x = \frac{6}{\sqrt{13}}$ (d) $y = \frac{6}{\sqrt{13}}$

46. The eccentricity of the hyperbola conjugate to $x^2 - 3y^2 = 2x + 8$ is

- (a) $2/\sqrt{3}$ (b) $\sqrt{3}$
(c) 2 (d) none of these

47. The eccentricity of the hyperbola $9x^2 - 16y^2 - 18x - 64y - 199 = 0$ is

- (a) 16/9 (b) 5/4
(c) 25/16 (d) 0

48. If the distance between the directrices of a rectangular hyperbola is 10, then the distance between its foci will be

- (a) $10\sqrt{2}$ (b) 5
(c) $5\sqrt{2}$ (d) 20

49. The equation of the common tangent to the curves $y^2 = 8x$ and $xy = -1$ is

- (a) $3y = 9x + 2$ (b) $y = 2x + 1$
(c) $2y = x + 8$ (d) $y = x + 2$

50. Which one of the following is independent of α in the hyperbola $\left(0 < \alpha < \frac{\pi}{2}\right) \frac{x^2}{\cos^2 \alpha} -$

$\frac{y^2}{\sin^2 \alpha} = 1$?

- (a) eccentricity (b) abscissa of foci
(c) directrix (d) vertex

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

- (a) $(-2, \sqrt{6})$ (b) $(-5, 2\sqrt{6})$



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

(d) $(4, -\sqrt{6})$

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

(a) $x^2 \operatorname{cosec}^2 \theta - y^2 \sec^2 \theta = 1$

(b) $x^2 \sec^2 \theta - y^2 \operatorname{cosec}^2 \theta = 1$

(c) $x^2 \sec^2 \theta - y^2 \cos^2 \theta = 1$

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

53. If the chords of contact of tangents from two points (x_1, y_1) and (x_2, y_2) to the hyperbola $4x^2 - 9y^2 - 36$ are at right angles, then $\frac{x_1 x_2}{y_1 y_2}$ is equal to

(a) $9/4$

(b) $-9/4$

(c) $81/16$

(d) $-81/16$

54. The equation of the director circle of the hyperbola $\frac{x^2}{16} - \frac{y^2}{4} = 1$ is given by

(a) $x^2 + y^2 = 16$

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

(c) $x^2 + y^2 = 20$

(d) $x^2 + y^2 = 12$

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

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

(b) $xy = 1$

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

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

56. If the distance between the foci and the distance between the directrices of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ are in the ratio 3:2, then $a:b$ is

(a) $\sqrt{2}:1$

(b) $\sqrt{3}:\sqrt{2}$

(c) $1:2$

(d) $2:1$

57. The ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ and the hyperbola $\frac{x^2}{25} - \frac{y^2}{16} = 1$ have in common

(a) centre only

(b) centre, foci and directrices

(c) centre, foci and vertices

(d) centre and vertices only

58. Coordinates of the foci of a hyperbola are $(-5, 3)$ and $(7, 3)$ and eccentricity is $3/2$. Then, length of its latus rectum is

(a) 20

(b) 10

(c) 40

(d) none of these

59. The length of the straight line $x - 3y = 1$ intercepted by the hyperbola $x^2 - 4y^2 = 1$ is

(a) $\frac{3}{5}\sqrt{10}$

(b) $\frac{6}{5}\sqrt{10}$

(c) $\frac{5}{3}\sqrt{10}$

(d) $\frac{5}{6}\sqrt{10}$

60. The eccentricity of the hyperbola which passes through $(3, 0)$ and $(3\sqrt{2}, 2)$ is

(a) $\sqrt{13}$

(b) $\sqrt{13}/3$



(c) $\sqrt{13}/4$

(d) none of these

61. The product of the perpendiculars drawn from any point on a hyperbola to its asymptotes is

(a) $\frac{ab}{\sqrt{a^2+b^2}}$

(b) $\frac{ab}{a^2+b^2}$

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

(d) $\frac{a^2+b^2}{a^2b^2}$

62. 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 KEY

1. (a)	2. (c)	3. (b)	4. (c)	5. (c)	6. (a)	7. (c)	8. (b)
9. (c)	10. (a)	11. (d)	12. (a)	13. (b)	14. (c)	15. (b)	16. (c)
17. (b)	18. (c)	19. (a)	20. (d)	21. (b)	22. (a)	23. (a)	24. (c)
25. (b)	26. (c)	27. (d)	28. (c)	29. (d)	30. (d)	31. (c)	32. (b)
33. (b)	34. (a)	35. (c)	36. (a)	37. (c)	38. (c)	39. (c)	40. (b)
41. (b)	42. (b)	43. (a)	44. (c)	45. (a)	46. (c)	47. (b)	48. (d)
49. (d)	50. (b)	51. (d)	52. (a)	53. (d)	54. (d)	55. (c)	56. (a)
57. (d)	58. (b)	59. (b)	60. (b)	61. (c)	62. (b)		

